APPENDICES

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APPENDIX F

2011 GROUNDWATER MANAGEMENT PLAN UPDATE

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City of Vacaville Groundwater Management Plan Update

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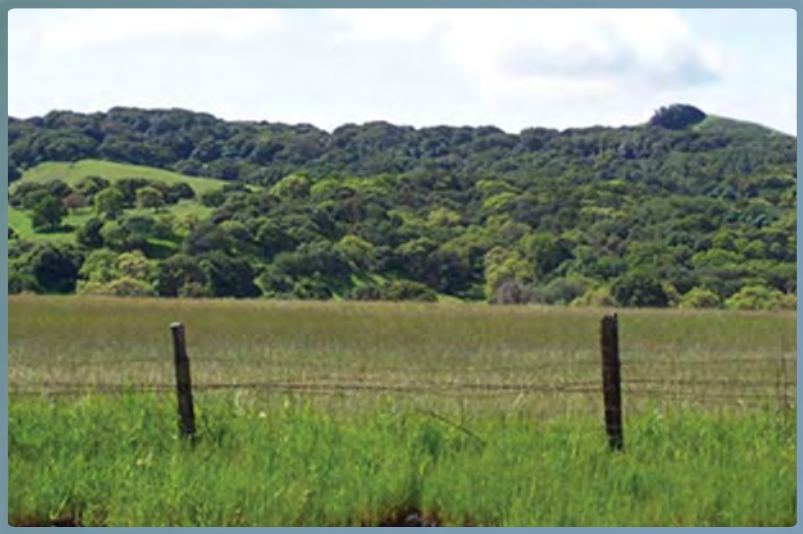

February, 2011

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1.0 INTRODUCTION

1.1 CITY DESCRIPTION AND OVERVIEW

1.1.1 City of Vacaville

The City of Vacaville, founded in 1850, is located at the base of the Vaca Mountains, approximately halfway between Sacramento and San Francisco on Interstate 80 (**Figure 1-1**). The City limits encompass over 21 square miles with a population in excess of 92,000, which makes Vacaville the third largest city in Solano County.

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 rate of growth has been slower in recent years, and recently imposed growth measures are expected to ensure adequate water supply for the community (Nolte, 2005).

1.1.2 Authority for Groundwater Management

The City of Vacaville is a local public agency that provides water service to customers within the City limits. As a result of Assembly Bill (AB) 3030, the California Water Code (CWC), Section 10750 *et seq.*, provides local agencies with the authority to adopt and implement groundwater management plans. On March 9, 1993, the City Council of Vacaville voted to adopt a resolution of intent to draft a groundwater management plan, and following the requirements of the CWC at that time, the City passed a resolution on February 14, 1995 approving the *City of Vacaville AB 3030 Groundwater Management Plan* (West Yost, 1995). As described further below, the CWC was subsequently amended as a result of Senate Bill (SB) 1938 (Machado), effective January 2003. As a result, the City has prepared this updated Groundwater Management Plan to comply with the revised requirements.

1.1.3 Plan Purpose

The purpose of the Plan is to maintain a high quality, reliable, and sustainable water supply for the citizens of Vacaville. To accomplish this, the City will continue to manage groundwater conjunctively with its surface water resources and support groundwater basin management objectives directed toward the sustainability of groundwater supplies. Groundwater management involves the ongoing performance of coordinated actions related to groundwater withdrawal, replenishment, and protection to achieve long-term sustainability of the resource without detrimental effects on other resources. To accomplish the City's purposes and the regional basin management objectives, the Plan sets forth a framework and related actions necessary to meet those objectives.

1.2 OVERVIEW OF REGIONAL PLANNING EFFORTS

1.2.1 Agency Coordination

The City is one of the member agencies of the Solano County Water Agency (SCWA), which encompasses all of Solano County plus the University of California at Davis (UCD) and the Yolo County portion of Reclamation District No. 2068 (RD 2068). SCWA was established in 1951 as the Solano County Flood Control and Water Conservation District (SCFC&WCD) under the governance of the Solano County Board of Supervisors. The governing board was expanded in 1988 to include the Solano County Board of Supervisors; mayors of the cities of Vallejo, Benicia, Suisun City, Dixon, Rio Vista, Fairfield, and Vacaville; Solano Irrigation District (SID); Maine Prairie Water District (MPWD); and RD 2068. The SCFC&WCD changed its name to SCWA in 1989. SCWA is responsible for water supply and flood control within its service area. Its water supply role consists of providing untreated surface water to cities, water districts, and state agencies within its boundaries. Other stakeholders that are not SCWA members include Rural North Vacaville Water District (RNVWD), the Dixon-Solano Municipal Water Service (DSMWS), and California Water Service Company (CWSC).

SCWA's primary source of water is the Solano Project, which stores water in the Lake Berryessa Reservoir created by the construction of Monticello Dam on Putah Creek in 1957. Other Solano Project facilities include the Putah Diversion Dam and the Putah South Canal, which delivers Solano Project water to the City and other recipients.

The City is also a member of the Solano Water Authority (SWA), which is a joint powers authority formed in 1987 with the same membership as SCWA. The SWA conducts its work through project agreements; one of these projects, the Coordinated Groundwater Data Analysis Project or SWA-4, is responsible for groundwater data management in northern Solano County. SWA prepares periodic reports to summarize the compiled data and describe historical and current groundwater conditions. Participants in this project include the cities of Vacaville and Dixon, SID, MPWD, RD 2068, SCWA, and Solano County.

Four local agencies, including the City of Vacaville, SID, MPWD, and RD 2068, each adopted groundwater management plans prior to the 2003 CWC amendments. In 2004 and 2005, SCWA facilitated a coordinated effort among these agencies directed toward updates of these plans such that the plans would comply with the amended CWC and also to accomplish consistency among the plans to achieve basin management objectives (West Yost, 2006).

1.2.2 Integrated Regional Water Management Plan

An Integrated Regional Water Management Plan (IRWMP) was prepared in 2005 (Solano Agencies, 2005) for the Solano agencies, including SCWA and its member entities, that identifies and prioritizes all water related actions for these Solano County agencies. Among the highest priorities noted in the IRWMP are conjunctive water resources management and groundwater management. The City and other SWA-4 entities have actively participated in steps to implement the IRWMP.

1.3 CITY WATER SUPPLY

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. In 1995, the City entered into a Water Master Agreement with 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 (City, in process). In aggregate, the estimated water resources available to the City in the year 2030 total 42,000 acre-feet (AF), including about 8,000 AF of groundwater (19% of the total supply).

1.4 LEGISLATION RELATED TO GROUNDWATER MANAGEMENT PLANS

The Legislature enacted legislation in 1992 (AB 3030) and 2002 (SB 1938), now incorporated in the CWC Section 10753, *et seq*. to encourage local public agencies to adopt plans to manage groundwater resources within their jurisdictions. The City is updating its Groundwater Management Plan to be compliant with revisions to the CWC that resulted from SB 1938.

SB 1938 provided that adoption of a groundwater management plan will be a prerequisite to obtaining funding assistance for groundwater projects from funds administered by DWR. To comply with SB 1938, a groundwater management plan must include components that address monitoring and management of water levels, groundwater quality degradation, inelastic land subsidence, and changes in surface flows and quality that either affect groundwater or are affected by groundwater pumping. SB 1938 specifies that groundwater management plans contain provisions to cooperatively work with other public (and presumably private) entities whose service areas or boundaries overlie the groundwater basin. Provisions must also be made to allow participation by interested parties in development of the plan. The plan must include mapping of the groundwater basin, as defined in DWR's Bulletin 118, along with the boundaries of the local agencies that overlie the basin. In this case, the Plan focuses on that portion of the Solano Subbasin that underlies the City. Finally, to comply with SB 1938, monitoring protocols must be designed to detect changes in groundwater levels, groundwater quality, inelastic land

subsidence (for basins where subsidence has been identified as a potential problem), and flow and quality of surface water that either directly affect groundwater, or are directly affected by groundwater pumping.

The potential components of groundwater management plans are listed in CWC Section 10753:

- the control of saline water intrusion;
- identification and management of wellhead protection areas and recharge areas;
- regulation of the migration of contaminated groundwater;
- the administration of a well abandonment and well destruction program;
- mitigation of conditions of overdraft;
- replacement of groundwater extracted by water producers;
- monitoring of groundwater levels and storage;
- facilitating conjunctive use operations;
- identification of well construction policies;
- the construction and operation by the local agency of groundwater contamination cleanup, recharge, storage, conservation, water recycling, and extraction projects;
- the development of relationships with state and federal regulatory agencies; and
- the review of land use plans and coordination with land use planning agencies to assess activities that create a reasonable risk of groundwater contamination.

In 2002, SB 1938 amended and added to CWC Section 10750 *et seq.* regarding the implementation of local groundwater management plans. While the provisions of SB 1938 did not alter the potential components of a local groundwater management plan, as listed above, it added the following provisions:

- The local agency, in preparing a groundwater management plan, shall make available to the public a written statement describing how interested parties may participate in developing the plan. For that purpose, the local agency may appoint, and consult with, a technical advisory committee consisting of interested parties.

- In order to qualify for funding assistance for groundwater projects, for funds administered by DWR, a local agency must accomplish all the following relative to groundwater management (CWC 10753.7(a)):

    - Prepare and implement a groundwater management plan that includes basin management objectives for the groundwater basin that is subject to the plan.

    - Include groundwater management components that address monitoring and management of water levels, groundwater quality degradation, inelastic land subsidence, and changes in surface flows and quality that either affect groundwater or are affected by groundwater pumping.

    - Include provisions to cooperatively work with other public (and presumably private) entities whose service area or boundary overlies the groundwater basin.

    - Include mapping of the groundwater basin, as defined in DWR's Bulletin 118,

and the boundaries of the local agency subject to the plan, plus the boundaries of other local agencies that overlie the basin.

- Adopt monitoring protocols designed to detect changes in groundwater levels, groundwater quality, inelastic land subsidence (for basins where subsidence has been identified as a potential problem), and flow and quality of surface water that either directly affect groundwater, or are directly affected by groundwater pumping.

Of the potential groundwater management activities listed in CWC Section 10753.8, those already being investigated and actively implemented as part of less formal groundwater management by the City include avoidance of overdraft, implementation of conjunctive use, monitoring of groundwater levels and quality, initiation of groundwater contamination control, analysis of basin yield for ongoing avoidance of overdraft, and regular analysis and reporting on groundwater conditions. The historic focus of informal groundwater management by the City has been on the quantity and quality of water supply, including avoidance of overdraft conditions, primarily by augmenting local groundwater supplies with supplemental, imported surface water resources. More recently, efforts have been added to include ongoing monitoring and the compilation of data into a database system. Recent efforts have also included use of an analytical groundwater model of the greater Vacaville area for analysis of aquifer system response to various groundwater extraction scenarios for a 20-year horizon. This work also provides an initial foundation for the future development of a numerical groundwater flow model that would be used to evaluate water supply, recharge, and conjunctive use alternatives that might be applicable to the basin. The City withdraws groundwater for municipal purposes from a deep aquifer, and most other extraction in the area occurs from overlying aquifers. Because there is much less risk of contamination of the deep aquifer as compared to shallow aquifers, the City's groundwater management provisions have focused more on supply and less on groundwater contamination. However, this component of local groundwater management is important in terms of overall basin management objectives as described in more detail herein.

In summary, the City has had a formal AB 3030 Groundwater Management Plan since 1995. The City is updating its current plan to be compliant with the SB 1938 requirements as part of its interest in developing and sustaining reliable water supplies to meet its own and also basin needs. To ensure the reliability of groundwater supplies to meet existing and projected demands, the components of local groundwater management planning already implemented include a monitoring program, formulation and maintenance of a database to manage the monitoring data, analysis of and annual reporting on groundwater conditions in the basin, initiation of groundwater modeling, ongoing conjunctive use of local groundwater and imported surface water supplies, and coordination with other agencies on the control of localized groundwater contamination.

1.5 ORGANIZATION OF GROUNDWATER MANAGEMENT PLAN

The balance of this plan is organized to describe management objectives, or goals, for the basin; describe existing groundwater basin conditions, including areas of concern and identified problems; present historical and projected water demands by the City from the basin; and finally to present a set of groundwater management actions which, collectively, form the components of this Groundwater Management Plan.

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, RNVWD, MPWD, and 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 SOURCES OF SUPPLY

As summarized in the City's General Plan Update (City, in process), the City's water supply includes both surface water and groundwater sources. The City's surface water sources are Lake Berryessa (Solano Project water) and the State Water Project (SWP) water delivered via the NBA. The balance of the City's water supply is groundwater. Current City water supplies are summarized in **Table 2-1** for normal, single-dry, and multiple-dry years. As indicated on the table, 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 total 26,548 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. Total groundwater pumping by the City has decreased from 6,600 AF in 2007 to 5,068 AF in 2010. This represents a 5% reduction in the percentage of the City's total available water supplied by groundwater pumping in a normal year. Surface water use by the City of Vacaville from 2008 to October 2010 is outlined in **Table 2-2**.

Raw surface water deliveries to the City of Vacaville are regularly tested (at least quarterly) for microbiological constituents, regulated organic chemicals, inorganic chemicals, radioactivity, secondary aesthetic standards, and a series of unregulated constituents (pH, alkalinity, hardness, sodium, calcium, potassium, manganese, asbestos, bromide and total organic carbon). The surface water deliveries received by the City are typically high quality with the majority of constituents consistently falling below detection limits.

Projected water supply sources in future years are summarized in **Table 2-3**. Surface water supplies are expected to increase from 16,991 AF in 2010 to 21,754 AF in 2050. Total City groundwater pumpage in normal years is projected to increase to 8,000 AF in 2020 and 2025 as new City wells come on line.

2.2.1 City of Vacaville Pumpage

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 **Table 2-4** and **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.

Changes in the City's historical pumpage are correspondingly reflected in the water level data from the Elmira Road well field; specifically, water levels increased as pumpage decreased and vice versa. Notably, the relationship between pumpage and water level response and the development of the localized cone of depression was recognized in the 1980s (Mann, 1985). The City has since developed new groundwater supplies for municipal purposes north of Elmira Road and decreased its total pumping to reduce the local pumping depression in the Elmira Road area. Beginning with the construction of City Well 14, which came on line in 1997, roughly 40% of pumpage has been redistributed from Elmira Road to the northeast sector of the City.

Well 15, located northeast of Well 14, came on line in September 2004. Well 16, located northwest of Wells 14 and 15, was drilled in January 2005 and came on line in July 2007. The DeMello well (completed in the upper Tehama Formation) came on line in 2003, but the capacity of this well is much smaller than the basal zone wells and it has been used only for backup supply since 2004. It has been offline as of 2005. With the addition of the northeast sector wells, Elmira Road pumpage decreased from 5,549 AF in 2003 to 2,698 AF in 2009. Increased

pumpage from the northeast sector wells in future years will further decrease reliance on the Elmira Road wells.

2.2.2 Other Pumpage in Northern Solano County

A brief summary of groundwater development in Solano County is contained in the IRWMP prepared in 2005. 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 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. SID's pumpage in 2005 (5,440 AF) was only slightly above the 40-year average of 5,363 AF.

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, 2003b). Pumpage by industrial and domestic wells in unincorporated portions of the Vacaville area is unmetered, but is assumed to be small. Groundwater development in the Vacaville area by others than the City has largely been from the upper part of the aquifer system rather than the basal zone of the Tehama Formation.

2.2.3 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 conjunctive water management plan 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 of 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. This plan was developed to ensure sustainable groundwater supplies in the City and SID service areas.

Base year water levels are not anticipated to be exceeded during "normal" water years (i.e., precipitation amount referred to as normal) 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.

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. Shallow wells are typically completed in the upper zone of the Tehama Formation and the overlying Quaternary alluvium. 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 bgs during construction of a multiple completion monitoring well in the Dixon area for 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.

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. The mean transmissivity of the basal zone is roughly 48,000 gpd/ft (LSCE, 2003a; LSCE, 2008). The transmissivity is significantly lower to the north in the RNVWD wells (mean of about 17,000 gpd/ft).

The Lagoon Valley/Vaca Valley fault flanks the eastern side of the Vaca Mountains and was recognized by Thomasson (1960) and others. The Lagoon Valley/Vaca Valley fault is an extension of the Vaca-Kirby Hills fault and is interpreted as a high-angle, northwest striking, east dipping, normal fault associated with Miocene to Pliocene age uplift and volcanism. Data to determine the hydraulic properties of this fault are limited, and it is unknown whether the fault affects groundwater flow.

2.3.2 Groundwater Levels

Groundwater level data for the City's wells are available from the City's monitoring program, which is discussed in Section 3.3. 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-7 to A-10**) 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 (Rural North Vacaville Water District (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. Elmira Road basal zone pumpage decreased from 1992 to 1996, was relatively constant from 1996 to 1999, and increased from 1999 to 2002. The City kept its total production at a constant level (between 6,600 and 6,700 AF) from 2002 through 2007, then pumpage decreased to about 5,800 AF in 2008 and to 4,600 AF in 2009. The changes in pumpage resulted in increasing water levels in Well 8 from 1992 to 1998, relatively constant water levels from 1998 to 2000, and water level declines of about 35 to 40 feet from spring 2000 to spring 2002 as pumpage increased. Spring water levels declined slightly from 2003 to 2005, recovered in 2006, and declined slightly in 2007. Hydrographs of other Elmira Road wells show water level declines from 2000 to 2005 and relatively stable water levels beginning in 2005. In spring 2009, groundwater levels in the basal Tehama Formation recovered by about 14 feet to an elevation of about -66 feet. In spring 2010, groundwater levels rose to an elevation of about -61 feet in response to further decreases in pumpage in 2009.

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 as discussed above, have risen since 2007.

Groundwater elevations in the basal zone 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 (measured between RNVWD MW-1389 and Vacaville MW-16 1430 2009 to 2010), 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 Comparison of Groundwater Level Responses in Different Aquifer Zones

Groundwater elevations in the deeper, more confined zones of the Tehama Formation have shown considerable variation over time in direct response to changes in the amount of groundwater used as a source of supply by the City. Groundwater levels in shallower, unconfined to semi-confined aquifers (e.g., the Quaternary alluvium and the upper zone of the Tehama), in which private water supply wells are typically constructed, appear to be largely unaffected by basal zone pumpage. Groundwater levels in the shallower compared to deeper portions of the aquifer system are shown in **Figures A-5 and A-6. Figure A-5** shows three monitoring wells near City Well No. 15. The shallowest well (MW-188, screened from a depth of 158 to 178 feet) shows stable groundwater elevations. Monitoring well MW-508, screened from a depth of 438 to 498 feet, also shows stable groundwater elevations. As seen in **Figure A-5**, water level trends in MW-188 and MW-508 are unaffected by the City's pumping. MW-1815, screened at multiple depths between 1,207 to 1,785 feet in the basal Tehama Formation, shows water level trends in response to the City's pumping. Similarly, **Figure A-6** shows three monitoring wells located near City Well No. 16. As seen in **Figure A-6**, groundwater levels in the shallowest monitoring well (MW- 117 screened from 97 to 107 feet) are unaffected by the City's pumping, whereas groundwater levels measured in the two deeper monitoring wells (MW-1176 and MW-1430, which are completed in zones that are also among the zones screened by Well No. 16), show a direct response to the City's pumping.

During 1968 to 2009, the City's total groundwater production ranged from 2,862 to 8,165 AF with significant variability in pumpage during that period. Even so, groundwater levels representing the shallower part of the Tehama Formation have shown little to no effect in relation to the City's basal zone pumpage. The basal Tehama Formation is highly confined meaning there are large sections of lower permeability materials, silts and clays, which occur between the zones from which the City's wells produce groundwater and the overlying units. This confinement has caused rapid, notable responses to groundwater levels in the pumped basal zone and at the same time precludes noticeable groundwater level responses in the overlying shallower part of the aquifer system.

As the City expands groundwater development of the basal Tehama Formation in the northern to northeastern areas, similar groundwater level observations are anticipated. Specifically, it is anticipated that additional drawdown will occur in the basal zone in response to such pumping, while little or no groundwater drawdown is anticipated in the shallower part of the aquifer system. Ongoing monitoring is recommended to further evaluate groundwater level trends in relation to the City's utilization of groundwater produced from the basal Tehama Formation.

2.3.4 Groundwater Quality

Historical groundwater quality data for the City's water supply wells are available from 1986 to the present, and the results are summarized in **Table 2-5**. 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, and most of the historical data do not show signs of water quality degradation. Concentrations have remained steady.

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, chromium-VI, and total chromium are typically detected at relatively low concentrations (less than half the MCL), except in Well 16 where arsenic approaches, and on one occasion has exceeded, the MCL of 10 µg/L[1].

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.

2.3.5 Land Subsidence

Limited monitoring of land subsidence has been conducted in Solano County using leveling surveys that relied on conventional spirit level surveying equipment prior to 1985. Since 1985, conventional survey methods have largely been replaced by Global Positioning System (GPS) techniques. The results of historical spirit level and more recent GPS surveys have been combined to estimate total subsidence and subsidence rates in the southern portion of the Sacramento Valley. The greatest subsidence in the Valley, more than 20 feet in some areas, has occurred in the Delta region as a result of draining of peat soils (Blodgett et al., 1990). Subsidence north of the Delta is caused primarily by groundwater pumping, but oil and gas extraction may be responsible for a significant fraction of the total subsidence in some areas.

The only available estimate of historical land subsidence near the City is based on Ikehara's 1994 report *Global positioning system surveying to monitor land subsidence in the Sacramento Valley, California, USA* that contains estimated subsidence rates for 18 benchmarks in the southern Sacramento Valley. One of these benchmarks (X128 R71) is located approximately halfway between the cities of Vacaville and Dixon. There was approximately 2.4 feet of total subsidence at this location between 1971 and 1989, which represents a subsidence rate of 0.131 feet/year. The location of this site, along with other subsidence monitoring stations in northern Solano County and adjoining portions of Yolo County, is shown on **Figure 2-9**.

Although greater subsidence rates have occurred to the north in Yolo County, the Vacaville area is considered to have a relatively high potential for future subsidence based on the historical data, geologic conditions, and lowered groundwater levels in the basal zone, particularly in areas

[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).

where limited development of the basal zone has occurred historically. In January 2011 two permanent GPS subsidence stations will be added to the regional monitoring network. These stations, located at City Well 16 and SCWA's Dixon monitoring well (**Figure 2-3**) will help decision makers to identify and mitigate any subsidence that may be occurring.

2.4 AREAS OF CONCERN

Although groundwater conditions in the Vacaville area are generally good, there are several areas of concern that may require changes in future groundwater management. These include:

- Sustainable pumpage from the basal zone of the Tehama Formation,
- Preservation of groundwater quality, and
- Prevention of significant future land subsidence.

From 2002 to 2007 the City's total annual pumping rate was held relatively constant at 6,600 to 6,700 AF. Water level data and groundwater modeling results from that period, summarized above and in LSCE (2003a), indicate that future City pumpage from the basal zone ranging from 7,000 AF, based on existing City wells, to 8,000 AF, with additional northeast sector wells, could be sustained to meet normal-year demands. As discussed above, spring groundwater levels measured in City wells during 1992 to 1993 were used to establish "base year" groundwater levels, or the levels to which the aquifer has recovered in response to an estimated sustainable level of pumpage from the Elmira Road well field. The actual amount of sustainable basal zone City pumpage will depend on factors such as other pumping in the area, the locations and perforated intervals of future wells, and effects of climatic conditions and land use factors on groundwater recharge reaching the basal zone. More recently, it has been observed that reducing overall pumping to 4,600 to 4,700 AF has produced significant rebound in groundwater levels. It is assumed that the continued shifting of pumpage away from the Elmira Road area will enable the City to increase pumpage from the basal zone without causing future chronic water level declines. It is also expected that if the City continues to pump at the currently reduced rates, groundwater levels in and around the City of Vacaville will continue to rebound.

In general, the City's groundwater supply is of high quality and meets drinking water standards. Groundwater produced from the basal zone of the Tehama Formation contains slightly elevated arsenic concentrations at Well 16. Vertical flow within the well structure causes some water quality variability when the well is idle; as a result, the City operates this well in a manner to ensure that the produced water meets the MCL for arsenic of 10 ug/L. There have also been localized instances of impacts on shallow groundwater quality due to hazardous chemical contamination, but existing or potential municipal supplies have not been affected to date. This Plan includes recommendations for prevention, monitoring, and mitigation of future threats to groundwater quality.

Land subsidence monitoring data are very limited in the Vacaville area, but data from one USGS report discussed above show that about 2.4 feet of total subsidence occurred between Vacaville and Dixon between 1971 and 1989. There are no data to indicate how much subsidence occurred within the City limits, and especially in the vicinity of the Elmira Road well field, but historical water level declines and geologic conditions result in a potential for future subsidence. Ensuring

that groundwater levels in the basal zone do not decline below 1992 levels at Elmira Road will reduce the risk of significant future subsidence in this area. Declining water levels in the northeast sector, which have resulted from the City's more distributed pumping scheme, may increase the risk of subsidence in that area. Two subsidence monitoring stations to be added to the regional monitoring network in January 2011 will help the City to analyze any trends and mitigate impacts as needed.

3.0 GROUNDWATER MANAGEMENT PLAN OBJECTIVES AND COMPONENTS

3.1 GROUNDWATER MANAGEMENT PLAN OBJECTIVES

The overall purpose of the Plan is to maintain a high quality, reliable, and sustainable water supply for the citizens of Vacaville. To accomplish this, the City will continue to manage groundwater conjunctively with its surface water resources and support basin management objectives (BMOs) directed toward the sustainability of groundwater supplies within the basin and subbasin. Groundwater management involves the ongoing performance of coordinated actions related to groundwater withdrawal, replenishment, and protection to achieve long-term sustainability of the resource without detrimental effects on other resources. To accomplish the City's purposes and the regional BMOs, the Plan sets forth a framework and related actions necessary to meet those objectives.

The City's utilization of surface water supplies from various sources along with local groundwater development represents a long history of water resource and water supply management actions that are consistent with what can be considered to be overall objectives for the Solano Subbasin. The BMOs addressed by this Plan can be expressed as follows:

1. **Assessment of Groundwater Basin Conditions.** Programs to monitor and report on groundwater levels, groundwater quality, and pumpage have been implemented to assess groundwater conditions in the Solano Subbasin. Plans to expand the existing programs and add monitoring of land subsidence are in progress. These monitoring programs are necessary to ensure that undesirable effects such as long-term groundwater level declines, groundwater quality degradation, and significant inelastic land subsidence are avoided. Regional coordination of groundwater monitoring is important, and monitoring programs should be reevaluated periodically to determine whether the location, depth, and frequency of monitoring is adequate. Data collected by the monitoring programs need to be evaluated on a regular basis to ensure that other BMOs are met.

2. **Avoidance of Progressive Groundwater Level Declines.** It is important that groundwater pumpage in the Solano Subbasin not exceed the sustainable yield of the subbasin in order to avoid chronic water level declines that could lead to overdraft conditions or cause significant inelastic land subsidence. This objective can be met through periodic evaluation of groundwater level and pumpage data collected by the monitoring program, along with refining the estimated sustainable yield of the subbasin.

3. **Preservation of Groundwater Quality.** This objective involves actions needed to sustain a supply of good quality groundwater for beneficial uses in the basin. It includes coordinated efforts that will be required to conduct a regional monitoring program that

identifies short and longer-term water quality trends. It also includes wellhead and recharge area protection and actions to avoid salt accumulation and/or mobility of naturally occurring constituents. Also included in this BMO will be the active characterization and solution of any groundwater contamination problems through cooperation with responsible parties or through independent action if timely response by responsible parties is not forthcoming and the preceding management objectives are thereby impacted or constrained.

4. **Increased Conjunctive Use of Surface Water and Groundwater Resources.** Several entities in the Solano Subbasin, including the City and SID, have used surface water and groundwater conjunctively for decades. There are opportunities to expand these programs in the future and to increase the use of recycled water to meet existing and projected demands. Included in this management objective is the non-degradation of surface water flows or quality as a result of groundwater management practices. In addition to being classified as a separate BMO, conjunctive use is one of the primary means of accomplishing BMOs 2 and 3 above.

Quantitatively, the preceding objectives translate into general preservation of groundwater levels and quality in the basin. Groundwater levels are allowed to fluctuate through seasonal demands and local hydrologic variations (wet and dry periods), but a progressive lowering of groundwater levels that could lead to overdraft would be prevented. As discussed in more detail in Chapter 2.0, the hydrogeologic setting in the Vacaville area and the City's extraction of groundwater from the deeper part of the aquifer system has resulted in large groundwater level fluctuations in the basal unit of the Tehama Formation. Fluctuations have been much smaller in the upper part of the aquifer where changes are primarily due to seasonal variations. Due to the integrated or conjunctive use of local groundwater and imported surface water, the City has managed its extraction, including locations and quantity, to prevent progressive lowering of groundwater levels in the deeper aquifer in the area beneath the City. A continuation of such local conjunctive use operations will help to accomplish the second BMO (avoidance of progressive groundwater level declines) while continuing to utilize local groundwater to meet a portion of the City's projected water requirements.

The City plans to intermittently use more groundwater from the basal zone of the Tehama Formation for dry-period and/or emergency water supply. Interpretation of historical pumping fluctuations and corresponding aquifer response suggests that such intermittent utilization of a slightly larger fraction of the Tehama Formation's large storage capacity during dry years can successfully contribute to meeting the City's water requirements while still accomplishing the management objectives listed above, primarily via corresponding reductions in pumping during normal and wet years.

3.2 PLAN CATEGORIES AND COMPONENTS

To accomplish the BMOs discussed above, this Plan incorporates a number of components that are divided into five categories: 1) monitoring program, 2) water resource sustainability, 3) groundwater resource protection, 4) agency coordination and public outreach, and 5) plan

implementation and updates. Each of these categories and the Plan components within each category are described in this section.

The Plan components reflect the focus on local groundwater management in the Solano Subbasin by the City and continuing cooperation with the members of the SWA and other stakeholders in the Solano Subbasin. In summary, this Plan aids the City in the continued management of its own groundwater resources, and provides the foundation for the City and other entities in the basin to cooperatively manage and potentially expand use of groundwater on a regional basis for municipal and emergency water supply purposes.

Category 1: Monitoring Program
- 1A. Elements of Monitoring Program
- 1B. Evaluation and Reporting of Monitoring Data

Category 2: Water Resource Sustainability
- 2A. Maintaining Stable Groundwater Levels
- 2B. Determination of Sustainable Pumpage
- 2C. Continuation of Conjunctive Use Operations
- 2D. Integration of Recycled Water
- 2E. Water Conservation

Category 3: Groundwater Resource Protection
- 3A. Well Construction and Destruction Policies
- 3B. Identification and Management of Recharge Areas and Wellhead Protection Areas
- 3C. Management and Mitigation of Contaminated Groundwater
- 3D. Long-Term Salinity Management

Category 4: Agency Coordination and Public Outreach
- 4A. Continuation of Local, State, and Federal Agency Relationships
- 4B. Public Outreach
- 4C. Water Awareness Education

Category 5: Plan Implementation and Updates
- 5A. Plan Implementation and Reporting
- 5B. Provisions to Update the Groundwater Management Plan

3.3 COMPONENT CATEGORY 1: MONITORING PROGRAM

The City's groundwater monitoring program was initially described in its first *AB 3030 Groundwater Management Plan* (West Yost, 1995), and additions to the monitoring program were outlined in a report updating local groundwater conditions through 2003 (LSCE, 2004b). The City's current groundwater monitoring program includes monitoring of groundwater levels, quality, and production. As discussed below, the City is coordinating with SCWA on the addition of two land subsidence monitoring stations to the regional monitoring program in January 2011.

3.3.1 Component 1A: Elements of Monitoring Program

The City's groundwater monitoring program is summarized in **Table 3-1**, and the monitoring locations are shown on **Figure 3-1**. The monitoring program summarized on this table and figure does not include 14 shallow monitoring wells located at the City's two wastewater treatment plants (WWTPs). There are nine monitoring wells at the Gibson Creek WWTP and five monitoring wells at the Easterly WWTP. Although these wells are not included in the groundwater monitoring program summarized below, the monitoring results are evaluated as part of achieving the third BMO (preservation of groundwater quality).

Groundwater Levels

As shown in **Table 3-1**, manual water level measurements are currently made by the City on a semi-annual basis in 11 of its 13 production wells and all of its dedicated Tehama Formation monitoring wells. In addition to the manual measurements, nine production wells are equipped with transducers connected to the City's SCADA system. Additional transducers are scheduled to be deployed in wells MW-14, MW15-1815, MW16-1430, MW-98A, and MW-98C in January 2011.

In 1992, the City implemented a program to obtain spring and fall water level measurements from its production wells that best represent static conditions. Manual water level measurements are preceded by a three-day shutdown period for all wells in order to eliminate the most pronounced effects of recent pumping to ensure consistent and generally static monitoring conditions. However, the spring measurements often do not reflect the highest groundwater levels of the year, and the fall measurements provide little indication of the low groundwater levels that occur during the summer. Since 2002, transducer measurements from the City's SCADA system have also been available to indicate the highest water levels in the spring and the lowest water levels during the summer. The SCADA system allows the City to continuously monitor pumpage and water levels in most of its active production wells. The exceptions are Well 1, which has a SCADA connection that monitors pumpage but not water levels, and Wells 2, 3, and DeMello, which are not connected to the SCADA system. Water level readings are taken every 10 seconds in the other wells, and the data are automatically uploaded via radio or telephone line to a computer at the City's Water Treatment Plant on Allison Road.

In 2001, the City began manual water level measurements in monitoring wells completed in all three zones of the Tehama Formation. As summarized in **Table 3-1**, manual water level measurements are currently made semi-annually (spring and fall) in 11 monitoring wells.

Several other entities also monitor groundwater levels in the vicinity of the City, including SCWA, DWR, USBR, SID, and RNVWD. Data collected by DWR and USBR are available on DWR's website, and data collected by SID and RNVWD are available from those districts. SWA also acts as a repository for water level data collected by DWR, USBR, SID, and UCD under the SWA-4 agreement. The purpose of the SWA-4 agreement is to coordinate groundwater monitoring data among the SWA member agencies and also other agencies, including DWR and USBR. SCWA has responsibility for managing the data and preparing periodic reports on behalf

of SWA to summarize the compiled data and describe historical and current groundwater conditions.

SWA has completed an initial report on groundwater conditions in northern Solano County (Summers Engineering, 1995) and three data summary reports, the most recent of which is entitled *2003-2005 Ground Water Report, Groundwater Conditions in Solano County* (SWA, in progress). This report lists the wells with groundwater data, shows the sampling frequency, and refers to a database that includes the well construction and water level data. The report includes data for 139 to 202 wells, depending of the year water levels were measured. The majority of these wells are monitored monthly or semi-annually; some wells are monitored annually. The majority of these wells are agricultural or domestic wells perforated in the upper aquifers (above 400 feet).

The regional groundwater monitoring program has been expanded. In October 2007, SCWA began installing multiple-completion monitoring wells at four locations in northern Solano County. Since then, monitoring wells have been installed at all four locations and are currently equipped with transducers. Transducer data are downloaded and analyzed at least semi-annually. Manual water level measurements are taken on the same frequency. A summary of construction information and monitoring activities for each SCWA monitoring well is provided in **Table 3-2**.

Groundwater Quality

Groundwater quality sampling of the City's production wells for general minerals, inorganics, and organics is conducted every three years as required for all public water supply systems. The City also collects samples annually for nitrate analysis. Samples were collected quarterly for radionuclide analysis from May 2005 to January 2006, and the City has received a 9-year waiver from the California Department of Public Health (DPH) for future radionuclide sampling because the gross alpha results were below the threshold of 3 pCi/L. The City's current groundwater quality monitoring program is summarized in **Table 3-1**.

SWA does not include groundwater quality data in its periodic monitoring reports; therefore, there is no central repository for water quality data in Solano County. In the vicinity of the City, RNVWD and SID conduct routine groundwater quality sampling. Although RNVWD has two production wells, only one is operated for public water supply. Due to elevated arsenic concentrations, exceeding the MCL of 10 ug/L, in the second production well, it is currently offline. Routine water quality sampling is conducted in both wells as required by DPH.

SID's *SB 1938 Groundwater Management Plan Upgrade* (Summers Engineering, 2006) states that groundwater quality is monitored on a rotating basis in agricultural wells in the SID service area. Although the number of wells sampled each year and the sample analyses conducted are not specified, SID produces a brief annual report each year that includes groundwater quality results. The 2009 annual report shows that four wells were sampled, and the samples were analyzed for general minerals including nitrate, boron, and sodium adsorption ratio (SAR). The 2009 annual report also indicates that nine SID wells have been sampled since 2001, and most of these were sampled every other year (Summers Engineering, 2009).

Groundwater Production

The City monitors pumpage in its water supply wells on a daily basis. As shown in **Table 3-1**, all but three water supply wells are connected to the SCADA system that allows the City to monitor pumpage electronically. By February of 2011, Wells 2 and 3 will be added to the SCADA system, leaving only the inactive DeMello Well to be monitored manually. The electronic pumpage data are typically recorded daily (at noon), but more frequent data can be collected if necessary. Other well information such as flow rate, pressure, pump speed, chemical tank level, etc. are also recorded daily.

There is no regional compilation of pumpage data in Solano County because SWA does not include pumpage in its database or reports. In the vicinity of the City, municipal pumpage is monitored by RNVWD. SID monitors agricultural pumpage from District wells but does not monitor non-District pumpage within its boundaries. As noted above, the DeMello well has been offline since 2005.

Land Subsidence

The City does not currently monitor land subsidence within its boundaries, and regional monitoring of land subsidence in Solano County has been limited. Regional land subsidence monitoring has included non-instrumented GPS monuments and continuous GPS monitoring stations; there are no extensometers in Solano County. In January 2011, two permanent GPS subsidence stations (located at the Vacaville Well 16 and SCWA Dixon monitoring well sites) will be added to the regional monitoring network.

The Sacramento-San Joaquin Delta non-instrumented GPS network consists of about 120 monuments, including about 30 monuments in Solano County. This network was initially surveyed in 1997 and resurveyed in 2002, but funding has not been available to process the data from the 2002 resurvey. Yolo County also has a non-instrumented GPS monitoring network consisting of 58 stations. The Yolo County network was surveyed in 1999, 2002, and 2005. The 2005 survey of the Yolo County network included several stations in northern Solano County. GPS monitoring locations in northern Solano County and adjoining portions of Yolo County are shown on **Figure 2-9**.

Instrumented GPS monitoring stations are generally referred to as Continuously Operating Reference Stations (CORS). Each CORS site includes a high-resolution GPS receiver and antenna with a solar collector and battery for power supply. The GPS receivers are attached to steel or concrete structures that are anchored deep into the soil. GPS positions are recorded at intervals of five to 30 seconds, and a daily average is calculated from all of the data to achieve maximum accuracy. CORS sites use some form of telemetry (typically a radio transceiver) to upload the data. After processing, the data are accessible on Internet sites operated by entities such as the National Geodetic Survey (NGS) or the California Spatial Reference Center (CSRC).

At present, there is one CORS site in northern Solano County. This site, labeled P267, is located south of Dixon and approximately six miles east of the City (**Figure 2-9**) and is operated by the Plate Boundary Observatory. Historical data are limited for this station, which began operation in

April 2005. The two new subsidence stations scheduled for January of 2011 will also be operated by the Plate Boundary Observatory.

Surface Water Flows and Quality

Monitoring of surface water flows and quality is generally not applicable to the City of Vacaville for three reasons: 1) there are no major streams in the vicinity of the City, 2) the City's production wells are completed in relatively deep and confined zones of the Tehama Formation (primarily the basal zone), and 3) there is no direct interaction between groundwater in this zone and surface water.

As required by DPH, the City monitors the quality of surface water delivered by the Solano Project and the SWP on a quarterly basis. Both raw and treated surface water are sampled at the City's water treatment plant and analyzed for nitrate on a quarterly basis (except for the first quarter) and for general mineral, general physical, inorganic, and organic constituents annually.

Actions

- Continue the City's existing groundwater monitoring program and complement with information gathered by other local and state agencies (e.g., DWR, SID, and USBR).

- Expand regional groundwater monitoring programs to ensure effective groundwater resource management and accomplishment of the BMOs.
    - Coordinate with SCWA regarding the adequacy of regional groundwater monitoring networks and programs.
    - Coordinate with SCWA on planned construction of additional monitoring facilities in northern Solano County.
    - Coordinate with SCWA on implementation of a land subsidence monitoring program.

3.3.2 Component 1B: Evaluation and Reporting of Monitoring Data

Groundwater level, quality, and production data collected as part of the City's monitoring program are periodically entered into a database, which allows the data to be summarized on tables and plots in an efficient manner. The data are routinely reviewed to check for any significant changes in groundwater conditions. On a less frequent basis, the data are comprehensively evaluated and a report is prepared to summarize the data.

The most recent evaluation of groundwater conditions in the Vacaville area is presented in the report entitled *Hydrostratigraphic Interpretation and Groundwater Conditions of the Northern Solano County Deep Aquifer System*, (LSCE, 2010). Previous reports have been prepared at least every other year beginning in 2000. Most of these reports have been comprehensive, detailed reports that contain much more analysis than is generally required in a routine annual summary of the data. Such routine annual reporting is recommended in the future, as described below.

Actions

- Prepare a brief annual summary of groundwater and land subsidence data collected through spring (i.e., March or April) in a groundwater management report to be completed each year by August 1st.

- Coordinate with SWA-4 on the maintenance and utilization of the regional monitoring database, including regular transfer of City data and coordination with others on the use of the data to assess basin conditions relative to the BMOs. Additionally, coordinate with SWA-4 on monitoring protocols (such as groundwater level objectives) being used to assess the effect of pumpage on levels and achieving BMOs.

- Coordinate with SWA-4 regarding the adequacy of regional evaluation and reporting of groundwater data. Potential improvements to the SWA database and reports include:
    - the addition of the City's wells and water level data;
    - the addition of groundwater quality, pumpage, and land subsidence data;
    - preparing reports on an annual basis to summarize data collected during the previous year; and
    - preparing a coordinated update of groundwater conditions in the subbasin at least every five years.

3.4 COMPONENT CATEGORY 2: WATER RESOURCE SUSTAINABILITY

3.4.1 Component 2A: Maintaining Stable Groundwater Levels

Accomplishment of the second BMO (avoidance of progressive groundwater level declines) requires that generally stable groundwater levels be maintained in the Tehama Formation, especially in the basal zone. On a subbasin scale, there have been increases in groundwater levels and storage since the Solano Project began delivering water in the late 1950s. As described above, however, groundwater levels in the basal zone of the Tehama Formation continue to exhibit a localized cone of depression in the vicinity of the City's Elmira Road well field, and groundwater levels in this area have fluctuated directly in response to the amount of pumpage. Following several years of maintaining total annual pumpage at 6,600 to 6,700 AF, basal zone groundwater levels in the Elmira Road wells appear to have stabilized as of spring 2006. Since 2007, reduced groundwater pumping by the City has caused groundwater levels in the basal aquifer to rebound significantly (upwards of 25 feet in some areas).

Water level fluctuations in the basal zone are typical of conditions in an area where groundwater and surface water are conjunctively managed. Historically, more groundwater was pumped from storage during dry years, and that storage was replenished when pumpage was reduced during subsequent wet years. Annual pumpage was held constant from 2002 to 2007 to observe water level responses in the basal zone. As discussed above, 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. 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 again used to restore groundwater levels to base year conditions following a dry year when increased pumpage has occurred.

In recent years, the City has also managed the location of its groundwater extraction in an effort to shift pumpage away from the Elmira Road well field to the northeast sector of the City. Prior to the construction of City wells 14, 15, and 16 in the northeast sector, there was no significant groundwater development of the basal zone of the Tehama Formation for municipal water supply in this area, although a small amount of groundwater is known to be produced from this zone for commercial purposes. Somewhat further north, there is a small amount of groundwater development from this zone by RNVWD. The City plans to develop some additional groundwater to supplement its currently available groundwater and surface water resources and add that yield to the existing water supply. One area identified for potential future groundwater development is in the northeast sector.

Actions

- Continue to manage groundwater and surface water conjunctively to ensure that groundwater levels in the Elmira Road wells recover to spring 1992-1993 "base year" levels during normal years based on the following criteria:
    - During dry years with increased pumpage, recognize that groundwater levels may decline below base year levels but maintain groundwater levels above historical lows.
    - Use conjunctive water management to restore groundwater levels to base year conditions following a dry year when increased pumpage has occurred.
    - Use 1992-1993 base year groundwater levels, in conjunction with the more complete data from 2002-2003, to measure aquifer system response to pumping and assess the sustainable pumpage.

- Manage pumping away from Elmira Road to prevent progressive groundwater level declines in other areas.

- Continue groundwater development programs that help to achieve the BMOs by optimizing the pumping distribution in the City's urban planning area.

3.4.2 Component 2B: Determination of Sustainable Pumpage

In order to accomplish BMOs that pertain to groundwater in the Vacaville area, it will be important to determine what yield can be developed on both a regular and an intermittent (dry period or emergency) basis. A determination 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.

The intent of this Plan component is to develop further understanding and quantification of sustainable pumpage from the Tehama Formation (especially the basal zone), accounting for variations in hydrologic conditions and the location and amount of pumpage, 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.

In the future, in coordination with other SWA members and state and federal agencies, implementation of this Plan component will be important in accomplishing the first and second management objectives for the basin. The observation of historical groundwater conditions, in combination with knowledge of pumpage from the basal zone of the Tehama Formation, has led to the City's current operational practices as well as general expectations regarding the approximate yield of this aquifer in the vicinity of the City. Historical operating experience, complemented by observed groundwater conditions, is an appropriate basis to initially determine available groundwater supplies. However, it is possible and appropriate to more precisely analyze the basin 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. Previous reports, including LSCE (2010), include recommendations for the future development of a numerical groundwater flow model that could be utilized for determination of the yield of the subbasin under existing land use and groundwater and surface water development conditions. Such a model could also be used for implementation of this Plan component 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.

Actions

- Assess levels of pumpage relative to the sustainable yield of the principal aquifer system.
    - Update sustainable pumpage estimates with expanded monitoring data (e.g., monitoring conducted with the new SCWA monitoring wells installed at the periphery of the urban planning area).

- Refine assessment of hydrogeologic conditions and the conceptual model in preparation for the future development of a regional numerical groundwater flow model.
    - Improve groundwater extraction (non-City pumpage) and recharge estimates.
    - Refine conceptual model of subbasin (e.g., conceptual model for enlarged study area).
    - Investigate stream-aquifer interactions.

- Discuss joint development of a regional numerical groundwater flow model to simulate and evaluate future water resources management scenarios with SWA and other entities that overlie the subbasin.

3.4.3 Component 2C: Continuation of Conjunctive Use Operations

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. Conjunctive water management goals have been established particularly to accomplish the second BMO, i.e., avoidance of progressive groundwater level declines. Continuation of conjunctive water management is expected to enable

the City to meet its future water demands to a 20-year horizon and beyond. Groundwater-related objectives of the conjunctive water management program are to:

- Recognize and implement actions to prevent persistent groundwater level declines.
- Continue to maintain groundwater levels above historical lows when levels temporarily decline during dry years in order to minimize subsidence and other adverse consequences caused by over pumping of the aquifer system.

Planning for additional groundwater development has preliminarily involved the use of an analytical groundwater flow model (LSCE, 2003 and 2007). Monitoring data have been and will continue to be utilized to assess actual response to pumping (particularly within the basal zone) so that operations can be adjusted as necessary to achieve this BMO, i.e. avoidance of 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 (**Figure 2-5**). 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. In light of all the preceding, continuation of this Plan component is essential to accomplishing all the BMOs.

Actions

- Continue the City's conjunctive management of its available water resources;
- Coordinate with other SWA members to explore other conjunctive use opportunities directed toward the BMOs.

3.4.4 Component 2D: Water Conservation

The City of Vacaville is committed to implementing water conservation programs. The 2005 UWMP contains descriptions of the conservation measures that the City has implemented, plans to implement, or intends to study (Nolte, 2005). This section highlights those measures that are the same as the best management practices (BMPs) outlined by the California Urban Water

Conservation Council. For more than 18 years, the City has participated in a Water Conservation Council that includes other cities in Solano County and SCWA, the City's wholesale supplier of imported surface water. Through regional partnering efforts, the cities have shared resources and benefited from each other's programs and studies.

Water conservation and related public education measures have generally been developed in California to achieve the following goals:

- meet legal mandates,
- reduce average annual potable water demands,
- reduce sewer flows,
- reduce water demands during peak seasons, and
- meet drought restrictions.

The City has implemented the following BMPs to increase water conservation:

- distribution system water audits and leak detection and repair;
- public information;
- school education;
- conservation pricing;
- conservation coordinator;
- residential plumbing retrofits;
- metering with commodity rates for all new connections and retrofit of existing connections;
- large landscape conservation programs and incentives;
- conservation programs for commercial, industrial, and institutional accounts; and
- water waste prohibition.

