APPENDIX L

CITY OF VACAVILLE 2010 URBAN WATER MANAGEMENT PLAN

CITY OF VACAVILLE

2010 Urban Water Management Plan Update

JULY 2011

NOLTE

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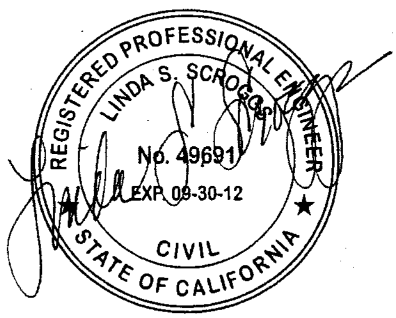
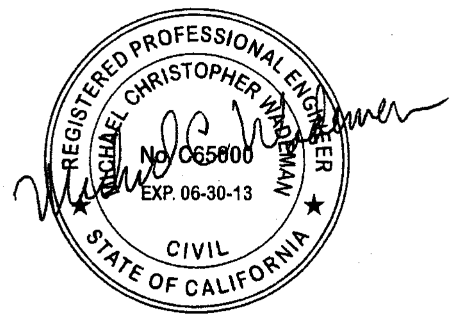
CITY OF VACAVILLE

2010 Urban Water Management Plan Update





July 2011

Submitted to:
City of Vacaville
Utilities Department
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City of Vacaville 2010 Urban Water Management Plan Contact Sheet

Date plan submitted to the Department of Water Resources: July 2011

Name of person preparing this plan: Vanessa Andrews

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Email address: vandrews@ci.vacaville.ca.us

The water supplier is a: Municipality

The water supplier is a: Retailer

Utility services provided by the water supplier include: water treatment, storage, and distribution; wastewater treatment

Is this agency a bureau of reclamation contractor? Yes

Is this agency a state water project contractor? Yes

1.0 INTRODUCTION

The following plan has been prepared in accordance with State of California Assembly Bill No. 797. The bill, adopted in 1983, required all water suppliers in California with more than 3,000 customers or a demand exceeding 3,000 acre-feet annually to prepare and adopt an urban water management plan (UWMP) by 1985. The legislation also required the suppliers to adopt follow-up plans by December 31, 1990. Since originally adopted in 1983, the UWMP Act has been modified by several bills:

1. Assembly Bill 2661, adopted in July 1990, formally extended the process, requiring suppliers to update their plans every five years.

2. Subsequently, Senate Bill 553 (SB 553) was signed into law on September 28, 2000, revising the Urban Water Management Planning Act by replacing the 16 Demand Management Measures (DMMs) with the 14 Best Management Practices (BMPs) currently being implemented by Group 1 signatories to the Memorandum of Understanding Regarding Urban Water Conservation in California.

3. AB 2552 was signed into law on September 28, 2000, and requires each urban water supplier to notify any city or county within which the supplier provides water supplies that the urban water supplier will be reviewing its UWMP and considering changes to the plan.

4. AB 1420 was adopted in 2007, and requires water suppliers to implement the water Demand Management Measures to be eligible for water management grants or loans administered by the Department of Water Resources (DWR).

5. SBx7-7, adopted in 2009, was passed with the goal of reducing municipal water use by 20 percent by the year 2020. SBx7-7 requires water suppliers to report baseline per capita water use, 2015 interim per capita water use target, 2020 per capita water use targets, and the basis for determining the estimates.

In response to assembly Bill 797, the City of Vacaville (City) prepared and submitted its first UWMP in 1985. The follow-up plan in 1990 was prepared and submitted in January 1991 as part of a county-wide effort. The water agencies of Solano County, with which the City of Vacaville cooperated for the 1990 plan, were the City of Benicia, City of Fairfield, Solano County Water Agency (SCWA), City of Suisun, and the City of Vallejo. Subsequent updates to the 1990 plan including this 2010 plan update were produced as individual plans by the City of Vacaville.

1.1 UWMP Contents

This section provides a brief description of the contents of the plan by section.

Section 1.0 – Introduction: This section provides the contact sheet, a review of the plan contents, and background information about the City of Vacaville.

Section 2.0 – Public Participation: Section 2.0 provides a summary of public outreach activities, plan adoption information, and agency coordination.

Section 3.0 – Water Supply Sources: This section reviews the potential sources for water in the City of Vacaville, including groundwater, surface water, and imported water.

Section 4.0 – SBx7-7 Water Use Targets: The calculation of baseline per capita water use and per capita water use targets are presented in Section 4.0 as required by SBx7-7.

Section 5.0 – Water Use Provisions: Past, current, and projected water use is summarized in Section 5.0. Water use is quantified for five-year increments through the year 2035 for uses such as single-family residential, industrial, commercial, etc.

Section 6.0 – Reliability Planning: This section discusses the frequency and magnitude of supply deficiencies, plans to ensure a reliable water supply, and transfer and exchange opportunities.

Section 7.0 – Supply and Demand Comparison Provisions: This section compares current and projected water supply and demand.

Section 8.0 – Water Demand Management Measures: Section 8.0 provides a description of each water DMM that is currently being implemented, or scheduled for implementation, including the steps necessary to implement any proposed measures.

Section 9.0 – Water Recycling: This section discusses wastewater generation, collection, and treatment, as well as disposal and potential recycled water uses. It also discusses actions taken to encourage recycled water use.

APPENDIX A Urban Water Management Plan Checklist

APPENDIX B Public Notification Materials

APPENDIX C Resolution to Adopt the City of Vacaville 2010 Urban Water Management Plan Update

APPENDIX D UWMP Update Participants

APPENDIX E Groundwater Source Sufficiency Technical Memorandum

APPENDIX F 2009 Drinking Water Quality Consumer Confidence Report

APPENDIX G Urban Water Shortage Contingency Plan

APPENDIX H Solano Project Water Supply Availability

APPENDIX I State Water Project Water Supply Availability

APPENDIX J Water Efficient Landscape Requirements & Comparison with State Model Water Efficient Landscape Ordinance

APPENDIX K Public Works Department 2010/2011 Second Quarter Status of Capital Improvement Projects

The Department of Water Resources Urban Water Management Plan Checklist is used to confirm that the required information is included in the UWMP. A Checklist for the 2010 UWMP Update is included in Appendix A.

1.2 Plan Implementation

This UWMP provides a comparison of water supplies available to the City with the projected water demand through the year 2035, as well as discusses conservation measures the City has implemented to ensure a safe and reliable water supply is available to the City. As with previous UWMP Updates prepared by the City, this plan will be used to provide the basis for determining that sufficient water supply is available for future proposed development.

This UWMP also provides the per capita water use baseline and target required by SBx7-7. The City will compare the per capita water use in upcoming years with the SBx7-7 targets to ensure the City will meet its 2015 and 2020 per capita water use targets.

1.3 Background

This section presents history and population growth information for the City of Vacaville, as well as a summary of the City's climate.

History and Growth

The City of Vacaville, founded in 1850, is nestled at the base of the Vaca Mountains. Vacaville is located centrally between Sacramento and San Francisco on Interstate 80. City limits encompass over 29 square miles with a population of approximately 97,000, which makes Vacaville the third largest city in Solano County.

The population of Vacaville increased by 63 percent from 1980 to 1990 and increased an additional 24 percent from 1990 to 2000. The growth rate from 2000 to 2010 was approximately 10 percent. It is anticipated that the population will grow by an additional 14 percent from 2011 to 2035. This population projection is based on slower growth than previous population projections, due to decreasing population growth trends caused by the economic downturn observed recently.

Population projections for Solano County published in the City Community Development Department's *Community Profile and Trends Report* are summarized in Table 1.

TABLE 1
CITY OF VACAVILLE POPULATION PROJECTIONS 2010 – 2035

Year	2010[a]	2015[b]	2020[b]	2025[b]	2030[b]	2035[b]
Population	97,300	102,600	105,000	107,300	109,400	111,100

[a] 2010 population from California Department of Finance.
[b] Population projections for 2015 to 2035 provided by Association of Bay Area Government's 2009 Projections and Priorities.

By far, the largest growth increase has been in the residential sector. While commercial and industrial growths have been steady, they have not kept pace with residential growth. In the next 20 years, commercial and industrial development is projected to increase an average of five percent per year. Approximately 76 percent of the City's total water consumption occurs in the residential sector. For this reason, the City has chosen to focus water conservation efforts on residential household and landscape usage. As of 2010, Vacaville's total domestic water connections number approximately 26,830. Table 2 provides a summary of the current number of connections by customer type.

TABLE 2
CURRENT NUMBER OF CONNECTIONS BY CUSTOMER TYPE

Customer Type	Number of Connections [a]
Single-family Residential	24,332
Multi-family Residential	644
Commercial	1,028
Industrial	79
Public Agency/Institutional	222
Dedicated Landscaping	525
General Other	0
Total	**26,830**

[a] Number of connections in 2010

Climate

The climate in Vacaville is characterized by mild winters and hot summers. The Western Regional Climate Center reports that the annual average precipitation is 24.55 inches, 85 percent of which occurs from December through March. Temperatures during the winter usually drop into the forties at night and occasionally drop below the freezing point. Snow is extremely rare. In the summer, temperatures often rise above 100 degrees. The days are typically hottest between four and five P.M. and temperatures cool off noticeably in the evenings.

The climate has significant influence on the water demands in Vacaville. Winters are characterized by relatively low water demand, while the summers have substantially higher demand. Lawn watering in the summer is a major contributor to the higher summer demand.

2.0 PUBLIC PARTICIPATION

2.1 Public Outreach

The City of Vacaville has actively encouraged community participation in its urban water management planning efforts since the first plan was developed in 1985. Advertisements were placed in the Vacaville Reporter (the City newspaper) and the draft Plan was made available to the public for review and comment before City Council approval. Copies of the draft Plan were available at City offices. Additionally, community input was sought during the development of the UWMP Workshop, which was held during the City Council meeting on June 14, 2011. Copies of the newspaper advertisement are included as Appendix B.

2.2 Plan Adoption

This 2010 update of the UWMP was prepared from March 2010 through March 2011. The updated plan was adopted by City Council and submitted to the Department of Water Resources (DWR) in July 2011. See Appendix C for a copy of the Resolution approving the filing of the 2010 Urban Water Management Plan Update. This plan includes all information necessary to meet the requirements of California Water Code Division 6, Part 2.6 (Urban Water Management Planning).

A copy of the adopted UWMP was submitted to the California Department of Water Resources, the California State Library, and is available to the public at the following locations in the City:

City Manager's Office (Front Counter)
Vacaville City Hall
650 Merchant Street
Vacaville, CA 95688

Utilities Department (Front Counter)
Utilities Control and Administration Building
6040 Vaca Station Road
Elmira, CA 95625

2.3 Agency Coordination

City of Vacaville Utilities Department staff coordinated the development of this plan with the City of Vacaville Finance Department. The Utilities Department is responsible for utility billing and maintains statistical data regarding water consumption. See Appendix D for a list of people contacted in the development of this plan.

The City also continues participation with SCWA as part of a Water Conservation Committee (WCC). This county-wide committee allows for broader distribution of materials and information as well as reduced costs to individual cities by sharing resources. Specific projects are highlighted in Section 8.0 of this plan.

SCWA is a wholesaler who supplies surface water to the City. SCWA is also instrumental in generating water source reliability factors used later in this report to determine the reliability of water sources. Water demand projections developed as part of this plan have been shared with SCWA. A copy of the UWMP will be provided to SCWA after adoption of the plan.

The City is currently upgrading its General Plan. The City coordinated with the General Plan consultant to ensure that information provided in the UWMP is consistent with the General Plan update.

3.0 WATER SUPPLY SOURCES

This section contains a description of the City's existing water supply system facilities. In addition, a discussion about existing and planned sources of water including groundwater, surface water, and recycled water, is provided.

3.1 Description of Existing Facilities

The water utility system is a self-supporting City enterprise that provides water to the residences of the City. The City's water supply service area is coaligned with the City limits. The water utility is responsible for operation, maintenance, and repair of the City's water treatment and distribution system, as well as water quality. It is also responsible for meter installation and meter reading. Vacaville's water utility system was purchased from Pacific Gas and Electric (PG&E) Company in 1959 by issuing voter-approved water revenue bonds. Since purchasing the system, the City has systematically improved and upgraded it.

The Vacaville water system consists of surface water treatment facilities, wells, pumping facilities, distribution and transmission pipelines, and storage reservoirs. The system receives water from several sources, including Solano Project water from the Lake Berryessa reservoir, State Water Project water and Settlement Water from the North Bay Aqueduct (NBA), and groundwater from local city wells. Within Vacaville's water entitlements, the percentage of water used from each supply source varies due to conjunctive use. If any one source has limited water availability or poor water quality, use from other sources can increase. Likewise, if unscheduled water becomes available it can be utilized to the City's advantage.

Surface water from Lake Berryessa is provided by contract between the U.S. Bureau of Reclamation and the SCWA and delivered by the Solano Irrigation District (SID). This water is treated at either the North Bay Regional water treatment plant (NBR) or at the City's diatomaceous earth water treatment plant (DE Plant). The DE Plant has a rated capacity of 12 million gallons per day (mgd) and a firm capacity of 10 mgd. Wells 1, 6, and 13 also supply water directly to the DE Plant clearwell. From the clearwell, a booster pump station pumps the water into the distribution system. Water from the remaining wells (2, 3, 5, 8, 9, 14, 15, 16, and De Mello) is treated at the wellhead and pumped directly to the distribution system. Well 7 is currently out of service due to a damaged casing. The City is evaluating whether the well will be repaired or abandoned. The De Mello Well is currently being used as a standby well. The City is currently planning for the construction of a new supply well, Well 17. The locations of the City wells and DE Plant are shown in Figure 1.

The NBR plant provides a capacity of 13.3 mgd for Vacaville and supplies water directly to the City's distribution system. The NBR plant draws water from the Sacramento River Delta via the NBA, as well as Solano project water from the Putah South Canal. The location of the NBA and Putah South Canal can be seen in Figure 2.

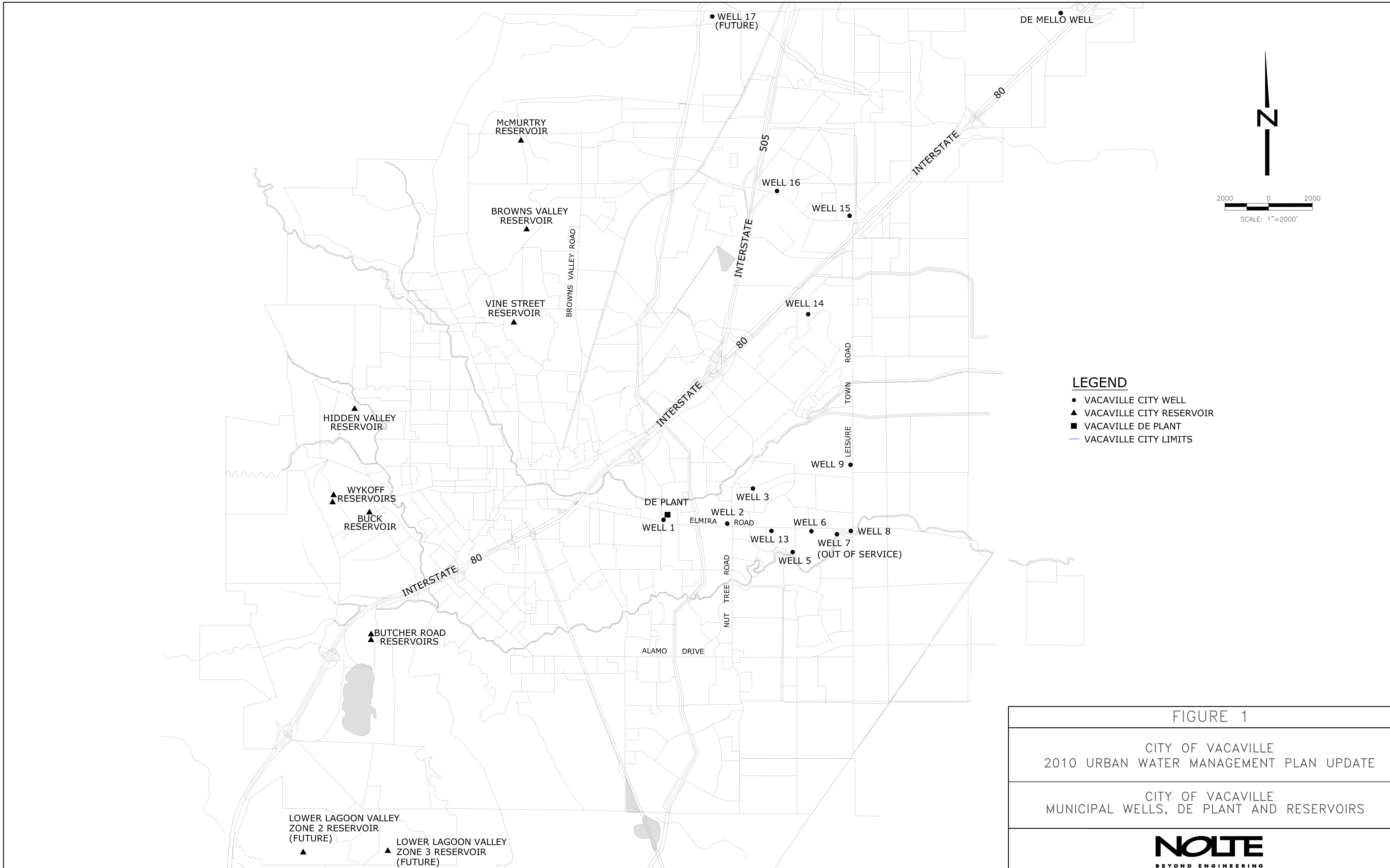

FIGURE 1

CITY OF VACAVILLE
2010 URBAN WATER MANAGEMENT PLAN UPDATE

CITY OF VACAVILLE
MUNICIPAL WELLS, DE PLANT AND RESERVOIRS

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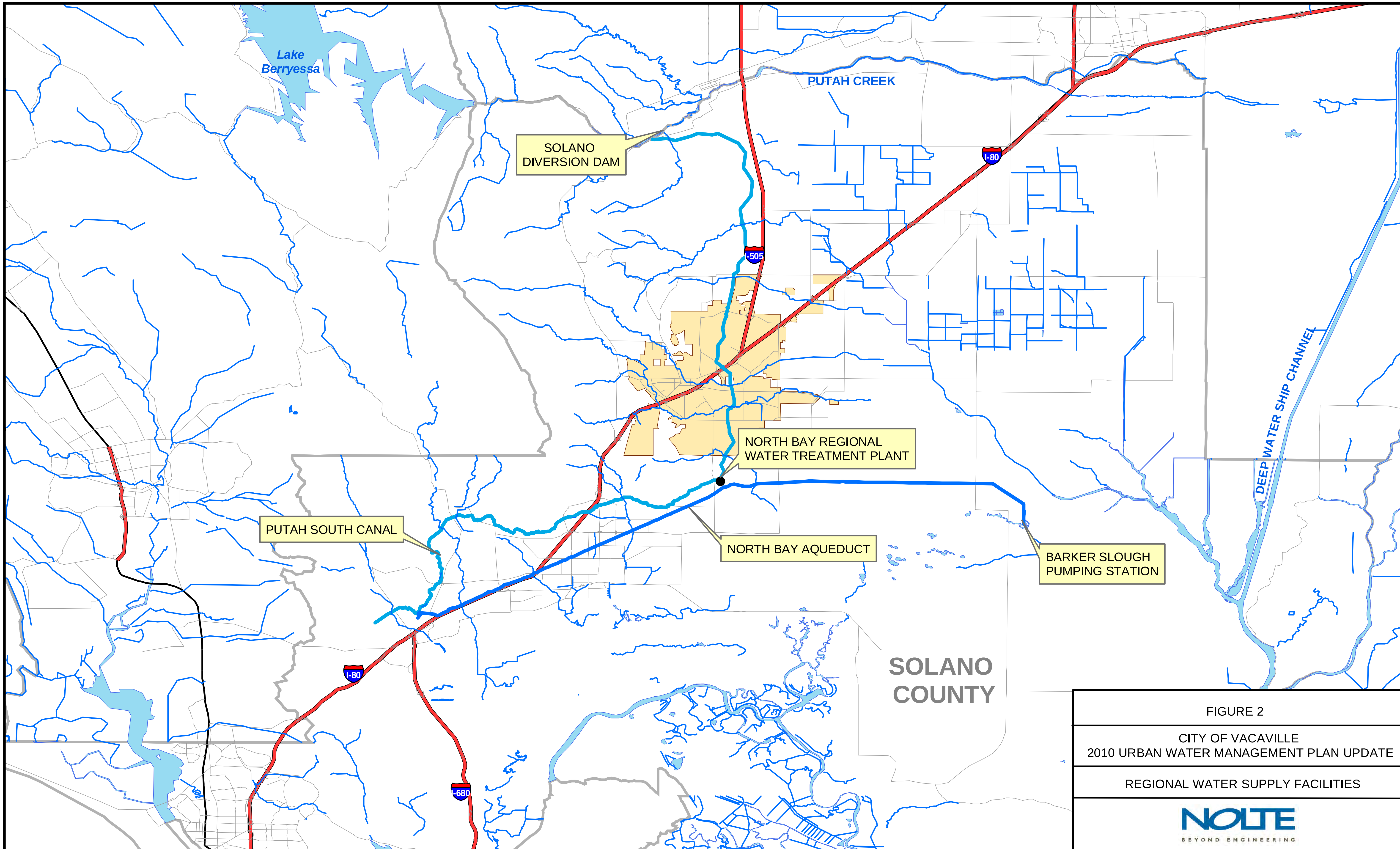

FIGURE 2

CITY OF VACAVILLE
2010 URBAN WATER MANAGEMENT PLAN UPDATE

REGIONAL WATER SUPPLY FACILITIES

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3.2 Groundwater

As noted earlier, one source of water supply for the City is groundwater. Currently, groundwater is provided by 12 permitted wells, 10 of which withdraw water from the deep aquifer in the basal zone of the Tehama Formation. Most City wells are located in the Elmira well field. However, new wells are being sited further north, near Interstate 80 (I-80). Currently, approximately 5,000 acre-feet per year (ac-ft/yr) of groundwater is withdrawn. Vacaville continues to explore well field expansion as a means of maintaining adequate water supply. A regional program is being implemented to monitor groundwater data as a means of insuring against overdraft or contamination. A discussion of the groundwater basin and historic groundwater pumping follows.

The City adopted a Groundwater Management Plan Update, prepared by Ludhorff and Scalmanini Consulting Engineers, on March 8, 2011. The Groundwater Management Plan provides the framework and related actions required to maintain a high quality, reliable, and sustainable groundwater supply.

Boundaries, Soils, Storage Capacity

The City pumps groundwater primarily from the basal zone of the Tehama Formation in the Solano Sub-basin, located east of the English Hills Fault. Well 1 is the only well currently in operation that extracts water from a different formation, the Markley Formation, located west of the English Hills fault. The Tehama formation consists of moderately to highly consolidated fluvial, alluvial, and lacustrine deposits. Lithology present within the Tehama Formation includes inter-layered sand, silt, clay, and gravel, a stiff blue lacustrine clay located near the upper portions of the formation, and other continuous clay layers that divide the formation into upper, middle, and basal zones. The basal zone of the formation also includes gravel and cobble deposits, layers of detrital tuff, and calcium carbonate cemented conglomerate.

The primary source of groundwater supply for municipal use is the basal zone of the Tehama Formation, which is a highly confined aquifer. The overlying Quaternary alluvial deposits and upper and middle zones of the Tehama Formation are not suitable for high production municipal water supply. However, they are used for some domestic and agricultural purposes in unincorporated areas of Vacaville. East of the Vacaville area, these aquifers are utilized by SID to supplement surface water supplies and for shallow groundwater pumping for drainage purposes.

The Solano Sub-basin includes the southernmost portion of the Sacramento Valley Basin and extends into the northern portion of the Sacramento-San Joaquin Delta. Sub-basin boundaries are as follows: (1) Putah Creek on the north; (2) Sacramento River on the east (from Sacramento to Walnut Grove); (3) North Mokelumne River on the southeast (from Walnut Grove to San Joaquin River); (4) San Joaquin River on the south (from the North Mokelumne River to Sacramento River); and, (5) boundary between the San Francisco bay and Sacramento River hydrologic study areas as described in DWR Bulletin 118 on the west.

Historic Groundwater Pumping

The City is the primary groundwater user within the Vacaville area. Unmeasured agricultural and domestic groundwater extractions in unincorporated areas of the Vacaville area, Rural North Vacaville Water District (RNVWD) production wells, and SID are the other groundwater usages. Since 1968, the City's annual groundwater pumping has varied from a low of 2,862 ac-ft in year 1968 to a high of 8,024 ac-ft in year 1983. Annual groundwater production, including all wells, is summarized in Table 3 from year 1968 to year 2010. The majority of groundwater production in the past was obtained from wells located at the Elmira Road well field. The newer northeast sector well field located near I-80 now contributes to the groundwater production. In the future, groundwater pumpage will be more widely distributed in the study area rather than concentrated in the Elmira Road well field.

TABLE 3
CITY OF VACAVILLE
HISTORICAL GROUNDWATER PUMPING

Year	ac-ft/yr	Year	ac-ft/yr
1968	2,862	1989	6,045
1969	3,046	1990	5,625
1970	2,871	1991	5,447
1971	3,198	1992	5,531
1972	3,255	1993	4,395
1973	3,125	1994	3,893
1974	3,316	1995	3,886
1975	3,970	1996	3,230
1976	4,965	1997	3,386
1977	5,093	1998	3,905
1978	5,020	1999	4,096
1979	6,185	2000	5,141
1980	6,990	2001	6,214
1981	7,740	2002	6,638
1982	7,683	2003	6,628
1983	8,024	2004	6,622
1984	6,089	2005	6,680
1985	5,853	2006	6,635
1986	5,824	2007	6,612
1987	6,236	2008	5,784
1988	5,421	2009	4,647
		2010	5,068

The Solano Sub-basin was not listed as in a "critical condition of overdraft" in the 1980 Bulletin 118: Groundwater Conditions in California. Based on information provided in the Groundwater Management Plan and the Groundwater Supply Sufficiency (see Appendix E), the sub-basin is not projected to become overdrafted if current management conditions continue.

3.3 Surface Water

The City has three separate sources for surface water including Solano Project, State Water Project, and Settlement Water. Each surface water source is described below.

Solano Project (Vacaville Supply, SID Agreement)

The Solano Project was constructed by the Bureau of Reclamation in 1958. The water rights permits for the Solano Project are held by the Bureau of Reclamation in trust for the Solano water users. The water rights permits further state that when the permits are converted to a license, the license will be issued in the name of Solano water users. Unlike most federal water projects, the water rights to the Solano Project "belong" to the Solano water users. The main feature of the Solano Project is Monticello Dam, which provides for storage of 1.6 million ac-ft of water in Lake Berryessa (Lake). Water from the Lake is diverted through the Putah Diversion Dam to the 32-mile Putah South Canal, which transports water to the eight SCWA-member unit contractors for Solano Project water.

SCWA has entered into agreements with cities, districts, and state agencies to provide water from the Solano Project. The Solano Project contracting agencies are: Fairfield, Suisun City, Vacaville, Vallejo, SID, Maine Prairie Water District, University of California at Davis, and California State Prison – Solano. The annual entitlement to each agency is described in Table 4.

TABLE 4
SUMMARY OF SOLANO PROJECT WATER CONTRACTS (AC-FT/YR)

Agency	Annual Entitlement
Fairfield	9,200
Suisun City	1,600
Vacaville	5,750
Vallejo	14,600
SID	141,000
Maine Prairie Water District	15,000
UC Davis	4,000
California State Prison – Solano	1,200
Project Operating Loss (average estimated)	15,000
Total	**207,350** [a]

[a] Value approximates a firm yield during the driest hydrologic period on record (1916-1934).

In addition to its entitlement from SCWA, Vacaville entered into a 1995 Master Water Agreement with SID, which was amended in 2010. Pursuant to the agreement, Vacaville receives an increasing supply from SID through the year 2039 and a consistent supply thereafter until the year 2050. The annual water schedule for SID water available to Vacaville is contained in Table 5.

TABLE 5
ANNUAL WATER SCHEDULE FOR THE SID WATER AGREEMENT (AC-FT/YR)

Year	Annual Entitlement	Year	Annual Entitlement
2010	2,500	2026	5,925
2011	2,625	2027	6,225
2012	2,750	2028	6,525
2013	2,875	2029	6,825
2014	3,000	2030	7,125
2015	3,125	2031	7,425
2016	3,325	2032	7,725
2017	3,525	2033	8,025
2018	3,725	2034	8,325
2019	3,925	2035	8,625
2020	4,125	2036	8,925
2021	4,425	2037	9,225
2022	4,725	2038	9,525
2023	5,025	2039	9,825
2024	5,325	2040 - 2050	10,050
2025	5,625		

<u>State Water Project (North Bay Aqueduct)</u>

Vacaville receives water allocations from the State Water Project through SCWA (termed Table A water) and water from a Year 2000 purchase agreement from the Kern County Water Agency (KCWA). Surface water received pursuant to these agreements is delivered through the NBA, a State Water Project facility. The City supply from the State Water Project is 6,100 ac-ft/yr, while KCWA Agreement water totals 2,878 ac-ft/yr. The Solano County branch of the NBA was completed in 1988. The Aqueduct is 28 miles long starting from Barker Slough in the Delta and ending in Napa County. The location of the NBA can be seen in Figure 2. DWR is the owner and operator of the NBA.

The water supply for the NBA is less reliable than the Solano Project. Supply from the NBA comes from the State Water Project which provides water to a total of 29 contractors. A list of these contractors and their respective allocations is shown in Table 6. Because the NBA is part of the entire State Water Project, any shortages occurring in the State Water Project impact the NBA.

TABLE 6
STATE WATER PROJECT 2010
WATER ALLOCATIONS (AC-FT/YR)

Agency	**Maximum Allocations**
Upper Feather River Area	
City of Yuba City	9,600
County of Butte	27,500
Plumas County Flood Control and Water Conservation District	2,160
Subtotal	39,260
North Bay Area	
Napa County Flood Control and Water Conservation District	29,025
Solano County Water Agency	47,506
Subtotal	76,531
South Bay Area	
Alameda County Flood Control and Water Conservation District	80,619
Alameda County Water District	42,000
Santa Clara Valley Water District	100,000
Subtotal	222,619
San Joaquin Valley Area	
County of Kings	9,305
Dudley Ridge Water District	50,343
Empire West Side Irrigation District	3,000
Kern County Water Agency	982,730
Oak Flat Water District	5,700
Tulare Lake Basin Water Storage District	88,922
Subtotal	1,140,000
Central Coastal Area	
San Luis Obispo County Flood Control and Water Conservation District	25,000
Santa Barbara County Flood Control and Water Conservation District	45,486
Subtotal	70,486

TABLE 6 (Continued)
STATE WATER PROJECT 2010
WATER ALLOCATIONS (AC-FT/YR)

Agency	Maximum Allocations
Southern California Area	
Antelope Valley-East Kern Water Agency	141,400
Castaic Lake Water Agency	95,200
Coachella Valley Water District	138,350
Crestline-Lake Arrowhead Water Agency	5,800
Desert Water Agency	55,750
Littlerock Creek Irrigation District	2,300
Metropolitan Water District of Southern California	1,911,500
Mojave Water Agency	82,800
Palmdale Water District	21,300
San Bernardino Valley Municipal Water District	102,600
San Gabriel Valley Municipal Water District	28,800
San Gorgonio Pass Water Agency	17,300
Ventura County Flood Control District	20,000
Subtotal	2,623,100
Total	**4,171,996**

Within Solano County there are currently seven agencies with NBA water allocations. These include Benicia, Dixon, Fairfield, Rio Vista, Suisun City, Vacaville, and Vallejo. The annual increase in SCWA's contract is described in Table 7. Member units using the NBA and their allocations are described in Table 8. Shortages during dry years are proportional to their share of the overall contract with DWR.

TABLE 7
SUMMARY OF STATE WATER PROJECT ALLOCATIONS TO THE
SOLANO COUNTY WATER AGENCY THROUGH THE NORTH BAY AQUEDUCT (AC-FT/YR)

Year	Annual Allocations	Year	Annual Allocations
2001	45,836	2009	47,456
2002	46,296	2010	47,506
2003	46,756	2011	47,556
2004	47,206	2012	47,606
2005	47,256	2013	47,656
2006	47,306	2014	47,706
2007	47,356	2015[a]	47,756
2008	47,406		

[a] Each year thereafter will have an annual allocation of 47,756 ac-ft/yr.

TABLE 8
STATE WATER PROJECT
ALLOCATION TO SOLANO COUNTY CITIES SERVED
BY THE NORTH BAY AQUEDUCT (AC-FT/YR) IN YEAR 2035

City	Annual Allocations
Benicia	17,200
Dixon	0[a]
Fairfield	14,678
Rio Vista	0[a]
Suisun City	1,300
Vacaville	8,978[b]
Vallejo	5,600
Total	**47,756**

[a] Dixon and Rio Vista currently do not use their individual allocation of 1,500 ac-ft/yr. If Dixon and/or Rio Vista decide to use the NBA water supply, supplies to Benicia, Fairfield and Vallejo are reduced commensurately.
[b] Vacaville allocations from State Water Project (including KCWA Agreement).

Settlement Water (DWR Agreement)

Settlement Water consists of surface water from the Sacramento River and Sacramento-San Joaquin Delta Estuary. Settlement Water is diverted under water rights held by DWR, but is not considered State Water Project water. The water is made available by DWR in settlement of area-of-origin water right applications by the cities of Fairfield, Benicia, and Vacaville.

The City currently uses only 25 to 30 percent of the Settlement Water, and experiences water quality and delivery challenges. The City is working with SCWA to construct a new intake on the Sacramento River to resolve these challenges. The Agreement provides an allocation to each of the three cities as shown in Table 9.

TABLE 9
SUMMARY OF SETTLEMENT WATER FOR THE CITIES OF
FAIRFIELD, BENICIA, AND VACAVILLE (AC-FT/YR)

Agency	Annual Allocations
Fairfield	11,800
Benicia	10,500
Vacaville	9,320
Total	**31,620**

3.4 Recycled Water

A preliminary planning study performed in 2003 evaluated the potential for recycled water delivery and use citywide. Potential customers were identified that may accept tertiary treated recycled water generated at the Easterly Wastewater Treatment Plant (EWWTP) in the future. Several considerations were also identified: (1) I-80 splits Vacaville into south and north segments with the EWWTP located in the farthest southeast section of the City. Distribution piping does not currently exist and the planning and coordination to construct a system reaching north of I-80 would be expensive and challenging; and (2) SID has a non-potable water conveyance system established throughout Vacaville and has the potential to deliver to all areas of the City at a lesser cost than the City could provide recycled water.

Evaluation of these considerations has focused the City's current planning on future delivery to customers south of I-80 and near the EWWTP. Delivery estimates for 2020 currently total 1,175 ac-ft/yr; however, this drought-proof resource will require user contracts and possible retrofit costs on the user's behalf. Therefore, for planning purposes, only 75 percent of the total delivery estimate, or 880 ac-ft/yr, is assumed to be available beginning in 2020.

3.5 Summary of Water Supply Sources

The total water supply available to the City in 2035 from groundwater, surface water, and recycled water will be 41,553 ac-ft/yr. A summary of the respective supply sources previously discussed is presented in Table 10.

TABLE 10
CITY OF VACAVILLE
TOTAL WATER SUPPLY IN YEAR 2035

Sources of Supply	**Allocations (ac-ft/yr)**
Solano Project	
Vacaville Entitlement [a]	5,750
SID Agreement [b]	8,625
State Water Project [c]	
Vacaville Table A	6,100
KCWA Agreement	2,878
Settlement Water [d]	9,320
Groundwater Pumping [e]	8,100
Recycled Water	880
Total	**41,653**

a See Table 4.
b See Table 5.
c See Table 8.
d See Table 9.
e Projected groundwater pumping. See Appendix E.

3.6 Quality of Water Supply

High quality water is supplied to customers in the City, as illustrated in the City's annual Drinking Water Quality Consumer Confidence Reports. The 2009 Drinking Water Quality Consumer Confidence Report is provided in Appendix F. Groundwater is typically higher in hardness and mineral content than surface water sources. Surface water is treated either at the City DE Water Treatment Plant or the NBR Water Treatment Plant. The quality of surface water varies seasonally, typically being more turbid during the winter months. Groundwater treatment includes chlorination and fluoridation at the wellhead. The chlorination of groundwater is to ensure a sufficient chlorine residual in the distribution system to prevent proliferation of harmful organisms. The quality of the City water supply is not expected to change through 2035.

4.0 SBx7-7 WATER USE TARGETS

In February 2008, Governor Arnold Schwarzenegger introduced a plan for improving the Sacramento-San Joaquin Delta, a component of which is to achieve a 20 percent reduction in per capita water use statewide by the year 2020. In November 2009, Senate Bill 7-7 (SBx7-7) was signed into law, addressing urban and agricultural water conservation. SBx7-7 requires water suppliers to calculate baseline per capita water use and per capita water use targets for 2015 and 2020 in the 2010 UWMP.

The following methodology was used to determine SBx7-7 compliance goals:

1. Determine the City's Baseline Per Capita Water Use (described in Section 4.1 and Table 11)
2. Determine the 2020 Per Capita Water Use Target by one of four methods (described in Section 4.2)
3. Confirm 2020 Per Capita Water Use Target against target based on minimum amount of conservation (described in Section 4.3 and Table 12)
4. Determine the 2015 Per Capita Water Use Target (described in Section 4.4)

4.1 Baseline Per Capita Water Use

The determination of baseline per capita water use for the City is summarized in Table 11. The baseline use is the average annual per capita water use calculated over a period of ten years ending between 2004 and 2010. As seen in Table 11, the City's baseline per capita water use is 172 gallons per capita per day (gpcd).

TABLE 11
BASELINE PER CAPITA WATER USE FOR THE CITY OF VACAVILLE

Year	Total Water Use [a], ac-ft/yr	Total Water Use [a], MG/yr	Population [b]	Annual Per Capita Water Use, [c] gpcd	SBx7-7 Baseline Per Capita Water Use Target, [d] gpcd
1995	14,695	4,788	81,361	161	--
1996	15,055	4,905	81,623	165	--
1997	15,155	4,938	82,258	164	--
1998	14,247	4,642	84,258	151	--
1999	16,011	5,217	85,817	167	--
2000	16,879	5,500	87,551	172	--
2001	17,662	5,755	90,770	174	--
2002	17,874	5,824	82,802	193	--
2003	17,460	5,689	94,215	165	--
2004	18,541	6,041	95,121	174	166
2005	17,990	5,862	96,222	167	167
2006	18,563	6,048	95,879	173	168
2007	19,321	6,295	96,025	180	169
2008	19,391	6,318	96,441	179	172
2009	17,694	5,765	96,235	164	172
2010	16,329	5,320	97,305	150	170
Baseline Per Capita Water Use, gpcd:					**172**

[a] The City Total Water Use is based on total production during a given year.
[b] City population as provided by the California Department of Finance for the City of Vacaville., including prison population.
[c] Annual per capita water use is the total water use divided by the population.
[d] The SBx7-7 baseline per capita water use is the ten-year average of annual per capita water use ending in a given year.

4.2 2020 Per Capita Water Use Target

The per capita water use target, which must be met by 2020, must be calculated using one of four methods described in the *Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan* (UWMP Guidebook). The four methods are, in brief:

- Method 1: 80 percent of Baseline Per Capita Water Use
- Method 2: Performance standard based on actual and estimated water use data including indoor residential water use; landscaping area; commercial, industrial, and institutional water use
- Method 3: 95 percent of the State Hydrologic Regional Target Water Use
- Method 4: Subtract water savings based on identified practices from Baseline Per Capita Water Use

The City evaluated all four methods and determined that Methods 1 and 3 are the most appropriate methods to determine Vacaville's 2020 Per Capita Water Use Target. It is in the City's interest to use the highest target calculated by the four methods in order to minimize impacts to the water users of the City while still meeting established water use goals.
The City used Methods 1 and 3 to determine potential per capita water use targets. Using Method 1, the per capita water use target is 80 percent of the baseline per capita water use. The City's per capita water use target would be 138 gpcd using Method 1.

Using Method 3, the per capita water use target is 95 percent of the applicable state hydrologic region target as defined in the draft 20x2020 Water Conservation Plan. The City is located in hydrologic region 5, which has a hydrologic region target of 176 gpcd. The City's per capita water use target, based on Method 3, is therefore 167 gpcd.

The 2020 Per Capita Water Use Target of 167 gpcd calculated by Method 3 is the preferred target, however further comparison to a maximum target figure is required.

4.3 Confirm 2020 Per Capita Water Use Target

SBx7-7 requires Cities to achieve a minimum amount of conservation regardless of the 2020 Per Capita Water Use Targets calculated by the four methods. This minimum amount of conservation is described in Section 10608.22 of SBx7-7. A water supplier may not use a per capita water use target greater than the water use target described in Section 10608.22.

This maximum water use target is determined using a baseline per capita water use calculated by averaging per capita water use over a five-year period ending between 2007 and 2010. The maximum per capita water use target is 95 percent of this baseline per capita water use. Note that the baseline per capita water use used to determine the maximum per capita water use target is not the same baseline per capita water use used to determine the Method 1 per capita water use target as described in Section 4.2 and Table 11. The maximum per capita water use target calculation for the City is summarized in Table 12.

TABLE 12
MAXIMUM PER CAPITA WATER USE TARGET

Year	Annual Per Capita Water Use [a], gpcd	SBx7-7 Baseline Per Capita Water Use [b], gpcd
2003	165	--
2004	174	--
2005	167	--
2006	173	--
2007	180	172
2008	179	175
2009	164	173
2010	150	169
Baseline Per Capita Water Use, gpcd:		175
Maximum Per Capita Water Use Target, gpcd:		**166**

[a] Annual per capita water use is the total water use divided by the population, from Table 11.

[b] The SBx7-7 baseline per capita water use is the five-year average of annual per capita water use ending in a given year. Note that this is different than the baseline per capita water use calculated in Table 11 to determine the Method 1 per capita water use goal.

As seen in Table 12, the baseline per capita water use associated with the maximum per capita water use target is 175 gpcd, which corresponds to a maximum per capita water use target of 166 gpcd (95 percent of 175 gpcd). Because the maximum per capita water use target is less than the per capita water use target calculated for 2020 using Method 3 (167 gpcd), the City is required to use the maximum per capita water use target of 166 gpcd.

4.4 2015 Interim Per Capita Water Use Target

The interim per capita water use target, which must be met in 2015, is defined as the midpoint between the baseline per capita water use and the 2020 per capita water use target. The City's 2015 interim per capita water use target is 169 gpcd.

4.5 SBx7-7 Implementation Plan

As described above and summarized in Table 13, the City's baseline per capita water use is 172 gpcd, the 2015 interim per capita water use target is 169 gpcd, and the 2020 per capita water use target is 166 gpcd. Per capita water use in the City has historically been relatively low due to the City's water conservation efforts. The City expects to be able to meet the per capita water use targets through continued water conservation. The per capita water use in the City is expected to decrease as new development is constructed due to more stringent building requirements such as mandatory measures of the 2010 California Green Building Standards Code. The City also plans to continue water conservation education and measures described in Section 8.

TABLE 13
SUMMARY OF SBx7-7 BASELINE AND TARGETS

Parameter	Value
Baseline Per Capita Water Use [a]	172 gpcd
Verification Baseline Per Capita Water Use [b]	175 gpcd
2015 Interim Per Capita Water Use [c]	169 gpcd
2020 Per Capita Water Use [d]	166 gpcd

[a] Based on ten-year average as described in Section 4.1.
[b] Based on five-year average as described in Section 4.3.
[c] As described in Section 4.4
[d] 2020 Per Capita Water Use as determined by SBx7-7 Section 10608.22 (minimum amount of water conservation), as described in Section 4.3.

5.0 WATER USE PROVISIONS

This section quantifies, to the extent records are available, past, current, and projected water use. As water demands increase and sources of production capacity are expanded in the future, the utilization of each source of production will shift. Each year the City establishes goals for utilization of each source.

Projected water demands in five year increments for the City and future development in the City are presented in Table 14. Baseline City demand is based on 2010 monthly water production as reported by the City of Vacaville. Water demands for the year 2035 were based on the growth projected in the most recent land use database prepared by the City's Community Development Department and population projects by the Association of Bay Area Governments (ABAG). The five-year incremental demands were estimated using linear interpolation between 2015 and 2035. The demands summarized in Table 14 are less than projected demands in previous documents to be consistent with lowered population projections due to the recent economic downturn.

TABLE 14
CITY OF VACAVILLE
SUMMARY OF NORMAL YEAR
ANNUAL WATER DEMAND (AC-FT/YR) IN FIVE YEAR INCREMENTS

Demand	2015	2020	2025	2030	2035
Existing City (2010) [a]	16,329	16,329	16,329	16,329	16,329
Proposed Developments [b]	1,432	2,167	2,902	3,510	3,510
Other Future Development in City [c]	126	252	378	505	821
Total Demand	**17,887**	**18,748**	**19,609**	**20,344**	**20,660**

[a] Existing City demand is based on actual water supply data for January through December 2010.
[b] Proposed developments include Lower Lagoon Valley, Southtown, Rice McMurtry, and Vanden Meadows.
[c] Other future development water demands are based on the most current land use information in the City's Web Based Land Use Database Management System (WBLUDMS).

The demand projections presented in Table 14 are based on the City's currently adopted General Plan, and takes into consideration recent development conditions. In conjunction with the population growth as projected by ABAG, water demand in 2035 is projected to be 20,660 ac-ft/yr with a population of 111,100. The City's General Plan update, currently underway, is evaluating low, medium, and high alternative growth scenarios in which growth projections range from a low of 2,100 to a high of 4,700 residential units in 2035, corresponding to 1,100 to 2,200 ac-ft/yr. As will be seen in later sections of this plan, the City has sufficient supplies to provide water to development in excess of the demand growth projected in Table 14.

Table 15 provides a summary of past, current, and projected population, service connections, and water demands through the year 2035. While increases in water demand are essentially proportional to population increase, the per capita figures also reflect commercial and industrial growth. For example, the per capita use rate in the year 2010 is estimated at 150 gallons/day. In the year 2035, the average per capita water use is estimated at 166 gallons/day. Table 16 presents projected water use by customer type through 2035. Historical data by customer type is only available starting in 2000.

Since 2005, the City has changed its water billing system, installed radio read meters throughout the City, and installed evapotranspiration based irrigation controllers at parks and City facilities. These changes are believed to account for the decrease in “Public Landscaping” water use observed from 2005 to 2010 in Table 16. Because the total water use in 2005 and 2010 are comparable, it is believed that the observed changes are due to how water is accounted.

Several steps, including demand reduction, are being taken to help ensure an adequate water supply for the City of Vacaville. First, the City has imposed a planned growth ordinance that allows the Public Utilities time to plan, acquire, and construct sources and facilities necessary to maintain an adequate water supply and environmentally safe processing and discharge of wastewater. Secondly, the City of Vacaville adopted Water Conservation Ordinance No. 1431 on March 12, 1991 that helped the utility meet short-term deficiencies. City-wide conservation throughout the peak dry years of 1991 through 1993 enabled the utility to adequately meet water demands with a 20 percent reduction in water consumption city-wide. In February 1992, the City, in cooperation with the SCWA, also adopted the “Urban Water Shortage Contingency Plan.” Both the Urban Water Shortage Contingency Plan and the ordinance are attached to this plan as part of Appendix G.

The City of Vacaville is committed to implementing water conservation measures to reduce overall water demands. Section 8 provides a detailed discussion of how the City is evaluating and putting into practice the 14 DMMs required by the Urban Water Management Planning Act. These DMMs include programs such as water surveys for single-family and multi-family residences, residential plumbing retrofits, and school education, to name a few.

Low Income Housing Water Demand

The projected water demand for low income housing is described in this section. A low income household is defined as a household whose income is 80 percent or less of the median income in the City.

The *Vacaville General Plan Housing Element*, adopted on April 27, 2010, states that a total of 2,901 housing units need to be constructed in the City between 2007-2014 to meet projected housing demands. Low income housing units make up 42 percent (1,222 units) of the total units needed. The water demand of low income housing was estimated by scaling the single-family and multi-family residential water demand. This is thought to be conservative because larger housing types that are not typically associated with low income housing, such as residential estates, typically have higher water demands. The water demand associated with low income housing units is presented in Table 17.

The Housing Element states, as New Construction Implementing Policy H.1- I23, that the City will grant priority for service allocation to proposed developments that include housing units affordable to lower-income households.

TABLE 15
PAST, CURRENT, AND PROJECTED WATER USE (1980-2035)

	Past (Actual)						Current[c]	Projected				
	1980	**1985**	**1990**	**1995[a]**	**2000[a]**	**2005[b]**	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**
Population	43,367	49,854	70,496	81,361	87,551	96,222	97,305	102,600	105,000	107,300	109,400	111,100
Growth Rate (% per 5 years)	37	14	35	15	8	10	1	5	2	2	2	2
Average per capita water use (gallons/day) [d]	182	200	177	161	172	167	150	156	159	163	166	166
Connections [e]												
Number of service connections	12,143	13,786	19,878	21,531	22,716	26,201	26,830	27,800	28,400	29,100	29,600	30,100
Water Demand Totals												
Drinking Water Deliveries (units/yr) [f]	3,845,187	4,884,558	6,094,734	6,401,070	7,353,941	7,838,622	7,112,299	7,791,648	8,166,770	8,541,892	8,861,693	8,999,397
Million gallons/day (MGD)	7.88	10.01	12.49	13.12	15.07	16.06	14.6	15.97	16.74	17.51	18.16	18.44
Million gallons/year (MGY)	2,876	3,654	4,559	4,788	5,500	5,862	5,320	5,828	6,109	6,389	6,629	6,732
Acre-feet/year (af/yr) [g]	8,827	11,213	13,991	14,695 [h]	16,879	17,990	16,329	17,887	18,748	19,609	20,344	20,660

[a] Data for 1995 and 2000 has been revised from the 2005 UWMP Update to reflect adjustments and the most current records by the City and State.
[b] 2005 data reported in this table differs from 2005 data reported in the 2005 UWMP Update. The 2005 data in the 2005 UWMP Update were estimates. Actual data is reported in this table.
[c] Existing City demand is based on actual water supply data for January through December 2010
[d] Includes residential and industrial demands.
[e] 100 percent of service connections are metered.
[f] One unit = 748 gallons or 100 cubic feet.
[g] City limits only.
[h] 1995 water use based on City water system production records.

TABLE 16
PAST, CURRENT, AND PROJECTED WATER USE BY CUSTOMER TYPE (2005 – 2035)

	Water Demand Totals (ac-ft/yr)						
	Past	**Current**	**Projected [b]**				
Customer Type [a]	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**
Single-Family Residential	10,541	9,437	10,338	10,835	11,334	11,758	11,940
Multi-Family Residential [c]	2,174	2,098	2,298	2,409	2,519	2,614	2,654
Commercial	1,305	1,405	1,539	1,613	1,687	1,750	1,778
Industrial	548	794	870	912	953	989	1,005
Public Agency/Institutional	830	684	749	785	821	852	865
Public Landscaping [d]	1,172	765	838	878	919	953	968
General Other	215	0	0	0	0	0	0
Unaccounted for Water Loss [e]	1,205	1,146	1,255	1,316	1,376	1,428	1,450
TOTAL	**17,990**	**16,329**	**17,887**	**18,748**	**19,609**	**20,344**	**20,660**

[a] The City does not supply water for saline water intrusion barrier, groundwater recharge, or agriculture. The City also does not sell water to other agencies
[b] Current and projected water use is based on the percentage of use by customer type in 2010.
[c] Single Family and Multi-Family Residential include water demand of low income units.
[d] The decrease in public landscape demand from 2005 to 2010 is attributed to the installation of evapotranspiration based irrigation controllers and the retrofit of irrigation heads at City parks and set-back landscaping.
[e] The increase in unaccounted for water loss from 2005 and 2010 is attributed to a change of the City's utility billing system software during the 2004/2005 fiscal year. The system change-out increased accuracy of consumption data and sales figures.

TABLE 17
LOW INCOME HOUSING WATER DEMAND (2010 – 2035)

	Water Demand Totals (ac-ft/yr)					
Customer Type	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**
Single Family Housing Water Demand, ac-ft/yr	3,975	4,355	4,564	4,774	4,953	5,030
Multi-Family Housing Water Demand, ac-ft/yr	884	968	1,015	1,061	1,101	1,118
Total Low Income Housing Water Demand, ac-ft/yr	**4,859**	**5,323**	**5,579**	**5,835**	**6,054**	**6,148**

6.0 RELIABILITY PLANNING

This section presents a discussion on reliability planning, where reliability is defined as a measure of a water service system's expected success in managing water shortages.

6.1 Frequency and Magnitude of Supply Deficiencies

Vacaville's Utilities Department continues to work closely with the Community Development Department, the City Council, and regional water suppliers to ensure adequate water supply for planned City growth. Current and projected water supply, to the year 2035, is shown in Table 18. Vacaville continues to plan for both short-term supply crisis and long-term supply acquisition.

In Vacaville, short-term supply deficiencies can be mitigated through a variety of measures as was evidenced during the peak of the 1991-1993 drought.

1. Conjunctive Use – With three (3) surface water supply sources (Solano Water Project, State Water Project, and Settlement Water) and groundwater, Vacaville has the ability to increase, decrease, or eliminate the production of any one source should supplies become limited or contaminated. During the 1991-1993 drought, NBA supplies were reduced by 80 percent. Vacaville was able to rely more heavily on alternate surface water and groundwater supplies. Conjunctive use does require close production management and monitoring of supply availability and quality. Foresight in supply planning ensures that Vacaville is not dependent on any single source.

2. Demand Management – Conservation measures that reduce demand will help to sustain a supply during short-term crisis. Section 8.0 outlines demand management measures in detail.

3. Purchase – Vacaville works closely through the SCWA in purchasing water for short-term use, possibly unused agricultural supplies or unscheduled State Water Project water. Long-term supply needs are met through purchases and trades with regional wholesalers and retailers. In addition, the City has the option of purchasing additional water under the SID Water Agreement.

TABLE 18
CURRENT AND PROJECTED AVAILABLE WATER SUPPLY (2010 – 2035)

Sources of Supply	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**
Solano Project - Quantity (af/yr)						
Vacaville Entitlement	5,750	5,750	5,750	5,750	5,750	5,750
SID Agreement	2,500	3,125	4,125	5,625	7,125	8,625
Percent of supply (%)	25	26	27	30	32	35
State Water Project -Quantity (af/yr)						
North Bay Aqueduct	6,100	6,100	6,100	6,100	6,100	6,100
Kern County Water Agency	2,878	2,878	2,878	2,878	2,878	2,878
Settlement Water	9,320	9,320	9,320	9,320	9,320	9,320
Percent of supply (%)	55	54	51	48	46	44
Groundwater						
Quantity (af/yr)	6,500	7,000	7,000	7,300	7,700	8,100
Percent of supply (%)	20	20	20	20	20	20
Recycled Water						
Quantity (af/yr)	--	--	880	880	880	880
Percent of Supply (%)	--	--	2	2	2	2
Water Supply Totals						
Drinking Water Available, units/yr [a]	14,398,353	14,888,493	15,707,571	16,491,795	17,319,587	18,147,379
Million gallons/day (MGD)	29.51	30.51	32.19	33.80	35.49	37.19
Million gallons/year (MGY)	10,770	11,137	11,749	12,336	12,955	13,574
Acre-feet/year (af/yr)	33,048	34,173	36,053	37,853	39,753	41,653

[a] One unit = 748 gallons or 100 cubic feet.

6.2 Plans to Ensure a Reliable Water Supply

In this section, the reliability of the City's groundwater and surface water supplies are analyzed. The sources are identified for their availability during normal, single dry, and multiple dry years as determined by the DWR Sacramento Valley Water Hydrologic Classifications. The three separate hydrologic conditions considered are described as follows:

Normal year: This is a year when average rainfall has been received. During a normal year, the water availability from some sources may be less than the allocated amount.

Single dry year: This is a solitary dry or critical dry year and may be the first year of a multiple year drought.

Multiple dry years: This is a series of three consecutive dry and/or critical dry years.

Groundwater

A groundwater source sufficiency report was prepared in 2011 by Ludhorff and Scalmanini Consulting Engineers to describe the use and sufficiency of groundwater supplies beneath the City (see Appendix E). As part of the groundwater source sufficiency report, an analytical groundwater flow model was used to provide a preliminary assessment of water level impacts from future increases in groundwater pumping by the City to meet future water demands. The modeling effort included simulations of ten future pumping scenarios in which pumping would be increased and/or redistributed within the study area. The recommended maximum pumping is summarized in Table 19. Details regarding the model simulations and suggested pumping practices are found in Appendix E.

TABLE 19
CITY OF VACAVILLE
PROJECTED MAXIMUM GROUNDWATER PUMPING (AC-FT/YR)
DURING NORMAL, SINGLE DRY, AND MULTIPLE DRY YEARS

Year	Normal Year	Single Dry Year	Multiple Dry Year
2010	6,500	7,800	7,800
2015	7,000	8,300	8300
2020	7,000	8,300	8,300
2025	7,300	8,700	8,700
2030	7,700	9,200	9,200
2035	8,100	9,700	9,700

Increased pumping during dry years will cause groundwater levels to decrease. Based on the results of the groundwater model, groundwater levels will return to normal levels once pumping decreases to normal year rates.

Surface Water

The following contains a description of the availability of the City's surface water sources during normal, single dry, and multiple dry years.

Solano Project (Vacaville Supply, SID Agreement)

The contracts with the public entities that use Solano Project water provide for the sale and distribution of water made available by the Bureau of Reclamation each year. The Bureau of Reclamation is contractually committed to delivering the full contract amount of water supply from the Solano Project unless the water supply does not physically exist (e.g. an empty reservoir). All Solano Project contractors, whether they are municipal or agricultural, are impacted by water supply reductions on an equal basis.

The Solano Project has an annual water supply of 207,350 ac-ft/yr. As shown in Table 20, Vacaville is entitled to 5,750 ac-ft/yr of this annual yield. The Solano Project differs from other reservoir projects in California due to the reservoir storage size relative to the watershed yield.

This means it may take a relatively long time to deplete the reservoir, but, in turn, it takes a relatively long time to fill the reservoir. Due to the size of the reservoir as a function of its yield, the long-term reliability for the Solano project is excellent.

Because of the high degree of reliability and historical records, the City anticipates receiving 99 percent of the entitlement (and SID agreement water) during normal years, and 98 percent of the entitlement during a single dry year, and 89 percent during multiple dry years. Solano Project availability percentages for the City are derived using Sacramento Valley Water Year Hydrologic Classifications and historical records and are included in Appendix H, Solano Project Water Supply Availability, dated August 10, 2010.

TABLE 20
CITY OF VACAVILLE
WATER SUPPLY IN YEAR 2010

		Normal Year		Single Dry Year		Multiple Dry Year	
Sources of Supply	**Entitlement**	**% Available**	**ac-ft/yr**	**% Available**	**ac-ft/yr**	**% Available**	**ac-ft/yr**
Solano Project							
Vacaville Entitlement	5,750	99%	5,693	98%	5,635	89%	5,118
SID Agreement	2,500	99%	2,475	98%	2,450	89%	2,225
State Water Project							
Vacaville Table A	6,100	64%	3,904	63%	3,843	33%	2,013
KCWA Agreement	2,878	64%	1,842	63%	1,813	31%	892
Settlement Water [a]	9,320	100%	9,320	100%	9,320	100%	9,320
Groundwater [b]	6,500	100%	6,500	120%	7,800	120%	7,800
Recycled Water	0	100%	0	100%	0	100%	0
Total	**33,048**		**29,734**		**30,861**		**27,368**

[a] The City is currently utilizing 25 to 30 percent of Settlement Water due to seasonal availability of the entitlement and turbid water conditions making treatment difficult.
[b] Recommended maximum groundwater pumping.

State Water Project (North Bay Aqueduct)

As previously discussed, the water supply for the NBA is less reliable than the Solano Project. Supply from the NBA originates from the State Water Project and has a similar level of priority as all other 28 contractors to the project. As a result, this source is subject to significant cutbacks during dry years. Specifically, the City anticipates 63 percent availability during a single dry year and 33 percent availability during multiple dry years for this source. State Water Project availability percentages for the City are derived from CALSIM II Model Studies for State Water Project Delivery Capability and provided by SCWA. The State Water Project availability is included in Appendix I, State Water Project Water Supply Availability, dated August 10, 2010.

The 2029 model includes pumping restrictions in the South Delta based on the Biological Opinions for Delta Smelt and Salmon, which has resulted in lower reliability then those used in the 2005 UWMP update. In addition, the 2029 scenario includes climate change impacts that further reduce reliability. These lower reliabilities are used in the 2030 and 2035 water supply estimates.

Settlement Water (DWR Agreement)

In lieu of an Area of Origin Water Rights filing by the City, DWR and the City entered into a settlement agreement for water. An analysis on the expected reliability of the water to be provided to the City in accordance with the settlement agreement concluded that the City can anticipate receiving 100 percent of the allocation during normal, single dry, and multiple dry years. However, as described in Section 3.3, there are hydrologic factors that may limit the availability of the full allocation.

Recycled Water

Preliminary planning estimates indicate that recycled water will be available for delivery in 2020. Recycled water is a 100 percent reliable source of non-potable water and is completely independent of hydrologic conditions. Therefore, the City anticipates that this source will be 100 percent available during normal, single dry, and multiple dry years.

Other Sources

The City does not have the opportunity to desalinate ocean water, brackish water, or groundwater.

Summary of Water Supply Availability

This section contains a determination of water supply availability. As previously described, the amount of water entitled to the City is increasing until the maximum entitlement is reached by year 2040. Furthermore, each source has a different availability under normal, single dry, and multiple dry years. Information on supply entitlement and availability is shown in Tables 20 through 25 for normal, single dry, and multiple dry years in five-year increments between 2010 and 2035. The water supply availability is summarized in Tables 26, 27, and 28.

TABLE 21
CITY OF VACAVILLE
WATER SUPPLY IN YEAR 2015

Sources of Supply	Entitlement	Normal Year % Available	Normal Year ac-ft/yr	Single Dry Year % Available	Single Dry Year ac-ft/yr	Multiple Dry Year % Available	Multiple Dry Year ac-ft/yr
Solano Project							
Vacaville Entitlement	5,750	99%	5,693	98%	5,635	89%	5,118
SID Agreement	3,125	99%	3,094	98%	3,063	89%	2,781
State Water Project							
Vacaville Table A	6,100	64%	3,904	63%	3,843	33%	2,013
KCWA Agreement	2,878	64%	1,842	63%	1,813	31%	892
Settlement Water [a]	9,320	100%	9,320	100%	9,320	100%	9,320
Groundwater [b]	7,000	100%	7,000	120%	8,300	120%	8,300
Recycled Water	0	100%	0	100%	0	100%	0
Total	**34,173**		**30,853**		**31,974**		**28,424**

[a] The City is currently utilizing 25 to 30 percent of Settlement Water due to seasonal availability of the entitlement and turbid water conditions making treatment difficult.
[b] Recommended maximum groundwater pumping.

TABLE 22
CITY OF VACAVILLE
WATER SUPPLY IN YEAR 2020

Sources of Supply	Entitlement	Normal Year % Available	Normal Year ac-ft/yr	Single Dry Year % Available	Single Dry Year ac-ft/yr	Multiple Dry Year % Available	Multiple Dry Year ac-ft/yr
Solano Project							
Vacaville Entitlement	5,750	99%	5,693	98%	5,635	89%	5,118
SID Agreement	4,125	99%	4,084	98%	4,043	89%	3,671
State Water Project							
Vacaville Table A	6,100	64%	3,904	63%	3,843	33%	2,013
KCWA Agreement	2,878	64%	1,842	63%	1,813	31%	892
Settlement Water [a]	9,320	100%	9,320	100%	9,320	100%	9,320
Groundwater [b]	7,000	100%	7,000	120%	8,300	120%	8,300
Recycled Water	880	100%	880	100%	880	100%	880
Total	**36,053**		**32,723**		**33,834**		**30,194**

[a] The City is currently utilizing 25 to 30 percent of Settlement Water due to seasonal availability of the entitlement and turbid water conditions making treatment difficult.
[b] Recommended maximum groundwater pumping.

TABLE 23
CITY OF VACAVILLE
WATER SUPPLY IN YEAR 2025

		Normal Year		Single Dry Year		Multiple Dry Year	
Sources of Supply	**Entitlement**	**% Available**	**ac-ft/yr**	**% Available**	**ac-ft/yr**	**% Available**	**ac-ft/yr**
Solano Project							
Vacaville Entitlement	5,750	99%	5,693	98%	5,635	89%	5,118
SID Agreement	5,625	99%	5,569	98%	5,513	89%	5,006
State Water Project							
Vacaville Table A	6,100	64%	3,904	63%	3,843	33%	2,013
KCWA Agreement	2,878	64%	1,842	63%	1,813	31%	892
Settlement Water [a]	9,320	100%	9,320	100%	9,320	100%	9,320
Groundwater [b]	7,300	100%	7,300	120%	8,700	120%	8,700
Recycled Water	880	100%	880	100%	880	100%	880
Total	**37,853**		**34,508**		**35,704**		**31,929**

[a] The City is currently utilizing 25 to 30 percent of Settlement Water due to seasonal availability of the entitlement and turbid water conditions making treatment difficult.
[b] Recommended maximum groundwater pumping.

TABLE 24
CITY OF VACAVILLE
WATER SUPPLY IN YEAR 2030

		Normal Year		Single Dry Year		Multiple Dry Year	
Sources of Supply	**Entitlement**	**% Available**	**ac-ft/yr**	**% Available**	**ac-ft/yr**	**% Available**	**ac-ft/yr**
Solano Project							
Vacaville Entitlement	5,750	99%	5,693	98%	5,635	89%	5,118
SID Agreement	7,125	99%	7,054	98%	6,983	89%	6,341
State Water Project							
Vacaville Table A	6,100	64%	3,904	46%	2,806	31%	1,891
KCWA Agreement	2,878	64%	1,842	46%	1,324	31%	892
Settlement Water [a]	9,320	100%	9,320	100%	9,320	100%	9,320
Groundwater [b]	7,700	100%	7,700	120%	9,200	120%	9,200
Recycled Water	880	100%	880	100%	880	100%	880
Total	**39,753**		**36,393**		**36,148**		**33,642**

[a] The City is currently utilizing 25 to 30 percent of Settlement Water due to seasonal availability of the entitlement and turbid water conditions making treatment difficult.
[b] Recommended maximum groundwater pumping.

TABLE 25
CITY OF VACAVILLE
WATER SUPPLY IN YEAR 2035

Sources of Supply	Entitlement	Normal Year % Available	Normal Year ac-ft/yr	Single Dry Year % Available	Single Dry Year ac-ft/yr	Multiple Dry Year % Available	Multiple Dry Year ac-ft/yr
Solano Project							
Vacaville Entitlement	5,750	99%	5,693	98%	5,635	89%	5,118
SID Agreement	8,625	99%	8,539	98%	8,453	89%	7,676
State Water Project							
Vacaville Table A	6,100	64%	3,904	46%	2,806	31%	1,891
KCWA Agreement	2,878	64%	1,842	46%	1,324	31%	892
Settlement Water [a]	9,320	100%	9,320	100%	9,320	100%	9,320
Groundwater [b]	8,100	100%	8,100	120%	9,700	120%	9,700
Recycled Water	880	100%	880	100%	880	100%	880
Total	**41,653**		**38,278**		**38,118**		**35,477**

[a] The City is currently utilizing 25 to 30 percent of Settlement Water due to seasonal availability of the entitlement and turbid water conditions making treatment difficult.
[b] Recommended maximum groundwater pumping.

