

Harper Valley Groundwater Basin

- Groundwater Basin Number: 6-47
- County: Kern, San Bernardino
- Surface Area: 410,000 acres (640 square miles)

Basin Boundaries and Hydrology

This groundwater basin underlies Harper Valley in western San Bernardino and eastern Kern Counties of the central Mojave Desert. This basin is bounded on the east by nonwater-bearing rocks of Fremont Peak, Black Mountain, the Gravel Hills, and the Mud Hills. The basin is bounded on the west by a combination of surface drainage divides, portions of the Harper, Kramer Hills and Lockhart faults, and nonwater-bearing rocks of the Kramer Hills and other low-lying basement hills. The basin is bounded on the south by nonwater-bearing rocks of Mount General, Iron Mountain, and the Waterman Hills, and by subsurface drainage patterns. The basin is bounded on the north by nonwater-bearing rocks of the Rand Mountains (DWR 1964; Jennings and others 1962; Rogers 1967)

Harper Valley is drained by numerous ephemeral streams towards Harper (dry) Lake (Jennings and others 1962; Rogers 1967). Floodwater from Grass Valley occasionally flows into Harper Valley via Black Canyon on the eastern side of the valley (DWR 1964). Average annual precipitation is about 5 inches and ranges from about 3 to 7 inches.

Hydrogeologic Information

Water Bearing Formations

Quaternary lacustrine and alluvial deposits, including unconsolidated younger alluvial fan material and unconsolidated to semi-consolidated older alluvium, can be water-bearing within the basin. The younger alluvium generally lies above the groundwater surface; whereas, the older alluvium extends beneath the groundwater table (DWR 1971). The alluvial deposits gradually thin and become interbedded with layers of silty clay of lacustrine origin toward the middle of the basin (Bader 1969; DWR 1964). The older alluvium is the most important water-bearing strata in the basin. Average yield of wells in the older alluvium is about 725 gpm with a maximum of 3,000 gpm (DWR 1975). Groundwater in the basin is generally unconfined, although confined conditions are found near Harper Lake (DWR 1971).

Restrictive Structures

The Lockhart, Mount General, and Harper Lake faults are partial barriers to groundwater flow (Mendez and Christensen 1997). A possible groundwater barrier, indicated by a change in the slope of the groundwater surface near Iron Mountain, may be caused by concealed faults (Stamos and Predmore 1995).

Recharge Areas

The natural recharge of the basin is mainly from infiltration of rainfall and percolation of surface runoff through alluvial fans around the edges of the

valley (Bader 1969; DWR 1964). Harper Valley also receives some groundwater underflow from the Middle Mojave River Valley and Cuddeback Valley Groundwater Basins (Bader 1969; DWR 1964; 1971). In general, groundwater flows toward Harper Lake, in the southern part of the valley (Bader 1969).

Groundwater Level Trends

A water-level hydrograph for a well in the northwestern part of the basin indicates a rapid rise of 34 feet in 1957. In this same well, the water level was relatively stable during 1974 through 1999, rising about 1.6 feet. Hydrographs for wells in the western portion of the basin indicate steady groundwater levels during 1992 through 1998. The hydrograph for a well in the southern part of the basin indicates that the groundwater surface elevation declined about 12 feet during 1992 through 1998. The hydrograph for a well in the southeastern part of the basin shows a drop of 17 feet from 1967 to 1999; whereas, a nearby well remained steady during 1987 through 1993. During 1996 through 1999, the water level in this well fluctuated widely. Groundwater flows dominantly toward Harper Lake (Bader 1969; DWR 1971).

Groundwater Storage

Groundwater Storage Capacity. The total storage capacity of the groundwater basin is estimated to be 6,975,000 af (DWR 1975).

Groundwater in Storage. For 1990, the groundwater in storage was estimated to be 101,500 (Bookman Edmonston 1994).

Groundwater Budget (Type A)

For the 1997-98 water year, replenishment is estimated to have been 36,300 af from natural sources, 487 af from spreading of treated waste water, and 1,383 af from spreading of imported water (MWA 1999). For 1997-98, extractions are estimated to have been 11,400 af urban use, 13,600 af for agricultural use, and 1,800 af for industrial and recreational use (MWA 1999). Average subsurface flow is estimated to be 2,000 af/yr in and 3,000 af/yr out (DWR 1967).

Groundwater Quality

Characterization. Groundwater in the northern portion of the basin is sodium sulfate-bicarbonate character with relative high concentrations of sodium, fluoride, and boron. Water from the western part of the basin is mostly sodium chloride character, has TDS contents ranging from 1,350 to 1,650 mg/L, and high concentrations of fluoride, boron, and sulfate. Water samples from beneath the west side of Harper Lake have uneven mixtures of sodium, chloride, bicarbonate, and sulfate, with TDS content as high as 2,391 mg/L. Groundwater from the southern part of the basin is of calcium-sodium sulfate character with high sulfate, boron, and TDS concentrations (DWR 1964). Water from 3 public supply wells has an average TDS content of 452 mg/L and a range of 179 to 784 mg/L.

Impairments. Water quality of the basin is generally marginal to inferior for irrigation and domestic uses because of high concentrations of boron,

fluoride, and sodium. The average concentration of boron is 1.76 mg/L with a range of 0.26 to 3.38 mg/L. Fluoride concentration is generally less than 1.5 mg/L with a range of 0.5 to 3.0 mg/L (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	2	0
Radiological	2	0
Nitrates	2	0
Pesticides	4	0
VOCs and SVOCs	4	0
Inorganics – Secondary	2	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 Production characteristics

Well yields (gal/min)		
Municipal/Irrigation	Maximum: 3,000	Average: 725 (DWR 1975)
Total depths (ft)		
Domestic		
Municipal/Irrigation		

Active Monitoring Data

Agency	Parameter	Number of wells /measurement frequency
USGS	Water levels	11/ annually
USGS	Miscellaneous water quality	3
Department of Health Services and Cooperators	Title 22 water quality	19

Basin Management

Groundwater management:	Part of this groundwater basin is contained within the area of the Mojave Basin adjudication and is managed by the Mojave Water Agency.
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Water agencies

Public	Mojave Water Agency
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Private	
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Additional References

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Errata

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