Santa Cruz Purisima Formation Highlands Groundwater Basin

- Groundwater Basin Number: 3-21
- County: Santa Cruz
- Surface Area: 40,200 acres (63 square miles)

Basin Boundaries and Hydrology

The Santa Cruz Purisima Formation Highlands Groundwater Basin is defined by the geologic boundary of the Purisima Formation that occupies a significant portion of northeast Santa Cruz County. The area is primarily drained by Branciforte Creek on the west, Soquel and Aptos Creeks in the central portion, and Corralitos and Browns Creeks in the southeast. The basin does not include the basins lying along the coast. The northern basin consists of mountainous terrain and the southeastern basin consists of the highlands near Pajaro Valley. The basin serves as a forebay to the West Santa Cruz Terrace Basin to the west, the Soquel Valley Basin to the south, and the Pajaro Valley Basin to the southeast.

Branciforte Creek drains into the San Lorenzo River. Soquel and Aptos Creeks drain to the Pacific Ocean. Corralitos Creek drains into the Pajaro River. Average precipitation varies from 29 inches annually in the south to 41 inches annually in the north basin.

Hydrogeologic Information

Water Bearing Formations

The main water bearing unit of the basin is the mid to upper Pliocene (SWRB 1953) Purisima Formation. Muir (1980) places the age at late Miocene and Pliocene and states the unit is a sequence of moderately to poorly consolidated, silty to clean, very fine to medium-grained sandstone beds interbedded with siltstone. The formation extends southwestward outside of the basin into the coastal basins and under Monterey Bay (Muir 1980) and outcrops extensively in the Soquel and Aptos areas (Thorup 1981). The formation is also found along the Zayante Fault and the Corralitos Creek drainage (Johnson 1980).

The Purisima Formation has a regional dip to the southeast of 3 to 5 degrees (Muir 1980) near the coast. The northern and eastern portions of the basin formation have been disrupted, due to faulting, and vary in dip up to 15 degrees (Thorup 1981). Two northwest-trending "fingers" of the northeastern basin boundary are associated with two fault zones, the San Andreas Fault and the sub-parallel Zayante Fault. The formation is as thick as 2,000 feet (Johnson 1980). Muir (1980) states that the formation, in the northwest, is about 600 feet thick and about 1,000 feet thick near Soquel. In the northern portion of the basin, groundwater flows eastward from the western boundary (Muir and Johnson 1979) although Bader (1969) indicated this flow was negligible. The remaining groundwater flows toward Monterey Bay or southeastward toward Pajaro Valley (Muir and Johnson 1979).

Recharge Areas

Most of the groundwater in the Purisima Formation is confined except in the inland areas where recharge takes place (Muir 1980). Groundwater recharge takes place from percolation of rainfall and stream seepage (Muir and Johnson 1979).

Groundwater Level Trends

Bloyd (1981) produced a groundwater elevation map for April 1981, showing gradients away from ridges toward drainage areas and then gradients sloping toward Monterey Bay. This map did not show areas adjacent to the Pajaro Valley Basin.

Groundwater Storage

Groundwater Storage Capacity. Storage capacity in the Purisima Formation and basin is subject to interpretation of the varying thickness of the unit and transition areas of unconfined and confined conditions.

Groundwater in Storage. Thorup (1981) estimated the groundwater in storage in the Purisima Formation west of the Zayante Fault at 1.22 million af. This included coastal basins and did not include the northeastern portion of the basin. The estimate was based upon a saturated thickness, varying from 100 feet in the northwest to 800 feet in the east and specific yields varying from 12 percent to 25 percent, respectively. Removing the coastal area stored groundwater described as the "Hickey Area" (877 thousand af) leaves about 346 thousand af in the remaining Thorup study area.
A rudimentary estimate using a saturated thickness of 100 feet and a specific yield of 12 percent over 40,200 acres (basin area) would indicate 480,000 af of groundwater in storage.

