San Joaquin Valley Groundwater Basin
Cosumnes Subbasin

- Groundwater Basin Number: 5-22.16
- County: Sacramento, San Joaquin
- Surface Area: 281,000 acres (439 square miles)

Basin Boundaries and Hydrology

The San Joaquin Valley comprises the southern portion of the Great Valley Geomorphic Province of California. The Great Valley is a broad structural trough bounded by the tilted block of the Sierra Nevada on the east and the complexly folded and faulted Coast Ranges on the west. The Cosumnes Subbasin is defined by the areal extent of unconsolidated to semiconsolidated sedimentary deposits that are bounded on the north and west by the Cosumnes River, on the south by the Mokelumne River, and on the east by consolidated bedrock of the Sierra Nevada Mountains.

The Cosumnes Subbasin is bounded on the south and southwest by the Eastern San Joaquin Subbasin and on the north to northwest by the South American Subbasin of the Sacramento Valley Groundwater Basin. The subbasin drains westward through three major rivers namely, the Cosumnes on the north, Dry Creek in the middle of the basin, and the Mokelumne River on the south. A large surface water body, the Camanche Reservoir, is located along a portion of the Mokelumne River in the southeast part of the subbasin.

Annual precipitation within the subbasin ranges from approximately 15 inches on the west to about 22 inches on the east.

Hydrogeologic Information

Water Bearing Formations

The Cosumnes subbasin aquifer system is comprised of continental deposits of Late Tertiary to Quaternary age. These deposits include Younger Alluvium, Older Alluvium, and Miocene/Pliocene Volcanics. The cumulative thickness of these deposits increases from a few hundred feet near the Sierra Nevada foothills on the east to over 2,500 feet along the western margin of the subbasin.

Younger Alluvium: This unit includes Recent stream channel deposits and dredge tailings. The maximum combined thickness of all the younger alluvial units is about 100 feet. Calculated specific yield values range from about 6 percent in the alluvial deposits to about 12 percent in the stream channel deposits (Olmstead and Davis 1961).

Minor exposures of dredge tailings are present along the Cosumnes and Mokelumne Rivers at the eastern margin of the subbasin. They consist of windrows of gravel, cobbles, boulders, sand, and silt resulting from gold dredging operations. The tailings are highly permeable, but well construction is complicated by the presence of cobbles and boulders.

The stream channel deposits include sediments deposited in the channels of active streams as well as overbank deposits and terraces of those streams. They occur along the Sacramento, Cosumnes, and Mokelumne Rivers and their major tributaries and consist primarily of unconsolidated silt, fine- to medium-grained sand, and gravel. Sand and gravel zones in the younger alluvium are highly permeable and yield significant quantities of water to wells.

Older Alluvium: This unit consists of loosely to moderately compacted sand, silt, and gravel deposited in alluvial fans during the Pliocene and Pleistocene. A number of formational names have been assigned to the older alluvium, including the Modesto and Riverbank Formations (Helley and Harwood, 1985), Victor Formation and Laguna Formation (Olmstead and Davis, 1961), and Victor Formation, Laguna Formation, Arroyo Seco Gravels, South Fork Gravels, and Fair Oaks Formation (DWR, 1974). The older alluvial units are widely exposed between the Sierra Nevada foothills and overlying younger alluvial units near the axis of the Sacramento Valley. Thickness of the older alluvium is about 100 to 650 feet. It is moderately permeable. The calculated specific yield of these deposits is approximately 6 to 7 percent (Olmstead and Davis 1961).

Miocene/Pliocene Volcanics: This unit consists of the Mehrten Formation, a sequence of fragmental volcanic rocks, which crops out in a discontinuous band along the eastern margin of the basin. It is composed of intervals of "black sands," stream gravels, silt, and clay interbedded with intervals of dense tuff breccia. The sand and gravel intervals are highly permeable and wells completed in them can have high yields. The tuff breccia intervals act as confining layers. Thickness of the unit is between 200 and 1,200 feet. Specific yields for this unit range from about 6 to 12 percent (O&D 1961).

