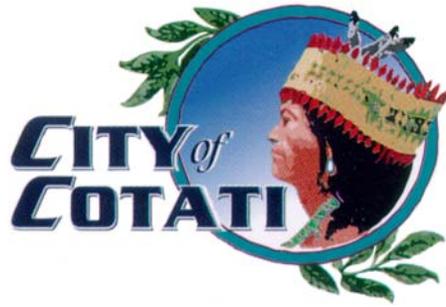


Appendix 4.14 Water Supply Assessment



Downtown Specific Plan Water Supply Assessment

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February 2008

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Section 1.0 Introduction

This Water Supply Assessment (WSA) is prepared for the Downtown Specific Plan as required by Senate Bill 610 (SB 610), which can be found in Part 2.10, Division 6 of the California Water Code enacted in 2001. As the water purveyor for the Project, the City of Cotati (City) is responsible for the preparation of a WSA for the Downtown Specific Plan. Although the City has an adopted Urban Water Management Plan (UWMP), due to recent changes in the citywide water demand projections, this WSA will update information from the UWMP.

In addition to SB 610 requirements, this WSA is prepared to assist the City in its water supply planning efforts and to ensure that the Project is consistent with appropriate sections of other water planning documents that have been prepared, namely:

- Cotati Groundwater Supply Assessment, prepared by Luhdorff & Scalmanini Consulting Engineers (LSCE), dated January 2008 (“City GSA”)¹;
- Cotati 2006 Urban Water Management Plan, prepared by Winzler & Kelly, dated November 2006 (“City UWMP”)²; and
- Sonoma County Water Agency 2005 Urban Water Management Plan, prepared by Brown & Caldwell, dated December 2006 (“SCWA UWMP”)³.

1.1 Structure of the WSA Report

This Report is organized into eight sections, as outlined below:

- Introduction;
- Summary of the Project, as proposed;
- Service area description and population projections;
- Reliability of water supply;
- Citywide water demands, including projected water demands through year 2027;
- Sufficiency analysis, which includes comparisons of water supply and demands for a normal, single-dry, and multiple-dry years; and

¹ See Appendix A.

² See link at www.ca.cotati.ca.us

³ See link at the following address: http://www.scwa.ca.gov/_pdf/2005_uwmp_report.pdf

- Water resources strategy for the City, summarizing when the various supply sources are used and how demand management is used to provide sufficiency of supply.

Section 2.0 Project Summary

In general, the Downtown Specific Plan (“Project”), as proposed, includes the City’s downtown area located mainly along the Old Redwood Highway Corridor. It is an area that covers 59.5 acres along Old Redwood Highway from Commerce Avenue on the northern end to Page Street on the southern end. The Project consists of approximately 455 additional residential units and approximately 315,000 square feet of new commercial space. A more accurate and detailed description can be obtained from the document entitled *Downtown Specific Plan DRAFT*, prepared by Moule & Polyzoides Architects and Urbanists and Crawford Multari & Clark Associates, 2007.

Section 3.0 Service Area Description

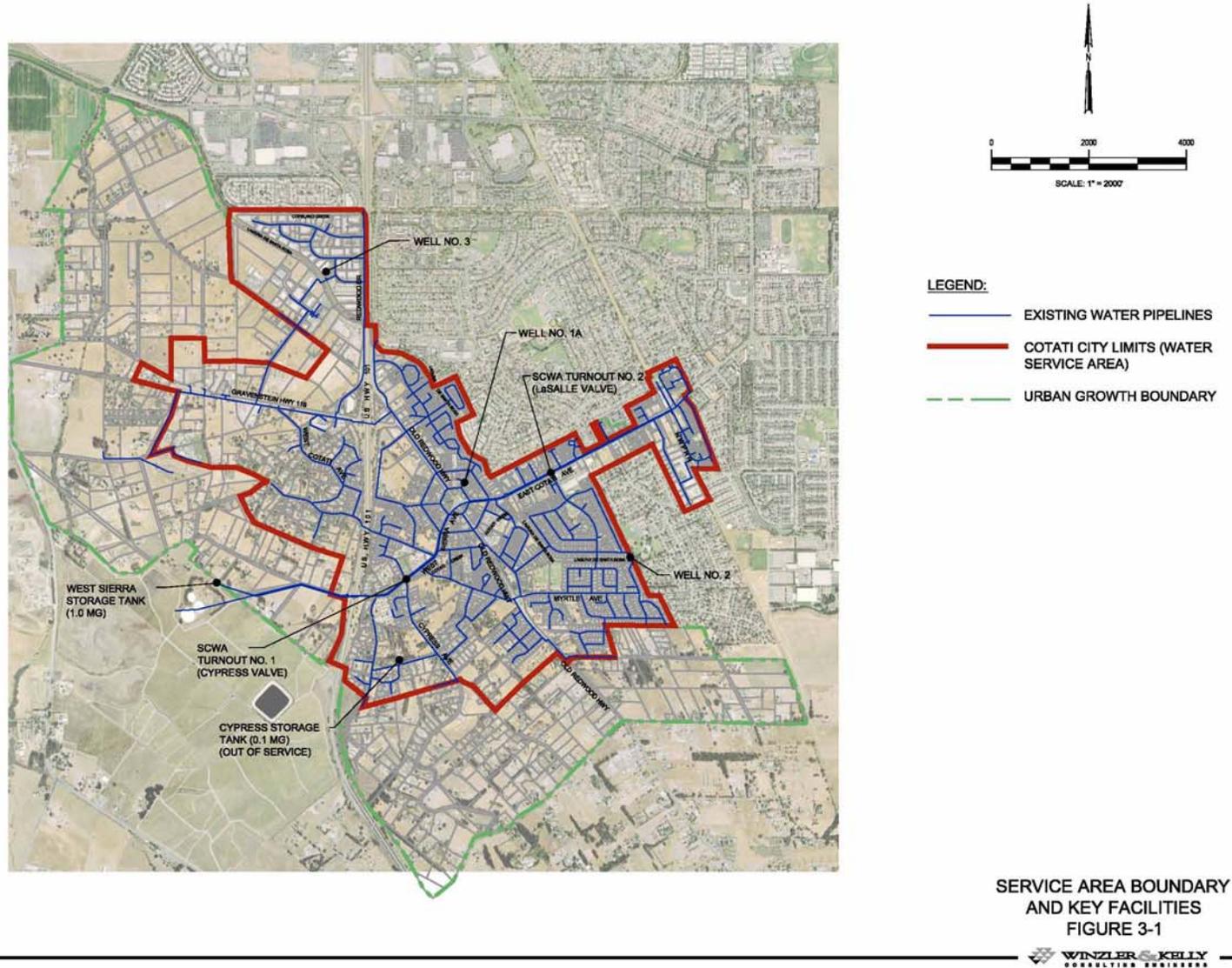
The City owns and operates a water supply and distribution system that currently provides water service to approximately 1,200 acres (1.8 square miles) within the City limits. The City's water service area is generally consistent with the City limit boundaries.

3.1 Water System Description

The water system is comprised of three groundwater wells, two turnouts from the Sonoma County Water Agency (SCWA), two storage facilities, and approximately 150,000 lineal feet of distribution piping ranging in size from 2-inch to 24-inch pipes. The existing water distribution system consists of a single pressure zone with an approximate hydraulic grade line elevation ranging from 288 to 294 feet. See Figure 3-1 for the service area boundary and general water system information.

Figure 3-1 – Service Area Boundary and Key Facilities

J:\02077 - Cotati\02077 06 001 Well No. 1A, Redwood Tank\CAD\Service Area & Facilities.dwg Nov 15, 2006 - 11:31am



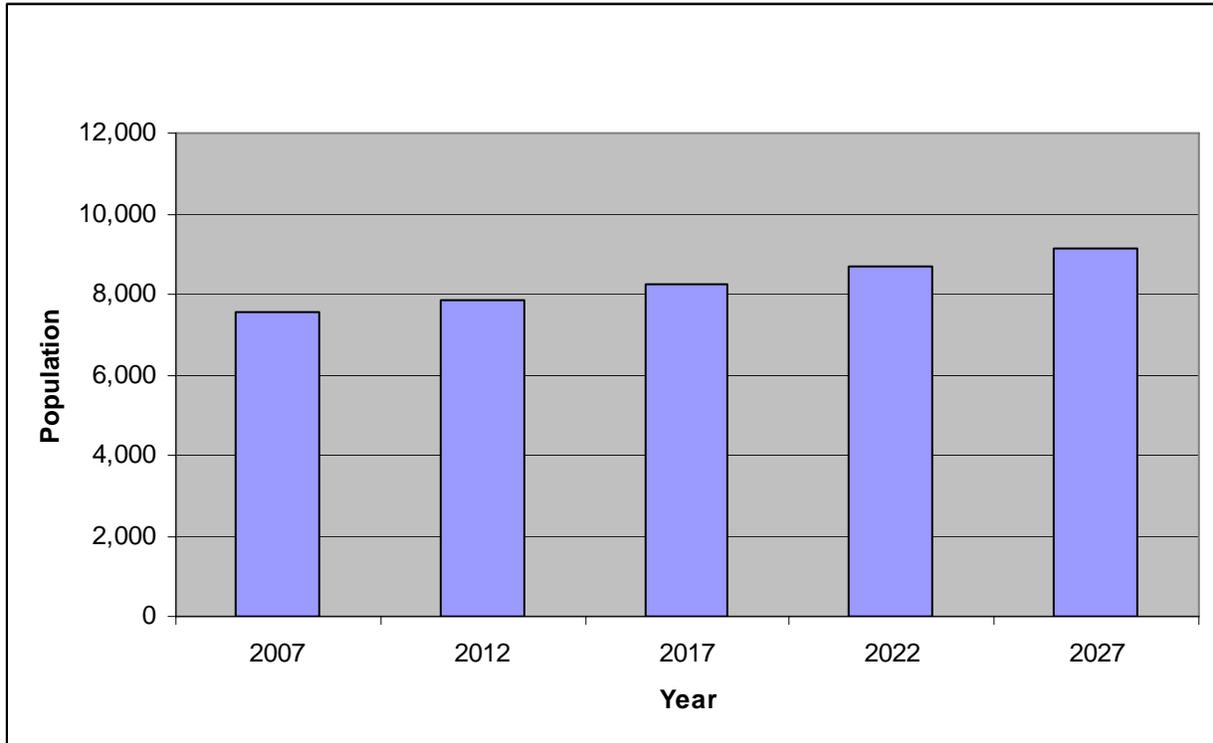
3.2 Population Projections

Citywide Projections

The City UWMP used the 2005 Association of Bay Area Governments (ABAG) population projections. However, it has since been determined that the 2005 ABAG projections were erroneous and unfortunately were not corrected in time for the City UWMP preparation. The City's 1998 General Plan Update projects population through year 2010, which is not an adequate horizon year for purposes of this WSA. The City intends to update its 1998 General Plan, but the new General Plan Update will not be completed until 2010. For this reason, the City Planning Department has revised the population projections to be more in line with historic population increases. Therefore, the City's Planning Department projection will be used for this WSA (see Appendix B).

The City currently has approximately 7,600 residents and is projected to have approximately 9,100 residents by the year 2027. This represents a slower rate of growth than what had been projected in the 1998 General Plan. The 1998 General Plan projected a population of 8,097 within the City limits by the year 2010.

**Figure 3-2
 Citywide Population – Existing and Projected to 2027**



**Table 3-1
 Population – Existing and Projected to 2027 within City Limits**

Year	2007 ^(a)	2012	2017	2022	2027
Population ^(b)	7,535	7,866	8,268	8,689	9,132

Notes: ^(a) Reference: State of California, Department of Finance, E-5 Population and Housing Estimates for Cities, Counties, and the State, 2001-2007, with 2000 Benchmark. Sacramento, California, May 2007.

^(b) Reference: Population projection spreadsheet for years 2012 through 2027 (See Appendix B).

Project Area Population versus Citywide Population

The projected population for the Project area is shown in Table 3-2. The buildout of the Project is estimated to occur in year 2025. This buildout assumption is used in the population projection for the Project in Table 3-2.

The table also shows a comparison of citywide and the Project population projections used in this WSA.

Table 3-2
Population – Existing and Projected to 2027 within City Limits

Population ^(a)	2007	2012	2017	2022	2027
Project Area	190	310	610	910	1,090
Rest of City ^(a)	7,345	7,566	7,658	7,779	8,042
Citywide ^(b)	7,535	7,866	8,268	8,689	9,132

Notes: ^(a) “Rest of City” refers to citywide population excluding the Project area. Population figures shown include “additional” population generated by the proposed Project (reference: Personal conversation with Marsha Sue Lustig, City Senior Planner, October 2007). Existing and projected population within the Project Area are based on data from water service records.

^(b) Reference: Population spreadsheet (see Appendix B).

Section 4.0 Water Supplies and Sources

The City's main water supply is water that it purchases from the SCWA. The SCWA water supply is comprised mainly of surface water supply from the Russian River and groundwater from three SCWA wells located in the Santa Rosa Plain. In addition to the primary SCWA water supply, the City uses local groundwater supply from three municipal well sites located within City limits.

Prior to 1992, the City used groundwater to supply more than half of its demands. After 2002, the City's water strategy has been to supply its demands by use of its SCWA water supply and to use its local groundwater supplies to supplement its needs during peak periods and also during periods of drought and other water shortages. Most recently (July 1 through October 28, 2007), the City increased its groundwater supply as requested by the SCWA to reduce reliance on the Russian River water source in an effort to increase storage levels in Lake Mendocino.

Lastly, the City plans to use recycled water from the Santa Rosa Subregional System.¹ In March 2007, the City completed its *Recycled Water Feasibility Study*. The study examined potential recycled water use within City limits from recycled water delivered by the Santa Rosa Subregional System. Summary information regarding the City's recycled water use potential can be found in Section 10 of the City UWMP.

4.1 Current and Planned Water Supplies

The following table summarizes the City's available current water supply as well as future (planned) water supplies during normal water years through year 2027.

¹ The City of Cotati's wastewater flow is collected and conveyed to the Santa Rosa Subregional Treatment Plant.

**Table 4-1
Current and Planned Water Supplies (AFY)**

Water Supply Sources	2007	2012	2017	2022	2027
SCWA water supply ^(a)	1,520	1,520	1,520	1,520	1,520
Groundwater (City wells) ^(b)	412	412	412	412	412
Recycled water ^(c)	0	0	0	0	70
Total	1,932	1,932	1,932	1,932	2,002

Notes: ^(a) Based on the City's maximum annual entitlement provided in the *Restructured Water Supply Agreement* with the SCWA and other water contractors.
^(b) Maximum pump capacity, based on a cumulative duty cycle of 50% of maximum well capacity, is 1,090 AFY (0.97 mgd). However, City plans to limit its average future municipal pumpage to the historical average of 412 AFY (0.37 mgd)
^(c) Maximum Delivery amount based on the potential recycled water use starting in 2027.

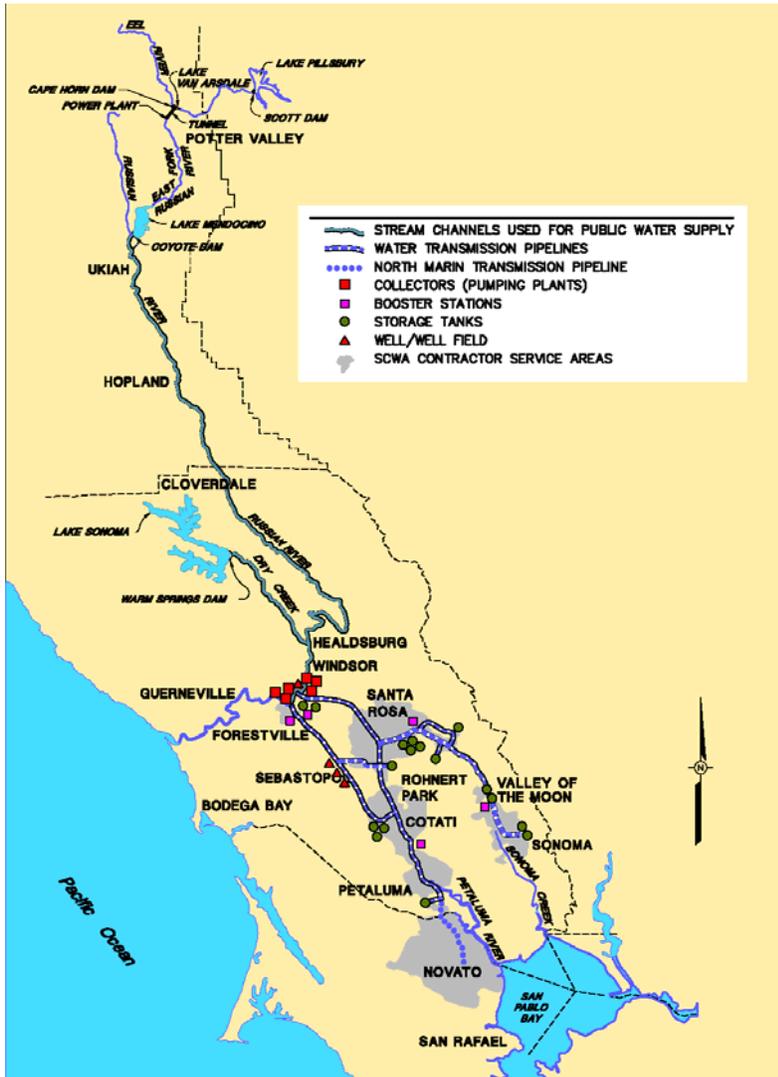
4.2 SCWA Water Supply

The SCWA owns and operates diversion facilities on the Russian River in the Rio Nido/Wohler Bridge area. Using the natural channel of Dry Creek and the Russian River, SCWA diverts water from the river near Wohler Bridge via six Ranney Collectors (large diameter shallow wells about 90 feet deep relative to the stream bed).¹ A system of aqueducts, booster pumps, and tanks then distribute the water to the City and various major water contractors and a handful of other SCWA customers located to the south of the Russian River in Sonoma and Marin counties. The SCWA also owns and operates three groundwater wells located in the Santa Rosa Plain Subbasin. The Russian River surface water supply in conjunction with the SCWA wells, make up the “SCWA water supply.” A map showing the SCWA water transmission system is shown in Figure 4-1.

A detailed description of the SCWA water supply and the terms of the allocation of water to the City and other water contractors can be found in Section 4 of the City UWMP.

¹ In 2005, the SCWA added Collector 6 and that collector is currently in operation.

Figure 4-1 – The Russian River Water System



4.3 Groundwater Supply

The City operates three groundwater wells and the locations of the wells are shown in Figure 3-1 in the previous section. A groundwater supply assessment was conducted as part of the City UWMP. Subsequent to that report, an updated assessment has been prepared entitled *Groundwater Supply Assessment, City of Cotati, LSCE, 2008* and is included in Appendix A (“City GSA”).

Based on the City GSA, the City plans to limit its average future municipal pumpage to the historical average of 412 acre-feet per year (AFY). This would be accomplished by conjunctive

use of groundwater and surface water resources, whereby the City would reduce pumpage and rely more on SCWA water deliveries during normal and wet water years and increase pumpage during dry years. The City's pumpage would increase to a maximum of 530 AFY during single-dry or multiple-dry water years to make up for potential cutbacks to surface water deliveries. The City plans to use its existing water supply wells to provide its future groundwater supplies; no new wells are planned.

4.4 Recycled Water

The City's plan to use recycled water from the Subregional System is evaluated in the document entitled *Recycled Water Feasibility Study*, Winzler & Kelly, 2007. The study identified a potential market demand for recycled water and also looked at potential costs for supplying that demand. The City UWMP identified a recycled water supply of 33 AFY by year 2030. This amount was a "placeholder" because the *Recycled Water Feasibility Study*, although ongoing, was not yet completed at the time the City UWMP was prepared and finalized.

The *Recycled Water Feasibility Study* developed six alternative recycled water projects ranging from a potential demand of 13 AFY to 132 AFY. More than one alternative project could be selected in the future with a maximum potential demand and potable water offset of almost 400 AFY of recycled water for all six projects combined. Because of the costs, it would not be feasible to implement all six projects. It would, however, be feasible to do two projects (Alternative 1 and Alternative 5) for a total of 115 AFY recycled water demand. At this time, the City is still developing its recycled water project implementation plan. The plan is to have recycled water projects on line by year 2027 that would deliver up to 70 AFY to the City's water customers.

The City has not received this water supply before, and under the requirements of SB 610, this WSA needs to identify other public water systems or water service contractors that received recycled water from the Subregional System. Currently, the City of Rohnert Park receives approximately 1,300 acre-feet of recycled water per year from the Subregional System.

Section 5.0 Reliability of Supply

The City UWMP included an analysis of the reliability of its water supply. The report included an analysis of the City's water supply under normal, single-dry and multiple-dry water years. The table that follows shows supply reliability through year 2027 under the hydrologic water conditions as required for this WSA. Because of the uncertainties associated with SCWA's ability to increase its Russian River diversions, this WSA analyzes two different, but possible, scenarios that could affect the City's water supply.

Scenario A is the case where the SCWA is able to increase its Russian River water diversion from 75,000 AFY to 101,000 AFY. Scenario B is the case where the SCWA is not successful in this increase and the current diversion of 75,000 AFY is the total amount available for the City and the other water contractors.

5.1 Scenario A

Scenario A assumes that the SCWA is able to increase its Russian River water diversion from 75,000 AFY to 101,000 AFY. This is the scenario, or plan included in the SCWA UWMP and is the subject of the SCWA's *Water Project Environmental Impact Report* scheduled for public release in 2008. In the SCWA UWMP, there is 100% reliability for water delivery during normal and multiple-dry water years. According to the SCWA UWMP, for a single-dry water year, there is an 85 percent reliability. The water supply amounts, showing these reliability figures, are shown in Table 5-1.

The groundwater and recycled water supply amounts are discussed in Section 4. The recycled water supply is estimated to be reduced by 10 percent (or 90 percent reliability) as a result of water conservation being implemented.

**Table 5-1
Scenario A Year 2027 Supply Reliability (AFY)**

Water Supply	Normal Year	Single-Dry Year	Multiple-Dry Water Years			
			Year 1	Year 2	Year 3	Year 4
SCWA Supply ^(a)	1,520	1,292	1,520	1,520	1,520	1,520
Groundwater (City wells)	412	530	530	530	530	530
Recycled water	70	63	63	63	63	63
Total (of above)	2,002	1,885	2,113	2,113	2,113	2,113
Percent of Normal ^(b)	100%	94%	100%	100%	100%	100%

Notes: ^(a) Based on 85% reliability for single-dry year and 100% reliability for multiple dry-years stated in the SCWA UWMP.

^(b) Maximum percent is limited to 100% of normal.

**Table 5-2
Scenario A Normal Water Year Supply (AFY)**

	2012	2017	2022	2027
SCWA water supply (100%) ^(a)	1,520	1,520	1,520	1,520
City wells	412	412	412	412
Recycled water	0	0	0	70
Total	1,932	1,932	1,932	2,002

Notes: ^(a) 100% of normal water year supply from the SCWA 2005 UWMP.

**Table 5-3
Scenario A Single-Dry Water Year Supply (AFY)**

	2012	2017	2022	2027
SCWA water supply (85%) ^(a)	1,292	1,292	1,292	1,292
City wells	530	530	530	530
Recycled water (90%) ^(b)	0	0	0	63
Total	1,822	1,822	1,822	1,885

Notes: ^(a) 85% refers to 85% of a normal water supply as shown in the SCWA 2005 UWMP.

^(b) 90% of normal water year supply as a result of increased water conservation.

**Table 5-4
Scenario A Multiple-Dry Water Year Supply (AFY)**

	2012	2017	2022	2027
SCWA water supply (100%) ^(a)	1,520	1,520	1,520	1,520
City wells	530	530	530	530
Recycled water (90%) ^(b)	0	0	0	63
Total	2,050	2,050	2,050	2,113

Notes: ^(a) 100% of normal water year supply from the SCWA UWMP.

^(b) 90% of normal water year supply as a result of increased water conservation.

5.2 Scenario B

Scenario B, on the other hand, is based on a “worst case scenario” that the SCWA is not able to increase its Russian River water diversion permit to 101,000 AFY. Consequently, Scenario B assumes the maximum Russian River diversion remains at the currently permitted amount of 75,000 AFY.¹ The result would be that the City’s annual water entitlement could be reduced by 25% from 1,520 AFY to 1,140 AFY. In the SCWA UWMP, there is 100% reliability for water delivery during normal and multiple-dry water years. According to the SCWA UWMP, for a single-dry water year, there is an 85 percent reliability. The water supply amounts for Scenario B, using an annual entitlement of 1,140 AFY instead of 1,520 AFY and using the reliability figures developed in the SCWA UWMP, are shown in Table 5-5.

The groundwater and recycled water supply amounts are discussed in Section 4. The recycled water supply is estimated to be reduced by 10 percent (or 90 percent reliability) as a result of water conservation being implemented.

¹ Another water supply option is the construction of a “Dry Creek Pipeline” to obtain water from Lake Sonoma to make up the difference for not receiving an increase in Russian River diversion. This option is currently being studied by the SCWA.

**Table 5-5
Scenario B Year 2027 Supply Reliability (AFY)**

Water Supply	Normal Year	Single-Dry Year	Multiple-Dry Water Years			
			Year 1	Year 2	Year 3	Year 4
SCWA Supply ^(a)	1,140	969	1,140	1,140	1,140	1,140
Groundwater (City wells)	412	530	530	530	530	530
Recycled water	100	90	90	90	90	90
Total (of above)	1,622	1,562	1,733	1,733	1,733	1,733
Percent of Normal ^(b)	100%	96%	100%	100%	100%	100%

Notes: ^(a) Based on 85% reliability for single-dry year and 100% reliability for multiple dry-years stated in the SCWA UWMP.

^(b) Maximum percent is limited to 100% of normal.

**Table 5-6
Scenario B Normal Water Year Supply (AFY)**

	2012	2017	2022	2027
SCWA water supply (100%) ^(a)	1,140	1,140	1,140	1,140
City wells	412	412	412	412
Recycled water	0	0	0	70
Total	1,552	1,552	1,552	1,622

Notes: ^(a) 100% of normal water year supply from the SCWA UWMP.

**Table 5-7
Scenario B Single-Dry Water Year Supply (AFY)**

	2012	2017	2022	2027
SCWA water supply (85%) ^(a)	969	969	969	969
City wells	530	530	530	530
Recycled water (90%) ^(b)	0	0	0	63
Total	1,499	1,499	1,499	1,562

Notes: ^(a) 85% refers to 85% of a normal water supply as shown in the SCWA 2005 UWMP.

^(b) 90% of normal water year supply as a result of increased water conservation.

**Table 5-8
Scenario B Multiple-Dry Water Year Supply (AFY)**

	2012	2017	2022	2027
SCWA water supply (100%) ^(a)	1,140	1,140	1,140	1,140
City wells	530	530	530	530
Recycled water (90%) ^(b)	0	0	0	63
Total	1,670	1,670	1,670	1,733

Notes: ^(a) 100% of normal water year supply from the SCWA 2005 UWMP.
^(b) 90% of normal water year supply as a result of increased water conservation.

Section 6.0 Water Demand

This section of the WSA uses information obtained from the City UWMP, updated population projections included in Section 2 of this WSA, as well as water demand projections for the Project. As described in Section 5 of this WSA, two water supply reliability scenarios (identified as Scenario A and Scenario B) were considered. Based on the two scenarios, water demand projections were modified to respond to the two different scenarios.

6.1 Methodology

Citywide Demand Projections

The basis of the water use projections are the City UWMP and the updated population projections provided in Section 2. The water contractors to the SCWA water supply used consistent methodology to develop water demand projections and the data were included for preparation of the SCWA UWMP.

Demand projections were developed using available demographic projections; for the City, the 2005 ABAG population projections were used. The year 2004 was used as the base year for the demand model. The year 2004 was selected because there were no unusual economic conditions or weather conditions that would skew the water use for the year. Data for the City's customers from the utility billing information was input to the demand model to project demand for future years. The demand model takes into consideration water conservation impacts for new and existing users due to plumbing code requirements.

The updated water demand projections used in this WSA were calculated by interpolating or extrapolating the projections developed in the City UWMP and the SCWA UWMP.

Project Demand Projections

This section describes the methodology for determining water demands for the Project. Demand projections for the Project were based on data from water billing records, parcel records, field data provided by Public Works staff and Project data from Crawford, Multari & Clark Associates

(the preparers of the Downtown Specific Plan EIR). The data were combined to create a master database to estimate water demand projections for each designated land use classification in the Project area. The data used to calculate the future water projections came primarily from the City’s water usage reports and information extracted from Sonoma County tax records.

Land Use Classifications

The land use classifications utilized in this WSA to calculate daily water demands are consistent with those used in the City UWMP.

Table 6-1, below, summarizes the land use categories created in the master database and for which demand factors have been calculated (subcategories are not defined). The table also provides a breakdown of the measurement units for each category.

**Table 6-1
Land Use Classification Categories**

Categorization	Units
Residential	
Single Family Residential (SFR)	Dwelling Units (DU)
Multi Family Residential (MFR)	Dwelling Units (DU)
Commercial	
Retail (RET)	Thousand Square Feet (TSF)
Office (OFF)	Thousand Square Feet (TSF)
Restaurant/Bar	Thousand Square Feet (TSF)
Other	
(RES) Parkland (PRK)	Acres (AC)

Estimating Daily Demand

The first step in estimating the Project area’s future water demand projections was to calculate the daily water demand per unit of measurement for each land use category. To calculate daily demand for each land use, the yearly average was calculated using the historic water usage data going back to 2004 (3 years). Once the yearly average for each land use category was calculated then the average daily consumption per land use (LU) unit was determined. The calculated

demand factors for each land use category were then used to calculate water demands for the buildout projected for the Project area.

6.2 Water Demand Projections

This section describes two water demand scenarios. Scenario A is the case where SCWA is able to increase its Russian River water diversion from 75,000 AFY to 101,000 AFY. Scenario B is the case where SCWA's currently permitted diversion of 75,000 AFY remains the amount available for the City and the other water contractors. See Section 5 of this WSA for a complete description of the reliability analysis summarized in the tables.

6.3 Scenario A Projections

In addition to the main premise of Scenario A (i.e., SCWA's permit is increased to 101,000 AFY), Scenario A also assumes the following water conservation measures are implemented by all existing and future water customers in the City's service area:

- Tier 1 Best Management Practices (BMPs) are implemented consistent with the City's Water Conservation Program. A complete listing and description of the 14 BMPs can be found in Sections 8.1 and 8.2 of the City UWMP.
- Tier 2 BMPs are developed and implemented consistent with Section 8.3 of the City UWMP.
- New development standards are implemented consistent with Section 8.3 of the City UWMP.

Water demand projections, for the Project are shown in Table 6-2. The row labeled "Additional water demand from Project" in the table is the difference between the existing demand and the Total Project water demand.

Table 6-2
Scenario A Water Use by Customer Type for Project (AFY)

	2007 ^(a)	2012	2017	2022	2027
Residential	15	15	24	33	42
Commercial retail	12	16	20	25	29
Commercial office	10	13	16	20	23
Commercial restaurant/bar	11	13	17	20	24
Parks and open space	1	2	3	3	3
Total Project water demand	49	59	80	101	121
Additional water demand from Project	-	10	31	52	72

Notes: ^(a) Based on 3-year average usage in the Project area.

Table 6-3 shows unaccounted-for water which is defined as the difference between water produced and water sold to customers. This differential between water supply and metered water use includes system flushing, leak repair flushing, hydrant leaks, street sweeping and known leaks that are subsequently repaired.

Table 6-3
Scenario A Water Demands (AFY)

	2007 ^(a)	2012	2017	2022	2027
Existing water demand (Rest of City)	990	990	990	990	990
Existing water demand (Project area)	49	49	49	49	49
Additional water demand (Project)	-	10	31	52	72
Additional water demand (Rest of City)	-	227	341	463	600
Unaccounted-for water	79 ^(b)	142	157	173	190
Total water demand	1,118	1,418	1,568	1,727	1,901

Notes: ^(a) Estimated from 2006 water billing records.

^(b) Actual unaccounted-for water was 7% of Total in 2006. Reference: City Finance Department.

6.4 Scenario B Projections

This scenario, on the other hand, is based on a “worst case scenario” where SCWA is not able to increase its Russian River water diversion permit to 101,000 AFY. Accordingly, additional measures would be required, including an additional 40 percent reduction for all new development beginning in the summer of 2008. Table 6-4 shows water demand projections for the Project under this scenario.

Scenario B also assumes that the following water conservation measures are implemented for all existing and future water customers in the City’s service area:

- Same as Scenario A with respect to Tier 1, Tier 2 and new development standards being implemented.
- Beginning in summer 2008, all new development to implement an additional demand reduction of 40 percent.
- City will implement measures to reduce its “unaccounted-for” water to 7 percent of the total water demand.

Water demand projections, for the Project are shown in Table 6-4. The row labeled “Additional water demand from Project” in the table is the difference between the existing demand and the Total Project water demand.

**Table 6-4
Scenario B Water Use by Customer Type for Project (AFY)**

	2007 ^(a)	2012	2017	2022	2027
Residential	15	15	20	26	31
Commercial retail	12	14	17	20	22
Commercial office	10	12	14	16	18
Commercial restaurant/bar	11	12	15	16	19
Parks and open space	1	2	2	2	2
Total Project water demand	49	55	68	80	92
Additional water demand from Project ^(b)	-	6	19	31	43

Notes: ^(a) Based on 3-year average usage.
^(b) 40% reduction in new development water use as compared with Scenario A.

Table 6-5 shows unaccounted-for water which is defined as the difference between water produced and water sold to customers. This differential between water supply and metered water use includes system flushing, leak repair flushing, hydrant leaks, street sweeping and known leaks that are subsequently repaired. In 2006, the unaccounted-for water was approximately 7 percent of the gross water use, or “metered” water use.¹

**Table 6-5
Scenario B Water Demands (AFY)**

	2007 ^(a)	2012	2017	2022	2027
Existing water demand (Rest of City)	990	990	990	990	990
Existing water demand (Project)	49	49	49	49	49
Additional water demand (Project) ^(b)	-	6	19	31	43
Additional water demand (Rest of City) ^(b)	-	136	205	278	362
Unaccounted-for water	79 ^(c)	83	88	94	107
Total water demand	1,118	1,264	1,351	1,442	1,551

Notes: ^(a) Estimated from 2006 water billing records.
^(b) From Table 6-4.
^(c) Actual unaccounted-for water was 7% of gross water demand in 2006. Reference: City Finance Department

¹ From City Finance Department water billing and water production data.

Section 7.0 Sufficiency Analysis

SB 610 requires that the City, as the water provider, make findings related to supply sufficiency under the normal, single-dry and multiple-dry water year conditions. This section compares the available water supply with the projected water demands for the City’s water service area under the two scenarios described in the previous sections.

7.1 Scenario A Comparisons

This section compares supply and demand for the three different hydrologic water years for Scenario A: normal, single-dry, and multiple-dry water years. Table 7-1 compares the City’s normal water year supply with projected water demands. Tables 7-2 and 7-3, respectively, compare the City’s single-dry water year and multiple-dry water year supplies with projected water demands.

Table 7-1
Scenario A Normal Water Year Supply and Demand Comparison (AFY)

	2012	2017	2022	2027
Supply ^(a)	1,932	1,932	1,932	2,002
Demand ^(b)	1,418	1,568	1,727	1,901
Shortfall (-)/Surplus (+)	+514	+364	+205	+101

Notes: ^(a) Supply figures from Table 5-2.
^(b) Demand figures from Table 6-3.

Table 7-2
Scenario A Single-Dry Water Year Supply and Demand Comparison (AFY)

	2012	2017	2022	2027
Supply ^(a)	1,822	1,822	1,822	1,885
Demand ^(b)	1,418	1,568	1,727	1,901
Shortfall (-)/Surplus (+)	+404	+254	+95	-16

Notes: ^(a) Supply figures from Table 5-3.
^(b) Demand figures from Table 6-3.

**Table 7-3
Scenario A Multiple-Dry Water Year Supply and Demand Comparison (AFY)**

	2012	2017	2022	2027
Supply ^(a)	2,050	2,050	2,050	2,113
Demand ^(b)	1,670	1,670	1,670	1,733
Shortfall (-)/Surplus (+)	+380	+380	+380	+380

Notes: ^(a) Supply figures from Table 5-4.
^(b) Demand figures from Table 6-3.

As shown in this analysis, there are sufficient supplies to meet Project and City demands during normal and multiple-dry water years under Scenario A. For the single-dry water year, there is a 16 acre-feet shortfall in year 2027. This small amount of shortfall could be offset with voluntary or mandatory water conservation measures as outlined in the City’s Water Shortage Emergency Plan. This plan is described in detail in the City UWMP.

7.2 Scenario B Comparisons

This section compares supply and demand for the three different hydrologic water years for Scenario B: normal, single-dry and multiple-dry water years. Table 7-4 compares the City’s normal water year supply with projected water demands. Tables 7-5 and 7-6, respectively, compare the City’s single-dry water year and multiple-dry water year supplies.

**Table 7-4
Scenario B Normal Water Year Supply and Demand Comparison (AFY)**

	2012	2017	2022	2027
Supply ^(a)	1,552	1,552	1,552	1,622
Demand ^(b)	1,264	1,351	1,442	1,551
Shortfall (-)/Surplus (+)	+288	+199	+110	+181

Notes: ^(a) Supply figures from Table 5-6.
^(b) Demand figures from Table 6-5.

Table 7-5

Scenario B Single-Dry Water Year Supply and Demand Comparison (AFY)

	2012	2017	2022	2027
Supply ^(a)	1,499	1,499	1,499	1,562
Demand ^(b)	1,264	1,351	1,442	1,551
Shortfall (-)/Surplus (+)	+235	+148	+57	+11

Notes: ^(a) Supply figures from Table 5-7.
^(b) Demand figures from Table 6-5.

Table 7-6

Scenario B Multiple-Dry Water Year Supply and Demand Comparison (AFY)

	2012	2017	2022	2027
Supply ^(a)	1,670	1,670	1,670	1,733
Demand ^(b)	1,264	1,351	1,442	1,551
Shortfall (-)/Surplus (+)	+406	+319	+228	+182

Notes: ^(a) Supply figures from Table 5-8.
^(b) Demand figures from Table 6-5.

As shown in this analysis, there are sufficient supplies to meet Project and City demands during normal, single-dry and multiple-dry water years under Scenario B.

Section 8.0 Water Resources Strategy

The City's water strategy is summarized below:

- Utilize water purchased from the SCWA as its primary water supply source. This water supply and the contract for this supply are detailed in Section 4 and Appendix B of the City UWMP.
- Utilize groundwater supply from three municipal wells located within city limits as a secondary water supply source. This supply will be used as a drought contingency and to the extent that the SCWA source is not available or sufficient to meet peak demands.
- Pursue and implement an aggressive Water Conservation Program and other demand management techniques to ensure that the water resources available to the City are used by existing and future customers in the most efficient manner.
- As determined in the recent City GSA (see Appendix A), the City would pump no more than 412 acre-feet on an average annual basis for normal water years and no more than 530 acre-feet for short-term dry years.
- Because of the City's reliance on water purchased from the SCWA, commit to a regional partnership with the SCWA and other water contractors to protect and secure water rights to Russian River water.

8.1 Demand Management

The City UWMP has a comprehensive description of its demand management techniques. In summary, the following are either currently being implemented or will be implemented in the near term, to reduce citywide water demands:

- As a signatory to the California Urban Water Conservation Council (CUWCC) Memorandum of Understanding, the City has committed to implementing Tier 1 Best Management Practices (BMPs). Tier 1 BMPs range from water use surveys and toilet retrofits to public education and outreach.
- The City plans to expand its Water Conservation Program to also include the implementation of Tier 2 BMPs. Tier 2 BMPs are "over and above" Tier 1 measures and range from rain sensor devices for irrigation controllers to turf removal incentives.

- The City is developing new development standards that require not just the industry-standard plumbing requirements in accordance with the Uniform Building Code but other standards ranging from installation of high efficiency toilets to efficient clothes washers.
- The City has adopted a Green Building Program which uses “build it green” standards and incorporates low-water use design standards.

8.2 New Development Standards

In Section 7, it was shown that in order for the City to have a sufficient supply of water in the worst-case scenario where the SCWA is not able to increase its Russian River diversions to the City and other water contractors (Scenario B), new development must reduce its projected water demand by 40 percent. When applying for City approvals, each new development must demonstrate that its building and landscape plans would demand 40 percent less water use than a standard development of the same type. For example, say that a typical single-family home uses an average of 350 gallons per day¹ for both indoor and outdoor use. For the new home to be approved, water savings devices and low water-use landscaping would be required to reduce the average daily usage to 210 gallons.

¹ When the City develops its new development standards, standard daily consumption for each land use classification will also be developed.

Appendix A
Groundwater Supply Assessment, LSCE

City of Cotati

Groundwater Supply Assessment

January 2008

Prepared for:

City of Cotati

Prepared by:



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Executive Summary

ES.1 Introduction

This Groundwater Supply Assessment (GSA) has been prepared for the City of Cotati (City) to describe projected water demands resulting from the City's proposed Downtown Specific Plan (DSP) project and other potential developments consistent with the City's adopted General Plan and the availability of water to supply those demands during normal and dry years. As the Lead Agency for the DSP project, the City is required to prepare a Water Supply Assessment (WSA) under the provisions of Senate Bill (SB) 610. This GSA has been prepared to provide the analysis of groundwater demand, supply, and predicted impacts required for the groundwater portion of the WSA. The GSA evaluates existing and future water demands and supply within the City's Urban Growth Boundary (UGB) to 2030, summarizes historical and current utilization of groundwater within the UGB, and describes hydrogeologic conditions in the groundwater basin from which the City will use groundwater as a source of supply. It also includes an analysis of the relationship between historical groundwater levels and pumpage by the City and other entities used to evaluate whether future groundwater supplies from the basin will be sufficient to meet projected demands to 2030.

SB 610 became effective January 1, 2002 with the stated intent of strengthening the process by which local agencies determine the adequacy and sufficiency of current and future water supplies to meet current and future demands. SB 610 amended the Water Code to broaden the types of information included in Urban Water Management Plans (UWMPs). It also added Part 2.10 (Section 10910 *et seq.*) to the Water Code to indicate the type of projects that require a WSA and specify what information must be included in the WSA. Section 10910(f) requires that additional information be included in the WSA if groundwater is to be a source of supply:

- A review of any information contained in a UWMP relevant to the identified water supply for the proposed project.
- A description of any groundwater basin from which the proposed project would be supplied with groundwater, including information obtained from the most current California Department of Water Resources (DWR) bulletin that characterizes the condition of the groundwater basin (i.e., whether DWR has identified the basin as overdrafted, or projected that the basin will become overdrafted if present management conditions continue, and what measures are being taken to prevent overdraft conditions from occurring). As suggested in the DWR guidance document (DWR, 2003a) relating to the implementation of SB 610, if the basin has not been (or recently been) evaluated by DWR, data that indicate historical and recent groundwater level trends should be evaluated.
- A detailed description and analysis of the amount and location of groundwater pumped by the public water system for the past five years from any groundwater basin from which the proposed project will be supplied.

- A detailed description and analysis of the amount and location of groundwater that is projected to be pumped (for at least a 20-year horizon) by the public water system from any basin from which the proposed project will be supplied.
- An analysis of the sufficiency of groundwater from the basin from which the proposed project will be supplied to meet the projected water demands associated with the project.

This GSA is based upon and intended to fulfill the requirements of SB 610 for groundwater sources as described above.

ES.2 Hydrogeology

The City is located in the southern portion of the Santa Rosa Plain (SRP) Subbasin, which is one of three subbasins that comprise the Santa Rosa Valley (SRV) Groundwater Basin. The SRV Groundwater Basin drains to the northwest toward the Russian River and then to the Pacific Ocean. The SRP Subbasin extends from just south of the City limits to the Russian River plain (south of Healdsburg). The City uses groundwater pumped from the SRP Subbasin for a portion of its water supply; the remainder of the City's water supply is imported surface water delivered by Sonoma County Water Agency (SCWA).

The SRV Groundwater Basin is in the northwest trending structural province of the Coast Ranges and contains a number of mapped folds and faults. The valley is formed by the Windsor syncline and is bounded by the Rodgers Creek fault on the east and the Meacham Hill and Tolay faults on the west. Several buried faults have been mapped within the valley, most notably the Sebastopol fault, which extends from the City of Cotati northwest to the City of Sebastopol, and the Petaluma Valley fault, which is mapped by some geologists as extending as far north as Cotati. The SRP Subbasin contains three primary water bearing units: the Wilson Grove Formation, Quaternary alluvial fan deposits, and Quaternary alluvium. City wells located east of the Sebastopol fault appear to be completed in the Quaternary alluvial fan deposits, and wells located west of the fault may be completed in older Petaluma Formation deposits.

DWR (1982a and 1987) investigated the hydraulic properties of the Sebastopol fault but was unable to find clear evidence that the fault acts as a barrier to groundwater flow. An independent analysis done to support the GSA found some evidence to the contrary since water level hydrographs of the three City wells show similar trends to nearby Rohnert Park wells even though some of these are on opposite sides of the mapped location of the fault. Water levels in all of the City wells are influenced by Rohnert Park pumpage, which also suggests that the Sebastopol fault does not act as a significant barrier to groundwater flow in the Cotati area.

In the southern SRP Subbasin, groundwater is produced largely from the upper 800 feet of the sedimentary deposits. Geologic cross sections and well profiles provide a generalized depiction of the subsurface geologic conditions that was used to divide the aquifer into depth zones to facilitate the analysis of groundwater levels. These zones do not represent laterally extensive aquifers but are strictly depth based for purposes of evaluating hydrogeologic conditions. These designations are based on an approximate correlation to the geologic

units and on water well completion depths. The vertical zones of the aquifer system were designated:

- Shallow (0 to 200 foot depth),
- Intermediate (200 to 600 foot depth),
- Deep (600 to 800 foot depth), and
- Lower (depths greater than 800 feet).

Most municipal and agricultural wells in the southern SRP Subbasin are completed primarily in the intermediate zone. This includes the City's three municipal wells, although two City wells (1A and 3) are also completed partially in the deep zone.

ES.3 Groundwater Pumpage

The City's total annual pumpage increased from 41 acre-feet (AF) in 1974 to 684 AF in 1988 and has generally decreased since 1988 as SCWA surface water deliveries increased. The City's annual municipal pumpage averaged 412 AF during 1990-2003. Much greater decreases have occurred since 2003, and the 2004-2006 pumpage averaged only 78 AF. Decreased pumpage in recent years is the result of the City's water resources strategy, which is to rely primarily on SCWA water supplies and to utilize groundwater only as needed to supplement those supplies.

Non-municipal pumpage for the area located between the City limits and the UGB is unmetered, and current annual pumpage in this area was estimated for this study to be about 463 AF. This includes 162 AF for rural residential use, 35 AF for commercial use, and 266 AF for agricultural use. There is also an estimated 17 AF of non-municipal pumpage that occurs within the City limits. The total annual non-municipal pumpage (about 480 AF) is slightly more than the average municipal pumpage during 1990-2003 and considerably more than the average municipal pumpage during 2004-2006 (78 AF). If historical non-municipal pumpage is assumed to be similar to current levels, the total pumpage in the City's UGB averaged about 892 AF for the 1990-2003 period. Divided by the area of the UGB, this represents an annual "unit" pumpage of 0.35 AF/acre.

In addition to the City, there are three other municipal pumpers in the southern portion of the SRP Subbasin. These are the City of Rohnert Park, Sonoma State University, and SCWA. Rohnert Park is the largest groundwater producer in this area, and its annual pumpage increased from 907 AF in 1970 to a high of 5,487 AF in 1995. Since 1995, Rohnert Park has decreased its reliance on groundwater due to a shift toward greater use of SCWA deliveries. As a result, Rohnert Park's annual pumpage decreased to 846 AF in 2005 and 348 AF in 2006.

Historical pumpage estimates in the SRP Subbasin were made by DWR for its 1987 study, by Todd Engineers (Todd, 2004) for the Sonoma County Canon Manor West Environmental Impact Report, and by Winzler & Kelly (W&K, 2007) for the Rohnert Park Urban Water Management Plan. The estimated unit pumpage was 0.32 to 0.36 AF/acre based on the DWR (1987) study that used an 81,000-acre study area similar to the boundaries of the SRP Subbasin. The Todd (2004) and W&K (2007) used similar study areas of 25,000 to 25,500 acres based on the upper Laguna watershed boundaries. These study areas encompassed the

southern portion of the SRP Subbasin, including the Cities of Cotati and Rohnert Park. Estimated average annual pumpage for the Todd (2004) study was about 8,500 AF or 0.33 AF/acre during 1986-2001. The estimated average annual pumpage for the W&K (2007) study area during 1990-1997 was about 8,700 AF or 0.35 AF/acre. These unit pumpage values are very similar to the unit pumpage estimated for the City's UGB. These pumping rates appear to be sustainable based on review of historical groundwater levels in the SRP Subbasin.

ES.4 Groundwater Conditions

ES.4.1 Water Level Hydrographs

DWR (1982a) described groundwater levels in the SRP Subbasin as "about in balance, with increased ground water levels in the northeast contrasting with decreased ground water levels in the south". Groundwater conditions have improved since 1982, with groundwater levels in the north continuing to increase and groundwater levels in the south (including the Cotati area) showing large increases in recent years primarily in response to decreased municipal pumping. A total of 130 water level hydrographs in the SRV Groundwater Basin, including 120 in the SRP Subbasin, were reviewed for this study, and these show no indication of overdraft conditions anywhere in the basin. The Healdsburg Area and Rincon Valley Subbasins have fewer wells with water level data, but these typically show stable to increasing water levels since water level measurements began.

Hydrographs for most shallow zone wells in the SRP Subbasin exhibit relatively stable long-term groundwater levels, indicating little response to changes in pumpage or variations in climatic conditions. Regardless of increases or decreases in pumpage or the occurrence of dry, normal, or wet years, spring water levels in the shallow zone have been essentially stable or increasing since about 1990.

Water levels measured in intermediate zone wells typically reflect confined conditions with lower depths to water and greater seasonal fluctuations. Water levels in these wells are influenced by municipal and agricultural pumping, which occurs primarily from this zone. In the southern portion of the SRP Subbasin, water levels in intermediate zone wells generally follow the trend of Rohnert Park's pumpage, with lower water levels during years of increased pumping and higher water levels during years of reduced pumping. This means that water levels were lowest in the late 1980s, stabilized in the 1990s, and have increased significantly in recent years.

The hydrographs of the three City of Cotati wells show similar trends to the nearby Rohnert Park wells. In general, water levels are lower in the City wells because the direction of groundwater flow is westerly toward the trough of the valley, which runs through the City. City Well 2 has the longest period of record, and spring water levels were relatively constant during the late 1970s and early 1980s, declined during the late 1980s, and gradually increased during the 1990s. The rate of water level rise has increased significantly since 2003 due to additional decreases in municipal pumpage by both Cotati and Rohnert Park. The spring 2006 measurement was the highest ever recorded in City Well 2.

ES.4.2 Groundwater Elevation Contour Maps

Three groundwater elevation contour maps are discussed in this report. A portion of a spring 1951 contour map published by Cardwell of the U.S. Geological Survey (USGS) in 1958 is presented to show historical groundwater elevations in the southern SRP Subbasin. Although water level data from wells of varying depths were combined to prepare the Cardwell map, the contour lines primarily reflect groundwater conditions in the shallow zone. The overall direction of groundwater flow in most of the SRP Subbasin was westerly toward the Laguna de Santa Rosa in the valley trough and ultimately to the northwest. West of the valley trough, groundwater flow is easterly toward the Laguna de Santa Rosa, and there was a steeper gradient for flow from the hills west of the valley.

A spring 2004 groundwater elevation contour map was prepared for the shallow zone in the SRP Subbasin and the northern portion of the Petaluma Valley Basin. This contour map shows that the direction of groundwater flow in the SRP Subbasin is generally westerly toward the Laguna de Santa Rosa, and the gradient for flow in the valley is relatively flat. At the eastern and western margins of the SRP Subbasin, there is a much steeper gradient for groundwater flow into the valley. Groundwater elevations and flow directions in 2004 were similar to those shown on Cardwell's 1951 contour map. The location of the groundwater divide between the SRV and Petaluma Valley Groundwater Basins in 2004 also appears to be similar to the 1951 location.

A spring 2006 groundwater elevation contour map for the intermediate zone in the southern portion of the SRP Subbasin shows that the direction of groundwater flow in the Rohnert Park area is generally to the northwest. Beneath the City of Cotati, the direction of flow is toward the valley trough (northeasterly in most areas). Groundwater elevations in the intermediate zone are lower than in the shallow zone, especially in the central and western portions of Rohnert Park. Groundwater levels have risen significantly in recent years, however, and the cone of depression beneath Rohnert Park in 2004 noted by Winzler & Kelly (W&K) (2007) had largely disappeared by 2006.

ES.4.3 Groundwater Quality

Groundwater quality in the City's water supply wells is generally good, but two wells have elevated iron and manganese concentrations. The City's wells are sampled triennially for complete general minerals and trace elements as required by the Department of Public Health (DPH) for all public water systems, and Wells 1A and 3 are also sampled weekly for iron and manganese. Raw groundwater produced from the three City wells meets primary state drinking water standards, and treated groundwater from these wells also meets secondary drinking water standards.

ES.5 Sufficiency of Groundwater or Relationship Between Pumpage and Groundwater Levels

When groundwater is a source of supply, as is the case for proposed developments in the City's UGB, Water Code Section 10910(f)(5) that the WSA include an analysis of the sufficiency of groundwater from the basin from which the proposed project will be supplied

to meet the projected water demands associated with the project during normal and multiple-dry years for a 20-year projection.

One way to evaluate groundwater supply sufficiency is to determine whether the projected pumping rate will be sustainable in both normal and dry years. Sustainable pumpage can be defined as pumping at a rate that does not exceed the safe yield of a groundwater basin on a long-term basis. DWR (2003b) defines safe yield as “the amount of groundwater that can be continuously withdrawn from a basin without adverse impact” and states that it may be indicated (but not quantified) “by stable groundwater levels measured over a period of years”. Although the safe yield of the SRP Subbasin has not been quantified, historical groundwater conditions indicate that the subbasin was in balance and the historical pumpage was sustainable at a unit pumpage ranging from about 0.32 to 0.36 AF/acre.

The sustainable pumpage for the W&K (2007) study area that included the Cities of Cotati and Rohnert Park was estimated at 8,700 AF based on the average pumpage during 1990-1997. This was a period when groundwater level trends indicated the subbasin was in balance, water levels in the southern portion of the subbasin were stable to increasing, and the average precipitation was only slightly above normal. An annual pumping rate of 8,700 AF represents a unit pumpage of 0.35 AF/acre. This is the same as the annual unit pumpage estimated for the Cotati UGB during 1990-2003 (0.35 AF/acre) and the projected future pumpage of 0.35/acre in 2015 and 0.34 AF/acre in 2030.

ES.6 Conclusions

Groundwater conditions are generally good in the SRV Groundwater Basin, including the City’s UGB. Groundwater levels have remained high and relatively stable at most shallow wells in the SRP Subbasin. Groundwater levels in intermediate zone wells in the southern SRP Subbasin declined during the 1980s, were stable to increasing during the 1990s, and have increased significantly since 2003. Recent water level increases are due primarily to decreased municipal pumpage in the southern portion of the SRP Subbasin in recent years. There is no evidence of overdraft conditions occurring anywhere in the groundwater basin. Future pumpage in the southern SRP Subbasin is projected to be less than historical pumpage during the 1990s. The data indicate that the historical pumping rate was sustainable, and projected future pumpage is also expected to be sustainable. Future groundwater supplies will be sufficient to meet the demands of the DSP project and other projected groundwater demands in the City’s UGB and the remainder of the southern SRP Subbasin.

1.0 Introduction

1.1 Purpose

Cities and counties with development projects that exceed a certain minimum size are required by Senate Bill (SB) 610 (Part 2.10, Division 6 of the California Water Code enacted in 2001) to prepare a Water Supply Assessment (WSA). This Groundwater Supply Assessment (GSA) addresses groundwater-related issues required for the WSA. This GSA describes projected water demands resulting from the proposed City of Cotati (City) Downtown Specific Plan (DSP) project and other potential developments and the availability of water to supply those demands during normal and dry years. The City is the Lead Agency for the DSP as well as the public water system that will supply water for the project. The City has requested that a WSA be prepared for the project as required by Water Code Section 10910. This GSA has been prepared to provide the analysis of groundwater demand, supply, and predicted impacts for the groundwater portion of the WSA and other reports. This report evaluates the water needs of the project until the year 2030 in relation to existing and future water demands and supply in the area and the Santa Rosa Plain (SRP) Subbasin.

Detailed information on historical and projected water requirements within the City's Urban Growth Boundary (UGB) are included in this GSA and will be summarized in the WSA. Based upon the information in the WSA and other studies, the City will determine whether water supplies are sufficient to satisfy the demands of the proposed project, in addition to existing and other planned future uses. The WSA is also intended to establish a framework for future cooperative water resources management and land use planning efforts within the City's UGB.

This report describes hydrogeologic conditions in the groundwater basin used by the City for water supply, and is intended as a supporting document for the groundwater portion of the WSA in preparation by Winzler & Kelly, Consulting Engineers (W&K). The report summarizes historical and projected utilization of groundwater within the City's UGB and includes a detailed description of hydrogeologic conditions in the groundwater basin and an evaluation of the relationship between historical groundwater levels and pumpage by the City and other entities in the area.

Major topics addressed in this report include the following:

- WSA requirements for groundwater sources;
- Description of the groundwater basin;
- Hydrogeologic conditions, including the regional geologic setting, prior geologic studies, local hydrogeology, groundwater production zones, and aquifer characteristics;
- Annual precipitation;
- Historical pumpage by the City and entities that overlie the groundwater basin, and projected pumpage in the southern portion of the Santa Rosa Plain Subbasin and by the City; and

- Groundwater conditions, including groundwater levels and groundwater quality

1.2 Scope of Analysis

The GSA includes a review of groundwater conditions in the basin from which the City will use groundwater as a source of supply and the existing and future water demand and groundwater supply within the City's UGB to the year 2030. The GSA also describes groundwater availability, historical and projected use, quality, and plans and programs related to use and management of the resource.

1.2.1 SB 610 Requirements for Groundwater Sources

SB 610 (Costa) became effective January 1, 2002. The intent of SB 610 is to strengthen the process by which local agencies determine the adequacy and sufficiency of current and future water supplies to meet current and future demands. SB 610 amended the California Public Resources Code to incorporate Water Code findings within the California Environmental Quality Act (CEQA) process for certain types of projects. SB 610 also amended the Water Code to broaden the types of information included in Urban Water Management Plans (UWMPs) – (Water Code Section 10620 *et seq.*) and to add Water Code Part 2.10 Water Supply Planning to Support Existing and Planned Future Uses (Section 10910 *et seq.*). Water Code Section 10910 defines “Projects” that are subject to a WSA and the water supplier's responsibilities related to the WSA. Section 10910 also clarifies the roles and responsibilities of the Lead Agency under CEQA and the public water system (water supplier) with respect to comparing current and future water supplies with current and future water demands.

1.2.1.1 Water Code Section 10910

As specified in Section 10910 of the Water Code, a WSA is required for (1) a proposed residential development of more than 500 dwelling units; (2) a proposed shopping center or business establishment employing more than 1,000 persons or having more than 500,000 square feet of floor space; (3) a proposed commercial office building employing more than 1,000 persons or having more than 250,000 square feet of floor space; (4) a proposed hotel or motel, or both, having more than 500 rooms; (5) a proposed industrial, manufacturing, or processing plant, or industrial park planned to house more than 1,000 persons, occupying more than 40 acres of land, or having more than 650,000 square feet of floor area; (6) a mixed-use development that includes one or more of the uses described above; (7) a development that would demand an amount of water equivalent to or greater than the amount of water required by a 500-dwelling-unit project; and (8) for water suppliers with under 5,000 water service connections, any new development that will increase the number of water service connections in the service area by ten percent or more.

If the water supplier has completed a UWMP, it must identify whether the new demands are included in the UWMP. If the UWMP includes the demands, it may be incorporated by reference. The City completed an UWMP in 2006 (W&K, 2006), but it did not include water demands of the DSP. Water Code Section 10910 requires the preparation of a WSA

because the DSP is defined as a “project” that meets the requirements for preparation of a WSA. To comply with the Water Code requirements, the WSA must include the following information:

- A description of the water service area including climate, current and projected population and other demographic factors that affect water management planning. Demographic data are presented in five-year increments for the period 2005 to 2030.
- A description and quantification of the existing and planned water sources.
- A description of the water source availability during normal, single-dry, and multiple dry water year types.
- A description of current and projected water demands among all user classes in the future public water system service area in five-year increments.
- A discussion of the total projected water supplies determined to be available to the public water system during normal, single-dry, and multiple-dry water years for a 20-year horizon that will meet the projected water demand associated with the proposed project, in addition to existing and planned future uses.

1.2.1.2 WSA Requirements When Groundwater is a Source

Groundwater is planned to serve as one of the sources of supply to the City’s DSP and other proposed projects. Accordingly, where groundwater is a source of supply, the WSA is to include, among other information such as documentation of the projected water demands for the project, the following additional information:

- A review of any information contained in a UWMP relevant to the identified water supply for the proposed project.
- A description of any groundwater basin from which the proposed project would be supplied with groundwater, including information obtained from the most current California Department of Water Resources (DWR) bulletin that characterizes the condition of the groundwater basin (i.e., whether DWR has identified the basin as overdrafted, or projected that the basin will become overdrafted if present management conditions continue, and what measures are being taken to prevent overdraft conditions from occurring). As suggested in the DWR guidance document (DWR, 2003a) relating to the implementation of SB 610, if the basin has not been (or recently been) evaluated by DWR, data that indicate historical and recent groundwater level trends should be evaluated.
- A detailed description and analysis of the amount and location of groundwater pumped by the public water system for the past five years from any groundwater basin from which the proposed project will be supplied.
- A detailed description and analysis of the amount and location of groundwater that is projected to be pumped (for at least a 20-year horizon) by the public water system from any basin from which the proposed project will be supplied.
- An analysis of the sufficiency of groundwater from the basin from which the proposed project will be supplied to meet the projected water demands associated with the proposed project.

The GSA is based upon and intended to fulfill the requirements of Water Code Section 10910 for groundwater sources as described above.

1.3 Definition of Terms

1.3.1 Sufficiency

Water Code Section 10910(f)(5) requires “an analysis of the sufficiency of the groundwater from the basin or basins from which the proposed project will be supplied to meet the projected water demand associated with the proposed project.” A “sufficient water supply” is defined in Government Code 66473.7 (a)(2) as follows:

“Sufficient water supply’ means the total water supplies available during the normal, single-dry, and multiple-dry years within a 20-year projection that will meet the projected demand associated with the proposed subdivisions, in addition to existing and planned future uses, including, but not limited to, agricultural and industrial uses....”

The public water system is as defined in Water Code Section 10912. The written verification prepared under Section 66473.7(g) is to include:

“[A] description, to the extent that data is reasonably available based on published records maintained by federal and state agencies, and public records of local agencies, of the reasonably foreseeable impacts of the proposed subdivision on the availability of water resources for agricultural and industrial uses within the public water system's service area (emphasis added) that are not currently receiving water from the public water system but are utilizing the same sources of water. To the extent that those reasonably foreseeable impacts have previously been evaluated in a document prepared pursuant to the California Environmental Quality Act (Division 13 (commencing with Section 21000) of the Public Resources Code) or the National Environmental Policy Act (Public Law 91-190) for the proposed subdivision, the public water system may utilize that information in preparing the written verification.”

The above Government and Water Codes (Gov. Code Section 66473.7 and Water Code 10910 *et seq.*) are understood to mean that the analysis of the sufficiency of groundwater from the basin applies to the availability of water supplies to meet the projected water demands during normal and multiple-dry years within a 20-year projection. The area from which groundwater will be withdrawn to meet the projected demands for the proposed project and other public, agricultural, and industrial uses is the City’s UGB that overlies a portion of the SRP Subbasin of the Santa Rosa Valley (SRV) Groundwater Basin. Historical and current groundwater conditions in the rest of the SRP Subbasin were also evaluated and considered as part of this analysis.

