GAM run 06-01

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Groundwater Availability Modeling Section
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REQUESTOR:

Mr. Armando Vela, Red Sands Groundwater Conservation District (GCD).

DESCRIPTION OF REQUEST:

Mr. Vela requested that we run the southern part of the Gulf Coast aquifer groundwater availability model (GAM) to provide him with the input numbers for his district's management plan. We provided average recharge from precipitation for the period 1980 to1999, average surface-water inflow, average surface-water outflow, average inflow into the district, average outflow from the district, average cross-formational flow (upper), and average cross-formational flow (lower).

METHODS:

To address the request, we:

- ran the transient GAM for the southern part of the Gulf Coast aquifer and extracted water budgets for each year of the 1980 through 1999 period and
- averaged the twenty year period for recharge, surface water inflow, surface water outflow, inflow to the district, outflow from the district, net cross-formational flow (upper) and net cross-formational flow (lower).

PARAMETERS AND ASSUMPTIONS:

- In the analysis, the pumpage distribution is the same as for the transient calibrated model described in Chowdhury and Mace (2003).
- See Chowdhury and Mace (2003) for assumptions and limitations of the GAM for the southern part of the Gulf Coast aquifer. Root mean squared error (a measure of the difference between simulated and actual water levels during model calibration) in the entire GAM for the period of 1990 to 2000 for the southern part of the Gulf Coast aquifer model is 18 feet.
- The model includes four layers, representing the Chicot aquifer (Layer 1), the Evangeline aquifer (Layer 2), the Burkeville confining unit (Layer 3), and the Jasper aquifer (Layer 4).

RESULTS:

The results are shown in Table 1. The Chicot, Evangeline, and Jasper are the principal aquifers in the Red Sands GCD with the Burkeville functioning as a confining unit.

The components of the budgets shown in Table 1 include:

- Precipitation Recharge—This component represents areally distributed recharge due to precipitation falling on the outcrop areas of aquifers. This value reflects the average precipitation from 1980 to 1999.

- Surface Water Inflow and Outflow—This describes the interaction between the aquifer and streams, springs, lakes, wetlands, and possibly irrigation return flow. For the area within the Red Sands GCD, surface water interaction was not modeled.

- Net cross-formational flow Upper and Lower—This describes the vertical flow, or leakage, between two aquifers. This flow is controlled by the water levels in each aquifer and aquifer properties of each aquifer that define the amount of leakage that can occur. "Inflow" to an aquifer from an overlying or underlying aquifer will always equal the "Outflow" from the other aquifer.

- Inflow Into and Outflow From the District—This component describes the lateral flow of groundwater within the aquifer between the GCD and the adjacent Hidalgo County.

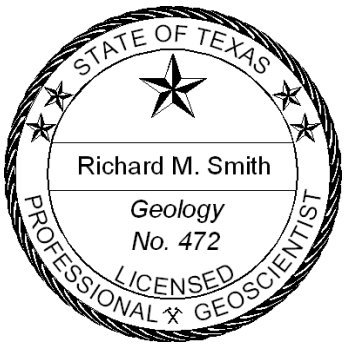
It is important to note that sub-regional water budgets for individual areas, such as the Red Sands GCD area, are not exact. This is due to the one-mile spacing of the model grid and because we assumed each model cell is assigned to a single county and/or GCD. The water budgets for an individual cell containing a GCD boundary are assigned to either the GCD or the surrounding county.

REFERENCES:

Chowdhury, A. H., and Mace, R., E., 2003, A groundwater availability model of the Gulf Coast aquifer in the Lower Rio Grande Valley, Texas: Numerical simulations through 2050: Texas Water Development Board, Model Summary Report, 176 p.

Table 1: All values are averages of the 1980 to 1999 water budgets. All values are in acre-feet per year. Note: negative values mean flow out of the district and positive values mean flow into the district.

GCD	Aquifer	Precipitation recharge	Surface water inflow	Surface water outflow	Inflow into district	Outflow from district	Net cross-formational flow upper	Net cross-formational flow lower
Red Sands	Chicot	136	0	0	226	-354	0	186
Red Sands	Evangeline	39	0	0	2,984	-2,848	-186	7
Red Sands	Burkeville	0	0	0	1	-2	-7	0
Red Sands	Jasper	0	0	0	104	-116	0	0



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