Transmissivity Estimates From Well Hydrographs In Multiple Porosity Aquifers

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Hydrograph recessions from rainfall events have previously been analyzed for discharge at springs and streams; however, relatively little quantitative research has been conducted with regard to hydrograph analysis of recessions from monitoring wells screened in karst and fractured aquifers. In previous work, a quantitative hydrograph analysis technique has been proposed from which matrix transmissivity (i.e., transmissivity of intergranular porosity) and specific yields of matrix, fracture, and conduit (larger fracture) components of the aquifer may be determined from well hydrographs. The technique has yielded realistic results at three sites tested by the authors thus far (Y-12 Plant, Oak Ridge, Tennessee; Ammunition Burning Ground, Crane, Indiana; and Main Cantonment Area, Ft. Campbell, Kentucky, U.S.A.). Observed field data show that well hydrographs obtained in multiple porosity systems are valid indicators of hydraulic properties of the associated fractured and/or karst aquifers. Results show matrix transmissivity (T) values to be in good agreement with values calculated using more traditional parameter estimation techniques such as aquifer pumping tests and slug tests in matrix dominated wells. While the hydrograph analysis technique shows promise for obtaining reliable estimates of aquifer T with a simple, relatively inexpensive and passive method, the utility of the technique is limited in its application depending on site-specific hydrologic conditions, which include shallow, submerged fractured or conduit systems located in areas with sufficient rainfall for water levels to respond to precipitation events.