Deadman Valley Groundwater Basin, Surprise Spring Subbasin

- Groundwater Basin Number: 7-13.02
- County: San Bernardino
- Surface Area: 29,300 acres (45.8 square miles)

Boundaries and Hydrologic Features

Surprise Spring Subbasin underlies a portion of Deadman Valley within the boundaries of Twentynine Palms Marine Corps Base. The subbasin is bounded on the west by the Emerson fault and on the east by the Surprise Spring fault (Mendez and Christensen 1997). This subbasin is bounded on the north by a surface drainage divide between ephemeral streams draining toward Emerson (dry) Lake or Deadman (dry) Lake, and by contact with consolidated basement rocks at Hidalgo Mountain. The southern boundary is a structural barrier called the transverse arch, which lies between this subbasin and the Twentynine Palms Valley Groundwater Basin (Schaefer 1978; Mendez and Christensen 1997). Annual average rainfall ranges from about 4 to 6 inches.

Hydrogeologic Description

Water Bearing Formations

The productive water-bearing materials in this subbasin consist of unconsolidated to partly consolidated Miocene to Quaternary age continental deposits (Mendez and Christensen 1997). Gravity anomalies suggest that regional thickness of the continental deposits reaches 10,000 feet (Moyle 1984). However, wells in this subbasin reach a maximum depth of 900 feet without encountering bedrock.

The main productive water-bearing deposits are interbedded gravel, conglomerate, and sand deposited in alluvial fan systems, with less productive units including distal silts and clays deposited in playa settings (Schaefer 1978; BEE 1994).

Restrictive Structures

Two northwest-trending faults in this subbasin have water table elevations that step down toward the east, indicating that they are barriers to groundwater flow. The water table drops about 300 feet across the Surprise Spring fault (Mendez and Christensen 1997) and 25 to 50 feet across the Emerson fault (Lewis 1972). The transverse arch, an anticline that brings more consolidated deposits in its core toward the surface, acts as a partial barrier to groundwater flow to the south (Schaefer 1978; Mendez and Christensen 1997).

Recharge

Natural recharge in the subbasin is derived mainly from subsurface flow into the subbasin, with minor contributions from percolation of precipitation and percolation of ephemeral streamflow (Lewis 1972; Schaefer 1978; BEE 1994; Mendez and Christensen 1997). Subsurface inflow appears to come from the Ames Valley Groundwater Basin, and subsurface outflow appears to move toward Deadman Lake (dry) across the Surprise Spring fault.

Because this subbasin lies almost wholly within the Twentynine Palms U.S. Marine Corps Base boundaries, there is little to no human-derived recharge in this subbasin.

Groundwater Level Trends

Water levels stayed essentially constant during 1952 through 1996 in the western part of the subbasin and declined about 115 feet from 1952 through 1996 in the eastern part of the subbasin (Mendez and Christensen 1997). The general regional groundwater flow pattern is from west to east, although local faults and basement highs modify this basic pattern. Groundwater appears to enter the Surprise Spring Basin mainly as subsurface flow through the Emerson fault from the Ames Valley Groundwater Basin on the west and exit eastward through the Surprise Spring fault into Deadman Lake Subbasin (Mendez and Christensen 1997).

Groundwater Storage

Groundwater Storage Capacity. Total storage capacity for the subbasin was estimated by Schaefer (1978) using 13 percent specific yield and 200 feet of saturated thickness to be about 650,000 af.

Groundwater in Storage. Groundwater in storage was estimated at about 322,000 af by Lewis (1967); whereas, Schaefer (1978) estimated groundwater in storage as 600,000 af.

Groundwater Budget (Type C)

Schaefer (1978) reported annual urban extractions to be 2,600 af in 1975.

Groundwater Quality

Characterization. Groundwater is primarily sodium bicarbonate in character. TDS concentrations range from 141 mg/L in the southern part of the subbasin to 1,050 mg/L in the northern part. An average TDS concentration of 177 mg/L was reported for the Marine Corps's base supply wells. Electrical conductivity ranges from 225 to 300 μmhos in the Marine Corps's base production wells and 255 to 415μmhos in the northern part of the subbasin (Schaefer 1978). TDS content for 9 public supply wells in the subbasin ranges from 159 to 210 mg/L and averages about 187 mg/L.

Impairments. Portions of the subbasin show high TDS concentrations, and a fluoride concentration of 5.0 mg/L near Emerson Lake was reported. However, in the southern part of the subbasin, where Marine Corps Base supply wells are located, the average fluoride concentration is about 0.7 mg/L, below the recommended limit for fluoride of 1.4 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	9	0
Radiological	9	1
Nitrates	9	0

Pesticides	9	0
VOCs and SVOCs	9	0
Inorganics – Secondary	9	5

[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	
Total depths (ft)	
Domestic	
Municipal/Irrigation	Range: 210 – 690 (Schaefer 1979; Mendez and Christensen 1997)

Active Monitoring Data

Agency	Parameter	Number of wells /measurement frequency
USGS	Water Levels	26
USGS	Water Quality`	6
Department of Health Services	Title 22 Water Quality	9

Basin Management

Groundwater management:	The subbasin is managed by the Twentynine Palms Marine Corps Base. Hydrologic data has been collected and analyzed since the 1950s by the USGS and utilized to manage the water resources.
Water agencies	
Public	USGS (Data collection agency); NREA (USMC Base's Resource Management Agency)
Private	

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Errata

Changes made to the basin description will be noted here.