Coachella Valley Groundwater Basin, Desert Hot Springs Subbasin

- Groundwater Basin Number: 7-21.03
- County: Riverside
- Surface Area: 101,000 acres (158 square miles)

Basin Boundaries and Hydrology

Desert Hot Springs Subbasin is located northwest of the Salton Sea and is within the Colorado Desert Region which is characterized by low precipitation (5.66 inches) and a wide range of temperatures. The subbasin underlies the northeastern portion of the Coachella Valley. The northeasterly boundary of the subbasin is the contact with non-permeable rocks of the Little San Bernardino Mountains from Little Morongo Canyon southeast to Thermal Canyon. The southwest boundary of the subbasin is defined by the contact with the semi-permeable rocks of the Indio Hills along with the Banning and Mission Creek faults.

The Mission Creek Fault forms the boundary from the Little Morongo Canyon southeast to Pushawalla Canyon in the Indio Hills. The semi-water bearing rocks of the Indio Hills border the subbasin from the Mission Creek Fault east to the Indio Hills Fault. The Banning-Mission Creek Fault separates the Desert Hot Springs Subbasin from the Indio Subbasin beneath the alluvial debris cone between the Indio Hills and Mecca Hills.
Between the Indio Hills Fault and the Banning-Mission Creek Fault at the southeast end of the Indio Hills, the subbasin boundary is the contact between Holocene alluvium and Plio-Pleistocene deposits. The subbasin contacts with the Mecca Hills to the southeast and the boundary is the southeastern side of Thermal Canyon from the Banning-Mission Creek Fault. The boundary continues easterly along the southeast wall of a tributary wash to outcrops of crystalline basement rock of the Little San Bernardino Mountains near Interstate 10 (CVWD 2000).

Hydrogeologic Information

Water Bearing Formations

The primary water-bearing materials in the subbasin are relatively undisturbed and unconsolidated late Pleistocene and Holocene alluvial fan deposits, principally the Ocotillo Conglomerate; a Pleistocene aged thick sequence of poorly-bedded, coarse sand and gravel (CVWD 2000). These deposits underlie the Dillon Road Piedmont Slope, which is higher in elevation than the central plain of the Coachella Valley and is actively being deposited by runoff and erosion from the Little San Bernardino Mountains. Thickness of the water bearing deposits is estimated to be in excess of 700 feet and the majority of groundwater is probably unconfined. (DWR 1964). Due to lack of development within the subbasin, groundwater and other hydrologic data are sparse except for the Miracle Hill area where development is greater due to the thermal waters that supply resorts. These hot thermal waters occur near active faults such as the Mission Creek fault. In the Miracle Hill area, more than 130 water wells have been drilled and approximately half of these were active in 1961 and pumped water for the hot water spas (DWR 1964). Many of these wells or replacement wells are still active (MSWD, 2000).

Restrictive Structures

The Desert Hot Springs Subbasin is in the northwestern part of a great structural trough that includes the Gulf of California. The northwest trending Mission Creek and Banning faults, along with the Indio Hills fault are the major groundwater barriers in the subbasin. Smaller, related faults parallel these larger faults and all act as barriers in various degrees to groundwater movement. Direction of groundwater movement varies within the subbasin because of these structural controls imposed upon it, however flow is generally southeastward toward the Mecca Hills-Thermal Canyon area (DWR 1964).

Recharge Areas

Seasonal runoff draining from the Little San Bernardino Mountains recharges the subbasin by percolating through the underlying water bearing coalescing alluvial fan deposits. Surface runoff, from high precipitation or snow-melt, is contained by intermittent creeks that discharge into the subbasin (DWR 1964).

Groundwater Level Trends

In 1961depth to water ranged from 12 feet below ground surface near the Mission Creek Fault to over 300 feet southeast of Miracle Hill (DWR 1964). Water level data was sparse in most areas within the subbasin except the Miracle Hills, where the water table is declining because of use by resorts. Water level data in the other areas of the subbasin suggest that the water table remained stable (DWR 1964).

The 1964 synopsis of groundwater level trends is probably still relevant to current basin conditions. Presently, the subbasin is still underdeveloped due to high levels of TDS and most of the groundwater extraction is in the Miracle Hill Area where water levels are still in decline.

Groundwater Storage

Groundwater Storage Capacity. DWR Bulletin 108 (1964) published calculated groundwater storage capacity for Desert Hot Springs at 4,100,000 acre-feet. This is based on specific yields determined from driller's log and capacity to store groundwater between 1935-1936 high ground water elevations and 1,000 feet below the ground surface.

Groundwater in Storage. DWR (1964) calculated the groundwater in storage values for the saturated thickness 20 feet below the water table at 172,000 acre-feet for the entire subbasin in 1961. This value may have declined slightly due to hot groundwater extraction in the Miracle Hill resort area.