TABLE 26
CITY OF VACAVILLE
WATER SUPPLY DURING NORMAL YEAR (AC-FT/YR)

Sources of Supply	Year 2010	2015	2020	2025	2030	2035
Solano Project						
Vacaville Entitlement	5,693	5,693	5,693	5,693	5,693	5,693
SID Agreement	2,475	3,094	4,084	5,569	7,054	8,539
State Water Project						
Vacaville Table A	3,904	3,904	3,904	3,904	3,904	3,904
KCWA Agreement	1,842	1,842	1,842	1,842	1,842	1,842
Settlement Water	9,320	9,320	9,320	9,320	9,320	9,320
Groundwater	6,500	7,000	7,000	7,300	7,700	8,100
Recycled Water	0	0	880	880	880	880
Total	**29,734**	**30,853**	**32,723**	**34,508**	**36,393**	**38,278**

TABLE 27
CITY OF VACAVILLE
WATER SUPPLY DURING SINGLE DRY YEAR (AC-FT/YR)

	Year					
Sources of Supply	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**
Solano Project						
Vacaville Entitlement	5,635	5,635	5,635	5,635	5,635	5,635
SID Agreement	2,450	3,063	4,043	5,513	6,983	8,453
State Water Project						
Vacaville Table A	3,843	3,843	3,843	3,843	2,806	2,806
KCWA Agreement	1,813	1,813	1,813	1,813	1,324	1,324
Settlement Water	9,320	9,320	9,320	9,320	9,320	9,320
Groundwater	7,800	8,300	8,300	8,700	9,200	9,700
Recycled Water	0	0	880	880	880	880
Total	**30,861**	**31,974**	**33,834**	**35,704**	**36,148**	**38,118**

TABLE 28
CITY OF VACAVILLE
WATER SUPPLY DURING MULTIPLE DRY YEAR (AC-FT/YR)

	Year					
Sources of Supply	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**
Solano Project						
Vacaville Entitlement	5,118	5,118	5,118	5,118	5,118	5,118
SID Agreement	2,225	2,781	3,671	5,006	6,341	7,676
State Water Project						
Vacaville Table A	2,013	2,013	2,013	2,013	1,891	1,891
KCWA Agreement	892	892	892	892	892	892
Settlement Water	9,320	9,320	9,320	9,320	9,320	9,320
Groundwater	7,800	8,300	8,300	8,700	9,200	9,700
Recycled Water	0	0	880	880	880	880
Total	**27,368**	**28,424**	**30,194**	**31,929**	**33,642**	**35,477**

6.3 Potential Reduction of Potable Water Demands

In addition to the potable water demand reductions required by SBx7-7, which will be achieved through established water conservation measures, the City has the ability to reduce potable water demands through the use of recycled water for irrigation, the City's water conservation and rationing ordinance, and ongoing water conservation programs. Each is described below.

Use of Recycled Water

Wastewater generated in the City of Vacaville is currently conveyed to and treated at the 15 mgd Easterly Wastewater Treatment Plant (Easterly Plant). Treated effluent is currently discharged to Alamo Creek which flows into Cache Slough. Reclaimed treated effluent is a viable resource and can reduce the demand for potable water supply when used for irrigating public parks and to meet industrial and other demands. Information regarding Vacaville's preliminary planning is discussed in Section 3.4.

The City of Vacaville has been working with a power ventures developer for a possible power plant located on property adjacent to the wastewater treatment plant. The close proximity to the wastewater treatment plant has allowed the City to establish a reasonable rate for recycled water. This incentive provided continuing interest in Vacaville as a project site and, if the project moves forward, could result in as much as 5 MGD of recycled water sales in the future. Incentives have not been offered to other potential customers at this time.

Water Conservation and Rationing Ordinance

The *Urban Water Shortage Contingency Plan* (Appendix G) establishes a Water Conservation Ordinance which defines three voluntary and mandatory water conservation stages. The contingency plan addresses water conservation during normal, drought, and emergency conditions as defined below.

Normal Conditions

The normal conservation condition is in effect any time when drought or emergency conditions are not in effect. Normal conditions will prevail when there is not a water shortage. Conservation practices (including the *City of Vacaville Water Efficient Landscape Requirements*) will be required during normal conditions in accordance with this ordinance. A copy of the *Water Efficient Landscape Requirements* and a memorandum comparing the requirements with the State mandated Model Water Efficient Landscape Ordinance are provided in Appendix J.

During normal conditions the goal is to maximize beneficial use of water through specific provisions of this ordinance, public education, voluntary water conservation, and the *City of Vacaville Water Efficient Landscape Requirements*.

Implementation Methods: Under normal conditions, water prices shall be established and modified from time to time with the objective of fully compensating for the acquisition, treatment, and distribution of water through revenues collected from customers, and promoting beneficial use of the water.

The *City of Vacaville Water Efficient Landscape Requirements* is applicable and water wasting activities may be prohibited under normal conditions. Water wasting activities are specified in Section 8.13.

No water may be supplied for temporary construction purposes without a permit from the Department of Public Works and payment of the costs of such water. Other than water released by the City itself for public purposes, no water may be taken from a fire hydrant without a permit from the City, payment of water charges as required, and the use of metering and backflow prevention devices.

Drought Conditions

Drought conditions will be in effect when there is a water shortage necessitating a reduction in water use, either city-wide or in area or use category within the City, greater than 10 percent from the normal condition but less than a 30 percent reduction.

<u>Implementation Methods</u>: Under drought conditions, water prices may be adjusted by any combination of (1) increases in the unit prices of water for established blocks, (2) modification of the unit amounts which define blocks, and (3) addition of new blocks. Under drought conditions, it will be necessary to increase price to balance cost to the City with revenues collected from customers as a result of lower water use, to acquire additional or supplemental supplies of water, or to promote water conservation. Changes in water pricing for drought conditions shall be made by a resolution of the City Council.

The water units which define the block structure price stages may be set from time to time by the City Council by resolution on either an annual or seasonal basis, and reduced by the percent decrease necessary to achieve the conservation goal for residential use, general use, and metered irrigation use.

In addition to normal restrictions, the following restrictions may be applicable under drought conditions. Further, the City Council may direct, by resolution, additional restrictions:

1. Watering and irrigation of plants, trees and landscaping will be allowed only during specified hours of the day, pursuant to regulations promulgated by the Director of Utilities.

2. Fountains and water using ornamental structures shall be prohibited from using water unless equipped with a recirculating pump.

3. Drought notices shall be posted in hotels, motels and all public establishments offering lodging.

4. Restaurants will serve water to customers only upon request of their patrons.

5. No landscaping, other than turf, may be installed unless irrigated with a drip irrigation system or a similar system with the equivalent savings in water usage.

6. Defer construction of new City parks unless specific factors determined by the City Council authorize such construction.

7. Prohibit new set-back landscaping at commercial and industrial sites. Deferred installation agreements may be required to ensure construction of the set-back landscaping when the water drought or emergency is over.

Emergency Conditions

Emergency conditions will be in effect whenever there is a water shortage necessitating a reduction in water use, either city-wide or in a sub-area or land-use category within the City, of 30 percent or greater from the normal condition.

During emergency conditions the goal is to achieve a 30 percent or greater reduction in water consumption compared with normal conditions.

Implementation Methods: Under emergency conditions, water prices may be further adjusted as set forth under drought conditions.

Under emergency conditions, water unit amounts which define the block structure price increase stages can be further adjusted, as set forth in the ordinance and as determined necessary by the City Council, by resolution, to maintain revenues and decrease water consumption.

In addition to normal and drought restrictions, the following additional restrictions may be enacted under emergency conditions. The City Council may also establish other water use restrictions to be in effect during an emergency condition.

1. Depending upon the severity of the water shortage, limit landscape watering to specified days only, or limit water utilization only for trees and plants watered by drip irrigation or hand-held buckets/hoses, or prohibit all irrigation completely.

2. Depending upon the severity of the water shortage, limit other outdoor water use such as, but not limited to, the washing of equipment or vehicles to specified times during the day, on specified days only, at commercial washes only where recycling of water is maintained, or prohibit all outdoor uses of water altogether.

3. Depending upon the severity of the water shortage, require all swimming pools and spas to have a cover, limit refilling of pools and spas to certain days, or prohibit the issuance of any new building permits for a pool or spa.

4. Prohibit the operation of fountains or ornamental water-using structures.

5. Prohibit the installation of turf grass.

6. Depending upon the severity of the water shortage, prohibit the construction of new golf courses and reduce or prohibit new residential construction.

Water Conservation Programs

To achieve short term and long term conservation, the City has implemented, is planning to implement, or is currently studying the 14 DMMs summarized in Section 8.

Summary of Reduced Potable Water Demands

Based on historical experience, the City has the ability to reduce potable water demands by 10 percent for a single dry year and 20 percent for multiple dry years. Water reductions are determined by comparing per capita water use during years when water conservation measures were in effect with years immediately prior to the implementation of water conservation measures. A summary of reduced water demands during drought years when conservation measures were implemented is presented in Table 29.

TABLE 29
CITY OF VACAVILLE
CHANGE IN WATER PRODUCTION AND DEMAND DURING DROUGHT YEARS (1990 – 1995)

Year	Population [a]	Water Production ac-ft/yr	mgd	Per Capita Demand, gpd/person	Demand Change [b]
1990	70,496	13,991	12.5	177	0%
1991	75,103	11,672	10.4	139	-21%
1992	77,504	12,036	10.7	139	-21%
1993	79,956	12,764	11.4	142	-20%
1994	81,592	14,189	12.7	155	-12%
1995[c]	81,361	14,695	13.1	161	-9%

[a] State of California, Department of Finance, Demographic Research Unit.
[b] Reduction in per capita demand as compared to 1990 demand.
[c] Data for 1995 has been revised from the 2005 UWMP Update to reflect adjustments and the most current records by the City and State.

6.4 Catastrophic Water Supply Interruption Plan

The *City of Vacaville Emergency Response Plan for Water Treatment* (Plan) outlines the water system response plan in the event of a disaster such as an earthquake, a City-wide power outage, or a bio-terrorism attack on the City's water treatment and distribution system. The City has an emergency operations center for the Utilities Department, which, when activated, coordinates damage surveys, gathers information, and conducts responses to the damaged processes and system. The Plan includes the following elements:

- List of water system components (wells, distribution system, storage tanks)
- Measures to be taken prior to and following an emergency event
- List of City emergency operation personnel
- Information regarding coordination with police and fire department personnel
- List of water testing laboratories, water system contractors, and pipe repair and installation contractors
- Utility service numbers for traffic signal repairs, gas and electrical repairs, and water works suppliers

6.5 Transfer or Exchange Opportunities

Vacaville works closely through SCWA to purchase water for short-term and long-term use. One example is the purchase of additional entitlements of State Water Project water from the Kern County Water Agency, outlined in Section 3.3. As a wholesaler, SCWA keeps the City of Vacaville appraised of any unscheduled water that may become available for short-term use. Vacaville has a good working relationship with the SID and is notified of supply changes through its Master Water Agreement.

6.6 Summary of Potable Water Supply and Distribution System Master Plan

In 1990 the City of Vacaville adopted a water system master plan that identified improvements to the water supply and distribution system required to implement the City's General Plan. In 1992, in conjunction with the master plan, the City adopted the *Water and Sewer Facilities Development Impact Fee Study* which laid the funding groundwork necessary to construct needed water facilities and infrastructure improvements for the existing users and future demands on the water system. The *Water and Sewer Facilities Development Impact Fee (DIF) Study* includes a Capital Improvement Program (CIP) for the City's water system. A copy of the city's most current CIP status report is provided in Appendix K.

The Master Plan identifies improvements to the existing water system necessary to solve existing deficiencies and to accommodate future growth and its estimated costs. In addition, improvements and associated cost estimates for the North Bay Regional Water Treatment Plant were developed. Pending water system improvements identified in the 2010/2011 planning period are summarized in Table 30. The City is currently in the process of developing an updated water system master plan. In addition, the *DIF* will be updated in 2011 to determine future project schedules.

Through the combined use of existing water rates, capital replacement funds, water connection fees (impact fees), direct developer construction, and various long-term financing options, the City has the ability to raise the necessary revenue to fund and implement the construction of the needed water production, treatment, and transmission facilities defined in the CIP and Master Plan.

The City budgeted $6,664,000 in local water improvements for 2010/2011. The local water improvements are funded with capital reserves and development impact fee revenues ($5,115,545), and net operating transfers and other revenue ($1,615,000). The City estimates that there would be a fund balance of $66,545 at the end of 2010/2011.

Implementation of the CIP and Master Plan will provide needed upgrades to the existing water system and facilities and continue to provide an adequate water supply for the currently planned new developments within the City's sphere of influence.

Permitting

The City submits amendments to the Water System Permit as needed, such as when constructing a new water supply well.

TABLE 30
PENDING WATER SYSTEM CAPITAL IMPROVEMENTS SUMMARY [a]

Project	Budget
E. Monte Vista Water Line: Horse Creek Lift Station to Vaca Valley Parkway (DIF 53C)	$2,567,000
Vaca Valley Parkway Water Line: Well 16 to Crocker Drive (DIF 43B)	$1,868,000
Noonan Reservoir	$797,300
Water Rights Buy Back	$1,589,500
Well Field Equipment/Instrumentation Improvements	$545,400
Alamo Drive Water Line: California Dr. to Merchant St.	$524,400
Water Reclamation Projects	$1,199,700
SCADA – Phase 2	$409,600
Water System Study	$1,153,400
Water Development Projects	$5,835,000
NBR Plant Upgrade	$5,211,900
Well #17 Drilling	$1,500,000
N. Orchard Reservoir – 2MG	$1,850,000
Water Main Capacity Program	$2,447,000
Peabody Road Water Line: NBR Plant to Foxboro Pkwy	$1,400,000
Reynolds Ranch Reservoir	$583,400
Reynolds Ranch Booster Pump Station	$446,100
Lagoon Valley Zone 2 Reservoir & Booster Pump Station (DIF 9A/B)	$1,192,400
Water DIF Study	$230,000
Water Meter Replacement Program	$2,650,000
Southeast Water Line: New Alamo Creek to UPRR	$108,000
Leisure Town Road Water Line: Orange Drive to Sequoia	$850,000
Butcher Reservoir Valve Vault	$543,500
Well #17 Equipping	$2,507,200
DE Plant Emergency Generator Replacement	$1,989,800
Water System Mapping (GIS)	$563,000
Groundwater Monitoring & Modeling	$1,218,000
Vine Street Reservoir Improvements	$52,500
Crocker Drive – 18" Water Main	$135,000

[a] As identified in the 2010/2011 Planning Period.

7.0 SUPPLY AND DEMAND COMPARISON PROVISIONS

This section compares projected water demand to available water supply during normal, single dry, and multiple dry years. It also provides a summary of the projected water demand at buildout.

7.1 Supply and Demand Comparison Through 2035

As shown in Table 31, Vacaville has sufficient water to meet its customers' needs through 2035. This is based on continued application of the water conservation ordinance and on-going conjunctive use of water supply sources.

Groundwater and surface water supplies are projected to meet or exceed projected water demands even during extended drought conditions. This was demonstrated during a previous drought that lasted for seven years. In planning for dry years, the City is fortunate to have as reliable a water source as the Solano Project. Based on storage volume and annual yield, the Solano Project has an approximate seven (7) year return period. This water coupled with the City's groundwater aquifer provides for a consistent supply in single and multiple dry years. In view of this demonstrated reliability of the City's conjunctive water supply strategy, future water supply will be adequate to offset future water demands during normal, single, and multiple dry years as illustrated in Table 31.

TABLE 31
CITY OF VACAVILLE
SUMMARY OF PROJECTED WATER DEMAND VERSUS AVAILABLE SUPPLY DURING NORMAL, SINGLE DRY, AND MULTIPLE DRY YEARS (AC-FT/YR)

	Normal Year		Single Dry Year		Multiple Dry Year	
Year	**Projected Demand**	**Available Supply**	**Projected Demand [a]**	**Available Supply**	**Projected Demand [b]**	**Available Supply**
2015	17,887	30,853	16,098	31,974	14,310	28,424
2020	18,748	32,723	16,873	33,834	14,998	30,194
2025	19,609	34,508	17,648	35,704	15,687	31,929
2030	20,344	36,393	18,310	36,148	16,275	33,642
2035	20,660	38,278	18,594	38,118	16,528	35,477

[a] Based on historical experience, the City has the ability to reduce demand by 10 percent during single dry years.
[b] Based on historical experience, the City has the ability to reduce demand by 20 percent during multiple dry years.

Tables 32, 33, 34, and 35 represent a potential response for single and multiple dry years consistent with the City's Water Shortage Contingency Plan (Appendix G) and based on actual water source reductions realized during the sixth and seventh consecutive year of the past drought. Table 32 assumes supply shortages with no change in demand. It is assumed that Year 3 of the multiple dry year scenario includes an additional 50 percent reduction in State Water Project water, an additional 20 percent reduction in Solano Project Water, and no change in groundwater pumping. Under these circumstances, a water supply shortage of 33 percent is observed in Year 3 of the multiple dry scenario; however, no overall water shortage is projected during multiple dry years.

TABLE 32
SINGLE DRY YEAR AND MULTIPLE DRY WATER YEARS
ASSUMES SUPPLY SHORTAGES WITH NO CHANGE IN DEMAND (AC-FT/YR)

Water Supply Sources	Current Normal Year Supply 2010	Single Dry Water Year [a]	Multiple Dry Water Years: Year 1	Year 2	Year 3
Supply totals	29,734	30,861	27,368	27,368	19,787
Demand totals	16,329	16,329	16,329	16,329	16,329
Supply Difference [b]		4%	-8%	-8%	-33%
Difference	**13,405**	**14,532**	**11,039**	**11,039**	**3,458**

[a] Single dry year supply increases because increased groundwater production is greater than reductions in surface water sources.
[b] The supply difference is the change in supply projected for a dry year compared to a normal year. A positive difference indicates an increase in supply during the dry year, and a negative difference indicates a decrease in supply.

The supply during single dry years is higher than normal year demand. This occurs because the increase in groundwater production is greater than decreases in surface water supply. The increased groundwater production cannot be sustained for more than a few years to prevent overdrafting the aquifer. For this reason, the increased groundwater production is not used to calculate normal year supplies.

Table 33 modifies the comparison by increasing the supply available for use with the inclusion of groundwater banking in previous years where demands did not equal the available supply. In this scenario, groundwater pumping is increased by an additional 15 percent, to 8,790 ac-ft/yr during Year 3. Demand remains the same as in Table 32. Vacaville's current water demand is approximately 45 percent less than its current water supply. This analysis demonstrates that the excess capacity of the City of Vacaville's water well system is sufficient to meet the demand in a water shortage, even after multiple dry years.

TABLE 33
RELIABILITY AND COMPARISON WITH SUPPLY OPTIONS
INCREASED GROUNDWATER PUMPING (AC-FT/YR)

Water Supply Sources	Average/ Normal Water Year	Single Dry Water Year [a]	Multiple Dry Water Years: Year 1	Year 2	Year 3
Supply totals	29,734	30,861	27,368	27,368	20,957
Demand totals	16,329	16,329	16,329	16,329	16,329
Difference	**13,405**	**14,532**	**11,039**	**11,039**	**4,628**

[a] Single dry year supply increases because increased groundwater production is greater than reductions in surface water sources.

Table 34 modifies the comparison by implementing DMMs and other consumption-reduction methods. Year 1 of multiple dry year water shortage exhibits a 10 percent reduction in demand, Year 2 exhibits a 15 percent reduction in demand, and Year 3 exhibits a 20 percent reduction in demand. This comparison holds supply at the same level as Table 32. This analysis demonstrates that the use of conservation measures can reduce demand levels to less than water supply quantities during multiple dry years.

TABLE 34
RELIABILITY AND COMPARISON WITH DEMAND OPTIONS (AC-FT/YR)

			Multiple Dry Water Years		
Water Supply Sources	**Average/Normal Water Year**	**Single Dry Water Year [a]**	**Year 1**	**Year 2**	**Year 3**
Supply totals	29,734	30,861	27,368	27,368	19,787
Demand totals	16,329	16,329	14,696	13,880	13,063
Demand difference [b]		0%	-10%	-15%	-20%
Difference	**13,405**	**14,532**	**12,672**	**13,488**	**6,724**

[a] Single dry year supply increases because increased groundwater production is greater than reductions in surface water sources.
[b] The demand difference is the change in demand projected for a dry year compared to a normal year. A positive difference indicates an increase in demand during the dry year, and a negative difference indicates a decrease in supply.

Table 35 modifies the comparison by increasing supply to account for increased groundwater production in Year 3 of multiple dry years and decreasing water supplies to account for conservation during dry years. It demonstrates that most circumstances of shortage can be planned for. However, effort should be devoted towards securing additional supplies during a catastrophic supply reduction.

TABLE 35
RELIABILITY AND COMPARISON WITH SUPPLY AND DEMAND OPTIONS (AC-FT/YR)

			Multiple Dry Water Years		
Water Supply Sources	**Average/Normal Water Year**	**Single Dry Water Year [a]**	**Year 1**	**Year 2**	**Year 3**
Supply totals	29,734	30,861	27,368	27,368	20,957
Demand totals	16,329	16,329	14,696	13,880	13,063
Difference	**13,405**	**14,532**	**12,672**	**13,488**	**7,894**

[a] Single dry year supply increases because increased groundwater production is greater than reductions in surface water sources.

As demonstrated in Tables 32, 33, 34, and 35 the City of Vacaville has more than sufficient water to effectively meet water demands during multiple dry water years. This was demonstrated during recent droughts. Even though the City is fortunate enough to have more than adequate water to meet current and projected future demands, it realizes the importance of conserving water to ensure sufficient future supplies are available for Vacaville and its neighboring communities. The City continues participation with the SCWA as part of the California Urban Water Conservation Council (CUWCC), and the following section highlights the City's continued commitment to water conservation practices.

7.2 General Plan Buildout Demand and Supply Analysis

Water demand estimates in this Plan are projected through 2035. In addition, buildout water demand was determined for the City using the most current WBLUDMS. In addition, projected water demand for five high-use customers was based on actual water allocated to each business. The five customers given special consideration were Genetech, Vaca Valley Parkway Business Park, Kaiser, Chiron, and Alza. As shown in Table 36, the City has sufficient water to meet its customers' needs through buildout in a normal, single dry, and multiple dry years.

TABLE 36
CITY OF VACAVILLE
SUMMARY OF PROJECTED WATER
DEMAND VERSUS AVAILABLE SUPPLY DURING
NORMAL, SINGLE DRY, AND MULTIPLE DRY YEARS (AC-FT/YR)
THROUGH GENERAL PLAN BUILDOUT

	Normal Year		Single Dry Year		Multiple Dry Year	
Year	Projected Demand	Available Supply	Projected Demand [a]	Available Supply	Projected Demand [b]	Available Supply
2015	17,887	30,853	16,098	31,974	14,310	28,424
2020	18,748	32,723	16,873	33,834	14,998	30,194
2025	19,609	34,508	17,648	35,704	15,687	31,929
2030	20,344	36,393	18,310	36,148	16,275	33,642
2035	20,660	38,278	18,594	38,118	16,528	35,477
Buildout [c]	33,026	38,277	29,723	38,117	26,420	35,477

[a] Based on historical experience, the City has the ability to reduce demand by 10 percent during single dry years.
[b] Based on historical experience, the City has the ability to reduce demand by 20 percent during multiple dry years.
[c] Buildout demand is based on land use data from the City's WBLUDMS.

8.0 WATER DEMAND MANAGEMENT MEASURES

The City of Vacaville is committed to implementing water conservation programs. This section provides brief descriptions of water conservation measures that the City has implemented, plans to implement, or intends to study. For over 20 years, the City has actively participated in a regional Water Conservation Committee (WCC) that includes other cities in Solano County, as well as the City's water wholesaler, the Solano County Water Agency (SCWA). As a result of this partnering, cities are able to share resources and benefit from each other's programs and studies. Reference will be made to the WCC throughout this section. The discussion of water conservation programs is outlined in the format of Demand Management Measures (DMMs), which are the same as the 14 Best Management Practices (BMPs) outlined by the California Urban Water Conservation Council (CUWCC).

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

<u>Implementation Description</u>

An indoor/outdoor residential water use survey is offered free of charge to the top 10 percent and 20 percent single-family and multi-family residential water users as identified through the City's utilities billing system. Surveys are also offered at change of account status and are available to any residential water customer upon request. The surveys are conducted by a two person team which identifies and recommends potential areas for water savings including repairs, corrections, or changes in usage.

During the indoor portion of the survey, surveyors provide the customer with a detailed history of their water consumption over a three year period; check toilets and fixtures for leaks; measure flow rates of fixtures; install high-efficiency showerheads and aerators as requested/required; and provide free literature, water savings devices, and materials to help promote water efficient use.

The surveyors then conduct an outdoor/landscape survey in which they demonstrate to the resident how to locate and read the water meter as well as leak detection practices; inspect the irrigation system equipment; review the sprinkler timer schedule; check for breaks and/or leaks; evaluate soil and ground cover condition; test water pressure; and provide free literature and water savings devices and materials to help promote water efficient landscaping.

<u>Implementation Schedule</u>

The City has been participating in the regional water survey program since 2009. The program is scheduled to be conducted over a ten year period.

<u>Method to Evaluate Effectiveness</u>

The program goal is to survey 1.5 percent of the City population over the life of the program, or 0.15 percent annually. Updated reports of invitations, responses, and surveys conducted are provided to the City on a regular basis in order to assess annual and overall program progress.

Feedback from customers contacted is considered for refining and updating the program as needed. In 2009, 3,701 customers were contacted, with 402 surveys completed. In 2010, 4,350 customers were contacted, with 225 surveys completed.

Conservation Savings

The City is currently compiling and evaluating water consumption data from 2009 and 2010 water survey participants to identify water savings and/or reduction in consumption, if any, since the implementation of the program. Factors to be considered in the analysis include impacts from weather and economic conditions for each year. In 2010, our surveyors reported that an estimated 70.7 percent of residents participating in the survey saved water totaling 60,119 gallons per day (GPD). Additional results are expected to be available by the end of 2011.

Budget

In 2010, Vacaville budgeted approximately $10,000 for the continuation of this DMM.

8.2 DMM 2 - Residential Plumbing Retrofit

Implementation Description

Currently, this DMM requires retrofitting all pre-1992 residences, estimated to be 17,106 single-family homes and 6,085 multi-family units (per the 1998 City of Vacaville Water Conservation Plan), with low flow fixtures.

Plumbing retrofit kits are provided to all pre-1992 accounts at change of account status (unless the City has a record of a retrofit at that account). Customers are also offered water use surveys at change of account status (see DMM 1). If a survey is scheduled at that time, the retrofit kit is delivered at the time of the survey. Implementation includes:

- Distribution of retrofit kits consisting of high-efficiency showerheads, rated at 2.5 gallons per minute (gpm) or less, and faucet aerators rated at 2.2 gpm or less
- Contacting the top 1 percent of single-family residential water users, and all multi-family managers, for delivery.
- Contacting potential users via direct mail and distributing information at local community events for distribution.

Implementation Schedule

In 1992, Vacaville distributed 3,000 low-flow showerheads to pre-1980 households in the service area as previously required. Since 2004, the City has been distributing low-flow devices on an as-requested basis.

Method to Evaluate Effectiveness

Based on data collected between 1998 and 2005, the City met the 75 percent saturation requirement for single-family housing in 2004. To date, an additional 2,164 low flow showerheads and 897 faucet aerators have been distributed to single and multiple family accounts. Currently, an estimated 80 percent of pre-1992 single-family residences in the City are fitted with low-flow devices. Accordingly, this meets the requirement for completing DMM 2. However, the City will continue to implement the change of account method in order to achieve 100 percent saturation.

The City will continue to collect and/or assess the following information to determine the effectiveness of this DMM:

- The total number of non-retrofitted pre-1992 single-family residence and multifamily units.
- The location, type, and number of retrofits completed, devices distributed, and program costs.
- The number of retrofit kits distributed and installed during the previous reporting period.
- The estimated percentage of pre-1992 single-family residences and multi-family units in the service area fitted with low flow showerheads and faucet aerators.

Conservation Savings

It is estimated that full implementation of this DMM will save approximately 265 acre-feet of water annually.

Budget

The 2010 budget for this program was $2,500 for the implementation of this DMM.

8.3 DMM 3 - System Water Audits, Leak Detection and Repair

Implementation Description

The City conducts distribution system water audits annually in order to reconcile water production figures with consumption records. After accounting for unmetered uses, the City estimates its system losses and utilizes leak detection equipment in an attempt to minimize those losses. The City's system audit program consists of the following:

- Annually complete a pre-screening system audit to determine the need for a full-scale system audit. The pre-screening system audit is determined as follows:
  - Determination of metered sales;
  - Determination of other system verifiable uses;
  - Determination of total supply into system
  - Division of metered sales plus other verifiable uses by total supply into the system. In the event this quantity is greater than 10 percent, a full-scale system audit is initiated.

- The City also advises customers whenever it appears possible that leaks exist on the customer's side of the meter; performs distribution system leak detection when warranted and cost-effective; and repairs leaks when found.

Implementation Schedule

Vacaville began its leak detection and repair program in 1989. The City initiated a meter replacement program in 2005 to upgrade existing meters to radio read meters in addition to maintaining its water main replacement and leak detection program. During this period, the City has been able to maintain unaccounted for water losses at 7 percent annually.

If the annual prescreening audit indicates that unaccounted water exceeds 10 percent, the City will complete a water audit of its distribution system using methodology consistent with that described in American Water Works Association's (AWWA) "Water Audit and Leak Detection Guidebook".

Method to Evaluate Effectiveness

The City collects the following information to determine the effectiveness of this DMM:

- Prescreening audit results and supporting documentation.
- Maintain in-house records of audit results or the completed AWWA Audit Worksheets for each completed audit period.

Conservation savings

Based on the system water supply and verifiable metered uses for 2010, water losses are currently estimated at 7.0 percent.

Budget

A portion of the Utilities Department's maintenance operating budget and capital improvement project budget is utilized on an as-needed basis for repair and replacement. More than 10 percent of the City's system was evaluated during the year.

8.4 DMM 4 - Metering with Commodity Rates for All New Connections and Retrofit of Existing Connections

Implementation Description

All new and existing connections are metered and billed by volume of use. As of March 1, 2011, Residential Tier 1 billing is based on an initial 12 units (1 unit = 748 gallons) of water at $1.12 per unit; each additional residential unit is $1.53 per unit. Senior primary residence rates are 15 percent lower. Meters and volume of use billings are also applied to commercial, industrial, and institutional (CII) accounts. The utilities billing system currently provides customers with a bar chart graphic of their volume-of-use over the last 12 months.

Table 37 provides a summary of the number of meter connections per account classification.

TABLE 37
WATER CONNECTIONS - METER INFORMATION

Account Classification	Number of Potable Connections Metered
Single Family	24,332
Residential Landscape	28
Multi-Dwelling	644
Multi-Dwelling Landscape	31
Commercial	965
Commercial Mixed Use	63
Commercial Landscape	138
Commercial Mixed Use Landscape	11
Industrial	79
Industrial Landscape	10
Institutional	100
Institutional – Public City	57
Institutional – Public City/School	65
Institutional Landscape	10
Institutional – Public City Landscape	287
Institutional – Public County/School Landscape	10
Total Urban Connections (2010)	**26,830**

Implementation Schedule

The City has required meters for all new connections since the inception of the public utility in 1959. The City does not have any unmetered connections so does not have a program for retrofitting unmetered connections. In 2005 the City initiated an evaluation of the City's meters to determine areas for retrofitting existing meters to newer and more accurate radio-read meters.

The City will continue to install and read meters on all new services, and will continue to conduct its meter calibration and replacement program, as well as continue to evaluate and determine areas for retrofitting and upgrading to more accurate meters. Since 2005, over 8,100 existing meters have been replaced and upgraded.

Conservation Savings

Conservation literature states that metered accounts can result in a 20 percent reduction in demand compared to non-metered accounts.

Budget

The budget for this program is part of the existing Utilities Department Operations and Maintenance (O&M) budget. The annual budget for replacement and upgrade to radio-read meters is $350,000.

8.5 DMM 5 - Large Landscape Conservation Programs and Incentives

Implementation Description

Large landscape areas in the City of Vacaville primarily consist of parks, schools, golf courses, and community and private facilities or businesses.

Through the WCC the City offers water conservation indoor (see DMM 9) and outdoor (landscape) surveys to its Commercial, Industrial, and Institutional (CII) customers. The goal of the program is to provide financial incentives for CII accounts to upgrade their irrigation systems, plumbing fixtures, and/or water-using appliances for the purpose of water use efficiency. The surveys are offered free of charge to CII customers as identified through the City's utilities billing system. The surveys are conducted by ConserVision, a consultant specializing in water conservation. The inspectors inspect the irrigation system equipment; check for breaks and/or leaks; evaluate the landscape; check pools and spas for leaks; and identify and recommend potential areas for water savings including repairs, corrections, or changes in usage.

Since 2005, we have offered to conduct 18 water conservation CII landscape surveys to customers, and have been able to complete 7 surveys. Participants in these surveys included the following:

- Creekside Shopping Center
- Vacaville City Hall
- America's Best Value Hotel
- Alamo Plaza Shopping Center
- Best Western Heritage Inn
- McDonald's
- Quality Inn

Total costs associated with these surveys were approximately $10,500.

Also, three California Irrigation Management Information System (CIMIS) weather stations are positioned at various micro climates by the WCC, collecting, calculating, and storing weather data for use by the central system. The City is able to use this weather data to further assist large landscape accounts with water conservation management techniques during development, as well as on request. The City is currently in the process of updating its large landscape irrigation control systems to coordinate with CIMIS.

To date Vacaville has installed smart weather-based central controllers at 11 City parks and one Business Park. The participating sites and approximate costs of equipment installation were:

- Alamo Creek Park $ 20,000
- Al Patch Park $ 50,000
- Andrews Park $ 10,000
- Cannon Station Park $ 4,000
- Cooper Park $ 14,000
- Countrywood Park $ 4,000
- Hawkins Park $ 5,000
- Meadowlands Park $ 12,000
- Ridgeview Park $ 15,000
- Southwood Park $ 14,000
- Stonegate Park $ 21,000
- Orange Drive Business Park $ 75,000 (paid for from tenant assessments)

The controllers receive data from the CIMIS station located at Arlington Park.

Finally, the City maintains *Water Efficient Landscape Requirements* that require a water budget for all landscape areas (except single-family backyards). The regulations establish a budget based on the season and the ratio of high, medium, low, and hardscape areas contained within the designated landscape area. New CII customers and change-of-service CII customer accounts are also provided information on climate-appropriate landscape design and efficient irrigation equipment/management. A copy of the *Water Efficient Landscape Requirements* is provided in Appendix J.

Implementation schedule

Approximately 75 percent of irrigation meter accounts have a water budget, including the Public-City landscape accounts, as of 2010. The City will continue to work towards 100 percent participation.

Method to Evaluate Effectiveness

Development plans are reviewed to ensure compliance with *Water Efficient Landscape Requirements* and Specifications. The plan check/review process is completed by city employees who have been trained as landscape water auditors and ensures that landscaping meets the high, medium, low water uses for the square footage of landscaping.

The program focus will be on identifying large landscapes installed prior to implementation of the *Water Efficient Landscape Requirements* update in 1998 and then offering presentations to market free landscape surveys.

Conservation Savings

The City will be compiling and evaluating water consumption data from 2009 and 2010 program participants to identify water savings and/or reduction in consumption. The manufacturers of the irrigation equipment installed at the City parks estimate a 30 to 40 percent savings in water use annually at the participating sites.

Budget

The City's 2010 annual budget for this DMM is estimated to be $2,000. Funds are budgeted for contingency activities, such as evapotranspiration landscape irrigation controllers; however, any other costs (such as requested customer surveys) are absorbed in the course of normal business.

8.6 DMM 6 - High-Efficiency Washing Machine (HEW) Rebate Programs

Implementation Description

The City participates in a high-efficiency clothes washing machine (HEW) rebate program funded by the State and administered through SCWA. The rebate program currently offers up to $125 rebates for the purchase of a Tier 3 water-saving, high-efficiency clothes washer.

Residents are notified of the availability of the program on the City and SCWA websites and program information is provided at City public counters. The City further supports the program by offering detailed information about the rebate and emphasizing the water saving aspects associated with high-efficiency washers. Residents eligible for these rebates may also be eligible for separate rebates through Pacific Gas and Electric for purchase of energy-efficient washers.

Implementation Schedule

The City has been participating in the HEW program since 2007. The program is scheduled to be conducted on an annual basis while funding is available.

Method to Evaluate Effectiveness

The City is monitoring the impact of the existing rebates on purchases of high efficiency washer purchases while continuing to assess any other customer incentives to purchase high-efficiency washing machines being offered by local energy service providers.

The rebate program has proved to be very popular, particularly when combined with the projected $650 long-term savings in energy and water costs over the life of the appliance. Since 2007, 840 residents have received rebates.

Conservation Savings

The City is currently compiling and evaluating water consumption data from 2009 and 2010 HEW rebate participants to identify water savings and/or reduction in consumption, if any, since the implementation of the program. However, there is no current method to determine what percentage of any water savings would come from installation of the HEWs.

Budget

The 2010 budget for Vacaville's support of this DMM is $4,000.

8.7 DMM 7 - Public Information Programs

Implementation Description

As a member of the WCC, Vacaville participates in the following programs:

- Planet Water Display at Six Flags Marine World in Vallejo, California - a permanent exhibit that includes a water-conserving demonstration garden and interactive exhibits emphasizing the need for water conservation. Approximately 2 million visitors to Marine world view this exhibit annually.
- Expanded Billing Software – since 2005 the city has utilized a billing system which incorporates bar chart displays of customers water use over the previous 12 months, allowing them to assess and monitor their water usage.
- As part of the Putah Creek Discovery Corridor (PCDC) partnership, continues support of the Corridor, a “place of discovery” demonstration/activity site that promotes many aspects of environmental and water conservation.
- Solano Water Relief Model- A table-top model of Water supply facilities in Solano County was designed and fabricated with WCC involvement and is used for public meetings and school education.

In addition to these group activities, the City’s public information program includes the following components:

- Public library displays.
- Providing speakers to employees, community groups, and the media.
- Annual billing inserts promoting water conservation awareness. Water conservation information is also printed directly on bills.
- Providing information on customer bills showing water use for the current billing period compared to the same period the year before.
- Maintaining a dedicated water conservation section on the Public Works Department website to promote water conservation practices and water rate information, as well as maintaining a link to www.solanosaveswater.org, the SCWA website promoting water conservation, education, and gardening county-wide.

As an active member of the regional WCC, the City has developed and participated in all of the public information events put together by the committee, as well as financially supporting the California Water Awareness Campaign through its participation in the WCC.

Implementation Schedule

The City will continue to promote water conservation via the City's and SCWA's websites and promotion efforts, rebate programs, materials, information and display sites, demonstration gardens, workshops, and public events. Additionally, the City has begun work with the WCC to hold residential irrigation and landscape workshops throughout the County, and anticipate the first workshops to be implemented in 2012. The City will continue to explore more partnership opportunities to increase its methods of marketing and encouraging water conservation.

Method to Evaluate Effectiveness

The City will annually collect and assess relevant data to determine program effectiveness, including, but not limited to:

- number of visits to conservation websites
- number of programs and materials distributed
- number of participants at workshops and public events
- annual budget for program

Conservation Savings

The City has no method to quantify the savings as a result of the implementation of this DMM, but maintains these programs and contributions to actively promote water conservation in the best interest of the City.

Budget

WCC public information program costs are shared county-wide by the member agencies. SCWA pays 50 percent and each agency pays a percentage commensurate with its population. The 2010 budget for Vacaville's share of this jointly funded DMM is currently estimated at $5,000.

8.8 DMM 8 - School Education Programs

Implementation Description

The Solano Water Education Program (SWEP), administered through the Solano Irrigation District (SID) in partnership with the cities of Vacaville, Suisun, Dixon, and Fairfield, provides in-school water conservation education workshops to K-12 students, teachers, and parents. The program focuses on educating participants on the water cycle, local water sources, water and wastewater treatment, and water conservation.

The program is supplemented with materials including videos, activity books, maps, posters, test kits, and models. A new poster, "OUR WATER: Where it Comes From, Where it Goes, and How to Conserve It," depicting the flow of water throughout Solano County, was provided to all educators participating in the program.

Incentive materials for student participation include bracelets, erasers, pencils, rulers, static clings, and stickers. Project W.E.T. (Water Education for Teachers) focuses on providing workshops specifically for teachers. This year's workshops provided six hours of water conservation training for 19 participating educators.

The program continues to administer the annual water education poster contest in which students from throughout the county compete to have their original artwork featured in the SWEP brochure and materials. In the 2010 school year, over 2,500 brochures were distributed to schools in the participating districts. Also, this was the first year in which the brochure was available on the SID website. The program plans to work with the participating agencies to post the program on each agency website in order to gain greater exposure for the program.

This regional program maintains the following emphasis: *Working with public and private schools in the water suppliers' service area to provide teacher workshops, educational materials, and classroom and school presentations that identify urban, agricultural, and environmental issues and conditions in the local watershed. Education materials shall meet the state education framework requirements, and grade appropriate materials shall be distributed to grade levels K-3, 4-6, 7-8, and high school.*

Implementation Schedule and Budget

In addition to the new materials for 2010, the program expanded to bring in Zun Zun Environmental Education to perform at school rallies throughout the region in the fall, with several requests for additional performances. The first annual high school water conservation video contest will take place in spring 2011. The City will continue to implement this DMM as described above.

Method to Evaluate Effectiveness

Periodic meetings are held throughout the year to review and discuss the program activities and strategies in order to determine the effectiveness of this DMM. In the 2009/2010 school year, the program reported the following for Vacaville:

- 19 in-school presentations were made during the reporting period. This year the program added "Hands On Water Activities" booklets for teachers.
- 471 students were reached.
- A "water play" activity booklet for 2nd and 3rd grade students and "Discovering Drought" booklet for 3rd through 6th graders was added to the curriculum.
- Over 2,500 activity books, posters, and materials were distributed to students and teachers.

Conservation Savings

The City has no method to quantify the savings as a result of the implementation of this DMM, but maintains these programs and contributions to actively promote water conservation in the best interest of the City.

Budget

The annual budget for 2010 is approximately $10,000.

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

Implementation Description

The City participates in a regional commercial, industrial, and institutional (CII) water use survey and customer incentive program. The program is grant funded and administered through SCWA. Implementation of the program consists of the following:

- The identification and confirmation of eligibility of CII customers. Participants must have a water service account active for the previous twelve months and use potable water for irrigation.
- Ranking potential participants – large landscapes for schools, parks and publicly funded common areas are targeted, with preference given to areas of irrigated turf.
- Providing water use surveys to identified CII customers.
- Monitoring the effectiveness of implemented audit recommendations.
- Identifying incentives programs that would encourage the implementation of cost-effective audit recommendations that were not implemented.

Publicly funded accounts are eligible for up to $10,000 in financial incentives, while commercial accounts are eligible for up to $5,000.

Implementation Schedule

The City implemented a pilot survey program in 2000, with $15,000 in funding. Additional funding received in 2004 was used for the second phase of the project to conduct additional indoor and outdoor water audits at industrial and mixed-use retail locations. With the additional funding made available for the current program through SCWA, the City will continue to update the eligible list and attempt to conduct more audits through the regional program. Ten indoor surveys were conducted between 2000 and 2004. Since 2005, an additional 20 indoor surveys have been conducted as part of this program.

The City has completed the development phase of this Regional CII program, and is developing a schedule for implementation for the remaining targeted accounts. Implementation will include some or all of the following components:

- Further marketing of the program on the City and County websites.
- Generating and distributing flyers to advertise the program.
- Conducting audits as requested.
- Enrolling in the Spray and Rinse program.

Method to Evaluate Effectiveness

The City is continuing to collect the following information to determine the effectiveness of the survey program implemented to satisfy this DMM:

- The number of customers and amount of water use within the CII customer classes for comparative years.
- The type and number of water saving recommendations implemented each year.
- Incentive program budget and customer outlays.

Conservation Savings

The City of Vacaville continues to monitor implementation of recommendations at each account location. Water consumption data for each year of participation will be assessed to determine water savings achieved.

Budget

The City has a 2010 budget of $6,300 for implementation of this DMM.

8.10 DMM 10 - Wholesale Agency Assistance Programs

The City of Vacaville is not a wholesale agency; therefore, this DMM does not apply.

8.11 DMM 11 - Conservation Pricing

Implementation Description

The City of Vacaville has uniform and increasing block price structures for all customer categories. Uniform pricing applies to commercial, industrial, and institutional customers that are billed at the higher, Tier 2 rate for all water units as a monetary incentive to conserve. All relevant codes and regulations have provisions allowing the City Council to approve higher rates and additional tiers or price blocks during drought or emergency conditions. Existing rates (2010) for water services are structured as shown in Table 38.

TABLE 38
CURRENT CITY RATE STRUCTURE

Customer Classification	Lifeline [a]	Uniform [b]	Inclining Block [c]
Single Family Residential	√		√
Multi-Family Residential	√		√
Commercial		√	
Industrial		√	
Institutional		√	
Public Agency		√	
Public Landscape		√	
Reclaimed		Free	
Agricultural		N/A	
Other			
Construction Water		√	
Miscellaneous		√	

[a] Lifeline = Minimal amount of water allotted to customer.
[b] Uniform = Price per unit used is constant.
[c] Inclining Block = Price is higher as use is greater.

Per Vacaville's regulations (Municipal Code 13.20.050.1, Ordinance 1431), as drought or emergency conditions are declared by City Council, additional tiers are added to the existing rate structure to promote conservation. A target water use amount is determined across the board for all residential customers and based on past usage patterns for commercial, industrial, and landscape customers. Customers exceeding their target water usage amount pay increasingly higher rates for that water.

Implementation Schedule

The City has employed conservation pricing since 1991.

Method to Evaluate Effectiveness

The City is currently compiling and evaluating water consumption data from 2009 and 2010 water users to determine impact on water usage from Tier 2 billing.

Conservation Savings

The incentive of this DMM is to decrease the customers' water costs and water use through price incentives, as described above.

Budget

There is no budget for implementation of this DMM.

8.12 DMM 12 – Conservation Coordinator

Implementation Description

The City of Vacaville has maintained a Water Conservation Coordinator position since 1989. The current water conservation coordinator is Ramiro Jimenez. Ramiro is a full-time Management Analyst with the Utilities Department and is in charge of water conservation and water information outreach. He can be contacted at:

Ramiro Jimenez
Management Analyst II/Water Conservation Coordinator
Utilities Department
City of Vacaville
P.O. Box 214
Elmira, CA 95625
(707) 469-4123
Email: rjimenez@cityofvacaville.com

Implementation Schedule

The Water Conservation Coordinator spends up to 30 percent of his time annually on water conservation programs.

Method to Evaluate Effectiveness

The Water Conservation Coordinator reports regularly on water conservation activities, efforts, goals and results in order to measure current program effectiveness, as well as recommends additional or alternative ideas for achieving water conservation.

Conservation Savings

The City has no method to quantify the savings as a result of the implementation of this DMM, but maintains this position to actively promote water conservation in the best interest of the City.

Budget

In 2010, the City budgeted a total of $40,000 towards staffing the Water Conservation Coordinator position to implement the various DMMs for the City of Vacaville.

8.13 DMM 13 - Water Waste Prohibition

Implementation Description

The Urban Water Shortage Contingency Plan (Appendix A) includes Ordinance No. 1431 titled "An Urgency Ordinance of the City of Vacaville Establishing Water Conservation Requirements and Water Rate Structures to Address Normal, Drought, and Emergency Conditions".

The intent of the ordinance is to initiate immediate water conservation measures and develop a plan to achieve a 50 percent reduction in water use should it become necessary to preserve and protect the limited water supplies available to the City of Vacaville for human consumption, public sanitation, residential use, and maintenance of business and commercial facilities. Water conservation measures, as well as pricing mechanisms to reduce water consumption, were approved in 1991 and continue to be applicable to all water users within the City.

No user of the City's water system may knowingly make, cause, use, or permit the use of water from the system in a manner that violates the ordinance as cited below:

- Excessive water runoff due to landscape irrigation activities.
- Washing of sidewalks, driveways, walkways, parking lots, and all other hard-surfaced areas by direct hosing except for removal of hazardous materials for protection of public health and safety.
- Washing of vehicles, equipment, structures, and other items without the use of a shutoff.
- The escape of water through breaks or leaks within the water users' plumbing or distribution system that is not repaired within 24 hours of discovery.
- Fire hydrants used for purposes other than firefighting, water quality, maintenance, sanitation, and construction.

Any customer violating the regulations and/or restrictions on water use set forth in the Ordinance is subject to compliance measures as follows:

- Customer receives a written warning for the first violation
- Customer is fined for up to three additional violations
- In the event of a fourth violation, customer is fined and the Utilities Director may install a flow restrictor, or disconnect water service, on the property for a temporary period of time
- Properties with multiple violations may be deemed a public nuisance and may be subject to abatement by restraining order or injunction. In addition to the aforementioned water use prohibitions, the City's Water Efficient Landscape Requirements are always in effect and apply to all water users as well.

During Drought and Emergency stages, City Council may also add supplemental water use restrictions, as appropriate, to achieve the desired level of conservation.

Implementation Schedule

The City has permanently incorporated this DMM into its ordinances, which have been in effect since 1991.

Method to Evaluate Effectiveness

The City is collecting the following information to determine the effectiveness of this DMM:

- Number of customers contacted about water waste violations
- Number of customers cited for repeat water waste violations

Conservation Savings

The City has no method to quantify the savings as a result of the implementation of this DMM, but maintains this DMM to actively promote water conservation in the best interest of the City.

Budget

Enforcement costs are part of the department's overhead, and while the ordinance is enforced at all times, additional enforcement costs would only be incurred during drought conditions.

8.14 DMM 14 - High-Efficiency Toilet (HET) Rebate Programs

Implementation Description

The City participates in a high-efficiency toilet rebate program funded by the State and administered through SCWA. The rebate program currently offers up to $125 rebates for the purchase and installation of a water-saving, high-efficiency toilet.

Residents are notified of the availability of the program on the City and SCWA websites and program information is provided at City public counters. The City further supports the program by offering detailed information about the rebate and emphasizing the water saving aspects associated with high-efficiency toilets.

Implementation Schedule

The City has been participating in the HET program since 2008. The program is scheduled to be conducted on an annual basis while funding is available.

Method to Evaluate Effectiveness

The City is monitoring the impact of the existing rebates on purchases of high efficiency toilet purchases while continuing to assess any other customer incentives or mandates to install high-efficiency toilets.

Since 2007, 149 residents have received rebates for purchasing and installing high-efficiency toilets.

Conservation Savings

The City is currently compiling and evaluating water consumption data from 2009 and 2010 HET rebate participants to identify water savings and/or reduction in consumption, if any, since the implementation of the program. However, there is no current method to determine what percentage of water savings has resulted from installation of the HET.

Budget

The 2010 budget for Vacaville's support of this DMM is $10,000.

9.0 WATER RECYCLING

This section provides information on recycled water and its potential for use as a water source in the City of Vacaville. It also includes a description of the wastewater collection and treatment system for the City.

9.1 Wastewater Collection and Treatment

The City owns and operates the Easterly Wastewater Treatment Plant (WWTP) located southeast of the town of Elmira, which serves the City of Vacaville. The WWTP is a standard secondary treatment facility with a rated dry weather flow capacity of 15 mgd. In April 2008, the Regional Water Quality Control Board (Regional Board) adopted a new permit for the WWTP which added new treatment requirements to include nitrate reduction, blending elimination, seasonal tertiary filtration, and trihalomethanes (THMs) reduction. The Regional Board also issued the City a Time Schedule Order (TSO) which requires nitrate reduction facilities to be in place, tested, and operating prior to April 2013. The permit requires tertiary level treatment and blending elimination facilities to be operating by April 2015. The City received City Council approval in 2009 to proceed with the Tertiary Project and complete all upgrades required by the Regional Board permit. These upgrades are underway.

The Gibson Canyon Creek Wastewater Treatment Plant (Gibson Plant) has been closed and demolished. This was a small, secondary treatment plant located on the west side of I-505. The Gibson Plant received waste from two industrial dischargers who are now discharging directly to the WWTP.

Table 39 provides a summary of current and projected annual average wastewater generation and treatment rates at Easterly WWTP.

TABLE 39
CURRENT AND PROJECTED ANNUAL AVERAGE
WASTEWATER GENERATION AND TREATMENT RATES (MGD)
EASTERLY WASTEWATER TREATMENT PLANT

	2010	2015	2020	2025	2030	2035
Wastewater Generation [a]	12.7	14.5	15.1	15.4	15.7	16.0
Wastewater Treatment [a]	14.9	17.0	17.7	18.1	18.4	18.8

[a] Wastewater generation and treatment volumes for 2010-2035 are from the draft 2002 Infrastructure Audit. Wastewater volumes for 2025 and 2030 are estimated based on a projected population increase of 2 percent every five years.

9.2 Wastewater Disposal and Water Reuse

Currently, treated effluent from the Easterly facility is discharged into Alamo Creek, which flows into Cache Slough. A portion is used for irrigation by the Solano and Maine Prairie Irrigation Districts and offered to construction firms free of charge for use in dust control and other construction activities. The use of reclaimed water for urban irrigational purposes is an important and viable resource. If reclaimed water were used for watering City parks or meeting industrial and other demands, reductions in the demand for domestic water supply could be realized.

A preliminary planning study performed in 2003 identified a network of recycled water pipelines, pumping, and storage facilities that could be constructed in the southern part of town. This distribution system could deliver recycled water mainly for the irrigation of public parks, green belts, golf courses, business parks, and schools. Additional customers could be added as they become viable. Possible future customers include the Vacaville-Elmira Cemetery and the California State Prison – Solano.

In addition, the City of Vacaville has been working with a power generation plant developer for a possible power plant located on property adjacent to the wastewater treatment plant. The close proximity to the wastewater treatment plant allowed the City to establish a reasonable rate for recycled water. This incentive provided continuing interest in Vacaville as a project site and, if the project moves forward, could result in as much as 5 MGD of recycled water sales. While this will not directly offset City potable water use, which is not available in the Elmira area, it could offset groundwater or non-potable SID water use. The power ventures developer is currently holding a lease on the property pending acceptance of their project by PG&E. The City has not offered incentives to other potential customers at this time.

APPENDIX A

URBAN WATER MANAGEMENT PLAN CHECKLIST

Table I-2 Urban Water Management Plan checklist, organized by subject

No.	UWMP requirement [a]	Calif. Water Code reference	Additional clarification	UWMP location
PLAN PREPARATION				
4	Coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable.	10620(d)(2)		Section 2.3 Agency Coordination (pg. 2-1 & 2-2)
6	Notify, at least 60 days prior to the public hearing on the plan required by Section 10642, any city or county within which the supplier provides water that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan. Any city or county receiving the notice may be consulted and provide comments.	10621(b)		**Not Applicable** – The City does not supply water to another city or county.
7	Provide supporting documentation that the UWMP or any amendments to, or changes in, have been adopted as described in Section 10640 et seq.	10621(c)		Section 2.2 Plan Adoption (pg. 2-1); Appendix B.
54	Provide supporting documentation that the urban water management plan has been or will be provided to any city or county within which it provides water, no later than 60 days after the submission of this urban water management plan.	10635(b)		**Not Applicable** – The City does not supply water to another city or county.
55	Provide supporting documentation that the water supplier has encouraged active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of the plan.	10642		Section 2.1 Public Outreach (pg. 2-1)
56	Provide supporting documentation that the urban water supplier made the plan available for public inspection and held a public hearing about the plan. For public agencies, the hearing notice is to be provided pursuant to Section 6066 of the Government Code. The water supplier is to provide the time and place of the hearing to any city or county within which the supplier provides water. Privately-owned water suppliers shall provide an equivalent notice within its service area.	10642		Section 2.2 Plan Adoption (pg. 2-1)
57	Provide supporting documentation that the plan has been adopted as prepared or modified.	10642		Section 2.2 Plan Adoption (pg. 2-1); Appendix B.

No.	UWMP requirement [a]	Calif. Water Code reference	Additional clarification	UWMP location
58	Provide supporting documentation as to how the water supplier plans to implement its plan.	10643		Section 1.2 Plan Implementation (pg. 1-3)
59	Provide supporting documentation that, in addition to submittal to DWR, the urban water supplier has submitted this UWMP to the California State Library and any city or county within which the supplier provides water supplies a copy of its plan no later than 30 days after adoption. This also includes amendments or changes.	10644(a)		Section 2.2 Plan Adoption (pg. 2-1);
60	Provide supporting documentation that, not later than 30 days after filing a copy of its plan with the department, the urban water supplier has or will make the plan available for public review during normal business hours	10645		Section 2.2 Plan Adoption (pg. 2-1)
SYSTEM DESCRIPTION				
8	Describe the water supplier service area.	10631(a)		Section 3.1 Description of Existing Facilities (pg. 3-1, Figures 1 & 2)
9	Describe the climate and other demographic factors of the service area of the supplier	10631(a)		Section 1.3 Background – History and Growth (pg. 1-3 & 1-4); Section 1.2 Background – Climate (pg. 1-4).
10	Indicate the current population of the service area	10631(a)	Provide the most recent population data possible. Use the method described in “Baseline Daily Per Capita Water Use.” See Section M.	Section 1.2 Background, History and Growth (pg. 1-3 & 1-4); Table 1 (pg.1-4)
11	Provide population projections for 2015, 2020, 2025, and 2030, based on data from State, regional, or local service area population projections.	10631(a)	2035 and 2040 can also be provided to support consistency with Water Supply Assessments and Written Verification of Water Supply documents.	Table 1 (pg.1-4)

No.	UWMP requirement [a]	Calif. Water Code reference	Additional clarification	UWMP location
12	Describe other demographic factors affecting the supplier's water management planning.	10631(a)		Section 1.2 Background – History and Growth (pg. 1-3 & 1-4)
SYSTEM DEMANDS				
1	Provide baseline daily per capita water use, urban water use target, interim urban water use target, and compliance daily per capita water use, along with the bases for determining those estimates, including references to supporting data.	10608.20(e)		Section 4.0 and subsections, (pgs. 4-1 through 4-5)
2	*Wholesalers:* Include an assessment of present and proposed future measures, programs, and policies to help achieve the water use reductions. *Retailers:* Conduct at least one public hearing that includes general discussion of the urban retail water supplier's implementation plan for complying with the Water Conservation Bill of 2009.	10608.36 10608.26(a)	Retailers and wholesalers have slightly different requirements	Section 2.1 Public Outreach (pg. 2-1)
3	Report progress in meeting urban water use targets using the standardized form.	10608.40		**Not Applicable** until 2015 UWMP
25	Quantify past, current, and projected water use, identifying the uses among water use sectors, for the following: (A) single-family residential, (B) multifamily, (C) commercial, (D) industrial, (E) institutional and governmental, (F) landscape, (G) sales to other agencies, (H) saline water intrusion barriers, groundwater recharge, conjunctive use, and (I) agriculture.	10631(e)(1)	Consider 'past' to be 2005, present to be 2010, and projected to be 2015, 2020, 2025, and 2030. Provide numbers for each category for each of these years.	Table 16 (pg. 5-4)
33	Provide documentation that either the retail agency provided the wholesale agency with water use projections for at least 20 years, if the UWMP agency is a retail agency, OR, if a wholesale agency, it provided its urban retail customers with future planned and existing water source available to it from the wholesale agency during the required water-year types	10631(k)	Average year, single dry year, multiple dry years for 2015, 2020, 2025, and 2030.	Section 2.3 Agency Coordination (pgs. 2-1 & 2-2)
34	Include projected water use for single-family and multifamily residential housing needed for lower income households, as identified in the housing element of any city, county, or city and county in the service area of the supplier.	10631.1(a)		Section 5.0 Water Use Provisions – Low Income Housing Water Demand (pg. 5-2 and Table 17)

No.	UWMP requirement [a]	Calif. Water Code reference	Additional clarification	UWMP location
SYSTEM SUPPLIES				
13	Identify and quantify the existing and planned sources of water available for 2015, 2020, 2025, and 2030.	10631(b)	The 'existing' water sources should be for the same year as the "current population" in line 10. 2035 and 2040 can also be provided.	Section 3.0 (pgs. 3-1 through 3-12); Table 18 (pg. 6-2)
14	Indicate whether groundwater is an existing or planned source of water available to the supplier. If yes, then complete 15 through 21 of the UWMP Checklist. If no, then indicate "not applicable" in lines 15 through 21 under the UWMP location column.	10631(b)	Source classifications are: surface water, groundwater, recycled water, storm water, desalinated sea water, desalinated brackish groundwater, and other.	The City uses groundwater as a supply source.
15	Indicate whether a groundwater management plan been adopted by the water supplier or if there is any other specific authorization for groundwater management. Include a copy of the plan or authorization.	10631(b)(1)		Section 3.2, Groundwater (pg. 3-4through 3-5)
16	Describe the groundwater basin.	10631(b)(2)		Section 3.2, Groundwater (pgs. 3-4 through 3-5)
17	Indicate whether the groundwater basin is adjudicated? Include a copy of the court order or decree.	10631(b)(2)		**Not Applicable** – The groundwater basin is not adjudicated.
18	Describe the amount of groundwater the urban water supplier has the legal right to pump under the order or decree. If the basin is not adjudicated, indicate "not applicable" in the UWMP location column.	10631(b)(2)		**Not Applicable** – The groundwater basin is not adjudicated.
19	For groundwater basins that are not adjudicated, provide information as to whether DWR has identified the basin or basins as overdrafted or has projected that the basin will become overdrafted if present management conditions continue, in the most current official departmental bulletin that characterizes the condition of the groundwater basin, and a detailed description of the efforts being undertaken by the urban water supplier to eliminate the long-term overdraft condition. If the basin is adjudicated, indicate "not applicable" in the UWMP location column.	10631(b)(2)		Section 3.2 Groundwater – Historic Groundwater Pumping (pgs. 3-5)

No.	UWMP requirement [a]	Calif. Water Code reference	Additional clarification	UWMP location
20	Provide a detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years	10631(b)(3)		Section 3.2, Groundwater (pgs. 3-4 through 3-5); Table 3 (pg. 3-5); Figure 1 (pg. 3-2)
21	Provide a detailed description and analysis of the amount and location of groundwater that is projected to be pumped.	10631(b)(4)	Provide projections for 2015, 2020, 2025, and 2030.	Table 18 (pg. 6-2); Section 6.2 Plans to Ensure a Reliable Water Supply, Groundwater (pg. 6-3); Table 19 (pg. 6-3)
24	Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis.	10631(d)		Section 6.5 Transfer and Exchange Opportunities (pg. 6-15).
30	Include a detailed description of all water supply projects and programs that may be undertaken by the water supplier to address water supply reliability in average, single-dry, and multiple-dry years, excluding demand management programs addressed in (f)(1). Include specific projects, describe water supply impacts, and provide a timeline for each project.	10631(h)		Section 6.6 Summary of Potable Water Supply and Distribution System Master Plan (pg. 6-15); Table 30 (pg. 6-16)
31	Describe desalinated water project opportunities for long-term supply, including, but not limited to, ocean water, brackish water, and groundwater.	10631(i)		Section 6.2 Plans to Ensure a Reliable Water Supply, Other Sources (pg. 6-6)

No.	UWMP requirement [a]	Calif. Water Code reference	Additional clarification	UWMP location
44	Provide information on recycled water and its potential for use as a water source in the service area of the urban water supplier. Coordinate with local water, wastewater, groundwater, and planning agencies that operate within the supplier's service area.	10633		Section 3.4 Recycled Water (pg. 3-11); Section 6.2 Plans to Ensure a Reliable Water Supply, Recycled Water (pg. 6-6); Section 9.0 Water Recycling (pgs. 9-1 through 9-2)
45	Describe the wastewater collection and treatment systems in the supplier's service area, including a quantification of the amount of wastewater collected and treated and the methods of wastewater disposal.	10633(a)		Section 9.1 Wastewater Collection and Treatment (pg. 9-1); Section 9.2 Wastewater Disposal and Water Reuse (pg. 9-1 through 9-2)
46	Describe the quantity of treated wastewater that meets recycled water standards, is being discharged, and is otherwise available for use in a recycled water project.	10633(b)		Section 9.1 (pg. 9-1)
47	Describe the recycled water currently being used in the supplier's service area, including, but not limited to, the type, place, and quantity of use.	10633(c)		Section 9.2 (pgs. 9-1 through 9-2)
48	Describe and quantify the potential uses of recycled water, including, but not limited to, agricultural irrigation, landscape irrigation, wildlife habitat enhancement, wetlands, industrial reuse, groundwater recharge, indirect potable reuse, and other appropriate uses, and a determination with regard to the technical and economic feasibility of serving those uses.	10633(d)		Section 9.1 Wastewater Collection and Treatment (pg. 9-1); Section 9.2 Wastewater Disposal and Water Reuse (pg. 9-1 through 9-2)

No.	UWMP requirement [a]	Calif. Water Code reference	Additional clarification	UWMP location
49	The projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years, and a description of the actual use of recycled water in comparison to uses previously projected.	10633(e)		Tables 21 – 28 (pg. 6-7 through 6-10)
50	Describe the actions, including financial incentives, which may be taken to encourage the use of recycled water, and the projected results of these actions in terms of acre-feet of recycled water used per year.	10633(f)		Section 9.2 (pgs. 9-1 through 9-2); Section 3.4 (pg. 3-11)
51	Provide a plan for optimizing the use of recycled water in the supplier's service area, including actions to facilitate the installation of dual distribution systems, to promote recirculating uses, to facilitate the increased use of treated wastewater that meets recycled water standards, and to overcome any obstacles to achieving that increased use.	10633(g)		Section 9.2 Wastewater Disposal and Water Reuse (pg. 9-1 through 9-2)
WATER SHORTAGE RELIABILITY AND WATER SHORTAGE CONTINGENCY PLANNING [b]				
5	Describe water management tools and options to maximize resources and minimize the need to import water from other regions.	10620(f)		Section 6.3 Potential Reduction of Potable Water Demands (pgs. 6-10 through 6-14).
22	Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage and provide data for (A) an average water year, (B) a single dry water year, and (C) multiple dry water years.	10631(c)(1)		Section 7.1 (pgs. 7-1 through 7-4)

No.	UWMP requirement [a]	Calif. Water Code reference	Additional clarification	UWMP location
23	For any water source that may not be available at a consistent level of use - given specific legal, environmental, water quality, or climatic factors - describe plans to supplement or replace that source with alternative sources or water demand management measures, to the extent practicable.	10631(c)(2)		Section 6.3 Potential Reduction of Potable Water Demands (pgs. 6-10 through 6-14); Section 6.4 Catastrophic Water Supply Interruption Plan (pg. 6-14); Section 6.5 Transfer or Exchange Opportunities (pg. 6-15)
35	Provide an urban water shortage contingency analysis that specifies stages of action, including up to a 50-percent water supply reduction, and an outline of specific water supply conditions at each stage	10632(a)		Appendix A – Urban Water Shortage Contingency Plan
36	Provide an estimate of the minimum water supply available during each of the next three water years based on the driest three-year historic sequence for the agency's water supply.	10632(b)		Tables 32 – 35 (pgs. 7-2 & 7-3)
37	Identify actions to be undertaken by the urban water supplier to prepare for, and implement during, a catastrophic interruption of water supplies including, but not limited to, a regional power outage, an earthquake, or other disaster.	10632(c)		Section 6.4 (pg. 6-14)
38	Identify additional, mandatory prohibitions against specific water use practices during water shortages, including, but not limited to, prohibiting the use of potable water for street cleaning.	10632(d)		Section 6.3 Potential Reduction of Potable Water Demands, Water Conservation and Rationing Ordinance (pgs. 6-10 through 6-14)

No.	UWMP requirement [a]	Calif. Water Code reference	Additional clarification	UWMP location
39	Specify consumption reduction methods in the most restrictive stages. Each urban water supplier may use any type of consumption reduction methods in its water shortage contingency analysis that would reduce water use, are appropriate for its area, and have the ability to achieve a water use reduction consistent with up to a 50 percent reduction in water supply.	10632(e)		Section 6.3 Potential Reduction of Potable Water Demands (pgs. 6-10 through 6-14); Appendix A Urban Water Shortage Contingency Plan
40	Indicated penalties or charges for excessive use, where applicable.	10632(f)		Appendix A Water Shortage Contingency Plan
41	Provide an analysis of the impacts of each of the actions and conditions described in subdivisions (a) to (f), inclusive, on the revenues and expenditures of the urban water supplier, and proposed measures to overcome those impacts, such as the development of reserves and rate adjustments.	10632(g)		Appendix A Urban Water Shortage Contingency Plan
42	Provide a draft water shortage contingency resolution or ordinance.	10632(h)		Appendix A Urban Water Shortage Contingency Plan (Appendix I of UWSCP)
43	Indicate a mechanism for determining actual reductions in water use pursuant to the urban water shortage contingency analysis.	10632(i)		Section 6.3 Potential Reduction of Potable Water Demands, Summary of Reduced Potable Water Demands (pg. 6-14)
52	Provide information, to the extent practicable, relating to the **quality** of existing sources of water available to the supplier over the same five-year increments, and the manner in which water quality affects water management strategies and supply reliability	10634	For years 2010, 2015, 2020, 2025, and 2030	Section 3.6 Quality of Water Supply (pg. 3-12)

No.	UWMP requirement [a]	Calif. Water Code reference	Additional clarification	UWMP location
53	Assess the water supply reliability during normal, dry, and multiple dry water years by comparing the total water supply sources available to the water supplier with the total projected water use over the next 20 years, in five-year increments, for a normal water year, a single dry water year, and multiple dry water years. Base the assessment on the information compiled under Section 10631, including available data from state, regional, or local agency population projections within the service area of the urban water supplier.	10635(a)		Section 6.2 Plans to Ensure a Reliable Water Supply (pgs. 6-2 through 6-10)
DEMAND MANAGEMENT MEASURES				
26	Describe how each water demand management measures is being implemented or scheduled for implementation. Use the list provided.	10631(f)(1)	Discuss each DMM, even if it is not currently or planned for implementation. Provide any appropriate schedules.	Section 8.0 Water Demand Management Measures (pgs. 8-1 through 8-17)
27	Describe the methods the supplier uses to evaluate the effectiveness of DMMs implemented or described in the UWMP.	10631(f)(3)		Section 8.0 Water Demand Management Measures (pgs. 8-1 through 8-17)
28	Provide an estimate, if available, of existing conservation savings on water use within the supplier's service area, and the effect of the savings on the ability to further reduce demand.	10631(f)(4)		Section 8.0 Water Demand Management Measures (pgs. 8-1 through 8-17)
29	Evaluate each water demand management measure that is not currently being implemented or scheduled for implementation. The evaluation should include economic and non-economic factors, cost-benefit analysis, available funding, and the water suppliers' legal authority to implement the work.	10631(g)	See 10631(g) for additional wording.	Section 8.0 Water Demand Management Measures (pgs. 8-1 through 8-17)
32	Include the annual reports submitted to meet the Section 6.2 requirements, if a member of the CUWCC and signer of the December 10, 2008 MOU.	10631(j)	Signers of the MOU that submit the annual reports are deemed compliant with Items 28 and 29.	Not Included, Items 26 – 29 satisfied although City is a member of CUWCC & signer of MOU.

a The UWMP Requirement descriptions are general summaries of what is provided in the legislation. Urban water suppliers should review the exact legislative wording prior to submitting its UWMP.

b The Subject classification is provided for clarification only. It is aligned with the organization presented in Part I of this guidebook. A water supplier is free to address the UWMP Requirement anywhere with its UWMP, but is urged to provide clarification to DWR to facilitate review.