1.3.2 Overdraft

The SB 610 requirements discussed above include evaluation of the condition of the groundwater basin, including whether DWR has identified the basin to be in overdraft or

projected to become overdrafted. The word “overdraft” is defined in Bulletin 118 as follows (DWR, 2003b):

“[T]he condition of a groundwater basin or subbasin in which the amount of water withdrawn by pumping exceeds the amount of water that recharges the basin over a period of years, during which the water supply conditions approximate average conditions (DWR, 1998a).”

An overdraft condition is primarily indicated by steadily declining water levels over a period of many years. If water levels eventually recover or stabilize at a lower level, groundwater pumping no longer exceeds recharge and, by definition, overdraft is no longer occurring. Therefore, water level declines followed by stabilization but without full recovery to historically high water levels do not represent overdraft, although lack of full recovery following a period of water level declines has been used incorrectly as an indication of overdraft. Groundwater levels that stabilize at a lower level are not exhibiting chronic declines or leading to groundwater depletion. Further, lowered groundwater levels are often necessary to create storage capacity and increase the yield of a basin. Stabilization can occur due to reduced pumping, but it can also be caused by induced recharge as lower groundwater levels create a steeper gradient for recharge from streams and overlying zones of the aquifer. Although lower water levels do not necessarily indicate overdraft, they can cause similar impacts including increased pumping costs, costs of well deepening or replacement, water quality degradation, streamflow reductions, and land subsidence.

A review of DWR’s findings relative to its characterization of overdraft in the groundwater basin is discussed in Chapter 5 along with an independent analysis based on historical groundwater level data.

2.0 Hydrogeology of the Groundwater Basin

2.1 Groundwater Basin Descriptions

DWR defines a groundwater basin as an alluvial aquifer or a stacked series of alluvial aquifers with reasonably well-defined boundaries in a lateral direction and a definable bottom (DWR, 2003b). DWR has currently delineated 431 groundwater basins in the state, and 24 basins are subdivided into subbasins.

As shown on **Figure 2-1**, the City of Cotati is located in the southern portion of the Santa Rosa Valley (SRV) Groundwater Basin, which drains to the northwest toward the Russian River and then to the Pacific Ocean. All of the City's water supply wells are located in the SRV Groundwater Basin. **Figure 2-1** also shows other nearby groundwater basins including the Petaluma Valley Groundwater Basin, which is located immediately south of the SRV Groundwater Basin and drains to the southeast toward San Francisco Bay. The southern portion of the City's Urban Growth Boundary extends into the Petaluma Valley Basin, but the City does not plan to pump groundwater from this basin.

This report contains a detailed summary of hydrogeologic conditions in the SRV Groundwater Basin based in part on DWR's basin description (DWR, 2004). Additional data reviewed for this analysis were gathered from the Cities of Cotati and Rohnert Park and other state and local entities. These data included:

- Historical groundwater levels;
- Historical pumpage;
- Historical precipitation;
- Groundwater quality data;
- Geological information, including driller's reports and geophysical logs;
- Published and unpublished reports and maps; and
- Projected water demands for the City and other nearby municipal and non-municipal pumpers.

2.1.1 Santa Rosa Valley Groundwater Basin

The SRV Groundwater Basin encompasses an area of 158 sq. miles. There are three subbasins within this basin: the Santa Rosa Plain (SRP) Subbasin, the Healdsburg Area Subbasin, and the Rincon Valley Subbasin (DWR, 2004). The City pumps groundwater from the SRP Subbasin, which is the largest of the three subbasins (125 sq. miles). The Healdsburg Area Subbasin has an area of 24 sq. miles, and the Rincon Valley Subbasin contains 9 sq. miles. The Russian River plain forms the boundary between the Healdsburg Area Subbasin and the SRP Subbasin. The Rincon Valley Subbasin is separated from the SRP Subbasin by a narrow constriction in the bedrock of the Sonoma Volcanics east of Santa Rosa. The basin and subbasin boundaries shown on **Figure 2-1** are based on boundaries available at the DWR website (<http://www.dwr.water.ca.gov>). A copy of DWR's online description of the SRV Groundwater Basin and subbasins is included in **Appendix A**. There is no finding of overdraft in this basin in any DWR reports or the online basin description. As further discussed below, 130 hydrographs in the SRV

Groundwater Basin, including 120 in the SRP Subbasin, were reviewed to update the groundwater conditions reported by DWR in 1982(a), and these show no indication of overdraft conditions anywhere in the basin.

2.1.1.1 Santa Rosa Plain Subbasin

The SRP Subbasin extends from the City of Cotati in the south to the Russian River, south of Healdsburg, in the northwest. The subbasin is approximately 22 miles long and up to nine miles wide. It is drained by the Laguna de Santa Rosa, which flows north to the Russian River. The subbasin contains three primary water bearing units: the Wilson Grove Formation, Quaternary alluvial fan deposits, and Quaternary alluvium. Groundwater quality in these formations is generally good (DWR, 2004).

DWR (1982a) described groundwater levels in the SRP Subbasin as “about in balance, with increased ground water levels in the northeast contrasting with decreased ground water levels in the south”. As discussed in Chapter 5.0, this situation has changed since 1982, with groundwater levels in the north continuing to increase and groundwater levels in the south showing large increases in recent years primarily in response to decreased Rohnert Park municipal pumping. The hydrogeology of the SRP Subbasin is discussed in detail in the following sections.

The City of Cotati is located in the southern portion of the SRP Subbasin. The City limits, UGB, and other political boundaries in the Cotati area are shown on **Figure 2-2**. The current City limits encompass 1,214 acres in the southwestern portion of the SRP Subbasin. The City’s UGB encompasses an additional 1,355 acres.

2.1.1.2 Healdsburg Area and Rincon Valley Subbasins

The Healdsburg Area Subbasin is located northwest of the SRP Subbasin and includes the flood plain of the Russian River. Quaternary alluvium, alluvial fan deposits, terrace deposits, and the Wilson Grove Formation are the principal water bearing units in the subbasin. The Quaternary alluvium is highly permeable and receives recharge from the Russian River and its tributaries. The City of Healdsburg uses wells perforated in the alluvium for most of its groundwater supply. DWR monitors groundwater levels in eight wells in this subbasin, and water levels in all but one well are stable or increasing over the period of record (DWR, 2004).

The Rincon Valley Subbasin is located east of the City of Santa Rosa and consists of a valley approximately seven miles long and up to 2.5 miles wide. The valley is bounded by the Sonoma Mountains except where it connects with the SRP Subbasin. The Rincon Valley Subbasin drains to Bush Creek, which flows south to Santa Rosa Creek. Quaternary alluvium and alluvial fan formations are the principal water bearing units in the subbasin, and groundwater quality in these formations is generally good. DWR (2004) states that water levels remained relatively constant in the Rincon Valley between 1951 and 2000 and that the subbasin is nearly full.

2.1.2 Petaluma Valley Groundwater Basin

The Petaluma Valley Groundwater Basin encompasses an area of 72 sq. miles (DWR, 2003b) and is not divided into subbasins. The basin boundaries shown on **Figure 2-1** are based on boundaries available at the DWR website (<http://www.dwr.water.ca.gov>). The northwestern boundary of the basin is formed by a groundwater divide located just south of the Cities of Cotati and Rohnert Park. This divide separates the basin from the SRV Groundwater Basin to the north. The Petaluma Valley Groundwater Basin extends southeast to San Pablo Bay and is bordered by the Sonoma Mountains on the east and the Mendocino Range on the west. The basin is within the watershed of the Petaluma River, which flows south to San Pablo Bay. DWR's website does not include a description of the Petaluma Valley Basin, but a 1982 report (DWR, 1982b) contains a detailed description of hydrogeologic conditions in the basin.

The primary water bearing units in the Petaluma Valley Groundwater Basin include Quaternary alluvium and alluvial fan deposits especially in the northern and eastern portions of the basin. Wells completed in these units have moderate to high yields. The other major water bearing unit is the Wilson Grove Formation, which underlies much of the valley at a depth of about 250 feet (Cardwell, 1958). The Wilson Grove Formation is exposed in the uplands along the northwestern edge of the valley. Wells completed in this formation generally have high yields (DWR, 1982b).

DWR (1982b) states that groundwater quality in the basin is generally poor due to several factors. Native groundwater quality in the alluvium and alluvial fan deposits is excellent, but much of the shallow groundwater northwest of Petaluma is contaminated with nitrates due to livestock management practices and septic systems. Groundwater near the base of the Wilson Grove Formation has naturally occurring high salinity. In the southern portion of the basin near San Pablo Bay, naturally occurring high salinity has been exacerbated by sea water intrusion. Sea water intrusion has also occurred in areas adjacent to the tidal portion of the Petaluma River (DWR, 1982b).

2.2 Geology of the Santa Rosa Valley Groundwater Basin

The City of Cotati is located in the southern portion of the SRP Subbasin in the California Coastal Ranges north of San Francisco Bay. The broad gentle plain on which the City lies is topographically known as the Cotati Valley. A brief summary of the geologic setting is provided below.

Many investigations pertaining to the geology in Sonoma County and more specifically to the SRV Groundwater Basin and adjacent areas have been conducted. Early works include those of Osmont (1905), Dickerson (1922), and Morse and Bailey (1935). Much of these early works is summarized in Cardwell's pioneering hydrogeologic investigation of the Santa Rosa and Petaluma Valley areas (Cardwell, 1958). DWR has also conducted a series of investigations in the Santa Rosa Valley area (DWR; 1975, 1982a, and 1987). Numerous geologic maps have been generated from the various investigations. Early mapping was summarized in Weaver (1949) and subsequent maps include Fox and others (1973), Huffman and Armstrong (1980), Allen (2003), and Clahan et al. (2004, in preparation).

Wagner and Bortugno (1982) is probably the most readily available large area map. Continued evaluation and interpretation of the stratigraphic and structural complexities of the geology of the area present uncertainties with even the most recent geologic maps. A brief synopsis of the major geologic formations occurring in the SRV area is provided below.

2.2.1 Regional Geologic Setting

The surficial exposure of geologic units in the southern SRP Subbasin is illustrated on **Figure 2-3**. Most of the valley is underlain by Quaternary alluvium and alluvial fan deposits. The valley is bordered by the Rodgers Creek fault to the east and the Sebastopol and Meacham Hill faults to the west. In the vicinity of the Rodgers Creek fault, the low hills and mountain ranges are predominantly composed of mafic rocks of the Sonoma Volcanics and the Petaluma Formation. West of the Sebastopol fault, the Petaluma Formation has been uplifted and is exposed along the southwestern edge of the SRP Subbasin. West of the Meacham Hill fault, a broad, low topographic area contains exposures of the Wilson Grove Formation and fragments of the Franciscan complex. These formations are discussed below.

The basement complex in the SRV Basin is formed by the Mesozoic Franciscan complex, which is the oldest geologic unit in the area. The Franciscan consists largely of clastic and chemical sediments of marine origin intermixed with pillow basalts and more basic igneous rock, and weakly metamorphosed marine sedimentary rocks. DWR (1975) describes a sedimentary sequence, a metamorphic sequence, and a sheared sequence. Signs of folding and faulting are common in the Franciscan complex.

Unconformably overlying the Franciscan basement are sequences of volcanic and volcanoclastic rocks of late Tertiary age (late Miocene and Pliocene) known as the Tolay and Sonoma Volcanics. The Tolay Volcanics have been described by Morse and Bailey (1935) as a series of lava flows, breccia, tuff, and agglomerate that extends beneath the southern SRP Subbasin at a depth of about 2,100 feet (DWR, 1982a). The Sonoma Volcanics consist of a Pliocene age series of lava flows, agglomerates, tuffs, intermixed with sediments of volcanic debris forming a very complex assemblage of flows, dikes, plugs, mudflows, breccias, pumice beds, and stratified (volcanic in origin) materials. Rocks have been folded, intensely faulted, and eroded causing considerable differences in the formation between adjacent areas. The Sonoma Volcanics are exposed in the Sonoma Mountains east of the SRP Subbasin.

Interbedded and interfingering with the Tolay and Sonoma Volcanics are non-marine, transitional marine, and marine sedimentary rocks of the Wilson Grove Formation (formerly known as the Merced Formation), the Petaluma Formation, and the Cotati Formation. The Wilson Grove Formation is a late Miocene marine deposit consisting predominantly of massive beds of coarse to fine-grained sandstone and thin interbeds of clay and silty clay, with lenses of gravel and pebbles. Material is largely derived from the Franciscan Formation and to a much lesser extent from the Sonoma Volcanics. The Petaluma Formation is late Miocene to Pliocene in age and largely consists of strongly folded continental and shallow marine to brackish-water deposits of clay, shale, and sandstone, some conglomerate and nodular limestone. Clay is particularly abundant in this unit. The

Cotati Formation is similar in age to the upper Petaluma Formation and is classified as Petaluma Formation on older maps. It consists of marine transitional deposits, primarily massive sandstone and conglomerate.

A Quaternary (Pliocene and Pleistocene) sequence of alluvial deposits, described as primarily consolidated alluvial fan but also containing fluvial and lacustrine deposits, overlies and interfingers with the Tertiary units in the Cotati Valley. This sequence was formerly known as the Glen Ellen Formation, and some reports still use this terminology. In the southern portion of the SRP Subbasin, the consolidated alluvial fan deposits are overlain by largely unconsolidated Quaternary (Pleistocene and Holocene) alluvium, including alluvial fan deposits. The alluvium and alluvial fan deposits are indicated on the geologic map (**Figure 2-3**) modified from Clahan et al. (2004) and Allen (2003).

The stratigraphic relationship between the western and eastern areas remains obscure due to poor exposures and because it is covered by the younger deposits in the Santa Rosa Plain. A generalized relationship of interfingering and interbedding of the western marine deposits with transitional marine and non-marine deposits is believed to occur beneath the valley. Allen (2003) mapped a region just west of the City that contains interbedded Wilson Grove and Petaluma Formations, which extend beneath the valley.

Surface geophysical survey interpretations indicate that up to 2.5 to 3 kilometers of Tertiary and younger deposits underlie the SRP Subbasin (Allen, 2003; McLaughlin & Sarna-Wojcicki, 2003). Investigators (Cardwell, 1958; DWR, 1975, 1979, and 1982a; and Allen, 2003) have developed various interpretations of the depositional relationships. These interpretations tend to show an interfingering and/or interbedding relationship between the Wilson Grove Formation to the west with the Petaluma Formation and Sonoma Volcanics to the east. Interpretation of these relationships are largely based on limited deep borehole information from a few oil and gas test holes, deep water wells, and/or projections of measured angles of dip at surface exposures (Allen, 2003) and need further study to better understand this complex environment.

2.2.2 Faults

The SRV Groundwater Basin is in the northwest trending structural province of the Coast Ranges. Folds and faults have deformed or displaced all formations with the exception of the younger alluvium. The syncline forming the Santa Rosa Valley was named the Windsor syncline by Gealey (1951). The northwest trending faults at the margins of the valley have displaced the formations and, therefore, control much of the shape of the valley and the thickness of the water-bearing deposits. One of the primary faults shown on **Figure 2-3** is the Rodgers Creek fault, located between the valley and Sonoma Mountain to the east. In the northern portion of the groundwater basin, the Healdsburg fault is generally considered a continuation of the Rodgers Creek fault. The Meacham Hill and Tolay faults are located west of the valley in the Wilson Grove Formation Highlands Groundwater Basin. There are often multiple smaller faults in the vicinity of these major faults, and these areas are described or mapped as “fault zones” in some reports.

Other major faults in the SRP Subbasin include the Sebastopol fault, which extends along the western edge of the valley from the City of Cotati on the southeast to the City of Sebastopol on the northwest. This fault and two other faults east of Rohnert Park (the Sonoma State and North College faults) were first identified by DWR (1979). Although the Sebastopol fault is mapped beneath the City, its location is approximate because the fault trace is not exposed at the surface. The Petaluma Valley fault was first proposed by Collins (1992) and Wright and Smith (1992). It is located primarily in the Petaluma Valley Groundwater Basin but is shown on some maps to intersect the Sebastopol fault just west of the City.

Due to uncertainty about the existence and location of the Sebastopol and Petaluma Valley faults, two different interpretations of these faults are shown on **Figure 2-3**. The first is based on DWR (1982a), which showed the Sebastopol fault as located further east and extending farther to the southeast. The DWR (1982a) map did not show the Petaluma Valley fault, which had not been identified at the time of the study. The second interpretation shown on **Figure 2-3** is based on Allen (2003), which shows the Sebastopol fault as located further west and intersecting the Petaluma Valley fault beneath the City. The uncertainty about these faults is further illustrated by the other recent geologic map of the area (Clahan et al., 2004), which shows an unlabeled fault in the general vicinity of the Petaluma Valley fault but does not show the Sebastopol fault.

Faults can act as barriers to groundwater flow, conduits for flow, or have no significant effect on groundwater flow (Fetter, 1980). Many faults in unconsolidated rock create partial barriers to groundwater flow because the fault zones typically contain fault gouge, which is the result of pulverization of rocks along the fault plane. This material has a low permeability that tends to restrict groundwater flow across the fault. The upper portion of the Sebastopol fault in the Cotati area is in unconsolidated Quaternary alluvium as mapped on **Figure 2-3**.

The hydraulic properties of faults are best determined from aquifer tests in which a well on one side of the fault is pumped while drawdown is monitored in an observation well on the other side of the fault. In 1985, DWR conducted aquifer tests at five sites as part of its investigation of the SRP Subbasin (DWR, 1987). One test was conducted near the Rodgers Creek fault, and three tests were conducted near the Sebastopol fault. DWR was unable to monitor water levels in wells on both sides of the faults during these tests but analyzed the test data to determine whether any effects of the faults were observable in the drawdown data. All of the test results were determined to be inconclusive.

In DWR (1982a), however, the results of a previous test using SCWA's Todd Road well, which is located about one mile east of the Sebastopol fault, was cited as evidence that the Sebastopol fault may act as a barrier to groundwater flow. Data for the first test were not provided, but results of the second test showed a steeper slope on the semi-log drawdown-response plot during the latter portion of the test. Although many factors can produce this result, one possibility is that the cone of depression produced by the well may have encountered lower permeability aquifer materials when it reached the fault. As discussed in Section 2.4, an aquifer test in City Well 1A, which is located about one-third mile west of the mapped location of the Sebastopol fault, also showed a change in slope on the

drawdown-response plot during the test. An aquifer test conducted in City Well 3, which is also located near the fault, did not show a similar result, however.

Another method of evaluating the hydraulic properties of faults is to compare water level data for wells located on both sides of a fault, and this approach is used in Chapter 5. Notably higher hydraulic heads in wells on the upgradient side of a fault would be a good indication that the fault represents a significant barrier to groundwater flow. The water level data discussed in Chapter 5 do not show clear evidence that the Sebastopol fault acts as a barrier to groundwater flow, however.

2.3 Local Hydrogeology and Groundwater Production Zones

In the southern SRP Subbasin, groundwater is produced largely from the upper 800 feet of the sedimentary deposits. For the evaluation of local hydrogeologic conditions, two geologic cross sections were prepared, and the cross-section locations are shown on **Figure 2-3**. Cross-section A-A' (**Figure 2-4**) has a southwest to northeast orientation and is roughly perpendicular to the longitudinal axis of the valley. Cross-section B-B' (**Figure 2-5**) has a northwest to southeast orientation and is roughly parallel to the valley's longitudinal axis. The cross sections were originally developed based on review of water well driller's reports for the City of Rohnert Park and available geophysical electric logs (W&K, 2005).

Local hydrogeology was evaluated by constructing vertical profiles of water supply wells operated by the Cities of Cotati and Rohnert Park and some nearby private wells in addition to the geologic cross sections. The well profiles show the geologic materials as recorded on individual water well driller's reports, an interpreted profile of the geophysical electric log for each well or borehole where available, and the depth of perforated or screened intervals in the well casing. The cross sections show geologic materials and perforated intervals for wells that lie along or near the cross section location. Six working cross sections were prepared for the area (W&K, 2005), and two of these are included in this report and discussed in detail below.

The well profiles and cross sections provide a generalized depiction of the subsurface geologic conditions that was used to divide the aquifer into depth zones to facilitate the analysis of groundwater levels in Chapter 5.0. These zones do not represent laterally extensive aquifers but are strictly depth based for purposes of evaluating hydrogeologic conditions. These designations are based on an approximate correlation to the geologic units and on water well completion depths. The vertical zones of the aquifer system were designated:

- Shallow (0 to 200 foot depth),
- Intermediate (200 to 600 foot depth, comprised of upper and lower sequences as described below),
- Deep (600 to 800 foot depth), and
- Lower (depths greater than 800 feet).

The locations of the City's wells and other municipal wells in the southern portion of the SRP Subbasin are shown on **Figure 2-2**. Information about the construction of the City's

wells is summarized on **Table 2-1**. The table shows the perforated interval of the wells along with the capacities (pumping rates) and other information. The City's wells pump predominantly from the intermediate zone, but Wells 1A and 3 are also completed partially in the deep zone. The tops and bottoms of the perforated intervals for the three existing City wells are:

Well 1A	290 – 630 feet below ground surface (bgs)
Well 2	220 – 485 feet bgs
Well 3	295 – 670 feet bgs

2.3.1 Shallow Zone

The shallow zone appears to consist largely of clays and sandy clays with a few thin sand to gravel beds (**Figure 2-4**). The sands appear to occur largely towards the margins of the Valley in the northern part of the southern SRP Subbasin. Somewhat more sand occurs further south possibly deposited by alluvial fan sources in the Copeland and Lichau Creek areas. Of the City's water supply wells, Well 2 has the most prominent coarse-grained stratum in the shallow zone, extending from 54 to 95 feet in depth without any silt or clay. The depositional system appears to have been small alluvial fans grading into a fluvial plain or possibly lacustrine area.

2.3.2 Intermediate Zone

As shown on **Figure 2-2**, water supply wells operated by the Cities of Cotati and Rohnert Park are constructed primarily in the intermediate zone, with perforated intervals between depths of 200 to 600 feet. Based on review of well profiles and geologic cross sections, this zone consists of a complex sequence of largely thin (and rare occurrences of thick) sand and sand to gravel deposits interbedded with deposits of sandy clay to clay (**Figures 2-4 and 2-5**). The correlation of individual sand and gravel beds between wells is generally poor. The intermediate zone appears to be the most complex stratigraphically of the four zones, and it is difficult to identify specific formations based on individual drillers' logs. Geologic cross sections prepared by DWR (1982a) suggest that the Rohnert Park wells and City wells located east of the Sebastopol fault are completed primarily in Quaternary alluvial fan formations. Deeper wells may also be completed partially in the underlying Wilson Grove Formation, especially in the northern portion of Rohnert Park. These formations have been uplifted on the west side of the Sebastopol fault, and City wells in this area are probably completed in the older Petaluma Formation.

An upper sand sequence in the upper intermediate zone (between depths of about 200 to 400 feet) occurs in the northern portion of the southern SRP Subbasin (**Figure 2-4**). In general, the sand to sand and gravel beds in this zone appear to be slightly thicker and more numerous than in the lower intermediate zone (400 to 600 feet). For example, City of Cotati Well 3 has a 78-foot thick sand and gravel stratum between depths of 264 and 342 feet. Some clay is present in almost all strata between depths of 400 and 600 feet. In contrast, clean clays constitute the majority of the subsurface materials encountered at City Well 1A in the upper intermediate zone and are also prevalent below a depth of 400 feet. Although bed correlation remains poor, the character of the geophysical log responses appears to be

more of an alluvial plain or fluvial nature. The sandy deposits of this upper sequence appear to be concentrated along the Valley axis (**Figure 2-5**); and, these deposits may be lacking east of Rohnert Park (**Figure 2-4**). In addition, the base of the upper sand sequence appears to rise somewhat to the southeast (**Figure 2-5**). It is unclear whether this rise is related to a southeastern sourced depositional pattern or basin tectonics.

A sand sequence consisting of many thin sand beds occurs in the lower intermediate zone (400 to 600 feet) in the northern half of the southern SRP Subbasin. The sequence may be either upper interbedded Wilson Grove-Petaluma Formation or Quaternary alluvial fan deposits. East of Rohnert Park, a thicker sequence of high-resistivity beds may represent a marginal-fault trapped area (**Figure 2-5**). In the central southern SRP Subbasin, this sandy sequence tends to be thinner and more fine grained. In the south, a thicker, high-resistivity, gravelly sequence is present (**Figure 2-5**), and it is unknown whether it correlates with the Tertiary "Sands and Gravels of Cotati" mapped by Clahan and others (2004).

2.3.3 Deep Zone

Underlying the intermediate zone, the deep zone is defined as occurring at depths between 600 to 800 feet. The deep zone is best defined in the northern portion of the southern SRP Subbasin as an approximately 100 to 150 foot interval of thin to thicker sand and gravel beds with interbeds of clays (**Figure 2-4**). These beds appear to rapidly thin or pinch out to the south. Correlation of the deep zone to surficial map units is difficult. It is unclear whether the deposits in the deep zone represent Tertiary sedimentary deposits (interbedded Wilson Grove-Petaluma) or Quaternary non-marine deposits.

2.3.4 Lower Zone

Underlying the deep zone, the lower zone is defined as occurring at depths between 800 to 1,500 feet, none of the three City of Cotati wells are perforated in this zone. The three deepest wells in the southern SRP Subbasin (RP-14, RP-15, and RP-16) encountered low resistivity, fine-grained clays at these depths. The units encountered by the wells constructed to depths greater than 800 feet are believed to be older Tertiary sedimentary units, probably Petaluma Formation or interbedded Wilson Grove-Petaluma Formation or equivalent. Because of the limited deep borehole information, it is difficult to correlate the lower zone laterally beneath the City. Because of the fine-grained nature of this zone, and the limited potential aquifer thickness, it appears the lower zone represents a poor target for groundwater production.

2.4 Well Yields and Aquifer Characteristics

Aquifer characteristics refer to the ability of aquifers to transmit and store groundwater. Aquifer characteristics are generally estimated using data from long-term constant rate pumping tests. The ability of the aquifer to transmit water is referred to as transmissivity (permeability times saturated thickness). Aquifer test data are available for two City wells (Wells 1A and 3), and data from a shorter-term specific capacity test are available for Well 2. Pumping rates measured during these tests range from 350 gallons per minute (gpm) at Well 2 to 1,000 gpm at Well 3. The test results are summarized in **Table 2-2**.

Aquifer tests conducted in City Wells 1A and 3 indicate specific capacities of 7.6 and 7.0 gallons per minute per foot (gpm/ft) of drawdown, respectively. Estimated transmissivities are on the order of 14,000 to 15,000 gallons per day per foot (gpd/ft). The transmissivity estimated for Well 1A is based on drawdown measured after the first two hours of pumping, because the early time drawdown data have a shallower slope indicating a higher transmissivity (about 27,000 gpd/ft). As discussed above, Well 1A is located close to the Sebastopol Fault, and the change in slope could be due to lower permeabilities within the fault zone. The test of Well 3 did not show a similar result, however. No observation wells were used for these tests; therefore, it was not possible to estimate aquifer storativity from the test results.

Aquifer test data are not available for City Well 2, but specific capacity data are available from short-term well efficiency tests. Specific capacity can be used to estimate aquifer transmissivity using the following empirical equation for a confined aquifer:

$$T = Q/s * 2000$$

Where: T = transmissivity of the well, in gallons per day/ft (gpd/ft)
 Q = yield of the well, in gpm
 s = drawdown in the well, in ft.

The well efficiency test results indicate that City Well 2 has a specific capacity of 2.1 gpm/ft of drawdown. Based on the empirical equation, the aquifer transmissivity would be about 4,200 gpd/ft at Well 2.

The Rohnert Park municipal wells have yields ranging from about 40 to 300 gpm (W&K, 2005). Specific capacity data from well efficiency tests of 31 Rohnert Park wells show that the specific capacities vary over an order of magnitude, ranging from 0.6 to 6.1 gpm/ft of drawdown. Based on the above empirical formula, the transmissivity of the intermediate zone in the vicinity of Rohnert Park is estimated to range from about 1,000 to 12,000 gpd/ft. The average transmissivity of the Rohnert Park wells is about 5,000 gpd/ft, which is lower than those for the City of Cotati Wells 1A and 3, but higher than Well 2.

Overall, the specific capacity and transmissivity values calculated from tests conducted in the City of Cotati and Rohnert Park wells are indicative of low yielding formation materials. The data suggest that the intermediate zone, from which the majority of the municipal groundwater extraction occurs, has a transmissivity of less than 15,000 gpd/ft. Well yields are correspondingly low, averaging 625 gpm for the City's wells and 180 gpm for the Rohnert Park wells.

DWR addressed well yields and aquifer characteristics in the SRP Subbasin in various studies (DWR; 1975, 1979, 1982a, and 1987). DWR's first report on groundwater resources in Sonoma County contains descriptions of well yields for various formations in the County (DWR, 1975). Specific capacity data were also provided for some formations. Wells completed in the Petaluma Formation typically are low-yielding (5 to 300 gpm). For the Merced Formation, which is one of the primary water-bearing units in the subbasin, DWR

(1975) reported yields of 20 to 1,000 gpm. For the overlying Quaternary alluvial fan deposits (previously known as the Glen Ellen Formation), DWR (1975) reported yields of 3 to 500 gpm and specific capacities of 0.5 to 20 gpm/ft of drawdown.

DWR (1987) contains results of five aquifer tests conducted in the SRP Subbasin. Transmissivities estimated from the test results ranged from about 6,000 gpd/ft for a well completed in the Merced Formation near the City of Windsor to more than 80,000 gpd/ft for a well completed primarily in Quaternary alluvial fan deposits in the City of Santa Rosa. Aquifer storativity was estimated for three of these tests, and estimates ranged from 0.0010 to 0.0017.

The southernmost test was conducted in SCWA's Todd Road well located in the southern SRP Subbasin about three miles southeast of Sebastopol. This well is completed primarily in Quaternary alluvial fan deposits, and the transmissivity was estimated to be 10,000 to 15,000 gpd/ft based on the test results. This is similar to the highest transmissivities estimated for the City of Cotati and Rohnert Park wells.

Cardwell (1965) and DWR (1983) addressed well yields and aquifer characteristics in the Healdsburg Area Subbasin. Groundwater is produced primarily from alluvium and river channel deposits that have relatively high yields of 200 to 1,000 gpm (Cardwell, 1965). Some groundwater is also produced from lower-yielding Quaternary alluvial fan deposits, and many domestic wells in the Healdsburg area are completed in this formation (DWR, 1983). Yields of 1 to 140 gpm and a specific capacity of 2 gpm/ft of drawdown were reported by Cardwell (1965).

The geology of the SRV Groundwater Basin is stratigraphically and structurally complex. Prior analyses of groundwater level responses to local groundwater extraction have reported on the semi-confined to confined nature of the deeper aquifers in the southern SRP Subbasin. Particularly, DWR (1982a) notes that there are differences in the water level declines observed in three piezometers completed to different depths and also that there are confining layers between the perforated intervals of the piezometers. The deepest of the three piezometers was further noted as similar in depth to most of the City wells; the water level difference in this zone was attributed to the response of "pressure aquifers" (i.e., confined aquifers).

3.0 Precipitation

An isohyetal map showing mean annual precipitation contours in the vicinity of the City is presented on **Figure 3-1**. This map was obtained from an SCWA (1983) report, and the associated period of record and gauge locations are unknown. The mean annual precipitation is about 30 inches near the City and increases in an easterly direction to more than 45 inches at Sonoma Mountain.

Sonoma County precipitation gauges with long periods of record are located north and northwest of the City. Annual precipitation data for the 1905 to 2007 water years from the Santa Rosa gauge, which is located north of the City of Santa Rosa at an elevation of 174 feet¹, are plotted on **Figure 3-2**. The lowest annual rainfall during this period was 12.78 inches during the 1977 water year (October 1, 1976 to September 30, 1977), and the highest annual rainfall was 55.68 inches in the 1983 water year. The mean annual precipitation was 30.05 inches, which is similar to the annual mean precipitation for the City shown on **Figure 3-2**. This represents an annual precipitation volume of 2.5 acre-feet (AF) per acre.

The long-term precipitation characteristics at the Santa Rosa gauge are shown by plotting the cumulative departure from the mean annual precipitation (**Figure 3-3**). This plot shows alternating wet, average, and dry periods of various durations, which are indicated by the slope of the cumulative departure curve. An upward slope indicates a wet period, and a downward slope indicates a dry period on the cumulative departure curve.

¹ The period of record for the Santa Rosa gauge is generally from 1905 to the present, but there are missing data for portions of the 1937, 1979, 2000, and 2001 water years. Precipitation for these years was estimated using data from the Graton station, located west of Santa Rosa.

4.0 Groundwater Pumpage

Historical and current pumpage data and estimates available for the Cotati UGB and the SRV Groundwater Basin are discussed in this chapter. Historical pumpage data are limited to municipal pumpers in the SRP Subbasin, but estimates of total pumpage are available for the SRP Subbasin and a portion of the Rincon Valley Subbasin. Pumpage data or estimates are not available for the Healdsburg Area Subbasin. Projections of future pumpage in the southern SRP Subbasin are also discussed in this chapter.

4.1 Historical and Current Pumpage in the Cotati Urban Growth Boundary

The City of Cotati relies on groundwater for a portion of its water supply and also receives surface water deliveries from SCWA. The City's historical and current groundwater pumpage and surface water deliveries are summarized below, followed by a discussion of estimated current non-municipal pumpage within the UGB.

4.1.1 City of Cotati Pumpage and Surface Water Deliveries

All available historical pumpage data for the City of Cotati wells (**Figure 2-2**) were reviewed for this report. As shown in **Table 4-1**, annual pumpage data were available from the City on a well-by-well basis from 1995 through 2006, with more sporadic data available prior to 1995. Total annual pumpage for 1974 was obtained from a City report (City of Cotati, 1975). Total annual pumpage for 1986 and 1988-1994 was obtained from Todd Engineers (Todd) (Iris Priestaf, pers. comm., August 3, 2004). Partial well-by-well pumpage data are also available for some of those years. Pumpage reported prior to 1995 should be considered an approximation because the raw data could not be obtained to confirm the values.

The City's total annual pumpage ranged from 41 acre-feet (AF) in 1974 to 684 AF in 1988. Pumpage has generally declined since 1988, but there were increases during 1995-1996 and 2000-2001. Pumpage decreased further after 2001, and the 2005 and 2006 pumpage (49 and 80 AF, respectively) were the smallest recorded since 1974. As further discussed below, water levels in the southern portion of the SRP Subbasin (including the City) were generally stable to increasing from 1990 to 2003. During this period, the City's pumpage ranged from 278 to 562 AF and averaged 412 AF. The City's annual pumpage is plotted on **Figure 4-1**.

SCWA began delivering water to the City in 1962, and **Table 4-1** and **Figure 4-1** show the available data for annual SCWA deliveries. SCWA delivery data are available for 1974 and from 1980 through 2006. Annual deliveries during this period ranged from 18 AF in 1985 to 1,101 AF in 2004 and show a generally increasing trend. SCWA deliveries have been more stable in recent years, with an average of 1,069 AF during 2004-2006.

Table 4-1 and **Figure 4-1** also show the total City annual water supply (groundwater plus surface water) during 1969-1970, 1973-1974, 1986, and from 1988 to the present. Note that

the term “water supply” is used here to represent the amount of water actually pumped by or delivered to the City, not the total **available** supply. The total annual water supply increased steadily from 172 AF in 1969 to a high of 1,232 AF in 2001. Since 2001, the total annual water supply has declined slightly to 1,118 AF in 2005 and 2006.

4.1.2 Non-Municipal Pumpage

There are a few private wells within the City limits, but any unmetered, non-municipal pumpage is assumed to be small. Outside the City limits but within the UGB, however, a significant amount of groundwater is pumped by private domestic, commercial, and agricultural wells. This pumpage is unmetered and was estimated based on current Sonoma County Assessor’s land use data provided by the Sonoma County Permit and Resource Management Department (2006). Estimated non-municipal pumpage within the City’s UGB in 2006 is summarized in **Table 4-2**.

Data provided by the County Assessor include land use designation, acreage, and number of existing dwelling units for each parcel. The Sonoma County General Plan (Planning Area 7) identifies the land use density (acres/dwelling) for these parcels. The County Assessor shows 307 dwelling units as currently existing within the UGB. 305 of these are listed as single-family dwellings and two as multi-family dwellings (duplexes). Two commercial properties (an auto repair shop and a golf course) are identified along with 124 acres of agricultural land, including one parcel of irrigated pasture, one dairy, and three vineyards.

Water demand estimates for residential and commercial parcels were based on the analysis presented in Todd (2004). Todd estimated water demands for single-family dwelling units at 0.53 acre-feet per year (AFY) and water demands for multi-family units at 0.25 AFY per unit. Commercial water demands were estimated at 2 AFY per parcel.

Agricultural pumping was estimated based on the irrigated acreage and representative Sonoma County crop demands obtained from DWR (1986). The estimated crop demands included 3.4 AF/acre/year for pasture and 1.0 AF/acre/year for vineyards. The agricultural lands located in the Cotati UGB include an estimated 14 acres of irrigated pasture and 22 acres of vineyard. There is also an 80-acre dairy estimated to have approximately 1,000 cows with a water demand of 175 gallons/day/head. Based on these assumptions, the total current residential, commercial, and agricultural pumpage in the area outside the City limits but within the UGB was estimated to be 463 AFY as shown on **Table 4-2**. This includes about 162 AFY for residential use, 35 AFY for commercial use, and 266 AFY for agricultural use. There is a small amount of non-municipal pumpage (16.8 AFY, Brian Bacciarini, W&K, pers. comm., October 10, 2006) that also occurs within the current City limits.

The total estimated non-municipal pumpage in the Cotati UGB (about 480 AFY) is slightly more than the average municipal pumpage during 1990-2003 (412 AFY) and considerably more than the average municipal pumpage during 2004-2006 (78 AFY). If non-municipal pumpage can be assumed to have been relatively constant since 1990, total pumpage in the City’s UGB would have ranged from 1,042 AF in 1990 to 758 AF in 2003, with an average of about 892 AFY during 1990-2003.

4.2 Municipal Pumpage in the Southern SRP Subbasin

In addition to the City, there are three other municipal pumpers in the southern portion of the SRP Subbasin. These are the City of Rohnert Park, Sonoma State University (SSU), and SCWA. Metered pumpage by these entities was evaluated to determine the relationship between historical groundwater level trends and the total pumpage in the vicinity of the City. Municipal pumpage in the southern SRP Subbasin from 1970 to 2006 is plotted on **Figure 4-2**.

The City of Rohnert Park is the largest groundwater producer in the southern portion of the SRP Subbasin. Rohnert Park's annual pumpage increased from 907 AF in 1970 to a high of 5,487 AF in 1995. Since 1995, Rohnert Park has decreased its reliance on groundwater due to a shift toward greater use of SCWA deliveries. As a result, Rohnert Park's annual pumpage decreased to 1,520 AF in 2004, 846 AF in 2005, and 348 AF in 2006.

Annual pumpage data for SSU (1994 to 2003) were provided by Todd (Priestaf, pers. comm., 2004). During this period, SSU's annual pumpage ranged from 41 AF (1999) to 139 AF (2003). Prior to 1994, annual SSU pumpage was estimated based on the SSU student population for 1970, 1980, and 1990 from "Systemwide and Campus Enrollment" (found online at http://calstate.edu/as/stat_abstract/stat0203/pdf/abstract/b_1_0203.pdf) and an average per capita water use based on the 1994-2003 data.

SCWA operates three wells in the SRP Subbasin, including two wells (the Occidental Road and Sebastopol Road wells) located east of Sebastopol in the central portion of the subbasin. The Todd Road well is the only SCWA well located in the southern SRP Subbasin, and pumpage from this well is included on **Figure 4-2**. SCWA drilled these wells for emergency water supply during the 1976-1977 drought. Prior to April 1999, the Todd Road well was classified as an emergency water supply well that could be pumped up to 15 days per year. The well is capable of pumping about 55 AF in 15 days, but the actual pumping was less than this amount (Don Seymour, SCWA, pers. comm., July 5, 2006).

4.3 Historical and Projected Pumpage in the SRP Subbasin

Historical and current pumpage data and estimates for the SRP Subbasin available from various studies are discussed in this section. Although metered pumpage is only available for municipal wells in the SRP Subbasin, estimates of total pumpage are available for the SRP Subbasin and a portion of the Rincon Valley Subbasin. Pumpage data or estimates are not available for the Healdsburg Area Subbasin. Projections of future pumpage in the southern SRP Subbasin are also discussed in this section.

4.3.1 Historical Pumpage

Historical pumpage estimates in the SRP Subbasin were made by DWR for its 1987 study and by Todd for its 2004 study for the Sonoma County Canon Manor West (CMW) EIR. The study areas used for these estimates are shown on **Figure 4-3**, and the pumpage estimates are summarized in **Table 4-3**. The pumpage estimates are divided into four categories: municipal, rural residential, agricultural, and commercial.

The DWR (1987) study area encompassed 81,000 acres and was the most similar to the actual boundaries of the SRP Subbasin. This study area also included half of the Rincon Valley Subbasin and the northern portion of the Petaluma Valley Groundwater Basin, however. As shown in **Table 4-3**, the estimated annual pumpage for the 1984 water year totaled 29,450 AF (7,391 AF municipal; 6,196 AF rural residential; 14,030 AF agricultural; and 1,833 AF commercial).

The Todd (2004) study area for the CMW EIR was based on the upper Laguna de Santa Rosa drainage area (i.e., the upper Laguna watershed) and encompassed 25,500 acres. Most of the study area was within the southern portion of the SRP Subbasin, but it also extended into the Wilson Grove Formation Highlands Groundwater Basin to the west and a portion of the foothills east of the southern SRP Subbasin to the east. As shown in **Table 4-3**, the average estimated pumpage for 1986-2001 totaled 8,468 AF (5,292 AF municipal; 1,418 AF rural residential; 1,478 AF agricultural; and 280 AF commercial).

A subsequent analysis of the upper Laguna watershed (W&K, 2007) reported historical pumpage data and projected pumpage estimates for the 25,000-acre area that was similar to the area used by Todd (2004). As shown in **Table 4-3**, the average annual pumpage was estimated to be 8,742 AF during 1990-1997. This included 5,640 AF municipal; 1,351 AF rural residential; 1,485 AF agricultural; and 267 AF commercial pumpage. By 2003, the total estimated pumpage had declined to 7,078 AF due primarily to a reduction in municipal pumpage to 3,968 AF.

Pumpage estimated for this report was based on the City's UGB, which includes 2,570 acres. As discussed above, the City's average municipal pumpage during 1990-2003 was 412 AF, and a small amount of non-municipal pumpage (17 AFY) also occurs within the City limits. Current non-municipal pumpage for the area located between the current City limits and the UGB was estimated to be 463 AF. Although this estimate was based on 2006 data, it is assumed that non-municipal pumpage has been relatively constant from 1990 to the present. Based on this assumption, the total pumpage in the City's UGB would average 892 AFY for the 1990-2003 period.

Since the pumpage estimates shown in **Table 4-3** are based on very different time periods and study areas, the estimated "unit" pumpage was also calculated on a per acre basis. The estimated unit pumpage was 0.32 to 0.36 AF/acre for the DWR (1987) study based on a study area that was similar to the actual boundaries of the SRP Subbasin. Unit pumpage for the Todd (2004) study area during 1986-2001 was very similar (0.33 AF/acre). Unit pumpage for the W&K (2007) study area averaged 0.35 AF/acre during 1990-1997. The unit pumpage estimated for the City of Cotati UGB during 1990-2003 was similar at 0.35 AF/acre. Although the City's UGB is much smaller than the other study areas discussed above, the unit pumpage estimated for the City's UGB was within the range of estimates for the entire SRP Subbasin (DWR, 1987) and the southern portion of the SRP Subbasin (Todd, 2004 and W&K, 2007).

4.3.2 Future Pumpage

Estimates of future pumpage in the SRP Subbasin are limited to the southern portion of the Subbasin. The W&K (2007) study discussed above contains a projection of future pumpage in 2025 for a 25,000-acre area that includes the Cities of Cotati and Rohnert Park. The study herein contains an estimate of future pumpage for the City's UGB in 2015 and 2030. These projections are summarized on **Table 4-3**.

The 2025 pumpage projection in W&K (2007) indicates that municipal pumpage in the upper Laguna watershed would likely decline from 3,968 AF in 2003 to 3,179 AF in 2025. The estimated future municipal pumpage included 382 AF for Cotati; 2,577 AF for Rohnert Park; and 220 AF for SSU. The decrease in municipal pumpage between 2003 and 2025 is expected to be offset by increases in non-municipal pumpage. Rural residential pumpage was projected to increase from 1,419 to 2,318 AF; agricultural pumpage was projected to remain constant at 1,411 AF; and commercial pumpage was projected to increase from 280 to 442 AF by 2025. As a result, the total pumpage was projected to increase by about four percent (from 7,078 AF in 2003 to 7,350 AF in 2025). This would increase to 7,380 AF based on an average pumping rate of 412 AFY for the City of Cotati in future years. This results in a slight increase in the estimated unit pumpage (to 0.30 AF/acre) compared to 2003 (unit pumpage of 0.28 AF/acre) but less than the estimated unit pumpage during 1990-1997 (0.35 AF/acre).

In accordance with the City's plan to rely primarily on SCWA supplies and to use groundwater only as needed to supplement those supplies, the average long-term pumpage is planned to be 412 AFY. The City's projected pumpage is also based on its plan to not pump more than the 1990-2003 average of 412 AFY on a long-term average basis. During some years, pumpage would be considerably less than that amount and up to 530 AF may be pumped temporarily during dry periods.

The City's planned long-term average pumping rate of 412 AFY represents about 1.4% of the total pumpage in the SRP Subbasin as estimated by DWR (1987) based on 1983-1984 data (see **Table 4-3**). The City's planned average pumping rate of 412 AFY also represents less than 5% of the total pumpage in the southern portion of SRP Subbasin during 1990-1997 (W&K, 2007).

Table 4-3 shows that the City plans to limit its average future municipal pumpage in 2015 and 2030 to the historical average of 412 AFY. This would be accomplished by conjunctive use of groundwater and surface water resources, whereby the City would reduce pumpage and rely more on SCWA water deliveries during normal and wet water years and increase pumpage during dry years. The City's pumpage would increase to a maximum of 530 AFY during single-dry or multiple-dry years to make up for potential cutbacks in surface water deliveries. The City plans to use its existing water supply wells (**Figure 2-2**) to provide its future groundwater supplies; no new wells are planned.

The City's future municipal pumpage estimates were combined with estimates of non-municipal pumpage to develop an overall pumpage estimate for the City's UGB. The remainder of the pumpage occurring in the UGB, including rural residential, agricultural and

commercial pumpage, is generally shown as similar to the current pumpage for those uses with the exception of the small amount of non-municipal pumpage (17 AFY) occurring within the City limits. By 2030, the non-municipal pumpage within the City current limits is expected to decrease through the replacement of this pumpage with the City's water sources. Therefore, total pumpage in the City's UGB is projected to be 892 AFY in 2015 and 875 AFY in 2030. The unit pumpage would remain at current levels (0.35 AFY) in 2015 and decline slightly (to 0.34 AFY) in 2030.

5.0 Groundwater Conditions

5.1 Regional Evaluation of Water Level Hydrographs

DWR evaluated historical groundwater level data for its 1982 investigation of the SRP area and concluded that the “Santa Rosa Plain groundwater basin as a whole is about in balance, with increased groundwater levels in the northeast and decreased groundwater levels in the south” (DWR, 1982a). It appears that this statement refers to the area now known as the SRP Subbasin, but historical data suggest that groundwater conditions in all subbasins of the SRV Groundwater Basin were “in balance” in 1982. DWR has never issued a finding of overdraft for the SRV Basin in Bulletin 118 or any other report. In this section, historical groundwater level data are used to independently evaluate groundwater conditions since 1982 in order to determine whether generally stable conditions and lack of overdraft in the basin have continued to the present.

In order to update DWR’s evaluation of groundwater resources in the basin and subbasin and assess groundwater level trends and conditions, all available water level data were obtained from DWR and other sources, including the Cities of Cotati and Rohnert Park, SCWA, the USGS, and Todd. Water level data for monitoring wells located at seven leaky underground fuel tank (LUFT) sites within the City’s UGB were also downloaded from the State Water Resources Control Board (SWRCB) Geotracker system (<http://geotracker.swrcb.ca.gov>). The water level data from DWR include publicly accessible data from DWR’s online water data library and also “draft” data recently received from DWR. The latter extend early historical water level records for some wells by adding earlier data that have been manually keyed into electronic format from hard copy records. These data are referred to as draft since the accuracy of DWR’s data entry process has not yet been reviewed.

As summarized in **Table 5-1**, hydrographs were reviewed for 145 wells, including 131 wells in the SRV Basin and 14 wells in the northern portion of the Petaluma Valley Basin. The SRV Basin hydrographs included 121 wells in the SRP Subbasin, two wells in the Rincon Valley Subbasin, and eight wells in the Healdsburg Area Subbasin. **Figures 5-1** and **5-2** show the locations of wells with water level hydrographs. The individual hydrographs for all 145 of these wells (which display groundwater levels as elevations and depths on the y-axes) are included in **Appendix B** and are summarized below.

The water level hydrographs were also categorized according to zone(s) of predominant completion and monitoring entity. All but 17 wells have perforation data that allow them to be classified by zone. As indicated in **Table 5-1**, 56 wells are classified as shallow, 24 as intermediate, and two as deep. There are also 34 wells classified as shallow and intermediate and 12 as intermediate and deep. Because most municipal and agricultural pumpage is from the intermediate zone, wells completed partially in the intermediate zone typically have hydrographs similar to wells completed exclusively in the intermediate zone.

Wells with publicly available water level data evaluated for this study have varying periods of record, and a few hydrographs show historical data dating back to the 1940s. The period

of record for most of the wells begins in the 1970s or 1980s. A number of wells were monitored by the USGS in the early 1950s on a one-time basis (Cardwell, 1958). Although nearly three quarters of the wells have current data, water level measurements have apparently been discontinued in the other wells. In the SRV Groundwater Basin, for example, 96 wells (74% of the total 130 wells) have current water level data (2004 or later).

5.1.1 Santa Rosa Plain Subbasin

Most of the water level data available for the SRV Groundwater Basin are from wells within the SRP Subbasin, and water level hydrographs in this subbasin are discussed by zone. A more detailed summary of hydrographs of wells within the City's UGB is presented in Section 5.2.

5.1.1.1 Shallow Zone

Hydrographs for most shallow zone wells in the SRP Subbasin exhibit relatively stable long-term groundwater levels, indicating little response to changes in pumpage or variations in climatic conditions. Regardless of increases or decreases in pumpage or the occurrence of dry, normal, or wet years, spring water levels in the shallow zone are essentially stable for all of the historical monitoring record. There are a few exceptions to this general trend as discussed below.

Figure 5-2 contains well locations and hydrographs for four shallow wells in the SRP Subbasin. These wells were selected from the available shallow wells with recent data (2004 or later) based on their location, period of record, and frequency of water level measurements. Two of the wells with hydrographs shown on **Figure 5-2** are located in the northern portion of the SRP Subbasin, one well is located near Santa Rosa, and two wells are located in the southern SRP Subbasin. A 200-foot y-scale is used on **Figure 5-2** so that data for all wells can be plotted on the same hydrograph. For consistency, a similar y-scale is used for other hydrographs in this chapter except as noted.

Well 8N/8W-29C3 (29C3) is located in the northeastern SRP Subbasin and is 95 feet deep. Well 29C3 has a period of record from 1980 to 2007, and the spring depth to water has varied between 8 and 32 feet, with seasonal fluctuations of 7 to 27 feet. The spring depth to water rose from 21 feet in 1981 to 8 feet in 2006. Water levels have generally increased over the period of record with the highest levels reported in 2006-2007.

Well 7N/9W-01C1 (01C1) is located in the northeastern SRP Subbasin and is 110 feet deep. Well 01C1 has a period of record from 1941 to 2007. Water levels gradually declined from 1950 to the late 1970s but rose by the 1980s and have been stable to slightly higher since that time. The spring depth to water declined from 7 feet in 1950 to 38 feet in 1977 and had increased to 6 feet by 2007. Seasonal fluctuations have been only about 6 feet since 1990.

Well 7N/7W-19F2 (19F2) is located near Santa Rosa and is 68 feet deep. Well 19F2 has a period of record from 1980 to 2007 and water levels have been generally stable during this period. The spring depth to water declined from 10 feet in 1981 to 14 feet in 1995, and rose to 9 feet in 2006, with seasonal fluctuations of about 5 feet.

Well 6N/8W-15J3 (15J3) is 166 feet deep and is located northeast of Rohnert Park. This shallow well has a period of record from 1950 to 2006. Well 15J3 showed significant historical water level declines from 1950 to the late 1980s followed by stabilization in the late 1980s and water level increases beginning in 2003. The depth to water in well 15J3 declined from 1 foot in 1950 to 49 feet by the late 1980s and was relatively stable from the late 1980s to 2003. This was followed by about 40 feet of increase between 2002 and 2006 (the 2006 depth to water was only 9 feet bgs). Unlike other shallow wells in the SRP Subbasin, well 15J3 appears to be influenced by pumping from the intermediate zone. The shape of the water level hydrograph is similar to that of the Rohnert Park water supply wells discussed below. The apparent lack of effective confining layers at this location results in more leakage from the shallow to the intermediate zone than is typical at other shallow SRP Subbasin wells.

The historical water level declines in well 15J3 are in contrast to SCWA-01, the shallowest monitoring well near SCWA Todd Road production well northwest of 15J3. The hydrograph of SCWA-01 (Appendix B) shows that spring water levels were very stable from 1978 to 1999. Water levels have declined by about 15 feet since 1999 due to the close proximity of pumping from the Todd Road production well. Water levels in SCWA-01 appear to have stabilized since 2004.

In summary, most shallow zone wells in the SRP Subbasin have periods of records beginning in the 1970s or 1980s and exhibit stable or increasing groundwater level trends. Of the 19 shallow wells with current (2004) water level measurements in the SRP Subbasin, 16 wells show stable or increasing trends, two wells (6N/8W-15J3 and 6N/8W-27H1) show water level declines until the late 1980s followed by stable water levels and recent water level increases. One well located north of Sebastopol (7N/9W-26P1) shows water level declines in recent years.

5.1.1.2 Intermediate Zone

As shown in **Table 5-1**, there are a total of 22 intermediate zone wells with water level data in the SRP Subbasin and 44 other wells that are perforated at least partially in the intermediate zone. Water levels measured in the intermediate zone typically reflect confined conditions with lower depths to water and greater seasonal fluctuations. Water levels in these wells are influenced by municipal and agricultural pumpage, which occurs primarily from the intermediate zone. In the southern SRP Subbasin, water levels in intermediate zone wells generally follow the trend of Rohnert Park's pumpage, with lower water levels during years of increased pumping and higher water levels during years of reduced pumping.

Non-Municipal Wells

Most of the intermediate zone wells with water level data are water supply wells operated by the City of Rohnert Park, the City of Cotati, and SCWA. There are few non-municipal wells with recent water level data and long periods of record, but **Figure 5-2** contains hydrographs for three other wells completed in the shallow and intermediate zones in the SRP Subbasin.

The northernmost well is located in the northern SRP Subbasin west of Santa Rosa; the other two wells are located in the central to southern SRP Subbasin, north of the cities of Cotati and Rohnert Park.

Well 7N/8W-08M1 (08M1) is located in the northern SRP Subbasin west of Santa Rosa and is perforated from 180 to 220 feet. Well 08M1 has a period of record from 1980 to 2007, and groundwater elevations have been generally stable during this period. Spring depths to water ranged from 36 to 56 feet, and seasonal fluctuations typically range from 5 to 15 feet in this well.

Well 7N/8W-30K1 (30K1) is located in the central SRP Subbasin east of Sebastopol and is perforated from 105 to 291 feet. Well 30K1 has a long period of record (1973 to 2007), and has experienced seasonal fluctuations of 10 to 25 feet during most of this period. Water levels have generally been stable over the period of record, with no increasing or decreasing trend.

Well 7N/8W-35K1 (35K1) is located in the southern SRP Subbasin north of Rohnert Park and is perforated from 185 to 205 feet. Well 35K1 has a period of record from 1980 to 2007 during which water levels have generally been stable. However, for the period 1990 to 2007 the spring depth to water rose steadily from 30 feet in 1990 to 20 feet in 2007. The April 2006 depth to water of 15 feet was the shallowest recorded during the long period of record for this well. Seasonal fluctuations have typically been 10 feet or less in this well.

Rohnert Park Wells

Figure 5-3 contains representative hydrographs for two water supply wells located in the northern and southern portions of Rohnert Park. Rohnert Park municipal pumpage, which is plotted on **Figure 4-2**, is the primary influence on water levels in these wells.

Well RP-17 is located in the northern portion of Rohnert Park and perforated from 302 to 462 feet. RP-17 has a period of record from 1980 to 2006. The shape of the hydrograph shows that spring depths to water rose during the early 1980s, reaching 84 feet bgs in 1982. Spring depths to water declined during the remainder of the 1980s, reaching 178 feet in 1991. Depths to water have generally been rising since 1991, reaching 94 feet by 2003. The rate of water level rise has increased since 2003, with the depth to water reaching a high of 19 feet bgs in 2006.

Well RP-8 is a shallow and intermediate zone well located in the southern portion of Rohnert Park approximately one-half mile east of City of Cotati Well 2. RP-8 is perforated from 125 to 490 feet, and has a period of record from 1972 to 2006. The spring depth to water declined from 30 feet bgs in 1972 to 51 feet in 1977. Spring water levels rose to 40 feet bgs by 1982 and remained relatively stable until 1987. Spring water levels declined during the 1987-1992 drought, reaching 120 feet bgs in 1991. Spring water levels rose during the 1990s, reaching 38 feet bgs by 1999, and then declined to 77 feet bgs in 2001. Water levels have increased considerably since 2001, reaching a high of 14 feet bgs in 2006. The spring 2006 water levels are the highest ever measured in wells RP-17 and RP-8.

5.1.2 Rincon Valley and Healdsburg Area Subbasins

Water level data are much more limited for the Rincon Valley and Healdsburg Area Subbasins. As indicated on **Table 5-1**, data from DWR were only available to prepare hydrographs for two wells in the Rincon Valley Subbasin and eight wells in the Healdsburg Area Subbasin. These hydrographs are included in **Appendix B** and described below.

In the Rincon Valley Subbasin, hydrographs were prepared for one shallow zone and one intermediate zone well. Both wells have periods of record from 1980 to 2006. The shallow well (well 7N/7W-06H2) is 100 feet deep and has a spring depth to water ranging from 15 to 27 feet. During most of the 1990s, the spring depth to water averaged 22 feet, with seasonal fluctuations of about 15 feet. By 2006, the spring depth to water had increased to 15 feet, which is the highest measured during the period of record for this well. Overall, water levels appear to be generally stable in this well.

The intermediate zone well monitored by DWR in the Rincon Valley Subbasin (well 7N/7W-09P1) is 296 feet deep and had a spring depth to water of about 82 feet in 1990. Water levels have increased considerably since that time (to about 46 feet in 2003), and have been stable since 2003. Seasonal fluctuations have decreased from about 20 feet in the early 1990s to about 5 feet in recent years.

In the Healdsburg Area Subbasin, hydrographs were prepared for one shallow zone well and seven wells of unknown depth. The shallow zone well (8N/9W-22E1) is 45 feet deep and has a period of record of 1974-2006. The spring depths to water in this well were generally stable from 1974 (27 feet) to 1990 (31 feet). Water levels rose after 1990, and the depth to water reached 5 feet in 2006. Seasonal fluctuations average about 8 feet in this well.

Most of the hydrographs in the Healdsburg Area Subbasin are for wells of unknown depth, all but one show stable to increasing water levels over the period of record. Only one well (9N/10W-12C1) northeast of Healdsburg shows evidence of historical water level declines. This well has the longest period of record (1964 to 2006) and experienced spring water level declines from about 12 feet bgs in the mid 1960s to about 25 feet bgs in 2003. The spring depth to water increased to 15 feet bgs by 2006. The other wells have shorter periods of record but show generally stable water levels prior to 2006 and relatively large water level increases in 2006.

5.1.3 Petaluma Valley Groundwater Basin

Hydrographs for 14 wells in the northern portion of the Petaluma Valley Groundwater Basin (north of the City of Petaluma) are included in **Appendix B**. As indicated in **Table 5-1**, this includes ten shallow zone wells, two shallow and intermediate zone wells, one intermediate zone well, and one well of unknown depth. Eleven of these wells have recent water level data until at least 2004; nine of these show stable to increasing water levels in recent years and two shallow wells (5N/7W-11N1 and 4N/7W-15K2) located east of northern Petaluma show slightly declining water levels.

Well 5N/7W-20B2 has the longest period of record (1953-2006) of the 14 wells. This shallow well has a depth of 158 feet and is located in the northern portion of the City of Petaluma. The spring depth to water in this well declined from about 12 feet in the mid 1950s to about 78 feet in the early 1960s. Water levels have increased since that time and have been relatively stable at 19 to 29 feet bgs since 1999.

5.2 Evaluation of Hydrographs in the Cotati Urban Growth Boundary

5.2.1 Shallow Wells

DWR monitors two wells, 6N/8W-26L1 (26L1) and 6N/8W-27H1 (27H1), within the City's UGB, and one well 5N/8W-02H1 (02H1) immediately south of the UGB. The locations of these wells and their hydrographs are shown on **Figure 5-3**. In addition to these wells, there are water level data for a number of shallow monitoring wells located at seven LUFT sites within the City's UGB (see **Appendix B**).

Well 26L1 is a domestic well located within the Cotati City Limits and perforated from a depth of 54 to 94 feet. Well 26L1 has the longest period of record of any well in the Cotati area (1972 to 2004). Since the mid 1990s, spring water levels have been essentially the same as spring water levels prior to the mid 1980s (about 12 feet bgs). Seasonal fluctuations ranged from 10 to 17 feet during most years; larger fluctuations that occur occasionally are probably drawdown caused by pumping of this well for domestic use. In spring 2004, the depth to groundwater was 9 feet. The last water level measurement in well 26L1 was made in June 2004, and the well has since been destroyed due to commercial construction in the area.

Well 27H1 is located in the Cotati UGB, just west of the City Limits, and perforated from a depth of 62 to 82 feet. The period of record for well 27H1 is 1976 to 2007. Spring water levels in this well declined from the late 1970s to late 1980s, were generally stable from the late 1980s until about 2003, and have increased in recent years. The shallowest depth to water measured in this well was 30 feet in 2006. The lower water levels in this well and the recent water level increases suggest that intermediate zone pumping, especially from the Rohnert Park wells, has had an effect on water levels in well 27H1. Seasonal fluctuations have been less than 5 feet in this well.

Well 02H1 is located just south of the Cotati UGB in the northern portion of the Petaluma Valley Groundwater Basin. It is perforated from a depth of 30 to 150 feet and has a long period of record (1975-2007). Spring water levels in this well have generally been stable, with spring depths to water ranging from about 27 to 47 feet. Seasonal fluctuations have been 2 to 21 feet in well 02H1. This well is located near the groundwater divide that separates the Santa Rosa Valley and Petaluma Valley basins. Stable water levels in this well are an indication that the location of the divide in this area has been stable since at least 1975.

Hydrographs for two shallow monitoring wells at underground storage tank sites are also shown on **Figure 5-3**. MW-2 at the L005 site is 20 feet deep, and MW-3 at the L126 site is 28 feet deep. These wells have a relatively short period of record (2002-2006) but show

stable to slightly increasing water levels with about 5 feet of seasonal fluctuation during this period.

5.2.2 City of Cotati Water Supply Wells

The City's water supply wells are the only intermediate zone wells within the City's UGB that have water level data. Hydrographs of water levels in the three existing City water supply wells are plotted on **Figure 5-4**, and individual hydrographs of each City of Cotati well and the closest Rohnert Park well are also shown on this figure. City Well 2 has the longest period of record (1977-2006); the period of record for Wells 1A and 3 is 1990-2006. Collection of water level data from the City wells has been intermittent, and there are periods of frequent water level measurements interspersed with extended periods of no measurements. Most of the available water level data were collected when the wells were operating by recording an air line water level measurement several times a week along with a flow meter reading.

Much of the available water level data for the City's wells are considered questionable due to equipment malfunctions (airline leaks and compressor failures) and other problems (pumping, rather than static, water level measurements; and a lack of manual measurements that would allow the air line readings to be verified). The measurements considered to be most reliable are plotted on **Figure 5-4**.

W&K made manual water level measurements in June 2006, and a few historical manual water level measurements are available from pump efficiency tests. W&K attempted to correct the difficulties experienced by the City and has provided recommendations to the City to improve future water level measurements.