The City's water conservation and public education program will expand to include the following BMPs found to be locally cost-effective, as detailed in the 2005 UWMP. These BMPs are intended to reduce California's long-term urban water demands and have been incorporated into the water demand management measures section of the Urban Water Management Planning Act.

- Water survey programs for single-family residential and multi-family residential programs (surveys of customers having the greatest potential to reduce water use started in 2006);
- High-efficiency washing machine rebate programs (the City supports the rebate program offered by Pacific Gas & Electric Company); and
- Residential ultra-low-flow toilet replacement program (the City exempted itself from this water demand management measure in its 1999 Water Management Plan; however, it is continuing to research an effective and efficient method to implement in the future).

The City uses a variety of communication tools to encourage water conservation. These tools include: press announcements and newspaper advertisements; public workshops; City web site posting with a dedicated water conservation section to promote water conservation practices and water rate information; billing software that shows each customer's water use over the last 12 months; cooperative exhibits, demonstration sites, library displays, and a water model used for

public meetings and school education; public information through regional projects; speakers for community groups and the media; and coordination with other government agencies, industry groups, public interest groups, and the media.

This Plan component will be incorporated with educational and outreach material to complement other Plan components. This update of the City's Plan includes continuation of public water awareness programs directed toward achievement of the BMOs.

Actions

- Continue to implement and promote water conservation programs within the City's service area.

3.5 COMPONENT CATEGORY 3: GROUNDWATER RESOURCE PROTECTION

3.5.1 Component 3A: Well Construction and Destruction Policies

Most of the City's groundwater supply is developed from the basal zone of the Tehama Formation. The City's wells are commonly completed to depths of over 600 feet, including many wells over 1,000 feet deep and one well over 1,800 feet deep. Proper well design and construction is required to prevent the movement of poorer quality water between aquifers through the well structure. In coordination with SWA, the City has implemented well construction guidelines to minimize the potential for groundwater quality degradation in deeper aquifers. These guidelines, which especially include the installation of deep seals, are followed for construction of all new City wells. The City also continues to follow the Solano County Code (see below) and guidance provided in DWR Bulletins 74-81 and 74-90 on well construction (DWR, 1981 and 1990).

The Solano County Environmental Health Services Division of the Department of Resource Management is responsible for well construction permitting in Solano County. The County Code, Chapter 13.10, effectively implements the State Well Standards for water supply wells, monitoring wells, and cathodic protection wells. Permitting of municipal supply wells is also within the purview of DPH. The third BMO, preservation of groundwater quality, requires that all wells be properly constructed and maintained during their operational lives and properly destroyed after their useful lives, so that they do not adversely affect groundwater quality by, for example, serving as conduits for movement of contaminants from the ground surface and/or from an aquifer with poor groundwater quality to one with good quality. Toward that end, this component is included in the overall plan to support well construction and destruction policies, and to participate in their implementation in the subbasin, particularly with regard to surface and inter-aquifer well sealing and proper well destruction, which are critical in the management of a multiple aquifer system.

Actions

- Continue current well construction and destruction policies.

- Coordinate with other SWA members as appropriate on well construction and future resource utilization.

3.5.2 Component 3B: Identification and Management of Recharge Areas and Wellhead Protection Areas

The 1986 Amendments to the federal Safe Drinking Water Act (SDWA) established requirements for new Wellhead Protection Programs (WPPs) to protect groundwater that supplies drinking water wells for public water systems. Each state was required to prepare a WPP and submit it to the USEPA by June 19, 1989. However, California did not develop an active statewide WPP at that time. Subsequently, in 1996, reauthorization of the SDWA established a related program called the Source Water Assessment Program. In 1999, the DPH Division of Drinking Water and Environmental Management developed its Drinking Water Source Assessment Program (DWSAP), which was approved by USEPA. The overall objective of the DWSAP is to ensure that the quality of drinking water sources is protected. The wellhead protection aspect of this groundwater management plan component is now essentially required as a result of the 1996 SDWA reauthorization.

In California, the DWSAP satisfies the mandates of both the 1986 and 1996 SDWA amendments. The California DWSAP includes delineation of Groundwater Protection Zones surrounding an existing or proposed drinking water source where contaminants have the potential to migrate and reach that source. The program includes preparation of an inventory of activities that may lead to the release of contaminants within these zones. The activities, referred to in the DWSAP as Potentially Contaminating Activities, include such land uses as gas stations and dry cleaners, as well as many other land uses. Known contaminant plumes regulated by local, state, and federal agencies are also included. The Groundwater Protection Zones, which are determined based on local hydrogeological conditions and also well operation and construction parameters, represent the approximate area from which groundwater would be withdrawn during 2, 5, and 10-year time periods. These zones also represent the area in which contaminants released to groundwater could migrate and potentially affect the groundwater extracted by wells located within the designated zones. The DWSAP evaluation also includes a risk or vulnerability ranking based on a combined numerical score that results from points assigned to various evaluations conducted as part of the DWSAP process. This ranking provides a relative indication of the potential susceptibility of drinking water sources to contamination.

DPH is responsible for conducting DWSAP assessments for systems existing prior to the adoption of the California program but has encouraged purveyors to perform their own assessments. Assessments for existing systems were due to be completed by May 2003.

Permitting of a new water supply well requires that the applicant complete a DWSAP analysis as part of the permit process. Fifteen DWSAP assessments have been completed on behalf of the City. The results of the DWSAP assessments can be used as a planning tool to guide land use development in the vicinity of water sources. The DWSAP analyses prepared for water sources in the basin should, in some fashion, be reviewed at least every five years and updated as appropriate. The collective DWSAP information can also be integrated with other management

activities, including siting of new wells, land use policies, and the County's Code concerning well construction.

This Plan component is included to incorporate the DWSAP efforts into the City's Groundwater Management Plan. Compliance with these DPH requirements is a key part of accomplishing the BMOs.

Actions

- Employ wellhead protection measures to ensure long-term sustainability of good quality water.
    - Use DWSAP information, including delineation of source area and protection zones.
    - Require deep sanitary seal construction standards for municipal supply wells.
    - Employ well destruction policy to prevent groundwater contamination.

- Coordinate with other SWA members (as applicable) regarding DWSAP analyses (and also other environmental assessments) conducted to help guide management decisions in the subbasin.

- Promote recharge area protection to mitigate impacts of urban infrastructure and sources of groundwater contamination that could reduce recharge potential.

3.5.3 Component 3C: Management and Mitigation of Contaminated Groundwater

In general, groundwater is of high quality and meets drinking water standards in the Vacaville area.

In the more publicized arena of hazardous chemical contamination that falls under the purview of the Regional Water Quality Control Board and sometimes other state or federal agencies, there have been localized instances of impacts on groundwater quality; however, these do not constrain existing or potential municipal supplies. This Plan includes active monitoring of groundwater quality and active participation with local health and other agencies as appropriate to identify spills, leaks or other threats to groundwater quality, and to participate in their control and cleanup such that groundwater quality is not impacted and does not limit water supply. Mitigation measures will be employed (well construction, placement, treatment, etc.) as an element of developing groundwater supplies in order to reduce nitrate concentrations and other constituent concentrations if they exceed drinking water standards, as necessary.

When groundwater remediation activities involve groundwater extraction, remediated groundwater may be discharged to Publicly Owned Treatment Works (POTW) with permitting authority through the POTW program and the appropriate regulatory agency approvals, including the Regional Water Quality Control Board and the State Water Resources Control Board. Remediated groundwater may also be discharged to surface water, applied to land, recycled, or otherwise beneficially used or discharged, with all required agency approvals and permits.

The Solano County Environmental Health Services Division has local oversight for groundwater protection through the Underground Storage Tank (UST) and Hazardous Materials programs. The UST regulations provide groundwater protection through annual integrity testing and stringent tank requirements.

Prevention is the most important factor in minimizing groundwater contamination. The City promotes public awareness of the importance of preventing water pollution through its web site and other outreach tools.

Actions

- Identify short and longer-term water quality trends and actions needed to sustain a supply of good quality groundwater.

- Employ BMPs to limit potential sources of contamination in the environment.

- Coordinate with the County Environmental Health Services Division and other land use/regulatory agencies to develop a method for identifying contamination concerns and mitigating public water supply contamination.
    - Identify locations of point sources of contamination.
    - Identify major nonpoint sources of contamination.
    - Mitigate potential impacts on groundwater quality resulting from point or nonpoint sources of contamination.
    - Identify short and longer-term water quality trends and actions needed to sustain a supply of good quality groundwater.

- Coordinate with other SWA members and the County Environmental Health Services Division to assess the quality of groundwater used by private well owners in the subbasin.

3.5.4 Component 3D: Long-Term Salinity Management Programs

In general, groundwater quality in the Solano Subbasin is such that groundwater supplies meet standards for beneficial uses in the basin, which include primarily Municipal and Domestic Supply and Agricultural Supply. There also have been no notable historical trends of groundwater quality degradation in the Solano Subbasin over time. However, several factors suggest that observations and interpretation of groundwater quality warrant attention to ensure long-term preservation of groundwater quality. Notable among these factors are: 1) historical and current agricultural irrigation practices, 2) other historical and current land uses that have contributed or can contribute higher salt concentrations than other sources of water supply in the basin (including, but not limited to, water softeners), 3) the presence of high water tables which cause increased soil salinity due to evaporation in some areas, and 4) tidal influences in the Sacramento-San Joaquin Delta. The combination of these factors suggests that, on a long-term basis, there could be an accumulation of dissolved minerals in the aquifer system if salinity is not managed in a way to avoid undesirable groundwater quality degradation. Consequently, this component is included in the overall Groundwater Management Plan to include the interpretation

of groundwater quality data and to incorporate groundwater quality as an important consideration in the implementation of the other Plan components, most notably continuation of conjunctive use operations, integration of recycled water, and management and mitigation of contaminated groundwater. The long-term salinity management component is essential to accomplishing the third management objective of preserving groundwater quality in the basin.

Actions

- Implement measures to avoid salt accumulation and other adverse changes in groundwater chemistry in the subbasin.

3.6 COMPONENT CATEGORY 4: AGENCY COORDINATION AND PUBLIC OUTREACH

3.6.1 Component 4A: Continuation of Local, State, and Federal Agency Relationships

The City has long-established working relationships with local and state agencies that will continue on an ongoing basis. The City will continue to interact with state agencies, particularly DWR, on the operation of the SWP and the agreement with DWR for Settlement water. The availability of surface water resources is key to continued conjunctive use operations in the future. The City has a historical and ongoing working relationship with local agencies, as well as with other local groundwater pumpers, to manage supplies to effectively meet water demands within the available yields of imported surface water and local groundwater.

The joint powers authority process that led to the formation of the SWA is a classic illustration of local agency partnering that has produced the beginnings of integrated regional water resources management. As a result of the willingness of the SWA members to seek opportunities to work together and develop programs that mutually benefit the region as well as their individual communities, these agencies prepared and executed the SWA-4 Project that initiated a collaborative and integrated approach to several of the aspects of groundwater resource management that are now included in this Plan. As a result of the SWA-4 Project, the member agencies have the capability to integrate their database management efforts, develop a regional monitoring network, and prepare reports on groundwater conditions in the subbasin.

In 2004 and 2005, SCWA coordinated meetings and other exchanges between local agencies (including the City, SID, MPWD, and RD 2068) with adopted groundwater management plans. The purpose was to identify common elements that could be used by each agency to update its individual plan to be consistent with the amended Water Code. Periodic review and update of the plans is planned to be coordinated with the SCWA member agencies.

The SWA-4 members are especially engaged in collaborative activities that are directed toward an integrated regional approach to groundwater resources management. The SWA-4 members also have the opportunity to inform citizens in their service areas of groundwater management activities, including plan updates and opportunities for the public to attend meetings and/or

provide comments on any issues of concern regarding groundwater in the northern Solano County area.

In 2005, SCWA adopted an IRWMP, which identifies and prioritizes water related actions for the Solano County agencies, including the City. One of the highest priorities of the IRWMP is continuation of conjunctive use and associated groundwater management. This Plan component is included to formalize the historical local and state agency working relationships as part of comprehensively managing local groundwater, in concert with imported surface water and local recycled water, to accomplish all the management objectives for the basin.

Actions

- Continue to develop working relationships with local, state, and federal agencies (regulatory and other) to achieve broader local and regional benefits.

- Continue to pursue grant opportunities in cooperation with SCWA to fund basin management activities and regional water projects including the planned IRWMP for the Westside Subregion that encompasses Solano County and other counties.

3.6.2 Component 4B: Public Outreach

The purpose of the Plan is to maintain a high quality, reliable, and sustainable water supply for the citizens of Vacaville. To accomplish this, the Plan components describe how the City intends to manage its water resources in support of four principle BMOs directed toward the sustainability of groundwater supplies. As the City is managing its water resources as a service to the local citizenry, the City is committed to engaging the public in awareness of the Plan's purpose and objectives.

The City plans to promote public awareness of the Plan through printed media, including bill inserts and periodic news releases.

Actions

- Continue public involvement process through the use of City Council meetings that periodically include updates on water resources management activities by the City.

- Continue public outreach through the use of the City's web site, bill inserts, radio spots, and printed media. These notices will include contact information so that interested parties can request additional information, ask questions, or provide comments on water resources management activities.

3.6.3 Component 4C: Water Awareness Education

The City of Vacaville is committed to implementing water awareness and conservation programs. The UWMP contains descriptions of the measures that the City has implemented, plans to implement, or intends to study (Nolte, 2005).

The City uses a variety of communication tools to provide for public information and involvement. These tools include: press announcements and newspaper advertisements; radio spots; public workshops; City web site posting with a dedicated water conservation section to promote water conservation practices and water rate information; billing software that shows each customer's water use over the last 12 months; cooperative exhibits, demonstration sites, library displays, and a water model used for public meetings and school education; public information through regional projects; speakers for community groups and the media; and coordination with other government agencies, industry groups, public interest groups, and the media.

This Plan component will be incorporated with educational and outreach materials to complement other Plan components, including the Water Conservation component. This update of the City's Plan will continue to include public education and water awareness programs directed toward achievement of the four BMOs.

Actions

- Continue water awareness education programs.

3.7 COMPONENT CATEGORY 5: PLAN IMPLEMENTATION AND UPDATES

3.7.1 Component 5A: Plan Implementation and Reporting

Action Plan

Table 3-3 summarizes the action items discussed under each Plan component and the implementation schedule for each item. Action items planned to be completed within two years are labeled "short-term" actions, and items expected to require more than two years to complete are labeled "long-term" actions. Action items that represent on-going groundwater management activities conducted by the City are labeled "continuing" actions.

Provisions to Cooperate with Other Agencies

The IRWMP adopted by SCWA in 2005 identifies and prioritizes regional water-related actions for the Solano County agencies, including the City. Highest priority actions identified in the IRWMP include quantifying countywide water demand and supply, increasing opportunities for conjunctive use, increasing the use of groundwater as part of conjunctive use operations, and implementation of water use efficiency programs (CDM, 2005). The City supports implementation of the current IRWMP and also efforts to develop a new IRWMP for the Westside Subregion.

As a member of the SWA-4 Project, the City will update other members on its groundwater monitoring and management activities. Updates to SWA-4 members include information and data transfer via reports and data exchanges as further described below.

Groundwater Management Reports

As described in the Introduction to this Plan, local groundwater management planning already includes, among several other activities, analysis of groundwater conditions and preparation of periodic reports on groundwater and all other aspects of water resources and water supplies within the Solano Subbasin in the vicinity of the City of Vacaville. In addition, the City updated its UWMP (Nolte, 2005) in 2005 and finalized a comprehensive report on groundwater conditions, including recommendations for additional groundwater and subsidence monitoring (LSCE, 2010).

Beginning in the 1980s, the City has prepared several reports to describe its groundwater utilization and summarize groundwater level and quality trends. The City plans to produce future reports on an annual basis to describe the status of management actions performed and/or recommended, including monitoring–related and other cooperative activities with other Solano County entities or state or federal agencies. These annual reports will include summaries of monitoring data collected during the previous year, including groundwater conditions (groundwater levels, quality, and production) and land subsidence data. The reports will include data collected through spring (March 31st) so that water level recovery during the winter months can be evaluated. The reports will also summarize current water requirements, use of local groundwater and imported surface water from the Solano Project and the SWP to meet those requirements, and other appropriate details about water requirements and supplies such as, for example, the status of introducing recycled water as a component of non-potable water supply. As appropriate, other more detailed technical reports on various aspects of Plan implementation and reports prepared in coordination with others, such as SCWA and/or SWA, would complement the City's annual management reports.

Actions

- Cooperate with other agencies.
  - Provide copies of adopted Plan, and related reports, to SCWA/SWA members.
  - Support the IRWMP, including implementation of priority objectives of the IRWMP.

- Prepare groundwater management reports.
  - Prepare annual groundwater management reports to be completed by August 1st. Reports will summarize activities conducted by the City to implement the components of the Plan and will include a summary of monitoring data collected through spring (March 31st).
  - Coordinate with SWA to prepare an update of groundwater conditions in the subbasin every five years.

3.7.2 Component 5B: Provisions to Update the Groundwater Management Plan

The components of this Plan reflect the current understanding of the occurrence of groundwater in the Solano Subbasin in the vicinity of Vacaville and specific problems or areas of concern about that resource. The Plan components are designed to achieve specified objectives to utilize local groundwater for regular water supply while both protecting and preserving groundwater quantity and quality. While the Plan provides a framework for present and future actions, new data will be developed as a result of Plan implementation. That new data could identify conditions which will require modifications to currently definable management actions. As a result, this Plan is intended to be a flexible document that can be updated to modify existing components and/or incorporate new components as appropriate in order to recognize and respond to future groundwater conditions. Review and update of this Plan would initially occur in about five years, or sooner if necessary. Subsequent future updates would be similarly scheduled. SWA members would be apprised of future updates to the City's Plan to ensure that the City's Plan is consistent with BMOs and management actions being implemented by others utilizing water resources within the same basin/subbasin. The City will also conduct outreach to encourage public participation in future Plan updates.

Actions

- Review and update Plan every five years or more often as needed.

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TABLES

Table 2-1

City of Vacaville Water Supply[1]

Source	Surface-Water Entitlement (ac-ft)	Normal Year		Single-Dry Year		Multiple-Dry Year	
		Percent Available	(ac-ft)	Percent Available	(ac-ft)	Percent Available	(ac-ft)
Solano Project							
Vacaville Entitlement	5,750	99	5,693	98	5,635	89	5,118
SID Agreement[2]	2,500	99	2,475	98	2,450	89	2,225
State Water Project							
Vacaville Entitlement	6,100	64	3,904	63	3,843	33	2,013
KCWA Agreement	2,878	64	1,842	63	1,813	33	950
Settlement Water	9,320	100	9,320	100	9,320	100	9,320
Groundwater[3]		100	7,000	120	8,400	110	7,700
Total	26,548		30,233		31,461		27,325

1. Source: Memorandum from David B. Okita (General Manager) to City/District Urban Agencies Subject - UWMP Reliability Data. August 10, 2010.
2. From: City of Vacaville General Plan Update - Water Supply and Service in Vacaville (In Process), http://www.vacavillegeneralplan.org.
3. Based on: Luhdroff & Scalmanini Consulting Engineers. Sept. 2003, *City of Vacaville, SB 610 Water Supply Assessment Groundwater Source Sufficiency.*

Table 2-2
City of Vacaville Water Supply Summary (Acre-Feet/Year)

		2008		2009		2010	
Source Agency	**Description**	**Allocated**	**Used**	**Allocated**	**Used**	**Allocated**	**Used**
Solano Project	Vacaville Entitlement	5750	0	5750	0	5750	0
Solano Project	Carryover	5230	4553	7428	2433	9793	2
Solano Project	SID Exchange	0	0	3000	3000	2500	2500
Solano Project	SID Exchange (M&I carryover)	0	0	678	678	527	527
State Water Project	Table A	3142	3142	3591	2276	4489	3513
State Water Project	Carryover	1960	1960	0	0	1520	1520
State Water Project	Benecia Exchange	1343	1343	0	0	0	0
State Water Project	Article 21	0	0	771	771	1040	1040
State Water Project	Settlement Water (E)	682	682	0	0	0	0
State Water Project	Settlement Water (B)	8638	1097	9320	3362	9320	1481
City of Vacaville	Groundwater Pumping		5784		4647		5068
	Total	26745	18561	30538	17167	34652	15651

Table 2-3
City of Vacaville Water Supply Sources in Normal Year
(acre-feet) [3]

Source	2010	2015	2020	2025	2050
Solano Project					
Vacaville Entitlement	5,693	5,693	5,693	5,693	5,693
SID Agreement[1]	2,475	3,094	4,084	5,569	9,850
State Water Project					
Vacaville Entitlement (Table A)	3,904	3,904	3,904	3,904	3,904
KCWA Agreement	1,842	1,842	1,842	1,842	1,842
Settlement Water	9,320	9,320	9,320	9,320	9,320
Groundwater[2]	8,000	8,000	8,000	8,000	8,000
Total	31,234	31,853	32,843	34,328	38,609

1. From: City of Vacaville General Plan Update - Water Supply and Service in Vacaville (In Process), http://www.vacavillegeneralplan.org.
2. Based on: Luhdroff & Scalmanini Consulting Engineers. Sept. 2003, *City of Vacaville, SB 610 Water Supply Assessment Groundwater Source Sufficiency.*
3. Source: *2010 Draft Urban Water Management Plan* . Vander Meadows Draft, W.S.A.R.

Table 2-4
City of Vacaville Annual Well Production (acre-feet)

Year	Elmira Road			Northeast Sector			All Wells		
	Basal Zone (Wells 2-13)	Non-Basal Zone (Well 1)	Total	Basal Zone (Wells 14-16)	Non-Basal Zone (DeMello)	Total	Basal Zone (Wells 2-16)	Non-Basal Zone (Well 1 & DeMello)	Total
1968									2862
1969									3046
1970									2871
1971									3198
1972									3255
1973									3125
1974	2,870	446	3,316				2,870	446	3,316
1975	3,492	478	3,970				3,492	478	3,970
1976	4,525	440	4,965				4,525	440	4,965
1977	4,725	368	5,093				4,725	368	5,093
1978	4,667	353	5,020				4,667	353	5,020
1979	5,858	327	6,185				5,858	327	6,185
1980	6,595	395	6,990				6,595	395	6,990
1981	7,540	200	7,740				7,540	200	7,740
1982	7,429	254	7,683				7,429	254	7,683
1983	7,751	273	8,024				7,751	273	8,024
1984	6,067	22	6,089				6,067	22	6,089
1985	5,709	144	5,853				5,709	144	5,853
1986	5,595	229	5,824				5,595	229	5,824
1987	6,085	151	6,236				6,085	151	6,236
1988	5,292	129	5,421				5,292	129	5,421
1989	5,897	148	6,045				5,897	148	6,045
1990	5,519	106	5,625				5,519	106	5,625
1991	5,298	149	5,447				5,298	149	5,447
1992	5,405	126	5,531				5,405	126	5,531
1993	4,395	0	4,395				4,395	0	4,395
1994	3,889	4	3,893				3,889	4	3,893
1995	3,856	30	3,886				3,856	30	3,886
1996	3,128	102	3,230				3,128	102	3,230
1997	3,240	14	3,254	132		132	3,372	14	3,386
1998	3,369	34	3,403	502		502	3,871	34	3,905
1999	3,288	33	3,321	775		775	4,063	33	4,096
2000	4,278	52	4,330	811		811	5,089	52	5,141
2001	5,162	113	5,275	939		939	6,101	113	6,214
2002	5,564	101	5,665	973		973	6,537	101	6,638
2003	5,456	93	5,549	919	160	1,079	6,375	253	6,628
2004	5,130	107	5,237	1,325	60	1,385	6,455	167	6,622
2005	4,862	96	4,959	1,722	0	1,722	6,584	96	6,680
2006	4,840	95	4,934	1,701	0	1,701	6,541	1,701	6,635
2007	4,590	101	4,691	1,920	0	1,920	6,511	101	6,612
2008	3,575	92	3,667	2,116	0	2,116	5,692	92	5,784
2009	2,644	54	2,698	1,946	0	1,946	4,593	54	4,647
2010	2,902	69	2,971	2,097	0	2,097	4,999	69	5,068

Table 2-5
Groundwater Quality Northern Solano County

						Cations				Anions					Trace Elements											
Well Name	Date	EC (µmho/cm)	TDS (mg/L)	pH	Total Alkalinity [1] (mg/L)	Ca (mg/L)	Mg (mg/L)	Na (mg/L)	K (mg/L)	SO_4 (mg/L)	Cl (mg/L)	HCO_3 [1] (mg/L)	NO_3 [1] (mg/L)	F (mg/L)	Al (µg/L)	As (µg/L)	B (mg/L)	Ba (mg/L)	Cr (µg/L)	Cr (VI) (µg/L)	Cu (mg/L)	Fe (mg/L)	Fe (f) (mg/L)	Mn (µg/L)	Mn (f) (µg/L)	Se (µg/L)	Zn (mg/L)
		900 [b]	500 [b]	6.5/8.5 [b]						250 [b]	250 [b]		45 [a]	2 [a]	1000 [a]	10 [a]	1 [c]	1 [a]	50 [a]		1.3 [a]	0.30 [b]	0.30 [b]	50 [b]	50 [b]	50 [a]	5 [a]
Well 01	2/18/1987	780	**530**	7.3	320	67	28	56	2.9	82	3	320	12	-	-	<4	-	0.11	<20	-	<0.02	<0.03	-	<10	-	<2	<0.01
Well 01	6/19/1990	790	**540**	7.6	310	72	25	55	2.5	69	35	310	13	-	<100	<10	-	<0.1	<10	-	<0.05	<0.1	-	<30	-	<5	<0.05
Well 01	1/1/1994	-	**520**	-	-	-	-	-	-	-	20	-	11	-	-	3	-	-	ND	-	-	-	-	-	-	ND	-
Well 01	1/1/1997	-	-	-	-	-	-	-	-	-	21	-	14.2	-	-	4	-	-	ND	-	-	-	-	-	-	15	-
Well 01	1/1/1999	-	-	-	-	-	-	-	-	-	-	-	12.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 01	4/29/1999	815	**500**	7.3	326	85.1	26.6	54.1	2.6	62	23	398	12.8	-	ND	2.6	-	ND	23	-	ND	ND	-	2.2	-	ND	ND
Well 01	10/31/2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	-	-	-	-	-	-	-	-
Well 01	11/1/2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-	-	-
Well 01	1/1/2001	-	-	-	-	-	-	-	-	-	-	-	12.8	-	-	-	-	-	2.3	-	-	-	-	-	-	-	-
Well 01	5/17/2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	1.5	-	-	-	-	-	-	-
Well 01	1/1/2002	-	-	-	-	-	-	-	-	-	-	-	12.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 01	3/7/2002	789	**530**	7.4	331	87	27	59	2.8	63	23	404	12.76	-	ND	2.1	0.2	ND	ND	1.7	ND	ND	-	ND	-	ND	ND
Well 01	5/27/2003	-	-	-	-	-	-	-	-	-	-	-	12.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 01	3/16/2005	656	**530**	7.4	322	87	28	57	2.9	65	24	-	12	-	-	<2	-	-	<10	-	<0.05	<0.1	-	<20	-	<5	<0.05
Well 01	1/25/2006	-	-	-	-	-	-	-	-	-	-	-	13.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 01	3/14/2007	-	-	-	-	-	-	-	-	-	-	-	12.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 01	1/31/2008	846	**546**	7.7	305	51	23	47	2.7	63	23	-	12.4	-	ND	1.4	0.16	0.094	3.8	-	ND	ND	-	ND	-	ND	ND
Well 02	2/18/1987	520	390	7.3	220	39	21	44	3.6	47	16	220	11	-	-	<4	-	<0.1	<20	-	<0.02	<0.03	-	<10	-	<2	<0.01
Well 02	6/17/1991	540	310	7.8	204	39	20	48	2.3	36	15	204	7.8	-	<100	<10	-	<0.1	<10	-	<0.05	<0.1	-	<30	-	<5	<0.05
Well 02	1/1/1993	-	-	-	-	-	-	-	-	-	-	-	9.3	-	-	ND	-	-	ND	-	-	-	-	-	-	5	-
Well 02	3/29/1993	-	-	-	-	-	-	-	-	-	-	-	8.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 02	6/21/1993	-	-	-	-	-	-	-	-	42	-	-	9.3	-	-	-	-	-	-	-	-	-	-	-	-	5	-
Well 02	1/1/1994	-	-	-	-	-	-	-	-	-	-	-	5.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 02	5/2/1994	570	380	7.3	220	53	22	51	3.5	46	16	130	9.5	-	<50	<5	-	0.1	<10	-	<0.05	<0.1	-	<30	-	<5	<0.05
Well 02	1/1/1996	-	370	-	-	-	-	-	-	-	19	-	27	-	-	ND	-	-	ND	-	-	-	-	-	-	ND	-
Well 02	1/1/1997	-	380	-	-	-	-	-	-	-	16	-	9.7	-	-	ND	-	-	ND	-	-	-	-	-	-	9	-
Well 02	1/1/1998	-	-	-	-	-	-	-	-	-	-	-	10.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 02	1/1/1999	-	-	-	-	-	-	-	-	-	-	-	15.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 02	6/3/1999	550	320	7.8	243	49.7	21.2	51.5	2	35.3	20.4	296	15.1	-	ND	1.9	-	ND	11	-	ND	ND	-	ND	-	ND	ND
Well 02	10/31/2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-
Well 02	11/1/2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.7	-	-	-	-	-	-	-
Well 02	1/1/2001	-	370	-	-	-	-	-	-	-	-	-	11.1	-	-	ND	-	-	ND	5	-	-	-	-	-	-	-
Well 02	5/17/2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.2	4.3	-	-	-	-	-	-	-
Well 02	1/1/2002	-	-	-	-	-	-	-	-	-	-	-	11.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 02	3/7/2002	558	370	7.4	216	51	21	44	3.3	42	16	263	11	-	ND	3	0.13	ND	6.2	4.7	ND	ND	-	ND	-	ND	ND
Well 02	5/27/2003	-	-	-	-	-	-	-	-	-	-	-	11.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 02	3/16/2005	486	380	7.6	223	53	22	46	3.3	43	17	-	11	-	-	2	-	-	<10	-	<0.05	<0.1	-	<20	-	<5	<0.05
Well 02	3/15/2006	-	-	-	-	-	-	-	-	-	-	-	13.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 02	5/10/2007	-	-	-	-	-	-	-	-	-	-	-	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 02	1/31/2008	616	380	8	161	85	28	59	2.9	40	19	-	13.3	-	ND	1.6	0.24	0.067	1.7	-	0.0035	0.035	-	ND	-	ND	ND
Well 03	3/30/1987	410	340	7.9	210	36	20	39	3.3	34	8	208	4	-	-	<4	-	0.12	20	-	<0.02	0.03	-	<10	-	<3	<0.01
Well 03	1/1/1992	-	-	-	-	-	-	-	-	-	-	-	ND	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 03	3/3/1992	520	320	7.9	200	33	24	47	3	45	12	200	<0.4	-	<100	<10	-	0.14	12	-	<0.05	<0.1	-	<30	-	<5	<0.05

Table 2-5 (continued)
Groundwater Quality Northern Solano County

Well Name	Date	EC (µmho/cm)	TDS (mg/L)	pH	Total Alkalinity [1] (mg/L)	Cations				Anions					Trace Elements												
						Ca (mg/L)	Mg (mg/L)	Na (mg/L)	K (mg/L)	SO_4 (mg/L)	Cl (mg/L)	HCO_3 [1] (mg/L)	NO_3 [1] (mg/L)	F (mg/L)	Al (µg/L)	As (µg/L)	B (mg/L)	Ba (mg/L)	Cr (µg/L)	Cr (VI) (µg/L)	Cu (mg/L)	Fe (mg/L)	Fe (f) (mg/L)	Mn (µg/L)	Mn (f) (µg/L)	Se (µg/L)	Zn (mg/L)
		900 [b]	500 [b]	6.5/8.5 [b]						250 [b]	250 [b]		45 [a]	2 [a]	1000 [a]	10 [a]	1 [c]	1 [a]	50 [a]		1.3 [a]	0.30 [b]	0.30 [b]	50 [b]	50 [b]	50 [a]	5 [a]
Well 03	3/29/1993	-	-	-	-	-	-	-	-	-	-	-	5.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 03	6/21/1993	-	-	-	-	-	-	-	-	37	-	-	6.2	-	-	ND	-	-	16	-	-	-	-	-	6	-
Well 03	1/1/1994	-	-	-	-	-	-	-	-	-	-	-	3.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 03	1/26/1995	480	320	7.6	200	42	21	41	4	38	11	120	6.6	-	<50	2	-	0.12	14	-	<0.05	<0.1	-	<30	-	<5	<0.05
Well 03	1/1/1996	-	340	-	-	-	-	-	-	-	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 03	3/20/1996	-	-	-	-	-	-	-	-	-	-	-	4.9	-	-	ND	-	-	ND	-	-	ND	-	ND	-	-	-
Well 03	1/1/1997	-	-	-	-	-	-	-	-	-	-	-	5.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 03	1/1/1998	-	-	-	-	-	-	-	-	-	-	-	5.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 03	4/29/1999	510	300	7.7	218	43.1	19.7	40.7	4.1	38	10	266	ND	-	ND	3.1	-	ND	26	-	ND	ND	-	ND	-	ND	ND
Well 03	8/24/2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14	17	-	-	-	-	-	-	-
Well 03	10/31/2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12	-	-	-	-	-	-	-	-
Well 03	11/1/2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15	-	-	-	-	-	-	-
Well 03	1/1/2001	-	330	-	-	-	-	-	-	-	9.9	-	6.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 03	2/15/2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11	-	-	-	-	-	-	-	-
Well 03	5/17/2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14	14.4	-	-	-	-	-	-	-
Well 03	3/7/2002	506	330	7.7	218	46	20	40	4.3	37	9.9	266	6.6	-	ND	3	ND	ND	15	15.9	ND	ND	-	ND	-	ND	ND
Well 03	5/27/2003	-	-	-	-	-	-	-	-	-	-	-	6.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 03	3/16/2005	461	340	7.8	210	45	20	41	4.2	37	9.9	-	6.8	-	-	2.6	-	-	17	-	<0.05	<0.1	-	<20	-	<5	<0.05
Well 03	3/15/2006	-	-	-	-	-	-	-	-	-	-	-	4.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 03	3/14/2007	-	-	-	-	-	-	-	-	-	-	-	13.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 05	2/25/1986	570	380	7.3	240	54	22.6	56.8	-	56	24	240	2.7	-	-	<4	-	<0.05	<20	-	<0.02	<0.03	-	<10	-	<5	<0.01
Well 05	2/22/1989	654	400	7.5	230	54	22	58	2.1	62	26	230	12	-	-	<4	-	<0.06	20	-	<0.02	<0.03	-	<10	-	<2	<0.02
Well 05	3/3/1992	700	430	7.6	238	64	26	47	3	57	37	238	<0.4	-	<100	<10	-	<0.1	<10	-	<0.05	<0.1	-	<30	-	<5	<0.05
Well 05	1/1/1993	-	-	-	-	-	-	-	-	-	-	-	15.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 05	3/29/1993	-	-	-	-	-	-	-	-	-	-	-	14.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 05	6/21/1993	-	-	-	-	-	-	-	-	56	-	-	15.1	-	-	-	-	-	-	-	-	-	-	-	6	-
Well 05	1/1/1994	-	-	-	-	-	-	-	-	-	-	-	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 05	1/26/1995	610	410	7.5	240	61	25	54	3	52	28	140	13	-	<50	2	-	<0.1	<10	-	<0.05	<0.1	-	<30	-	<5	<0.05
Well 05	1/1/1996	-	460	-	-	-	-	-	-	-	30	-	13.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 05	1/1/1997	-	-	-	-	-	-	-	-	-	-	-	13.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 05	1/1/1998	-	-	-	-	-	-	-	-	-	-	-	16.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 05	1/1/1999	-	-	-	-	-	-	-	-	-	-	-	19.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 05	6/3/1999	685	410	7.9	248	63.8	26.3	57.8	3.2	63	36.9	302	19.7	-	ND	1.6	-	ND	8.8	-	ND	ND	-	ND	-	ND	0.021
Well 05	11/1/2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.1	3.3	-	-	-	-	-	-	-
Well 05	1/1/2001	-	430	-	-	-	-	-	-	-	32	-	15.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 05	5/17/2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	3.2	-	-	-	-	-	-	-
Well 05	3/7/2002	672	430	7.5	244	62	25	54	2.9	60	32	297	15.84	-	ND	2	0.27	ND	6.8	4.1	ND	ND	-	ND	-	ND	ND
Well 05	5/27/2003	-	-	-	-	-	-	-	-	-	-	-	16.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 05	3/16/2005	615	440	7.6	243	65	26	58	3.2	64	32	-	17	-	-	<2	-	-	<10	-	<0.05	<0.1	-	<20	-	<5	<0.05
Well 05	1/25/2006	-	-	-	-	-	-	-	-	-	-	-	16.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 05	3/14/2007	-	-	-	-	-	-	-	-	-	-	-	19.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 05	1/31/2008	774	476	7.7	265	67	27	58	3.2	66	33	-	18.2	-	ND	1.2	0.31	0.072	2.9	-	ND	ND	-	ND	-	ND	ND
Well 06	3/16/1988	542	340	7.7	220	44	19	48	4.3	36	11	220	7	-	-	<4	-	<0.07	<10	-	<0.02	<0.03	-	<10	-	<2	<0.01

Table 2-5 (continued)
Groundwater Quality Northern Solano County

						Cations				Anions					Trace Elements											
Well Name	Date	EC (µmho/cm)	TDS (mg/L)	pH	Total Alkalinity [1] (mg/L)	Ca (mg/L)	Mg (mg/L)	Na (mg/L)	K (mg/L)	SO_4 (mg/L)	Cl (mg/L)	HCO_3 [1] (mg/L)	NO_3 [1] (mg/L)	F (mg/L)	Al (µg/L)	As (µg/L)	B (mg/L)	Ba (mg/L)	Cr (µg/L)	Cr (VI) (µg/L)	Cu (mg/L)	Fe (mg/L)	Fe (f) (mg/L)	Mn (µg/L)	Mn (f) (µg/L)	Se (µg/L)	Zn (mg/L)
		900 [b]	500 [b]	6.5/8.5 [b]						250 [b]	250 [b]		45 [a]	2 [a]	1000 [a]	10 [a]	1 [c]	1 [a]	50 [a]		1.3 [a]	0.30 [b]	0.30 [b]	50 [b]	50 [b]	50 [a]	5 [a]
Well 06	2/6/1991	550	360	7.7	226	37	21	45	2.5	39	13	226	6.1	-	<100	<10	-	<0.1	11	-	<0.05	<0.1	-	<30	-	<5	<0.05
Well 06	1/1/1994	-	350	-	-	-	-	-	-	-	11	-	5.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 06	1/1/1997	-	380	-	-	-	-	-	-	-	14	-	7.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 06	1/1/1999	-	-	-	-	-	-	-	-	-	-	-	10.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 06	4/29/1999	610	340	7.7	240	49.9	18.9	55.8	3.3	49	16	292	10.6	-	ND	1.9	-	ND	16	-	ND	ND	-	2.6	-	ND	ND
Well 06	10/31/2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.3	-	-	-	-	-	-	-	-
Well 06	11/1/2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11	-	-	-	-	-	-	-
Well 06	1/1/2001	-	360	-	-	-	-	-	-	-	12	-	6.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 06	5/17/2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	9.8	-	-	-	-	-	-	-
Well 06	3/7/2002	533	360	7.8	222	48	19	48	4.6	40	12	270	6.6	-	ND	3	0.15	ND	12	11.2	ND	ND	-	ND	-	ND	ND
Well 06	5/27/2003	-	-	-	-	-	-	-	-	-	-	-	6.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 06	3/16/2005	465	360	7.9	218	46	17	55	4.3	41	13	-	6.7	-	-	2.4	-	-	10	-	<0.05	<0.1	-	<20	-	<5	<0.05
Well 06	1/25/2006	-	-	-	-	-	-	-	-	-	-	-	7.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 06	1/31/2008	586	382	8	231	48	19	50	4.6	43	15	-	7.1	-	ND	2.1	0.16	0.067	8.9	-	ND	ND	-	ND	-	ND	ND
Well 07	3/16/1988	541	350	7.8	230	40	19	53	5.4	32	11	230	4	-	-	<4	-	<0.08	<10	-	<0.02	<0.03	-	<10	-	<2	<0.01
Well 07	6/17/1991	640	380	7.8	240	43	18	66	6.3	44	18	240	4.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 07	8/2/1994	-	-	-	-	-	-	-	-	40	-	-	4.4	-	-	4	-	-	-	-	-	-	-	-	-	-	-
Well 07	1/1/1996	-	380	-	-	-	-	-	-	-	14	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 07	1/1/1997	-	350	-	-	-	-	-	-	-	14	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 07	1/1/1998	-	-	-	-	-	-	-	-	-	-	-	5.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 07	1/1/1999	-	360	-	-	-	-	-	-	-	-	-	4.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 07	4/29/1999	540	360	7.8	226	41.3	16.9	52.4	5.2	42	13	275	ND	-	ND	3.9	-	ND	19	-	ND	ND	-	ND	-	ND	ND
Well 07	10/31/2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.1	-	-	-	-	-	-	-	-
Well 07	11/1/2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.9	-	-	-	-	-	-	-
Well 07	1/1/2001	-	360	-	-	-	-	-	-	-	12	-	4.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 07	5/17/2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	8.5	-	-	-	-	-	-	-
Well 07	3/14/2002	521	360	8	228	41	17	57	5.8	41	12	277	4.224	-	ND	4.1	0.17	ND	8.3	9.5	ND	ND	-	ND	-	ND	ND
Well 07	5/27/2003	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 07	3/16/2005	458	360	7.8	218	42	18	56	5.6	41	13	-	4.3	-	-	3.5	-	-	11	-	<0.05	<0.1	-	<20	-	<5	<0.05
Well 07	1/25/2006	-	-	-	-	-	-	-	-	-	-	-	5.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 07	3/14/2007	-	-	-	-	-	-	-	-	-	-	-	4.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 07	1/31/2008	580	384	7.9	228	43	18	59	6.1	43	14	-	4.4	-	ND	3.1	0.19	0.082	8	-	ND	ND	-	ND	-	ND	ND
Well 08	3/16/1988	588	360	7.7	220	47	23	47	3	43	16	220	13	-	-	<4	-	<0.08	<10	-	<0.03	<0.03	-	<10	-	<2	<0.04
Well 08	2/6/1991	530	360	7.5	223	42	18	48	5	37	10	223	5.6	-	<100	<10	-	<0.1	<10	-	<0.05	<0.1	-	<30	-	<5	<0.05
Well 08	1/1/1993	-	-	-	-	-	-	-	-	-	-	-	3.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 08	3/29/1993	-	-	-	-	-	-	-	-	-	-	-	13.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 08	6/21/1993	-	-	-	-	-	-	-	-	37	-	-	4	-	-	-	-	-	15	-	-	-	-	-	-	-	-
Well 08	1/1/1994	-	430	-	-	-	-	-	-	-	-	-	6.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 08	5/2/1994	630	430	7.5	240	59	-	63	4.7	45	17	150	10	-	<50	<5	-	0.12	<10	-	<0.05	<0.1	-	<30	-	<5	<0.05
Well 08	1/1/1996	-	400	-	-	-	-	-	-	-	17	-	9.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 08	1/1/1997	-	-	-	-	-	-	-	-	-	11	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 08	1/1/1998	-	-	-	-	-	-	-	-	-	-	-	10.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 08	1/1/1999	-	-	-	-	-	-	-	-	-	-	-	5.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 2-5 (continued)
Groundwater Quality Northern Solano County

						Cations				Anions					Trace Elements												
Well Name	Date	EC (µmho/cm) 900 [b]	TDS (mg/L) 500 [b]	pH 6.5/8.5 [b]	Total Alkalinity [1] (mg/L)	Ca (mg/L)	Mg (mg/L)	Na (mg/L)	K (mg/L)	SO_4 (mg/L) 250 [b]	Cl (mg/L) 250 [b]	HCO_3 [1] (mg/L)	NO_3 [1] (mg/L) 45 [a]	F (mg/L) 2 [a]	Al (µg/L) 1000 [a]	As (µg/L) 10 [a]	B (mg/L) 1 [c]	Ba (mg/L) 1 [a]	Cr (µg/L) 50 [a]	Cr (VI) (µg/L)	Cu (mg/L) 1.3 [a]	Fe (mg/L) 0.30 [b]	Fe (f) (mg/L) 0.30 [b]	Mn (µg/L) 50 [b]	Mn (f) (µg/L) 50 [b]	Se (µg/L) 50 [a]	Zn (mg/L) 5 [a]
Well 08	10/28/1999	550	340	7.5	222	41.3	17.7	49.5	4.9	37.9	12.1	271	ND	-	ND	4.2	-	ND	30	-	0.005	ND	-	ND	-	ND	ND
Well 08	8/24/2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	9	-	-	-	-	-	-	-
Well 08	10/31/2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	-	-	-	-	-	-	-	-
Well 08	11/1/2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12	-	-	-	-	-	-	-
Well 08	1/1/2001	-	350	-	-	-	-	-	-	-	11	-	4.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 08	2/8/2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.6	-	-	-	-	-	-	-	-
Well 08	2/15/2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	-	-	-	-	-	-	-	-
Well 08	5/17/2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	6.4	-	-	-	-	-	-	-
Well 08	3/14/2002	504	350	7.7	222	43	18	52	5.7	37	11	270	4.4	-	170	5.4	0.16	0.1	17	12.8	ND	-	-	ND	-	ND	ND
Well 08	5/27/2002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	-	-	-	-	-
Well 08	3/16/2005	451	360	7.7	215	41	18	49	5.5	37	10	-	4	-	-	3.8	-	-	13	-	<0.05	<0.1	-	<20	-	<5	<0.05
Well 08	1/25/2006	-	-	-	-	-	-	-	-	-	-	-	8.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 08	3/14/2007	-	-	-	-	-	-	-	-	-	-	-	4.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 08	1/31/2008	552	270	8	222	42	19	50	5.8	38	11	-	4.1	-	ND	3	0.17	0.088	11	-	ND	ND	-	ND	-	ND	ND
Well 09	1/30/1989	524	300	7.8	210	39	21	45	4.2	37	17	210	4	-	-	<4	-	0.11	20	-	<0.02	0.12	-	<30	-	<1	0.07
Well 09	3/2/1992	690	480	7.2	240	60	28	57	<3	96	17	240	<0.4	-	<100	<10	-	<0.1	<10	-	<0.05	<0.1	-	<30	-	<5	<0.05
Well 09	3/3/1992	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	-	-	ND	-	-	-	-	-	-	-	-
Well 09	3/29/1993	-	-	-	-	-	-	-	-	-	-	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 09	6/21/1993	-	-	-	-	-	-	-	-	33	-	-	4	-	-	ND	-	0.1	ND	-	-	-	-	-	-	3	-
Well 09	1/1/1994	-	-	-	-	-	-	-	-	-	-	-	7.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 09	1/26/1995	490	330	7.6	200	39	23	45	3	43	11	120	4.9	-	<50	2	-	0.11	15	-	<0.05	<0.1	-	<30	-	<5	<0.05
Well 09	1/1/1996	-	340	-	-	-	-	-	-	-	10	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 09	3/20/1996	-	-	-	-	-	-	-	-	-	-	-	4	-	-	ND	-	-	ND	-	-	ND	-	ND	-	-	-
Well 09	1/1/1997	-	-	-	-	-	-	-	-	-	-	-	7.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 09	1/1/1998	-	-	-	-	-	-	-	-	-	-	-	5.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 09	1/1/1999	-	-	-	-	-	-	-	-	-	-	-	5.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 09	4/29/1999	-	-	-	-	-	-	-	-	-	-	-	5.3	-	-	3	-	-	30	-	-	ND	-	ND	-	-	-
Well 09	10/28/1999	515	320	7.6	206	37.4	20.6	45.1	3.2	44.1	11.3	251	ND	-	ND	3.1	-	ND	30	-	ND	ND	-	ND	-	ND	ND
Well 09	8/24/2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18	23	-	-	-	-	-	-	-
Well 09	10/31/2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15	-	-	-	-	-	-	-	-
Well 09	11/1/2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	-	-	-	-	-	-	-
Well 09	1/1/2001	-	300	-	-	-	-	-	-	-	8.6	-	4.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 09	2/15/2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18	-	-	-	-	-	-	-	-
Well 09	5/17/2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16	17.9	-	-	-	-	-	-	-
Well 09	3/14/2002	454	300	7.8	209	36	20	41	4.1	31	8.6	255	4.048	-	ND	4.4	0.13	0.11	22	20.4	ND	ND	-	ND	-	ND	ND
Well 09	5/27/2003	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 09	3/16/2005	429	300	7.8	200	36	20	42	4.2	32	8.5	-	3.9	-	-	3.3	-	-	19	-	<0.05	<0.1	-	<20	-	<5	<0.05
Well 09	1/25/2006	-	-	-	-	-	-	-	-	-	-	-	10.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 09	5/10/2007	-	-	-	-	-	-	-	-	-	-	-	16.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 13	6/7/1990	530	340	7.9	230	44	21	43	2.6	40	16	230	7.7	-	50	<5	0.1	<0.1	<10	-	<0.05	<0.1	-	<30	-	<5	<0.05
Well 13	9/30/1991	540	370	7.74	210	2.5	2.06	2	<3	41	18	210	6.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 13	1/1/1992	-	480	-	-	-	-	-	-	-	-	-	ND	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 13	1/1/1994	-	330	-	-	-	-	-	-	-	13	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 2-5 (continued)
Groundwater Quality Northern Solano County