APPENDIX B

PUBLIC NOTIFICATION MATERIALS

CITY OF VACAVILLE

UTILITIES DEPARTMENT
650 MERCHANT STREET
VACAVILLE, CALIFORNIA 95688-6908
www.cityofvacaville.com

March 28, 2011

David Okita, PE
General Manager
Solano County Water Agency
810 Vaca Valley Parkway, Suite 203
Vacaville, CA 95688

RE: 2010 Urban Water Management Plan Update

Dear David:

In accordance with the Urban Water Management Planning Act (CA Water Code Section 10642), the City of Vacaville is informing all city and county agencies in our service area that we are currently reviewing and updating the City's Urban Water Management Plan (UWMP). The UWMP will provide an analysis of projected water demand and supply over the next 25 years, as well as an updated water conservation plan that meets state requirements. The update is due to the state Department of Water Resources (DWR) by July 31, 2011.

This draft document will be available for public review 30 days prior to the scheduled Public Hearing, tentatively scheduled for May 25, 2011. We will notice you when the public hearing at which the UWMP will be considered is actually scheduled.

Please contact me at (707) 469-4123 or rjimenez@cityofvacaville.com if you have any questions.

Sincerely,

Ramiro Jimenez
Management Analyst

cc: Vanessa Andrews, Utilities Administrative Manager
Steve Sawyer, Acting Assistant Director of Utilities
Rod Moresco, Acting Utilities Director
Linda Scroggs, Engineering Manager, Nolte and Associates
Michael Wademan, Project Manager, Nolte and Associates

CITY OF VACAVILLE
UTILITIES DEPARTMENT
650 MERCHANT STREET
VACAVILLE, CALIFORNIA 95688-6908
www.cityofvacaville.com

ESTABLISHED 1850

March 28, 2011

David Mansfield
General Manager
Solano Irrigation District
810 Vaca Valley Parkway, Suite 201
Vacaville, CA 95688

RE: 2010 Urban Water Management Plan Update

Dear David:

In accordance with the Urban Water Management Planning Act (CA Water Code Section 10642), the City of Vacaville is informing all city and county agencies in our service area that we are currently reviewing and updating the City's Urban Water Management Plan (UWMP). The UWMP will provide an analysis of projected water demand and supply over the next 25 years, as well as an updated water conservation plan that meets state requirements. The update is due to the state Department of Water Resources (DWR) by July 31, 2011.

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Please contact me at (707) 469-4123 or rjimenez@cityofvacaville.com if you have any questions.

Sincerely,

Ramiro Jimenez
Management Analyst

cc: Vanessa Andrews, Utilities Administrative Manager
Steve Sawyer, Acting Assistant Director of Utilities
Rod Moresco, Acting Utilities Director
Linda Scroggs, Engineering Manager, Nolte and Associates
Michael Wademan, Project Manager, Nolte and Associates

APPENDIX C

RESOLUTION TO ADOPT THE CITY OF VACAVILLE 2010 URBAN WATER MANAGEMENT PLAN UPDATE

RESOLUTION NO. 2011-66

RESOLUTION ADOPTING, DIRECTING FILING AND IMPLEMENTING THE CITY OF VACAVILLE 2010 URBAN WATER MANAGEMENT PLAN UPDATE IN COMPLIANCE WITH STATE OF CALIFORNIA WATER CODE REQUIREMENTS

WHEREAS, the California Legislature enacted Assembly Bill 797 during the 1983-1984 Regular Session of the California Legislature (Water Code Section 10610 et. seq.), known as the Urban Water Management Planning Act, which mandates that every urban water supplier, providing service to more than 3,000 customers, or supplying more than 3,000 acre-feet of water annually, prepare an Urban Water Management Plan (UWMP), of which the primary objective is to plan for the conservation and efficient use of water; and

WHEREAS, the California Legislature enacted Assembly Bill 2661 in July 1990, which formally extended the urban water management-planning process, requiring suppliers to update their plans every five years. The City of Vacaville, having submitted an initial UWMP in 1990, and subsequent updates in 1995, 2000, and 2005, has a further obligation to prepare and implement an updated UWMP in 2010 in accordance with legislative requirements; and

WHEREAS, Senate Bill 610 was enacted in 2001, requiring preparation of a Water Supply Assessment Report (WSAR) by cities and counties with proposed large development projects to ensure adequate, current, and future water availability for said projects. The City of Vacaville completed a WSAR for Lower Lagoon Valley, Southtown, and Rice McMurtry in January 2004, and for Vanden Meadows in 2010, and is required under SB 610 to include the WSAR twenty year projections for water demand versus available supply for the entire service area in the UWMP Update; and

WHEREAS, Senate Bill 553 was signed into law in September 2000, requiring each urban water supplier to notify any city or county within which the supplier serves, that the urban water supplier will be reviewing its UWMP and considering changes to the plan; and

WHEREAS, Senate Bill 7 (SBX7-7), also known as the Water Conservation Act of 2009, requires that each urban water supplier shall reduce per capita water use by 20% in 2020. Each supplier shall include in its 2010 UWMP Update a baseline per capita water use, compliance per capita water use, water use target, and interim water use targets; and

WHEREAS, Assembly Bill 797 requires that said plan be adopted by July 1, 2011, after public review and hearing, and filed with the California Department of Water Resources within thirty days of adoption; and

WHEREAS, the City of Vacaville is an urban supplier of water to over 26,000 customers and has, therefore, prepared and circulated for public review a Draft 2010 Urban Water Management Plan Update. In compliance with the requirements of AB 797, a public hearing regarding said Draft UWMP Update was properly noticed.

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

1. The 2010 Urban Water Management Plan Update is hereby adopted and ordered filed with the City Clerk.

2. The Interim Director of Utilities is hereby authorized and directed to file the Plan Update with the California Department of Water Resources within thirty days after this date, in accordance with AB 797.

3. The Interim Director of Utilities is hereby authorized to recommend to the City Council the water conservation programs as detailed in the adopted 2010 Urban Water Management Plan Update, including procedures, rules, and regulations to carry out

effective and equitable conservation programs, and comply with the water use targets and per capita use required under SBX7-7.

I HEREBY CERTIFY that the foregoing resolution was introduced and passed at a regular meeting of the City Council of the City of Vacaville, held on the 14th day of June 2011, by the following vote:

AYES: Council members, Harris, Hunt, Mashburn, and Mayor Hardy

NOES: None

ABSENT: Vice-Mayor Rowlett

ATTEST:

By: Michelle A. Thornbrugh

Michelle A. Thornbrugh, City Clerk

APPENDIX D

UWMP UPDATE PARTICIPANTS

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APPENDIX E

GROUNDWATER SOURCE SUFFICIENCY TECHNICAL MEMORANDUM

Technical Memorandum

GROUNDWATER SUPPLY SUFFICIENCY

Prepared for:

City of Vacaville

MAY 2011

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CONSULTING ENGINEERS

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1.0 INTRODUCTION

1.1 CITY'S GROUNDWATER UTILIZATION

This Technical Memorandum describes the use and sufficiency of groundwater supplies beneath the City of Vacaville and vicinity to meet the City's historical and projected groundwater demands. This Memorandum summarizes subsurface hydrogeologic conditions and describes the City's approach to managing groundwater resources. This Memorandum also describes the sufficiency of groundwater pumped for the past 5 years and planned utilization of groundwater resources for a more than 20-year planning horizon (through 2035), including results of a groundwater flow model and the estimated pumpage for the principal aquifer in the northern Solano County area.

This Memorandum has been prepared in support of the City's *2010 Urban Water Management Plan Update* (City of Vacaville, 2011).

1.1.1 City Water Supplies

The City of Vacaville is located at the base of the Vaca Mountains, approximately halfway between Sacramento and San Francisco on Interstate 80 (**Figure 1-1**). Water demand has increased as the City's population grew from about 43,400 in 1980 to 71,500 in 1990 and 92,000 in 2009.

The City's water utility system was purchased from the Pacific Gas and Electric Company in 1959 by issuing voter-approved water revenue bonds (Nolte, 2005). Since that time, the City has systematically improved and upgraded the water utility system. Today, the City's system consists of transmission and distribution pipelines, storage reservoirs, wells, pumping facilities, and water treatment facilities. The system receives water from several sources, including Solano Project water from the Lake Berryessa Reservoir, State Water Project (SWP) water and Settlement Water from the North Bay Aqueduct (NBA), and groundwater from local City wells. The percentage of water used from each supply source varies due to the City's conjunctive management of its water resources. Prior to completion of the Solano Project, all water supplies provided for municipal purposes were developed from local groundwater. The City has received Solano Project water through an agreement with SCWA since 1959.

Some of the Solano Project and SWP water supply is based on the City's entitlement and some is based on other agreements and settlements. The City's surface water entitlements for 2010 totaled 26,548 acre-feet (AF), but SWP deliveries are less than the entitlement in all but the wettest years. The availability of SWP water is approximately 64% of the entitlement in a normal year and is projected to decrease to 31% in a single-dry year and to 46% in a multiple-dry year. Therefore, approximately 16,991 AF of surface water would typically be available in a normal year.

In 1995, the City entered into a Water Master Agreement with Solano Irrigation District (SID) that increases the City's allocation from this source until the year 2045. The City has also received surface water allocations from the SWP and from a purchase agreement with Kern

County Water Agency. Settlement water is not considered SWP water but consists of surface water from the Sacramento River and Sacramento-San Joaquin Delta estuary diverted under water rights held by the California Department of Water Resources (DWR). This water is made available by DWR in settlement of area-of-origin water right applications by the cities of Vacaville, Fairfield, and Benicia. The City would receive an increasing supply from SID through the year 2040 followed by a consistent supply of 10,050 AF until the year 2050 (Second Amendment to the 1995 Master Water Agreement between the Solano Irrigation District and the City of Vacaville, adopted June 8, 2010).

In aggregate, the estimated water resources available to the City in the year 2030 total 42,000 AF, including about 8,000 AF of groundwater (19% of the total supply) during normal water years and more groundwater during drier years. Historically, the City has generally used less than 8,000 AFY.

1.1.2 Groundwater Supply Sufficiency

With regard to the demonstration of groundwater supply sufficiency and reliability for purposes of Urban Water Management Plans (UWMPs), the California Water Code, Section 10631(b)(3) requires the water supplier to provide a "detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years." Water Code Section 10631(4)(c) further requires that the City "describe the reliability of the water supply and vulnerability to seasonal or climatic shortage, to the extent practicable, and provide data for each of the following:

(A) An average water year.
(B) A single dry water year.
(C) Multiple dry water years."

A "sufficient water supply" is defined in Government Code 66473.7 as "the total water supplies available during the normal, single-dry, and multiple-dry years within a 20-year projection that will meet the projected demand associated with the proposed subdivisions, in addition to existing and planned future uses, including, but not limited to, agricultural and industrial uses." The California Water Code Section 10644 also requires updating of the Urban Water Management Plan, including provisions relating to groundwater as part of the City's water supply.

Although three water year terms (normal, single-dry and multiple-dry years) are identified in Government Code 66473.7, definitions for these water years are not included in the Code. The following definitions are used for purposes of this Memorandum:

> ***Normal year***: This is a year when average rainfall has been received. During a normal year, the water availability from some sources (surface water) may be less than the entitlement amount.
>
> ***Single Dry Year***: This is a year when less than average rainfall has been received and may be the first year of a multiple year drought period.

Multiple Dry Years: This is a series of years when less than average rainfall has been received.

Water Code Section 10631(b)(1) specifies that a copy of any groundwater management plan adopted by the urban water supplier, including plans adopted pursuant to Part 2.75 (commencing with Section 10750) be supplied with the UWMP. The City recently adopted its *Groundwater Management Plan Update* (LSCE, 2011). This Memorandum summarizes information on hydrogeologic conditions, including the description of the groundwater basins from which the City of Vacaville pumps groundwater, along with an analysis of the City's historical use of groundwater and the groundwater levels observed in response to City and other pumpage in the northern Solano County area. Most importantly, this Memorandum provides the basis for estimating the potentially sustainable level of annual pumpage.

An analytical groundwater model was developed to simulate the response of the principal aquifer used by the City for meeting municipal demands under various pumping scenarios through the year 2035, including a climate-based scenario to evaluate increased pumpage during drier water years (e.g., single-dry year and/or multiple-dry water years).

Finally, this Memorandum describes the groundwater monitoring data that will continue to be collected and used to evaluate future pumpage sustainability based on the criteria discussed below.

1.1.3 Memorandum Outline

This Memorandum summarizes the analyses necessary to address the groundwater supply sufficiency and reliability portions of the UWMP requirements, including:

- A summary of the geologic setting and groundwater conditions;
- A summary of the City's historical pumpage and the groundwater level response to the City's and others' pumpage;
- The concept of base year water levels established as a gauge to guide the City's conjunctive water management operations;
- The methodology used to evaluate the groundwater level response to projected City pumpage during normal and dry water year types;
- A summary of the estimated groundwater production during the 2015 to 2035 planning horizon and the groundwater level response to that pumpage; and
- Recommendations for ongoing groundwater monitoring and additional analysis of future sustainable pumpage.

2.0 SUMMARY OF CITY WATER SUPPLIES AND GROUNDWATER CONDITIONS

2.1 GROUNDWATER BASIN DESCRIPTIONS

As shown on **Figure 2-1**, the City of Vacaville overlies portions of two DWR-designated groundwater basins. The City primarily overlies the northwestern portion of the Solano Subbasin, which is one of 18 subbasins in the Sacramento Valley Basin of the Sacramento River Hydrologic Region. A small area in the southern portion of the City overlies the Suisun-Fairfield Valley Basin in the San Francisco Bay Hydrologic Region. The western portion of the City, west of the Solano Subbasin boundary, is located in the Sacramento River Hydrologic Study Area but does not overlie any area currently designated by DWR as a groundwater basin or subbasin (**Figure 2-1**).

All of the City's existing and proposed municipal wells are located in the Solano Subbasin. **Figure 2-2** also shows the other major purveyors in the northern portion of the subbasin. These include the City of Dixon, SID, Rural North Vacaville Water District (RNVWD), Maine Prairie Water District (MPWD), and Reclamation District 2068 (RD 2068). Descriptions of the Solano Subbasin and the Suisun-Fairfield Valley Basin are provided below. These descriptions are partly based on the information contained in *California's Groundwater, Bulletin 118 Update 2003* (DWR, 2003). For the Solano Subbasin, a more detailed groundwater basin description is posted on the DWR web site (DWR, 2010).

2.1.1 Sacramento Valley Basin, Solano Subbasin (Basin Number: 5-21.66)

The Solano Subbasin includes the southernmost portion of the Sacramento Valley Basin and extends into the northern portion of the Sacramento-San Joaquin Delta. Overall, population density within the subbasin is sparse, with the major cities being Vacaville, Dixon, and Rio Vista. Subbasin boundaries are defined by Putah Creek on the north, the Sacramento River on the east (from Sacramento to Walnut Grove), the North Mokelumne River on the southeast (from Walnut Grove to the San Joaquin River), and the San Joaquin River on the south (from the North Mokelumne River to the Sacramento River). The western subbasin boundary, which extends through a portion of the City, is partly defined by the groundwater divide between the San Francisco Bay and Sacramento River Hydrologic Regions as described by DWR (2010). DWR reports that the location of the divide is roughly delineated by the English Hills (a section of the Coast Range south of Putah Creek and north of Vacaville) and the Montezuma Hills. There is an area west of the Solano Subbasin between the subbasin boundary and the Lagoon Valley/Vaca Valley fault in which some groundwater development has occurred, but which does not lie within a designated basin or subbasin area.

2.1.2 Suisun-Fairfield Valley Basin (Basin Number: 2-3)

The Suisun-Fairfield Valley Basin is composed of low alluvial plains, with surrounding foothills and mountains, located immediately north of Suisun Bay. The foothills of the Coast Ranges, lying west of Green Valley, bound the basin on the west. The southern extent of the Vaca Mountains forms the northern boundary of the basin. The eastern extent of the basin is marked by low ridges of consolidated rock that appear near the City and extend southeast to the Montezuma Hills (Thomasson et al, 1960).

2.2 CITY OF VACAVILLE GROUNDWATER

Prior to 1997, all City pumpage was from the Elmira Road well field, primarily from wells completed in the basal zone of the Tehama Formation but also including a small amount of pumpage from Well 1 completed in the Markley Formation. Concentrated pumpage in the Elmira Road area caused a localized cone of depression and declining groundwater levels in the basal zone. In order to alleviate this condition, the City began constructing new wells outside of the Elmira Road area in the mid-1990s. Beginning with the construction of Well 14, which came on line in 1997, some pumpage has been redistributed from Elmira Road to the northeastern portion of the City. Two other northeast sector wells have since been constructed in the basal zone. Well 15 came on line in 2004, and Well 16 came on line in 2007. Construction of a new production well in the northeast sector, Well 17, is expected to begin in 2011. The northeast sector wells produced about 1,900 AF (41% of the total) in 2009 and 2010. The locations of existing City wells are shown on **Figure 2-3**.

The majority of the City's historical and current pumpage is from the basal zone of the Tehama Formation; Well 1 is the only non-basal zone well currently in operation. Total annual pumpage for the City from 1968 to October 2010 is shown on **Figure 2-4**. Annual pumpage from the City's wells is divided into four categories on **Figure 2-4**:

1) Basal zone pumpage from the Elmira Road well field (Wells 2 through 13);
2) Non-basal zone pumpage from Well 1 at Elmira Road (currently less than 100 AF per year);
3) Basal zone pumpage from northeast sector wells (currently Wells 14, 15, and 16);
4) Non-basal zone pumpage from the DeMello well in the northeast sector (maximum of 160 AF per year in 2003, offline as of 2005).

The City's annual groundwater pumpage was relatively constant from 1968 to 1974, ranging from 2,862 to 3,316 AF per year. All pumpage during this period was from Elmira Road wells but was not differentiated by zone. Pumpage began to increase in 1975 and reached a peak of 8,024 AF in 1983. Pumpage decreased to 6,089 AF in 1984 and ranged from 5,421 to 6,236 AF, with an average of about 5,800 AF, during 1984 to 1992. Pumpage decreased to 4,395 AF in 1993 and continued to decrease to a low of 3,230 AF in 1996. Pumpage increased from1996 to 2002, reaching 6,638 AF in 2002. From 2002 to 2007 pumping remained relatively constant, averaging 6,635 AF per year. Since 2007, the City of Vacaville has gradually reduced the amount of groundwater it produces to 5,068 AF in 2010, which represents 31% of total use for that year. In 2007, 34% of water demand was supplied by groundwater.

2.2.1 City Groundwater Pumpage 2006 - 2010

Total groundwater pumping by the City for 2006 to 2010 ranged between 4,647 to 6,635 AF (**Table 2-1**).

Table 2-1
Groundwater — Volume Pumped[1]

Basin name(s)	Aquifer Unit	2006	2007	2008	2009	2010
Sacramento Valley Basin/Solano Subbasin	Basal Tehama Fm.	6,541	6,511	5,692	4,593	4,999
Sacramento Valley Basin/Solano Subbasin	Non Basal Tehama Fm.	1,701	101	92	54	69
Total groundwater pumped		6,635	6,612	5,784	4,647	5,068

Units: acre-feet per year
[1]Pumpage amount based on volumetric meter readings

2.2.2 Projected City Groundwater Pumpage 2015-2035

Based on normal water years, projected groundwater supplies are summarized in **Table 2-2**. Total City groundwater pumpage in normal years is projected to increase to 8,100 AF in 2035 as new City wells come on line.

Table 2-2
Groundwater — Volume Projected to be Pumped
(Normal Water Year)

Basin name(s)	Aquifer Unit	2015	2020	2025	2030	2035
Sacramento Valley Basin/Solano Subbasin	Basal Tehama Fm.	6,850	6,850	7,200	7,550	8,000
Sacramento Valley Basin/Solano Subbasin	Non Basal Tehama Fm.	100	100	100	100	100
Total groundwater projected		6,950	6,950	7,300	7,650	8,100

Units: acre-feet per year
Includes future planned expansion

The City anticipates the addition of approximately four new wells during the period from about 2015 to 2035. It is anticipated that these new wells would be generally located in the northern to northeastern part of the City. The City is also planning for replacement of approximately three of its older wells (e.g., wells located in the Elmira area) during this period. Pending the future condition and status of other older wells, additional well replacements may occur. Initially, the well replacement locations are anticipated to be in the northern to northeastern areas. In future years, toward 2030 and beyond, older wells that are currently located in the Elmira area may be replaced with wells constructed closer to the Elmira area.

Projected water supply sources in future dry water years (single-dry and/or multiple-dry water years) are summarized in **Table 2-3**. Total City groundwater pumpage in dry years is projected to increase to 9,700 AF in 2035 as new City wells come on line. The City has the capability to increase the amount of groundwater extraction for a period of time should surface water not be available.

Table 2-3
Groundwater — Volume Projected to be Pumped
(Dry Water Years)

Basin name(s)	Aquifer Unit	2015	2020	2025	2030	2035
Sacramento Valley Basin/Solano Subbasin	Basal Tehama Fm.	8,220	8,220	8,640	9,060	9,600
Sacramento Valley Basin/Solano Subbasin	Non Basal Tehama Fm.	100	100	100	100	100
Total groundwater projected		8,320	8,320	8,740	9,160	9,700

Units: acre-feet per year
Includes future planned expansion

The City's conjunctive water management program allows it to adjust its groundwater production so that groundwater levels recover to spring 1992-1993 "base year" levels during normal years. As discussed further below, the base year water levels are used to define the "normal condition" referenced in the Master Water Agreement (SID and City, 1995). Groundwater levels may decline below base year levels during dry years with increased pumpage, but levels should remain above historical lows. Conjunctive water management is used to restore groundwater levels to base year conditions following a dry year when increased pumpage has occurred. Following dry years (i.e., in normal or wet years), surface water utilization is increased, while groundwater pumping is reduced in order to restore groundwater levels to base year conditions. During periods that follow a dry year, the City may target groundwater production amounts that are lower than the amounts shown in **Table 2-2** as surface water availability allows.

During the development of future City groundwater supplies and the replacement of its older wells, consideration will be given to optimizing the pumping distribution in the City's urban planning area. The optimal location of new and replacement wells will include consideration of such factors as maintaining groundwater levels above historical lows, reducing energy costs as feasible, and ensuring delivered water meets all applicable drinking water standards.

2.2.3 Other Pumpage in Northern Solano County

Prior to construction of the Solano Project, both municipal and agricultural users relied primarily on groundwater. Wells were perforated primarily in the Quaternary alluvium and the upper and middle zones of the Tehama Formation, and groundwater levels declined significantly in those zones. After completion of the Solano Project in 1958, most agricultural users switched to surface water, and groundwater levels recovered. Most growers in SID rely primarily on surface water, and growers in MPWD and RD 2068 use surface water exclusively (Solano Agencies, 2005).

After the City of Vacaville, SID, and the City of Dixon are the largest producers of groundwater in northern Solano County. SID operates wells to supplement surface water supplies and also to provide for drainage due to a high water table in certain areas. Although the amount of pumpage by privately owned wells in SID is unknown, annual metered pumpage is available for SID-owned wells since 1964. SID's pumpage ranged from a low of 2,311 AF during a wet year (1983) to a high of 13,965 AF during the 1976 drought year.

The City of Dixon relies entirely on groundwater for its water supply. The City of Dixon is supplied with domestic water by California Water Service Company (Cal Water) and the Dixon-Solano Municipal Water Service (DSMWS). The City's water demand in 2005 was approximately 2,858 AF/year and is projected to be 3,899 AF/year in 2010 (Dixon, 2008).

The RNVWD also produces groundwater from the basal zone of the Tehama Formation. RNVWD pumpage was about 40 AF in 2003 (LSCE, 2003). Pumpage by industrial and domestic wells in unincorporated portions of the Vacaville area is unmetered, but it is assumed to be small.

Groundwater development in the Vacaville area by others than the City and RNVWD has largely been from the upper part of the aquifer system rather than the basal zone of the Tehama Formation.

2.2.4 Conjunctive Water Use and Management

The City conjunctively manages its groundwater and surface water resources to most effectively use those resources during different water year types. This has been previously demonstrated to be an effective and flexible management approach. Continued conjunctive water management is expected to enable the City to meet its future water demands for a 20-year horizon and beyond. Groundwater-related objectives of the City's conjunctive water management approach are to:

1) Recognize and implement actions to prevent persistent water level declines, and

2) Continue to maintain water levels above historical lows when levels temporarily decline during dry years to minimize adverse consequences that would result from over pumping the aquifer system.

As discussed below, groundwater monitoring data collected by the City indicate the response of the aquifer system to variations in the City's annual pumping amounts. Spring groundwater levels measured during 1992-1993 were initially used to establish "base year" groundwater levels, or the levels to which the aquifer had recovered in response to an estimated sustainable level of pumpage. The 1992-1993 base year groundwater levels have been augmented with more complete data collected during 2002-2010. This base year groundwater level concept serves to guide conjunctive management of the City's water resources. The base year concept is used to define the "normal condition" referenced in the Master Water Agreement between the City of Vacaville and SID signed on May 25, 1995.

Base year water levels are not anticipated to be exceeded during normal water years in response to the pumpage associated with those years. The concept also recognizes that if pumpage is increased during single-dry or multiple-dry years, water levels would temporarily decline to below base year levels in response to increased pumpage. Following a short-term water level decline during a dry year with increased pumping, the base year groundwater levels provide a target to which to restore water levels.

In summary, the City's conjunctive water management approach is based on the following:

1. Spring 1992-1993 groundwater levels represent base year spring groundwater recovery levels.

2. The base year groundwater levels are based on a historical level of pumpage for the Elmira Road well field that appears to be sustainable.

3. During dry years with increased pumpage, groundwater levels may be lower than base year groundwater levels and the reverse would generally occur during periods of reduced pumpage. Following a dry year condition where increased pumpage has occurred, conjunctive water management will be used to restore groundwater levels to base year conditions.

4. The 1992-1993 base year groundwater levels, in conjunction with the 2002-2003 levels which include more complete data during peak extraction periods, provide an important means for measuring aquifer system response to future pumping that occurs as part of the City's conjunctive water management plan.

5. As the City's wellfield expands to the northern part of the urban planning area, additional groundwater monitoring will be necessary to evaluate water level responses to the additional groundwater development and provide a better understanding of spring groundwater level recovery.

Base year groundwater level conditions have only been established for the Elmira area. For purposes of this Memorandum, the modeling analysis described below is based on the assumption that areas north of the Elmira Road well field would respond similarly to pumping. The data from the Elmira Road well field are used to establish the drawdown occurring in response to normal water year pumpage for that area. However, the drawdown occurring at the Elmira location would not be applicable to areas outside the Elmira Road well field.

2.3 GROUNDWATER CONDITIONS

2.3.1 Hydrogeology

Most City and non-City wells in the Vacaville area are completed in the Tehama Formation, which has been subdivided into upper, middle, and basal zones. The City's wells are largely completed in the basal zone of the Tehama Formation. City Well 1 is also partially completed in older pre-Tehama deposits. A geologic map is provided as **Figure 2-5** to illustrate the regional geology. A detailed discussion of the regional geologic setting, including geologic cross sections, is provided in *Hydrostratigraphic Interpretation and Groundwater Conditions of the Northern Solano County Deep Aquifer System* (LSCE, 2010). A brief summary of geologic conditions is provided below.

The Pliocene and Pleistocene Tehama Formation is the primary aquifer for agricultural and municipal water supply in northern Solano County, including the Vacaville area. This formation consists of slightly to moderately consolidated fluvial, alluvial, and lacustrine deposits and includes interlayered clay, silt, sand, and gravel beds. A stiff blue lacustrine clay found near the upper boundary of the formation and other relatively continuous clay layers divide the formation into upper, middle, and basal zones.

In the Vacaville area, the continuous clay layers within the Tehama Formation appear to thin to the west-southwest, with some layers pinching out altogether. The Tehama Formation has a thickness of up to 2,200 feet in the vicinity of the City's eastern boundary and an outcrop area of over 35 square miles in the English Hills, north of the City, and continuing north toward the Solano County line (**Figure 2-5**). This outcrop serves as the primary recharge area for the Tehama Formation.

The upper and middle zones of the Tehama Formation are used for domestic and agricultural water supply. Southwest of the Highway 80/Midway Road junction, these zones are characterized by predominately thick, fine-grained silt and clay with a few thin sand and gravel beds. Northeast of this area, the number of coarser-grained beds appears to increase. In most western areas, the fine-grained nature, discontinuity of the sands, and generally low yields make these zones unsuitable for high capacity municipal water wells. Typically, these zones are only capable of producing 100 to 300 gallons per minute (gpm) with specific capacities of less than 2 gallons per minute per foot (gpm/ft), although some wells can produce up to 1,000 gpm. Aquifer test data in the upper zone are limited, but a transmissivity of only 1,500 gallons per day per foot (gpd/ft) was estimated based on a test of the City's DeMello well. Reliable transmissivity estimates are not available for the middle zone.

The basal zone of the Tehama Formation includes gravel and cobble deposits and layers of volcanic tuff and conglomerate cemented with calcium carbonate. The more permeable portions of the basal zone are comprised primarily of gravelly sand with calcium carbonate cementation in some areas. The basal zone occurs near the surface on the western edge of the City's Elmira Road well field and gradually deepens to the east (**Figure 2-6**, basal zone outlined in blue). The basal zone ranges in thickness from less than 400 feet in the Elmira Road area, to greater than 700 feet between Vacaville and Dixon (**Figure 2-7**). Up to 350 feet of this zone yields significant quantities of groundwater. The bottom of the basal zone occurs at a depth of about 2,400 feet in the vicinity of the City's Easterly Wastewater Treatment Plant and near the Midway Road/Highway 80 junction area. East of these areas, the basal zone appears to contain fine-grained sand beds. Detailed correlations using numerous oil and gas test holes with geophysical logs indicate that the basal zone extends beneath the Dixon area at a depth of 2,000-2,500 feet. The top of the basal zone was encountered at 1,980 feet below ground surface (bgs) during construction of a multiple completion monitoring well in the Dixon area for Solano County Water Agency (SCWA) (LSCE, 2010). Regional correlations suggest a finer-grained sandy zone extending eastward to beneath the Davis area at depths below existing municipal wells. However, the yield and water quality of this zone are presently unknown.

Aquifer Characteristics

Specific capacities of wells completed in the basal zone in the Vacaville area generally range from 4 to 24 gpm/ft, depending on the thickness of aquifer materials encountered by the well and included in the perforated interval. The City's municipal basal zone wells range in capacity from 500 to 1,800 gpm.

Table 2-4 summarizes aquifer characteristics estimated for the basal zone in the northeastern area based on pumping tests conducted in these wells.

Constant-rate pumping tests have been conducted in the City's three northern water supply wells (Well 14, 15, and 16) and vary in duration from 4 hours to 19 days. Data from these tests have been used to determine the specific capacity of the wells and estimate aquifer characteristics, including transmissivities and aquifer storativities. Although more than one test has been conducted at some of these wells, only the results from the most recent test at each well are shown on **Table 2-4**.

As shown on **Table 2-4** are the mean transmissivities calculated for the three City of Vacaville wells completed in the basal zone of the Tehama Formation (Wells 14, 15, and 16), ranging from 39,700 to 56,600 gpd/ft, with an overall mean of 48,100 gpd/ft. The transmissivity is significantly lower to the north in the RNVWD wells (mean of about 17,000 gpd/ft). Storativities in the northern Solano County area range from 1.6×10^{-4} to 3.2×10^{-4}, with an overall mean of 2.2×10^{-4}.

Table 2-4
Aquifer Characteristics, Northeastern Area, City of Vacaville

Pumped Well	Observation Well	Distance	Start Date	Test Length	Discharge Rate	Depth to Water		Drawdown	24-hr Specific Capacity	Pumping Phase			Recovery Phase		Mean Values	
						(Start)	(End)			Transmissivity	Storativity	Method of Analysis	Transmissivity	Method of Analysis	Transmissivity	Storativity
		(ft)		(hrs)	(gpm)	(ft)	(ft)	(ft)	(gpd/ft)	(gpd/ft)	-		(gpd/ft)		(gpd/ft)	-
Well 14[a]	-	-	04/15/03	24	1,740	153.82	246.03	92.21	18.8	54,900	-	Cooper-Jacob	52,700	Theis	56,600	1.6E-04
	MW-14	183				151.96	175.30	23.35	-	61,800	1.6E-04	Cooper-Jacob	57,000	Theis		
	MW-15-1815'	4,530				141.09	140.26	-0.83	-	-	-	-	-	-		
	Well 15	4,580				138.57	138.95	0.38	-	-	-	-	-	-		
	MW-16-1400'	6,970				160.73	161.16	0.43	-	-	-	-	-	-		
	MW-98B	9,290				124.87	125.16	0.28	-	-	-	-	-	-		
Well 15[a]	-	-	04/14/03	10	1,790	135.32	216.15	80.83	20.8	48,900	-	Cooper-Jacob	40,000	Theis	39,700	3.2E-04
	MW-15-188'	112				16.78	16.53	-0.25	-	-	-	-	-	-		
	MW-15-508'	112				29.51	29.12	-0.39	-	-	-	-	-	-		
	MW-15-1815'	112				136.11	181.66	45.55	-	37,000	3.2E-04	Theis	33,000	Theis		
	MW-16-1400'	4,490				159.30	161.36	2.06	-	-	-	-	-	-		
	Well 14	4,580				153.15	154.02	0.86	-	-	-	-	-	-		
	MW-14	4,740				151.63	152.20	0.56	-	-	-	-	-	-		
	MW-98B	4,810				123.77	125.46	1.69	-	-	-	-	-	-		
Well 16[b]	-	-	Spring 07	19 days	2,230	178.65	359.15	180.50	15.7	-	-	-	-	-	-	-
	MW-16-(1430')	144				178.41	264.08	85.67	-	48,000	1.7E-04	Theis	48,000	Theis	48,000	1.7E-04
Mean (City of Vacaville basal zone wells 14, 15 and 16)															**48,100**	**2.2E-04**

a. Source: LSCE. 2006. *Evaluation of Hydrogeologic Conditions and Groundwater Supplies for SB 221/610 Requirements*, *Administrative Draft,* prepared for City of Vacaville.

b. Source: LSCE. 2008. *Technical Memorandum, Well 16 Aquifer Test, Spring 2007, City of Vacaville, Solano County, CA*, Prepared for City of Vacaville.

2.3.2 Groundwater Levels

Groundwater level data for the City's wells are available from the City's monitoring program. The monitoring program includes semi-annual manual water level measurements in 13 production wells and 11 monitoring wells. In addition to the manual measurements, nine production wells are also monitored electronically with transducers connected to the City's Supervisory Control and Data Acquisition (SCADA) system. Groundwater levels in other wells in and near the City are also monitored at least semi-annually by (or on behalf of) other entities, including SCWA, DWR, the U.S. Bureau of Reclamation (USBR), SID, and RNVWD (**Figure A-1**).

Representative water level hydrographs for the Vacaville area are provided in **Appendix A** (**Figures A-3** and **A-4)**. The hydrographs included in **Appendix A** are organized according to the four primary formations in which the wells are completed: Quaternary alluvium and the upper, middle, and basal zones of the Tehama Formation (**Figure A-2**). Groundwater elevation contour maps prepared for the basal zone of the Tehama Formation are also included in **Appendix A** (**Figures A-5** and **A-6**) to indicate the hydraulic gradient and direction of groundwater flow beneath the City.

Water levels in wells completed in Quaternary alluvium and the upper zone of the Tehama Formation (**Figure A-3**) show similar trends. Water levels in those zones generally show declining levels from the 1940s to the early 1960s as a result of increasing groundwater pumpage. Beginning in the 1960s, water levels rose following the delivery of surface water from the Solano Project and corresponding reductions in groundwater pumpage. Water levels have remained relatively high since the late 1960s, largely unaffected by wet or dry climatic periods, with depths to water typically less than 10 feet. Groundwater levels in the Quaternary alluvium and upper zone of the Tehama Formation show small seasonal effects with slightly higher groundwater levels in the spring. Water levels in these relatively shallow aquifers appear to be unaffected by basal zone pumpage.

Water level data are more limited for wells completed in the middle zone of the Tehama Formation. **Figure A-3** illustrates groundwater levels for two wells (6N/1W-23C1 and 7N/1W-34F1) monitored by DWR in the Vacaville area that had sufficient historical data to indicate water level trends in this zone. Groundwater level trends in these wells are generally similar to those observed in the upper zone of the Tehama Formation. Also shown in **Figure A-3** are two monitoring wells RNVWD MW-446 screened between 426 and 436 feet and RNVWD MW-594 screened between depths of 564 to 584 feet) located near RNVWD production Well No. 1. Groundwater levels in the RNVWD monitoring wells show declining groundwater levels until about 2008. The trends in these wells are likely due to local pumping effects from the RNVWD water supply well and a higher level of hydraulic connectivity between the middle and deeper (basal) Tehama Formation deposits.

Water level data since 2000 for the basal zone of the Tehama Formation are shown in **Figure A-4**. A response to reduced pumping since 2008 can be seen in all of the wells shown. A detailed hydrograph of City Well 8 at Elmira Road shows a typical water level response to pumpage for the City's basal zone wells since 1988 (**Figure 2-8**). In order to obtain generally static measurements, manual water level measurements in the City's wells since 1992 have been preceded by a three-day shutdown period that eliminated the most pronounced effects of recent pumping by one or more nearby wells to ensure consistent and generally static monitoring conditions. Beginning in 2002, selected transducer measurements from the City's SCADA system have been available to indicate the highest water levels in the spring and the lowest water levels during the summer.

As noted above, the City has considered 1992 to 1993 to represent a "base year" groundwater level condition. The maximum spring water levels in 2003 were approximately the same as 1992 for a similar level of Elmira Road pumpage (about 5,400 AF per year), and the spring 1993 and 2003 water levels are highlighted on **Figure 2-8**. Water level data from Well 8 reflect changes in the City's basal zone pumpage from the Elmira Road well field; specifically, water levels increase as pumpage decreases and vice versa.

The City has reduced its Elmira Road basal zone pumpage by shifting more pumpage to new wells constructed in the northeast sector (Wells 14, 15, and 16). As of 2010, 42% of groundwater production occurred in the northeast sector wells, up from 30% in 2007 and 16% in 2000. Overall, this has resulted in water level declines in the northeast sector wells and reduced drawdown in the Elmira Road well field. A hydrograph of Well 14, which has the longest period of record of the northeast sector production wells, is included in **Appendix A** (**Figure A-4**). Water levels in Well 14 declined at a faster rate between 1998 and 2005 than in the Elmira Road wells (about 50 feet in seven years), stabilized between 2005 and 2007, and have risen since 2007.

Groundwater elevations in the basal zone of the Tehama Formation are much lower than in the middle and upper zones in the Vacaville area, ranging from about 20 feet above sea level in RNVWD to 60 feet below sea level in the vicinity of the City's main well field on Elmira Road. A pumping depression in the basal zone exists in the Elmira Road area, and the gradient for groundwater flow is southerly toward this depression. North of the City, the gradient has a magnitude of approximately 45 feet per mile which is much steeper than the gradient in the upper zone of the Tehama Formation. The gradient becomes less steep in the Elmira Road area, e.g., the gradient between Well 14 and the Elmira Road wells is only about 3 feet per mile. This is due to the northerly expansion of the cone of depression in the Elmira Road area as more pumpage has been shifted to Wells 14 and 15 in the northeast sector.

2.3.3 Groundwater Quality

Every three years, the City performs water quality monitoring as required for all public water supply systems. The City also collects samples annually for nitrate analysis. Water quality is generally good at all City wells. Most of the historical data do not show signs of water quality degradation, and concentrations have remained stable.

Total dissolved solids (TDS) concentrations in the basal zone wells ranged from 270 to 546 milligrams per liter (mg/L) in 2008. The TDS concentration in Well 1 was 546 mg/L in 2008, which slightly exceeds the recommended secondary Maximum Contaminant Level (MCL) of 500 mg/L but not the upper secondary limit of 1,000 mg/L. Nitrate concentrations exhibit more variability from well to well than TDS, but concentrations have been stable at most wells. Nitrate (as NO_3) ranged from non-detect (<2 mg/L) in Well 16 to 19.9 mg/L in Well 5 during 2007 to 2008. Nitrate concentrations in Wells 1, 2, 5, and 13 have historically been over 10 mg/L nitrate (as NO_3), but not near the MCL of 45 mg/L.

Concentrations of trace elements in the City wells have generally been low. Copper and selenium have been non-detect at all City wells; and iron, manganese, and zinc have been non-detect at most City wells. Arsenic, boron, hexavalent chromium, and total chromium are typically detected at relatively low concentrations (less than half the MCL in the City's supply wells), except in Well 16 where arsenic approaches, and on one occasion has exceeded, the MCL of 10 µg/L[1]. Elevated chromium and hexavalent chromium concentrations were recently observed in the analytical results for three monitoring wells constructed on Midway Road. The concentrations ranged from about 27 to 44 ug/L; at this time, these concentrations are lower than the MCL of 50 ug/L for chromium, which is also applied to hexavalent chromium. A draft public health goal is being considered by the Office of Environmental Health Hazard Assessment, and there is the potential for a new MCL to be established for hexavalent chromium.

There have been localized instances of impacts to shallow groundwater quality due to hazardous chemical contamination, but existing or potential municipal supplies have not been affected. Analyses for volatile organic compounds (VOCs) and other manmade constituents in the City's water supply wells have all been non-detect.

[1] An investigation of the elevated arsenic concentration on February 8, 2007 led to controlled operation of Well 16 to ensure the delivered water quality is within the drinking water standard for arsenic of 10 µg/L (LSCE, 2009).

3.0 ANALYSIS OF FUTURE PUMPING

An analytical groundwater flow model was used to assess water level impacts from future increases in groundwater pumpage by the City of Vacaville to meet future water demands. The modeling effort included simulations of a baseline scenario and ten future pumping scenarios in which pumpage would be increased and/or redistributed within the study area. The ten future scenarios include normal and dry water year pumpage considerations. The well locations for the baseline and future pumping scenarios, including existing wells and potential new well locations (Wells 17 through 20), are shown in **Figure 3-1**. The model results provide a basis for estimating the average annual sustainable pumpage amount that could be used in conjunction with surface water to meet the City's future water demands. Application of the analytical model involved three tasks, including: 1) preparation of the data needed to develop and calibrate the model, 2) model development and calibration, and 3) design and simulation of the future pumping scenarios. The development of the analytical model and the modeling results are summarized below.

3.1 GROUNDWATER FLOW MODEL

An analytical model was used to simulate the incremental increase in drawdown in the northern Solano County area in response to projected City pumpage to the year 2035. The model is based on the Hantush-Jacob (1955) equation as programmed by Walton (1985). The Hantush-Jacob equation calculates drawdown in a confined aquifer that allows for leakage from overlying subsurface materials. Because the Hantush-Jacob model simulates vertical leakage (recharge) to the underlying aquifer, it simulates recovery after pumping periods due to this same mechanism. For purposes of this model application, a no-flow boundary was incorporated to represent the extent of the basal Tehama Formation in the west (**Figure 3-1**). The analytical model allows for incorporating well cycling on and off within one day and also seasonal pumping variations.

Input parameters for this analytical model were as follows: transmissivity 40,000 gpd/ft and storativity 0.0002 (from LSCE's 2006 and 2008 reports for the average City of Vacaville basal wells and Well 16's aquifer test in 2007); leakage factor of 20,000 feet (used in previous analytical model efforts by LSCE). The analytical model is not applicable for simulating multiple-year periods because it does not include recharge other than from vertical leakage contributed from overlying zones of the Tehama Formation.

3.1.1 Model Calibration and Baseline and Future Pumping Scenarios

Calibration and Baseline Scenario

The period from January through December 2006 (2006) was selected as the model calibration period because of the relative frequency of water level measurement, and the availability of data from production and monitoring wells outside of the Elmira Road well field. **Figure 3-2** shows a representative calibration hydrograph for Well 8 in the Elmira Road well field. The simulated drawdown and recovery show good correlation to observed water level trends; therefore, the model is considered appropriate for assessing the potential water level impacts of projected pumpage on a year-to-year basis. The model calibration simulation also served as the baseline scenario. The total City pumpage for the baseline scenario was 6,500 AFY for ten wells. Additional pumpage for the Gibson Canyon Area and by RNVWD is also included in the simulation at fixed rates (**Table 3-1**). The monthly and annual pumpage amounts for the baseline scenario and the ten future scenarios through 2035 are included in **Appendix B**.

The baseline scenario provides a basis for comparison with the future pumping scenarios. **Figure 3-2** shows the 2006 baseline scenario results, including the relationship between the "simulated groundwater elevations" compared to those actually observed in 2006. The simulated groundwater elevations portray the relative simulated month-to-month drawdown pattern in response to pumpage consistent with the 2006 pumpage amount; actual groundwater levels showed a similar overall pattern.

Ten future pumping scenarios were developed to evaluate the aquifer response to increased, decreased, and redistributed pumpage in the basal zone, including pumpage at new well locations (e.g., City Wells 17 through 20). **Table 3-1** summarizes the total City pumpage and pumpage by location for each scenario modeled (additional pumpage information is contained in **Appendix B**). As noted on the table, the scenarios also include estimations of other pumpage from the basal zone, including from the RNVWD wells and wells in the Gibson Canyon area.

Table 3-1
Summary of Current and Future Basal Tehama Pumping Scenarios

Scenario[1]	Elmira Well Field (AFY)	Number of Elmira Wells	Other City Basal Zone (AFY)	Number of Other City Basal Zone Wells	Total City Basal Pumping[2] (AFY)	Total Basal Pumpage[3] (AFY)	Notes[4]
Baseline	4,550	7	1,950	3	**6,500**	**6,684**	Existing wells with Well 7 abandoned
Scenario 1 - 2015	4,359; 5,231	7	2,491; 2,340	4	**6,850; 8,220**	**7,034; 8,404**	Add Well 17 (Midway/Eubanks)
Scenario 2 - 2020	3,736; 4,484	6	3,114; 3,736	5	**6,850; 8,220**	**7,034; 8,404**	Add Meridian Road Site (Well 7 Replacement = Well 18)
Scenario 3 - 2025	3,600; 4,320	6	3,600; 4,320	6	**7,200; 8,640**	**7,384; 8,824**	Add Willow Drive Area Site (Well 19)
Scenario 4 - 2030	3,146; 3,775	5	4,404; 5,285	7	**7,550; 9,060**	**7,734; 9,244**	Add Weber/Byrnes Area Site (Tentative Well 20)
Scenario 5 - 2035	2,909; 3,491	4	5,091; 6,109	7	**8,000; 9,600**	**8,184; 9,784**	Increase to 8,000 AFY production

Notes

1. Each scenario includes pumping that represents average precipitation years ("normal" years, shown by the first number listed) and low precipitation years ("dry" years, the second number listed) with the possibility that the City may pump their wells as usual during normal years and may decide to increase their groundwater well pumping during dry years when sufficient surface water supplies are not available. The "dry" year amount is repeated for the Multiple Dry Year simulations.

2. When any well is out of service all other available wells will be operated (pumped) to make up for the loss of production. 100 AFY from Well 1 is not included in the simulations, as this well is not completed in the Basal Tehama.

3. Other entities known to have wells completed in the Basal Tehama (RNVWD and commercial pumping in the Gibson Canyon Area) add an estimated 184 AFY to the annual pumping in the area simulated.

4. Wells in the Elmira Well Field will be removed from service according to the order of the City's well replacement schedule.

3.2 MODEL RESULTS AND GROUNDWATER SUPPLY SUFFICIENCY

Figures 3-3 to 3-7 illustrate the simulated drawdown for six representative locations in the northern Solano County area for the 2015 and 2035 future pumping scenarios (normal water year). The six locations include City Well 8, City Well 16, the potential site for Well 17, the potential site for Well 18, Maine Prairie nested deep monitoring wells location, and Dixon nested deep monitoring wells location. Each figure also displays the simulated drawdown for the 2006 baseline scenario so that drawdowns based on current and projected pumpage volumes for 2015 and 2035 can be compared. **Table 3-2** summarizes the predicted minimum and maximum drawdown for the ten future pumping scenarios in relation to the minimum and maximum drawdown occurring with the 2006 baseline scenario. The results show that groundwater levels in the Elmira Road well field for all future normal water year scenarios would be generally similar to or higher than the 2006 baseline scenario during both minimum and maximum periods of drawdown. This result was expected because the pumpage simulated for the Elmira Road area was similar to or less than the 2006 pumpage for all future normal water year scenarios. The opposite occurs in the northern portion of Solano County, where future groundwater levels (normal and dry water years) are projected to be significantly lower than 2006 levels. This is due to increased pumpage in this area and redistribution of City pumpage away from the Elmira Road well field to the north at the projected locations for future City Wells 17, 18, 19, and 20.

Comparison of the simulated drawdown for future pumping scenarios to the results of the 2006 baseline scenario provides the basis for developing an estimate of the potentially sustainable annual pumpage. This comparison is particularly of interest for wells located in the Elmira Road well field where, as described above, base year groundwater levels are used to evaluate the response of the aquifer system to future pumpage. The base year groundwater levels provide a basis for measuring the response of the aquifer system that is particularly important during single-dry and multiple-dry year periods when the City, as part of its conjunctive water management plan, increases pumpage above normal year levels. Similarly, these water levels also provide a basis for measuring the response of the aquifer system when the City offsets the increase with reduced pumpage in subsequent years. The model results also provide a basis for the recommended maximum pumpage amount for relatively short-term use, i.e., pumpage that could occur during a single-dry year condition.

Although the analytical model is capable of reasonably predicting drawdown during peak pumping periods, it is limited in its ability to accurately predict recovery at the end of each year. Specifically, the model results show essentially complete recovery for all scenarios. However, the actual amount of vertical leakage into the basal zone is unknown and other forms of recharge are not simulated with the model. A multi-year calibration period would be required before a numerical model (rather than the current analytical model) could be used for multi-year simulations.

3.2.1 Basal Zone Pumpage Simulations for 2015 and 2035

The model results indicate that, with the present and planned location of groundwater development through 2015, annual total pumpage in an amount of about 6,850 acre-feet by the City (and a total pumpage of 7,034 acre-feet when the City and also other pumpers are included) could be sustained for meeting normal water year demands. As shown in **Table 3-1**, this total pumpage is comprised of groundwater extracted primarily from the basal zone, but also includes some pumpage by the City from other zones. At this amount of pumpage, some water level recovery is anticipated to occur in the Elmira Road well field due to the pumpage decrease relative to the baseline scenario (**Table 3-2**). Existing wells 14, 15, and 16 show similar levels to slight drawdown compared to the baseline scenario. The largest additional drawdown (13.9 to 29.5 feet) occurs at the potential new Well 17 location. During dry water years, as would be expected, additional drawdown compared to the baseline drawdown occurs both in and away from the Elmira Road well field (**Table 3-3**).

At the amount of pumpage simulated for 2015 (normal water years), groundwater levels in the basal zone are anticipated to remain at or above the 1992-1993 base year and 2002-2003 water levels in the Elmira Road well field. However, the distribution of pumpage in the basal zone is very important. It is recommended that normal-year basal zone pumpage in the Elmira Road well field be limited to not more than occurred during 1992 and 2002 (i.e., about 5,600 acre-feet). The balance of the normal year supply from groundwater sources would result from pumpage elsewhere in the northern to northeastern part of Solano County. In 2015, the total sustainable City pumpage, including groundwater from basal and non-basal zones, is estimated to be about 6,950 acre-feet.

In future years, at year 2035, shifting pumpage to proposed City well locations sited away from the Elmira Road well field would reduce drawdown in the Elmira Road area (**Tables 3-2** and **3-3**). Similarly, management of the timing and distribution of pumpage would ensure that water levels in the basal zone remain at or above the 1992-1993 base year and 2002-2003 water levels. Managed pumpage from the basal zone would also allow the level of sustainable pumpage within the northern Solano County area to be increased. However, as other groundwater sources outside the Elmira Road well field are developed, the influence of the basal zone pumpage in other areas on groundwater levels at the Elmira Road well field and elsewhere in northern Solano County must also be considered. For the normal water year 2035 scenario with a pumpage total of 8,184 acre-feet, some water level recovery is anticipated to occur in the Elmira Road well field due to the pumpage decrease relative to the baseline scenario (**Table 3-2**). Existing wells 14, 15, and 16 show increased levels of drawdown compared to the 2015 scenario. The largest additional drawdown (more than 40 feet maximum drawdown difference) compared to the baseline scenario occurs at the potential new well locations (Wells 17, 18, 19 and 20). During dry water years, as would be expected, additional drawdown compared to the baseline drawdown occurs both in and away from the Elmira Road well field (**Table 3-3**).

Minimum and maximum simulated drawdowns were also evaluated at locations farther from the City's pumping. Particularly, **Tables 3-2** and **3-3** summarize drawdown compared to the baseline scenario for locations at four SCWA monitoring well sites (Allendale MW-1925; Dixon MW-2212; Maine Prairie MW-2170; and Meridian MW-1680). Comparative drawdown amounts are also illustrated for two of these locations (Dixon and Maine Prairie) on **Figure 3-3** for the 2015 (normal water year) and 2035 (normal and dry water years) scenarios. As shown in **Tables 3-2** and **3-3** and **Figure 3-3**, little drawdown occurs at these locations (up to 3.3 feet maximum simulated drawdown at the Maine Prairie location for a normal water year simulation in 2035).

Table 3-2 Simulated Drawdown Results for the Basal Tehama - Normal Years

		Simulated Drawdown Results for the Basal Tehama - Normal Years											
				Incremental Difference in Simulated Drawdown Compared to Baseline [1]									
		Baseline Scenario: 6,500 AFY		Scenario 1 - 2015: 6,850 AFY		Scenario 2 - 2020: 6,850 AFY		Scenario 3 - 2025: 7,200 AFY		Scenario 4 - 2030: 7,550 AFY		Scenario 5 - 2035: 8,000 AFY	
	Well Name	Minimum Simulated Drawdown (ft)	Maximum Simulated Drawdown (ft)	Minimum Simulated Drawdown (ft)	Maximum Simulated Drawdown (ft)	Minimum Simulated Drawdown (ft)	Maximum Simulated Drawdown (ft)	Minimum Simulated Drawdown (ft)	Maximum Simulated Drawdown (ft)	Minimum Simulated Drawdown (ft)	Maximum Simulated Drawdown (ft)	Minimum Simulated Drawdown (ft)	Maximum Simulated Drawdown (ft)
City of Vacaville Production Wells	Well 01	30.5	84	***-0.3***	***-1.4***	***-3***	***-7.6***	***-2.7***	***-7.5***	***-4.3***	***-6.9***	***-5.3***	***-11***
	Well 02	38.7	112.2	***-0.6***	***-2.7***	***-2.9***	***-9.8***	***-3***	***-10.8***	***-4.5***	***-9.5***	***-12.4***	***-34.7***
	Well 03	39.7	113.4	***-0.7***	***-2.7***	***-3.7***	***-9.7***	***-3.8***	***-10.5***	***-5.3***	***-9.1***	***-4.5***	***-7.3***
	Well 05	40	111.8	***-0.9***	***-3***	***-4.9***	***-13***	***-5.1***	***-14***	***-7.6***	***-14.3***	***-6.5***	***-11.4***
	Well 06	39.3	107.4	***-0.8***	***-2.8***	***-10.8***	***-30.7***	***-10.7***	***-30.8***	***-14.2***	***-33***	***-13.8***	***-32.5***
	Well 07	31.9	83.2	***-0.5***	***-1.9***	***-4***	***-11.6***	***-3.9***	***-11.5***	***-9.2***	***-16.2***	***-8.7***	***-15.5***
	Well 08	38.9	92.5	***-0.9***	***-2.3***	***-3.5***	***-10.5***	***-3.6***	***-10.9***	***-17.1***	***-28.4***	***-16.5***	***-27.5***
	Well 09	37.4	97.5	***-0.6***	***-2.1***	***-3.7***	***-8.1***	***-3.5***	***-8.2***	***-5.6***	***-8***	***-3.3***	***-2.6***
	Well 13	40.7	116.1	***-0.8***	***-3.1***	***-5.1***	***-12***	***-5.2***	***-13***	***-7.3***	***-12.5***	***-6.7***	***-10.8***
	Well 14	30.9	83.3	0.1	***-0.5***	***-0.4***	***-2.7***	0.6	***-0.9***	1.5	2.8	4.7	10.1
	Well 15	31.7	68.6	0.3	0.7	***-0.6***	0.3	1.6	4.8	3.3	10	7.5	17.9
	Well 16	28.6	72.8	1	1.5	1	1.1	2.3	3.4	3.8	8.2	7.5	16.6
	Well 17 (Midway/Eubanks)	10.7	26.8	13.9	29.5	14.1	30.1	14.5	31.2	16.1	35.3	19.5	42.5
	Well 18 (Meridian Rd/Well7Replace)	6.5	17.5	0.7	1.5	13.7	31.1	14.3	32.3	16.9	38.6	20.2	45.8
	Well 19 (Willow Drive)	16.6	40	0.7	1.6	0.4	2.2	13.6	29.6	16	36.1	20	44.4
	Well 20 (Weber/Byrnes)	10.2	25.9	0.7	1.5	1.8	4.8	3.6	8.6	17.7	38.9	21.3	46.6
City of Vacaville Monitoring Wells	MW-14	26.4	68.8	0.3	0.1	***-0.3***	***-2.2***	0.9	0.1	1.5	3.1	4	8.1
	MW-15-1815ft	26.8	60	0.4	1.1	***-0.4***	0.7	1.9	5.5	3.4	10.2	6.8	16.8
	MW-16-1614ft	20	48.7	1.5	2.9	0.8	2.6	2.2	5.6	3.4	9.5	5.8	14.5
	MW-98A	10	25.4	2	4.1	2.5	6	3.7	8.6	5.3	12.9	7	16.5
	MW-98B	14.6	35.6	1.4	3	1.4	4.1	3.6	8.7	5.4	13.6	7.6	18.2
	MW-98C	6.9	18.4	0.7	1.6	4.7	10.9	5.6	13	8	18.7	9.9	22.8
Peripheral Monitoring Wells	Allendale MW-1925	3.4	10.2	1	2.2	1.3	3	1.6	3.8	2.1	5.3	2.7	6.8
	Dixon MW-2212	0.7	3.2	0.1	0.4	0.4	0.8	0.5	1.1	0.7	1.7	0.8	2.2
	Maine Prairie MW-2170	3.5	10.6	0.1	0.2	0.1	0.5	0.4	1.2	0.7	2.3	1	3.3
	Meridian MW-1680	14.2	36.5	***-0.2***	***-0.6***	***-2.5***	***-3.7***	***-2.3***	***-3.4***	***-3.6***	***-4***	***-3.4***	***-3.6***
Other Basal Tehama Pumping Locations	RNVWD 1	8.3	21.6	2.3	4.8	2.2	5.1	2.7	6.4	3.4	8.5	4.5	11
	RNVWD 2	7.8	20.3	2.1	4.5	2.1	4.9	2.6	6.2	3.2	8.2	4.3	10.6
	11 #3 AHF (Mariani)	16.7	38.8	2.5	5.3	2.2	5.5	3.3	8	4.4	11.5	6.3	15.6
	1 #5 AHF (Mariani)	16	37.2	2.7	5.7	2.5	6.1	3.6	8.6	4.8	12.1	6.7	16.2

1. Total AFY listed for each scenario represents pumping in the Basal Tehama aquifer unit by the City of Vacaville during a normal year. A negative incremental difference indicates that less drawdown was simulated compared to the baseline scenario.

Table 3-3 Simulated Drawdown Results for the Basal Tehama - Dry Years

		Simulated Drawdown Results for the Basal Tehama - Dry Years											
				Incremental Difference in Simulated Drawdown Compared to Baseline [1]									
		Baseline Scenario: 6,500 AFY		Scenario 1 - 2015: 8,220 AFY		Scenario 2 - 2020: 8,220 AFY		Scenario 3 - 2025: 8,640 AFY		Scenario 4 - 2030: 9,060 AFY		Scenario 5 - 2035: 9,600 AFY	
	Well Name	Minimum Simulated Drawdown (ft)	Maximum Simulated Drawdown (ft)	Minimum Simulated Drawdown (ft)	Maximum Simulated Drawdown (ft)	Minimum Simulated Drawdown (ft)	Maximum Simulated Drawdown (ft)	Minimum Simulated Drawdown (ft)	Maximum Simulated Drawdown (ft)	Minimum Simulated Drawdown (ft)	Maximum Simulated Drawdown (ft)	Minimum Simulated Drawdown (ft)	Maximum Simulated Drawdown (ft)
City of Vacaville Production Wells	Well 01	30.5	84	5.7	15	2.5	7.6	2.7	7.7	0.9	8.4	***-0.3***	3.4
	Well 02	38.7	112.2	6.9	19.1	4.2	10.5	4.1	9.4	2.3	10.9	***-7.1***	***-19.3***
	Well 03	39.7	113.4	7.1	19.3	3.4	10.9	3.4	10	1.5	11.6	2.5	13.8
	Well 05	40	111.8	6.9	18.7	2.1	6.7	1.9	5.5	***-1.3***	5.1	0.2	8.6
	Well 06	39.3	107.4	6.8	18	***-5.1***	***-15.4***	***-5***	***-15.5***	***-9.3***	***-18.2***	***-8.8***	***-17.6***
	Well 07	31.9	83.2	5.7	14.3	1.5	2.7	1.7	2.7	***-4.8***	***-2.9***	***-4.1***	***-2.1***
	Well 08	38.9	92.5	6.7	15.7	3.5	5.8	3.4	5.4	***-12.8***	***-15.7***	***-12.1***	***-14.6***
	Well 09	37.4	97.5	6.7	16.9	3	9.7	3.2	9.5	0.7	9.7	3.5	16.3
	Well 13	40.7	116.1	7.1	19.5	2.1	8.8	1.9	7.5	***-0.7***	8.2	0.1	10.1
	Well 14	30.9	83.3	6.2	15.9	5.6	13.3	6.8	15.4	7.8	19.8	11.6	28.6
	Well 15	31.7	68.6	6.5	14.3	5.6	13.8	8.1	19.3	10.2	25.4	15.2	35
	Well 16	28.6	72.8	6.7	16.1	6.8	15.6	8.2	18.4	10.2	24.1	14.6	34.1
	Well 17 (Midway/Eubanks)	10.7	26.8	18.6	40.5	18.8	41.2	19.3	42.5	21.2	47.5	25.2	56
	Well 18 (Meridian Rd/Well7Replace)	6.5	17.5	2.1	5.1	17.8	40.7	18.4	42.2	21.6	49.8	25.4	58.3
	Well 19 (Willow Drive)	16.6	40	4	9.7	3.7	10.4	19.5	43.4	22.4	51.1	27.2	61.1
	Well 20 (Weber/Byrnes)	10.2	25.9	2.8	6.9	4.1	10.8	6.3	15.4	23.2	51.8	27.5	61
City of Vacaville Monitoring Wells	MW-14	26.4	68.8	5.5	13.7	4.8	11	6.2	13.7	7	17.2	9.9	23.3
	MW-15-1815ft	26.8	60	5.8	13.1	4.8	12.6	7.5	18.4	9.3	24	13.4	32
	MW-16-1614ft	20	48.7	5.6	12.9	4.8	12.6	6.5	16.2	7.8	20.8	10.7	26.8
	MW-98A	10	25.4	4.2	9.8	4.8	12	6.3	15.2	8.2	20.3	10.3	24.7
	MW-98B	14.6	35.6	4.4	10.5	4.5	11.8	7.1	17.3	9.2	23.2	11.8	28.7
	MW-98C	6.9	18.4	2.2	5.5	6.9	16.7	8.1	19.2	10.9	26.1	13.1	30.9
Peripheral Monitoring Wells	Allendale MW-1925	3.4	10.2	1.8	4.5	2.1	5.5	2.5	6.5	3.1	8.3	3.9	10
	Dixon MW-2212	0.7	3.2	0.3	1	0.6	1.6	0.7	2	0.9	2.7	1.1	3.3
	Maine Prairie MW-2170	3.5	10.6	0.8	2.3	0.8	2.7	1.2	3.6	1.5	4.9	1.9	6
	Meridian MW-1680	14.2	36.5	2.6	6.6	***-0.1***	2.8	0.1	3.2	***-1.6***	2.5	***-1.3***	3
Other Basal Tehama Pumping Locations	RNVWD 1	8.3	21.6	4.1	9.6	4	10	4.7	11.6	5.5	14.1	6.8	17.1
	RNVWD 2	7.8	20.3	3.8	9.1	3.8	9.6	4.4	11	5.2	13.5	6.5	16.4
	11 #3 AHF (Mariani)	16.7	38.8	5.7	13.3	5.3	13.5	6.7	16.5	8	20.7	10.3	25.6
	1 #5 AHF (Mariani)	16	37.2	5.9	13.5	5.6	13.9	7	16.9	8.3	21.1	10.6	26

1. Total AFY listed for each scenario represents pumping in the Basal Tehama aquifer unit by the City of Vacaville during a normal year. A negative incremental difference indicates that less drawdown was simulated compared to the baseline scenario.

Slightly more drawdown (up to 6 feet maximum drawdown at Maine Prairie) is simulated at these locations for the 2035 (dry year) scenario (**Table 3-3**).

The results for the normal water year 2035 scenario indicate the overall lowering of hydraulic heads in the northern to northeastern Solano County area and a shift in the position of the cone of depression. Levels are also likely to decrease below historical levels, especially in areas where there has been little to no prior development of groundwater supplies from the basal Tehama Formation. Groundwater levels are anticipated to reach a new equilibrium between extraction and recharge. However, at some stage of total groundwater level development from this deep unit, levels may continue to decline reflecting a net deficit in the overall groundwater budget.

