Groundwater salinity in the southern San Joaquin Valley

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ABSTRACT

Water salinity in the San Joaquin Valley is a function of depth, location, and stratigraphy. This paper presents a reconnaissance study of water salinity within Kern County, California, using chemical analyses from oil field produced water and water wells as well as geophysical logs. Log analysis indicates that the base of underground sources of drinking water (USDWs) (<10,000 mg/L) slopes from northwest to southeast. Lab analyses show that USDWs extend to depths as great as 1900 m (6233.5 ft) southeast of Bakersfield. This area receives the greatest amount of fresh water recharge from streams flowing westward from the Sierras. The marine Olcese Sand is more saline than the overlying and underlying aquifers and separates the aquifers into an upper and lower USDW. Log analysis also indicates a zone of higher salinity separating zones of lower salinity in this area. Salinities in the west are higher, and depths to base USDW are variable. Although waters in many sands in the western valley are more saline than 3000 ppm total dissolved solids (TDS), numerous wells contain waters between 3000 and 10,000 ppm at depths of less than 600 m (1968.5 ft), particularly in the nonmarine Tulare Formation. At North Belridge field, a salinity reversal is apparent below 2100 m (6890 ft). Waters above this depth are approximately 40,000 mg/L TDS, whereas water salinities below 2200 m (7218 ft) range from 10,000 to 32,000 mg/L. Extremely high salinities are found in several wells less than 30 m (98 ft) deep, primarily in the northwestern area. These may be perched aquifers or lie adjacent to unmapped agricultural drainage sumps and do not reflect salinities in the regional aquifer.

INTRODUCTION

The southern San Joaquin Valley (SJV) forms the southern half of California's Central Valley (Figure 1). Kern County lies in the southernmost end of the SJV and contains 68% of the known oil

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