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.