The modeled basal zone pumpage of 8,184 acre-feet for the 2035 normal year scenario and 9,784 acre-feet for the 2035 dry-year scenario include pumpage in the Elmira Road well field at a lesser amount than occurred during 1992, 2002, and also the 2006 baseline scenario. Based on the model results for the 2035 normal year scenario, City pumpage for future normal years appears to be sustainable at about 8,000 acre-feet for all pumpage from the basal zone. As discussed below, ongoing groundwater monitoring and use of a numerical flow model to refine the estimated sustainable pumpage are recommended.

It is suggested that the 2035 dry year total pumpage for the City of 9,600 acre-feet (as shown in **Table 3-1**) be considered only in the context of short-term use as part of a conjunctive water management program. Until additional monitoring data are gathered outside of the Elmira Road area and water level responses to expanded groundwater development and recharge mechanisms are better understood, it is recommended that higher pumpage levels (e.g., dry-year amount) be offset through continued conjunctive water management by reducing pumpage in wet years and allowing water levels to recover.

3.3 ONGOING GROUNDWATER MONITORING AND FUTURE SUSTAINABLE PUMPAGE ESTIMATE

Planning for additional groundwater development has preliminarily involved the use of an analytical groundwater flow model. Monitoring data have been and will continue to be utilized to assess the actual response to pumping (particularly within the basal zone) so that operations can be adjusted as necessary, i.e. to avoid progressive groundwater level declines.

As part of the conjunctive management of surface water and groundwater to meet the City’s requirements, it is recognized that there will be variations in the amount of available surface water supplies from year to year, particularly since a large fraction of the supply is imported from outside the subbasin. Similarly, there are expected to be variations in groundwater conditions as a function of the local hydrogeology that affect, among other things, the natural recharge to the groundwater basin from year to year. Local hydrology, which affects local groundwater conditions in the basal zone, may be considerably different from the hydrology in a distant (Central Sierra Nevada) location that directly affects the availability of imported surface water in any given year.

Recharge to the basal zone is expected to occur primarily east of the English Hills and north of the Vacaville area where the Tehama Formation outcrops. A significant portion of the recharge is probably the result of leakage from the overlying Quaternary alluvium and the upper zone of the Tehama Formation in the outcrop areas. Thus, conjunctive water management by the City necessitates particular attention to groundwater level recovery from year to year to ensure that water levels in the basal zone are maintained to meet a regular component of the City's water supply in normal and wet years and a larger component of the water supply during dry periods that affect supplemental surface water availability.

3.3.1 Future Refinement of Sustainable Pumpage Estimate

Ongoing evaluation of sustainable pumpage, particularly for the basal zone of the Tehama Formation, will be required to accomplish the main objectives of operating within the yield of the groundwater basin and avoiding overdraft.

Further understanding and quantification of sustainable pumpage from the Tehama Formation (especially the basal zone), which accounts for variations in hydrologic conditions and the location and amount of pumpage, is recommended so that groundwater development and use can be managed in such a way to meet an appropriate fraction of total water demand while avoiding over pumping that could result in overdraft conditions.

The City's historical operating experience, complemented by observed groundwater conditions, has served as the initial basis for determining available groundwater supplies. However, it is possible to refine the analysis to determine values or ranges of yield under varying hydrologic conditions, and to assess the impacts of various management actions that might be implemented in the basin. Development of a numerical groundwater flow model is recommended to determine the yield of the subbasin under existing land use and groundwater and surface water development conditions. Such a model could also be used to assess the yield of the subbasin under future land use conditions as well as future ranges of surface water importation, groundwater development, and recycled water use through varying hydrologic conditions, i.e., wet and dry periods that affect the availability of imported surface water. Among the modeling scenarios examined with a numerical model would be simulation of the effects of redistributing pumpage between the Elmira and northern Solano County areas to reduce the degree to which drawdown in the basal zone occurs at either location.

4.0 SUMMARY OF GROUNDWATER SOURCE SUFFICIENCY

4.1 GROUNDWATER SUPPLY SUFFICIENCY FOR 2015-2035

The model results generally show that water levels in the Elmira Road well field for all future scenarios would be similar to or higher than the 2006 baseline scenario results. It appears that groundwater (from the non basal and basal zones of the aquifer system) can be used by the City on a sustained basis at an amount of about 8,000 acre-feet (including basal and non basal zone pumpage) to meet normal year demands through 2035. On a short-term basis for a single-dry year condition, basal and non-basal zone pumpage up to 9,700 acre-feet, pending the pumpage distribution, would result in increased water level drawdown, especially in year 2015, but water level drawdown in the Elmira area is anticipated in future years (2020 to 2035) to become comparable to that simulated with the 2006 baseline scenario. Correspondingly, as more groundwater development occurs in future years in the northern to northeastern part of the county, the drawdown increases.

Based on available data and the model results, annual groundwater pumpage for normal, single-dry, and multiple-dry year types are summarized in **Table 4-1**.

Table 4-1

City of Vacaville
Groundwater Supply Sufficiency Years 2015-2035[1]

Water Supply Year	Normal Year (acre-feet/year)	Single-Dry Year (acre-feet/year)	Multiple-Dry Year (acre-feet/year)
2015	7,000	8,300	8,300
2020	7,000	8,300	8,300
2025	7,300	8,700	8,700
2030	7,700	9,200	9,200
2035	8,100	9,700	9,700

1. Groundwater quantities include non basal and basal pumpage.

As shown on **Table 4-1**, the total normal year sustained pumpage amount for the City is projected to increase from 7,000 acre-feet in 2015 to 8,100 acre-feet by 2035. The single-dry year pumpage increases from 8,300 acre-feet in 2015 to 9,700 acre-feet by 2035. The pumpage levels shown in **Table 4-1** for multiple-dry years are recommended based on the available monitoring data and current understanding of the response of the aquifer system to pumping stresses. The multiple-dry year pumpage levels range from 8,300 acre-feet in 2015 to 9,700 acre-feet in 2035. The likely impact of this level of pumpage for multiple years is still unknown because the model does not simulate recharge variations necessary for multi-year simulations.

When pumpage at these amounts occurs over a multiple-dry year period, it is recommended that the portion of the pumpage occurring in the Elmira Road well field be limited (at least initially) to about 5,100 acre-feet, or about 10 percent above the presently identified level of sustained pumpage for that area (about 4,600 acre-feet based on 2006 baseline scenario results, **Table 3-2**). Total City pumpage for multiple-dry year periods would thus be comprised of basal pumpage from the Elmira Road area; City Wells 14 through 16 and other new wells; and also non-basal pumpage from Well 1. As new City wells (Wells 17 through 20) are constructed, more is known about the nature of the aquifer system, and further analysis occurs with the use of a numerical groundwater model, then the additional information (particularly information about spring water level recovery in the northern portion of the study area) will allow further determination of the pumpage that can be sustained during single-dry year and multiple-dry year periods.

4.2 CITY'S CONJUNCTIVE WATER MANAGEMENT AND MONITORING PROGRAM

Maximizing the groundwater supply without causing significant impacts requires distribution of pumpage to prevent excessive water level drawdown and to ensure that persistent water level declines do not occur. Conjunctive water management of surface and groundwater has allowed groundwater levels to recover in the Elmira Road area to base year water levels.

Although short-term pumpage by the City at amounts of 9,700 acre-feet, or possibly more, is possible during single-dry year or multiple-dry year periods, analysis of existing data indicates that this level of pumpage would increase significantly the maximum (or summertime) drawdown in the northeastern county area. The conjunctive water management plan which is being employed by the City would be used to reduce drawdown during normal and wet water years. Specifically, short-term pumpage occurring at increased levels to meet demand during dry years would be offset in subsequent years through a corresponding reduction in pumpage and increased utilization of surface-water supplies.

Continued groundwater level monitoring is important for ensuring that when pumpage is increased for multiple dry-year periods, levels, particularly in the Elmira Road well field, do not drop below historical low levels during summer months and recover to base year spring levels after the dry period is over. Continuation of the groundwater monitoring program is described in the City's *Groundwater Management Plan Update* (LSCE, 2011). The amount of pumpage considered to be sustainable may change in the future as a result of ongoing evaluation of monitoring data, managed extraction from the basal zone, continued application of conjunctive water management, and further analysis of the pumpage that can be sustained during dry-year periods by the creation and implementation of a numerical model.

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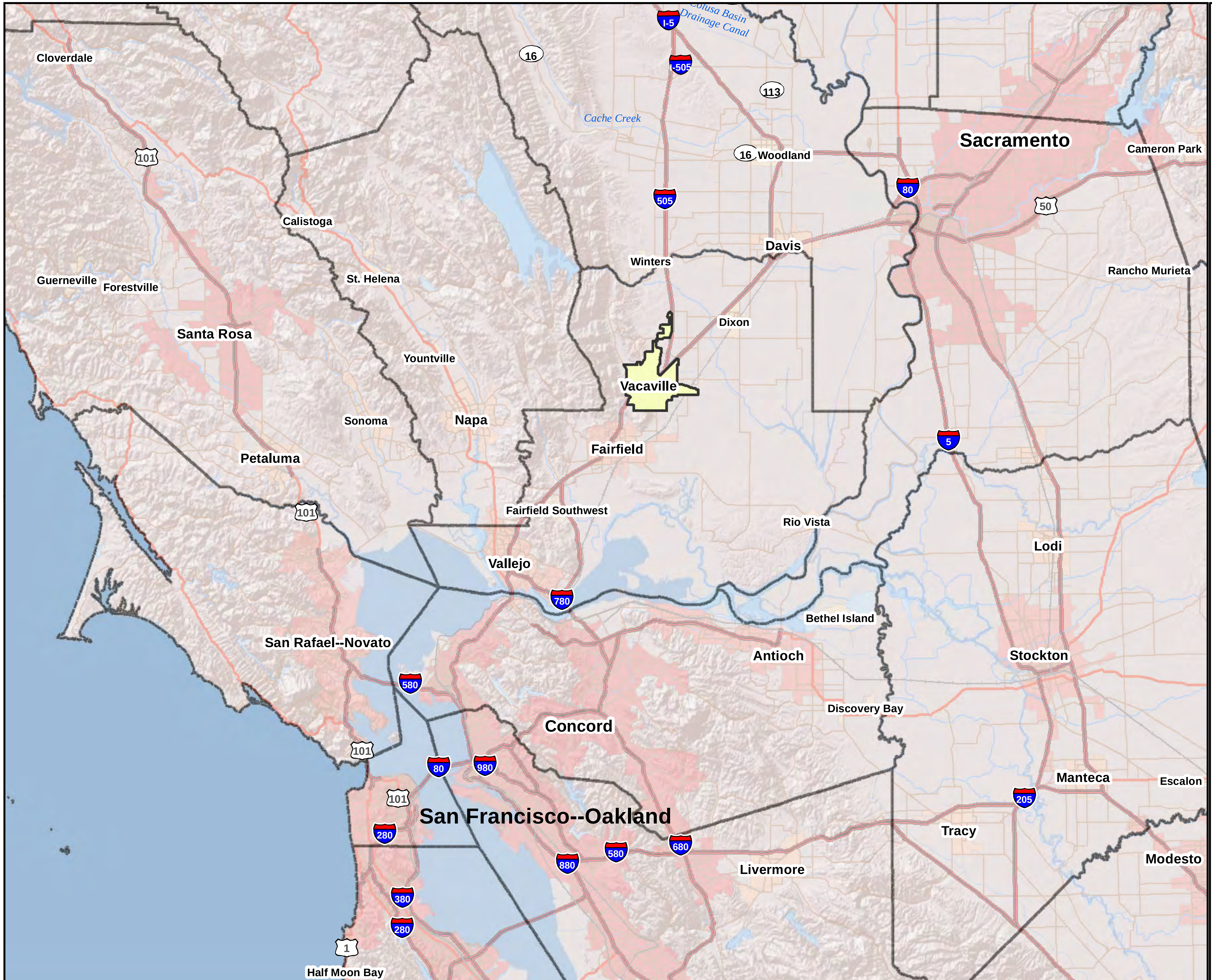
FIGURES



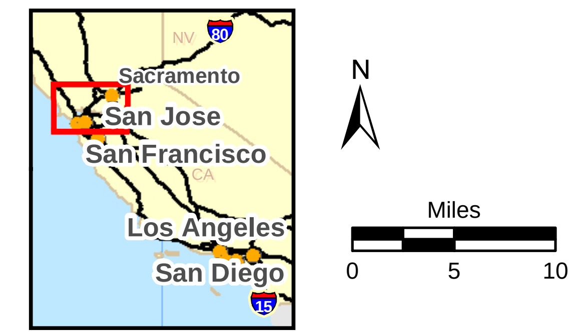


Figure 1-1
City of Vacaville
Location Map

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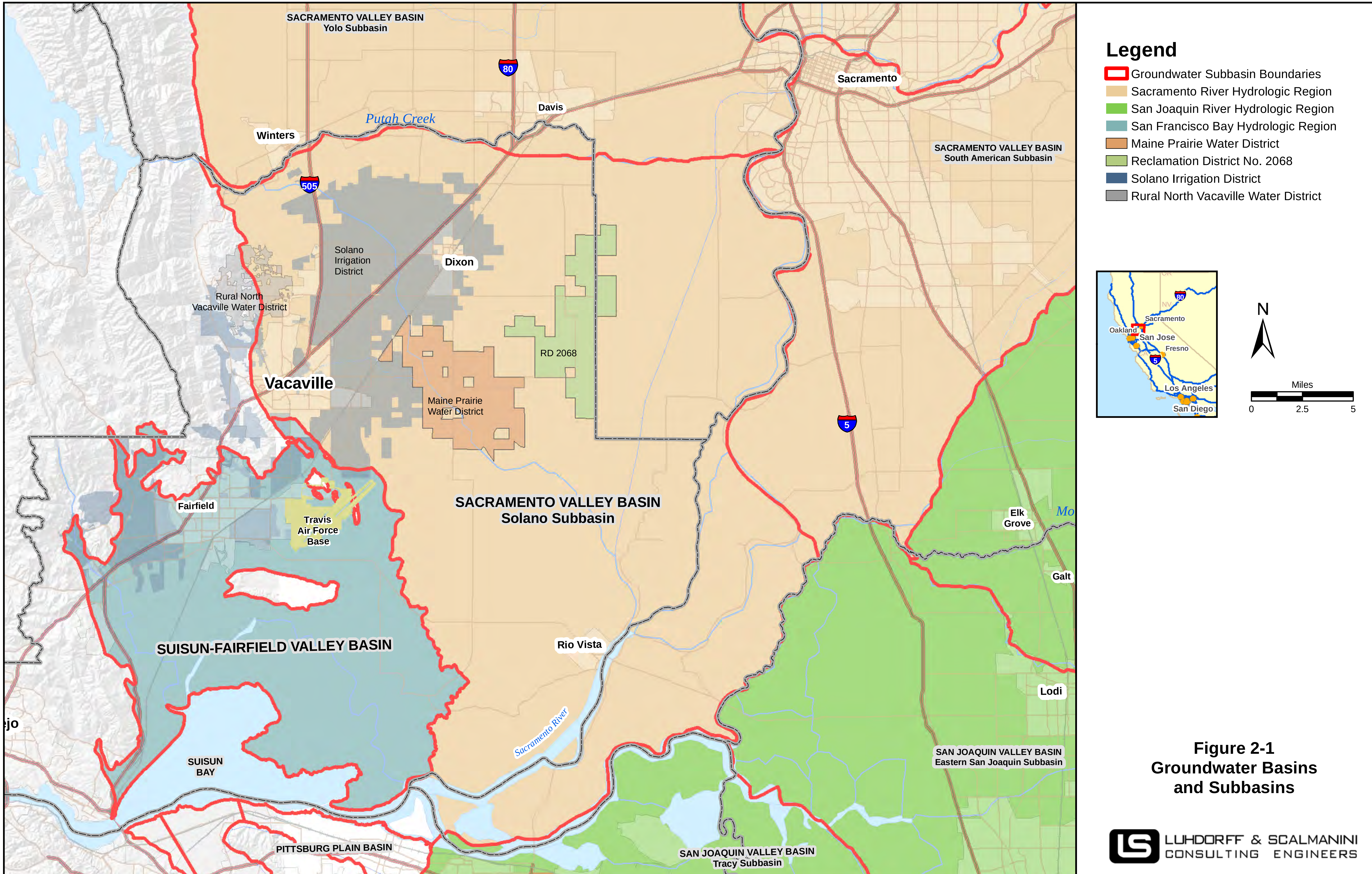

Figure 2-1
Groundwater Basins and Subbasins

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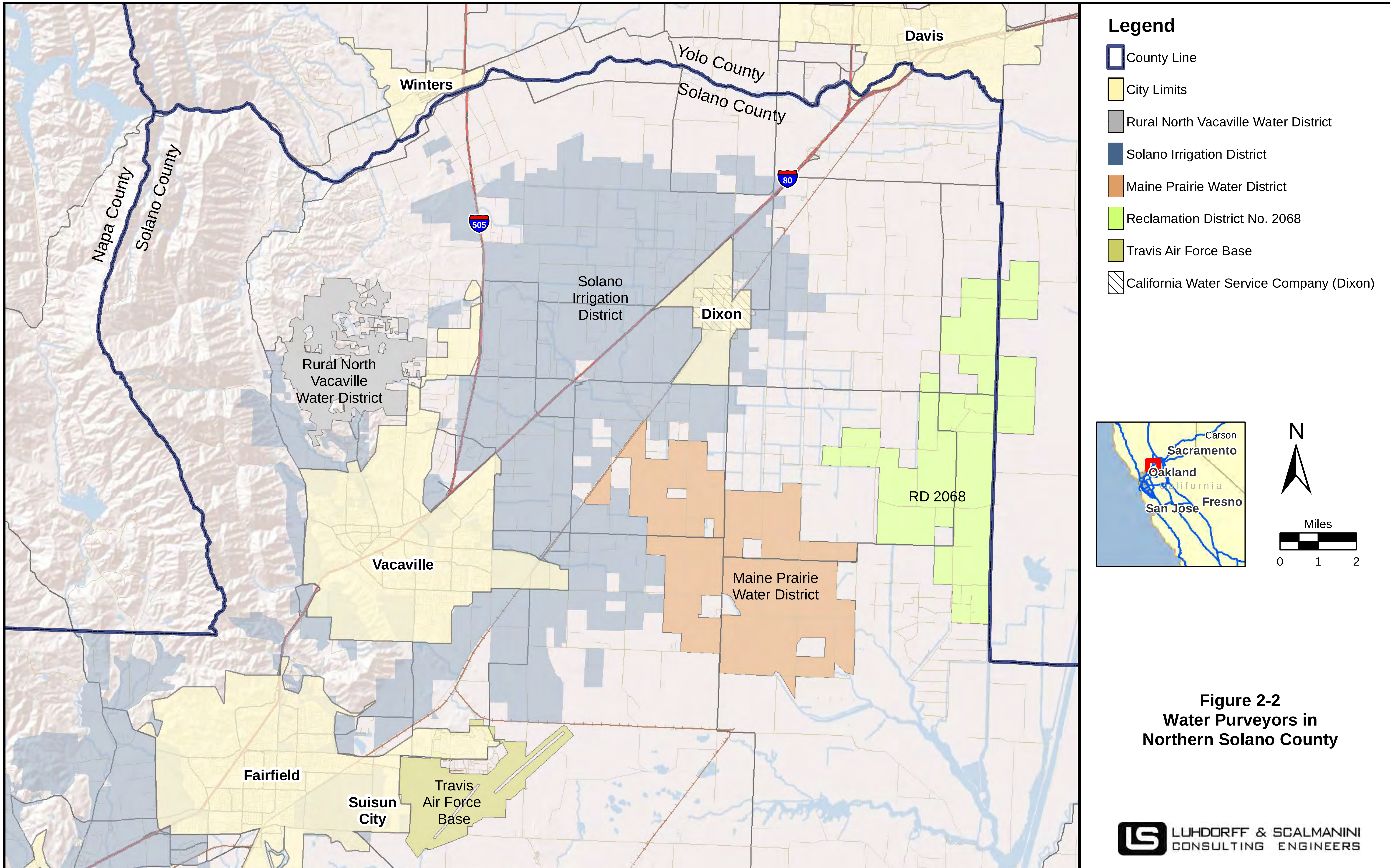

Figure 2-2
Water Purveyors in Northern Solano County

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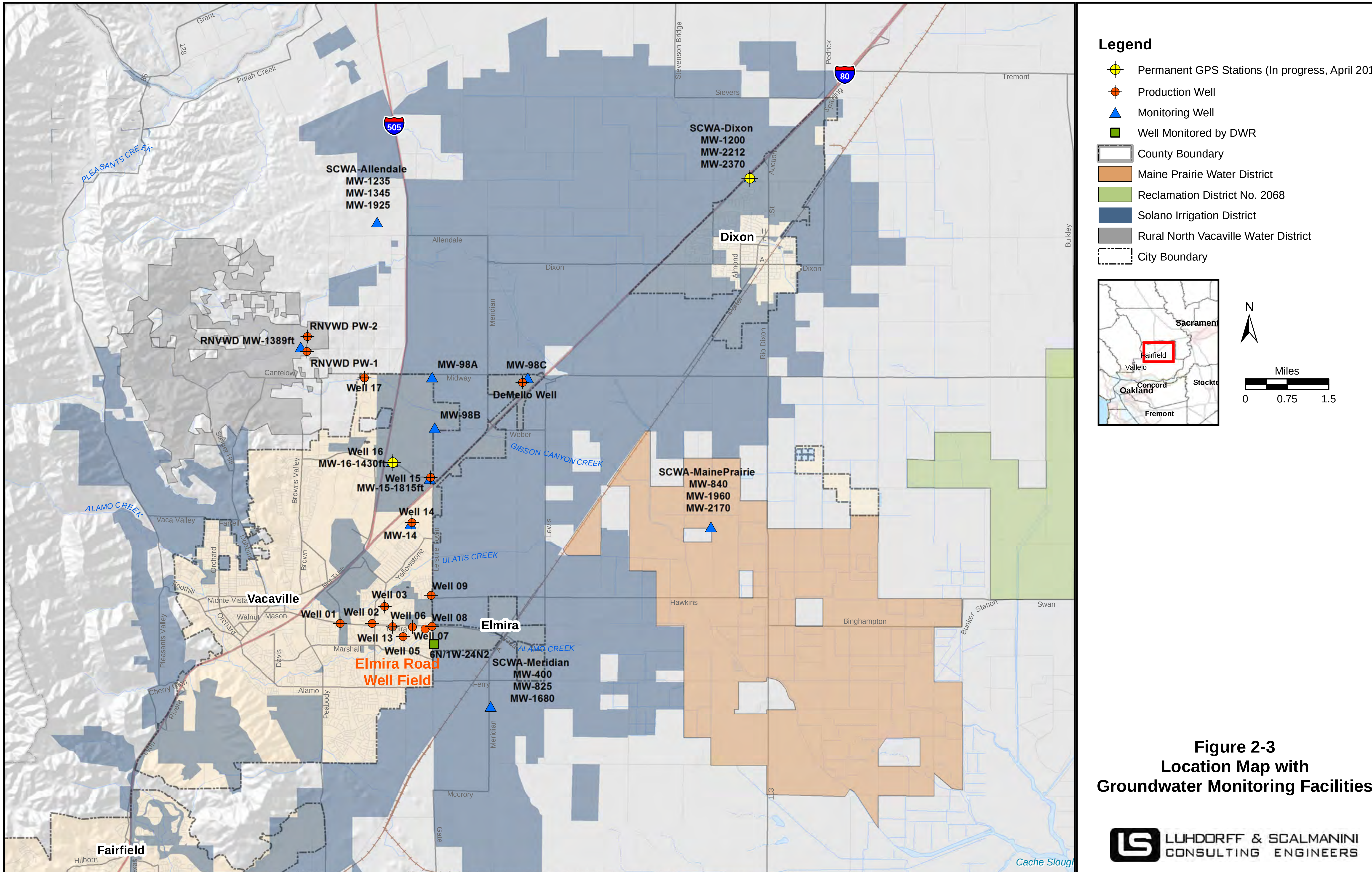

Figure 2-3
Location Map with
Groundwater Monitoring Facilities

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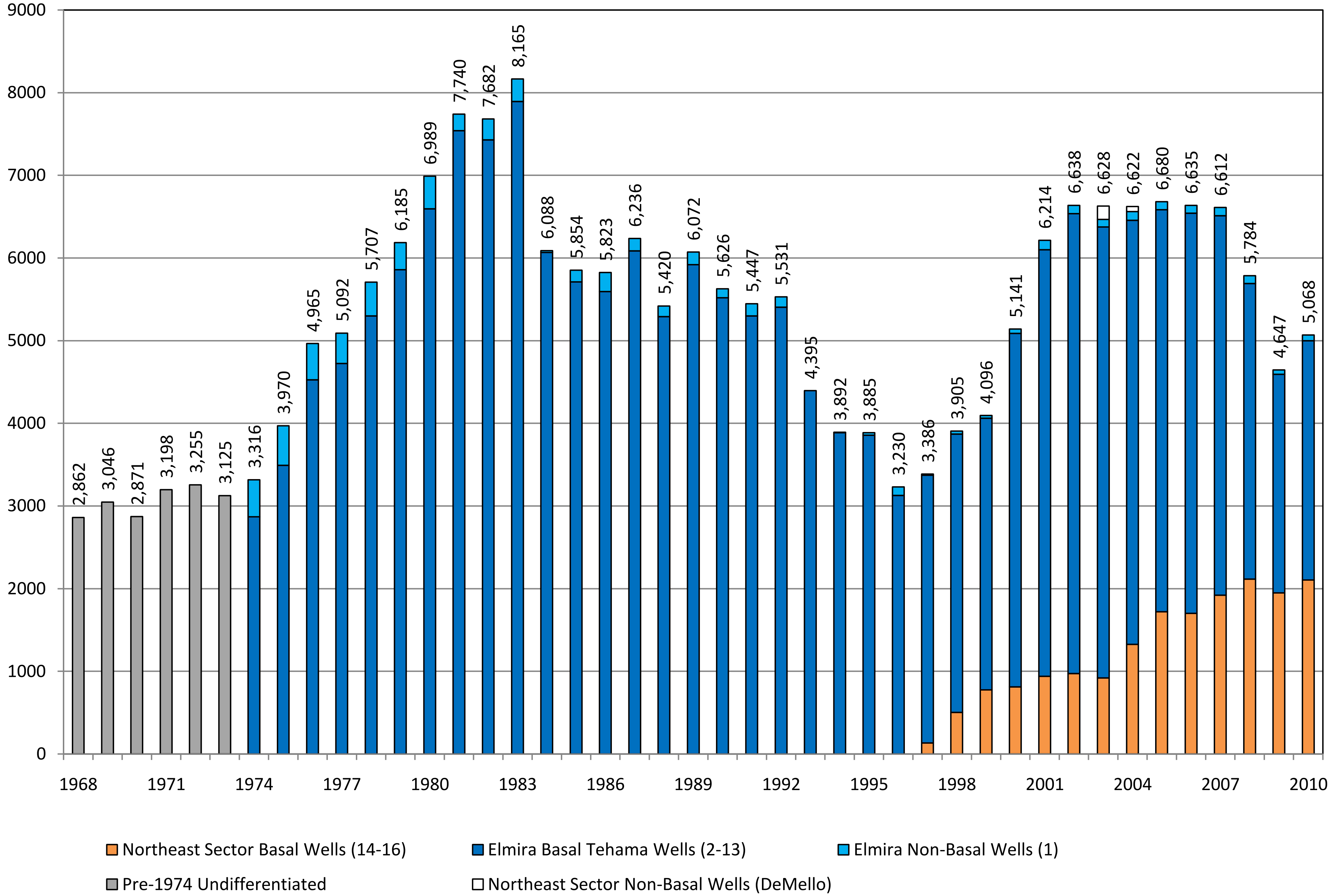

Y:\Vacaville\Modeling\Modeling for UWMP Update 032011\Copy of updatedFig2-8Hydrograph.xlsx\Figure 2-4

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Figure 2-4
City of Vacaville Annual Groundwater Pumpage

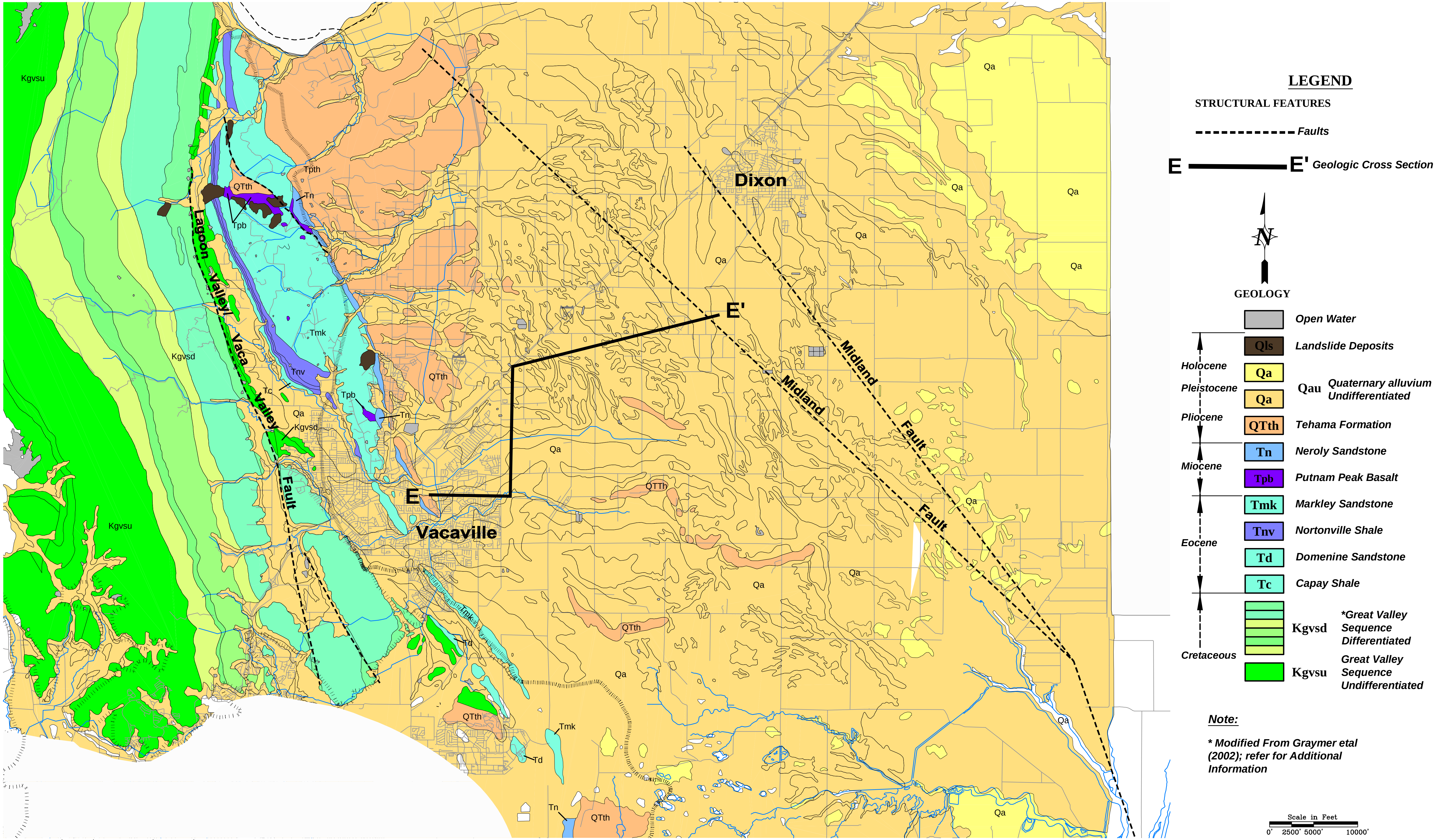

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Figure 2-5
Surficial Geologic Map of Solano County

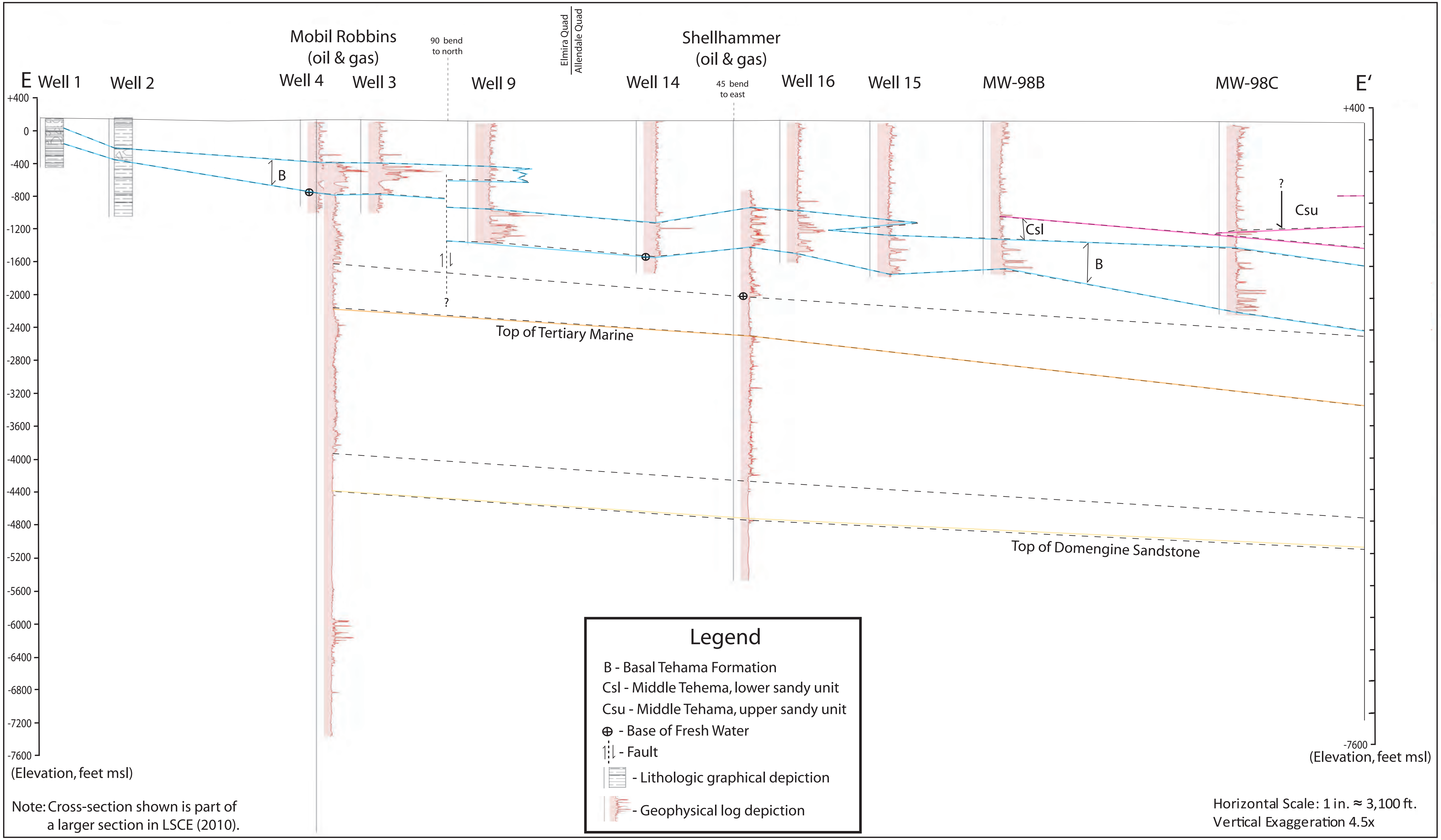

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Figure 2-6
Cross-Section E-E'

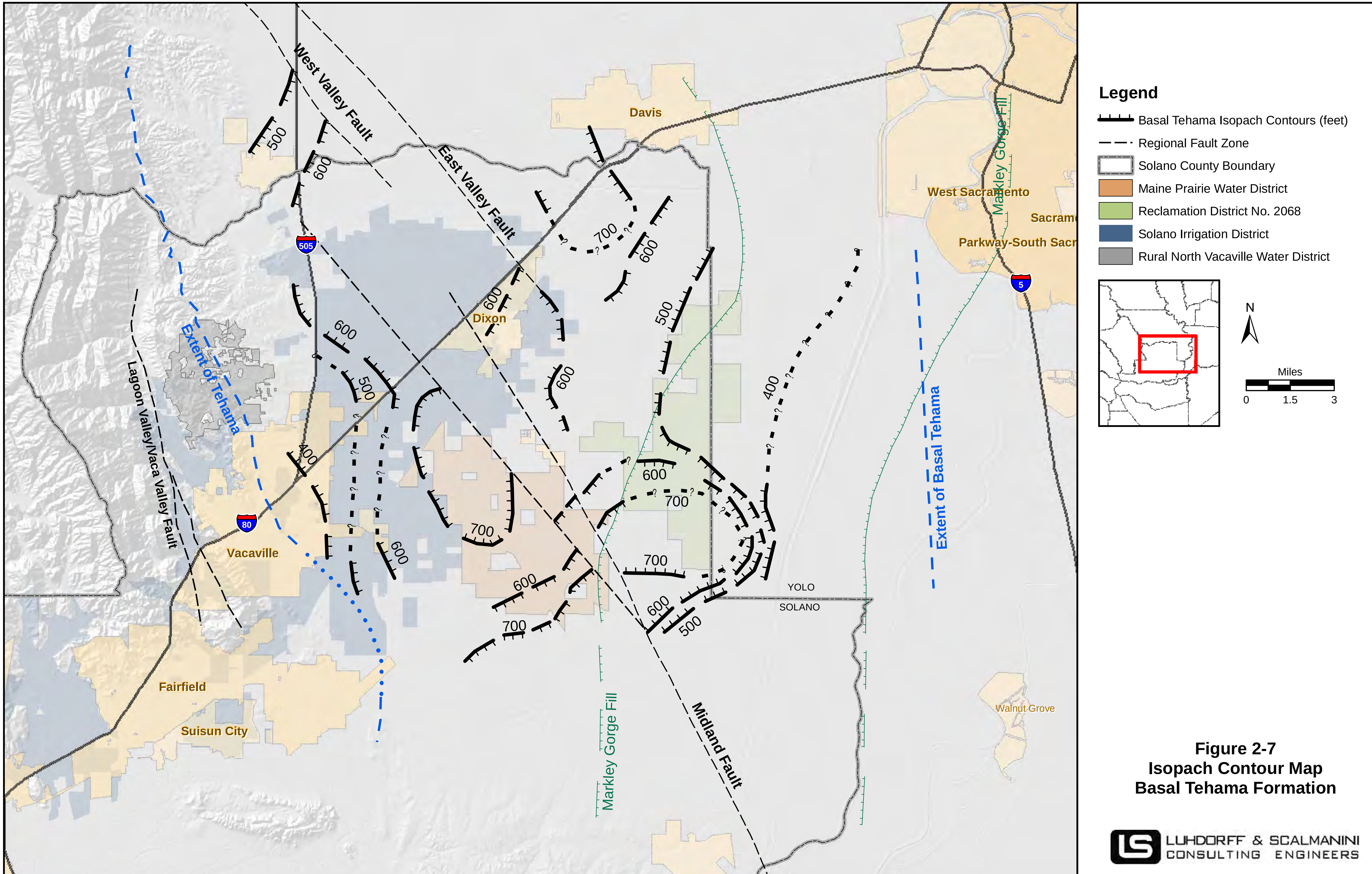

Figure 2-7
Isopach Contour Map
Basal Tehama Formation

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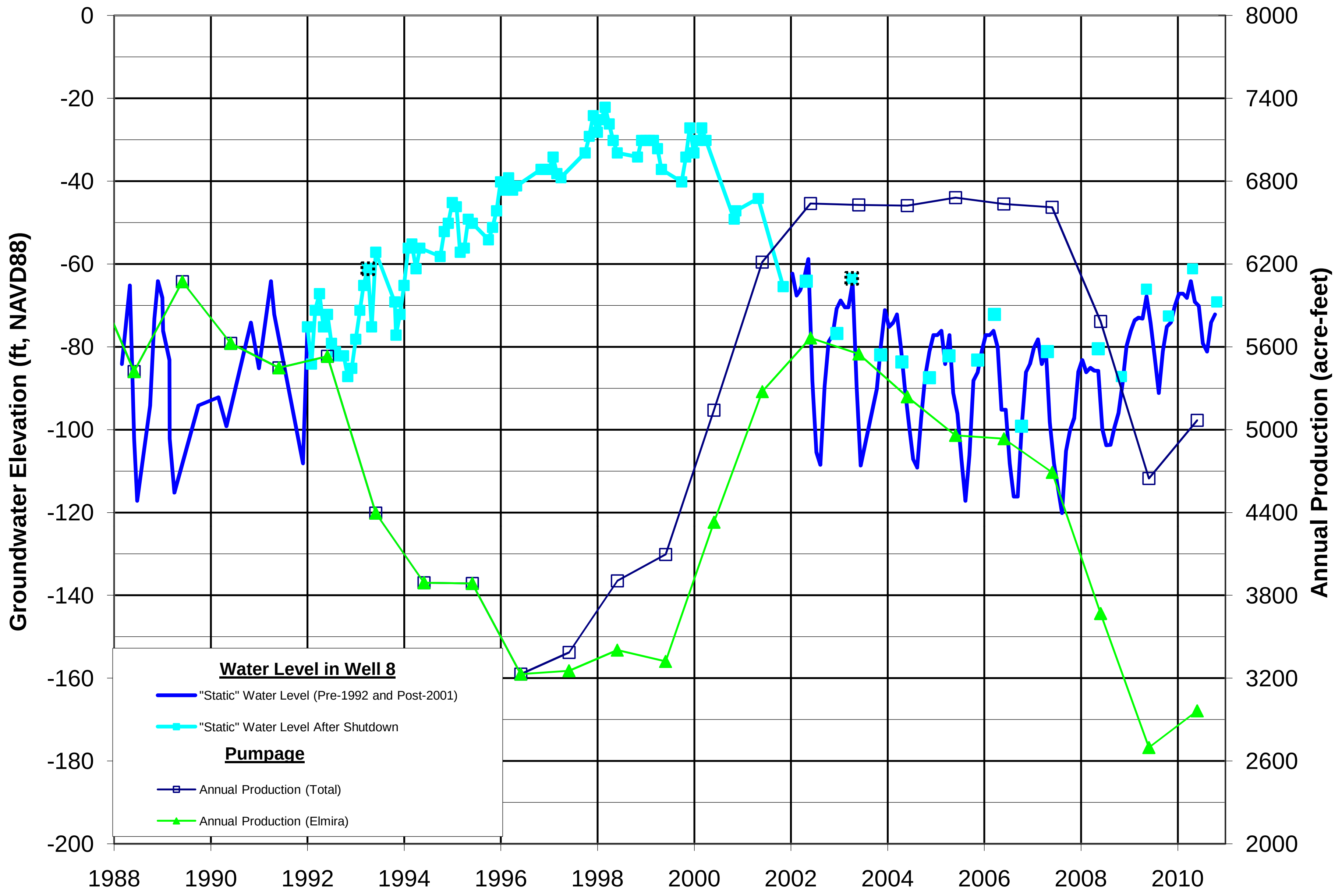

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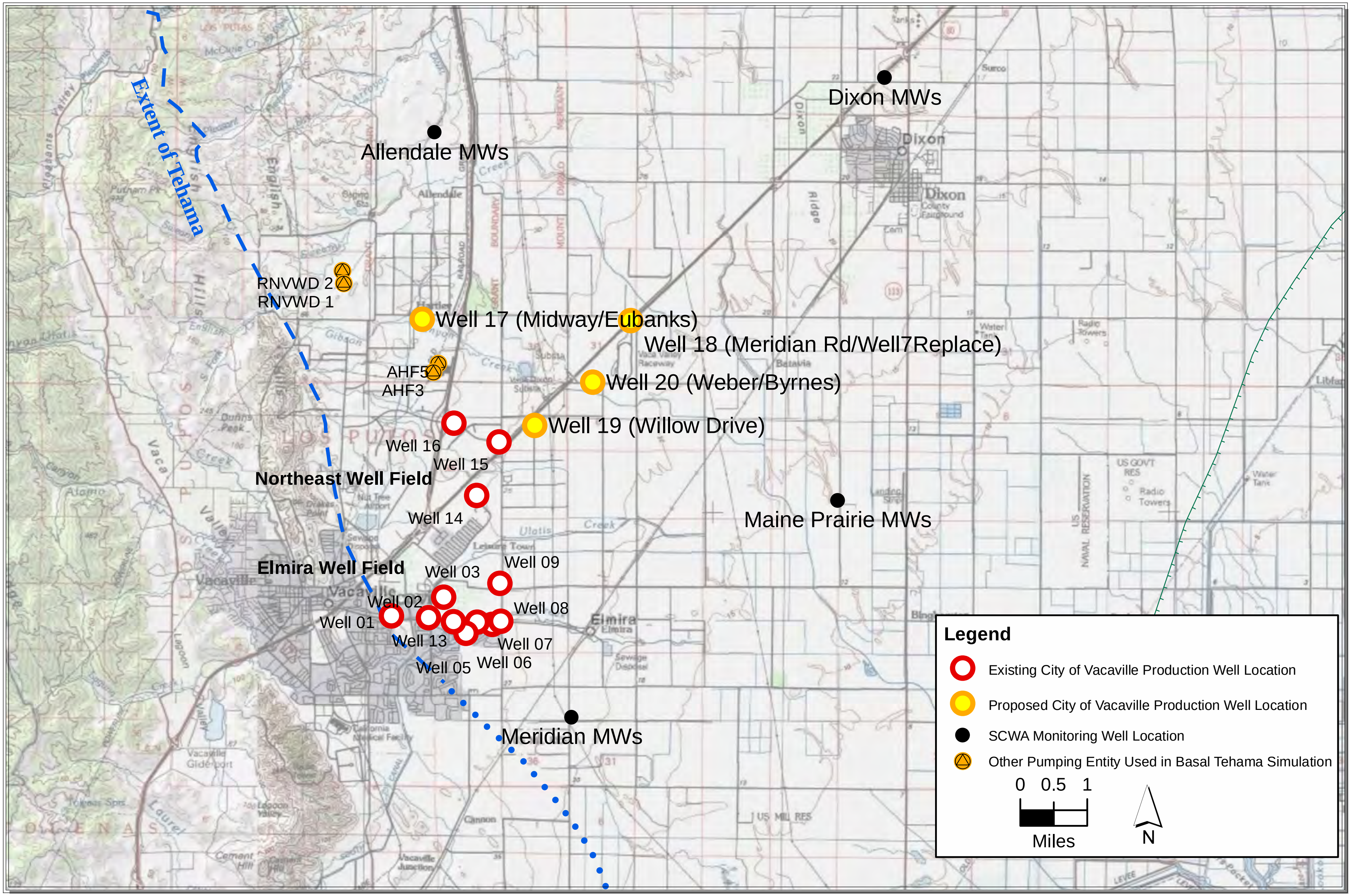
Figure 2-8
Groundwater Level Hydrograph
City of Vacaville Well 08



FILE: Figure 3-1 Well Location Map.mxd Date: 3/22/2011

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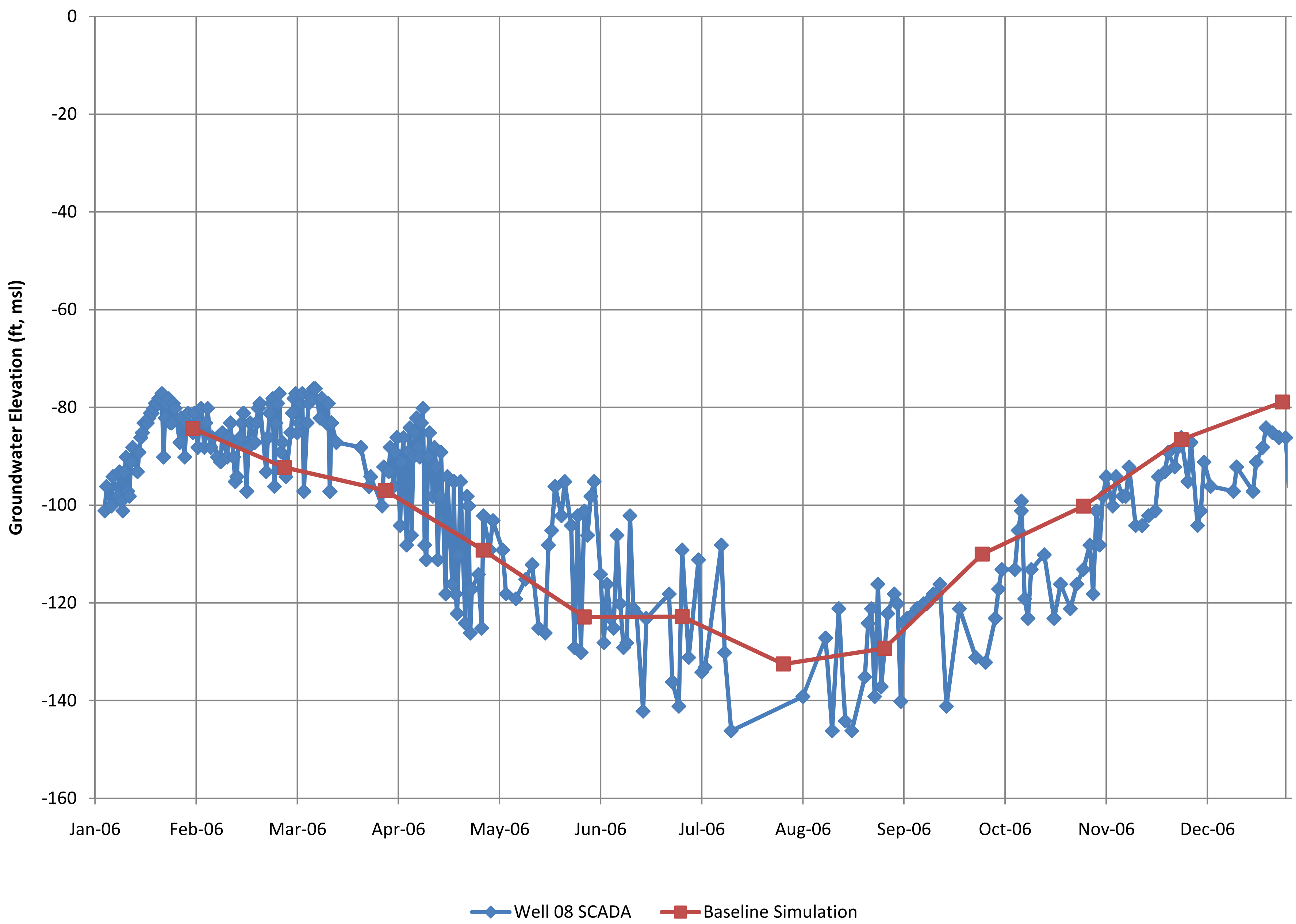
Figure 3-1
Well Location Map



Y:\Barb\Projects\Vacaville\2011AnalyticModelWorking\BDWork_03212011.xlsx\CALIBRATION Well 08

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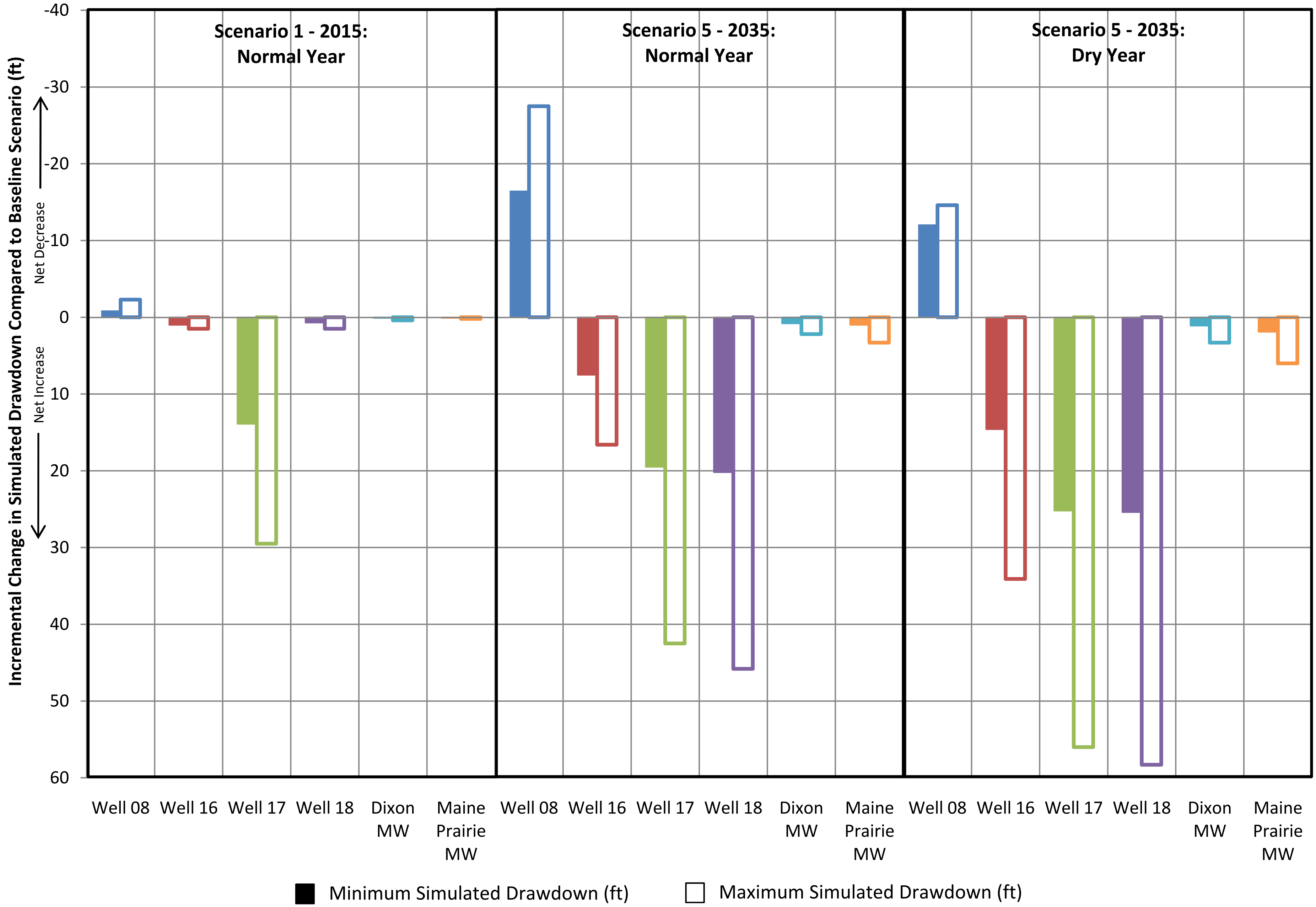
Figure 3-2
Measured Groundwater Elevation and Simulated Water Levels for Calibration, Well 08



Y:\Barb\Projects\Vacaville\2011AnalyticModelWorking\BDWork_03212011.xlsx\BAR CHART 2015 2035

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Figure 3-3
Incremental Change in Simulated Drawdown
2015 and 2035 Normal Years and 2035 Dry Year

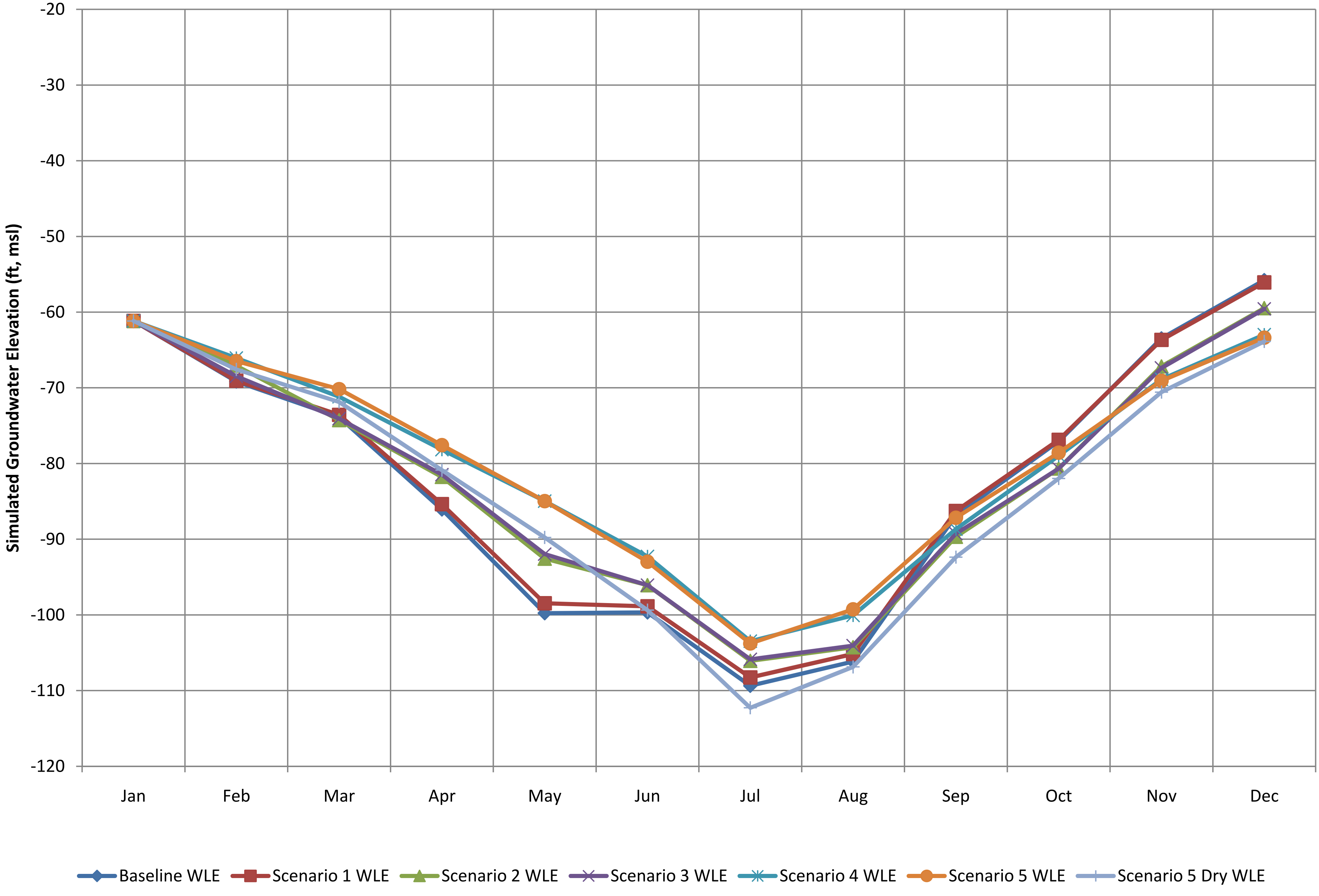

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Figure 3-4
Simulated Groundwater Elevations
Well 08

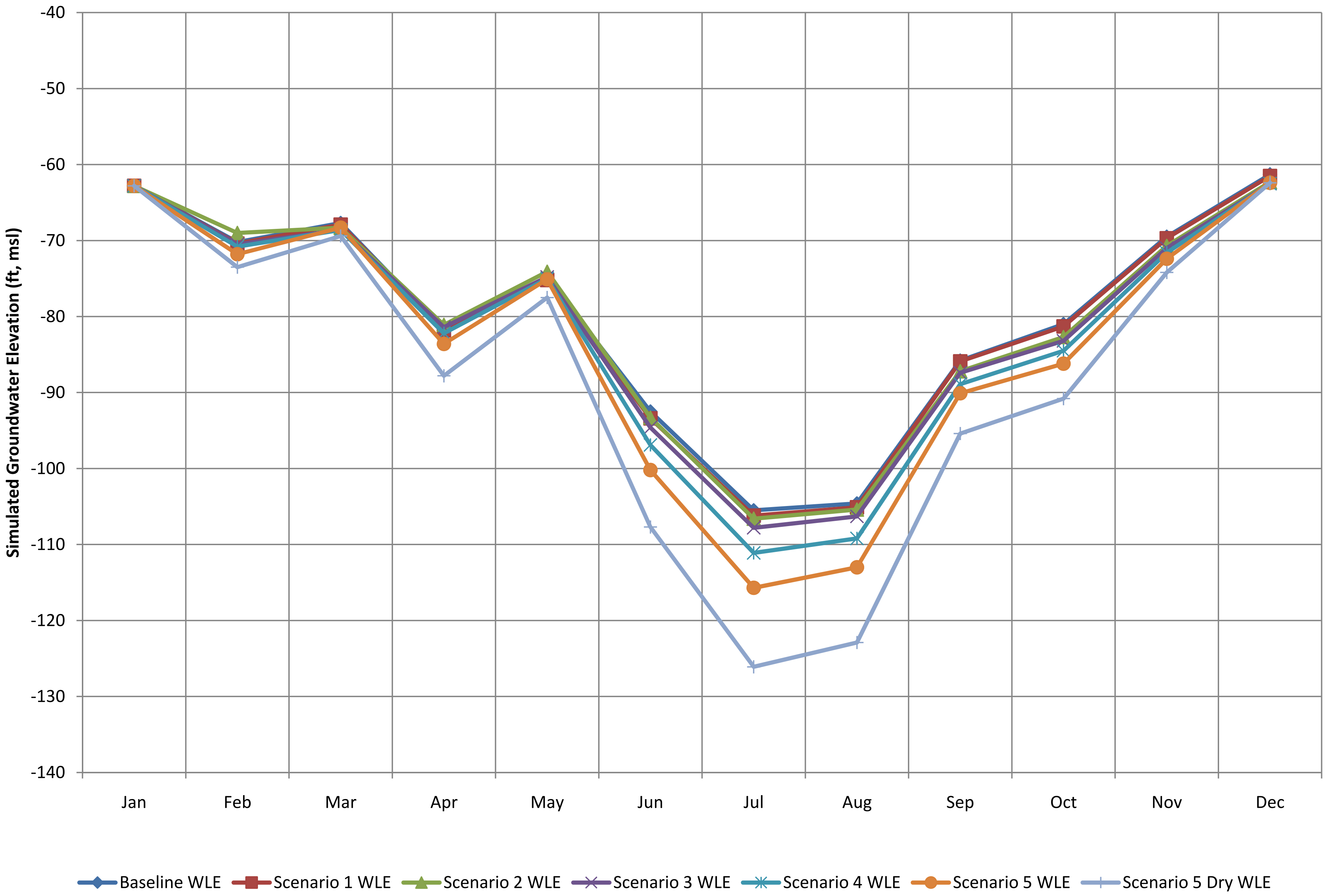

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Figure 3-5
Simulated Groundwater Elevations
Well 16

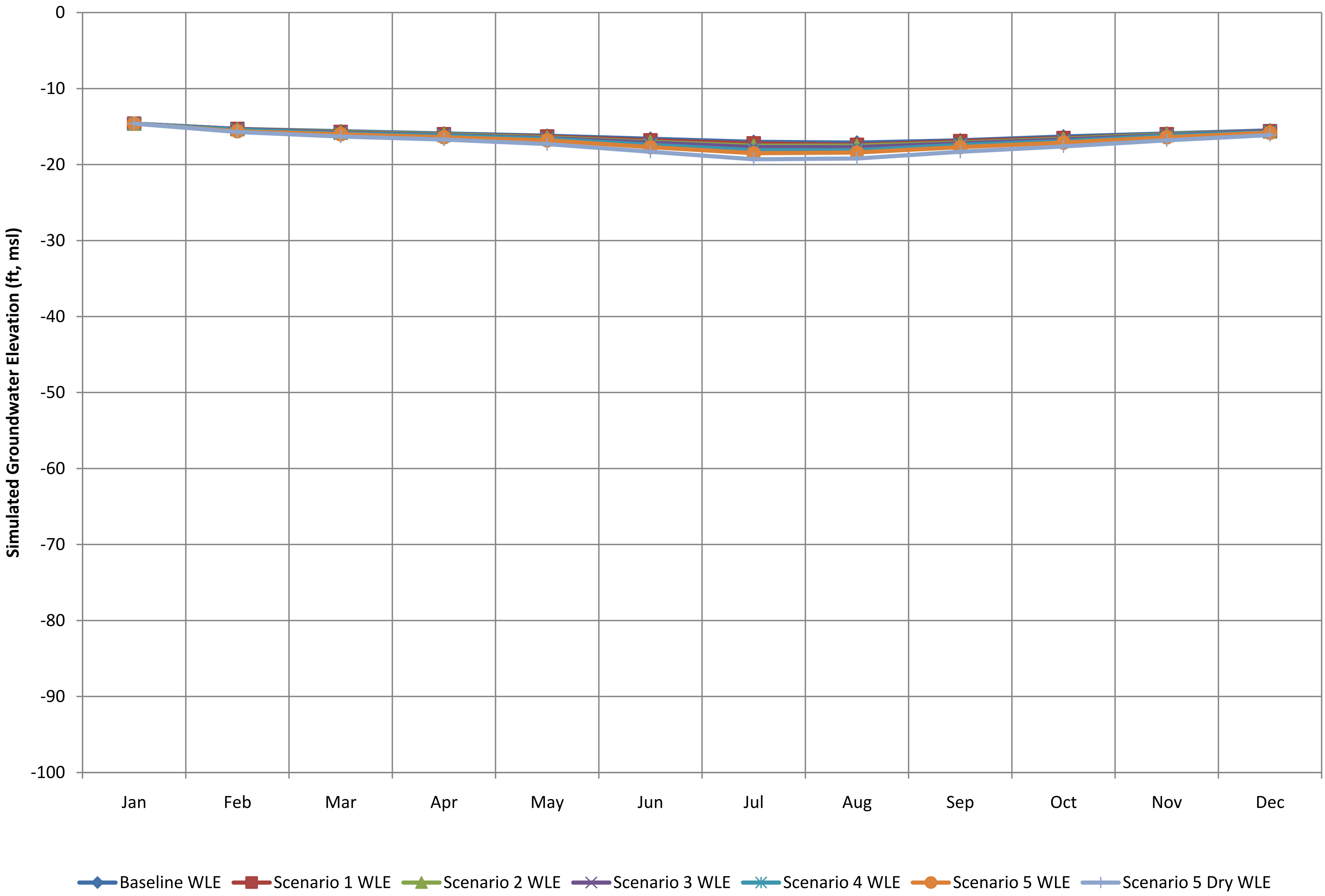

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Figure 3-6
Simulated Groundwater Elevations
Dixon MW