Groundwater Budget (Type C)

Inflows to the Purisima Formation would include precipitation and stream seepage and a determination of subsurface inflows along the western boundary. Outflows would include overlying pumpage, flows through the formation for pumpage in the three major discharge areas, additional flows to the ocean where applicable, and migration of groundwater to the less permeable units in contact with the formation.

Groundwater Quality

Characterization. Johnson (1980) states the groundwater in north-central Santa Cruz County from sand and silt deposits is primarily of the calcium bicarbonate type. Johnson further states that the lithologies of the Tertiary units are similar, therefore, the groundwaters of the units do not have uniquely distinguishing features. Bader (1969) listed calcium and bicarbonate as major constituents in groundwater from the Purisima formation in the Soquel-Aptos vicinity with a total dissolved solids range of 300-600 parts per million. Three wells within the Santa Cruz Purisima Formation Highlands Groundwater Basin indicated a range of TDS from 380-560 mg/L with an average of 440 mg/L (DHS 2000).

Impairments. Groundwater from the Purisima Formation contains elevated levels of iron and manganese (Johnson 1980).

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	7	1
Radiological	3	0
Nitrates	6	0
Pesticides	10	0
VOCs and SVOCs	10	1
Inorganics – Secondary	7	6

[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: – 1-200	Average: 20
	Total depths (ft)	
Domestic	Range: - 61-833	Average: 300
Municipal/Irrigation		

Active Monitoring Data

Agency	Parameter	Number of wells /measurement frequency
Department of Health Services and cooperators	Groundwater levels	
	Miscellaneous water quality	
	Title 22 water quality	39 Varies

Basin Management

Groundwater management:	Scotts Valley WD adopted a groundwater management plan in 1994, Soquel Creek WD adopted a groundwater management plan in 1996.
Water agencies	
Public	Scotts Valley WD (portion), Soquel Creek WD (portion).
Private	Corralitos Ridge MWC, Jarvis Mutual Water System, Loma Alta MWC, Lagunita MWC, Rancho Soquel MWC.

References Cited

Bader, J. S. 1969. Ground-Water Data as of 1967, Central Coastal Subregion, California. Menlo Park: USGS. Open file report. 16p.

Bloyd, R. M. 1981. Approximate Ground-Water-Level Contours, April 1991, for the Soquel-Aptos Area, Santa Cruz County, California. USGS 81-680. 3p. plus map.

California Department of Health Services (DHS). 2000. California Water Quality Monitoring Database. Sacramento: Division of Drinking Water and Environmental Management. CD-ROM.

California State Water Resources Board (SWRB). 1953. Bulletin No. 5, Santa Cruz-Monterey Counties Investigation. 230p.

Johnson, M. J. 1980. Geology and Ground Water in North-Central Santa Cruz County, California. Menlo Park: Santa Cruz County Flood Control and Water Conservation District. USGS Water-Resources Investigations 80-26. 33p.

Muir, K. S. 1980. Seawater Intrusion and Potential Yield of Aquifers in the Soquel-Aptos Area, Santa Cruz County, California. Menlo Park: Soquel Creek County Water District. USGS Water-Resources Investigation 80-84. 29p.

Muir, K. S. and M. J. Johnson. 1979. Classification of Ground-Water Recharge Potential in Three Parts of Santa Cruz County, California. Menlo Park: Santa Cruz County Flood Control and Water Conservation District. USGS Water-Resources Investigation Open file report 79-1065.

Thorup, R. R. 1981. Groundwater Review of the Soquel-Aptos Area, Santa Cruz County, California. Monterey: Santa Cruz County Builders Exchange. 125p.

Additional References

HEA, A Division of J. H. Kleinfelder & Associates. 984. *Pajaro Basin Groundwater Management Study*. Association of Monterey Bay Area Governments.

Hickey, J. J. 1968. *Hydrogeologic Study of the Soquel-Aptos area, Santa Cruz County, California*. USGS. Open file report. 48p.

Rogers, T. H. (compiler). 1966. S*an Jose Sheet of Geologic Map of California*. California Division of Mines and Geology (CDMG). Scale 1:250,000.

Errata

Changes made to the basin description will be noted here.