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LITHOSOME S OF THE TESUQUE FORMATION: HYDROSTRATIGRAPHIC AND TECTONIC IMPLICATIONS OF A NEWLY DELINEATED LITHOSOME IN THE SOUTHERN ESPAÑOLA BASIN, NEW MEXICO

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Sedimentologic investigation of the Tesuque Formation in the southern Española basin supports the designation of a new lithosome called lithosome S. It is characterized by extensive channel deposits of pebbly sand with subordinate sandy gravel and sand. Floodplain deposits are present but comprise less than 5% of the strata observed in outcrop; however, these may become more abundant down-dip in the subsurface. The main differences of lithosome S ("S" standing for Santa Fe) compared to lithosome A (established by Cavazza, 1986) to the north are: 1) composition, 2) its paucity of silty sandstone extra-channel deposits, 3) its weaker consolidation and lesser degree of cementation, and 4) channel geometries. Lithosome S channels are stacked and generally comprised of thin, lenticular to broadly lenticular to planar beds with only minor ribbon forms; lithosome A channels are commonly thicker and have more discrete ribbon-like forms interbedded in extra-channel sediment. Whereas the gravel in lithosome A is typically greater than 90% granite south of the Santa Cruz River (with the remainder being quartzite and yellowish Paleozoic siltstone), lithosome S generally contains 35-65% granite, 10-30% Paleozoic clasts, 10-25% quartzite (including a distinctive black quartzite), and 1-5% chert. The sand fraction of lithosome S differs from lithosome A in that it has minor Paleozoic grains (estimated at 1-7%) and trace-2% chert and dark quartzite grains; these are much less abundant in lithosome A. Lithosome S grades laterally northward into lithosome A (over a distance of about 2 km) west of Tesuque Pueblo and just north of, and paralleling, the Rio Tesuque east of Tesuque Pueblo. Lithosome S grades upward into lithosome A (age of contact is ~13-14 Ma) north of Arroyo Calabasas. Near the mountain front, lithosome S is gradationally underlain by lithosome A (interpreted to be 25-28 Ma), which in turn is underlain by the Bishops Lodge Member (BLM) of the Tesuque Formation. Northeast of Bishops Lodge, the BLM is underlain by, and interfingers with, ~400 m of strata somewhat similar to lithosome S; these lower strata, however, differ from lithosome S above the BLM in that they have less than 5% quartzite and no or trace chert.

Lithosome S is significant for both geohydrologic and paleotectonic reasons. Its overall coarseness, channel connectivity, and lesser cementation likely make it a more productive aquifer than lithosome A. Lithosome S was deposited on an alluvial slope by a relatively large drainage that is interpreted to have crossed the present-day divide of the Santa Fe Range, so that it was sourced in the headwaters of the modern Pecos River. The tongue of lithosome A (thinning to the south) between the Bishops Lodge Member and lithosome S may represent uplift of the Santa Fe Range at approximately 26-29 Ma, during which the drainage depositing lithosome S was likely diverted to the south as the hanging wall of the Española basin bowed upwards. Lessening of uplift rates, perhaps combined with stream piracy, allowed the drainage associated with lithosome S to shift back to north of Arroyo Hondo. Comparison of the thickness of a measured interval of lithosome S along the Santa Fe River with an interpreted correlative section in the Yates #2 well differs by approximately 300-400 m (with a lower value in the well). This suggests that the structural high on which the well is situated was uplifted, at least in part, in the early to middle Miocene.