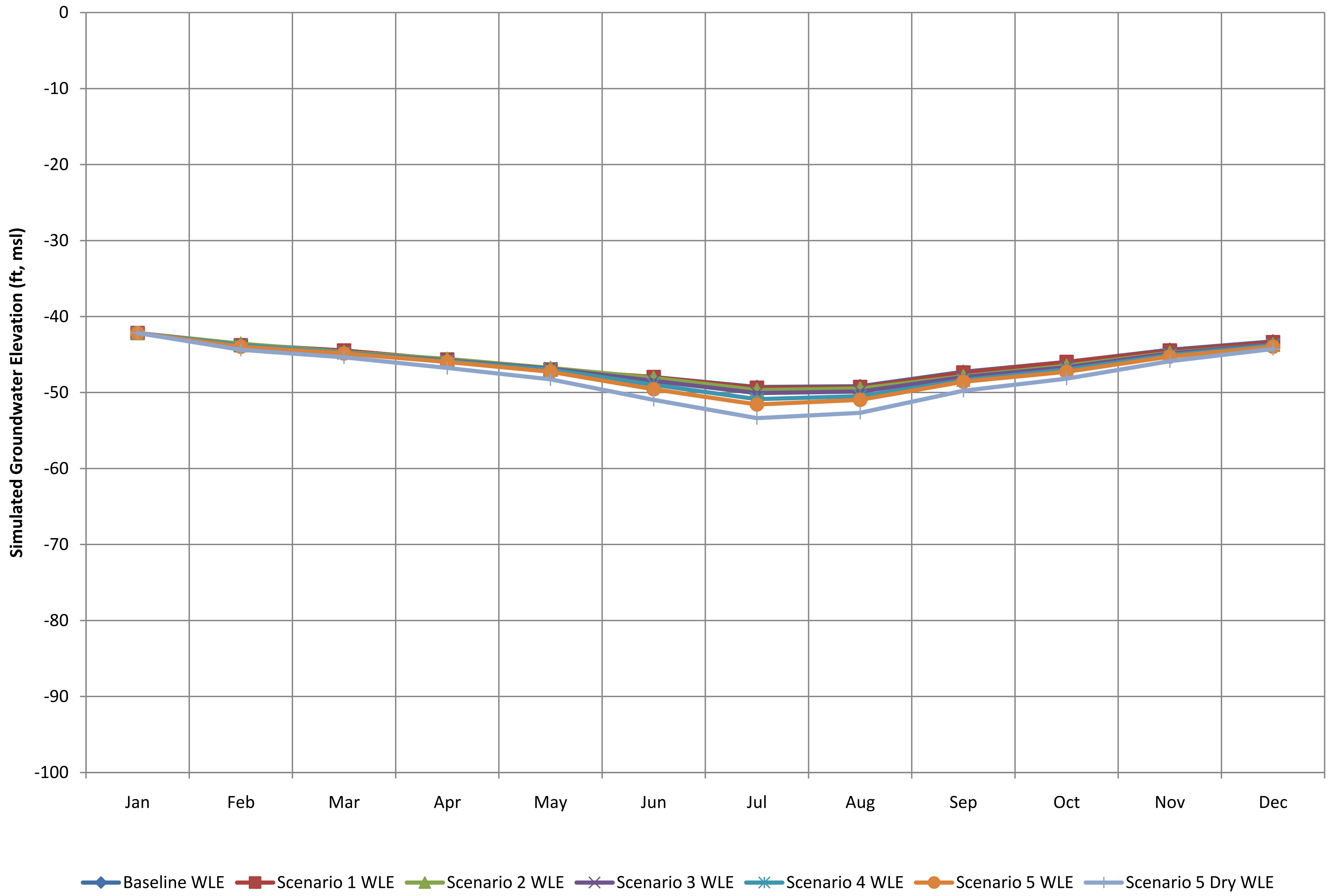

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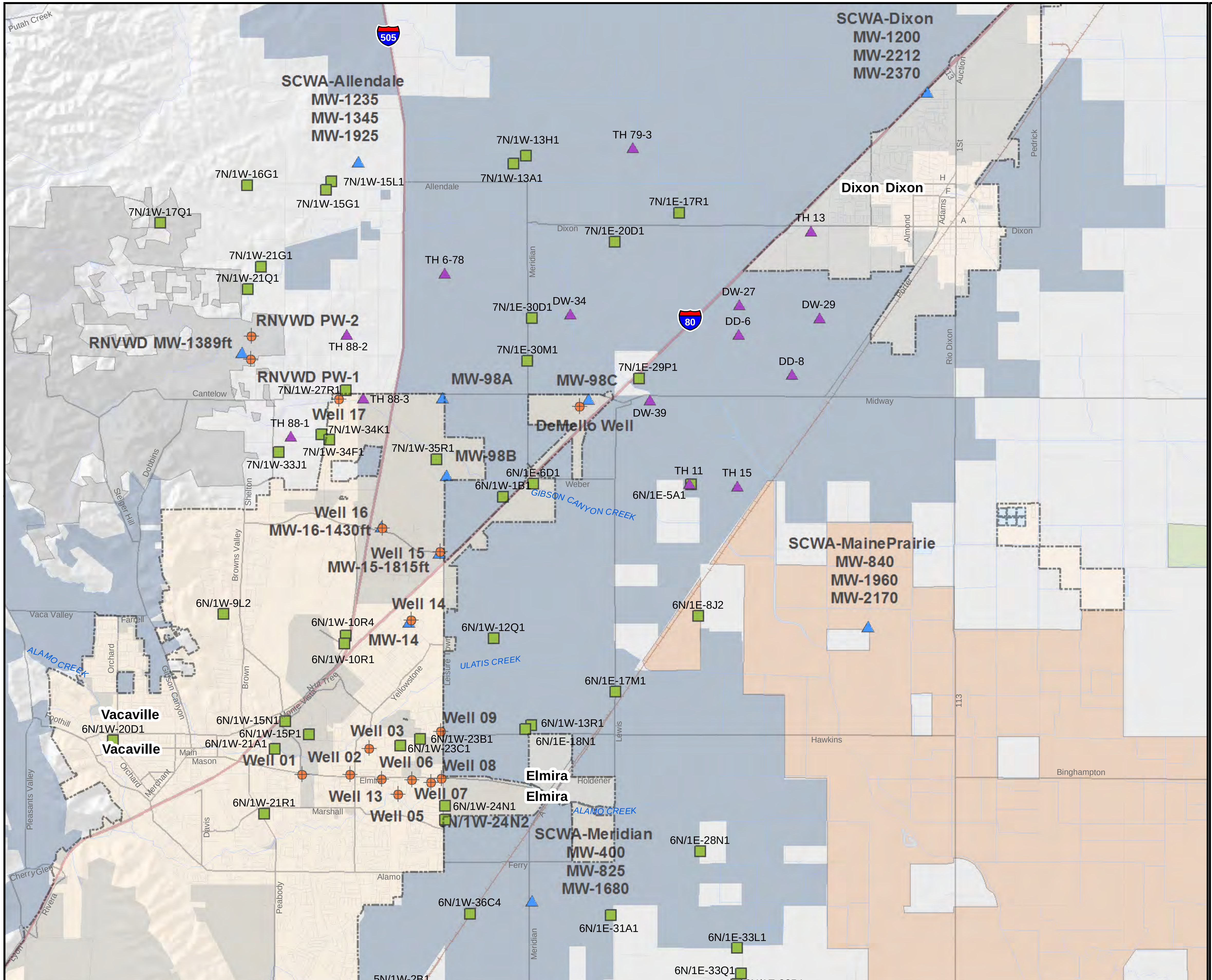
Figure 3-7
Simulated Groundwater Elevations
Maine Prairie MW

APPENDIX A



Legend

- Production Well
- Monitoring Well
- Well Monitored by DWR
- Solano Irrigation District Well
- County Boundary
- City Boundary
- Maine Prairie Water District
- Reclamation District No. 2068
- Solano Irrigation District
- Rural North Vacaville Water District

N

Miles
0 0.75 1.5

Figure A-1
Well Location Map

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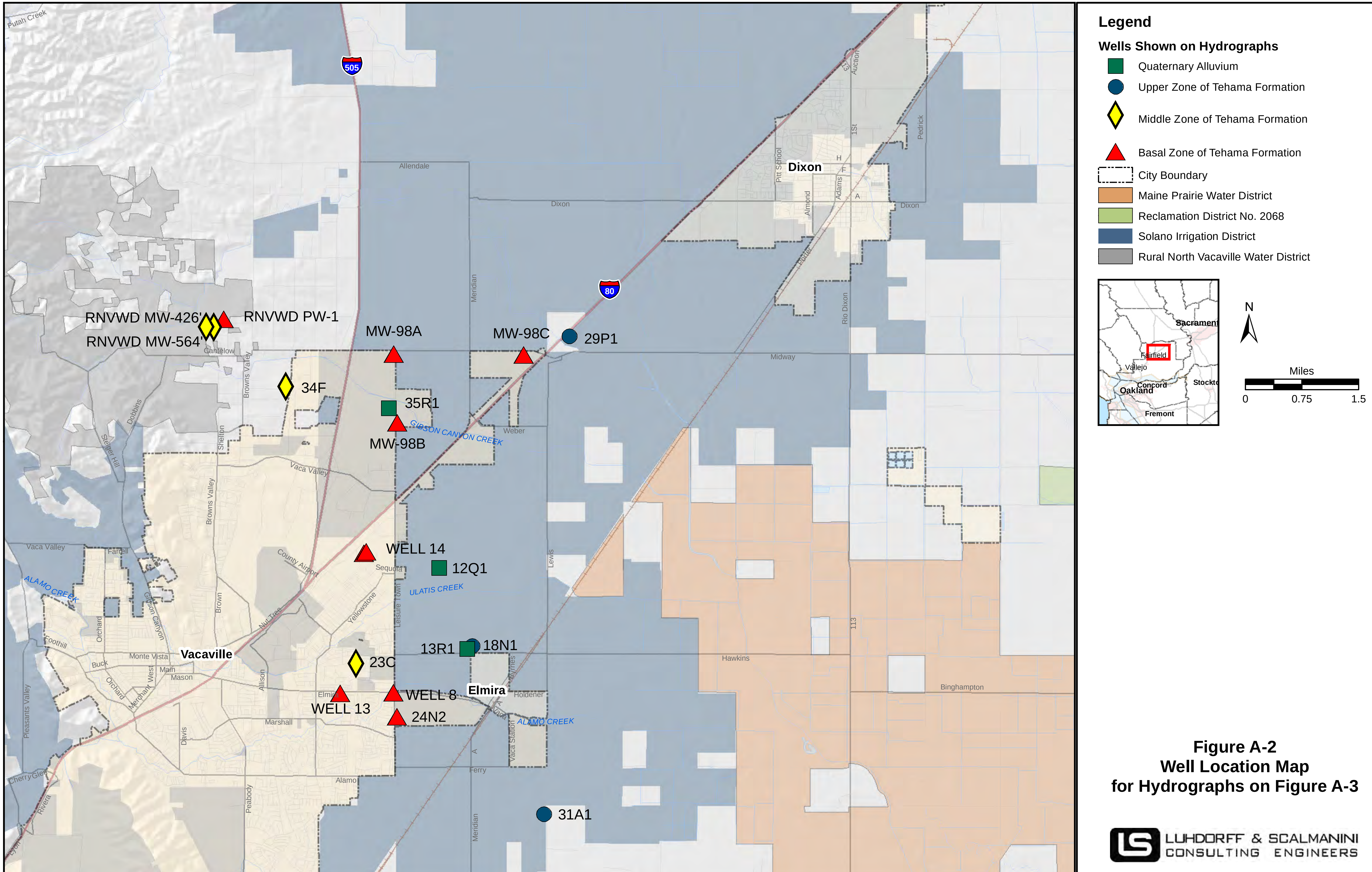

Figure A-2
Well Location Map
for Hydrographs on Figure A-3

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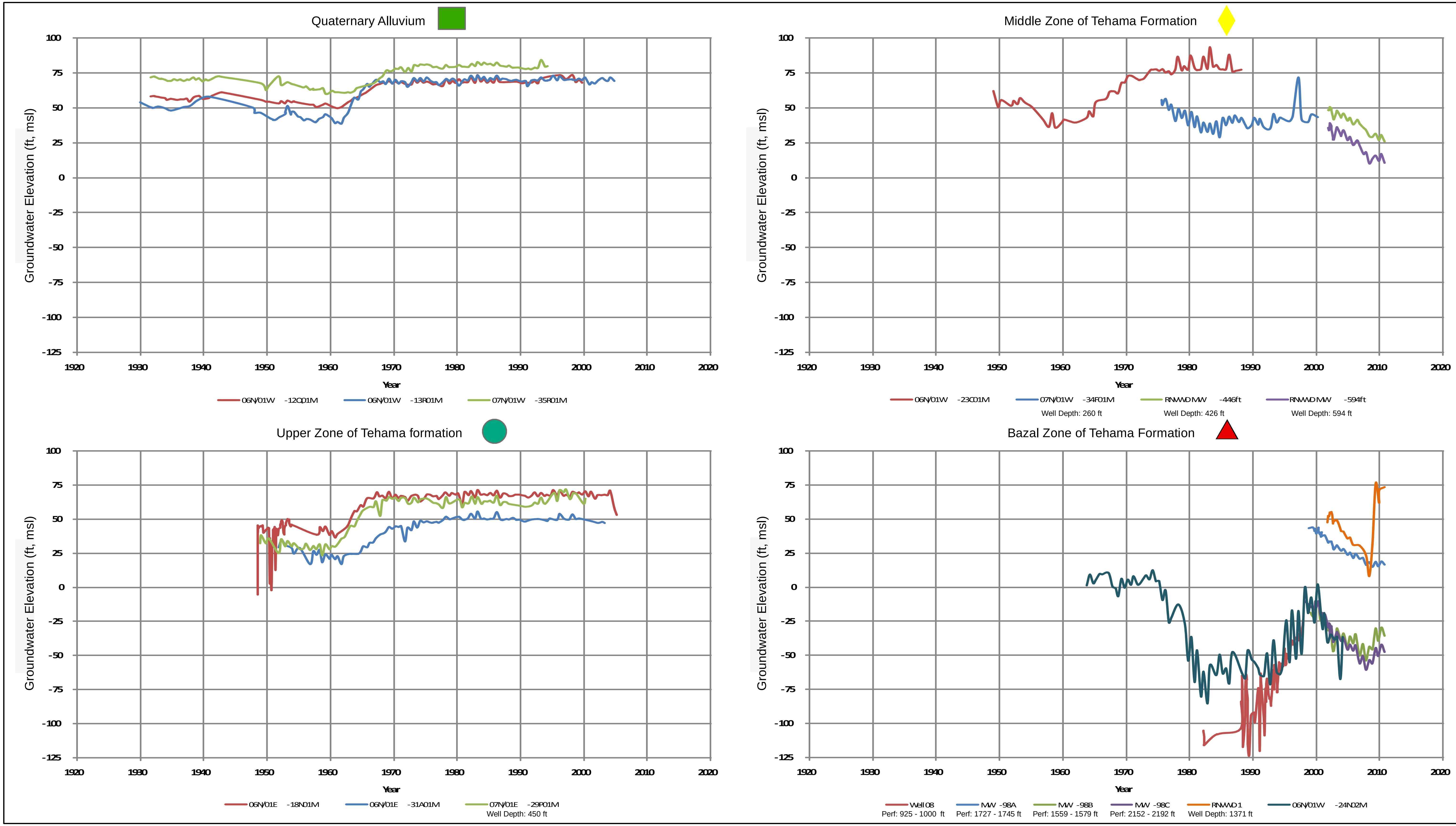

File: Y:\Casey_Meirovitz\10-1-124 Vacaville GWMP Update\Report\GIS\Figure A-3 WL Hydrograph for all zones.mxd Date: 12/15/2010

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Figure A-3
Hydrographs of Groundwater Elevations by Zone

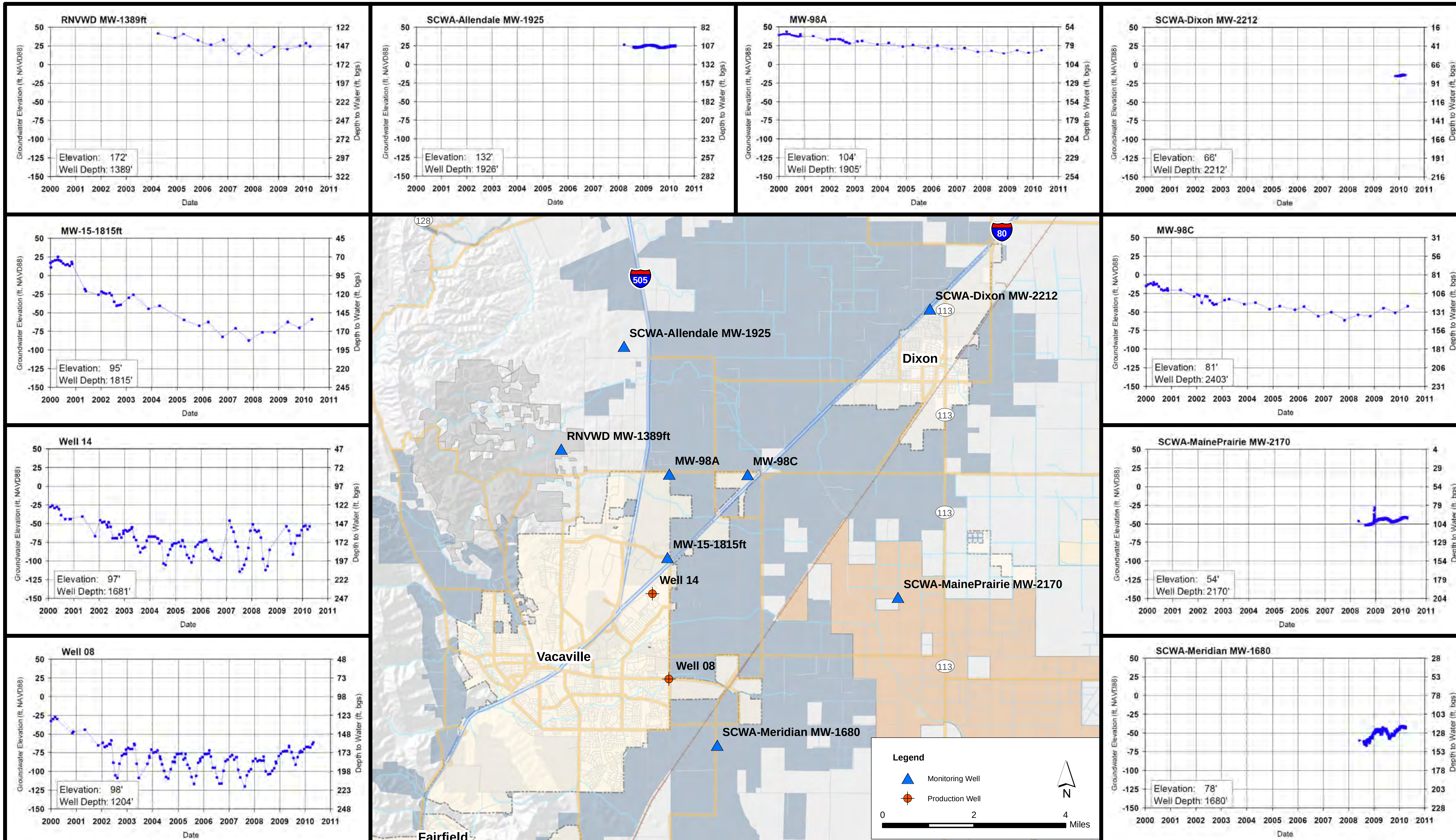

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Figure A-4
Representative Hydrographs of Basal Zone Wells

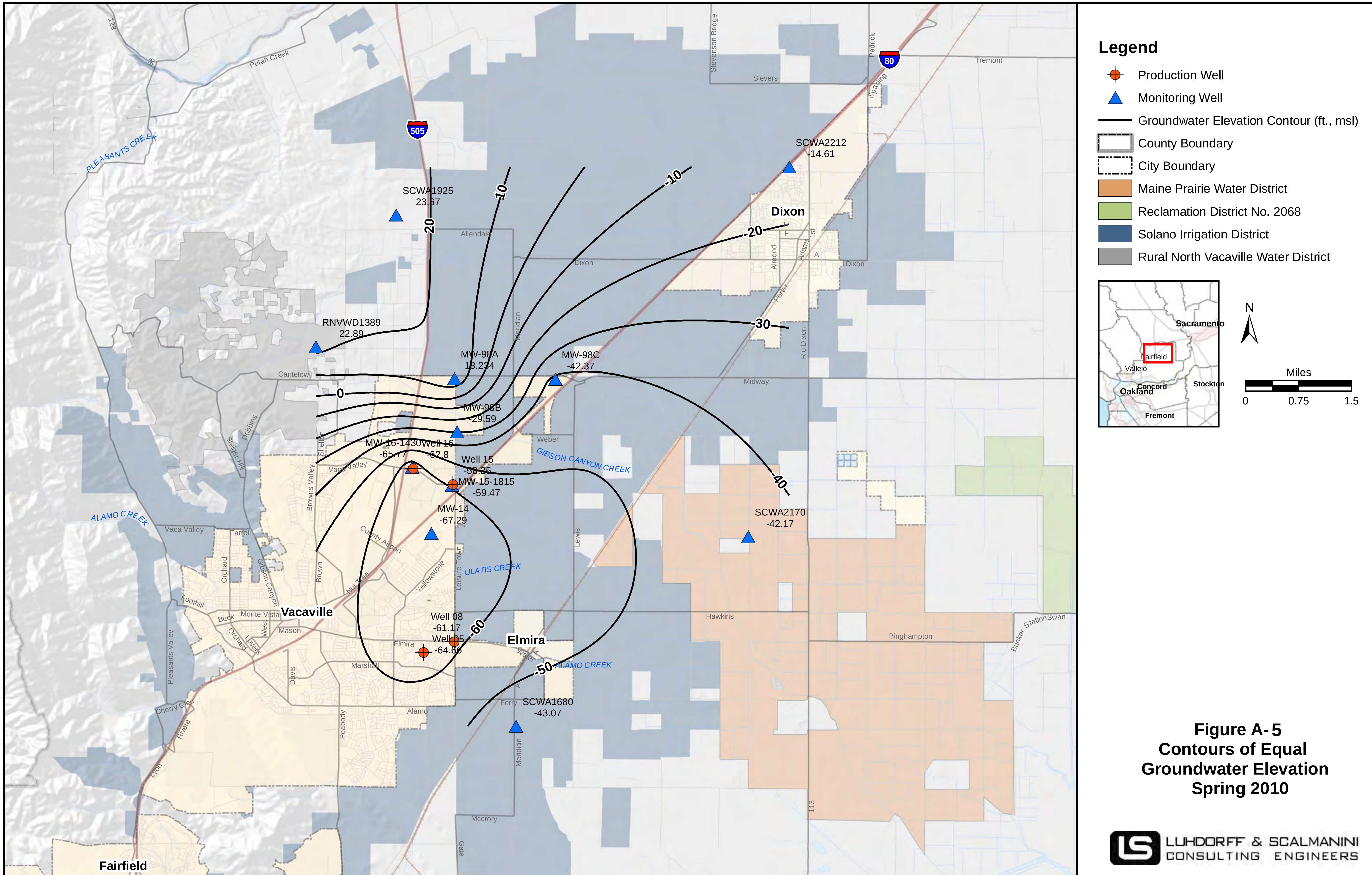


Figure A-5
Contours of Equal Groundwater Elevation
Spring 2010

File: Y:\Casey_Meirovitz\10-1-124 Vacaville GWMP Update\Report\GIS\Figure A-9 WL Contours Spring 2010.mxd Date: 12/9/2010

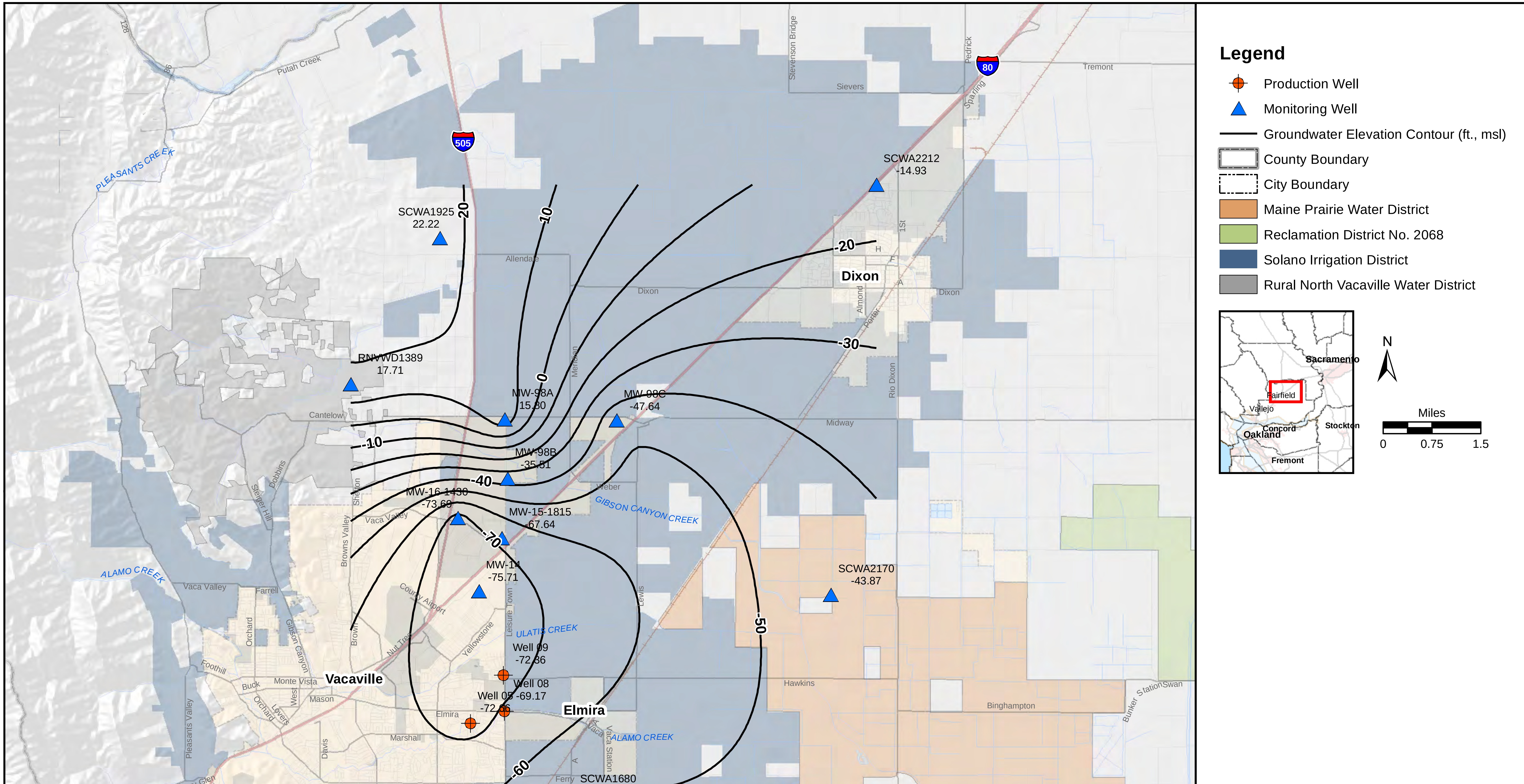


Figure A-6
Contours of Equal Groundwater Elevation Fall 2010

LUHDORFF & SCALMANINI CONSULTING ENGINEERS

File: Y:\Casey_Meirovitz\10-1-124 Vacaville GWMP Update\Report\GIS\Figure A-10 WL Contours Fall 2010.mxd Date: 12/9/2010

APPENDIX B

Appendix B Monthly and Annual Pumpage Amounts, Baseline and Future Scenarios

City of Vacaville Monthly Pumping Distribution (AF) for Baseline Scenario

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
Well 02	27.50	26.74	51.79	55.24	60.69	63.33	85.25	90.86	76.71	54.70	33.07	24.13	650.00
Well 03	28.79	27.70	36.00	39.38	50.39	53.28	96.32	99.64	85.06	62.76	41.61	29.06	650.00
Well 05	28.94	31.91	45.04	52.74	62.50	73.21	88.85	79.54	67.72	53.27	37.65	28.62	650.00
Well 06	53.05	52.30	47.87	80.95	103.39	75.09	75.56	62.46	26.20	23.98	23.46	25.69	650.00
Well 08	46.69	49.06	56.14	56.63	69.69	60.95	61.34	64.76	50.91	54.34	42.26	37.22	650.00
Well 09	33.98	37.37	51.87	53.41	69.51	75.07	91.85	79.30	60.52	38.18	23.49	35.45	650.00
Well 13	24.87	25.46	30.19	62.87	83.95	74.03	90.00	80.18	54.93	54.69	41.71	27.12	650.00
												Elmira Annual Total:	4550.00
Well 14	41.54	43.98	51.52	48.38	79.25	98.29	87.56	71.07	50.63	23.07	27.56	27.17	650.00
Well 15	41.25	39.02	45.64	36.98	48.63	64.92	71.72	63.82	39.24	87.21	60.71	50.86	650.00
Well 16	37.17	43.14	34.69	62.28	29.23	64.50	90.12	93.21	62.21	59.25	42.50	31.69	650.00
Well 17 Midway/Eubanks Dr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Well 18 Meridian Rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Well 19 Willow Drive	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Well 20 Weber/Byrnes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
												Northeast Annual Total:	1950.00
												Annual Total:	6500.00

City of Vacaville Monthly Pumping Distribution (AF) for Scenario 1

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
Well 02	26.34	25.62	49.62	52.92	58.14	60.67	81.68	87.05	73.49	52.40	31.68	23.12	622.73
Well 03	27.59	26.54	34.49	37.73	48.28	51.04	92.28	95.46	81.49	60.13	39.86	27.84	622.73
Well 05	27.73	30.57	43.15	50.53	59.87	70.14	85.12	76.20	64.88	51.04	36.07	27.42	622.73
Well 06	50.82	50.11	45.86	77.55	99.05	71.94	72.39	59.84	25.10	22.97	22.48	24.61	622.73
Well 08	44.73	47.00	53.78	54.26	66.77	58.39	58.76	62.04	48.78	52.06	40.49	35.66	622.73
Well 09	32.55	35.81	49.69	51.17	66.60	71.92	87.99	75.97	57.98	36.57	22.50	33.97	622.73
Well 13	23.83	24.39	28.93	60.23	80.42	70.92	86.23	76.81	52.62	52.40	39.96	25.99	622.73
												Elmira Annual Total:	4359.09
Well 14	39.80	42.13	49.36	46.35	75.93	94.17	83.88	68.08	48.51	22.10	26.40	26.03	622.73
Well 15	39.52	37.38	43.72	35.43	46.59	62.20	68.71	61.14	37.60	83.55	58.16	48.73	622.73
Well 16	35.61	41.33	33.24	59.67	28.00	61.80	86.34	89.30	59.60	56.77	40.72	30.36	622.73
Well 17 Midway/Eubanks Dr	38.31	40.28	42.10	47.15	50.17	72.72	79.64	72.84	48.57	54.14	41.76	35.04	622.73
Well 18 Meridian Rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Well 19 Willow Drive	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Well 20 Weber/Byrnes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
												Other City Annual Total:	2490.91
												Annual Total:	6850.00

Appendix B Monthly and Annual Pumpage Amounts, Baseline and Future Scenarios

City of Vacaville Monthly Pumping Distribution (AF) for Scenario 2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
Well 02	26.34	25.62	49.62	52.92	58.14	60.67	81.68	87.05	73.49	52.40	31.68	23.12	622.73
Well 03	27.59	26.54	34.49	37.73	48.28	51.04	92.28	95.46	81.49	60.13	39.86	27.84	622.73
Well 05	27.73	30.57	43.15	50.53	59.87	70.14	85.12	76.20	64.88	51.04	36.07	27.42	622.73
Well 06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Well 08	44.73	47.00	53.78	54.26	66.77	58.39	58.76	62.04	48.78	52.06	40.49	35.66	622.73
Well 09	32.55	35.81	49.69	51.17	66.60	71.92	87.99	75.97	57.98	36.57	22.50	33.97	622.73
Well 13	23.83	24.39	28.93	60.23	80.42	70.92	86.23	76.81	52.62	52.40	39.96	25.99	622.73
												Elmira Annual Total:	**3736.36**
Well 14	39.80	42.13	49.36	46.35	75.93	94.17	83.88	68.08	48.51	22.10	26.40	26.03	622.73
Well 15	39.52	37.38	43.72	35.43	46.59	62.20	68.71	61.14	37.60	83.55	58.16	48.73	622.73
Well 16	35.61	41.33	33.24	59.67	28.00	61.80	86.34	89.30	59.60	56.77	40.72	30.36	622.73
Well 17 Midway/Eubanks Dr	38.31	40.28	42.10	47.15	50.17	72.72	79.64	72.84	48.57	54.14	41.76	35.04	622.73
Well 18 Meridian Rd	37.18	34.51	51.74	50.22	64.37	69.94	83.03	61.04	55.81	48.07	31.58	35.22	622.73
Well 19 Willow Drive	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Well 20 Weber/Byrnes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
												Other City Annual Total:	**3113.64**
												Annual Total:	**6850.00**

City of Vacaville Monthly Pumping Distribution (AF) for Scenario 3

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
Well 02	25.38	24.68	47.81	50.99	56.02	58.46	78.70	83.87	70.81	50.49	30.52	22.27	600.00
Well 03	26.58	25.57	33.23	36.35	46.52	49.18	88.91	91.97	78.51	57.93	38.41	26.83	600.00
Well 05	26.72	29.46	41.58	48.68	57.69	67.58	82.02	73.42	62.51	49.17	34.75	26.42	600.00
Well 06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Well 08	43.10	45.29	51.82	52.28	64.33	56.26	56.62	59.78	47.00	50.16	39.01	34.36	600.00
Well 09	31.36	34.50	47.88	49.30	64.17	69.30	84.78	73.20	55.87	35.24	21.68	32.73	600.00
Well 13	22.96	23.50	27.87	58.03	77.49	68.34	83.08	74.01	50.70	50.49	38.50	25.04	600.00
												Elmira Annual Total:	**3600.00**
Well 14	38.34	40.59	47.55	44.66	73.16	90.73	80.82	65.60	46.74	21.29	25.44	25.08	600.00
Well 15	38.08	36.02	42.13	34.13	44.89	59.93	66.20	58.91	36.22	80.50	56.04	46.95	600.00
Well 16	34.31	39.82	32.02	57.49	26.98	59.54	83.19	86.04	57.42	54.69	39.23	29.25	600.00
Well 17 Midway/Eubanks Dr	36.91	38.81	40.57	45.43	48.34	70.07	76.74	70.18	46.79	52.16	40.24	33.76	600.00
Well 18 Meridian Rd	35.82	33.25	49.86	48.38	62.02	67.39	80.00	58.81	53.78	46.32	30.43	33.93	600.00
Well 19 Willow Drive	36.91	38.81	40.57	45.43	48.34	70.07	76.74	70.18	46.79	52.16	40.24	33.76	600.00
Well 20 Weber/Byrnes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
												Other City Annual Total:	**3600.00**
												Annual Total:	**7200.00**

Appendix B Monthly and Annual Pumpage Amounts, Baseline and Future Scenarios

City of Vacaville Monthly Pumping Distribution (AF) for Scenario 4

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
Well 02	26.62	25.88	50.13	53.47	58.74	61.30	82.52	87.95	74.25	52.95	32.01	23.36	629.17
Well 03	27.87	26.81	34.84	38.12	48.78	51.57	93.24	96.45	82.33	60.75	40.28	28.13	629.17
Well 05	28.02	30.89	43.60	51.05	60.49	70.86	86.00	76.99	65.55	51.56	36.44	27.70	629.17
Well 06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Well 08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Well 09	32.89	36.18	50.21	51.70	67.29	72.67	88.90	76.76	58.58	36.95	22.74	34.32	629.17
Well 13	24.07	24.64	29.23	60.85	81.25	71.66	87.12	77.61	53.17	52.94	40.37	26.25	629.17
												Elmira Annual Total:	**3145.83**
Well 14	40.21	42.57	49.87	46.83	76.71	95.14	84.75	68.79	49.01	22.33	26.67	26.30	629.17
Well 15	39.93	37.77	44.18	35.79	47.07	62.84	69.42	61.77	37.99	84.41	58.76	49.23	629.17
Well 16	35.98	41.76	33.58	60.28	28.29	62.44	87.23	90.22	60.21	57.35	41.14	30.68	629.17
Well 17 Midway/Eubanks Dr	38.71	40.70	42.54	47.64	50.69	73.47	80.47	73.59	49.07	54.70	42.19	35.40	629.17
Well 18 Meridian Rd	37.56	34.87	52.28	50.74	65.04	70.67	83.89	61.67	56.39	48.57	31.91	35.58	629.17
Well 19 Willow Drive	38.71	40.70	42.54	47.64	50.69	73.47	80.47	73.59	49.07	54.70	42.19	35.40	629.17
Well 20 Weber/Byrnes	38.71	40.70	42.54	47.64	50.69	73.47	80.47	73.59	49.07	54.70	42.19	35.40	629.17
												Other City Annual Total:	**4404.17**
												Annual Total:	**7550.00**

City of Vacaville Monthly Pumping Distribution (AF) for Scenario 5

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
Well 02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Well 03	32.22	30.99	40.28	44.06	56.38	59.61	107.78	111.48	95.17	70.22	46.56	32.52	727.27
Well 05	32.38	35.71	50.40	59.01	69.92	81.91	99.42	89.00	75.77	59.60	42.13	32.02	727.27
Well 06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Well 08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Well 09	38.01	41.82	58.04	59.76	77.78	84.00	102.77	88.72	67.72	42.71	26.28	39.67	727.27
Well 13	27.83	28.48	33.78	70.34	93.92	82.83	100.70	89.71	61.46	61.20	46.67	30.35	727.27
												Elmira Annual Total:	**2909.09**
Well 14	46.48	49.20	57.64	54.13	88.68	109.98	97.96	79.51	56.65	25.81	30.83	30.40	727.27
Well 15	46.16	43.66	51.06	41.38	54.41	72.64	80.25	71.40	43.91	97.57	67.93	56.91	727.27
Well 16	41.59	48.27	38.82	69.68	32.71	72.17	100.84	104.29	69.60	66.30	47.55	35.46	727.27
Well 17 Midway/Eubanks Dr	44.74	47.04	49.17	55.06	58.60	84.93	93.02	85.07	56.72	63.23	48.77	40.92	727.27
Well 18 Meridian Rd	43.42	40.31	60.43	58.65	75.18	81.69	96.97	71.29	65.18	56.15	36.89	41.13	727.27
Well 19 Willow Drive	44.74	47.04	49.17	55.06	58.60	84.93	93.02	85.07	56.72	63.23	48.77	40.92	727.27
Well 20 Weber/Byrnes	44.74	47.04	49.17	55.06	58.60	84.93	93.02	85.07	56.72	63.23	48.77	40.92	727.27
												Other City Annual Total:	**5090.91**
												Annual Total:	**8000.00**

Appendix B Monthly and Annual Pumpage Amounts, Baseline and Future Scenarios

City of Vacaville Monthly Pumping Distribution (AF) for Scenario 1 Dry Year

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
Well 02	31.61	30.74	59.55	63.50	69.77	72.81	98.01	104.46	88.19	62.89	38.02	27.74	747.27
Well 03	33.10	31.85	41.39	45.27	57.93	61.25	110.74	114.55	97.79	72.15	47.84	33.41	747.27
Well 05	33.28	36.69	51.78	60.63	71.85	84.17	102.15	91.44	77.86	61.24	43.29	32.90	747.27
Well 06	60.99	60.13	55.03	93.06	118.86	86.33	86.86	71.81	30.12	27.57	26.97	29.54	747.27
Well 08	53.68	56.40	64.54	65.11	80.12	70.07	70.52	74.45	58.53	62.47	48.59	42.80	747.27
Well 09	39.06	42.97	59.63	61.40	79.92	86.31	105.59	91.16	69.58	43.89	27.00	40.76	747.27
Well 13	28.59	29.27	34.71	72.28	96.51	85.11	103.47	92.18	63.15	62.88	47.95	31.18	747.27
												Elmira Annual Total:	**5230.91**
Well 14	47.75	50.56	59.23	55.62	91.11	113.00	100.66	81.70	58.21	26.52	31.68	31.23	747.27
Well 15	47.43	44.86	52.47	42.51	55.91	74.64	82.45	73.37	45.12	100.26	69.79	58.48	747.27
Well 16	42.73	49.59	39.88	71.60	33.60	74.16	103.61	107.16	71.52	68.12	48.86	36.44	747.27
Well 17 Midway/Eubanks Dr	45.97	48.34	50.53	56.58	60.21	87.26	95.57	87.41	58.28	64.97	50.11	42.05	747.27
Well 18 Meridian Rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Well 19 Willow Drive	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Well 20 Weber/Byrnes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
												Other City Annual Total:	**2989.09**
												Annual Total:	**8220.00**

City of Vacaville Monthly Pumping Distribution (AF) for Scenario 2 Dry Year

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
Well 02	31.61	30.74	59.55	63.50	69.77	72.81	98.01	104.46	88.19	62.89	38.02	27.74	747.27
Well 03	33.10	31.85	41.39	45.27	57.93	61.25	110.74	114.55	97.79	72.15	47.84	33.41	747.27
Well 05	33.28	36.69	51.78	60.63	71.85	84.17	102.15	91.44	77.86	61.24	43.29	32.90	747.27
Well 06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Well 08	53.68	56.40	64.54	65.11	80.12	70.07	70.52	74.45	58.53	62.47	48.59	42.80	747.27
Well 09	39.06	42.97	59.63	61.40	79.92	86.31	105.59	91.16	69.58	43.89	27.00	40.76	747.27
Well 13	28.59	29.27	34.71	72.28	96.51	85.11	103.47	92.18	63.15	62.88	47.95	31.18	747.27
												Elmira Annual Total:	**4483.64**
Well 14	47.75	50.56	59.23	55.62	91.11	113.00	100.66	81.70	58.21	26.52	31.68	31.23	747.27
Well 15	47.43	44.86	52.47	42.51	55.91	74.64	82.45	73.37	45.12	100.26	69.79	58.48	747.27
Well 16	42.73	49.59	39.88	71.60	33.60	74.16	103.61	107.16	71.52	68.12	48.86	36.44	747.27
Well 17 Midway/Eubanks Dr	45.97	48.34	50.53	56.58	60.21	87.26	95.57	87.41	58.28	64.97	50.11	42.05	747.27
Well 18 Meridian Rd	44.62	41.42	62.09	60.26	77.25	83.93	99.63	73.25	66.97	57.69	37.90	42.26	747.27
Well 19 Willow Drive	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Well 20 Weber/Byrnes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
												Other City Annual Total:	**3736.36**
												Annual Total:	**8220.00**

Appendix B Monthly and Annual Pumpage Amounts, Baseline and Future Scenarios

City of Vacaville Monthly Pumping Distribution (AF) for Scenario 3 Dry Year

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
Well 02	30.46	29.62	57.37	61.18	67.22	70.15	94.44	100.64	84.97	60.59	36.63	26.73	720.00
Well 03	31.90	30.68	39.87	43.62	55.82	59.02	106.70	110.37	94.22	69.52	46.09	32.19	720.00
Well 05	32.06	35.35	49.89	58.42	69.23	81.09	98.42	88.11	75.02	59.01	41.71	31.70	720.00
Well 06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Well 08	51.72	54.34	62.18	62.73	77.19	67.51	67.94	71.74	56.40	60.19	46.81	41.23	720.00
Well 09	37.63	41.40	57.46	59.16	77.00	83.16	101.74	87.84	67.04	42.29	26.02	39.27	720.00
Well 13	27.55	28.20	33.44	69.64	92.99	82.00	99.70	88.81	60.84	60.58	46.20	30.05	720.00
												Elmira Annual Total:	**4320.00**
Well 14	46.01	48.71	57.06	53.59	87.79	108.88	96.99	78.72	56.08	25.55	30.52	30.09	720.00
Well 15	45.70	43.22	50.55	40.96	53.87	71.91	79.44	70.69	43.47	96.60	67.25	56.34	720.00
Well 16	41.17	47.78	38.43	68.99	32.38	71.45	99.83	103.25	68.91	65.63	47.08	35.11	720.00
Well 17 Midway/Eubanks Dr	44.29	46.57	48.68	54.51	58.01	84.08	92.09	84.22	56.15	62.60	48.28	40.51	720.00
Well 18 Meridian Rd	42.99	39.90	59.83	58.06	74.43	80.87	96.00	70.57	64.53	55.58	36.52	40.72	720.00
Well 19 Willow Drive	44.29	46.57	48.68	54.51	58.01	84.08	92.09	84.22	56.15	62.60	48.28	40.51	720.00
Well 20 Weber/Byrnes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
												Other City Annual Total:	**4320.00**
												Annual Total:	**8640.00**

City of Vacaville Monthly Pumping Distribution (AF) for Scenario 4 Dry Year

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
Well 02	31.94	31.06	60.16	64.16	70.49	73.56	99.03	105.54	89.10	63.54	38.41	28.03	755.00
Well 03	33.45	32.18	41.81	45.74	58.53	61.89	111.88	115.73	98.80	72.90	48.33	33.76	755.00
Well 05	33.62	37.07	52.32	61.26	72.59	85.04	103.21	92.39	78.66	61.88	43.73	33.24	755.00
Well 06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Well 08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Well 09	39.46	43.41	60.25	62.04	80.74	87.20	106.68	92.11	70.30	44.34	27.28	41.18	755.00
Well 13	28.89	29.57	35.07	73.02	97.51	85.99	104.54	93.13	63.80	63.53	48.44	31.51	755.00
												Elmira Annual Total:	**3775.00**
Well 14	48.25	51.08	59.84	56.20	92.06	114.17	101.70	82.55	58.81	26.80	32.01	31.55	755.00
Well 15	47.92	45.32	53.01	42.95	56.48	75.41	83.30	74.13	45.58	101.29	70.52	59.08	755.00
Well 16	43.17	50.11	40.30	72.34	33.95	74.92	104.68	108.27	72.26	68.82	49.37	36.81	755.00
Well 17 Midway/Eubanks Dr	46.45	48.84	51.05	57.16	60.83	88.17	96.56	88.31	58.88	65.64	50.63	42.48	755.00
Well 18 Meridian Rd	45.08	41.84	62.74	60.88	78.04	84.80	100.66	74.00	67.67	58.29	38.29	42.70	755.00
Well 19 Willow Drive	46.45	48.84	51.05	57.16	60.83	88.17	96.56	88.31	58.88	65.64	50.63	42.48	755.00
Well 20 Weber/Byrnes	46.45	48.84	51.05	57.16	60.83	88.17	96.56	88.31	58.88	65.64	50.63	42.48	755.00
												Other City Annual Total:	**5285.00**
												Annual Total:	**9060.00**

Appendix B Monthly and Annual Pumpage Amounts, Baseline and Future Scenarios

City of Vacaville Monthly Pumping Distribution (AF) for Scenario 5 Dry Year													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
Well 02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Well 03	38.66	37.19	48.33	52.88	67.66	71.54	129.33	133.78	114.20	84.27	55.87	39.02	872.73
Well 05	38.86	42.85	60.48	70.81	83.91	98.30	119.30	106.79	90.93	71.53	50.55	38.42	872.73
Well 06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Well 08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Well 09	45.62	50.18	69.65	71.71	93.33	100.80	123.32	106.47	81.26	51.26	31.54	47.60	872.73
Well 13	33.39	34.18	40.54	84.41	112.71	99.40	120.84	107.65	73.75	73.43	56.00	36.42	872.73
												Elmira Annual Total:	3490.91
Well 14	55.77	59.04	69.17	64.96	106.41	131.97	117.56	95.42	67.98	30.97	37.00	36.47	872.73
Well 15	55.39	52.39	61.28	49.65	65.29	87.17	96.29	85.68	52.69	117.09	81.51	68.29	872.73
Well 16	49.91	57.92	46.58	83.62	39.25	86.61	121.00	125.15	83.52	79.56	57.06	42.55	872.73
Well 17 Midway/Eubanks Dr	53.69	56.45	59.01	66.08	70.32	101.91	111.62	102.08	68.06	75.87	58.52	49.11	872.73
Well 18 Meridian Rd	52.11	48.37	72.52	70.38	90.21	98.02	116.36	85.54	78.22	67.37	44.26	49.36	872.73
Well 19 Willow Drive	53.69	56.45	59.01	66.08	70.32	101.91	111.62	102.08	68.06	75.87	58.52	49.11	872.73
Well 20 Weber/Byrnes	53.69	56.45	59.01	66.08	70.32	101.91	111.62	102.08	68.06	75.87	58.52	49.11	872.73
												Other City Annual Total:	6109.09
												Annual Total:	9600.00

APPENDIX F

2009 DRINKING WATER QUALITY CONSUMER CONFIDENCE REPORT

Vacaville 2009 Drinking Water Quality Consumer Confidence Report

The City of Vacaville wants you, our customers to know that your water system has met all water quality standards established by the U.S. Environmental Protection Agency (USEPA) and the California State Department of Public Health (DPH) and is a safe and reliable supply.

In 2009 Vacaville distributed over 5.8 billion gallons of drinking water. This water was subjected to extensive testing, not only for regulated contaminants, but also for non-regulated. More than 16,000 analyses were performed on water samples in 2009.

In order to ensure that tap water is safe to drink, the USEPA and the DPH prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. DPH regulations also establish limits for contaminants in bottled water that provide the same protection for public health.

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the USEPA's Safe Drinking Water Hotline at (1-800-426-4791), or visit the web site at http://www.epa.gov/safewater/.

For a full table of analyses of Vacaville's water and other facts, see our web site at http://www.cityofvacaville.com. We would like to hear your comments on this report and invite you to join our source water protection efforts. Please contact the City of Vacaville Water Quality Lab Supervisor, Tony Pirondini by phone at (707) 469-6400 or by email at tpirondini@cityofvacaville.com.

SOURCES OF WATER & CONTAMINANTS

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Vacaville's water supply consists of two surface water sources and 13 deep groundwater wells. Lake Berryessa surface water, conveyed through Putah South Canal (PSC), provided 35% of the City's total consumption and Sacramento Delta surface water, from the North Bay Aqueduct (NBA), provided an additional 39% in the year 2009. Groundwater from the 13 deep wells made-up the balance (26%) of our water needs. Treatment for surface water is divided between the Vacaville Water Treatment Plant (VWTP), located on Allison Drive and the North Bay Regional Water Treatment Plant (NBR), located on Peabody Road. The VWTP treats PSC source water only, while the NBR plant, which is jointly-owned by the cities of Vacaville and Fairfield, treats both PSC and NBA source waters. The deep groundwater wells are located on or near Elmira Road, Orange Drive, and Vaca Valley Parkway.

CONTAMINANTS THAT MAY BE PRESENT IN SOURCE WATER INCLUDE:

- Microbial contaminants, such as viruses and bacteria, that may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife;
- Inorganic contaminants, such as salts and metals, that can be naturally-occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming;
- Pesticides and herbicides, that may come from a variety of sources such as agriculture, urban stormwater runoff, and residential uses;
- Organic chemical contaminants, including synthetic and volatile organic chemicals, that are by-products of industrial processes and petroleum production and can also come from gas stations, urban stormwater runoff, agricultural application, and septic systems; and
- Radioactive contaminants that can be naturally-occurring or be the result of oil and gas production and mining activities.
- If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children.

Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. The City of Vacaville is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline at 1-800-426-4791 or at http://www.epa.gov/safewater/lead.

MESSAGE FROM THE WATER QUALITY MANAGER

2010 marks my 30th year with the City and the 20th year we have provided our customers an annual water quality report. This year the format has changed from a technical report to a 13-month calendar with water information.

This format allows us to meet several regulatory educational and outreach requirements in a single mailer, while providing a fresh message every month. I hope you find it as informative, useful and exciting as I do! *Salute!*

Jacqueline McCall, Retired

ARSENIC IN DRINKING WATER
Vacaville Meets the Limit

While arsenic levels in your drinking water are less than the current USEPA standard of 10 ppb, the groundwater does contain low levels of arsenic. These results are from samples taken in 2009. The standard balances the current understanding of arsenic's possible health effects against the costs of removing arsenic from drinking water. The USEPA continues to research the health effects of low levels of arsenic, which is a mineral known to cause cancer in humans at high concentrations and is linked to other health effects such as skin damage and circulatory problems.

SOURCE WATER ASSESSMENTS AND VULNERABILITY SUMMARIES

A Source Water Assessment evaluates the quality of a source water that is used in a community drinking water supply. It is also used to determine the Potential Contributing Activities (PCAs) that occur within and nearby a source water supply. The PCAs are then compiled into a Vulnerability Summary report.

The latest Vulnerability Summary report for the Sacramento Delta, including the Barker Slough North Bay Aqueduct (NBA), was completed in 2006. The source was considered to be most vulnerable to cattle and sheep grazing activities in the watershed associated with turbidity, total organic carbon, and coliform bacteria detected in the water supply. Approximately 85% of the watershed is grazing land or irrigated pastures. The cities treating NBA water, in conjunction with the Solano County Water Agency, have implemented watershed management practices to improve water quality and reduce the significance of the potential contaminant sources.

The latest Vulnerability Summary report for Putah South Canal (PSC) was completed in 2006. PSC was determined to have a physical barrier effectiveness rating of "low." The results of the assessment survey indicated that PSC is most vulnerable to illegal activities/unauthorized dumping and herbicide application. Management measures along the canal have been implemented that mitigate the risk for each of these PCAs. These measures include restricted access to the canal by installation of security fencing, regular patrolling of the canal, reduction of herbicide use, replanting canal walls with grasses, cleaning of the canal during periods of no water deliveries, and diversion of surface drainage around and away from the canal. The Vulnerability Summaries for Vacaville's groundwater wells were performed in 2002, 2003, and 2005. The wells are considered most vulnerable to automobile gas stations, chemical and petroleum processing and storage, dry cleaners, septic systems, sewer collection systems, agricultural drainage and agricultural and irrigation wells. The wells offer various levels of protection from PCAs due to factors such as characteristics of the aquifer, deep water table intakes, well construction features and physical barriers. Therefore, although the PCAs listed in the assessment surveys are activities that have the potential to contaminate the wells, the PCAs are not causing nor have historically caused contamination of the water sources.

Additionally, Vacaville has a long-standing Source Control Program, whereby inspectors perform audits of commercial and industrial facilities. This is to ensure that no illicit discharges are taking place or have taken place, and to confirm that pollutant disposal practices conform to guidelines and laws.

A copy of the Source Water Assessment(s) and Vulnerability Summaries can be obtained through the California DPH, Drinking Water Field Operations Branch, San Francisco District Office, 850 Marina Bay Parkway, Bldg P, 2nd Floor, Richmond, California 94804. You may request that a summary be sent to you by contacting Betty Graham, District Engineer, California Department of Public Health, at (510) 620-3474.

HEALTH RELATED INFORMATION

PRECAUTIONS FOR PEOPLE WITH WEAKENED IMMUNE SYSTEMS:

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised people such as those with cancer undergoing chemotherapy, people who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. USEPA and Center for Disease Control guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants can be obtained by calling USEPA's Safe Drinking Water Hotline (800-426-4791) or visiting the web site at www.epa.gov/.

Vacaville 2009 Drinking Water Quality Consumer Confidence Report

HOW TO READ THE FOLLOWING TABLES.

The test results are divided into the following tables: Health-Based Primary Standards; Aesthetic-Based Secondary Standards; and Unregulated Constituents. Monitoring unregulated constituents helps USEPA and DPH to determine where contaminants occur and whether to regulate them. To read the tables, start with the far left column titled Constituent Detected and read across the row. Units express the amount measured. MCL shows the highest amount of constituent allowed. PHG (MCLG) is the goal amount for that constituent, which may be a lower amount than the amount allowed. The Range reports the lowest and highest amounts detected and the Avg is the annual average. Major Sources in Drinking Water describes where the substance usually originates. To better understand the report, use the Legend that defines the terms used.

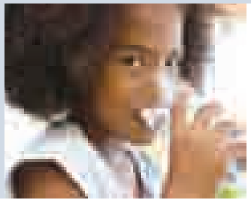
HEALTH-BASED PRIMARY STANDARDS

CONSTITUENT DETECTED	UNITS	MCL	PHG (MCLG)	RANGE	AVG	MAJOR SOURCES IN DRINKING WATER
GROUNDWATER			**Clarity**			
Turbidity (a)	ntu	TT	na	0.05 - 2.6	0.08	Soil runoff.
			Inorganic Chemicals			
Arsenic	ppb	10	0.004	1.2 - 7.8	3.4	Erosion of natural deposits, glass & electronics production waste.
Barium	ppm	1	2	0.07- 0.12	0.10	Erosion of natural deposits.
Chromium	ppb	50	100	1.7 - 21	13	Discharge from chrome plating & erosion of natural deposits.
Nitrate (as N)	ppm	10	10	0.4 - 3.4	1.5	Runoff and leaching from fertilizer use; leaching from septic tanks; erosion of natural deposits.
SURFACE WATER - NBR			**Clarity**			
CONSTITUENT DETECTED	UNITS	MCL	PHG (MCLG)	Highest Detection	Percent in Compliance (<0.5 ntu)	
Turbidity (a)	ntu	TT	na	0.06	100%	Soil runoff.
			Organic Chemicals			
SUBSTANCE	UNITS	MCL	PHG (MCLG)	RANGE	AVG	
Total Trihalomethanes	ppb	80	na	1.5 - 2.7	2.1	By-product of drinking water disinfection.
			Inorganic Chemicals			
Aluminum	ppb	1000	600	nd - 0.06	0.02	Erosion of natural deposits; residue from some surface water treatment processes.
Barium	ppm	1	2	nd - 0.04	0.02	Erosion of natural deposits.
Fluoride	ppm	2.0	1	nd - 0.2	0.07	Erosion of natural deposits.
Nitrate (as N)	ppm	10	10	0.7 - 1.8	1.1	Runoff and leaching from fertilizer use; leaching from septic tanks; erosion of natural deposits.
SURFACE WATER - VWTP			**Clarity**			
CONSTITUENT DETECTED	UNITS	MCL	PHG (MCLG)	Highest Detection	Percent in Compliance (<0.5 ntu)	
Turbidity (a)	ntu	TT	na	0.20	100%	Soil runoff.
			Organic Chemicals			
CONSTITUENT DETECTED	UNITS	MCL	PHG (MCLG)	RANGE	AVG	
Total Trihalomethanes	ppb	80	none	29	29	By-product of drinking water disinfection.
			Inorganic Chemicals			
Arsenic	ppb	10	0.004	1.5	1.5	Erosion of natural deposits, glass and electronics production waste.
Barium	ppm	1	2	0.05	0.05	Erosion of natural deposits.
Chromium	ppb	50	100	2.7	2.7	Discharge from chrome plating and erosion of natural deposits.
Fluoride	ppm	2.0	1	0.1	0.1	Erosion of natural deposits.

HEALTH BASED PRIMARY-STANDARDS

CONSTITUENT DETECTED	UNITS	MCL	PHG (MCLG)	RANGE	DRINKING WATER SOURCES
DISTRIBUTION SYSTEM					
Lead (b) (c)	ppb	AL = 15	0.2	2.5 ppb reflects the 90th percentile. Of the 32 samples analyzed, none exceeded the action level. Data is from the last required sampling August of 2008.	Erosion of natural deposits. Internal corrosion of household water plumbing systems.
Copper (b) (c)	ppm	AL=1.3	0.3	0.17 ppm reflects the 90th percentile. Of the 32 samples analyzed, none exceeded the action level. Data is from the last required sampling August of 2008.	
Fluoride (d) (e)	ppm	0.7 - 1.3	0.8	Distribution system-wide highest monthly average = 0.8 ppm with a minimum of 0.8 ppm and a maximum of 0.9 ppm.	Erosion of natural deposits; Water additive that promotes strong teeth.
Total Coliform Bacteria (Total Coliform Rule)	MPN/ 100mL	5%	(0)	Distribution system-wide highest monthly value = 0 % (1352 samples taken in 2009; no Total Coliform detected.)	Naturally present in the environment.

CONSTITUENT DETECTED	UNITS	MCL or [MRDL]	MCLG or [MRDLG]	LEVEL DETECTED	MAJOR SOURCES IN DRINKING WATER
DISTRIBUTION SYSTEM					
Disinfectants & Disinfection By-Products (DBP)					
Total Trihalomethanes (d) (f)	ppb	80	na	Average =17 ppb Minimum = nd Maximum = 50 ppb	By-product of drinking water disinfection.
Haloacetic Acids (d) (f)	ppb	60	na	Average = 5 ppb Minimum = nd Maximum = 25 ppb	By-product of drinking water disinfection.
Chlorine	ppm	[4]	[4]	Average = 0.7 ppm Minimum = 0.0 ppm Maximum = 1.4 ppm	Drinking water disinfectant added for treatment.
Bromate	ppb	10	0.1	Average = 2.2 ppb Minimum = 1.0 ppb Maximum = 4.0 ppb	By-product of drinking water disinfection.
Control of DBP Precursors (TOC)	mg/L	TT	na	Average = 2.2 Minimum = 1.2 Maximum = 2.7	Various natural and manmade sources.




Protect Your Water Supply

Polluted stormwater potentially affects drinking water sources, which can affect public health and increase drinking water treatment costs. Please help protect your water supply by controlling household, landscaping and automotive products that contain toxic chemicals. Reduce the use of toxic chemicals wherever possible (including fertilizers and pesticides) and be sure to properly recycle or dispose of waste.

Everything that goes down a storm drain or sewer may potentially affect your local water. Never dispose of household, landscaping or automotive products and chemicals down the storm drain or in the sewer.

MONITORING

The City monitors your drinking water for more than 100 different constituents. Some constituents are tested daily to ensure the water is safe to drink. Only those constituents detected are reported in the tables. While most monitoring was conducted in 2009, the State allows monitoring for some constituents less than once per year because the levels do not change frequently. Some of our data, though representative, are more than one year old.

More information can be obtained about monitoring requirements, contaminants and potential health effects by calling the USEPA's Safe Drinking Water Hotline (800-426-4791) or by visiting the EPA's web site at www.epa.gov/safewater/hfacts.html/.

POLICY ON NONDISCRIMINATION ON THE BASIS OF DISABILITY

In accordance with the requirements of Title II of the Americans with Disabilities Act of 1990, the City of Vacaville ("City") does not discriminate against qualified individuals with disabilities on the basis of disability in the City's services, programs or activities, or employment. Information, comments, requests for accommodations or barrier removal, and/or complaints concerning the accessibility of City programs, services or activities to persons with disabilities should be directed to the City's ADA Coordinator, 650 Merchant Street, 449-5409, 449-5162 (TTY), or ada@cityofvacaville.com.

AESTHETIC-BASED SECONDARY STANDARDS

CONSTITUENT DETECTED	UNITS	MCL	GROUNDWATER		SURFACE WATER NBR		SURFACE WATER VWTP	
			RANGE	AVG	RANGE	AVG	RANGE	AVG
Chloride	ppm	500	7.9 - 33	14	14 - 28	19	7.7	7.7
Copper	ppm	1.0	nd - 0.004	0.001	nd	nd	0.005	0.005
Color	units	15	nd	nd	nd	nd	3	3
Iron	ppb	300	nd - 35	2	nd	nd	nd	nd
Odor - Threshold	ton	3	1 - 3	1.3	1.4 - 2.0	1.6	1	1
Silver	ppb	100	nd	nd	12 - 19	16	nd	nd
Sulfate	ppm	500	24 - 66	37	34 - 43	38	24	24
Specific Conductance	ummhos/cm	1600	471 - 846	554	302 - 372	337	360	360
Total Dissolved Solids	ppm	1000	270 - 546	342	193 - 235	213	220	220
Zinc	ppm	5	nd - 0.065	0.008	nd	nd	nd	nd
UNREGULATED CONSTITUENTS								
Alkalinity	ppm	No Std	161 - 305	211	105 - 153	124	150	150
Boron	ppb	al = 1000	110 - 310	210	130 - 190	153	180	180
Calcium	ppm	No Std	14 - 85	38	14 - 18	16	18	18
Hardness (g)	ppm	No Std	84 - 330	171	99 - 169	126	170	170
Magnesium	ppm	No Std	12 - 28	18	14 - 28	21	31	31
pH	units	No Std	7.7 - 8.2	8.0	8.0 - 8.3	8.2	8.4	8.4
Potassium	ppm	No Std	2.3 - 6.1	3.7	1.4 - 2.4	1.7	1.2	1.2
Sodium	ppm	No Std	39 - 82	59	20 - 58	31	11	11
Vanadium	ppb	al = 50	8 - 26	16	nd - 4.3	2.8	7	7
Molybdenum	ppb	No Std	nd - 25	42	nd	nd	nd	nd

LEGEND

Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the PHGs (or MCLGs) as is economically and technologically feasible. Secondary MCLs are set to protect the odor, taste, and appearance of drinking water.

Maximum Contaminant Level Goal (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the U.S. Environmental Protection Agency.

Public Health Goal (PHG): The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California Environmental Protection Agency.

Primary Drinking Water Standard (PDWS): MCLs and MRDLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

Maximum Residual Disinfectant Level [MRDL]: The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

Maximum Residual Disinfectant Level Goal (MRDLG): The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.

Regulatory Action Level (AL): The concentration of a contaminant which, if exceeded, triggers treatment or other requirements that a water system must follow.

Treatment Technique (TT): A required process intended to reduce the level of a contaminant in drinking water.

na: Not applicable or Not available at this time.

nd: Not Detected.

ntu: Nephelometric Turbidity Units. The standard unit for turbidity measurement.

pCi/L: Pico Curies per Liter.

umhos/cm: unit of measure for conductance.

ppm: Parts Per Million or Milligrams Per Liter (mg/L).

ppb: Parts Per Billion or Micrograms Per Liter (ug/L).

ton: Total Odor Number.

(a): Range is maximum monthly value; 100% represents the lowest percentage of samples which meet monthly compliance limit of 0.5 ntu. Turbidity is a measure of water cloudiness. It is a good indicator of filtration effectiveness.

(b): This is the State action level for samples collected from inside homes.

(c): The 90th percentile reflects the concentration of lead or copper at which 90% of the samples tested were found to have not exceeded. Household lead and copper results are from 2008. The next sampling is scheduled for 2011.

(d): Not possible to differentiate between groundwater and surface water source.

(e): Added as required for dental health protection. Standard depends upon temperature.

(f): Compliance is based on a running annual average of samples collected quarterly.

(g): To convert hardness data from ppm to grains per gallon, divide by 17.

APPENDIX G

URBAN WATER SHORTAGE CONTINGENCY PLAN

CITY OF VACAVILLE
URBAN WATER SHORTAGE CONTINGENCY PLAN

[AB 11, Section 3, Section 10631(e)]
Adopted February 1992

AMENDMENT TO THE URBAN WATER MANAGEMENT PLAN
ADOPTED JANUARY 1991

CITY OF VACAVILLE
URBAN WATER SHORTAGE CONTINGENCY PLAN

[AB 11, Section 3, Section 10631(e)]
Adopted February 1992

AMENDMENT TO THE URBAN WATER MANAGEMENT PLAN
ADOPTED JANUARY 1991

Prepared by:

City of Vacaville
Public Works Department
650 Merchant Street
Vacaville, CA 95688

In Cooperation with:

The Water Agencies of Solano County
City of Benicia
City of Fairfield
Solano Irrigation District
Solano County Water Agency
City of Suisun City
City of Vallejo
City o Dixon
City of Rio Vista

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SECTION 1. Plan Purpose

The following plan has been prepared in accordance with State of California Assembly Bill No. 11. The Bill, adopted during the 1991-1992 First Extraordinary Session of the California Legislature, requires all urban water suppliers in California to prepare, adopt, and submit an amendment to its Urban Water Management Plan. This amendment, titled the Urban Water Shortage Contingency Plan, outlines progressive steps to be taken to insure adequate water supply during drought years.

SECTION 2. Coordinated Planning

Vacaville's Urban Water Shortage Contingency Plan, like the Urban Water Management Plan, was completed in cooperation with the Solano County Water Agency (SCWA) and its member cities and water districts. The SCWA is responsible for provision of untreated water to cities and districts within Solano County. The SCWA is also responsible for long-term planning and management of water resources within the County. They hold master contracts for water supply with the Department of Water Resources for the North Bay Aqueduct and with the United States Bureau of Reclamation for the Solano Project. The SCWA contracts with its member units for these water supplies.

In 1989 SCWA members formed an Urban Water Conservation Committee who continue to meet monthly to coordinate planning efforts, education and public information, and other water management activities. As a result of these meetings, water conservation information is consistent County-wide. Funding and coordination of several large scale County projects has been shared by committee members including County Fair exhibits, poster contests, a low water use landscape fair, and drought information distribution. The committee has also met several times to discuss the development of Urban Water Shortage Contingency Plans and water conservation ordinances.

The City of Vacaville's Water Conservation Ordinance is attached to this plan as Appendix L. The Ordinance was adopted March 12, 1991 and since that time Vacaville has been under Drought Stage conditions with all accompanying water use restrictions.

Disaster Planning

A water shortage disaster response has been coordinated with the County Office of Emergency Services in conjunction with the City of Vacaville's Emergency Operations Plan. Emergency Operations Plan requires the inspection of storage tanks, wells, plant facilities, and reservoirs for impaired pumping operation, leaks, and contamination. The Public Works Department is in the process of developing a Disaster Preparedness Plan, which further details the emergency response plans. Emergency power units are available.

SECTION 3. Past, Current, and Projected Water Use (1990-1994)

The City of Vacaville supplies water to customers for residential, commercial, and industrial uses. Agricultural water for the area is provided by the Solano Irrigation District (SID).

Vacaville has approximately 75,000 residents, and over 79% of the City's water is used by residential customers. The City Council is currently considering a growth management plan that would limit new single-family residential dwellings to 750 per year.

Our highest annual water demand occurred in 1990 at 14,503 AFY. During 1991 the Water Conservation program reduction goal was 10%. However, we achieved a 20% reduction city-wide bringing us to an annual demand of 11,700 AFY. Planning department projections estimate new residential connections will be increasing by 2.5 to 3.3 percent per year and other user groups will be slightly higher.