Figure 5-4 shows that spring water levels in Well 2 (the southernmost City well) were relatively constant during the late 1970s and early 1980s. Spring groundwater elevations declined from about 73 feet msl in 1983 to near sea level in 1990. Water levels were stable to slightly increasing during the 1990s, reaching a high of 23 feet msl in 1996, and additional water level increases have occurred in recent years. The spring groundwater elevation measured in 2006 (91 feet msl) was the highest ever recorded in this well and represents a depth to water of only 22 feet.

The hydrographs of the other two City wells exhibit a similar pattern to Well 2 after water level measurements began in 1990. Well 3 is the northernmost City well, and groundwater elevations in this well are typically about 50 feet lower than in Well 2. Depths to water in Well 3 are greater than the other City wells, with a minimum of 45 feet reported in 2006. Well 1A is located between Wells 2 and 3, and spring groundwater elevations in this well are generally similar to Well 2. Groundwater elevations in Well 1A were slightly higher than in Well 2 during the 1990s, and have been slightly lower since about 2003. The minimum depth to water reported in Well 1A was 28 feet in 2006.

Groundwater elevations in City Well 1A and the closest Rohnert Park well (RP-4) are shown on **Figure 5-4**. Groundwater elevations in RP-4 are generally 20 to 30 feet higher than in City Well 1A, but both wells show a similar trend. Well 1A is located about 0.6 mile

west of RP-4, and the direction of groundwater flow is to the west toward the valley trough in this area. **Figure 5-4** shows groundwater elevations in City Well 2 and Rohnert Park RP-8. These wells also show a similar trend, with RP-8 generally having higher groundwater levels. Well 2 is located about 0.4 mile west of RP-8, and the direction of groundwater flow is also to the west in this area. Water level data are more limited for City Well 3 (**Figure 5-4**), but the available spring groundwater elevations in this well are more similar to those in Rohnert Park RP-7. This is expected because RP-7 is located north of and cross-gradient to Well 3, and the two wells are only about 0.3 mile apart.

The degree of similarity between hydrographs of City of Cotati and nearby Rohnert Park wells suggests that water levels in the City's wells are significantly influenced by pumping (and also the reduction in pumping) from the Rohnert Park wells. Large water level increases in the City's wells since 2003 are due to pumpage reductions by both cities.

5.3 Groundwater Elevation Contours

Maps showing contours of equal groundwater elevation are useful to show differences in groundwater levels over a large area. The direction of groundwater flow can also be inferred from these maps because it is perpendicular to the groundwater elevation contour lines.

Historical groundwater elevation contours are available from USGS and DWR reports. Cardwell (1958) prepared a spring 1951 contour map for the SRP and Rincon Valley Subbasins and the northern portion of the Petaluma Valley Groundwater Basin. More data were available for this period than any other historical or recent period because the USGS conducted a one-time round of water level measurements in approximately 450 wells in April 1951. The majority of these wells are shallow, and the shapes of the contours on the Cardwell map primarily reflect groundwater conditions in the shallow zone. The portion of the Cardwell map showing the southern SRP Subbasin, including the Cotati area, is shown on **Figure 5-5**. The overall direction of groundwater flow in the SRP Subbasin was westerly toward the Laguna de Santa Rosa in the valley trough and ultimately to the northwest. West of the valley trough, there was a steeper gradient for groundwater flow toward the Laguna de Santa Rosa from the hills west of the valley.

5.3.1 Shallow Zone

A contour map of groundwater elevations in shallow zone wells in spring 2004 was prepared for the SRP Subbasin and the northern portion of the Petaluma Valley Basin (**Figure 5-6**). 2004 was selected for this contour map because water level measurements were available for more DWR wells in that year than in subsequent years. The 2004 shallow zone contour map also includes data from a number of LUFT monitoring wells in the Cotati/Rohnert Park area available from the SWRCB Geotracker website.

Groundwater elevations in the SRP Subbasin shown on **Figure 5-6** ranged from 195 feet msl in the Santa Rosa area to 45 feet msl in the City's UGB. The direction of groundwater flow was generally westerly toward the Laguna de Santa Rosa. Data are available for a few wells west of the Laguna de Santa Rosa in the Sebastopol area, which show a much steeper

gradient for groundwater flow into the valley from the west. Groundwater elevations and flow directions in 2004 were similar to those shown on Cardwell's 1951 contour map (**Figure 5-5**). The Cardwell map shows a very shallow gradient for groundwater flow toward the Laguna de Santa Rosa from the east and a much steeper gradient for groundwater flow into the SRP Subbasin from the west.

In the northern portion of the Petaluma Valley Basin, the direction of groundwater flow is generally to the south toward the City of Petaluma and away from the groundwater divide that separates the two groundwater basins. The 2004 contours shown on **Figure 5-6** indicate that the approximate location of the groundwater divide is similar to the southern boundary of the SRP Subbasin as mapped by DWR. Based on groundwater elevation contours on either side of the divide, its current location appears to be essentially the same as it was in 1951 based on Cardwell's map (**Figure 5-5**). The lack of movement of the groundwater divide is supported by water level hydrographs for shallow wells near the divide, which indicate that shallow groundwater levels have generally been stable for at least the last 15 years. Hydrographs for wells near the divide such as T6N/R7W-30R1, T5N/R8W-02H1, and T5N/R8W-01L2 are included in **Appendix B**.

5.3.2 Intermediate Zone

Water level data available for the intermediate zone were sufficient to prepare a spring 2006 groundwater elevation contour map for the Cotati/Rohnert Park area, but it was not possible to extend these contours north to the central portion of the SRP Subbasin or south to the northern Petaluma Valley Basin as was done for the shallow zone. The spring 2006 intermediate zone groundwater elevation contours are shown on **Figure 5-7**. Groundwater elevations range from 110 feet msl in the southeastern portion of Rohnert Park to 52 feet msl in the western portion. Groundwater elevations in the intermediate zone are lower than in the shallow zone, especially in the central and western portions of Rohnert Park. Although local variations exist, the direction of groundwater flow in the intermediate zone in the Rohnert Park area is generally to the northwest. There are a few intermediate zone wells located west of the valley trough, but the direction of groundwater flow beneath most of the City is assumed to be to the northwest as indicated by the dashed contours on **Figure 5-5**.

5.4 Effect of Faults

The water level data discussed above do not provide clear evidence about the hydraulic properties of the Sebastopol and Petaluma Valley faults. Both the shallow and intermediate zone groundwater elevation contours are approximately perpendicular to the Sebastopol fault, but this is inconclusive because the fault generally underlies the valley trough and there are insufficient data to determine the true shape of the contour lines in this area due to the lack of well control west of the fault.

The hydrographs show that groundwater elevations in the shallow and intermediate zones are similar on both sides of the Sebastopol fault. The location of the City wells relative to the fault is also shown on **Figure 5-7**. Based on either the DWR (1982a) or the Allen (2003) interpretation of the fault location, City Well 1A is located west of the fault and City Well 3 is located east of the fault. City Well 2 is either located west of the Sebastopol fault based

on the DWR (1982a) geologic map or east of the Petaluma Valley fault based on the Allen (2003) map. For City Wells 1A and 2, the closest Rohnert Park wells are located on the opposite side of the Sebastopol fault. As shown on the water level hydrographs (**Figure 5-4**), all three City wells are affected by Rohnert Park pumpage, and water level trends are similar to the nearby Rohnert Park wells. These hydrographs suggest that the Sebastopol fault does not act as a barrier to groundwater flow in the Cotati area.

5.5 Groundwater Quality

5.5.1 City Wells

Groundwater quality in the City's water supply wells is generally good, but two wells have elevated iron and manganese concentrations that require treatment as discussed below. General mineral and trace element concentrations for the three City wells from January 2000 to March 2006 are summarized in **Table 5-2**. The wells are sampled triennially for complete general minerals and trace elements as required by the Department of Public Health (DPH) for all public water systems, and Wells 1A and 3 are also sampled weekly for iron and manganese. The results for each individual sampling event are summarized in **Appendix C**. Groundwater produced from the three City wells meets primary state drinking water standards.

The overall mineral content in the City wells, as indicated by total dissolved solids (TDS) concentrations, ranges from 240 to 310 mg/L. TDS concentrations are slightly lower in Wells 1A and 2 (240-250 mg/L) than in Well 3 (300-310 mg/L). These values are below the recommended secondary Maximum Contaminant Level (MCL) of 500 mg/L.

Groundwater in the southern SRP Subbasin can contain elevated concentrations of nitrate, iron, and manganese. Elevated nitrate concentrations occur primarily in shallow wells, and all nitrate concentrations in City wells are lower than the primary MCL of 45 mg/L as nitrate. Nitrate has always been non-detect (less than 2 mg/L as nitrate) in City Well 1A. Nitrate concentrations range from 4.7 to 8.2 mg/L in Well 2 and from non-detect to 4.6 mg/L in Well 3.

Naturally occurring iron and manganese concentrations in the raw water from City Wells 1A and 3 often exceed the secondary MCLs for these constituents. Secondary MCLs are set for aesthetic reasons such as taste, odor, and appearance of the water and are not a health concern. The secondary MCLs are 300 µg/L for iron and 50 µg/L for manganese. Water from Wells 1A and 3 is treated to remove iron and manganese, and iron and manganese concentrations, and the treated water is sampled daily in accordance with DPH requirements. With the exception of a single sample from Well 1A on December 9, 2005, all of the treated water samples from both wells have been below the secondary MCLs.

5.5.2 LUFT Wells in the Cotati Urban Growth Boundary

Volatile organic compounds (VOCs), pesticides, and other manmade contaminants were not detected in any of the City wells during the January 2000 to March 2006 period.

Although no contaminants have been detected, there is a slight potential for contamination introduced through known point sources. The most common point sources are leaking underground storage tank (LUFT) sites, and these are shown on **Figure 5-8**. A total of 12 LUFT sites are currently undergoing remediation within the City's UGB. There are additional LUFT sites in Rohnert Park, and a total of 20 sites are currently undergoing remediation within one mile of the City's water supply wells and within the SRP Subbasin. Although other potential point sources are not shown on **Figure 5-8**, there are no known serious or widespread issues that affect community water supplies due to organic chemical sources in the vicinity of the City.

6.0 Groundwater Supply Sufficiency

When groundwater is a source of supply, as is the case for proposed developments in the City's UGB, SB 610 requires that the WSA include an analysis of the sufficiency of groundwater from the basin from which the proposed project will be supplied to meet the projected water demands associated with the project during normal and multiple-dry years for a 20-year projection.

6.1 Groundwater Supply Sufficiency

Maintaining sustainable groundwater supplies is one of the primary goals of managing the City's water resources. As described above, DWR (1982a) indicated that groundwater levels in the SRP Subbasin are "about in balance, with increased ground water levels in the northeast contrasting with decreased ground water levels in the south." As also described above, nearly 140 water level hydrographs for wells in the SRV Groundwater Basin were prepared and reviewed to update DWR's 1982 evaluation of groundwater resources in Sonoma County and provide a current assessment of groundwater level trends and conditions. The updated analysis of groundwater levels shows an overall improvement in groundwater conditions compared to DWR's 1982 study. Groundwater levels remained generally stable in the northeast but showed significant improvement in the south. These water level trends reflect the basin's response to groundwater recharge and discharge (including pumpage). Although historical pumpage has not been expressly quantified for the SRP Subbasin since DWR's 1987 study, groundwater level trends within the basin indicate that the historical pumpage has been sustainable. Thus, as previously reported by DWR (1982a), the SRV Groundwater Basin is still "in balance"; the updated analysis shows no evidence of overdraft conditions occurring in the basin.

One way to evaluate groundwater supply sufficiency is to determine whether the projected pumping rate will be sustainable in both normal and dry years. Sustainable pumpage can be defined as pumping at a rate that does not exceed the safe or sustainable yield of a basin on a long-term basis. DWR (2003b) defines safe yield as "the amount of groundwater that can be continuously withdrawn from a basin without adverse impact" and states that it may be indicated (but not quantified) "by stable groundwater levels measured over a period of years". Although the safe yield of the SRP Subbasin has not been quantified, historical groundwater conditions indicate that the subbasin has been and remains in balance and the historical pumpage was sustainable at a unit pumpage ranging from about 0.32 to 0.36 AF/acre.

The total pumpage for the southern portion of the SRP Subbasin that included the Cities of Cotati and Rohnert Park was estimated to be sustainable during 1990-1997 at a level of 8,700 AF (W&K, 2007), which represents a unit pumpage of 0.35 AF/acre. This was a period when groundwater level trends indicated the subbasin was in balance, water levels in the southern portion of the subbasin were stable to increasing, and the average precipitation was only slightly above normal. This unit pumpage is similar to the annual historical unit pumpage estimated for the Cotati UGB during 1990-2003 (0.35 AF/acre) and the projected unit pumpage of 0.34 AF/acre in 2030. The projected unit pumpage is based in part on the

City's plan to not pump more than the 1990-2003 average of 412 AFY on a long-term average basis. This would be accomplished by conjunctive use of groundwater and surface water resources, whereby the City would reduce pumpage and rely more on SCWA water deliveries during normal water years. The City's pumpage would increase to a maximum of 530 AFY during single-dry or multiple-dry years to make up for potential cutbacks in surface water deliveries. The projected future pumpage in the City's UGB is expected to be sustainable on both a short-term and long-term basis.

As a complement to the groundwater utilization factors described above for the SRP Subbasin and the City's UGB, two other methods have been used to demonstrate groundwater supply sufficiency (W&K, 2007). Todd (2004) performed a detailed water budget analysis for the upper Laguna watershed; this analysis, which was for the area shown on Figure 4-3, is summarized and expanded on in W&K, 2007. The water budget analysis provided a means to estimate inflows to and outflows from the upper Laguna watershed and assess the change in groundwater storage occurring during a historical period (1986-2001). This analysis included estimates of all municipal and non-municipal (domestic, agricultural, and commercial) pumpage along with other water budget components. The water budget analysis showed that the average groundwater recharge and subsurface inflow were slightly greater than the historical pumpage, which resulted in a positive change in storage.

The water budget was complemented by an empirical analysis of historical groundwater level and pumpage data for 1970 through 2005 that resulted in an estimated range of pumpage within which the Cities of Rohnert Park and Cotati and other pumpers in the southern portion of the SRP Subbasin could operate without causing persistent groundwater level declines. The average 1990-1997 total pumpage within the upper Laguna watershed area (about 8,700 AFY) was at the upper end of this range.

6.2 Reliability of the Groundwater Supply

The City's groundwater supply has historically been reliable even during dry years. As discussed in Section 5.1, groundwater levels in the shallow zone in the southern SRP Subbasin have generally been stable except for small fluctuations due primarily to changes in precipitation. In the intermediate zone, larger fluctuations in water levels historically occurred in response to changes in pumpage, but groundwater levels have shown little response to changes in climatic conditions. The City's water resources strategy is to rely primarily on SCWA water supplies and to utilize groundwater only as needed to supplement those supplies. This will increase reliability of the groundwater supply by allowing the City to limit its future average pumpage to the long-term historical average (412 AFY). During dry years, the City's groundwater resource can be managed in conjunction with other water sources and water conservation measures to maximize reliability. Short-term pumpage increases that would occur during dry years will be offset by decreases during normal and wet years.

There are no physical constraints to the City's planned groundwater pumping. The City has more than adequate capacity from its existing wells to pump the 412 AFY it anticipates utilizing on an average basis and up to approximately 530 AFY that it may use during dry periods.

6.3 Summary of Groundwater Supply and Sufficiency.

6.3.1 Summary of the City's Groundwater Supply

As described above, the City plans to use SCWA water as its primary source of supply and to supplement that supply with groundwater as needed to meet the City's water demands. The average long-term pumpage is planned to not exceed 412 AFY, with some years being considerably less than that amount and up to 530 AF being pumped temporarily during dry periods. **Table 6-1** illustrates the City's maximum proposed use of groundwater under a range of hydrologic conditions.

Table 6-1 Summary of City's Anticipated Groundwater Use

Hydrologic Condition	Pumpage Through 2030 (AFY)	Comment
Normal Water Year	Up to 412	Groundwater supply will be use to enhance reliability. Long-term average pumpage will not exceed 412 AFY.
Single-Dry Water Year	Up to 530	
Multiple-Dry Water Year 1	Up to 530	
Multiple-Dry Water Year 2	Up to 530	
Multiple-Dry Water Year 3	Up to 530	

6.3.2 Summary of Groundwater Sufficiency

Groundwater conditions are generally good in the SRV Groundwater Basin, including the City's UGB. Groundwater levels have remained high and relatively stable at most shallow wells in the SRP Subbasin. Groundwater levels in intermediate zone wells in the southern SRP Subbasin declined during the 1980s, were stable to increasing during the 1990s, and have increased significantly since 2003. Recent water level increases are due primarily to decreased municipal pumpage in the southern portion of the SRP Subbasin in recent years. There is no evidence of overdraft conditions occurring anywhere in the groundwater basin. Future pumpage in the southern SRP Subbasin is projected to be less than historical pumpage during the 1990s. The data indicate that historical pumpage in the SRP Subbasin was sustainable, and that projected future pumpage from the subbasin, including the City's, is also expected to be sustainable during normal, single-dry, and multiple-dry years. Future groundwater supplies will be sufficient to meet the demands of the DSP project and other projected groundwater demands in the City's UGB and the remainder of the southern SRP Subbasin.

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TABLES

**Table 2-1
City of Cotati Well Construction**

	Units	Well 1	Well 1A	Well 2	Well 3
Construction Date		Sep. 1946	Dec. 1991/Jan. 1992	Dec. 1975	May 1981 (in service since Apr. 22, 1985)
Date of Abandonment		1992	-	-	-
Drilling Method		cable tool	(reverse?) mud rotary	reverse mud rotary	reverse mud rotary
DWR Well Log		49-2664	NA	No. 97871	No. 43814 through 43816 (test hole no. 79760)
Geophysical Log		no	yes	yes	yes
Total Depth	feet, bgs	NA	703	515	705
Completed Depth	feet, bgs	660	650	500	685
Screened Interval	feet, bgs	top of perforated interval = 370	290-310; 360-410; 450-460; 480-500; 570-630	220-235; 300-330; 405-425; 475-485	295-320; 330-345; 377-387; 520-530; 553-560; 640-670
Total Screen Length	feet	about 140	160	75	97
Casing Diameter	inches	12 (0-552 feet) 10 (552-660 feet)	12 (entire length)	12 (entire length)	16 (0-280 feet) 10 (280-685 feet)
Sanitary Seal	feet, bgs	0-30	0-60	0-50	0-50
Wellhead Elevation ¹	feet, msl	NA	109.7	112.5	97.4
Well Yield ²	gpm	NA	530	310	670
Notes		Abandoned after construction of Well 1A	Replacement for Well 1 (approximately 25 feet away)		

NA: Not available

1. Approximate reference point elevation for manual water measurements based on GPS survey by W&K, June 2006.
Datum = NGVD 29
2. Well yield based on 2005 pump efficiency tests.

**Table 2-2
City of Cotati Pumping Test Results**

Pumped Well	Start Date	Test Duration (hrs)	Pumping Rate (gpm)	Depth to Water (Start) (ft)	Depth to Water (End) (ft)	Drawdown (ft)	24-hr Specific Capacity (gpm/ft)	Pumping Phase		Recovery Phase			Mean T (rounded) (gpd/ft)
								T (gpd/ft)	Method of Analysis	Duration (hrs)	T (gpd/ft)	Method of Analysis	
Well 1A	03/24/92	24	750	45	144.2	99.2	7.6	14,100	Cooper-Jacob	6	14,400	Theis	14,300
Well 2	10/12/82	6	350	-	-	165	2.1	-	-	-	-	-	-
Well 3	05/14/81	12	1,000	92.7	231.5	138.8	7.0	16,500	Cooper-Jacob	2	13,200	Theis	14,900

Notes:

na = not applicable; T = transmissivity

Well 1A: Depth-to-water measurement immediately prior to pump start not available; used 3/20/1992 (45 feet) static depth-to-water measurement for calculations.

The drawdown plot shows a distinct slope increase at t = 100 min. Transmissivity was calculated based on late time data (after t = 100 min). Similarly, late time data were used for the recovery phase calculations.

Well 3: Specific capacity based on extrapolated drawdown from 12-hr test.

**Table 4-1
City of Cotati Annual Pumpage and Surface Water Supply (acre-feet)**

Year	Annual Pumpage by Well				Total Pumpage ²	SCWA Supply ³	Total Supply ⁴
	Well 1	Well 1A	Well 2	Well 3 ¹			
1969	Constructed 9/46				-	-	172
1970	-				-	-	182
1971	-				-	-	-
1972	-				-	-	-
1973	-				-	-	318
1974	41				41	306	347
1975	-		Constructed 12/75		-	-	-
1976	-		-		-	-	-
1977	-		138		-	-	-
1978	-		29		-	-	-
1979	-		103		-	-	-
1980	-		146		-	<i>131</i>	-
1981	-		-	Constructed 5/81	-	<i>212</i>	-
1982	-		-	-	-	<i>372</i>	-
1983	-		-	-	-	<i>56</i>	-
1984	-		-	-	-	<i>198</i>	-
1985	-		-	-	-	<i>18</i>	-
1986	-		-	-	<i>629</i>	<i>140</i>	769
1987	-		-	-	-	<i>122</i>	-
1988	-		-	-	<i>684</i>	<i>141</i>	825
1989	-		-	-	<i>641</i>	<i>196</i>	837
1990	121		167	-	562	399	961
1991	0		121	-	494	418	912
1992	Abandoned	Constructed 7/92	225	-	356	593	949
1993		-	102	-	353	616	969
1994		-	86	-	322	765	1,087
1995		52	43	203	298	768	1,067
1996		122	61	257	440	655	1,096
1997		159	84	266	510	676	1,186
1998		134	12	291	437	621	1,057
1999		121	48	238	407	693	1,100
2000		119	73	253	444	745	1,189
2001		131	164	237	532	700	1,232
2002		104	61	174	340	877	1,217
2003		74	48	157	278	916	1,194
2004		31	46	29	106	1,101	1,207
2005		13	22	14	49	1,069	1,118
2006		20	48	12	80	1,038	1,118

- Missing data

1. City of Cotati Finance Department records used to estimate monthly pumpage for Well 3 during March-June 1998 due to meter malfunction.
2. 1986 to 1994 annual pumpage (in italics) provided by DHS (July 2006). 1995 to 2005 pumpage from City of Cotati monthly meter readings. 2006 pumpage from City of Cotati Finance Department table for DHS.
3. 1980 to 1985 SCWA supply (in italics) provided by DWR. 1986 to 1994 SCWA supply (in italics) provided by DHS. 1995 to 2006 SCWA supply provided by City of Cotati Finance Department. SCWA deliveries to City began in 1962.
4. 1969, 1970, 1973, and 1974 total supply values (shaded) based on Table 8, Water Consumption Evaluation, in "Amendment No. 1 to a Study Regarding Water Supply and Distribution City of Cotati", August 1975. 1969 and 1970 values represent 1968-1969 and 1969-1970, respectively.

**Table 4-2
Estimated Current Non-Municipal Pumpage Between Cotati City Limits and Urban Growth Boundary**

Land Use Designations	Residential		Commercial and Agriculture			Total Acres	Estimated Current Groundwater Pumpage (AFY)
	Existing Dwelling Units	Water Demand (AFY per dwelling unit)	Number of Parcels	Estimated Irrigated Acres	Water Demand (AFY per parcel or per acre)		
Residential	Single-Family Dwelling Units	305	0.53			815	162
	Multi-Family Dwelling Units	2	0.25			2	0.5
Commercial	Auto Repair			1	2.0 per parcel	4	2
	Golf Course			1	10	11	33
Agriculture	Irrigated Pasture			1	14	16	48
	Dairy			1		81	191
	Vineyard			3	22	27	27
Total						955	463

note: Total pumpage does not include current non-municipal pumpage within City Limits (16.8 AFY) calculated by Winzler and Kelly.

Sources:

1. Source of land use designation, number of dwelling units, and acres per parcel: Sonoma County Assessors Office (personal communication 6/20/06 and 7/13/06).
2. Source of dwelling unit demand: Todd Engineers, 2004, Canon Manor West Subdivision Assessment District groundwater study for Sonoma County.
3. Source of crop demand: Department of Water Resources, 1986, Crop Water Use in California, Bulletin 113-4. Table 1. Estimated 1980 County of Sonoma Average Unit Applied Water.

Assumptions:

1. Vacant lots are non-irrigated. (There are 132 vacant lots on a total of 382 acres.)
2. The auto repair shop was assigned a commercial water use of 2 ac-ft/yr although it is designated rural residential by the County.
3. The golf course was assumed to have the same water demand as irrigated pasture (3.4 acre-feet per acre).
4. A land use designation of pasture is assumed to be non-irrigated unless stated.
5. Calculation of estimated irrigated acres = total acres of parcel - (total acres *10% (for roads)).
6. Dairy has approximately 1,000 head with a water demand of 175 gal/day/head. (Source: Falk, D.E., Fresh Water Needs for Dairy Farms, www.oneplan.org/Stock/DairyWater.shtml)
7. Dwelling on vineyard is counted as single residential unit. Calculation of total irrigated acres = total acres - 1 acre for dwelling - (total acres*10% (for roads)).

**Table 4-3
Estimated Pumpage in Santa Rosa Plain Subbasin**

Reference	Study Area	Size (ac)	Study Period	Annual Pumpage (AF)					Unit Pumpage (AF/ac)
				Municipal	Rural Residential	Agricultural	Commercial	Total	
DWR (1987)	SRP + Rincon Valley	81,000	1974-1984	5,182	5,573	14,173	1,345	26,273	0.32
			1983-1984	7,391	6,196	14,030	1,833	29,450	0.36
Todd (2004)	Southern SRP ¹	25,500	1986-2001	5,292	1,418	1,478	280	8,468	0.33
W&K (2007)	Southern SRP ²	25,000	1990-1997	5,640 ³	1,351	1,485	267	8,742	0.35
			2003	3,968 ³	1,419	1,411	280	3,110	0.12
			Projection (2025)	3,179 ³	2,318	1,411	442	7,350	0.29
LSCE (2008)	Cotati UGB	2,570	1990-2003 ⁴	412	168 ⁵	266	46 ⁵	892	0.35
			Projection (2015)	412 ⁶	168 ⁵	266	46 ⁵	892	0.35
			Projection (2030)	412 ⁶	162 ⁷	266	35 ⁷	875	0.34

1. Upper Laguna watershed above the Stony Point Gauge.
2. Upper Laguna watershed above the Stony Point Gauge based on California Interagency Watershed map (1999, updated in 2004).
3. Municipal pumpage includes City of Rohnert Park, City of Cotati, and Sonoma State University. 2025 pumpage for City of Cotati estimated at 382 AFY (W&K, 2007).
4. Historical City of Cotati municipal pumpage (412 AFY) is the average for the period 1990-2003. Non-municipal pumpage was estimated based on 2006 data but assumed to be similar during 1990-2003.
5. Value includes estimated current groundwater pumpage for Residential (5.8 AFY) and Commercial/Industrial (11 AFY) parcels within City limits, but not served by the City (Brian Bacciarini, W&K, pers. comm., October 10, 2006). It is assumed that pumpage in the area between the City limits and UGB will remain at current levels in future years.
6. Projected City of Cotati municipal pumpage based on the historical (1990-2003) average municipal pumpage, i.e. the City intends to maintain this amount as a long-term average pumpage where in wetter years it may pump substantially less groundwater and in drier years it may pump more, up to about 530 AF.
7. It is assumed that non-municipal (Rural Residential and Commercial) parcels currently within City limits will be served by the City in 2030 (using surface water) and that pumpage in the area between the City limits and UGB will remain at 2006 levels.

**Table 5-1
Hydrographs Reviewed for City of Cotati UWMP**

Groundwater Basin or Subbasin		No. of Wells by Aquifer Designation ¹						No. of Wells by Monitoring Entity						Total	
Basin	Subbasin	Shallow Zone	Shallow and Intermed. Zone	Intermed. Zone	Intermed. and Deeper Zones	Deep Zone	Unknown	DWR	SWRCB ²	City of Cotati	City of Rohnert Park	SCWA	Todd		USGS
Santa Rosa Valley	Santa Rosa Plain	44	32	22	12	2	9	50	7	3	43	6	1	11	121
	Rincon Valley	1	0	1	0	0	0	2	0	0	0	0	0	0	2
	Healdsburg	1	0	0	0	0	7	8	0	0	0	0	0	0	8
Total		46	32	23	12	2	16	60	7	3	43	6	1	11	131
Petaluma Valley	--	10	2	1	0	0	1	11	0	0	0	0	0	3	14
Total		56	34	24	12	2	17	71	7	3	43	6	1	14	145

¹ Aquifer zonation:

- Shallow <200 feet
- Shallow and Intermediate <600 feet
- Intermediate 200 - 600 feet
- Intermediate and Deeper >200 feet (Includes three wells completed partially in the shallow zone)
- Deep 600-800 feet
- Unknown No perforation data available (includes wells with no well depth data or wells with total well depths > 200)

² There are seven LUFT sites within the City of Cotati UGB. Each site has multiple monitoring wells, but hydrographs were only generated for one representative well from each site.

Note: Only wells with more than two data points are included

**Table 5-2: Summary of Groundwater Quality Data for City of Cotati Wells:
January 2000 to March 2006**

Analyte	Limit	Units	Well 1A			Well 2			Well 3				
			No. of Meas.	Range of Values	Avg. Value (Detects)	No. of Detects	No. of Meas.	Range of Values	Avg. Value (Detects)	No. of Detects	No. of Meas.	Range of Values	Avg. Value (Detects)
Aluminum	1000(1)/200(3)	ug/L	2	<50		1	130	130	1	2	<50-51	51	1
Arsenic	10(1)	ug/L	2	3.1-3.4	3	2	3	3	1	2	3.3-3.6	3	2
Barium	1000(3)	ug/L	2	<100-130	130	1	140	140	1	2	220-240	230	2
Bicarb Alkalinity		mg/L	2	95-110	103	2	200	200	1	2	140-150	145	2
Boron	1000(2)	ug/L	2	<100		2	<100-160	160	1	2	<100-130	130	1
CaCO3 Alkalinity		mg/L	2	78-88	83	2	160	160	1	2	120	120	2
Cadmium	5(3)	ug/L	2	<1		1	<1		1	2	<1		2
Calcium	N/A	mg/L	2	12	12	2	31	31	1	2	19	19	2
Chloride	250/500(4)	mg/L	2	31-36	34	2	16	16	1	2	68-69	69	2
Chromium	50(3)	ug/L	3	<1		4	<1-2.3	2	2	3	<1		2
Copper	1000(4)	ug/L	2	<50		1	<50		1	2	<50		2
Hardness	N/A	mg/L	2	62-67	65	2	160	160	1	2	100-120	110	2
Iron	300(4)	ug/L	135	340-5900	1011	135	160	160	1	140	<100-6600	595	85
Lead	15(2)	ug/L	2	<5		1	<5		1	2	<5		2
Magnesium	N/A	mg/L	2	7.8-9.1	8	2	20	20	1	2	13-17	15	2
Manganese	500(2)/50(4)	ug/L	135	<20-750	66	128	<20		1	140	<20-1000	243	137
Mercury	2(3)	ug/L	2	<1		1	<1		1	2	<1		2
Nitrate as NO3	45(3)	mg/L	3	<2		2	4.7-8.2	6	2	3	<2-4.6	4	2
pH	6.5/8.5(5)	pH units	2	7.1-7.2	7	2	7.5	8	1	2	7.1-7.3	7	2
Selenium	50(3)	ug/L	2	<5		1	<5		1	2	<5		2
Silver	100(4)	ug/L	2	<10		1	<10		1	2	<10		2
Sodium	N/A	mg/L	2	41-61	51	2	23	23	1	2	60-70	65	2
Specific Conductance (EC)	900/1600(4)	umhos/cm	2	320-330	325	2	420	420	1	2	460-480	470	2
Sulfate	250/500(4)	mg/L	2	14-15	15	2	16	16	1	2	7.9-8	8	2
Total_Dissolved_Solids	500/1000(4)	mg/L	2	240-250	245	2	250	250	1	2	300-310	305	2
Zinc	5000(4)	ug/L	2	<50		1	<50		1	2	<50		2

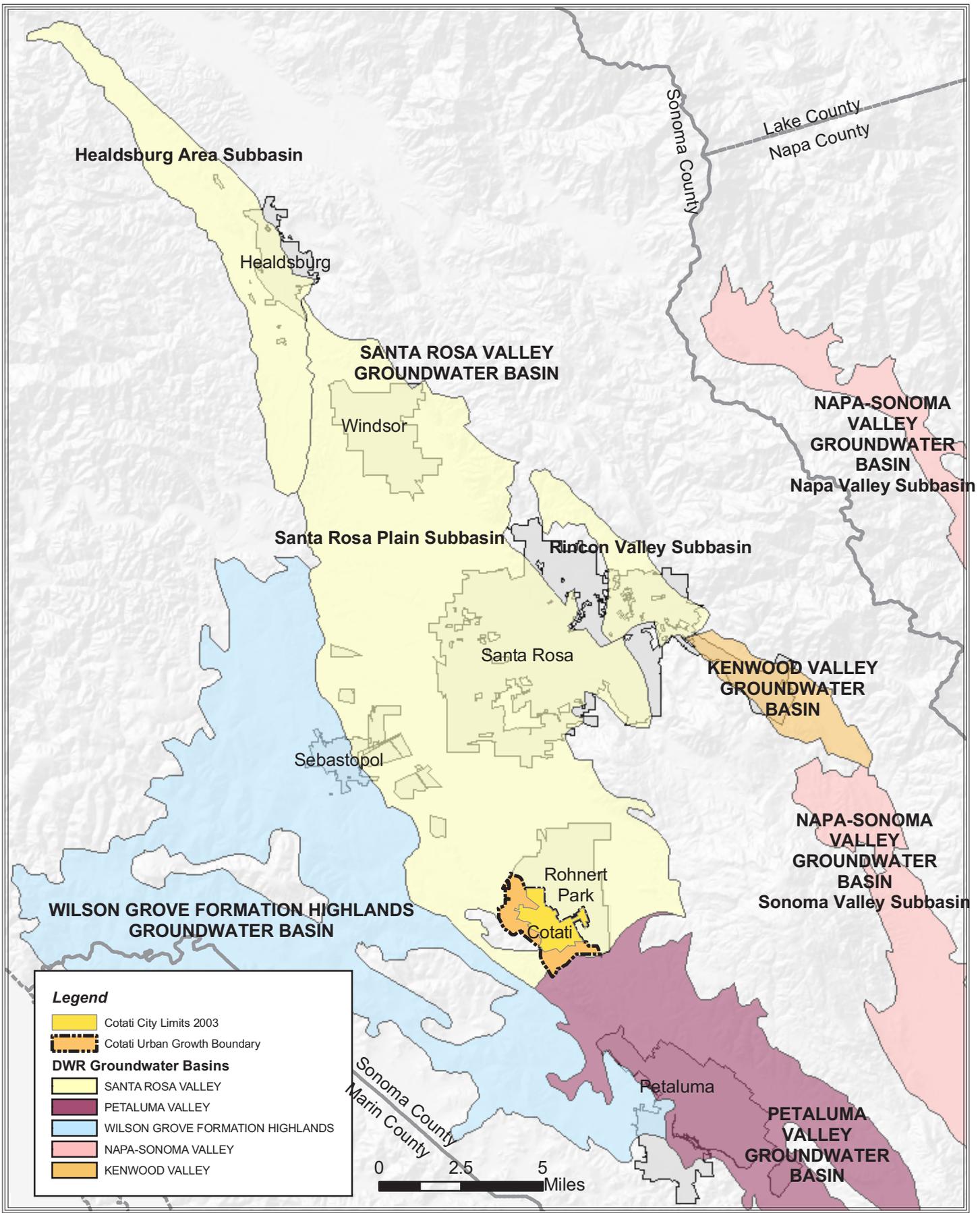
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2. Notification Level
3. State Primary MCL
4. Secondary MCL (recommended/upper)
5. Suggested Range

FIGURES



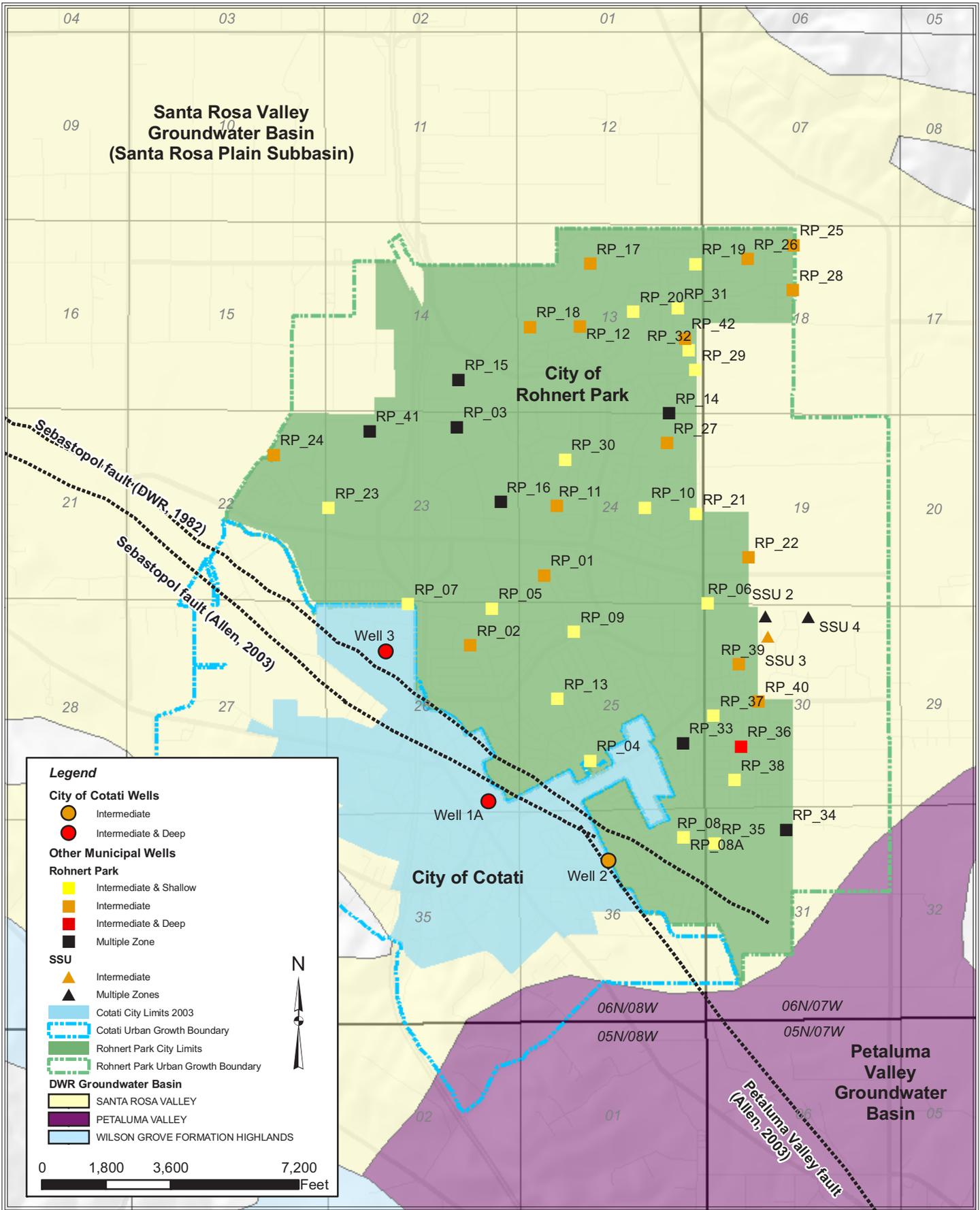
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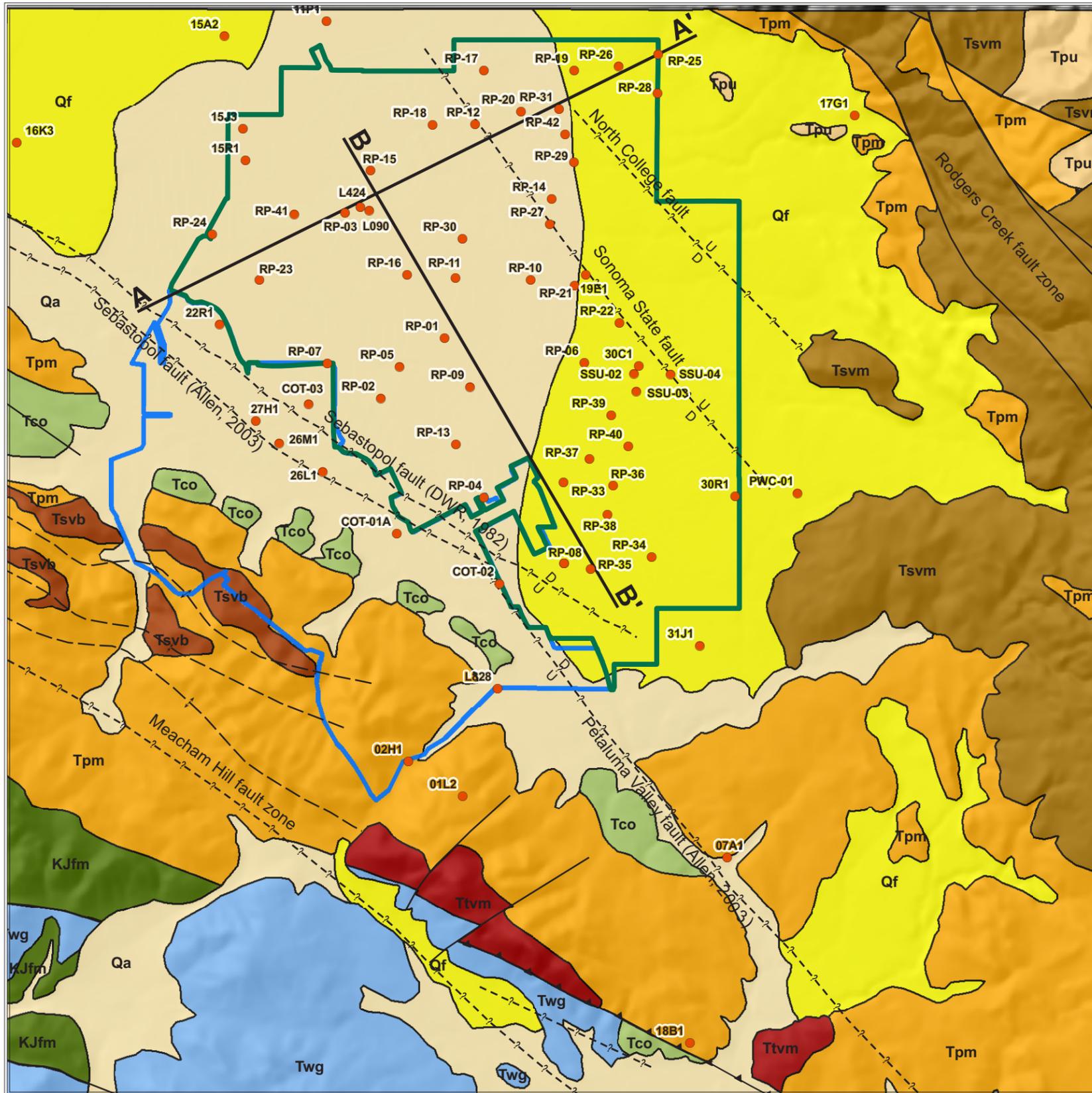
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Figure 2-2
City of Cotati Political Boundaries
and Well Locations



Legend

Geologic Unit

- Qa - Alluvium
- Qf - Alluvial Fans
- Tpu - Petaluma Formation (Upper)
- Tco - Cotati Formation
- Tpm - Petaluma Formation (Middle)
- Twg - Wilson Grove Formation
- Tsvb - Sonoma Volcanics - Basalt
- Tsvm - Sonoma Volcanics - Mafic
- Ttvm - Tolay Volcanics
- KJfm - Franciscan Complex

- Fault
- ▲▲ Thrust Fault
- Buried Fault
- ++ Syncline
- ++ Anticline
- Cross Section Location
- AA' A ___ A'
- UD U = Uphrown Side
D = Downthrown Side
- Well Location
- Cotati UGB
- Rohnert Park UGB

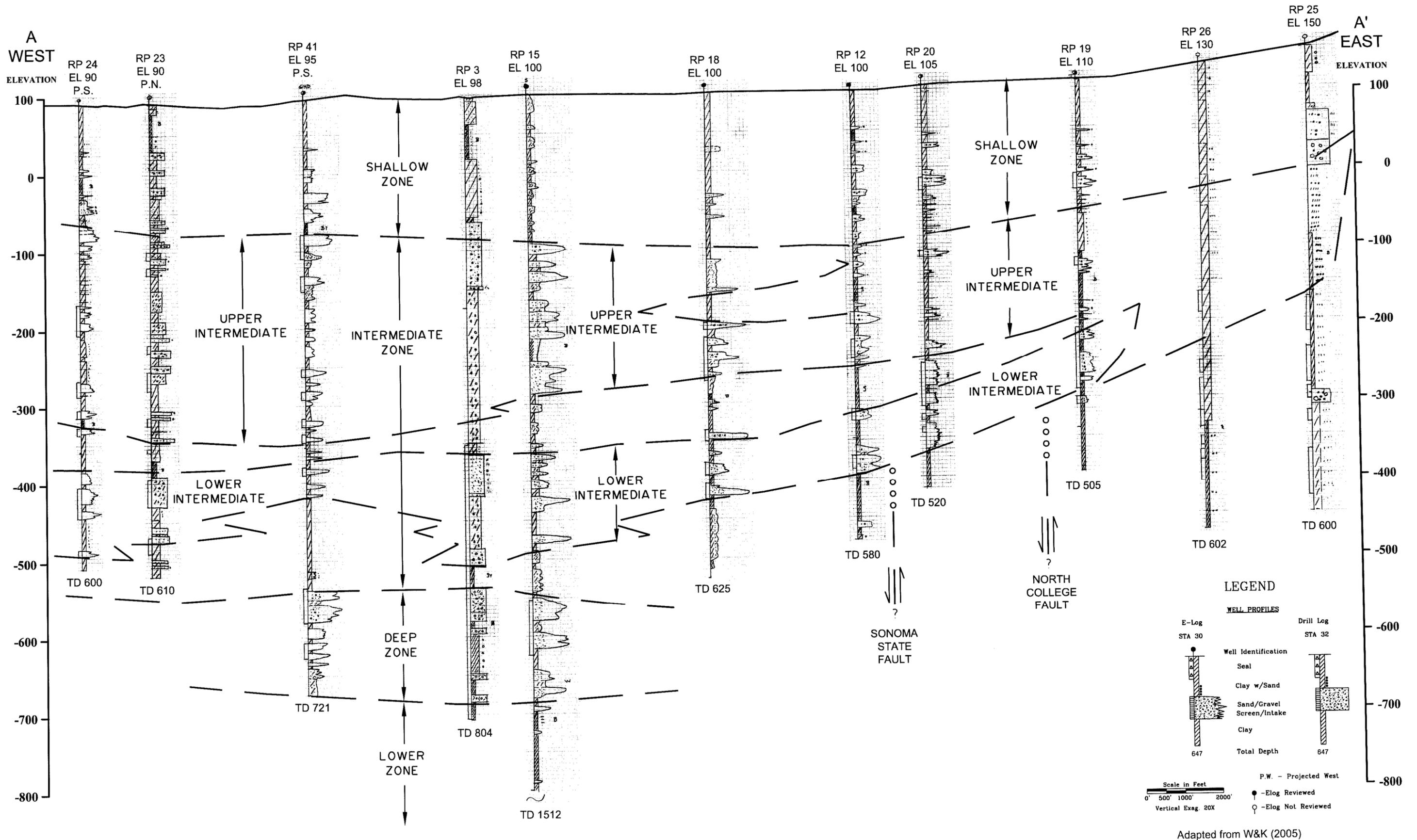
Note: Due to uncertainty about the Sebastopol fault, two locations are shown based on DWR (1982) and Allen (2003). DWR (1982) does not show the Petaluma Valley fault.

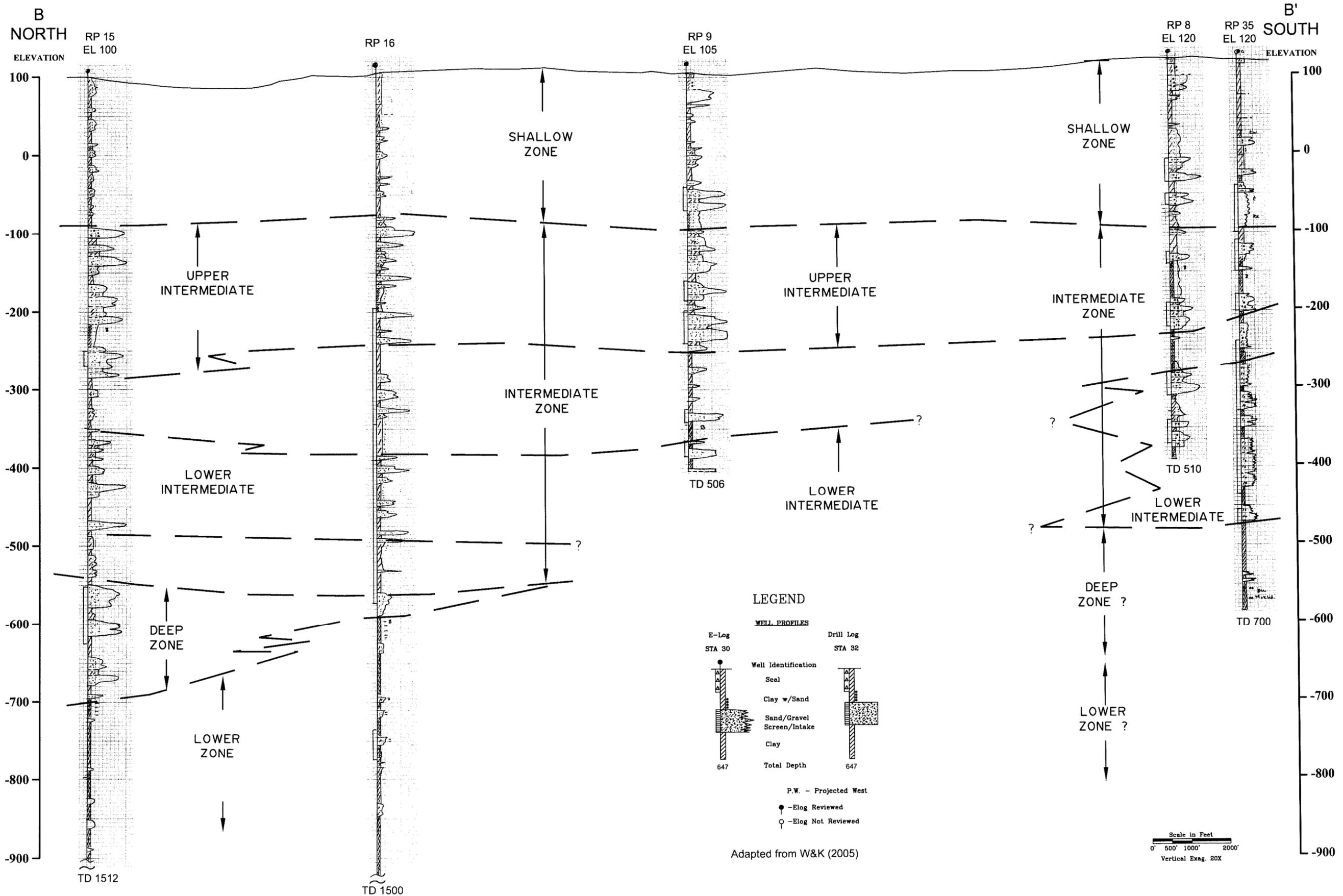
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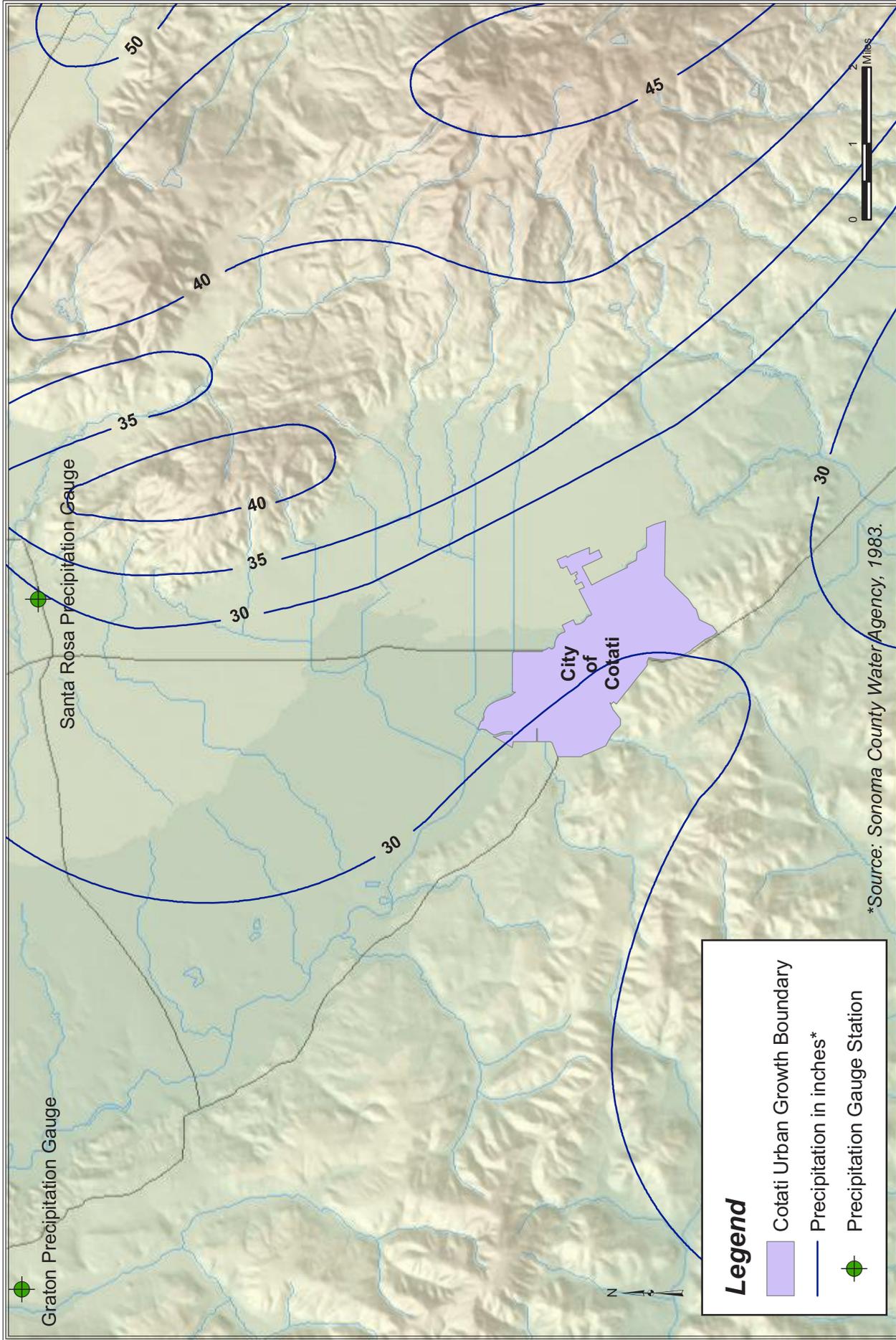
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Figure 3-1
Contours of Mean Annual Precipitation
City of Cotati and Vicinity

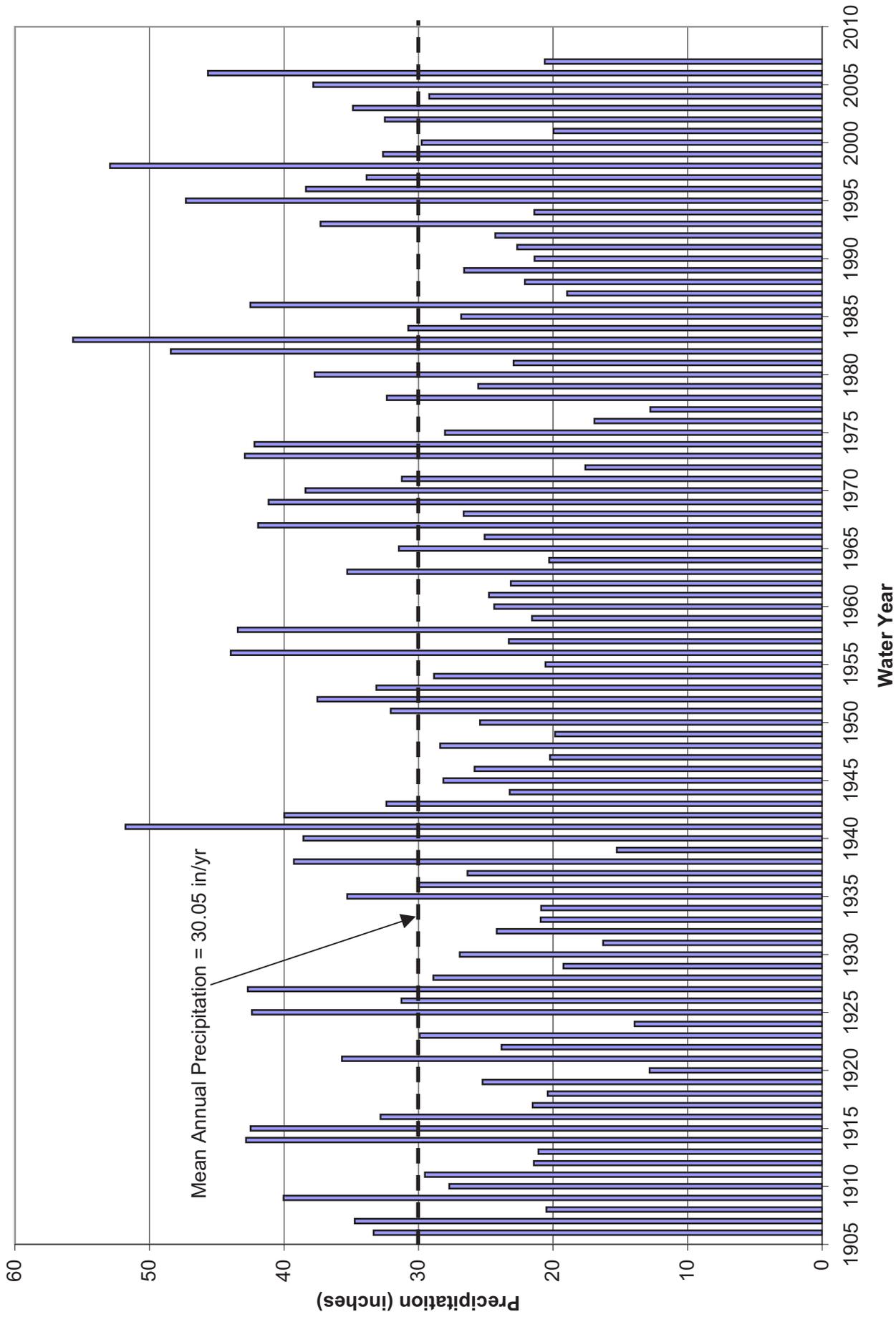
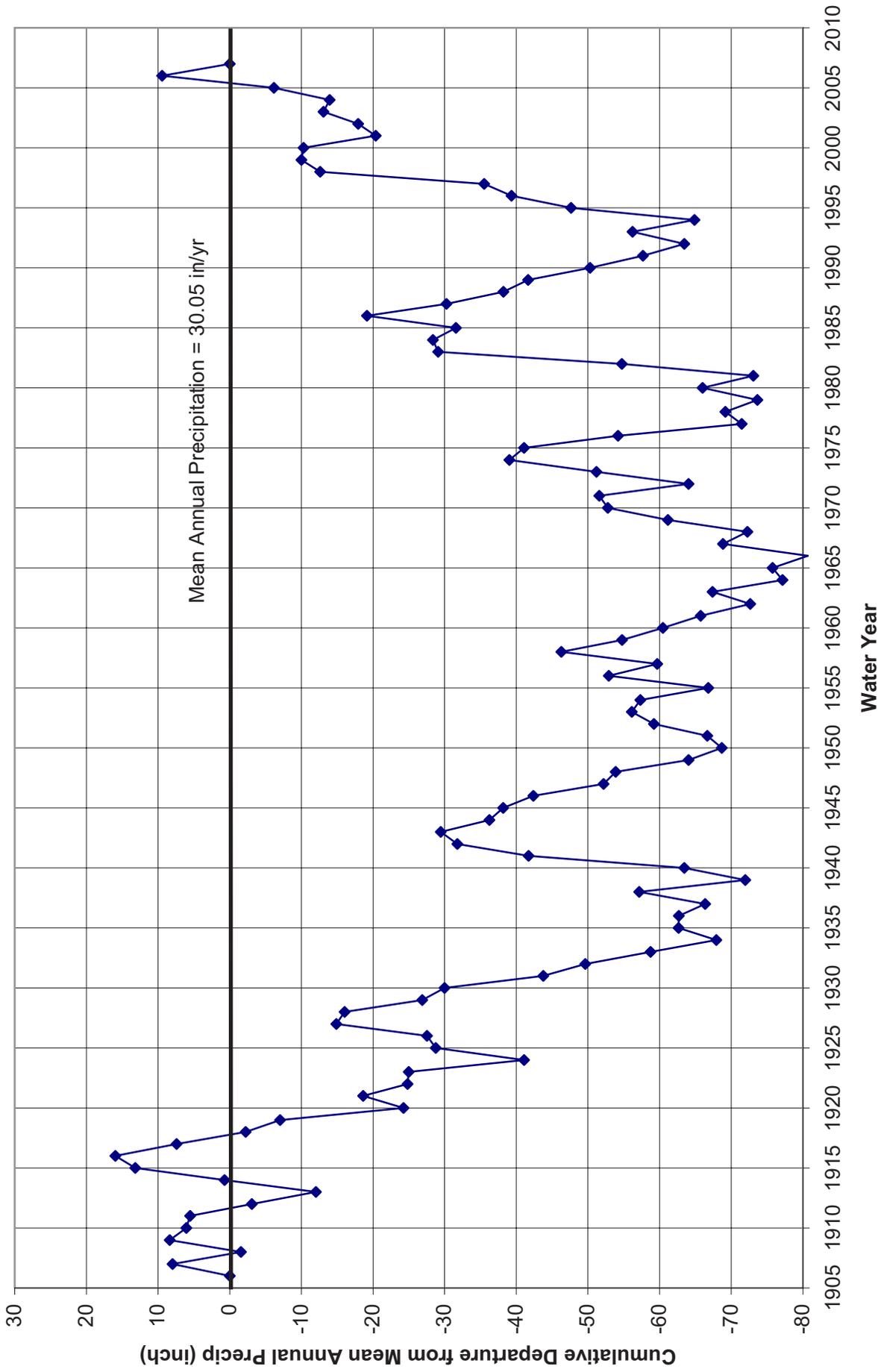
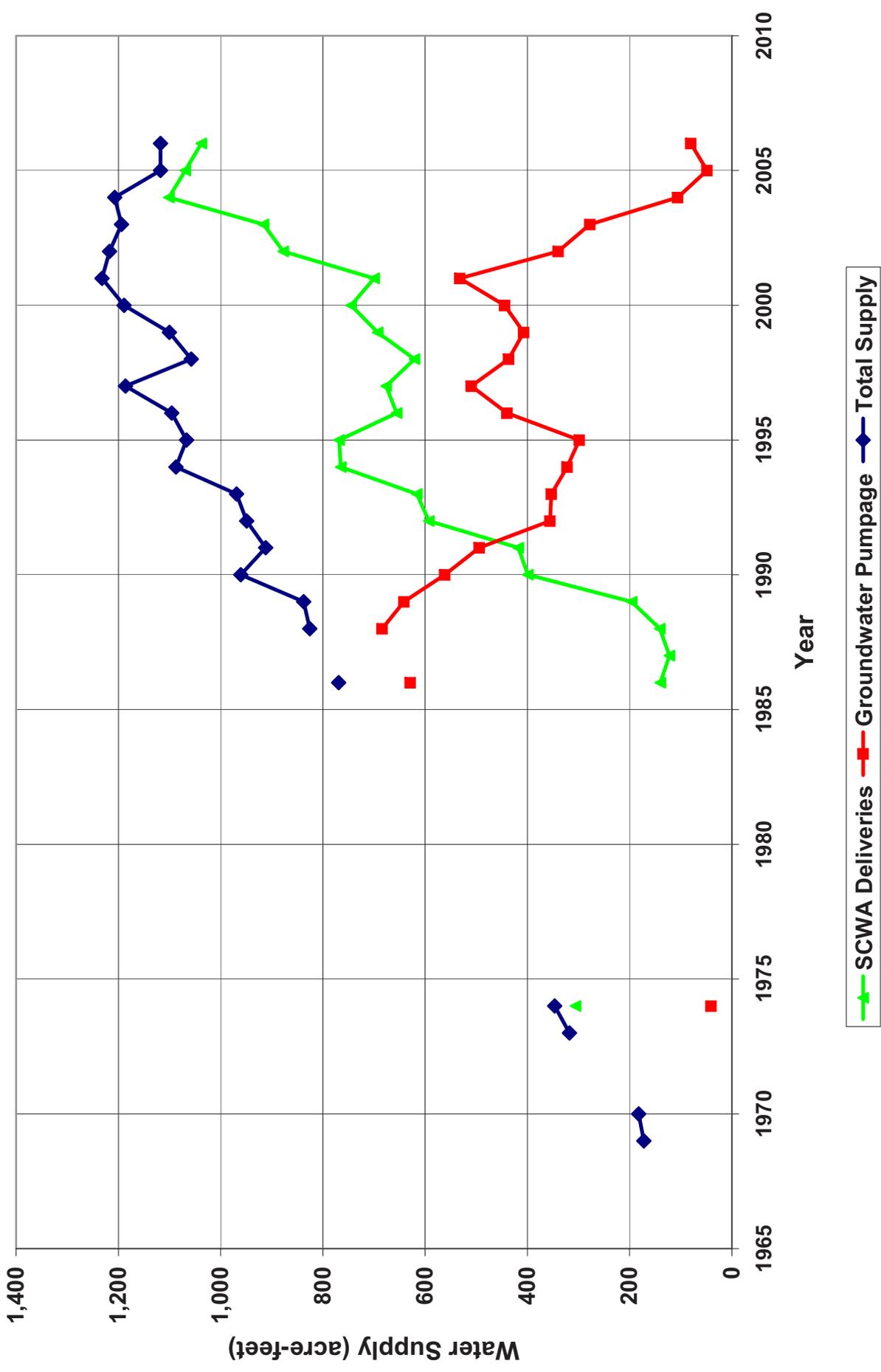


Figure 3-2
Annual Precipitation at Santa Rosa Gauge
Water Year 1906-2007



1906-1965 Santa Rosa Station monthly precipitation data from California Data Exchange Center (38°26.7'N / 122°45'W, 109 feet elev)
 1931-2007 Santa Rosa Station monthly precipitation data from National Climatic Data Center. Missing data (Aug '37, Jan-May '79, Apr-May '00 and Mar-May '01) approximated using correlation with Graton Station (38°26'N / 122°52'W, 200 feet elev).

