Santa Barbara Groundwater Basin

- Groundwater Basin Number: 3-17
- County: Santa Barbara
- Surface Area: 6,160 acres (9.6 square miles)

Basin Boundaries and Hydrology

The Santa Barbara Groundwater Basin is bounded on the north by the Mission Ridge fault, on the east by an administrative boundary between the Santa Barbara and Montecito basins, on the southeast by the Pacific Ocean, on the southwest by the Lavigia fault, and on the west by an unnamed fault. Consolidated sedimentary rocks of Tertiary age underlie the groundwater basin and compose the surrounding hills (Martin and Berenbrock 1986). These rocks are predominantly marine in origin and form the lower boundary of the groundwater basin, as well as much of the perimeter boundary of the basin. Sycamore, Mission, and San Roque Creeks, and Arroyo Burro (Nishikawa 1998) drain the surface of the Santa Barbara Groundwater Basin. Mission Creek flows southeast through the central portion of the Santa Barbara lowland and the City of Santa Barbara before discharging into the Pacific Ocean. Average annual rainfall ranges from 15 to 19 inches.

Hydrogeologic Information

Water Bearing Formations

The primary unconsolidated water-bearing rocks in this basin consist of Holocene alluvium and the Santa Barbara Formation (Dibblee 1966; Muir 1968; Toups 1974). The consolidated rocks are composed of older Tertiary age rocks, which are semiwater-bearing or nonwater-bearing. These rocks are nearly impermeable except for slightly permeable sandstones and where fractured (Martin and Berenbrock 1986).

Groundwater in the Santa Barbara Basin occurs mostly under partly confined and confined conditions (Todd 1978; Martin 1984). The average specific yield of the basin is estimated at 10 percent for unconfined portions of the basin (DWR 1999).

Alluvial Deposits. Holocene age alluvium consists of gravel, sand, silt, and clay with some cobbles and boulders. The maximum thickness of this alluvium is approximately 500 feet (Toups 1974).

Santa Barbara Formation. The Santa Barbara Formation, which is the main water-bearing unit, consists of massive, unconsolidated marine deposits of sand, silt, and clay and is of late Pliocene and early Pleistocene age (Martin 1984). The thickness ranges from 400 to 500 feet beneath the City of Santa Barbara up to 2,000 feet near the Lavigia fault and thins toward the north (Toups 1974).

Restrictive Structures

The Mission Ridge fault defines the north and northwest boundaries of the basin and significantly restricts groundwater from entering the basin from the north (DWR 1999). The Mesa fault is probably an effective barrier to

groundwater movement through the basin and particularly near the ocean (Hutchinson 1979; Martin 1984; Martin and Berenbrock 1986).

Recharge Areas

Natural recharge in the basin is derived from infiltration of precipitation, seepage from streams, and subsurface inflow from consolidated rocks (Martin 1984). Other recharge is derived from releases into Mission Creek from the Mission Tunnel, which brings water to the city from Gibraltar Reservoir (Mack 2001). The potential recharge of the Santa Barbara Groundwater Basin from controlled releases of surplus surface water to Mission Creek is estimated at 1,876 af/yr (Martin 1984). Some recharge comes from percolation of excess irrigation water (Mack 2001).

Groundwater Level Trends

Groundwater levels were at a high in 1959 but dropped to a low in 1964 because of below average precipitation and heavy groundwater extraction (Toups 1974). One hydrograph shows a drop in groundwater levels from a high of 22 feet in 1959 to a low of 18 feet below ground surface in 1965 (Toups 1974). Hydrographs show that water levels have been steadily increasing or have remained stable between 1990 and 1996 (DWR 1999). Water levels remained relatively stable between 1996 and 1997, primarily because of the wet winters of 1993 and 1995 (SBCWA 1999). Shallow wells have exhibited slight declines through the moderate winters of 1998 through 2000, whereas some deep wells have continued to show rises in water level (SBCWA 2001) and are currently at historic highs (Mack 2001).

Groundwater movement is generally southward toward the Pacific Ocean (Martin and Berenbrock 1986).

Groundwater Storage

Groundwater Storage Capacity. The total usable storage capacity was estimated to be 184,000 af in 1959 (Muir 1968). The estimate is based on the specific yield values of unconsolidated materials and on the water table conditions prevailing in the basin in 1959 (Todd 1978). Muir also assumed the usable aquifer volume to occupy a zone between the 1959 water table and the lowest recorded pumping level, thus assuming the usable aquifer thickness was equivalent to the zone of maximum recorded water level fluctuation (Todd 1978).

Groundwater in Storage. The available usable storage was estimated to be 10,000 af/yr for water year 1999 through 2000 (SBCWA 2001).

Groundwater Budget (Type A)

For the 1975 water year, SBCWA estimated natural recharge at 1,400 af/yr, and artificial recharge at 800 af/yr (Todd 1978). Subsurface inflow and outflow were estimated at 300 af inflow and 150 af outflow (Jones 1979). Agricultural water consumptive use was estimated at 170 af and municipal and industrial water consumptive use was estimated at 2,090 af (Jones 1979). Withdrawal of groundwater by pumpage is the largest outflow in the Santa Barbara Groundwater Basin. Pumpage for domestic, agricultural, and industrial uses is small in comparison with the quantity pumped for

municipal use (Martin 1984). Municipal pumpage ranged from approximately 500 af/yr to 1,500 af/yr for water years 1975 to 1977 (Todd 1978). Non-municipal pumpage has been less than 200 af/yr since 1964 (Martin 1984). Pumpage by the city of Santa Barbara ranged from a low of 81 af/yr in 1958 and 1959 to a high of 4,243 af in 1949, with an average of 1,866 af/yr during 1947 through 1979 (Martin 1984). Currently, no pumpage is occurring due to surplus surface supplies (Mack 2001; SBCWA 1999; SBCWA 2001).

Groundwater Quality

Characterization. The reported TDS content for groundwater in 1999 ranged from 520 to 960 mg/L (CSB 2000). Water from 3 public supply wells in the basin show an average TDS content of 588 mg/L with a range from 500 to 744 mg/L. The local groundwater is very hard, containing large amounts of calcium and magnesium ions (Todd 1978). The principal ions in the groundwater are calcium, magnesium, bicarbonate, and sulfate (Martin 1984). The reported electrical conductivity values ranged from 790 to 1464 μmhos in 1999 (CSB 2000).

Impairments. Seawater intrusion has affected the southern part of the basin. Recent samples taken from coastal wells have confirmed the presence of seawater intrusion, with chloride concentrations greater than 1,000 mg/L (SBCWA 2001). Dissolved hydrogen sulfide gas is found in groundwater near the Mesa fault (Toups 1974).

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	4	0
Radiological	3	0
Nitrates	4	0
Pesticides	3	0
VOCs and SVOCs	3	0
Inorganics – Secondary	4	3

[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 Production characteristics

	Well yields (gal/min)	
Municipal/Irrigation	Range: 486 – 625	Average: 556 (3 Well Completion Reports)
Total depths (ft)		
Domestic		
Municipal/Irrigation	Range: 240-646	Average: 514 (6 Well Completion Reports)

Active Monitoring Data

Agency	Parameter	Number of wells /measurement frequency
City of Santa Barbara	Groundwater levels	75 wells
U. S. Geological Survey	Miscellaneous water quality	36 wells
Department of Health Services	Title 22 water quality	5 wells

Basin Management

Groundwater management:	The City of Santa Barbara manages the basin.
Water agencies	
Public	City of Santa Barbara, Santa Barbara County Water Agency
Private	Los Positas MWC

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Errata

Changes made to the basin description will be noted here.