Well Name	Date	EC (µmho/cm)	TDS (mg/L)	pH	Total Alkalinity [1] (mg/L)	Cations				Anions					Trace Elements												
						Ca (mg/L)	Mg (mg/L)	Na (mg/L)	K (mg/L)	SO_4 (mg/L)	Cl (mg/L)	HCO_3 [1] (mg/L)	NO_3 [1] (mg/L)	F (mg/L)	Al (µg/L)	As (µg/L)	B (mg/L)	Ba (mg/L)	Cr (µg/L)	Cr (VI) (µg/L)	Cu (mg/L)	Fe (mg/L)	Fe (f) (mg/L)	Mn (µg/L)	Mn (f) (µg/L)	Se (µg/L)	Zn (mg/L)
		900 [b]	500 [b]	6.5/8.5 [b]						250 [b]	250 [b]		45 [a]	2 [a]	1000 [a]	10 [a]	1 [c]	1 [a]	50 [a]		1.3 [a]	0.30 [b]	0.30 [b]	50 [b]	50 [b]	50 [a]	5 [a]
Well 13	1/1/1997	-	330	-	-	-	-	-	-	-	20	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 13	1/1/1999	-	310	-	-	-	-	-	-	-	-	-	8.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 13	4/29/1999	490	310	8.1	172	45.6	8.42	46.1	3.1	43	18	209	ND	-	ND	1.9	-	ND	16	-	0.028	ND	-	ND	-	ND	ND
Well 13	10/31/2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.4	-	-	-	-	-	-	-	-
Well 13	11/1/2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.8	-	-	-	-	-	-	-
Well 13	1/1/2001	-	360	-	-	-	-	-	-	-	19	-	11.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 13	5/17/2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	7.8	-	-	-	-	-	-	-
Well 13	3/7/2002	553	360	7.7	219	47	23	46	2.8	43	19	267	11	-	ND	2	0.15	ND	ND	7.8	ND	ND	-	ND	-	ND	ND
Well 13	5/27/2003	-	-	-	-	-	-	-	-	-	-	-	11.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 13	3/16/2005	511	350	7.8	208	45	24	48	2.8	47	21	-	12	-	-	2	-	-	<10	-	<0.05	<0.1	-	<20	-	<5	<0.05
Well 13	1/25/2006	-	-	-	-	-	-	-	-	-	-	-	11.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 13	3/14/2007	-	-	-	-	-	-	-	-	-	-	-	5.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 13	1/31/2008	615	372	7.9	229	49	25	47	3.1	45	21	-	12	-	ND	1.6	0.18	0.083	8.2	-	ND	ND	-	ND	-	ND	ND
Well 14	10/20/1993	452	290	8	-	16	10	58	3.1	23	<0.5	230	3.1	-	<50	4.1	-	0.14	13	-	<0.02	0.075	-	<5	-	<1	<0.005
Well 14	1/1/1997	-	-	-	-	-	-	-	-	-	-	-	2.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 14	8/4/1997	460	280	8.2	190	17	12	74	4	30	10	190	2	-	ND	7	-	0.11	10	-	ND	0.11	-	ND	-	ND	ND
Well 14	1/1/1998	-	-	-	-	-	-	-	-	-	-	-	ND	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 14	6/4/1998	450	290	7.9	190	18	12	70	4	25	9	230	2	-	ND	6	-	0.1	20	-	ND	ND	-	ND	-	ND	ND
Well 14	8/28/1998	440	330	7.9	190	18	13	59	3	29	10	230	-	-	ND	5	-	0.1	20	-	ND	ND	-	ND	-	ND	ND
Well 14	8/31/1998	-	-	-	-	-	-	-	-	-	-	-	ND	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 14	1/1/1999	-	-	-	-	-	-	-	-	-	-	-	3.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 14	4/29/1999	440	280	8.1	197	20.6	13.7	60.2	3.1	26	8.3	240	ND	-	ND	5.4	-	0.13	28	-	0.0029	ND	-	ND	-	ND	ND
Well 14	1/1/2000	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 14	8/24/2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21	23	-	-	-	-	-	-	-
Well 14	10/31/2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	-	-	-	-	-	-	-	-
Well 14	11/1/2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19	-	-	-	-	-	-	-
Well 14	1/1/2001	-	290	-	-	-	-	-	-	-	8.8	-	3.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 14	2/15/2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21	-	-	-	-	-	-	-	-
Well 14	5/17/2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19	20.3	-	-	-	-	-	-	-
Well 14	3/14/2002	441	290	8.1	199	21	14	62	3.4	25	8.8	242	3	-	ND	6.2	0.15	0.12	18	22.2	ND	ND	-	ND	-	ND	ND
Well 14	5/27/2003	-	-	-	-	-	-	-	-	-	-	-	ND	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 14	3/16/2005	393	280	8.1	193	21	14	61	3.3	26	7.8	-	2.9	-	-	4.8	-	-	20	-	<0.05	<0.1	-	<20	-	<5	<0.05
Well 14	1/25/2006	-	-	-	-	-	-	-	-	-	-	-	3.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 14	5/10/2007	-	-	-	-	-	-	-	-	-	-	-	3.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 14	1/31/2008	471	288	8.2	199	22	14	62	3.5	27	8.1	-	3	-	ND	3.9	0.17	0.12	17	-	ND	ND	-	ND	-	ND	0.065
MW-14	3/25/1993	453	290	8.1	190	17	12	66	3.5	29	10	240	2.2	-	740	<10	-	0.11	<10	-	<0.05	**1.3**	<0.03	**64**	<10	1.4	<0.05
Well 15	2/22/2001	440	300	8.1	210	20	12	73	3.8	23	8.9	-	2.5	-	-	3.9	0.22	-	20	12	<0.05	<0.1	-	<10	-	<5	<0.05
Well 15	3/16/2005	395	300	8	198	26	14	55	5.1	21	7.9	-	3.5	-	-	3.8	-	-	13	-	<0.05	<0.1	-	<20	-	<5	<0.05
Well 15	1/25/2006	-	-	-	-	-	-	-	-	-	-	-	3.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 15	5/10/2007	-	-	-	-	-	-	-	-	-	-	-	2.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 15	1/31/2008	483	298	8.1	197	21	12	70	4.2	24	8.2	-	3.1	-	ND	3.5	0.22	0.11	11	-	ND	ND	-	ND	-	ND	ND
MW-15-1815ft	1/6/1999	458	277	7.91	-	23.1	9.91	53.6	4.17	16.7	10.8	210	3.73	-	<50	<2	0.109	0.0691	<5	-	<0.005	**2.2**	0.261	27.4	28.9	<4	-

Table 2-5 (continued)
Groundwater Quality Northern Solano County

						Cations				Anions					Trace Elements											
Well Name	**Date**	**EC** (µmho/cm) 900 [b]	**TDS** (mg/L) 500 [b]	**pH** 6.5/8.5 [b]	**Total Alkalinity** [1] (mg/L)	**Ca** (mg/L)	**Mg** (mg/L)	**Na** (mg/L)	**K** (mg/L)	**SO_4** (mg/L) 250 [b]	**Cl** (mg/L) 250 [b]	**HCO_3** [1] (mg/L)	**NO_3** [1] (mg/L) 45 [a]	**F** (mg/L) 2 [a]	**Al** (µg/L) 1000 [a]	**As** (µg/L) 10 [a]	**B** (mg/L) 1 [c]	**Ba** (mg/L) 1 [a]	**Cr** (µg/L) 50 [a]	**Cr (VI)** (µg/L)	**Cu** (mg/L) 1.3 [a]	**Fe** (mg/L) 0.30 [b]	**Fe (f)** (mg/L) 0.30 [b]	**Mn** (µg/L) 50 [b]	**Mn (f)** (µg/L) 50 [b]	**Se** (µg/L) 50 [a]	**Zn** (mg/L) 5 [a]
Well 16	12/28/2004	475	290	8.3	206	13	12	81	2.4	26	6.9	-	1.9	-	-	7.1	0.29	-	22	18.3	<0.05	0.043	-	<10	-	<25	0.055
Well 16	2/8/2007	506	350	8.3	208	7.5	4.4	98	1.9	38	9.3	-	ND	-	ND	**13**	0.41	0.073	5	-	ND	ND	-	ND	-	ND	ND
Well 16	4/13/2007	470	-	-	218	14	12	84	2.2	29.7	9	218	0.5	-	-	8.5	-	-	-	-	-	-	-	-	-	-	-
Well 16	6/18/2007	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.8	-	-	-	-	-	-	-	-	-	-	-
Well 16	9/28/2007	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.8	-	-	-	-	-	-	-	-	-	-	-
Well 16	10/30/2007	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.5	-	-	-	-	-	-	-	-	-	-	-
Well 16	11/28/2007	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.7	-	-	-	-	-	-	-	-	-	-	-
Well 16	11/30/2007	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.6	-	-	-	-	-	-	-	-	-	-	-
Well 16	12/4/2007	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.2	-	-	-	-	-	-	-	-	-	-	-
Well 16	1/24/2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.7	-	-	-	-	-	-	-	-	-	-	-
Well 16	1/30/2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.8	-	-	-	-	-	-	-	-	-	-	-
Well 16	1/31/2008	495	308	8.2	198	14	12	82	2.3	30	7.9	-	1.9	-	ND	7.8	0.31	0.12	21	-	0.0037	ND	-	ND	-	ND	ND
Well 16	2/12/2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.7	-	-	-	-	-	-	-	-	-	-	-
Well 16	3/12/2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.9	-	-	-	-	-	-	-	-	-	-	-
Well 16	4/14/2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.1	-	-	-	-	-	-	-	-	-	-	-
Well 16	5/27/2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.9	-	-	-	-	-	-	-	-	-	-	-
Well 16	6/29/2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.8	-	-	-	-	-	-	-	-	-	-	-
Well 16	7/19/2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.5	-	-	-	-	-	-	-	-	-	-	-
Well 16	9/19/2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.3	-	-	-	-	-	-	-	-	-	-	-
Well 16	11/13/2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.7	-	-	-	-	-	-	-	-	-	-	-
MW-16-1430ft	11/19/2002	460	280	7.8	230	18	19	63	2.7	19	6.5	230	2.1	-	<50	7.4	0.18	0.21	**50**	-	<0.05	<0.1	-	<10	-	<25	<0.05
MW-16-1430ft	7/5/2007	470	302	-	234	19	21	53.4	2.5	15.94	6.73	337	0.63	-	<20	2.3	-	0.2	**50**	-	<0.002	-	-	-	-	<5	<0.02
MW-16-1464-1604	9/20/2002	490	330	8.3	200	8.7	6.6	110	2.1	42	11	200	<1	-	-	**11**	-	-	-	-	-	-	-	-	-	-	-
MW-98A	11/16/1998	500	271	7.67	-	21	27.3	40.3	3.15	16.8	8.24	242	2.24	-	<50	<3	0.111	0.214	24.2	-	<0.005	**1**	**0.461**	35.1	37.6	<4	<0.005
MW-98A	11/23/1999	477	296	7.93	-	21.6	27.3	38.8	3.18	16.4	7.72	253	-	-	-	-	-	-	-	-	<0.005	**1.29**	0.197	34	33.8	-	<0.005
MW-98B	1/13/1999	494	362	8.02	-	13.6	6.01	84	5.22	25.6	7.88	259	<0.1	-	<50	4.7	0.28	0.0672	<5	-	<0.005	**1.01**	**0.813**	45.6	47	<4	0.0345
MW-98C	1/29/1999	506	302	8.32	-	11.1	8.4	93.9	1.86	43	7.41	238	0.32	-	<50	<2	0.42	0.107	<5	-	<0.005	**0.788**	**0.774**	34	34.5	<4	<0.005
SCWA-Meridian MW-1680	6/4/2008	540	320	7.55	220	24	18	74	3.9	41	13	220	3.6	-	<50	3.3	0.22	<0.1	17	12	<0.05	<0.1	-	38	-	<5	<0.05
SCWA-MainePrairie MW-2170	4/29/2008	600	380	7.9	260	10	5.3	130	1.6	35	16	260	<2	-	<50	5.2	0.31	0.12	<10	<1	<0.05	<0.1	<0.1	38	37	<5	<0.05
SCWA-Allendale MW-1925	3/26/2008	620	360	7.58	230	23	37	62	3.9	61	17	230	<2	-	<50	3	0.39	0.12	13	11	<0.05	<0.1	<0.1	**63**	**63**	<5	<0.05
SCWA-Dixon MW-2212	10/1/2009	530	310	8.25	200	7.8	4.3	110	1.3	47	20	200	<2	-	<50	3.5	0.74	<0.1	<10	<1	<0.05	<0.1	<0.1	21	24	<5	<0.05
RNVWD MW-1389ft	9/9/1998	533	344	7.67	-	29.2	18.7	54	4.51	34.2	8.99	248	6.07	-	<50	6.3	0.125	0.0865	<5	-	<0.005	**1.06**	**0.43**	41.2	39	<4	<0.005

Table 2-5 (continued)
Groundwater Quality Northern Solano County

						Cations				Anions					Trace Elements											
Well Name	Date	EC	TDS	pH	Total Alkalinity [1]	Ca	Mg	Na	K	SO_4	Cl	HCO_3 [1]	NO_3 [1]	F	Al	As	B	Ba	Cr	Cr (VI)	Cu	Fe	Fe (f)	Mn	Mn (f)	Se	Zn
		(µmho/cm)	(mg/L)		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(µg/L)	(µg/L)	(mg/L)	(mg/L)	(µg/L)	(µg/L)	(mg/L)	(mg/L)	(mg/L)	(µg/L)	(µg/L)	(µg/L)	(mg/L)
		900 [b]	500 [b]	6.5/8.5 [b]						250 [b]	250 [b]		45 [a]	2 [a]	1000 [a]	10 [a]	1 [c]	1 [a]	50 [a]		1.3 [a]	0.30 [b]	0.30 [b]	50 [b]	50 [b]	50 [a]	5 [a]

1. HCO_3 , Total Alkalinity and NO_3 reported as HCO_3 , $CaCO_3$ and NO_3 respectively.

a) Primary Drinking Water Standards for California and Federal Maximum Contaminant Levels

b) Secondary Drinking Water Standards for California and Federal Maximum Contaminant Levels

c) California State Notification Level

"-" Not Analyzed; ND = Non-Detect (Reporting Limit unknown)
For repeated sampling within a day, the maximum result for each constituent for the day is shown
Bold indicates value exceeds Water Quality Limit

Table 3-1
City of Vacaville Groundwater Monitoring Program[1]

Well Type	Well ID	Formation	Perforated Interval[2] (ft)	Water Levels		Water Quality[3]				Production	
				Manual	Electronic	General Mineral/ Physical	Inorganics	Organics	Nitrate	Manual	Electronic
Production	Well 1	Markley	Depth = 605	Semi-annual	-	Triennial	Triennial	Triennial	Annual	-	SCADA
	Well 2	Basal & Middle Tehama	335-710	-	-					Daily	-
	Well 3	Basal & Middle Tehama	420-900	-	-					Daily	-
	Well 5	Basal Tehama	588-793	Semi-annual	SCADA					-	SCADA
	Well 6	Basal Tehama	752-932							-	
	Well 7	Basal Tehama	964-1004							-	
	Well 8	Basal Tehama	952-1192							-	
	Well 9	Basal Tehama	1100-1430							-	
	Well 13	Basal & Middle	560-840							-	
	Well 14	Basal Tehama	1108-1663							-	
	Well 15	Basal Tehama	1206-1816							-	
	Well 16	Basal Tehama	1165-1610							-	
	DeMello	Upper Tehama	372-572		-					Daily	-
Monitoring[4]	MW-14	Basal Tehama	1100-1650	Semi-annual	Transducer	NA	NA	NA	NA	NA	NA
	MW-15-188'	Qal & Upper Tehama	158-178		-						
	MW-15-508'	Upper Tehama	438-498		-						
	MW-15-1815'	Basal Tehama	1207-1785		Transducer						
	MW-16-117'	Upper Tehama	97-107		-						
	MW-16-1176'	Basal Tehama	1136-1166		-						
	MW-16-1430'	Basal Tehama	1264-1374		Transducer						
	MW-98A	Basal Tehama	1727-1830		Transducer						
	MW-98B	Basal Tehama	1559-1798		-						
	MW-98C	Basal Tehama	2152-2305		Transducer						
	DeMello-MW-95'	Qal	65-85		-						

1. Does not include shallow monitoring wells at wastewater treatment plants.
2. Depth to top and bottom of perforated interval, if available. Otherwise, total well depth shown.
3. Does not include weekly monitoring of the distribution system for coliform bacteria, chloride residual, etc..
4. Transducers to be installed in monitoring wells before January 1, 2011.

NA - Not applicable

Table 3-2
Summary of SCWA Monitoring Well Construction

Well ID [1]	*Depth (ft)*	*Perforated Interval (ft)*	*Diameter (in)*	*Began Monitoring Water Levels*
Allendale 1235	1235	1205-1225	2.5	8/7/2008
Allendale 1345	1345	1315-1335	2.5	8/7/2008
Allendale 1925	1925	1877-1917	4/2[2]	8/7/2008
Dixon 1200	1200	1180-1190	2.5	11/13/2009
Dixon 2212	2212	2182-2202	4/2	11/13/2009
Dixon 2370	2370	2340-2360	4/2	11/13/2009
Maine Prairie 840	841	811-831	2.5	8/7/2008
Maine Prairie 1960	1960	1930-1950	4/2	8/7/2008
Maine Prairie 2170	2170	2140-2160	4/2	8/7/2008
Meridian 400	400	360-370	2.5	8/7/2008
Meridian 825	824	794-814	2.5	8/7/2008
Meridian 1680	1680	1650-1670	4/2	8/7/2008

1. See Appendix X for as-built construction drawings and additional construction details.
2. Four-inch diameter with reduction to two-inch diameter.

Table 3-3
Summary of Action Items

Plan Components and Action Items	Short-term[1]	Long-term[2]	Continuing[3]
CATEGORY 1: MONITORING PROGRAM			
1A. Elements of Monitoring Program			
• Continue City's existing monitoring program and complement with information gathered by other agencies			X
• Expand regional monitoring programs			
o Coordinate with SCWA regarding adequacy of regional groundwater monitoring networks and programs	X		
o Coordinate with SCWA on planned construction of additional monitoring facilities in northern Solano County	X		
o Coordinate with SCWA on implementation of land subsidence monitoring program	X		
1B. Evaluation and Reporting of Monitoring			
• Prepare brief annual summary of groundwater and land subsidence data collected through March 31st in groundwater management report to be completed each year by June 30th	X		
• Coordinate with SWA-4 on maintenance and utilization of regional monitoring database, including regular transfer of City data. Also coordinate with SWA on monitoring protocols used to evaluate data	X		
• Coordinate with SWA-4 regarding adequacy of regional evaluation and reporting of groundwater data (see Sect. 3.3.2)	X		
CATEGORY 2: WATER RESOURCE SUSTAINABILITY			
2A. Maintaining Stable Groundwater Levels			
• Continue to manage groundwater and surface water conjunctively to ensure that groundwater levels in Elmira Road wells recover to spring 1992-1993 "base year" levels during normal years			X
• Manage pumping away from Elmira Road to prevent progressive groundwater level declines		X	
• Continue groundwater development programs that optimize pumping distribution in City's urban planning area			X
2B. Determination of Sustainable Pumpage			
• Assess pumpage relative to sustainable yield of principal aquifer system			
o Update sustainable pumpage estimates with expanded monitoring data		X	
• Refine assessment of hydrogeologic conditions and conceptual model in preparation for future development of regional numerical groundwater flow model (see Section 3.4.2)		X	
• Discuss joint development of regional numerical groundwater flow model with SCWA and other entitles that overlie subbasin		X	

Table 3-3 (continued)
Summary of Action Items

Plan Components and Action Items	Short-term	Long-term	Continuing
2C. Continuation of Conjunctive Use Operations			
• Continue City's conjunctive management of available water resources			X
• Coordinate with SCWA to explore other conjunctive use opportunities			
2D. Water Conservation			
• Continue to implement and promote water conservation programs			X
CATEGORY 3: GROUNDWATER RESOURCE PROTECTION			
3A. Well Construction and Destruction Policies			
• Continue current well construction and destruction policies			X
• Coordinate with other SCWA members on well construction and future resource utilization		X	
3B. Identification and Management of Recharge Areas and Wellhead Protection Areas			
• Employ wellhead protection measures to ensure long-term sustainability of good quality water			
o Use DWSAP information, including delineation of source area and protection zones	X		
o Require deep sanitary seal construction standards for municipal supply wells			X
o Employ well destruction policy to prevent groundwater contamination			X
• Coordinate with other SCWA members regarding DWSAP analyses and other environmental assessments		X	
• Promote recharge area protection to mitigate impacts of urban infrastructure and sources of groundwater contamination		X	
3C. Management and Mitigation of Contaminated Groundwater			
• Identify short and longer-term water quality trends and actions needed to sustain supply of good quality groundwater		X	
• Employ BMPs to limit potential sources of contamination	X		
• Coordinate with County Environmental Health Services Division and other land use/regulatory agencies to identify and mitigate any public water supply contamination	X		
• Coordinate with SCWA members and County Environmental Health Services Division to assess quality of groundwater used by private well owners in subbasin		X	
3D. Long-Term Salinity Management Programs			
• Implement measures to avoid salt accumulation and other adverse changes in groundwater chemistry		X	

Table 3-3 (continued)
Summary of Action Items

Plan Components and Action Items	Short-term	Long-term	Continuing
CATEGORY 4: AGENCY COORDINATION AND PUBLIC OUTREACH			
4A. Continuation of Local, State, and Federal Agency Relationships			
• Continue relationships with local, state, and federal agencies to achieve broader local and regional benefits			X
• Continue to pursue grant opportunities with SCWA to fund basin management activities and regional water projects			X
4B. Public Outreach			
• Continue public involvement through City Council meetings that include updates on water resource management			X
• Continue public outreach on Plan activities through web site, bill inserts, radio spots, and printed media			X
4C. Water Awareness Education			
• Continue water awareness education programs			X
CATEGORY 5: PLAN IMPLEMENTATION AND UPDATES			
5A. Plan Implementation and Reports			
• Cooperate with other agencies			
o Provide copies of adopted Plan, and related reports, to SCWA/SWA members	X		
o Continue to support IRWMP, including implementation of priority objectives			X
• Prepare groundwater management reports			
o Prepare annual groundwater management reports to be completed by August 1st. Reports will summarize activities conducted to implement Plan and include summary of monitoring data collected through March 31st	X		
o Coordinate with SWA to prepare update of groundwater conditions in subbasin every five years		X	
5B. Provisions to Update the Groundwater Management Plan			
• Review and update plan every five years or more often as needed		X	

1. Short-term actions are items to be completed within two years.
2. Long-term actions are items expected to require more than two years.
3. Continuing are items that are ongoing groundwater management activities.

FIGURES

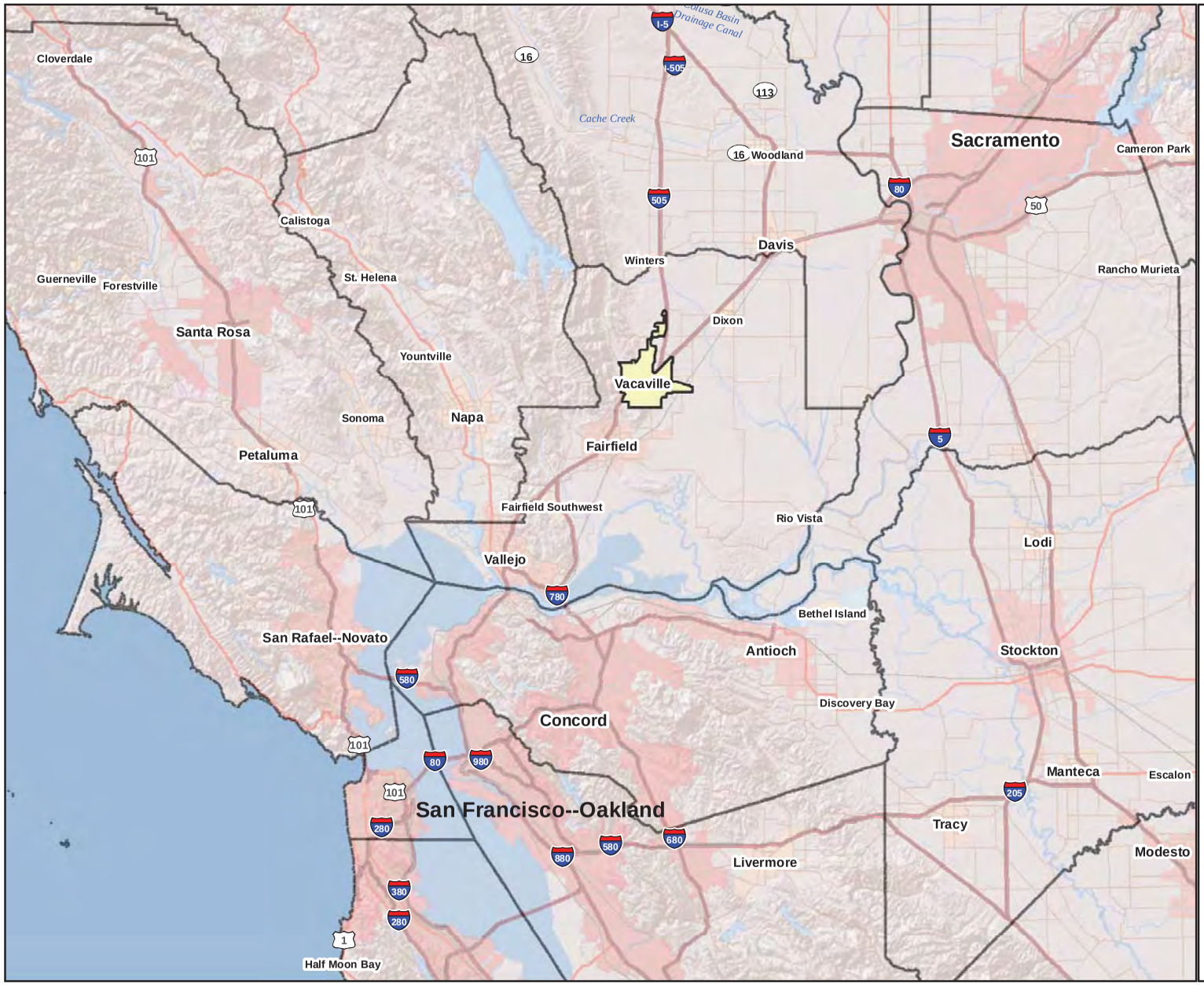

Figure 1-1
City of Vacaville
Location Map

LUHDORFF & SCALMANINI CONSULTING ENGINEERS

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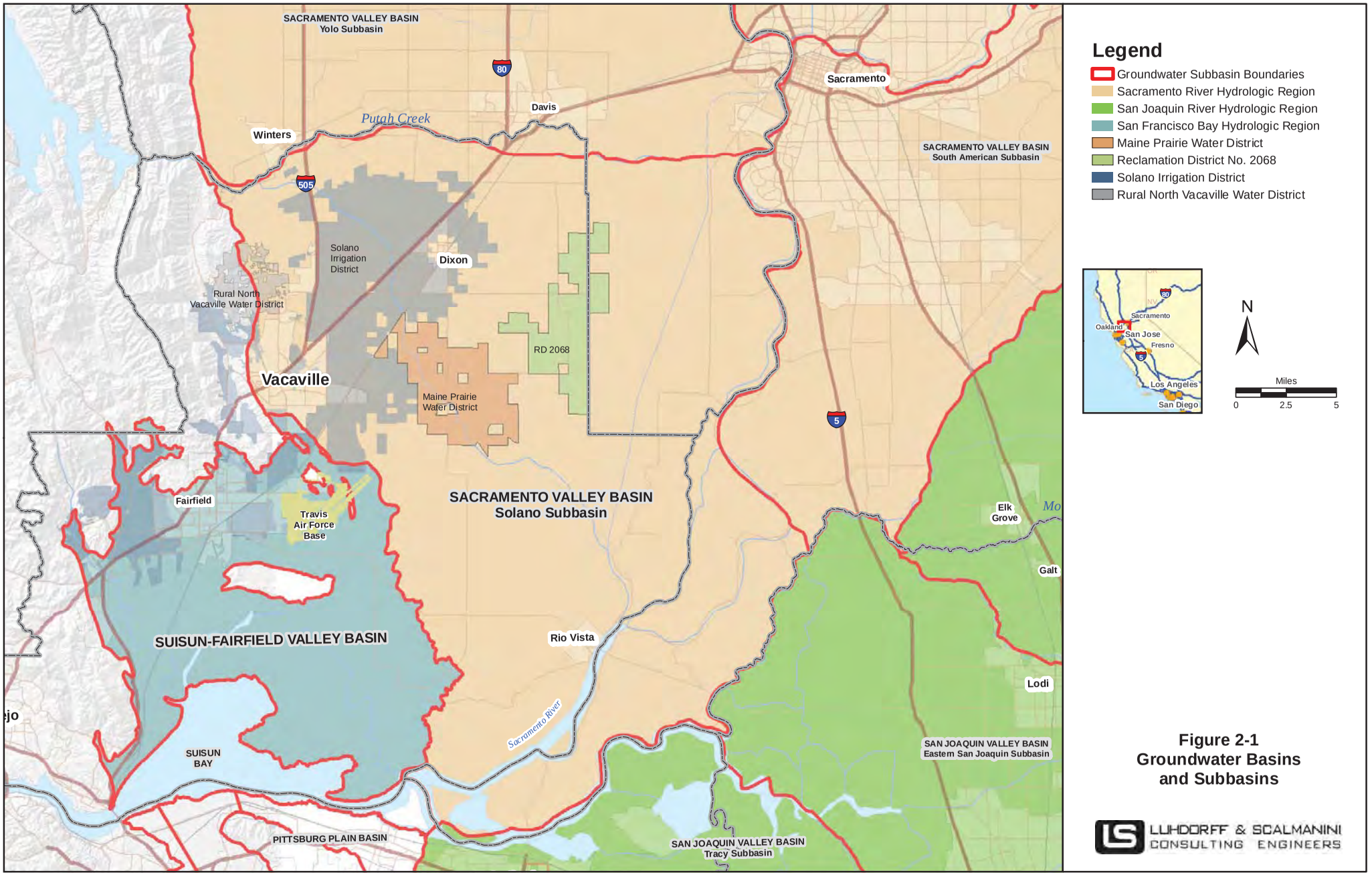

Figure 2-1
Groundwater Basins and Subbasins

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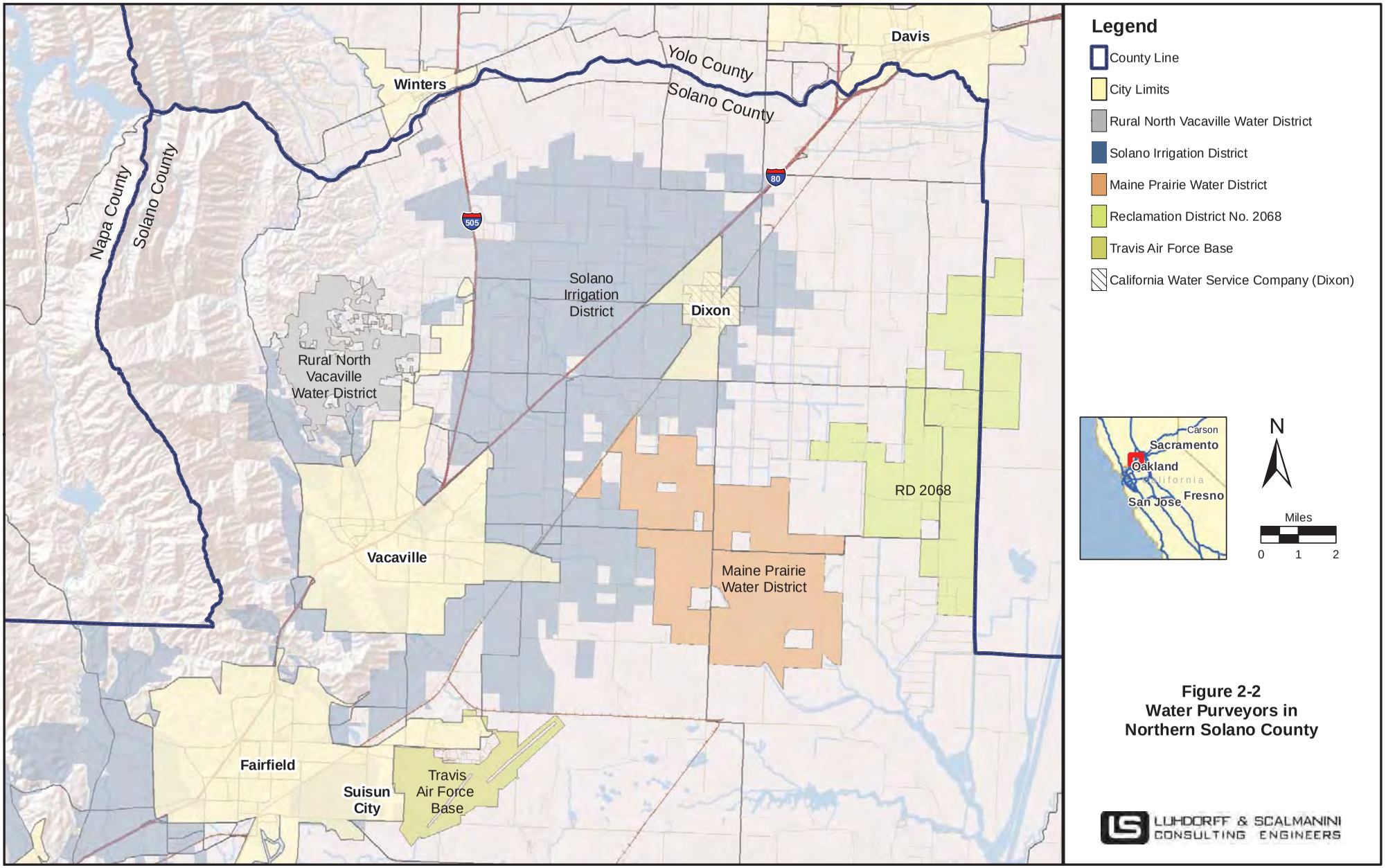

Figure 2-2
Water Purveyors in Northern Solano County

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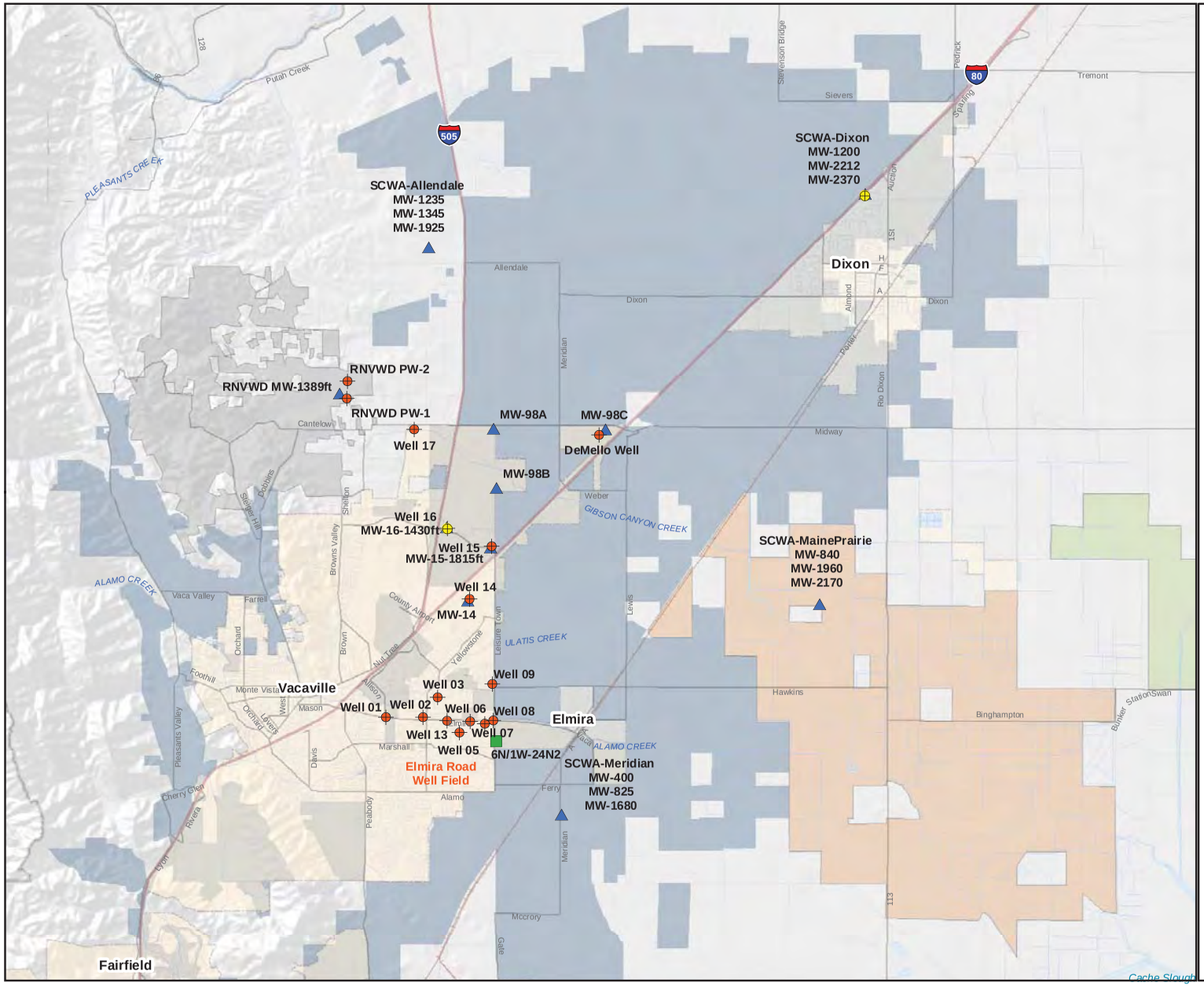
File: Y:\Casey_Meirovitz\10-1-124 Vacaville GWMP Update\Report\GIS\Figure 2-2 Water Purveyors.mxd Date: 12/15/2010



Legend

- Permanent GPS Stations (Jan. 2011)
- Production Well
- Monitoring Well
- Well Monitored by DWR
- County Boundary
- City Boundary
- Maine Prairie Water District
- Reclamation District No. 2068
- Solano Irrigation District
- Rural North Vacaville Water District

Figure 2-3
Location Map with
Groundwater Monitoring Facilities

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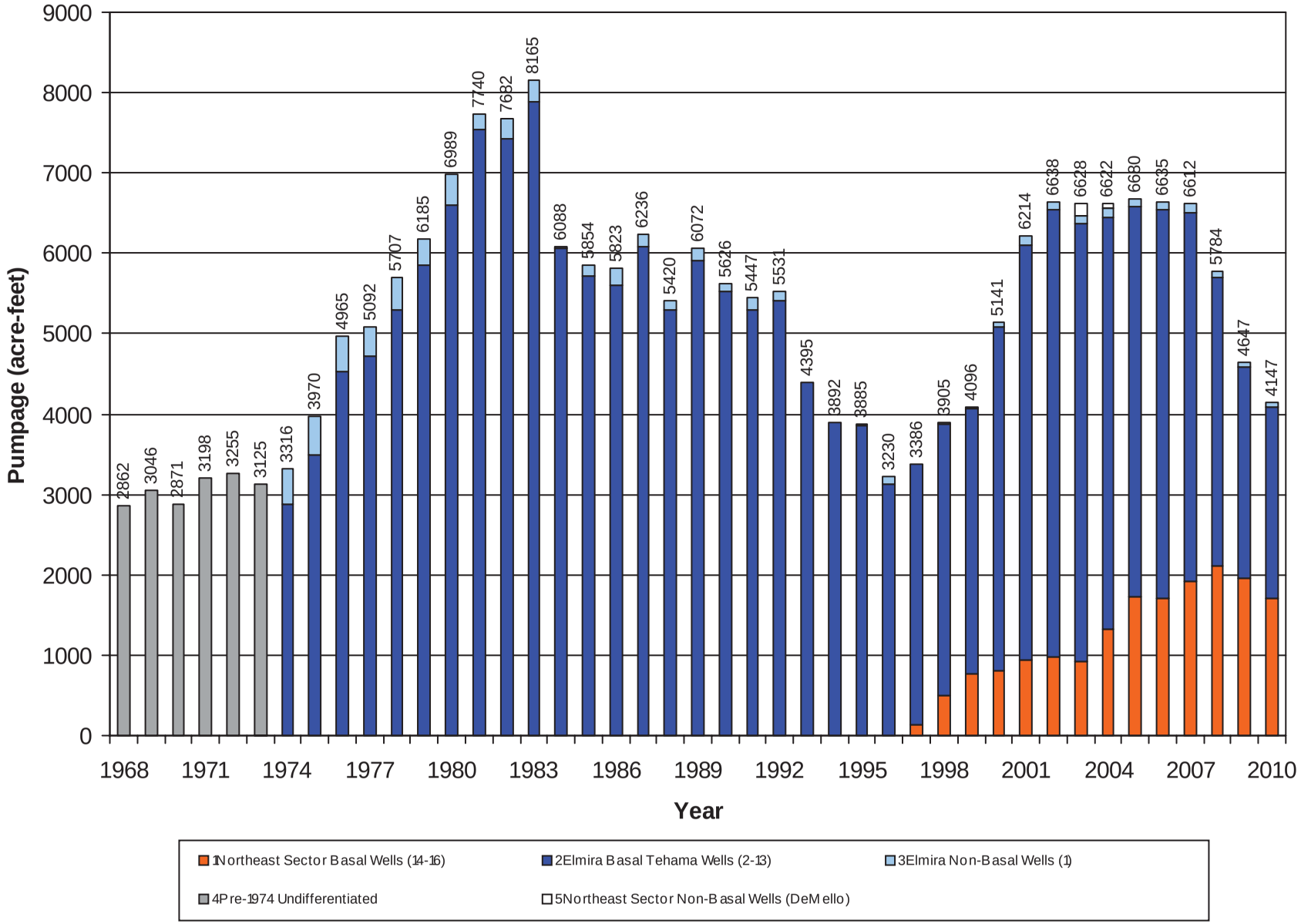

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Figure 2-4
City of Vacaville Annual Groundwater Pumpage

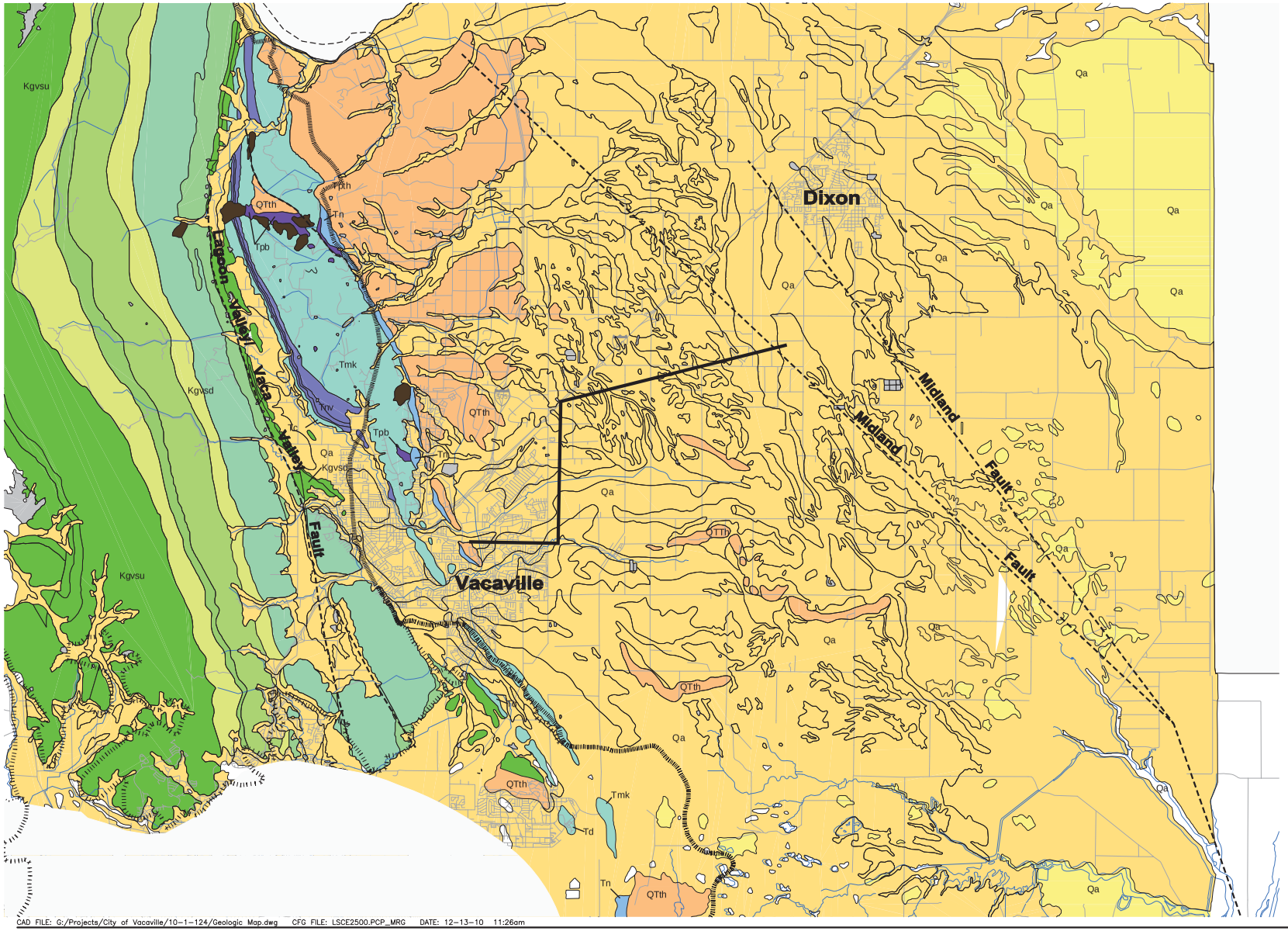

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Figure 2-5
Surficial Geologic Map of Solano County