Table 1 displays water demand information by user category for 1990 and 1991 with projections for 1992 through 1994. Water demand figures for 1992 through 1994 are projected two ways: 1) for normal water years without growth limitations, and 2) at current water conservation levels assuming no growth in 1993 and 1994. Should the drought continue, City Council may implement a growth reduction or no growth plan by 1993.

TABLE 1 Water Demand by User Category for 1990 and 1991 with Projections for 1992 through 1994

Customer Type	Connections (1991)	Actual 1990 AF	Actual 1991 AF	Projected 1992 AF	Projected 1993 AF	Projected 1994 AF
Single Family	17,832	8,440	7,196	9,407	9,689	9,980
Multi-Family	612	1,350	1,942	2,539	2,615	2,693
Commercial	533	1,450	901	1,230	1,322	1,421
Industrial	38	790	187	256	275	296
Governmental	2,583	1,524	1,147	1,488	1,522	1,557
Other	3	949	327	426	436	446
TOTAL	21,601	14,503	11,700	15,346	15,859	16,393
Total Demand at current Conservation Reduction of 20%.				12,000	12,000	12,000

The conservation production figure of 12,000 AFY is used for contingency planning throughout this document. By remaining at a 20% conservation level or 12,000 AFY, the Public Works Department believes they can manage the water supply to meet demand without making additional water purchases.

SINGLE FAMILY and MULTI-FAMILY connections are projected to increase an average of 3.0 percent per year over the next 3 years. The 1990 daily water consumption average for a single-family household was 403 gpd. New homes use approximately 420 gpd due to larger meter connections, lot sizes, and greater square footage.

COMMERCIAL and INDUSTRIAL connections are projected to increase 7.5 percent per year.

GOVERNMENTAL connections are projected to increase 2.3 percent per year. This category includes City, County, State, and Federal buildings; parks; median strips; and schools.

OTHER is a category of user which includes the California Medical Facility and has high consumption with relatively few connections. We estimated its growth at 2.3 percent per year.

In 1991, the Public Works Department in conjunction with the City Finance Department reclassified all water accounts based on sewer classifications. Any visible anomalies between 1990 and 1991 demand figures by category are due to this classification change in which numerous accounts were reclassified to Governmental. This reclassification has taken place since the adoption and submittal of Vacaville's Urban Water Management Plan, therefore the connection figures shown above supersede those submitted under the Urban Water Management Plan.

Unaccounted-for water loss was high in 1990 at about 17%. We attribute this to several factors: 1) water used from hydrants for construction purposes was unmetered and free of charge; 2) during both 1989 and 1990 Vacaville experienced unprecedented growth which meant additional water for construction purposes, ground preparation, and line testing; 3) builders were able to obtain water for concrete work and landscape germination unmetered and free of charge; 4) the City did not have a leak detection program in place. Since that time, these factors have been addressed and we expect the amount of water classified as unaccounted for-water to drop significantly to a level of 5 to 10%. For purposes of this plan, unaccounted-for water has been apportioned to all account types.

SECTION 4. Worst Case Supply Availability For 12, 24 & 36 Months

Vacaville's water sources include Solano Project water from the Lake Berryessa reservoir; State Water Project water from the North Bay Aqueduct; and groundwater through nine City wells.

Lake Berryessa's storage capacity is large (1.6 million acre-feet), but the reservoir has a relatively small watershed (576 square miles). This type of reservoir provides good drought protection if the reservoir is full when the drought starts. The water year 1991-92 was the first year that the United States Bureau of Reclamation (USBR) declared a deficiency in Solano Project supplies and imposed a 17.4 percent reduction for the water year beginning March 1, 1991.[1]

Water from the North Bay Aqueduct is treated at the North Bay Regional Water Treatment Plant, a joint project between the cities of Vacaville and Fairfield. In calendar year 1991 there was a 70 percent reduction imposed on municipal State Water Project contractors in Solano County.

Vacaville draws groundwater from a deep aquifer located under the northeastern part of the County in the Vacaville/Dixon area. Vacaville's groundwater extraction has been about 5,000 - 6,000 AFY, with 6,000 AFY being the maximum safe yield.

Table 2 displays Vacaville's supply sources and worst case supply projection through 1994. Total entitlements for 1992 through 1994 reflect a reduced percent of supply as follows:

- Groundwater - 95% and 90% of contractual amount in 1993 and 1994. The change is an affect of the continuous drawdown of the water table by all users of the aquifer as the drought persists into future years.
- Solano Project - 72% of contracted entitlements year by year as indicated by the Solano County Water Agency Contingency Plan.
- NBA - Our current contract allows for an increase in entitlements annually. In 1991 our entitlement was 20% of contracted amount.
- SID North - 75% of contracted entitlements year by year is anticipated.

In 1991, Vacaville balanced the reduction in supply by using NBA carryover water from 1990 and unscheduled water received in Summer 1991. The City anticipates the use of carryover water through 1994.

[1] Solano County Water Agency Drought Contingency Plan For 1992.

TABLE 2 Supply Sources and Worst Case Supply Projections (Acre - feet)

Source	1991 Contractual Amount	1991 Actual Supply	1992	1993	1994
Groundwater	6,000	5,400	5,500	5,700[1]	5,400
NBA					
Entitlement[2]	1,000	300	300 (.2x1,500)	400 (.2x2,000)	500 (.5x2,500)
Carryover		300			
Unscheduled		799	100		
Solano Project	5,600	4,625	4,032[3]	4,032[3]	4,032[3]
SID North Industrial (1972 Agreement)	2,500	2,000	1,875[4]	1,875[4]	1,875[4]
1991 Entitlement Usage		11,200[5]			
Est. Total Demand		11,700	12,000[6]	12,000	12,000
Total Entitlements	15,100	13,424	11,807	12,007	11,807
Carryover Supply					
Solano Project		2,200			
SCWA Drought Pool		2,400			
Carryover Usage					
Solano Project (2400)			200		200
SCWA Drought Pool					
Total Carryover Available		4,600	4,400	4,400	4,200

1. 1993 new Well in service.
2. Increasing entitlements as years progress assumes 20% of supply.
3. Assuming 72% of supply.
4. Assuming 75% of supply.
5. Used Entitlements shown are less than demand due to use of 1990 carryover.
6. Assumes 3% increase in water demand due to growth.

Should Vacaville be required to meet a more stringent reduction goal, we have the ability to do so through the Water Conservation Ordinance.

SECTION 5. Stages of Action

Vacaville has developed and adopted a three (3) stage Water Conservation Ordinance which includes voluntary and mandatory stages, see Appendix I. Since March 12, 1991, Vacaville has been under Drought Stage conditions.

TABLE 3 Water Conservation Stages and Reduction Goals

Shortage	Stage	Demand Reduction Goal	Program Type
up to 10%	Normal	Variable to 10%	Voluntary
10% to 30%	Drought	Variable 10% to 30%	Mandatory
30% +	Emergency	Variable 30% +	Mandatory

The City's Water Conservation Ordinance establishes four (4) mechanisms which work together to achieve the necessary reduction goal:

1. Council declaration of appropriate water conservation stage based on reduced supply.
2. Establish water use goals for each user group corresponding to the percent reduction necessary.
3. Council adoption of rates to correspond to each of 4 blocks on increasing block rate structure.
4. Water use restrictions appropriate to achieve the reduction goal.

Copies of ordinance overviews for both residential and general use customers is included as Appendix II.

Supply Shortage Triggering Levels

The City's three water sources are groundwater, local surface, and state water project water. Water conservation stages may be triggered by a shortage in one source or a combination of sources. Shortages may trigger a water conservation stage change at any time as directed by City Council.

The specific criteria for triggering the City's water conservation stages is based on the percent by which projected supply does not meet projected demand, see Table 4.

TABLE 4 Water Conservation. Stages Triggering Levels (Normal Supply 14,900 AFY)

Stage	Percent Shortage	Water Shortage
Normal	Up to 10% Supply reduction	Combined supply reductions totaling up to 1,490 AFY
Drought	10 to 30% Supply Reduction	Combined supply reductions totaling between 1,490 and 4,470 AFY
Emergency	30% + Supply Reduction	Combined supply reductions totaling 4,470 AFY or more

SECTION 6. Prohibitions on Water Use

Vacaville's Water Conservation Ordinance includes specific water use restrictions, see Appendix I.

During Normal water conditions and all water conservation stages the City's Water Efficient Landscape Regulations are in effect, as are several basic water waste restrictions.

(a) No excessive water runoff.

(b) No washing of sidewalks, driveways, walkways, parking lots and all other hard surfaced areas by direct hosing except for removal of hazardous materials for protection of public health and safety.

(c) Washing of vehicles, equipment, structures, and other items without the use of a shutoff nozzle is not allowed.

(d) The escape of water through breaks or leaks within the water users plumbing or distribution system must be repaired within 24 hours after discovery.

(e) Fire Hydrants are limited to use by firefighting, water quality, sanitation, and construction purposes only.

During Drought and Emergency stages, City Council can add additional water use restrictions as appropriate to achieve the desired level of conservation. Optional restrictions are outlined in Appendix I.

SECTION 7. Consumption Limits

Vacaville establishes conservation goals for each customer type based on the methods outlined in Table 5.

TABLE 5 Conservation Goal Determination

Customer Classification	Customer Type	Determination
Residential	Single Family	Percent reduction derived from 1990 city-wide household average, per season (Summer/Winter)
General Use	Multi-Family	Percent Reduction from Base Year 1990
General Use	Commercial	Percent Reduction from Base Year 1990
General Use	Industrial	Percent Reduction from Base Year 1990
General Use	Governmental	Percent Reduction from Base Year 1990
Landscape	Landscape Meters	Percent Reduction from Base Year 1990 - Variable

Vacaville's highest per capita water use year was 1990 and is used as the Base Year in determining water conservation goals.

RESIDENTIAL goals are set by calculating the city-wide household averages seasonally for 1990 and then reducing those averages by the required percent reduction. For example, the 1990 Summer average (May 1 - Nov 30) was 43 units per billing period. In 1991, a 10% City-wide water conservation target was necessary to insure adequate water supply, thus 43 units less 10% equaled a target goal of 39 units. Similarly, in Winter months (December 1 - April 30), the 1990 average was 24 units per billing period reduced to 22 units establishing the 1991 target goal. A seasonal approach was established to allow moderate landscape irrigation in Summer months.

GENERAL USE goals are established by calculating each individual customer’s 1990 average and reducing that amount by the percent reduction required. This method creates targets based on a customer's own past usage history. If no usage history or an inadequate history exists, targets are based on similar users.

LANDSCAPE accounts are established in the same manner as General Use accounts; however, their target goal reflects seasonal patterns. Additionally, landscape accounts are subject to reduction percentages greater than that of other customers’ categories. City Council will establish landscape account targets based on the severity of the water shortage.

The Water Conservation Office shall classify each customer and calculate their water conservation target goal as outlined above. Each customer shall be notified of their classification and target goal by mail prior to program implementation. New customers and connections will be notified at the time service commences. In a disaster, prior notice of target goals may not be possible; notice will be provided by other means. Any customer may appeal their target goal on the basis of misclassification, use, or incorrect calculation. Appeals shall be processed as set forth in Appendix III, Water Conservation Program Exception and Appeal Process.

SECTION 8. Penalties or Charges for Excessive Use or Use in Violation of Ordinance Provisions

The City of Vacaville's Normal Stage rate structure contains two tiers and is outlined in Table 6. Customers over age 65 receive reduced pricing.

TABLE 6 Normal Stage Rate Structure

Tier	Rates per HCF	Residential HCF	General Use HCF	Landscape HCF
Tier 1	$0.60	0 - 12	0 - 12	0 - 12
Tier 2	$0.77	13 +	13 +	13 +

During Drought and Emergency stages two tiers are added to the existing structure and rates associated with these tiers are punitive in nature to discourage excessive consumption, see Table 7. These rates are currently in place in Vacaville.

TABLE 7 Current Drought Stage Rate Structure

Tier	Rates per HCF	Senior Rates per HCF	Residential (Winter) HCF	Residential (Summer) HCF	General Use HCF	Landscape HCF
Tier 1	$0.60	$0.51	0 - 12	0 - 12	0 - 12	0 - 12
Tier 2	$0.92	$0.77	13 - 22	13 - 39	13 – A[2]	13 – A[2]
Tier 3	$1.84	$1.55	22 - 28	39 - 43	A – B[1]	A – B[3]
Tier 4	$2.76	$2.32	28 +	43 +	B +	B +

1. Estimated 1991 rates if in Normal State conditions.
2. 90% of average annual usage for 1990.
3. 20% greater than A.

Please note:

- Construction water obtained from fire hydrants is metered. Consumed units are priced at Tier 4 rates.
- Recycled water is available free of charge to permitted users.

Under Normal conditions, water rates shall be established and modified from time to time with the objective of fully compensating for the acquisition, treatment and distribution of water through revenues collected from customers, and promoting beneficial use of the water.

Under Drought and Emergency stages, Vacaville's rate structure allows for flexibility in pricing and goal determination. This structure is an important mechanism in attaining water use reduction up to 50%, if required.

Under Drought conditions, water rates may be adjusted by any combination of 1) increases in the unit prices of water for established blocks, 2) modification of the unit amounts which define blocks, and 3) addition of new blocks. Under Drought conditions, it will be necessary to increase rates to balance revenues as a result of reduced water sales, acquisition of additional or supplemental supplies of water, or to promote water conservation.

Emergency conditions may dictate further adjustment in the water rate structure. As in Drought conditions, water unit amounts which define the block structure and individual block rates can be adjusted to maintain le revenues and decrease water consumption.

Customers who violate the established water use restrictions will be subject to monetary penalties and flow restriction as outlined in Appendix I and administered as set forth in Appendix IV, Processing Water Waste Notifications and Water Conservation Information Requests.

SECTION 9. Analysis of Revenue and Expenditure Impacts

The City of Vacaville approaches drought-related rate increases with the intent of maintaining revenue neutrality.

Lower-than-projected operating revenues coupled with above-average increases in budgeted operating expenses produced a revenue shortfall projection for the 1991/92 fiscal year. To overcome the deficit, the City adopted an annual rate increase of 9% for calendar years 1991 through 1993. This was taken into account when planning the rate structure and charges set forth in the Water Conservation Ordinance.

Working with the consulting firm Bartle Wells Associates, Vacaville worked to develop a rate model which assumes that reduced water sales and drought related expenses will primarily impact the second tier (Tier 2) rate block. Table 8 displays the estimated financial impact this will have on our budget under several shortage scenarios.

TABLE 8 Projected Water Conservation Budget Impacts (no rate increases & no additional water purchases)

Water Conservation Reduction Goal	Normal 1990 Base Year	Drought (15%)	Emergency (30%)	Emergency (50%)
Average Second Tier Revenues	$2,853,000	$2,178,000	$1,740,000	$1,170,000
Reduced Revenues		$675,000	$1,113,000	$1,683,000
Water Conservation Program Expenses		$110,000	$130,000	$150,000
Total Budget Impact		$785,000	$1,243,000	$1,833,000
% Gross Impact on Second Tier		28%	44%	64%
% Net Impact'		21%	33%	48%

1. To calculate net impact, gross impact is reduced by 25% due to expected revenues from users above the conservation goal which arc charged at higher rates.

Once the City's water conservation reduction goal is established, the corresponding budget impact will be calculated. To maintain revenue neutrality, second tier rates will be increased by the net impact percentage. Third and fourth tier rates are multiples of the second tier and will increase accordingly.

The cost of additional water purchases for a given year, if known at the time rates are set, will be included as an expense and recovered through the net increase. Water purchases not included in the net increase can be recovered in arrears through the next rate adjustment.

Surplus revenues are used to fund capital improvements.

SECTION 10. Water Use Monitoring Procedures

Normal Stage Monitoring

In Normal stage water supply conditions, production figures are recorded daily and reviewed by the Chief Water Plant Operator. Totals are reported monthly to the Utility Division Engineer and incorporated into the water supply report.

Drought Stage Monitoring

During Drought stage water supply conditions, daily production figures are reported to the Chief Water Plant Operator. The Chief Water Plant Operator reports the weekly production figures to the Water Conservation Office. The Water Conservation Office compares the weekly production to the 1990 base year data to verify reduction goals are being met. Weekly reports are generated and provided to the Assistant Director of Public Works and the Chief Water Plant Operator. Monthly reports are prepared and provided to the Director of Public Works. If reduction goals are not met, the Director of Public Works will notify the City Council so corrective action can be taken.

Emergency Stage Monitoring

During Emergency Stage shortage, Drought stage procedures will be followed, with addition of a daily production report to the Assistant Director of Public Works. During a disaster shortage the Emergency stage applies.

SECTION 11. Water Conservation Ordinance Implementation

The City of Vacaville previously adopted an urgency Ordinance No. 1431 establishing water conservation requirements and a water rate structure to address normal, drought, and emergency conditions. Upon determination of a water shortage, the Director of Public Works shall notify the City Council of the condition along with recommendations for enactment of the appropriate conservation level.

When the above Ordinance was adopted on March 12, 1991, an accompanying Resolution (No. 1991-N-2) was adopted declaring Drought Stage conditions. Should Vacaville be required to move to Emergency Stage measures, a modification to Resolution 1991-N-2 would be prepared and submitted for Council action, see Appendix V, sample draft Resolution.

SECTION 12. Plan Adoption Standards

The City of Vacaville prepared this Urban Water Shortage Contingency Plan during December 1991 and January 1992. The Plan was adopted on February 11, 1992 (see Appendix VI) and submitted to the Department of Water Resources on February 19, 1992. The Plan includes all information necessary to meet the requirements of subdivision (e) of California Water Code Section 10631.

The availability of draft Plan copies for review was properly noticed in the City's newspaper, and copies were available at City Offices and the Public Library. The 1992 Urban Water Shortage Contingency Plan for the City of "Vacaville was formally adopted at a duly noticed City Council Meeting on February 11, 1992, see Appendix VI.

SECTION 13. Summary of Ordinance Implementation from May 1, 1991 through December 31, 1991

Vacaville's water conservation pricing program began May 1, 1991, and statistical water demand data has been compiled through December 31, 1991. City Council established a water conservation goal of 10%; however, the city's water demand has dropped by a total average of 20.4% since the implementation of the program when compared to the same months in 1990. Table 9 depicts calendar year water demand for 1990 and 1991 on a monthly basis.[2]

TABLE 9 Annual Water Demand 1990 and 1991

Month	1990 AF	1991 AF	Qty Change	Percent Reduction
JAN	722	753	-31	**-4.3**
FEB	644	668	-24	**-3.7**
MAR	844	618	226	**26.8**
APR	1168	770	398	**34.1**
MAY	1333	986	347	**26.0**
JUN	1499	1241	258	**17.2**
JUL	1837	1468	369	**20.1**
AUG	1757	1361	396	**22.5**
SEP	1528	1245	283	**18.5**
OCT	1366	1097	269	**20.0**
NOV	993	781	212	**21.5**
DEC	812	712	100	**12.3**
TOTALS	14,503	11,700	2,803	**17.6**
			MAY - DEC	**19.8**

Table 10 displays water demand information by user category for 1990 and 1991.

TABLE 10 Water Demand by User Category for 1990 and 1991

Customer Type	Connections (1990)	Actual 1990 AF	Actual 1991 AF
Single Family	16,358	8,440	9,459
Multi-Family	1,533	1,350	889
Commercial	552	1,450	323
Industrial	40	790	97
Governmental	1,379	1,524	801
Other	10	949	131
TOTAL	19,872	14,503	11,700
		% Reduction =	**20%**

As previously mentioned throughout this Plan, the Water Conservation Ordinance uses four mechanisms to achieve the established goal: 1) the declaration of a specific water condition, 2) establishment of a water conservation goal, 3) an inclining block rate structure, and 4) water use restrictions. Additionally, a

[2] Appendix VII displays the graph for Table 9.

public information campaign and drought related public services aid in achieving the desired reduction goal. In addition to the water management activities outlined in Section 2, Vacaville began a voluntary retrofit program in 1991.

Water Efficient Landscape Regulations, an important, long-term conservation measure, was implemented as part of Vacaville's Water Conservation Ordinance. Since May 1, 1991, all newly permitted commercial and industrial projects are required to install water efficient landscapes. Vacaville took the Regulations a step further and is requiring that front yards of developer installed single-family homes comply also. Estimated long-term water savings information is available in Vacaville's Urban Water Management Plan.

APPENDIX H

SOLANO PROJECT WATER SUPPLY AVAILABILITY

Appendix H Solano Project Reliability

Ultimate level of development-of Lake Berryessa watershed @ 30,000 AF/yr - 2009 Study

Lake Berryessa Index

Value	Year Type
W	Wet
N	Below Normal
N	Above Normal
D	Dry
D	Critically Dry

Year	Index Value	% Full Alloc	% Full Alloc for Normal Year (N)	% Full Alloc for Single Dry Year (D) *	% Full Alloc for Multiple Dry Years (3 or more Dry years)
1906	W	100%			
1907	W	100%			
1908	D	100%		100%	
1909	W	100%			
1910	N	100%	100%		
1911	W	100%			
1912	D	100%		100%	
1913	D	100%			
1914	W	100%			
1915	W	100%			
1916	W	100%			
1917	N	100%	100%		
1918	D	100%		100%	
1919	N	100%	100%		
1920	D	100%		100%	
1921	N	100%	100%		
1922	N	100%	100%		
1923	N	100%	100%		
1924	D	95%		95%	
1925	N	95%	95%		
1926	N	95%	95%		
1927	W	95%			
1928	N	100%	100%		
1929	D	95%		95%	
1930	N	95%	95%		
1931	D	100%		100%	100%
1932	D	100%			100%
1933	D	45%			45%
1934	D	45%			45%
1935	N	100%	100%		
1936	N	100%	100%		
1937	N	100%	100%		
1938	W	100%			
1939	D	95%		95%	

1940	W	100%			
1941	W	100%			
1942	W	100%			
1943	N	100%	100%		
1944	D	100%		100%	
1945	N	100%	100%		
1946	N	100%	100%		
1947	D	100%		100%	100%
1948	D	95%			95%
1949	D	95%			95%
1950	D	95%			95%
1951	N	95%	95%		
1952	W	100%			
1953	N	100%	100%		
1954	N	100%	100%		
1955	D	95%		95%	
1956	W	100%			
1957	D	100%		100%	
1958	W	100%			
1959	D	100%		100%	
1960	N	100%	100%		
1961	D	100%		100%	
1962	N	100%	100%		
1963	W	100%			
1964	D	100%		100%	
1965	W	100%			
1966	N	100%	100%		
1967	W	100%			
1968	N	100%	100%		
1969	W	100%			
1970	W	100%			
1971	N	100%	100%		
1972	D	100%		100%	
1973	W	100%			
1974	W	100%			
1975	N	100%	100%		
1976	D	100%		100%	
1977	D	100%			
1978	W	100%			
1979	N	100%	100%		
1980	W	100%			
1981	D	100%		100%	
1982	W	100%			
1983	W	100%			
1984	N	100%	100%		
1985	D	100%		100%	
1986	W	100%			
1987	D	100%		100%	100%
1988	D	100%			100%
1989	D	100%			100%
1990	D	95%			95%
1991	N	95%	95%		

1992	D	90%		90%	
1993	W	95%			
1994	D	95%		95%	
1995	W	100%			
1996	W	100%			
1997	W	100%			
1998	W	100%			
1999	N	100%	100%		
2000	N	100%	100%		
2001	D	100%		100%	
2002	N	100%	100%		
2003	N	100%	100%		
2003	W	100%			
2004	N	100%	100%		
2005	N	100%	100%		
2006	W	100%			
2007		100%			
	Average	98%	99%	98%	89%

*Includes first year of consecutive dry years

APPENDIX I

STATE WATER PROJECT WATER SUPPLY AVAILABILITY

Appendix I State Water Project Reliability

DWR Study 2009 data - SCWA Specific

Sacramento Valley Index

Value	Year Type
W	Wet
N	Below Normal
N	Above Normal
D	Dry
D	Critically Dry

Year	Sacramento Valley Index	% Full Table A	% Full Table A for Normal Year (N)	% Full Table A for Single Dry Year (D) *	% Full Table A for Multiple Dry Year (3 or more Dry years)
1922	N	0.37	0.37		
1923	N	0.84	0.84		
1924	D	0.26		0.26	0.26
1925	D	0.39			0.39
1926	D	0.49			0.49
1927	W	0.46			
1928	N	0.86	0.86		
1929	D	0.31		0.31	0.31
1930	D	0.36			0.36
1931	D	0.22			0.22
1932	D	0.35			0.35
1933	D	0.35			0.35
1934	D	0.24			0.24
1935	N	0.43	0.43		
1936	N	0.71	0.71		
1937	N	0.66	0.66		
1938	W	0.77			
1939	D	0.96		0.96	
1940	N	0.60	0.60		
1941	W	0.59			
1942	W	0.83			
1943	W	0.77			
1944	D	0.75		0.75	
1945	N	0.44	0.44		
1946	N	0.74	0.74		
1947	D	0.74		0.74	
1948	N	0.65	0.65		
1949	D	0.58		0.58	
1950	N	0.50	0.50		
1951	N	0.43	0.43		
1952	W	0.86			
1953	W	0.89			
1954	N	0.69	0.69		
1955	D	0.51		0.51	
1956	W	0.48			

1957	N	0.82	0.82		
1958	W	0.58			
1959	N	0.83	0.83		
1960	D	0.52		0.52	
1961	D	0.49			
1962	N	0.70	0.70		
1963	W	0.46			
1964	D	0.81		0.81	
1965	W	0.54			
1966	N	0.83	0.83		
1967	W	0.55			
1968	N	0.83	0.83		
1969	W	0.66			
1970	W	0.58			
1971	W	0.83			
1972	N	0.58	0.58		
1973	N	0.45	0.45		
1974	W	0.78			
1975	W	0.79			
1976	D	0.81		0.81	
1977	D	0.14			
1978	N	0.45	0.45		
1979	N	0.65	0.65		
1980	N	0.60	0.60		
1981	D	0.84		0.84	
1982	W	0.57			
1983	W	0.64			
1984	W	0.53			
1985	D	0.77		0.77	
1986	W	0.67			
1987	D	0.55		0.55	0.55
1988	D	0.24			0.24
1989	D	0.38			0.38
1990	D	0.42			0.42
1991	D	0.20			0.20
1992	D	0.20			0.20
1993	N	0.43	0.43		
1994	D	0.67		0.67	
1995	W	0.54			
1996	W	0.85			
1997	W	0.75			
1998	W	0.91			
1999	W	0.60			
2000	W	0.86			
2001	D	0.37		0.37	
2002	D	0.42			
2003	N	0.79	0.79		
	Average	0.59	0.64	0.63	0.33

*Includes first year of consecutive dry years

Appendix I State Water Project Reliability

DWR Study 2029 data - SCWA Specific

Sacramento Valley Index

Value	Year Type
W	Wet
N	Below Normal
N	Above Normal
D	Dry
D	Critically Dry

Year	Sacramento Valley Index	% Full Table A	% Full Table A for Normal Year (N)	% Full Table A for Single Dry Year (D) *	% Full Table A for Multiple Dry Year (3 or more Dry years)
1922	N	0.64	0.64		
1923	N	0.61	0.61		
1924	D	0.20		0.20	0.20
1925	D	0.42			0.42
1926	D	0.52			0.52
1927	W	0.72			
1928	N	0.64	0.64		
1929	D	0.28		0.28	0.28
1930	D	0.41			0.41
1931	D	0.15			0.15
1932	D	0.39			0.39
1933	D	0.39			0.39
1934	D	0.27			0.27
1935	N	0.57	0.57		
1936	N	0.66	0.66		
1937	N	0.81	0.81		
1938	W	1.00			
1939	D	0.43		0.43	
1940	N	0.63	0.63		
1941	W	0.75			
1942	W	0.64			
1943	W	0.74			
1944	D	0.47		0.47	
1945	N	0.75	0.75		
1946	N	0.59	0.59		
1947	D	0.48		0.48	
1948	N	0.58	0.58		
1949	D	0.56		0.56	
1950	N	0.59	0.59		
1951	N	0.74	0.74		
1952	W	0.82			
1953	W	0.57			
1954	N	0.58	0.58		

1955	D	0.43		0.43	
1956	W	0.82			
1957	N	0.54	0.54		
1958	W	0.92			
1959	N	0.44	0.44		
1960	D	0.47		0.47	
1961	D	0.46			
1962	N	0.66	0.66		
1963	W	0.58			
1964	D	0.64		0.64	
1965	W	0.67			
1966	N	0.62	0.62		
1967	W	0.81			
1968	N	0.55	0.55		
1969	W	1.00			
1970	W	0.69			
1971	W	0.59			
1972	N	0.57	0.57		
1973	N	0.66	0.66		
1974	W	0.74			
1975	W	0.69			
1976	D	0.62		0.62	
1977	D	0.09			
1978	N	0.78	0.78		
1979	N	0.68	0.68		
1980	N	0.83	0.83		
1981	D	0.57		0.57	
1982	W	0.95			
1983	W	1.00			
1984	W	0.77			
1985	D	0.68		0.68	
1986	W	0.79			
1987	D	0.23		0.23	0.23
1988	D	0.30			0.30
1989	D	0.49			0.49
1990	D	0.19			0.19
1991	D	0.22			0.22
1992	D	0.18			0.18
1993	N	0.66	0.66		
1994	D	0.57		0.57	
1995	W	0.85			
1996	W	0.66			
1997	W	0.81			
1998	W	0.83			
1999	W	0.71			
2000	W	0.65			
2001	D	0.30		0.30	
2002	D	0.67			
2003	N	0.58	0.58		
	Average	0.60	0.64	0.46	0.31

*Includes first year of consecutive dry years

APPENDIX J

WATER EFFICIENT LANDSCAPE REQUIREMENTS & COMPARISON WITH STATE WATER EFFICIENT LANDSCAPE ORDINANCE

APPENDIX J

WATER EFFICIENT LANDSCAPE REGULATIONS

Revision V
Adopted: April 14, 1998
Ord. No. 1591

Originally Adopted: March 12, 1991
Ord. No. 1431

Refer Questions To:
Community Services Department
Landscape Architect Office
(707) 449-5643

or

Public Works Department
Water Conservation Office
(707) 449-6263

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I. INTRODUCTION

A. PURPOSE:

These Water Efficient Landscape Requirements shall also be known as the Water Efficient Landscape Regulations, with the terms "requirements" and "regulations" used interchangeably in their intent and definition.

The purpose of these requirements is to establish standards and procedures for landscape designs and installations which are publicly and privately owned and maintained. The intent of the requirements is to develop standards and guidelines for landscapes which utilize reasonable amounts of water and maintain design freedom. To this end, these requirements call for reduced water consumption, responsible landscape design, water efficient landscape irrigation practices, responsible landscape maintenance, and the use of non-potable water for irrigation when available, and when in compliance with regulatory health and safety requirements. These requirements are integrated into the City's existing process of checking landscape and irrigation plans as part of the building permit process.

B. APPLICABILITY

These requirements shall be applicable to all new and rehabilitated landscaping for commercial, industrial, institutional, multi-family residential, public and private recreational/open space areas, roadways, medians, and model home complexes. These requirements are also applicable to all new landscaping for new single-family residential units where the landscaping is installed by the developer as part of the purchase price.

It shall be a violation of the City of Vacaville Ordinance #1431 for any applicable water customer or account holder to be found in non-compliance with the Water Efficient Landscape Requirements. These requirements shall be enforced as set forth in Section 13.20.030 of the Vacaville Municipal Code. All violations shall be brought to the attention of the Public Works Department for action and shall be handled in accordance with said Section 13.20.030.

Projects that are exempted from, but encouraged to use these requirements as guidelines, are single family residential landscapes which are installed by the homeowner and projects irrigated solely with reclaimed water. Additionally, the Director of Public Works may exempt any project due to extenuating conditions so long as it is in substantial compliance with these requirements.

Additional regulations and standards may apply depending on the type of the project. Review of the City's Standard Specifications is required for all City owned and maintained projects.

C. DEFINITIONS:

For the purposes of these Water Efficient Landscape Requirements, the following words and terms shall be defined as follows:

Amendment:	Any material added to the soil to alter the pH or improve the physical properties of the soil.
Backflow Prevention Devices:	Double detector check valve (D.D.C.V.) and reduced pressure (R.P.) devices that prevent contamination of potable water supplies.
Controller:	An automatic timing device with enclosure, which signals remote control valves to open and close on a pre-set program.
Cycle:	The complete operation of an irrigation controller station.
Drip Irrigation:	Surface or subsurface irrigation systems which apply water through low volume devices.
Grading:	Earthwork performed to alter the natural contours of an area to be planted.
Hardscape:	For purposes of this document, hardscape is defined as paving (i.e., decks and patios) and hard surfaces which are part of the calculated total landscape area.
Irrigation System:	A complete connection of system components, including the water source, the water distribution network, and the necessary irrigation equipment.

Median:	A planted area which separates two roadways or divides a portion of a road into two or more lanes.
Micro Spray:	Low volume spray nozzles having a flow rate in gallons per hour (gph). Their use is limited to small annual beds, sheltered entryways, or ground cover planting where a fresh look is desired or other limited specialized use.
Mulch:	Materials such as bark or sawdust placed on the soil surface to retain moisture, retard weed growth, or prevent erosion.
Ornamental Grasses:	Non-mowed, low water use plant material.
Overspray:	Water which is discharged from a spray irrigation head which is outside the desired planting area.
Point of Connection (P.O.C.):	The point at which an irrigation system connects into the public water system. This is usually that point at which the meter is located or will be installed.
Precipitation Rate (P.R.):	The amount of water in inches that an irrigation system discharges, usually measured in inches per hour, gallons per hour, or gallons per minute.
Purple Pipe Requirement:	All non-potable irrigation water (e.g., raw, filtered, reclaimed, etc.) shall be distributed through purple piping only.
Rehabilitated Landscape:	Any planting area in which landscape materials are tested, replaced, or modified. Examples include a change of landscape, installation of a new irrigation system, and grading modifications.
Remote Control Valve (R.C.V.):	A valve in an irrigation system which is activated by an automatic electric controller via an electric control wire.
Runoff:	Water which is not absorbed by the soil to which it is applied. Runoff usually occurs when water is applied at too great a precipitation rate, when water is applied to saturated soils, or when water is applied to a steep slope.

Soil Moisture Sensor:	An instrument for measuring the moisture content of the soil and capable of interruption of the irrigation cycle sensor when excessive or inadequate moisture is detected.
Total Landscape Area:	The parcel area less the building footprint, driveways, walkways, and parking area. Landscape areas include water bodies (i.e., fountains, swimming pools, planting areas, ponds, and hardscape as defined above) and natural areas.
Turf:	Regularly mowed, walk-on grasses.

II. IMPLEMENTATION

A. LANDSCAPE PLANS REQUIRED:

To assure that the intent of these requirements is carried out, the applicant for a building permit is required to submit to the City of Vacaville, landscape plans as described in the Section B, Submittal Requirements, for review and approval by the City.

B. SUBMITTAL REQUIREMENTS:

The following shall be submitted to the City of Vacaville for review and approval as part of the building permit submittal:

1. Landscape plans shall be prepared by a licensed Landscape Architect or a licensed Landscape Contractor;

2. Landscape Planting Plans. The planting plans shall be drawn on sheets no larger than 30" by 42" and no smaller than 18" by 24" at a scale which shows sufficient detail to clearly interpret the plans, preferably not less than 1" - 30 ft. The plans shall clearly identify:

   a. Landscape Materials (i.e., trees, shrubs, groundcovers, and turf). Planting symbols shall be clearly drawn and labeled. The plant material legend will show botanical name, common name, container size and quantities of each group of plants indicated. The seed or sod type must be clearly noted. If seed is used, show seeding rate per 1,000 square feet and application method;

   b. Property lines;

   c. Streets, driveways, walks, and other paved areas;

   d. Sight distance criteria (see City Standard Specifications);

   e. Buildings and structures (existing and proposed);

   f. All overhead and underground utility locations;

g. Natural Features (i.e., rock outcroppings, native oaks, existing plants to remain, etc.). Spot elevations at the base of each existing tree and proposed elevation changes within their drip lines;

h. Peripheral features affecting the design concept;

i. Planting Details. As required to clearly convey planting and staking concepts including areas of unique conditions (i.e., specimen tree guying, hillside watering basin construction, etc.);

j. Mulch Selection (see Section III.B.5, Planting Design Requirements, Surface Mulch).

k. Screening of backflow prevention devices in accordance with the provisions of Section III.B.6., Planting Design Requirements, Screening of Backflow Prevention Devices).

3. Irrigation Plans. The irrigation plans shall be prepared and drawn in the same scale and same format as planting plans to provide a clear and legible presentation of the irrigation system concept. Irrigation plans shall include the following information:

a. Irrigation Heads - all types and models of irrigation heads shall be shown in a graphic format that provides a description of the type of head, including flow rate (gpm), coverage area, manufacturer, pattern, operating pressure and symbol used to depict it on the plan;

b. Remote Control Valves (R.C.V.) - for each valve please show the size of valve, flow rate in gpm or inches/hour and number in sequence with the irrigation controller;

c. Layout of typical emitter systems;

d. Routing of pressurized mainline;

e. Routing of non-pressurized lateral lines;

f. System P.O.C. (Point of Connection), noting size, and available hydrostatic pressure, and available gallons per minute (gpm);

g. Water meter;

h. Automatic controller(s);

i. Isolation valves;

j. Hose connections (quick coupling valves, hose bibbs);

k. Backflow prevention device;

l. Ancillary equipment, such as specialty valves (e.g. pressure reducing valves, check valves, flow meters, master valves, rain shut-off sensor/switch, etc.);

m. Soil moisture sensor(s), if required;

n. Pump station, if required;

o. If non-potable irrigation water has been approved for use, irrigation plans must reflect requirements for non-potable water use. See Uniform Plumbing Code Section 603.3.11.

4. Grading Plan. When landscape grading is too complicated to be shown clearly on the planting plan a Landscape Grading Plan should be submitted. The Landscape Grading Plan should be of a similar format as the irrigation and planting plan. For more information on site grading and landscape grading plans see Section III.A., Grading Requirements.

5. Soil Test Information. Samples of the on-site soil shall be taken after completion of rough grading work and all ancillary work that may cause compaction of the planting areas and then submitted to a certified soil testing laboratory for analysis. The soil samples shall be taken to account for every two acres or less of landscape area and their locations shall be noted on approved site plan.

   Exemption: Total landscape areas of less than 1/4 acre in which no turf is to be planted, or three (3) or fewer lots where the builder installs front yard landscaping as part of the purchase price in which no turf is to be planted, shall not require soil tests. Compliance with all other requirements of these regulations is mandatory.

   All soil samples showing adverse rates of compaction shall receive mitigation recommendations in the soils report. The report that the lab issues will be submitted along with the required plans. The soils report must provide the following information:

   a. Soil permeability rate in inches per hour;

   b. Soil texture test;

c. Cation exchange capacity;

d. Soil fertility, including test for nitrogen; potassium, phosphorous, pH, organic matter and specific conductance (electrical conductivity);

e. Recommendation for amendments to the planting area soil;

f. If grading work has not been completed prior to submission of landscape plans to the City, a note shall be placed on the drawings requiring a soil test when grading is complete. The landscape designer or the landscape contractor shall submit copies of soil test to the City prior to soils preparation. Additional actions will be required for any lime treated landscape areas.

6. Water Use Calculations. Estimated plant water use calculations for each planting area shall be submitted on the planting plan. (Refer to Section III.B., Planting Design Requirements, and Tables 1 and 2.)

7. Irrigation Schedules. The irrigation system designer shall submit along with the required plans irrigation schedules that demonstrate the run time and frequency of operation (see Attachment 2, Sample Irrigation Schedule). Two separate schedules for established landscape shall be developed to reflect seasonal changes; (1) warm season - May through September (5 months); (2) cool season - March/April and October/November (4 months). The remaining 3 months (December, January, and February) are considered "off season" and no scheduling is required. The schedules shall not exceed a total average precipitation rate of 40 inches per year. For newly planted landscape, these schedules can be adjusted upward by 20 percent for the first full growing season or a precipitation rate of 48 inches per year;

   a. Additionally, calculations are to be shown on the plan which give the total number of inches per year the two irrigation schedules will precipitate (see Attachment 3, Sample Irrigation Schedule with Precipitation Calculations). Computer generated scheduling (by month/by valve) is an acceptable alternative;

   b. A copy of the schedules shall be posted next to the controller along with as-built and operations manuals by the installing contractor. These schedules are designed as a guide only. Field adjustments by maintenance persons must be made during variable weather conditions.

C. INSPECTION REQUIRED:

After the approved landscape plans are installed, it is the responsibility of the State registered landscape architect and/or State licensed landscape contractor to inspect the project to confirm that the landscaping was installed in accordance with the approved plans:

1. The landscape designer shall certify that the project is in compliance with these regulations by signing and submitting a completed Certificate of Compliance (Attachment 4).

2. The Certificate of Compliance shall be submitted prior to the issuance of any Certificate of Occupancy.

3. The installed landscaping shall also be subject to inspection by the City to confirm the Certificate of Compliance.

4. The Community Development Director may authorize the deferral of landscape completion for good and valid reasons subject to the posting of appropriate security with the City.

III. SITE PREPARATION AND DESIGN REQUIREMENTS

A. GRADING REQUIREMENTS:

1. Site Grading. The site should be graded when possible to encourage percolation into the soil.

2. Berms shall not be placed adjacent to paved areas (sidewalks) such that the toe of slope is less than 4 feet away from the paved area. Slopes on berms with turf shall not exceed 25 percent or 4:1. Berms irrigated by a drip irrigation system and not covered with turf may be placed adjacent to paved area if they are contained by a concrete curb. Slopes of such berms shall not exceed 33 percent or 3:1. Slopes exceeding 3:1 shall have erosion resistant covers consisting of jute netting or erosion resistant ground covers.

3. Slope areas shall be indicated on the planting plan or the Landscape Grading Plan by contour lines. Those areas that exceed allowable turf slope of 4:1 (25 percent) shall be labeled as non-turf areas. Any slope retention devices (i.e., jute netting, retaining walls, etc.) shall be shown on the Landscape Grading Plan.

B. PLANTING DESIGN REQUIREMENTS:

The maximum amount of irrigation water that can be applied to landscaped areas shall not exceed a cumulative total of 40 inches per year or 48 inches for newly planted landscape.

1. Water Use Zones. Plant types shall be grouped so as to have zoned landscape areas that utilize a similar water requirement. The cumulative effect of this zoning shall be to create a moderate water consuming landscape. The zone types shall be designated low, medium, high, and hardscape with reference to the proposed water consumption. Water use values (see Table 1) reflect the relative water use of each type of landscape area.

   To determine if a landscape design is consistent with the water use requirements, first multiply the landscape zone area by the water use value of that zone. Repeat the calculation for each zone. If the design is consistent with the water use requirements then the sum of the products shall not exceed the total landscape area.

TABLE 1 WATER USE VALUES	
Landscape Zone Type	Water Use Value
Hardscape(1)	0.0
Low Use	0.4
Medium Use	1.0
High Use	1.6
(1) Hardscape shall not exceed that percentage of site area as allowed in the City of Vacaville Zoning Ordinance.	

Example 1: A 10,000 sq.ft. landscape area has 35 percent of its landscape classified as a high water use zone, 20 percent as a medium water use zone, 25 percent as a low water use zone and 20 percent as hardscape. Therefore the equivalent water use area is equal to:

1.6 (10,000 sq. ft. x .35)
1.0 (10,000 sq. ft. x .20)
0.4 (10,000 sq. ft. x .25)
\+ 0.0 (10,000 sq. ft. x .20) = 8,600 sq. ft.

Since the equivalent water use area of 8,600 sq. ft. is less than the actual landscape area of 10,000 sq. ft., the design is acceptable.

Example 2: A 10,000 sq.ft. landscape area has 50 percent of its landscape classified as a high water use zone, 20 percent as a medium use zone, and 10 percent as a low use zone. Therefore the equivalent water use area is equal to:

6.0 (10,000 sq. ft. x .50)
1.0 (10,000 sq. ft. x .20)
0.4 (10,000 sq. ft. x .10)

$$\underline{+ \ 0.0 \ (10{,}000 \text{ sq. ft.} \times .20)} = 10{,}400 \text{ sq. ft.}$$

Since the equivalent water use area of 10,400 sq. ft. is greater than the actual landscape area of 10,000 sq. ft., the design is not acceptable.

Water use zones are determined by the highest water use type of plant material in an area that is controlled by an irrigation valve. All plants should be of the same water use type within a zone. However, if there are high water consuming plants in a predominantly low water consuming area, the zone is classified as high water use. Plant water use type is noted in the plant list (Attachment 5). Turf and water bodies are classified as high water use zones.

Water use calculations are to be shown on the planting plan in the format shown in Table 2, Water Use Calculations.

2. Turf Selection and Use. Turf plantings shall be limited to those areas that provide optimum utilization of irrigation equipment and discourage misuse of irrigation water.

   a. Turf will not be permitted in planting areas less than 10 ft. in width to prevent overspray by irrigation heads;

   b. Turf shall not be planted on slopes greater than 25 percent to discourage runoff;

   c. Turf shall not be installed within 10 ft. of the drip line of an existing native oak tree;

   d. Turf varieties shall be selected for suitability to local climate and conditions (low water consumption, heat tolerant, not winter dormant). Suggested varieties include the "Turf Type Tall Fescues" and Dwarf "Turf Type Tall Fescues": Adventure, Avanti, Crossfire, Jaguar, Mustang, Medallion, Medallion Jr, and Rebel Junior. Additional types of turf may be allowed, and the designer is encouraged to consider appropriate level of water consumption when selecting turf species.

3. Non-Turf Plant Selection and Use. Plants selected for use in non-turf areas should be chosen on the basis of their appropriateness to the site. Consideration should be given to those plants that are well suited to the warm summers, cool winters, and prevalent wind conditions. Exotics and high water consumers should be used sparingly in areas of high visibility.

Plants are to be selected from the approved plant list (see Attachment 5). Additional plants not on the approved list may be used if materials are submitted with the planting plans to document their water use. Documentation may be submitted from the list of approved references (see Attachment 1).

TABLE 2

WATER USE CALCULATIONS
Sample Format

Water Use Zone	Plant Name	Area (sq. ft.)	Water Use Factor	Equivalent Water Use Area (sq. ft.)
High	Turf Swimming Pool Azalea indica Camellia japonica	1000 850 250 250	1.6	1600 1360 400 400
Medium	Buxus harlandii Escallonia rubra Hedra helix	2000 400 1500	1.0	
Low	Gazania "Burgundy" Mahonia repens	2000 500	0.4	800 200
Hardscape	-----	600	0.0	0
Total:		9350		8660

4. The specification and use of preemergent chemicals in all appropriate areas of the landscape is encouraged as the first step in promotion of an adequate landscape maintenance program. If specified by the landscape designer, the preemergent needs to be incorporated as per label directions prior to mulching area with bark.

5. Surface Mulch. All non-turf planting areas shall receive a 2 inch layer of mulch to reduce soil temperature and water evaporation. The use of non-porous material under the mulch is not permitted, however, the use of porous weed barriers is encouraged in non-groundcover planted areas. Care should be exercised to avoid root crown coverage by keeping all mulch 3 inches away from root crowns.

   The recommended mulch is a minimum 1/2" to 3/4" bark. Alternatives may be acceptable, however consideration must be taken for slope, stability in wind, and possible flammability of mulch. As stated in Section II.B.2. of Submittal Requirements, mulch selection is to be submitted as part of the landscape planting plan. Additionally, a sample of the actual mulch shall be submitted to the City Landscape Inspector for approval prior to mulch delivery to the site.

6. Screening of backflow prevention devices as follows:

   i. Backflow devices shall be screened on three sides with the side facing the street or driveway left open for visibility and access; screening shall include landscaping and/or a low wood or masonry wall matching adjacent buildings;

   ii. Backflow devices and any visible materials such as insulation shall be painted an industry standard gloss green #A-430814056, or an approved equivalent;

   iii. Backflow devices shall not be located in the sight triangle adjacent to a driveway;

   iv. Backflow devices shall comply with City Standard Specifications.

C. SOIL PREPARATION REQUIREMENTS:

1. Soil pH. The native soil shall be amended as directed by the soil test results to bring the relative alkalinity/acidity within an acceptable range to promote good plant health.

2. Application. All materials that are being added to the soil as amendments shall be thoroughly cultivated into the top 8 inches of soil.

3. Planting Pits. Tree planting pits shall be three times the width of the root ball and one time in depth. Shrub planting pits shall be two times in width and one time in depth.

D. IRRIGATION DESIGN REQUIREMENTS:

1. Drip Irrigation. A drip irrigation or similar system shall be used. Drip systems shall be designed to provide irrigation water within the root zone of the shrubs and trees. Drip systems shall not be controlled by remote control valves which control other types of systems.

2. Spray Irrigation. Spray irrigation systems shall be designed for those areas that are not effectively irrigated with drips systems. All spray systems shall be designed to utilize low volume sprinkler heads. This low volume design will encourage the slow application of water and reduce water runoff. All spray irrigation systems will be designed utilizing pressure regulating sprinkler heads. The appropriate regulator device will be chosen for the applicable sprinkler head.

   Spray irrigation systems designed for turf area shall utilize pop-up heads that are equipped with a minimum of a 4" pop-up. This is to ensure that the spray will not be blocked by the adjacent turf.

3. Remote Control Valves. Irrigation systems shall be valved so that only areas of similar water use and environmental conditions shall be controlled by the same valve. Separate valves shall be required for low, medium, and high water use zones.

4. Automatic Controllers. Each irrigation system shall be controlled with an automatic controller. Controllers shall have enough stations to operate valves of a dissimilar function independently. An example of this is the separation of full sun turf from full shade turf and drip systems from spray systems. Automatic controllers should be equipped with a rain shutoff, exact day alternation/custom programming capability with two independent programs, and three start times per day.

5. Additional Equipment. All spray irrigation systems may be required to provide the following additional equipment if the site conditions or the City feels that it will be advantageous in reducing wasted water.

   a. Check Valves - Incline check valves or check valves installed in heads by the manufacturer to prevent low head drainage;

   b. Soil Moisture Sensor - To measure the actual demand for water that a large turf area has versus the perceived needs as estimated in the irrigation schedule;

   c. Water Meters - Projects with large landscape areas may be required to provide a separate meter for irrigation water;

6. Irrigation Schedules. The designer is encouraged to utilize multiple short cycles to operate spray systems. This is to allow time for water to percolate into the soil deeper and prevent surface saturation and runoff. A typical example might be three 5-minute cycles approximately 15 minutes apart, twice a week.

   Drip system schedules should be developed to run for longer periods of time with greater time between cycles. The goal is to maintain optimum levels of subsurface moisture for the plant root zone. Always consider climate/soil/root depth data when establishing watering frequency for the various plans on your project. If excessive drying, runoff, or puddling occur, adjust the watering time and interval to eliminate the problem and still meet the plant water requirement.

7. The contractor is required to provide equipment operating instructions and copies of the watering schedules to the project owner. Copies of the irrigation schedules will be permanently attached in or near the irrigation controller(s).

8. Irrigation design using an approved, non-potable water source shall comply with the Uniform Plumbing Code Section 603.3.11 using purple pipe to denote non-potable water.

IV. LANDSCAPE MAINTENANCE RECOMMENDATIONS

A. RECOMMENDATIONS:

1. Surface Mulch. All non-turf planting areas should maintain a 2 inch layer of mulch to reduce soil temperature and water evaporation. See Section III.B.5. for mulch recommendations.

2. Slow-Release Nitrogen Fertilizer. The use of slow-release nitrogen fertilizer is recommended to encourage root development and to replace essential nutrients. Excessive fertilization should be discouraged as it will increase the lawns need for water and add to plant stress. While it is desirable to maintain healthy growing foliage, excessive nitrogen can promote excessive growth which wastes water.

3. De-thatching. De-thatching and aerification should be performed as necessary to minimize disease and to reduce water consumption and runoff.

4. Water Audits. Periodic auditing of irrigation systems is recommended to insure efficiency of irrigation coverage and water scheduling. Auditing is recommended when substantial changes to the irrigation equipment and the landscape environment have occurred.

5. Preemergent herbicide use is encouraged, if the product is registered for use in California and Solano County, and applied in accordance with the labeling instructions by a licensed/certified applicator.

V. MODEL HOME LANDSCAPING REQUIREMENTS

A. INTENT:

The intent of these requirements is to provide home buyers with the opportunity to learn about the water conserving landscape requirements and demonstrate the aesthetic qualities of water conserving landscape design. All subdivision model homes shall also comply with Sections B and C below.

B. SIGNAGE:

Signs identifying the landscape as complying with the City's water conserving landscape regulations shall be prominently located in each yard. Additional signs shall be provided pointing out specific aspects and features of the landscape. Examples include drought tolerant plant materials and the drip irrigation system.

C. LANDSCAPE PLANS:

Color presentation copies of landscape plans should be displayed within each model. Plans should call out plant materials in botanical and common names.

ATTACHMENT 1

REFERENCE LIST

The following books are suggested as a bibliography reference list for the selection of plants in addition to the plants listed in Attachment 5. Additional references will be considered.

A Success List of Water-Conserving Plants, Saratoga Horticultural Foundation.

Encyclopedia of Ornamental Grasses, John Greenlee, Rodale Press.

Landscape Plants for Western Regions, An Illustrated Guide to Plants for Water Conservation.

Plants for California Landscapes: A Catalog of Drought-Tolerant Plants, California Department of Water Resources.

Plants for Dry Climates, HP Books.

Select California Native Plants, Saratoga Horticultural Foundation.

Sunset's Western Garden Book, Sunset Books.

Taylor's Guide to Ornamental Grasses, Houghton Mifflin Co., 222 Berkeley Street, Boston, MA 02116.

Trees and Shrubs for Dry California Landscapes, Robert Perry.

Water-Conserving Plants and Landscapes for the Bay Area, Barrie Coate/East Bay Municipal Utility District.

Water-Saving Gardening, Taylor's Guides.

Water Wise Gardening, East Bay Municipal Utility District.

Water Wise Gardening, Sunset Books.

ATTACHMENT 2

SAMPLE IRRIGATION SCHEDULE

PROJECT NAME:

IRRIGATION SCHEDULE: ________________ Season (insert WARM or COOL in blank)

Controller	Station (Valve No.)	System Type	System Precipitation Rate	Total Run Time/Month (hours)	Run Days per Month	Cycles per Day	Cycle Length (min.)
1	1	Spray	.28 in/hr	6.4	12	4	8
1	2	Spray	.28 in/hr	3.3	10	4	5
1	3	Spray	.86 in/hr	4.0	12	2	10
1	4	Spray	.86 in/hr	2.6	10	2	8
1	5	Spray	2.02 in/hr	1.6	8	3	4
1	6	Spray	2.02 in/hr	0.4	4	2	6
2	1	Drip	45 gph	16	2	1	8
2	2	Drip	50 gph	32	4	1	8
2	3	Drip	38 gph	8	1	1	8
2	4	Drip	90 gph	16	2	1	8

NOTE: 1) Use this format to create two irrigation schedules, one cool season and one warm season.
2) Show calculations displaying the total number of inches per year the two schedules will precipitate (see sample on Attachment 3).
3) The total precipitation rate per year shall not exceed 40" (48" for newly planted landscape).
4) These schedules will be permanently attached to the irrigation controller.

ATTACHMENT 3

SAMPLE IRRIGATION SCHEDULE WITH PRECIPITATION CALCULATIONS

To calculate the total number of inches per year for submittal as required under Section II.B.7.a., the following conversions may be used. A calculations sample is displayed for further clarity:

$$\text{Cubic ft/year} = \frac{\text{Gallons/year}}{\text{7.48 cubic ft./gallon}} \qquad \text{Inches/Year} = \frac{\text{Cubic feet/year}}{\text{Total sq. ft. landscaping}} \times 12 \text{ inches}$$

PROJECT NAME: **SAMPLE**							
IRRIGATION SCHEDULE: Warm Season (5 months, May - September)							
Controller	Station (Valve No.)	System Type	System Precipitation Rate	Total Run Time/Month (hours)	Run Days per Month	Cycles per Day	Cycle Length (min.)
1	1	Spray	1.75 in/hr	2.4	8	3	6
1	2	Drip	240 gph	6.0	6	2	30
IRRIGATION SCHEDULE - Cool Season (4 months, October/November and March/April)							
1	1	Spray	1.75 in/hr	0.8	4	1	12
1	2	Drip	240 gph	2.0	4	1	30

STATION 1: WARM SEASON: 11.9 gpm x 60 min/hr = 714 gal/hr x 2.4 hrs/mo x 5 mos = 8,568 gals
COOL SEASON: 11.9 gpm x 60 min/hr = 714 gal/hr x 0.8 hrs/mo x 4 mos = 2,285 gals

STATION 2: WARM SEASON: 6.0 hr/mo x 5 months = 30 hrs x 240 gal/hr = 7,200 gals
COOL SEASON: 2.0 hr/mo x 4 months = 8 hrs x 240 gal/hr = 1,920 gals

TOTAL STATION 1 + STATION 2 = 19,973 gals/yr

19,973 gal/yr / 7.48 cu ft/gal = 2,670 cu ft/yr
2,670 cu ft/897 sq ft area = 2.98 cu ft/yr x 12 in. = <u>35.72 in/yr</u>

ATTACHMENT 4

CERTIFICATE OF COMPLIANCE

CITY OF VACAVILLE
COMMUNITY SERVICES DEPARTMENT
PARK PLANNING DIVISION

I / We certify that based upon periodic site observations, the work has been completed in accordance with the Water Efficient Landscape Requirements, and that the landscape planting and irrigation installation conform to the approved plans and specifications.

Please ensure that this form is delivered to the City Landscape Architect/Landscape Inspector.

____

PROJECT NAME

______________________________ ______________________

SIGNATURE - LANDSCAPE ARCHITECT **DATE**

______________________________ ______________________

PLEASE PRINT NAME **STATE LICENSE NUMBER**

______________________________ ______________________

SIGNATURE - LANDSCAPE CONTRACTOR **DATE**

______________________________ ______________________

PLEASE PRINT NAME **STATE LICENSE NUMBER**

ATTACHMENT 5

RELATIVE WATER REQUIREMENTS OF COMMONLY USED PLANTS

The following is a list of plants that are commonly used in landscape designs with water requirement classifications of low (L), medium (M), or high (H).

The list should not be considered a complete list of plants that can be used in landscape projects. The list is provided to assist the landscape designer in choosing species of appropriate water demands to meet the requirements of this document, and to group species of similar water demands to facilitate efficient irrigation. To use species other than those listed, the designer may provide information indicating the water requirement of the species. Information may include the listing of a plant in an acceptable reference stating its water requirement characteristics, comparing it to a species in the plant list, field data, etc.

Note: Plants with the asterisk (*) should be used in protected areas as they may not be frost tolerant for all locations.

