GAM Run 08-32

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EXECUTIVE SUMMARY:

Texas State Water Code, Section 36.1071, Subsection (h), states that, in developing its groundwater management plan, groundwater conservation districts shall use groundwater availability modeling information provided by the Executive Administrator of the Texas Water Development Board in conjunction with any available site-specific information provided by the district for review and comment to the Executive Administrator. Information derived from groundwater availability models that shall be included in groundwater management plans include:

(1) the annual amount of recharge from precipitation to the groundwater resources within the district, if any;
(2) for each aquifer within the district the annual volume of water that discharges from the aquifer to springs and any surface water bodies, including lakes, streams, and rivers; and
(3) the annual volume of flow into and out of the district within each aquifer and between aquifers in the district.

The purpose of this model run is to provide information to the Victoria County Groundwater Conservation District for its groundwater management plan. The groundwater management plan for the Victoria County Groundwater Conservation District is due for approval by the executive administrator of the Texas Water Development Board before November 8, 2008.

This report discusses the methods, assumptions, and results from model runs using the groundwater availability model for the central part of the Gulf Coast Aquifer. Table 1 summarizes the groundwater availability model data required by statute for the Victoria County Groundwater Conservation District's groundwater management plan.

METHODS:

We ran the groundwater availability model for the central part of the Gulf Coast Aquifer (Chowdhury and others, 2004) and (1) extracted annual water budgets from 1981 through 1999 and (2) averaged the annual water budget values for recharge, surface water outflow, groundwater inflow to the district, groundwater outflow from the district, net inter-aquifer flow (upper) and net inter-aquifer flow (lower) for the portions of the Gulf Coast Aquifer located within the district.

PARAMETERS AND ASSUMPTIONS:

- We used Version 1.01 of the groundwater availability model for the central part of the Gulf Coast Aquifer. See Chowdhury and others (2004) and Waterstone and others (2003) for assumptions and limitations of the groundwater availability model for the central part of the Gulf Coast Aquifer.

- The model simulates groundwater flow through four hydrostratigraphic layers. From top to bottom, these layers are: the Chicot Aquifer, Evangeline Aquifer, Burkeville Confining System, and the Jasper Aquifer.

- The mean absolute error (a measure of the difference between simulated and actual water levels during model calibration) in the entire model for 1999 is 26 feet, which is 4.6 percent of the hydraulic head drop across the model area (Chowdhury and others, 2004).

- The transient portion of the model has a total of 85 stress periods. Of these, monthly stress periods were assigned for 1987 through 1989 and 1996 through 1998. Monthly stress periods were assigned to better simulate possible effects of drought on the groundwater flow system. The remainders of the stress periods represent annual stress periods.

- We used Groundwater Vistas Version 5 (Environmental Simulations, Inc. 2007) as the interface to process model output results.

RESULTS:

A groundwater budget summarizes the water entering and leaving the aquifer according to the groundwater availability model. Selected components were extracted from the groundwater budget and averaged over the duration of the calibrated portion of the model run (1981 through 1999). The components of the modified budgets shown in Table 1 include:

- Precipitation recharge—This is the areally distributed recharge sourced from precipitation falling on the outcrop areas of the aquifers (where the aquifer is exposed at land surface) within the district.

- Surface water outflow—This is the total water exiting the aquifer (outflow) to surface water features such as streams, reservoirs, and drains (springs).

- Flow into and out of district—This component describes lateral flow within the aquifer between the district and adjacent counties.

- Flow between aquifers—This describes the vertical flow, or leakage, between aquifers or confining units. This flow is controlled by the relative water levels in each aquifer or confining unit and aquifer properties of each aquifer or confining unit that define the amount of leakage that occurs. “Inflow” to an aquifer from an overlying or underlying aquifer will always equal the “Outflow” from the other aquifer.

The information needed for the district’s management plan is summarized in Table 1. It is important to note that sub-regional water budgets are not exact. This is due to the size of the model cells and the approach used to extract data from the model. To avoid double accounting, a model cell that straddles a political boundary, such as district or county boundaries, is assigned to one side of the boundary based on the location of the centroid of the model cell. For example, if a cell contains two counties, the cell is assigned to the county where the centroid of the cell is located.

REFERENCES:

Chowdhury, A.H., Wade, S.W., Mace, R.E., and Ridgeway, C., 2004, Groundwater availability model of the central Gulf Coast Aquifer system—Numerical simulations through 1999: Unpublished Texas Water Development Board report, 114 p. http://www.twdb.state.tx.us /gam /glfc_c/glfc_c_TWDB_SummaryReport.pdf

Environmental Simulations, Inc. 2007, Guide to Using Groundwater Vistas Version 5, 381 p.

Waterstone Environmental Hydrology and Engineering Inc. and Parsons, 2003, Groundwater availability of the Central Gulf Coast Aquifer: Numerical Simulations to 2050, Central Gulf Coast, Texas: Contract report to the Texas Water Development Board, 157 p.

Table 1: Summarized information needed for the Victoria County Groundwater Conservation District's groundwater management plan. All values are reported in acre-feet per year. All numbers are rounded to the nearest 1 acre-foot. Negative values indicate water is leaving the aquifer system using the parameters or boundaries listed in the table.

Management Plan requirement	Aquifer or confining unit	Results
Estimated annual amount of recharge from precipitation to the district	Chicot	22,747
	Evangeline	687
	Burkeville	0
	Jasper	0
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Chicot	-25,455
	Evangeline	-3,398
	Burkeville	0
	Jasper	0
Estimated annual volume of flow into the district within each aquifer in the district	Chicot	6,645
	Evangeline	10,288
	Burkeville	39
	Jasper	650
Estimated annual volume of flow out of the district within each aquifer in the district	Chicot	-14,590
	Evangeline	-4,442
	Burkeville	-9
	Jasper	-108
Estimated annual net volume of flow between each aquifer in the district	Chicot into Evangeline	-10,712
	Evangeline into Burkeville	-1,943
	Burkeville into Jasper	-1,002

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