Variability of Hydraulic Relationships Between the Edwards and Trinity Aquifers of the Balcones Fault Zone of Central Texas

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The Edwards and Trinity Aquifers are significant sources of water for domestic, industrial, and agricultural use and for ecological resources in Central Texas. Demand for this groundwater has increased considerably in recent years, to the point that usage has either reached or nearly reached the sustainable yield of these aquifers. Stratigraphically, the Trinity Aquifer underlies the Edwards Aquifer. However, along the Balcones Fault Zone, normal faulting has juxtaposed the two aquifers horizontally, with units of the Trinity to the west of the Edwards in the Austin area and to the north in the San Antonio area. Proper management of these aquifers requires an understanding of factors affecting the hydraulic relationships between the two aquifers.

To evaluate the potential ground-water flow between the Edwards and Trinity Aquifers, hydrogeologic studies have been conducted that include evaluations of synoptic water-level data from individual wells, well pairs, and multilevel wells, in addition to interpretation of geochemical data, tracer studies, and geologic structures. Results indicate that inter-formational flow varies in direction, depending on specific locations, local structures, and karst features. A nested well pair near Austin shows that heads in the Edwards are about 80 ft higher than in the underlying Trinity. Yet in some areas, hydrochemical evidence suggests that older, more saline water from the Trinity flows upwards, generally along faults, into the Edwards. In the San Antonio area, tracer studies have documented flow from the Trinity into the Edwards through karst conduits that are perpendicular to faults. Such site-specific influences on ground-water flow must be considered when assessing ground-water availability from a karst aquifer and the potential influence of large pumping wells on adjacent aquifers.

Biographical Sketches

Dr. Brian A. Smith is the Senior Hydrogeologist with the Barton Springs/Edwards Aquifer Conservation District in Austin, Texas. He received his B.A. in Geology from Rice University and a Ph.D. in Geological Sciences from the University of Texas at Austin. He has more than 20 years of experience in geology, environmental hydrogeology, and karst studies.

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