NCN: No Common Name

RELATIVE WATER REQUIREMENTS OF COMMONLY USED PLANTS

EVERGREEN TREES

GENUS SPECIES	CULTIVAR or VARIETY	COMMON NAME	WATER REQUIREMENT
Arbutus menziesii	---	Madrone	L
Calocedrus decurrens	---	Incense Cedar	M
Casuarina stricta	---	Beefwood	L
Cedrus atlanticas	---	Atlas Cedar	L
Cedrus deodara	---	Deodar Cedar	L
Ceratonia siliqua	---	Carob Tree	L
Citrus various species	---	Lemon, Lime, Orange	M
Cupressus glabra	---	Smooth Arizona Cypress	L
Cupressus sempervirens	---	Italian Cypress	L
Eucalyptus camaldulensis	---	Red Gum	L
*Eucalyptus cladocalyx	---	Sugar Gum	L
Eucalyptus gunnii	---	Cider Gum	L
Eucalyptus Peppermint nicholii	---	Nichol's Willow Leafed	L
Eucalyptus polyanthemos	---	Silver Dollar Gum	L

Eucalyptus rudis	---	Flooded Gum	L

GENUS SPECIES	CULTIVAR or VARIETY	COMMON NAME	WATER REQUIREMENT
Eucalyptus sideroxylon	---	Red Ironbark	M
*Geijera parviflora	---	Australian Willow	M
Laurus noblis	---	Sweet Bay	L
Magnolia grandiflora	---	Southern Magnolia	M
Metasequoia glyptostroboides	---	Dawn Redwood	H
Olea europaea	---	Olive Tree	L
Phoenix canariensis	---	Canary Island Date Palm	L
Picea pungens	---	Colorado Spruce	H
Pinus canariensis	---	Canary Island Pine	M
Pinus eldarica	---	NCN	L
Pinus halepensis	---	Aleppo Pine	L
Pinus mugo	---	Swiss Mountain Pine	M
Pinus nigra	---	Austrian Black Pine	H
Pinus patula	---	Jelecote Pine	M
Pinus sabiniana	---	Digger Pine	L
Pinus sylvestris	---	Scotch Pine	M
Pinus thunbergii	---	Japanese Black Pine	L

Pinus torreyana	---	Torrey Pine	L

GENUS SPECIES	CULTIVAR or VARIETY	COMMON NAME	WATER REQUIREMENT
*Podocarpus gracilior	---	Fern Pine	M
Prunus caroliniana	---	Carolina Laurel Cherry	M
Prunus laurocerasus	---	English Laurel	H
Prunus lyonii	---	Catalina Cherry	L
Pyrus kawakamii	---	Evergreen Pear	M
Quercus agrifolia	---	Coast Live Oak	L
Quercus ilex	---	Holly Oak	L
Quercus suber	---	Cork Oak	L
Quercus wislizenii	---	Interior Live Oak	L
Rhus lancea	---	African Sumac	L
*Schinus molle	---	California Pepper	L
Sequoia sempervirens variance	"Aptos Blue"	Coast Redwood	M
Thuja plicata	---	Western Red Cedar	H
Trachycarpus fortunei	---	Windmill Palm	M
Umbellularia californica	---	California Bay	M
Washingtonia filifera	---	California Fan Palm	M

Washingtonia robusta	---	Mexican Fan Palm	M

DECIDUOUS TREES

GENUS SPECIES	CULTIVAR or VARIETY	COMMON NAME	WATER REQUIREMENT
Albizia julibrissin	---	Silk Tree	L
Betula pendula	---	European White Birch	H
Betula pendula	"Dalecarlica"	Cutleaf Weeping Birch	H
Catalpa speciosa	---	Western Catalpa	M
Celtis australis	---	European Hackberry	L
Celtis occidentalis	---	Common Hackberry	L
Celtis sinensis	---	Chinese Hackberry	L
Cercidium floridum	---	Palo Verde	L
Cercis canadensis	---	Eastern Redbud	L
Cercis occidentalis	---	Western Redbud	L
Crataegus lavellei	---	English Hawthorne	M
Fraxinus holotricha	"Moraine"	Moraine Ash	M
Fraxinus latifolia	---	Oregon Ash	H
Fraxinus oxycarpa	"Raywood"	Raywood Ash	M
Fraxinus pennsylvanica	---	Green Ash	M

Ginkgo biloba	---	Maidenhair Tree	M

GENUS SPECIES	CULTIVAR or VARIETY	COMMON NAME	WATER REQUIREMENT
Gleditsia triacanthos	---	Honeylocust	M
Juglans Californica	---	CA Black Walnut	L
Koelreuteria bipannata	---	Chinese Flame Tree	M
Koelreuteria paniculata	---	Golden Rain Tree	M
Laburnum watereri	---	Goldenchain Tree	H
Lagerstroemia indica	---	Crape Myrtle	L
Liquidambar styraciflua	---	Sweet Gum	M
Liriodendron tulipifera	---	Tulip Tree	H
Magnolia soulangiana	---	Saucer Magnolia	H
Malus floribunda	---	Crabapple	H
Pistacia chinensis	---	Chinese Pistache	L
Platanus acerifolius	"Yarwood"	London Plane Tree	M
Platanus acerifolius	"Bloodgood"	London Plane Tree	M
Platanus occidentalis	---	American Sycamore	M
Platanus racemosa	---	California Sycamore	M
Populus fremontii	---	Fremont Cottonwood	M
Populus nigra	"Theivistinia"	Lombardy Poplar	H

Prunus blireiana	---	Purple Leaf Plum	M

GENUS SPECIES	CULTIVAR or VARIETY	COMMON NAME	WATER REQUIREMENT
Prunus cerasifera	---	Flowering Plum	M
Prunus serrulata	---	Japanese Flowering Cherry	H
Prunus subhirtella	---	Flowering Cherry	H
Prunus yedoensis	---	Yoshino Flowering Cherry	H
Pyrus calleryana	---	Bradford Pear	M
Quercus coccinea	---	Scarlet Oak	M
Quercus douglasii	---	Blue Oak	L
Quercus kelloggii	---	California Black Oak	M
Quercus lobata	---	Valley Oak	L
Quercus palustris	---	Pin Oak	M
Quercus robur	---	English Oak	M
Quercus rubra	---	Red Oak	M
Quercus shumardii	---	Shumard Red Oak	M
Sapium sebiferum	---	Chinese Tallow Tree	M
Sophora japonica	---	Japanese Pagoda Tree	M
Sorbus aucuparia	---	European Mountain Ash	H
Tilia cordota	---	Little Leaf Linden	H

LARGE SHRUBS

GENUS SPECIES	CULTIVAR or VARIETY	COMMON NAME	WATER REQUIREMENT
Arbutus unedo	---	Strawberry Tree	M
Arctostaphylos manzanita	"Dr. Hurd"	Common Manzanita	L
Atriplex lentiformis	---	Quailbush	L
Atriplex lentiformis	breweri	Brewer Saltbush	L
Callistemon citrinus	---	Lemon Bottlebrush	L
Callistemon viminalis	---	Weeping Bottlebrush	L
Ceanothus ---	"Ray Hartman"	NCN	L
Ceanothus ---	"Sierra Blue"	NCN	L
Ceanothus hearstiorum	---	Blue Blossom	L
Chamaerops humilis	---	Mediterranean Fan Palm	M
Cocculus laurifolius	---	NCN	H
Cornus stolonifera	---	Red Twig Dogwood	H
Corylus californica cornuta	---	Western Hazelnut	H
Dodonaea viscosa	"Purpurea"	Purple Hop Seed Bush	L
Elaeagnus angustifolia	---	Russian Olive	L

Elaeagnus pungens	—	Silverberry	L
Eriobotrya deflexa	—	Bronze Loquat	M

GENUS SPECIES	CULTIVAR or VARIETY	COMMON NAME	WATER REQUIREMENT
Eriobotrya japonica	---	Loquat	M
Feijoa sellowiana	---	Pineapple Guava	M
Fremontodendron ---	"California Glory"	Flannel Bush	L
Fremontodendron ---	"Pacific Sunset"	Flannel Bush	L
Grevillea ---	"Canberra"	NCN	M
*Grewia occidentalis	---	Lavender Starflower	H
Hakea suaveolens	---	Sweet Hakea	L
Heteromeles arbutifolia	---	Toyon	L
Ilex cornuta	---	Chinese Holly	H
Ilex vomitoria	---	Yaupon	H
Ligustrum japonicum	---	Japanese Privet	H
Ligustrum lucidum	---	Glossy Privet	H
Ligustrum vulgare	---	Common Privet	H
Magnolia stellata	---	Star Magnolia	H
*Myoporum laetum	---	NCN	L
Myrica califonica	---	Pacific Wax Myrtle	M
Osmanthus fragrans	---	Sweet Olive	M

Osmanthus heterophylla	--	Holly-leaf Osmanthus	M

GENUS SPECIES	CULTIVAR or VARIETY	COMMON NAME	WATER REQUIREMENT
Photinia fraseri	---	Photinia	M
Photinia serrulata	---	Chinese Photinia	M
Pieris forrestii	---	Chinese Pieris	H
Pieris japonica	---	Lily-Of-The-Valley-Shrub	M
Pittosporum crassifolium	---	Pittosporum	M
Pittosporum tobira	---	Tobira	M
Pittosporum tobria	---	Tobria Vangata	M
Podocarpus macrophyllus	---	Yew Pine	H
Punica granatum	---	Pomegranate	L
Pyracantha coccinea	---	Firethorne	L
Pyracantha fortuneana	---	Firethorne	L
Rhamnus alaternus	---	Italian Buckthorn	L
Rhamnus californica	---	Coffeeberry	L
Rhamnus crocea	ilicifolia	Hollyleaf Redberry	L
Rhus typhina	---	Staghorn Sumac	L
Sambucus caerulea	---	Blue Elderberry	H
Sambucus mexicana	---	California Elderberry	H

Syzygium paniculatum	—	Australian Bush Cherry	M

GENUS SPECIES	CULTIVAR or VARIETY	COMMON NAME	WATER REQUIREMENT
Taxus baccata	---	English Yew	M
Taxus media	---	Yew	M
Thuja occidentalis	---	American Arborvitae	H
Viburnum burkwoodii	---	Viburnum	M
Viburnum plicatum	---	Japanese Snowball	M
Viburnum suspensum	---	Sandankwa Viburnum	M
Viburnum tinus	---	Laurustinus	L
Xylosma congestum	---	Xylosma	L
Yucca brevifolia	---	Joshua Tree	L
Yucca filamentosa	---	Yucca	L
Yucca gloriosa	---	Spanish Dagger	L

MEDIUM SHRUBS

GENUS SPECIES	CULTIVAR or VARIETY	COMMON NAME	WATER REQUIREMENT
Aloe arborescens	---	Tree Aloe	L
Arctostaphylos bakeri	"Louis Edmunds"	NCN	L
Arctostaphylos	"Sunset"	NCN	L
Aucuba japonica	---	Japanese Aucuba	H
Baccharis pilularis	---	Coyote Brush	L
Berberis darwinii	---	Darwin Barberry	L
Berberis julianae	---	Wintergreen Barberry	L
Berberis mentorensis	---	NCN	L
Berberis thunbergii	---	Japanese Barberry	L
Buxus harlandii	---	Korean Boxwood	M
Buxus microphylla	japonica	Japanese Boxwood	M
Buxus sempervirens	---	Common Boxwood	M
Callistemon citrinus	"Jeffersii"	Dwarf Bottlebrush	L
Calycanthus occidentalis	---	Spice Bush	H
Camellia japonica	---	Camellia	H
Camellia sasanqua	---	Sasanqua Camellia	H

GENUS SPECIES	CULTIVAR or VARIETY	COMMON NAME	WATER REQUIREMENT
Carpenteria californica	---	Bush Anemone	L
Cassia artemisioides	---	Feathery Cassia	L
Ceanothus ---	"Jeans"	NCN	L
Ceanothus ---	"Concha"	NCN	L
Ceanothus ---	"Dark Star"	NCN	L
Ceanothus ---	"Frosty Blue"	NCN	L
Ceanothus ---	"Joyce Coulter"	NCN	L
Ceanothus ---	"Julia Phelps"	NCN	L
Ceanothus ---	"Skylark"	NCN	L
Ceanothus glorious	porrectus	Point Reyes Ceanothus	L
Ceanothus griseus Hor	"Yankee Point"	NCN	L
Ceanothus griseus Hor	"Santa Ana"	NCN	L
Chaenomeles ---	---	Flowering Quince	M
Choisya ternata	---	Mexican Orange	H
Cistus hybridus	---	White Rockrose	L
Cistus landaifer	---	Crimson-Spot Rockrose	L
Cistus purpureus	---	Orchid Rockrose	L

Coleonema pulchrum	---	Pink Breath of Heaven	M

GENUS SPECIES	CULTIVAR or VARIETY	COMMON NAME	WATER REQUIREMENT
Coprosma repens	---	Mirror Plant	L
Correa alba	---	Australian Fuchsia	L
Correa pulchella	---	Australian Fuchsia	L
Cotoneaster apiculatus	---	Cranberry Cotoneaster	L
Cotoneaster lacteus	---	Red Clusterberry	L
Cycas revoluta	---	Sago Palm	M
Cyperus alternifolius	---	Umbrella Plant	H
Cyperus papyrus	---	Papyrus	H
Cytisus praecos	---	Warminster Broom	L
Deutzia gracilis	---	Slender Deutzia	M
*Dicksonia antarctica	---	Tasmanian Tree Fern	H
Diosma pulchrum	---	Pink Breath of Heaven	M
Echium fastuosum	---	Pride of Madera	L
Eriogonum fasciculatum	---	California Buckwheat	L
Eriogonum giganteum	---	St. Catherine's Lace	L
Escallonia ---	"Fradesii"	NCN	M
Escallonia rubra	---	NCN	M

Eonymus alata	"Compacta"	Dwarf Winged Euonymus	M

GENUS SPECIES	CULTIVAR or VARIETY	COMMON NAME	WATER REQUIREMENT
Fatsia japonica	---	Japanese Aralia	H
Forsythia intermedia	---	NCN	M
Galavezia speciosa	---	Island Bush-Snapdragon	L
Gardenia jasminoides	---	Gardenia	H
Garrya elliptica	---	Silktassel	M
Grevillea ---	"Noellii"	NCN	M
*Hibiscus rosa-sinensis	---	Tropical Hibiscus	H
Hybiscus macrophylla	---	Garden Hydrangea	M
Ilex altaclarensis	---	Wilson Holly	H
Ilex crenata	---	Japanese Holly	H
Juniperus chinensis	---	Chinese Juniper	L
Juniperus scopulorum	---	Juniper	M
Lavandula angustifolia	---	English Lavender	L
Leucophyllum frutescens	---	Texas Ranger	L
Mahonia aquifolium	---	Oregon Grape	L
Mahonia lomariifolia	---	Ventian Blind Mahonia	L
Mahonia nevinii	---	Nevin Mahonia	L

Mahonia pinnata	—	California Holly Grape	L

GENUS SPECIES	CULTIVAR or VARIETY	COMMON NAME	WATER REQUIREMENT
Mahonia repens	---	Creeping Mahonia	L
Myrtus communis	---	True Myrtle	L
Nandina domestica	---	Heavenly Bamboo	M
Nerium oleander	---	Oleander	L
Philadelphus virginalis	---	Mock Orange	M
Phormium tenax	---	New Zealand Flax	M
Pittosporum tobira	"Wheeler's Dwarf"	Dwarf Tobira	M
Plumbago auriculata	---	Cape Plumbago	M
Podocarpus macrophyllus	maki	Shrubby Yew Pine	M
Polygala dalmaisiana	---	Sweet Pea Shrub	M
Rhus ovata	---	Sugar Bush	M
Ribes aureum	---	Golden Current	M
Ribes sanguineum	---	Pink Winter Current	M
Rosmarinus officinalis	---	Rosemary	L
Salvia clevelandii	---	Sage	L
Salvia greggii	---	Sage	L
Salvia leucophylla	---	Purple Sage	L

Sarcococca ruscifolia	---	NCN	M

GENUS SPECIES	CULTIVAR or VARIETY	COMMON NAME	WATER REQUIREMENT
Spiraea camtoniensis	---	NCN	M
Spiraea prunifolia	"Plena"	Bridal Wreath Spiraea	M
Spiraea thunbergii	---	NCN	M
Spiraea vanhouttei	---	NCN	M
Syringa persica	---	Persian Lilac	H
Syringa vulgaris	---	Common Lilac	H
Ternstroemia gymnanthera	---	NCN	H
Trichostema lanatum	---	Wooly Blue Curls	L
*Weigela florida	---	NCN	H
Woodwardia fimbriata	---	Giant Chain Fern	H
Yucca aloifolia	---	Spanish Bayonet	L

SMALL SHRUBS

GENUS SPECIES	CULTIVAR or VARIETY	COMMON NAME	WATER REQUIREMENT
Aloe vera	---	Barbados Aloe	M
Andromeda polifolia	---	Bog Rosemary	H
Arctostaphylos densiflora	"Howard McMinn"	Vine Hill Manzanita	L
Arctostaphylos densiflora	"Sentinel"	Sentinel Manzanita	L
Arctostaphylos edmundsii	"Carmel Sur"	Little Sur Manzanita	L
Arctostaphylos ----	"Emerald Carpet"	Emerald Carpet Manzanita	L
Arctostaphylos hookeri	"Wayside"	Monterey Manzanita	L
Arctostaphylos uva-ursi	---	Bearberry	L
Arctostaphylos uva-ursi	"Radiant"	NCN	L
Arctostaphylos uva-ursi	"Woods Compact"	NCN	L
Artemisia pycnocephala	---	Sandhill Sage	L
Artemisia stelleriana	---	Dusty Miller	L
*Asparagus densiflorus	"Sprengeri"	Sprenger Asparagus	M
Athyrium filix-femina	---	Lady Fern	H
Azalea Belgian Indica	---	Shade Azaleas	H
Azalea Southern Indica	---	Sun Azaleas	H

Ceanothus gloriosus	"Anchor Bay"	NCN	L

GENUS SPECIES	CULTIVAR or VARIETY	COMMON NAME	WATER REQUIREMENT
Ceanothus gloriosus	exaltatus "Emily Brown"	NCN	L
Chaenomeles ---	---	Flowering Quince	M
Cistus salviifolius	"Prostratus"	Sageleaf Rockrose	L
Cistus skanbergi	"Low Pink"	NCN	L
Convolvulus cneorum	---	Bush Morning Glory	L
Coprosma kirkii	---	NCN	L
Cotoneaster dammeri	---	Bearberry Cotoneaster	L
Cotoneaster horizontalis	---	Rock Cotoneaster	L
Cotoneaster microphyllus	---	Rockspray Cotoneaster	L
Cotoneaster microphullus	thymifolius	NCN	L
Dietes bicolor	---	Butterfly Iris	L
Dietes vegata	---	Butterfly Iris	L
Escallonia ---	"Newport Dwarf"	Dwarf Escallonia	M
Euonymus fortunei	---	NCN	M
Euonymus japonica	---	Evergreen Euonymus	M
*Fatshedera lizei	---	NCN	H
Gailtheria shallon	---	Sasal	M

Genista lydia	---	Broom	L

GENUS SPECIES	CULTIVAR or VARIETY	COMMON NAME	WATER REQUIREMENT
Genista pilosa	"Vancouver Gold"	Broom	L
Helianthemum ---	---	Sunrose	L
Jasminum mesnyi	---	Primrose Jasmine	L
Juniperus chineses	procumbens	Japanese Garden Juniper	M
Juniperus horizontalis	"Bar Harbor"	Bar Harbor Juniper	M
*Myrsine africana	---	African Boxwood	M
Nephrolepis cordifolia	---	Sword Fern	H
Polystichum munitum	---	Sword Fern	H
Potentilla fruticosa	---	Shrubby Potentilla	H
Ribes viburnifolium	---	Evergreen Current	M
Salvia leucantha	---	Mexican Bush Sage	L
Santolina chamaecyparissus	---	Lavender Cotton	L
Santolina virens	---	NCN	L
Sollya heterophylla	---	Australian Bluebell Creeper	H
Spiraea bumalda	---	NCN	M
Spiraea nipponica tosaensis	"Snowmound"	NCN	M
Viburnum davidii	---	Viburnum	H

Zauschneria californica	—	California Fuchsia	L

PERENNIALS

GENUS SPECIES	CULTIVAR or VARIETY	COMMON NAME	WATER REQUIREMENT
Alpinia zerumbet	—	Shell Ginger	H
Arenaria verna	—	Scotch Moss	H
Aspidistra elatior	—	Cast Iron Plant	H
Berginia cordifolia	—	Heartleaf Berginia	M
Campanula various species	—	Bell-Flower	H
Centaurea cineraria	—	Dusty Miller	L
Cheiranthis cheiri	—	Wallflower	L
*Chrysanthemum frutescens	—	Marguerite	H
Chrysanthemum maximum	—	Shasta Daisy	M
*Clivia miniata	---	Kaffir Lily	H
*Cyperus alternifolius	—	Umbrella Plant	H
Cyperus papyrus	—	Papyrus	H
*Dianthus caryophyllus	---	Carnation	M
Diascia rigescens	---	Twinspur	M

Diascia —	"Ruby Field"	Twinspur	M
Eriogonum arborescens	—	Santa Cruz Island Buckwheat	L

GENUS SPECIES	CULTIVAR or VARIETY	COMMON NAME	WATER REQUIREMENT
Eriogonum croatum	---	Saffron Buckwheat	L
Eriogonum umbellatum	---	Sulfur Flower	L
*Euryops pectinatus	---	Euryops	M
Felicia Amelloides	---	Blue Marguerite	M
Hemerocallis sp.	---	Daylilies	M
Heuchera sanguinea	---	Coral Bells	M
Heuchera ---	"Santa Ana Cardinal"	Coral Bells	M
Iberis sempervirens	---	Evergreen Candytuft	M
Iris douglasiana	---	Iris	H
Kniphofia uvaria	---	Red Hot Poker	L
Liriope muscari	---	Big Blue Lily Turf	H
Liriope spicata	---	Creeping Lily Turf	H
Lupinus polyphyllus	---	Lupine	H
Oenothera berlandieri	---	Mexican Evening Primrose	L
Oenothera stubbei	---	Baja Evening Primrose	L
*Pachysandra terminalis	---	Japanese Spurge	M
Pennisetum setaceum	---	Fountain Grass	L

Penstemon gloxinioides	---	Garden Penstemon	L

GENUS SPECIES	CULTIVAR or VARIETY	COMMON NAME	WATER REQUIREMENT
Phyla nodiflora	---	Lippia	M
Romneya coulteri	---	Matilija Poppy	M
Sagina subulata	---	Irish Moss	H
*Saxifraga rosacea	---	Saxifrage	H
Saxifraga stolonifera	---	Strawberry Geranium	H
Scaevola ---	"Mauve Cluste"	NCN	M
Sisyrinchium bellum	---	Blue-Eyed Grass	H
Sisyrinchium californicum	---	Yellow-Eyed Grass	H
Sisyrinchium macounii	---	NCN	H
*Veronica hybrids	---	Veronica	H
Zantedeschia aethiopica	---	Calla Lilly	H

GROUND COVER

GENUS SPECIES	CULTIVAR or VARIETY	COMMON NAME	WATER REQUIREMENT
Arctotheca calendula	---	Cape Weed	M
Baccharis pilularis	"Twin Peaks"	Dwarf Coyote Brush	L
*Carpobrotus edulis	---	Ice Plant	M
Duchesnea indica	---	Indian Mock Strawberry	H
Festuca ovina	"Glauca"	Blue Fescue	L
Fragaria chiloensis	---	Wild Strawberry	H
Gazania ---	---	Clumping Gazania	L
Hedera helix	---	English Ivy	M
Herniaria glabra	---	Green Carpet	H
Hypericum calcycin	---	Aaron's Beard	M
*Myoporum parvifolium	"Putah Creek"	NCN	L
Ophiopogon japonicus	---	Mondo Grass	H
Potentilla tabernaemontanii	---	Spring Cinquefoil	H
Thymus citriodorus	---	Lemon Thyme	L
Thymus praecox arcticus	---	Mother-of-Thyme	L
Vinca major	---	Periwinkle	L

Vinca minor	---	Dwarf Periwinkle	L

VINES

GENUS SPECIES	CULTIVAR or VARIETY	COMMON NAME	WATER REQUIREMENT
Akebia quinata	---	Five Leaf Akebia	M
Ampelopsis veitchi	---	Blueberry Climber	M
Campsis radicans	---	Trumpet Creeper	M
Clematis armandii	---	Evergreen Clematis	H
Clytostoma callistegioides	---	Violet Trumpet Vine	M
Distictis buccinatoria	---	Blood Red Trumpet Vine	H
Ficus pumila	---	Creeping Fig	H
Gelsemium sempervirens	---	Carolina Jessamine	M
Jasminum polyanthum	---	Jasmine	M
Lonicera heckrotti	---	Gold Flame Honeysuckle	M
Lonicera japonica	"Halliana"	Hall's Honeysuckle	M
Macfadyena unguis-cati	---	Yellow Trumpet Vine	L
Parthenocissus quinquefolia	---	Virginia Creeper	M
Parthenocissus tricuspidata	---	Boston Ivy	M
Passiflora alatocaerulea	---	Passion Vine	M

Rosa banksiae	—	Lady Banks Rose	M

GENUS SPECIES	CULTIVAR or VARIETY	COMMON NAME	WATER REQUIREMENT
*Solanum jasminoides	---	Potato Vine	M
Trachelosperum asiaticum	---	Asian Jasmine	M
Trachelosperum jasminoides	---	Star Jasmine	M
Vitis californica	---	California Grape	H
Wisteria floribunda	---	Japanese Wisteria	M
Wisteria sinensis	---	Chinese Wisteria	M

TECHNICAL MEMORANDUM Date: December 18, 2009

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PROJECT DESCRIPTION: Comparison of the City of Vacaville Water Efficient Landscape Regulations with the State of California Model Water Efficient Landscape Ordinance

As requested by the City of Vacaville (City), Nolte Associates (Nolte) compared the City of Vacaville Water Efficient Landscape Regulation (City Regulation) with the State of California Model Water Efficient Landscape Ordinance (MWELO). The two documents are generally consistent. Significant differences are described in detail in this memorandum.

A section by section comparison of MWELO and the City Regulation is provided in Table 1. Table 1 includes three columns. The first column is a section by section summary of MWELO. The second column summarizes City Regulation requirements that are applicable with the MWELO section. The third column includes a comparison of the MWELO section and applicable City Regulation requirements.

The most significant difference in MWELO and the City Regulation is the method to determine if a landscape project is water efficient. MWELO requires the calculation of the maximum applied water allowance (MAWA) and estimated total water use (ETWU). If the sum of the ETWUs for the entire landscape does not exceed MAWA, the landscape is determined to be water efficient. MAWA and ETWU are determined using the following equations:

$$MAWA = ET_o(0.62)(0.7LA + 0.3SLA)$$

$$ETWU = ET_o(0.62)(PF \cdot HA/IE + SLA)$$

Where, ET_o = Reference Evapotranspiration Rate
0.62 is a conversion factor
LA = Landscaped Area
SLA = Special Landscape Area
PF = Plant Factor
HA = Hydrozone Area
IE = Irrigation Efficiency

The SLA is defined in MWELO as “an area of landscape dedicated solely to edible plants, areas irrigated with recycled water, water features using recycled water and areas dedicated to active play such as parks, sports fields, golf courses, and where turf provides a playing surface”. Plant Factor determines the amount of water required by plants when multiplied by ET_o, and are derived from the Department of Water Resources publication “Water Use Classification of Landscape Species” (WUCOLS). Irrigation Efficiency (IE) is the ratio of beneficial water to total applied water. The minimum average IE allowed in MWELO is 0.71.

The City Regulation requires the calculation of an equivalent water use area (EWUA) for each irrigation zone. If the sum of the EWUAs for the entire landscape does not exceed the total landscape area, the landscape is considered water efficient. In addition, the City Regulation requires that the maximum amount of irrigation water not exceed a cumulative total of 40 in/yr or 48 in/yr of newly planted landscape.

Although the two methods of determining water efficiency do not appear to be consistent, simple algebraic manipulation can put the MWELO method in a form that allows comparison with the City Regulation method. Starting with a mathematical statement of the MWELO water efficiency statement:

$$\text{MAWA} \geq \text{ETWU}$$

The definitions of MAWA and ETWU yields:

$$ET_o(0.62)(0.7LA + 0.3SLA) \geq ET_o(0.62)(PF \cdot HA/IE + SLA)$$

Reducing common factors yields:

$$0.7LA + 0.3SLA \geq PF \cdot HA/IE + SLA$$

Combining like terms yields:

$$0.7LA - 0.7SLA \geq PF \cdot HA/IE$$

Rearranging yields:

$$LA - SLA \geq (PF/0.7IE)HA$$

At this point it is important to note that MWELO defines LA such that it includes the SLA. The expression LA – SLA can therefore be interpreted as the total landscape area without special landscape areas, denoted in this technical memorandum as LA*. The MWELO criterion now becomes:

$$LA^* \geq (PF/0.7IE)HA$$

Noting that PF and IE are constants for each hydrozone, the MWELO criterion becomes:

$$LA^* \geq C \cdot HA \tag{1}$$

$$C = PF/(0.7IE) \quad (2)$$

The City Regulation can be expressed as:

$$TLA \geq EWUA$$

$$EWUA = K \cdot HA$$

Where, TLA = Total Landscape Area
EWUA = Equivalent Water Use Area
K = Water Use Value defined in City Regulation

The City Regulation simplifies to:

$$TLA \geq K \cdot HA \quad (3)$$

By comparing Equations 1 and 3, it can be seen that the MWELO and City Regulation criteria are similar in that a constant dependant on the type of plant in a zone is multiplied by the area of that zone. The sum of these products must be less than the landscape area. The two criteria area consistent if the landscape area is determined in the same manner, and the constants are similar.

The MWELO criterion (Equation 1) ignores special landscape areas. Recall that LA* is the total landscaped area less the special landscape area, and that special landscape areas are not included in the right hand side of Equation 1. The City Regulation does not include a provision for special landscape areas. Areas that would be treated as SLAs under MWELO are not considered differently in the City Regulation. This difference causes MWELO to be more stringent when the SLA would be a low or medium water use zone, such as a permanent edible plant area or planted area irrigated with recycled water, and less stringent when the SLA is a high water use area, such as a turf area used as a sport field or irrigated with recycled water.

The City Regulation defines water use values as 0 for hardscaped areas, 0.4 for low water use areas, 1.0 for moderate water use areas, and 1.6 for high water use areas. MWELO effectively has a similar constant defined in Equation 2. The plant factor, equivalent to the species factor defined in WUCOLS, is defined <0.1 for very low water use areas, 0.1 – 0.3 for low water use areas, 0.4 – 0.6 in moderate water use areas, and 0.7 – 1.0 in high water use areas. WUCOLS provides a range to allow landscape designers to use their judgment and experience to account for site specific conditions and microclimates. WUCOLS recommends using a value in the middle of the range if the designer has little experience with a species in that area. Using these middle values (0.2 for low water use areas, 0.5 for moderate water use areas, and 0.8 for high water use areas), and the minimum average irrigation efficiency allowed by MWELO of 0.71,the MWELO constant, C=PF/(0.7IE), is equivalent to the water use values defined in the City Regulation.

In addition to the criterion described above, the City Regulation has an additional requirement that the total annual applied irrigation water shall not exceed 40 in/yr. The application rate can be defined as the volume of applied water divided by the application area. The maximum volume of water that may be applied based on MWELO is the MAWA. The MAWA can be converted to an application rate by dividing by the irrigated area:

$$\text{Application Rate} = \text{MAWA/LA} = 0.7ET_o$$

The above expression assumes that SLA = 0, which is reasonable because the City Regulation does not recognize SLAs. Recall that the factor of 0.62 in the MAWA definition is a unit conversion factor. Based on a distance-weighted average of evapotranspiration data from California Irrigation Management Information System stations in Dixon (Station 121), Hastings Tract (Station 122), and Suisun Valley (Station 123), the reference annual evapotranspiration rate for the City is 55 in/yr. The application rate derived from MWELO ($0.7ET_o$) is 39 in/yr, which is consistent with the maximum annual applied irrigation rate of 40 in/yr required in the City Regulation.

Based on this analysis, the City Regulation is significantly consistent with MWELO. Notable differences between MWELO and City Regulation include:

1. The method of determining if a landscape is water efficient.
2. MWELO requires stormwater BMPS that retain rainfall to be retained and percolate on the landscape to be identified on the plans, and encourages the incorporation of these BMPS into landscape design.
3. MWELO and the City Regulation require different soil analyses to be included as part of the Soil Management Report.
4. MWELO requires irrigation systems to be controlled by evapotranspiration or soil moisture sensors. The City Regulation only specifies soil moisture sensors “when required”.
5. MWELO requires the submittal of a regular maintenance schedule. The City Regulation only makes recommendations as to how landscapes are to be maintained.
6. MWELO requires landscapes to allow for the current and future use of recycled water in areas that recycled water may be available in the foreseeable future. The City Regulation does not require landscapes to allow for irrigation with recycled water.
7. MWELO requires the City to provide water efficient landscaping information to new homeowners. The City Regulation does not have this requirement.

TABLE 1

COMPARISON OF CITY WATER EFFICIENT LANDSCAPE REGULATIONS WITH STATE MODEL WATER EFFICIENT LANDSCAPE ORDINANCE

State of California Model Water Efficient Landscape Ordinance Requirements	City of Vacaville Water Efficient Landscape Regulations	Discussion
§490 – Purpose Describes the purpose of MWELO	§I.A – Purpose Describes the purpose of the City Regulation	The purpose of MWELO and the City Regulation are consistent.
§490.1 – Applicability 1. New public agency or private development construction and rehabilitated landscapes with landscape area >2,500 ft^2 requiring a permit, plan check, or design review. 2. New developer-installed construction and rehabilitated landscapes in single-family or multi-family projects with landscape area >2,500 ft^2 requiring a permit, plan check, or design review. 3. New homeowner-provided or –hired construction landscapes in single family and multi-family residential projects with landscape area >5,000 ft^2 requiring permit, plan check, or design review. 4. Existing landscapes (see §493) 5. Cemeteries (see §492.2,492.11,492.12) 6. Not applicable to registered historic sites, ecological restoration projects without permanent irrigation system, mined land reclamation projects without permanent irrigation systems, and plant collections open to the public.	Requirements applicable to all new and rehabilitated landscaping for commercial, industrial, institutional, multi-family residential, public and private recreational/open space areas, roadways, medians, model home complexes, and single family residential units where landscaping is installed by developer as part of purchase price. (§I.B.) Single family residential landscapes installed by homeowner and projects irrigated with reclaimed water are exempt. (§I.B.) Public Works Director may exempt project due to extenuating conditions as long as substantial compliance is obtained. (§I.B.)	The City Regulations differ from MWELO in the following ways: 1. MWELO has minimum landscape area requirements. City Regulation is more stringent 2. The MWELO requirements for cemeteries reference sections for new construction. Although the City Regulation does not specifically mention cemeteries, they would be covered under §I.B. 3. The City Regulation does not contain any requirements for existing landscapes. MWELO includes requirements for landscapes over 1 acre in size that were installed before January 1, 2010. 4. MWELO lists several situations that MWELO is not applicable. The City Regulation states that the Public Works Director may except projects due to extenuating conditions.
§491 – Definitions Includes definitions used the MWELO	§I.C – Definitions Includes definitions used in the City Regulation.	The definitions are specific to each ordinance
§492 – Provisions for New Construction or Rehabilitated Landscapes Local agency may designate another agency to implement some or all of the requirements in MWELO	N/A	The City Regulation is largely consistent with MWELO and does designate another party to implement any requirements.
§492.1 – Compliance with Landscape Documentation Package (New Landscapes) Describes permitting or plan check process	The City Regulation does not explicitly describe the actions taken by the City. (§I.B)	Although the City Regulation does not specifically state what the responsibilities of the City, the submittal requirements are stated throughout the regulation. The City Regulation is consistent with MWELO.
§492.2 – Penalties (New Landscapes) The City may establish and administer penalties to the extent permitted by law.	The regulations shall be enforced as per §13.20.030 of the Vacaville Municipal Code.	MWELO and City Regulation are consistent.
§492.3 – Elements of Landscape Documentation Package (New Landscapes) Items to be included in package include project information, water efficient landscape worksheet, soil management report, landscape design plan, irrigation design plan, and grading plan	The elements required to be submitted to the City are described throughout the City Regulation.	MWELO and City Regulation are consistent.
§492.4 – Water Efficient Landscape Worksheet (New Landscapes) Shall include: 1. Hydrozone information table 2. Water budget calculation, adhering to: a. Plant factor from WUCOLS b. Water features in high water use hydrozone, temporarily irrigated areas in low water use hydrozone c. SLA identified and water use calculated d. SLA ETAF $\leq$ 1 3. MAWA calculation, ETWU < MAWA	1. Estimated plant water use calculation for each planting area shall be submitted in the planting plan (§II.B.6.) 2. Sum of the Products of Zone Areas and Water Use Value shall not exceed the total landscape area (§III.B.1)	The most important aspect of MWELO §492.4 is the definition of compliance with MWELO, i.e. that ETWU $\leq$MAWA. The method of determining compliance is different between MWELO and the City Regulation. The City Regulation is more stringent in most situations. See technical memorandum discussion for justification.

State of California Model Water Efficient Landscape Ordinance Requirements	City of Vacaville Water Efficient Landscape Regulations	Discussion
§492.5 – Soil Management Report (New Landscapes) 1. Soil samples are required to be analyzed by a lab and may include soil texture, infiltration rate, pH, total soluble salts, sodium, percent organic matter, and recommendations. 2. Soil analysis report submitted as part of Landscape Documentation Package if not significant grading, or as part of Certificate of Completion if significant grading 3. Soil analysis report shall be available to the landscape and irrigation designer. 4. Submit documentation verifying implementation of soil analysis report recommendations with Certificate of Completion	§II.B.5. Soil Test Information 1. Soil samples taken after rough grading and all work that may cause compaction. 2. Soils samples collected for every 2 acres or less. Sample locations shall be noted on site plan. Soil test not required if area < ¼ acre and no turf or ≤3 lots where builder installs front yard as part of purchase price with no turf. 3. All soil samples showing adverse compaction shall receive mitigation recommendations in the soils report. 4. The soils report shall include: a. Soil permeability (in/hr) b. Soil texture c. Cation exchange capacity d. Soil fertility (nitrogen, potassium, phosphorous, pH, organic matter, and EC) e. Amendment recommendations f. If soil sampling prior to grading, note shall be placed on drawings requiring soil test when grading is complete. Native soil pH shall be amended as directed by soil tests to bring pH within acceptable range. (§III.C.1) All materials added to soil shall be thoroughly cultivated into the top 8 inches of soil (§III.C.2) Tree planting pits shall be 3x the width and 1x the depth of the root ball (§III.C.3).	MWELO and the City Regulation differ slightly in the required analysis for soil samples. MWELO requires total soluble salts and sodium where the City Regulation required cation exchange capacity and EC, among other analysis not required by MWELO. The cation exchange capacity and EC may provide similar information as the total soluble salts. A soil scientist may need to be consulted to confirm. The City Regulation is largely consistent with MWELO.
§492.6 – Landscape Design Plan (New Landscapes) Requirements: 1. Plant Material a. Any if ETWU < MAWA, recommended to use native, water conserving, disease and pest resistant plants and to select plants from local ordinances and lists b. Each hydrozone shall have similar water use plants c. Chosen based on adaptability d. Turf not allowed on slopes >25% e. Address fire safety and prevention in fire-prone areas f. Invasive/noxious plants discouraged g. Architectural guidelines shall not prohibit low-water use plants 2. Water Feature a. Water features shall use recirculating water systems b. Recycled water for decorative water features when available c. Water feature surface area included in high water use hydrozone area in water budget calculation d. Pool and spa covers recommended 3. Mulch and Amendment a. Minimum of 2 inches of mulch on exposed soil, except on turf, creeping or rooting groundcover, or direct seeding applications b. Stabilizing mulching products shall be used on slopes c. Mulching portion of hydro-seed shall meet mulching requirement d. Incorporate soil amendments consistent with soil report Landscape Design Plan shall include: 1. Delineate and label each hydrozone 2. Identify hydrozone water use (low, medium, high, or mixed) 3. Identify recreation areas 4. Identify permanent areas for edible plants 5. Identify areas irrigated with recycled water 6. Identify type and depth of mulch 7. Identify soil amendments, type, and quantity 8. Identify water features and surface areas 9. Identify pervious and impervious hardscape 10. Identify location and details of stormwater BMPs 11. Identify applicable rain harvesting or catchment technologies	§II.B.2. Landscape Planting Plans 1. Landscape planting plans shall be drawn on sheets no larger than 30"x42" and no smaller than 18"x24", at a scale to show sufficient detail to interpret, not less than 1"=30'. Plans must identify: a. Landscape materials b. Property lines c. Paved areas d. Sight distance criteria e. Buildings and structures f. Overhead and underground utilities g. Natural features h. Peripheral features affecting design concept i. Planting details j. Mulch selection k. Screening of backflow prevention devices. 2. Must be prepared by licensed Landscape Architect or Landscape Contractor (§II.B.1.) §III.B. Planting Design Requirements Maximum annual irrigation application is 40 in/yr or 48 in/yr for newly planted landscape. 1. Water Use Zones: Plant types shall be grouped to areas to use similar water requirement. Zone types shall be designated low, medium, or high. To determine if landscape is consistent with water use requirements: a. Multiply zone area by water use value for each zone. b. Consistent if sum is less than total landscape area. Water use zone is determined by highest water use type of plant in an area controlled by an irrigation valve. Turf and water bodies are classified as high water use zones. Water use calculations shall be shown on planting plan 2. Turf shall be planted on areas to optimize irrigation equipment and discourage misuse of irrigation water: a. Not permitted in areas less than 10 ft in width b. Not permitted on slopes greater than 25% c. Not permitted within 10 ft of drip line of existing native oak tree d. Variety shall be selected for suitability	The City Regulation is largely consistent with MWELO. The City Regulation does not make recommendations for a landscape plan that is found to be not compliant with the regulation, address fire safety, covering pool and spa covers, and does not require recycled water use for decorative water features when available. Although the City Regulation does not explicitly require the plans to identify location and details of stormwater BMPS or rain harvesting or catchment technologies, the City Regulation does require the plans to identify peripheral features affecting design concept. Stormwater BMPs and rain harvesting and catchment technologies may be considered peripheral features. The City Regulation encourages low-water use plants, therefore the requirement regarding the prohibition of low-water use plants is not applicable. The City Regulation requires plants to be selected that are appropriate to the site, and must be chosen off an approved list. This has the effect of discouraging the use of invasive/noxious plants.

State of California Model Water Efficient Landscape Ordinance Requirements	City of Vacaville Water Efficient Landscape Regulations	Discussion
12. Compliance statement 13. Licensed professional signature	to local climate and conditions. 3. Non-turf plants chosen based on appropriateness (warm summers, cool winters, prevalent wind conditions). Plants selected from approved list. Plants not on approved list may be used if materials documenting water use are submitted. 4. Specification and use of preemergent chemicals is encouraged. 5. Surface Mulch – non-turf planting areas shall receive 2-inch layer of mulch. Non-porous material may not be used under mulch. Porous weed barrier is encouraged in non-groundcover areas. 6. Backflow devices shall be screened on threes sides with side facing street or driveway left open for visibility and access. Screenings include landscaping and/or low wood or masonry wall matching adjacent buildings. Backflow devices and any visible material shall be painted gloss green Backflow devices shall not be located in site triangle adjacent to a driveway	
§492.7 – Irrigation Design Plan (New Landscapes) Requirements: 1. System a. Dedicated landscape water meters recommended on landscape area <5,000 ft^2 b. Evapotranspiration or soil moisture sensor data shall control automatic irrigation controllers c. Pressure at emission device shall be within manufacturer's recommended range d. Sensors to suspend irrigation during unfavorable weather are required. Irrigation discouraged during rain or wind. e. Manual shut-off valve near water supply connection required. f. Backflow prevention device required g. High flow sensors recommended h. Design shall prevent runoff, low head drainage, overspray onto non-targeted areas. i. Information for Soil Management Plan shall be used to design irrigation system j. Irrigation design shall conform to hydrozones in landscape design plan k. Irrigation design shall meet irrigation efficiency criteria in §492.4 regarding MAWA (min. 0.71) l. Inquiring with water purveyor about peak water operating demands or restrictions that may impact irrigation efficiency is recommended m. Low volume irrigation is required in mulched areas n. Sprinkler heads and emission devices shall have matched precipitation rates, unless manufacturer recommends otherwise o. Head to head coverage recommended. Sprinklers shall be spaced to maximize distribution uniformity. p. Riser-protection components (such as swing joints) are required. q. Check valves or anti-drain valves are required. r. Narrow or irregularly shaped areas, less than 8 ft in width shall be irrigated with subsurface irrigation or low volume irrigation system s. Overhead irrigation not permitted within 24 inches of non-permeable surface (restriction may be modified in some situations) t. Slopes >25% shall not be irrigated with rate exceeding 0.75 in/hr (restriction may be modified) 2. Hydrozone a. Each valve shall irrigate a hydrozone with similar site, slope, exposure, soil condition, and plant material with similar water use.	§II.B.3. Irrigation Plans 1. Prepared in same scale and format as planting plans, and shall include: a. Irrigation heads - type, flow rate, coverage area, manufacturer, pattern, operating pressure b. Remove control valves – size, flow rate, and controller sequence number c. Typical emitter system layout d. Pressurized mainlines e. Non-pressurized lateral lines f. Point of Connection – size, available pressure, and available flow g. Water meter h. Automatic controllers i. Isolation valves j. Hose connections k. Backflow prevention device l. Ancillary equipment such as specialty valves m. Moisture sensors (if required) n. Pump station (if required) o. Plans must reflect non-potable water use requirements if non-potable water is approved §III.D. Irrigation Design Requirements 1. Drip irrigation or similar system shall be used to provide irritation water within the root zone. Drip systems shall not be controlled by remote control valves which control other types of systems. 2. Spray irrigation shall be designed for areas not effectively irrigated with drip irrigation. Low volume, pressure regulating sprinkler heads shall be utilized. Spray irrigation in turf areas shall use 4" pop-up sprinkler heads. 3. Systems shall be valved so that only areas of similar water use and environmental condition are controlled by the same valve. 4. Systems shall be controlled by automatic controllers. Controllers shall have enough stations to operate valves of dissimilar function independently. Controllers shall be equipped with a rain shutoff, exact day alternation/custom programming capability with two independent programs, and three start times per day. 5. Additional equipment may be required if site conditions or the City feels a reduction in water waste will result: a. Check valves b. Soil Moisture Sensor c. Water meters 6. Multiple short irrigation cycles are encouraged for spray systems. Drip irrigation system should run for longer periods of time with greater time between cycles. 7. Contractor shall provide equipment operating instructions and copies of water schedules to project owner. Copies of irrigation schedule shall be permanently	The City Regulation is largely consistent with MWELO. Differences include: 1. MWELO requires water meters only for landscapes >5,000 ft^2 where the City Regulation implies water meters are always required. 2. MWELO requires irrigation systems to be controlled by evapotranspiration or soil moisture sensors. The City Regulation requires soil moisture sensors "if required" 3. The City Regulation does not require pressure at emission device to be within manufacturer's recommended range. 4. City Regulation does not recommend high flow sensors. 5. The City Regulation does not recommend head-to-head sprinkler coverage. 6. The City Regulation does not require riser-protection components (e.g. swing joints) 7. MWELO prohibits overhead irrigation $\leq$24 inches from non-permeable surfaces, and is more stringent than the City Regulation. 8. §III.B.2.a of the City Regulation prohibits turf in planting areas les than ten feet in width to prevent overspray. This prohibition is more stringent than MWELO. 9. The City Regulation does not explicitly prohibit overhead irrigation within 24 hours of non-permeable surfaces. However, the City Regulation does prohibit overspray and runoff in several locations. 10. The City Regulation requires any zone with mixed water use plants (low and medium, for example) to use the water use factor for the higher water use. MWELO allows a weighted average to be used. The City Regulation is more stringent. 11. The City Regulation does not require a manual shut-off valve near the water supply connection. This may be required elsewhere in the City's standard specifications. 12. The City Regulation only requires check valves or anti-drain valves when required to prevent low head drainage.

State of California Model Water Efficient Landscape Ordinance Requirements	City of Vacaville Water Efficient Landscape Regulations	Discussion
b. Emission device shall be selected for appropriateness based on plant type in hydrozone c. Trees placed on separate valves from other plants where feasible d. Hydrozone may mix plants of moderate and low water use, or moderate and high water use if plant factor calculation is based on proportions of plant water uses or higher water using plant is used for calculations e. Hydrozone mixing low and high water use plants prohibited f. Hydrozone areas and areas irrigated by each valve shall be designated Irrigation Design Plan shall include: 1. Location and size of landscape water meters 2. Location, type, and size of irrigation system components (controllers, main and lateral lines, valves, sprinkler heads, moisture sensing devices, rain switches, quick couplers, pressure regulators, and backflow protection devices) 3. Static water pressure at connection 4. Flow rate (gpm), application rate (in/hr), and design operating pressure (psi) for each station 5. Recycled water irrigation systems (see §492.14) 6. Compliance statement 7. Licensed professional signature	attached in or near irrigation controllers. 8. Irrigation systems using non-potable watr source shall comply with UPC §603.3.11, and used purple pipe.	
<u>§492.8 – Grading Design Plan (New Landscapes)</u> 1. A Grading Design Plan is required to minimize soil erosion, runoff, and water waste, including: a. Height of graded slopes b. Drainage patterns c. Pad elevations d. Finish grade e. Stormwater retention improvements 2. Recommendations to prevent excessive erosion and runoff: a. Grade so all irrigation and normal rainfall remains on property and doesn't drain to non-permeable hardscape b. Avoid disruption of natural drainage patterns and undisturbed soil c. Avoid soil compaction in landscape areas 3. Shall include compliance Statement and signature of licensed professional	<u>§II.B.4. Grading Plan</u> Landscape grading plan should be submitted when landscape grading is too complicated to be shown on Planting Plan. (§II.B.4.) <u>§III.A. Grading Requirements</u> 1. Site should be graded to encourage percolation 2. Berms shall not be < 4 ft from paved areas. Berms with turf shall not be >25% (4:1 slope). Berms irrigate by drip irrigation without turf may be placed adjacent to paved area if contained by concrete curb. These berms shall not be > 33% (3:1 slope). Berms > 33% (3:1 slope) shall have erosion resistant covers (jute netting or erosion resistant ground covers). 3. Slope areas shall be indicated on Landscape Grading Plan with contour lines. Areas >25% shall be labeled as non-turf areas. Retention devices (jute netting, retention walls) shall be shown on Landscape Grading Plan.	MWELO requires the Grading Design Plan to be a separate submittal, whereas the City Regulation only requires a separate submittal if grading is too complicated to be shown on the Planting Plan. The City Regulation differs from MWELO by not requiring drainage patterns and stormwater retention improvements to be shown. The City Regulation does require some stormwater BMPs to be shown on the Grading Plan (i.e., erosion resistant covers and retention devices). The City Regulation does not require a site to be graded to contain all normal rain on the site, nor to avoid disruption of natural drainage patterns and undisturbed soil. The City Regulation does not explicitly require the Grading Plan to be signed by a licensed professional; however, the Planting Plan is required to be signed by licensed professional.
<u>§492.9 – Certificate of Completion (New Landscapes)</u> Applicant shall submit with following elements: 1. Project Information 2. Certification by signer of landscape design plan, irrigation design plan or licensed landscape contractor that installed per approved document package. As-built drawings shall be included if significant changes. 3. Controller irrigation scheduling parameters (see §492.10) 4. Maintenance schedule (see §492.11) 5. Irrigation audit report (see §492.12) 6. Soil analysis report (if not submitted previously, see §492.5) Local agency may approve or deny certificate of completion. If denied agency shall provide information regarding reapplication, appeal, or other assistance	A Certificate of Completion is required by the City Regulation and include as Attachment 4 of the Regulation. (II.C.2.) Other requirements (controller irrigation scheduling parameters, maintenance schedule, irrigation audit report, soil analysis report) are required elsewhere in the City Regulation	MWELO and the City Regulation are consistent.

State of California Model Water Efficient Landscape Ordinance Requirements	City of Vacaville Water Efficient Landscape Regulations	Discussion
§492.10 – Irrigation Scheduling (New Landscapes) Apply minimal amount of water to maintain plant health, schedules shall meet: 1. Regulated by automatic irrigation controllers 2. Overhead irrigation between 10 pm and 8 am, or as allowed by purveyor, when weather conditions allow. Exceptions for auditing and system maintenance 3. Ensure applied water meets ETWU. Total applied water < MAWA. Irrigation schedule shall be regulated by CIMIS data or soil moisture sensor data. 4. Controller parameters developed and submitted for plant establishment period, established landscape, and temporarily irrigated areas 5. Following shall be considered for each irrigation station: a. Irrigation interval (days between irrigation) b. Irrigation run times c. Number of cycle starts for each irrigation event d. Amount of applied water on monthly basis e. Application rate setting f. Root depth setting g. Plant type setting h. Soil type i. Slope factor setting j. Shade factor setting k. Irrigation uniformity or efficiency setting	§II.B.7. Irrigation Schedules 1. Irrigation system designer shall submit irrigation schedules demonstrating run time and frequency of operation. Separate schedules shall be developed for warm season (May through September – 5 months) and cool season (March/April and October/November – 4 months). December through February are considered off season and no scheduling is required. Scheduling shall not exceed 40 in/yr. New landscapes may be irrigated 20% more (48 in/yr) for first full growing season 2. Calculations shall be shown on plans providing total precipitation from the two irrigation schedules. 3. Copy of schedules shall be posted next to controller with as-built and operations manuals. Field adjustments by maintenance persons shall be made during variable weather conditions.	The City Regulation does not restrict the period of time that irrigation can occur. The City Regulation requires that irrigation schedules do not exceed 40 in/yr (48 in/yr during establishment period). This is equivalent to MAWA for the City. See technical memorandum for more detail. MWELO does not require copies of the irrigation schedule to be posted near irrigation controllers as required by the City Regulation. MWELO explicitly states what parameters shall be considered for each irrigation system. Although the City Regulation does not explicitly state each parameter, the City Regulation requires this calculation to be performed.
§492.11 – Landscape and Irrigation Maintenance Schedule (New Landscapes) 1. Landscapes shall be maintained to ensure water use efficiency. Regular maintenance schedule submitted with Certificate of Completion 2. Shall include: a. routine inspection b. adjustment and repair of system and components c. aerating and dethatching turf d. replenishing mulch e. fertilizing f. pruning g. weeding h. removing obstructions to emission devices 3. Repair with originally install components or equivalent 4. Sustainable or environmentally-friendly maintenance practices encouraged	§IV. Landscape Maintenance Recommendations 1. Non-turf planting areas should maintain a 2-inch layer of mulch 2. Slow-release nitrogen fertilizer is recommended. Excessive fertilization is discouraged. 3. Dethatching and aeration should be performed. 4. Periodic water audits are recommended 5. Preemergent herbicide use is encouraged, if product is registered for use in California and Solano County, and applied by licensed/certified applicator.	The City Regulation does not require the submission of a regular maintenance schedule. The City Regulation does recommend maintenance to landscaped areas, but does not include some of the more obvious maintenance items such as pruning and weeding. MWELO requires that irrigation system components be repaired only with originally installed or equivalent components.
§492.12 – Irrigation Audit, Irrigation Survey, and Irrigation Water Use Analysis (New Landscapes) 1. Audits shall be conducted by certified landscape irrigation auditor 2. For new/rehabilitation projects after Jan 1, 2010: a. Certificate of Compliance shall include irrigation audit report, including inspection, system tune-up, system test with distribution uniformity, reporting overspray or runoff causing overland flow, and preparation of irrigation schedule. b. Local agency shall administer programs including irrigation water use analysis, irrigation audits, and irrigation surveys for compliance with MAWA.	§II.C. Inspection Required State registered landscape architect or landscape contractor has responsibility to inspect installed landscape to installation in accordance to approved plans. 1. Certificate of Compliance must be signed and submitted prior to issuance of Certificate of Occupancy 2. Landscape also subject to inspection by City 3. Community Development Director may authorize deferral of landscape completion.	The City Regulation is largely consistent with, although not as explicit as MWELO.
§492.13 – Irrigation Efficiency (New Landscapes) Average irrigation efficiency is assumed to be 0.71. Irrigation systems shall be designed, maintained and managed to meet or exceed assumption.	The City Regulation does not specify an assumed irrigation efficiency.	The irrigation efficiency is used in MWELO to calculate MAWA. Although the City Regulations do not specify irrigation efficiency or MAWA, the City water efficiency criteria is consistent with MWELO. See technical memorandum for more detail.

State of California Model Water Efficient Landscape Ordinance Requirements	City of Vacaville Water Efficient Landscape Regulations	Discussion
§492.14 – Recycled Water (New Landscapes) 1. Recycled water irrigation systems shall allow for current and future use of recycled water 2. Irrigation systems and decorative water features shall use recycled water unless recycled water will not be available in foreseeable future 3. Systems shall be installed in accordance with applicable local and State law 4. Landscapes using recycled water are Special Landscape Areas, ETAF for SLA must be <1	§II.B.3.o. of the City Regulation requires irrigation plans to reflect requirements for non-potable water use if non-potable water is approved as a source for irrigation water.	The City Regulation does not explicitly require that recycled water systems shall be designed to allow the use of recycled water unless recycled water will not be available in the foreseeable future. The City Regulation is not consistent with MWELO. This requirement may not be applicable to the City until the City's Recycled Water Master Plan is adopted.
§492.15 – Stormwater Management (New Landscapes) 1. Encourage stormwater BMPs to minimize runoff and increase on-site retention and infiltration 2. Applicant shall refer to local agency or Regional Board regarding applicable ordinances and management plans 3. Rain gardens, cisterns, and features/practices to increase rainwater capture are recommended	The City Regulation does not require or encourage stormwater BMPs, rain capture devices.	§492.15 of MWELO does not have any requirements, only recommendations and encouragements.
§492.16 – Public Education (New Landscapes) 1. Local agency shall provide information to owners of new homes regarding design, installation, management, and maintenance of water efficient landscapes 2. Landscaped model homes shall have signs and written information demonstrating principles of water efficient landscaping	Signs identifying compliance with City regulations prominently located in yard of each model home. Additional signs shall indicate specific features of landscape. Color copies of landscape plans should be displayed within each model (§V.B. & §V.C.)	The City Regulation does not require the City to provide new homeowner information. Otherwise the City Regulation is consistent with MWELO.
§492.17 – Environmental Review (New Landscapes) Local agency must comply with CEQA	The City Regulation does not have a requirement for the City for comply with CEQA.	The City Regulation is not explicitly consistent with MWELO in this case; however, it is assumed that other regulations and good business practices require the City to comply with CEQA.
§493 – Provisions for Existing Landscapes Local agency may designate another agency to implement some or all of the requirements in MWELO	N/A	The City Regulation is largely consistent with MWELO and does designate another party to implement any requirements.
§493.1 – Irrigation Audit, Irrigation Survey, and Irrigation Water Use Analysis (Existing Landscapes) 1. Landscapes > 1 ac a. Local agency shall administer programs to evaluate water use and provide recommendations to reduce irrigation use below MAWA for existing landscapes	Periodic water audits of irrigation systems is recommended (§IV.A.4.)	The City Regulation does not describe MAWA; however the City Regulation does recommend periodic water audits and therefore is largely consistent with MWELO.
§493.2 – Water Waste Prevention (Existing Landscapes) 1. Runoff from target landscape prohibited. Penalties set by local agency 2. Overspray/runoff restrictions restrictions may be modified if landscape is adjacent to permeable surface, or adjacent non-permeable surface designed to drain to landscape	Several sections of the City Regulations prohibit runoff (§III.A.1, §III.D.2, and §III.D.6).	The City Regulation is consistent with MWELO.
§494 – Effective Precipitation Effective precipitation (25% of annual precipitation) may be used to calculate MAWA	Not included in City Regulation.	The City Regulation does not include MAWA. This section of MWELO states that MAWA *may* be calculated using effective precipitation. Therefore compliance with this section of MWELO is not required.

List of Abbreviations:
EC = Electroconductivity
ETAF = Evapotranspiration Adjustment Factor
ETWU = Estimated Total Water Use
MAWA = Maximum Applied Water Allowance
MWELO = Model Water Efficient Landscape Ordinance
SLA = Special Landscape Area
WUCOLS: Water Use Classification of Landscape Species

APPENDIX K

PUBLIC WORKS DEPARTMENT 2010/2011 SECOND QUARTER STATUS OF CAPITAL IMPROVEMENT PROJECTS

January 2011

2010/11 SECOND QUARTER

STATUS OF CAPITAL IMPROVEMENT PROGRAM PROJECTS

The following is the present status of all pending Capital Improvement Program Projects (CIP's). In this report, Original Budget, Adjusted Budget, or Remaining Budget are shown as (OB, AB, or RB - $_______)

SECTION A
Capital Improvement Program (CIP) Projects in Design

Account No.	Project Title	Budget

810233	**Energy Efficiency Upgrades Project**		**OB: $849,000**
Funding	Economic Stimulus	$849,000	
Project Engineer	James Loomis		

Funding for this project is provided as part of the American Recovery and Reinvestment Act through the U.S. Department of Energy under the Energy Efficiency and Conservation Block Grant (EECBG) program. A portion of this budget provides funding to conduct energy grade audits at various City facilities and report on energy related deficiencies. The remainder of the budget provides funding for the prescribed energy upgrades.

Based on the energy audits, recommended upgrades include replacement of existing HVAC units and control systems with more efficient equipment at City Hall, the Old Police Building, Ulatis Community Center, and the Performing Arts Theater.

This past quarter, the City's Consultants, Turley and Associates and Honeywell Business Solutions, began preparation of construction plans and contract documents. City staff met with the Consultants on several occasions to discuss the scope of the project and coordinate work efforts. City staff anticipates completion of the documents in the next quarter.

The anticipated schedule for completion of this project is as follows:

Complete Construction Plans and Contract Documents .... JAN 2011
Advertise for Bids .... JAN 2011
Bid Opening .... FEB 2011
Award of Contract .... FEB 2011
Begin Construction .... MAR 2011
Complete Construction .... SEP 2011

820239	Davis Street Widening (Hickory Lane to Bella Vista Avenue		AB: $5,692,000
Funding	Traffic Impact Fee CIP General Fund I-505/80 Capital Improvements Capital Outlay	$5,541,000 $41,700 $75,000 $34,300	
Project Engineer	Rick Navarro		

This budget provides funding to widen the west side of Davis Street to the ultimate width from Hickory Lane to Bella Vista Road. The project will provide two through lanes in both the northbound and southbound directions as well as a new driveway into the existing park and ride lot at the Davis Street/Hume Way intersection.

On August 28, 2007, the City Council adopted a Mitigated Negative Declaration for the project. The Notice of Determination was filed with the County on September 5, 2007.

Acquisition of required parcels, relocation of the tenants from said parcels, and demolition of the two commercial buildings has been completed.

This past quarter, PG&E completed relocation of their facilities that were in conflict with the proposed widening. This next quarter, staff will complete construction plans and contract documents and will obtain the required encroachment permit from Caltrans.

The anticipated schedule for completion for the road widening portion of the project is as follows:

Complete Construction Plans and Contract Documents............................ MAR 2011
Advertise for Bids.. MAR 2011
Bid Opening.. APR 2011
Award of Contract .... APR 2011
Begin Construction ....MAY 2011
Complete Construction.. AUG 2011

820252	**Lagoon Valley Boulevard/I-80 Intersection Ramp Modifications and Signal**		**OB: $164,000**
Funding	Capital Outlay Revolving	$164,000	
Project Engineer	Tracy Rideout		

The budget for this project is provided through developer contributions, and provides funding for City staff to perform design oversight for the reconstruction of the Lagoon Valley Interchange ramps and bridge widening to accommodate left turn storage for both eastbound and westbound on and off ramps and provide pedestrian access across the bridge. The complete design and construction of this project will be funded by the developer of Lower Lagoon Valley, sponsored by the City of Vacaville, and approved by Caltrans. The City of Vacaville is acting as lead agency in dealing with Caltrans.

The Lagoon Valley Boulevard/I-80 Intersection Ramp Modification and Signal Project is a mitigation measure for the Lower Lagoon Valley Policy Plan Implementation Project that will add traffic signals to both the existing Lagoon Valley Road/Eastbound (“EB”) and Westbound (“WB”) I-80 intersections and add left turn lane storage to the overcrossing (“Proposed Project”).

The Traffic Forecasting Memo and Traffic Operations Report (TOR) have been approved by Caltrans. Geometric Approval Drawings have been submitted to Caltrans for review and comment. The Cooperative Agreement between Caltrans and the City has been approved by District 4, Local Assistance and is currently under review by the City before finalizing. Once the agreement is finalized, a Cooperative Agreement between the City and the developer will be executed detailing the developer’s responsibilities. Edits are required to the final environmental documents, detailing impacts and results of studies for the westbound ramp project area. The reports will be resumed upon completion of the City/developer Cooperative Agreement and approval of Caltrans Expenditure Authorization.

A schedule for the project will be developed upon restarting consultation with Caltrans and the developer.

820263	Ulatis Creek Bike Path (Nut Tree Road to Leisure Town Road)		AB: $154,200
Funding	Transportation Development Act	$68,100	
	Congestion Mitigation & Air Quality (CMAQ) Grant	$37,100	
	Yolo-Solano Air Quality Management District (YSAQMD) Grant	$29,000	
	Transportation Fund	$20,000	
Project Engineer	Brian Oxley		

This budget provides partial funding for environmental clearance and design of the project. An additional $810,000 in CMAQ funding will be added to the project this next quarter following approval of the 2011 Transportation Improvement Program (TIP). This additional funding is for acquisition of needed right-of-way and construction of the project.

The project consists of a 10-foot wide Class 1 off-street bike path, from Nut Tree Road to Leisure Town Road, adjacent to Ulatis Creek. The additional segment to tie the proposed path to the adjacent neighborhood has been approved by Caltrans. Staff checked the feasibility of adding an additional path around the existing City owned detention basin located adjacent to the creek. During the environmental review, numerous Valley Elderberry Shrubs were located adjacent to the proposed additional path. Due to the high costs for mitigation of potential negative impacts to the shrubs, staff decided to remove the additional path around the detention basin from the project limits.

The City has an existing agreement with the Solano County Water Agency to utilize the top of the creek bank for the construction of the bike path. While verifying the right-of-way, it was determined that there are some right-of-way conflicts that the City will need to resolve.

This past quarter, Engineering Services staff held an updated field review meeting with Caltrans to discuss the right-of-way conflicts and the additional path to the adjacent neighborhood. Staff prepared and delivered the additional environmental studies requested by Caltrans.

This next quarter, staff anticipates obtaining environmental clearance of the project in accordance with the National Environmental Policy Act (NEPA) and will then request authorization to proceed with right-of-way activities from Caltrans.

The anticipated schedule for completion of this project is as follows:

Complete NEPA Environmental Clearance .... MAR 2011
Complete CEQA Environmental Clearance .... JUN 2011
Complete Right-of-Way Process .... DEC 2011
Complete Construction Plans and Contract Documents .... JAN 2012
Receive Authorization to Bid from Caltrans .... APR 2012
Advertise for Bids .... MAY 2012
Bid Opening .... JUN 2012
Award of Contract .... JUL 2012
Begin Construction .... AUG 2012
Complete Construction .... OCT 2012

820265	Jepson Parkway Gateway Improvements		AB: $400,700
Funding	Traffic Impact	$35,700	
	State Transportation Improvement Program	$244,000	
	ISTEA-CMAQ, STP	$106,000	
	Transportation Fund	$15,000	
Project Engineer	Brian Oxley		

This budget provides funding for planning, design and construction of the Jepson Parkway Gateway Improvements project, which consists of the installation of enhanced landscaping and roadway artwork in the vicinity of the Leisure Town Road/I-80 Interchange that will serve to identify the beginning of the Jepson Parkway.

The project was determined to be categorically exempt under the California Environmental Quality Act (CEQA) and a Notice of determination was filed on September 11, 2008. Caltrans has also approved the environmental document for the project in conformance with the National Environmental Policy Act (NEPA).

This past quarter, the City Council approved the recommendation by the Arts Advisory Committee and the Community Services Commission for the conceptual design of the project. The City Council approved the selection of Howard Kalish to create the main artwork, and Rachel Slick to create supplemental artwork for the project.

Also this past quarter, Engineering Services staff provided existing utility location information and City landscape design standards to Callendar Associates, the landscape architect for the project. Callander Associates submitted 65% complete design documents to the City for review.

Next quarter, staff will request allocation of funds for construction of the project from the California Transportation Commission as well as authorization to proceed with construction from Caltrans.

The anticipated schedule for completion of this project is as follows:

Complete Construction Plans and Contract Documents............................MAY 2011
Advertise for Bids..MAY 2011
Bid Opening.. JUN 2011
Award of Contract ....JUL 2011
Begin Construction .... AUG 2011
Complete Construction..DEC 2011

820268	Ulatis Creek Bike Path (Allison Drive to I-80)		OB: $191,000
Funding	Congestion Mitigation & Air Quality (CMAQ) Grant Yolo-Solano Air Quality Management	$169,000 $22,000	
Project Engineer	Brian Oxley		

This budget provides partial funding for environmental clearance and preliminary design of the project. The initial proposed alignment for the path consisted of a 10-foot wide Class 1 off-street bike path extending west from Allison Drive along the north bank of Ulatis Creek, under Interstate 80, and connecting to an existing section of bike path constructed as part of the Ivywood Subdivision.

Engineering Services staff has concerns with the remote nature of the proposed path. This past quarter staff met with D-Team to discuss these concerns, and D-Team concurred that alternative path alignments should be evaluated. This next quarter, staff will investigate alternatives for the bike path alignment, and seek the necessary approvals for a change of project scope.

A detailed schedule will be developed once the project scope and overall budget have been better defined.

820273	Vaca Valley / I-505 SB Interim Improvements		AB: $1,540,000
Funding	Traffic Impact Fee	$1,540,000	
Project Engineer / Manager	Tracy Rideout		

This budget provides funding for design and construction of the interim improvements to the Vaca Valley Parkway/I-505 southbound interchange. The interim improvements include widening of Vaca Valley Parkway to provide a protected left turn lane for westbound traffic and a right turn lane for eastbound traffic onto the southbound I-505 on-ramp, widening of the southbound off-ramp to provide a left turn lane for eastbound traffic onto Vaca Valley Parkway, and signalization of the southbound ramp intersection.

Engineering Services staff has met with Caltrans District 4, initiating the project. Staff has requested that Caltrans process this project under the Project Engineering and Evaluation Report (PEER) format to eliminate the need for a lengthy Project Study Report/Project Report process. Due to the unavailability of resources and budget, Caltrans has informed the City that this project will be rescheduled for fiscal year 2011/2012 to receive Caltrans oversight.

Design level topographic surveying of the project area has been completed and Analytical Environmental Services has prepared biological assessments and delineation studies. The Traffic Division has performed initial volume counts and synchro analysis of the proposed intersection showing that the project meets signal warrants and compiled the information into a Traffic Methodology Memorandum. The above information has been forwarded to Caltrans along with a preliminary geometric layout, and a purpose and need statement.

This past quarter, a geotechnical investigation was completed to aid in the design of the project. Next quarter, Engineering Services staff plans to complete a 65% plans, specifications, and estimate package.

The schedule for completion of this project is completely dependent upon Caltrans staff availability for oversight. A detailed schedule will be completed once Caltrans commits Project Management resources to this project.

820280	2011 Asphalt Concrete Overlay		OB: $1,460,000
Funding	Prop 1B Capital Outlay Revolving	$985,000 $25,000	
Project Engineer	Rick Navarro/Tracy Rideout		

This budget provides partial funding for the design and construction of the 2011 Asphalt Concrete Overlay Project, including the purchase and installation of video detection equipment. An additional $874,000 in Proposition 42 funds will be applied to this project.

To help ensure the proper operation of the signalized intersections within the project limits during construction and to minimize the impacts to the public, the project was split into two phases. Phase 1 of the overall project includes installation of City furnished cameras, wiring and configuration of the video detection zones at ten interestions impacted by the overlay.

The anticipated schedule for completion of Phase 1 of the project is as follows:

Complete Construction Plans and Contract Documents............................ JAN 2011
Advertise for Bids.. JAN 2011
Bid Opening.. FEB 2011
Award of Contract .... FEB 2011
Begin Construction .... MAR 2011
Complete Construction.. APR 2011

Phase 2 of the project includes overlaying the following streets with 0.20' of asphalt concrete:

	FROM	TO
East Monte Vista Ave.	Dobbins Street	500 ft. West of Browns Valley Parkway
Alamo Drive	Merchant Street	Butcher Road
Orange Drive	Lawrence Drive	Nut Tree Road
Hemlock Street	Dobbins Street	Orchard Avenue
Dobbins Street	East Monte Vista Ave.	Ulatis Creek Bridge
Orchard Avenue	Fruitvale Road	Vaca Valley Road

Additional work will include replacement of sidewalk curb ramps within the project limits to conform to the requirements of the Americans with Disabilities Act, striping, and adjustment of existing utility facilities.

This past quarter, Engineering Services staff continued with preparation of plans and contract documents. This next quarter, the project will be advertised for bids.

The anticipated schedule for completion of Phase 2 of the project is as follows:

Complete Construction Plans and Contract Documents............................ FEB 2011
Advertise for Bids.. FEB 2011
Bid Opening.. MAR 2011
Award of Contract .... MAR 2011
Begin Construction .... APR 2011
Complete Construction..JUL 2011

820285	Bella Vista / I-80 Soundwall		AB: $450,000
Funding	Prop 1B	$450,000	
Project Engineer	Brian Oxley		

This budget provides funding for the design and construction of the replacement of two 16ft. high sections of steel soundwall. These two portions of the wall have deteriorated, and over the years have required numerous repairs. The existing sections of wall will be replaced by a concrete masonry block wall.

Staff is evaluating the environmental impacts of the project, and expects the project to be categorically exempt under the California Environmental Quality Act (CEQA).

Staff has retained the services of Sousa Land Surveys to prepare a topographic survey of the area. This next quarter, staff will complete the design of the project.

The anticipated schedule for completion of this project is as follows:

Complete Construction Plans and Contract Documents .... APR 2011
Advertise for Bids .... APR 2011
Bid Opening .... MAY 2011
Award of Contract .... MAY 2011
Begin Construction .... JUN 2011
End Construction .... SEP 2011

830014	Ulatis Creek #1 Detention Basin Set Aside		AB:$2,080,000
Funding	Solano County Water Agency Drainage Detention Zone 2 Development Impact Fee	$1,000,000 $1,080,000	
Project Engineer	James Loomis		

This budget provides initial funding for the purchase of right-of-way, preliminary engineering and environmental clearance of the project. The project is eligible for a $4,000,000 grant under the Hazard Mitigation Grant Program (HMGP) administered through the Federal Emergency Management Agency (FEMA). In August 2009, Engineering Services staff requested a portion of this grant funding to conduct preliminary studies needed by FEMA to complete environmental review of the project under the National Environmental Policy Act (NEPA). Staff is awaiting approval of funding from FEMA.

The project consists of constructing a detention basin on a 50-acre site along the south bank of Ulatis Creek. The site is located east of Bucktown Lane, just outside the City limits.

Engineering staff has provided FEMA with copies of environmental studies prepared as part of the California Environmental Quality Act (CEQA) process for their use.

In June 2010, staff responded to a March 2010 letter received from FEMA asking for clarification of several items contained in the original application for the project and related to the City's funding request. The City is awaiting notification from FEMA for authorization to proceed with preliminary design tasks.

Pursuant to CEQA requirements, the City completed a Draft Environmental Impact Report (DEIR) and circulated it for public comment from October 25, 2010 to December 8, 2010. A public meeting was held on November 18, 2010 to allow public comment on the DEIR. Responses to comments have been prepared and a Final Environmental Impact Report (FEIR) will be completed for adoption by the City Council in March 2011.

A detailed schedule will be developed upon receiving authorization to proceed from FEMA and once the NEPA environmental clearance timeframe and overall budget have been better defined.

830040	Alamo Creek Detention Basin		AB: $4,014,100
Funding	Solano County Water Agency CA Dept of Parks & Recreation Drainage Detention Zone 2 Hazard Mitigation Grant Program	$1,107,300 $500,000 $1,421,700 $985,100	
Project Engineer	James Loomis		

This budget provides initial funding for the purchase of right-of-way, preliminary engineering and environmental clearance of the project. A total of $6 million have been approved for the project under the Hazard Mitigation Grant Program (HMGP), administered through the Federal Emergency Management Agency (FEMA); in addition to $3 million of Proposition 84 grant funds administered through the Department of Water Resources (DWR) as part of the Flood Protection Corridor Program. To date Phase 1 reimbursement eligible costs in the amount of $696,000 have been authorized by FEMA for the project, resulting in $522,000 of federal HMGP funding. The City is awaiting notification from DWR regarding availability of funding for this project as a result of State bond sales. The total project cost is estimated to be approximately $13,900,000.

The project consists of constructing a detention basin located along the north bank of Alamo Creek, west of Rogers Lane, just outside the City limits. The Alamo Creek Detention Basin will provide 544 acre-feet of storm water run-off storage capacity.

This past quarter, Engineering Services staff submitted 95% complete construction documents to the Division of Safety of Dams (DSOD) for their review. Staff and their Consultants have been working with the DSOD to address their comments and answer questions as they arise. Staff is awaiting formal comments from the DSOD. Additionally, staff continued to work with FEMA, the U.S. Army Corps of Engineers, the State Historic Preservation Office, and the Yocha Dehe Winton Nation to finalize the Memorandum of Agreement and associated Treatment Plan related to archeological resources and potential impacts as a result of the project.

Also this past quarter, and pursuant to CEQA requirements, the City completed a Draft Environmental Impact Report (DEIR) and circulated it for public comment from October 25, 2010 to December 8, 2010. A public meeting was held on November 18, 2010 to allow public comment on the DEIR. Responses to comments have been prepared and a Final Environmental Impact Report (FEIR) will be completed for adoption by the City Council in March 2011.