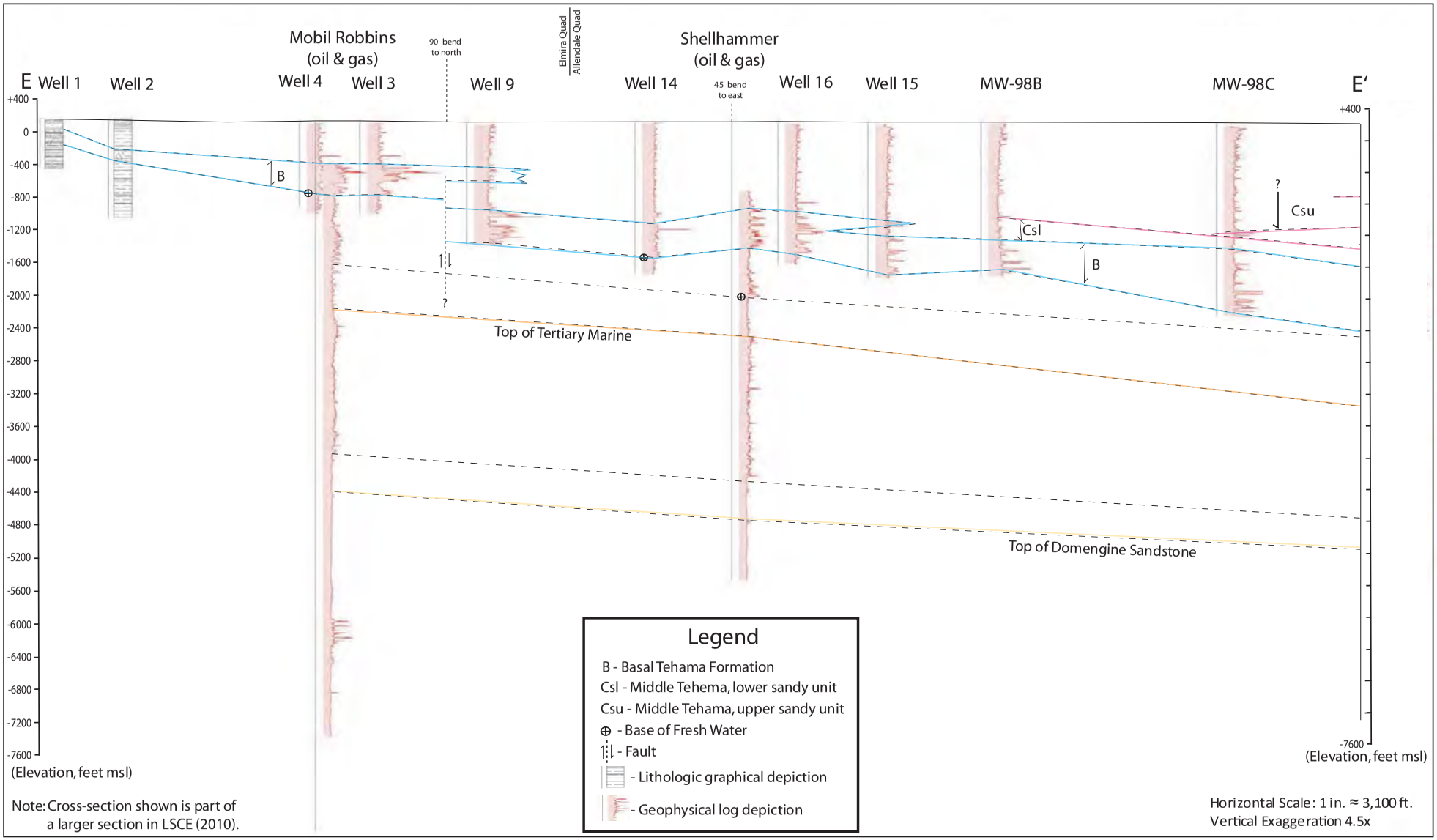

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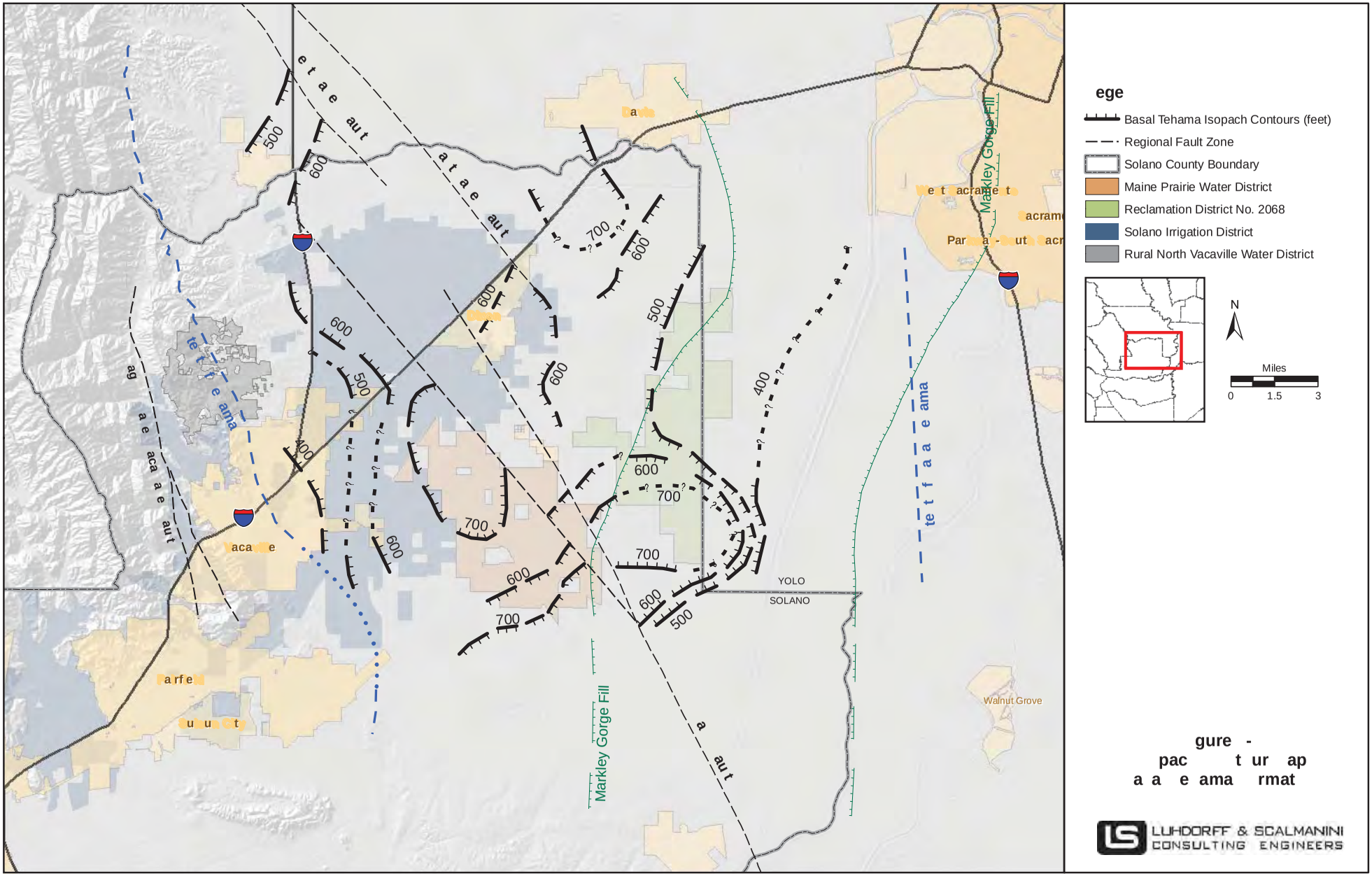
Figure 2-6
Cross-Section E-E'



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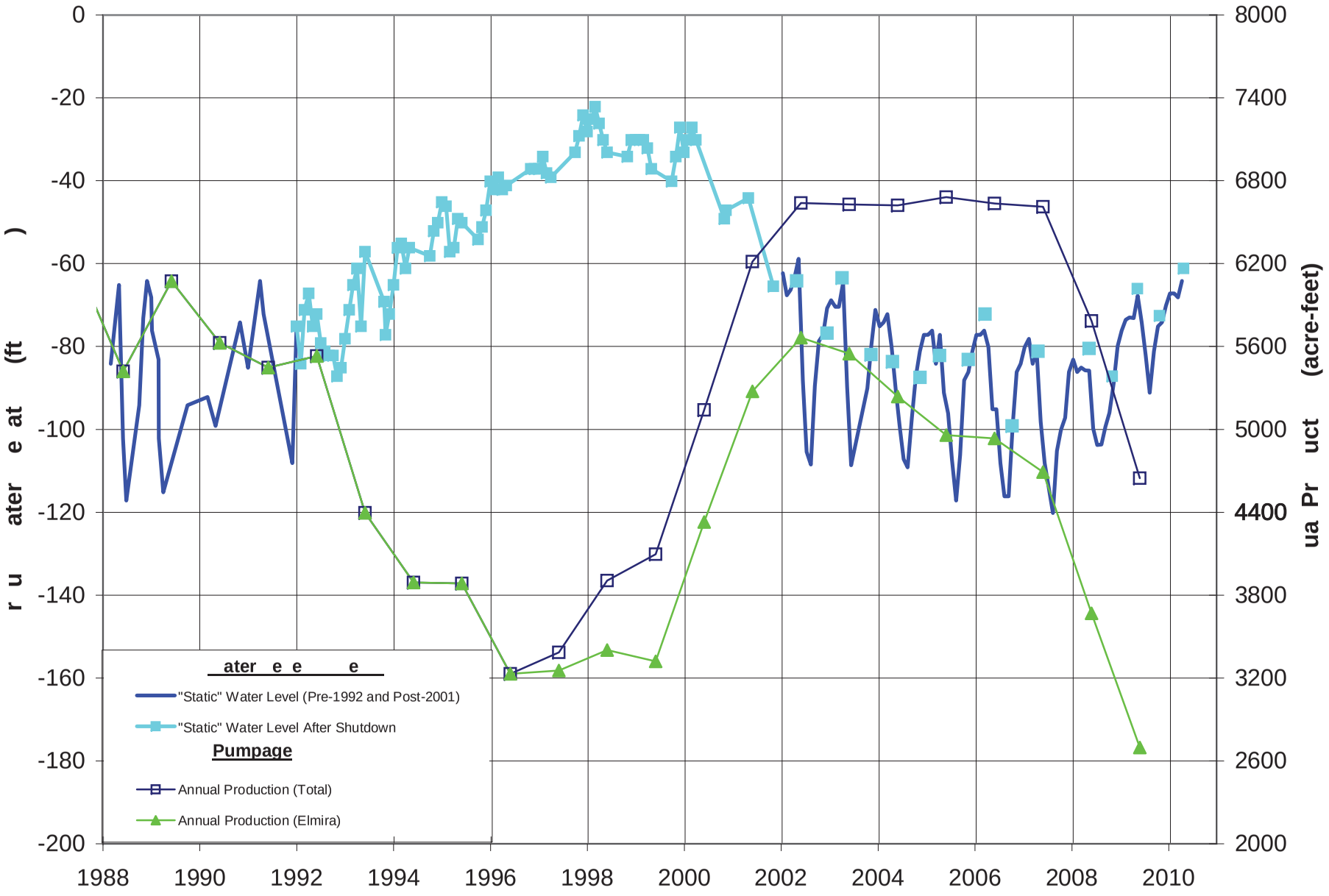

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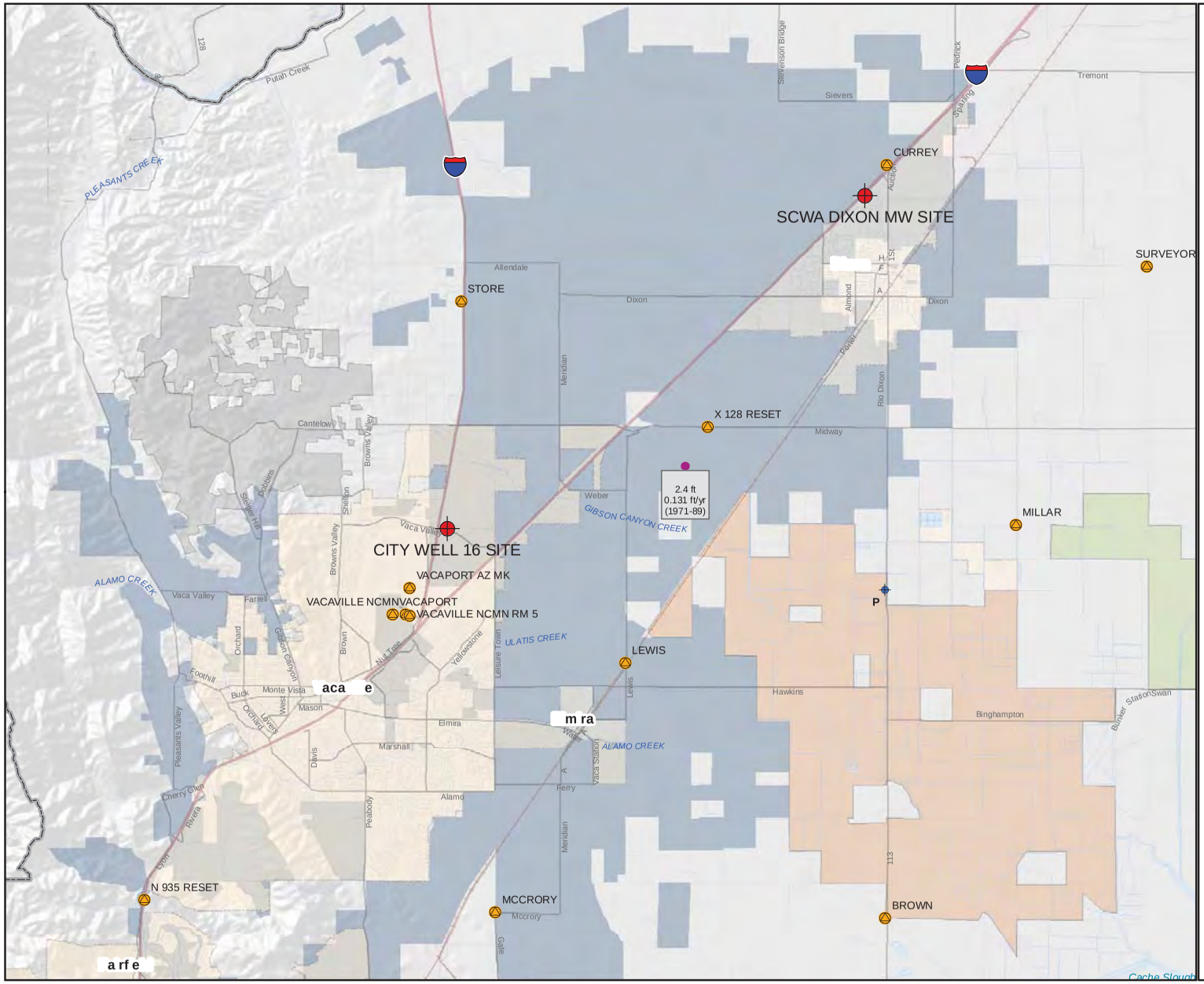
Figure 2-8
Groundwater Level Hydrograph
City of Vacaville, Well No. 8



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- Permanent GPS Stations (Jan. 2011)
- Continuous GPS Station
- Ikehara Stations
- GPS Survey Events
- County Boundary
- City Boundary
- Maine Prairie Water District
- Reclamation District No. 2068
- Solano Irrigation District
- Rural North Vacaville Water District

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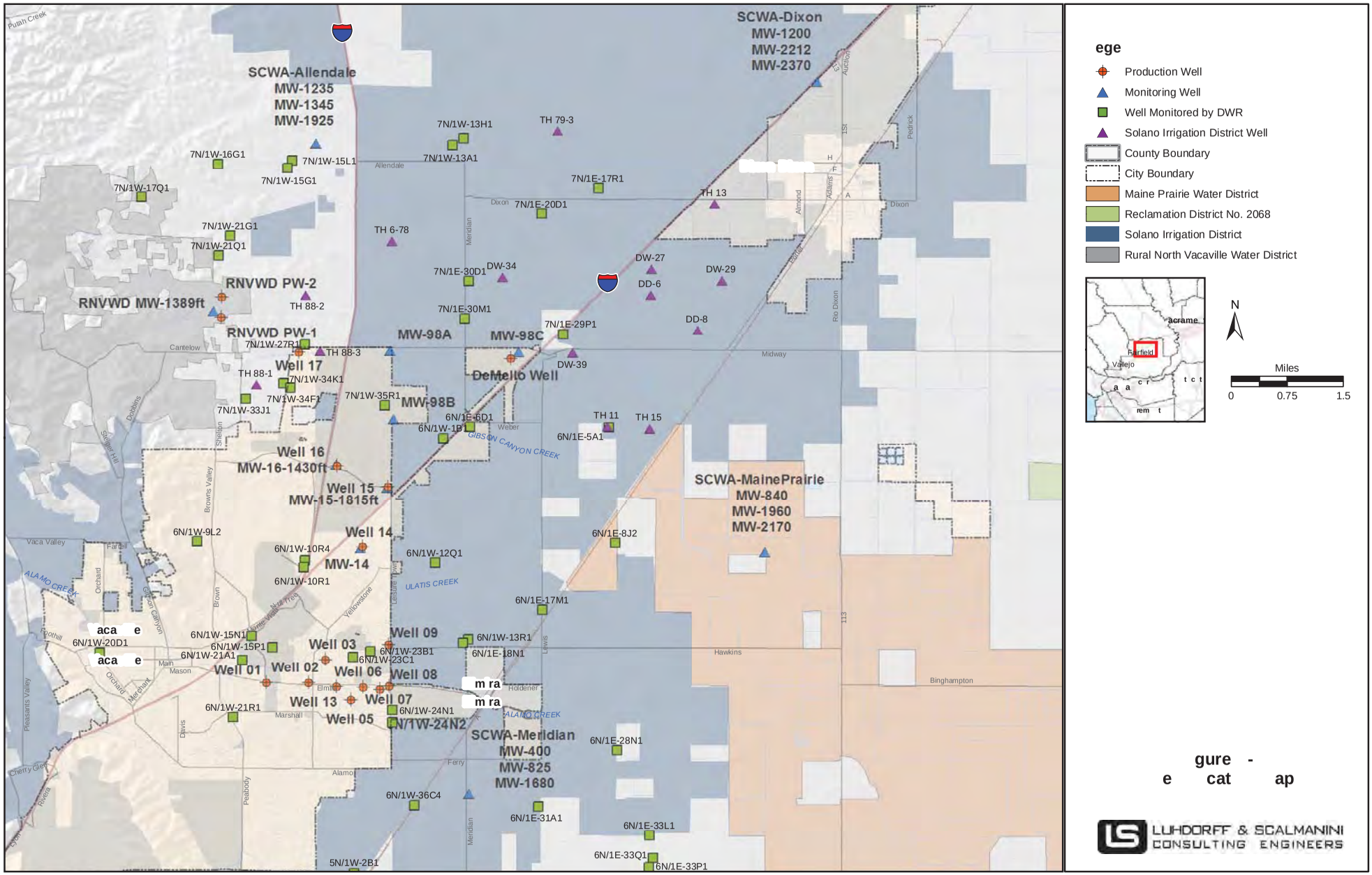

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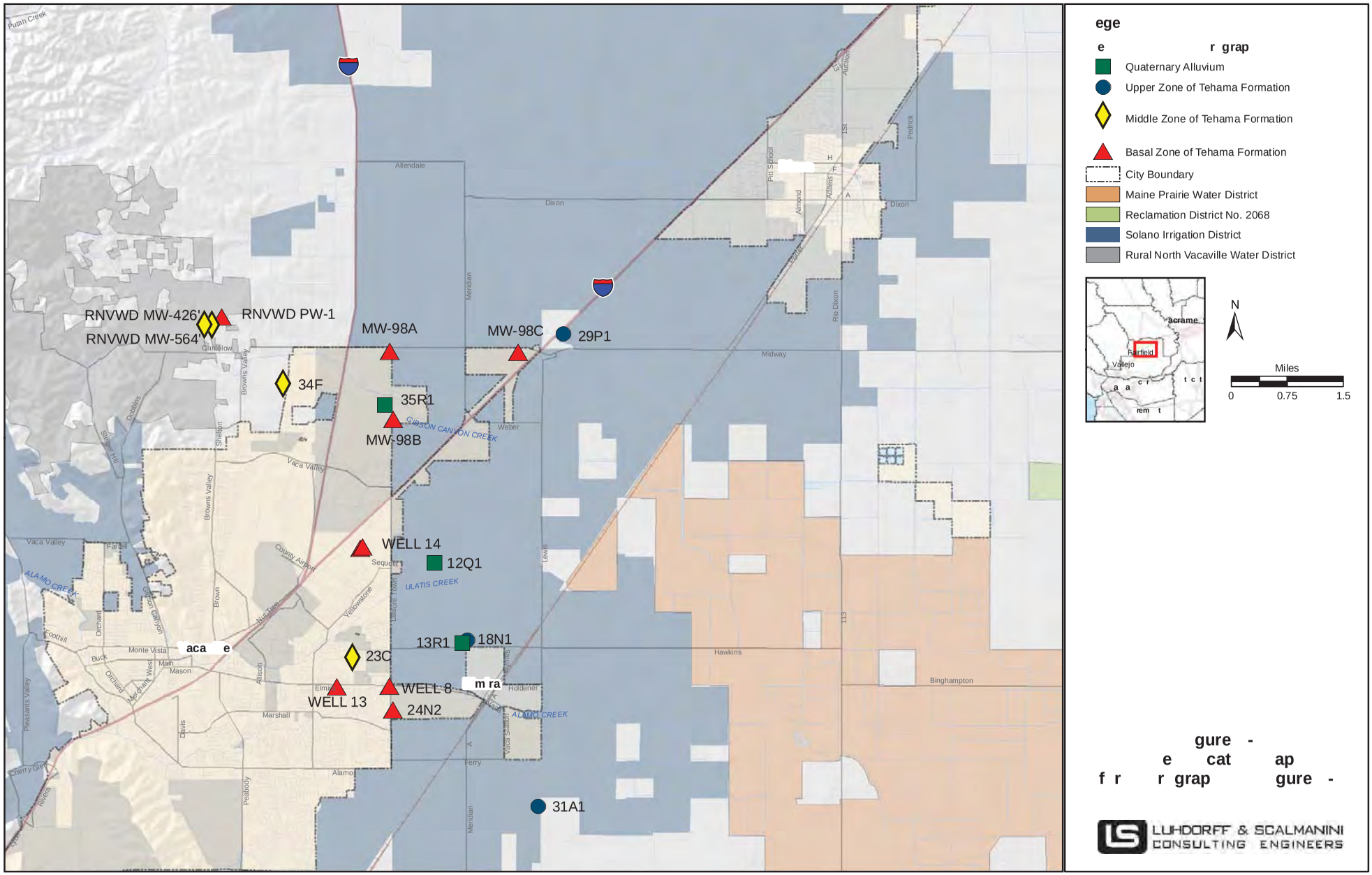

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- Quaternary Alluvium
- Upper Zone of Tehama Formation
- Middle Zone of Tehama Formation
- Basal Zone of Tehama Formation
- City Boundary
- Maine Prairie Water District
- Reclamation District No. 2068
- Solano Irrigation District
- Rural North Vacaville Water District

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File: Y:\Casey_Meirovitz\10-1-124 Vacaville GWMP Update\Report\GIS\Figure A-2 Well Location Map for hydrographs.mxd Date: 12/15/2010

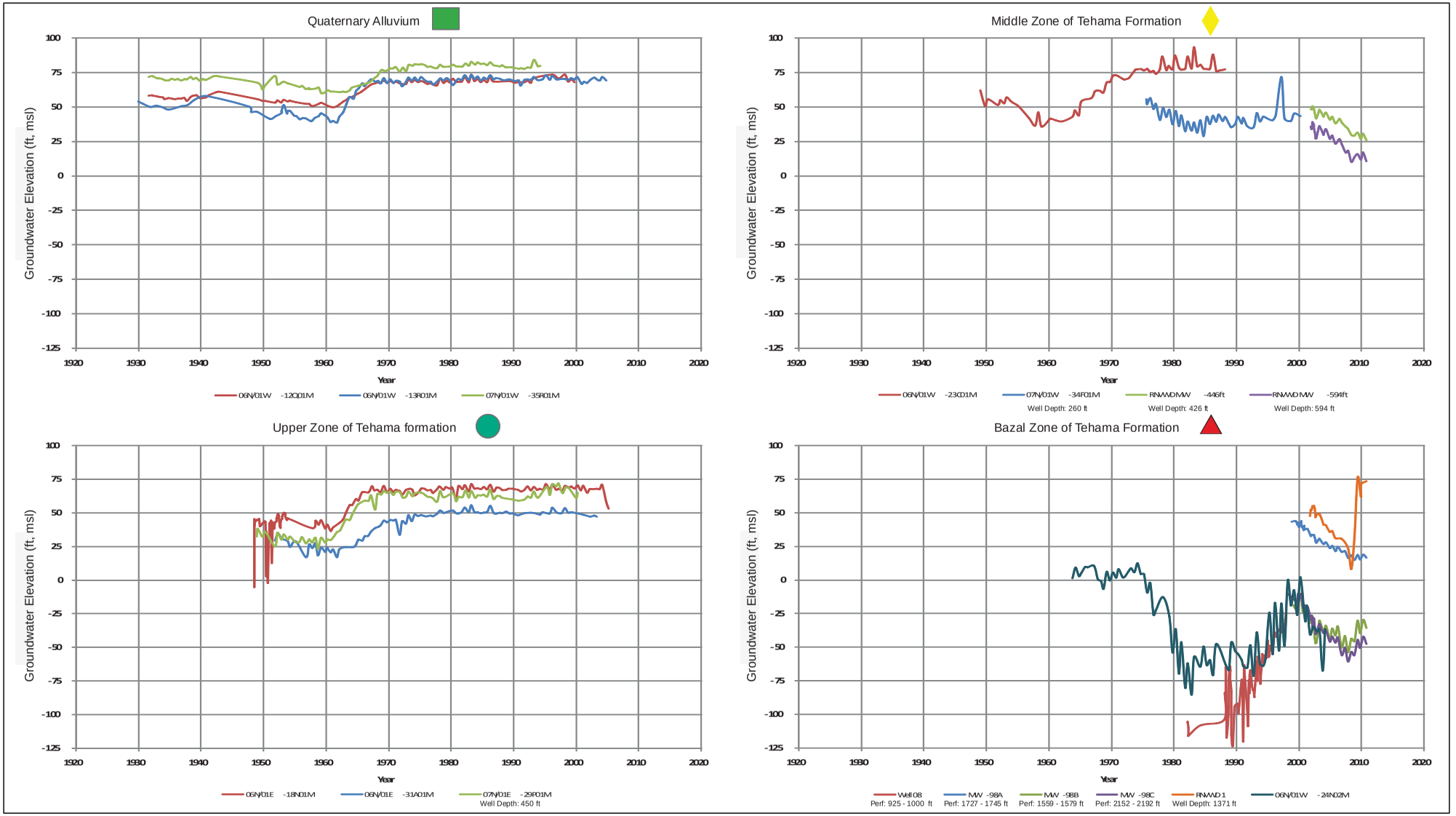

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Figure A-3
Hydrographs of Groundwater Elevations by Zone

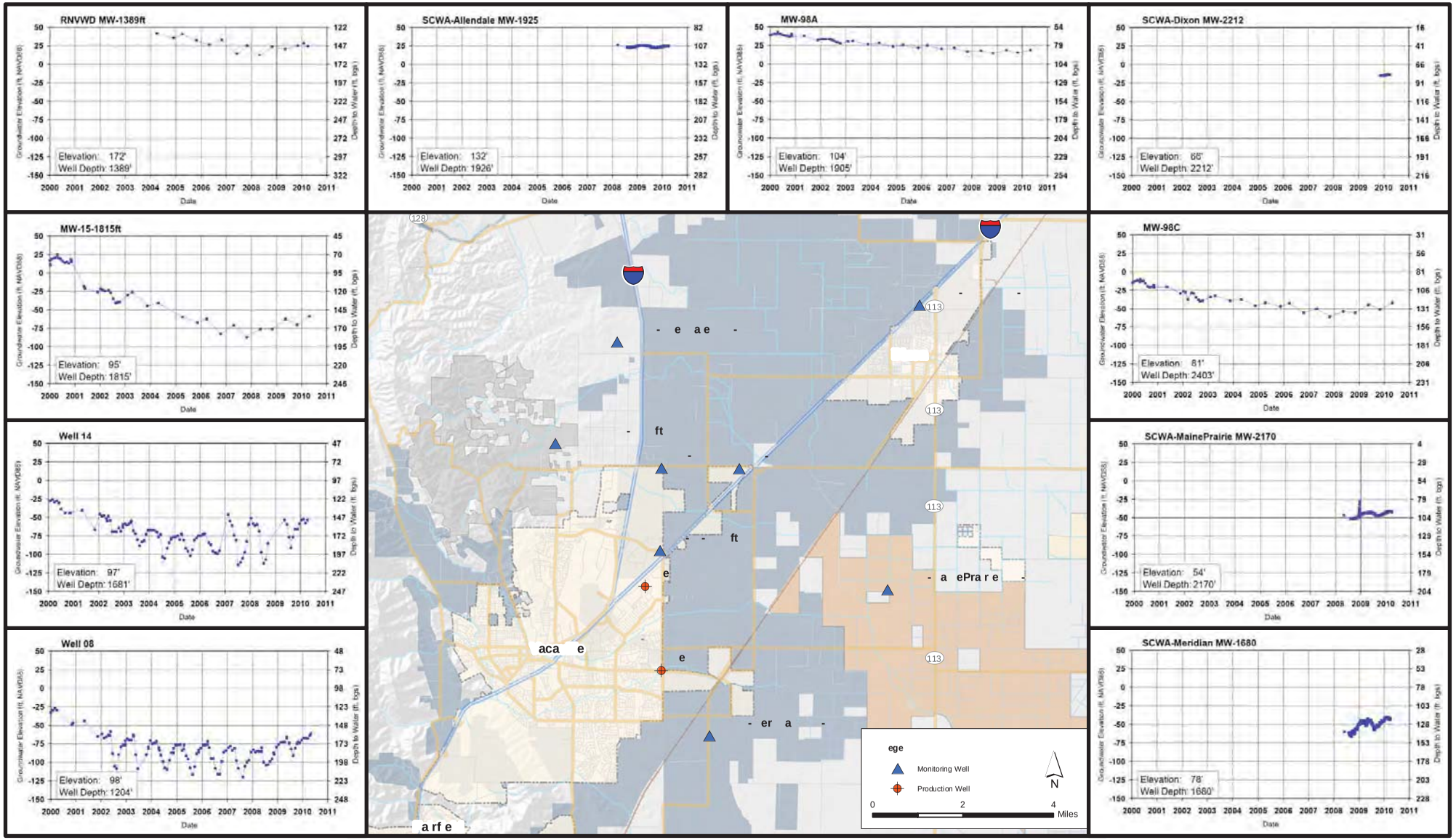

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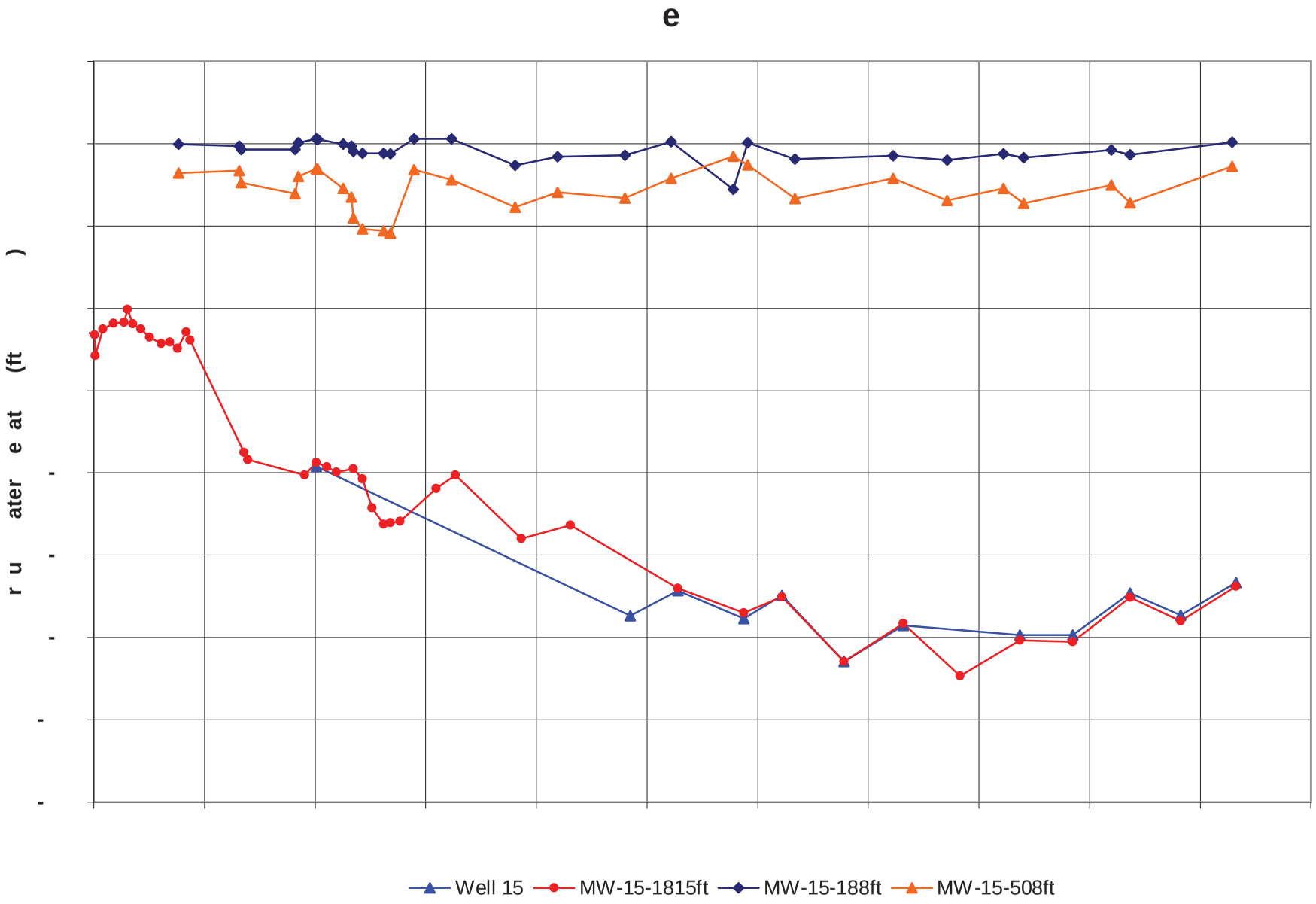
Figure A-4
Representative Hydrographs of Basal Zone Wells



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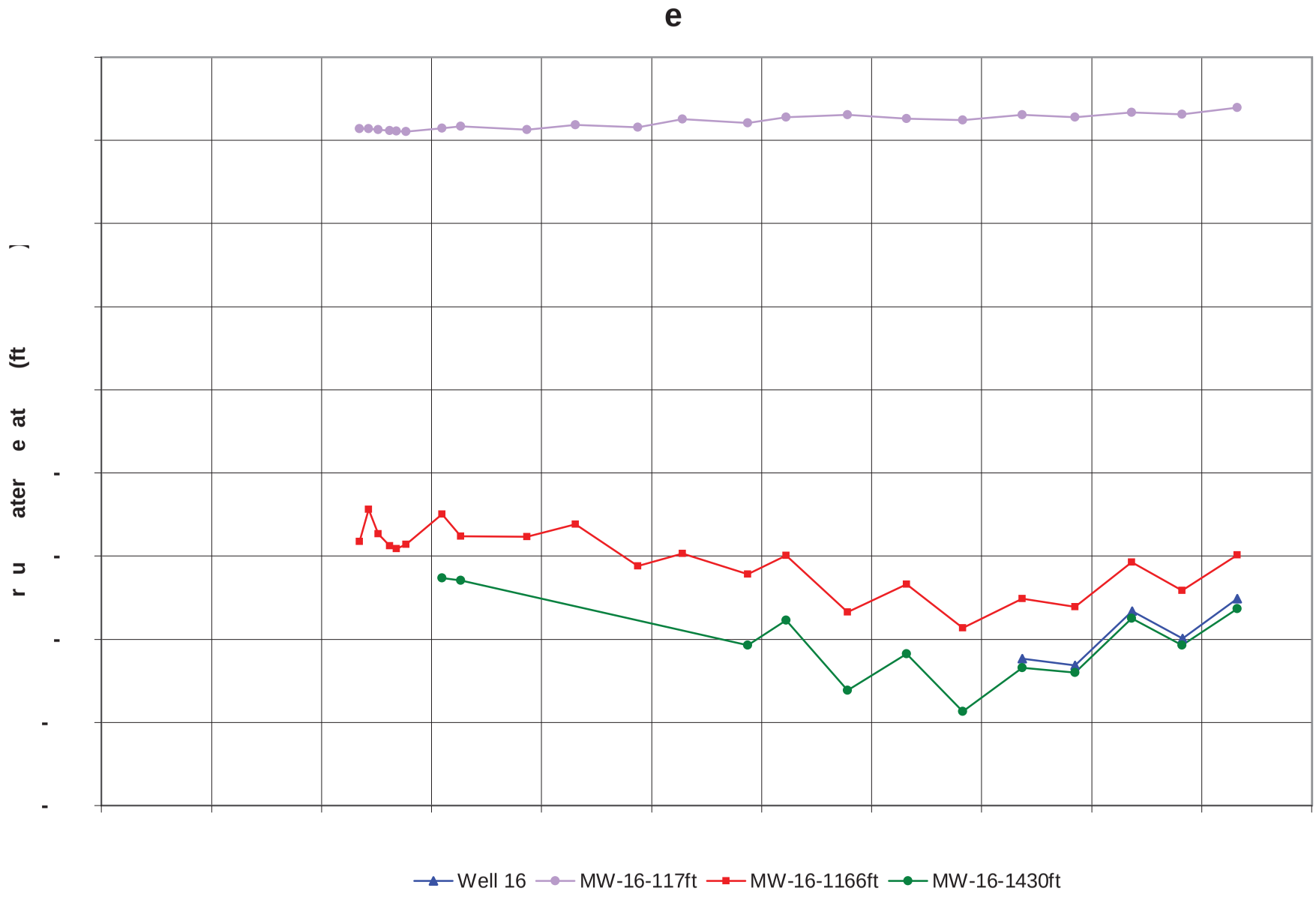

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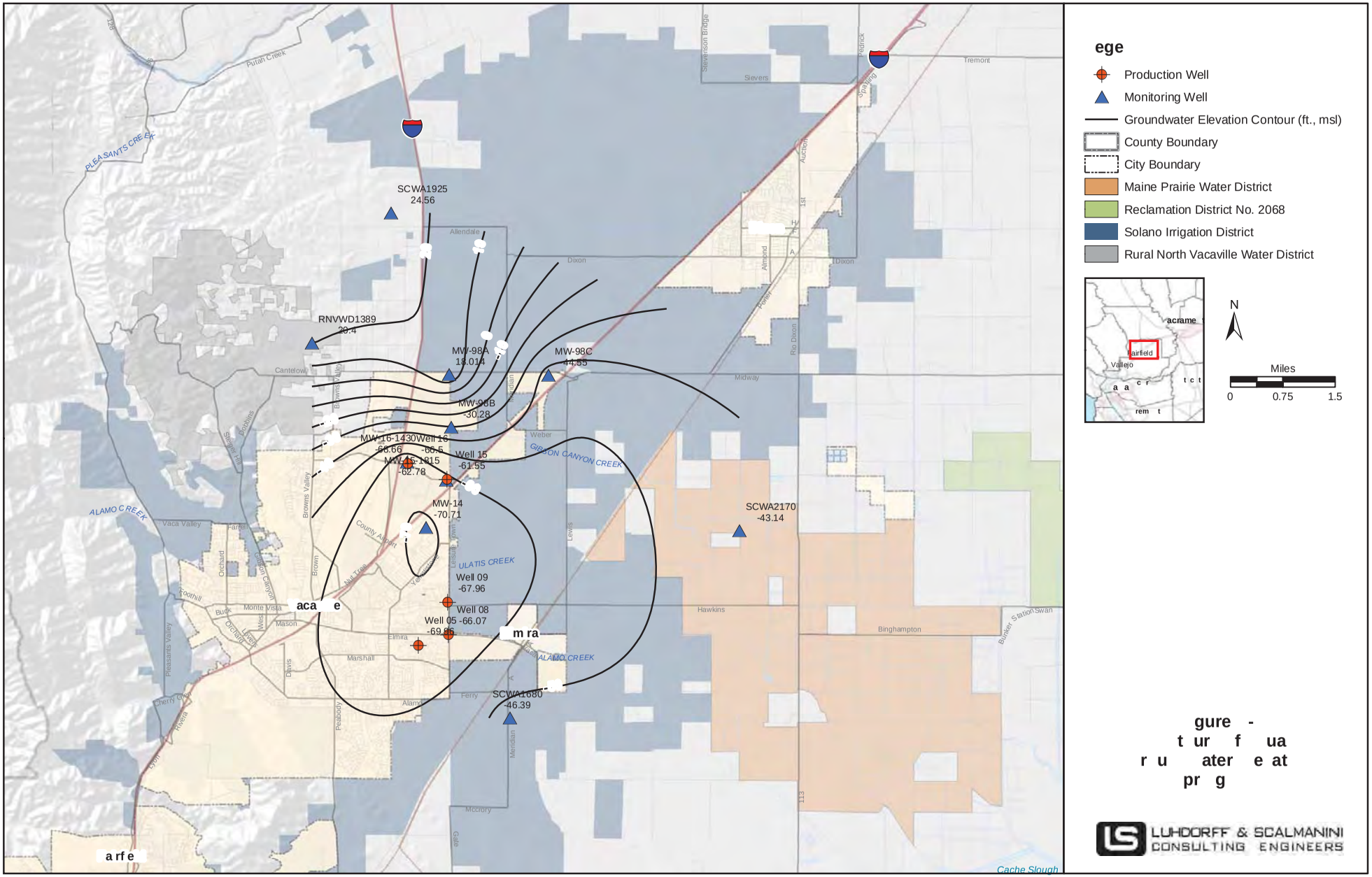

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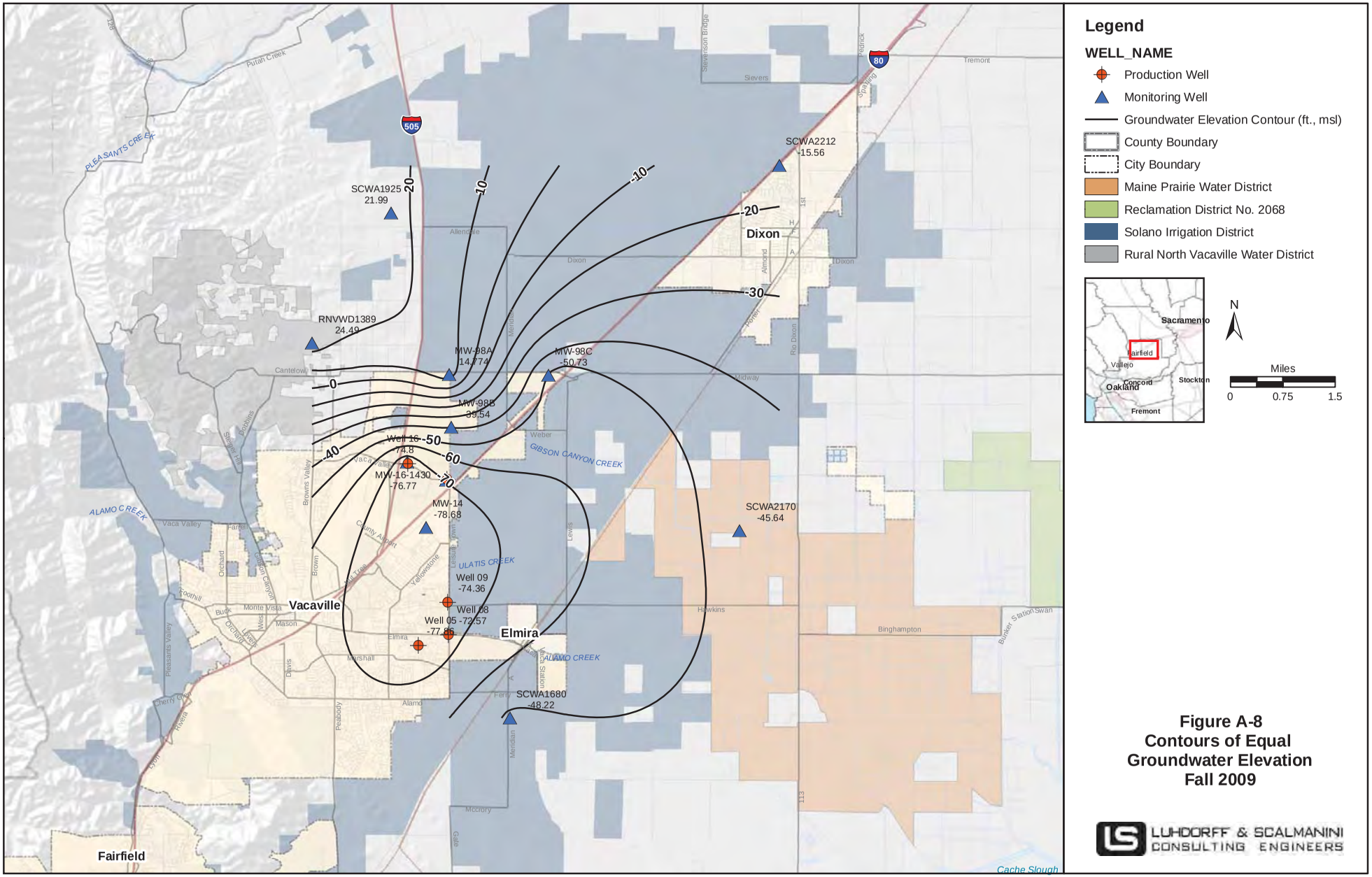

Figure A-8
Contours of Equal Groundwater Elevation
Fall 2009

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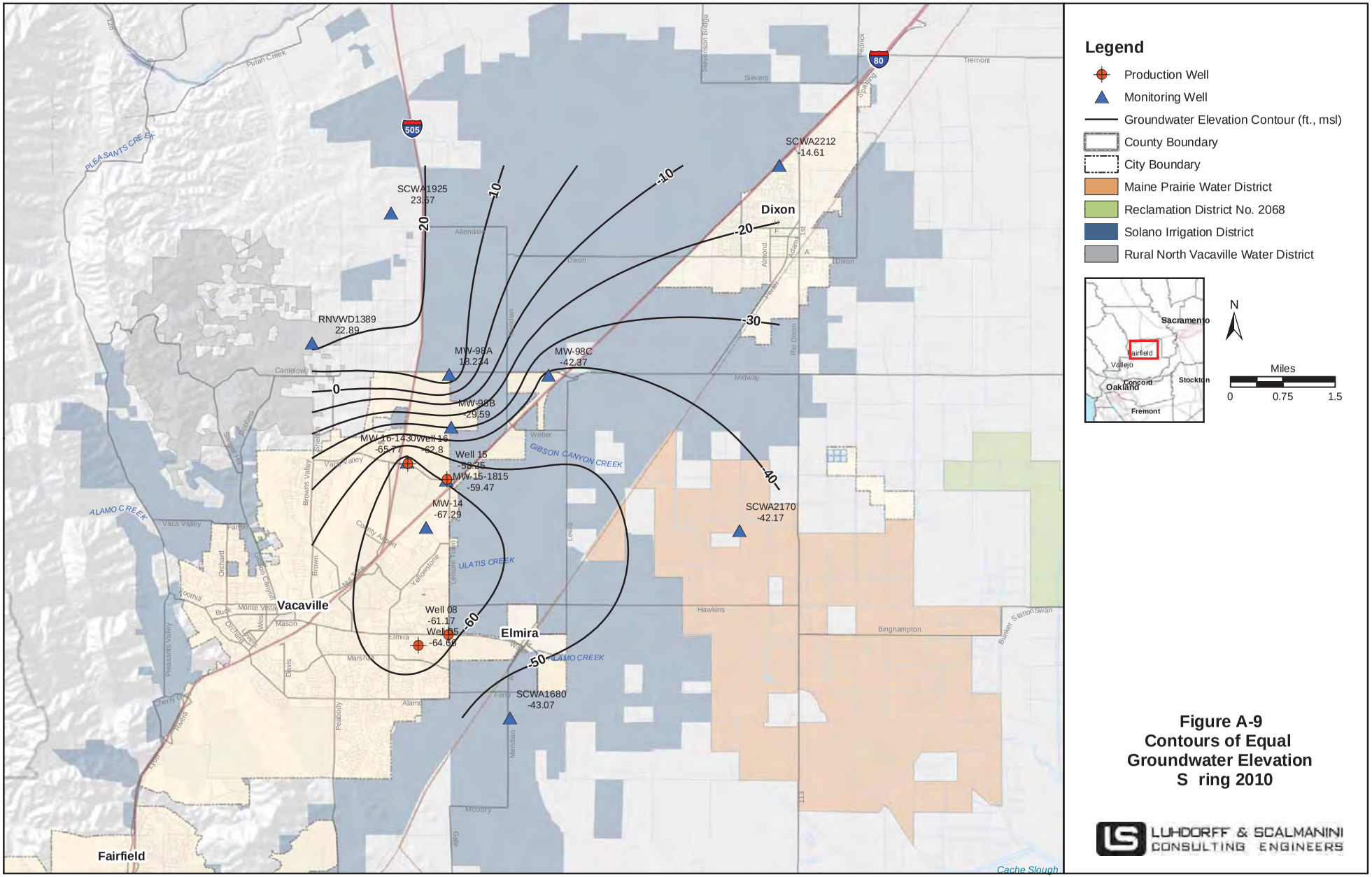

Figure A-9
Contours of Equal Groundwater Elevation
S ring 2010

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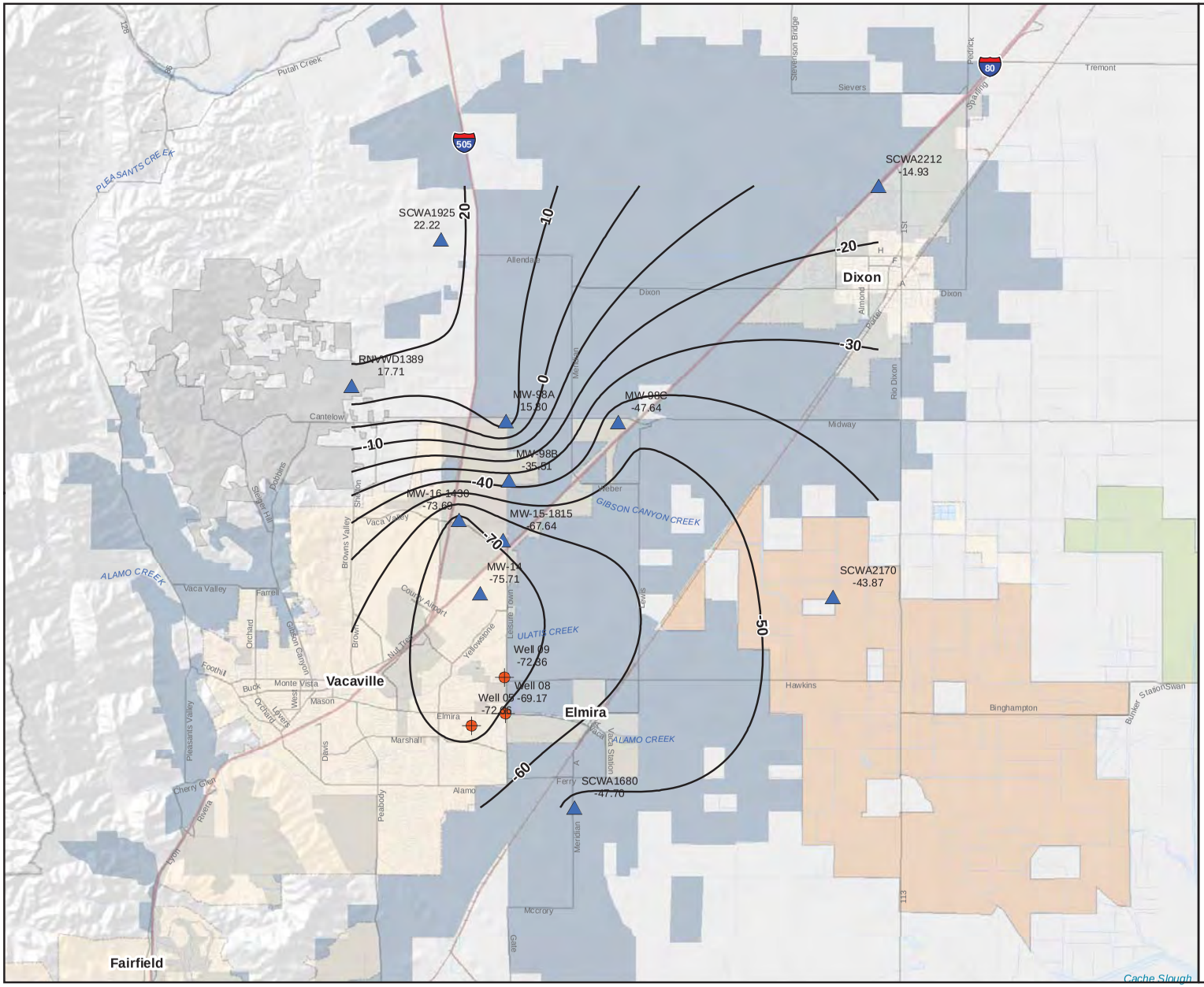

Legend

- Production Well
- Monitoring Well
- Groundwater Elevation Contour (ft., msl)
- County Boundary
- City Boundary
- Maine Prairie Water District
- Reclamation District No. 2068
- Solano Irrigation District
- Rural North Vacaville Water District

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Figure A-10
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 G

URBAN WATER SHORTAGE CONTINGENCY PLAN

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CITY OF VACAVILLE
URBAN WATER SHORTAGE CONTINGENCY PLAN

FINAL

AN AMENDMENT TO THE URBAN WATER MANAGEMENT PLAN

ADOPTED JANUARY 1991
REVISED JUNE 2015

Prepared by:

City of Vacaville
Utilities Department
650 Merchant Street
Vacaville, CA 95688

TABLE OF CONTENTS

Sections

Tables

Appendices

SECTION 1. Plan Overview and Purpose

The following plan has been updated in accordance with the Urban Water Management Planning Act and California Water Code Sections 10610 and 10632 (Appendix A), which require all urban water suppliers in California to prepare, adopt, and submit an amendment to its Urban Water Management Plan (UWMP). This amendment, titled the Urban Water Shortage Contingency Plan (UWSCP), outlines progressive steps to be taken to insure adequate water supply during drought years or other water shortage emergencies.