Figure 3-3
Cumulative Departure from Mean
Annual Precipitation at Santa Rosa Gauge

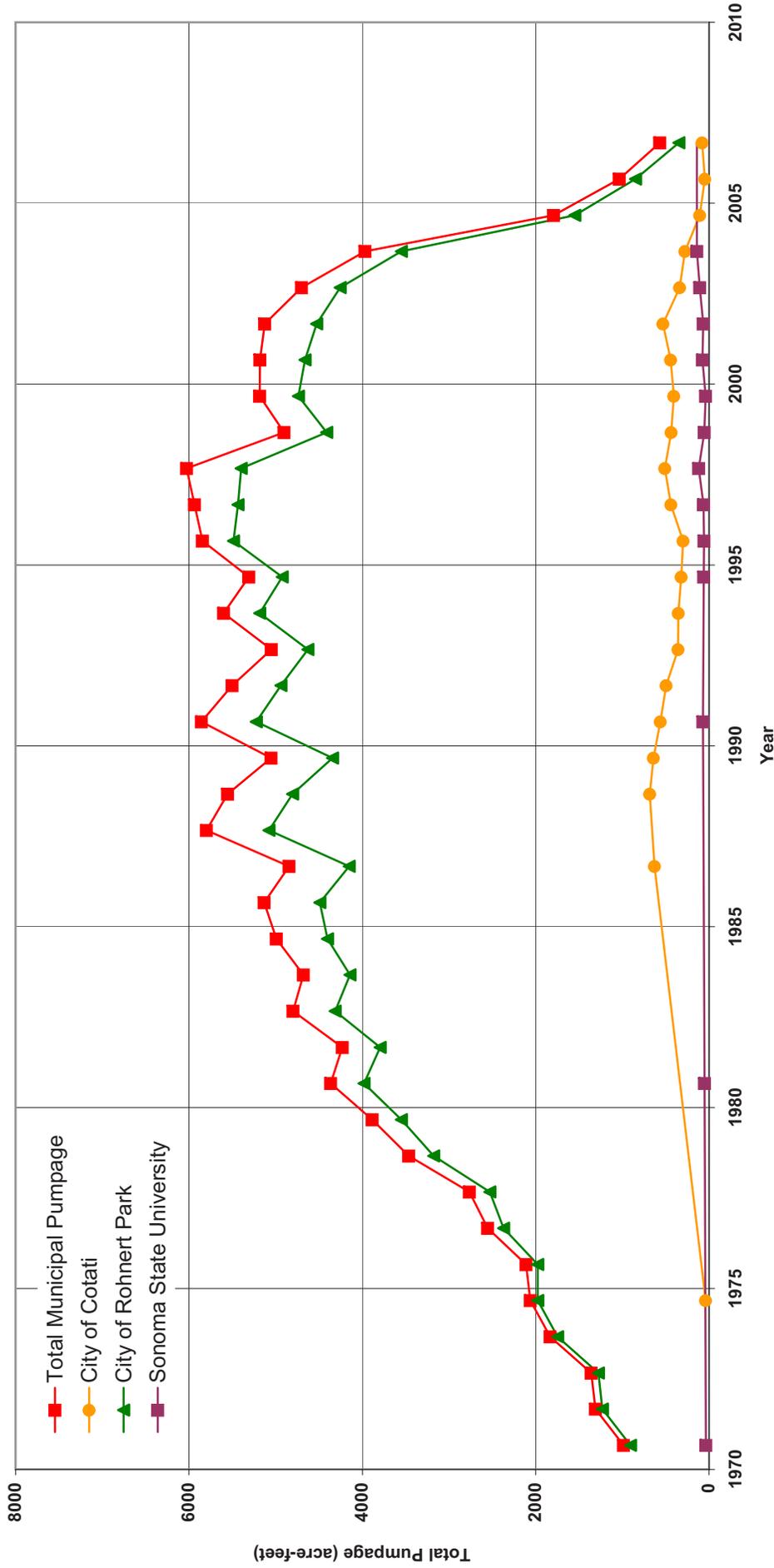


Y:\Cotati\WSA (07-1-070)\Tables & figures\Table 4-1 City of Cotati Pumpage 10-9-07.xls\Figure 4-1



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Figure 4-1
City of Cotati Groundwater
and Surface Water Supply



(1) Municipal pumpage in the Southern SRP Subbasin includes the City of Cotati, the City of Rohnert Park, and Sonoma State University.

(2) City of Cotati: 1974 pumpage from pg 13 of City of Cotati (1975) report. 1986 to 1994 annual pumpage from DHS (2006). 1995 to 2005 pumpage from City monthly meter readings.

(3) City of Rohnert Park based on annual pumpage for 1970 to 1971 and monthly pumpage for 1972 to 2006 from City.

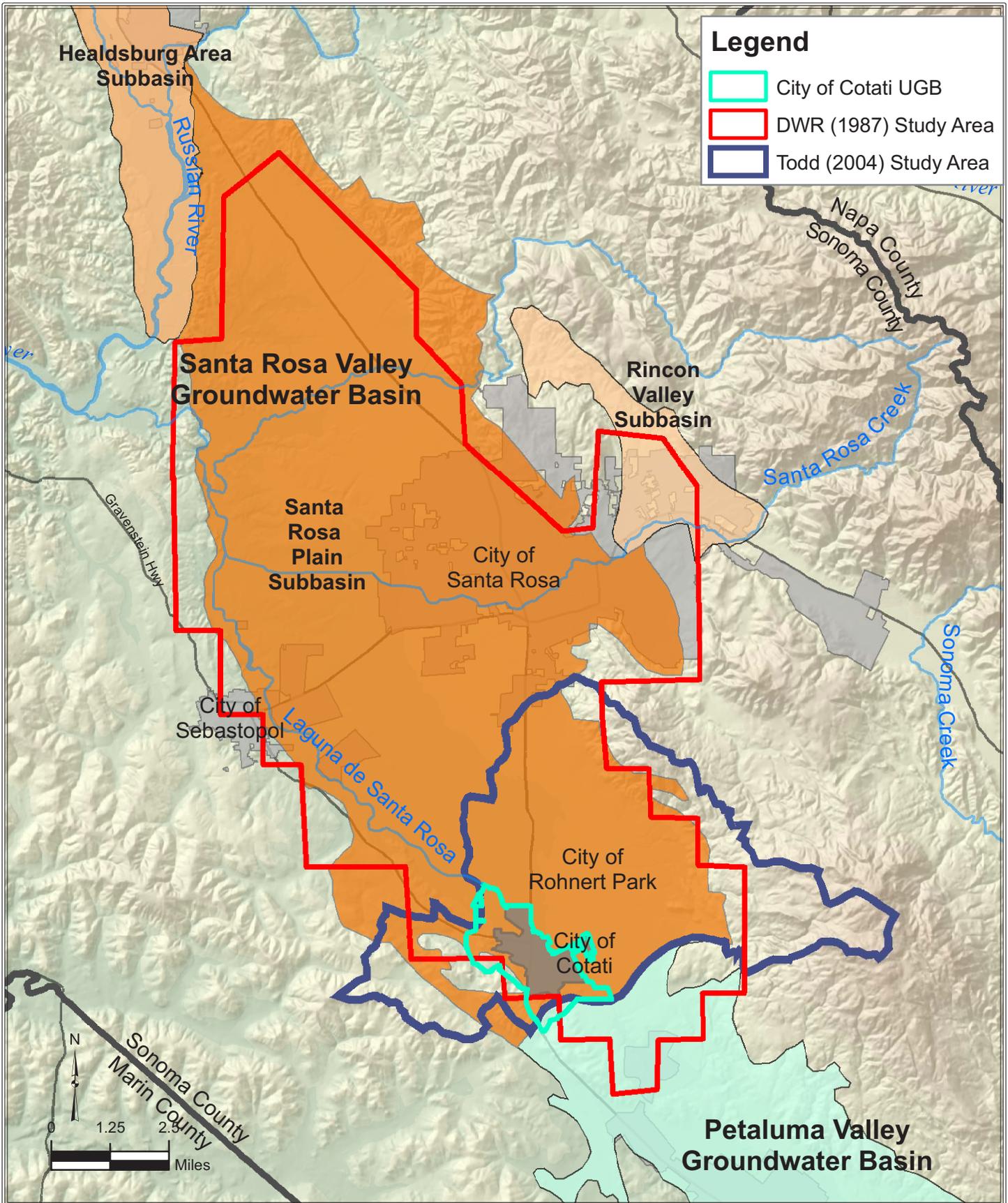
(4) Sonoma State University: 1994-2003 annual pumpage provided by Todd (personal communication, 2004). 1970 to 1993 annual pumpage based on SSU student population for 1970, 1980, and 1990 from "System and Campus Enrollment" and an average water use per student (1994-2003). 2004, 2005, and 2006 pumpage assumed to be the same as 2003.

Y:\Cotati\WSA (07-1-070)\Tables & figures\Figure 4-2 Municipal Pumpage in Southern SRP.xlsx, pumpage.g



LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

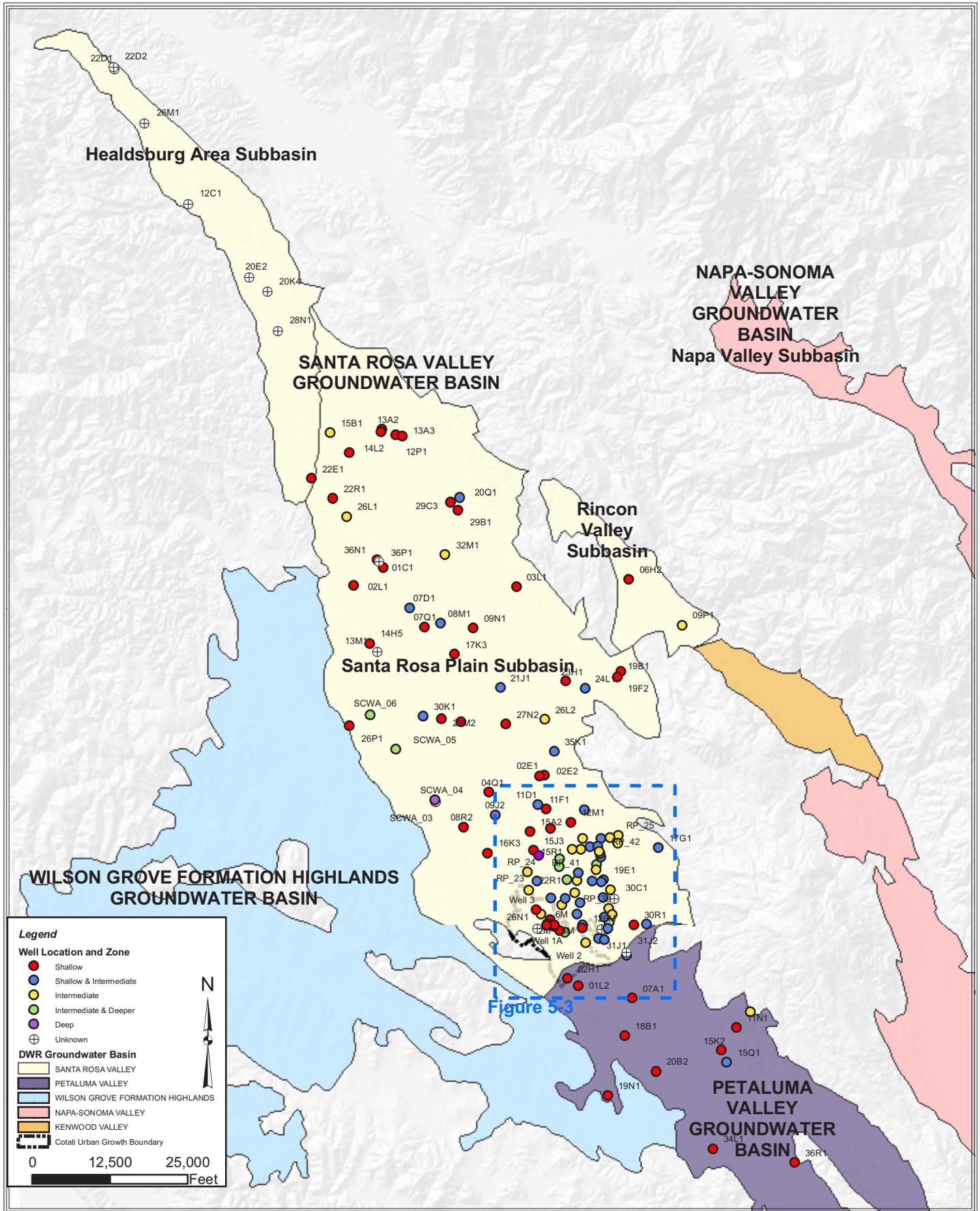
Figure 4-2
Municipal Pumpage in the Southern
Santa Rosa Plain Subbasin



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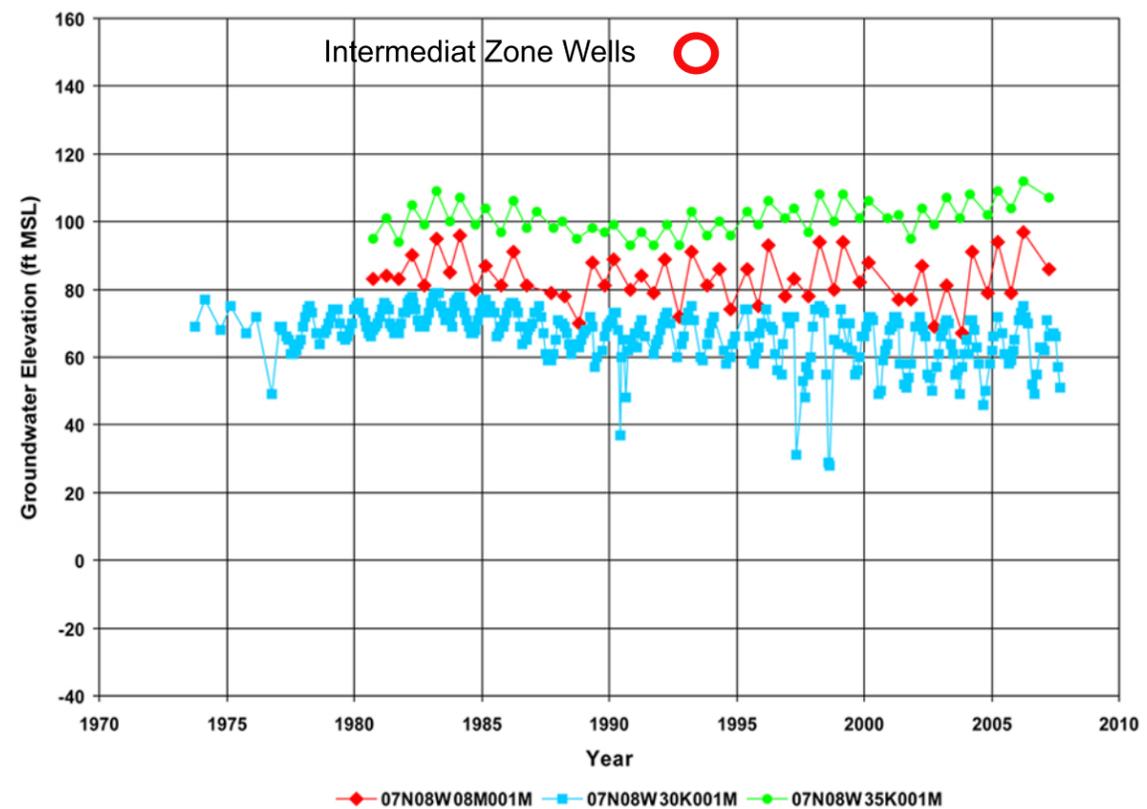
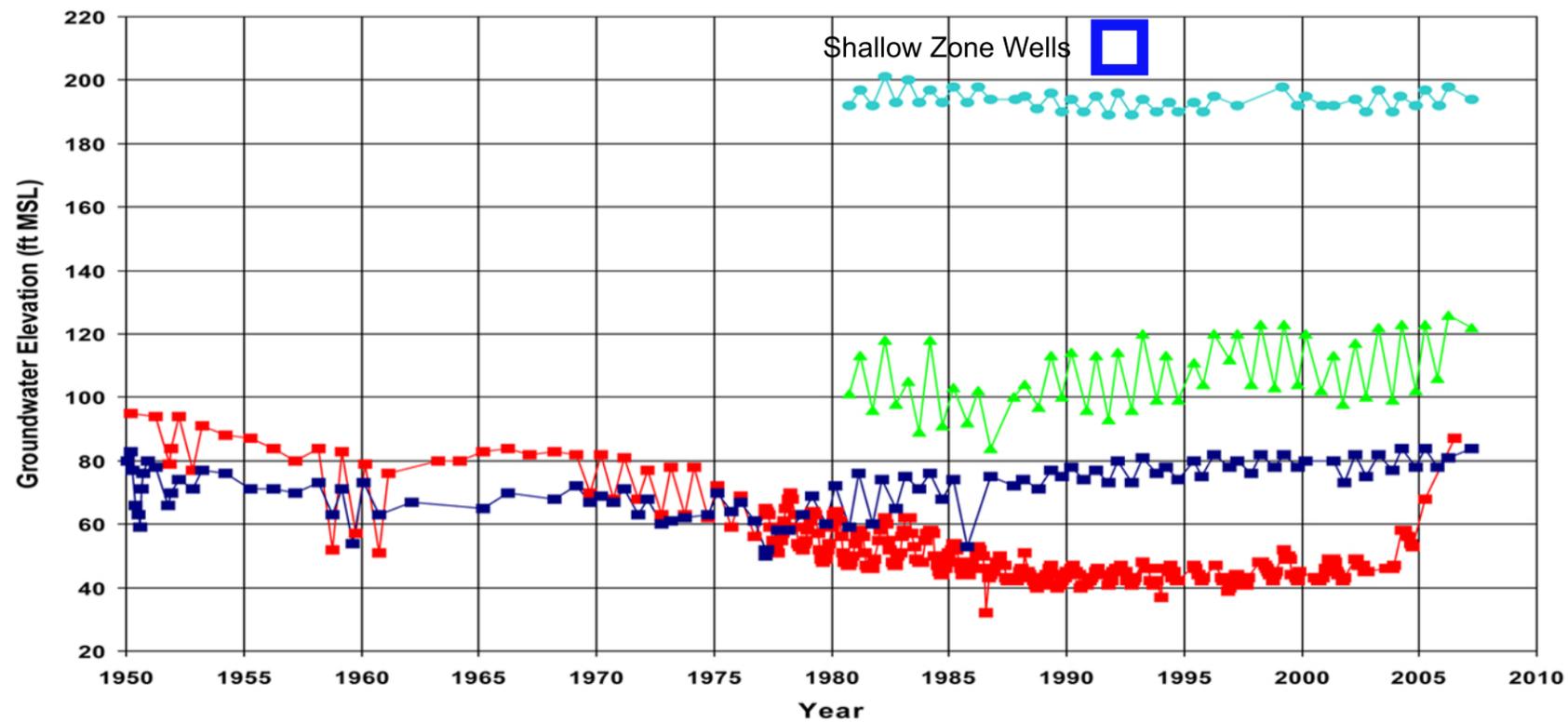
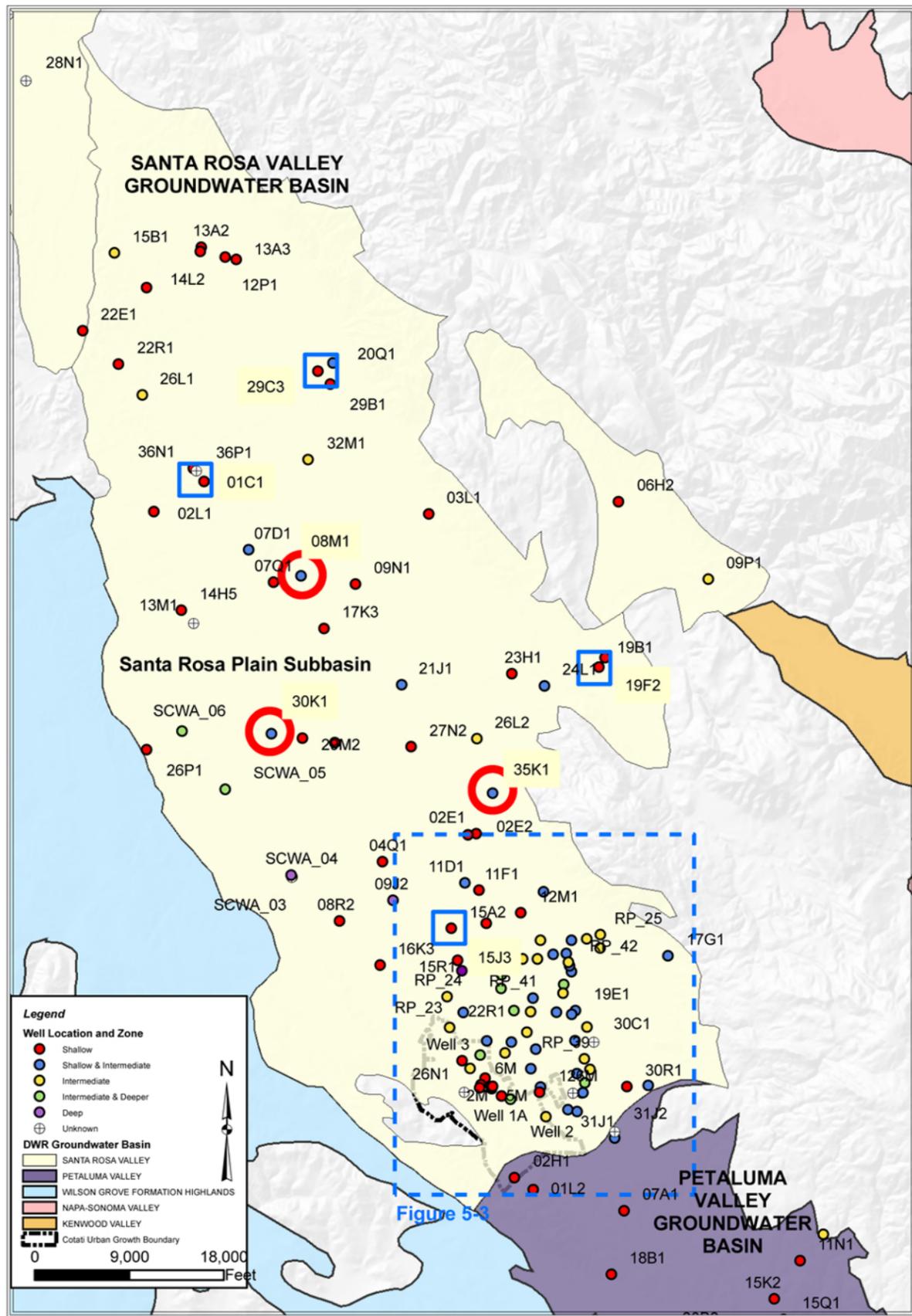
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Figure 4-3
Study Areas for Pumpage Estimates
in Santa Rosa Valley Groundwater Basin



FILE: \\public\Cotati\Maps\Figure 5-1 Location of Wells.mxd

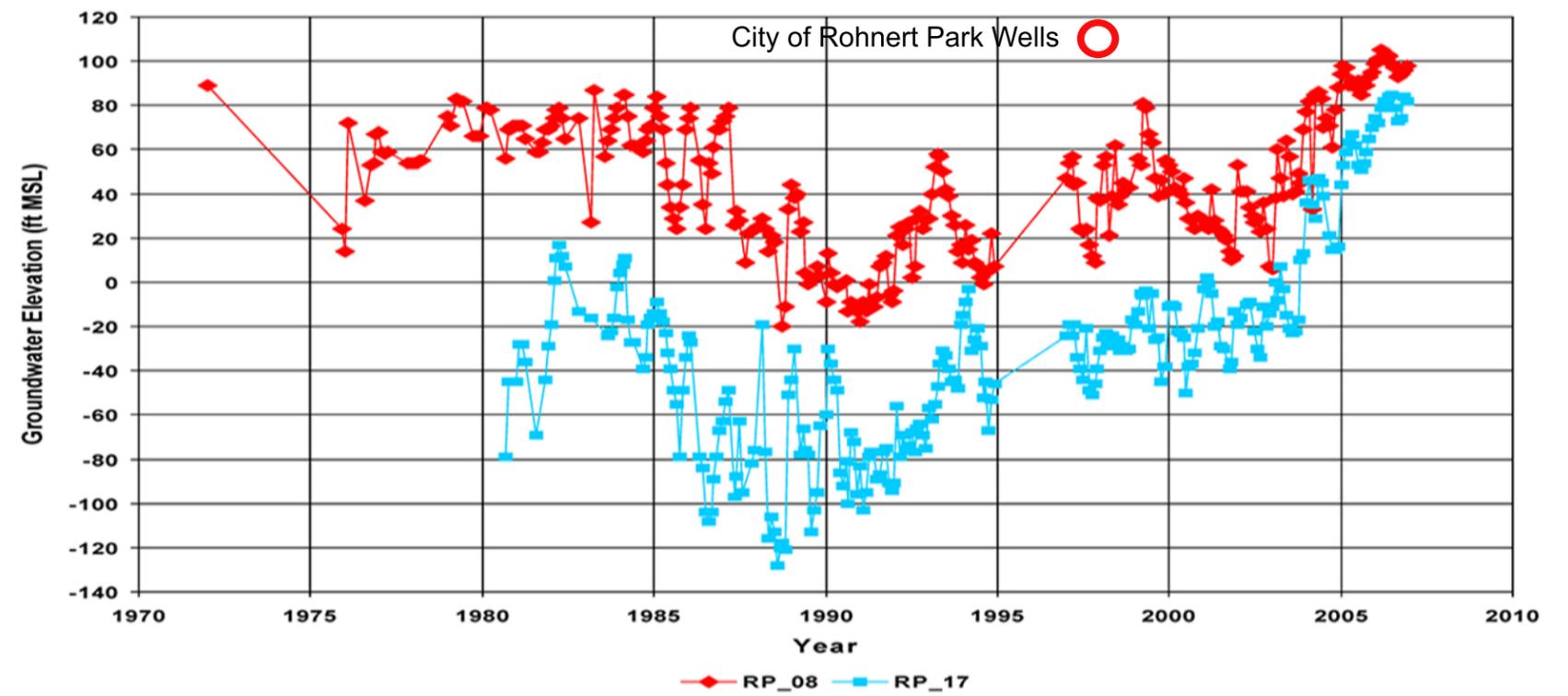
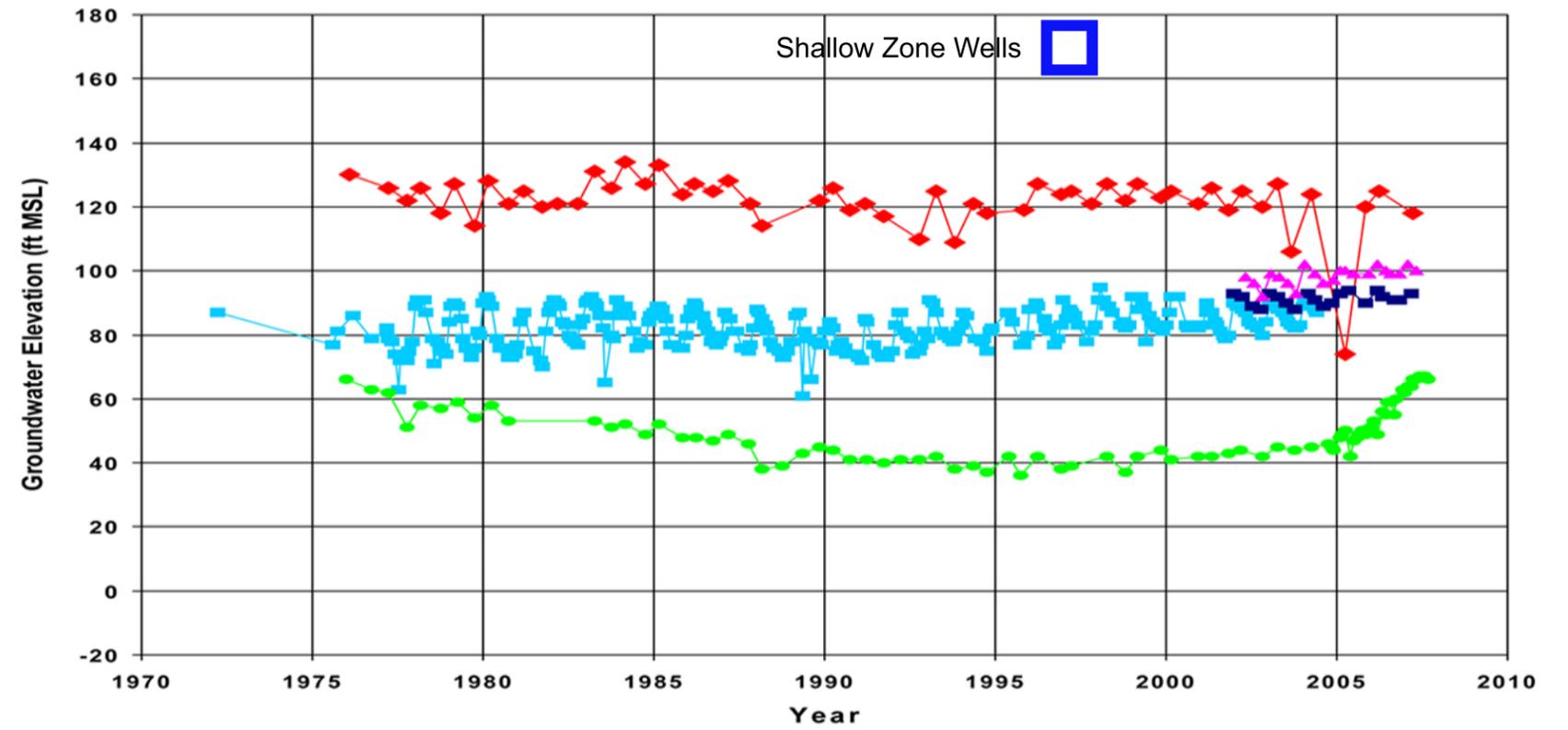
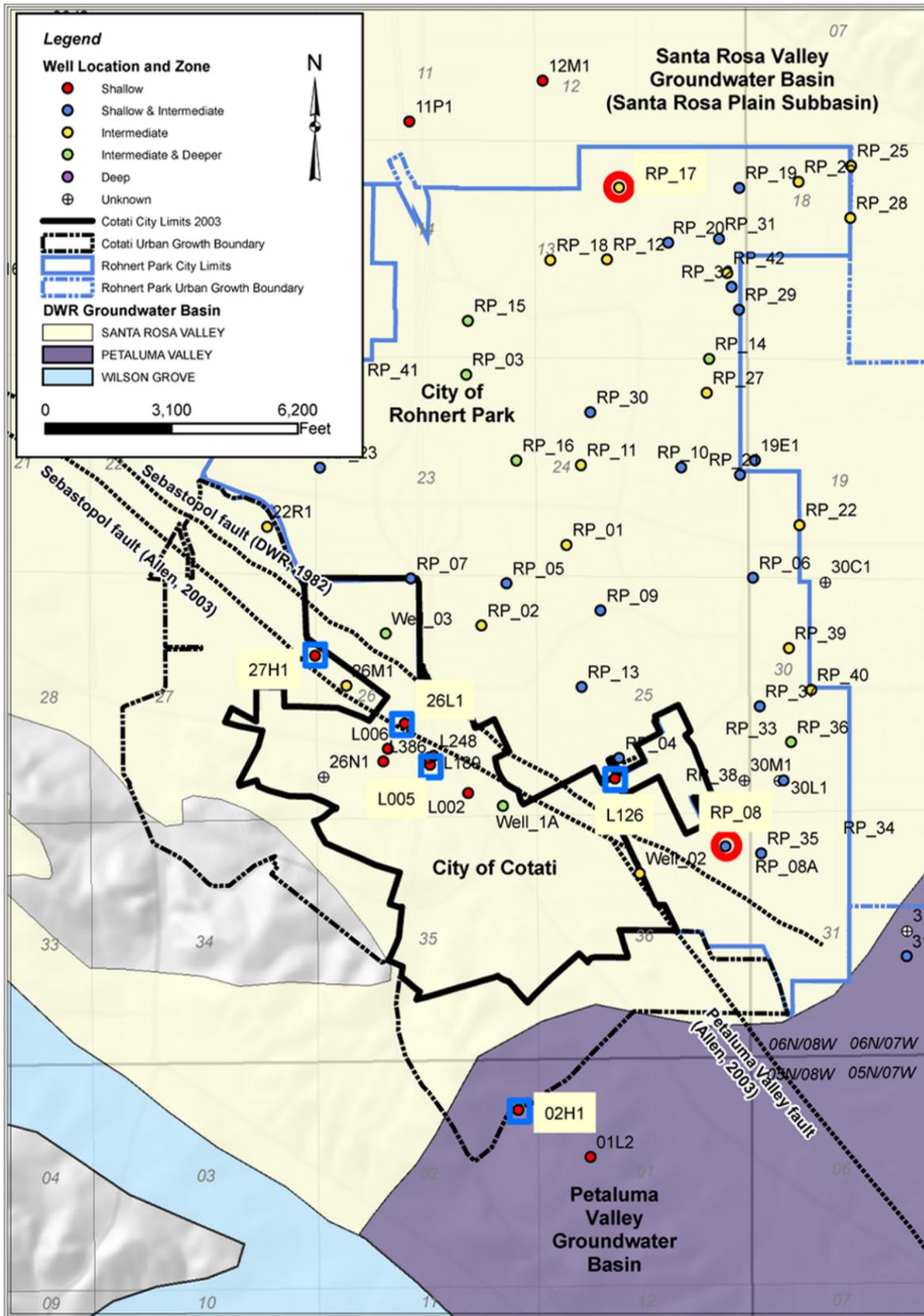
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FILE: \\public\Cotati\Maps\Figure 5-2 Location of Well with WLH.mxd

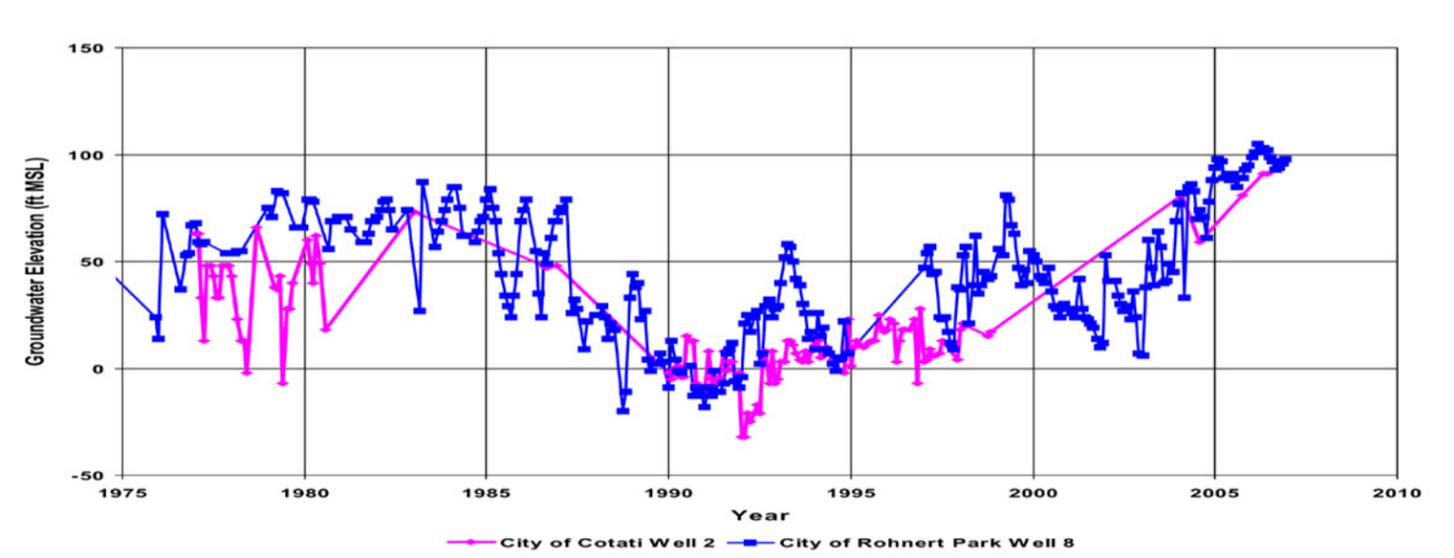
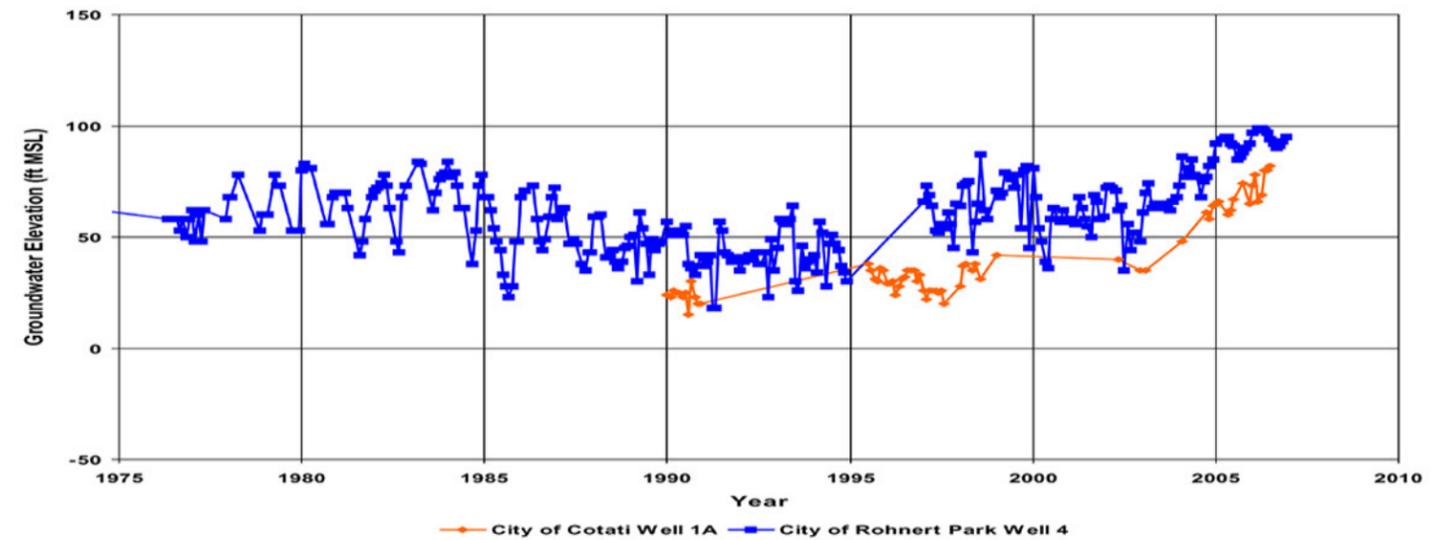
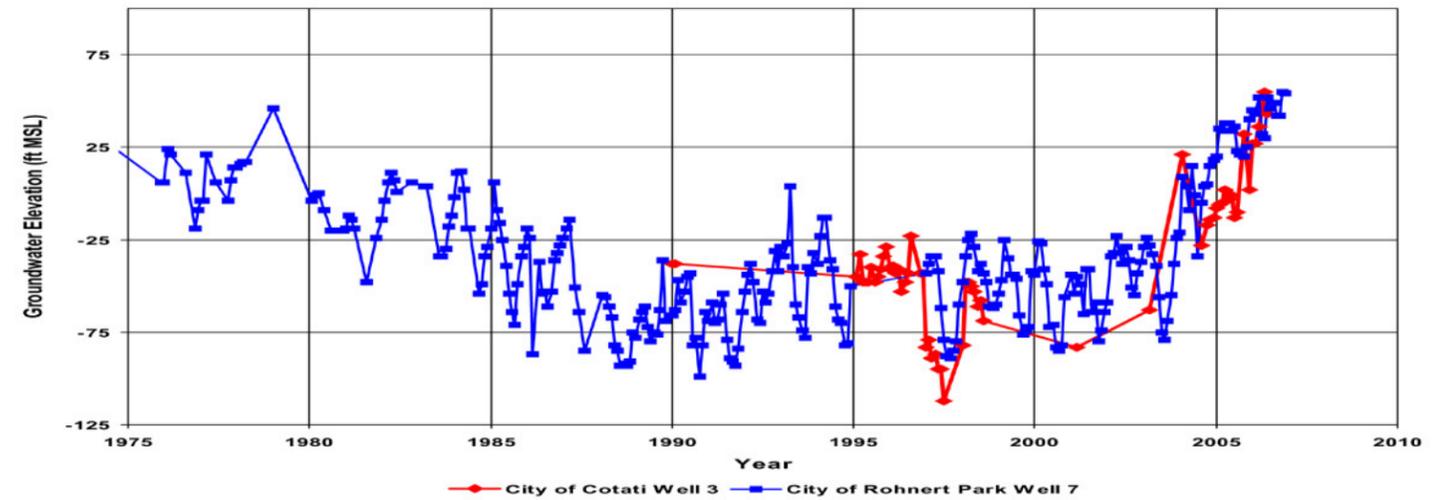
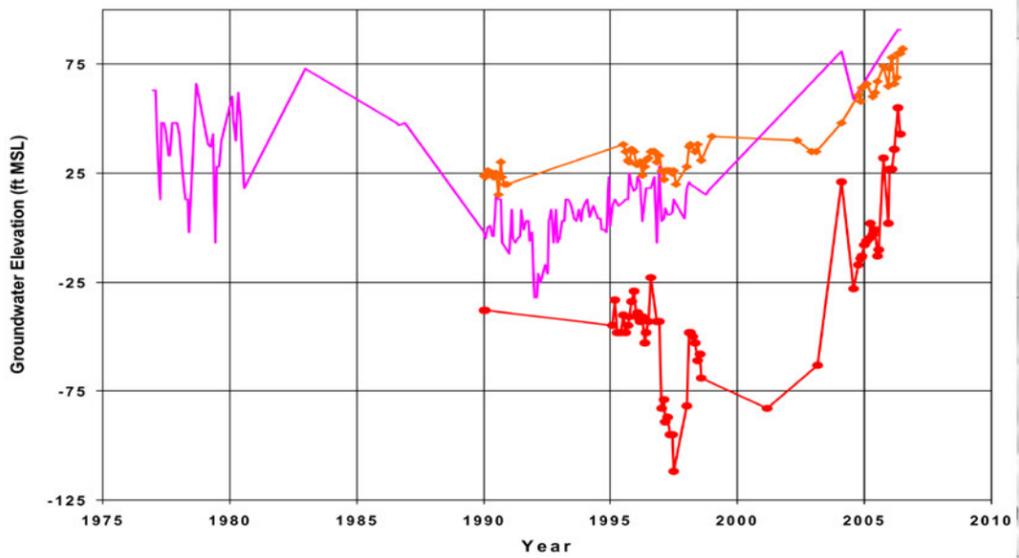
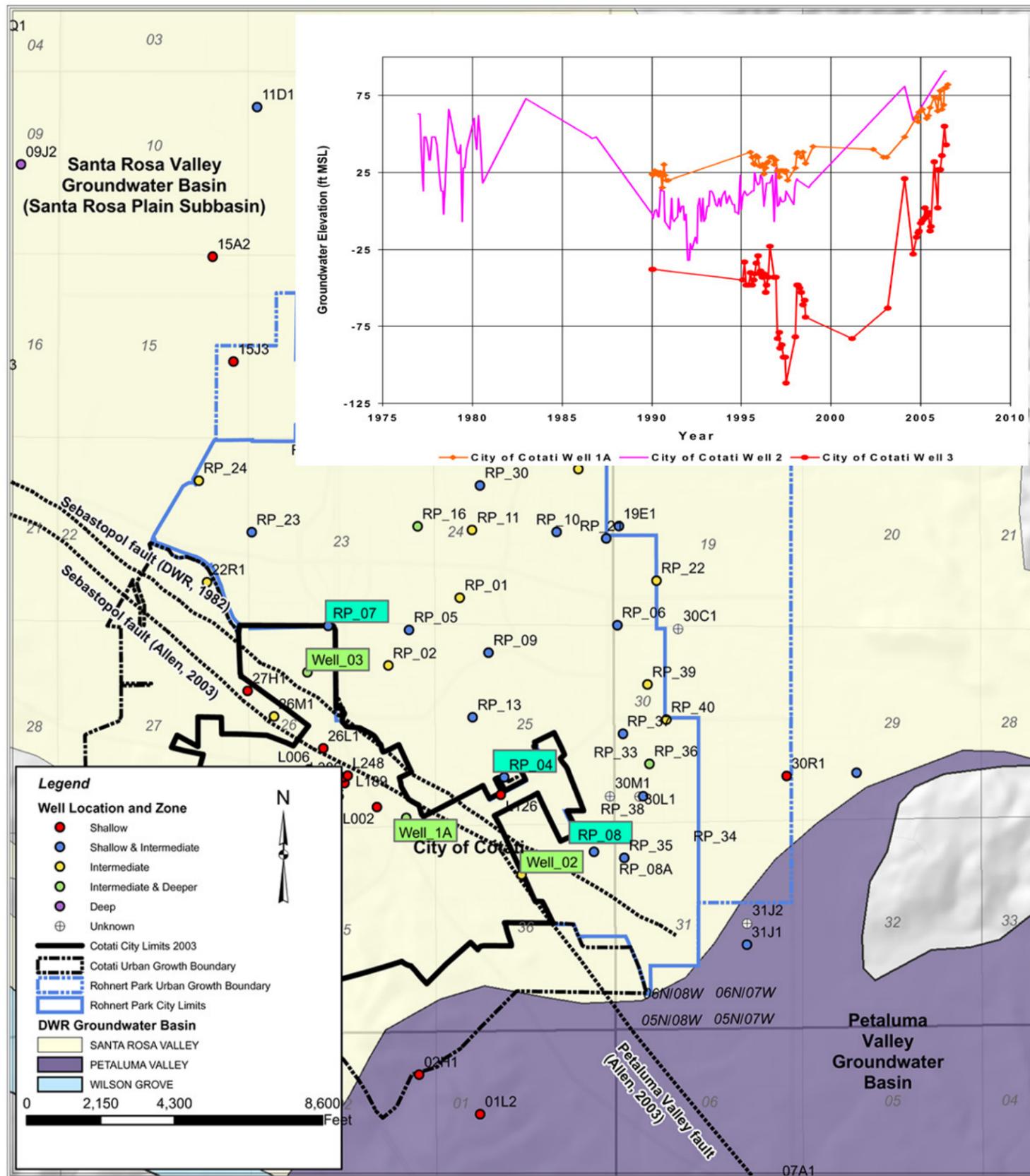
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Figure 5-2
Representative Water Level Hydrographs
in Santa Rosa Plain Subbasin



FILE: \\public\Cotati\Maps\Figure 5-3 Location of Well.mxd

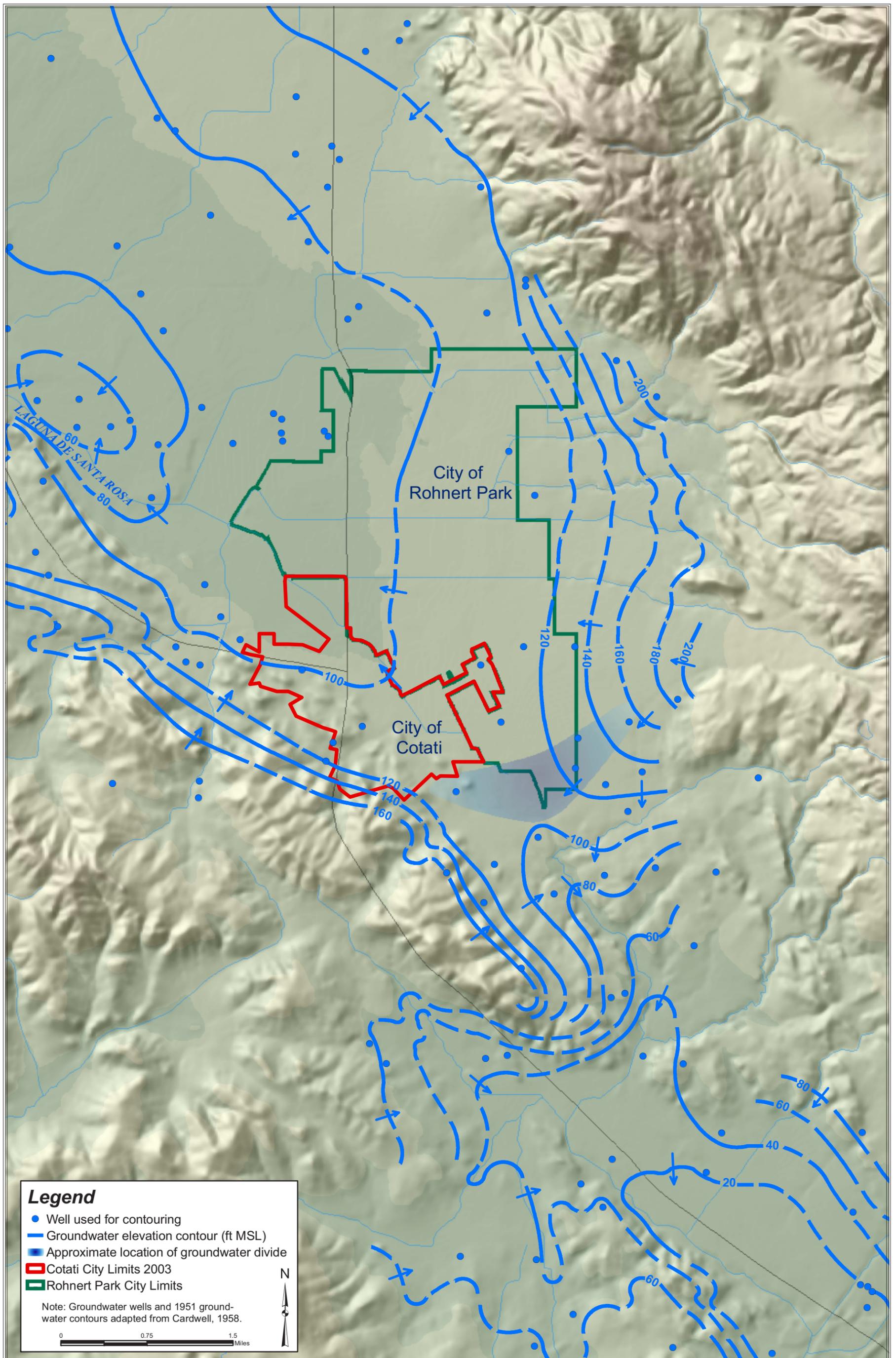
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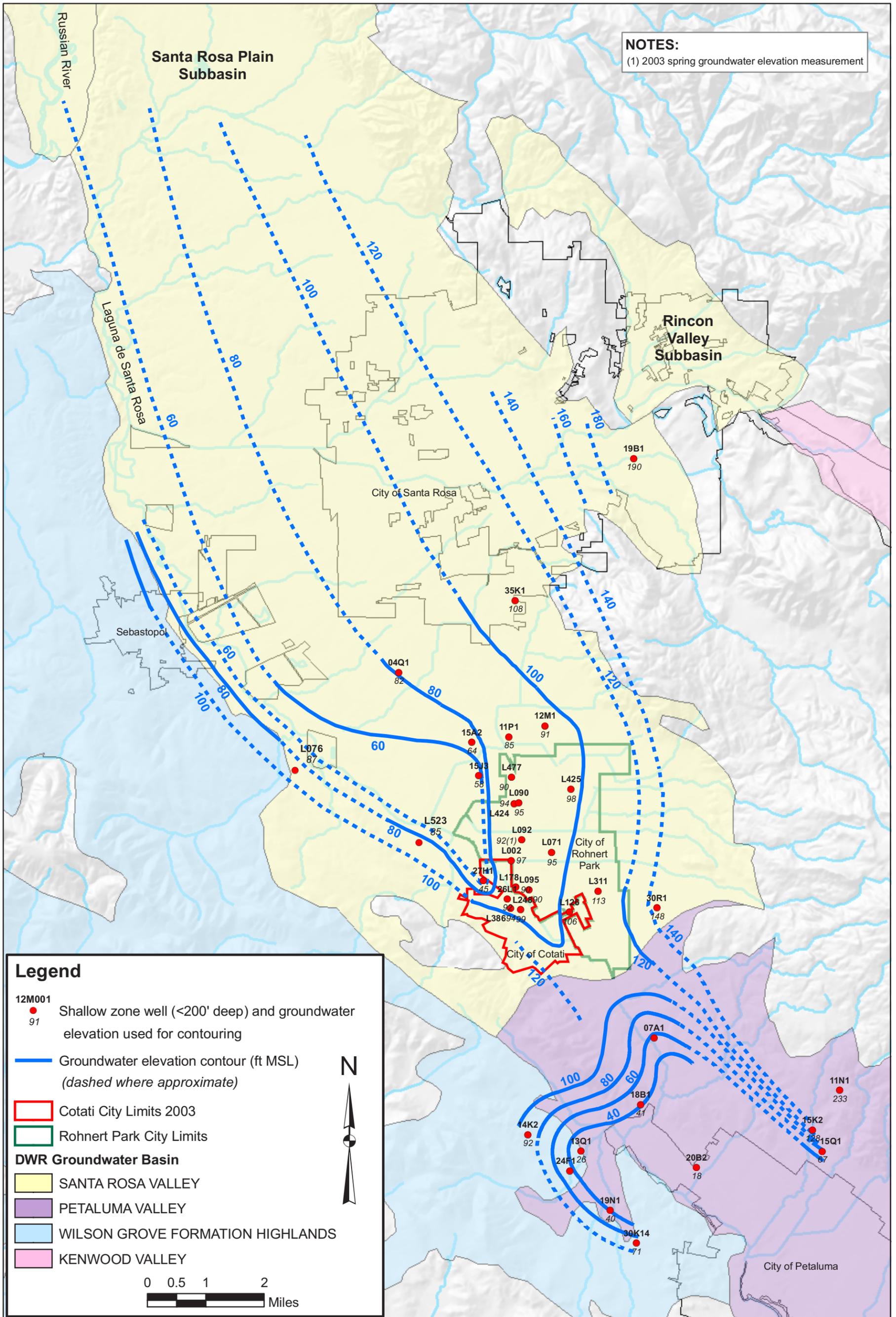
FILE: \\public\Cotati\Maps\Figure 5- 4 water Level Hydrograph in city of Cotati.mxd

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Figure 5-4
Water Level Hydrographs
in City of Cotati Water Supply Wells

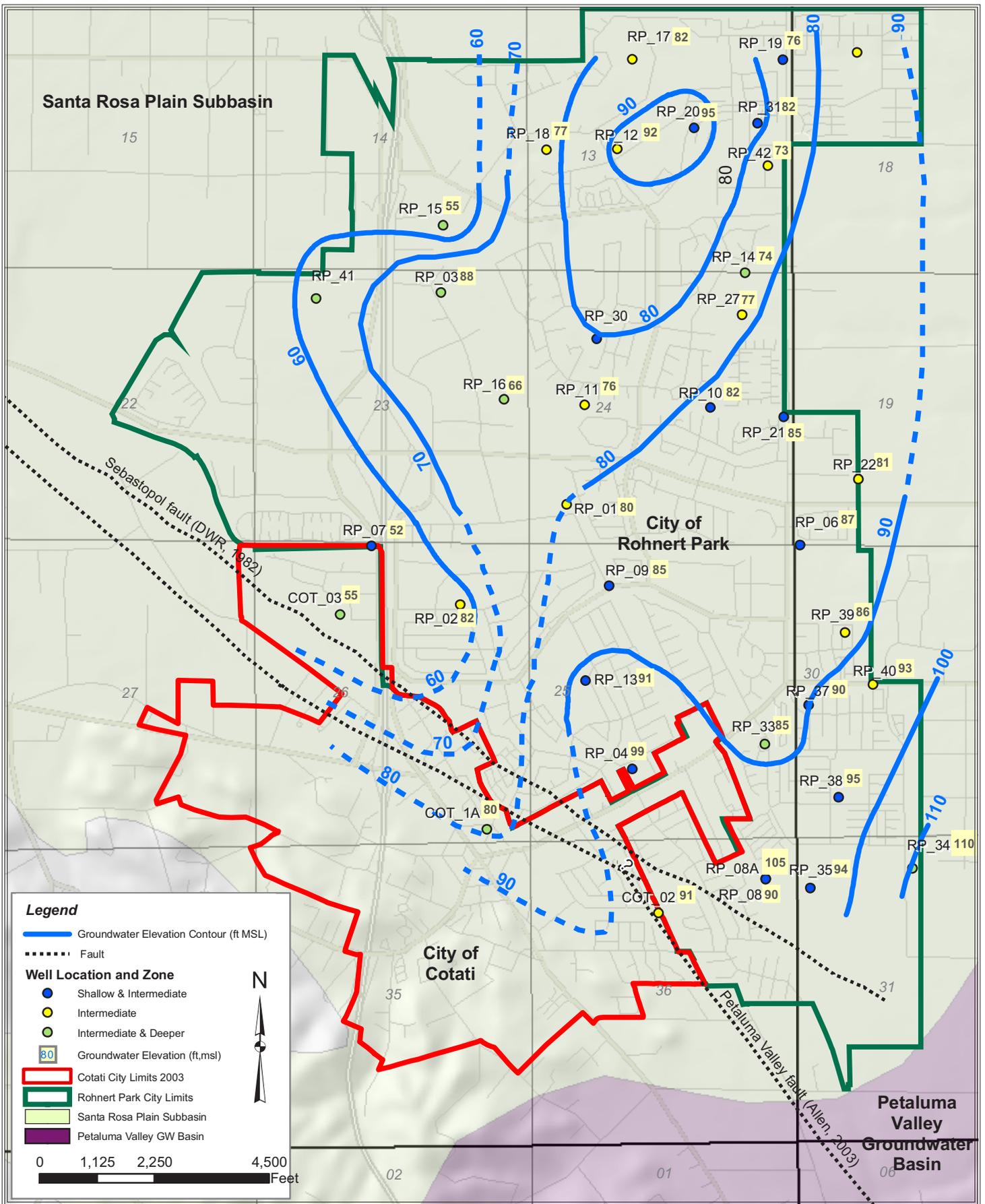


Y:\Cotati UWMP 06-1-003\Maps\Figure5-11 Cardwell 1951 Contours.mxd



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Figure 5-6
Spring 2004 Groundwater Elevation Contours
for Shallow Wells in the Santa Rosa Plain Subbasin
and Northern Petaluma Valley Groundwater Basin

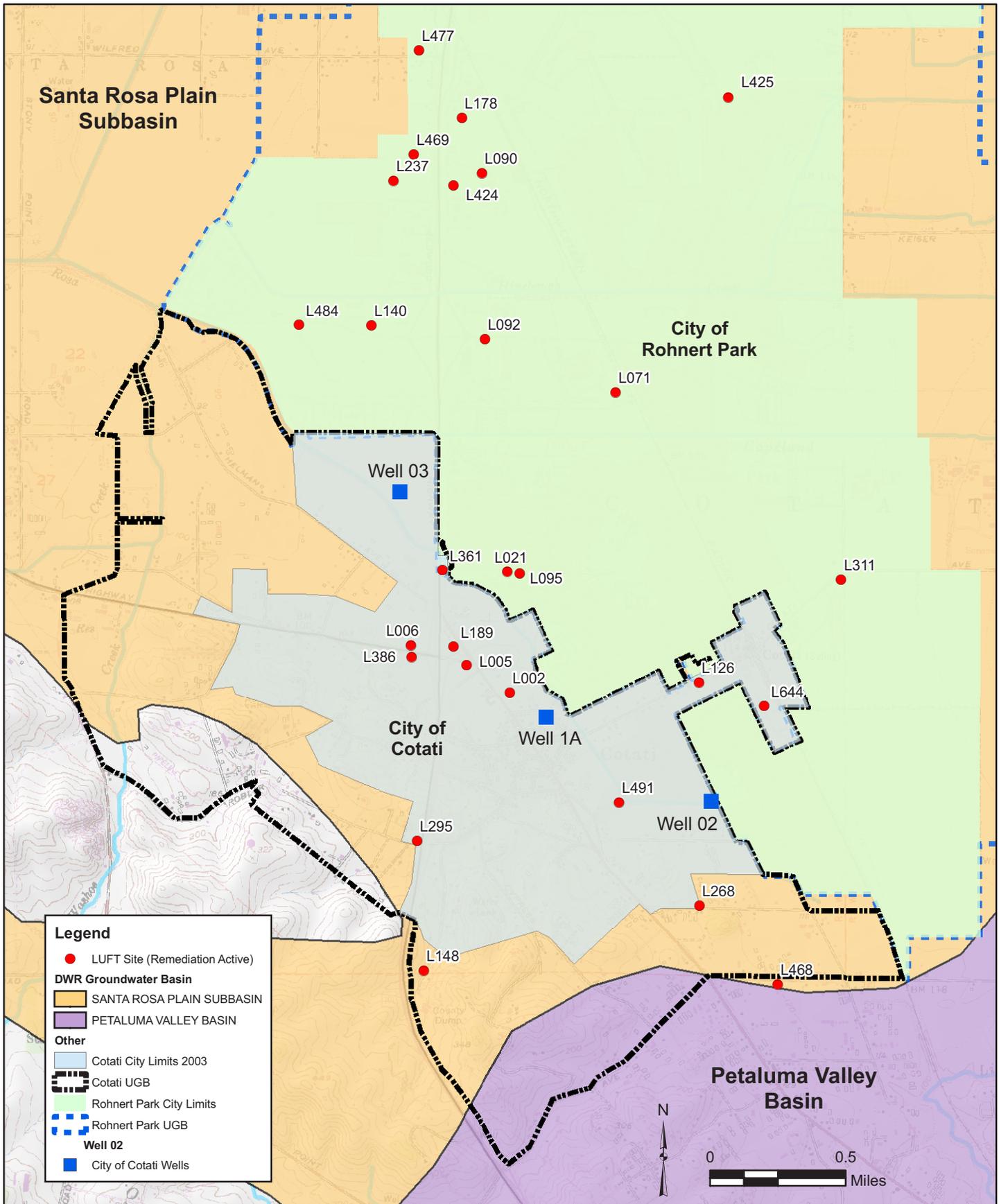


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Figure 5-7
Spring 2006 Groundwater Elevation Contours for Intermediate/Deeper Wells in Southern SRP Subbasin



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Figure 5-8
Leaking Underground Fuel Tank Sites
in City of Cotati/Rohnert Park Area

APPENDIX A

DWR Groundwater Basin and Subbasin Descriptions

Santa Rosa Valley, Santa Rosa Plain Subbasin

- Groundwater Basin Number: 1-55.01
- County: Sonoma
- Surface Area: 80,000 acres (125 square miles)

Basin Boundaries and Hydrology

The Santa Rosa Valley occupies a northwest-trending structural depression in the southern part of the Coast Ranges of northern California. This depression divides the Mendocino Range on the west from the Mayacmas and Sonoma Mountains on the east. The Santa Rosa Plain sub basin is approximately 22 miles long and 0.2 miles wide at the northern end; approximately 9 miles wide through the Santa Rosa area; and about 6 miles wide at the south end of the valley near the City of Cotati. The Santa Rosa Plain Sub Basin is bounded on the northwest by the Russian River plain approximately one mile south of the City of Healdsburg and the Healdsburg sub basin; mountains of the Mendocino Range flank the remaining western boundary. The southern end of the sub basin is marked by a series of low hills, which form a drainage divide that separates the Santa Rosa Valley from the Petaluma Valley basin south of Cotati. The eastern sub basin boundary is flanked by the Sonoma Mountains south of Santa Rosa and the Mayacmas Mountains north of Santa Rosa. The Rincon Valley sub basin is situated east of the City of Santa Rosa and is separated from the Santa Rosa Plain sub basin by a narrow constriction formed in rocks of the Sonoma Volcanics.

