Regional Groundwater Model for the Chicot and Evangeline Aquifers, Central Texas Gulf Coast: Benefits of a Chronostratigraphic Framework

Paul R. Knox[1], Steven C. Young[2], Van Kelley[3], Trevor Budge[2], and Neil E. Deeds[3]

[1]Baer Engineering and Environmental Services, Inc., 7756 Northcross Dr., Ste. 211, Austin, Texas 78757

[2]URS Corporation, 9400 Amberglen Blvd., Austin, Texas 78729

[3]Intera, Inc., 1812 Centre Creek Dr., Ste. 300, Austin, Texas 78754

ABSTRACT

Most regional groundwater models of Gulf Coast aquifers are based on a fairly simplified and homogeneous geologic framework. A recent model of the Chicot and Evangeline aquifers was developed for a seven-county region surrounding the Lower Colorado River in Texas, as part of the Lower Colorado River Authority and San Antonio Water System water project. For this model, the authors used a detailed geologic framework to incorporate spatial variability (vertical and lateral heterogeneity) into the aquifer hydraulic properties. The geologic framework included a detailed chronostratigraphic analysis and aquifer properties that were determined on the basis of depositional facies, sand and clay percentages, sand and clay bed thicknesses, and depth.

Chronostratigraphic correlations were used to develop model layers that group sediments which are likely to be in lateral hydraulic communication. Such sediment layers are bounded, by definition, by clay-rich marine flooding events (maximum flooding surfaces), and thus are less likely to be connected hydraulically to layers above and below. Sand thickness distribution for the model layers was calculated from geophysical logs and the distribution was used to map depositional facies. Depositional facies strongly influence hydraulic parameters because they govern original sediment grain size, sorting, and degree of interlaminated fine material. Our analysis suggests that significant hydraulic property variability exists between fluvial and coastal plain environments within the study area. To identify properly layer boundaries and depositional facies, stratigraphic correlations must be carried downdip several thousand feet into more marine sediments. This allows incorporation in the model of regions of more brackish waters. Brackish water resources are of increasing interest as the possibility of desalinization projects grows.

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