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## **A PRELIMINARY HYDROGEOLOGIC FRAMEWORK OF THE SANTA FE AREA**

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The New Mexico Bureau of Geology is finalizing work on geologic, hydrologic, and geochemical studies in the southern Española Basin (SEB) and integrating the multiple data sets into a hydrogeologic framework for the region. This work, conducted in collaboration with the New Mexico Office of the State Engineer Hydrology Bureau, has progressed along several fronts: (1) geologic mapping; (2) hydrologic data collection and compilation; (3) geochemical sampling; (4) examination of lithologic data in exploration holes; and (5) structural and stratigraphic analysis of the Ancha Fm. Current efforts are focused on analyzing the spatial relations of ground water flow and geochemistry with geologic structures, formations and lithostratigraphic units. We use these relations to integrate data into a hydrogeologic framework.

Under NMBGMR's geologic mapping program (STATEMAP/EDMAP), and USGS efforts, most of the 7.5-minute quadrangles in the Española Basin are complete or in progress. Geologic maps are available at <http://geoinfo.nmt.edu/publications/maps/geologic/ofgm/home.html>. A geologic compilation map of the SEB is available as an open-file report, OFR-481, at <http://geoinfo.nmt.edu/publications/openfile/home.cfm>. Data on wells, water levels, aquifer hydraulic properties, and aquifer geochemistry are stored in an ACCESS database that facilitates integration of multiple data sets and will be available with final publications.

Mapping lithostratigraphic units has culminated in a basin depositional model of the late Oligocene- to Miocene-age Tesuque Fm (Santa Fe Group). These units include lithosomes S, B, and A.

Lithosome S was probably deposited on an alluvial fan by an ancestral Santa Fe River. Strata consist predominately of pebbly sand near the axis of this fan (approximately coinciding with the present Santa Fe River) that allows for high rates of westward ground water flow and infiltration of Santa Fe River surface water west of the San Isidro Crossing fault (SICF) – indicated by TDS, Ca/Na ratios, SO<sub>4</sub>/Cl ratios, and a water-table mound centered over the river channel. To the north, alluvial slope deposits of lithosome A interfinger westward with basin-floor deposits of lithosome B.

Relatively coarse sediment of the Pliocene-age Ancha Fm is partially saturated to the west, but only locally saturated along the southeast side of the SEB. Coarse-grained Ancha sediment filling paleovalleys cut into the Tesuque Fm support high-yield wells. High hydraulic conductivity values are derived from aquifer tests in paleovalley-fill and ancestral Santa Fe River deposits of the Ancha Fm, and in coarse-grained strata of lithosome S.

The structure of the SEB consists of a half graben to the north transitioning to a syncline south of the Santa Fe uplands that deforms both the shallow Santa Fe platform and the north-down, arcuate flexure named the Rancho Viejo hinge zone. The Barrancos structure, which includes the SICF and north-striking, basement highs NW of Santa Fe, impounds westward ground water flow. Impounded groundwater spills around the north end of the SICF. Localized bedrock jointing and dilation is inferred at intersecting faults between Santa Fe and upper Arroyo Hondo, and northwest of Agua Fria. In the latter, a northeast-trending monoclinical structure intersects the Barrancos structure and the syncline. These two locations coincide with strong upward ground water gradients and a noteworthy suite of dissolved constituents that includes elevated TDS, chloride, sulfate, sodium, calcium, and, northwest of Agua Fria, elevated arsenic.