The Santa Rosa Plain Sub basin is drained principally by the Santa Rosa and Mark West Creeks that flow westward and collect into the Laguna de Santa Rosa. The Laguna de Santa Rosa flows northward and discharges into the Russian River. Precipitation in the Santa Rosa Plain ranges from approximately 28 inches in the south to about 40 inches in the north.

Hydrogeologic Information

Water Bearing Formations

The Santa Rosa Plain sub-basin has one main water-bearing unit (Merced Formation) and several units with lower water-bearing capacities (Glen Ellen Formation and Alluvium). The groundwater is not everywhere continuous because many of the units only have lenses of water-bearing material, and the valley is cut by northwest trending faults.

Alluvium. Alluvial deposits blanket most of the Santa Rosa Valley. The deposits consist of poorly sorted coarse sand and gravel, and moderately sorted fine sand, silt, and clay, and have a specific yield of 8 to 17 percent (DWR 1982). The source of the fine sand may be the Merced Formation. The older alluvial deposits are Late Pleistocene in age, are sometimes dissected, and have a maximum exposed thickness of 100 feet (Cardwell 1958). The younger alluvium is a thin veneer over the old, ranging from 30 to 100 feet thick, and is Late Pleistocene to Holocene in age. The deposits are not perennially saturated, have low permeability, and are generally unconfined or slightly confined (Cardwell 1958). Although the water quality

is generally good for most uses, there are few wells screened adjacent to the deposits (Cardwell 1958).

Glen Ellen Formation. The Glen Ellen Formation crops out extensively in the center of the Santa Rosa Plain, and extends beneath the eastern hills (Cardwell 1958). In most places it overlies the Merced Formation and some places the two formations are continuous, together housing the principal water body in the basin (Cardwell 1958). The Glen Ellen consists of partially cemented beds and lenses of poorly sorted gravel, sand, silt, and clay that vary widely in thickness and extent (Cardwell 1958; DWR 1982). This continental deposit is Pliocene (?) to Pleistocene in age, and was deposited in structural troughs so it varies in thickness from 3,000 feet to less than 1,500 feet on the west side of the valley (Cardwell 1958). It is reported that some wells sourced from the Glen Ellen produce more than 500 gal/min, but for most wells the specific capacities are less than 10 gpm/ft (Cardwell 1958). Most of the water under the Santa Rosa Valley is at water table conditions, but locally the water can be confined in areas of folding and faulting. Since the unit crops out in favorable areas and has moderate permeability (HLA 1978), recharge may occur fairly quickly, but it can be inhibited in areas of well-developed soils with hardpan (Cardwell 1958). Average specific yield for the Glen Ellen Formation is 3 to 7 percent (DWR 1982). It is tapped for domestic and some irrigation use.

Merced Formation. The Merced Formation is the major water-bearing unit in the basin. It extends beneath the western hills, crops out along the western side of the valley from the Russian River (Wilson Grove) south towards Petaluma, and dips beneath the center of the valley (Cardwell 1958). It is Pliocene in age, and its thickness is estimated to range from 300 to greater than 1,500 feet. The Merced Formation is a marine deposit of fine sand and sandstone, but has thin interbeds of clay and silty-clay, some lenses of gravel, and localized fossils (Cardwell 1958). Aquifer continuity and water quality are generally very good, with well yields from 100 to 1,500 gpm (Cardwell 1958) and specific yields from 10 to 20 percent (DWR 1982). Semi-confined to confined conditions may exist locally where clay lenses occur. Recharge occurs in the southwest portion of the basin, but is not at the maximum because much of the permeable soil is on slopes too steep for good recharge (DWR 1982). Some recharge may occur from the overlying Glen Ellen Formation (HLA 1978).

Groundwater Level Trends

The Santa Rosa Plain ground water basin as a whole is about in balance, with increased ground water levels in the northeast contrasting with decreased ground water levels in the south (DWR 1982).

Groundwater Storage

Groundwater Storage Capacity. The USGS estimated the gross groundwater storage capacity for this basin to be about 948,000 af based on an average specific yield of 7.8 percent for aquifer materials at depths of 10 to 200 feet (Cardwell 1958). The DWR performed a study of the area and calculated a groundwater storage capacity for this basin to be approximately 4,313,000 af (DWR 1982). This calculation was made by dividing the

approximate basin area into a grid of 193 cells ranging in size from 320 to 640 acres. Specific yield values were calculated for each cell using lithologic and aquifer thickness data processed by the TRANSCAP computer program. In the DWR study, aquifer thicknesses ranged from 50 to over 1,000 feet with an average thickness of approximately 400 feet.

Groundwater in Storage. Using water level information for the spring of 1980 and the product of the TRANSCAP program, the volume of groundwater in storage was estimated to be 3,910,000 af (DWR 1982).

Groundwater Budget (Type A)

A groundwater model for the Santa Rosa Plain Subbasin was prepared by the DWR (DWR 1982). The 15-year period from 1960-61 through 1974-75 was selected as the study period for the Santa Rosa Plain basin because it contained a mixture of wet and dry years approximating long-term climatic conditions. Average annual natural recharge for the period 1960 to 1975 was estimated to be about 29,300 af. Average annual pumping during the same time period was estimated to be approximately 29,700 af.

Water Quality

Characterization. On the western side of the basin, sodium and bicarbonate are the dominant cation and anion in water from all depths (DWR 1982). Moving south along the western boundary, the shallow waters have magnesium and calcium as the dominant cation and in the deep zone (below 150 feet) sodium dominates. In the vicinity of Windsor, magnesium chloride water is present in the shallow aquifer to a depth of about 100 feet. In the Santa Rosa area, groundwater at all depths is characterized primarily by sodium and magnesium bicarbonate types. In the Rohnert Park vicinity, groundwater in the deep zone (below 150 feet) is characterized by sodium and calcium bicarbonate types (DWR 1982).

Impairments. According to a DWR study of the basin, few wells tested for water quality contained constituents over the recommended concentration for drinking water (DWR 1982). Many wells produced water with aesthetic problems such as high concentrations of iron, manganese, or high hardness. Private well owners questioned about groundwater quality reported many complaints about the color and/or taste of the water. Although high iron, manganese, and hardness have been reported in groundwater from some portions of the Santa Rosa Plain basin, the overall quality of groundwater in the Santa Rosa Plain is good.

With respect to agriculture, areas with elevated boron concentrations in groundwater (greater than 2.0 mg/L) have been reported south of Windsor and north of the City of Rohnert Park (DWR 1982).

Water Quality in Public Supply Wells

Constituent Group ¹	Number of wells sampled ²	Number of wells with a concentration above an MCL ³
Inorganics – Primary	150	3
Radiological	120	5

Nitrates	155	1
Pesticides	139	0
VOCs and SVOCs	126	2
Inorganics – Secondary	150	86

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

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

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

Well Characteristics

Well yields (gal/min)

Merced Formation wells have reported yields ranging from 100 to 1,500 gpm; Glenn Ellen Formation wells have reported yields of 500+ gpm; Alluvial wells are not significant water producers in the Santa Rosa Plain sub basin although alluvial wells in Petaluma Valley reportedly yield up to about 150 gpm.

(Well-yield data reported from Cardwell 1958)

Total depths (ft)

Domestic	Range: 30 to 840	Average: 197 (based on 1,280 wells)
Municipal/Irrigation	Range: 35 to 971	Average: 359 (based on 111 wells)

Active Monitoring Data

Agency	Parameter	Number of wells / measurement frequency
DWR (incl. Cooperators)	Groundwater levels	37 wells/semi-annually and 6 wells/monthly
DWR (incl. Cooperators)	Mineral, nutrient, & minor element.	14 wells/biennially
Department of Health Services	Coliform, nitrates, mineral, organic chemicals, and radiological.	155 wells as required in Title 22, Calif. Code of Regulations

Basin Management

Groundwater management: No groundwater management plans identified

Water agencies

Public Sonoma County Water Agency, City of Sebastopol WSA, Town of Windsor WSA, City of Santa Rosa, City of Cotati, City of Rohnert Park

Private

References Cited

- Cardwell, G.T.. 1958. Geology and Ground Water in the Santa Rosa and Petaluma Valley Areas, Sonoma County, California. USGS Water Supply Paper 1427.
- California Department of Water Resources (DWR). 1982. Evaluation of Ground Water Resources in Sonoma County Volume 2: Santa Rosa Plain. DWR Bulletin 118-4.
- Harding-Lawson Associates. 1978. Evaluation of Alternatives for Recharge of the Santa Rosa Plain Ground-Water Basin.

Errata

Changes made to the basin description will be noted here.

Santa Rosa Valley, Healdsburg Area Subbasin

- Groundwater Basin Number: 1-55.02
- County: Sonoma
- Surface Area: 15,400 acres (24 square miles)

Basin Boundaries and Hydrology

The Healdsburg Area subbasin includes the floodplain of the Russian River. To the north it is bounded by the confluence of School House Creek and Dry Creek, and to the south by Lafayette School and the U.S. Government Reservation (Healdsburg). The boundaries are generally defined by alluvium and river channel deposits (DWR 1983). Precipitation in the Healdsburg area subbasin ranges from about 36 inches in the south to about 44 inches in the north (USDA 1999).

Hydrogeologic Information

Water Bearing Formations

The principal water source in the Healdsburg area is alluvium, with secondary sources being the Glen Ellen Formation, alluvial fan and terrace deposits, and the Merced Formation in the south. The Sonoma Volcanics contribute a very limited amount of water (DWR 1983).

Quaternary Alluvium. Holocene-age Alluvium and River Channel deposits underlie the Russian River, Dry Creek, and other tributaries. The deposits are unconsolidated, permeable gravel and sand. Increasing amounts of silt and poorer sorting away from the river causes lower permeability. Alluvium produces high yields, and provides most of the groundwater supply to the City of Healdsburg. The specific yield is high -- between 8 to 20 percent -- and near the river 25 to 50 foot wells can yield 200 to 500 gpm (DWR 1983).

Terrace Deposits. Terrace deposits, Pleistocene in age, outcrop discontinuously along the Russian River and Dry Creek. The deposits are unconsolidated, cross-bedded sands with some silt and clay, with a thickness of up to 200 feet. These were originally alluvial fan, floodplain and stream deposits until the streams downgraded and left the terraces exposed. Yields from the Terrace Deposits are adequate for domestic use, stock watering, commercial, and limited industrial use. Yields range from 10 to 50 gpm, higher where the terraces are less dissected, and the specific yield is moderate (8 to 15 percent). The specific capacity is about 5 gpm/ft (DWR 1983).

Glen Ellen Formation. The Glen Ellen consists of partially cemented beds and lenses of poorly sorted gravel, sand, silt, and clay that vary widely in thickness and extent (Cardwell 1958; DWR 1983). This continental, alluvial fan and floodplain deposit is Pliocene (?) to Pleistocene age, and is about 1,500 feet thick east of the Russian River and along the east side of Dry Creek (DWR 1983). Water yield is highly variable because the unit is very heterogeneous, but permeability is generally low (DWR 1983). Average specific yield for the Glen Ellen Formation is 3 to 7 percent (DWR 1982;

DWR 1983). It is tapped for domestic use, and wells yield from 1 to 140 gpm, with a specific capacity of about 2 gpm/ft (DWR 1983).

Merced Formation. The Merced Formation occurs only in the extreme southern part of the basin. It is a marine deposit of fine sand and sandstone, but has thin interbeds of clay and silty clay, some lenses of gravel, and localized fossils (Cardwell 1958). It is Pliocene in age, and its thickness is estimated from 300 to greater than 1,500 feet. Further south in the Santa Rosa Plain, the Merced Formation is a major producer, but in the Healdsburg Area yields are only small to moderate (8 to 15 percent) with local exceptions (DWR 1983).

Groundwater Level Trends

DWR measures groundwater levels in eight (8) wells in the Healdsburg area. Data from the last 10 years show that the groundwater level has remained relatively constant, although one well (09N10W12C01M) that has been measured since 1965 shows a gradual decrease in the water table, from 110 to 100 ft above sea level (DWR unpublished data).

Groundwater Storage

Groundwater Storage Capacity. The groundwater storage capacity has been estimated at 489,000 af (DWR 1983). This estimate is based on a TRANSCAP calculation for an area slightly larger than the one defined by this bulletin (includes parts of Santa Rosa Plain).

Groundwater in Storage. The estimated total volume of groundwater in storage for the year 1980 was 390,000 af (DWR 1983). This estimate is based on a TRANSCAP calculation for an area slightly larger than the one defined by this bulletin (includes parts of Santa Rosa Plain).

Groundwater Budget (Type C)

There is insufficient data available in order to provide a water budget for this sub basin.

Groundwater Quality

Characterization. The water in this area can be characterized as moderately hard to hard bicarbonate type and generally suitable for all uses (Cardwell 1965). TDS ranges from 90 to 500 mg/L but generally is less than 200 mg/L. EC ranges from 178 to 672 μ mhos/cm based on 16 wells from Alexander Valley and two wells from Healdsburg (DWR 1983).

Impairments. No major impairments identified (DWR 1983). In areas where wells tap the alluvial deposits, the quality of the river water may affect water in those wells. Water quality in both Dry Creek and the Russian River is considered good (DWR 1983; Cardwell 1965).

Water Quality in Public Supply Wells

Constituent Group ¹	Number of wells sampled ²	Number of wells with a concentration above an MCL ³
Inorganics – Primary	25	0
Radiological	11	0
Nitrates	26	0
Pesticides	13	0
VOCs and SVOCs	14	0
Inorganics – Secondary	25	11

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

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

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

Well Characteristics

Well yields (gal/min)

Alluvial wells near the river generally yield 200 to 500 gal/min
 Terrace deposit wells generally yield 10 to 50 gal/min
 Glen Ellen Formation wells yield 1 to 140 gal/min
 (Well-yield data obtained from Cardwell 1965)

Total depths (ft)

Domestic	Range: 30 - 600	Average: 176 (based on 206 wells)
Municipal/Irrigation	Range: 32 - 673	Average: 141 (based on 58 wells)

Active Monitoring Data

Agency	Parameter	Number of wells /measurement frequency
DWR (incl. Cooperators)	Groundwater levels	8 wells/semi-annually
Department of Health Services	Coliform, nitrates, mineral, organic chemicals, and radiological.	28 wells as required in Title 22, Calif. Code of Regulations

Basin Management

Groundwater management:	No groundwater management plans were identified.
Water agencies	
Public	City of Healdsburg Public Works Department
Private	

References Cited

California Department of Water Resources. 1982. Evaluation of Ground Water Resources, Sonoma County. Volume 2: Santa Rosa Plain. Bulletin 118-4.

_____. 1983. Evaluation of Ground Water Resources, Sonoma County. Volume 5: Alexander Valley and Healdsburg Area. Bulletin 118-4.

Cardwell, G.T., 1958. Geology and Ground Water in the Santa Rosa and Petaluma Valley Areas, Sonoma County, California. USGS Water Supply Paper 1427.

_____. 1965. Geology and Ground Water in Russian River Valley Areas and in Round, Laytonville and Little Lake Valleys, Sonoma and Mendocino Counties, California. USGS Water Supply Paper 1548.

Errata

Changes made to the basin description will be noted here.

Santa Rosa Valley, Rincon Valley Subbasin

- Groundwater Basin Number: 1-55.03
- County: Sonoma
- Surface Area: 5,600 acres (9 square miles)

Basin Boundaries and Hydrology

The Santa Rosa Valley occupies a northwest-trending structural depression in the southern part of the Coast Ranges of northern California, which divides the Mendocino Range on the west from the Mayacmas and Sonoma Mountains on the east. Rincon Valley occupies a portion of a small north to northwest-trending structural trough located east of the larger Santa Rosa Valley and the City of Santa Rosa. This valley is approximately 7 miles long along its eastern edge and varies in width from about 0.5 miles to 2.5 miles.

The majority of the valley is bounded by the Napa-Sonoma Volcanic Highlands with two exceptions. On the southeast side, Rincon valley is separated from Kenwood Valley subbasin by Santa Rosa Creek and on the southwest side, Rincon Valley is separated from the Santa Rosa Plain by a narrow constriction formed in bedrock of the Sonoma Volcanics.

Rincon Valley drains to the south through Brush Creek, a small intermittent stream, which is a tributary of Santa Rosa Creek. Precipitation in Rincon Valley ranges from about 32 inches in the south to over 40 inches in the north-northeast.

Hydrogeologic Information

Water Bearing Formations

The primary water-bearing units in the Rincon Valley are Alluvium and the Glen Ellen Formation.

Alluvium. Alluvial deposits are present over a significant proportion of Rincon Valley. These deposits consist of poorly sorted coarse sand and gravel, and moderately sorted fine sand, silt, and clay, and have a specific yield of 8 to 17 percent (DWR 1982). The older alluvial deposits are Late Pleistocene in age, are sometimes dissected, and have a maximum exposed thickness of 100 feet in the Santa Rosa Valley (Cardwell 1958). The younger alluvium is a thin veneer over the old, ranging from 30 to 100 feet thick, and is Late Pleistocene to Holocene in age. The deposits are not perennially saturated, have low permeability, and are generally unconfined or slightly confined (Cardwell 1958). The water quality is generally good for most uses, and the unit yields water to some wells in the downstream part of the Rincon Valley (Cardwell 1958).

Glen Ellen Formation. The Glen Ellen Formation provides the major water source in the Rincon Valley subbasin, and is connected to the principal groundwater body in the Santa Rosa Valley (Cardwell 1958). The Glen Ellen consists of partially cemented beds and lenses of poorly sorted gravel, sand, silt, and clay that vary widely in thickness and extent (Cardwell 1958; DWR 1982). This continental deposit is Pliocene (?) to Pleistocene age, and

was deposited in structural troughs so it varies in thickness from 3,000 feet to less than 1,500 feet on the west side of the Santa Rosa Valley (Cardwell 1958). In the southeast part of the Rincon valley, confined conditions exist and some wells are flowing (Cardwell 1958). Since the unit crops out in favorable areas and has moderate permeability (HLA 1978), recharge may occur fairly quickly, but it can be inhibited in areas of well-developed soils with hardpan (Cardwell 1958). Average specific yield for the Glen Ellen Formation is 3 to 7 percent (DWR 1982). This formation is tapped for domestic use (Cardwell 1958).

Groundwater Level Trends

Review of water level data from representative wells within Rincon Valley indicate that water levels have remained relatively stable during the period of 1951 to 2000 and that the subbasin is nearly full (DWR 1975; DWR unpublished data). One well located in the southeast part of the subbasin near Santa Rosa Creek has shown a gradual increase in water level of over 20 feet between 1990 and 2000 (DWR unpublished data).

Groundwater Storage

Groundwater Storage Capacity. An estimate of the gross groundwater storage capacity for the Rincon Valley of 21,000 af was obtained by the USGS using an average specific yield of 5.5 percent for an estimated 190 feet of primary water-bearing materials (Cardwell 1958). An estimate of the total groundwater storage capacity of 45,000 af was calculated for a large portion of the Rincon Valley subbasin and a smaller portion of the Kenwood Valley subbasin (DWR 1965). This estimate was based on the alluvium from a depth of 10 to 200 feet and an average specific yield of 5.5 percent. The depth range used for this estimate probably includes a portion of the Glen Ellen Formation. Bulletin 118-4 provided an estimate of the gross storage capacity for the Rincon Valley subbasin of 290,000 af (DWR 1975). This estimate was obtained using the GEOLOG program and an average specific yield of 6.83 percent; however, this value cannot be construed to be the usable groundwater storage capacity.

Groundwater in Storage. An estimate of the groundwater in storage during the spring of 1980 of approximately 43,000 af was obtained using data from Bulletin 118-4 Volume 2 (DWR 1982). This estimate was obtained for an area less than that of the currently defined Rincon Valley subbasin.

Groundwater Budget (Type C)

There is not enough data available in order to estimate a groundwater budget.

Groundwater Quality

Characterization. The Rincon Valley subbasin is generally characterized by a calcium-bicarbonate water type (DWR 1975). A localized area of sodium and/or magnesium chloride water is present in the southwest portion of the subbasin. In the southern portions of the subbasin, groundwater hardness ranges from about 100 to 200 mg/L (DWR 1975).

Impairments. In the southwest portion of the subbasin near the boundary with the Santa Rosa Plain, an area of elevated iron, manganese, and boron was reported (DWR 1975).

Water Quality in Public Supply Wells

Constituent Group ¹	Number of wells sampled ²	Number of wells with a concentration above an MCL ³
Inorganics – Primary	12	0
Radiological	9	0
Nitrates	14	0
Pesticides	11	0
VOCs and SVOCs	10	0
Inorganics – Secondary	12	5

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

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

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

Well Characteristics

	Well yields (gal/min)	
Municipal/Irrigation	Range: –	Average: (based on ___wells)
	Total depths (ft)	
Domestic	Range: 85 to 500	Average: 231 (based on 8 wells)
Municipal/Irrigation	N/A	

Active Monitoring Data

Agency	Parameter	Number of wells /measurement frequency
DWR (incl. Cooperators)	Groundwater levels	2 wells/semi-annually
DWR (incl. Cooperators)	Mineral, nutrient, & minor element.	None known
Department of Health Services	Coliform, nitrates, mineral, organic chemicals, and radiological.	12 wells as required in Title 22, Calif. Code of Regulations

Basin Management

Groundwater management: No groundwater management plans identified.

Water agencies

Public Sonoma County Water Agency

Private

References Cited

Cardwell, G.T., 1958. Geology and Ground Water in the Santa Rosa and Petaluma Valley Areas, Sonoma County, California. USGS Water Supply Paper 1427.

California Department of Water Resources (DWR). 1965. Water Resources and Future Water Requirements. North Coast Hydrographic Region. Volume 1: Southern Region. DWR Bulletin 142-1.

_____. 1975. Evaluation of Ground Water Resources: Sonoma County. Volume 1: Geologic and Hydrologic Data. DWR Bulletin 118-4.

_____. 1982. Evaluation of Ground Water Resources - Sonoma County. Volume 2: Santa Rosa Plain. DWR Bulletin 118-4.

Additional References

Harding-Lawson Associates 1978. Evaluation of Alternatives for Recharge of the Santa Rosa Plain Ground-Water Basin. March 1978.

Errata

Changes made to the basin description will be noted here.

APPENDIX B

Groundwater Level Hydrographs

Wells with Groundwater Level Data in the Santa Rosa Valley Groundwater Basin and Adjacent Areas

DWR Basin: SANTA ROSA VALLEY GROUNDWATER BASIN

Subbasin Name : HEALDSBURG AREA SUBBASIN

Well ID	Well Name	Aquifer Designation*	Period of WL Data	No. of Meas.	Depth	Perforation Interval
8N/9W-22E1	22E1	S	3/26/1974 - 4/17/2006	29	45	-
9N/9W-20E2	20E2	Unknown	4/5/1976 - 4/17/2006	40		-
9N/9W-20K4	20K4	Unknown	11/30/1989 - 4/17/2006	34		-
9N/9W-28N1	28N1	Unknown	11/15/1990 - 4/17/2006	30		-
9N/10W-12C1	12C1	Unknown	8/18/1964 - 4/17/2006	130		-
10N/10W-22D1	22D1	Unknown	4/5/1976 - 10/29/1991	12		-
10N/10W-22D2	22D2	Unknown	4/27/1994 - 4/17/2006	24		-
10N/10W-26M1	26M1	Unknown	4/5/1976 - 4/17/2006	41		-

Subbasin Name : RINCON VALLEY SUBBASIN

Well ID	Well Name	Aquifer Designation*	Period of WL Data	No. of Meas.	Depth	Perforation Interval
7N/7W-6H2	6H2	S	10/9/1980 - 4/17/2006	30	100	60 - 80
7N/7W-9P1	9P1	I	10/9/1980 - 4/18/2006	33	296	286 - 296

Subbasin Name : SANTA ROSA PLAIN SUBBASIN

Well ID	Well Name	Aquifer Designation*	Period of WL Data	No. of Meas.	Depth	Perforation Interval
6N/7W-17G1	17G1	SI	10/15/1980 - 4/6/2004	20	370	120 - 370
6N/7W-19E1	19E1	SI	2/24/1968 - 8/20/1991	10	303	160 - 303
6N/7W-30C1	30C1	WD_ONLY	10/17/1974 - 4/18/2006	33	465	-
6N/7W-30L1	30L1	Unknown	9/29/1949 - 4/1/1952	23		-
6N/7W-30M1	30M1	Unknown	1/1/1947 - 3/15/1957	23		-
6N/7W-30R1	30R1	S	12/1/1966 - 4/18/2006	34	150	35 - 150
6N/8W-2E1	2E1	S	12/1/1963 - 12/9/1996	11	172	167 - 172
6N/8W-2E2	2E2	S	3/21/1990 - 10/20/1992	4	60	52 - 60
6N/8W-4Q1	4Q1	S	1/26/1976 - 4/18/2006	34	80	10 - 80
6N/8W-8R2	8R2	S	1/26/1976 - 4/6/2004	13	92	52 - 92

* "S" indicates Shallow, (<200') "I" indicates Intermediate, (200-600') "D" indicates Deep, (600-800') "L" indicates Lower, > 800' and "WD Only" indicates well depth but no perforation data is available.

Note: Only Wells with more than two data points are included

Subbasin Name : SANTA ROSA PLAIN SUBBASIN

Well ID	Well Name	Aquifer Designation*	Period of WL Data	No. of Meas.	Depth	Perforation Interval
6N/8W-9J2	9J2	D	10/17/1980 - 4/26/1996	2	745	719 - 739
6N/8W-11D1	11D1	SI	10/6/1980 - 4/6/2004	22	251	104 - 251
6N/8W-11F1	11F1	S	8/7/1975 - 12/9/1996	21	110	70 - 90
6N/8W-11P1	11P1	S	10/6/1980 - 4/18/2006	33	120	-
6N/8W-12F1	12F1	SI	8/14/1975 - 9/26/2000	105	252	76 - 252
6N/8W-12M1	12M1	S	1/29/1976 - 4/18/2006	31	90	80 - 90
6N/8W-15A2	15A2	S	1/22/1976 - 10/19/2005	28	72	50 - 72
6N/8W-15J3	15J3	S	3/1/1950 - 7/12/2006	306	166	65 - 166
6N/8W-15R1	15R1	WD_ONLY	3/27/1951 - 11/23/1987	71	1025	-
6N/8W-16K3	16K3	S	10/17/1980 - 4/6/2004	14	79	59 - 79
6N/8W-22R1	22R1	I	10/15/1980 - 4/6/2004	19	407	387 - 407
6N/8W-26L1	26L1	S	4/15/1972 - 7/8/2004	301	94	54 - 94
6N/8W-26M1	26M1	I	10/15/1980 - 12/11/1996	8	224	205 - 224
6N/8W-26N1	26N1	Unknown	12/19/1949 - 4/4/1952	15		-
6N/8W-27H1	27H1	S	1/27/1976 - 9/12/2007	47	82	62 - 82
7N/7W-19B1	19B1	S	10/9/1980 - 4/18/2006	22	85	45 - 85
7N/7W-19F2	19F2	S	10/9/1980 - 4/13/2007	30	68	48 - 68
7N/8W-3L1	3L1	S	5/1/1946 - 3/17/2004	18	150	17 - 95
7N/8W-7D1	7D1	SI	10/16/1980 - 4/5/2004	18	232	74 - 232
7N/8W-7Q1	7Q1	S	10/16/1980 - 4/6/2004	18	82	72 - 82
7N/8W-8M1	8M1	SI	10/10/1980 - 4/12/2007	33	220	180 - 220
7N/8W-9N1	9N1	S	5/24/1974 - 4/16/2003	18	63	35 - 65
7N/8W-17K3	17K3	S	3/22/1990 - 4/11/1991	2	90	70 - 90
7N/8W-21J1	21J1	SI	10/13/1980 - 4/18/2006	34	360	148 - 360
7N/8W-23H1	23H1	S	3/21/1990 - 4/27/1993	6	128	104 - 128
7N/8W-24L1	24L1	SI	10/13/1980 - 4/5/2004	23	330	160 - 200
7N/8W-26L2	26L2	I	10/15/1980 - 4/5/2004	24	258	209 - 249
7N/8W-27N2	27N2	S	6/27/1973 - 4/5/2004	23	65	45 - 65

* "S" indicates Shallow, (<200') "I" indicates Intermediate, (200-600') "D" indicates Deep, (600-800') "L" indicates Lower, > 800' and "WD Only" indicates well depth but no perforation data is available.

Note: Only Wells with more than two data points are included

Subbasin Name : SANTA ROSA PLAIN SUBBASIN

Well ID	Well Name	Aquifer Designation*	Period of WL Data	No. of Meas.	Depth	Perforation Interval
7N/8W-29K1	29K1	S	5/1/1972 - 11/9/1993	3	67	47 - 67
7N/8W-29M2	29M2	S	10/1/1966 - 4/5/2004	19	98	78 - 98
7N/8W-30K1	30K1	SI	10/31/1973 - 9/12/2007	313	290	105 - 291
7N/8W-35K1	35K1	SI	10/6/1980 - 4/13/2007	34	205	185 - 205
7N/9W-1C1	1C1	S	11/24/1941 - 4/12/2007	33	110	-
7N/9W-2L1	2L1	S	10/14/1980 - 4/5/2004	20	141	132 - 141
7N/9W-13M1	13M1	WD_ONLY	10/13/1980 - 3/1/1996	3	316	-
7N/9W-14H5	14H5	S	10/13/1980 - 4/5/2004	19	94	-
7N/9W-26P1	26P1	S	10/14/1980 - 4/18/2006	33	110	-
8N/8W-20Q1	20Q1	SI	11/1/1973 - 10/16/2002	16	312	55 - 310
8N/8W-29B1	29B1	S	10/10/1980 - 4/17/2006	31	64	52 - 64
8N/8W-29C3	29C3	S	10/10/1980 - 4/12/2007	35	95	82 - 95
8N/8W-32M1	32M1	I	10/10/1980 - 10/16/2002	17	332	310 - 331
8N/9W-12P1	12P1	S	11/14/1974 - 10/16/2002	23	187	67 - 187
8N/9W-12P2	12P2	S	3/16/1976 - 11/15/1990	8	100	85 - 100
8N/9W-13A2	13A2	S	11/1/1973 - 5/10/1999	102	109	87 - 109
8N/9W-13A3	13A3	S	10/10/1980 - 10/16/2002	22	192	176 - 188
8N/9W-14L2	14L2	S	10/10/1980 - 6/27/1995	10	132	122 - 132
8N/9W-15B1	15B1	I	10/10/1980 - 4/24/1997	6	235	215 - 235
8N/9W-22R1	22R1	S	10/14/1980 - 11/3/2004	26	145	122 - 142
8N/9W-26L1	26L1	I	1/18/1990 - 4/17/1991	14	265	246 - 265
8N/9W-36N1	36N1	S	10/14/1949 - 4/18/2006	35	89	-
8N/9W-36P1	36P1	WD_ONLY	10/5/1949 - 6/7/2006	136	1048	-
Well 02	COT_02	I	1/29/1977 - 6/7/2006	133	500	220 - 485
Well 03	COT_03	ID	1/10/1990 - 6/7/2006	61	685	295 - 670
Well 1A	COT_1A	ID	1/24/1990 - 7/12/2006	66	650	290 - 630
PWC_01	PWC_01	SI	9/16/2000 - 10/25/2003	41		188 - 380
RP_01	RP_01	I	1/1/1955 - 12/1/2006	288		265 - 458

* "S" indicates Shallow, (<200') "I" indicates Intermediate, (200-600') "D" indicates Deep, (600-800') "L" indicates Lower, > 800' and "WD Only" indicates well depth but no perforation data is available.

Note: Only Wells with more than two data points are included

Subbasin Name : SANTA ROSA PLAIN SUBBASIN

Well ID	Well Name	Aquifer Designation*	Period of WL Data	No. of Meas.	Depth	Perforation Interval
RP_02	RP_02	I	1/1/1956 - 12/1/2006	294		288 - 462
RP_03	RP_03	IDL	1/1/1960 - 12/1/2006	262		272 - 805
RP_04	RP_04	SI	1/1/1961 - 12/1/2006	293		60 - 425
RP_05	RP_05	SI	8/1/1976 - 12/1/2006	292		160 - 463
RP_06	RP_06	SI	1/1/1970 - 12/1/2006	280		120 - 380
RP_07	RP_07	SI	1/1/1971 - 12/1/2006	282		128 - 460
RP_08	RP_08	SI	1/1/1972 - 12/1/2006	289		125 - 490
RP_08A	RP_08A	SI	5/1/1987 - 12/1/2006	199		80 - 594
RP_09	RP_09	SI	7/1/1974 - 12/1/2006	278		144 - 490
RP_10	RP_10	SI	1/1/1976 - 12/1/2006	286		200 - 450
RP_11	RP_11	I	12/1/1975 - 12/1/2006	285		224 - 494
RP_12	RP_12	I	1/1/1976 - 12/1/2006	275		224 - 565
RP_13	RP_13	SI	1/1/1976 - 12/1/2006	284		118 - 478
RP_14	RP_14	IDL	1/1/1977 - 12/1/2006	259		275 - 819
RP_15	RP_15	IDL	1/1/1977 - 12/1/2006	262		351 - 1491
RP_16	RP_16	IDL	1/1/1977 - 12/1/2006	264		300 - 1500
RP_17	RP_17	I	9/1/1980 - 12/1/2006	253		302 - 462
RP_18	RP_18	I	9/1/1980 - 12/1/2006	251		298 - 522
RP_19	RP_19	SI	3/1/1982 - 12/1/2006	241		120 - 420
RP_20	RP_20	SI	3/1/1982 - 12/1/2006	183		100 - 470
RP_21	RP_21	SI	3/1/1982 - 12/1/2006	241		190 - 395
RP_22	RP_22	I	3/1/1982 - 12/1/2006	242		242 - 344
RP_23	RP_23	SI	3/1/1982 - 12/1/2001	193		190 - 580
RP_24	RP_24	I	3/1/1982 - 12/1/2006	233		258 - 582
RP_25	RP_25	I	11/1/1985 - 12/1/2001	155		323 - 580
RP_26	RP_26	I	1/1/1986 - 12/1/2006	199		297 - 540
RP_27	RP_27	I	9/1/1985 - 12/1/2006	204		260 - 594
RP_28	RP_28	I	11/1/1985 - 12/1/2001	152		395 - 595

* "S" indicates Shallow, (<200') "I" indicates Intermediate, (200-600') "D" indicates Deep, (600-800') "L" indicates Lower, > 800' and "WD Only" indicates well depth but no perforation data is available.

Note: Only Wells with more than two data points are included

Subbasin Name : SANTA ROSA PLAIN SUBBASIN

Well ID	Well Name	Aquifer Designation*	Period of WL Data	No. of Meas.	Depth	Perforation Interval
RP_29	RP_29	SI	2/1/1987 - 12/1/2006	197		130 - 450
RP_30	RP_30	SI	4/1/1989 - 12/1/2006	176		161 - 421
RP_31	RP_31	SI	8/1/1987 - 12/1/2006	190		110 - 510
RP_32	RP_32	SI	3/1/1986 - 7/1/1998	110		38 - 411
RP_33	RP_33	SID	7/1/1989 - 12/1/2006	176		156 - 666
RP_34	RP_34	SID	8/1/1990 - 12/1/2006	164		170 - 680
RP_35	RP_35	SI	4/1/1990 - 12/1/2006	164		160 - 590
RP_36	RP_36	ID	4/1/1991 - 12/1/2001	104		210 - 695
RP_37	RP_37	SI	5/1/1991 - 12/1/2006	153		130 - 380
RP_38	RP_38	SI	11/1/1991 - 12/1/2006	133		165 - 280
RP_39	RP_39	I	9/1/1991 - 12/1/2006	151		238 - 398
RP_40	RP_40	I	6/1/1991 - 12/1/2006	154		220 - 480
RP_41	RP_41	SID	3/1/1993 - 12/1/2006	133		175 - 675
RP_42	RP_42	I	8/1/1998 - 12/1/2006	77		300 - 440
SCWA_01	SCWA_01	S	6/15/1977 - 12/15/2005	114	80	60 - 80
SCWA_02	SCWA_02	WD_ONLY	6/15/1977 - 12/15/2005	115	257	-
SCWA_03	SCWA_03	WD_ONLY	6/15/1977 - 4/15/2005	115	570	-
SCWA_04	Todd Rd	D	10/15/1977 - 3/25/1997	93	808	650 - 800
SCWA_05	Sebastopol Rd	IDL	9/15/1977 - 3/22/1999	93	1040	400 - 1040
SCWA_06	Occidental Rd	ID	10/15/1977 - 6/20/2001	102	600	400 - 600
T060970002MW-7	L002	S	8/26/2002 - 7/22/2005	13	21	-
T0609700005MW-2	L005	S	1/18/2002 - 3/19/2007	60	20	-
T0609700006MW-7	L006	S	6/20/2002 - 2/1/2006	26	19	-
T0609700126MW-3	L126	S	3/14/2002 - 5/10/2007	28	28	-
T0609700189MW-18	L189	S	12/27/2002 - 11/9/2005	12		-
T0609700248MW-3	L248	S	5/17/2002 - 11/9/2005	15		-
T0609700386MW-6	L386	S	11/19/2001 - 11/9/2005	17	20	-

DWR Basin: PETALUMA VALLEY GROUNDWATER BASIN

* "S" indicates Shallow, (<200') "I" indicates Intermediate, (200-600') "D" indicates Deep, (600-800') "L" indicates Lower, > 800' and "WD Only" indicates well depth but no perforation data is available.
 Note: Only Wells with more than two data points are included

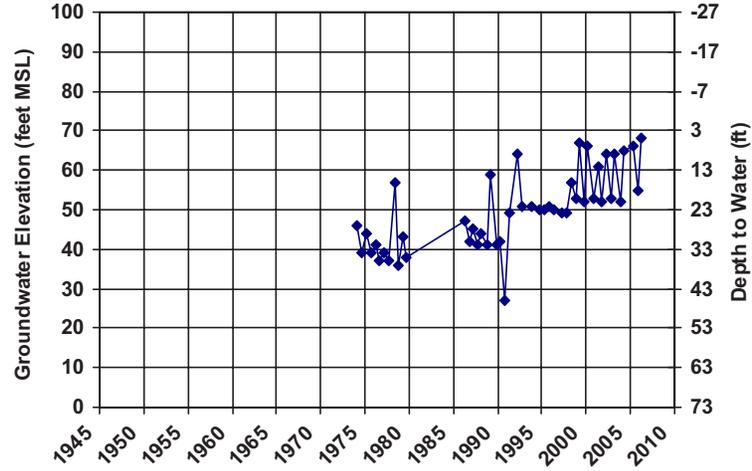
Subbasin Name : SUBBASIN

Well ID	Well Name	Aquifer Designation*	Period of WL Data	No. of Meas.	Depth	Perforation Interval
5N/7W-7A1	7A1	S	11/9/1989 - 11/6/2002	21	62	35 - 60
5N/7W-11F1	11F1	I	10/8/1980 - 4/18/2006	41	480	300 - 450
5N/7W-11N1	11N1	S	10/8/1980 - 4/18/2006	40	100	60 - 100
5N/7W-15K2	15K2	S	12/1/1989 - 4/18/2006	32	177	158 - 177
5N/7W-15Q1	15Q1	SI	12/1/1989 - 6/7/2006	132	200	180 - 200
5N/7W-18B1	18B1	S	11/10/1989 - 4/6/2004	25	82	58 - 78
5N/7W-19N1	19N1	S	1/19/1990 - 6/7/2006	175	180	-
5N/7W-20B2	20B2	S	4/19/1953 - 4/18/2006	201	158	-
5N/7W-34L1	34L1	S	11/10/1989 - 3/20/2000	21	196	123 - 163
5N/7W-36R1	36R1	S	12/1/1989 - 10/20/2005	89	34	20 - 34
5N/8W-1L2	1L2	S	1/21/1976 - 4/18/2006	56	185	165 - 185
5N/8W-2H1	2H1	S	8/1/1975 - 4/13/2007	56	155	30 - 150
6N/7W-31J1	31J1	SI	11/9/1989 - 4/6/2004	24	280	45 - 228
6N/7W-31J2	31J2	Unknown	6/14/1950 - 4/1/1952	10		-

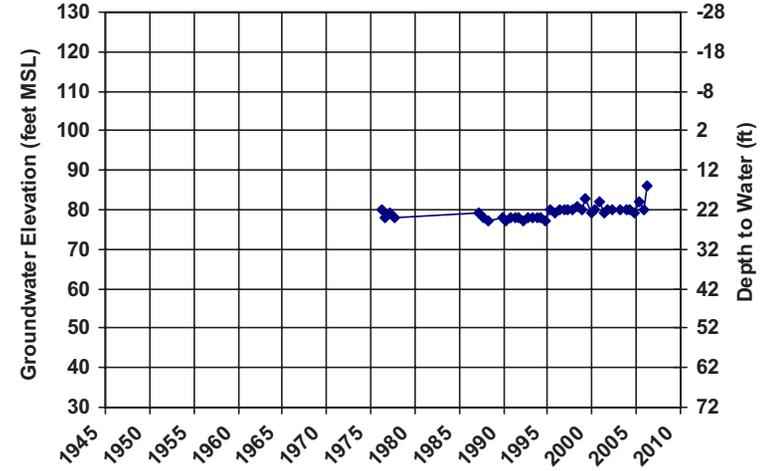
* "S" indicates Shallow, (<200') "I" indicates Intermediate, (200-600') "D" indicates Deep, (600-800') "L" indicates Lower, > 800' and "WD Only" indicates well depth but no perforation data is available.

Note: Only Wells with more than two data points are included

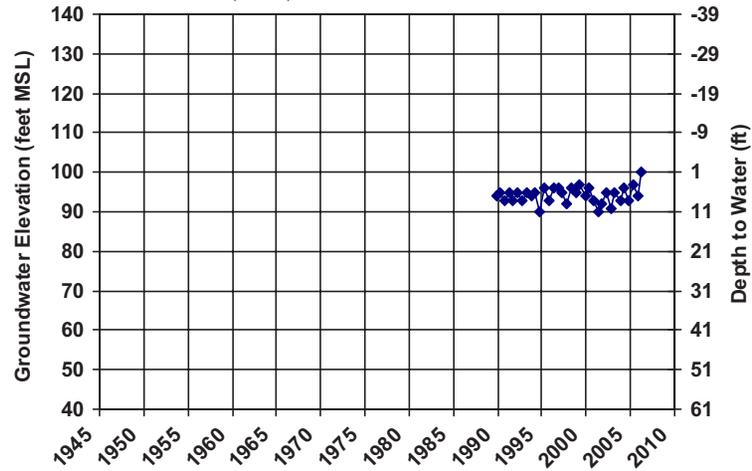
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 HEALDSBURG AREA
 Well ID: 8N/9W-22E1 (22E1)
 Aquifer: S
 Depth: 45 ft
 RPE: 73



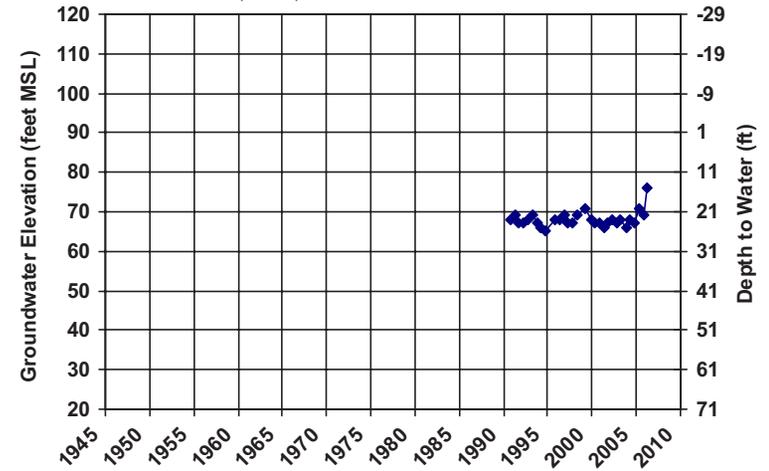
SANTA ROSA VALLEY
 HEALDSBURG AREA
 Well ID: 9N/9W-20E2 (20E2)
 Aquifer: Unknown
 Depth: n/a
 RPE: 102



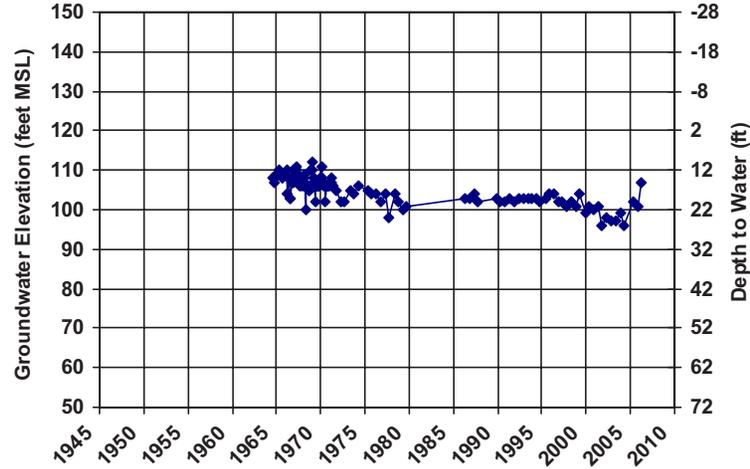
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 HEALDSBURG AREA
 Well ID: 9N/9W-20K4 (20K4)
 Aquifer: Unknown
 Depth: n/a
 RPE: 101



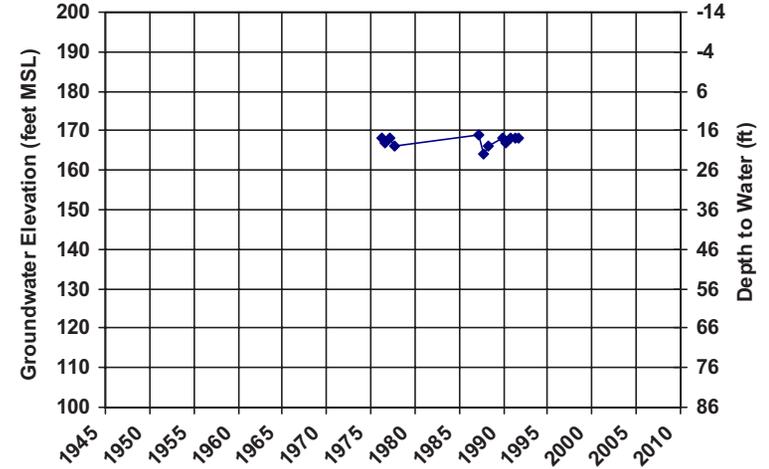
SANTA ROSA VALLEY
 HEALDSBURG AREA
 Well ID: 9N/9W-28N1 (28N1)
 Aquifer: Unknown
 Depth: n/a
 RPE: 91



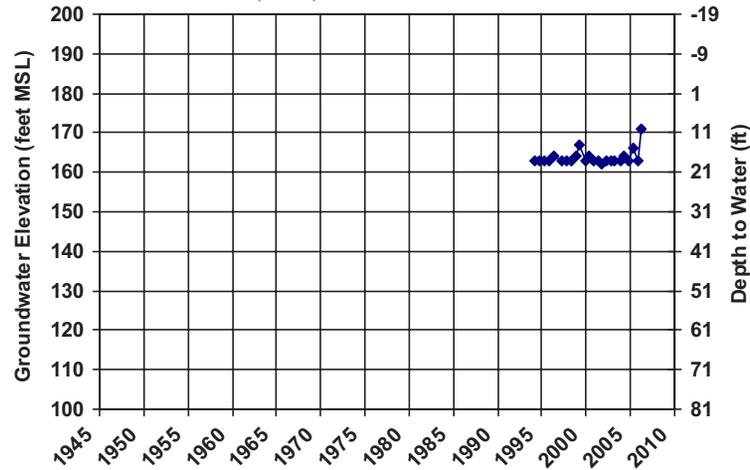
SANTA ROSA VALLEY
 HEALDSBURG AREA
 Well ID: 9N/10W-12C1 (12C1)
 Aquifer: Unknown
 Depth: n/a
 RPE: 122



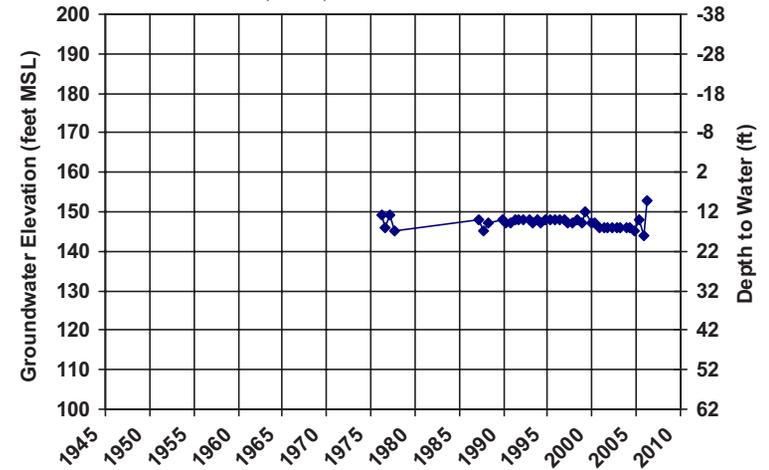
SANTA ROSA VALLEY
 HEALDSBURG AREA
 Well ID: 10N/10W-22D1 (22D1)
 Aquifer: Unknown
 Depth: n/a
 RPE: 186

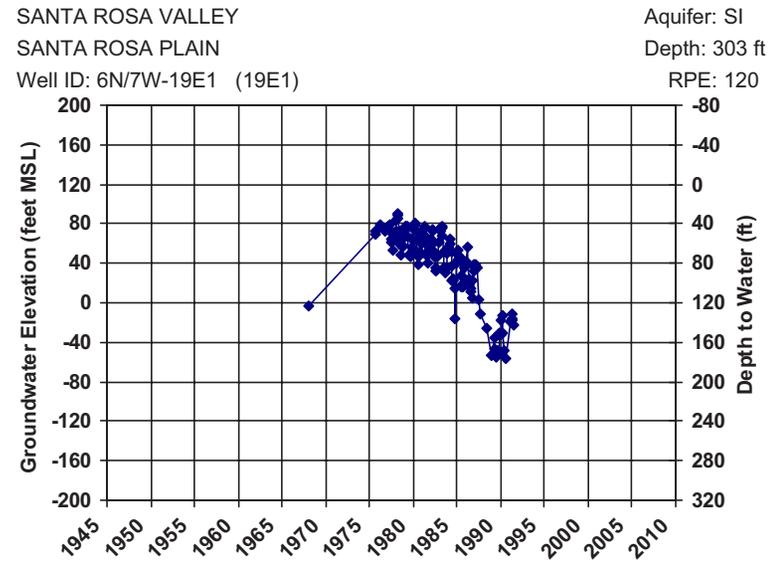
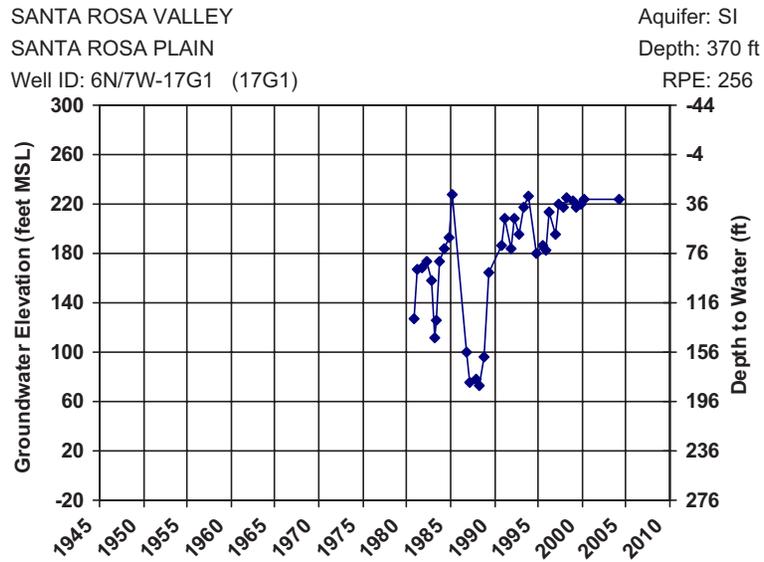
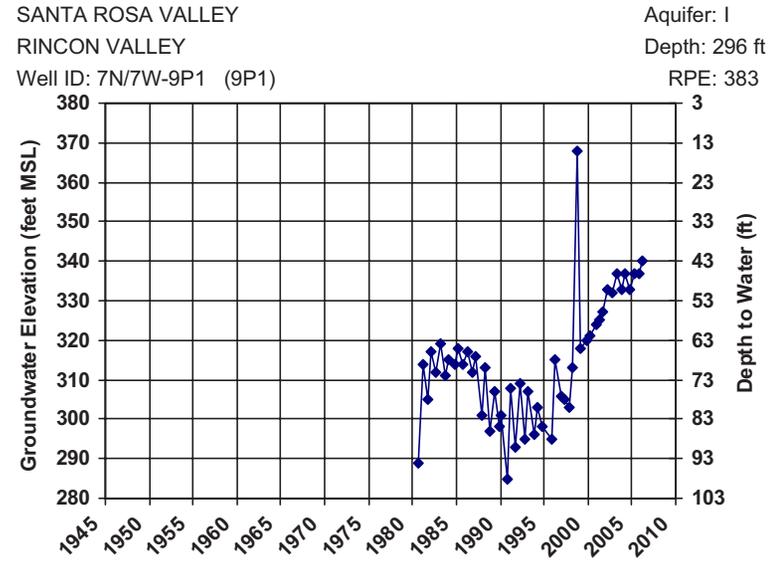
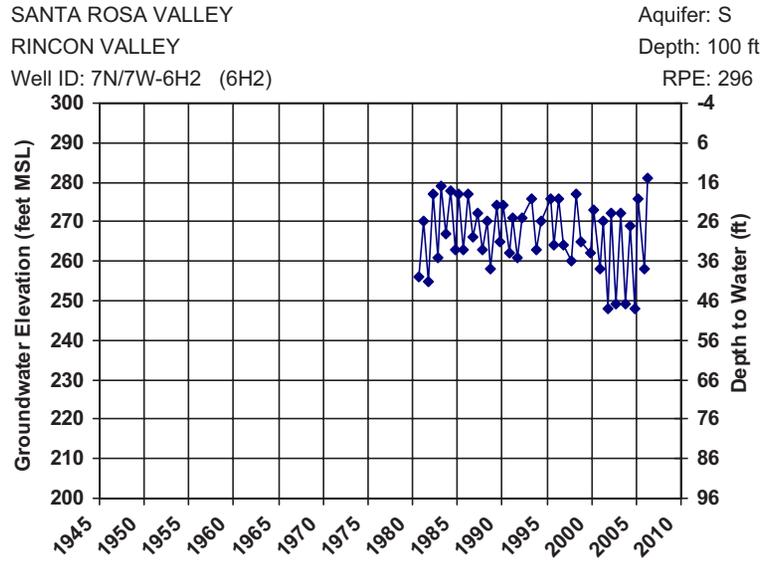


SANTA ROSA VALLEY
 HEALDSBURG AREA
 Well ID: 10N/10W-22D2 (22D2)
 Aquifer: Unknown
 Depth: n/a
 RPE: 181

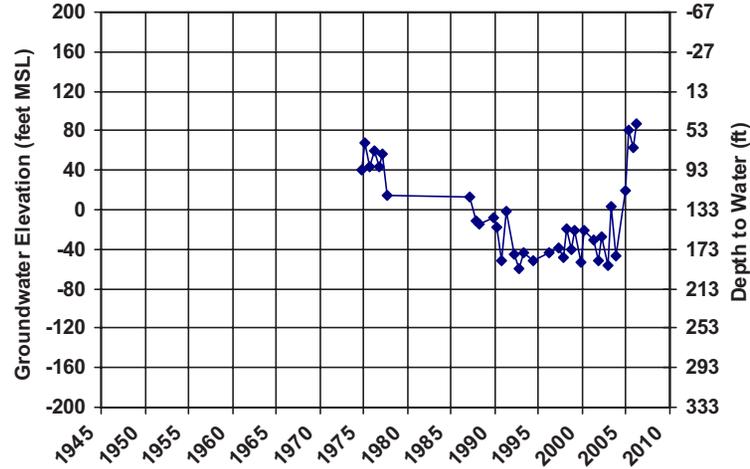


SANTA ROSA VALLEY
 HEALDSBURG AREA
 Well ID: 10N/10W-26M1 (26M1)
 Aquifer: Unknown
 Depth: n/a
 RPE: 162

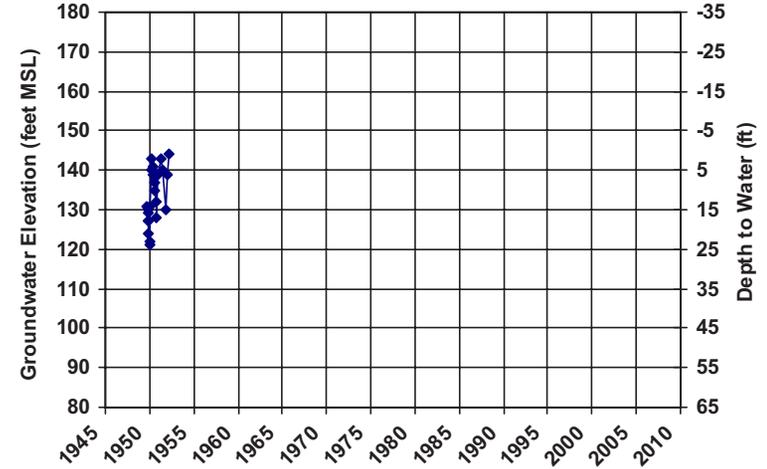




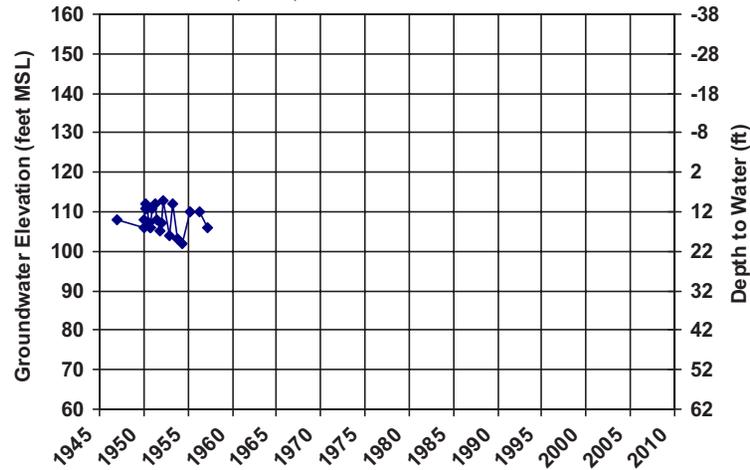
SANTA ROSA VALLEY
 SANTA ROSA PLAIN
 Well ID: 6N/7W-30C1 (30C1)
 Aquifer: WD_ONLY
 Depth: 465 ft
 RPE: 133



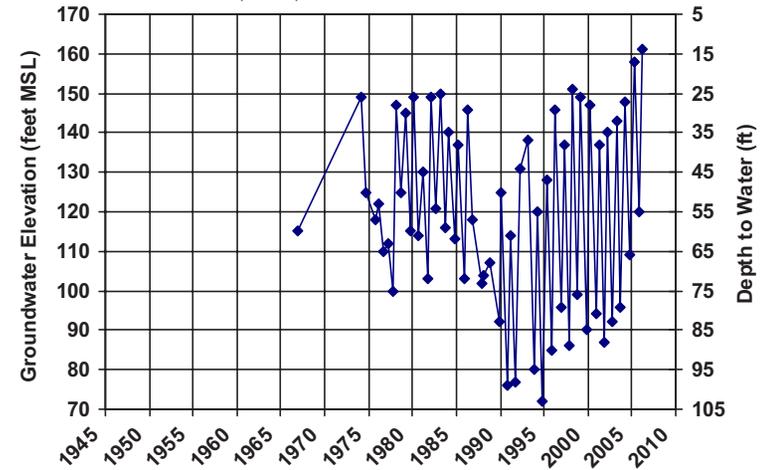
SANTA ROSA VALLEY
 SANTA ROSA PLAIN
 Well ID: 6N/7W-30L1 (30L1)
 Aquifer: Unknown
 Depth: n/a
 RPE: 145

