El Mirage Valley Groundwater Basin

- Groundwater Basin Number: 6-43
- County: San Bernardino
- Surface Area: 75,900 acres (119 square miles)

Basin Boundaries and Hydrology

The El Mirage Valley Groundwater Basin underlies Swarthout Valley in the San Gabriel Mountains and extends northwards beneath El Mirage Valley along the western border of central San Bernardino County. Elevation of the valley floor ranges from 2,833 feet above mean sea level at El Mirage (dry) Lake to about 6,000 feet near the community of Wrightwood in Swarthout Valley. The basin is bounded by nonwater-bearing rocks of the of the Shadow Mountains on the north, Adobe Mountain and Nash Hill on the northwest, and the San Gabriel Mountains on the south. Alluvial drainage divides extending from the San Gabriel Mountains define the western and eastern boundaries of the basin. The neighboring San Gabriel Mountains rise to an elevation of about 8,500 feet, and Silver Peak in the Shadow Mountains attains an elevation of 4,118 feet. El Mirage Lake occasionally inundates about 4.5 square miles of El Mirage Valley and overlies the northcentral part of the basin (DWR 1964; Bookman-Edmonston 1994).

Annual average precipitation ranges from about 4 to 6 inches in the vicinity of El Mirage Lake and increases to about 28 to 32 inches in the Swarthout Valley over the southern part of the basin. Surface runoff is derived chiefly from melting snow and rainfall in the San Gabriel Mountain and drains north towards El Mirage Lake by way of Sheep Creek (Rogers 1967).

Hydrogeologic Information

Water Bearing Formations

Quaternary alluvium forms the major water-bearing material within the basin and includes unconsolidated younger alluvial deposits and underlying unconsolidated to semi-consolidated older alluvial deposits. Maximum thickness of the alluvium is at least 392 feet (DWR 1964).

Restrictive Structures

The northwest-trending Mirage Valley fault, located in the northern part of the basin, may impede the movement of groundwater (Bookman-Edmonston 1994). The San Andreas fault cuts alluvium deposited in Swarthout Valley, but it is unknown whether or not the fault is a barrier to groundwater movement.

Recharge and Discharge Areas

Recharge to the basin is derived chiefly from the percolation of surface runoff through alluvial deposits at the mouth of Sheep Creek. Groundwater moves northwards, as does surface flow, towards El Mirage Lake (DWR 1964).

Groundwater Level Trends

During 1918 through 1999, groundwater levels generally declined throughout most of the basin. Groundwater levels in two wells approximately 1 mile south of the community of Wrightwood in Swarthout Valley, were measured at about 205 feet below the surface in the spring of 1991 and 265 feet below the surface in the fall of 1993. In the southern half of the El Mirage Valley at the mouth of Sheep Creek, water levels declined by about 2 feet during 1972 through 1992; depth to water at this location ranged between 6 and 17 feet. Further north in the eastern portion of Mirage Valley, groundwater levels declined by about 56 feet during 1975 through 1999, with depth to water ranging between 385 and 440 feet. In the western portion of the valley, water levels declined by about 7 feet during 1992 through 1998, and depth to water ranged from about 302 and 309 feet.

Groundwater levels in the northern half of the El Mirage Valley near the eastern boundary, declined by about 41 feet during 1950 through 1986, with a depth to water ranging between 95 and 142 feet. Near the western boundary, water levels declined by about 18 feet during 1974 through 1986, with depth to water ranging between about 77 and 106 feet. In the northcentral part of the valley, water levels in one well declined about 3 feet during 1962 through 1999, and depth to water ranged between 26 and 43 feet. Along the north side of El Mirage Lake, water levels declined by about 40 feet during 1957 through 1969, and. depth to water ranged from about 33 to 72 feet. Water levels rose in the portion of the basin north of El Mirage Lake. During 1976 through 1986, water levels at one well rose by about 50 feet, with a depth to water ranging between 145 and 195 feet. At another well to the west, water levels increased by about 8 feet during 1956 through 1980, and depth to water ranged from about 60 to 69 feet.

Groundwater Storage

Groundwater Storage Capacity. The total storage capacity of the basin is estimated at about 1,760,000 af (DWR 1975).

Groundwater in Storage. Unknown.

Groundwater Budget (A)

Estimated annual recharge to the basin is about 1,500 af (Bookman-Edmonston 1994). Groundwater discharge occurs primarily through the extraction by wells for urban and agricultural use, which was estimated to amount to about 5,300 af during water-year 1997-98 (MWA 1999). Subsurface outflow is estimated to be about 800 af/yr (Bookman-Edmonston 1994).

Groundwater Quality

Characterization. In Swarthout Valley and most of the southern part of the basin, groundwater is calcium bicarbonate in character. In the central part of the basin east of Gray Mountain and Black Mountain, groundwater is largely sodium sulfate-bicarbonate in character. Near El Mirage Lake and in the northern part of the basin, groundwater is sodium sulfate-chloride in character.

In general, groundwater of suitable quality for most beneficial uses is found in the southern half of the basin; whereas, water of marginal to inferior quality is found in the northern half. In the southern part of the basin, TDS content ranges from about 275 to 600 mg/L, with an average of about 425 mg/L. In the northern part of the basin, the quality of the groundwater is rated marginal to inferior for both domestic and irrigation purposes because of elevated concentrations of fluoride, sulfate, sodium, and TDS.

Impairments. In the northern half of the basin including the area near El Mirage Lake, the quality of the groundwater is rated marginal to inferior for both domestic and irrigation purposes because of elevated concentrations of fluoride, sulfate, sodium, and TDS. Fluoride concentrations range from 0.2 to 8.0 mg/L, with an average concentration of 0.9 mg/L. Sulfate concentrations range from 139 to 1,479 mg/L and average about 270 mg/L, with 21 of 35 wells at or above the MCL of 250 mg/L. Elevated sodium content in many wells precludes the use of groundwater for irrigation. In general, TDS content ranges from about 260 to 1,550 mg/L, but in the vicinity of El Mirage Lake can range as high as 15,700 mg/L.

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	19	0
Radiological	18	0
Nitrates	20	0
Pesticides	18	0
VOCs and SVOCs	17	2
Inorganics – Secondary	19	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: to 1,000 gal/min	Average: 230 gal/min (DWR 1975; Bookman-Edmonston 1994)
	Total depths (ft)	
Domestic		
Municipal/Irrigation		

Active Monitoring Data

Agency	Parameter	Number of wells /measurement frequency
U.S. Geological Survey	Groundwater levels	50
U. S. Geologic Survey	Miscellaneous water quality	3
Department of Health Services and cooperators	Title 22 water quality	21

Basin Management

Groundwater management:

Water agencies

Public	Mojave Water Agency
Private	

References Cited

Bookman-Edmonston Engineering Inc. 1994. Regional Water Management Plan; Mojave Water Agency, Apple Valley, California. 135 p.

California Department of Water Resources (DWR). 1964. Ground Water Occurrence and Quality Lahontan Region. Bulletin No.106-1. 439 p.

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Mojave Water Agency (MWA). 1999. Forth Annual Engineers Report on Water Supply, for Water Year 1997-1998. 77 p.

Rogers T. H., 1967. Geologic Map of California: San Bernardino Sheet. Olaf p. Jenkins Edition. California Department of Conservation, Division of Mines and Geology. Scale 1: 250,000.

Errata

Substantive changes made to the basin description will be noted here.