

Sacramento Valley Groundwater Basin, Sutter Subbasin

- Groundwater Basin Number: 5-21.62
- County: Sutter
- Surface Area: 234,400 acres (366 square miles)

Boundaries and Hydrology

The Sutter Subbasin lies in the eastern central portion of the Sacramento Valley Groundwater Basin. It is bounded on the north by the confluence of Butte Creek and the Sacramento River and Sutter Buttes, on the west by the Sacramento River, on the south by the confluence of the Sacramento River and the Sutter Bypass, and on the east by the Feather River. The subbasin lies entirely within the Sacramento River watershed with the most notable hydrological features being the Sacramento and Feather Rivers. Other notable features are Tisdale Bypass and Sutter Bypass. The manmade Sutter Bypass acts as a flood control overflow for the Sacramento River.

The topography of the subbasin is comprised primarily of the gentle flatlands of the Sacramento River Valley. The only prominent topographic feature near the subbasin is the Sutter Buttes at its northern boundary, a Pliocene volcanic plug which rises abruptly 2,000 feet above the surrounding valley floor.

Average precipitation ranges from 17 to 21 inches in the subbasin. Annual rainfall increases across the basin from the southwest to the northeast. (PMC, 1996).

Hydrogeologic Information

Water Bearing Formations

The geologic formations of the Sutter Subbasin include pre-Cretaceous metamorphic and igneous rocks of the Sierra Nevada block, which extends beneath the valley fill overlain principally by Tertiary sedimentary formations derived from these and other rocks which are exposed in the Sierra Nevada to the east. The sedimentary rocks are of both marine and continental origin and are frequently interbedded with tuff-breccias. Volcanic rocks are also represented in the area in and around Sutter Buttes, which are erosional remnants of an extinct Pliocene volcano. Only the sedimentary rocks can be considered as being water bearing to any appreciable degree.

The Sutter Subbasin aquifer system is comprised of continental deposits of Quaternary (Recent) to Late Tertiary (Miocene) age. The cumulative thickness of these deposits increases from a few hundred feet near the Sierra Nevada foothills on the east to over 2,000 feet along the western margin of the basin (DWR 1978). Groundwater and geology information for this aquifer system was referenced from Olmsted and Davis 1961, DWR 1978, Page 1986, and B-E 1992.

Holocene Stream Channel and Floodplain Deposits. These alluvial materials occur as coarse sand and gravel along present stream channels of

the Yuba, Feather, and Sacramento Rivers. Coarser grained materials occur near streams with thicknesses up to about 100 feet. Both grain size and thickness decrease with increased distance from streams. These deposits are highly permeable and provide for large amounts of groundwater recharge within the subbasin. Well yields are reported in the range of 2,000 to 4,000 gpm.

Pleistocene Floodplain Deposits. These deposits occur as gravelly sand, silt, and clay from flood events along the Feather River and its tributaries. This unit overlies the Older Alluvium, underlies Quaternary Deposits, and ranges in thickness up to about 100 feet. These deposits provide a good medium for groundwater recharge, provided the groundwater can pass the lower contact with the Older Alluvium.

Pleistocene Victor Formation (Old Alluvium). Victor Formation ranges in thickness up to about 100 feet. This formation is comprised of Sierran alluvial fan deposits of loosely compacted silt, sand, and gravel with lesser amounts of clay deposits. The deposits occur as lenticular beds with decreasing thickness and grain size with increasing distance from the Yuba River and the foothills. Hardpan and claypan soils have developed to form an impermeable surface, but below this the Older Alluvium is moderately permeable and provides for most of the groundwater from domestic and shallow irrigation wells. Wells in the older alluvium have yields up to 1,000 gpm.

Pliocene Laguna Formation. This formation consists of compacted layers of sand, silt, and clay with hardpan in surface soils. In the subsurface, this formation has a thickness of about 300 feet but is estimated to be up to 1,000 feet along the valley axis. Although the occurrence of thin sand and gravel zones is common, many of them have reduced permeability due to cementation. This coupled with its fine-grained character, leads to an overall low permeability for the Laguna Formation. This formation is an important source of water for southeastern Sacramento Valley.