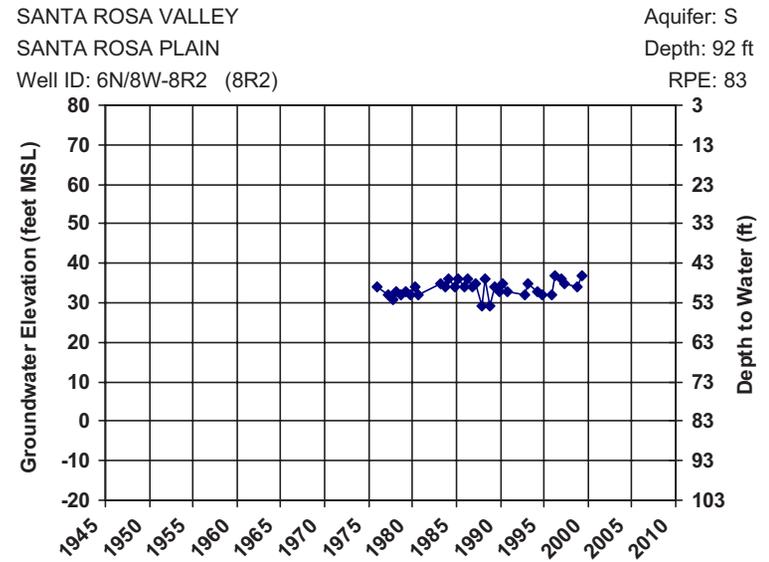
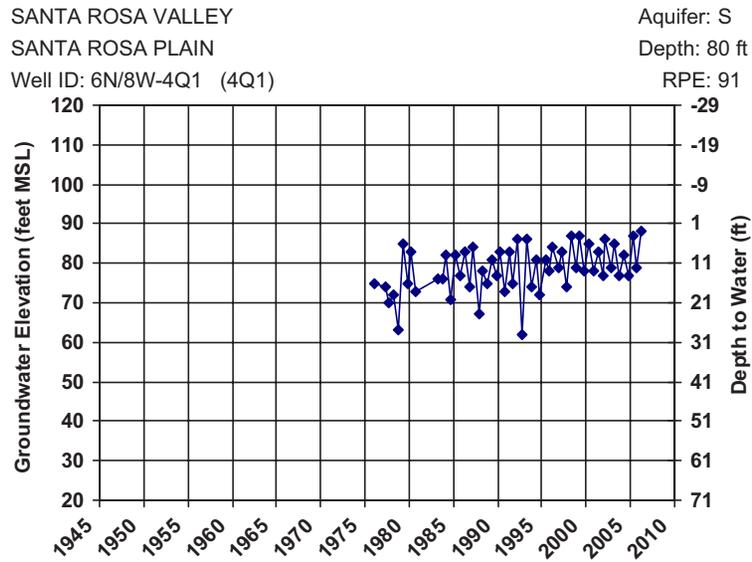
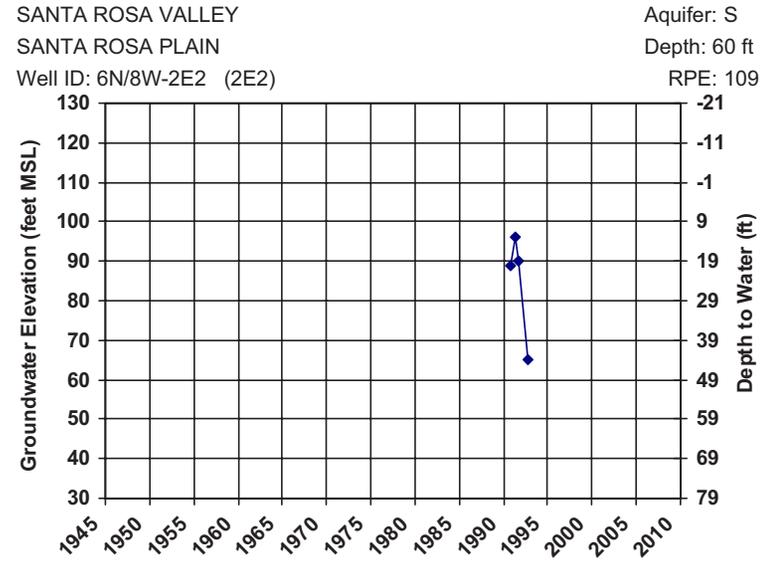
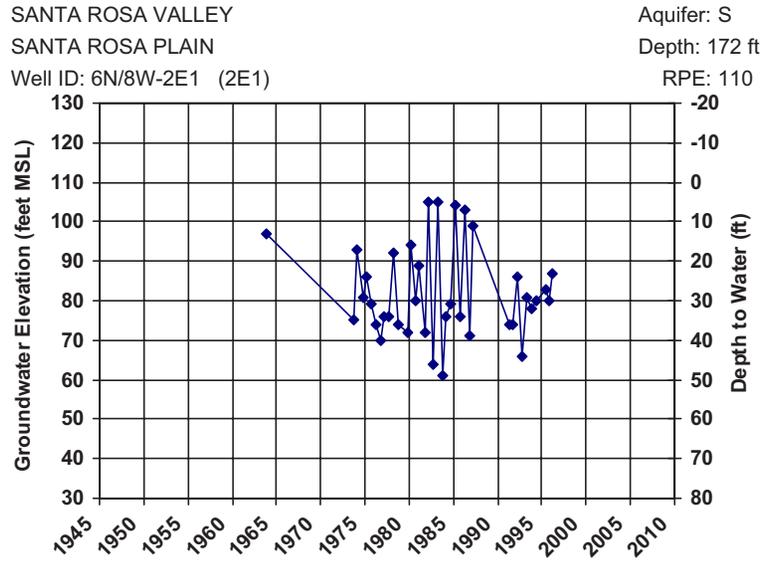


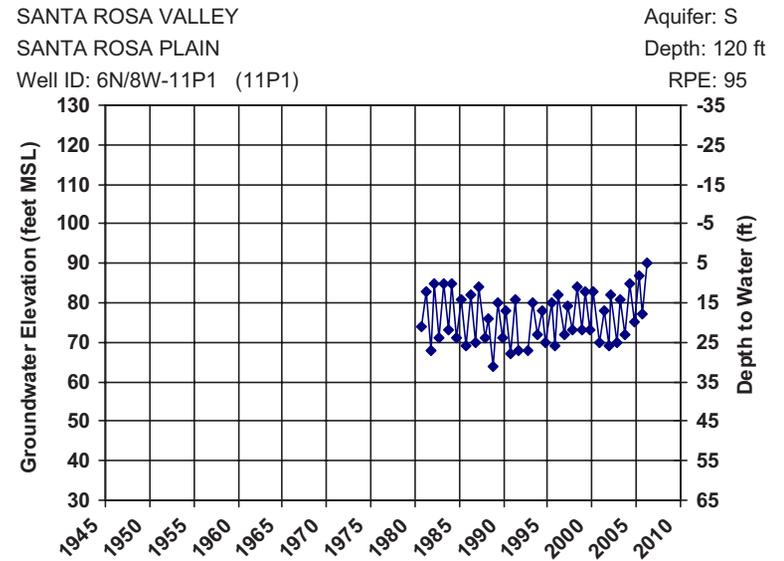
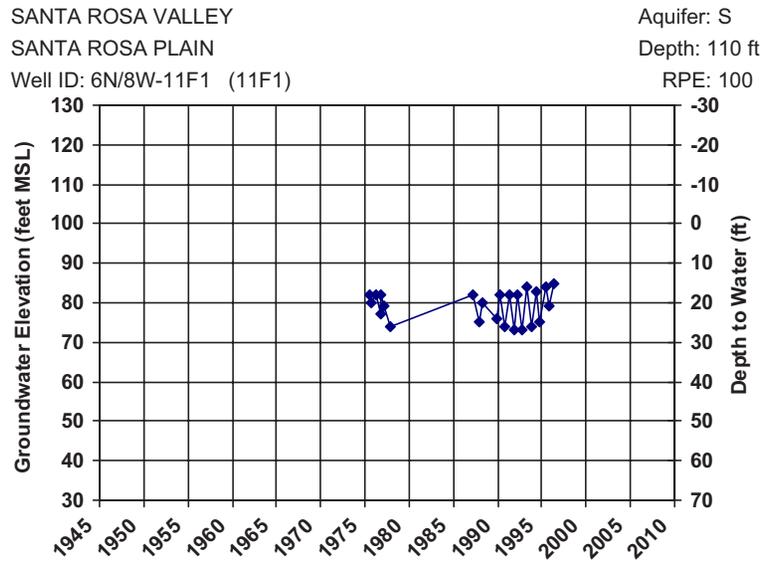
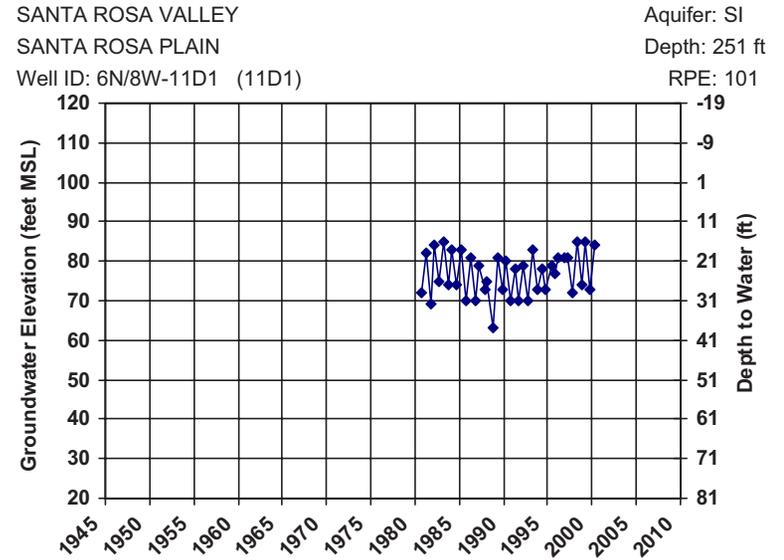
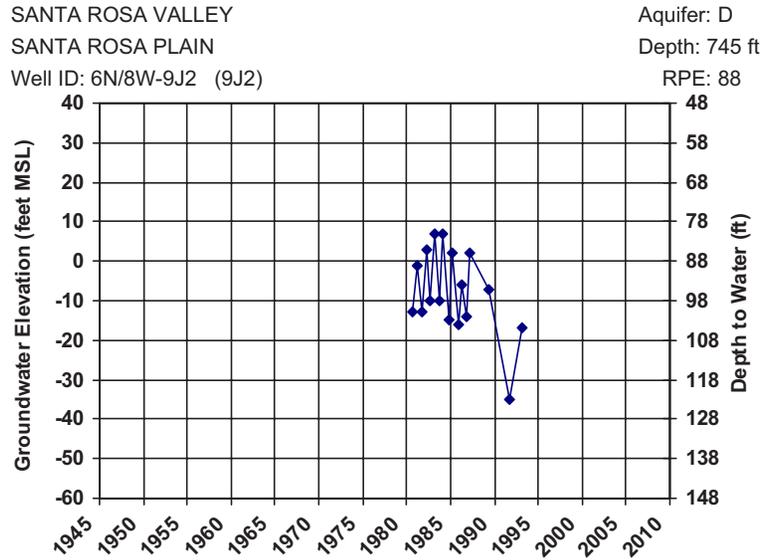
SANTA ROSA VALLEY
 SANTA ROSA PLAIN
 Well ID: 6N/7W-30M1 (30M1)
 Aquifer: Unknown
 Depth: n/a
 RPE: 122

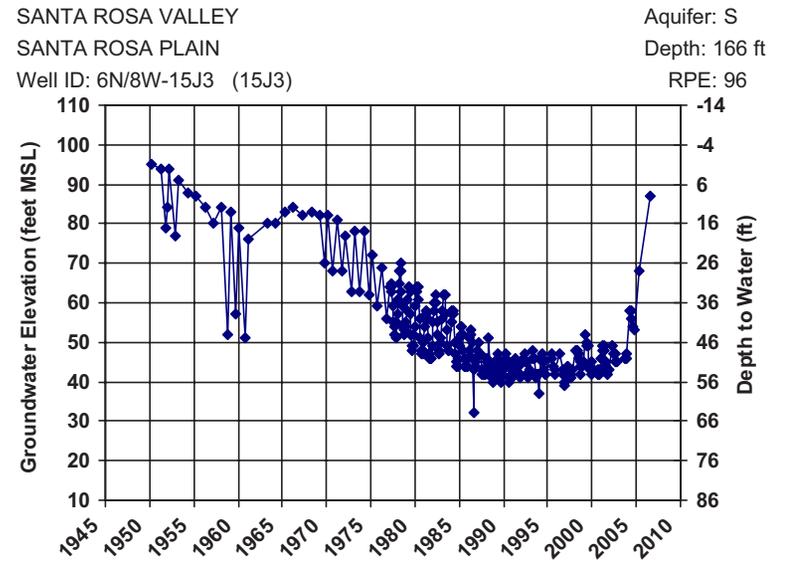
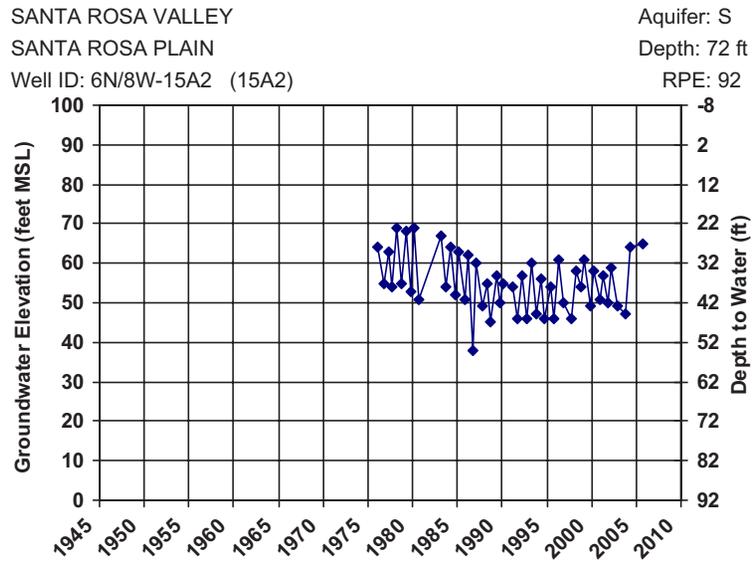
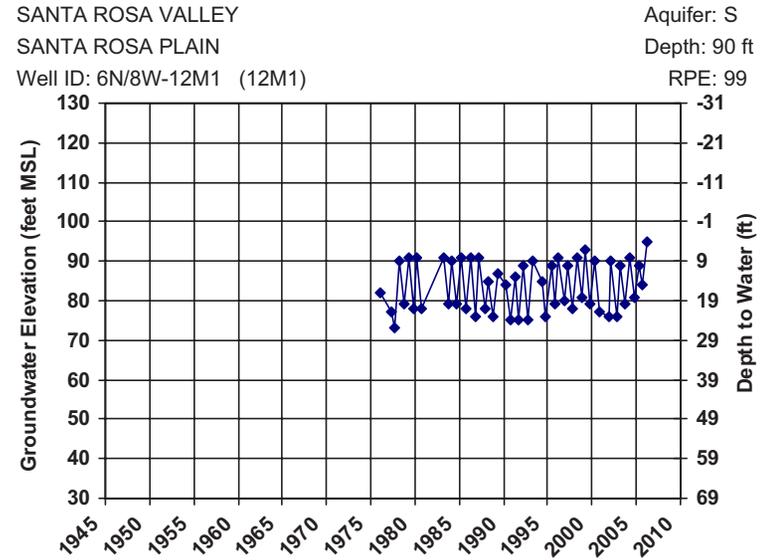
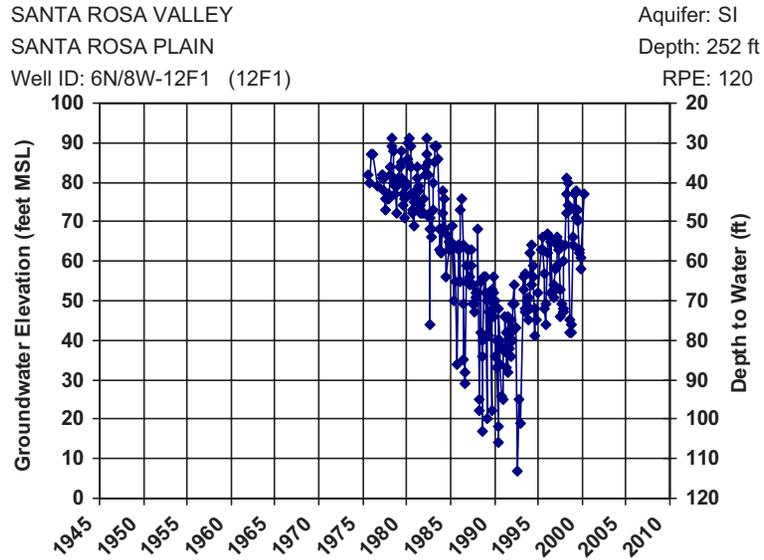


SANTA ROSA VALLEY
 SANTA ROSA PLAIN
 Well ID: 6N/7W-30R1 (30R1)
 Aquifer: S
 Depth: 150 ft
 RPE: 175

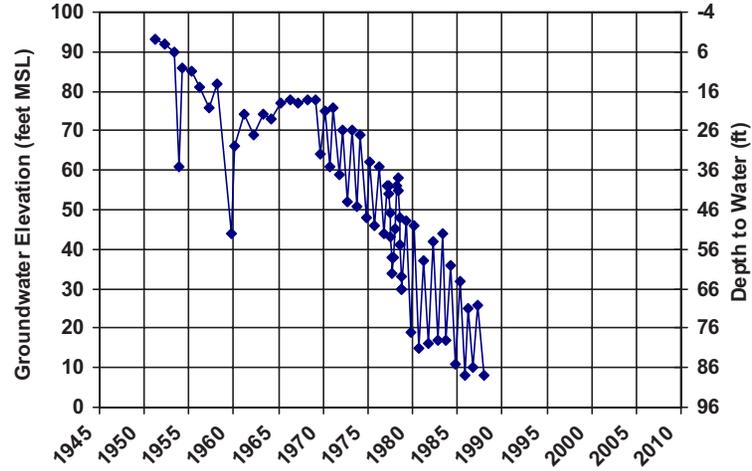




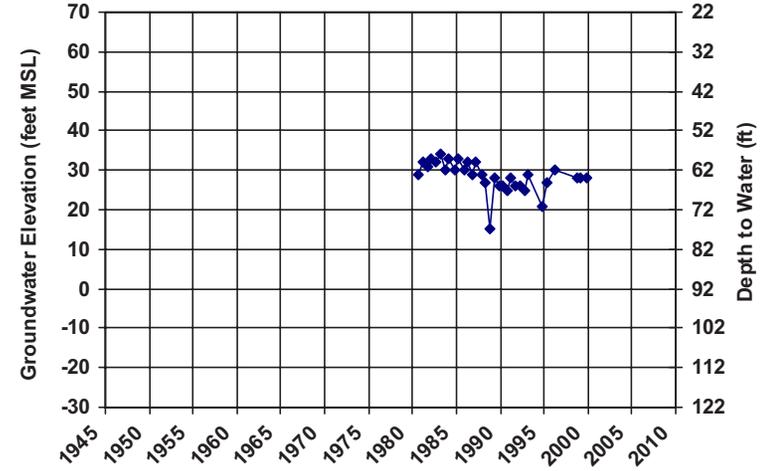




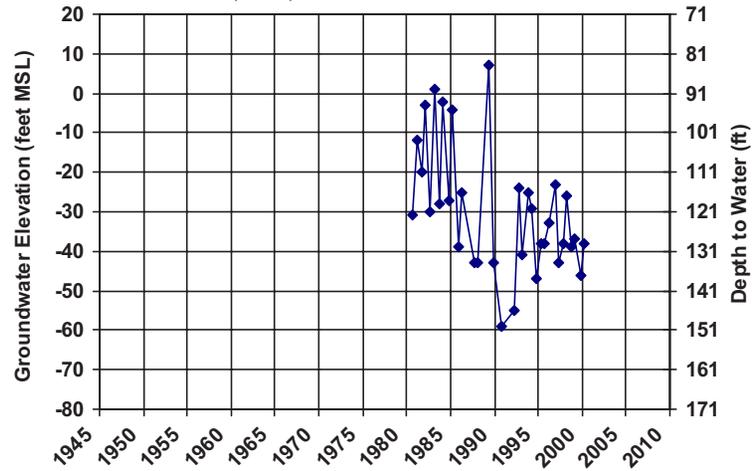
SANTA ROSA VALLEY
 SANTA ROSA PLAIN
 Well ID: 6N/8W-15R1 (15R1)
 Aquifer: WD_ONLY
 Depth: 1025 ft
 RPE: 96



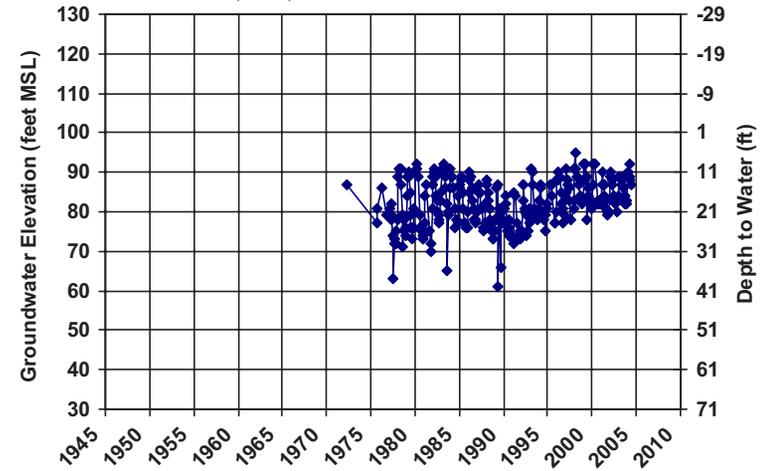
SANTA ROSA VALLEY
 SANTA ROSA PLAIN
 Well ID: 6N/8W-16K3 (16K3)
 Aquifer: S
 Depth: 79 ft
 RPE: 92

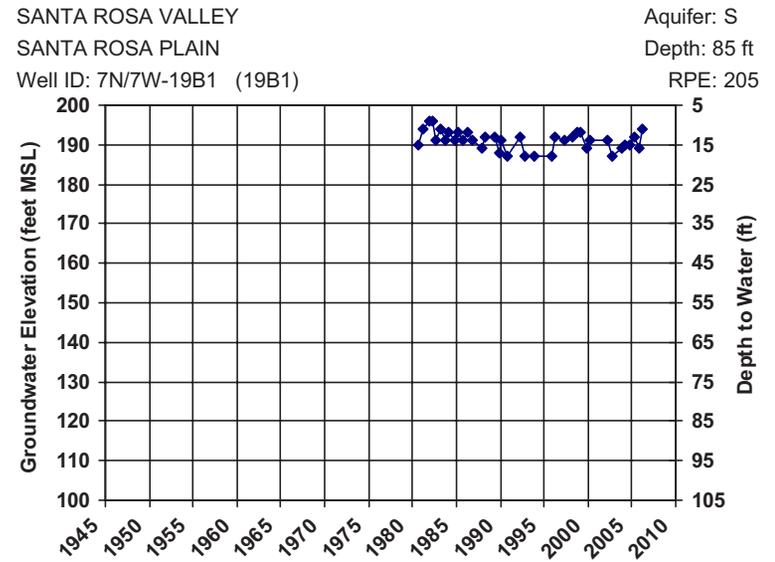
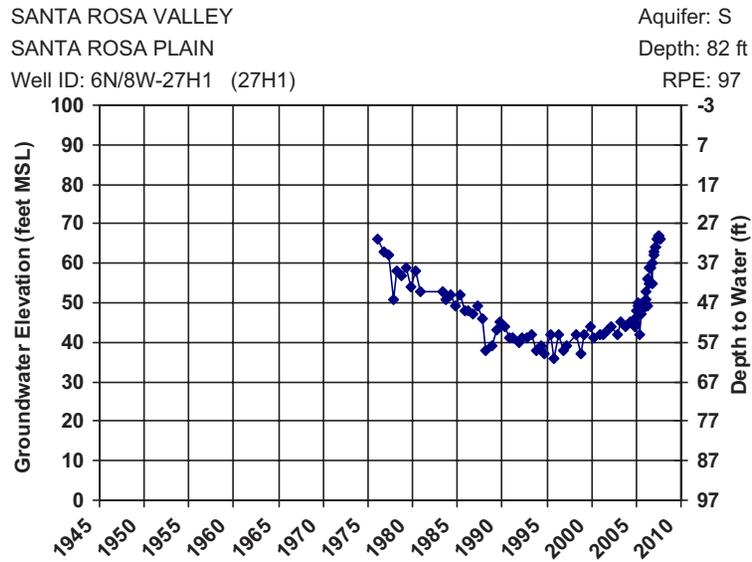
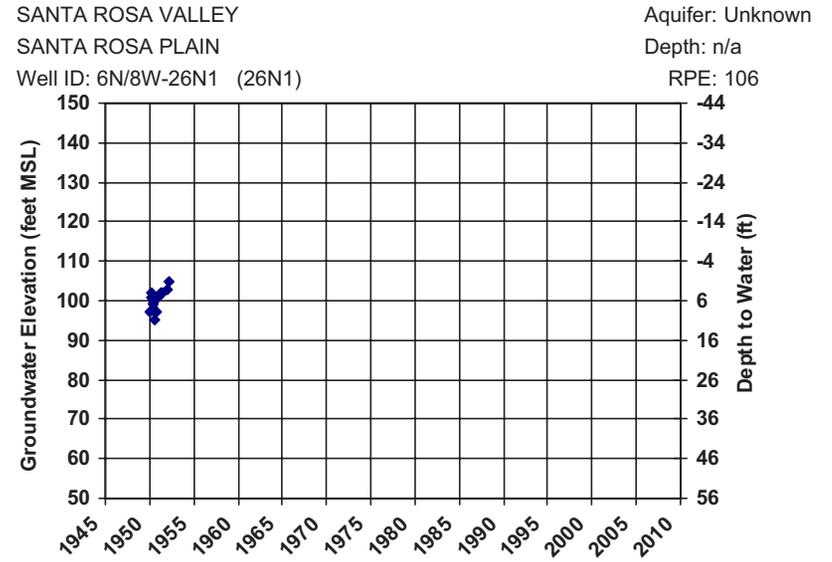
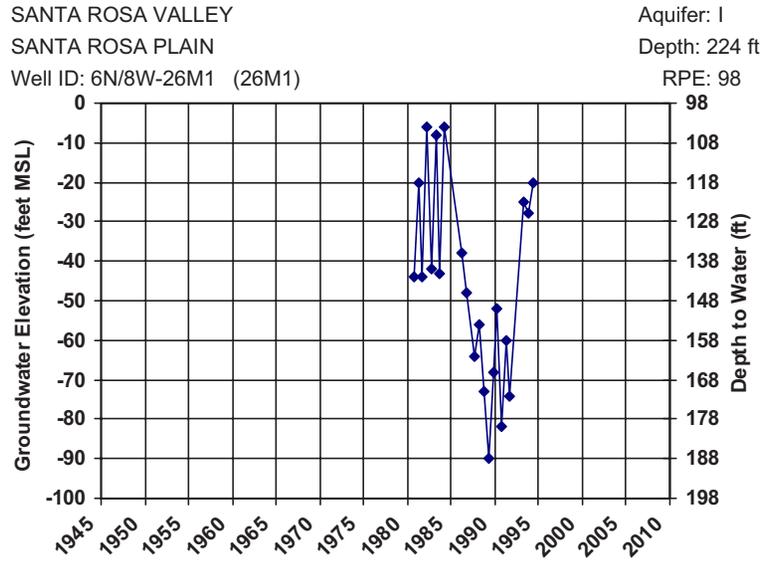


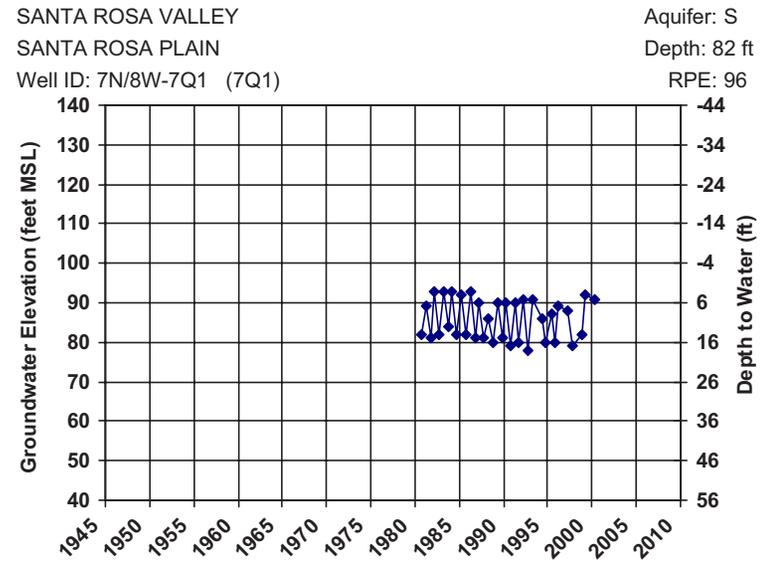
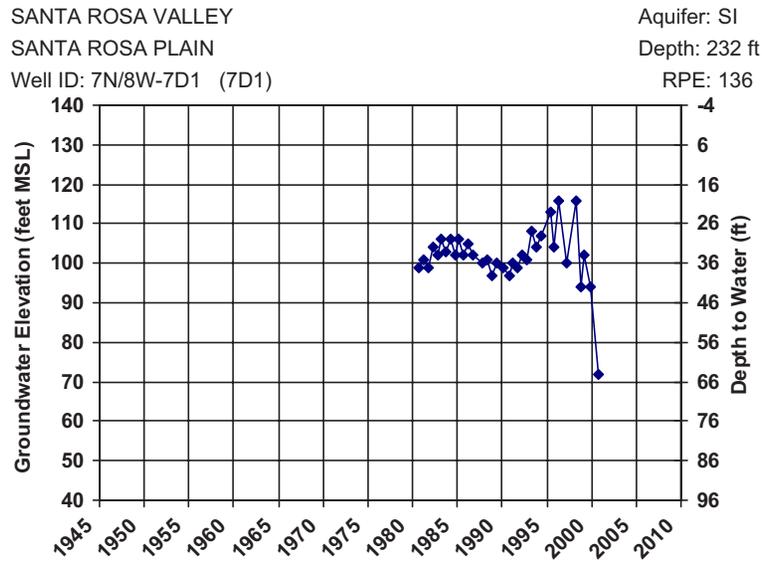
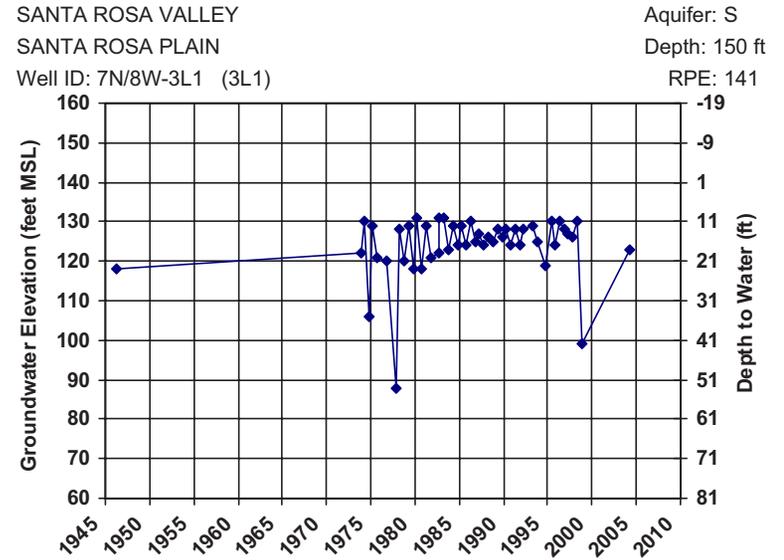
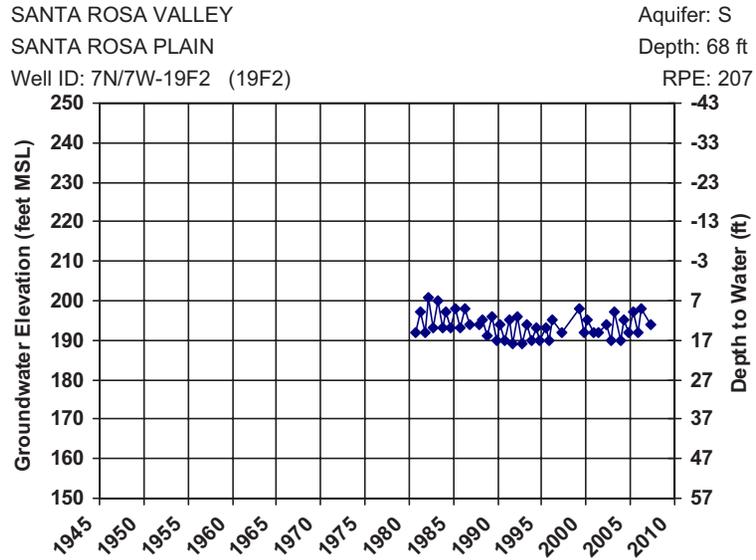
SANTA ROSA VALLEY
 SANTA ROSA PLAIN
 Well ID: 6N/8W-22R1 (22R1)
 Aquifer: I
 Depth: 407 ft
 RPE: 91

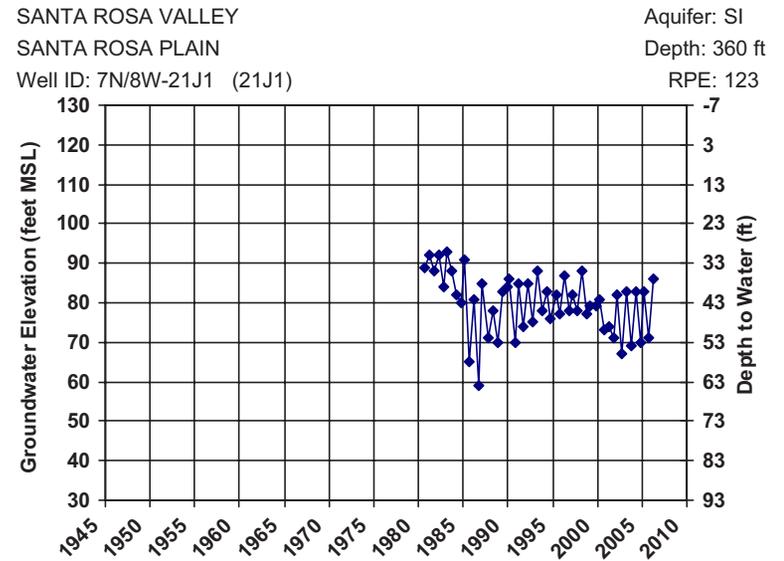
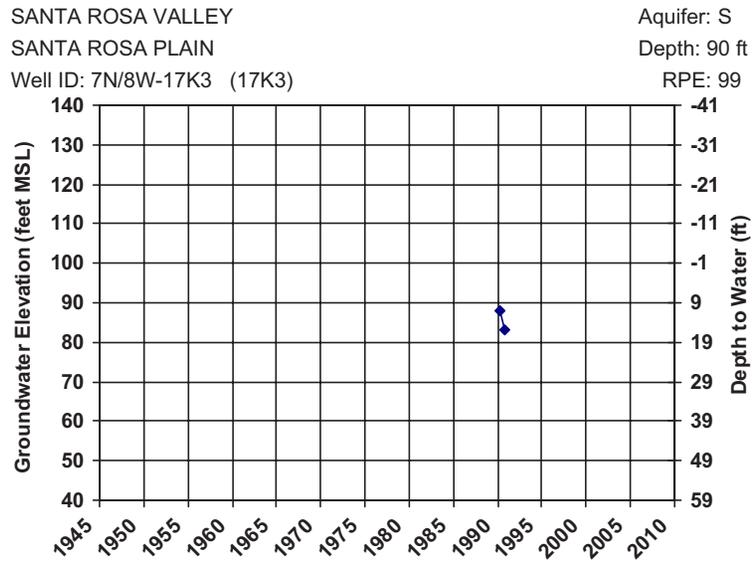
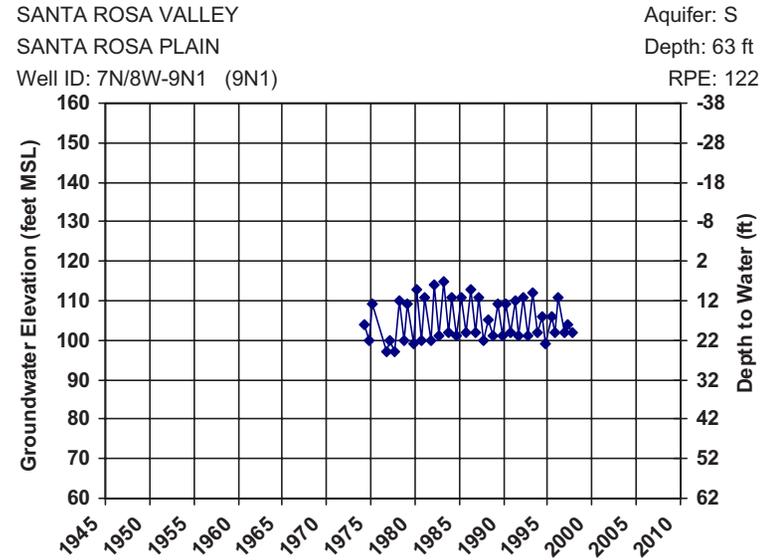
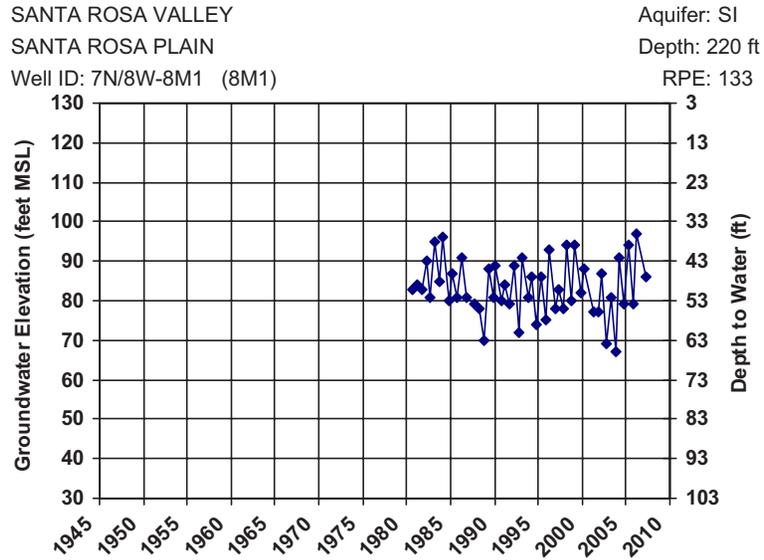


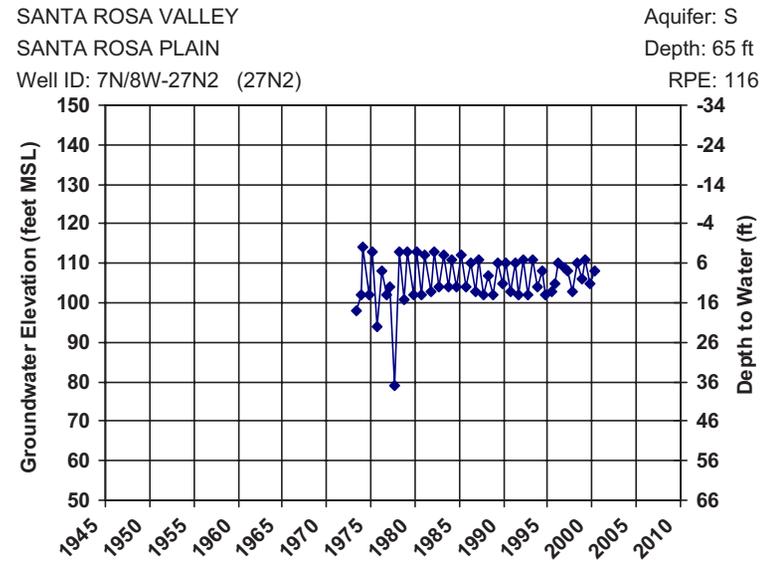
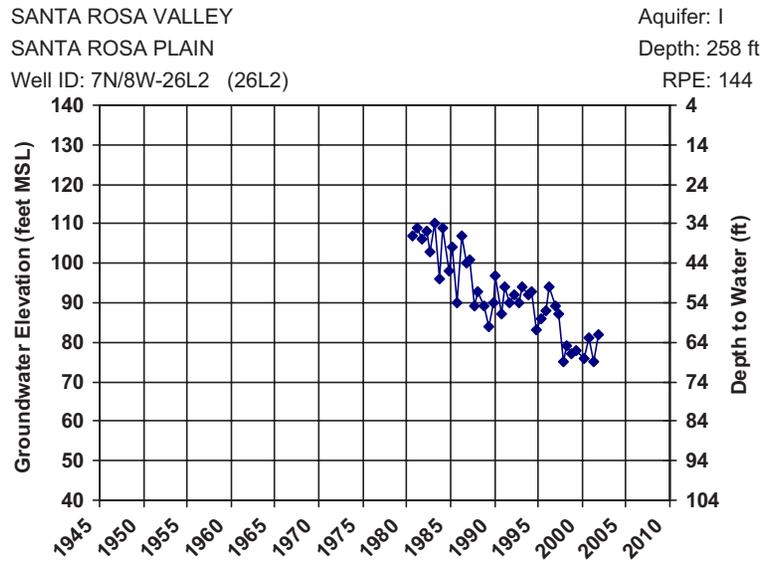
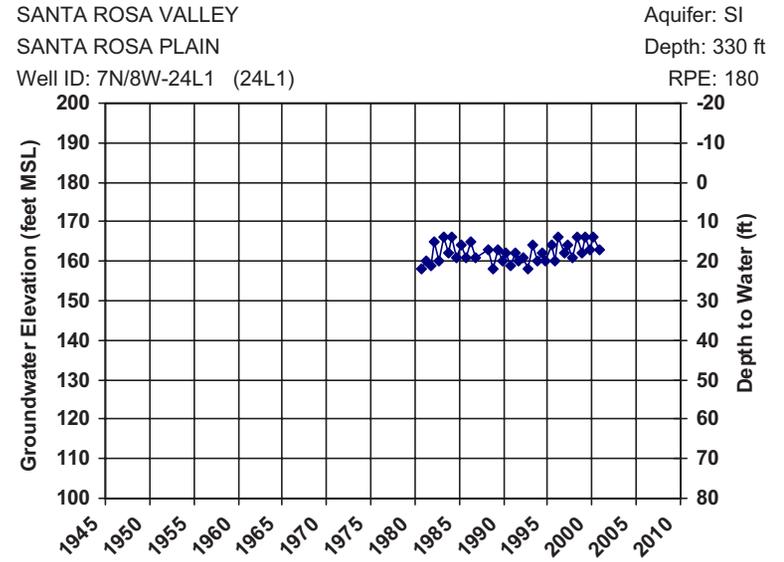
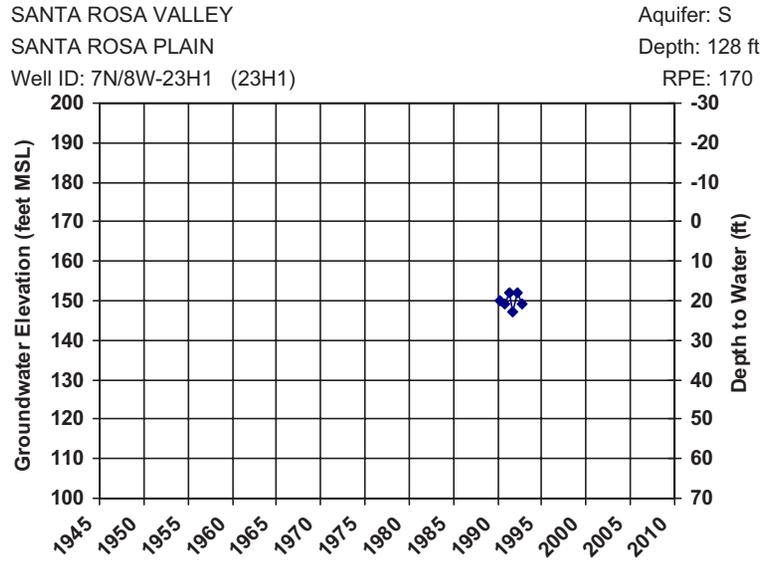
SANTA ROSA VALLEY
 SANTA ROSA PLAIN
 Well ID: 6N/8W-26L1 (26L1)
 Aquifer: S
 Depth: 94 ft
 RPE: 101

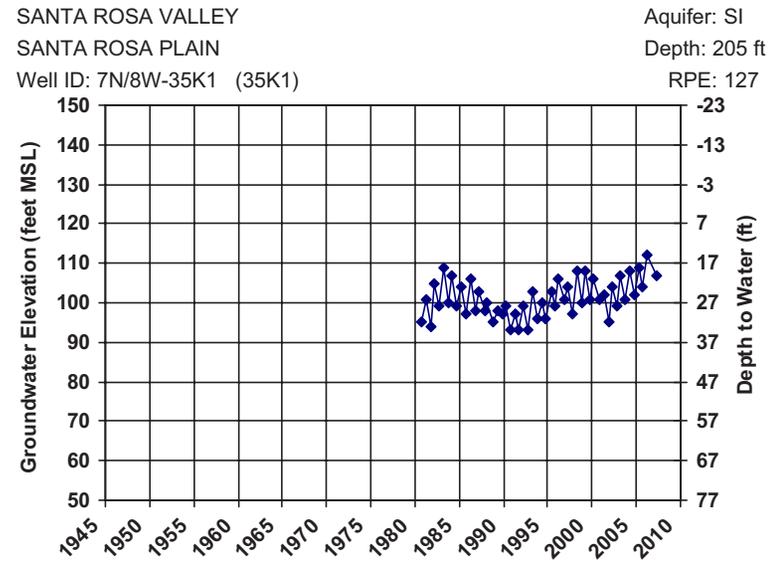
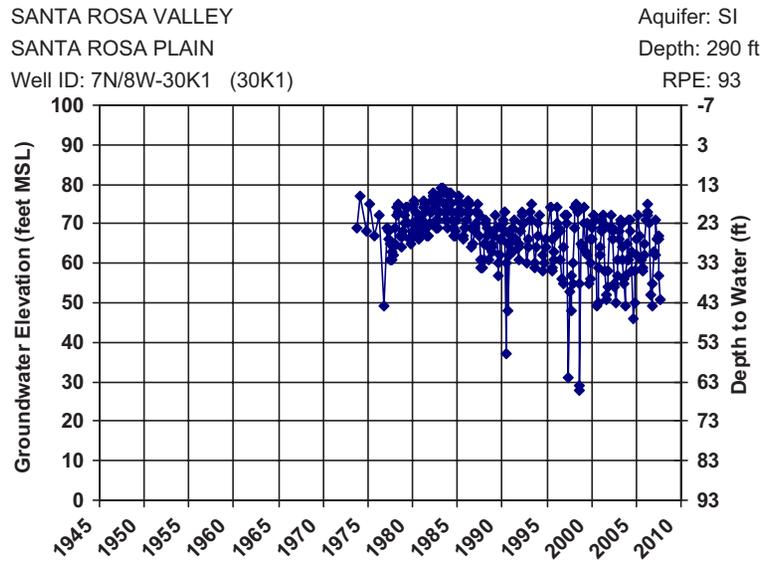
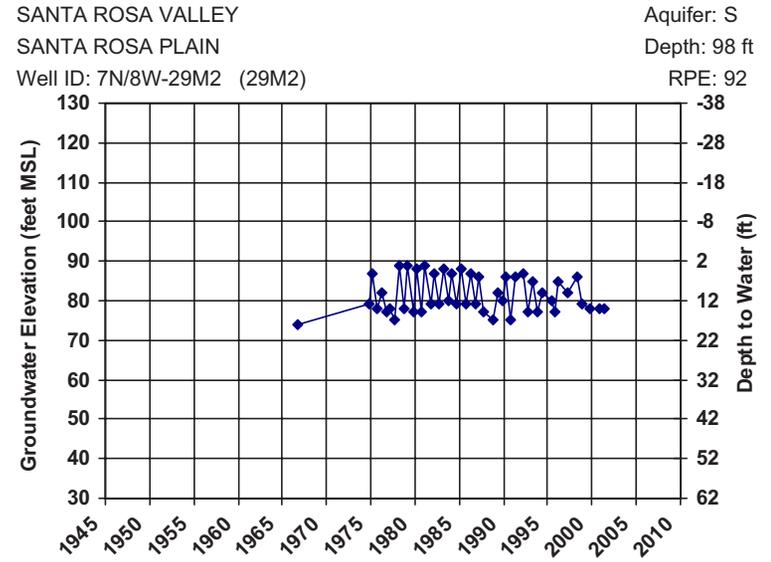
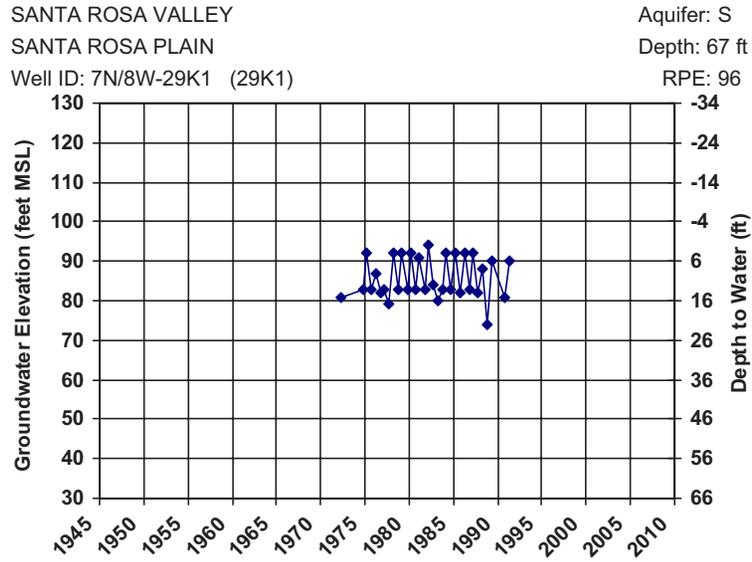


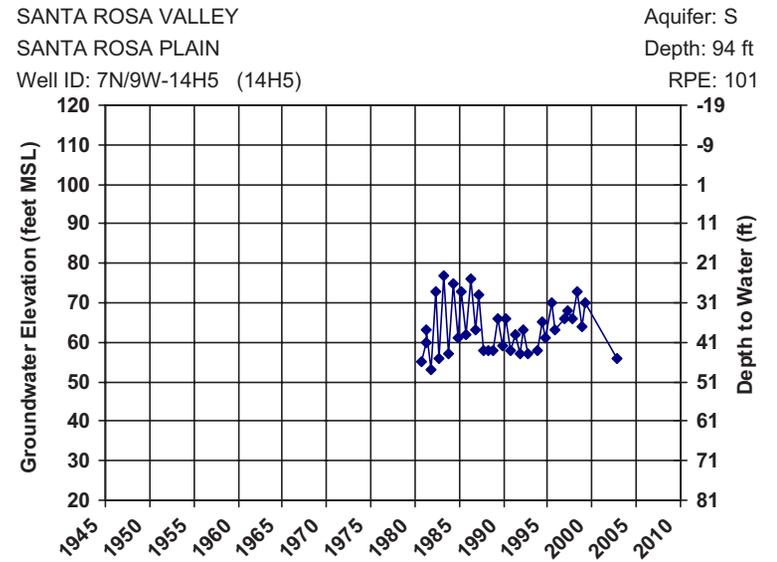
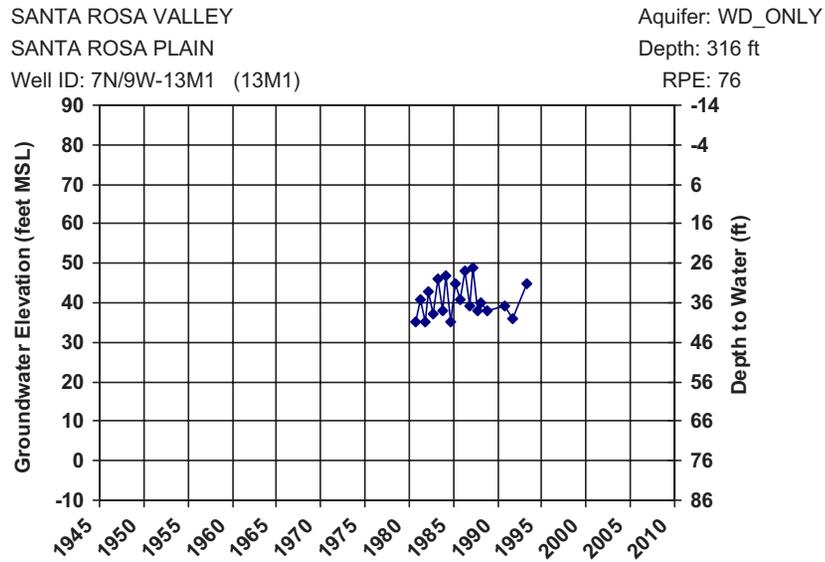
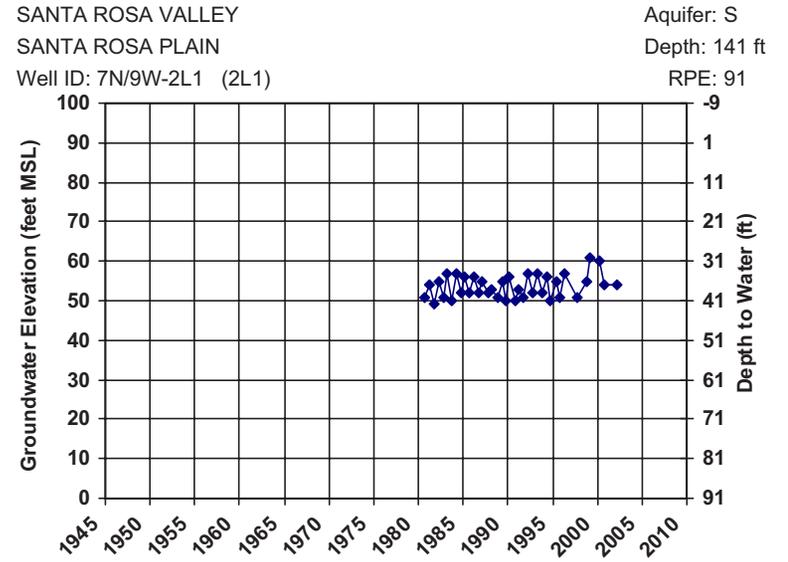
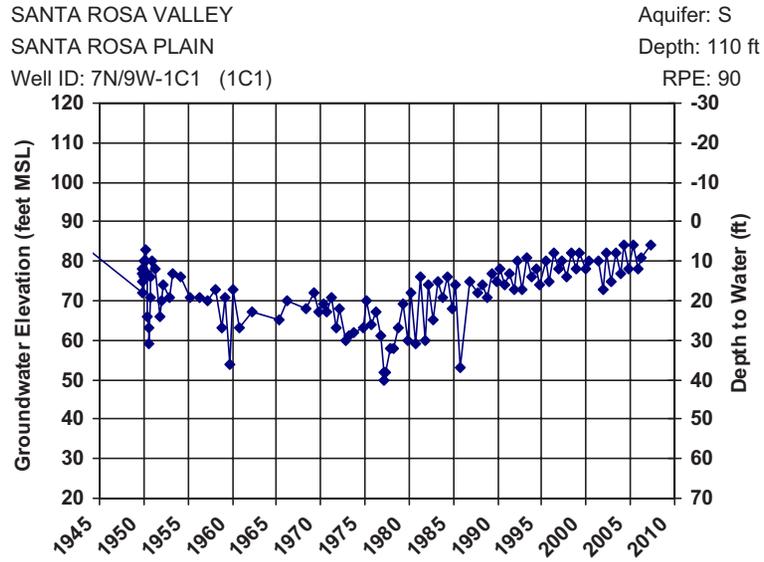


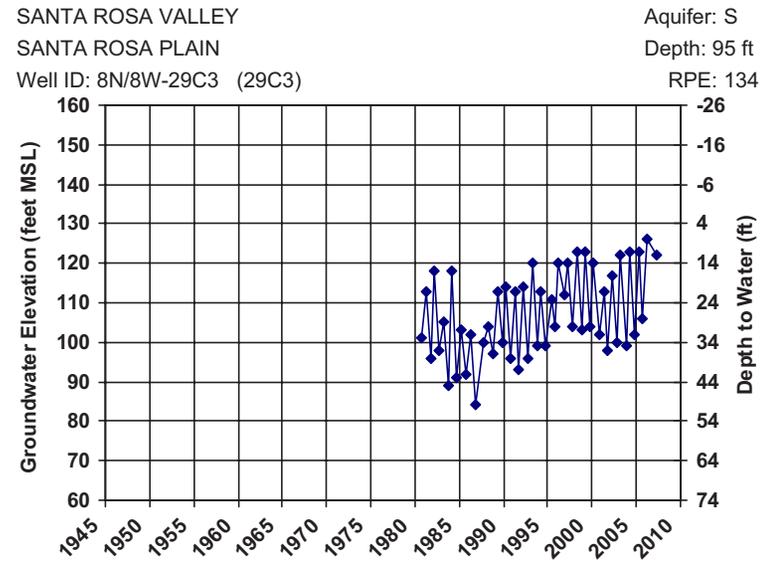
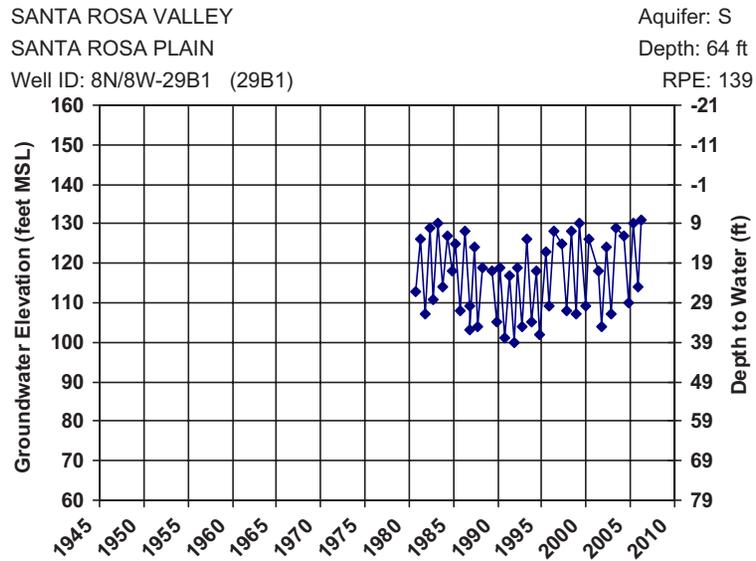
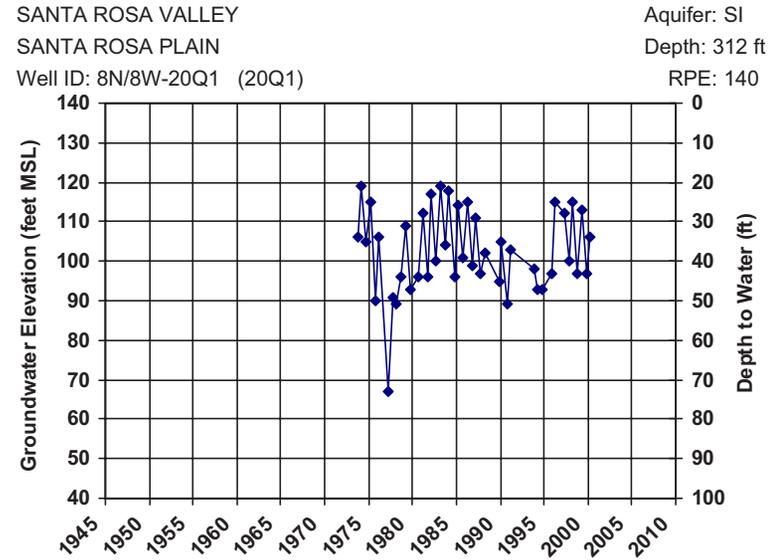
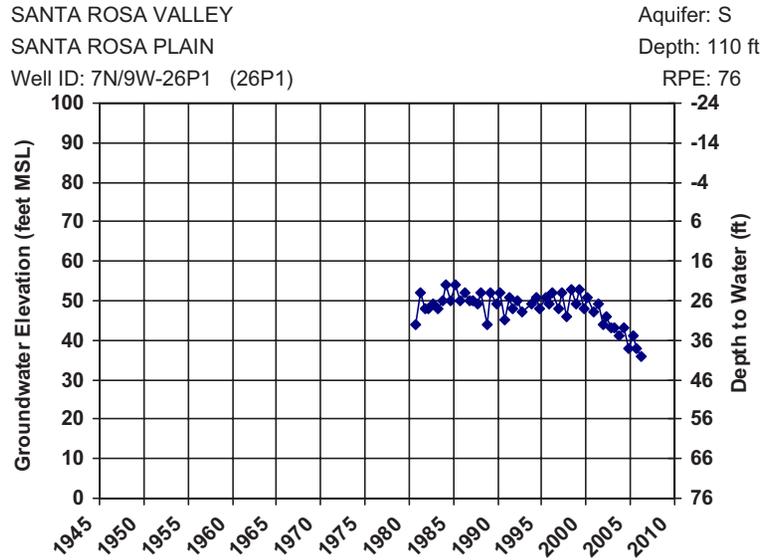


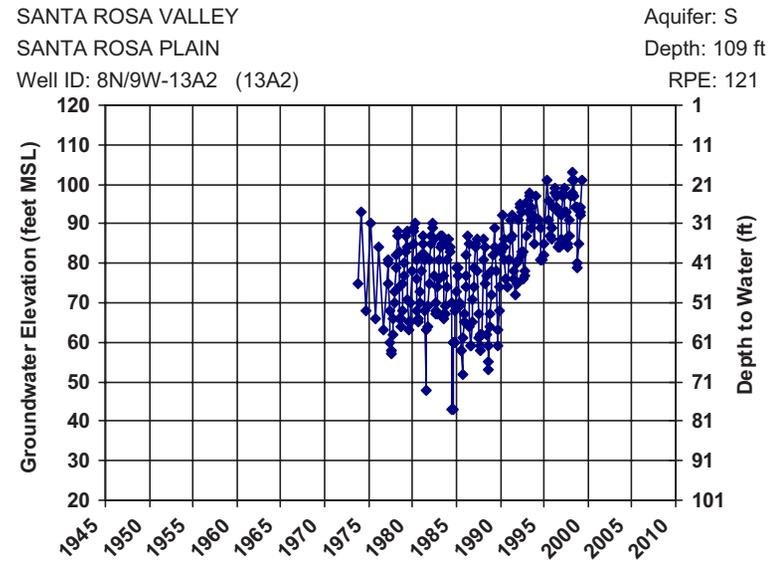
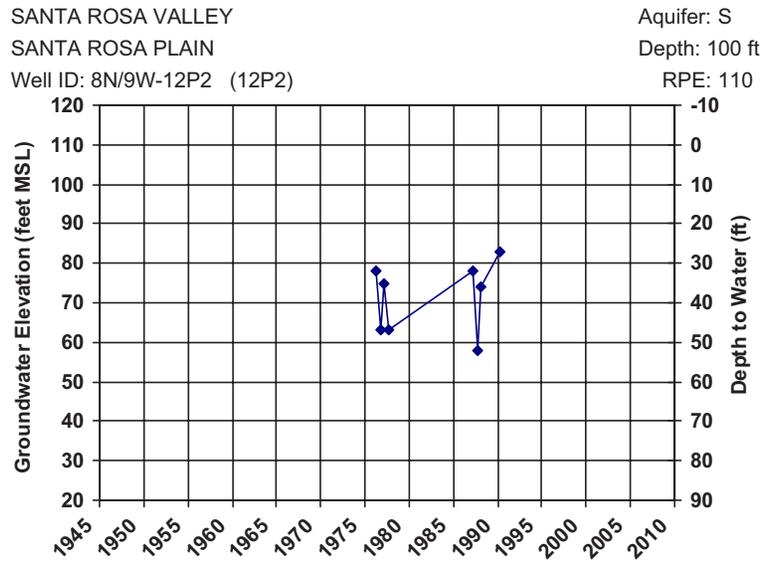
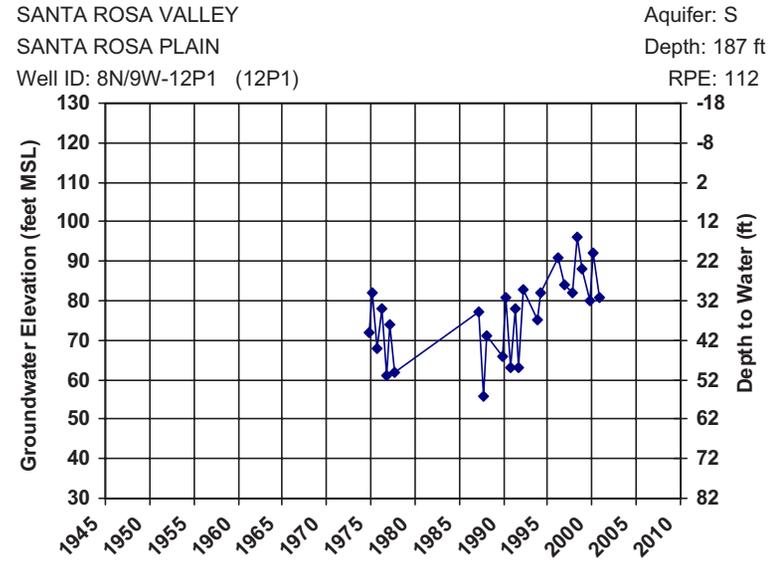
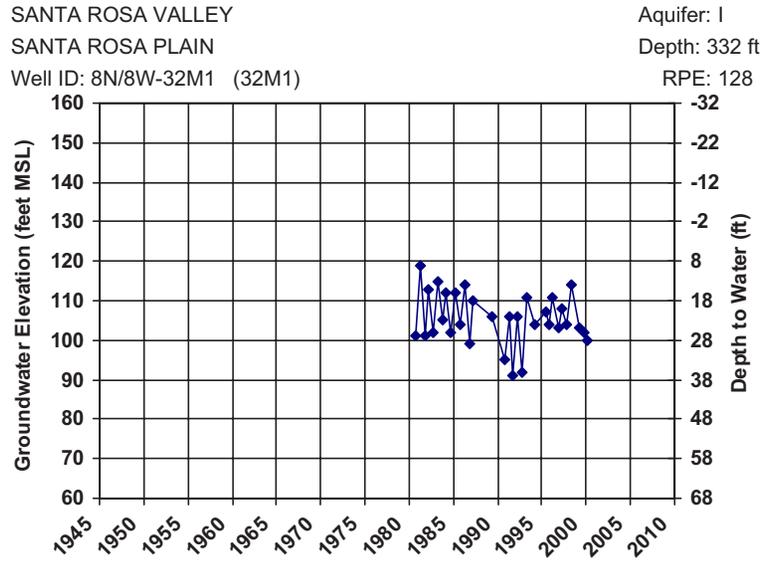