Groundwater Level Trends

A review of 23 long-term hydrographs dating back to the early 1960s shows a fairly consistent pattern of water level trends through much of the subbasin. Wells outside the influence of the Cosumnes River declined from the mid-1960s to about 1980 on the order of 20 to 30 feet. From 1980 through 1986, water levels recovered on the order of 5 to 10 feet. During the 1987 through 1992 drought, water levels once again declined by 10 to 15 feet. From 1993 through 2000, much of the basin recovered by 15 to 20 feet, leaving water levels at the about the same elevation or slightly higher than they were in the mid-1980s. One exception is along the eastern subbasin margin where water levels remained fairly constant during the 1993 through 2000 recovery period. Prior to that, those eastern wells behaved similarly to other wells in the subbasin.

Groundwater Storage

Groundwater Storage Capacity. Groundwater storage capacity is estimated to be on the order of 6,000,000 af based on data from DWR 1967 and DWR 1974. This estimate is based on a surface area of 281,000 acres, an aquifer thickness of 290 feet (20 to 310 feet depths), and an average specific yield of 7.4 percent.

Groundwater in Storage. There are no published estimates of groundwater in storage available.

Groundwater Budget (Type A)

Montgomery Watson Consultants (Montgomery Watson 1993) developed a groundwater model for Sacramento County. A subsequent model was developed for San Joaquin County by Montgomery Watson as part of the American River Water Resources Investigation (USBR 1996). Based on running these models together and with data updates, Bookman-Edmonston/Navigant Consulting provided estimates of several groundwater budget components for an area generally corresponding to the Cosumnes Subbasin. The data represent an average budget for the period from 1970 to 1995. Basin inflows include natural and applied water recharge, which total 269,518 af. Subsurface inflow and outflow are not known specifically, but the model indicates that there is a net subsurface outflow of 144,551 af. Other groundwater outflows include annual urban extraction of 35,063 af, and agricultural extraction calculated by the model of 94,198 af.

Groundwater Quality

Characterization. Groundwater contained in the water-bearing deposits underlying most of Sacramento County is of excellent mineral quality for irrigation and domestic use (DWR 1974). Within the subbasin, calcium-magnesium and calcium-sodium bicarbonate water types are most common (DWR 1974 and Sorenson 1981). Groundwater from wells in the San Joaquin County portion of the subbasin typically show specific conductance values of less than 500 μmhos/cm (Sorenson 1981). Based on analyses of 20 water supply wells in the subbasin, TDS ranges from 140 to 438 mg/L and averages about 218 mg/L.

Impairments. No significant impairments were identified.

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	26	0
Radiological	17	0
Nitrates	30	0
Pesticides	22	1
VOCs and SVOCs	22	0
Inorganics – Secondary	26	21

[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	Well yields in the fresh water-bearing formations underlying the basin range (in general) from about 650 to 1,500 gpm	
	Total depths (ft)	
Domestic	Range: 10 – 812	Average: 261 (Based on 832 well completion reports)
Municipal/Irrigation	Range: 130 – 934	Average: 473 (Based on 48 well completion reports)

Active Monitoring Data

Agency	Parameter	Number of wells /measurement frequency
DWR and cooperators	Groundwater levels	71 wells semiannually 4 wells monthly
DWR and cooperators	Miscellaneous water quality	13 wells every two years
Department of Health Services and cooperators	Title 22 water quality	72 wells annually

Basin Management

Groundwater management:	San Joaquin County adopted a groundwater management ordinance in 1996. Sacramento Metropolitan Water Authority adopted an AB 3030 plan on November 14, 1994. Water agencies that are part of the authority and active in the Cosumnes subbasin are denoted by a *. Northeastern San Joaquin County Groundwater Banking Authority adopted a groundwater management plan.
Water agencies	
Public	Galt ID*, Jackson Valley ID, North Delta WA, North San Joaquin WCD, Omochumne-Hartnell WD*, Clay WD*, Amador WA, Calaveras County WD, City of Galt Service Area*, Rancho Murieta CSD*, Sacramento County WD, Sacramento County MUD, North San Joaquin WCD
Private	

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Errata

Updated groundwater management information and added hotlinks to applicable websites. (2/03/06)