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**INFLUENCE OF BASEMENT STRUCTURE ON SHALLOW AQUIFER
GEOCHEMISTRY IN THE RIO GRANDE RIFT, NORTHERN NEW MEXICO—
EXAMPLES FROM THE SANTA FE AND PEÑASCO EMBAYMENTS OF THE
ESPAÑOLA BASIN**

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The west-tilted half graben of the eastern Española Basin is structurally and topographically high along the base of the southern Sangre de Cristo Mountains, where Precambrian basement lies at shallow depths beneath Santa Fe Group rift sediments that form the region's primary aquifers. At the southern end of the basin, geophysical data indicate a shallow platform bounded on its northern side by a north-down, arcuate flexure herein named the Rancho Viejo hinge zone. Both the platform and the hinge zone have been folded into a north-plunging syncline. Whereas the Santa Fe Group is 250 ft or less across much of the Santa Fe platform, the upper surface of Oligocene-age volcanic and volcanoclastic strata, which forms the base of the Santa Fe Group aquifer, appears faulted and irregular, with as much as 650 ft of Santa Fe Group filling local paleovalleys eroded on the surface. The Oligocene surface is deformed dramatically across the Rancho Viejo hinge zone, where depth (and thickness of Ancha and Tesuque Formations) increases from 500 to 2,000 ft. Northwest of Santa Fe, north-striking faults in the Barrancos structure zone uplift blocks of Oligocene volcanic rocks, thinning the Santa Fe Group to about 3,000 ft. These basement structures produce a relatively thin Santa Fe Group aquifer in the Santa Fe embayment and have brought Precambrian and Oligocene rocks upward into range of shallow domestic and municipal water wells. Upward movement of deep, sodium- and arsenic-rich (up to 54 µg/L) ground water into the shallow aquifer near Santa Fe may be facilitated by basement faults and flexure-related fracturing of Oligocene volcanic rocks in the Rancho Viejo hinge zone. At the northern end of the basin, geologic mapping defines the Peñasco embayment as a bedrock low between the Picuris Mountains to the north and the Sangre de Cristo Mountains to the south. The Dixon Member (Tesuque Formation) and Picuris Formation fill the embayment to depths ranging from a few tens to several hundred feet, and form the valley's major aquifers. Sets of northeast-striking faults associated with the Picuris–Pecos fault system form horst and graben structures in the embayment that are oriented perpendicular to directions of regional ground water and surface water flow. The Peñasco horst, a major upthrown block of Precambrian crystalline rock, lies as much as 300 ft below land surface at Chamisal to as little as 30 ft below the Rio Santa Barbara. Locally elevated concentrations of naturally occurring uranium, arsenic, and fluoride are associated with the Peñasco horst, the Picuris–Pecos fault system, and/or tuffaceous sediments in the Picuris Formation. Anomalously high TDS, chloride, chloride/bromide ratios, and silica are also measured in shallow wells near horst-bounding faults.