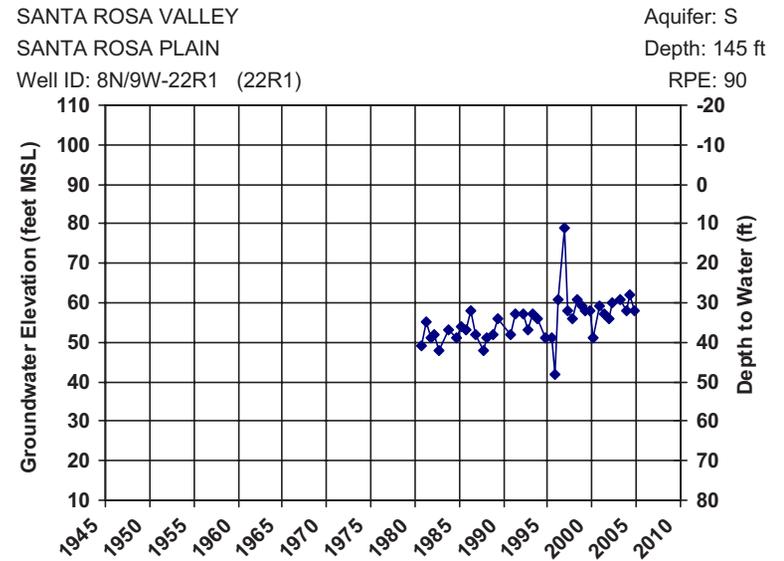
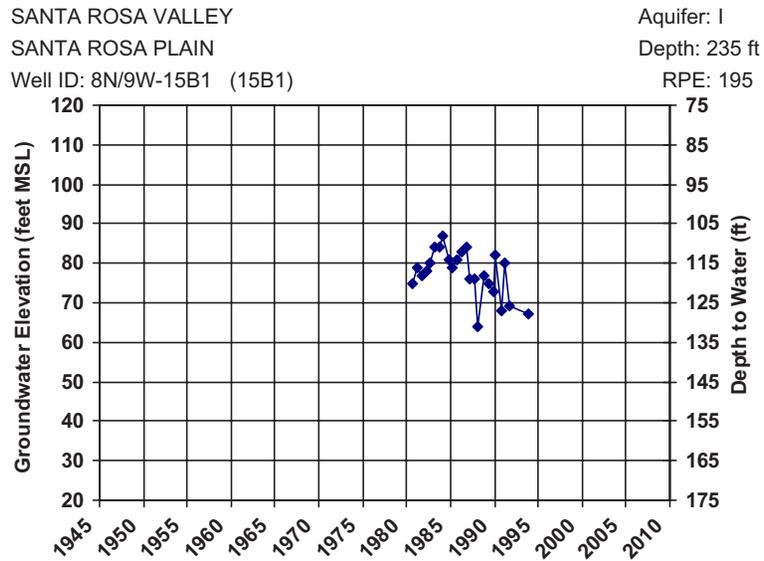
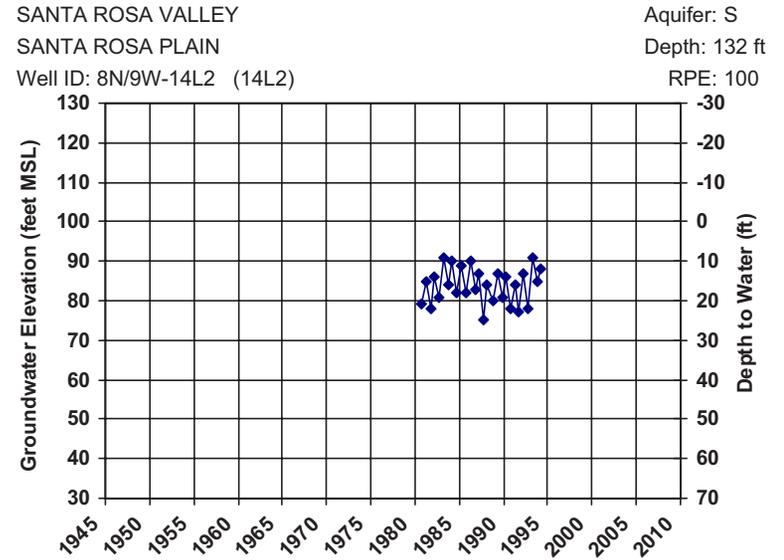
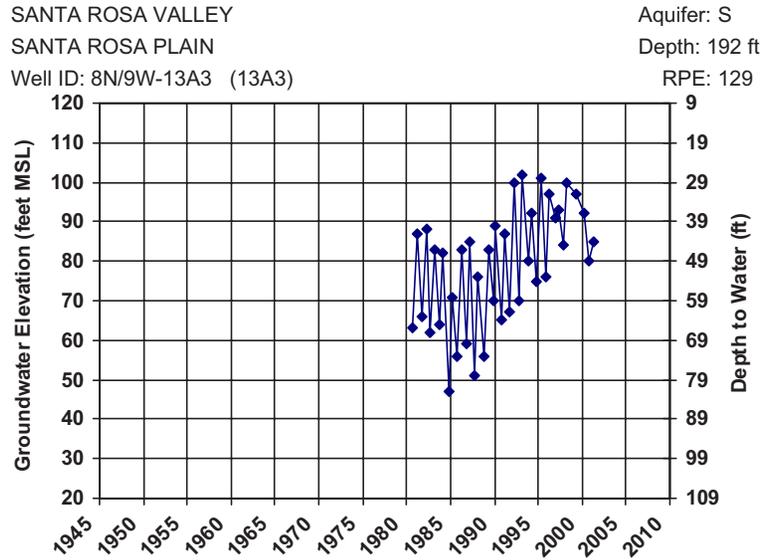


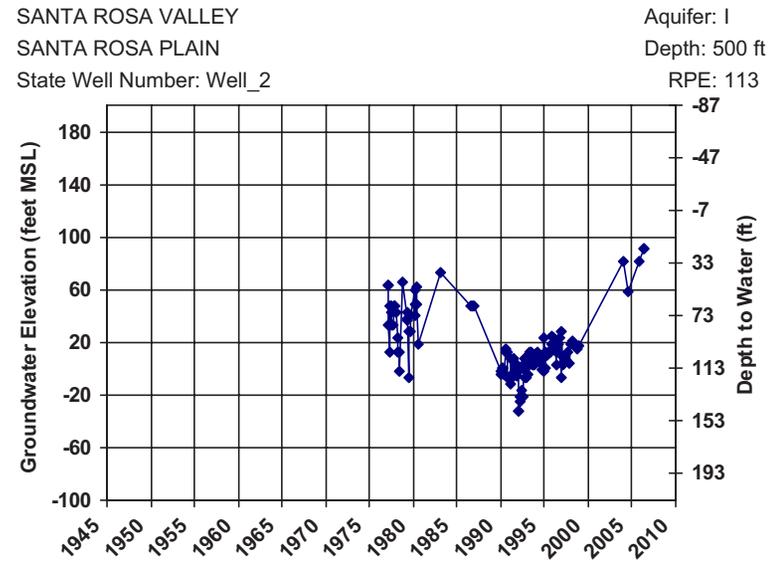
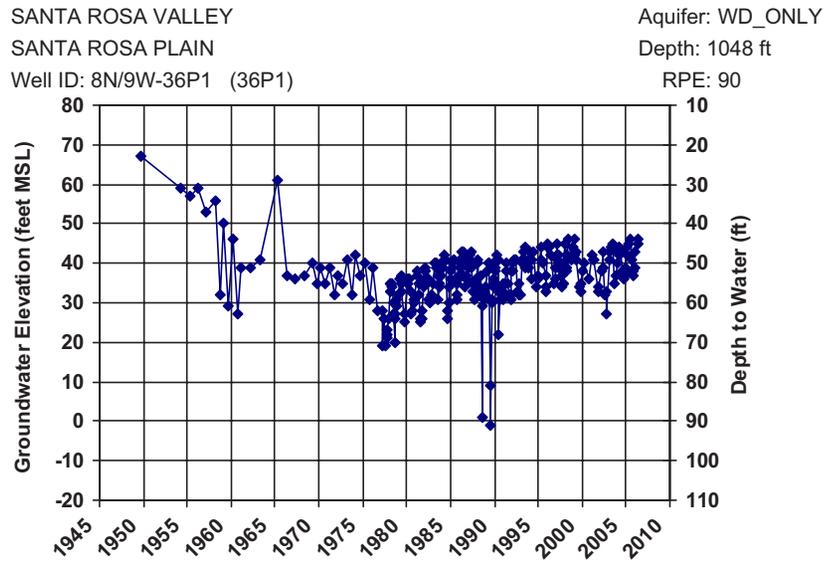
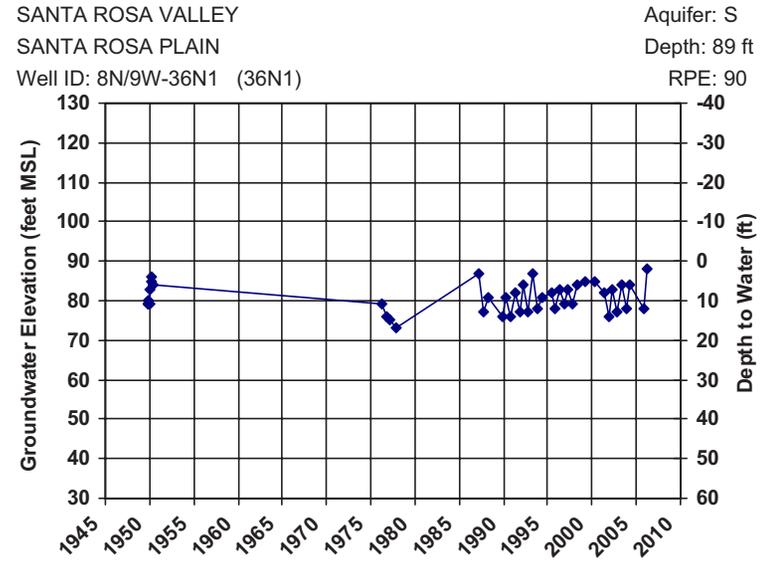
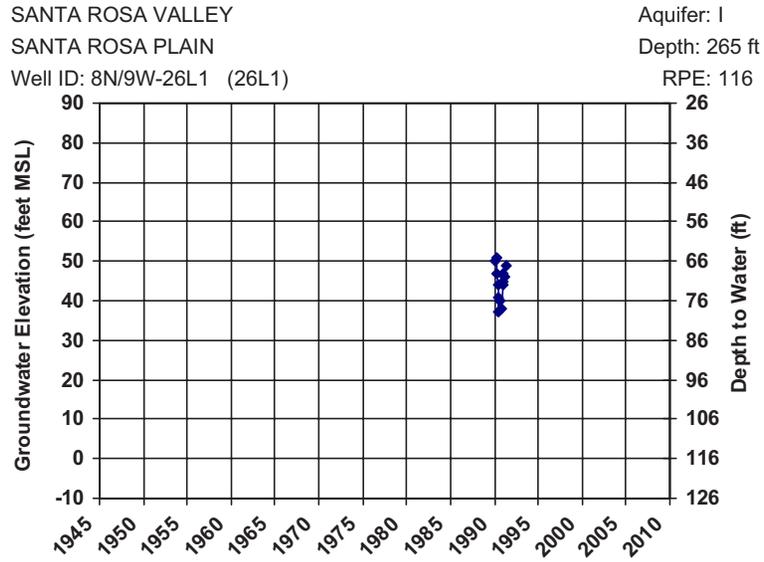




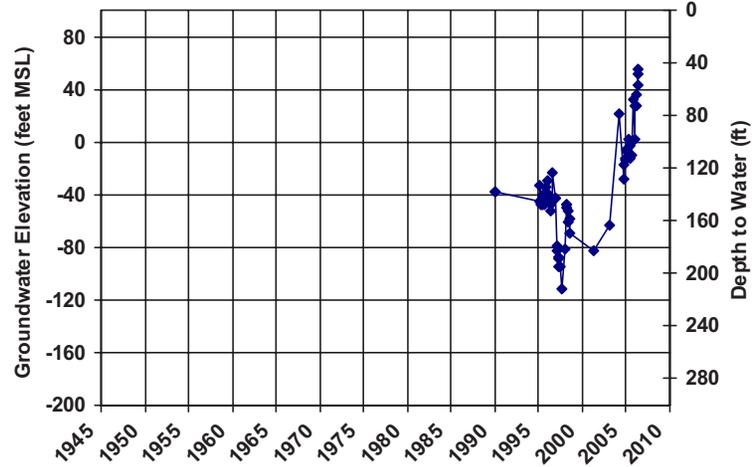




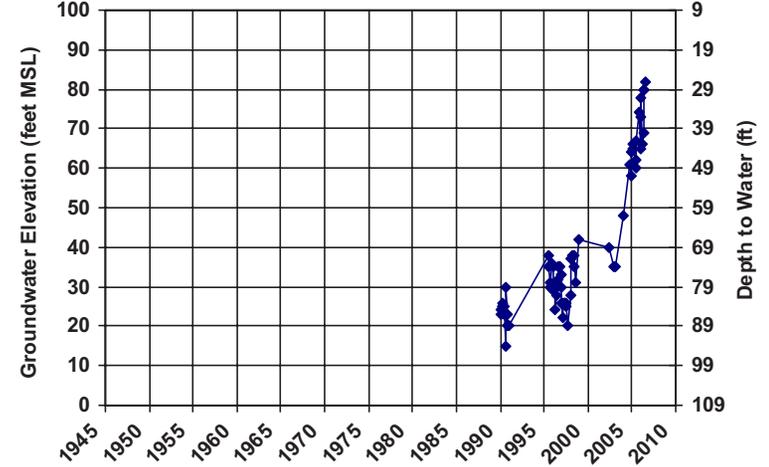




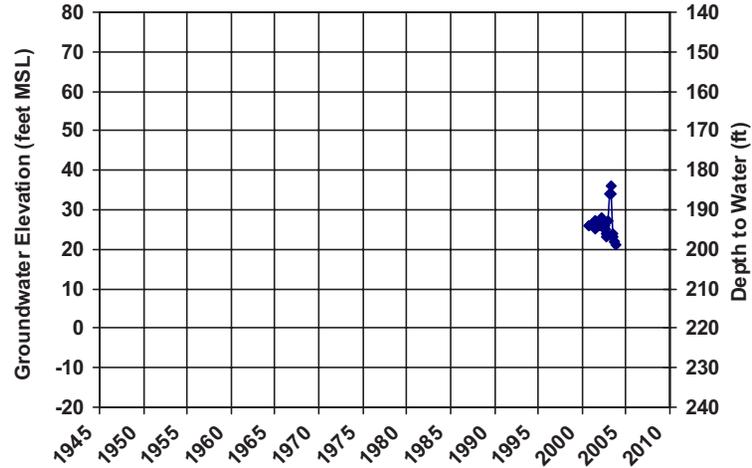
SANTA ROSA VALLEY
 SANTA ROSA PLAIN
 State Well Number: Well_3
 Aquifer: ID
 Depth: 685 ft
 RPE: 100



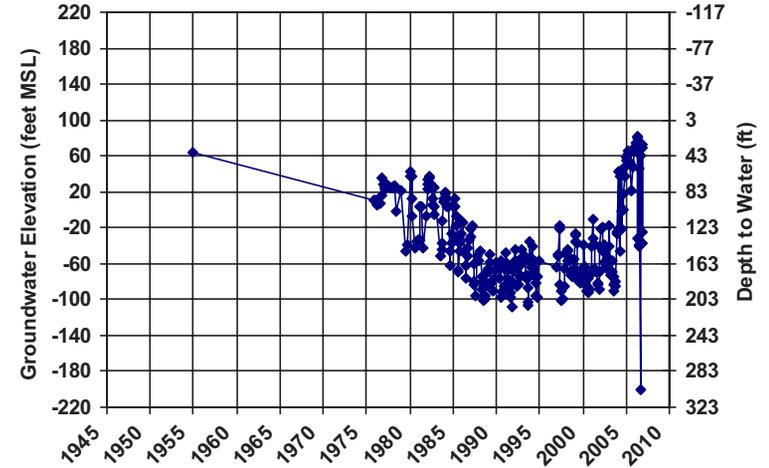
SANTA ROSA VALLEY
 SANTA ROSA PLAIN
 State Well Number: Well_1A
 Aquifer: ID
 Depth: 650 ft
 RPE: 109

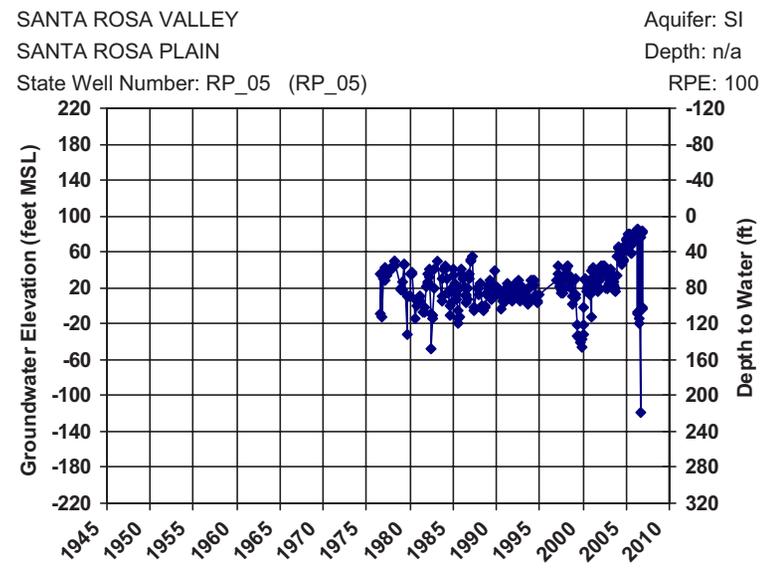
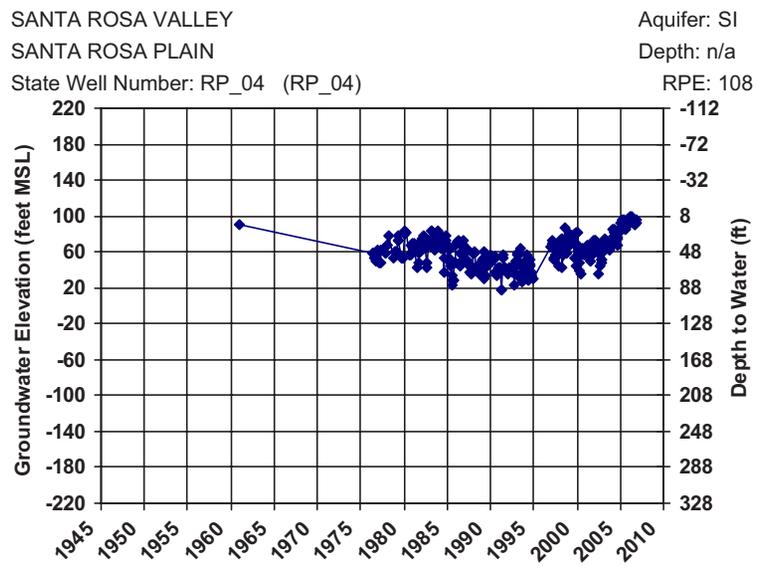
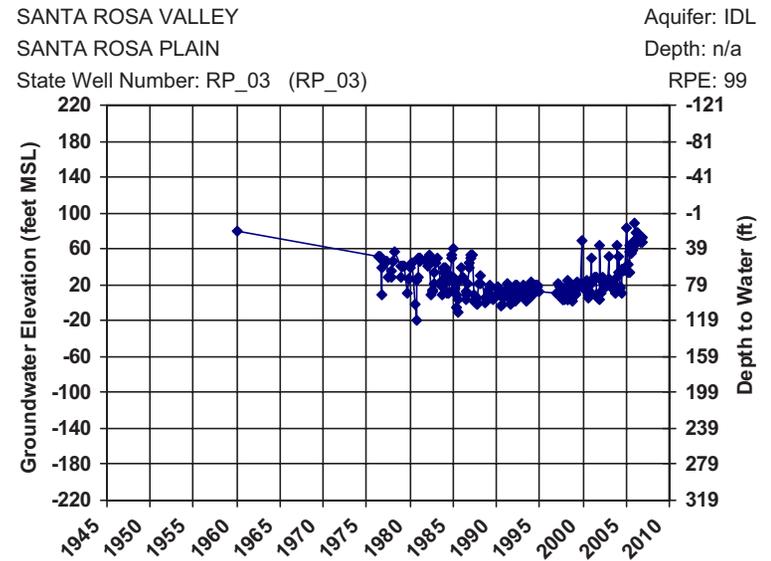
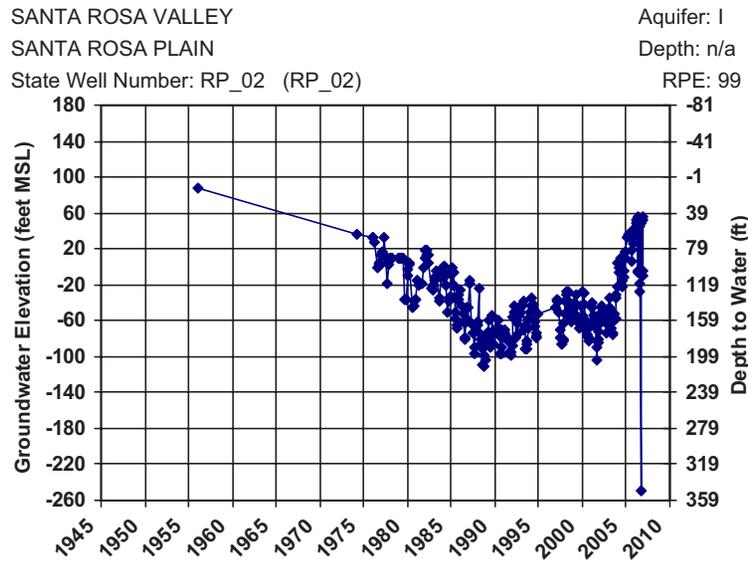


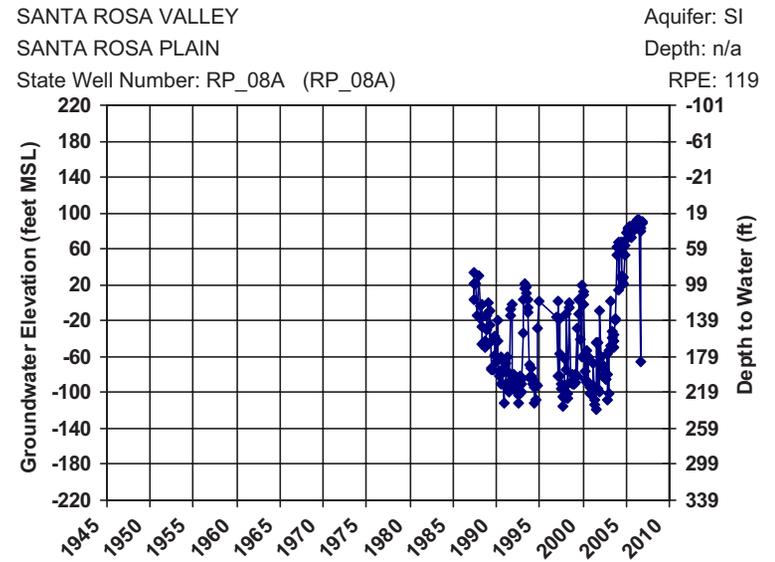
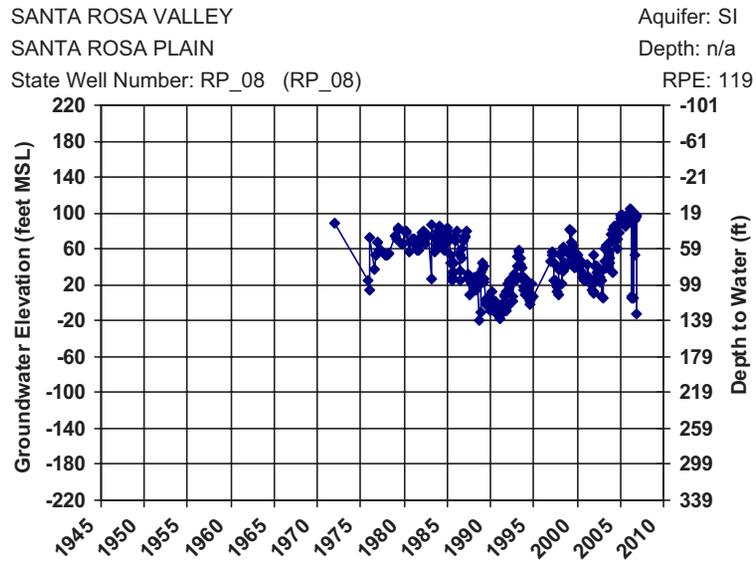
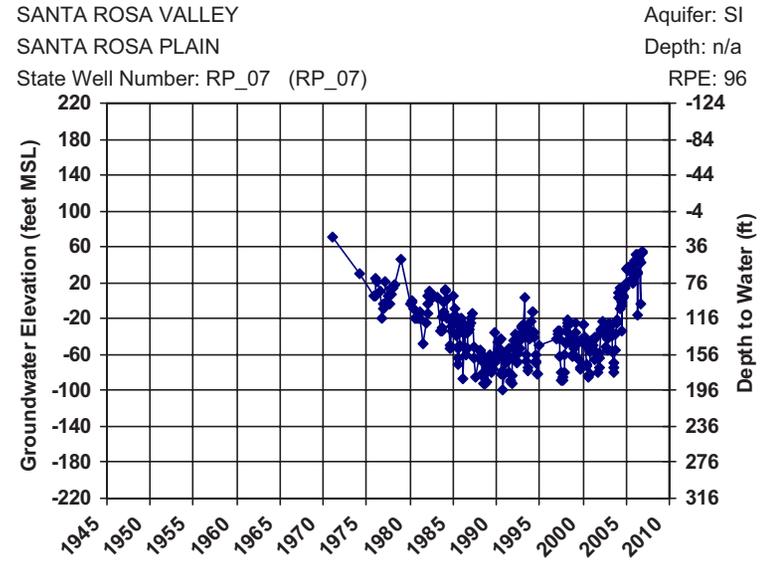
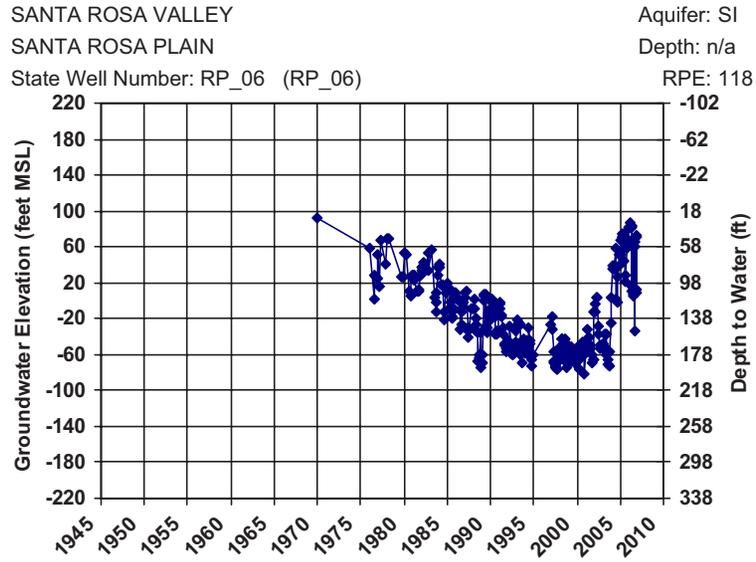
SANTA ROSA VALLEY
 SANTA ROSA PLAIN
 State Well Number: PWC_01 (PWC_01)
 Aquifer: SI
 Depth: n/a
 RPE: 220

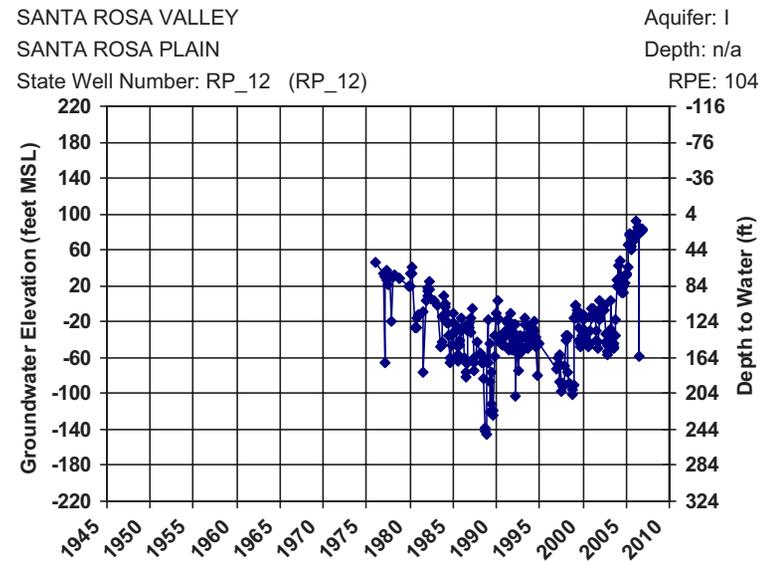
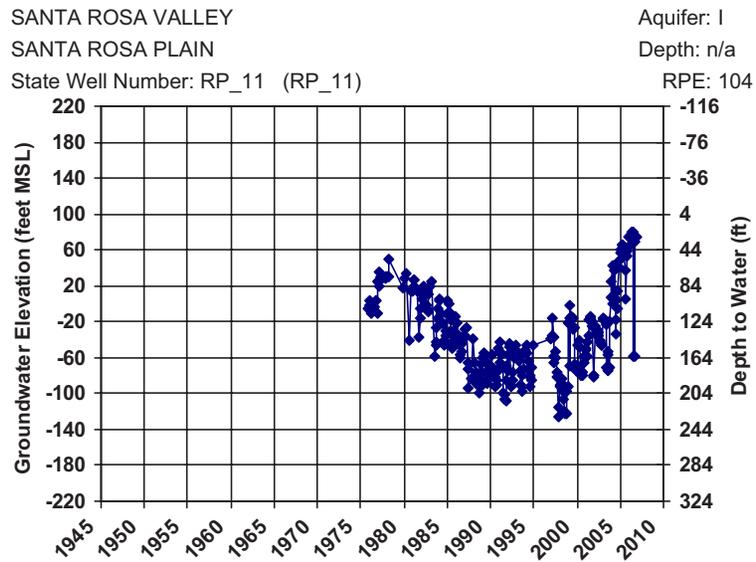
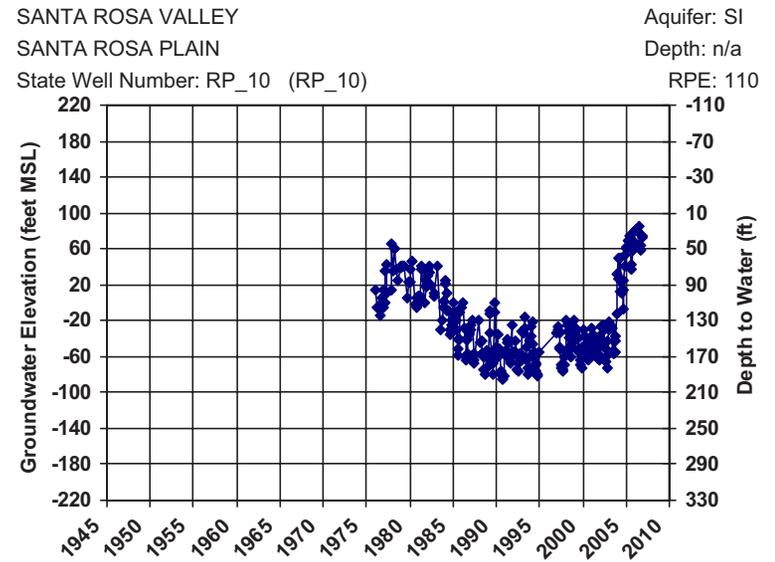
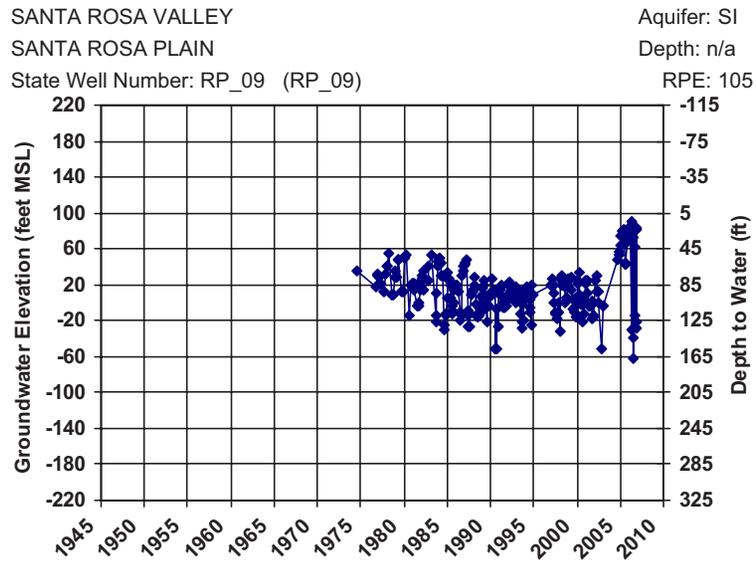


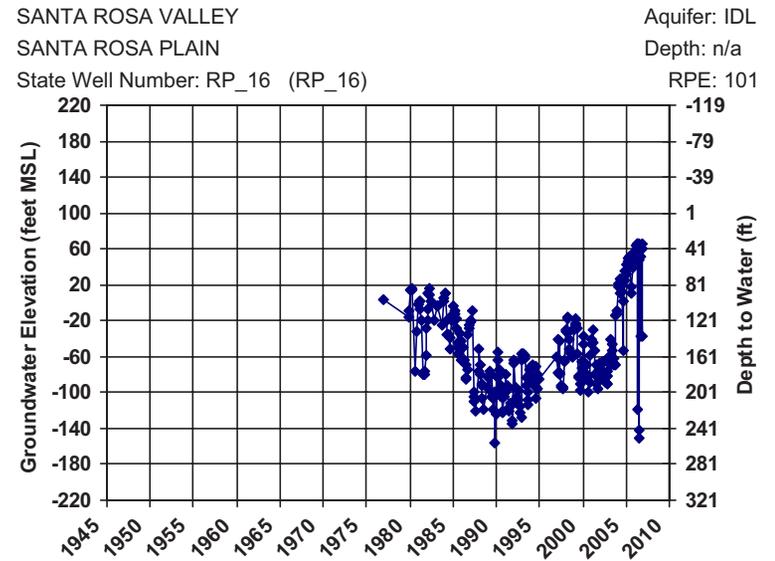
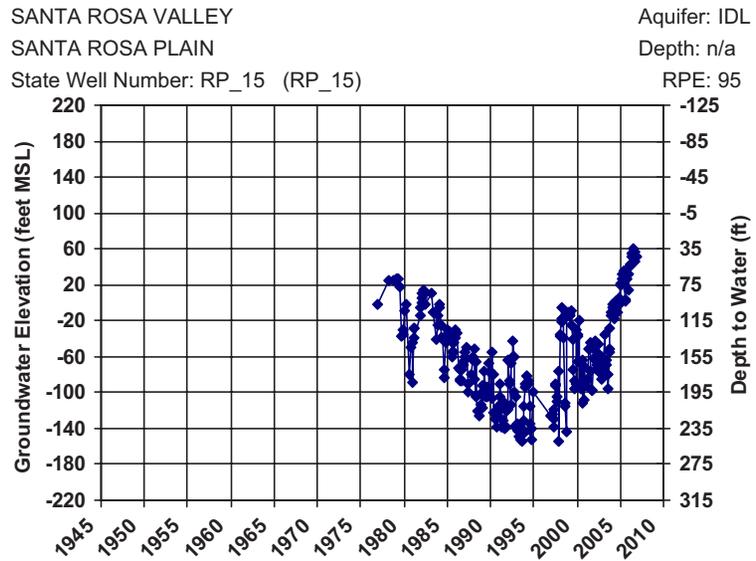
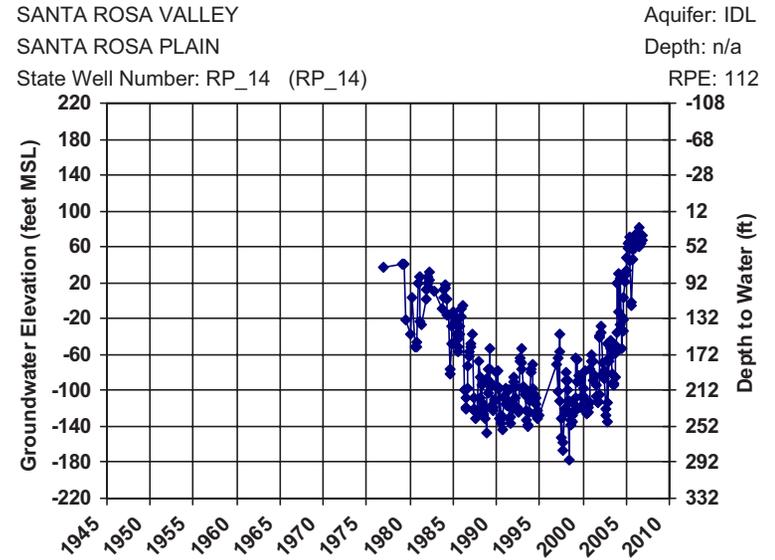
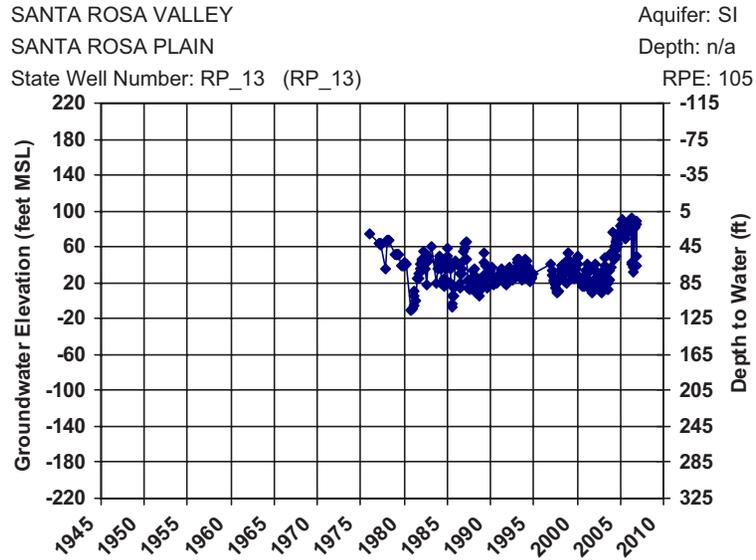
SANTA ROSA VALLEY
 SANTA ROSA PLAIN
 State Well Number: RP_01 (RP_01)
 Aquifer: I
 Depth: n/a
 RPE: 103

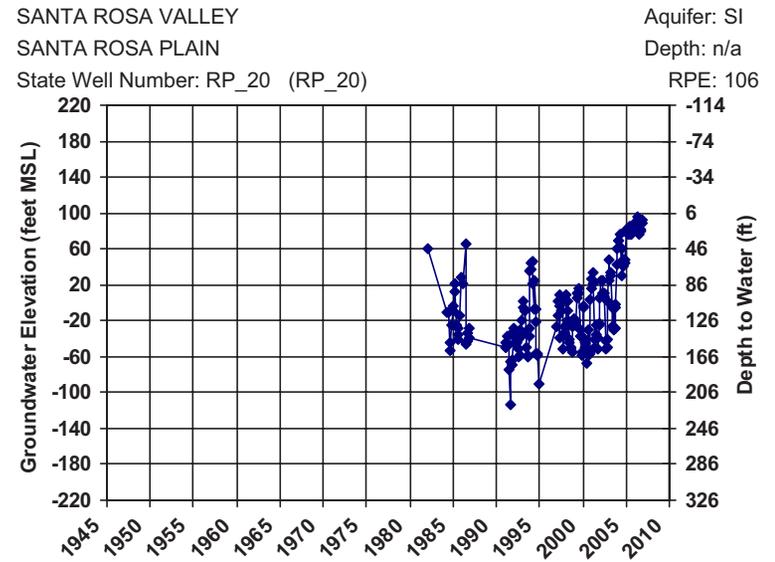
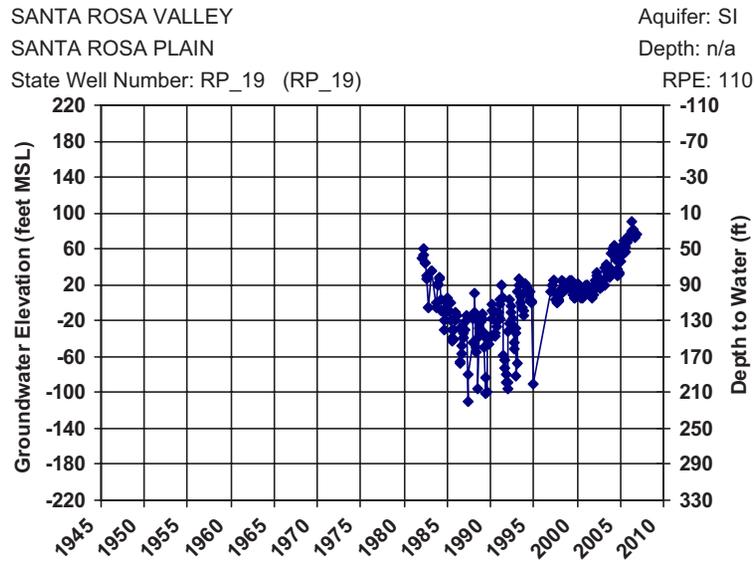
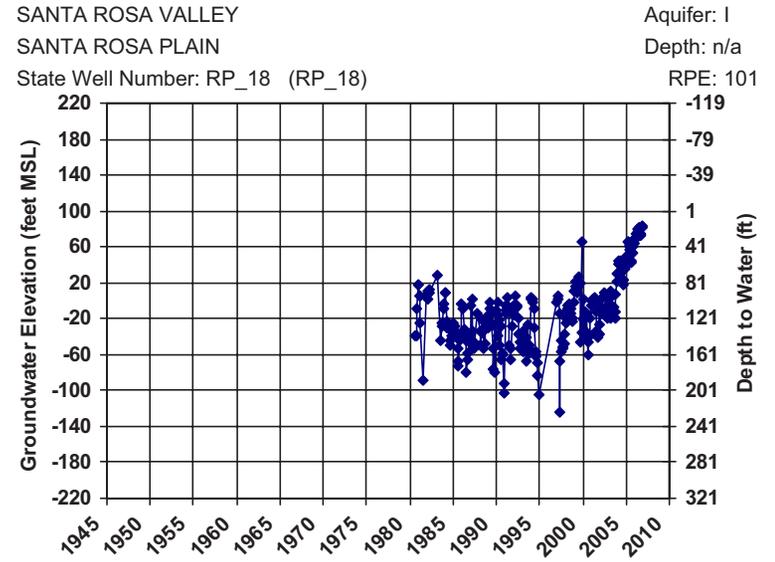
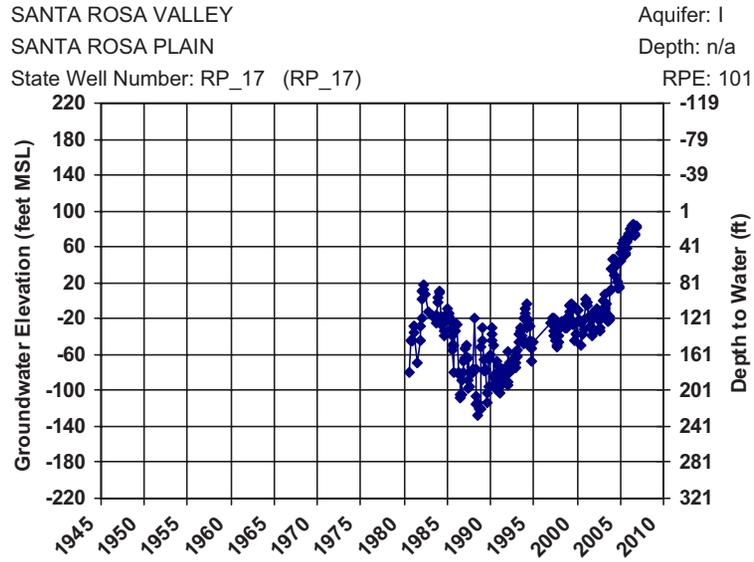


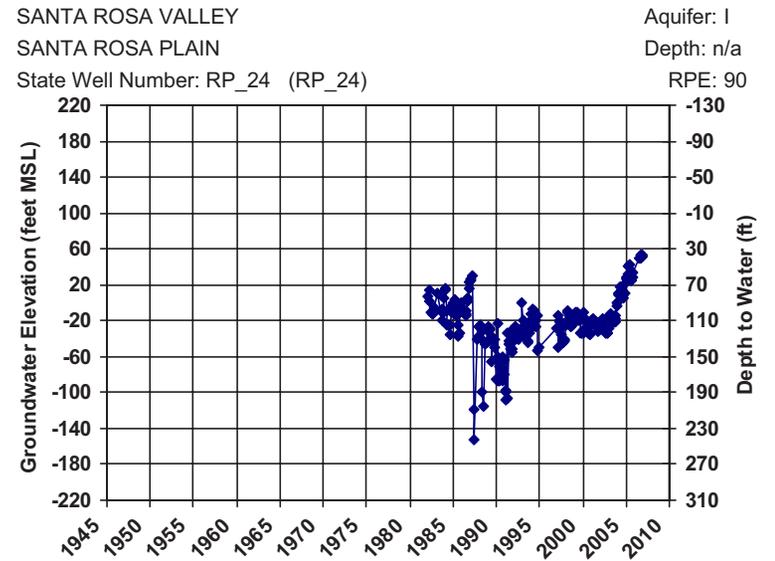
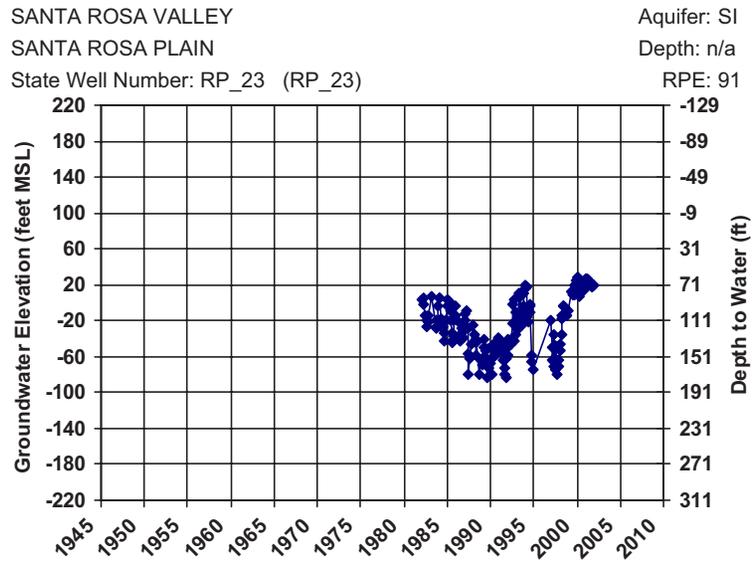
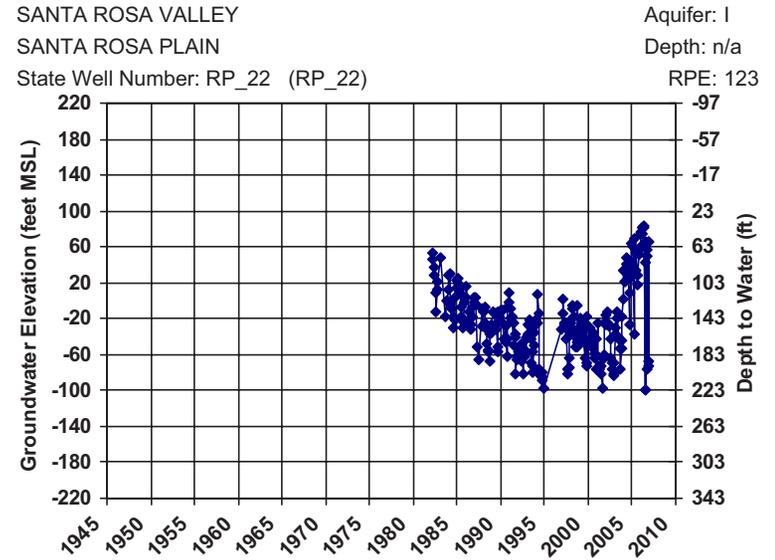
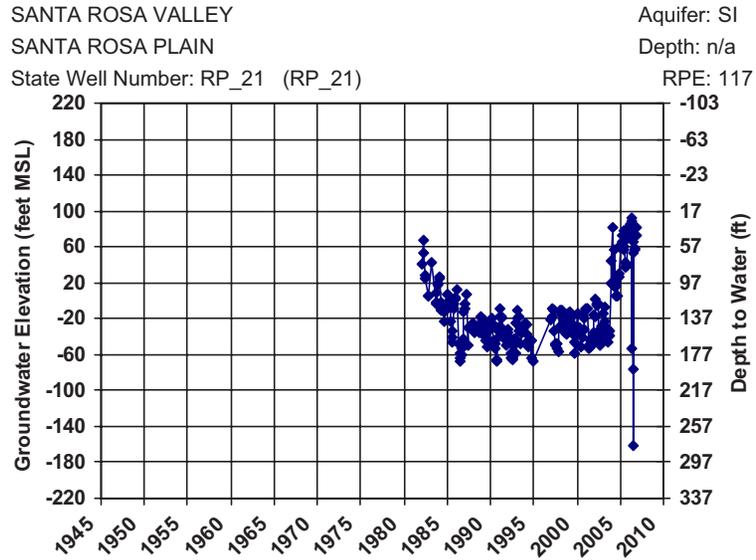


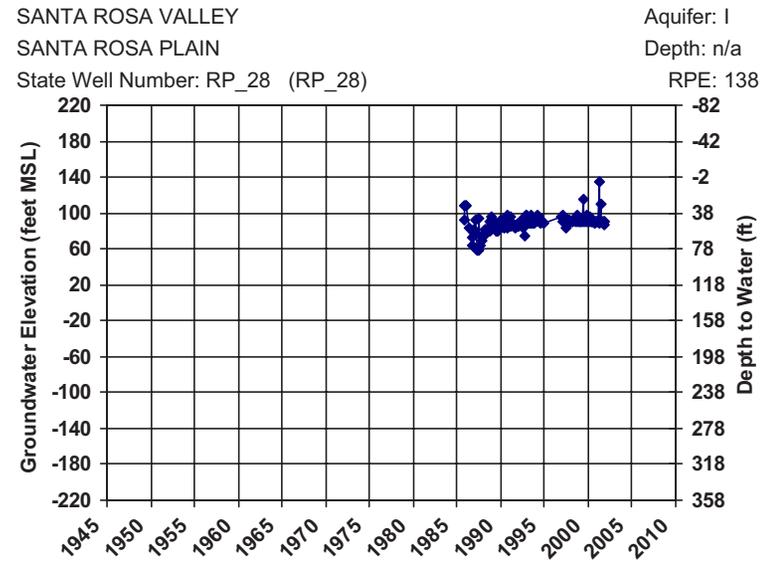
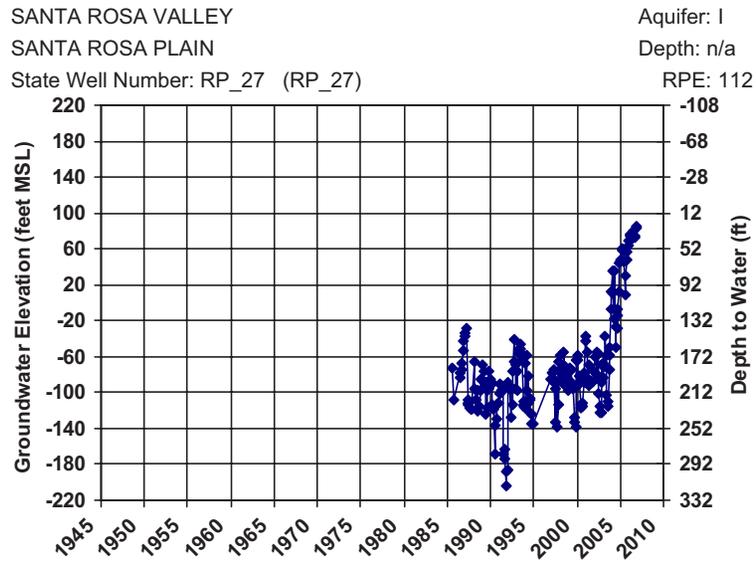
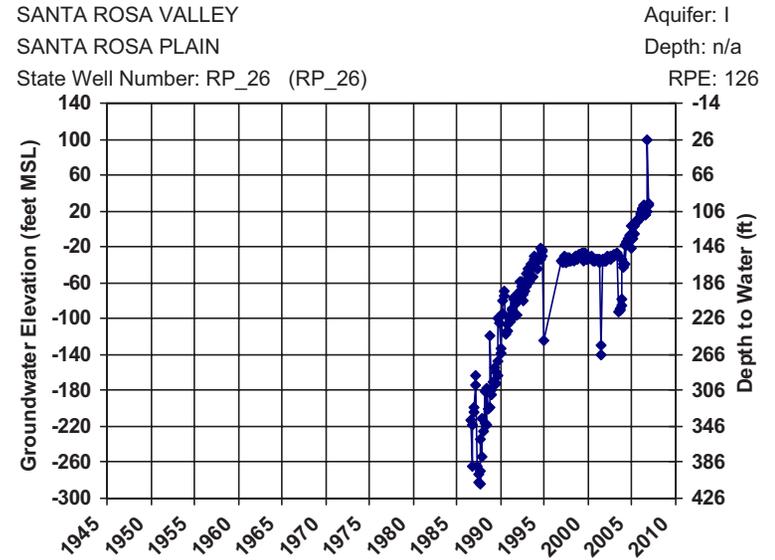
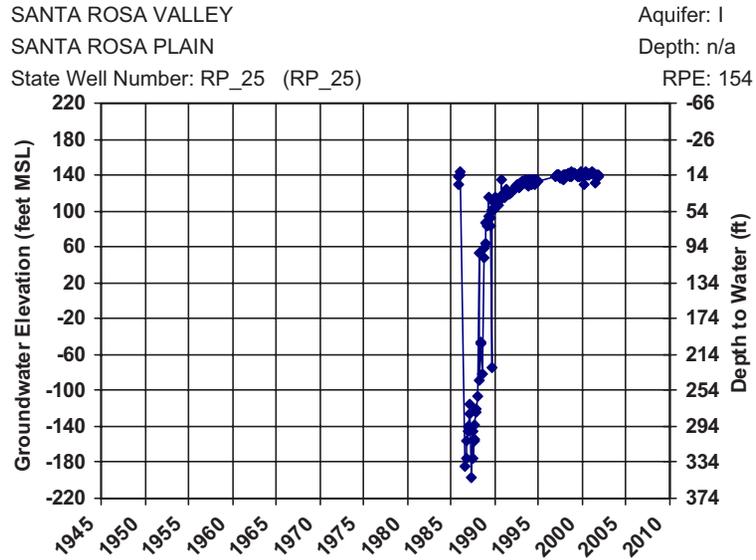


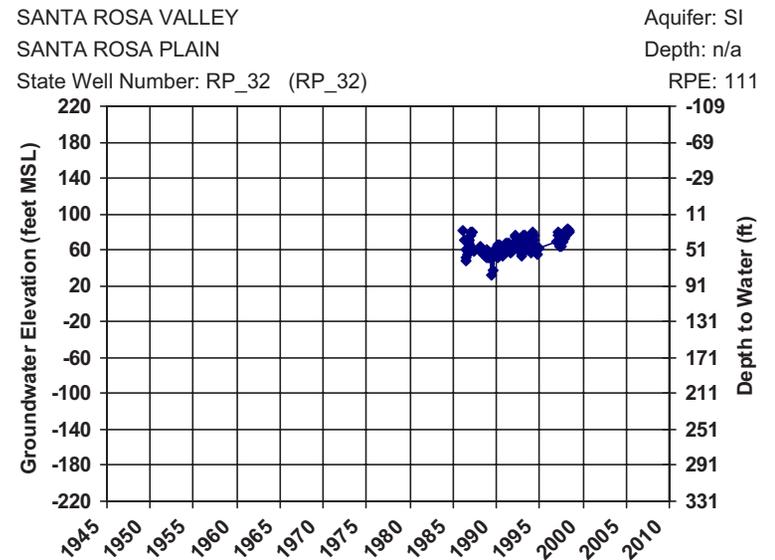
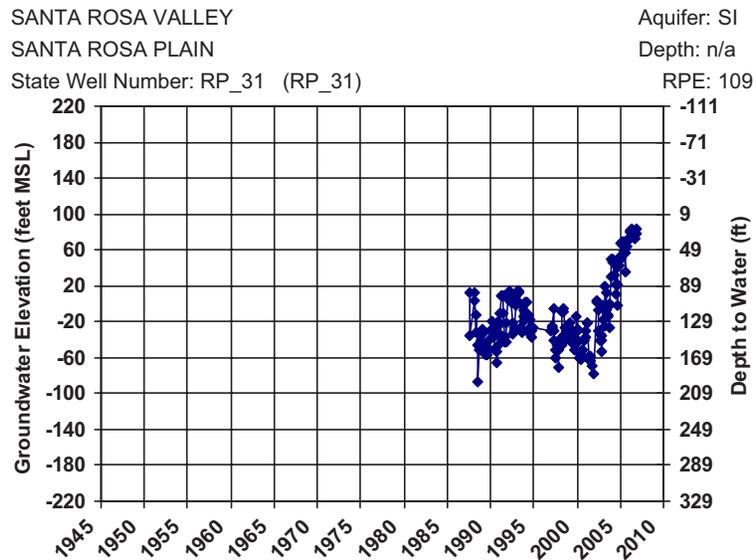
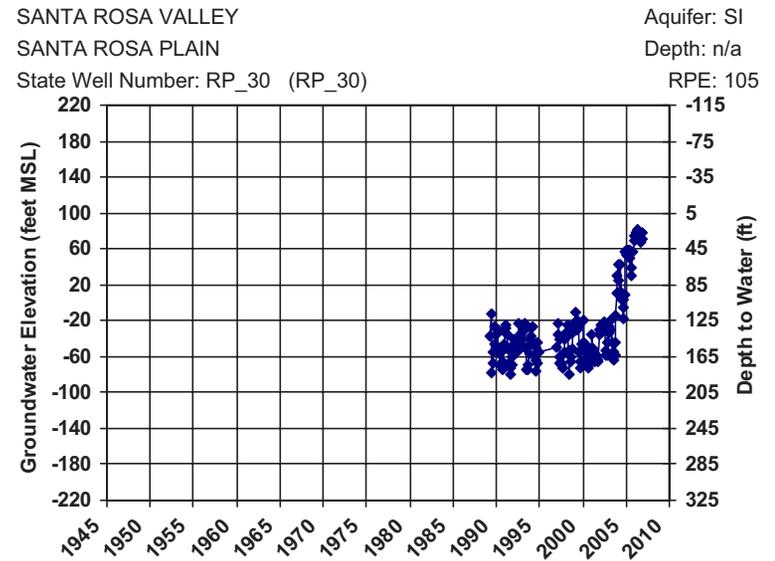
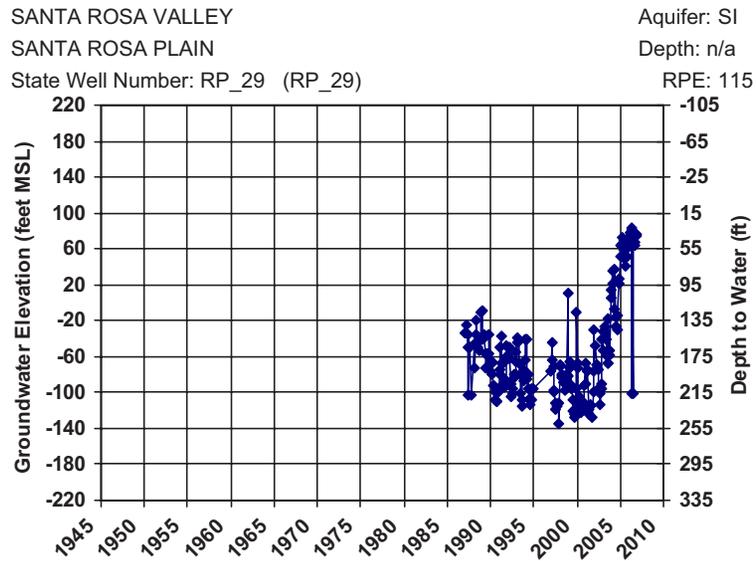




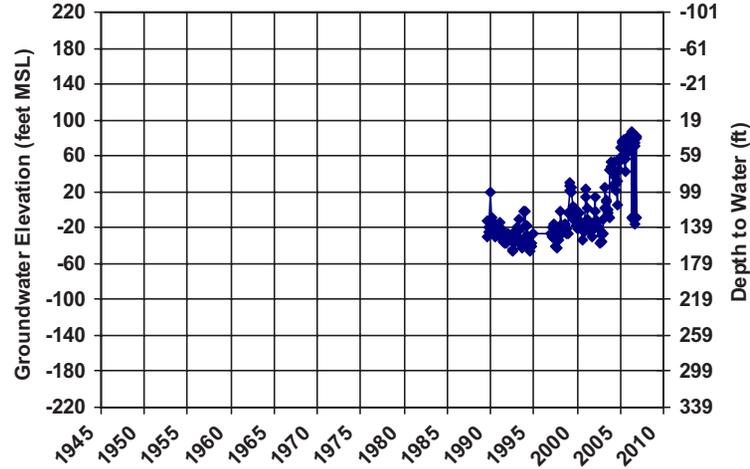




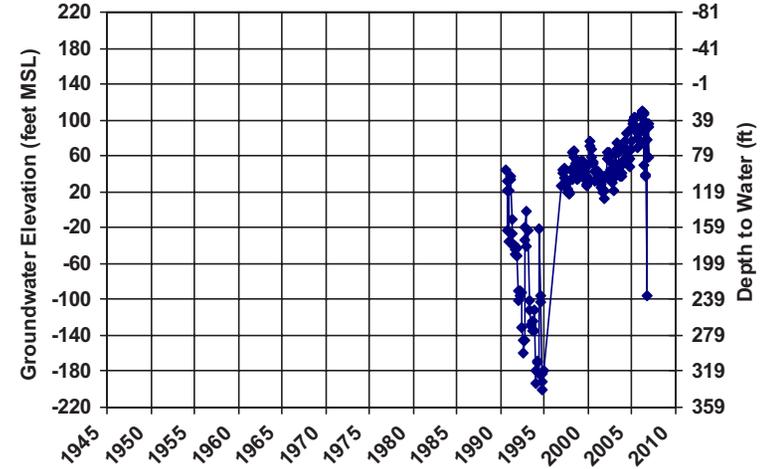




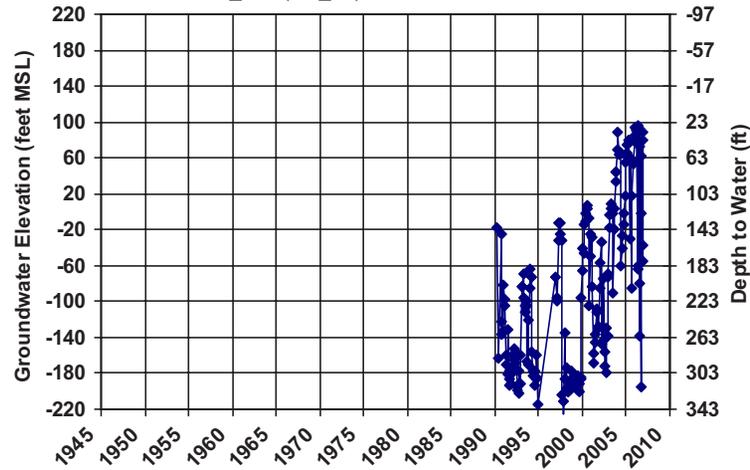
SANTA ROSA VALLEY
 SANTA ROSA PLAIN
 State Well Number: RP_33 (RP_33)
 Aquifer: SID
 Depth: n/a
 RPE: 119