Groundwater Budget (Type-C)

Not enough data exist to compile a detailed groundwater budget for the subbasin. Little groundwater extraction data is reported or made public at this time. Due to the lack of groundwater management of this subbasin a water budget cannot be given. Groundwater extraction values of thermal waters for the resorts and spas are not in a known published form. Average seasonal tributary runoff to the subbasin was estimated to be 2,900 acre-feet (DWR 1964).

Groundwater Quality

Characterization. Sodium sulfate type groundwater exists throughout the subbasin based on 1968 to 1974 chemical analyses. TDS values were high and ranged from 800 to 1000 mg/l. Chloride levels of 100 to 150 mg/l were also noted (USGS 1978).

Impairments. High concentrations of TDS exist in the groundwater throughout the subbasin which limits agricultural or domestic water resources for the valley (CVWD, 2000). Groundwater adjacent to the Mission Creek fault and in the Miracle Hill area of the subbasin contains the largest amounts of sodium and sulfate ions and have abnormally high temperatures (DWR 1964).

Hot water wells, by the city of Desert Hot Springs, in the subbasin along the Mission Creek Fault, have groundwater temperatures on average of 118°F (DWR 1964).

Gypsum, which is a significant source of sulfate, is present in the exposures of the Mission Creek Fault and in the semi-water bearing materials of the Indio and Mecca Hills. This would be a possible source of the sulfate ions in the ground water within the subbasin (DWR 1964).

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	0	0
Radiological	1	0
Nitrates	1	0
Pesticides	1	0
VOCs and SVOCs	1	0
Inorganics – Secondary	0	0

[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 Characteristics

	Well yields (gal/min)	
Municipal/Irrigation	Range: 5 to 2500	Average yield: 985 (18 well completion reports)
	Total depths (ft)	
Domestic	Range: 300-845	Average Depth: 532 (18 well completion reports
Municipal/Irrigation	Range: 192 – 520	Average Depth: 422 (15 well completion reports)

Active Monitoring Data

Agency	Parameter	Number of wells /measurement frequency
CVWD	Water Level	10 to 15 (Tri-annually)
Department. of Health Services	Title 22 Water Quality	2/As required
Riverside County Environmental Services	Hot water wells water quality for bacteria (Resorts)	Randomly selected/Semi-annually

Basin Management

Groundwater management:	The Coachella Valley Water District is in the process of drafting a comprehensive groundwater management plan. The Desert Hot Springs Subbasin is not adjudicated and no formal plan is on record. Part of Desert Hot Springs Subbasin falls under the jurisdiction of the Mission Springs Water District. However, due to the undesirable character of water quality a groundwater management plan is lacking. Status of metering of hot water wells is unknown and unregulated for the hot water resort industry. Coachella Valley Water District monitors selected wells for water levels. These representative wells are used for CVWD's grid network used to track groundwater levels throughout the Coachella Valley.
Water agencies	
Public	Coachella Valley Water District, Mission Springs Water District, Desert Water Agency.
Private	

References Cited

Bigley, Steve. 2000. Coachella Valley Water District. Telephone conversation with D.A. Gamon (California Department of Water Resources). October 31.

California Department of Water Resources (DWR). 1964. Coachella Valley Investigation. Bulletin 108. 145 p. 13 plates.

Coachella Valley Water District. 2000. Engineer's Report on Water Supply and Replenishment Assessment 2000/2001. 46 p.

Mission Springs Water District. 2000. Mission Springs Water District Urban Water Management Plan 2000.

Swain, L.A. 1978. Predicted Water-Level and Water-Quality Effedts of Artificial Recharge in the Upper Coachella Valley, California, Using a Finite-Element Digital Model. U.S. Geological Survey Water Resources Investigations 77-29. 54 p.

Additional References

Allen, C.R. 1957. San Andreas Fault Zone in San Gorgonio Pass, Southern California Geological Society of America Bulletin. V68. No.3. pp. 315-350.

_______. 1979 Coachella Valley Area Well Standards Investigation. Southern District Memorandum Report. 40 p.

Dibblee, T.W., Jr. 1954. Geology of the Imperial Valley Region, California. California Department of Natural Resources, Division of Mines. Bulletin 170. Plate 2.

Dutcher, L.C., and Bader, J.S. 1963. Geology and Hydrology of Agua Caliente Spring, Palm Springs, California. U.S. Geological Survey Water Supply Paper 1605. 43 p.

Mendenhall, W.C. 1909. Ground Waters of the Indio Region, California. United States Geological Survey Water Supply Paper 225.

Planert, Michael, and John S. Williams. 1995. Ground Water Atlas of the United States – Segment 1 California Nevada. U. S. Geological Survey Hydrologic Investigations Atlas 730-B.

Tyley, S.J. 1974. Analog Model Study of the Ground-Water Basin of the Upper Coachella Valley, California. U.S. Geological Survey Water Supply Paper 2027.

Errata

Changes made to the basin description will be noted here.