GAM Run 08-11

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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, if any, to the groundwater resources within the district;
(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 groundwater availability model run is to provide information to the Blanco-Pedernales Groundwater Conservation District needed for its groundwater management plan. The groundwater management plan for the Blanco-Pedernales Groundwater Conservation District is due for approval by the Executive Administrator of the Texas Water Development Board before June 19, 2008.

This report discusses the methods, assumptions, and results from model runs using the groundwater availability model for the Hill Country portion of the Trinity Aquifer. Table 1 summarizes the groundwater availability model data required by statute for the Blanco-Pedernales Groundwater Conservation Districts groundwater management plan.

The Hickory, Marble Falls, and Ellenbuger-San Saba aquifers also underlie the Blanco-Pedernales Groundwater Conservation District. If the district would like information for the Hickory, Marble Falls, and Ellenbuger-San Saba aquifers, they may request it from the Groundwater Technical Assistance Section of the Texas Water Development Board.

METHODS:

We ran the groundwater availability models for the Hill Country portion of the Trinity Aquifer and (1) extracted water budgets for each year of the 1996 through 1997 period and (2) averaged the annual water budget values for recharge, surface water inflow, surface water outflow, inflow to the district, outflow from the district, net inter-aquifer flow (upper) and net inter-aquifer flow (lower) for the Hill Country portion of the Trinity Aquifer located within the district.

PARAMETERS AND ASSUMPTIONS:

- We used version 1.02 of the Hill Country portion of the Trinity Aquifer groundwater availability model. See Mace and others (2000) for assumptions and limitations of the groundwater availability model for the Hill Country portion of the Trinity Aquifer.

- The model simulates groundwater flow through three hydrostratigraphic layers. From top to bottom, these layers are: layer 1 represents the Edwards Aquifer, layer 2 represents the Upper Trinity Aquifer, and layer 3 represents the Middle Trinity Aquifer.

- The transient portion of the model has monthly stress periods for 1996 through 1997. Monthly stress periods were assigned to better simulate possible effects of drought on the groundwater flow system.

- We used Processing Modflow for Windows (PMWIN) version 5.3 (Chiang and Kinzelbach, 2001) as the interface to process model output.

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 (1996 through 1997). 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.

Table 1: Summarized information needed for the Blanco-Pedernales 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.

Management Plan requirement	Aquifer or confining unit	Results
Estimated annual amount of recharge from precipitation to the district	Edwards (Plateau)	0
	Trinity (Upper)	22,069
	Trinity (Middle)	10,411
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Edwards (Plateau)	0
	Trinity (Upper)	-14,371
	Trinity (Middle)	-12,463
Estimated annual volume of flow into the district within each aquifer in the district	Edwards (Plateau)	0
	Trinity (Upper)	3,505
	Trinity (Middle)	4,214
Estimated annual volume of flow out of the district within each aquifer in the district	Edwards (Plateau)	0
	Trinity (Upper)	-1,995
	Trinity (Middle)	-8,490
Estimated net annual volume of flow between each aquifer in the district	Edwards (Plateau) into Trinity (Upper)	0
	Trinity (Upper) into Trinity (Middle)	-8,271

REFERENCES:

Chiang, W. and Kinzelbach, W., 2001, Groundwater Modeling with PMWIN, 346 p.

Mace, R.E., Chowdhury, A.H., Anaya, R., and Shao-Chih (Ted) Way, 2000, Groundwater availability of the Trinity Aquifer , Hill Country Area, Texas: Numerical simulations through 2050, Texas Water Development Board Report 353, 119 p.

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