The City of Vacaville (City) prepared and submitted its first UWSCP in January 1991 as part of the City's 1991 UWMP update. The UWSCP was updated in August 2014 in response to the Emergency Drought Regulations issued on July 15, 2014 by the State Water Resources Control Board (SWRCB).

1.1 Compliance with City of Vacaville Municipal Code

The UWSCP complies with Section 13.20 of the City of Vacaville Municipal Code (Municipal Code) titled "Water Conservation in Normal, Drought and Emergency Conditions" (Appendix B). The Municipal Code is referenced or quoted in the UWSCP where appropriate.

1.2 Establishment of Water Conservation Conditions

The Municipal Code defines three water conservation conditions. The UWSCP addresses water conservation during normal, drought, and emergency conditions as defined below.

Normal Conditions (MC 13.20.040)

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 compliance with the *City of Vacaville Water Efficient Landscape Requirements* (WELR) will be required during normal conditions in accordance with the Municipal Code.

Drought Conditions (MC 13.20.050)

Drought conditions will be in effect when 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.

Emergency Conditions (MC 13.20.060)

Emergency conditions will be in effect whenever there is a water shortage necessitating a reduction in water use of 50 percent or greater from the normal condition, either city-wide or in a sub-area or land-use category within the City.

SECTION 2. Water Supply Availability

The City of Vacaville has three water supply sources. Two are surface water sources, the Solano Project and the State Water Project, that require treatment prior to distribution. The third source is from groundwater wells, which only require disinfection at the wellhead prior to distribution.

2.1 Solano Project Water

Vacaville's water supply sources include water from the Solano Project, which consists of Monticello Dam, Lake Berryessa, Lake Solano, and the Putah South Canal. The primary storage reservoir of the Solano Project is the Lake Berryessa reservoir, which has a large storage capacity (1.6 million acre-feet), but a relatively small watershed (576 square miles). This type of reservoir provides good drought protection if the reservoir is near full when the drought starts. Solano Project water is treated at the North Bay Regional Water Treatment Plant, a Joint Powers of Authority project between the cities of Vacaville and Fairfield, or at the City's Diatomaceous Earth Water Treatment Plant located at the City's Corporation Yard.

2.2 State Project Water

A second water supply source is the State Water Project, which delivers water from the Sacramento Delta through the North Bay Aqueduct. Water from the North Bay Aqueduct is treated at the North Bay Regional Water Treatment Plant. In calendar year 2014 there was a 95% percent reduction imposed on State Water Project contractors throughout California due to the extended drought of 2012 through 2014. This reduction in State Water Project supply was the most severe in the history of the State Water Project.

2.3 Groundwater

The third water supply source is groundwater from eleven (11) City wells. Vacaville draws groundwater from a deep aquifer located under the northeastern part of Solano County in the Vacaville/Dixon area. Vacaville's groundwater extraction in recent years has been maintained at about 5,000 - 6,000 acre feet per year (AF/YR), with the maximum safe yield determined to be over 8,000 AF/YR.

2.4 Supply Sources and Driest Three-Year Projection

Table 2-1 displays Vacaville's supply sources and the driest three-year period water supply projection through 2016. Total entitlements for 2014 through 2016 reflect water supply as follows:

- Groundwater - 100% of entitled amount from 2015 through 2016. Groundwater is closely monitored and managed by the member agencies of the Solano County Water Agency that utilize the groundwater resource in order to not overdraft the aquifer. Therefore groundwater should always be available at the maximum safe yield amount.
- Solano Project – Statistically, the Solano Project can deliver 89% of entitlements for multiple dry years as indicated by the 2010 UWMP. However, due to the extended drought of 2012 through 2014, and Lake Berryessa being at approximately 60% of capacity in 2014, another drought year in 2015 could result in a reduction in reliable Solano Project supply of up to 50%
- State Water NBA – The City's current contract allows for an increase in entitlements annually. In 2013 the City's entitlement was 35% of the entitled amount. This amount dropped to 5% in 2014. In multiple dry years the City's allocation is statistically projected at 30% of the normal entitlements. However, under the driest three-year scenario, which would be a continuation of the 2012-2014 drought, the State Water Project source could be unavailable in 2015 and 2016.

TABLE 2-1 Supply Sources and Driest Three-Year Period Supply Projection (Acre - feet)

Source	2013 Entitled Supply	2013 Actual Use	2014 Projected Supply	2015 Projected Supply	2016 Projected Supply
Groundwater	8,100	5,236	8,100	8,100	8,100
State Water Project					
Entitlement	3,142	1,591	449	0	0
Carryover	5,836	5,836	1,654	0	0
Settlement Water	-	0	0	0	0
Solano Project					
Entitlement	5,750	0	5,750	5,118	2,815
Carry Over	21,802	6,405	24,022	13,681	7,524
SID Master Agreement	2,875	0	3,000	2,781	1,440
Totals	47,505	19,068	34,875	29,680	19,879

In 2014, Vacaville will balance the reduction in supply from the State Water Project by using Solano Project carryover water from previous years and slightly increasing the amount of groundwater used. The City anticipates the availability of carryover water to continue through 2016. Table 2-1 shows that even under the most extreme circumstance, the continuation of the 2012-2014 drought for two additional years, and complete unavailability of the State Water Project supply source, the City will still have adequate water supply to meet the actual water use experienced in 2013.

Should Vacaville be required to meet a more stringent reduction goal, the City has the ability to do so through the Municipal Code.

SECTION 3. Stages of Action and Catastrophic Interruption

3.1 Stages of Water Conservation Actions

Vacaville has developed four (4) stages of water conservation actions, which progress from voluntary to mandatory stages. The water conservation stages and target water use reductions are shown in Table 3-1.

TABLE 3-1 Water Conservation Stages and Reduction Targets

Condition	Stage	Target Demand Reduction Goal	Level of Compliance
Drought	1 – Mild Drought	20%	Voluntary
Drought	2 – Moderate Drought	20%	Mandatory
Drought	3 – Severe Drought	35%	Mandatory
Emergency	4 – Emergency	50%	Mandatory

Each stage of water conservation action represents a water conservation response to a specified reduction in water supply. Each stage, when declared by the City Council, requires either a voluntary or mandatory reduction in water use by all customers, along with possible mandatory limitations on outdoor irrigation, and prohibitions on certain types of water use.

Stage 1 - Mild Drought. This stage will be declared when a reduction in total available water supply sources of 35% resulting from one or more single dry years occurs. At this stage water customers shall be asked to conserve water through a voluntary reduction in water use of 20%. Customers are also requested to limit the use of outdoor irrigation to no more than three days per week while in this stage. Additionally, the prohibitions on water use described in Section 4 shall apply.

Stage 2 - Moderate Drought. This stage will be declared when a reduction in total available water supply sources of 50% resulting from one or more single dry years occurs. At this stage water customers shall be required to conserve water through a mandatory reduction in water use of 20%. Customers are also required to limit the use of outdoor irrigation to no more than four days per week while in this stage. Additionally, the prohibitions on water use described in Section 4 shall apply.

Stage 3 - Severe Drought. This stage will be declared when a reduction in total available water supply sources of 65% resulting from one or more single dry years occurs. At this stage water customers shall be required to conserve water through a mandatory reduction in water use of 35%. Customers are also required to limit the use of outdoor irrigation to no more than three days per week while in this stage. Additionally, the prohibitions on water use described in Section 4 shall apply.

Stage 4 - Emergency. This stage will be declared when a reduction in total available water supply sources of 75% or more resulting from an emergency drought condition, catastrophic interruption such as a natural disaster, power outage or bio-terrorism attack on the City's water treatment and distribution system. At this stage water customers shall be required to conserve water through a mandatory reduction in water use of 50%. Customers are also required to limit the use of outdoor irrigation to no more than two days per week while in this stage. Additionally, the prohibitions on water use described in Section 4 shall apply.

To verify if the target demand reduction goal has been met, water use will be reviewed on a citywide basis and compared to the goal. For example, in a Stage 2 declaration, the target water demand reduction goal is 20%. If on a citywide basis the goal is met, no further analysis is conducted and all customers are considered to have reached their goal for the specific review period.

Should the citywide goal not be met, the actual water use of each individual water customer shall then be evaluated in comparison to their base 2013 water use to confirm if they met the target water demand reduction goal. In addition to meeting the required reduction in demand, users will be required to comply with all other water use prohibitions and water waste restrictions implemented at the declared stage in accordance with Section 4.

Appeals shall be processed as set forth in Appendix C, Water Conservation Program Exception and Appeal Process.

3.2 Water Conservation Triggering Conditions or Events

Water conservation stages may be triggered by one or more water supply conditions or events. A significant shortage in one water supply source or moderate shortages in a combination of water supply sources 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 based on water supply shortage is shown in Table 3-2.

TABLE 3-2 Supply Shortage Triggering Levels (Baseline Supply 47,505 AF/YR)

Stage	Percent Shortage	Available Supply Due to Water Shortage
Mild Drought	35% Supply reduction	Combined supply reduced to 30,878 AF/YR
Moderate Drought	50% Supply Reduction	Combined supply reduced to 23,752 AF/YR
Severe Drought	60% Supply Reduction	Combined supply reduced to 19,002 AF/YR
Emergency	75% Supply Reduction	Combined supply reduced to 11,876 AF/YR or less

Water conservation action stages may also be triggered by local, state or federal action impacting the management of the City's water supply sources. The City Manager or his/her Designee, which will typically be the Director of Utilities or the Director of Public Works, shall use multiple sources of information to make a recommendation to the City Council on the implementation of one or more specific water conservation stages.

3.3 Catastrophic Interruption and Disaster Planning

The City of Vacaville developed a Utilities Department Emergency Response Plan in August 1991and has maintained and updated the plan on a regular basis, with the most recent update occurring in April 2014. The City continues to maintain a comprehensive plan which outlines the water system response plan in the event of a natural disaster, a City-wide power outage, or a bio-terrorism attack on the City's water treatment and distribution system.

The Utilities Department emergency operations center, 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

In the event of a catastrophic interruption or other emergency, the City Council can direct the implementation of the Emergency stage of water conservation action.

SECTION 4. Prohibitions on Water Use and Consumption Reduction Methods

4.1 Water Waste Restrictions established by Municipal Code

Section 13.20 of the Municipal Code includes specific water use restrictions. Accordingly, 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 Municipal Code as cited below:

1. Excessive water runoff due to landscape irrigation activities.
2. 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.
3. Washing of vehicles, equipment, structures, and other items without the use of a shutoff nozzle.

4. The escape of water through breaks or leaks within the water users' plumbing or system that is not repaired within 24 hours of discovery.
5. Fire hydrants used for purposes other than firefighting, water quality, maintenance, sanitation, and construction.

4.2 Additional Restrictions in Drought Stages

During Drought stages, the City Council can require additional water use restrictions as appropriate to achieve the desired level of conservation. Potential and additional restrictions include:

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.

4.2 Additional Restrictions in Emergency Stages

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.

During Normal water conditions, and during all water conservation stages, the City's Water Efficient Landscape Regulations shall be in effect.

Violations of any of the provisions in Section 4 may be subject to enforcement in accordance with Section 13.20.030 of the Municipal Code.

SECTION 5. Penalties for Excessive Water Use

Under the Normal condition, 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. There are no penalties for high water use under the Normal condition.

In Drought and Emergency conditions in which a water conservation stage is declared and conservation goals set, penalties, in the form of surcharges on the water bill, may be assessed for water use in excess of the conservation goal and/or water use allocation. For any instance in which the customer's use exceeds the conservation goal and/or the water use allocation, that customer will be assessed a surcharge of 25% of the variable water charges for that billing period as a penalty for excessive water use.

SECTION 6. Revenue and Expenditure Impacts

The City of Vacaville manages the Water Utility with the intent of maintaining revenue neutrality. The City's goal is to bill its customers only for the costs to operate and maintain an efficient water system that meets the public health requirements of its customers and promotes a high quality of life and vibrant economy.

Reductions in water use due to water conservation measures will typically result in a corresponding decrease in revenues to the Water Utility. Potential revenue reduction projections under several drought stage scenarios are shown in Table 6-1.

TABLE 6-1 Projected Water Conservation Budget Impacts

	Normal 2013 Base Year	Drought (20%)	Severe Drought (35%)	Emergency (50%)
Water Volume Revenues	$9,912,000	$7,930,000	$6,443,000	$4,956,000
Reduced Revenues		$1,982,000	$3,469,000	$4,956,000
Additional Water Conservation Program Expenses		$44,000	$48,000	$52,000
Total Budget Impact		$2,126,000	$3,517,000	$5,008,000

Once the City's water conservation reduction goal is established, the corresponding budget impact will be calculated. If revenue reductions become significant, the City Council may have to consider adjusting water rates in order to offset reductions. Any water rate adjustments considered by the City Council would be administered in accordance with the requirements of Proposition 218.

In the event additional water purchases were to become necessary, the cost for these purchases will be included as an expense and recovered through the net increase.

SECTION 7. Water Use Monitoring Procedures

7.1 Normal Conditions Monitoring

In Normal stage water supply conditions, production figures are recorded daily and reviewed by the Water Operations Section. Totals are reported monthly and incorporated into the water supply report.

7.2 Drought Conditions Monitoring

During Drought stage water supply conditions, daily production figures are provided to the Water Operations Section of the Utility Department. The Water Operations Section provides the weekly production figures to the Water Conservation Coordinator. The Water Conservation Coordinator compares the weekly production to the 2013 base year data to verify reduction goals are being met. Weekly and monthly reports are generated and provided to the Director of Utilities. The Director of Utilities will notify the City Manager and City Council if water reduction goals are not met, so corrective action can be taken.

7.3 Emergency Conditions Monitoring

During an Emergency conditions shortage or interruption of service, Drought stage procedures will be followed, with the addition of a daily production report to the Director of Utilities. During a disaster shortage the Emergency stage applies.

SECTION 8. Drought Ordinance Implementation

On November 18, 2014, the City of Vacaville adopted Drought Ordinance No. 1877 (Appendix D) establishing water conservation requirements and a water rate structure to address Normal, Drought, and Emergency conditions. Upon determination of a water shortage, or local, state, or federal declaration, the City Manager or his/her Designee shall notify the City Council of the condition along with recommendations for enactment of the appropriate conservation level.

An accompanying Resolution (No. 2014-85 – see Appendix E) was adopted declaring Drought Stage 2 conditions. Should Vacaville be required to move to Drought Stage 3 measures, a modification to Resolution 2014-85 would be prepared and submitted for Council action.

SECTION 9. Plan Adoption Standards

The City of Vacaville updated this Urban Water Shortage Contingency Plan during July and August 2014. The Plan was adopted on August 12, 2014 (see Appendix VI). The Plan includes all information necessary to meet the requirements of California Water Code Section 10632.

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.

Appendix A

WATER CODE
SECTIONS 10630 and 10632

10630. It is the intention of the Legislature, in enacting this part, to permit levels of water management planning commensurate with the numbers of customers served and the volume of water supplied.

10632. (a) The plan shall provide an urban water shortage contingency analysis that includes each of the following elements that are within the authority of the urban water supplier:

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

(2) 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.

(3) 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.

(4) 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.

(5) 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.

(6) Penalties or charges for excessive use, where applicable.

(7) An analysis of the impacts of each of the actions and conditions described in paragraphs (1) to (6), 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.

(8) A draft water shortage contingency resolution or ordinance.

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

(b) Commencing with the urban water management plan update due December 31, 2015, for purposes of developing the water shortage contingency analysis pursuant to subdivision (a), the urban water supplier shall analyze and define water features that are artificially supplied with water, including ponds, lakes, waterfalls, and fountains, separately from swimming pools and spas, as defined in subdivision (a) of Section 115921 of the Health and Safety Code.

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C a ter 13 20
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Sections:

13 20 010 Definitions

As used in this chapter:

A. “Customer or account holder” means the person, corporation, agency, or other entity who owns a water meter connected to the city’s water system, and is responsible for making payment for service.

B. Drought condition. 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 ten percent from the normal condition but less than a thirty percent reduction.

C. Emergency Condition. Emergency conditions will be in effect whenever there is a water shortage necessitating a reduction in water use, either city-wide or in an subarea or land-use category within the city, of thirty percent or greater from the normal condition.

D. “Flow restrictor” means any device which limits the pressure or flow rate at the water service connection.

E. “General use” means all commercial, industrial, office and business water users, customers, and accounts including those condominium, apartment, multifamily, and mobile home park uses where several habitations are served by a single water meter.

F. “Irrigated metered use” means all water users, customers and accounts which either serve an agricultural use or water used for temporary construction purposes.

G. “Landscape irrigation schedule” means a schedule established which limits landscape irrigation activities to specified times of day. Specified irrigation days may also be established and irrigation times may be rotated among various users throughout the water system service area to equalize demands on the water system.

H. Normal Condition. 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 Landscape Water Efficient Regulations) will be required during normal conditions in accordance with this chapter.

I. “Rate blocks” means groups of units of water supplied by the city water system and priced with an increasing block rate structure incorporating two or more blocks.

J. “Residential use” means all water users, customers and accounts except for those classified general use and metered irrigation use.

K. “Spray irrigation” means the act of applying water to landscape by sprinklers or spray nozzles.

L. Wasting Water. Wasting water includes the following activities, and except for subsection (4) below, applies whether by a water customer of the city or by any other person within the city:

1. The watering of grass, lawns, ground-cover, shrubbery, open ground, crops and trees in a manner or to an extent which allows excess water to run off of the landscaped area being watered or which results in overspray by spray irrigating facilities;

2. The washing of sidewalks, walkways, driveways, parking lots and all other hard surfaced areas by direct hosing, except as may be necessary to remove hazardous materials for protection of the public health and safety;

3. The washing of vehicles, equipment, structures and other items by direct hosing without the use of a shutoff nozzle;

4. The escape of water through breaks or leaks within the plumbing or distribution system of a user or customer of city water for any substantial period of time within which such break or leak should reasonably have been discovered and corrected. It will be presumed that up to twenty-four hours is a reasonable period after discovery of a break or leak to correct the problem.

M. “Water shortage” means any condition in which water supply is less than actual or projected water demand. Water shortages can be short term such as those caused by failure of water system infrastructure or long term such as those caused by insufficient raw water supplies.

N. “Water user or consumer” means any person, corporation, agency, or other entity that uses water from the city water system for any reason whatsoever regardless of whether the person, corporation, etc., is a customer or account holder. (Ord.1431 §4(part), 1991).

13 20 020 Administration of ordinance

The department of public works, through the director of public works, shall be responsible for administration of the provisions of this chapter. Wherever the term “director of public works” is used in this chapter it shall include the designee of the director of public works.

A. Monitoring. The department of public works shall monitor water supply and demand and shall determine whether a water shortage exists or is projected to exist and for determining the magnitude of such shortage.

B. Recommendation to City Council. Upon determination of a water shortage, the director of public works shall notify the city council of determination of the condition along with recommendations for enactment of drought or emergency conservation conditions beyond those set forth in this chapter. The city council will review recommendations by the director of public works and will authorize implementation of such drought or emergency conservation provisions determined necessary by the city council to address the drought or emergency condition.

C. Public Notification and Public Hearing. Before implementation, a public hearing shall be scheduled and held by the city council. The hearing shall be advertised in a newspaper of general circulation within the city at least seven days in advance of the hearing. The public shall be notified of (1) the city’s intent to implement drought or emergency conservation measures, (2) a list of proposed conservation measures or means of access thereto, and (3) the date, time and place of the public hearing.

D. Declaration of Drought or Emergency Conservation Conditions. Following the public hearing, the city council will, by resolution, determine whether a drought or emergency condition exists, the conservation provisions in addition to those set forth in this chapter to be put into effect by the department of public works during the period of the drought or emergency condition, and the water rates to be charged to water customers and users during the period of the drought or emergency condition.

E. Withdrawal of Drought and Emergency Conservation Measures. Drought or emergency conditions will continue to be in effect until the department of public works has determined that the water shortage conditions warrant change to a less restrictive conservation level and a resolution of the city council is adopted declaring a reduction in conservation levels.

F. Right of Inspection and Access to Meters. Any duly authorized representative of the city shall have the right to inspect existing and new construction for compliance with this chapter and to access the customer’s water meter for inspection and for shutting off and turning on water service for installing or removing flow restrictors.

G. Place of Use. Water received from or through a meter may be used only on and for the property served by that meter.

H. Resale of Water. Resale of water supplied by the city is prohibited.

I. Use of Reclaimed Wastewater. Use of reclaimed wastewater is exempt from the provisions of this chapter and is encouraged in place of potable water supplied by the city water system where it is feasible and within state reclamation guidelines. (Ord. 1431 §4(part), 1991).

13 20 030 Enforcement

It shall be a violation of this chapter for any water customer or account holder to violate any of the provisions of this chapter or of the administrative rules and regulations promulgated hereunder or to waste any water obtained from or through the distribution facilities of the city, or from any person to engage in wasting water as defined herein. The violation of each specific provision of this chapter, and each separate violation thereof, shall be deemed a separate offense, and shall be enforced accordingly.

A. Violations.

1. For the first violation within the preceding twelve calendar months, the director of public works shall issue a written notice of the fact of such violation.

2. For the second violation within the preceding twelve calendar months, the director of public works shall impose a surcharge of fifty dollars against the account holder for the property where the violation occurred.

3. For the third violation within the preceding twelve calendar months, the director of public works shall impose a surcharge of one hundred dollars against the account holder for the property where the violation occurred.

4. For a fourth and any subsequent violation within the preceding twelve calendar months, the director of public works or his designee shall impose a surcharge of two hundred fifty dollars against the account holder for the property where the violation occurred.

Further, the director of public works may:

a. Install a flow restrictor on the property where the violation occurred or is occurring, for a length of time to be determined by the director of public works, but in no event for more than one year; or

b. Disconnect service on the property where the violation occurred or is occurring, for a length of time not to exceed sixty days in length.

5. As an additional remedy, the violation of any provision of this chapter by any person who has received more than one written warning pursuant to subsection (A)(1) above or against whom the director of public works has imposed a second violation in

one consecutive twelve-month period is deemed to be and is hereby declared a public nuisance and may be subject to abatement by restraining order or injunction issued by a court of competent jurisdiction.

B. Time Period for Accounting Violations. Accrued violations will be based on acts of noncompliance occurring within a consecutive twelve-month period. Each successive twenty-four-hour period of any violation or failure to comply shall be a separate and distinct violation.

C. Notice of Violation. For each violation, the director of public works shall give notice as follows:

1. Written notice of violation will be sent through the U.S. mail, first-class prepaid, to the address of the account holder as shown on current water billing records or personally served on the account holder. The notice will be considered to have been served upon the account holder either upon depositing the notice in the U.S. mail or when personally served, whichever methodology is utilized.

2. Written notice of violation shall include the date, time, and location of the violation; a description of the violation; provisions of the ordinance violated; a statement of the assessed surcharge or other enforcement action; and the appeal procedures.

D. Right of Appeal. Any account holder provided a notice of violation in accordance with the provisions of this chapter shall have the right of appeal. A request for hearing must be made in writing and must be received by the director of public works within ten calendar days from the date of personal or mailed service of the notice of violation. Upon receipt of an appeal and request for hearing, all applicable surcharges and enforcement actions will be suspended until such hearing has been completed and a final determination made.

E. Determination of Appeal. The appeal will be heard and determined by city manager or the designee of the city manager. The city manager shall consider whether the account holder knew or should have known of the violation at the time it occurred and whether the account holder took reasonable action to correct the violation upon notification of said violation. The determination of the city manager will be final and conclusive.

F. Payment of Penalties and Charges. Any surcharge imposed pursuant to this section, or reimbursement of city expenses, shall be added to the account of the account holder for the property where the violation occurred and shall be due and payable on the same terms and subject to the same conditions as any other charge for regular water service.

G. Reimbursement of City Expenses. If violations result in either installation of a flow restrictor, discontinuation of water service, or injunctive relief sought and obtained by the

city pursuant to this chapter, the account holder whose service is affected shall reimburse the city for all costs incurred, including attorney's fees.

H. Reimbursement from Tenants. Nothing in this chapter shall limit or be construed to limit the right of an account holder to seek reimbursement of a surcharge or other costs from a tenant or other consumer. (Ord. 1431 §4(part), 1991).

13 20 040 Normal Conditions

A. Water Conservation Goal. During normal conditions the goal is to maximize beneficial use of water through specific provisions of this chapter, public education, voluntary water conservation, and the City of Vacaville Water Efficient Landscape Regulations.

B. Implementation Methods.

1. Water Pricing. 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. Water blocks and the water rates applicable to such blocks will be established by resolution of the city council.

2. Water Use Restrictions. The City of Vacaville Water Efficient Landscape Regulations for Water Conservation be applicable and water wasting activities shall be prohibited under normal conditions.

3. Irrigated Metered Use. 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 as determined by the city council by resolution. 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. (Ord.1431 §4(part), 1991).

13 20 050 Droug t Conditions

A. Water Conservation Goal. During drought conditions the goal is to achieve from a ten percent to a thirty percent reduction in water consumption compared with normal conditions.

B. Implementation Methods.

1. Water Pricing. Under drought conditions, water prices may be adjusted by any combination of (a) increases in the unit prices of water for established blocks, (b) modification of the unit amounts which define blocks, and (c) 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.

2. Water Allotment. 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. The director of public works is authorized to promulgate regulations to implement the allocations established by the city council and address those situations in which circumstances warrant a modification of the allocation.

3. Water Use Restrictions. In addition to normal restrictions in this chapter, the following restrictions shall be applicable under drought conditions. Further, the city council may direct, by resolution, additional restrictions.

a. 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 public works.

b. Fountains and water-using ornamental structures shall be prohibited from using water unless equipped with a recirculation pump.

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

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

e. 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.

f. Defer construction of new city parks unless specific factors determined by the city council authorize such construction.

g. Prohibit new set-back landscaping at commercial and industrial sites. Deferred installation agreements may be required to ensure construction of the setback landscaping when the water drought or emergency is over. (Ord.1431 §4(part), 1991).

13 20 060 Emergenc Condition

A. Water Conservation Goal. During emergency conditions the goal is to achieve a thirty percent or greater reduction in water consumption compared with normal conditions.

B. Implementation Methods.

1. Water Pricing. Under emergency conditions, water prices may be further adjusted as set forth in Section 13.20.050(b)(1) herein.

2. Water Allotment. Under emergency conditions, water unit amounts which defined the block structure price increase stages can be further adjusted, as set forth in Section 13.20.050(B)(1) and as determined necessary by the city council, by resolution, to maintain revenues and decrease water consumption.

3. Water Use Restrictions. In addition to normal and drought restrictions, the following additional restrictions may be enacted under emergency conditions. Further, the city council may establish, by resolution, other water use restrictions to be in effect during an emergency condition.

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

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

c. 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;

d. Prohibit the operation of fountains or ornamental water using structures;

e. Prohibit the installation of turf grass;

f. Depending upon the severity of the water shortage, prohibit the construction of new golf courses and reduce or prohibit new residential construction. (Ord. 1431 §4(part),1991).

A endix C

Policy and Procedure
Date issued: Date
revised: Section:

S EC Water Conservation rogram
Exce tion and A eal rocess

Approved: David Tompkins Assistant Director of Public Works

1.0 PURPOSE

To provide a systematic means for processing water conservation exceptions to Conservation the city of Vacaville's Water Ordinance. To approvals and denials. insure consistent application of

2.0 DEFINITION

During Drought and Emergency water conditions as adopted by Resolution of the City Council of the City of Vacaville, water use goals are established. Water customers in the City of Vacaville may apply for additional water above that goal based upon: (1) having more than four (4) residents per household in case an additional 50 which gallons per day per person will be granted to such household but not to exceed an additional 100 gallons per day per household, (2) due to medical requirements, (3) due to severe economic hardship, (4) due to emergency conditions, (5) for livestock or (6) other extenuating circumstances as determined by the Director of Utilities.

3.0 POLICY

3.1 Additional water units will be granted based on the following guidelines:

1

3.1.1 More than four (4) residents per household: 50 gallons per day (4 units) per person not to exceed an additional 100 gallons per day per household.

3.1.2 Medical requirements: Determined on a case-by-case basis based on customer description of water usage for medical needs. Generally allotted in multiples of four (4) units (50 gallons per day).

3.1.3 Severe economic hardship: Twelve (12) units or 150 gallons per day.

3.1.4 Emergency conditions: Determined on a case-by-case basis based on customer description of water usage for emergency needs.

3.1.5 Large livestock (horse, cattle, sheep): 30 gallons per large animal per day.

3.1.6 Residential Use - Home Based Businesses

a) Daycare - two (2) units or 25 gallons per day per daycare child.

b) Water Usage Business (eg, painting, janitorial, etc) - Four (4) units or 50 gallons per day.

c) Non-water usage business (eg, office, instructional classes, etc) - Two units or 25 gallons per day.

3.1.7 General Use - Extenuating Circumstances

Determined on a case-by-case basis based on customer description of type of business, water needs, usage history, etc.

3.1.8 Residential Use - Extenuating Circumstances

Determined on a case-by-case basis based on customer description on type of business, water needs, usage history, etc.

3.2 Right of Appeal- Any account holder provided a denial of exception or a goal amount less than they deem necessary shall have the right of appeal.

3.1.1 More than four {4) residents per household: 50 gallons per day (4 units) per person not to exceed an additional 100 gallons per day per household.

3.1.2 Medical requirements: Determined on a case-by-case basis based on customer description of water usage for medical needs. Generally allotted in multiples of four (4) units (50 gallons per day).

3.1.3 Severe economic hardship: Twelve (12) units or 150 gallons per day.

3.1.4 Emergency conditions: Determined on a case-by-case basis based on customer description of water usage for emergency needs.

3.1.5 Large livestock (horse, cattle, sheep): 30 gallons per large animal per day.

3.1.6 Residential Use- Home Based Businesses

a) Daycare - two (2) units or 25 gallons per day per daycare child.

b) Water Usage Business (eg, painting, etc) janitorial, per - Four (4) units or 50 gallons day.

c) Non-water usage business (eg, office, etc) instructional classes, gallons per - Two units or 25 day.

3.1.7 General Use- Extenuating Circumstances

Determined on a case-by-case basis based on customer description of type of business, water needs, usage history, etc.

3.1.8 Residential Use - Extenuating Circumstances

Determined on a case-by-case basis based on customer description on type of business, water needs, usage history, etc.

3.2 Right of Appeal- Any account holder provided a denial of exception or a goal amount less than they deem necessary shall have the right of appeal.

A request for appeal must be made in writing and received by the Assistant Director of Utilities. The appeal will be considered with a determination made by the Assistant Director of Utilities, who shall consider the circumstances of the appealing customer, the status of the City's water supply, and whether reasonable action is being taken on the part of the account holder to conserve water. A written response will be forwarded to the account holder upon determination.

Should the account holder request further considerations after the above mentioned steps have been completed and a determination issued; those steps may be repeated to the Director of Utilities whose determination will be final and conclusive.

3.3 All efforts will be made to insure strict confidentiality of Water Conservation Exception Forms and the identity of any account holder who submits said forms.

4.0 PROCEDURE

Water Conservation Exception Forms are available through the Water Conservation Office and can be submitted at anytime throughout the duration of Drought and Emergency conditions.

All efforts will be made to process the Exception Forms in a timely manner.

Completed forms will be copied and forwarded to the Finance Department for computerized account input. Original forms will remain at the Water Conservation Office. Copied forms will be shredded.

Account holders will be notified of denial or of additions to goal amounts.

5.0 RESPONSIBILITY

It is the responsibility of the Water Conservation Coordinator to maintain all documents pertaining to the exception process and to insure consistent application of this policy and procedure.

Attachments:

(1) Water Conservation Exception Form Residential Use Classification

(2) Water Conservation Exception Form - General Use Classification

CITY OF VACAVILLE

WATER ALLOTMENT EXCEPTION FORM

General Use Classification

This form must be completed in full and submitted for additional allotments of water or for water use contrary to the adopted Water Conservation Ordinance. Please mail the completed form to: City of Vacaville, Water Conservation Office, PO Box 220, Elmira, CA 95625. Must be received on or before the date shown below in order to be in effect by your next billing. The decision of the Director of Utilities is final. You will receive a prompt reply. For additional information, call the Water Conservation Hotline at 469-6555.

The ordinance allows exceptions to water allotment based on the following reasons only. Circle which exception applies to you and explain below.

(a) Medical requirements
(b) When failure to do so would cause severe economic hardship to the applicant including, but not limited to, threat of imminent insolvency
(c) When failure to do so would cause an emergency condition affecting the health, sanitation, fire protection or safety of applicant/public
(d) Large livestock (i.e., horses and cattle)
(e) Serious extenuating circumstances

Describe why one or more of the above exceptions apply to you. The Director of Utilities or his/her designee can grant your request only upon clear and convincing evidence that one or more of the foregoing conditions have been satisfied. (Additional space on back).

_____

_____

I hereby declare, under penalty of perjury, that the above information is true and correct. Water bills are calculated on information provided. If information is inaccurate, the customer will be responsible for retroactive full and proper payment.

_____ _____

Print Name Signature Date

_____

Telephone Number

CITY OF VACAVILLE
WATER CONSERVATION EXCEPTION FORM
Residential Use
Classification

This form must be completed in full and submitted for an increase to the standard conservation goal or for water use contrary to the adopted Water Conservation Ordinance. Please mail the completed form to: City of Vacaville, Water Conservation Office, P.O. Box 220, Elmira, CA 95625. The decision of the Director of Utilities is final. You will receive a prompt reply. For additional information, call the Water Conservation Hotline at 469-6555.

Name and Address Account Number:

The ordinance allows exceptions to the standard conservation goal based on the following reasons only. Check which applies to you and explain below.

A. More than 4 residents in a single family residential household.
    1. I am requesting an exception to the standard conservation goal for _____(#) of people who permanently
    2. Reside here for more than 6 months per year.
    3. List all permanent residents by name and birth date. (Additional space on back).

_____ _____ _____

_____ _____ _____

B. Medical requirements. (Explain in space below)
C. When failure to do so would cause severe economic hardship to the applicant including, but not limited to, threat of imminent insolvency
D. When failure to do so would cause an emergency condition affecting the health, sanitation, fire protection or safety of applicant/public
E. Large livestock (i.e., horses and cattle)
F. Serious extenuating circumstances
G. Home based business which requires additional water.
    1. Business license number:
    2. Type of Business:

Describe why one or more of the above exceptions apply to you. The Director of Utilities or his designee can grant your request only upon clear and convincing evidence that one or more of the foregoing conditions have been satisfied. Include if applicable: # of employees, business size and hours, # of work stations, if daycare # of children provided services, etc. (Additional space on back)

_____

_____

_____

_____

I hereby declare, under penalty of perjury, that the above is true and correct.

_____ _____

Print Name Signature Date

_____

Telephone Number

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ORDINANCE NO. 1431

AN URGENCY ORDINANCE OF THE CITY OF VACAVILLE ESTABLISHING WATER CONSERVATION REQUIREMENTS AND WATER RATE STRUCTURES TO ADDRESS NORMAL, DROUGHT AND EMERGENCY CONDITIONS

THE CITY COUNCIL OF THE CITY OF VACAVILLE DOES ORDAIN AS FOLLOWS:

SECTION 1. URGENCY FINDINGS

The City council of the City of Vacaville finds as follows:

1. The State of California is facing unprecedented drought conditions which have resulted in reductions of water entitlements to the city of Vacaville and proposed additional reductions. The Governor of the State of California, the State Water Resources Control Board and the Federal Bureau of Reclamation have either ordered cutbacks of water allocations to the city of Vacaville or have announced their intention to do so in the immediate future. At present the State Department of Water Resources has reduced Vacaville's 1991 water entitlement from the State Water Project's North Bay Aqueduct by 90%, which represents about 6% of the City's total annual water supply for 1991. The Federal Bureau of Reclamation has required the City to reduce its releases from the Solano Project by 25%, which represents about 10% of the City's total water supply for 1991. The Governor has directed that each public agency develop a plan and implement procedures to reduce water usage by 50%.

2. The State Legislature has also enacted legislation to address drought conditions including, among others, Water Code sections 350-359 establishing requirements for declaration and implementation of water shortage emergency conditions. Assembly Bill 325 requiring preparation of landscape regulations, and section 17921.3 of the Health and Safety Code pertaining to plumbing standards for water closets and urinals.

3. Limited water supplies, both regionally and to the City, create additional obligations to put those limited water resources available to the maximum beneficial use to the extent possible. Maximizing beneficial use includes elimination of waste or unreasonable use of water while protecting the interests of the people of the City of Vacaville and for the protection of the public health safety, and welfare.

4. In order for the city of Vacaville to (1) achieve the presently mandated reduction of 15 of its 1991 water supply and to implement methods to be able to achieve a reduction in water use by 50%, should that become necessary, and (2) to preserve and protect the limited water supplies available to the city of Vacaville for residential use, human consumption, public sanitation and maintenance of business and commercial facilities, it is imperative that water conservation measures, including pricing mechanisms to reduce water consumption, be put in place immediately on an urgency basis.

SECTION 2. COORDINATION WITH PRESENT MUNICIPAL CODE

The provisions of this Ordinance shall prevail over conflicting sections of the existing Vacaville Municipal Code, if any.

SECTION 3. APPLICABILITY

The provisions of this ordinance shall apply to all Water Users served by the City of Vacaville water system. No Water User of the City of Vacaville water system shall knowingly make, cause, use, or permit the use of water from the City water system for residential, commercial, industrial, agricultural, institutional, or any other purpose in a manner contrary to any provisions of this Ordinance.

SECTION 4.

Chapter 13.20 of the Vacaville Municipal Code is added to read as follows:

CHAPTER 13.20
WATER CONSERVATION IN
NORMAL, DROUGHT AND EMERGENCY CONDITIONS

Section 13.20.010. Definitions:

(A). Wasting Water. Wasting water includes the following activities, and except for subsection (d) below, applies whether by a water customer of the City of Vacaville or by any other person within the City of Vacaville:

(1) The watering of grass, lawns, ground-cover, shrubbery, open ground, crops and trees in a manner or to an extent which allows excess water to run off of the landscaped area being watered or which results in overspray by Spray Irrigation facilities.

(2) The washing of sidewalks, walkways, driveways, parking lots and all other hard surfaced areas by direct hosing, except as may be necessary to remove hazardous materials for protection of the public health and safety.

(3) The washing of vehicles, equipment, structures and other items by direct hosing without the use of a shutoff nozzle.

(4) The escape of water through breaks or leaks within the plumbing or distribution system of a user or customer of City water for any Substantial period of time within which such break or leak should reasonably have been discovered and corrected. It will be presumed that up to 24 hours is a reasonable period after discovery of a break or leak to correct the problem.

(B). Customer or Account Holder. A Customer or Account Holder is the person, corporation, agency, or other entity who owns a water meter connected to the City's water system, and is responsible for making payment for service.

(C). Water User or Consumer. A Water User or Consumer is any person, corporation, agency, or other entity who uses water from the city water system for any reason whatsoever regardless of whether the person, corporation, etc., is a customer or Account Holder.

(D). Flow Restrictor. A Flow Restrictor is any device which limits the pressure or flow rate at the water service connection.

(E). Spray Irrigation. Spray Irrigation is the act of applying water to landscape by sprinklers or spray nozzles.

(F). Water Shortage. A Water Shortage is defined as any condition in which water supply is less than actual or projected water demand. Water shortages can be short term such as those caused by failure of water system infrastructure or long term such as those caused by insufficient raw water supplies.

(G). Rate Blocks. Groups of units of water supplied by the City water system and priced with an increasing block rate structure incorporating two or more blocks.

(H). Landscape Irrigation Schedule. A schedule established which limits landscape irrigation activities to specified times of day. Specified irrigation days may also be established and irrigation times may be rotated among various users throughout the water system service area to equalize demands on the water system.

(I). Normal Condition. 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 of the City of Vacaville Landscape water Efficient Regulations) will be required during normal conditions in accordance with this ordinance.

(J). Drought Condition. 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% from the Normal Condition but less than a 30% reduction.

(K). Emergency Condition. Emergency conditions will be in effect whenever there is a Water Shortage necessitating a reduction in water use, either city-wide or in an sub-area or land-use category within the City, of 30% or greater from the Normal Condition.

(L). Residential Use. All water users, customers and accounts except for those classified General Use and Metered Irrigation Use.

(M). General Use. All commercial, industrial, office and business water users, customers, and accounts including those condominium, apartment, multi-family, and mobile home park uses where several habitations are served by a single water meter.

(N). Irrigated Metered Use. All water users, customers and accounts which either serve an agricultural use or water used for temporary construction purposes.

Section 13.20.020 Administration of Ordinance:

The Department of Public Works, through the Director of Public Works, shall be responsible for administration of the provisions of this Chapter. Wherever the term "Director of Public Works" is used in this Chapter it shall include the designee of the Director of Public Works.

(A). Monitoring. The Department of Public Works shall monitor water supply and demand and shall determine whether a Water Shortage exists or is projected to exist and for determining the magnitude of such shortage.

(B). Recommendation to City Council. Upon determination of a water Shortage, the Director of Public Works shall notify the city Council of determination of the condition along with recommendations for enactment of drought or emergency conservation conditions beyond those set forth in this chapter. The City Council will review recommendations by the Director of Public Works and will authorize implementation of such drought or emergency conservation provisions determined necessary by the City Council to address the drought or emergency condition.

(C). Public Notification and Public Hearing. Before implementation, a public hearing shall be scheduled and held by the City Council. The hearing shall be advertised in a newspaper of general circulation within the City of Vacaville at least seven days in advance of the hearing. The public shall be notified of 1) the City's intent to implement drought or emergency conservation measures, 2) a list of proposed conservation measures or means of access thereto, and 3) the date, time and place of the public hearing.

(D). Declaration of Drought or Emergency Conservation Conditions. Following the public hearing, the City Council will, by resolution, determine whether a drought or emergency condition exists, the conservation provisions in addition to those set forth in this Chapter to be put into effect by the Department of Public Works during the period of the drought or emergency condition, and the water rates to be charged to water customers and users during the period of the drought or emergency condition.

(E). withdrawal of Drought and Emergency Conservation Measures. Drought or Emergency conditions will continue to be in effect until the Department of Public Works has determined that the Water Shortage conditions warrant change to a less restrictive conservation level and a resolution of the. City Council is adopted declaring a reduction in conservation levels.

(F). Right of Inspection and Access to Meters. Any duly authorized representative of the City shall have the right to inspect existing and new construction for compliance with this Ordinance and to access the Customer's water meter for inspection and for shutting off and turning on water service for installing or removing Flow Restrictors.

(G). Place of Use. Water received from or through a meter may be used only on and for the property served by that meter.

(H). Resale of Water. Resale of water supplied by the City of Vacaville is prohibited.

(I). Use of Reclaimed Wastewater. Use of reclaimed wastewater is exempt from the prov1s10ns of this Ordinance and is encouraged in place of potable water supplied by the City water system where it is feasible and within state reclamation guidelines.

Section 13.20.030 Enforcement:

It shall be a violation of this Chapter for any water customer or account holder to violate any of the provisions of this Chapter or of the administrative rules and regulations promulgated hereunder or to waste any water obtained from or through the distribution facilities of the City, or for any person to engage in wasting water as defined herein. The violation of each specific provision of this Chapter, and each separate violation thereof, shall be deemed a separate offense, and shall be enforced accordingly.

(A). Violations:

(1) For the first violation within the preceding twelve (12) calendar months, the Director of Public Works shall issue a written notice of the fact of such violation.

(2) For the second violation within the preceding twelve (12) calendar months, the Director of Public Works shall impose a surcharge of $50.00 against the account holder for the property where the violation occurred.

(3) For the third violation within the preceding twelve (12) calendar months, the Director of Public Works shall impose a surcharge of $100.00 against the account holder for the property where the violation occurred.

(4) For a fourth and any subsequent violation within the preceding twelve (12) calendar months, the Director of Public Works or his designee shall impose a surcharge of $250.00 against the account holder for the property where the violation occurred. Further, the Director of Public Works may:

(a) install a flow restrictor on the property where the violation occurred or is occurring, for a length of time to be determined by the Director of Public Works, but in no event for more than one (1) year; or

(b) disconnect service on the property where the violation occurred or is occurring, for a length of time not to exceed sixty (60) days in length.

(5) as an additional remedy, the violation of any provision of this Chapter by any person who has received more than one written warning pursuant to section (1) above or against whom the Director of Public Works has imposed a second violation in one consecutive

twelve-month period is deemed to be and is hereby declared a public nuisance and may be subject to abatement by restraining order or injunction issued by a court of competent jurisdiction.

(B). Time Period for Accounting Violations. Accrued violations will be based on acts of non-compliance occurring within a consecutive twelve (12) month period. Each successive twenty-four hour period of any violation or failure to comply shall be a separate and distinct violation.