Miocene - Pliocene Mehrten Formation. The Mehrten Formation is a sequence of volcanic and volcanoclastic rocks of late Miocene through middle Pliocene age. The formation ranges in thickness from about 200 feet to over 1,000 feet along the axis of the valley. The Mehrten Formation is composed of two distinct units: One unit occurs as intervals of gray to black, well-sorted fluvial andesitic sand (up to 20 feet thick), with andesitic stream gravel lenses and brown to blue clay and silt beds. These sand intervals are highly permeable and wells completed in them can produce high yields; The second unit is an andesitic tuff-breccia that acts as a confining layer between sand intervals. This formation is also an important source of water for southeastern Sacramento Valley.

Oligocene - Miocene Valley Springs Formation. The Valley Springs Formation consists of gravel, sand, silt, and clay, siltstone, and tuffaceous beds which all contain rhyolitic material. This unit is reported to have a maximum thickness of about 200 feet. The Valley Springs Formation deposits typically have low permeabilities and therefore, yield only small quantities of water to wells.

Recharge Areas

DWR, Bulletin 118-6, indicates stream percolation, deep percolation of rainwater, and percolation of irrigation water are the principal sources of groundwater recharge in the Sacramento Valley.

Groundwater Level Trends

Current DWR records indicates groundwater levels have remained relatively constant. DWR hydrographs indicate a shallow-depth water table. Most groundwater levels in Sutter Subbasin tend to be within about 10 feet of ground surface. (DWR, 1992)

Groundwater Storage

Groundwater Storage Capacity. DWR's 1992 California Water Plan estimated a useable storage potential of five million-acre feet for Sutter County. There are no published reports, which specifically discuss the amount of groundwater in storage for the Sutter Subbasin.

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Groundwater Quality

Characterization. DWR maintains data for 38 water quality wells in the Sutter Subbasin. Data collected from these wells indicate a TDS range of 133 to 1,660 mg/l. The primary groundwater chemistry in the subbasin is calcium, magnesium, sodium, chloride, sulfate and bicarbonate, which may occur in any combination. Groundwater containing calcium magnesium bicarbonate or magnesium calcium bicarbonate can be found in the northwest portion of the subbasin (Bertoldi, 1991). Recent groundwater quality data collected indicates some wells drilled to various depths contain chemical elements and compounds in amounts that exceed drinking water quality safety and aesthetic standards. (PMC, 1996).

Impairments. Groundwater resources in some portions of the County have naturally occurring levels of minerals, which present some concerns. Groundwater quality is expected to deteriorate unless additional steps are taken to decrease the amounts of contaminants that exist in the ground and are applied to the ground. Steps also must be taken to decrease the ability of wells and other excavations to transmit contaminants from upper regions of the ground to lower regions that provide well water. (PMC, 1996).

Groundwater Budget (Type B)

As part of its water planning process, DWR estimated the following components of the ground water budget for the entire Sutter Subbasin. The calculations are for a 1990 level of development. Estimated inflows include natural recharge at 40,000 acre-feet and applied water recharge at 22,100 acre-feet. There was no artificial recharge. Estimated outflows include urban extraction at 3,900 acre-feet and agricultural extraction at 171,400 acre-feet.

Well Characteristics

Well yields (gal/min)		
Municipal/Irrigation	Range: 500-2000	Average: 728 (DWR, Bulletin 118-6, 1978)
Total depths (ft)		
Domestic	Range: 35-320	Average: 121 (496 Well Completion Reports)
Municipal/Irrigation	Range: 60-672	Average: 205 (131 Well Completion Reports)

Active Monitoring Data

Agency	Parameter	Number of wells /measurement frequency
DWR	Groundwater levels	2 wells semi-annually, 1 well monthly
Yuba County Sutter County		21 wells semi-annually 10 wells semi-annually
DWR	Mineral, nutrient, & minor element. Title 22	13 wells semi-annually
Department of Health Services (including co-operators)		115 wells annually

Basin Management

Groundwater management:	Reclamation District 1500, Draft AB3030 7/97. Feather WD adopted a groundwater management plan on November 8, 2005.
Water agencies	
Public	Sutter Mutual Water Company, Meridian Farms Water Company, Butte Slough Irrigation Company, Tisdale Irrigation District, Pelger Mutual Water Company, Sutter Extension Water District, Feather Water District, Oswald Water District, Tudor Mutual Water Company, Garden Highway Municipal Water Company
Private	Garden Highway Municipal Water Company, Reclamation District 70, Reclamation District 1660, Reclamation District 1500

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Errata

Updated groundwater management plan information. (1/20/06)