

Challenges and Approaches for Groundwater Availability Modeling of the Carrizo-Wilcox Aquifer of Texas

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Abstract

Through an initiative by the Texas Water Development Board, Groundwater Availability Models (GAM) are being developed for the major aquifers of Texas to provide reliable information on groundwater availability in the state over a 50-year planning horizon. GAMs are being developed for the entire Carrizo-Wilcox Aquifer across Texas through the development of three models, a Southeastern GAM, a Central GAM being developed by a team led by the Bureau of Economic Geology, and a Northeastern GAM.

The Carrizo-Wilcox aquifer system extends from South Texas northeastward through East Texas into Arkansas and Louisiana. The Tertiary Wilcox Group and Carrizo Sand consist of fluvial-deltaic sediments that generally dip (100 ft per mile) beneath confining and other shallower aquifer strata toward the Gulf of Mexico. An increase in salinity from rock-water reaction and cross-formational flow of poor-quality water from confining layers limits the downdip extent of freshwater. Farther downdip, listric faults coincide with the onset of highly over-pressured and saline fluids in under-compacted deposits.

The challenges associated with model development and calibration for these super-regional flow models (thousand of square miles) are significant, resulting from uncertainty in hydrostratigraphy, hydrologic properties, and model calibration targets; and the added constraint of accurately modeling both near surface phenomena and deep basin hydraulics. This presentation will focus on aspects of model parameterization, hydraulic property distribution, and recharge. In addition, the model calibration process will be discussed focusing on calibration accuracy and the evaluation of unbiasedness in the calibrated model.