(C). Notice of Violation. For each violation, the Director of Public Works shall give notice as follows:

(1) Written notice of violation will be sent through the US mail, first class pre-paid, to the address of the account holder as shown on current water billing records or personally served on the account holder. The notice will be considered to have been served upon the account holder either upon depositing the notice in the US mail or when personally served, whichever methodology is utilized.

(2) Written notice of violation shall include the date, time, and location of the violation; a description of the violation; provisions of the ordinance violated; a statement of the assessed surcharge or other enforcement action; and the appeal procedures.

(D). Right of Appeal. Any account holder provided a notice of violation in accordance with the provisions of this Ordinance shall have the right of appeal. A request for hearing must be made in writing and must be received by the Director of Public Works within ten (10) calendar days from the date of personal or mailed service of the notice of violation. Upon receipt of an appeal and request for hearing, all applicable surcharges and enforcement actions will be suspended until such hearing has been completed and a final determination made.

(E). Determination of Appeal. The appeal will be heard and determined by city Manager or the designee of the City Manager. The City Manager shall consider whether the account holder knew or should have known of the violation at the time it occurred and whether the account holder took reasonable action to correct the violation upon notification of said violation. The determination of the City Manager will be final and conclusive.

(F). Payment of Penalties and Charges. Any surcharge imposed pursuant to this section, or reimbursement of city expenses, shall be added to the account of the account holder for the property where the violation occurred and shall be due and payable on the same terms and subject to the same conditions as any other charge for regular water service.

(G). Reimbursement of City Expenses. If violations result in either installation of a flow restrictor, discontinuation of water service, or injunctive relief sought and obtained by the City pursuant to this chapter, the account holder whose service is affected shall be reimburse the City for all costs incurred, including attorney's fees.

(H). Reimbursement from Tenants. Nothing in this Ordinance shall limit or be construed to limit the right of an account holder to seek reimbursement of a surcharge or other costs from a tenant or other consumer.

Section 13.20.040 Normal Conditions

(A). Water Conservation Goal. 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 Regulations.

(B). Implementation Methods

(1) Water Pricing

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 revenue collected from customers, and promoting beneficial use of the water. Water blocks and the water rates applicable to such blocks will be established by resolution of the City council.

(2) Water Use Restrictions

The City of Vacaville Water Efficient Landscape Regulations for Water Conservation be applicable and water wasting activities shall be prohibited under normal conditions.

(3) Irrigated Metered Use

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 as determined by the city Council by resolution. 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.

Section 13.020.050 Drought Conditions

(A). Water Conservation Goal. During drought conditions the goal is to achieve from a 10% to a 30 percent reduction in water consumption compared with normal conditions.

(B). Implementation Methods

(1) Water Pricing

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.

(2) Water Allotment

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. The Director of Public Works is authorized to promulgate regulations to implement the allocations established by the city Council and address those situations in which circumstances warrant a modification of the allocation.

(3). Water Use Restrictions

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

(a) 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 Public Works.

(b) fountains and water using ornamental structures shall be prohibited from using water unless equipped with a recirculating pump.

(c) drought notices shall be posted in hotels, motels and all public establishments offering lodging.

(d) restaurants will served water to customers only upon request of their patrons.

(e) 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.

(f) defer construction of new city parks unless specific factors determined by the City Council authorize such construction.

(g) 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.

Section 13.20.060 Emergency Condition

(A). Water Conservation Goal. During emergency conditions the goal is to achieve a 30.percent or greater reduction in water consumption compared with normal conditions •.

(B). Implementation Methods

(1) Water Pricing

Under emergency conditions, water prices may be further adjusted as set forth in section 13.20.050 (B) (1) herein.

(2) Water Allotment

Under emergency conditions, water unit amounts which define the block structure price increase stages can be further adjusted, as set forth in section 13.020.050 (B)(1) and as determined necessary by the city Council, by resolution, to maintain revenues and decrease water consumption.

(3) Water Use Restrictions

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

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

(b) depending upon the severity of the water shortage, prohibit 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 to prohibit all outdoor uses of water altogether.

(c) 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.

(d) prohibit the operation of fountains or ornamental water using structures.

(e) prohibit the installation of turf grass.

(f) depending upon the severity of the water shortage, prohibit the construction of new golf courses and reduce or prohibit new residential construction.

SECTION 5. SEVERABILITY

If any section, subsection, sentence, clause or phrase of this Ordinance is for any reason held to be unenforceable or invalid, such decision shall not affect the validity of the remaining portions of this Ordinance. It is intended that each portion of this Ordinance would have been adopted irrespective of the fact that anyone or more sections, subsections, sentences, clauses or phrases be declared unenforceable or invalid.

SECTION 6. PUBLICATION

This ordinance shall be published once, within fifteen (15) days after its adoption, in the Vacaville Reporter, a newspaper of general circulation in the city of Vacaville.

I HEREBY CERTIFY that this urgency ordinance was introduced and adopted at a regular meeting of the City Council of the City of Vacaville, held on the 12th day of March, 1991, and effective March 13, 1991, by the following vote:

AYES:	Councilmembers Clancy, Conner, Lowe, Vice Mayor Kimme, and Mayor Fleming
NOES:	None
ABSENT:	None

APPROVED

_____
David A. Fleming, Mayor

ATTEST:

_____
Kathleen M. Andronico, City Clerk

RESOLUTION NO. 2014-085

RESOLUTION DECLARING A DROUGHT CONDITION AND DIRECTING STAFF TO IMPLEMENT WATER CONSERVATION ACTIONS AT STAGE 2 – MODERATE DROUGHT OF THE 2014 CITY OF VACAVILLE URBAN WATER SHORTAGE CONTINGENCY PLAN

WHEREAS, on January 17, 2014, Governor Edmund G. Brown, Jr. declared a Drought State of Emergency throughout California after three consecutive years of extremely low precipitation; and

WHEREAS, on April 25, 2014, Governor Brown signed an Executive Order authorizing the State Water Resources Control Board to adopt emergency regulations as it deemed necessary to reduce water use statewide; and

WHEREAS, on July 15, 2014, the State Water Resources Control Board adopted emergency regulations adding new sections to Title 23 of the California Code of Regulations requiring urban water suppliers to implement certain water conservation actions, including implementation of the stage of the urban water supplier's Urban Water Shortage Contingency Plan that includes restrictions on the irrigation of ornamental landscaping and lawns, to reduce urban water use; and

WHEREAS, on August 12, 2014, the City Council adopted the August 2014 update to the Urban Water Shortage Contingency Plan, last revised in 1991, to include all of the required elements to meet the new regulations adopted by the State Water Resources Control Board.

NOW, THEREFORE, BE IT RESOLVED by the City Council of the City of Vacaville that a Drought Condition is declared in Vacaville.

BE IT FURTHER RESOLVED by the City Council of the City of Vacaville that City staff is directed to implement Stage 2 – Moderate Drought of the August 2014 update to the Urban Water Shortage Contingency Plan, with a mandatory twenty percent (20%) reduction in water use and limiting the irrigation of outdoor ornamental landscaping and lawns to 4 days per week.

BE IT FURTHER RESOLVED by the City Council of the City of Vacaville that all fines and penalties described in the August 2014 update to the Urban Water Shortage Contingency Plan shall be waived for the next 2 utility billing cycles.

I HEREBY CERTIFY that the forgoing resolution was introduced and passed at a regular meeting of the City Council of the City of Vacaville, held on the 26th day of August, 2014 by the following vote:

AYES:	Council members Hunt, Rowlett, Vice-Mayor Mashburn and Mayor Hardy
NOES:	None
ABSENT:	Council member Harris

ATTEST:

Michelle A. Thombrugh

Michelle A. Thombrugh, City Clerk

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RESOLUTION NO. 2014-076

RESOLUTION ADOPTING THE UPDATE TO THE CITY OF VACAVILLE URBAN WATER SHORTAGE CONTINGENCY PLAN IN RESPONSE TO EMERGENCY DROUGHT REGULATIONS ADOPTED BY THE STATE WATER RESOURCES CONTROL BOARD ON JULY 15, 2014

WHEREAS, on January 17, 2014, Governor Edmund G. Brown, Jr. declared a Drought State of Emergency throughout California after three consecutive years of extremely low precipitation; and

WHEREAS, on April 25, 2014, Governor Brown signed an Executive Order authorizing the State Water Resources Control Board to adopt emergency regulations as it deemed necessary to reduce water use statewide; and

WHEREAS, on July 15, 2014, the State Water Resources Control Board adopted emergency regulations adding new sections to Title 23 of the California Code of Regulations requiring urban water suppliers to implement certain water conservation actions, including implementation of the urban water supplier's Urban Water Shortage Contingency Plan, to reduce urban water use; and

WHEREAS, the City of Vacaville has updated the Urban Water Shortage Contingency Plan, last revised in 1991, to include all of the required elements to meet the new regulations adopted by the State Water Resources Control Board.

NOW, THEREFORE, BE IT RESOLVED by the City Council of the City of Vacaville that the August 2014 update to the Urban Water Shortage Contingency Plan is hereby adopted.

I HEREBY CERTIFY that the forgoing resolution was introduced and passed at a regular meeting of the City Council of the City of Vacaville, held on the 12th day of August, 2014 by the following vote:

AYES: Council members Harris, Hunt, Rowlett and Vice-Mayor Mashburn

NOES: None

ABSENT: Mayor Hardy

ATTEST:

Michelle A. Thornbrugh, City Clerk

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APPENDIX H

KENNEDY/JENKS SCWA WATER SUPPLY RELIABILITY TECHNICAL MEMORANDUM

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14 April 2016

Technical Memorandum

To: Thomas Pate, Solano County Water Agency

From: Jennifer Lau, Kennedy/Jenks Consultants

CC: Sachi Itagaki and Mary Lou Cotton, Kennedy/Jenks Consultants

Subject: SCWA Water Supply Reliability
K/J 1568025*00

Introduction

This Technical Memorandum is part of Task 3A of the Solano County Water Agency (SCWA) Strategic Plan Update to provide technical support for the SCWA Participating Agencies to address water supply reliability for their 2015 Urban Water Management Plans. This Technical Memorandum provides:

- A review of 2015 California Department of Water Resources (DWR) State Water Project (SWP) Delivery Capability Report (DCR) for applicable delivery reliability assumptions, particularly for SCWA.

- A review and summary of Solano Project Reliability.

SCWA supplies untreated water from the Solano Project and the State Water Project for agriculture, and municipal and industrial uses. SCWA Participating Agencies that are also urban water suppliers include:

- City of Benicia
- City of Dixon
- City of Fairfield
- City of Rio Vista
- Suisun City
- City of Vacaville
- City of Vallejo

State Water Project Supply

SCWA has a long-term water master water supply contract with DWR for water supply from the State Water Project that currently expires in 2035 but is renewable. SCWA is a North of Delta SWP Contractor and receives SWP water via the North Bay Aqueduct, which is owned and operated by DWR to deliver wholesale water supply for municipal and industrial uses from the Barker Slough Pumping Plant in the Sacramento-San Joaquin Delta to Napa and Solano Counties. SCWA's contract with DWR includes a maximum allocation of 47,756 acre-feet per

year (AFY), known as Table A water. Supplemental SWP water, "Advanced Table A" (ATA), under specific conditions, is available to SCWA under specific conditions. Additional supplemental water, Settlement Water (SW), is also available from year to year with some restrictions.

State Water ro ect Ca a ilit e ort

DWR prepares a biennial report to assist SWP contractors assess the availability of supplies from the SWP. The most recent update, the 2015 DWR State Water Project DCR was finalized in July 2015. In this 2015 update, DWR provides SWP supply estimates for SWP contractors to use in their planning efforts, including for use in their 2015 UWMPs. The 2015 DCR includes DWR's estimates of SWP water supply availability under both current and future conditions. Further details on modeling assumptions can be found in the DCR and its appendices.

erms and Definitions

Table A Water (Table A Amounts)

Each SWP contractor's State Water Supply Contract (SWP Contract) contains a "Table A," which lists the maximum amount of annual allocated water supply, or "Table A water," an agency may request each year throughout the life of the contract. The Table A Amounts in each contractor's SWP Contract ramped up over time, based on projections at the time the contracts were signed of future increases in population and water demand, until they reached a maximum Table A Amount. SCWA's Table A reached its maximum allotment in 2015. Table A Amounts are used in determining each contractor's proportionate share, or "allocation," of the total SWP water supply DWR determines to be available each year. Table 1 below shows SCWA's active Participating Agencies' allocation of 100% Table A. Vacaville and Fairfield numbers include 5,756 AF (50-50 split) Kern County Water Agency permanent Table A transfer purchased in 2001.

A LE 1
SCWA A C A NG AGENC MA M M SW A LE A AMO N S AF

SCWA artici ating Agenc	Maximum a le A Amounts AF
City of Benicia	17,200
City of Fairfield	14,678
Suisun City	1,300
City of Vacaville	8,978
City of Vallejo	5,600
O AL	**47 756**

The cities of Dixon and Rio Vista have a right to obtain a specified portion of SCWA Table A supply (1,500 AF each) in the future with a 5-year notice. However, they currently do not have a means to deliver the water into their service areas but may call upon their water with a 5-year notice. This allocation is currently being utilized by Benicia (1,125 AF), Fairfield (750 AF), and Vallejo (1,125 AF).

SWP Allocation

The amount of water that is allocated and delivered by the SWP to each contractor during a year under SWP contract is determined annually by DWR. Table A Amounts determine the maximum amount of water a contractor may request in any year from DWR. SWP allocations are based on CALSIM modeling runs that take into consideration SWP storage in Oroville and San Luis reservoirs, "South of Delta" (SOD) Contractor demand, hydrology, operational requirements and regulatory constraints. The allocation is typically reported as a percentage of maximum Table A amounts and is finalized by May 1 of the current year.

North of Delta Allocation

As a result of the North of Delta Settlement (December 31, 2013), DWR issues a separate SWP annual allocation for SCWA, Napa, and Yuba City ("the North of Delta (NOD) Contractors"), defined as the NOD Allocation. The NOD Allocation cannot exceed the Annual Table A Amounts. The NOD Allocation amounts to an additional increment of annual allocation above the current SWP Allocation described above. The other SOD contractors receive the baseline SWP allocation.

The concept of the NOD is to not penalize the NBA for conveyance restriction exclusive to the SOD pumping plants. Currently, DWR's D1461 CALSIM model run is used as a surrogate for determining the NOD Allocation. All regulatory requirements under D1641 are met before allocations are met, so all contractors share in the responsibility to meet those regulatory requirements. D1641 was what the SWP operated to prior to the new ESA regulations, the 2008 and 2009 Biological Opinions. The Old-Middle River restrictions (OMR) part of the ESA regulations greatly impact the SOD pumping plant, but do not impact NOD diversions. However, the NOD allocation does provide an equitable share of any additional Delta outflow and water quality requirements, such as Fall X2.. If Delta regulations change in the future, the NOD Allocation may be affected commensurately.

Analysis performed by DWR estimated that SCWA could receive an additional 11 TAF approximately 50% of the years compared to existing Table A deliveries.[1] The actual differential varies each year being less in drier years. Since the implementation of the NOD Allocation in 2014, SCWA has received an additional increment of: 0% (2014), 5% (2015), and 15% (2016 as of April 1).

[1] California Department of Water Resources State Water Project Analysis Office, *Initial Study/Proposed Negative Declaration State Water Project Supply Allocation Settlement Agreement*. Prepared by AECOM. July 2013.

Carryover Water

Carryover is unused Table A water "stored" in SWP reservoirs, when storage capacity is available, for use in the following years. SCWA Carryover is accounted for in San Luis Reservoir and may be partially or completely lost when San Luis "spills" meaning that carryover is displaced by higher priority new State Water Project water pumped into storage. The amount of Table A that can be converted and added to storage at the end of each year as new Carryover is governed by Article 56 of the SWP Contract. The amount of new Carryover allowed each year by Article 56 ranges from 25% to 50%, with interpolation in between, depending on the SWP Allocation for that year. There is no limit to the amount of accumulated carryover that can be stored.

Advanced Table A (ATA)

Another component of the North of Delta Settlement (December 31, 2013), Advanced Table A (ATA), is supplemental SWP water that can be used to make up shortfalls of the NOD Allocation in a given year under specific conditions. The annual NOD Allocation plus Advanced Table A requested cannot exceed SCWA contract amount of 47,756 acre-feet per year. ATA is limited to a maximum of 15,000 acre feet per year and a cumulative balance of 60,000 acre feet. ATA is only accessible when the SWP Allocation is greater than 20% and all available SCWA Table A and Carryover is used. Computer simulations show that a 20% or lower allocation would occur only once in the 82 years of record. In these years, the cumulative ATA limit is temporarily increased by 16,800 acre feet (or the current Advanced Table A balance, whichever is lessor) for use in future years. The ATA limit and cumulative balance resets when Oroville Reservoir spills and has limited pay-back provisions after 5 years. All active SCWA Participating Agencies have access to proportional allocation of ATA, at a minimum, when available.

Article 21 Water

Water identified in Article 21 of SWP Contract is additional unregulated water above the annual NOD Allocation available for diversion at the NBA when the Delta is in "excess" conditions. Solano, as a North Bay contractor, can access this water when DWR and the US Bureau of Reclamation mutually agree and declare that the Delta is in "excess" conditions which typically occur in winter and spring with storm runoff. The Delta is considered in "excess" conditions when the SWP and Central Valley Project are pumping the maximum amount allowed, all Delta standards are met, and there is still water available for export. "Balanced" conditions in the Delta occur when the SWP and CVP are releasing stored water into the Delta to meet their obligations and there is no extra water available in the system.

Settlement Water

Settlement Water (SW) is additional non-project water provided by a settlement agreement (executed May 19, 2003) among DWR, SCWA, and the cities of Fairfield, Vacaville, and Benicia. The agreement provides for delivery of up to 31,620 AFY of SW to SCWA for delivery through the NBA to the three cities to help meet their current and future municipal and industrial water needs. SW is not available when the Standard Water Right Term 91 is in effect. The Settlement expires December 31, 2035 with the option to renew. [2]

Standard Water Right Term 91 (Term 91)

Term 91 is declared by the State Water Resources Control Board when it is determined that the SWP and CVP are releasing stored water into the Delta in excess of natural flow ("natural" flow is the flow that would have been present if the dams did not exist) to meet inDelta demands and Delta water standards.

2014 SW Water Su l Allocation

The extremely dry sequence from the beginning of January 2013 through the end of 2014 was one of the driest two-year periods in the historical record. Water year 2013 was a year with two hydrologic extremes.[3] October through December 2012 was one of the wettest fall periods on record, but was followed by the driest consecutive 12 months on record. Accordingly, the 2013 State Water Project (SWP) supply allocation was a low 35% of SWP Table A Amounts. The 2013 hydrology ended up being even drier than DWR's conservative hydrologic forecast, so the SWP began 2014 with reservoir storage lower than targeted levels and less stored water available for 2014 supplies. Compounding this low storage situation, 2014 also was an extremely dry year, with runoff for water year 2014 the fourth driest on record. Due to extraordinarily dry conditions in 2013 and 2014, the 2014 SWP water supply allocation was a historically low 5% of Table A Amounts. The dry hydrologic conditions that led to the low 2014 SWP water supply allocation were extremely unusual, and to date have not been included in the SWP delivery estimates presented in DWR's 2015 Delivery Capability Report.[4] It is anticipated that the hydrologic record used in the DWR model will be extended to include the period through 2014 during the next update of the model, which is expected to be completed prior to issuance of the next update to the biennial SWP Delivery Capability Report. For the reasons stated above, the SCWA UWMP uses a conservative assumption that a 5% allocation of SWP Table A Amounts represents the "worst case" scenario.

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[2] California Department of Water Resources (DWR). 2014. *Management of the California State Water Project: Bulletin 132-14*. <http://www.water.ca.gov/swpao/bulletin_home.cfm>

[3] A water year begins in October and runs through September. For example, water year 2013 is October 2012 through September 2013.

[4] SWP delivery estimates from DWR's 2015 SWP Delivery Capability Report are from computer model studies which use 82 years of historical hydrologic inflows from 1922 through 2003.

SCWA SW elia ilit

For long term planning purposes, the Early Long Term (ELT) scenario of the DWR SWP CalSim model found in Appendix C of the DCR (excerpted and attached) was agreed upon by the SWP Contractors as the most appropriate scenario to use to estimate future supply availability. Therefore, future SWP supply availability presented in Table 2 is based on the ELT study included in the 2015 DCR.

A LE 2
SW SCWA A LE A S L EL A L AF [a]

DW SW a le A Su l	of a le A Amount [c]	2015	2020	2025	2030	2035-2050
Average Water Year[(d)]	73%	34,869	34,869	34,869	34,869	34,869
North of Delta Allocation[(e)]	+10%	3,487	3,487	3,487	3,487	3,487
Single Dry Year[(f)]	22%	10,351	10,351	10,351	10,351	10,351
North of Delta Allocation [(e)]	+0%	0	0	0	0	0
Multiple-Dry Year[(g)]	24%	11,542	11,542	11,542	11,542	11,542
North of Delta Allocation [(e)]	+3%	346	346	346	346	346
2014 Table A Supply[(h)]	5%	2,388	2,388	2,388	2,388	2,388
North of Delta Allocation [(e)]	+0%	0	0	0	0	0

Notes:
(a) Supplies to SCWA are based on DWR analyses presented in its "*2015 State Water Project Delivery Capability Report" (2015 DCR),* assuming existing SWP facilities and current regulatory and operational constraints (except as otherwise indicated in Note (h)).
(b) Table A supplies include supplies allocated in one year that are carried over for delivery the following year.
(c) Supply as a percentage of SCWA's Table A Amount of 47,756 AF (DWR Bulletin 132-15, Appendix B, Data and Computations Used to Determine 2016 Water Charges, page B-36, Table B-4).
(d) Based on average deliveries over a repeat of the study's historic hydrologic period of 1922 through 2003.
(e) North of Delta Allocation as an additional percentage of SCWA's Table A Allocation, estimated based on actual amounts received since the implementation of the North of Delta Settlement in 2014. Because of the limited historical data, this estimate is preliminary and will be adjusted for subsequent UWMP updates as additional data becomes available.
(f) Based on a repeat of the worst case historic single dry year of 1977 (from 2015 DCR).
(g) Supplies shown are annual averages over four consecutive dry years, based on a repeat of the historic four-year dry period of 1931-1934.
(h) Based on the worst-case actual allocation of 2014.
(i) Advanced Table A allocations are not quantified in this table but this supplemental SWP water can be used to make up shortfalls in the North of Delta Allocation in a given year under specific conditions.

SCWA has subsequent long term water service contracts for SWP water supply deliveries with Participating Agencies. The SWP Table A Supply Reliability values in Table 2 can be applied directly to SCWA supply reliability and need to be adjusted to reflect individual SCWA Participating Agencies contract terms with SCWA. The following tables show the SCWA

Participating Agency SWP allocations based on Table 2 and Participating Agency maximum SCWA contract allocations in Table 1:

A LE 3a
SW SCWA A C A NG AGENC S L EL A L AF [a]
C OF EN C A

DW SW a le A Su l	of a le A Amount [c]	2015	2020	2025	2030	2035-2050
Average Water Year[(d)]	73%	12,559	12,559	12,559	12,559	12,559
North of Delta Allocation [(e)]	+10%	1,256	1,256	1,256	1,256	1,256
Single Dry Year[(f)]	22%	3,728	3,728	3,728	3,728	3,728
North of Delta Allocation [(e)]	+0%	0	0	0	0	0
Multiple-Dry Year[(g)]	24%	4,157	4,157	4,157	4,157	4,157
North of Delta Allocation [(e)]	+3%	125	125	125	125	125
2014 Table A Supply[(h)]	5%	860	860	860	860	860
North of Delta Allocation [(e)]	+0%	0	0	0	0	0

Notes:
(a) Supplies to SCWA are based on DWR analyses presented in its "*2015 State Water Project Delivery Capability Report" (2015 DCR),* assuming existing SWP facilities and current regulatory and operational constraints (except as otherwise indicated in Note (h)).
(b) Table A supplies include supplies allocated in one year that are carried over for delivery the following year.
(c) Based on average SWP deliveries over a repeat of the study's historic hydrologic period of 1922 through 2003.
(d) Supply as a percentage of City of Benicia's SCWA Table A contract amount for SWP supply of 17,200 AF, not including Advanced Table A or Settlement Water.
(e) North of Delta Allocation as an additional percentage of SCWA's Table A Allocation, estimated based on actual amounts received since the implementation of the North of Delta Settlement in 2014. Because of the limited historical data, this estimate is preliminary and will be adjusted for subsequent UWMP updates as additional data becomes available.
(f) Based on a repeat of the worst case historic single dry year of 1977 (from 2015 DCR).
(g) Supplies shown are annual averages over four consecutive dry years, based on a repeat of the historic four-year dry period of 1931-1934.
(h) Based on the worst-case actual SWP allocation of 2014.
(i) Advanced Table A allocations are not quantified in this table but this supplemental SWP water can be used to make up shortfalls in the North of Delta Allocation in a given year under specific conditions.

In addition to SWP supplies, the City of Benicia has access to 10,500 AFY of Settlement Water delivered through the North Bay Aqueduct when available.

Memorandum

Thomas Pate, Solano County Water Agency
14 April 2016
1568025*00

A LE 3
SW SCWA A C A NG AGENC S L EL A L AF [a]
C OF FA F ELD

DW SW a le A Su l	of a le A Amount [c]	2015	2020	2025	2030	2035-2050
Average Water Year[(d)]	73%	10,717	10,717	10,717	10,717	10,717
North of Delta Allocation [(e)]	+10%	1,072	1,072	1,072	1,072	1,072
Single Dry Year[(f)]	22%	3,181	3,181	3,181	3,181	3,181
North of Delta Allocation [(e)]	+0%	0	0	0	0	0
Multiple-Dry Year[(g)]	24%	3,547	3,547	3,547	3,547	3,547
North of Delta Allocation [(e)]	+3%	106	106	106	106	106
2014 Table A Supply[(h)]	5%	734	734	734	734	734
North of Delta Allocation [(e)]	+0%	0	0	0	0	0

Notes:
(a) Supplies to SCWA are based on DWR analyses presented in its "*2015 State Water Project Delivery Capability Report" (2015 DCR),* assuming existing SWP facilities and current regulatory and operational constraints (except as otherwise indicated in Note (h)).
(b) Table A supplies include supplies allocated in one year that are carried over for delivery the following year.
(c) Based on average SWP deliveries over a repeat of the study's historic hydrologic period of 1922 through 2003.
(d) Supply as a percentage of City of Fairfield's SCWA contract amount for SWP supply of 14,678 AF, not including Advanced Table A or Settlement Water.
(e) North of Delta Allocation as an additional percentage of SCWA's Table A Allocation, estimated based on actual amounts received since the implementation of the North of Delta Settlement in 2014. Because of the limited historical data, this estimate is preliminary and will be adjusted for subsequent UWMP updates as additional data becomes available.
(f) Based on a repeat of the worst case historic single dry year of 1977 (from 2015 DCR).
(g) Supplies shown are annual averages over four consecutive dry years, based on a repeat of the historic four-year dry period of 1931-1934.
(h) Based on the worst-case actual SWP allocation of 2014.
(i) Advanced Table A allocations are not quantified in this table but this supplemental SWP water can be used to make up shortfalls in the North of Delta Allocation in a given year under specific conditions.

In addition to SWP supplies, the City of Fairfield has access to 11,800 AFY of Settlement Water Settlement Water, delivered through the North Bay Aqueduct when available.

Memorandum

Thomas Pate, Solano County Water Agency
14 April 2016
1568025*00

A LE 3c
SW SCWA AC C A NG AGENC S L EL A L AF [a]
C OF S S N C

DW SW a le A Su l	of a le A Amount [c]	2015	2020	2025	2030	2035-2050
Average Water Year[(d)]	73%	949	949	949	949	949
North of Delta Allocation [(e)]	+10%	95	95	95	95	95
Single Dry Year[(f)]	22%	282	282	282	282	282
North of Delta Allocation [(e)]	+0%	0	0	0	0	0
Multiple-Dry Year[(g)]	24%	314	314	314	314	314
North of Delta Allocation [(e)]	+3%	9	9	9	9	9
2014 Table A Supply[(h)]	5%	65	65	65	65	65
North of Delta Allocation [(e)]	+0%	0	0	0	0	0

Notes:
(a) Supplies to SCWA are based on DWR analyses presented in its "*2015 State Water Project Delivery Capability Report" (2015 DCR),* assuming existing SWP facilities and current regulatory and operational constraints (except as otherwise indicated in Note (h)).
(b) Table A supplies include supplies allocated in one year that are carried over for delivery the following year.
(c) Based on average SWP deliveries over a repeat of the study's historic hydrologic period of 1922 through 2003.
(d) Supply as a percentage of City of Suisun City's SCWA contract amount for SWP supply of 1,300 AF.
(e) North of Delta Allocation as an additional percentage of SCWA's Table A Allocation, estimated based on actual amounts received since the implementation of the North of Delta Settlement in 2014. Because of the limited historical data, this estimate is preliminary and will be adjusted for subsequent UWMP updates as additional data becomes available.
(f) Based on a repeat of the worst case historic single dry year of 1977 (from 2015 DCR).
(g) Supplies shown are annual averages over four consecutive dry years, based on a repeat of the historic four-year dry period of 1931-1934.
(h) Based on the worst-case actual SWP allocation of 2014.
(i) Advanced Table A allocations are not quantified in this table but this supplemental SWP water can be used to make up shortfalls in the North of Delta Allocation in a given year under specific conditions.

A LE 3d
SW SCWA A C A NG AGENC S L EL A L AF [a]
C OF VACAV LLE

DW SW a le A Su l	of a le A Amount [c]	2015	2020	2025	2030	2035-2050
Average Water Year[(d)]	73%	6,555	6,555	6,555	6,555	6,555
North of Delta Allocation [(e)]	+10%	656	656	656	656	656
Single Dry Year[(f)]	22%	1,946	1,946	1,946	1,946	1,946
North of Delta Allocation [(e)]	+0%	0	0	0	0	0
Multiple-Dry Year[(g)]	24%	2,170	2,170	2,170	2,170	2,170
North of Delta Allocation [(e)]	+3%	65	65	65	65	65
2014 Table A Supply[(h)]	5%	449	449	449	449	449
North of Delta Allocation [(e)]	+0%	0	0	0	0	0

Notes:
(a) Supplies to SCWA are based on DWR analyses presented in its "*2015 State Water Project Delivery Capability Report" (2015 DCR),* assuming existing SWP facilities and current regulatory and operational constraints (except as otherwise indicated in Note (h)).
(b) Table A supplies include supplies allocated in one year that are carried over for delivery the following year.
(c) Based on average SWP deliveries over a repeat of the study's historic hydrologic period of 1922 through 2003.
(d) Supply as a percentage of City of Vacaville's SCWA contract amount for SWP supply of 8,978 AF, not including Advanced Table A or Settlement Water.
(e) North of Delta Allocation as an additional percentage of SCWA's Table A Allocation, estimated based on actual amounts received since the implementation of the North of Delta Settlement in 2014. Because of the limited historical data, this estimate is preliminary and will be adjusted for subsequent UWMP updates as additional data becomes available.
(f) Based on a repeat of the worst case historic single dry year of 1977 (from 2015 DCR).
(g) Supplies shown are annual averages over four consecutive dry years, based on a repeat of the historic four-year dry period of 1931-1934.
(h) Based on the worst-case actual SWP allocation of 2014.
(i) Advanced Table A allocations are not quantified in this table but this supplemental SWP water can be used to make up shortfalls in the North of Delta Allocation in a given year under specific conditions.

In addition to SWP supplies, the City of Vacaville has access to 9,320 AFY of Settlement Water delivered through the North Bay Aqueduct when available.

Memorandum

Thomas Pate, Solano County Water Agency
14 April 2016
1568025*00

A LE 3e
SW SCWA A C A NG AGENC S L EL A L AF [a]
C OF VALLE O

DW SW a le A Su l	of a le A Amount [c]	2015	2020	2025	2030	2035-2050
Average Water Year[(d)]	73%	4,089	4,089	4,089	4,089	4,089
North of Delta Allocation [(e)]	+10%	409	409	409	409	409
Single Dry Year[(f)]	22%	1,214	1,214	1,214	1,214	1,214
North of Delta Allocation [(e)]	+0%	0	0	0	0	0
Multiple-Dry Year[(g)]	24%	1,353	1,353	1,353	1,353	1,353
North of Delta Allocation [(e)]	+3%	41	41	41	41	41
2014 Table A Supply[(h)]	5%	280	280	280	280	280
North of Delta Allocation [(e)]	+0%	0	0	0	0	0

Notes:
(a) Supplies to SCWA are based on DWR analyses presented in its "*2015 State Water Project Delivery Capability Report" (2015 DCR),* assuming existing SWP facilities and current regulatory and operational constraints (except as otherwise indicated in Note (h)).
(b) Table A supplies include supplies allocated in one year that are carried over for delivery the following year.
(c) Based on average SWP deliveries over a repeat of the study's historic hydrologic period of 1922 through 2003.
(d) Supply as a percentage of City of Vallejo's SCWA contract amount for SWP supply of 5,600 AF
(e) North of Delta Allocation as an additional percentage of SCWA's Table A Allocation, estimated based on actual amounts received since the implementation of the North of Delta Settlement in 2014. Because of the limited historical data, this estimate is preliminary and will be adjusted for subsequent UWMP updates as additional data becomes available.
(f) Based on a repeat of the worst case historic single dry year of 1977 (from 2015 DCR).
(g) Supplies shown are annual averages over four consecutive dry years, based on a repeat of the historic four-year dry period of 1931-1934.
(h) Based on the worst-case actual SWP allocation of 2014.
(i) Advanced Table A allocations are not quantified in this table but this supplemental SWP water can be used to make up shortfalls in the North of Delta Allocation in a given year under specific conditions.

Solano Project

The Solano Project is a federal facility owned by the Bureau of Reclamation (USBR) that stores water in Lake Berryessa for delivery to agriculture and municipal and industrial users throughout the Solano County. SCWA has a long-term master water supply agreement with USBR that currently expires in 2025 but is renewable. The Solano Project first delivered water in 1959. The major facilities are:

- Monticello Dam, which captures water from Putah Creek in Lake Berryessa;
- Putah Diversion Dam, which diverts water out of Lower Putah Creek just downstream of Monticello Dam; and

- Putah South Canal, which delivers water to local agencies. The Putah South Canal is 33 miles long, concrete lined and has a maximum capacity of 956 cubic feet per second.

The annual firm yield of the Solano Project is 207,350 AFY. Solano Project water is designated for Agricultural (AG) and Municipal and Industrial (M&I) uses allocated to Participating Agencies as follows in Table 4:

TABLE 4
SCWA PARTICIPATING AGENCY MAXIMUM SOLANO PROJECT ALLOCATION (AF)

Participating Agency	Maximum Allocation (AFY)	Use
City of Fairfield	9,200	M&I
City of Suisun	1,600	M&I
City of Vacaville	5,750	M&I
City of Vallejo	14,600	M&I
Solano Irrigation District	141,000	AG+M&I
Maine Prairie Water District	15,000	AG
University of California- Davis	4,000	AG
California State Prison- Solano	1,200	AG+M&I
SCWA	15,000	Operating Loss
TOTAL	**207,350**	

Reliability estimates for the Solano Project were last updated for the 2010 UWMP and were developed based on historic hydrology from 1906-2003, Lake Berryessa inflows, and the Sacramento Valley Index (SVI) for hydrologic year types (wet, above normal, below normal, dry, critically dry). The SVI was further categorized into Average Year (above normal, below normal), Single Dry Year, and Multi-Dry Year. As noted in the August 10, 2010 SCWA memorandum presenting the 2010 SCWA water supply reliability, the update of the Solano Project reliability analysis from 2005 to 2009 resulted in minimal change. This is assumed to remain true for 2015; therefore, it is recommended that the 2015 Solano Project Reliability estimates use the Solano Project reliability estimates from the 2010 SCWA UWMP. The recommended 2015 Solano Project Reliability estimates are presented in Table 5 below.

Memorandum
Thomas Pate, Solano County Water Agency
14 April 2016
1568025*00

TABLE 5
SOLANO PROJECT SUPPLY RELIABILITY (AF)

Solano Pro ect Supply[(a)]	20 5	2020	2025	2030	2035 2050
Average Water Year[(b)]	205,825	205,825	205,825	205,825	205,825
% of Contract Amount[(b)]	99%	99%	99%	99%	99%
Single Dry Year[(c)]	204,051	204,051	204,051	204,051	204,051
% of Contract Amount[(c)]	98%	98%	98%	98%	98%
Multi-Dry Year[(d)]	184,887	184,887	184,887	184,887	184,887
% of Contract Amount[(d)]	89%	89%	89%	89%	89%

Notes:
(a) SCWA's Total Participating Agency Contract Amounts equal 207,350 AF and includes 15,000 AF of canal losses.
(b) Based on average percent allocation (including canal losses) during Average Years over the study's historic hydrologic period of 1906 through 2007, rounded to the nearest whole percent.
(c) Based on the average percent allocation (including canal losses) during Single Dry Years over the study's historic hydrologic period of 1906 through 2007, rounded to the nearest whole percent.
(d) Supplies shown are average percent allocation (including canal losses) over four consecutive dry years, based on a repeat of the historic four-year dry period with low inflow to Lake Berryessa of 1990-1994, rounded to the nearest whole percent.

SCWA has subsequent long term water service contracts for Solano Project water supply deliveries with Participating Agencies. Similar to the SWP Table A Supply Reliability, Solano Project Reliability shown in Table 5 are for SCWA and need to be adjusted to reflect individual Participating Agencies contract terms. The following tables show the SCWA Participating Agency Solano Project allocations based on Table 5 and Participating Agency maximum contract allocations in Table 4:

Memorandum
Thomas Pate, Solano County Water Agency
14 April 2016
1568025*00

TABLE a
CITY OF FAIRFIEL SOLANO PROJECT SUPPLY RELIABILITY (AF)

Solano Pro ect Supply[(a)]	20 5	2020	2025	2030	2035 2050
Average Water Year[(b)]	9,132	9,132	9,132	9,132	9,132
% of Contract Amount[(b)]	99%	99%	99%	99%	99%
Single Dry Year[(c)]	9,054	9,054	9,054	9,054	9,054
% of Contract Amount[(c)]	98%	98%	98%	98%	98%
Multi-Dry Year[(d)]	8,203	8,203	8,203	8,203	8,203
% of Contract Amount[(d)]	89%	89%	89%	89%	89%

(a) City of Fairfield's Solano Project Contract Amount is 9,200 AF, not including canal losses.
(b) Based on average percent allocation (including canal losses) during Average Years over the study's historic hydrologic period of 1906 through 2007, rounded to the nearest whole percent.
(c) Based on the average percent allocation (including canal losses) during Single Dry Years over the study's historic hydrologic period of 1906 through 2007, rounded to the nearest whole percent.
(d) Supplies shown are average percent allocation (including canal losses) over four consecutive dry years, based on a repeat of the historic four-year dry period with low inflow to Lake Berryessa of 1990-1994, rounded to the nearest whole percent.
(e) The City of Fairfield may have additional water supply agreements in place with other agencies. See the City of Fairfield's most recently adopted UWMP for descriptions of their water supply portfolio.

TABLE
CITY OF SUISUN CITY SOLANO PROJECT SUPPLY RELIABILITY (AF)

Solano Pro ect Supply[(a)]	20 5	2020	2025	2030	2035 2050
Average Water Year[(b)]	1,588	1,588	1,588	1,588	1,588
% of Contract Amount[(b)]	99%	99%	99%	99%	99%
Single Dry Year[(c)]	1,575	1,575	1,575	1,575	1,575
% of Contract Amount[(c)]	98%	98%	98%	98%	98%
Multi-Dry Year[(d)]	1,427	1,427	1,427	1,427	1,427
% of Contract Amount[(d)]	89%	89%	89%	89%	89%

(a) City of Suisun City's Solano Project Contract Amount is 1,600 AF, not including canal losses.
(b) Based on average percent allocation (including canal losses) during Average Years over the study's historic hydrologic period of 1906 through 2007, rounded to the nearest whole percent.
(c) Based on the average percent allocation (including canal losses) during Single Dry Years over the study's historic hydrologic period of 1906 through 2007, rounded to the nearest whole percent.
(d) Supplies shown are average percent allocation (including canal losses) over four consecutive dry years, based on a repeat of the historic four-year dry period with low inflow to Lake Berryessa of 1990-1994, rounded to the nearest whole percent.
(e) Suisun City may have additional water supply agreements in place with other agencies. See the Suisun Solano Water Authority's most recently adopted UWMP for descriptions of their water supply portfolio.

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Thomas Pate, Solano County Water Agency
14 April 2016
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TABLE c
CITY OF ACA ILLE SOLANO PROJECT SUPPLY RELIABILITY (AF)

Solano Pro ect Supply[a]	20 5	2020	2025	2030	2035 2050
Average Water Year[b]	5,708	5,708	5,708	5,708	5,708
% of Contract Amount[b]	99%	99%	99%	99%	99%
Single Dry Year[c]	5,659	5,659	5,659	5,659	5,659
% of Contract Amount[c]	98%	98%	98%	98%	98%
Multi-Dry Year[d]	5,127	5,127	5,127	5,127	5,127
% of Contract Amount[d]	89%	89%	89%	89%	89%

(a) City of Vacaville's Solano Project Contract Amount is 5,750 AF, not including canal losses.
(b) Based on average percent allocation (including canal losses) during Average Years over the study's historic hydrologic period of 1906 through 2007, rounded to the nearest whole percent.
(c) Based on the average percent allocation (including canal losses) during Single Dry Years over the study's historic hydrologic period of 1906 through 2007, rounded to the nearest whole percent.
(d) Supplies shown are average percent allocation (including canal losses) over four consecutive dry years, based on a repeat of the historic four-year dry period with low inflow to Lake Berryessa of 1990-1994, rounded to the nearest whole percent.
(e) City of Vacaville may have additional water supply agreements in place with other agencies. See the City of Vacaville's most recently adopted UWMP for descriptions of their water supply portfolio.

TABLE
CITY OF ALLEJO SOLANO PROJECT SUPPLY RELIABILITY (AF)

Solano Pro ect Supply[a]	20 5	2020	2025	2030	2035 2050
Average Water Year[b]	14,493	14,493	14,493	14,493	14,493
% of Contract Amount[b]	99%	99%	99%	99%	99%
Single Dry Year[c]	14,368	14,368	14,368	14,368	14,368
% of Contract Amount[c]	98%	98%	98%	98%	98%
Multi-Dry Year[d]	13,018	13,018	13,018	13,018	13,018
% of Contract Amount[d]	89%	89%	89%	89%	89%

(a) City of Vallejo's Solano Project Contract Amount is 14,600 AF, not including canal losses.
(b) Based on average percent allocation (including canal losses) during Average Years over the study's historic hydrologic period of 1906 through 2007, rounded to the nearest whole percent.
(c) Based on the average percent allocation (including canal losses) during Single Dry Years over the study's historic hydrologic period of 1906 through 2007, rounded to the nearest whole percent.
(d) Supplies shown are average percent allocation (including canal losses) over four consecutive dry years, based on a repeat of the historic four-year dry period with low inflow to Lake Berryessa of 1990-1994, rounded to the nearest whole percent.
(e) City of Vallejo may have additional water supply agreements in place with other agencies. See the City of Vallejo's most recently adopted UWMP for descriptions of their water supply portfolio.

TABLE e
CALIFORNIA STATE PRISON SOLANO PROJECT SUPPLY RELIABILITY (AF)

Solano Pro ect Supply[(a)]	20 5	2020	2025	2030	2035 2050
Average Water Year[(b)]	1,191	1,191	1,191	1,191	1,191
% of Contract Amount[(b)]	99%	99%	99%	99%	99%
Single Dry Year[(c)]	1,181	1,181	1,181	1,181	1,181
% of Contract Amount[(c)]	98%	98%	98%	98%	98%
Multi-Dry Year[(d)]	1,070	1,070	1,070	1,070	1,070
% of Contract Amount[(d)]	89%	89%	89%	89%	89%

(a) California State Prison's Solano Project Contract Amount is 1,200 AF, not including canal losses.
(b) Based on average percent allocation (including canal losses) during Average Years over the study's historic hydrologic period of 1906 through 2007, rounded to the nearest whole percent.
(c) Based on the average percent allocation (including canal losses) during Single Dry Years over the study's historic hydrologic period of 1906 through 2007, rounded to the nearest whole percent.
(d) Supplies shown are average percent allocation (including canal losses) over four consecutive dry years, based on a repeat of the historic four-year dry period with low inflow to Lake Berryessa of 1990-1994, rounded to the nearest whole percent.

TABLE
MAINE PRAIRIE WATER ISTRICT SOLANO PROJECT SUPPLY RELIABILITY (AF)

Solano Pro ect Supply[(a)]	20 5	2020	2025	2030	2035 2050
Average Water Year[(b)]	14,890	14,890	14,890	14,890	14,890
% of Contract Amount[(b)]	99%	99%	99%	99%	99%
Single Dry Year[(c)]	14,761	14,761	14,761	14,761	14,761
% of Contract Amount[(c)]	98%	98%	98%	98%	98%
Multi-Dry Year[(d)]	13,375	13,375	13,375	13,375	13,375
% of Contract Amount[(d)]	89%	89%	89%	89%	89%

(a) Maine Prairie Water District's Solano Project Contract Amount is 15,000 AF, not including canal losses.
(b) Based on average percent allocation (including canal losses) during Average Years over the study's historic hydrologic period of 1906 through 2007, rounded to the nearest whole percent.
(c) Based on the average percent allocation (including canal losses) during Single Dry Years over the study's historic hydrologic period of 1906 through 2007, rounded to the nearest whole percent.
(d) Supplies shown are average percent allocation (including canal losses) over four consecutive dry years, based on a repeat of the historic four-year dry period with low inflow to Lake Berryessa of 1990-1994, rounded to the nearest whole percent.
(e) Maine Prairie Water District may have additional water supply agreements in place with other agencies, which are not shown in this table.

Memorandum
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14 April 2016
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TABLE g
SOLANO IRRIGATION ISTRICT SOLANO PROJECT SUPPLY RELIABILITY (AF)

Solano Pro ect Supply[a]	20 5	2020	2025	2030	2035 2050
Average Water Year[b]	139,963	139,963	139,963	139,963	139,963
% of Contract Amount[b]	99%	99%	99%	99%	99%
Single Dry Year[c]	138,757	138,757	138,757	138,757	138,757
% of Contract Amount[c]	98%	98%	98%	98%	98%
Multi-Dry Year[d]	125,725	125,725	125,725	125,725	125,725
% of Contract Amount[d]	89%	89%	89%	89%	89%

(a) Solano Irrigation District's Solano Project Contract Amount is 141,000 AF, not including canal losses.
(b) Based on average percent allocation (including canal losses) during Average Years over the study's historic hydrologic period of 1906 through 2007, rounded to the nearest whole percent.
(c) Based on the average percent allocation (including canal losses) during Single Dry Years over the study's historic hydrologic period of 1906 through 2007, rounded to the nearest whole percent.
(d) Supplies shown are average percent allocation (including canal losses) over four consecutive dry years, based on a repeat of the historic four-year dry period with low inflow to Lake Berryessa of 1990-1994, rounded to the nearest whole percent.
(e) Solano Irrigation District may have additional water supply agreements in place with other agencies, which are not shown in this table.

TABLE
UNI ERSITY OF CALIFORNIA, A IS SOLANO PROJECT SUPPLY RELIABILITY (AF)

Solano Pro ect Supply[a]	20 5	2020	2025	2030	2035 2050
Average Water Year[b]	3,971	3,971	3,971	3,971	3,971
% of Contract Amount[b]	99%	99%	99%	99%	99%
Single Dry Year[c]	3,936	3,936	3,936	3,936	3,936
% of Contract Amount[c]	98%	98%	98%	98%	98%
Multi-Dry Year[d]	3,567	3,567	3,567	3,567	3,567
% of Contract Amount[d]	89%	89%	89%	89%	89%

(a) University of California, Davis's Solano Project Contract Amount is 4,000 AF, not including canal losses.
(b) Based on average percent allocation (including canal losses) during Average Years over the study's historic hydrologic period of 1906 through 2007, rounded to the nearest whole percent.
(c) Based on the average percent allocation (including canal losses) during Single Dry Years over the study's historic hydrologic period of 1906 through 2007, rounded to the nearest whole percent.
(d) Supplies shown are average percent allocation (including canal losses) over four consecutive dry years, based on a repeat of the historic four-year dry period with low inflow to Lake Berryessa of 1990-1994, rounded to the nearest whole percent.

