Santa Clara Valley Groundwater Basin, East Bay Plain Subbasin

- Groundwater Basin Number: 2-9.04
- County: Alameda, Contra Costa
- Surface Area: 77,800 acres (122 square miles)

Basin Boundaries & Hydrology

The East Bay Plain Subbasin is a northwest trending alluvial plain bounded on the north by San Pablo Bay, on the east by the contact with Franciscan Basement rock, on the south by the Niles Cone Groundwater Basin. The East Bay Plain Basin extends beneath San Francisco Bay to the west.

Numerous creeks including San Pablo Creek, Wildcat Creek, San Leandro Creek, and San Lorenzo Creek flow from the western slope of the Coast Ranges westward across the plain and into the San Francisco and San Pablo bays (CRWQCB 1999). Average precipitation in the subbasin ranges from about 17 inches in the southeast to greater than 25 inches along the eastern boundary, most of which occurs between the months of November and March.

Hydrogeologic Information

Water Bearing Formations

The East Bay Plain subbasin aquifer system consists of unconsolidated sediments of Quaternary age. Deposits include the early Pleistocene Santa Clara Formation, the late Pleistocene Alameda Formation, the early Holocene Temescal Formation, and Artificial Fill. The cumulative thickness of the unconsolidated sediments is about 1,000 feet (CRWQCB 1999). The average specific yield of the basin was calculated to be about 6% (DWR 1994).

Early Pleistocene Santa Clara Formation. The Santa Clara Formation consists of alluvial fan deposits inter-fingered with lake, swamp, river channel, and flood plain deposits. The formation ranges from 300 to 600 feet thick (CRWQCB 1999).

Late Pleistocene Alameda Formation. The Alameda Formation includes a sequence of alluvial fan deposits bounded by mud deposits on top and bottom of the formation. The formation was deposited primarily in an estuarine environment and ranges from 26 to 245 feet thick (CRWQCB 1999).

Early Holocene Temescal Formation. The Temescal Formation is an alluvial deposit consisting primarily of silts and clays with some gravel layers. The formation ranges from 1 to 50 feet thick (CRWQCB 1999).

Artificial Fill is found mostly along the bay front and wetlands areas and is derived primarily from dredging as well as quarrying, construction, demolition debris, and municipal waste. The fill ranges from 1 to 50 feet with the thickest deposits found nearer the Bay (CRWQCB 1999).

Groundwater Level Trends

Historic water levels in the deep (more than 500 feet) aquifer in the basin have varied between –10 to –140 feet mean sea level since the early 1950's. The low water level was reached in about 1962. Shallower aquifers have a much less pronounced water level decline. The historical low water level for aquifers at a depth of about 250 feet bgs since 1950 has been about –30 feet msl. Water levels rose about 5 feet per year between 1965 and 1980. Water levels have been rising continuously since then, but at a less rapid rate. As of 2000 water levels are very near surface in all aquifers.

Groundwater Storage

Groundwater Storage Capacity. Based on an analysis of 357 well logs, DWR (1994) calculated a total storage capacity in the subbasin of 2,670,000 acre feet. The analysis made calculation of storage for successive slices of the subbasin starting at a surface elevation of 350 above MSL and extending to a depth of 1,000 feet below MSL. The calculated average specific yield was 6%.

Groundwater in Storage. Based on 1993 groundwater elevations, DWR (1994) calculated to available storage to a depth of 1,000 below MSL at about 2,500,000 acre feet. However, due to concern over potential adverse impacts such as sea water intrusion, another calculation for the volume of water stored in sediments above MSL was determined at about 80,000 acre feet for 1993 (DWR 1994).

Groundwater Budget (Type A)

Groundwater extraction in the basin remained fairly constant over the last several years. The following budget is based on two studies by Muir (1993 and 1996). It is representative of current conditions in the subbasin. Annual basin inflows include natural recharge of 9,900 af, artificial/incidental recharge of 9,900 af, applied water recharge of 200 af, and subsurface inflow of 200 af. Annual basin outflows include urban extraction of 2,440 af, agricultural extraction of 910 af, and subsurface outflow of 13,500 af.

Groundwater Quality

Characterization. Calcium bicarbonate type groundwater occurs mostly in the upper 200 feet of the subsurface, while sodium bicarbonate waters are common from about 200 to 1,000 foot depths (Ken Muir personal communication 2001). Data from 29 wells in the subbasin indicates that TDS in the shallow zone ranges from about 360 to 1,020 mg/l, while TDS from 200 to 1000 feet below ground surface ranges from 310 to 1,420 mg/l from 13 wells (Muir 1997). TDS exceeded 500 mg/l in 15 of the 29 sampled wells.

Impairments. The San Francisco Regional Water Quality Control Board (1999) identified 13 distinct locations with as areas of major groundwater pollution. These were identified as having plumes of contamination greater than 1,000 feet in length. Most contamination is due to release of fuels and solvents. Most contamination appears to be restricted to the upper 50 feet of the subsurface (RWQCB 1999).

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	5	0
Radiological	4	0
Nitrates	5	0
Pesticides	3	0
VOCs and SVOCs	3	0
Inorganics – Secondary	5	2

[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: 100 – 1,000	Average: unknown (Muir pers comm 2001)
	Total depths (ft)	
Domestic	Range: 32-525	Average: 206 (20 Well Completion Reports)
Municipal/Irrigation	Range: 29-630	Average: 191 (62 Well Completion Reports)

Active Monitoring Data

Agency	Parameter	Number of wells /measurement frequency
EBMUD	Groundwater levels	29 wells semi-annually
Alameda County FC & WCD	Major ion	16 wells (9 in odd numbered years, 7 in even years)
Department of Health Services	Coliform, nitrates, mineral, organic chemicals, and radiological.	7 wells as required in Title 22, Calif. Code of Regulations

Basin Management

Groundwater management:	Entities in the basin have had preliminary discussions on groundwater management, but there is currently no compelling need and no groundwater management plans or ordinances are currently underway.
Water agencies	
Public	East Bay MUD, Alameda County FC & WCD.
Private	

References Cited

California Department of Water Resources. 1994. Ground Water Storage Capacity of a Portion of the East Bay Plain, Alameda County, California. 35 p.

California Regional Water Quality Control Board. 1999. East Bay Plain Groundwater Basin Beneficial Use Evaluation Report – Alameda and Contra Costa Counties, CA. 100 p.

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_____. 1996b. Groundwater Yield of the East Bay Plain Area, Alameda County, California.

Errata

Changes made to the basin description will be noted here.

Additional References

California Department of Water Resources. 1960. Intrusion of Salt Water into Ground Water Basins of Southern Alameda County. Bulletin No. 81. 44p.

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Figuers, S. 1998. Groundwater Study and Water Supply History of the East Bay Plain, Alameda and Contra Costa Counties, CA. 90 p.

Hickenbottom, K. and K.S. Muir. 1988. Geohydrology and Groundwater-Quality Overview, of the East Bay Plain Area, Alameda County, California – 205 (J) Report. 83 p. and Appendix.

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