Staff hopes to receive comments from the DSOD next quarter, and will then finalize plans and contract documents for construction of the project.

At this time, the critical path for the project schedule is FEMA (as the federal lead agency) obtaining NEPA environmental clearance. Based on the estimated timeframe for FEMA to obtain federal environmental clearance, the anticipated schedule for completion of this project is as follows:

Complete CEQA Environmental Clearance .... MAR 2011
Complete Federal Environmental Clearance .... APR 2011
Obtain Required Permits ....MAY 2011
Complete Construction Plans and Contract Documents............................MAY 2011
Obtain Final DSOD Approval ....MAY 2011
Begin Cultural Resources Treatment ....JUL 2011
Complete Cultural Resources Treatment..OCT 2011
Advertise for Bids... FEB 2012
Bid Opening.. MAR 2012
Award of Contract .... APR 2012
Begin Construction .... APR 2012
Complete Construction.. AUG 2014

850067	Browns Valley Parkway Sewer: SPRR to Allison Drive (DIF 16)/East Monte Vista Avenue to Allison Drive (DIF 65)		AB: $1,810,000
Funding	Sewer - Capital	$1,810,000	
Project Engineer	James Loomis		

This budget provides funding to upsize an existing 18-inch sewer to 21 inches along Browns Valley Parkway between the former South Pacific Railroad and Allison Drive to serve growth in the Northeast Sector of the City and partial funding for the additional scope of work added to the project as described below.

This past quarter, the Utilities Department requested that we expand the scope of the original project. Utilities staff has been experiencing maintenance issues related to an existing sanitary sewer lift station located near the intersection of East Monte Vista Avenue and Browns Valley Parkway. It was determined that additional benefit could be realized by combining the two projects. The additional scope of work will include demolition of the existing sanitary sewer lift station and construction of a new 12” gravity system from E. Monte Vista Ave. to the intersection of Browns Valley Parkway and Allison Drive.

Next quarter, Engineering Services staff will modify the existing contracts with its Consultants to obtain survey and geotechnical data required for design and begin work on the revised project.

The anticipated schedule for completion of this project is as follows:

Complete Construction Plans and Contract Documents............................MAY 2011
Advertise for Bids...MAY 2011
Bid Opening.. JUN 2011
Award of Contract .... JUN 2011
Begin Construction ....JUL 2011
Complete Construction.. NOV 2011

850073	Brown Street Lift Station		OB: $200,000
Funding	Sewer-Facilities Rehabilitation Sewer Capital	$100,000 $100,000	
Project Engineer	Brian Oxley		

This budget provides partial funding for property acquisition, environmental clearance, design and construction of a new lift station and force main on Brown Street, just north of the County's Corporation Yard, to replace the existing lift station. The capacity of the existing lift station and force main will not adequately carry future anticipated flows. Acquisition of additional property will be required to accommodate the new lift station.

Engineering Services staff previously worked with Utilities Department staff to decide on the portion of land that would be functionally feasible for the construction of the proposed lift station. While preparing survey and right-of-way documents, it was determined that the land is encumbered by two PG&E easements that prevent the construction of the lift station in its currently proposed location. Staff is working with PG&E, the County and the City's Utility Department to find a suitable location in the same vicinity for the lift station.

A detailed schedule will be developed once the project scope and overall budget have been better defined.

850079	Tertiary Project – Denitrification Improvements (Contract #1)		AB:$4,010,000
Funding	Sewer Facilities Rehabilitation Sewer - Capital Tertiary Project	$911,600 $911,600 $2,186,800	
Project Engineer	Rick Navarro		

This budget provides funding for the design and construction of Contract 1 of the EWWTP – Tertiary project. The overall Tertiary project has been split into four different contract phases. Contract 1 includes improvements that are needed to meet denitrification regulatory requirements by May 2013, as well as facility upgrades to improve operations at the treatment plant. The current estimated construction cost for Contract 1 is $30 million. Contract 1 includes work on the following elements:

- Headworks facility
- Grit handling
- Aeration basins
- Flow equalization basin
- Biosolids storage
- Perimeter landscaping
- Standby generator

This past quarter, the City's design consultant, HDR Engineering, Inc., submitted the 100% construction documents. City staff reviewed the documents and provided comments to the design consultant.

Also this past quarter, staff prepared an agreement between the City and Harris and Associates to provide construction management services during construction The contract will be taken to Council for approval early next quarter.

This past quarter, a Notice to Bidders indicating the City's intent to prequalify Contractors was advertised. On November 16, 2010, staff received prequalification packages from 17 prime contractors and 22 major subcontractors. After reviewing their performance history, financial history, project experience and interviewing the listed references, staff publicized the draft list of prequalified prime contractors and major subcontractors on December 22, 2010. The draft list included 14 prime contractors and 20 major subcontractors. There were 3 prime contractors and 2 major subcontractors that initially failed to qualify under the established requirements. Engineering Services received one appeal from Pacific Coast Steel within the allowed appeal period. The appeal from Pacific Coast Steel will be heard and evaluated early next quarter.

The list of prequalified prime contractors and major subcontractors will be finalized in late January 2011.

The anticipated schedule for completion of this project is as follows:

Complete Construction Plans and Contract Documents............................ JAN 2011
Advertise for Bids... FEB 2011
Bid Opening.. MAR 2011
Award of Contract ....MAY 2011
Begin Construction .... JUN 2011
Complete Construction.. NOV 2012

850080	**Tertiary Project – Laboratory Expansion (Contract #2)**	**AB: $610,000**

Funding	Tertiary Project	$610,000
Project Engineer	Rick Navarro	

This budget provides funding for the design and construction of the Laboratory Expansion portion of the EWWTP – Tertiary project. The overall Tertiary project has been split into four different contract phases. This Phase consists of the expansion of the laboratory in the Administration Building. The project will be constructed using the design/build process. The project will consist generally of expansion of the laboratory building to include new testing areas, modifications to the existing laboratory, improvements to the HVAC system, modifications to the electrical system, and new administrative and engineering spaces on the second level.

This past quarter, the City began negotiations with HDR, Inc. for the preparation of procurement documents for the design-build contract for the Laboratory Expansion. Also this last quarter, Utilities staff has been working to select and assemble a Technical Review Panel to assist with the design-build process. This next quarter, HDR, Inc. is anticipated to begin preparation of procurement documents that will be necessary to hire a design-build firm.

The anticipated schedule for completion of this project is as follows:

Assemble Technical Review Panel .... FEB 2011
Develop & Issue Request for Proposal Document .... AUG 2011
Select Design-Build Team ....MAY 2012
Complete Design & Construction .... JUN 2014

850081	Tertiary Project – Filtration Improvements (Contract #3)		AB:$810,000
Funding	Tertiary Project	$810,000	
Project Engineer	Rick Navarro		

This budget provides funding for the design and construction of the Filtration Improvements of the EWWTP – Tertiary project. The overall Tertiary project has been split into four different contract phases. This Phase includes improvements to the influent pump station, primary clarifiers, secondary clarifiers, return activated sludge/waste activated sludge pump station, new effluent filtration facility, chlorine contact basins, solids handling facility, and North Plant electrical system.

This past quarter, the City entered into an agreement with HDR Engineering, Inc. for the development of construction documents for the project. This next quarter, HDR Engineering, Inc will work on developing the 65% construction documents. It is anticipated that 65% design documents will be submitted to the City for review in May 2011.

The anticipated schedule for completion of this project is as follows:

Complete Construction Plans and Contract Documents............................ APR 2012
Advertise for Bids.. APR 2012
Bid Opening...MAY 2012
Award of Contract .... AUG 2012
Begin Construction ....OCT 2012
Complete Construction.. NOV 2014

860089	E. Monte Vista Water Line: Horse Creek Lift Station to Vaca Valley Parkway-DIF 53C		AB:$2,567,000
Funding	I-505/80 Capital Improvements Water-Capital Distribution	$485,100 $2,081,900	
Project Engineer	James Loomis		

This budget provides funding to extend an 18" water transmission line northward on E. Monte Vista Avenue, from Pine Tree Creek to Vaca Valley Parkway. DIF 53 segments A and B have been completed and installed along Nut Tree Road, across I-80 and along E. Monte Vista Avenue from Nut Tree Road to Pine Tree Creek.

This past quarter, Engineering Services staff began preparation of the 65% design submittal. Additionally, Engineering staff prepared and circulated an Initial Study Mitigated Negative Declaration from November 23 to December 22, 2010. The CEQA document is scheduled to go before the City Council for adoption in January 2011.

The anticipated schedule for completion of this project is as follows:

Complete Construction Plans and Contract Documents............................ MAR 2012
Advertise for Bids.. MAR 2012
Bid Opening.. APR 2012
Award of Contract ....MAY 2012
Begin Construction ....MAY 2012
Complete Construction.. SEP 2012

860095	**Vaca Valley Parkway Water Line: Well 16 to Crocker Drive (DIF 43B)**		**OB:$1,868,000**
Funding	Water - Capital Distribution	$1,868,000	
Project Engineer	Tracy Rideout		

This budget provides funding for the design and construction of an 18” water transmission main on Vaca Valley Parkway, between Well 16 and Crocker Drive, to improve potable water capacity in the northeast sector of Vacaville. This project will connect to the 18” water main at the Well 16 service location, cross under I-505 and connect to the existing 18” water transmission main on the north side of Vaca Valley parkway near the intersection of Vaca Valley Parkway and Crocker Drive.

Construction will include installation of approximately 1750 feet of 18” ductile iron pipe. The water line will be installed inside a steel casing pipe within the State right-of-way. Bored and jacked segments are required under the I-505 mainline and on and off ramps.

This past quarter, Engineering Services staff completed the 100% plans, specifications and estimate (PS&E) package. Additionally, staff submitted for a Department of Interior, underground classification and a Caltrans encroachment permit. A Mitigated Negative Declaration has been circulated in accordance with the California Environmental Quality Act (CEQA) and the public comment period ends in February 2011.

The anticipated schedule for completion of this project is as follows:

Complete Environmental Clearance .... FEB 2011
Complete Construction Plans and Contract Documents .... FEB 2011
Advertise for Bids.. MAR 2011
Bid Opening... MAR 2011
Award of Contract .... APR 2011
Begin Construction ....MAY 2011
Complete Construction.. AUG 2011

January 2011

PUBLIC WORKS DEPARTMENT

2010/11 SECOND QUARTER

SECTION B
Capital Improvement Program (CIP) Projects Under Construction

In this Section B, the following abbreviations are used:
Estimated Completion Date (ECD) & Estimated Completion Amount (ECA)

Account No.	Project Title

810177	Vacaville Intermodal Station			
	ECD:	Jan 2011	**ECA:**	$3,900,000
	Project Inspector:		Tim Dunne	

This budget provides funding for the construction of a bus transfer facility along the I-80 corridor with ten bus bays, as well as 247 automobile parking spaces in a surface lot. A contract was awarded to Hess Concrete Construction Company, Inc. of American Canyon, California on November 10, 2009. The project is nearly completed through second quarter with the Contractor finishing up incidental item work and punch list work. The project will be finalized and operational this next quarter.

820138	Leisure Town Road Overcrossing Landscaping			
	ECD:	Aug 2011	**ECA:**	$933,400
	Project Inspector:		Ray Talbot	

This budget provides funding for the construction of the landscaping and irrigation portion of the Leisure Town Road Overcrossing project. The contractor completed all construction in October of 2008, and the project commenced the three year maintenance period. The project will not be accepted until successful completion of the maintenance period, anticipated to be August 2011.

January 2011

PUBLIC WORKS DEPARTMENT

2010/11 SECOND QUARTER

SECTION C
Capital Improvement Program (CIP) Projects Handled by Other Departments or Divisions

In this Section C, the following abbreviations are used:
Adjusted Budget (AB) & Remaining Budget (RB)

Account No.	Project Title	Budget

810080	**Lagoon Valley Park Safety Improvements**		**AB: $30,000** **RB: $14,800**
Funding	CIP General Fund	$30,000	
Project Manager	Gary Cullen		

This funding provides for safety related improvements to the park site at the direction of the State Office of Dam Safety.

810109	**General Plan Update**		**AB:$1,767,100** **RB:$1,186,000**
Funding	Capital Outlay Revolving General Facilities Development Impact Fee Traffic Impact Fee Drainage Conveyance Development Impact Fee Sewer Capital Connection Fee Water Capital Plant Connection Fee Water Capital Distribution Connection Fee	$900 $26,200 $10,000 $10,000 $1,710,000 $3,000 $7,000	
Project Manager	Maureen Carson		

This project provides funding for the update of the City of Vacaville General Plan. Current funding consists of 1998/99, 1999/00, 2009/10 and 2010/11 budget allocations. In March 2010, the City Council initiated a comprehensive General Plan Update, Environmental Impact Report and Climate Action Plan. A planning consultant has been retained for the project and work is underway by consultant Design Community & Environment, Community Development Department staff, and a Steering Committee appointed by the City Council.

810120	Development Impact Fee Update		AB:$446,600 RB:$323,500
Funding	General Facilities Development Impact	$21,000	
	Fee	$140,000	
	Sewer Capital Connection Fee	$15,000	
	Water Capital Plant Connection Fee	$135,000	
	Water Capital Distribution Connection	$35,000	
	Fee	$35,000	
	Traffic Impact Fee		
	Drainage Conveyance Development Impact Fee	$2,000	
	Greenbelt Preservation Development	$16,000	
	Impact Fee	$32,600	
	Police Development Impact Fee	$2,000	
	Fire Development Impact Fee		
	Drainage Detention Zone 1 Development Impact Fee	$2,000	
	Drainage Detention Zone 2 Development Impact Fee	$1,000	
	Drainage Conveyance Water Quality Development Impact Fee	$10,000	
	Parks & Recreation Development Impact Fee		
Project Manager	Rod Moresco		

This project provides funding for the update of the City of Vacaville Development Impact Fees. Current funding consists of 2000/01 budget allocations.

810138	City Standard Drawings & Specifications Update		AB:$194,800 RB: $8,000
Funding	Transportation Fund	$44,800	
	Traffic Impact Fees	$60,000	
	Drainage Conveyance Fee	$30,000	
	Sewer Facilities Rehab	$5,000	
	Sewer Capital	$25,000	
	Water Capital Plant	$20,000	
	Water Capital Distribution	$10,000	
Project Manager	Shawn Cunningham		

This budget provides funding to update the City Standard Drawings and Specifications. Public Works is currently in the process of developing Design and Construction Standard Specifications, as well as Standard Drawings related to Retaining/Sound Walls and Landscape and Irrigation. These are expected to be completed in 2011.

810157	**Transit AVL / Announciator Technology**		**AB: $948,500** **RB: $881,300**
Funding	Federal Transit Administration Grant Transportation Development Act Grant	$935,100 $13,400	
Project Manager	Brian McLean		

This budget provides funding to acquire and install state of the art Automatic Vehicle Locator (AVL) technology on transit fleet vehicles. This project includes replacement destination signs, 'talking bus' technology, camera/video security systems and interior/exterior speakers. Transit staff has initiated discussion with the Metropolitan Transportation Commission (MTC) to ensure the system procured meets the Bay Area AVL guidelines. TDA match funding will be requested in the FY2010-11 TDA grant application. Staff anticipates moving forward with this project in the fall of 2010.

810158	**Vacaville / Fairfield Rail Station**		**AB: $359,500** **RB: $0**
Funding	Transportation Development Act Grant	$359,000	
Project Manager	Jeff Knowles		

The proposed commuter rail station at the southeast corner of Peabody and Vanden Roads is currently in the Design Phase of the PS&E. The City of Fairfield is the lead agency in charge of the design and administration of this project. Preliminary site investigations such as surveys and soil samplings are ongoing. Union Pacific Railroad is reviewing the latest version of rail design and right of way acquisition for the PG&E parcel is in progress. Traffic Engineering will continue to support and monitor project status throughout duration of the project.

810166	**Corp Yard Building B Improvements**		**OB:$804,200 RB:$754,200**
Funding	CIP General Fund General Facilities	$299,100 $505,100	
Project Engineer	Tracy Rideout		

This project provides initial funding for improvements and modifications to the existing Building B at the Corporation Yard. Phase 1 will include demolition of the existing shops and storage areas, renovation of the existing building structure, construction of a training/conference area, and construction of accessible locker rooms with showers and restrooms for maintenance employees. Phase 2 will complete the building modifications including construction of a new administration area, conference room and administrative offices to replace the temporary buildings currently in use.

Engineering staff previously retained a structural engineer to evaluate the existing structure and prepare as-built base drawings. Based on this information, Engineering staff completed several layout options (for both Phases 1 and 2 as a master plan). Currently, Maintenance Operations staff is evaluating alternative locations for the locker rooms. Design of the Phase 1 improvements will continue once a final decision has been made regarding the locker room location. A detailed schedule will be developed once the project scope and anticipated costs have been better defined.

810183	**ADA Facility Improvements**		**AB: $32,800 RB: $10,900**
Funding	Capital Improvement Program General Fund Vaca Community Administrative Services	$21,900 $10,900	
Project Manager	Gary Cullen		

This budget provides funding to implement the City's ADA transition plan for public facilities.

810188	Alternative Fuel Vehicle (AFV) Incentive Program		AB: $634,500 RB: $99,100
Funding	Congestion Mitigation & Air Quality (CMAQ) Improvement Program Grant Yolo-Solano Air Quality Management District Regional Clean Air Funding Grant Transportation Fund	$400,000 $227,500 $7,000	
Project Engineer	Brian McLean		

This program historically provided incentives for alternative fuel vehicles (primarily all battery-electric and dedicated compressed natural gas vehicles) purchased or leased by the City of Vacaville for the City's Fleet, and also purchased by those who live or work in the northeastern portion of Solano County. The incentive program has ceased, and the remaining budget will be dedicated to ongoing lease payments for the City's electric vehicle fleet.

810192	Garage Maintenance Facility Upgrades		OB: $914,300 RB: $752,300
Funding	Federal Transit Administration Transportation Development Act	$731,400 $182,900	
Project Manager	Brian McLean		

These grant funds address the need to upgrade parts and major system components in the transit garage maintenance facility. The garage maintenance facility requires upgrading of the following key components: transit bus exhaust system, concrete parking pads adjacent to maintenance garage, repair and upgrading of bus lifts, replacement of major transit tools and bus inspection devices. Facility upgrades to the garage maintenance facility have been initiated. Projects include the construction of a garage mechanic library area and office area for support staff. Future projects include concrete drive aprons in front of the transit garage bays to eliminate asphalt failure in this area due to bus vehicle weight.

810197	Brush Truck Acquisition		AB: $71,900 RB: $ 0
Funding	Fire Impact Community Benefit Contribution	$53,900 $18,000	
Project Manager	Frank Drayton		

This budget provides funding for annual lease payments to purchase a new Fire Department brush truck to provide brush fire protection to newly developing areas north of Browns Valley. The total purchase cost is $135,821 with annual lease payments of $16,978.

810213	Aerial Photogrammetry		OB: $35,000 RB: $18,400
Funding	CIP General Fund Traffic Impact Drainage Conveyance Sewer Capital Water – Capital Plant	$10,000 $6,250 $6,250 $6,250 $6,250	
Project Manager	Tracy Rideout		

This budget provides partial funding for updated aerial orthophotography and directional oblique pictometry of the City of Vacaville in conjunction with other Solano County cities and agencies. Cost sharing options have been negotiated between interested Solano County cities and agencies as a means to facilitate increased accuracy, detail and frequency of the photogrammetry updates at a cost savings to the participants.

The City has received orthographic images and oblique (north, south, east, west facing directional) images, digital terrain modeling (LiDAR contour mapping), as well as free software that allows the images to be viewed and manipulated from Pictometry. Software, imagery and installation instructions are available on the City's network. The ortho-images have been reviewed by USGS and have been certified for accuracy in accordance with National standards. Delivery of the Ortho-images allows the City to utilize the photos as CAD/GIS overlays to assist in Engineering and Planning documents and exhibits.

Citywide utilization of the Pictometry software is currently on the project list for IT to incorporate into its work plan agenda. Installation of this software would allow users Citywide to utilize the imagery to perform basic, scaling, measurements, exhibit creation and general planning tasks. At this time, the Pictometry software has been installed on most computers in Public Works.

810215	Transit Amenities		AB:$1,209,300 RB:$ 814,100
Funding	Federal Transit Administration Transportation Development Act American Recovery & Reinvestment Act	$200,000 $894,000 $115,300	
Project Manager	Brian McLean		

This budget provides funding to support our ongoing program of acquiring new bus shelters to replace damaged bus shelters and to install new bus shelters at newly identified locations throughout the City. Additionally, bus stop amenities such as trash cans, route map display cases, and bus stop signage is purchased through this program. This is an ongoing activity project for Transit staff. Funding is arranged annually and expended throughout the year to enhance the City Coach Transit System.

810231	Transit Improvements		AB: $297,700 RB: $191,100
Funding	Transportation Development Act Prop 1B Caltrans	$59,500 $109,800 $128,400	
Project Manager	Brian McLean		

This budget provides the necessary local match funding for the City of Vacaville's Lifeline and New Freedom grant awards. Vacaville was awarded $109,800 through the Lifeline grant program which will allow the City of Vacaville to purchase bus shelters and transit amenities for low-income areas within Vacaville. An award of $128,391 was received through the New Freedom program which will allow the City of Vacaville to provide enhancements to the City's ADA service including the installation of additional wheelchair/mobility device securements within our transit vehicles, building additional transit accessible pathways and providing mobility training services for those individuals in need. As of the last quarter, bus shelters have been ordered and enhancements to several transit projects as related to ADA service have been started, such as the construction of ADA accessible curb cuts.

810232	City Coach - Lawrence Drive		OB: $46,800 RB: $46,800
Funding	Yolo-Solano Air Quality Management District	$46,800	
Project Manager	Brian McLean		

This budget provides partial funding to support the operation of a new fixed route bus line serving the areas along Orange Drive and Lawrence Drive. Specific sites to be served will include the Senior Manor Apartment complex, Lemon Tree Senior Mobile Home Park, and the Diamond Grove Senior Community. This new route, dubbed Route 3, is being partially funded by this grant received from the Yolo-Solano Air Quality Management District. Route 3 began operating on January 4, 2010. The new Route 3 has quickly developed a large and growing daily ridership. Additional Route 3 marketing and public outreach will be made during this next quarter.

820076	Street Resurfacing Project		AB:$2,104,100 RB:$1,248,100
Funding	Gas Tax Section 2105 Gas Tax Section 2106 Capital Outlay Revolving	$1,480,100 $518,900 $105,000	
Project Manager	Gary Cullen		

This budget is a source of funding for Maintenance Division preparation, design and construction for resurfacing various City streets with asphalt concrete and slurry seal, along with associated Americans with Disabilities Act improvements.

$750,000 was reallocated as part of the 08/09 and 09/10 budget to cover public works streets maintenance staff in order to make General Fund Dollars available to the City. This is anticipated to be an annual allocation in Fiscal Year 10/11 as well.

820206	Renewable Energy Program Support		AB: $17,800 RB: $ 6,500
Funding	Transportation Fund	$17,800	
Project Manager	Shawn Cunningham		

This budget provides funding to support those efforts involving renewable energy projects, such as photovoltaic systems which create clean energy. Projects that have already utilized this support are the Electric Vehicle Incentive Program (Expansion Phase), the Bella Vista Road Park and Ride Lot, and the new Police Headquarters. Toyota RAV4 EV Fleet Vehicles 637 – 646 have been outfitted with the RAV4Info Palm Pilot device, assisting the operators of the RAV4 EV vehicles with precise State of Charge (SOC) information, along with battery pack monitoring information.

820217	Solano Transportation Authority		AB: $510,300 RB: $700
Funding	Gas Tax Section 2105 Gas Tax Section 2106	$379,200 $131,100	
Project Manager	Shawn Cunningham		

This budget provides funding for the City of Vacaville's annual allocation to support the Solano Transportation Authority. The 10/11 allocation of $57,376 has been paid.

820226	Traffic Volume Counts & Land Use Database		AB: $140,100 RB: $0
Funding	Traffic Impact	$140,100	
Project Manager	Jeff Knowles		

This budget provides funding to perform bi-annual intersection turning and roadway segment traffic counts, as well as maintenance of the land use data base for use with the traffic model. Accurate traffic count and land use data are essential when preparing future traffic model volume forecasts. The City collects traffic volume data at all of the City gateways and at over 120 intersections within the City.

820235	ADA Right-of-Way Improvements		AB: $171,000 RB: $ 16,900
Funding	Gas Tax Section 2105 Vaca Community Admin Services Vacaville Community Capital Improvements Capital Outlay Revolving	$225,700 $28,500 $25,000 $2,700	
Project Manager	Gary Cullen		

The scope of this project is to remove pedestrian barriers within the public right-of-way, such as the installation of curb ramps.

820244	Traffic Signals – Various Locations		AB: $328,100 RB: $302,900
Funding	Traffic Impact Fee	$328,100	
Project Manager	Jeff Knowles		

This budget provides funding for the design and construction of new traffic signals or modifications to existing traffic signals to accommodate growth at various locations within the City. Locations are based upon traffic circulation needs and warrant assessments performed by the City's Traffic Engineering staff.

820247	Replace Pedestrian Signal Heads		OB: $50,000 RB: $31,300
Funding	Gas Tax-Section 2106	$50,000	
Project Manager	Jeff Knowles		

This budget provides funding to replace existing traditional pedestrian signal heads with the visual countdown display. Staff has completed the upgrade of more than half of the City traffic signals. Locations are selected based on pedestrian traffic levels, the proximity to schools and transit stops and type/width of streets being crossed.

820259	Intersection Level of Service Improvements		AB: $945,000 RB: $540,200
Funding	Traffic Impact	$945,000	
Project Engineer	Jeff Knowles		

This budget provides for minor construction modifications at various locations. It is expected to facilitate signal timing, phasing improvements, and general operational improvements without major construction. These improvements are predicated on improving the Level of Service for both existing and future traffic circulation. This project funded improvements on Peabody Road, between Elmira Road and Cliffside Drive; the double left turn, from Mason Street onto Depot Street; and a dozen other low-cost projects that significantly improve traffic circulation and safety as traffic volumes increase due to new development Citywide.

820260	Citywide Basemap & Benchmark Development		AB: $84,100 RB: $70,400
Funding	Traffic Impact Fees	$84,100	
Project Engineer	Shawn Cunningham		

This budget provides for the purchase of software, additional equipment, survey consultant work, and staff time to expand the City's survey monumentation. This survey monumentation is used for horizontal and vertical control for Land Development and Capital Improvement Program projects.

820266	**Asphalt Grinder**		**AB: $243,100** **RB: $ 68,100**
Funding	Gas Tax – Section 2105	$243,100	
Project Manager	Gary Cullen		

This project is to cover the annual lease payment for the asphalt grinder for Public Works Maintenance.

830002	**Storm Drain Master Plan Update**		**AB: $441,200** **RB: $ 15,800**
Funding	Storm Drainage Drainage Conveyance Development Impact Fee	$348,800 $92,400	
Project Manager	Gary Cullen		

This project is to update the Storm Drainage Master Plan due to development.

830012	**Storm Water Monitoring Program**		**AB: $540,100** **RB: $ 37,700**
Funding	Storm Drainage Drainage Conveyance	$79,800 $460,300	
Project Manager	Gary Cullen		

This budget provides funding to install, monitor, and maintain stream and rain monitoring gauges throughout the City which provide data used to calibrate the City's Storm Water Monitoring Program.

Staff is currently working with Vendors to improve our stream gauges and the public access interface.

830015	**Storm Drain System Studies**		**AB: $705,700** **RB: $ 60,400**
Funding	Storm Drainage Drainage Conveyance Development Impact Fee	$40,100 $665,600	
Project Manager	Gary Cullen		

This is an ongoing project for preliminary engineering services for storm water study projects, which will incorporate new development into the hydrological and hydraulic storm drain models.

830021	Pine Tree Creek Improvements Phase 2-3		AB: $83,500 RB: $22,300
Funding	Drainage Conveyance	$83,500	
Project Manager	Gary Cullen		

This budget provides funding to construct channel improvements and on-line detention along Pine Tree Creek between Brown Street and Browns Valley Parkway.

The City's consultant West Yost & Associates completed a final draft of the Brown Street Detention Basin Study, which is funded through this account, and staff is Public Works Maintenance staff is reviewing and commenting. The final report will be completed this next quarter, and is recommending two alternatives to either construct a detention basin between Brown Street and Browns Valley Pkwy, or increase downstream storm drain capacity to alleviate flooding on Brown Street.

830023	Storm Drain Upgrade Program		AB: $238,800 RB: $220,100
Funding	Drainage Conveyance Development Impact Fee	$238,800	
Project Manager	Gary Cullen		

This project includes channel improvements, storm drain upsizing, and water quality improvements as it relates to growth. The schedule will be determined at a later date.

830024	National Pollutant Discharge Elimination System (NPDES) Permit		AB: $626,100 RB: $142,700
Funding	Drainage Conveyance Water Quality Development Impact Fee Drainage Conveyance Development Impact Fee	$596,100 $30,000	
Project Manager	Steve Sawyer		

This ongoing project is set up to meet the program requirements of the EPA's National Pollutant Discharge Elimination System Phase II, for Municipal Separate Storm Sewer Systems. Having passed required local ordinances in 2004, the City will continue implementation of a five-year Storm Water Management Plan as required under its permit. Plan year for 2009/10 will focus on training and continue development and implementation of various Best Management Practices covering public education and training, community involvement, illicit discharge detection and elimination, construction and post-construction and municipal operations.

830025	North Horse Creek Detention Basin		AB: $522,500 RB: $347,600
Funding	Drainage Detention Zone #1	$522,500	
Project Engineer	Gary Cullen		

This budget was intended to provide partial funding for design and construction of improvements within the North Horse Creek Detention Basin (Zone #1). A project was developed that included utilizing the detention capacity of an existing 11.5 acre basin by modifying a culvert at the Putah South Canal to detain flows in excess of the 10-year event. The modifications to the culvert would allow for up to 33 acre feet of storage. In July 2007, the Bureau of Reclamation issued a determination that it does not approve the project as proposed. This project has been suspended, pending evaluations of alternatives.

830026	Middle Horse Creek Detention Basin Setaside		AB: $8,000 RB: $8,000
Funding	Capital Outlay Revolving	$8,000	
Project Manager	Gary Cullen		

These are set aside funds for the expansion of the Middle Horse Creek Detention Basin.

830035	Putah South Canal Detention Basins		AB: $52,900 RB: $52,900
Funding	Capital Outlay Revolving	$52,900	
Project Manager	Gary Cullen		

These are set aside funds for the construction of storm water detention basins upstream of the Putah South Canal.

830041	Florence Drive Detention Basin		AB: $272,100 RB: $ 36,600
Funding	Drainage Detention Zone 2	$272,100	
Project Engineer	Brian Oxley		

This budget provides partial funding for land acquisition, environmental clearance, design and construction of a detention basin located at the west end of Florence Drive and north of North Park Drive. The capacity of the basin will be approximately 16 acre-feet.

The design and construction of this project are on hold due to funding constraints; however, staff is working to complete the CEQA Negative Declaration, which is in its final draft and will be circulated for review within the next 6 months.

The land acquisition for the project is complete.

840069	City Contribution to Youth Athletic Leagues for Athletic Field Expansion		AB: $150,000 RB: $36,900
Funding	Parks & Recreation Development Impact Fee	$150,000	
Project Manager	Kerry Walker		

This project provides funding for City contributions to Youth Athletic Leagues for athletic field expansion due to growth to sites covered under a City lease agreement with the Leagues. This provides an ongoing grant opportunity for youth leagues. Community Services staff is making progress on lighting one diamond at Arlington Park. The City-funded portion of the Arlington project is complete.

840086	Park Master Planning and Studies		OB: $207,400 RB: $ 48,400
Funding	Park and Recreation Community Benefit Contribution	$195,500 $11,800	
Project Manager	Kerry Walker		

This budget provides funding to allocate staff time for master planning activities related to City park expansion or redevelopment to accommodate increased usage.

850033	Wastewater System Studies		AB: $940,000 RB: $365,200
Funding	Sewer Capital Connection Fee	$940,000	
Project Manager	Steve Sawyer		

The scope of this ongoing program is to perform studies related to collection and treatment of wastewater to facilitate growth. (DIF 73, 77, 85, 91, 93, 97, 105, 109)

850034	Infiltration Control Program		AB:$4,802,700 RB:$2,221,100
Funding	Sewer Facilities Rehabilitation Sewer Capital Connection Fee	$2,190,800 $2,611,900	
Project Manager	Steve Sawyer		

This is an ongoing project to reduce inflow and infiltration into the sewer collection system and to comply with the regional board requirements. It provides for sewer system monitoring equipment, testing and analysis to identify where excessive amounts of storm water are entering the system, and the rehabilitation of those areas. (DIF 62, 87, 91, 95, 99, 107, 111A)

850037	Wastewater Treatment Plant Upgrades		AB: $200,000 RB: $188,100
Funding	Sewer Facilities Rehabilitation	$200,000	
Project Manager	Steve Sawyer		

This provides funding for the upgrade of process control devices, as well as maintenance and safety improvements at the Easterly Wastewater Treatment Plant. (DIF 25)

850045	CSP-S Sewer: Fry Road to EWWTP		AB:$6,030,000 RB:$5,953,800
Funding	Sewer Capital Connection Fee	$6,030,000	
Project Manager	Steve Sawyer		

This budget provides funding to enlarge the existing Fry Road and California State Prison – Solano trunk sewers north of Fry Road with a single trunk line to accommodate new development. This project needs to be in place in two to three years. The total cost is $8.7 million. This is a first phase. (DIF 54A)

850046	Sewer Facilities Rehab/Upgrades		AB:$2,708,600 RB:$1,242,500
Funding	Sewer Facilities Rehabilitation	$2,450,600	
Project Manager	Steve Sawyer		

This budget provides funding for miscellaneous regulatory and maintenance improvements at Easterly Wastewater Treatment Plant and lift stations. (DIF 76, 84, 88, 92, 96, 100, 104, 108)

850056	Sewer Master Plan & Connection Fee Analysis		AB: $200,000 RB: $29,600
Funding	Sewer – Capital	$200,000	
Project Manager	Steve Sawyer		

This budget provides funding for updating the Sewer Master Plan and analysis of Sewer Connection Fees.

850057	Sewer Main Capacity Program		AB:$1,616,300 RB:$1,239,500
Funding	Sewer Facilities Rehabilitation Sewer – Capital	$545,500 $1,070,800	
Project Manager	Steve Sawyer		

This budget provides supplemental funding for the design and construction of various Citywide sewer replacements and upgrades. (DIF 78, 86, 90, 94, 98, 106A/B, 110A/B)

850060	Tertiary Plant Project - Permitting		AB:$4,000,000 RB: $ 565,600
Funding	Sewer - Facilities Rehabilitation Sewer – Capital	$679,000 $3,321,000	
Project Manager	Steve Sawyer		

This budget provided funding for various permitting requirements imposed on the construction of the tertiary treatment plant improvements by state and federal regulatory agencies. (DIF 23A/B)

850066	Allison Parkway Lift Station		AB: $478,500 RB: $115,200
Funding	Sewer Developer Fund	$478,500	
Project Manager	Tawnia Skow		

This budget provides initial funding for the design of a new larger lift station on Allison Parkway, near Edenderry Drive, to provide capacity for proposed development to the north in Reynolds Ranch and Rice-McMurtry areas. This project is 100% funded by developers of Reynolds Ranch, including the costs of design, construction and purchase of required right-of-way. The design of this project is complete, and the schedule for completion is dependent upon funding from the developer. (DIF 120)

850068	Ulatis Drive Sewer: Nut Tree Road to Leisure Town Road		AB:$6,043,000 RB:$6,039,600
Funding	Sewer – Capital I-505/80 Capital Improvements	$4,343,000 $1,700,000	
Project Manager	Steve Sawyer		

This budget provides funding to replace one or both of the existing parallel sewers on Cooper School Road, Christine Drive and Ulatis Drive, from Nut Tree Road to Leisure Town Road, including the single 30” trunk sewer crossing Ulatis Creek, to accommodate growth. The total project cost is $12.1 million. (DIF 37)

850069	Leisure Town Road Sewer: Ulatis Drive to Elmira Road		AB:$2,700,000 RB:$2,700,000
Funding	Sewer – Capital	$2,700,000	
Project Manager	Steve Sawyer		

This budget provides funding for a 30” trunk sewer on Leisure Town Road, from Ulatis Drive to Elmira Road, to accommodate growth. The 30” Sewer will replace an existing 24” sewer. The total project budget is $2,700,000. This will fully fund the project. (DIF 38A)

850070	Digester Rehabilitation		OB: $365,000 RB: $115,000
Funding	Sewer Facilities Rehabilitation	$365,000	
Project Manager	Steve Sawyer		

This budget provides funding for repairs to Digester #3. (DIF 59, 68)

850074	Easterly Cogeneration Project		OB: $80,000 RB: $75,400
Funding	Sewer Facilities Rehabilitation	$80,000	
Project Manager	Steve Sawyer		

This budget provides funding for addition to existing cogeneration unit for removal of siloxane bi-product. (DIF 84)

850076	**Leisure Town Road Lift Station**		**OB: $200,000** **RB: $200,000**
Funding	Sewer-Capital	$200,000	
Project Manager	Steve Sawyer		

This budget provides partial funding for the design of pumps with increased capacity to accommodate increases in flow related to Citywide growth and development. The total project cost is estimated at $770.000. (DIF31B)

850077	**Sewer System Management Plan**		**OB: $200,000** **RB: $200,000**
Funding	Sewer Facilities Rehabilitation Sewer-Capital	$100,000 $100,000	
Project Manager	Steve Sawyer		

This budget provides funding to provide funding to administer and implement State mandates related to sewer collection system capacity, growth planning, and prevention of sanitary sewer overflows (SSO's).

850078	**Tertiary Project – Planning**		**AB: $4,514,000** **RB: $ 423,100**
Funding	Sewer Facilities Rehabilitation Sewer - Major Replacement Sewer – Capital	$2,664,000 $1,000,000 $850,000	
Project Engineer	Steve Sawyer		

This budget provides funding for preparation of a Facilities Plan, environmental clearance in accordance with the California Environmental Quality Act (CEQA), and completion of the pre-design phase of the Easterly Tertiary Treatment Project. The Project is required to comply with the City's NPDES permit with the State Water Resources Control Board (Regional Board). The necessary Easterly Plant upgrades are estimated to cost a total of $150 million. The Project will be funded by connection fees and Operations and Maintenance funds (DIF 23). The City is also pursuing additional funding through the State Revolving Fund Loan Program.

In an effort to complete the more time sensitive denitrification-related improvements in a timely manner, the Project has been split into four different construction contract phases. Each contract has been designated its own account number and the status of the individual contracts will be reported separately: 850060 Tertiary Project – Permitting, 850078 Tertiary Project – Planning, 850079 Tertiary Project – Denitrification Improvements, 850080 Tertiary Project – Lab Expansion , 850081 Tertiary Project – Filtration Improvements, and 850082 Tertiary Project – Completion Project.

This past quarter, the State began its review of the City's SRF loan application including the EIR, the Facilities Plan, and the PDR. (DIF 23A/B)

850082	**Tertiary Project – Completion Project**		**AB: $100,000** **RB: $100,000**
Funding	Tertiary Project	$100,000	
Project Engineer	Steve Sawyer		

This budget provided initial funding for the final design and construction of the Lab Expansion, Tertiary Filtration Improvements, and Completion of Tertiary Plant Improvements related to the Tertiary Treatment improvements project. This project will be separated and moved to Section A at the time that the design contract is initiated for each of the three projects. (DIF 23A/B)

Following are the anticipated schedules for the remaining contract phases of the Project:

Completion Project:
- Complete Design .... MAR 2013
- Advertise for Bids .... MAR 2013
- Begin Construction .... JUL 2013
- Complete Construction .... MAY 2015

860006	**Noonan Reservoir**		**AB: $797,300** **RB: $104,100**
Funding	Water Capital Distribution Connection Fee	$797,300	
Project Manager	Steve Sawyer		

Vacaville is the lead agency for the Noonan Reservoir project, Solano Water Authority Project #2. This project was on hold for a long period of time. The City of Fairfield requested a decrease in size of the reservoir to facilitate a Train Station Specific Plan on which they are working. By combining the two projects, it is mutually beneficial. RBI is doing an environmental analysis and Summers Engineering is doing an environmental review and cost analysis. All agencies paid their share of the approved budget increase.

860023	**Water Rights Buy Back**		**AB:$1,589,500** **RB: $ 200,200**
Funding	Water Capital Distribution Connection Fee Water Capital Plant Connection Fee	$419,600 $1,169,900	
Project Manager	Steve Sawyer		

This funding is for an ongoing program to purchase an estimated 125 water rights from developers who are built-out and have excess water right connection fees. This buyback is provided for in the Water Rights Program.

860025	Well Field Equipment / Instrument Improvements		AB: $545,500 RB: $246,600
Funding	Water Facilities Rehabilitation Water Capital Plant Connection Fee	$355,500 $190,000	
Project Manager	Steve Sawyer		

Based on regulatory requirements and operational needs, this project will provide Supervisory Control and Data Acquisition (SCADA) instrumentation at City wells. (DIF 3, 14, 23, 32)

860028	Alamo Drive Water Line: California Dr. to Merchant St.		AB: $524,400 RB: $516,400
Funding	Water Capital Distribution Connection Fee	$524,400	
Project Manager	Steve Sawyer		

This project will provide for a new water main within the Zone 1 distribution system giving better service from the Butcher Reservoir to Lower Lagoon Valley and northwest Vacaville. (DIF 10B)

A portion of the work for this project was completed along with the widening of California Drive, installing a new 24-inch water main along the south side of California Drive, from Peabody Road to Alamo Lane. Construction of the remaining portion of the project will be delayed until the Lower Lagoon Valley Water System is constructed.

860030	Water Reclamation Projects		AB: $1,199,700 RB: $ 904,600
Funding	Water Capital Plant Connection Fee	$1,199,700	
Project Manager	Steve Sawyer		

Reclamation of wastewater has the benefit of offsetting needs for treated potable water, and allows existing supplies to serve a new development. This Capital Improvement Program project establishes a budget for the City to seek and implement reclamation projects. Specific projects are in development at this time, but include a facility master plan and system improvements based on private developments. This project is on hold. (DIF 12, 20, 29, 37, 44, 49)

860041	SCADA- Phase 2	AB: $409,600

			RB: $131,100
Funding	Water Capital Distribution Connection Fee Water Capital Plant Connection Fee	$159,600 $250,000	
Project Manager	Steve Sawyer		

This is an ongoing program to install Supervisory Control and Data Acquisition (SCADA) equipment; including programmable logic controllers and core SCADA equipment at wells, distribution system pump stations, and Zone 1 distribution system reservoirs. This equipment allows operators to monitor and make operational changes at each facility from the Water Plant. (DIF 25, 34, 40)

860042	**Water System Study**		**AB: $1,153,400** **RB: $ 584,100**
Funding	Water Capital Plant Connection Fee Water Distribution Development Impact Fee	$1,153,400 $100,000	
Project Manager	Steve Sawyer		

This is an ongoing program to perform studies for development and extension of the water system to facilitate growth to comply with regulatory requirements. (DIF 77, 82, 86, 97, 101A, 106A, 110A, 114A)

860045	**Water Development Projects**		**AB: $5,835,000** **RB: $1,627,800**
Funding	Water Capital Plant Connection Fee Water Capital Distribution Connection Fee	$5,421,700 $413,300	
Project Manager	Steve Sawyer		

This initial funding is to acquire new water supplies. In 2000, the City purchased 2,880 acre feet of State Water Project Entitlements from the Kern County Water Agency. (DIF 21, 38)

860048	**NBR Plant Upgrade**		**AB: $5,211,900** **RB: $3,513,300**
Funding	Water Capital Plant Connection Fee	$5,211,900	
Project Manager	Steve Sawyer		

This funding is for additional facilities and capacity at the NBR Plant. Certain facilities, such as a raw water blending reservoir and emergency power, were not included in the initial phase of construction of the NBR Plant in order to reduce initial expenditures. This fund accumulation is intended to provide a budget for a variety of both anticipated and unforeseen needs and regulatory improvements. (DIF 2, 13, 22, 31, 39, 45, 50, 56, 62, 68, 72, 76, 80, 85, 90, 96, 100, 109, 113)

860049	**Water Facilities Rehab/Upgrades**	**AB:$1,967,300**

		RB:$ 514,200
Funding	Water Facilities Rehabilitation	$1,967,300
Project Manager	Steve Sawyer	

This provides funding for miscellaneous regulatory and maintenance improvements at production facilities, reservoirs and pump stations. (DIF 98C, 102C, 107C, 111C, 115D)

860051	**Well #17 Drilling**		**AB: $1,500,000** **RB: $1,403,400**
Funding	Water Facilities Rehabilitation Water Capital Plant	$500,000 $1,000,000	
Project Manager	Steve Sawyer		

This provides initial funding for site location studies, land acquisitions, drilling and testing for the proposed Well #17. This past quarter, the City Attorney's Office completed its review of the purchase option and acquisition agreements. These agreements were reviewed by Seeno's attorney and real estate staff, and were forwarded to Seeno for final approval and signature. (DIF 33A). The Well #17 option and agreement was executed and a contract was entered into with Luhdorff Scalmanini Civil Engineers to drill a test hole, develop a monitoring well and evaluate the site for a potable water well. The test hole has been drilled and the monitoring well has been developed. Water samples have been taken and water quality analyses are being run.

860057	**N. Orchard Reservoir - 2MG**		**AB:$1,850,000** **RB:$1,849,200**
Funding	Water Capital Plant	$1,850,000	
Project Manager	Steve Sawyer		

This budget provides funding for the next reservoir. Scheduling will be based on the City's growth rate. Another project will supply funding for the future pump station. (DIF 55A)

860065	**Water Main Capacity Program**		**AB:$2,447,000** **RB: $ 836,300**
Funding	Water Capital Distribution Fee Water Facilities Rehabilitation Fee	$1,113,700 $1,333,300	
Project Manager	Steve Sawyer		

This project provides funds to model, plan, design, and install water mains to facilitate growth and to replace deteriorating mains. (DIF 87A/B, 92A/B, 98A/B, 102A/B, 107A/B, 111A/B, 115A/B)

860069	Peabody Road Water Line: NBR Plant to Foxboro Pkwy		AB:$1,400,000 RB:$1,400,000
Funding	Water Capital Plant Connection Fee	$1,400,000	
Project Manager	Steve Sawyer		

This budget provides funding for additional transmission capacity from the North Bay Regional (NBR) Plant to California Drive. The current funding is a set aside for preliminary engineering. (DIF 60A)

860071	Reynolds Ranch Reservoir		AB: $583,400 RB: $124,700
Funding	Water Developer Fund	$583,400	
Project Engineer	James Loomis		
860072	**Reynolds Ranch Booster Pump Station**		**AB: $446,100 RB: $ 96,900**
Funding	Water Developer Fund	$446,100	
Project Engineer	James Loomis		

The budget for these two projects provide funding for the design of a new upper zone water reservoir and booster pump station to serve residential units to be constructed in the developments northwest of Vaca Valley Parkway and Browns Valley Road. The reservoir will have a capacity of approximately 560,000 gallons and will serve residences whose pad elevations are too high to be served by the City's main zone reservoirs. The booster pump station will have a capacity to pump 510 gallons per minute and will pump potable water to the upper zone reservoir.

The property necessary for the reservoir and booster pump station has been secured by D.R. Horton and dedicated to the City. The final construction plans and contract documents were completed by the City and turned over to D.R. Horton in June 2006. The developer is responsible for obtaining the necessary environmental clearances for the projects prior to construction. Per the development agreement, the developer will hire the construction contractor and administer the construction contract; however, City staff will oversee and inspect the construction work. The schedule for completion of this project will be determined by the developer.

860073	**Lagoon Valley Zone 2 Reservoir & Booster Pump Station (DIF 9A/B)**		**AB:$1,192,400** **RB:$ 384,400**
Funding	Water Developer Fund	$1,192,400	
Project Engineer	James Loomis		
850065	**Pena Adobe Lift Station & Force Main (DIF 143)**		**AB: $699,700** **RB: $181,900**
Funding	Sewer Developer Fund	$699,700	
Project Engineer	James Loomis		

The budget for these two projects provide funding for the design of a new 2.6 million gallon pre-stressed concrete water storage reservoir, a 2,400 gallon per minute booster pump station, and a lift station and force main constructed in the Lower Lagoon Valley area to serve the proposed development.

Funding for 860073 and 850065 has been provided by the developer. The developer will hire the construction contractor and administer the construction contract; however, City staff will oversee and inspect the construction work. The developer is responsible for obtaining the appropriate environmental clearances for the projects prior to construction. The final construction plans and contract documents are complete and the schedule for construction will be determined by the developer.

860074	**Water DIF Study**		**OB: $230,000** **RB: $230,000**
Funding	Water Capital Distribution Fee Water Capital Connection Fee	$155,000 $75,000	
Project Manager	Steve Sawyer		

This budget provides funding for engineering (planning/scoping) and financial analysis (cost scheduling/capacity/demand/EDU impact) to calculate the cost of the Water DIF Update. (DIF 84B)

860075	**Water Meter Replacement Program**		**AB:$2,650,000** **RB: $ 353,900**
Funding	Water Major Replacement Water Facilities Rehabilitation Redevelopment Agency Fund	$1,300,000 $1,270,000 $80,000	
Project Manager	Steve Sawyer		

This budget provides funding to continue the program for replacing older residential and non-residential direct read meters that are under registering actual water consumption due to the age of the meters.

860076	**Southeast Water Line: New Alamo Creek to UPRR**		**AB:$108,000 RB:$107,000**
Funding	Water Capital Distribution Fee	$108,000	
Project Manager	Steve Sawyer		

This budget provides funding for the City to reimburse the developer of the Development so that they may upgrade the 12" water line to an 18" water line on Leisure Town Road. This is partial funding for the project. (DIF 88A)

860078	**Leisure Town Road Water Line: Orange Drive to Sequoia**		**AB: $850,000 RB: $844,900**
Funding	Water-Capital Distribution	$850,000	
Project Manager	Steve Sawyer		

This budget provides initial funding to extend the 24" water transmission main from Interstate 80 south on Leisure Town Road to Vanden Road into the residential Southtown development. (DIF 65B)

860079	**Butcher Reservoir Valve Vault**		**AB:$543,500 RB:$103,400**
Funding	Water – Major Replacement Water Development Fund Water Facilities - Rehabilitation	$400,000 $142,100 $1,400	
Project Engineer	Rick Navarro		

This budget provides partial funding for the preparation of design documents and construction of the Butcher Reservoirs valve vault. Additional funding to support the costs to increase the system capacity will be provided by the Lagoon Valley developer. The project includes removal of the two existing valve vaults and replacing them with a single larger valve vault, rerouting piping, reconfiguring the site access to the reservoirs to provide one common entrance with an automatic gate, and modifying inlet piping to provide better mixing in the reservoirs, improve water quality and circulation, and expand the system to accommodate Lagoon Valley.

An EIR was approved for the Lower Lagoon Valley Specific Plan. Community Development staff has confirmed that the Butcher Reservoirs site is within the scope of the projects identified in the Lower Lagoon Valley EIR and does not appear to involve any new or more severe environmental effects than those disclosed in the EIR. No further environmental documentation is needed for the project.

The construction plans and contract documents for the project have been completed by the City. Although this project will be constructed and administered by the City, the timing for construction will be coordinated with the construction of the Lagoon Valley Booster Pump Station and Reservoir (Account #860073); and is therefore dependant upon the Lagoon Valley developer. (DIF 98D)

860081	Well #17 Equipping		AB:$2,507,200 RB:$2,507,200
Funding	Water-Capital Plant	$2,507,000	
Project Manager	Steve Sawyer		

This budget provides initial funding for the equipping of proposed Well #17. The location will be identified in DIF 33A. See also 860051 “Well #17 Drilling.”

860083	DE Plant Emergency Generator Replacement		AB:$1,989,800 RB:$1,929,500
Funding	Water-Facilities Rehabilitation Water-Major Replacement Water-Capital Plant	$54,800 $1,435,000 $500,000	
Project Engineer	Rick Navarro		

This budget provides partial funding for the design and construction of the DE Plant Emergency Generator to replace the improvements that were destroyed as a result of a fire.

Utilities Department staff has contracted with CH2MHill to prepare a Preliminary Design Report (PDR) for the project. This past quarter, Utilities staff continued to work with the consultant to finalize the PDR.

The project schedule is dependent upon completion of the PDR and funding. (DIF 98F)

860084	Water System Mapping (GIS)		AB:$563,000 RB:$520,800
Funding	Water-Capital Plant Water Facilities Rehabilitation	$308,000 $255,000	
Project Manager	Steve Sawyer		

This budget provides funding to plan and administer water system growth on a GIS platform in Utilities. (DIF 101B/C, 106B/C, 110B/C)

860085	Groundwater Monitoring & Modeling		AB:$1,218,000 RB:$1,173,500
Funding	Water-Capital Plant	$1,218,000	
Project Manager	Steve Sawyer		

This budget provides funding to implement SB 221/610 recommendations for expanded groundwater development. (DIF 101C, 106D, 110D)

880039	Vine Street Reservoir Improvements		OB:$52,500 RB: $8,300
Funding	Vine Street Assessment District	$52,500	
Project Manager	Steve Sawyer		

The budget for this project provides funding to reconstruct perimeter fencing around the reservoir, install additional screening landscaping, merge two City-owned parcels, and vacate a landscape maintenance easement. This last quarter, the new perimeter fencing was constructed and original cattle fencing removed. Staff is working on document preparation for merging the two parcels and vacating the easement. This is anticipated to be completed during this next quarter.

910014	Affordable Housing Development Assistance		AB:$15,855,400 RB: $6,624,900
Funding	Low and Moderate Income Housing Fund Low Income Housing Equity Loan Repayment I-505/80 Capital Improvements	$13,055,400 $2,300,000 $500,000	
Project Manager	Cyndi Johnston		

The budget provides for acquisition and affordable housing opportunities. Negotiations have been initiated with a developer for a 60 unit senior apartment project. Staff will continue to negotiate for affordable housing projects as opportunities come up.

910019	Creekwalk Water Feature Enhancement		AB: $84,600 RB: $59,200
Funding	Vacaville Community Redevelopment Agency – 2000 Tax Allocation Bond	$84,600	
Project Engineer	Tawnia Skow		

This budget provides funding for design and installation of additional water features at the Creekwalk. The project consists of installation of a new cobble-lined waterfall on the bank of Ulatis Creek at Andrews Park. A Mitigated Negative Declaration was approved for this project in accordance with the provisions of the California Environmental Quality Act (CEQA).

Plans and contract documents have been completed for this project. Construction of the project is dependent upon funding.

910025	Opportunity Hill Remediation		AB: $503,300 RB: $468,600
Funding	Low & Moderate Housing Vaca Community Capital Improvements VCRA 2000 Bonds	$253,300 $125,000 $125,000	
Project Manager	Brenda Clyma		

This budget provides funding for unknown underground tank and archeological remediation that may be encountered during development of Agency property located within the Opportunity Hill area. The architectural and archaeology studies are already completed. Based on these studies, the site will need to be designed to minimize subsurface impacts. Additionally, during construction, the archeology consultant will need to be consulted for specific recommendations for mitigation.

This past quarter, staff applied for but was not awarded Federal TLC grant funds for water and sewer infrastructure upgrades. This next quarter, staff will be applying for other potential grant opportunities.

910026	Downtown Area Land Purchase for Resale		OB:$1,180,000 RB:$1,179,500
Funding	Vaca Community Capital Improvements	$1,180,000	
Project Manager	Brenda Clyma		

This budget provides supplemental funding for acquisition of additional properties for Opportunity Hill project area.

910031	Gateway Master Plan		AB: $163,400 RB: $116,800
Funding	I-505/80 Capital Improvements 2001 Tax Allocation Bonds	$133,800 $ 29,600	
Project Manager	Cyndi Johnston		

This budget provides funding for design and installation of downtown directional and parking signs at several locations within and around the downtown area. Twelve parking signs were installed in the Downtown area. A Request for Qualifications/Proposal process was conducted to select a consultant to develop the Citywide Directional Signage program. This past quarter, staff had worked with a stakeholder committee and retained a consultant. This next quarter, staff will conduct a kickoff meeting, stakeholder interviews, and project initiation.

910033	Auto Mall Landscaping		AB: $140,300 RB: $140,300
Funding	I-505/80 Capital Improvements ABAG 2006 Bonds	$113,700 $ 26,600	
Project Manager	Cyndi Johnston		

This budget provides initial funding to design and install landscaping and irrigation along Interstate 80, outside of the Caltrans right-of-way, but visible to eastbound traffic. The scope and specific limits of work will be determined.

910034	Northeast Sector EIR PW-Traffic		AB: $29,500 RB: $5,500
Funding	I-505/80 Capital Improvements	$29,500	
Project Manager	Ozzie Hilton		

This budget provided supplemental funding for the traffic model update for the support of traffic analysis of the Northeast Sector (Prior Project 820240), but was replaced by the pending update of the City General Plan. Traffic model validation is near completion and application of validation to initial projections for Year 2035 and General Plan Buildout will be accomplished this next quarter. With completion of projections, work will transition to applying model to support General Plan Transportation Element update, other elements needing traffic analysis, and associated General Plan Environmental Impact Report.

910036	DHR, FIRST and Social Service Building		AB:$2,620,000 RB:$2,617,800
Funding	Low & Moderate Housing Vaca Community Capital Improvements VCRA 2000 Bonds CRA 2001 Tax Allocation Bonds	$1,413,600 $497,200 $634,200 $75,000	
Project Engineer	James Loomis		

This budget provides funding for the design and construction of the proposed Vacaville Social Services building. The new facility will be located at the corner of Brown Street and East Monte Vista Avenue adjacent to the planned Solano County William J. Carroll Government Center. The Vacaville Department of Housing and Redevelopment, the Family Investigative Response Service Team (FIRST), and existing and future non-profit organizations will occupy the new facility.

The Redevelopment Agency is evaluating various alternatives related to this project and to determine the best use of its funding.

920037	Downtown Traffic Circulation and Parking Projects		AB:$2,243,900 RB:$1,617,400
Funding	Vaca Community Capital Improvements Vacaville Community Redevelopment Agency – 2000 Tax Allocation Bond	$25,000 $2,218,900	
Project Manager	Cyndi Johnston		

This budget provides set-aside funding to prepare various studies to assess whether current circulation and parking in the Downtown area impedes or facilitates economic vitality, and also to fund potential projects and land acquisitions.

The Downtown Parking Study and Master Plan has been completed and this past quarter was approved by the council. This next quarter, staff will be working with Public Works-Traffic and Police Departments to begin to implement the Downtown Parking Study recommendations regarding the timing of parking lots and analyzing the parking citation fees. Staff will also be working with DBVID on a public outreach program to identify the location of City parking lots.

920038	Freeway Directional Signs		AB: $324,400 RB: $201,200
Funding	Vacaville Community Redevelopment Agency – 2000 Tax Allocation Bond	$324,400	
Project Manager	Cyndi Johnston		

This budget includes funding to install a sign on I-80 to identify the Downtown area. It also funds three (6’ x 12’) signs at off ramp stops to identify major visitor designations. This past quarter, a consultant was selected to develop the Citywide Directional Signage program and will be working with staff on the design.

920060	Dobbins Street Parking		AB: $849,700 RB: $819,700
Funding	Vacaville Community Redevelopment Agency – 2000 Tax Allocation Bond	$849,700	
Project Manager	Cyndi Johnston		

This budget provides funding to add and renovate public parking on Dobbins Street. This past quarter, staff began assessing a site plan and the potential need for additional land.

920064	Dobbins Street Remediation		AB: $267,000 RB: $267,000
Funding	VCRA 2000 Bonds	$267,000	
Project Manager	Brenda Clyma		

This budget provides funding for unknown underground tank and archeological remediation that may be encountered during development of Agency property located on the west side of Dobbins Street, south of E. Monte Vista Avenue.

940002	Centennial Park Improvements		AB: $1,299,200 RB: $1,228,400
Funding	CRA 2001 Tax Allocation Bonds Vacaville Community Redevelopment Agency – 2000 Tax Allocation Bond	$1,258,000 $41,200	
Project Manager	Cyndi Johnston		

This budget provides funding to develop a master land use plan for park uses and private development for approximately 240 acres, of undeveloped Agency's property located at Centennial Park. It also provides funding to assess potential environmental impacts and provide for mitigation that would be needed as development occurred. This appropriation brings the total budget to $1,299,189.

Additionally, this budget provided funding to conduct preliminary site assessments and prepare project budget estimates for a fire station to be located within Centennial Park. Staff evaluated two different sites along Browns Valley Parkway, one at the intersection of Allison Drive and Browns Valley Parkway, and the other on the southwest corner of Centennial Park near the tennis courts. Engineering staff presented preliminary findings to the City's Development Team (D-Team) and finalized the site assessments.

In the next quarter, staff will begin the process to solicit a consultant to develop a Master Plan and assess infrastructure needs related to the wetlands.

960503	Crocker Drive – 18" Water Main		OB: $135,000 RB: $ 95,700
Funding	I-505/I-80 Capital Improvements	$135,000	
Project Engineer	Tracy Rideout		

This budget provides initial funding that will allow for the preliminary design and easement acquisition for construction of a new water main that will improve the systems water pressure and quality in the vicinity of the Eubanks Drive area. Design and construction of the water main will most likely be completed by private developers and will start when development in the area occurs.

Public Works Administration staff has completed the acquisition of easements from several property owners. These acquisitions are necessary for the construction and maintenance of the water line. Design has not commenced, pending agreements between the City and adjacent developers.

At this time, the design and preparation of construction plans and contract documents are on hold.

PUBLIC WORKS DEPARTMENT

2010/11 SECOND QUARTER

SECTION D
Capital Improvement Program (CIP) Projects Pending Final Closeout

Account No.	Project Title	Council Acceptance	Construction Contract Final Amount
820094	Allison Drive/I-80 Overcrossing – Mapping and Closeout	OCT 1998	$7,794,300
830028	Alamo Creek High Flow Water Bypass Channel	AUG 2004	$221,500
840076 840080	Lagoon Valley Lake Watershed Improvements	MAR 2005	$407,500
820028	Easterly Wastewater Treatment Plant Telecommunications Infrastructure	APR 2005	$80,600
850028	Easterly Wastewater Treatment Plant Renovation & Expansion	MAY 2005	$65,100,000
850041	Nut Tree Historic Area Assessment District Sewer	JUL 2005	$897,200
920049 820127	Bella Vista Road Realignment Bella Vista Road Park & Ride Lot	AUG 2005	$2,688,700
820224	Curb Ramp Construction (2005)	OCT 2005	$155,000
810140	Police Department Headquarters	DEC 2005	$11,469,800
67102	Gibson Canyon Creek Wastewater Treatment Plant Off-Site Groundwater Remediation Pipeline	MAR 2006	$141,800
820197	Nut Tree Road Resurfacing (Alamo to Ulatis)	MAR 2006	$801,700
820232	Alamo Drive Resurfacing(Spring Lane to Merchant)	MAY 2006	$344,700
820210	Underground Utility District #15 Mason Street (Davis to Merchant)	N/A	N/A
840084	Pena Adobe Rehabilitation	OCT 2006	$329,000
840067	Al Patch Park Phase I	FEB 2007	$3,955,500
860062	Wykoff Booster Pump Station	FEB 2007	$1,001,600
920047 820029	Mason Street Widening	FEB2007	$528,100
850028	Easterly Wastewater Treatment Plant Landscape Completion	FEB 2007	$384,400
850028	Easterly Wastewater Treatment Plant Maintenance Building	MAR 2007	$335,900
67202	Depot Street Water Line Realignment	MAR 2007	$151,900
860029	McMurtry Reservoir	JUN 2007	$8,363,900
820201	Nut Tree Road Resurfacing – Ulatis Drive to Orange Drive	JUL 2007	$705,100
820243	2006 AC Overlay	AUG 2007	$970,700
820192	Ulatis Creek Bike Path	SEP 2007	$301,900
850064	E. Monte Vista/Crocker Drive – Gravity Sewer Main	OCT 2007	$1,271,100
850068	Well 16 Equipping	NOV 2007	$1,714,400
850041	Nut Tree Trunk Sewer	NOV 2007	$1,208,600

Account No.	Project Title	Council Acceptance	Construction Contract Final Amount
820245	Elmira Road Soundwall	DEC 2007	$454,100
820162	Elmira Road Widening – Peabody to Allison	FEB 2008	$3,573,800
820172 880034 880035 880036	Nut Tree/I-80 Overcrossing Nut Tree Historic Area Assessment District Nut Tree Historic A.D – Utilities Cost Nut Tree Historic A.D. – Area Wide Cost	FEB 2008	$17,206,000
820127	Bella Vista Road Park & Ride	MAR 2008	$57,300
820138	Leisure Town Road Overcrossing @ I-80 Interchange	MAR 2008	$16,190,200
820233	Centennial Bikeway (Browns Valley Parkway to Vaca Valley Parkway)	MAR 2008	$569,000
850028	Easterly Wastewater Treatment Plant Project Completion (DIF 22,63)	APR 2008	$8,017,400
820251	2007 Slurry Seal	APR 2008	$1,612,300
820234	Southside Bikeway (Alamo Drive to California Drive)	MAY 2008	$207,400
820256	2007 Asphalt Concrete Overlay	MAY 2008	$517,900
810074	Vacaville Transit Plaza	AUG 2008	$1,868,000
810165	Corporation Yard Expansion – Phase I (Streets Maintenance Shop Building)	AUG 2008	$331,100
830039	Laurelwood Storm Drain Improvements	SEP 2008	$278,400
850072	Grandview Sewer Lift Station	SEP 2008	$140,800
810186	Ulatis Creekwalk Flood Damage	OCT 2008	$276,900
850071	Gibson Canyon Creek Wastewater Treatment Plant Closure	DEC 2008	$713,800
820267	2008 Asphalt Concrete Overlay	JAN 2009	$1,690,500
810195	Alamo Creek Bank Restoration	JAN 2009	$668,200
820128	Dobbins/E. Monte Vista Intersection Improvements & Widening East Monte Vista Bridge Over Ulatis Creek	FEB 2009	$2,167,600
820221 860088	Nob Hill Bike Path Nob Hill Water Main	FEB 2009	$300,300 $301,700
830032	Pleasants Valley Detention Basins	FEB 2009	$2,321,900
810201	McBride-Restroom Renovation/ADA Improvement	APR 2009	$100,300
940007	Andrews Park Irrigation Improvements	MAY 2009	$123,500
880038	Harbison Drive Sidewalk Improvements	JUN 2009	$30,000
920058	Town Square Shade Structure	JUN 2009	$80,000
820239	800 and 810 David Street Demolition	SEP 2009	$96,100
820257	Padan School Road Extension	SEP 2009	$1,051,000
820262	2008 Slurry Seal Project	NOV 2009	$981,500
820270	Marshall/Peabody Intersection Safety Improvements	NOV 2009	$359,200
810193	CNG Facility Upgrades	MAY 2010	$341,900
850028	Easterly Sludge Drying Bed #2	MAY 2010	$1,186,700
850062	Elmira Road Trunk Sewer Main	MAY 2010	$2,417,400
860082	DE Plant Contact Basin Roof Replacement	MAY 2010	$1,151,100
860090	Lawrence Drive Water Line: Comfort Suites Inn to Orange Drive	MAY 2010	$151,400
810219	Transit Opticom	APR 2010	$295,000

Account No.	Project Title	Council Acceptance	Construction Contract Final Amount
810228	Traffic Signal Pre-emption	MAY 2010	$325,000
850028	EWWTP North Plant Process Containment	SEP 2010	$171,000
910040	Alamo Drive and Allison Drive Overcrossing Enhancements	SEP 2010	$117,400
820272	2009 Asphalt Concrete Overlay	SEP 2010	$2,188,900
830038	Dobbins/Deodara Storm Drain Repair	OCT 2010	$185,250
810230	Solar Photovoltaic Systems	OCT 2010	$334,900
860093	Vaca Valley Parkway Water Line: Crescent Drive to Well 16	OCT 2010	$641,000
910030	Creekwalk Extension – Phase II	DEC 2010	$288,900
		Totals: 71 Projects	**$183,406,950**