Enclosure(s) (2)

1. 2015 SWP Delivery Capability Report Excerpt of Appendix C
2. Memorandum, Subject: UWMP Reliability Data (Revised for SWP-prior memo is dated 6/10/10 - Solano Project data unchanged)

Table C.29. Solano County WA: 2015 DCR ELT

SWP Table A Deliveries for 2015 Study					Probability Curve			
Year	Delivery w/o Article 56 Carryover (TAF)	Article 56 Carryover (TAF)	Total Table A Delivery (TAF)	Percent of Maximum Table A	Year	Total Table A Delivery (TAF)	Exceedence Frequency (%)	Percent of Maximum Table A
1922	48	0	48	100%	1938	48	0%	100%
1923	40	0	40	84%	1938	48	1%	100%
1924	12	0	12	25%	1938	48	2%	100%
1925	23	0	23	48%	1938	48	4%	100%
1926	23	0	23	48%	1938	48	5%	100%
1927	44	0	44	93%	1938	48	6%	100%
1928	44	0	44	93%	1922	48	7%	100%
1929	12	0	12	25%	1922	48	9%	100%
1930	23	0	23	48%	1922	48	10%	100%
1931	12	0	12	25%	1922	48	11%	100%
1932	12	0	12	25%	1963	48	12%	100%
1933	12	0	12	25%	1963	48	14%	100%
1934	10	0	10	22%	1963	48	15%	100%
1935	23	0	23	48%	1963	48	16%	100%
1936	40	0	40	84%	1942	48	17%	100%
1937	23	0	23	48%	1942	48	19%	100%
1938	48	0	48	100%	1942	48	20%	100%
1939	40	0	40	84%	1942	48	21%	100%
1940	44	0	44	93%	1942	48	22%	100%
1941	48	0	48	100%	1942	48	23%	100%
1942	48	0	48	100%	1942	48	25%	100%
1943	48	0	48	100%	1942	48	26%	100%
1944	23	0	23	48%	1942	48	27%	100%
1945	40	0	40	84%	1942	48	28%	100%
1946	44	0	44	93%	1942	48	30%	100%
1947	23	0	23	48%	1942	48	31%	100%
1948	40	0	40	84%	1927	44	32%	93%
1949	23	0	23	48%	1927	44	33%	93%
1950	23	0	23	48%	1927	44	35%	93%
1951	44	0	44	93%	1927	44	36%	93%
1952	48	0	48	100%	1927	44	37%	93%
1953	48	0	48	100%	1927	44	38%	93%
1954	44	0	44	93%	1927	44	40%	93%
1955	23	0	23	48%	1927	44	41%	93%
1956	48	0	48	100%	1927	44	42%	93%
1957	44	0	44	93%	1940	44	43%	93%
1958	48	0	48	100%	1940	44	44%	93%
1959	40	0	40	84%	1940	44	46%	93%
1960	23	0	23	48%	2003	43	47%	91%
1961	23	0	23	48%	1923	40	48%	84%
1962	40	0	40	84%	1923	40	49%	84%
1963	48	0	48	100%	1923	40	51%	84%
1964	23	0	23	48%	1923	40	52%	84%

SWP Table A Deliveries for 2015 Study					Probability Curve			
Year	Delivery w/o Article 56 Carryover (TAF)	Article 56 Carryover (TAF)	Total Table A Delivery (TAF)	Percent of Maximum Table A	Year	Total Table A Delivery (TAF)	Exceedence Frequency (%)	Percent of Maximum Table A
1965	48	0	48	100%	1923	40	53%	84%
1966	40	0	40	84%	1923	40	54%	84%
1967	48	0	48	100%	1923	40	56%	84%
1968	40	0	40	84%	1923	40	57%	84%
1969	48	0	48	100%	1923	40	58%	84%
1970	48	0	48	100%	1923	40	59%	84%
1971	48	0	48	100%	1923	40	60%	84%
1972	40	0	40	84%	1947	23	62%	48%
1973	44	0	44	93%	2002	23	63%	48%
1974	48	0	48	100%	1925	23	64%	48%
1975	48	0	48	100%	1925	23	65%	48%
1976	23	0	23	48%	1925	23	67%	48%
1977	12	0	12	25%	1925	23	68%	48%
1978	44	0	44	93%	1925	23	69%	48%
1979	23	0	23	48%	1925	23	70%	48%
1980	44	0	44	93%	1925	23	72%	48%
1981	23	0	23	48%	1925	23	73%	48%
1982	48	0	48	100%	1925	23	74%	48%
1983	48	0	48	100%	1925	23	75%	48%
1984	48	0	48	100%	1925	23	77%	48%
1985	40	0	40	84%	1925	23	78%	48%
1986	48	0	48	100%	1925	23	79%	48%
1987	23	0	23	48%	1925	23	80%	48%
1988	12	0	12	25%	1925	23	81%	48%
1989	23	0	23	48%	1925	23	83%	48%
1990	12	0	12	25%	1937	23	84%	48%
1991	12	0	12	25%	1937	23	85%	48%
1992	12	0	12	25%	1924	12	86%	25%
1993	44	0	44	93%	1924	12	88%	25%
1994	12	0	12	25%	1924	12	89%	25%
1995	48	0	48	100%	1931	12	90%	25%
1996	48	0	48	100%	1931	12	91%	25%
1997	48	0	48	100%	1931	12	93%	25%
1998	48	0	48	100%	1931	12	94%	25%
1999	48	0	48	100%	1931	12	95%	25%
2000	44	0	44	93%	1931	12	96%	25%
2001	23	0	23	48%	1931	12	98%	25%
2002	23	0	23	48%	1931	12	99%	25%
2003	43	0	43	91%	1934	10	100%	22%
Average	**35**	**0**	**35**	**73%**		**35**		**73%**
Maximum	**48**	**0**	**48**	**100%**		**48**		**100%**
Minimum	**10**	**0**	**10**	**22%**		**10**		**22%**

Appendix C 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

SBX7-7 VERIFICATION FORMS

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WUEdata Entry Exceptions

The data from the tables below will not be entered into WUEdata tables (the tabs for these tables' worksheets are colored **purple**). These tables will be submitted as separate uploads, in Excel, to WUEdata.

Process Water Deduction

SB X7-7 tables 4-C, 4-C.1, 4-C.2, 4-C.3, 4-C.4 and 4-D

A supplier that will use the process water deduction will complete the appropriate tables in Excel, submit them as a separate upload to the WUE data tool, and include them in its UWMP.

Target Method 2

SB X7-7 tables 7-B, 7-C, and 7-D

A supplier that selects Target Method 2 will contact DWR (gwen.huff@water.ca.gov) for SB X7-7 tables 7-B, 7-C, and 7-D.

Target Method 4

These tables are only available online at http://www.dwr.water.ca.gov/wateruseefficiency/sb7/committees/urban/u4/ptm4.cfm A supplier that selects Target Method 4 will save the tables from the website listed above, complete the tables, submit as a separate upload to WUE data, and include them with its UWMP.

SB X7-7 Table 0: Units of Measure Used in UWMP* *(select one from the drop down list)*
Acre Feet
**The unit of measure must be consistent with Table 2-3*
NOTES:

SB X7-7 Table-1: Baseline Period Ranges			
Baseline	**Parameter**	**Value**	**Units**
10- to 15-year baseline period	2008 total water deliveries	17,690	Acre Feet
	2008 total volume of delivered recycled water	-	Acre Feet
	2008 recycled water as a percent of total deliveries	0.00%	Percent
	Number of years in baseline period[1, 2]	10	Years
	Year beginning baseline period range	2000	
	Year ending baseline period range[3]	2009	
5-year baseline period	Number of years in baseline period	5	Years
	Year beginning baseline period range	2004	
	Year ending baseline period range[4]	2008	

[1] If the 2008 recycled water percent is less than 10 percent, then the first baseline period is a continuous 10-year period. If the amount of recycled water delivered in 2008 is 10 percent or greater, the first baseline period is a continuous 10- to 15-year period. *[2] The Water Code requires that the baseline period is between 10 and 15 years. However, DWR recognizes that some water suppliers may not have the minimum 10 years of baseline data.*

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

[4] The ending year must be between December 31, 2007 and December 31, 2010.

NOTES:

SB X7-7 Table 2: Method for Population Estimates	
Method Used to Determine Population (may check more than one)	
☑	**1. Department of Finance** (DOF) DOF Table E-8 (1990 - 2000) and (2000-2010) and DOF Table E-5 (2011 - 2015) when available
☐	**2. Persons-per-Connection Method**
☐	**3. DWR Population Tool**
☐	**4. Other** DWR recommends pre-review
NOTES:	

SB X7-7 Table 3: Service Area Population		
Year		Population
10 to 15 Year Baseline Population		
Year 1	2000	82,460
Year 2	2001	83,725
Year 3	2002	86,396
Year 4	2003	85,846
Year 5	2004	86,882
Year 6	2005	87,935
Year 7	2006	87,734
Year 8	2007	85,638
Year 9	2008	85,908
Year 10	2009	85,953
Year 11		
Year 12		
Year 13		
Year 14		
Year 15		
5 Year Baseline Population		
Year 1	2004	86,882
Year 2	2005	87,935
Year 3	2006	87,734
Year 4	2007	85,638
Year 5	2008	85,908
2015 Compliance Year Population		
2015		89,627
NOTES: DOF values adjusted to exclude the portion of CMF that is served by SCWA		

SB X7-7 Table 4: Annual Gross Water Use *

Baseline Year *Fm SB X7-7 Table 3*		Volume Into Distribution System *This column will remain blank until SB X7-7 Table 4-A is completed.*	Deductions					Annual Gross Water Use
			Exported Water	Change in Dist. System Storage (+/-)	Indirect Recycled Water *This column will remain blank until SB X7-7 Table 4-B is completed.*	Water Delivered for Agricultural Use	Process Water *This column will remain blank until SB X7-7 Table 4-D is completed.*	
10 to 15 Year Baseline - Gross Water Use								
Year 1	2000	16,804			-		-	16,804
Year 2	2001	17,658			-		-	17,658
Year 3	2002	17,577			-		-	17,577
Year 4	2003	17,461			-		-	17,461
Year 5	2004	18,456			-		-	18,456
Year 6	2005	17,985			-		-	17,985
Year 7	2006	18,555			-		-	18,555
Year 8	2007	19,336			-		-	19,336
Year 9	2008	19,390			-		-	19,390
Year 10	2009	17,690			-		-	17,690
Year 11	0	-			-		-	-
Year 12	0	-			-		-	-
Year 13	0	-			-		-	-
Year 14	0	-			-		-	-
Year 15	0	-			-		-	-
10 - 15 year baseline average gross water use								**18,091**
5 Year Baseline - Gross Water Use								
Year 1	2004	18,456			-		-	18,456
Year 2	2005	17,985			-		-	17,985
Year 3	2006	18,555			-		-	18,555
Year 4	2007	19,336			-		-	19,336
Year 5	2008	19,390			-		-	19,390
5 year baseline average gross water use								**18,744**
2015 Compliance Year - Gross Water Use								
2015		13,204	-		-		-	**13,204**

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

NOTES:

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

Complete one table for each source.

Name of Source	Wells
This water source is:	
☑	The supplier's own water source
☐	A purchased or imported source

Baseline Year *Fm SB X7-7 Table 3*		Volume Entering Distribution System	Meter Error Adjustment* *Optional (+/-)*	Corrected Volume Entering Distribution System
10 to 15 Year Baseline - Water into Distribution System				
Year 1	2000	5,070.2		5,070
Year 2	2001	6,214.0		6,214
Year 3	2002	6,637.6		6,638
Year 4	2003	6,627.0		6,627
Year 5	2004	6,561.5		6,562
Year 6	2005	6,680.2		6,680
Year 7	2006	6,634.8		6,635
Year 8	2007	6,611.8		6,612
Year 9	2008	5,783.8		5,784
Year 10	2009	4,646.4		4,646
Year 11	0			-
Year 12	0			-
Year 13	0			-
Year 14	0			-
Year 15	0			-
5 Year Baseline - Water into Distribution System				
Year 1	2004	6,561.5		6,562
Year 2	2005	6,680.2		6,680
Year 3	2006	6,634.8		6,635
Year 4	2007	6,611.8		6,612
Year 5	2008	5,783.8		5,784
2015 Compliance Year - Water into Distribution System				
2015		**5,222.1**		5,222

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

NOTES:

SB X7-7 Table 4-A: Volume Entering the Distribution				
Name of Source	Solano Project Water			
This water source is:				
☐	The supplier's own water source			
☑	A purchased or imported source			
Baseline Year *Fm SB X7-7 Table 3*		Volume Entering Distribution System	Meter Error Adjustment* *Optional (+/-)*	Corrected Volume Entering Distribution System
10 to 15 Year Baseline - Water into Distribution System				
Year 1	2,000	8,522.2		8,522
Year 2	2,001	7,829.5		7,830
Year 3	2,002	4,605.7		4,606
Year 4	2,003	5,446.5		5,446
Year 5	2,004	4,111.9		4,112
Year 6	2,005	4,584.2		4,584
Year 7	2,006	6,111.1		6,111
Year 8	2,007	6,021.1		6,021
Year 9	2,008	5,803.6		5,804
Year 10	2,009	6,194.5		6,195
Year 11	-			0
Year 12	-			0
Year 13	-			0
Year 14	-			0
Year 15	-			0
5 Year Baseline - Water into Distribution System				
Year 1	2,004	4,111.9		4,112
Year 2	2,005	4,584.2		4,584
Year 3	2,006	6,111.1		6,111
Year 4	2,007	6,021.1		6,021
Year 5	2,008	5,803.6		5,804
2015 Compliance Year - Water into Distribution System				
2015		**6,213.5**		6,214
** Meter Error Adjustment - See guidance in Methodology 1, Step 3 of Methodologies Document*				
NOTES:				

SB X7-7 Table 4-A: Volume Entering the Distribution				
Name of Source	State Water Project			
This water source is:				
☐	The supplier's own water source			
☑	A purchased or imported source			
Baseline Year *Fm SB X7-7 Table 3*		Volume Entering Distribution System	Meter Error Adjustment* *Optional (+/-)*	Corrected Volume Entering Distribution System
10 to 15 Year Baseline - Water into Distribution System				
Year 1	2,000	3,211.7		3,212
Year 2	2,001	3,614.7		3,615
Year 3	2,002	6,333.5		6,334
Year 4	2,003	5,387.8		5,388
Year 5	2,004	7,782.2		7,782
Year 6	2,005	6,720.7		6,721
Year 7	2,006	5,809.2		5,809
Year 8	2,007	6,702.7		6,703
Year 9	2,008	7,802.9		7,803
Year 10	2,009	6,848.8		6,849
Year 11	-			0
Year 12	-			0
Year 13	-			0
Year 14	-			0
Year 15	-			0
5 Year Baseline - Water into Distribution System				
Year 1	2,004	7,782.2		7,782
Year 2	2,005	6,720.7		6,721
Year 3	2,006	5,809.2		5,809
Year 4	2,007	6,702.7		6,703
Year 5	2,008	7,802.9		7,803
2015 Compliance Year - Water into Distribution System				
2015		**1,768.5**		1,769
** Meter Error Adjustment - See guidance in Methodology 1, Step 3 of Methodologies Document*				
NOTES:				

SB X7-7 Table 4-B: Indirect Recycled Water Use Deduction *(For use only by agencies that are deducting indirect recycled water)*

Baseline Year *Fm SB X7-7 Table 3*		**Surface Reservoir Augmentation**					**Groundwater Recharge**			**Total Deductible Volume of Indirect Recycled Water Entering the Distribution System**
		Volume Discharged from Reservoir for Distribution System Delivery	Percent Recycled Water	Recycled Water Delivered to Treatment Plant	Transmission/ Treatment Loss	Recycled Volume Entering Distribution System from Surface Reservoir Augmentation	Recycled Water Pumped by Utility*	Transmission/ Treatment Losses	Recycled Volume Entering Distribution System from Groundwater Recharge	
10-15 Year Baseline - Indirect Recycled Water Use										
Year 1	2000			-		-			-	-
Year 2	2001			-		-			-	-
Year 3	2002			-		-			-	-
Year 4	2003			-		-			-	-
Year 5	2004			-		-			-	-
Year 6	2005			-		-			-	-
Year 7	2006			-		-			-	-
Year 8	2007			-		-			-	-
Year 9	2008			-		-			-	-
Year 10	2009			-		-			-	-
Year 11	0			-		-			-	-
Year 12	0			-		-			-	-
Year 13	0			-		-			-	-
Year 14	0			-		-			-	-
Year 15	0			-		-			-	-
5 Year Baseline - Indirect Recycled Water Use										
Year 1	2004			-		-			-	-
Year 2	2005			-		-			-	-
Year 3	2006			-		-			-	-
Year 4	2007			-		-			-	-
Year 5	2008			-		-			-	-
2015 Compliance - Indirect Recycled Water Use										
2015				-		-			-	-

**Suppliers will provide supplemental sheets to document the calculation for their input into "Recycled Water Pumped by Utility". The volume reported in this cell must be less than total groundwater pumped - See Methodology 1, Step 8, section 2.c.*

NOTES:

SB X7-7 Table 4-C: Process Water Deduction Eligibility *(For use only by agencies that are deducting process water) Choose Only One*	
☐	**Criteria 1**- Industrial water use is equal to or greater than 12% of gross water use. Complete SB X7-7 Table 4-C.1
☐	**Criteria 2** - Industrial water use is equal to or greater than 15 GPCD. Complete SB X7-7 Table 4-C.2
☐	**Criteria 3** - Non-industrial use is equal to or less than 120 GPCD. Complete SB X7-7 Table 4-C.3
☐	**Criteria 4** - Disadvantaged Community. Complete SB x7-7 Table 4-C.4
NOTES:	

SB X7-7 Table 4-C.1: Process Water Deduction Eligibility

Criteria 1

Industrial water use is equal to or greater than 12% of gross water use

Baseline Year *Fm SB X7-7 Table 3*		Gross Water Use Without Process Water Deduction	Industrial Water Use	Percent Industrial Water	**Eligible for Exclusion Y/N**
10 to 15 Year Baseline - Process Water Deduction Eligibility					
Year 1	2000	16,804		0%	NO
Year 2	2001	17,658		0%	NO
Year 3	2002	17,577		0%	NO
Year 4	2003	17,461		0%	NO
Year 5	2004	18,456		0%	NO
Year 6	2005	17,985	600	3%	NO
Year 7	2006	18,555	634	3%	NO
Year 8	2007	19,336	841	4%	NO
Year 9	2008	19,390	1,102	6%	NO
Year 10	2009	17,690	873	5%	NO
Year 11	0	-			NO
Year 12	0	-			NO
Year 13	0	-			NO
Year 14	0	-			NO
Year 15	0	-			NO
5 Year Baseline - Process Water Deduction Eligibility					
Year 1	2004	18,456		0%	NO
Year 2	2005	17,985	600	3%	NO
Year 3	2006	18,555	634	3%	NO
Year 4	2007	19,336	841	4%	NO
Year 5	2008	19,390	1,102	6%	NO
2015 Compliance Year - Process Water Deduction Eligiblity					
2015		13,204	773	6%	NO

NOTES: Data unavailable from 2000 to 2004

SB X7-7 Table 4-C.2: Process Water Deduction Eligibility

Criteria 2

Industrial water use is equal to or greater than 15 GPCD

Baseline Year *Fm SB X7-7 Table 3*		Industrial Water Use	Population	Industrial GPCD	**Eligible for Exclusion Y/N**
10 to 15 Year Baseline - Process Water Deduction Eligibility					
Year 1	2000		82,460	-	NO
Year 2	2001		83,725	-	NO
Year 3	2002		86,396	-	NO
Year 4	2003		85,846	-	NO
Year 5	2004		86,882	-	NO
Year 6	2005	600	87,935	6	NO
Year 7	2006	634	87,734	6	NO
Year 8	2007	841	85,638	9	NO
Year 9	2008	1,102	85,908	11	NO
Year 10	2009	873	85,953	9	NO
Year 11	0		-		NO
Year 12	0		-		NO
Year 13	0		-		NO
Year 14	0		-		NO
Year 15	0		-		NO
5 Year Baseline - Process Water Deduction Eligibility					
Year 1	2004		86,882	-	NO
Year 2	2005	634	87,935	6	NO
Year 3	2006	841	87,734	9	NO
Year 4	2007	1,102	85,638	11	NO
Year 5	2008	873	85,908	9	NO
2015 Compliance Year - Process Water Deduction Eligibility					
2015		773	89,627	8	NO

NOTES:

SB X7-7 Table 4-C.3: Process Water Deduction Eligibility							
Criteria 3 Non-industrial use is equal to or less than 120 GPCD							
Baseline Year *Fm SB X7-7 Table 3*		Gross Water Use Without Process Water Deduction *Fm SB X7-7 Table 4*	Industrial Water Use	Non-industrial Water Use	Population *Fm SB X7-7 Table 3*	Non-Industrial GPCD	**Eligible for Exclusion Y/N**
10 to 15 Year Baseline - Process Water Deduction Eligibility							
Year 1	2000	16,804		16,804	82,460	182	NO
Year 2	2001	17,658		17,658	83,725	188	NO
Year 3	2002	17,577		17,577	86,396	182	NO
Year 4	2003	17,461		17,461	85,846	182	NO
Year 5	2004	18,456		18,456	86,882	190	NO
Year 6	2005	17,985	600	17,385	87,935	176	NO
Year 7	2006	18,555	634	17,921	87,734	182	NO
Year 8	2007	19,336	841	18,495	85,638	193	NO
Year 9	2008	19,390	1,102	18,288	85,908	190	NO
Year 10	2009	17,690	873	16,817	85,953	175	NO
Year 11	0	-		-	-		NO
Year 12	0	-		-	-		NO
Year 13	0	-		-	-		NO
Year 14	0	-		-	-		NO
Year 15	0	-		-	-		NO
5 Year Baseline - Process Water Deduction Eligibility							
Year 1	2004	18,456	600	17,856	86,882	183	NO
Year 2	2005	17,985	634	17,351	87,935	176	NO
Year 3	2006	18,555	841	17,714	87,734	180	NO
Year 4	2007	19,336	1,102	18,234	85,638	190	NO
Year 5	2008	19,390	873	18,517	85,908	192	NO
2015 Compliance Year - Process Water Deduction Eligiblity							
2015		13,204	773	12,431	89,627	124	NO
NOTES:							

SB X7-7 Table 4-C.4: Process Water Deduction Eligibility

Criteria 4

Disadvantaged Community

Use IRWM DAC Mapping tool http://www.water.ca.gov/irwm/grants/resources_dac.cfm

California Median Household Income		Service Area Median Household Income	Percentage of Statewide Average	**Eligible for Exclusion? Y/N**
2015 Compliance Year - Process Water Deduction Eligibility				
2010	$53,046	$74,207	140%	NO

A "Disadvantaged Community" is a community with a median household income less than 80 percent of the statewide average.

NOTES:

SB X7-7 Table 4-D: Process Water Deduction - Volume *Complete a separate table for each industrial customer with a process water exclusion*

Name of Industrial Customer		*Industrial Customer 1*				
Baseline Year *Fm SB X7-7 Table 3*		Industrial Customer's Total Water Use	Total Volume Supplied by Water Agency	% of Water Supplied by Water Agency	Customer's Total Process Water Use	Volume of Process Water Eligible for Exclusion for this Customer
10 to 15 Year Baseline - Process Water Deduction						
Year 1	2000					-
Year 2	2001					-
Year 3	2002					-
Year 4	2003					-
Year 5	2004					-
Year 6	2005					-
Year 7	2006					-
Year 8	2007					-
Year 9	2008					-
Year 10	2009					-
Year 11	0					-
Year 12	0					-
Year 13	0					-
Year 14	0					-
Year 15	0					-
5 Year Baseline - Process Water Deduction						
Year 1	2004					-
Year 2	2005					-
Year 3	2006					-
Year 4	2007					-
Year 5	2008					-
2015 Compliance Year - Process Water Deduction						
2015						-

NOTES:

SB X7-7 Table 5: Gallons Per Capita Per Day (GPCD)				
Baseline Year *Fm SB X7-7 Table 3*		Service Area Population *Fm SB X7-7 Table 3*	Annual Gross Water Use *Fm SB X7-7 Table 4*	Daily Per Capita Water Use (GPCD)
10 to 15 Year Baseline GPCD				
Year 1	2000	82,460	16,804	182
Year 2	2001	83,725	17,658	188
Year 3	2002	86,396	17,577	182
Year 4	2003	85,846	17,461	182
Year 5	2004	86,882	18,456	190
Year 6	2005	87,935	17,985	183
Year 7	2006	87,734	18,555	189
Year 8	2007	85,638	19,336	202
Year 9	2008	85,908	19,390	202
Year 10	2009	85,953	17,690	184
Year 11	0	-	-	
Year 12	0	-	-	
Year 13	0	-	-	
Year 14	0	-	-	
Year 15	0	-	-	
10-15 Year Average Baseline GPCD				**188**
5 Year Baseline GPCD				
Baseline Year *Fm SB X7-7 Table 3*		Service Area Population *Fm SB X7-7 Table 3*	Gross Water Use *Fm SB X7-7 Table 4*	Daily Per Capita Water Use
Year 1	2004	86,882	18,456	190
Year 2	2005	87,935	17,985	183
Year 3	2006	87,734	18,555	189
Year 4	2007	85,638	19,336	202
Year 5	2008	85,908	19,390	202
5 Year Average Baseline GPCD				**193**
2015 Compliance Year GPCD				
2015		89,627	13,204	**132**
NOTES:				

SB X7-7 Table 6: Gallons per Capita per Day *Summary From Table SB X7-7 Table 5*	
10-15 Year Baseline GPCD	188
5 Year Baseline GPCD	193
2015 Compliance Year GPCD	132
NOTES:	

SB X7-7 Table 7: 2020 Target Method *Select Only One*		
Target Method		Supporting Documentation
☐	Method 1	SB X7-7 Table 7A
☐	Method 2	SB X7-7 Tables 7B, 7C, and 7D *Contact DWR for these tables*
☑	Method 3	SB X7-7 Table 7-E
☐	Method 4	Method 4 Calculator
NOTES:		

SB X7-7 Table 7-A: Target Method 1 20% Reduction	
10-15 Year Baseline GPCD	**2020 Target GPCD**
188	**151**
NOTES:	

SB X7-7 Table 7-B: Target Method 2 Target

Landscape Water Use

Tables for Target Method 2 (SB X7-7 Tables 7-B, 7-C, and 7-D) are not included in the SB X7-7 Verification Form, but are still required for water suppliers using Target Method 2. These water suppliers should contact Gwen Huff at (916) 651-9672 or gwen.huff@water.ca.gov

SB X7-7 Table 7-C: Target Method 2

Target CII Water Use

Tables for Target Method 2 (SB X7-7 Tables 7-B, 7-C, and 7-D) are not included in the SB X7-7 Verification Form, but are still required for water suppliers using Target Method 2. These water suppliers should contact Gwen Huff at (916) 651-9672 or gwen.huff@water.ca.gov

SB X7-7 Table 7-D: Target Method 2 Summary
Tables for Target Method 2 (SB X7-7 Tables 7-B, 7-C, and 7-D) are not included in the SB X7-7 Verification Form, but are still required for water suppliers using Target Method 2. These water suppliers should contact Gwen Huff at (916) 651-9672 or gwen.huff@water.ca.gov

SB X7-7 Table 7-E: Target Method 3				
Agency May Select More Than One as Applicable	Percentage of Service Area in This Hydrological Region	Hydrologic Region	"2020 Plan" Regional Targets	Method 3 Regional Targets (95%)
☐		North Coast	137	130
☐		North Lahontan	173	164
☑	94%	Sacramento River	176	167
☑	6%	San Francisco Bay	131	124
☐		San Joaquin River	174	165
☐		Central Coast	123	117
☐		Tulare Lake	188	179
☐		South Lahontan	170	162
☐		South Coast	149	142
☐		Colorado River	211	200
Target *(If more than one region is selected, this value is calculated.)*				**164**
NOTES:				

SB X7-7 Table 7-F: Confirm Minimum Reduction for 2020 Target			
5 Year Baseline GPCD *From SB X7-7 Table 5*	Maximum 2020 Target[1]	Calculated 2020 Target[2]	**Confirmed 2020 Target**
193	183	164	**164**

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

NOTES:

SB X7-7 Table 8: 2015 Interim Target GPCD		
Confirmed 2020 Target *Fm SB X7-7 Table 7-F*	10-15 year Baseline GPCD *Fm SB X7-7 Table 5*	**2015 Interim Target GPCD**
164	188	**176**
NOTES:		

SB X7-7 Table 9: 2015 Compliance								
Actual 2015 GPCD	2015 Interim Target GPCD	Optional Adjustments *(in GPCD)* Enter "0" if Adjustment Not Used: Extraordinary Events	Weather Normalization	Economic Adjustment	TOTAL Adjustments	Adjusted 2015 GPCD	2015 GPCD *(Adjusted if applicable)*	**Did Supplier Achieve Targeted Reduction for 2015?**
132	176	*From Methodology 8 (Optional)*	*From Methodology 8 (Optional)*	*From Methodology 8 (Optional)*	-	132	132	**YES**
NOTES:								

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APPENDIX J

ORDINANCE NO.1891 ADOPTING STATE MODEL WATER EFFICIENT LANDSCAPE ORDINANCE DIVISION 14.27

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ORDINANCE NO. 1891

ORDINANCE ADOPTING THE STATE MODEL WATER EFFICIENT LANDSCAPE ORDINANCE AND REPEALING THE CURRENT WATER EFFICIENT LANDSCAPE REQUIREMENTS

WHEREAS, having a reliable water supply is essential to the vitality of Vacaville; and

WHEREAS, water resources are of a limited supply and are subject to increasing demands; and

WHEREAS, the recent drought has emphasized the need to be prudent in the use and conservation of water; and

WHEREAS, in 1998 the City of Vacaville adopted Ordinance 1591, adopting the Vacaville Water Efficient Landscape Requirements; and

WHEREAS, pursuant Governor Brown's Drought Executive Order of April 1, 2015 (EO B-29-15), the California Water Commission approved an update the state's Model Water Efficient Landscape Ordinance; and

WHEREAS, the state requires the City to adopt the model ordinance or an ordinance that is at least as effective in conserving water; and

WHEREAS, to comply with state requirements, to provide consistency with other jurisdictions, and to ease use for applicants, the City desires to adopt the updated state Model Water Efficient Landscape Ordinance; and

WHEREAS, this project is exempt from the California Environmental Quality Act (CEQA) pursuant to Section 15307 of the State CEQA Guidelines (Actions by Regulatory Agencies for Protection of Natural Resources).

NOW, THEREFORE, THE CITY COUNCIL OF THE CITY OF VACAVILLE DOES ORDAIN AS FOLLOWS:

Section 1. Repeal of Water Efficient Landscape Requirements.

The City of Vacaville Water Efficient Landscape Requirements, adopted by Ordinance 1591 and added to Title 14 of the Vacaville Municipal Code as an appendix, is hereby repealed.

Section 2. Adoption of Division 14.27, Water Efficient Landscaping.

The following shall be added as Division 14.27 under Title 14 of the Vacaville Municipal Code.

DIVISION 14.27
WATER EFFICIENT LANDSCAPING

Chapters

Chapter 14.27.010
Title, Purpose, Applicability

14.27.010.010 Title

This division shall be known as the "Vacaville Water Efficient Landscape Ordinance," and may be so cited.

14.27.010.020 Purpose

A. The State Legislature has found:

1. that the waters of the state are of limited supply and are subject to ever increasing demands;

2. that the continuation of California's economic prosperity is dependent on the availability of adequate supplies of water for future uses;

3. that it is the policy of the State to promote the conservation and efficient use of water and to prevent the waste of this valuable resource;

4. that landscapes are essential to the quality of life in California by providing areas for active and passive recreation and as an enhancement to the environment by cleaning air and water, preventing erosion, offering fire protection, and replacing ecosystems lost to development;

5. that landscape design, installation, maintenance and management can and should be water efficient; and

6. that section 2 of Article X of the California Constitution specifies that the right to use water is limited to the amount reasonably required for the beneficial use to be served and the right does not and shall not extend to waste or unreasonable method of use.

B. Consistent with these legislative findings, the purpose of this ordinance is to:

1. promote the values and benefits of landscaping practices that integrate and go beyond the conservation and efficient use of water;

2. establish a structure for planning, designing, installing, maintaining and managing water efficient landscapes in new construction and rehabilitated projects by encouraging the use of a watershed approach that requires cross-sector collaboration of industry, government and property owners to achieve the many benefits possible;

3. establish provisions for water management practices and water waste prevention for existing landscapes;

4. use water efficiently without waste by setting a Maximum Applied Water Allowance as an upper limit for water use and reduce water use to the lowest practical amount; and

5. promote the benefits of consistent landscape ordinances with neighboring local and regional agencies.

C. Landscapes that are planned, designed, installed, managed and maintained with the watershed based approach can improve California's environmental conditions and provide benefits and realize sustainability goals. Such landscapes will make the urban environment resilient in the face of climatic extremes. Consistent with the legislative findings and purpose of the Ordinance, conditions in the urban setting will be improved by:

1. Creating the conditions to support life in the soil by reducing compaction, incorporating organic matter that increases water retention, and promoting productive plant growth that leads to more carbon storage, oxygen production, shade, habitat and esthetic benefits.

2. Minimizing energy use by reducing irrigation water requirements, reducing reliance on petroleum based fertilizers and pesticides, and planting climate appropriate shade trees in urban areas.

3. Conserving water by capturing and reusing rainwater and graywater wherever possible and selecting climate appropriate plants that need minimal supplemental water after establishment.

4. Protecting air and water quality by reducing power equipment use and landfill disposal trips, selecting recycled and locally sourced materials, and using compost, mulch and efficient irrigation equipment to prevent erosion.

5. Protecting existing habitat and creating new habitat by choosing local native plants, climate adapted non-natives and avoiding invasive plants. Utilizing integrated pest management with least toxic methods as the first course of action.

14.27.010.030 Applicability

A. After December 1, 2015, and consistent with Governor's Executive Order No. B-29-15, this ordinance shall apply to all of the following landscape projects:

1. new development projects with an aggregate landscape area equal to or greater than 500 square feet requiring a building or landscape permit, plan check or design review;

2. rehabilitated landscape projects with an aggregate landscape area equal to or greater than 2,500 square feet requiring a building or landscape permit, plan check, or design review;

3. existing landscapes limited to Chapter 14.27.040 and

4. cemeteries. Recognizing the special landscape management needs of cemeteries, new and rehabilitated cemeteries are limited to sections 14.27.030.050, 14.27.030.100, 14.27.030.110, and existing cemeteries are limited to Chapter 14.27.040.

C. Any project with an aggregate landscape area of 2,500 square feet or less may comply with the performance requirements of this ordinance or conform to the prescriptive measures contained in chapter 14.27.070.

D. For projects using treated or untreated graywater or rainwater captured on site, any lot or parcel within the project that has less than 2500 sq. ft of landscape and meets the lot or parcel's landscape water requirement (Estimated Total Water Use) entirely with treated or untreated graywater or through stored rainwater captured on site is subject only to section 14.27.070(B)(5).

E. This ordinance does not apply to:

1. registered local, state or federal historical sites;

2. ecological restoration projects that do not require a permanent irrigation system;

3. mined-land reclamation projects that do not require a permanent irrigation system; or

4. existing plant collections, as part of botanical gardens and arboretums open to the public.

14.27.010.040 Alternate methods and exceptions

The Director may approve an alternate method or exception to this ordinance where it can be demonstrated that the exception or alternate is at least as effective in conserving water as adherence to the provisions of this ordinance.

Chapter 14.27.020
Definitions

14.27.020.010 Definitions

The terms used in this ordinance have the meaning set forth below:

"Applied water" means the portion of water supplied by the irrigation system to the landscape.

"Automatic irrigation controller" means a timing device used to remotely control valves that operate an irrigation system. Automatic irrigation controllers are able to self-adjust and schedule irrigation events using either evapotranspiration (weather-based) or soil moisture data.

"Backflow prevention device" means a safety device used to prevent pollution or contamination of the water supply due to the reverse flow of water from the irrigation system.

"Certificate of Completion" means the document required under section 14.27.030.080.

"Certified irrigation designer" means a person certified to design irrigation systems by an accredited academic institution, a professional trade organization or other program such as the US Environmental Protection Agency's WaterSense irrigation designer certification program and Irrigation Association's Certified Irrigation Designer program.

"Certified landscape irrigation auditor" means a person certified to perform landscape irrigation audits by an accredited academic institution, a professional trade organization or other program such as the US Environmental Protection Agency's WaterSense irrigation auditor certification program and Irrigation Association's Certified Landscape Irrigation Auditor program.

"Check valve" or "anti-drain valve" means a valve located under a sprinkler head, or other location in the irrigation system, to hold water in the system to prevent drainage from sprinkler heads when the sprinkler is off.

"Common interest developments" means community apartment projects, condominium projects, planned developments, and stock cooperatives per California Civil Code section 1351.

"Compost" means the safe and stable product of controlled biologic decomposition of organic materials that is beneficial to plant growth.

"Conversion factor (0.62)" means the number that converts acre-inches per acre per year to gallons per square foot per year.

"Director" means the Director of Community Development of the City of Vacaville or a person designated by the Director to assume some or all of the Director's duties.

"Distribution uniformity" means the measure of the uniformity of irrigation water over a defined area.

"Drip irrigation" means any non-spray low volume irrigation system utilizing emission devices with a flow rate measured in gallons per hour. Low volume irrigation systems are specifically designed to apply small volumes of water slowly at or near the root zone of plants.

"Ecological restoration project" means a project where the site is intentionally altered to establish a defined, indigenous, historic ecosystem.

"Effective precipitation" or "usable rainfall" (Eppt) means the portion of total precipitation which becomes available for plant growth.

"Emitter" means a drip irrigation emission device that delivers water slowly from the system to the soil.

"Established landscape" means the point at which plants in the landscape have developed significant root growth into the soil. Typically, most plants are established after one or two years of growth.

"Establishment period of the plants" means the first year after installing the plant in the landscape or the first two years if irrigation will be terminated after establishment. Typically, most plants are established after one or two years of growth. Native habitat mitigation areas and trees may need three to five years for establishment.

"Estimated Total Water Use" (ETWU) means the total water used for the landscape as described in section 14.27.030.050.

"ET adjustment factor" (ETAF) means a factor of 0.55 for residential areas and 0.45 for non-residential areas, that, when applied to reference evapotranspiration, adjusts for plant factors and irrigation efficiency, two major influences upon the amount of water that needs to be applied to the landscape. The ETAF for new and existing (non-rehabilitated) Special Landscape Areas shall not exceed 1.0. The ETAF for existing non-rehabilitated landscapes is 0.8.

"Evapotranspiration rate" means the quantity of water evaporated from adjacent soil and other surfaces and transpired by plants during a specified time.

"Flow rate" means the rate at which water flows through pipes, valves and emission devices, measured in gallons per minute, gallons per hour, or cubic feet per second.

"Flow sensor" means an inline device installed at the supply point of the irrigation system that produces a repeatable signal proportional to flow rate. Flow sensors must be connected to an automatic irrigation controller, or flow monitor capable of receiving flow signals and operating master valves. This combination flow sensor/controller may also function as a landscape water meter or submeter.

"Friable" means a soil condition that is easily crumbled or loosely compacted down to a minimum depth per planting material requirements, whereby the root structure of newly planted material will be allowed to spread unimpeded.

"Fuel Modification Plan Guideline" means guidelines from a local fire authority to assist residents and businesses that are developing land or building structures in a fire hazard severity zone.

"Graywater" means untreated wastewater that has not been contaminated by any toilet discharge, has not been affected by infectious, contaminated, or unhealthy bodily wastes, and does not present a threat from contamination by unhealthful processing, manufacturing, or operating wastes. "Graywater" includes, but is not limited to, wastewater from bathtubs, showers, bathroom washbasins, clothes washing machines, and laundry tubs, but does not include wastewater from kitchen sinks or dishwashers. See California Health and Safety Code section 17922.12.

"Hardscapes" means any durable material (pervious and non-pervious).

"Hydrozone" means a portion of the landscaped area having plants with similar water needs and rooting depth. A hydrozone may be irrigated or non-irrigated.

"Infiltration rate" means the rate of water entry into the soil expressed as a depth of water per unit of time (e.g., inches per hour).

"Invasive plant species" means species of plants not historically found in California that spread outside cultivated areas and can damage environmental or economic resources. Invasive species may be regulated by county agricultural agencies as noxious species. Lists of invasive plants are maintained at the California Invasive Plant Inventory and USDA invasive and noxious weeds database.

"Irrigation audit" means an in-depth evaluation of the performance of an irrigation system conducted by a Certified Landscape Irrigation Auditor. An irrigation audit includes, but is not limited to: inspection, system tune-up, system test with distribution uniformity or emission uniformity, reporting overspray or runoff that causes overland flow, and preparation of an irrigation schedule. The audit must be conducted in a manner consistent with the Irrigation Association's Landscape Irrigation Auditor Certification program or other U.S. Environmental Protection Agency "Watersense" labeled auditing program.

"Irrigation efficiency" (IE) means the measurement of the amount of water beneficially used divided by the amount of water applied. Irrigation efficiency is derived from measurements and estimates of irrigation system characteristics and management practices. The irrigation efficiencies for purposes of this ordinance are 0.75 for overhead spray devices and 0.81 for drip systems.

"Irrigation survey" means an evaluation of an irrigation system that is less detailed than an irrigation audit. An irrigation survey includes, but is not limited to: inspection, system test, and written recommendations to improve performance of the irrigation system.

"Irrigation water use analysis" means a review of water use data based on meter readings and billing data.

"Landscape architect" means a person who holds a license to practice landscape architecture in the California Business and Professions Code, section 5615.

"Landscape area" (LA) means all the planting areas, turf areas, and water features in a landscape design plan subject to the Maximum Applied Water Allowance calculation. The landscape area does not include footprints of buildings or structures, sidewalks, driveways, parking lots, decks, patios, gravel or stone walks, other pervious or non-pervious hardscapes, and other non-irrigated areas designated for non-development (e.g., open spaces and existing native vegetation).

"Landscape contractor" means a person licensed by the state of California to construct, maintain, repair, install, or subcontract the development of landscape systems.

"Landscape Documentation Package" means the documents required under section 14.27.030.040.

"Landscape project" means total area of landscape in a project as defined in "landscape area" for the purposes of this ordinance, meeting requirements under section 14.27.010.030.

"Landscape water meter" means an inline device installed at the irrigation supply point that measures the flow of water into the irrigation system and is connected to a totalizer to record water use.

"Lateral line" means the water delivery pipeline that supplies water to the emitters or sprinklers from the valve.

"Local water purveyor" means any entity, including a public agency, city, county, or private water company that provides retail water service.

"Low volume irrigation" means the application of irrigation water at low pressure through a system of tubing or lateral lines and low-volume emitters such as drip, drip lines, and bubblers. Low volume irrigation systems are specifically designed to apply small volumes of water slowly at or near the root zone of plants.

"Main line" means the pressurized pipeline that delivers water from the water source to the valve or outlet.

"Master shut-off valve" is an automatic valve installed at the irrigation supply point which controls water flow into the irrigation system. When this valve is closed water will not be supplied to the irrigation system. A master valve will greatly reduce any water loss due to a leaky station valve.

"Maximum Applied Water Allowance" (MAWA) means the upper limit of annual applied water for the established landscaped area as specified in section 14.127.030.040. It is based upon the area's reference evapotranspiration, the ET Adjustment Factor, and the size of the landscape area. The Estimated Total Water Use shall not exceed the Maximum Applied Water Allowance. Special Landscape Areas, including recreation areas, areas permanently and solely dedicated to edible plants such as orchards and vegetable gardens, and areas irrigated with recycled water are subject to the MAWA with an ETAF not to exceed 1.0. MAWA = (ETo) (0.62) [(ETAF x LA) + ((1-ETAF) x SLA)].

"Median" is an area between opposing lanes of traffic that may be unplanted or planted with trees, shrubs, perennials, and ornamental grasses.

"Microclimate" means the climate of a small, specific area that may contrast with the climate of the overall landscape area due to factors such as wind, sun exposure, plant density, or proximity to reflective surfaces.

"Mined-land reclamation projects" means any surface mining operation with a reclamation plan approved in accordance with the Surface Mining and Reclamation Act of 1975.

"Mulch" means any organic material such as leaves, bark, straw, compost, or inorganic mineral materials such as rocks, gravel, and or decomposed granite left loose and applied to the soil surface for the beneficial purposes of reducing evaporation, suppressing weeds, moderating soil temperature, and preventing soil erosion.

"New construction" means, for the purposes of this ordinance, a new building with a landscape or other new landscape, such as a park, playground, or greenbelt without an associated building.

"Non-residential landscape" means landscapes in commercial, institutional, industrial and public settings that may have areas designated for recreation or public assembly. It also includes portions of common areas of common interest developments with designated recreational areas.

"Operating pressure" means the pressure at which the parts of an irrigation system are designed by the manufacturer to operate.

"Overhead sprinkler irrigation systems" means systems that deliver water through the air (e.g., spray heads and rotors).

"Overspray" means the irrigation water which is delivered beyond the target area.

"Permit" means an authorizing document issued by local agencies for new construction or rehabilitated landscapes.

"Pervious" means any surface or material that allows the passage of water through the material and into the underlying soil.

"Plant factor" or "plant water use factor" is a factor, when multiplied by ETo, estimates the amount of water needed by plants. For purposes of this ordinance, the plant factor range for very low water use plants is 0 to 0.1, the plant factor range for low water use plants is 00.1 to 0.3, the plant factor range for moderate water use plants is 0.4 to 0.6, and the plant factor range for high water use plants is 0.7 to 1.0. Plant factors cited in this ordinance are derived from the Department of Water Resources 2000 publication "Water Use Classification of Landscape Species." Plant factors may also be obtained from horticultural researchers from academic institutions or professional associations as approved by the California Department of Water Resources (DWR).

"Project applicant" means the individual or entity submitting a Landscape Documentation Package required under section 14.27.030.040 to request a permit, plan check, or design review from the City of Vacaville. A project applicant may be the property owner or his or her designee.

"Rain sensor" or "rain sensing shutoff device" means a component which automatically suspends an irrigation event when it rains.

"Record drawing" or "as-builts" means a set of reproducible drawings which show significant changes in the work made during construction and which are usually based on drawings marked up in the field and other data furnished by the contractor.

"Recreational area" means areas, excluding private single family residential areas designated for active play, recreation or public assembly, in parks, sports fields, picnic grounds, amphitheaters and or golf course tees, fairways, roughs, surrounds and greens.

"Recycled water," "reclaimed water," or "treated sewage effluent water" means treated or recycled waste water of a quality suitable for non-potable uses such as landscape irrigation and water features. This water is not intended for human consumption.

"Reference evapotranspiration" or "ETo" means a standard measurement of environmental parameters which affect the water use of plants. ETo is expressed in inches per day, month, or year as represented in Table 14.27.030.01, and is an estimate of the evapotranspiration of a large field of four-to seven-inch tall, cool-season grass that is well

watered. Reference evapotranspiration is used as the basis of determining the Maximum Applied Water Allowance so that regional differences in climate can be accommodated.

"Rehabilitated landscape" means any re-landscaping project that requires a permit, plan check, or design review, meets the requirements of section 14.27.010.030, and the modified landscape area is equal to or greater than 2,500 square feet.

"Residential landscape" means landscapes surrounding single or multifamily homes.

"Runoff" means water which is not absorbed by the soil or landscape to which it is applied and flows from the landscape area. For example, runoff may result from water that is applied at too great a rate (application rate exceeds infiltration rate) or when there is a slope.

"Soil moisture sensing device" or "soil moisture sensor" means a device that measures the amount of water in the soil. The device may also suspend or initiate an irrigation event.

"Soil texture" means the classification of soil based on its percentage of sand, silt, and clay.

"Special Landscape Area" (SLA) means an area of the landscape dedicated solely to edible plants, recreational areas, areas irrigated with recycled water, or water features using recycled water.

"Sprinkler head" means a device which delivers water through a nozzle.

"Static water pressure" means the pipeline or municipal water supply pressure when water is not flowing.

"Station" means an area served by one valve or by a set of valves that operate simultaneously.

"Swing joint" means an irrigation component that provides a flexible, leak-free connection between the emission device and lateral pipeline to allow movement in any direction and to prevent equipment damage.

"Submeter" means a metering device to measure water applied to the landscape that is installed after the primary utility water meter.

"Turf" means a ground cover surface of mowed grass. Annual bluegrass, Kentucky bluegrass, Perennial ryegrass, Red fescue, and Tall fescue are cool-season grasses. Bermudagrass, Kikuyugrass, Seashore Paspalum, St. Augustinegrass, Zoysiagrass, and Buffalo grass are warm-season grasses.

"Valve" means a device used to control the flow of water in the irrigation system.

"Water conserving plant species" means a plant species identified as having a very low or low plant factor.

"Water feature" means a design element where open water performs an aesthetic or recreational function. Water features include ponds, lakes, waterfalls, fountains, artificial streams, spas, and swimming pools (where water is artificially supplied). The surface area of water

features is included in the high water use hydrozone of the landscape area. Constructed wetlands used for on-site wastewater treatment or stormwater best management practices that are not irrigated and used solely for water treatment or stormwater retention are not water features and, therefore, are not subject to the water budget calculation.