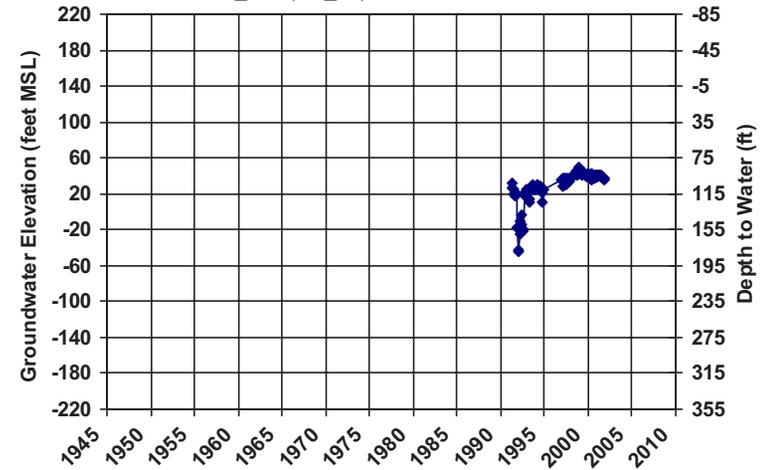
SANTA ROSA VALLEY
 SANTA ROSA PLAIN
 State Well Number: RP_34 (RP_34)
 Aquifer: SID
 Depth: n/a
 RPE: 139

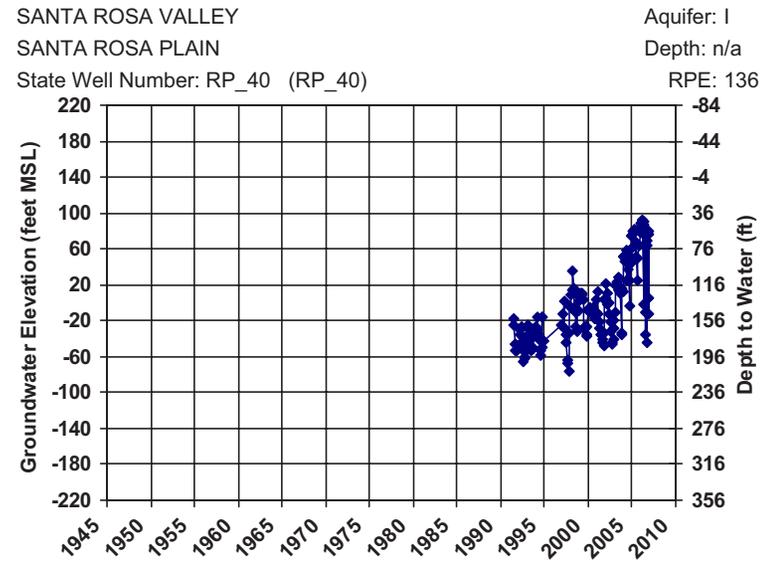
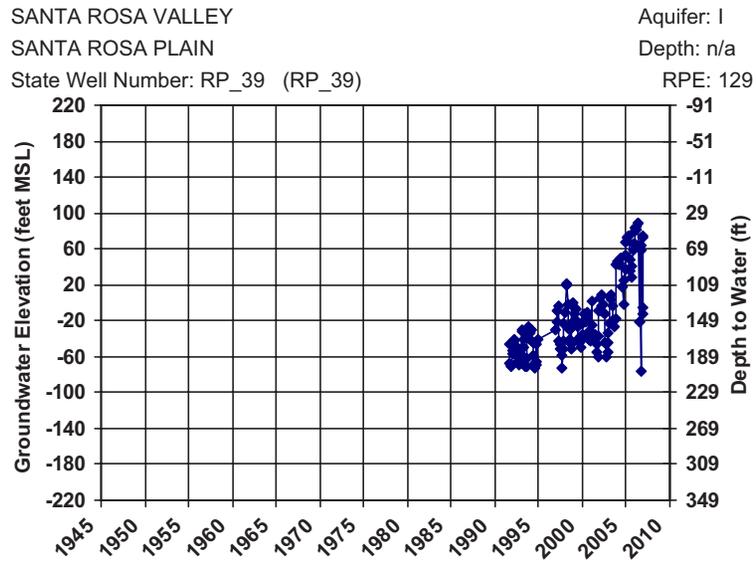
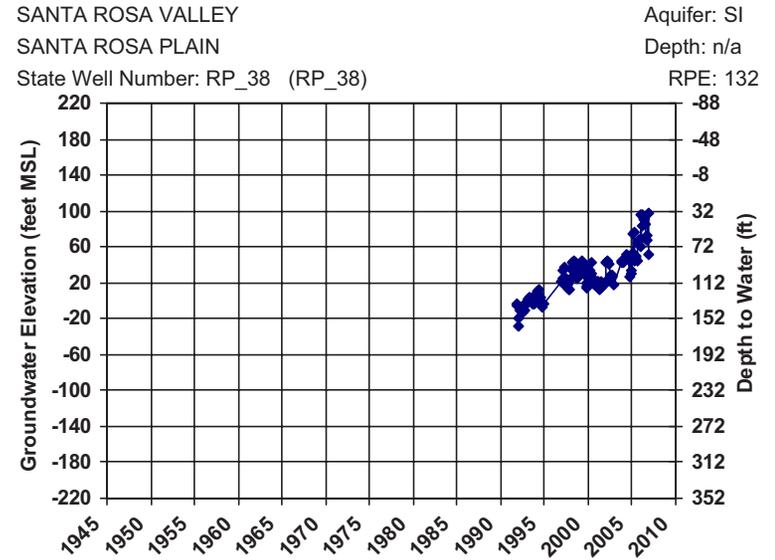
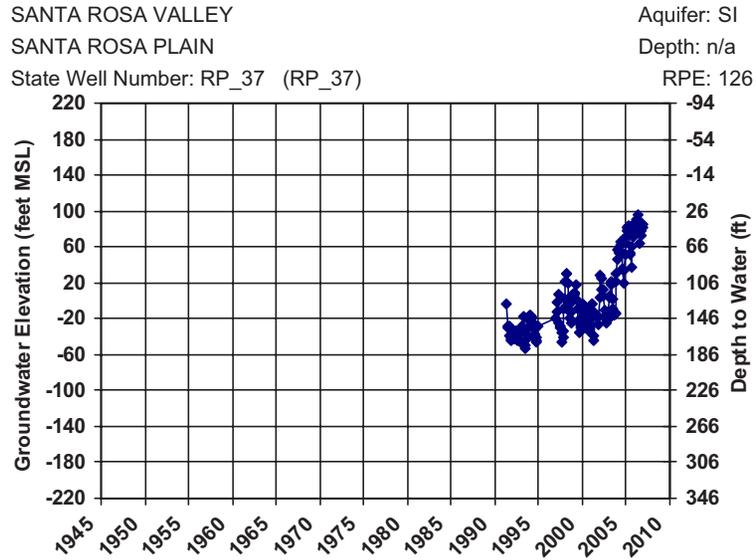


SANTA ROSA VALLEY
 SANTA ROSA PLAIN
 State Well Number: RP_35 (RP_35)
 Aquifer: SI
 Depth: n/a
 RPE: 123

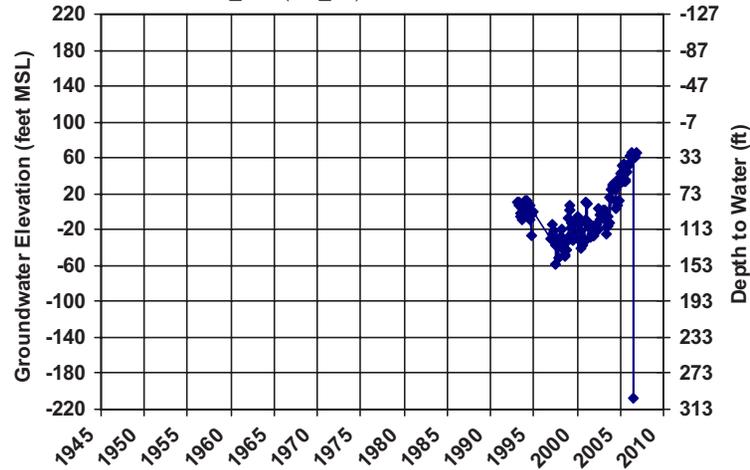


SANTA ROSA VALLEY
 SANTA ROSA PLAIN
 State Well Number: RP_36 (RP_36)
 Aquifer: ID
 Depth: n/a
 RPE: 135

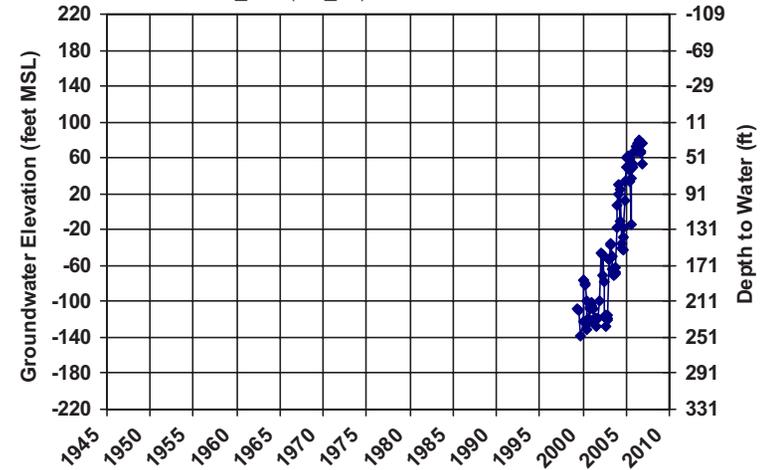




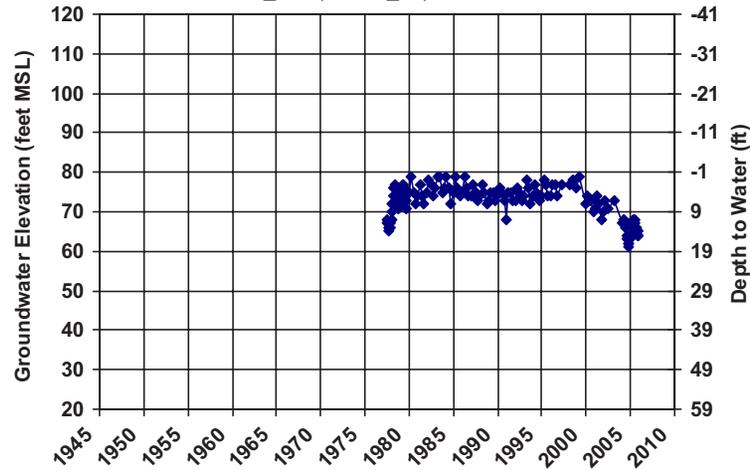
SANTA ROSA VALLEY
 SANTA ROSA PLAIN
 State Well Number: RP_41 (RP_41)
 Aquifer: SID
 Depth: n/a
 RPE: 93



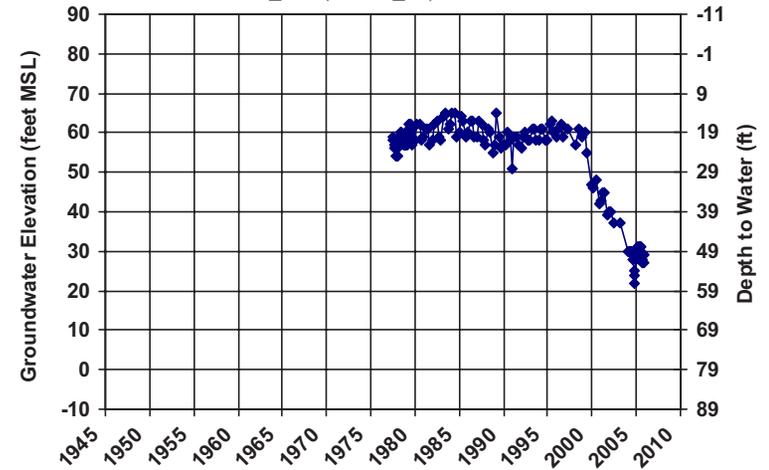
SANTA ROSA VALLEY
 SANTA ROSA PLAIN
 State Well Number: RP_42 (RP_42)
 Aquifer: I
 Depth: n/a
 RPE: 111



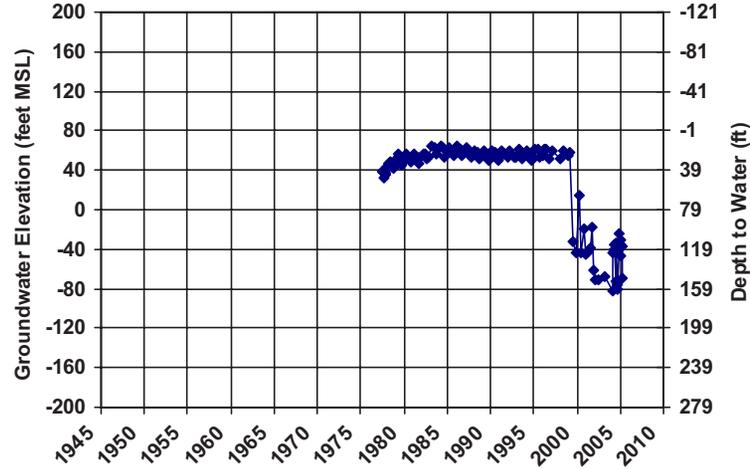
SANTA ROSA VALLEY
 SANTA ROSA PLAIN
 State Well Number: SCWA_01 (SCWA_01)
 Aquifer: S
 Depth: 80 ft
 RPE: 79



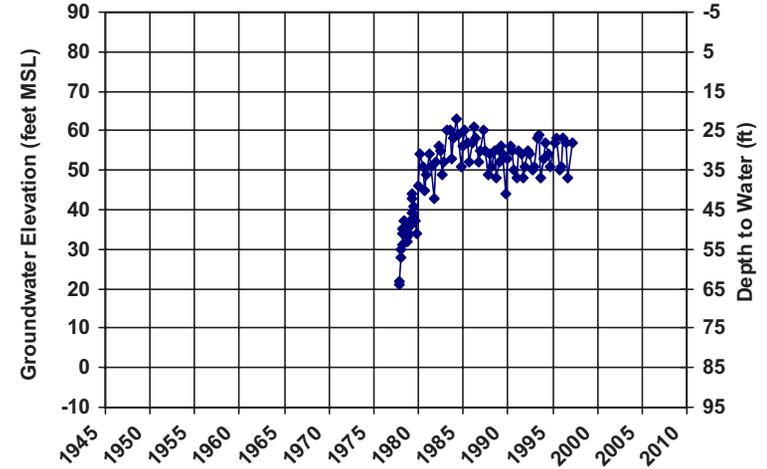
SANTA ROSA VALLEY
 SANTA ROSA PLAIN
 State Well Number: SCWA_02 (SCWA_02)
 Aquifer: WD_ONLY
 Depth: 257 ft
 RPE: 79



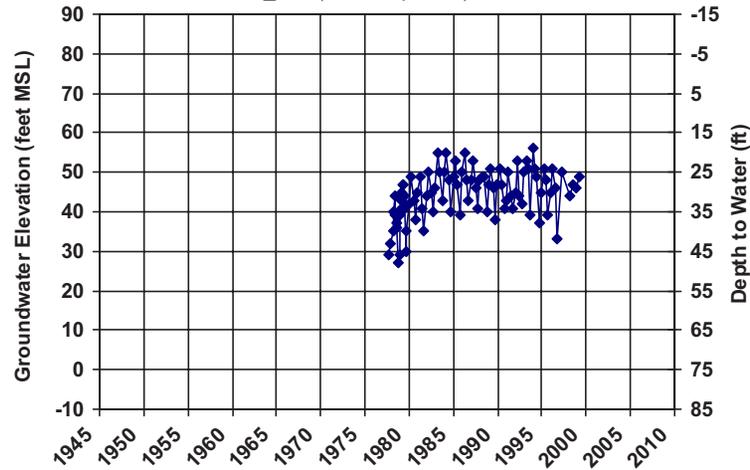
SANTA ROSA VALLEY
 SANTA ROSA PLAIN
 State Well Number: SCWA_03 (SCWA_03)
 Aquifer: WD_ONLY
 Depth: 570 ft
 RPE: 79



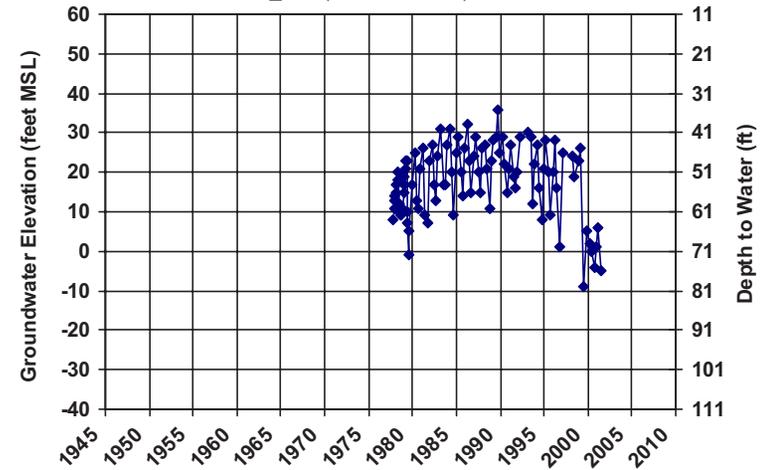
SANTA ROSA VALLEY
 SANTA ROSA PLAIN
 State Well Number: SCWA_04 (Todd Rd)
 Aquifer: D
 Depth: 808 ft
 RPE: 85

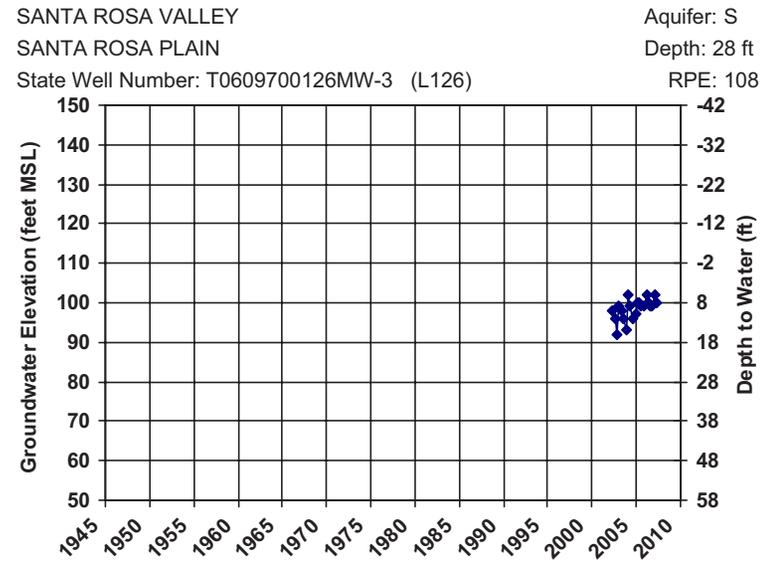
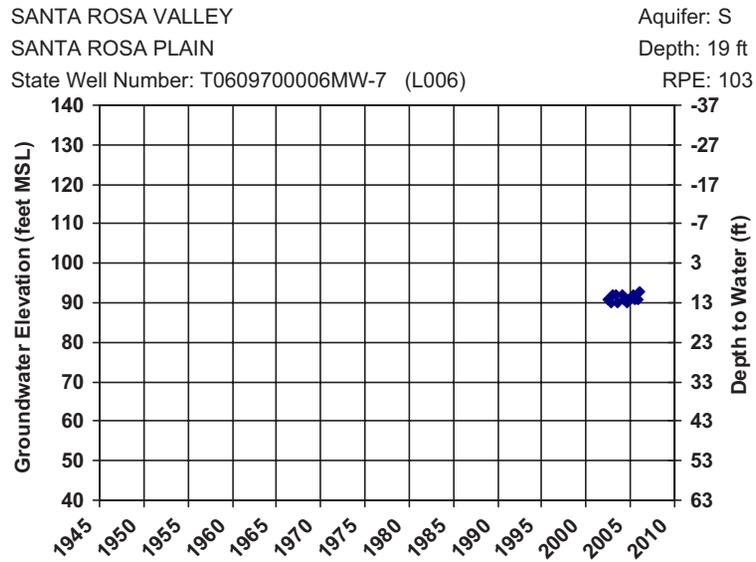
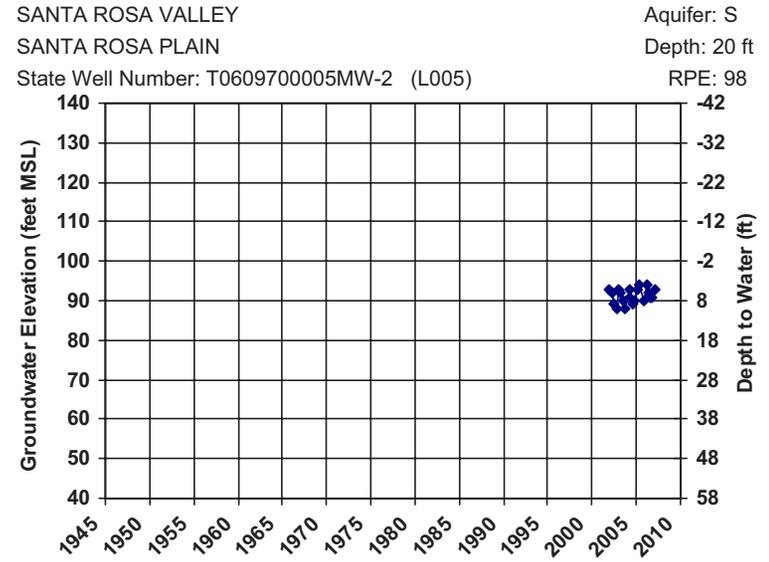
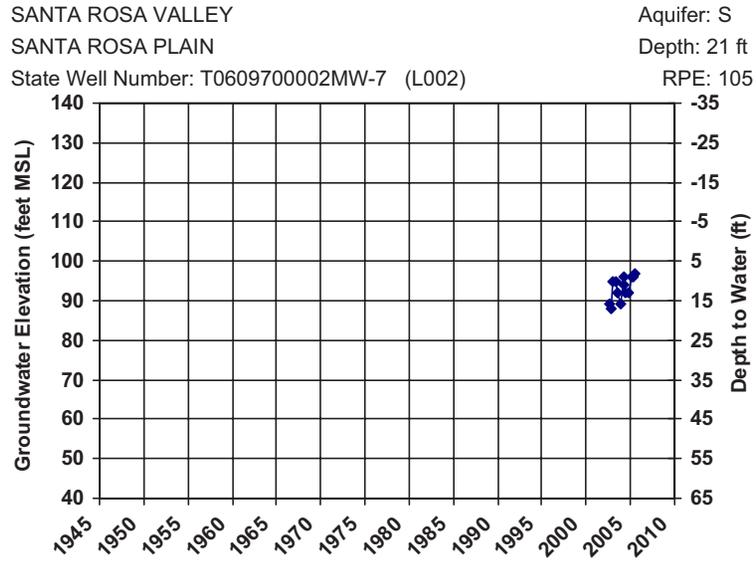


SANTA ROSA VALLEY
 SANTA ROSA PLAIN
 State Well Number: SCWA_05 (Sebastopol Rd)
 Aquifer: IDL
 Depth: 1040 ft
 RPE: 75

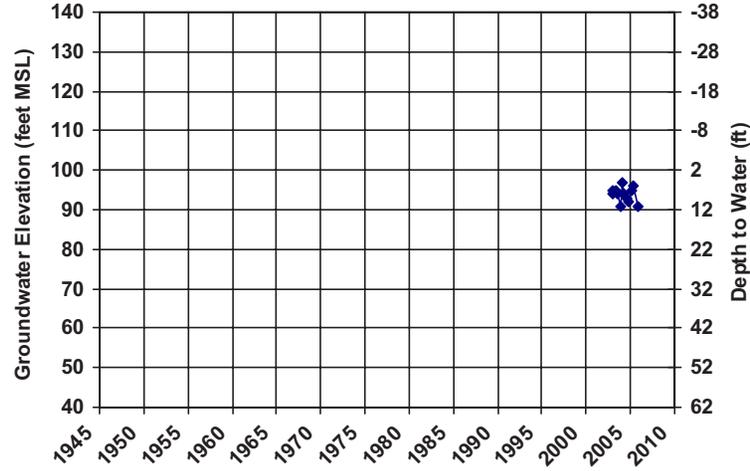


SANTA ROSA VALLEY
 SANTA ROSA PLAIN
 State Well Number: SCWA_06 (Occidental Rd)
 Aquifer: ID
 Depth: 600 ft
 RPE: 71

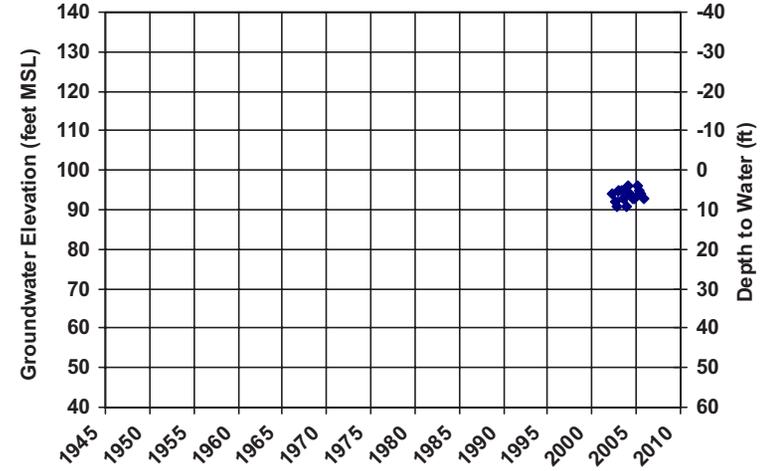




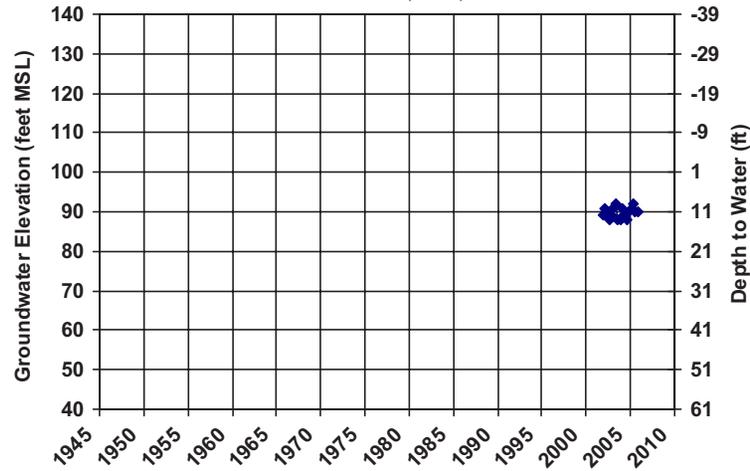
SANTA ROSA VALLEY
 SANTA ROSA PLAIN
 State Well Number: T0609700189MW-18 (L189)
 Aquifer: S
 Depth: n/a
 RPE: 102



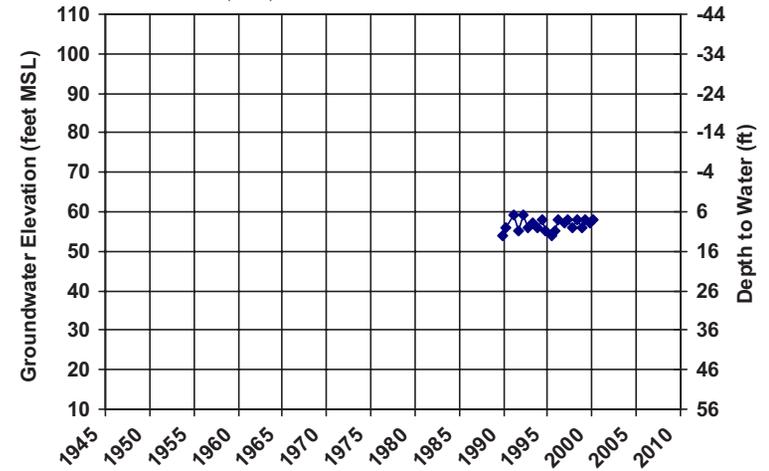
SANTA ROSA VALLEY
 SANTA ROSA PLAIN
 State Well Number: T0609700248MW-3 (L248)
 Aquifer: S
 Depth: n/a
 RPE: 100



SANTA ROSA VALLEY
 SANTA ROSA PLAIN
 State Well Number: T0609700386MW-6 (L386)
 Aquifer: S
 Depth: 20 ft
 RPE: 101



PETALUMA VALLEY
 Well ID: 5N/7W-7A1 (7A1)
 Aquifer: S
 Depth: 62 ft
 RPE: 66

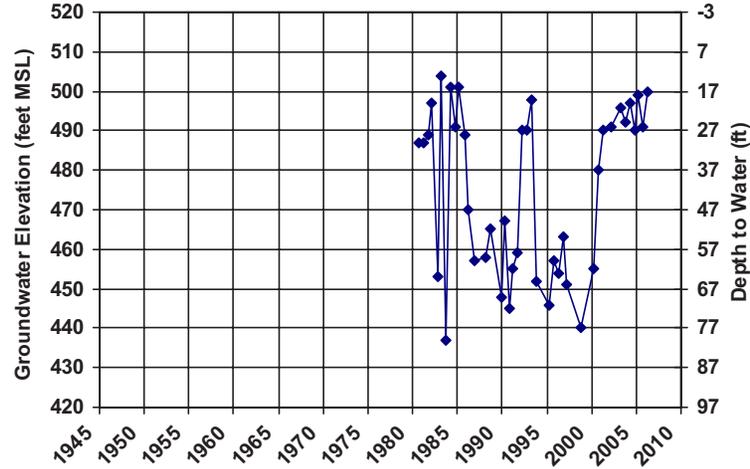


PETALUMA VALLEY

Aquifer: I
Depth: 480 ft

Well ID: 5N/7W-11F1 (11F1)

RPE: 517

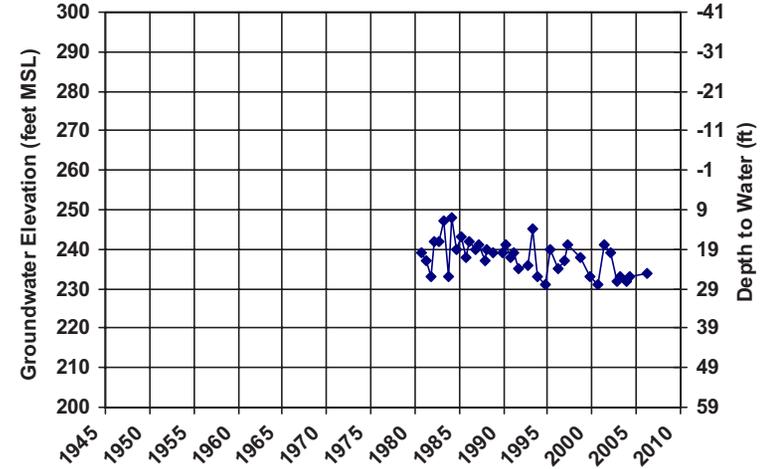


PETALUMA VALLEY

Aquifer: S
Depth: 100 ft

Well ID: 5N/7W-11N1 (11N1)

RPE: 259

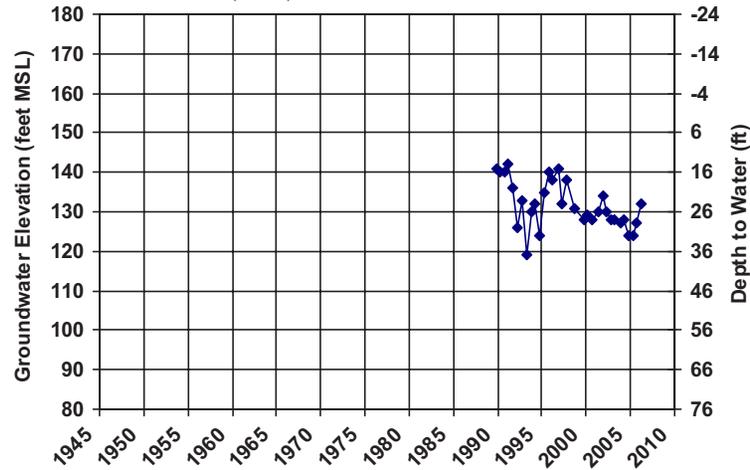


PETALUMA VALLEY

Aquifer: S
Depth: 177 ft

Well ID: 5N/7W-15K2 (15K2)

RPE: 156

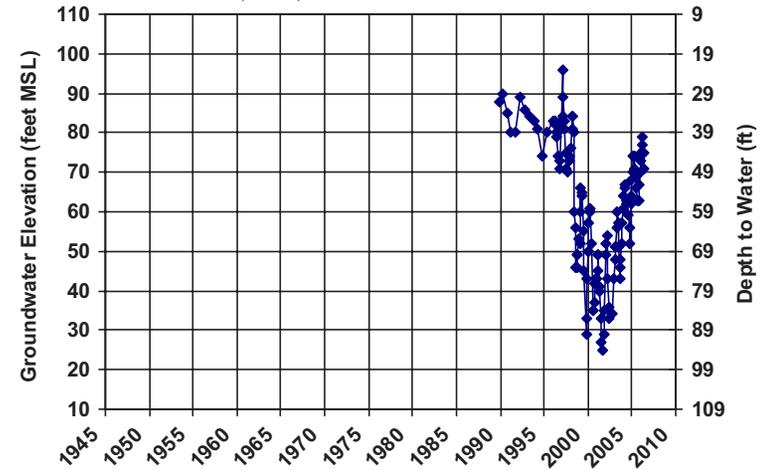


PETALUMA VALLEY

Aquifer: SI
Depth: 200 ft

Well ID: 5N/7W-15Q1 (15Q1)

RPE: 119

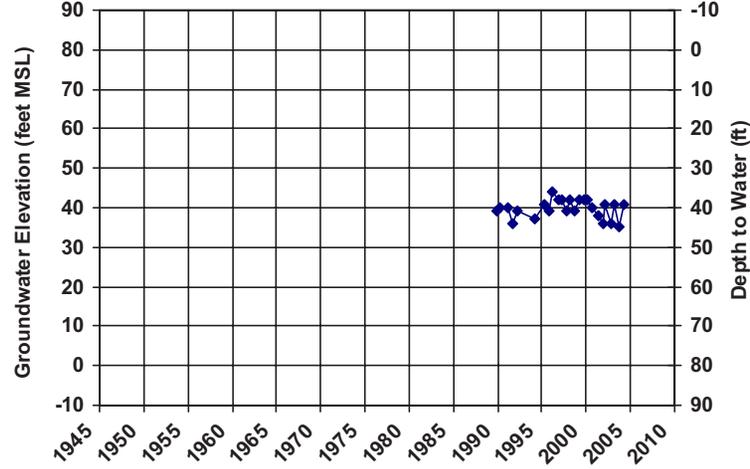


PETALUMA VALLEY

Aquifer: S
Depth: 82 ft

Well ID: 5N/7W-18B1 (18B1)

RPE: 80

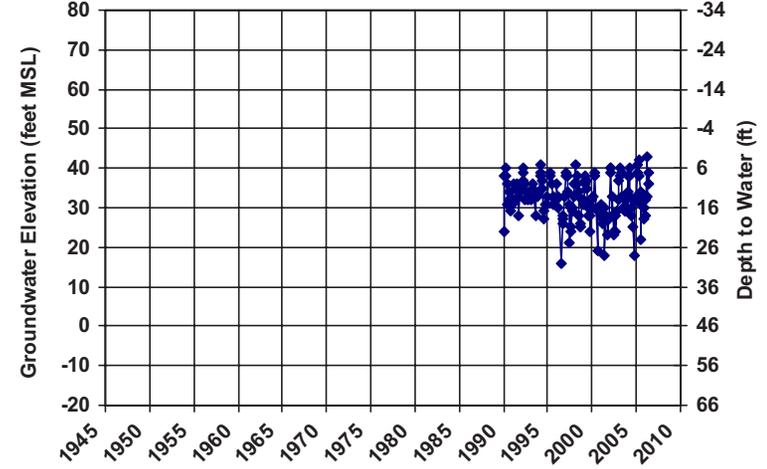


PETALUMA VALLEY

Aquifer: S
Depth: 180 ft

Well ID: 5N/7W-19N1 (19N1)

RPE: 46

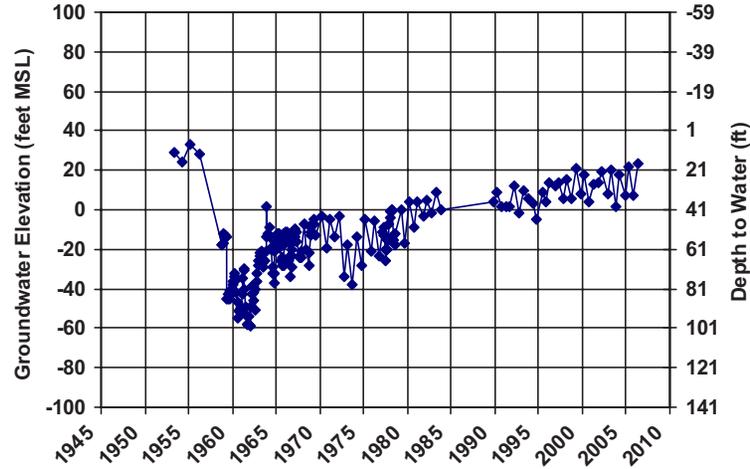


PETALUMA VALLEY

Aquifer: S
Depth: 158 ft

Well ID: 5N/7W-20B2 (20B2)

RPE: 41

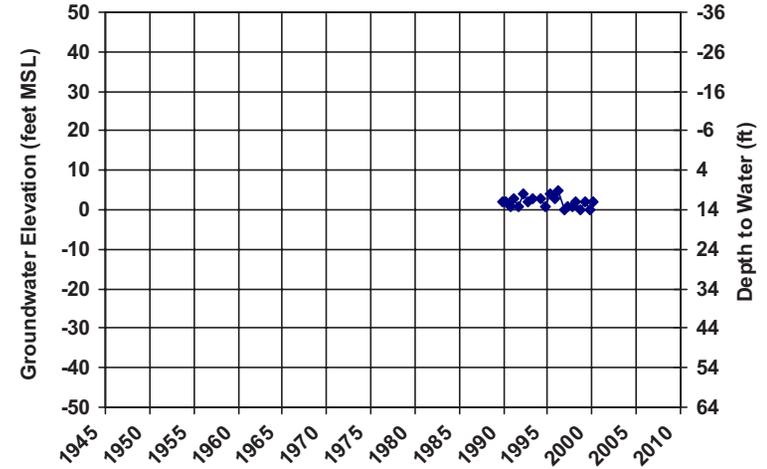


PETALUMA VALLEY

Aquifer: S
Depth: 196 ft

Well ID: 5N/7W-34L1 (34L1)

RPE: 14

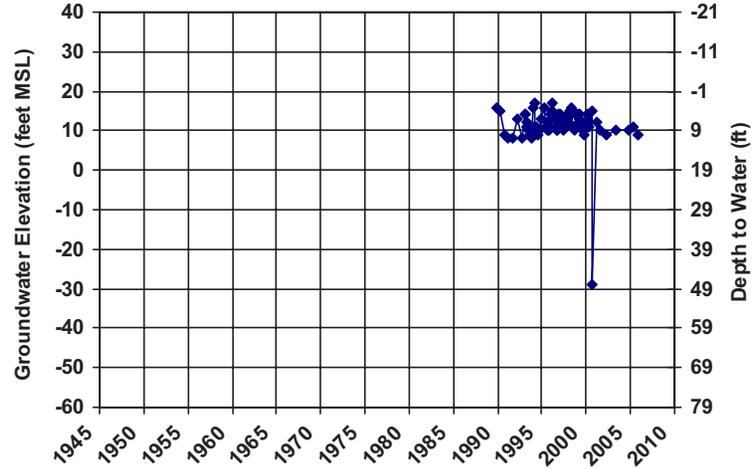


PETALUMA VALLEY

Aquifer: S
Depth: 34 ft

Well ID: 5N/7W-36R1 (36R1)

RPE: 19

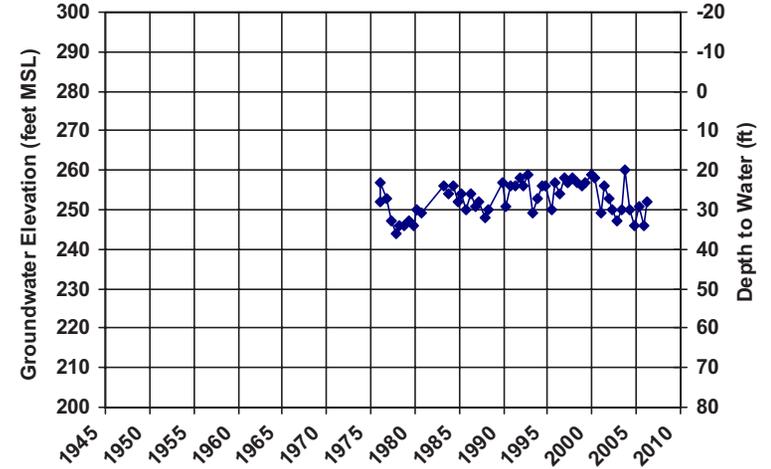


PETALUMA VALLEY

Aquifer: S
Depth: 185 ft

Well ID: 5N/8W-1L2 (1L2)

RPE: 280

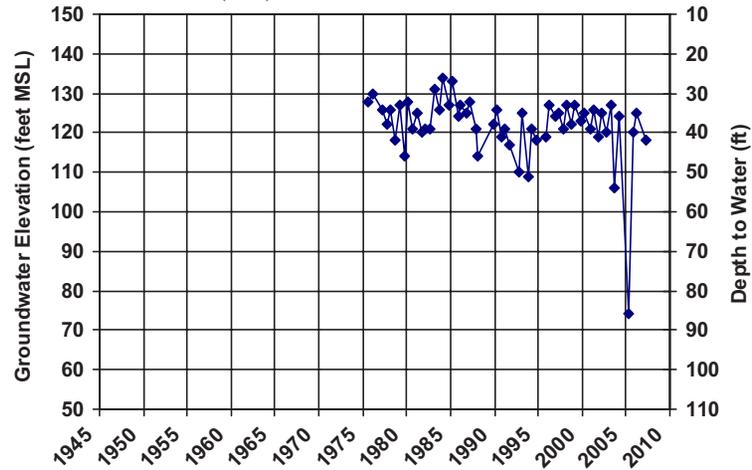


PETALUMA VALLEY

Aquifer: S
Depth: 155 ft

Well ID: 5N/8W-2H1 (2H1)

RPE: 160

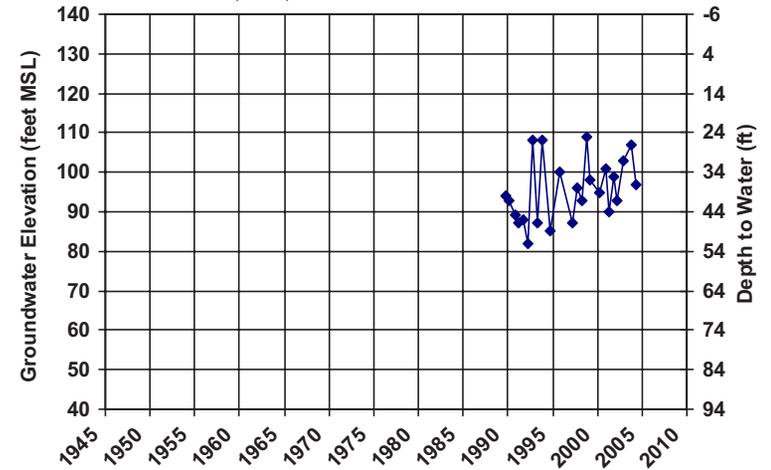


PETALUMA VALLEY

Aquifer: SI
Depth: 280 ft

Well ID: 6N/7W-31J1 (31J1)

RPE: 134



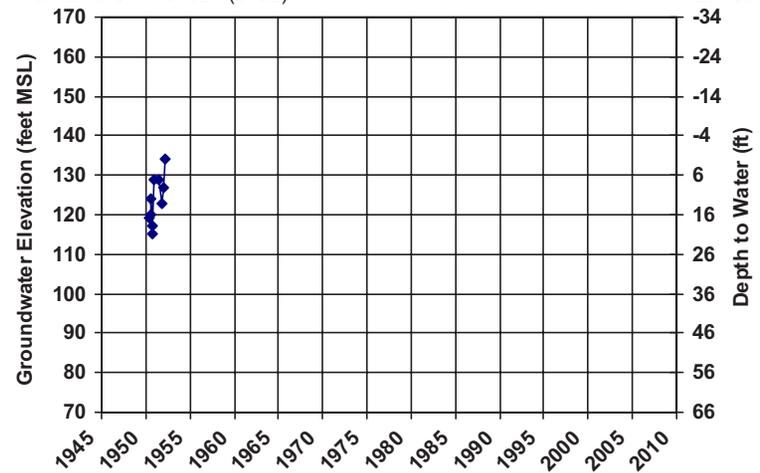
PETALUMA VALLEY

Aquifer: Unknown

Depth: n/a

Well ID: 6N/7W-31J2 (31J2)

RPE: 136



APPENDIX C

Summary of Groundwater Quality Results

City of Cotati Municipal Wells

Appendix C Summary of Ground-Water Quality Laboratory Results (City of Cotati Wells)

Well Name	Sample Date	General Minerals						Trace Elements														
		EC (µmhos/cm)	TDS (mg/l)	pH	Total Alkalinity (mg/l)	Cations			Anions				As (µg/l)	B (µg/l)	Cu (µg/l)	Fe (µg/l)	Cr (µg/l)	Cr-VI (µg/l)	Mn (µg/l)	Se (µg/l)	Zn (µg/l)	
Well 1A	5/2/1995	390	270	7.1	86	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K (mg/l)	SO ₄ (mg/l)	Cl (mg/l)	NO ₃ (mg/l)	F (mg/l)	3.2	-	<50	620	<10	-	44	<5	<50
Well 1A	4/2/1996	280	220	7.7	88	11	6.5	50	-	18	29	<2	0.25	3.7	-	<50	550	<10	-	55	<5	<50
Well 1A	11/8/1996	-	-	-	-	-	-	-	-	-	-	<2	-	-	-	-	-	-	-	-	-	-
Well 1A	7/11/1997	-	-	-	-	-	-	-	-	-	-	<2	-	-	-	-	-	-	-	-	-	-
Well 1A	8/28/1998	-	-	-	-	-	-	-	-	-	-	<2	-	-	-	-	-	-	-	-	-	-
Well 1A	12/10/2001	330	250	7.2	78	12	7.8	41	-	14	36	<2	0.28	3.4	<100	<50	460	-	<1	<20	<5	<50
Well 1A	6/28/2002	-	-	-	-	-	-	-	-	-	-	-	-	-	<100	-	-	-	<1	-	-	-
Well 1A	5/16/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	920	-	-	41	-	-	-
Well 1A	5/22/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	370	-	-	24	-	-	-
Well 1A	5/30/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	880	-	-	43	-	-	-
Well 1A	6/5/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	650	-	-	45	-	-	-
Well 1A	6/13/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2600	-	-	110	-	-	-
Well 1A	6/19/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	720	-	-	47	-	-	-
Well 1A	6/27/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	560	-	-	33	-	-	-
Well 1A	7/3/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	650	-	-	46	-	-	-
Well 1A	7/11/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	650	-	-	45	-	-	-
Well 1A	7/17/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	780	-	-	45	-	-	-
Well 1A	7/24/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	540	-	-	44	-	-	-
Well 1A	7/31/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	550	-	-	48	-	-	-
Well 1A	8/8/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	510	-	-	41	-	-	-
Well 1A	8/14/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	540	-	-	44	-	-	-
Well 1A	9/19/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	610	-	-	45	-	-	-
Well 1A	9/25/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	600	-	-	44	-	-	-
Well 1A	10/3/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	590	-	-	44	-	-	-
Well 1A	10/9/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	620	-	-	41	-	-	-
Well 1A	10/17/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	630	-	-	44	-	-	-
Well 1A	10/23/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	670	-	-	51	-	-	-
Well 1A	10/31/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	590	-	-	45	-	-	-
Well 1A	11/6/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	600	-	-	53	-	-	-
Well 1A	11/14/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	960	-	-	76	-	-	-
Well 1A	11/20/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	930	-	-	78	-	-	-
Well 1A	11/26/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	820	-	-	94	-	-	-
Well 1A	12/4/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	960	-	-	110	-	-	-
Well 1A	12/12/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1100	-	-	110	-	-	-
Well 1A	12/18/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	780	-	-	94	-	-	-
Well 1A	12/26/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3000	-	-	200	-	-	-
Well 1A	12/31/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	790	-	-	110	-	-	-
Well 1A	1/9/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2000	-	-	89	-	-	-
Well 1A	1/15/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	930	-	-	90	-	-	-
Well 1A	1/23/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5500	-	-	120	-	-	-
Well 1A	1/29/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	920	-	-	52	-	-	-
Well 1A	2/6/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	400	-	-	39	-	-	-
Well 1A	2/11/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	380	-	-	37	-	-	-

Summary of Ground-Water Quality Laboratory Results (City of Cotati Wells)

Well Name	Sample Date	General Minerals										Trace Elements										
		EC					Cations					Anions					Trace Elements					
		EC (µmhos/cm)	TDS (mg/l)	pH	Total Alkalinity (mg/l)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K (mg/l)	SO ₄ (mg/l)	Cl (mg/l)	NO ₃ (mg/l)	F (mg/l)	As (µg/l)	B (µg/l)	Cu (µg/l)	Fe (µg/l)	Cr (µg/l)	Cr-VI (µg/l)	Mn (µg/l)	Se (µg/l)	Zn (µg/l)
Well 1A	2/20/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<20	-	-
Well 1A	2/26/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	-	-
Well 1A	3/5/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23	-	-
Well 1A	3/11/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	-	-
Well 1A	3/25/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	32	-	-
Well 1A	4/2/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<20	-	-
Well 1A	4/6/2004	320	240	7.1	88	12	9.1	61	-	15	<2	0.47	3.1	-	<50	-	-	<1	-	<5	<50	-
Well 1A	4/8/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<20	-	-
Well 1A	4/16/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<20	-	-
Well 1A	4/22/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<20	-	-
Well 1A	6/25/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	44	-	-
Well 1A	7/9/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<20	-	-
Well 1A	7/23/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	34	-	-
Well 1A	7/29/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	31	-	-
Well 1A	8/6/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	28	-	-
Well 1A	8/12/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	37	-	-
Well 1A	8/20/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	36	-	-
Well 1A	9/3/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	470	-	-
Well 1A	9/9/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	39	-	-
Well 1A	9/17/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	560	-	-
Well 1A	9/23/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2000	-	-
Well 1A	10/1/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2000	-	-
Well 1A	10/7/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	730	-	-
Well 1A	10/21/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	41	-	-
Well 1A	10/29/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	-	-
Well 1A	11/4/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	510	-	-
Well 1A	11/12/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	510	-	-
Well 1A	11/18/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	340	-	-
Well 1A	11/24/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	880	-	-
Well 1A	11/18/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1000	-	-
Well 1A	11/24/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	420	-	-
Well 1A	12/2/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	440	-	-
Well 1A	12/10/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	740	-	-
Well 1A	12/16/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2200	-	-
Well 1A	12/22/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	580	-	-
Well 1A	12/30/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	430	-	-
Well 1A	1/7/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	410	-	-
Well 1A	1/13/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	560	-	-
Well 1A	1/21/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2900	-	-
Well 1A	1/27/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1700	-	-
Well 1A	2/4/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	360	-	-
Well 1A	2/10/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	930	-	-
Well 1A	2/18/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2500	-	-
Well 1A	2/24/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	960	-	-
Well 1A	3/4/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2600	-	-

Summary of Ground-Water Quality Laboratory Results (City of Cotati Wells)

Well Name	Sample Date	General Minerals										Trace Elements										
		EC					Cations					Anions					Trace Elements					
		EC (µmhos/cm)	TDS (mg/l)	pH	Total Alkalinity (mg/l)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K (mg/l)	SO ₄ (mg/l)	Cl (mg/l)	NO ₃ (mg/l)	F (mg/l)	As (µg/l)	B (µg/l)	Cu (µg/l)	Fe (µg/l)	Cr (µg/l)	Cr-VI (µg/l)	Mn (µg/l)	Se (µg/l)	Zn (µg/l)
Well 1A	12/29/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 1A	1/6/2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 1A	1/12/2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 1A	1/20/2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 1A	1/26/2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 1A	2/3/2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 1A	2/9/2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 1A	2/17/2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 1A	2/23/2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 1A	3/3/2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 1A	3/9/2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 1A	3/17/2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 1A	3/23/2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 1A	3/31/2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 2	1/27/1984	-	-	-	-	1.79	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 2	4/6/1984	-	-	-	-	1.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 2	8/31/1984	-	-	-	-	1.29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 2	11/30/1984	-	-	-	-	1.06	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 2	3/24/1987	320	210	7.1	110	25	14	32	3	12	48	1.8	<0.1	<2	<50	<100	<10	<10	<10	<10	<10	<50
Well 2	3/8/1993	400	260	6.8	110	22	15	30	-	11	46	1.9	0.16	<2	<50	<100	<10	<10	<10	<10	<10	<50
Well 2	9/6/1994	390	260	7.9	110	25	14	30	-	9.6	44	<2	0.16	<2	<50	<100	<10	<10	<10	<10	<10	<50
Well 2	4/2/1996	410	260	7.5	120	28	15	30	-	21	41	4.9	0.18	3.2	<100	<100	<10	<10	<10	<10	<10	<50
Well 2	11/8/1996	-	-	-	-	-	-	-	-	-	-	<2	-	-	-	-	-	-	-	-	-	-
Well 2	7/11/1997	-	-	-	-	-	-	-	-	-	-	<2	-	-	-	-	-	-	-	-	-	-
Well 2	6/30/1999	540	320	7.5	130	33	21	34	-	16	59	3.4	0.27	<2	<50	240	<10	<10	<10	<10	<10	<50
Well 2	12/10/2001	-	-	-	-	-	-	-	-	-	-	4.7	-	-	-	-	<10	<10	<10	<10	<10	<50
Well 2	6/28/2002	-	-	-	-	-	-	-	-	-	-	-	-	-	<100	-	<10	2.3	-	-	-	-
Well 2	1/27/2005	420	250	7.5	160	31	20	23	-	16	16	8.2	0.34	3	<50	160	1.8	-	<20	<5	<50	<50
Well 3	4/26/1991	460	280	6.9	120	16	11	45	-	6	57	<2	<0.1	<2	<50	130	<10	-	250	<5	<50	<50
Well 3	9/9/1994	440	260	8.1	130	19	11	52	-	7	54	<2	<0.1	<2	<50	<100	<10	-	180	<5	<50	<50
Well 3	11/8/1996	-	-	-	-	-	-	-	-	-	-	<2	-	-	-	-	-	-	-	-	-	-
Well 3	7/11/1997	-	-	-	-	-	-	-	-	-	-	<2	-	-	-	-	-	-	-	-	-	-
Well 3	8/28/1998	-	-	-	-	-	-	-	-	-	-	<2	-	-	-	-	-	-	-	-	-	-
Well 3	12/10/2001	460	310	7.1	120	19	13	60	-	8	69	3.1	0.17	3.3	<100	<100	<10	<10	<10	<10	<10	<50
Well 3	6/28/2002	-	-	-	-	-	-	-	-	-	-	-	-	-	130	-	-	<10	<10	<10	<10	<50
Well 3	5/16/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	<100	<100	-	-	230	-	-	-
Well 3	5/22/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	<100	<100	-	-	180	-	-	-
Well 3	5/30/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	<100	<100	-	-	180	-	-	-
Well 3	6/5/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	<100	<100	-	-	180	-	-	-
Well 3	6/13/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	700	-	-	-	160	-	-	-

Summary of Ground-Water Quality Laboratory Results (City of Cotati Wells)

Well Name	Sample Date	General Minerals										Trace Elements										
		EC					Cations					Anions					Trace Elements					
		EC (µmhos/cm)	TDS (mg/l)	pH	Total Alkalinity (mg/l)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K (mg/l)	SO ₄ (mg/l)	Cl (mg/l)	NO ₃ (mg/l)	F (mg/l)	As (µg/l)	B (µg/l)	Cu (µg/l)	Fe (µg/l)	Cr (µg/l)	Cr-VI (µg/l)	Mn (µg/l)	Se (µg/l)	Zn (µg/l)
Well 3	6/19/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<100	-	-	190	-	-	-
Well 3	6/27/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<100	-	-	180	-	-	-
Well 3	7/3/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<100	-	-	190	-	-	-
Well 3	7/11/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<100	-	-	200	-	-	-
Well 3	7/17/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<100	-	-	200	-	-	-
Well 3	7/24/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<100	-	-	180	-	-	-
Well 3	7/31/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<100	-	-	220	-	-	-
Well 3	8/8/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<100	-	-	180	-	-	-
Well 3	8/14/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	170	-	-	<20	-	-	-
Well 3	9/19/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	110	-	-	200	-	-	-
Well 3	9/25/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<100	-	-	180	-	-	-
Well 3	10/3/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<100	-	-	180	-	-	-
Well 3	10/9/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<100	-	-	190	-	-	-
Well 3	10/17/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<100	-	-	190	-	-	-
Well 3	10/23/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<100	-	-	190	-	-	-
Well 3	10/31/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<100	-	-	190	-	-	-
Well 3	11/6/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<100	-	-	200	-	-	-
Well 3	11/14/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<100	-	-	230	-	-	-
Well 3	11/20/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<100	-	-	240	-	-	-
Well 3	11/26/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<100	-	-	270	-	-	-
Well 3	12/12/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	780	-	-	250	-	-	-
Well 3	12/18/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<100	-	-	250	-	-	-
Well 3	12/26/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	810	-	-	250	-	-	-
Well 3	12/31/2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<100	-	-	270	-	-	-
Well 3	1/9/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	540	-	-	280	-	-	-
Well 3	1/15/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1300	-	-	340	-	-	-
Well 3	1/23/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	300	-	-	200	-	-	-
Well 3	1/29/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<100	-	-	<20	-	-	-
Well 3	2/6/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<100	-	-	180	-	-	-
Well 3	2/11/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<100	-	-	160	-	-	-
Well 3	2/20/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<100	-	-	110	-	-	-
Well 3	2/26/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<100	-	-	110	-	-	-
Well 3	3/5/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<100	-	-	140	-	-	-
Well 3	3/11/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<100	-	-	220	-	-	-
Well 3	3/19/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<100	-	-	161	-	-	-
Well 3	3/25/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	870	-	-	330	-	-	-
Well 3	4/2/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2700	-	-	410	-	-	-
Well 3	4/6/2004	480	300	7.3	120	19	17	70	7.9	68	4.6	0.29	3.6	-	<50	<100	-	<1	180	<5	<50	
Well 3	4/8/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	120	-	-	150	-	-	-
Well 3	4/16/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	120	-	-	150	-	-	-
Well 3	4/22/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<100	-	-	150	-	-	-
Well 3	4/30/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	130	-	-	150	-	-	-
Well 3	5/6/2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	400	-	-	180	-	-	-

Summary of Ground-Water Quality Laboratory Results (City of Cotati Wells)

Well Name	Sample Date	General Minerals										Trace Elements										
		Cations					Anions					Trace Elements					Trace Elements					
		EC (µmhos/cm)	TDS (mg/l)	pH	Total Alkalinity (mg/l)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K (mg/l)	SO ₄ (mg/l)	Cl (mg/l)	NO ₃ (mg/l)	F (mg/l)	As (µg/l)	B (µg/l)	Cu (µg/l)	Fe (µg/l)	Cr (µg/l)	Cr-VI (µg/l)	Mn (µg/l)	Se (µg/l)	Zn (µg/l)
Well 3	4/7/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	260	-	-	240	-	-	-
Well 3	4/15/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	400	-	-	340	-	-	-
Well 3	4/21/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	460	-	-	250	-	-	-
Well 3	4/29/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	360	-	-	380	-	-	-
Well 3	5/5/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<100	-	-	140	-	-	-
Well 3	5/13/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	240	-	-	200	-	-	-
Well 3	5/19/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	550	-	-	370	-	-	-
Well 3	5/27/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	140	-	-	200	-	-	-
Well 3	6/2/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<100	-	-	180	-	-	-
Well 3	6/10/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	130	-	-	240	-	-	-
Well 3	6/16/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	380	-	-	400	-	-	-
Well 3	6/24/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	440	-	-	290	-	-	-
Well 3	6/30/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	150	-	-	180	-	-	-
Well 3	7/8/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	410	-	-	350	-	-	-
Well 3	7/14/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	350	-	-	360	-	-	-
Well 3	7/22/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	380	-	-	270	-	-	-
Well 3	7/27/2005	-	-	-	-	-	-	-	-	-	<2	-	-	-	-	-	-	-	-	-	-	-
Well 3	7/28/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 3	8/5/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1700	-	-	570	-	-	-
Well 3	8/11/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1800	-	-	380	-	-	-
Well 3	8/19/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	170	-	-	230	-	-	-
Well 3	8/25/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	230	-	-	260	-	-	-
Well 3	9/2/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	790	-	-	270	-	-	-
Well 3	9/8/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1500	-	-	340	-	-	-
Well 3	9/16/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	180	-	-	210	-	-	-
Well 3	9/22/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	260	-	-	210	-	-	-
Well 3	9/30/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	160	-	-	190	-	-	-
Well 3	10/6/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	360	-	-	200	-	-	-
Well 3	10/14/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	240	-	-	210	-	-	-
Well 3	10/20/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	720	-	-	240	-	-	-
Well 3	10/28/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	750	-	-	210	-	-	-
Well 3	11/3/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	150	-	-	210	-	-	-
Well 3	11/10/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<100	-	-	190	-	-	-
Well 3	11/17/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	190	-	-	190	-	-	-
Well 3	11/23/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<100	-	-	190	-	-	-
Well 3	12/1/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	500	-	-	310	-	-	-
Well 3	12/9/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	820	-	-	1000	-	-	-
Well 3	12/15/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1100	-	-	990	-	-	-
Well 3	12/23/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	130	-	-	210	-	-	-
Well 3	12/29/2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<100	-	-	180	-	-	-
Well 3	1/6/2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	700	-	-	170	-	-	-
Well 3	1/12/2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	590	-	-	180	-	-	-
Well 3	1/20/2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	-	-	200	-	-	-

Summary of Ground-Water Quality Laboratory Results (City of Cotati Wells)

Well Name	Sample Date	General Minerals										Trace Elements									
		EC (µmhos/cm)	TDS (mg/l)	pH	Total Alkalinity (mg/l)	Cations			Anions				As (µg/l)	B (µg/l)	Cu (µg/l)	Fe (µg/l)	Cr (µg/l)	Cr-VI (µg/l)	Mn (µg/l)	Se (µg/l)	Zn (µg/l)
						Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K (mg/l)	SO ₄ (mg/l)	Cl (mg/l)	NO ₃ (mg/l)									
Well 3	1/26/2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 3	2/3/2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 3	2/9/2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 3	2/17/2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 3	2/23/2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well 3	3/3/2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Appendix B
Population Projections, Marsha Sue Lustig,
City Senior Planner

City of Cotati

Population Projections

Year	Population
2010	7,711
2011	7,788
2012	7,866
2013	7,945
2014	8,024
2015	8,105
2016	8,186
2017	8,268
2018	8,350
2019	8,434
2020	8,518
2021	8,603
2022	8,689
2023	8,776
2024	8,864
2025	8,953
2026	9,042
2027	9,132
2028	9,224
2029	9,316
2030	9,409

Reference: Marsha Sue Lustig, Senior City Planner

Note: Based on 1 percent increase in population 2005 through 2030.