

Downtown San Francisco Groundwater Basin

- Groundwater Basin Number: 2-40
- County: San Francisco
- Surface Area: 7,600 acres (12 square miles)

Boundaries & Hydrology

The Downtown San Francisco groundwater basin is located on the northeastern portion of the San Francisco peninsula, and is one of five basins in the eastern part of San Francisco each separated from the other by bedrock ridges (Phillips et.al. 1993). The groundwater basin is made up of shallow unconsolidated alluvium underlain by less permeable bedrock within the watershed located east and northeast of the Twin Peaks area including Nob and Telegraph Hills to the north and Potrero Point to the east, as well as most of the downtown area. Bedrock outcrops along much of the ridge form the northeastern and southern basin boundaries. In general, groundwater flow is northeast, following the topography. Average precipitation within the basin is approximately 24 inches per year.

Hydrogeologic Information

Water Bearing Formations

The primary water-bearing formations are comprised of unconsolidated sediments and include alluvial fan deposits, beach and dune sands, undifferentiated alluvium and artificial fill. The oldest of these sediments are Pleistocene in age (Knudsen et.al. 2000). Water-bearing formations are thickest beneath the central and northeastern portion of the basin (between Interstate 80 and Chinatown) where bedrock is encountered at less than 300 feet below ground surface. In much of the basin bedrock is encountered at less than 200 feet below ground surface (Phillips et.al. 1993). Bedrock underlying the basin consists of consolidated rocks of the Franciscan Complex (Schlocker 1974).

Groundwater Recharge

Groundwater recharge to the groundwater basin occurs from infiltration of rainfall, landscape irrigation, and leakage of water and sewer pipes. Recharge to the Downtown San Francisco groundwater basin was estimated to be 5,900 ac-ft per year. Recharge due to leakage from municipal water and sewer pipes accounted for about half of the total recharge of groundwater in the San Francisco area (Phillips et.al. 1993).

Groundwater Level Trends

No published water level data showing long-term groundwater level trends was found for the basin, however measurements taken from 1988 to 1992 indicate little to no seasonal fluctuations in groundwater levels.

Groundwater Storage

No published groundwater storage information was found for the basin.

Groundwater Budget

A hydrologic routing model was developed by the USGS to estimate groundwater recharge on the San Francisco peninsula. The model was based on land use zones in the region. A detailed discussion of the groundwater budget can be found in the report by Phillips et.al. (1993).

Groundwater Quality

Characterization. No published groundwater quality information was found for the Downtown basin, however limited water quality data for the surrounding basins is available and shows that the general character of groundwater for all basins beneath the entire San Francisco peninsula is similar (Phillips et.al. 1993). Groundwater beneath the San Francisco peninsula is a mixed cation bicarbonate type, and considered generally “hard” (CaCO₃ concentrations between 121 and 180 mg/L). Concentrations of most major dissolved constituents are within the guidelines recommended by the U.S. EPA. Total dissolved solids vary from about 200 to over 700 ppm. Elevated concentrations of nitrate and chloride are common, especially at shallower depths (Phillips et.al. 1993).

Impairments. Groundwater within the Downtown basin is subject to high concentrations of nitrates and elevated chloride, boron and total dissolved solids concentrations. High nitrate levels are attributed to groundwater recharge from sewer pipe leakage and possibly to fertilizer introduced by irrigation return flows. Elevated chloride and TDS levels are most likely due to a combination of leaky sewer pipes, historic and current seawater intrusion, and connate water (Phillips et.al. 1993).

Well Characteristics

Well yields (gal/min)		
Municipal/Irrigation	Range: N/A	Average: N/A
Total depths (ft)		
Domestic	Range: N/A	Average: N/A
Municipal/Irrigation	Range: N/A	Average: N/A

Active Monitoring Data

Agency	Parameter	Number of wells /measurement frequency
	Groundwater Levels	N/A
	Water Quality	N/A

Basin Management

Groundwater management:

Water agencies

Public	San Francisco Water Department
Private	

References Cited

- Blake, M.C., Graymer, R.W., and Jones, D.L. 2000. *Geologic Map and Map Database of Parts of Marin, San Francisco, Alameda, Contra Costa, and Sonoma Counties, California*. U.S. Geological Survey Miscellaneous Field Studies MF 2337, Online Version 1.0. (available online at <http://geopubs.wr.usgs.gov/map-mf/mf2337/>) .
- Bonilla, M.G. 1998. Preliminary geologic map of the San Francisco South 7.5' quadrangle and part of the Hunters Point 7.5' quadrangle, San Francisco Bay area, California: A digital database. U.S. Geological Survey Open-File Report 98-354. (available online at <http://wrgis.wr.usgs.gov/open-file/of98-354/>)
- Knudsen, K.L. et.al. 2000. Preliminary Maps of Quaternary Deposits and Liquefaction Susceptibility, Nine-County San Francisco Bay Region, California: A Digital Database. U.S. Geological Survey Open-File Report 00-444. (available online at <http://geopubs.wr.usgs.gov/open-file/of00-444/>).
- Knudsen, K.L., Noller, J.S., Sowers, J.M., and Lettis, W.R. 1997. *Quaternary Geology and Liquefaction Susceptibility, San Francisco, California 1:100,000 Quadrangle: A digital database*. U.S. Geological Survey Open-File Report 97-715. (available online at <http://wrgis.wr.usgs.gov/open-file/of97-715/>)
- * Phillips, S.P., Hamlin, S.N., and Yates, E.B. 1993. *Geohydrology, Water Quality, and Estimation of Ground-water Recharge in San Francisco, California, 1987-92*. U.S. Geological Survey Water-Resources Investigations Report 93-4019. Prepared in cooperation with the San Francisco Water Department. 69 p.
- Schlocker, Julius. 1974. *Geology of the San Francisco north quadrangle, California*. U.S. Geological Survey Professional Paper 782. 109p.

* Denotes that the reference is a key one for the basin

Errata

Changes made to the basin description will be noted here.