"Watering window" means the time of day irrigation is allowed.

"WUCOLS" means the Water Use Classification of Landscape Species published by the University of California Cooperative Extension and the Department of Water Resources 2014.

Chapter 14.27.030
Provisions for New Construction or Rehabilitated Landscapes

14.27.030.010 Designation of Implementation Agency.

The City of Vacaville may designate by mutual agreement, another agency, such as a water purveyor, to implement some or all of the requirements contained in this ordinance.

14.27.030.020 Compliance with Landscape Documentation Package.

A. Prior to construction, the Director of Community Development shall:

1. provide the project applicant with the ordinance and procedures for permits, plan checks, or design reviews;

2. review the Landscape Documentation Package submitted by the project applicant;

3. approve or deny the Landscape Documentation Package;

4. issue a permit or approve the plan check or design review for the project applicant; and

5. upon approval of the Landscape Documentation Package, submit a copy of the Water Efficient Landscape Worksheet to the local water purveyor if other than the City of Vacaville.

B. Prior to construction, the project applicant shall submit a Landscape Documentation Package to the Director

C. Upon approval of the Landscape Documentation Package by the Director, the project applicant shall:

1. receive a permit or approval of the plan check or design review and record the date of the permit in the Certificate of Completion;

2. submit a copy of the approved Landscape Documentation Package along with the record drawings, and any other information to the property owner or his/her designee; and

3. submit a copy of the Water Efficient Landscape Worksheet to the local water purveyor if other than the City of Vacaville.

14.27.030.030 Penalties

Violation of any provision of this division is subject to penalties as described in chapter 1.16 of the Vacaville Municipal Code and any other penalty or remedy to the extent permitted by law..

14.27.030.040 Elements of the Landscape Documentation Package.

A. The Landscape Documentation Package shall include the following six elements:

1. project information;

a. date

b. project applicant

c. project address (if available, parcel and/or lot number(s))

d. total landscape area (square feet)

e. project type (e.g., new, rehabilitated, public, private, cemetery, homeowner-installed)

f. water supply type (e.g., potable, recycled, well) and identify the local retail water purveyor if the applicant is not served by a private well

g. checklist of all documents in Landscape Documentation Package

h. project contacts to include contact information for the project applicant and property owner

2. Water Efficient Landscape Worksheet with water budget calculations, including Maximum Applied Water Allowance (MAWA) and Estimated Total Water Use (ETWU);

3. soil management report;

4. landscape design plan; and

5. irrigation design plan.

14.27.030.050 Water Efficient Landscape Worksheet.

A. A project applicant shall complete the Water Efficient Landscape Worksheet in Figure 27.030-1, or other worksheet that demonstrates compliance, which contains information on the plant factor, irrigation method, irrigation efficiency, and area associated with each hydrozone. Calculations are then made to show that the evapotranspiration adjustment factor (ETAF) for the landscape project does not exceed a factor of 0.55 for residential areas and 0.45 for non-residential areas, exclusive of Special Landscape Areas. The ETAF for a landscape project is based on the plant factors and irrigation methods selected. The Maximum Applied Water Allowance is calculated based on the maximum ETAF allowed (0.55 for residential areas and

0.45 for non-residential areas) and expressed as annual gallons required. The Estimated Total Water Use (ETWU) is calculated based on the plants used and irrigation method selected for the landscape design. ETWU must be below the MAWA. In calculating the Maximum Applied Water Allowance and Estimated Total Water Use, a project applicant shall use the ETo values from the Reference Evapotranspiration Table 14.27.030.01.

B. Water budget calculations shall adhere to the following requirements:

1. The plant factor used shall be from WUCOLS or from horticultural researchers with academic institutions or professional associations as approved by the California Department of Water Resources (DWR). The plant factor ranges from 0 to 0.1 for very low water using plants, 0.1 to 0.3 for low water use plants, from 0.4 to 0.6 for moderate water use plants, and from 0.7 to 1.0 for high water use plants.

2. All water features shall be included in the high water use hydrozone, and temporarily irrigated areas shall be included in the low water use hydrozone.

3. All Special Landscape Areas shall be identified and their water use calculated as shown in Figure 14.27.030-1.

4. ETAF for new and existing (non-rehabilitated) Special Landscape Areas shall not exceed 1.0.

TABLE 14.27.030.01
Reference Evapotranspiration (ETo)Table

	Month (Inches/month)												Total (Inches/ year)
Area	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Total**
Vacaville except Lagoon Valley	0.7	1.4	3.2	5.2	6.3	7.6	8.2	7.2	5.5	4.3	1.6	1.1	52.1
Lagoon Valley	1.1	1.7	2.8	4.0	5.5	6.1	7.8	6.0	4.8	3.1	1.4	0.9	45.2

Figure 14.27.030-1
Water Efficient Landscape Worksheet

This worksheet is filled out by the project applicant and it is a required element of the Landscape Documentation Package.

Reference Evapotranspiration (ETo) _____

Hydrozone # /Planting Description[a]	Plant Factor (PF)	Irrigation Method[b]	Irrigation Efficiency (IE)[c]	ETAF (PF/IE)	Landscape Area (sq, ft,)	ETAF x Area	Estimated Total Water Use (ETWU)[e]
Regular Landscape Areas							
				Totals	(A)	(B)	
Special Landscape Areas							
				1			
				1			
				1			
				Totals	(C)	(D)	
						ETWU Total	
						Maximum Allowed Water Allowance (MAWA)[e]	

[a] ***Hydrozone #/Planting Description***
E.g
1.) front lawn
2.) low water use plantings
3.) medium water use planting

[b] ***Irrigation Method***
overhead spray or drip

[c] ***Irrigation Efficiency***
0.75 for spray head
0.81 for drip

[d] ***ETWU*** **(Annual Gallons Required) =**
Eto x 0.62 x ETAF x Area
where 0.62 is a conversion factor that acre-inches per acre per year to gallons per square foot per year.

[e] ***MAWA (Annual Gallons Allowed) =*** *(Eto) (0.62) [(ETAF x LA) + ((1-ETAF) x SLA)]*
where 0.62 is a conversion factor that acre-inches per acre per year to gallons per square foot per year, LA is the total landscape area in square feet, SLA is the total special landscape area in square feet,
and ETAF is .55 for residential areas and 0.45 for non-residential areas.

ETAF Calculations

Regular Landscape Areas

Total ETAF x Area	(B)
Total Area	(A)
Average ETAF	**B ÷ A**

Average ETAF for Regular Landscape Areas must be 0.55 or below for residential areas, and 0.45 or below for non-residential areas.

All Landscape Areas

Total ETAF x Area	(B+D)
Total Area	(A+C)
Sitewide ETAF	**(B+D) ÷ (A+C)**

14.27.030.060 Landscape Design Plan

A. For the efficient use of water, a landscape shall be carefully designed and planned for the intended function of the project. A landscape design plan meeting the following design criteria shall be submitted as part of the Landscape Documentation Package.

1. Plant Material

a. Any plant may be selected for the landscape providing the Estimated Total Water Use in the landscape area does not exceed the Maximum Applied Water Allowance and the selection complies with any other adopted landscaping requirements.

b. Each hydrozone shall have plant materials with similar water use, with the exception of hydrozones with plants of mixed water use, as specified in section 14.27.030.070(A)(2)(d).

c. Plants shall be selected and planted appropriately based upon their adaptability to the climatic, geologic, and topographical conditions of the project site. Methods to achieve water efficiency shall include one or more of the following:

i. use the Sunset Western Climate Zone System which takes into account temperature, humidity, elevation, terrain, latitude, and varying degrees of continental and marine influence on local climate;

ii. recognize the horticultural attributes of plants (i.e., mature plant size, invasive surface roots) to minimize damage to property or infrastructure [e.g., buildings, sidewalks, power lines]; allow for adequate soil volume for healthy root growth; and

iii. consider the solar orientation for plant placement to maximize summer shade and winter solar gain.

d. Turf is not allowed on slopes greater than 25% where the toe of the slope is adjacent to an impermeable hardscape and where 25% means 1 foot of vertical elevation change for every 4 feet of horizontal length (rise divided by run x 100 = slope percent).

e. High water use plants, characterized by a plant factor of 0.7 to 1.0, are prohibited in street medians.

f. A landscape design plan for projects in fire-prone areas shall address fire safety and prevention. A defensible space or zone around a building or structure is required per California Public Resources Code section 4291(a) and (b). Avoid fire-prone plant materials and highly flammable mulches. Refer to the local Fuel Modification Plan guidelines.

g. The use of invasive plant species, such as those listed by the California Invasive Plant Council, is strongly discouraged.

h. The architectural guidelines of a common interest development, which include community apartment projects, condominiums, planned developments, and stock

cooperatives, shall not prohibit or include conditions that have the effect of prohibiting the use of low-water use plants as a group.

2. Water Features

a. Recirculating water systems shall be used for water features.

b. Where available, recycled water shall be used as a source for decorative water features.

c. Surface area of a water feature shall be included in the high water use hydrozone area of the water budget calculation.

d. Pool and spa covers are highly recommended.

3. Soil Preparation, Mulch and Amendments

a. Prior to the planting of any materials, compacted soils shall be transformed to a friable condition. On engineered slopes, only amended planting holes need meet this requirement.

b. Soil amendments shall be incorporated according to recommendations of any soil report prepared and what is appropriate for the plants selected.

c. For landscape installations, compost at a rate of a minimum of four cubic yards per 1,000 square feet of permeable area shall be incorporated to a depth of six inches into the soil. Soils with greater than 6% organic matter in the top 6 inches of soil are exempt from adding compost and tilling.

d. A minimum three inch layer of mulch shall be applied on all exposed soil surfaces of planting areas except in turf areas, creeping or rooting groundcovers, or direct seeding applications where mulch is contraindicated. To provide habitat for beneficial insects and other wildlife, up to 5 % of the landscape area may be left without mulch. Designated insect habitat must be included in the landscape design plan as such.

e. Stabilizing mulching products shall be used on slopes that meet current engineering standards.

f. The mulching portion of the seed/mulch slurry in hydro-seeded applications shall meet the mulching requirement.

B. The landscape design plan, at a minimum, shall:

1. delineate and label each hydrozone by number, letter, or other method;

2. identify each hydrozone as low, moderate, high water, or mixed water use. Temporarily irrigated areas of the landscape shall be included in the low water use hydrozone for the water budget calculation;

3. identify recreational areas (for uses other than single family residential, if any);

4. identify areas permanently and solely dedicated to edible plants (if any);

5. identify areas irrigated with recycled water (if any);

6. identify type of mulch and application depth;

7. identify soil amendments, type, and quantity;

8. identify type and surface area of water features (if any);

9. identify hardscapes (pervious and non-pervious, if any);

10. bear the signature of a licensed landscape architect, licensed landscape contractor, or any other person authorized to design a landscape. (See sections 5500.1, 5615, 5641, 5641.1, 5641.2, 5641.3, 5641.4, 5641.5, 5641.6, 6701, 7027.5 of the California Business and Professions Code, section 832.27 of Title16 of the California Code of Regulations, and section 6721 of the California Food and Agriculture Code.)

14.27.030.070 Irrigation Design Plan.

A. This section applies to landscaped areas requiring permanent irrigation, not areas that require temporary irrigation solely for the plant establishment period. For the efficient use of water, an irrigation system shall meet all the requirements listed in this section and the manufacturers' recommendations. The irrigation system and its related components shall be planned and designed to allow for proper installation, management, and maintenance. An irrigation design plan meeting the following design criteria shall be submitted as part of the Landscape Documentation Package.

1. System

a. Landscape water meters, defined as either a dedicated water service meter or private submeter, shall be installed for all non-residential irrigated landscapes of 1,000 sq. ft. but not more than 5,000 sq.ft. (the level at which California Water Code section 535 applies) and residential irrigated landscapes of 5,000 sq. ft. or greater. A landscape water meter may be either:

i. a customer service meter dedicated to landscape use provided by the local water purveyor; or

ii. a privately owned meter or submeter.

b. Automatic irrigation controllers utilizing either evapotranspiration or soil moisture sensor data utilizing non-volatile memory shall be required for irrigation scheduling in all irrigation systems.

c. Sensors (rain, freeze, wind, etc.), either integral or auxiliary, that suspend or alter irrigation operation during unfavorable weather conditions shall be required on all

irrigation systems, as appropriate for local climatic conditions. Irrigation should be avoided during windy or freezing weather or during rain. d. Flow sensors that detect high flow conditions created by system damage or malfunction are required for all on non-residential landscapes and residential landscapes of 5000 sq. ft. or larger.

e. Master shut-off valves are required on all projects except landscapes that make use of technologies that allow for the individual control of sprinklers that are individually pressurized in a system equipped with low pressure shut down features.

f. The irrigation system shall be designed to prevent runoff, low head drainage, overspray, or other similar conditions where irrigation water flows onto non-targeted areas, such as adjacent property, non-irrigated areas, hardscapes, roadways, or structures.

g. Relevant information from the soil management plan, such as soil type and infiltration rate, shall be utilized when designing irrigation systems.

h. The design of the irrigation system shall conform to the hydrozones of the landscape design plan.

i. The irrigation system must be designed and installed to meet, at a minimum, the irrigation efficiency criteria as described in section 14.127.030.040 regarding the Maximum Applied Water Allowance.

j.All irrigation emission devices must meet the requirements set in the American National Standards Institute (ANSI) standard, American Society of Agricultural and Biological Engineers'/International Code Council's (ASABE/ICC) 802-2014 "Landscape Irrigation Sprinkler and Emitter Standard." All sprinkler heads installed in the landscape must document a distribution uniformity low quarter of 0.65 or higher using the protocol defined in ASABE/ICC 802-2014.

k. It is highly recommended that the project applicant or City of Vacaville inquire with the local water purveyor about peak water operating demands (on the water supply system) or water restrictions that may impact the effectiveness of the irrigation system.

l. In mulched planting areas, the use of low volume irrigation is required to maximize water infiltration into the root zone.

m. Sprinkler heads and other emission devices shall have matched precipitation rates, unless otherwise directed by the manufacturer's recommendations.

n. Head to head coverage is recommended. However, sprinkler spacing shall be designed to achieve the highest possible distribution uniformity using the manufacturer's recommendations.

o. Swing joints or other riser-protection components are required on all risers subject to damage that are adjacent to hardscapes or in high traffic areas of turfgrass.

p. Check valves or anti-drain valves are required on all sprinkler heads where low point drainage could occur.

q. Areas less than ten(10) feet in width in any direction shall be irrigated with subsurface irrigation or other means that produces no runoff or overspray.

r. Overhead irrigation shall not be permitted within 24 inches of any non-permeable surface. Allowable irrigation within the setback from non-permeable surfaces may include drip, drip line, or other low flow non-spray technology. The setback area may be planted or unplanted. The surfacing of the setback may be mulch, gravel, or other porous material. These restrictions may be modified if:

i. the landscape area is adjacent to permeable surfacing and no runoff occurs; or

ii. the adjacent non-permeable surfaces are designed and constructed to drain entirely to landscaping; or

iii. the irrigation designer specifies an alternative design or technology, as part of the Landscape Documentation Package and clearly demonstrates strict adherence to irrigation system design criteria in section 14.27.030.070 (A)(1)(f). Prevention of overspray and runoff must be confirmed during the irrigation audit.

s. Slopes greater than 25% shall not be irrigated with an irrigation system with a application rate exceeding 0.75 inches per hour. This restriction may be modified if the landscape designer specifies an alternative design or technology, as part of the Landscape Documentation Package, and clearly demonstrates no runoff or erosion will occur. Prevention of runoff and erosion must be confirmed during the irrigation audit.

2. Hydrozone

a. Each valve shall irrigate a hydrozone with similar site, slope, sun exposure, soil conditions, and plant materials with similar water use.

b. Sprinkler heads and other emission devices shall be selected based on what is appropriate for the plant type within that hydrozone.

c. Where feasible, trees shall be placed on separate valves from shrubs, groundcovers, and turf to facilitate the appropriate irrigation of trees. The mature size and extent of the root zone shall be considered when designing irrigation for the tree.

d. Individual hydrozones that mix plants of moderate and low water use, or moderate and high water use, may be allowed if:

i. plant factor calculation is based on the proportions of the respective plant water uses and their plant factor; or

ii. the plant factor of the higher water using plant is used for calculations.

e. Individual hydrozones that mix high and low water use plants shall not be permitted.

f. On the landscape design plan and irrigation design plan, hydrozone areas shall be designated by number, letter, or other designation. On the irrigation design plan, designate the areas irrigated by each valve, and assign a number to each valve. Use this valve number in the Hydrozone Information Table (see Figure 14.27.030-1). This table can also assist with the irrigation audit and programming the controller.

B. The irrigation design plan, at a minimum, shall contain:

1. location and size of separate water meters for landscape;

2. location, type and size of all components of the irrigation system, including controllers, main and lateral lines, valves, sprinkler heads, moisture sensing devices, rain switches, quick couplers, pressure regulators, and backflow prevention devices;

3. static water pressure at the point of connection to the public water supply;

4. flow rate (gallons per minute), application rate (inches per hour), and design operating pressure (pressure per square inch) for each station;

5. recycled water irrigation systems as specified in section 14.27.030.130; and

6. the signature of a licensed landscape architect, certified irrigation designer, licensed landscape contractor, or any other person authorized to design an irrigation system. (See sections 5500.1, 5615, 5641, 5641.1, 5641.2, 5641.3, 5641.4, 5641.5, 5641.6, 6701, 7027.5 of the California Business and Professions Code, section 832.27 of Title 16 of the California Code of Regulations, and section 6721 of the California Food and Agricultural Code.)

14.27.030.080 Certificate of Completion.

A. The Certificate of Completion (see Figure 14.27.030-2 for a sample certificate) shall include the following six (6) elements:

1. project information sheet that contains:

a. date;

b. project name;

c. project applicant name, telephone, and mailing address;

d. project address and location; and

e. property owner name, telephone, and mailing address.

2. certification by either the signer of the landscape design plan, the signer of the irrigation design plan, or the licensed landscape contractor that the landscape project has been installed per the approved Landscape Documentation Package;

a. where there have been significant changes made in the field during construction, these "as-built" or record drawings shall be included with the certification;

b. A diagram of the irrigation plan showing hydrozones shall be kept with the irrigation controller for subsequent management purposes.

3. irrigation scheduling parameters used to set the controller (see section 14.27.030.090);

4. landscape and irrigation maintenance schedule (see section 14.27.030.100); and

5. irrigation audit report (see section 14.27.030.110).

B. The project applicant shall:

1. submit the signed Certificate of Completion to the Director for review;

2. ensure that copies of the approved Certificate of Completion are submitted to the local water purveyor if other than the City of Vacaville and property owner or his or her designee.

C. The Director shall:

1. receive the signed Certificate of Completion from the project applicant;

2. approve or deny the Certificate of Completion. If the Certificate of Completion is denied, the Director shall provide information to the project applicant regarding reapplication, appeal, or other assistance.

Figure 14.27.030-2
Sample Certificate of Completion

CERTIFICATE OF COMPLETION

This certificate is filled out by the project applicant upon completion of the landscape project.

PART 1. PROJECT INFORMATION SHEET

Date		
Project Name		
Name of Project Applicant	Telephone No.	
	Fax No.	
Title	Email Address	
Company	Street Address	
City	State	Zip Code

Project Address and Location:

Street Address		Parcel, tract or lot number, if available.
City		Latitude/Longitude (optional)
State	Zip Code	

Property Owner or his/her designee:

Name	Telephone No.	
	Fax No.	
Title	Email Address	
Company	Street Address	
City	State	Zip Code

Property Owner

"I/we certify that I/we have received copies of all the documents within the Landscape Documentation Package and the Certificate of Completion and that it is our responsibility to see that the project is maintained in accordance with the Landscape and Irrigation Maintenance Schedule."

_____

Property Owner Signature Date

Please answer the questions below:

1 Date the Landscape Documentation Package was submitted to the City of Vacaville _____
2 Date the Landscape Documentation Package was approved by the City of Vacaville _____
3 Date that a copy of the Water Efficient Landscape Worksheet (including the Water Budget Calculation) was submitted to the City of Vacaville_____

PART 2. CERTIFICATION OF INSTALLATION ACCORDING TO THE LANDSCAPE DOCUMENTATION PACKAGE

"I/we certify that based upon periodic site observations, the work has been completed in accordance with the Vacaville Water Efficient Landscape Ordinance and that the landscape planting and irrigation installation conform to the criteria and specifications of the approved Landscape Documentation Package."

Signature*	Date	
Name (print)	Telephone No.	
	Fax No.	
Title	Email Address	
License No. or Certification No		
Company	Street Address	
City	State	Zip Code

*Signer of the landscape design plan, signer of the irrigation plan, or a licensed landscape contractor.

PART 3. IRRIGATION SCHEDULING

Attach parameters for setting the irrigation schedule on controller per Vacaville Code 14.27.030.100.

PART 4. SCHEDULE OF LANDSCAPE AND IRRIGATION MAINTENANCE

Attach schedule of Landscape and Irrigation Maintenance per Vacaville Code 14.27.030.110.

PART 5. LANDSCAPE IRRIGATION AUDIT REPORT

Attach Landscape Irrigation Audit Report per Vacaville Code 14.27.030.120.

14.27.030.090 Irrigation Scheduling.

For the efficient use of water, all irrigation schedules shall be developed, managed, and evaluated to utilize the minimum amount of water required to maintain plant health. Irrigation schedules shall meet the following criteria:

A. Irrigation scheduling shall be regulated by automatic irrigation controllers.

B. Overhead irrigation shall be scheduled between 8:00 p.m. and 10:00 a.m. unless weather conditions prevent it. If allowable hours of irrigation differ from the local water purveyor, the stricter of the two shall apply. Operation of the irrigation system outside the normal watering window is allowed for auditing and system maintenance.

C. For implementation of the irrigation schedule, particular attention must be paid to irrigation run times, emission device, flow rate, and current reference evapotranspiration, so that applied water meets the Estimated Total Water Use. Total annual applied water shall be less than or equal to Maximum Applied Water Allowance (MAWA). Actual irrigation schedules shall be regulated by automatic irrigation controllers using current reference evapotranspiration data (e.g., CIMIS) or soil moisture sensor data.

D. Parameters used to set the automatic controller shall be developed and submitted for each of the following:

1. the plant establishment period;

2. the established landscape; and

3. temporarily irrigated areas.

E. Each irrigation schedule shall consider for each station all of the following that apply:

1. irrigation interval (days between irrigation);

2. irrigation run times (hours or minutes per irrigation event to avoid runoff);

3. number of cycle starts required for each irrigation event to avoid runoff;

4. amount of applied water scheduled to be applied on a monthly basis;

5. application rate setting;

6. root depth setting;

7. plant type setting;

8. soil type;

9. slope factor setting;

10. shade factor setting; and

11. irrigation uniformity or efficiency setting.

14.27.030.100 Landscape and Irrigation Maintenance Schedule.

A. Landscapes shall be maintained to ensure water use efficiency. A regular maintenance schedule shall be submitted with the Certificate of Completion.

B. A regular maintenance schedule shall include, but not be limited to, routine inspection; auditing, adjustment and repair of the irrigation system and its components; aerating and dethatching turf areas; topdressing with compost, replenishing mulch; fertilizing; pruning; weeding in all landscape areas, and removing obstructions to emission devices. Operation of the irrigation system outside the normal watering window is allowed for auditing and system maintenance.

C. Repair of all irrigation equipment shall be done with the originally installed components or their equivalents or with components with greater efficiency.

D. A project applicant is encouraged to implement established landscape industry sustainable Best Practices for all landscape maintenance activities.

14.27.030.110 Irrigation Audit, Irrigation Survey, and Irrigation Water Use Analysis.

A. All landscape irrigation audits shall be conducted by a third party certified landscape irrigation auditor. Landscape audits shall not be conducted by the person who designed the landscape or installed the landscape

B. In large projects or projects with multiple landscape installations (i.e. production home developments) an auditing rate of 1 in 7 lots or approximately 15% will satisfy this requirement.

C. For new construction and rehabilitated landscape projects installed after December 1, 2015, as described in section 14.27.010.030:

1. the project applicant shall submit an irrigation audit report with the Certificate of Completion to the local agency that may include, but is not limited to: inspection, system tune-up, system test with distribution uniformity, reporting overspray or run off that causes overland flow, and preparation of an irrigation schedule, including configuring irrigation controllers with application rate, soil types, plant factors, slope, exposure and any other factors necessary for accurate programming;

2. the City of Vacaville shall administer programs that may include, but not be limited to, irrigation water use analysis, irrigation audits, and irrigation surveys for compliance with the Maximum Applied Water Allowance.

14.27.030.120 Irrigation Efficiency.

For the purpose of determining Estimated Total Water Use, average irrigation efficiency is assumed to be 0.75 for overhead spray devices and 0.81 for drip system devices.

14.27.030.130 Recycled Water.

A. The installation of recycled water irrigation systems shall allow for the current and future use of recycled water.

B. All recycled water irrigation systems shall be designed and operated in accordance with all applicable local and State laws.

C. Landscapes using recycled water are considered Special Landscape Areas. The ET Adjustment Factor for new and existing (non-rehabilitated) Special Landscape Areas shall not exceed 1.0.

14.27.030.140 Graywater Systems.

Graywater systems promote the efficient use of water and are encouraged to assist in on-site landscape irrigation. All graywater systems shall conform to the California Plumbing Code (Title 24, Part 5, Chapter 16) and any standards adopted by the City of Vacaville. Refer to section 14.27.010.030 (d) for the applicability of this ordinance to landscape areas less than 2,500 square feet with the Estimated Total Water Use met entirely by graywater.

14.27.030.150 Stormwater Management and Rainwater Retention.

A. Stormwater management practices minimize runoff and increase infiltration which recharges groundwater and improves water quality. Implementing stormwater best management practices into the landscape and grading design plans to minimize runoff and to increase on-site rainwater retention and infiltration are encouraged.

B. Project applicants shall refer to the local agency or Regional Water Quality Control Board for information on any applicable stormwater technical requirements.

C. All planted landscape areas are required to have friable soil to maximize water retention and infiltration. Refer to section 14.27.030.060 (A)(3).

D. It is strongly recommended that landscape areas be designed for capture and infiltration capacity that is sufficient to prevent runoff from impervious surfaces (i.e. roof and paved areas) from either: the one inch, 24-hour rain event or (2) the 85th percentile, 24-hour rain event, and/or additional capacity as required by any applicable local, regional, state or federal regulation.

E. It is recommended that storm water projects incorporate any of the following elements to improve on-site storm water and dry weather runoff capture and use:

1. Grade impervious surfaces, such as driveways, during construction to drain to vegetated areas.

2. Minimize the area of impervious surfaces such as paved areas, roof and concrete driveways.

3. Incorporate pervious or porous surfaces (e.g., gravel, permeable pavers or blocks, pervious or porous concrete) that minimize runoff.

4. Direct runoff from paved surfaces and roof areas into planting beds or landscaped areas to maximize site water capture and reuse.

5. Incorporate rain gardens, cisterns, and other rain harvesting or catchment systems.

6. Incorporate infiltration beds, swales, basins and drywells to capture storm water and dry weather runoff and increase percolation into the soil.

7. Consider constructed wetlands and ponds that retain water, equalize excess flow, and filter pollutants.

14.27.030.160 Public Education.

A. Publications. Education is a critical component to promote the efficient use of water in landscapes. The use of appropriate principles of design, installation, management and maintenance that save water is encouraged in the community. The City of Vacaville shall provide information to owners of permitted renovations and new single-family residential homes regarding the design, installation, management, and maintenance of water efficient landscapes based on a water budget.

B. Model Homes. All model homes shall be landscaped and use signs and written information to demonstrate the principles of water efficient landscapes described in this ordinance.

1. Signs shall be used to identify the model as an example of a water efficient landscape featuring elements such as hydrozones, irrigation equipment, and others that contribute to the overall water efficient theme. Signage shall include information about the site water use; specify who designed and installed the water efficient landscape; and demonstrate low water use approaches to landscaping such as using native plants, graywater systems, and rainwater catchment systems.

2. Information shall be provided about designing, installing, managing, and maintaining water efficient landscapes

14.27.030.170 Environmental Review.

The City of Vacaville must comply with the California Environmental Quality Act (CEQA), as appropriate.

Chapter 14.27.040
Provisions for Existing Landscapes

14.27.040.010 Designation of Implementation Agency.

The City of Vacaville may by mutual agreement, designate another agency such as a water purveyor, to implement some or all of the requirements contained in this ordinance. Local agencies may collaborate with water purveyors to define each entity's specific responsibilities relating to this ordinance.

14.27.040.020 Irrigation Audit, Irrigation Survey, and Irrigation Water Use Analysis.

A. This section,14.27.040.020, shall apply to all existing landscapes that were installed before December 1, 2015 and are over one acre in size.

1. For all landscapes in 14.27.040.020(A) that have a water meter, the City of Vacaville shall administer programs that may include, but not be limited to, irrigation water use analyses, irrigation surveys, and irrigation audits to evaluate water use and provide recommendations as necessary to reduce landscape water use to a level that does not exceed the Maximum Applied Water Allowance for existing landscapes. The Maximum Applied Water Allowance for existing landscapes shall be calculated as: MAWA = (0.8) (ETo)(LA)(0.62).

2. For all landscapes in 14.040.020(A) that do not have a meter, the City of Vacaville shall administer programs that may include, but not be limited to, irrigation surveys and irrigation audits to evaluate water use and provide recommendations as necessary in order to prevent water waste.

B. All landscape irrigation audits shall be conducted by a certified landscape irrigation auditor.

14.27.040.030 Water Waste Prevention.

Refer to Chapter 13.20 for required water conservation measures..

Chapter 14.27.050
Effective Precipitation

14.27.050.010 Effective Precipitation.

The City of Vacaville may consider Effective Precipitation (25% of annual precipitation) in tracking water use and may use the following equation to calculate Maximum Applied Water Allowance: MAWA= (ETo -Eppt) (0.62) [(0.55 x LA) + (0.45 x SLA)] for residential areas, MAWA= (ETo -Eppt) (0.62) [(0.45 x LA) + (0.55 x SLA)] for non-residential areas.

Chapter 14.27.060
Reporting

14.27.060.010 Reporting.

The Director shall report to the California Department of Water Resources by January 31st of each year following the requirements of California Code of Regulations Title 23, Division 2, Chapter 2.7, section 495.

Chapter 14.27.070
Prescriptive Compliance Option

14.27.070.010 Prescriptive Compliance Option

A. This chapter contains prescriptive requirements which may be used as a compliance option to the Model Water Efficient Landscape Ordinance.

B. Compliance with the following items is mandatory and must be documented on a landscape plan in order to use the prescriptive compliance option:

1. Submit a Landscape Documentation Package which includes the following elements:

a. date

b. project applicant

c. project address (if available, parcel and/or lot number(s))

d. total landscape area (square feet), including a breakdown of turf and plant material

e. project type (e.g., new, rehabilitated, public, private, cemetery, homeowner-installed)

f. water supply type (e.g., potable, recycled, well) and identify the local retail water purveyor if the applicant is not served by a private well

g. contact information for the project applicant and property owner

h. applicant signature and date.

2. Incorporate compost at a rate of at least four cubic yards per 1,000 square feet to a depth of six inches into landscape area (unless contra-indicated by a soil test);

3. Plant material shall comply with all of the following;

a. For residential areas, install climate adapted plants that require occasional, little or no summer water (average WUCOLS plant factor 0.3) for 75% of the plant area excluding

edibles and areas using recycled water; For non-residential areas, install climate adapted plants that require occasional, little or no summer water (average WUCOLS plant factor 0.3) for 100% of the plant area excluding edibles and areas using recycled water;

b. A minimum three inch (3") layer of mulch shall be applied on all exposed soil surfaces of planting areas except in turf areas, creeping or rooting groundcovers, or direct seeding applications where mulch is contraindicated.

4. Turf shall comply with all of the following:

a. Turf shall not exceed 25% of the landscape area in residential areas, and there shall be no turf in non-residential areas;

b. Turf shall not be planted on sloped areas which exceed 25%;

c. Turf is prohibited in parkways less than 10 feet wide, unless the parkway is adjacent to a parking strip and used to enter and exit vehicles. Any turf in parkways must be irrigated by subsurface irrigation or by other technology that creates no overspray or runoff.

5. Irrigation systems shall comply with the following:

a. Automatic irrigation controllers are required and must use evapotranspiration or soil moisture sensor data.

b. Irrigation controllers shall be of a type which does not lose programming date in the event the primary power source is interrupted.

c. Pressure regulators shall be installed on the irrigation system to ensure the dynamic pressure of the system is within the manufacturers recommended pressure range.

d. Manual shut-off valves (such as a gate valve, ball valve, or butterfly valve) shall be installed as close as possible to the point of connection of the water supply.

e. All irrigation emission devices must meet the requirements set in the ANSI standard, ASABE/ICC 802-2014. "Landscape Irrigation Sprinkler and Emitter Standard," All sprinkler heads installed in the landscape must document a distribution uniformity low quarter of 0.65 or higher using the protocol defined in ASABE/ICC 802-2014.

C. At the time of final inspection, the permit applicant must provide the owner of the property with a certificate of completion, certificate of installation, irrigation schedule and a schedule of landscape and irrigation maintenance.

Section 3. Severability.

If any section, subsection, phrase or clause of this ordinance is for any reason held to be unconstitutional, such decision shall not affect the validity of the remaining portions of this ordinance. The City Council hereby declares that it would have passed this ordinance and each section, subsection, phrase, or clause thereof irrespective of the fact that any one or more sections, subsections, phrases, or clauses be declared unconstitutional.

Section 4. Effective Date.

This ordinance shall take effect December 1, 2015.

Section 5. Publication.

This ordinance shall be published in accordance with the provisions of Government Code section 36933.

I HEREBY CERTIFY that this ordinance was introduced at a regular meeting of the City Council of the City of Vacaville, held on the 13th day of October, 2015, and **ADOPTED AND PASSED** at a regular meeting of the City Council of the City of Vacaville held on the 27th day of October, 2015 by the following vote:

AYES: Council members Mashburn and Rowlett, and Mayor Augustine

NOES: None

ABSENT: Councilmember Harris, Vice-Mayor Hunt

ATTEST:

Michelle Thornbrugh, City Clerk

Dated: Oct. 29, 2015

APPROVED:

Leonard J. Augustine, Mayor

APPENDIX K

2015 DRINKING WATER QUALITY CONSUMER CONFIDENCE REPORT

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2014 CITY OF VACAVILLE

Water Quality Report to Consumers

Este in orme contiene in ormaci n muy importante so re su a ua pota le Tra calo o a le con alguien ue lo entien a ien

The City of Vacaville (City) wants you, our customers, to know that your water system has met all water quality standards and is a safe and reliable drinking water supply. These standards are established by the U.S. Environmental Protection Agency (USEPA) and the California State Water Resources Control Board (State Board). In 2014 the City distributed over 5 billion gallons of drinking water. This water was subjected to extensive testing, not only for regulated contaminants, but for many non-regulated chemical properties as well. More than 4,000 analyses were performed on drinking water samples in 2014.

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants doesn't 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 (800) 426-4791. If you have further questions, please contact the Water Quality Laboratory Supervisor, Mindy Boele, by phone at (707) 469-6400 or by email at mindy.boele@cityofvacaville.com.

SOURCES OF WATER AND CONTAMINANTS:

The sources of drinking water (both tap and bottled) 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 11 deep groundwater wells. Lake Berryessa surface water, conveyed through Putah South Canal (PSC), provided 57% of the City's total consumption of water in 2014, and Sacramento Delta surface water, from the North Bay Aqueduct (NBA), provided an additional 9%. Groundwater from the 11 deep wells made up the balance (34%) of our water needs. Treatment of the surface water is divided between the Vacaville Water Treatment Plant (VWTP) and the North Bay Regional Water Treatment Plant (NBR). 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 water.

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 storm-water 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 storm-water 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 storm-water runoff, agricultural application, and septic systems.
- Radioactive contaminants that can be naturally-occurring or be the result of oil and gas production and mining activities.

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

KEEP THE LEAD OUT OF DRINKING WATER

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 is responsible for providing high quality drinking water but can not always 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 or at http://www.epa.gov/safewater/lead.

HEALTH RELATED INFORMATION:

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons 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 (CDC) guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the USEPA's Safe Drinking Water Hotline (1-800-426-4791).

ARSENIC IN DRINKING WATER: Vacaville Meets the Limit

While your drinking water meets the federal and state standard for arsenic, it does contain low levels of arsenic. The arsenic 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 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 Summary report for the Sacramento Delta, including the North Bay Aqueduct (NBA), was updated in 2012. The source was considered to be most vulnerable to animal grazing activities, urban and agricultural runoff, recreational use and seawater intrusion.

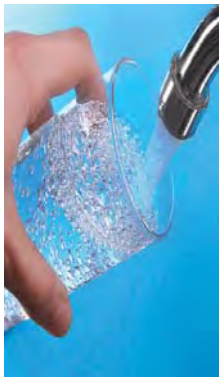
The Solano County cities treating NBA water, in conjunction with the Solano County Water Agency, have implemented watershed management practices to improve water quality and reduce the significance of the potential contaminant sources. The latest Summary report for Putah South Canal (PSC) was completed in 2012. 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.

The 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, agricultural wells and irrigation wells. The wells offer various levels of protection from PCAs due to factors such as the aquifer, deep water table intakes, well construction features and physical barriers. A copy of the Source Water Assessments and Vulnerability Summaries can be obtained through the SWRCB, Division of Drinking Water (DDW), 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 Bob Brownwood, District Engineer, DDW, at (510) 620-3474.

Lake Berryessa "glory hole"

HEXAVALENT CHROMIUM IN DRINKING WATER

Chromium is a metallic chemical that occurs naturally in some of Vacaville's deep water aquifers, but can also enter drinking water sources through discharges of dye and paint pigments, wood preservatives, chrome plating, and leaching from hazardous waste sites. Chromium may be present in drinking water sources in two forms: trivalent chromium (chromium 3) and hexavalent chromium (chromium 6). Chromium 3 is found naturally in foods at low levels and is an essential human dietary nutrient. Chromium 6 is the toxic form of chromium, and has been found to cause cancer in humans when inhaled. The hazards of airborne chromium 6 in the workplace environment have been extensively documented yet there continues to be debate in the scientific community whether or not chromium 6 can cause cancer when ingested at levels found in drinking water. To be on the safe side of regulations, CA State Board has lowered the accepted level of Chromium 6 in drinking water to 10 parts per billion (ppb), whereas the USEPA limit is 100 ppb. Some of the City's source water wells have levels over 10 ppb and we are currently working with Division of Drinking Water (DDW) staff to investigate options to reduce the level of chromium 6 served to the residents of Vacaville.



Where your water comes from. Map is not to scale, but gives you a relative idea of the location of water sources for the City of Vacaville.

PROTECT YOUR WATER SUPPLY

Polluted storm water 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, health care 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 supply. Never dispose of household, landscaping, health care or automotive products that contain toxic chemicals down the storm drain or in the sewer.

The following tables list all the drinking water contaminants that were detected during the most recent sampling for the constituents. To read the tables, start with the far left column titled Constituent and read across the row. Units express the amount measured. MCL shows the highest amount of the substance allowed. PHG (MCLG) is the goal amount for that substance, which may be a lower amount than the amount allowed. The Range reports the lowest and highest amounts detected and the Average is the annual average. Contaminant Sources describe where the substance usually originates. To better understand the report, use the Legend that defines the terms used.

Table 1- SAMPLING RESULTS SHOWING THE DETECTION OF COLIFORM BACTERIA

Microbiological Contaminant	Highest No. of Detections	No. of Months in Violation	MCL	MCLG	Contaminant Sources
Total Coliform Bacteria	0	0	5% (1353 samples collected in 2014)	0	Naturally present in the environment.
Fecal Coliform Bacteria	0	0	A routine sample and a repeat sample detect for total coliform and either sample also detects for fecal coliform.	0	Human and animal fecal waste.

Table 2 - SAMPLING RESULTS SHOWING THE DETECTION OF LEAD AND COPPER

Constituent (reporting units)	No of samples (collected in 2014)	90th Percentile Detected	No. Sites exceeding AL	AL	PHG	Contaminant Sources
Lead (ppb) [a]	36	2.5	0	15	0.2	Internal corrosion of household water plumbing systems; discharges from industrial manufacturers; erosion of natural deposits.
Copper (ppm)[a]	36	0.2	0	1.3	0.3	Internal corrosion of household water plumbing systems; erosion of natural deposits; leaching from wood preservatives.

Table 3 - SAMPLING RESULTS FOR SODIUM AND HARDNESS [b]

Constituent (reporting units)	Sample date	GROUNDWATER		SURFACE WATER TREATED AT NBR		SURFACE WATER TREATED AT VWTP		Contaminant Sources
		Range	Average	Range	Average	Range	Average	
Hardness (ppm)	2014	71 - 310	149	123 - 187	167	170	170	Sum of polyvalent cations present in the water, generally magnesium and calcium, and are usually naturally occurring.
Sodium (ppm)	2014	39 - 75	55	12 - 34	19	14	14	Salt present in the water and is generally naturally occurring.

Table 4 - DETECTION OF CONTAMINANTS WITH A PRIMARY DRINKING WATER STANDARD

Constituent (reporting units)	MCL	PHG (MCLG)	GROUNDWATER		SURFACE WATER TREATED AT NBR		SURFACE WATER TREATED AT VWTP		Contaminant Sources
			Range	Average	Range	Average	Range	Average	
Aluminum (ppb)	1000	600	nd	nd	nd - 66	37	nd	nd	Erosion of natural deposits; residue from some surface water treatment processes.
Arsenic (ppb)	10	0.004	nd - 6.3	1.6	nd - 2.7	1.2	nd	nd	Erosion of natural deposits; runoff from orchards; glass and electronics production wastes.
Barium (ppm)	1	2	0.07 - 0.14	0.1	0.04 - 0.05	0.04	nd	nd	Discharges of oil drilling wastes and from metal refineries; erosion of natural deposits.
Chromium (ppb)	50	(100)	nd - 23	12	nd - 1.1	0.3	nd	nd	Discharge from steel and pulp mills and chrome plating; erosion of natural deposits.
Fluoride (ppm)[d]	2	1	System wide monthly average = 0.82, minumum = 0.70, maximum = 0.98						Erosion of natural deposits; water additive that promotes strong teeth.
Nickel (ppb)	100	12	nd	nd	nd	nd	nd	nd	Erosion of natural deposits; discharge from metal
Nitrate as NO3 (ppm)	45	45	1.9 - 16	6.8	nd - 4.4	1.5	nd	nd	Runoff and leaching from fertilizer use; leaching from septic tanks and sewage; erosion of natural deposits.
Gross Beta Activity (pCi/L)	50	0	nd - 5.0[c]	nd[c]	nd[c]	nd[c]	nd[c]	nd[c]	Decay of natural and man-made deposits.
Uranium (pCi/L)	20	0.43	1.1 - 3.2[c]	1.7[c]	nd[c]	nd[c]	nd[c]	nd[c]	Erosion of natural deposits.

Table 5 - DETECTION OF CONTAMINANTS WITH A SECONDARY DRINKING WATER STANDARD [e]

Constituent (reporting units)	MCL	GROUNDWATER		SURFACE WATER TREATED AT NBR		SURFACE WATER TREATED AT VWTP		Contaminant Sources
		Range	Average	Range	Average	Range	Average	
Aluminum (ppb)	200	nd	nd	nd - 66	37	nd	nd	Erosion of natural deposits; residue from some surface water treatment processes.
Color (units)	15	nd -5	2	nd	nd	nd	nd	Naturally-occurring organic materials.
Iron (ppb)	300	nd	nd	nd	nd	nd	nd	Leaching from natural deposits; industrial wastes.
Manganese (ppb)	50	nd	nd	nd	nd	nd	nd	Leaching from natural deposits.
Odor- Threshold (units)	3	nd	nd	1.4	1.4	1	1	Naturally-occurring organic materials.
Silver (ppb)	100	nd	nd	nd	nd	nd	nd	Industrial discharges.
Turbidty (units)[f]	5	nd - 0.25	0.01	0.04 - 0.08	0.06	0.34	0.34	Soil runoff.
Total Dissolved Solids (ppm)	1000	290 - 540	350	184 - 222	204	210	210	Runoff/leaching from natural deposits.
Specific Conductance (uS/cm)	1600	440 - 800	531	358 - 382	372	380	380	Substances that form ions when in water; seawater influence.
Chloride (ppm)	500	7.9 - 35	15.1	10 - 15	12	10	10	Runoff/leaching from natural deposits; seawater influence.
Sulfate (ppm)	500	27 - 71	40	14 - 73	36	21	21	Runoff/leaching from natural deposits; seawater influence.

Table 6 - DETECTION OF UNREGULATED CONTAMINANTS (UCMR3)

Constituent (reporting units)	NL	PHG (MCLG)	Source Water		Distribution System Water		
			Range	Average	Range	Average	
Chlorate (ppb)	800	na	27 - 370	157	77 - 330	133	Unregulated contaminant monitoring helps the EPA and the State determine where certain contaminants occur and whether the contaminants need to be regulated. **Chromium is a regulated primary drinking water standard which has also been included in the UCMR3 data gathering program.
Chromium (ppb) **	50	(100)	nd - 21	9.2	2.6 - 17	10.8	
Hexavalent Chromium (ppb)	na	0.020	0.1 - 19	8	2.2 - 16	10.1	
Molybdenum (ppb)	na	na	nd - 1.7	0.5	nd - 2.1	1.1	
Strontium (ppb)	na	na	180 - 600	427	260 - 530	375	
Vanadium (ppb)	50	na	2.8 - 24	13	5.7 -23	15.4	

Table 7 - DETECTION OF DISINFECTION BYPRODUCTS

(reporting units)	MCL	(MCLG)	Range	Average	Violations	Contaminant Sources
Total Trihalomethanes (ppb)	80	na	3.3 - 49	29	0	By-product of drinking water disinfection.
Halo-Acetic Acids (ppb)	60	na	nd - 24	10	0	By-product of drinking water disinfection.
(reporting units)	MRDL	MRDLG	Average	Minimum	Maximum	Contaminant Sources
DBP Precursors/TOC (ppm)	tt	-	2.5	1.9	2.9	Various natural and man made sources.
Chlorine (ppm)	4	4	0.74	0.02	1.43	By-product of drinking water disinfection.

FOOTNOTES:

(a) This is the state action level for samples collected inside homes. 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 August 2014.

(b) There are no Drinking water standards (MCLs, PHGs or MCLGs) for these constituents, they are just reported for customer information. To convert hardness data from ppm to grains per gallon, divide by 17.

(c) Results from last samples collected in 2011.

(d) Not possible to differentiate water source. The City of Vacaville treats the water by adding fluoride to the naturally occuring level to help prevent dental caries in consumers. The fluoride levels in the treated water are maintained within the range of 0.7 - 1.3 ppm, as required by the California Department of Public Health regulations.

(e) There are no PHGs, MCLGs or mandatory standard health effects language for these constituents because secondary MCLs are set on the basis of aesthetics.

(f) Turbidity is a measure of the cloudiness of the water. We monitor it because it is a good indicator of water quality. High turbidity can hinder the effectiveness of disinfectants.

LEGEN

MCL (Maximum Contaminant Level): 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. **Secon ary MCLs** are set to protect the odor, taste, and appearance of drinking water.

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

P G (Public Health Goal): The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the Cal EPA.

MR L (Maximum Residual Disinfectant Level): 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.

MR LG (Maximum Residual Disinfectant Level Goal): 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.

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

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

na Not applicable or Not available.

n Not Detected.

ntu Nephelometric Turbidity Units. This is the standard unit for turbidity.

pCi L Pico Curies per Liter.

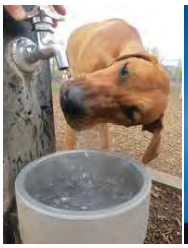
uS cm: unit of measure for conductance.

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

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

City of Vacaville Water Treatment Plant

McMurtry Reservoir



WATER CONSERVATION EFFORTS

The State of California has entered a fourth consecutive year of low rainfall totals, leading Governor Brown to declare a series of drought emergency regulations. Although the City of Vacaville benefits from multiple sources of potable water, we are requesting that everyone do their part to conserve water. So far, Vacaville residents have reduced their use of water by an average of 15 percent from 2013. If you go to The City's Water Conservation webpage, you will find the latest information regarding the Emergency Drought Regulations issued by the state and how it may impact you; the City's current water use restrictions and enforcement policies; how to determine your water usage; how to report water waste or other concerns to the City; and a variety of water savings tips on how you can save water in your home with links to other sites and resources. The link to that page is: http://www.cityofvacaville.com/savingwater

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, 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, 469-6578, 449-5162 (TTY), or Shannon.Nelson@cityofvacaville.com.