GAM Run 08-26

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Groundwater Availability Modeling Section
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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 Hill Country Underground Water Conservation District needed for its groundwater management plan. The groundwater management plan for the Hill Country Underground Water Conservation District is due for approval by the Executive Administrator of the Texas Water Development Board before October 30, 2008.

This report discusses the methods, assumptions, and results from model runs using the groundwater availability model for the Edwards-Trinity (Plateau) Aquifer. Table 1 summarizes the groundwater availability model data required by statute for the Hill Country Underground Water Conservation District's groundwater management plan.

The Hickory and Ellenbuger-San Saba aquifers also underlie the Hill Country Underground Water Conservation District. If the district would like information for the Hickory 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 model for the Edwards-Trinity (Plateau) Aquifer, and (1) extracted water budgets for each year of the 1980 through 1999 period and (2)

averaged the water budget values for recharge, surface water outflow, inflow to the district, outflow from the district, net inter-aquifer flow (upper) and net inter-aquifer flow (lower) for the portions of the Edwards and the Trinity aquifers located within the district.

PARAMETERS AND ASSUMPTIONS:

- We used version 1.01 of the groundwater availability model for the Edwards-Trinity (Plateau) Aquifer.

- In the analysis, the pumpage distribution for each transient calibrated model is the same as described in Anaya and Jones (2004).

- The root mean squared error (a measure of the difference between simulated and actual water levels during model calibration) in the Edwards-Trinity (Plateau) groundwater availability model for the period of 1990 to 2000 is 143 feet, or six percent of the range of measured water levels (Anaya and Jones, 2004).

- The Edwards-Trinity (Plateau) Aquifer model includes two layers representing the Edwards and associated limestones (Layer 1) and the undifferentiated Trinity units (Layer 2) in the district.

- 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. The groundwater budget for the annual average values for the Edwards-Trinity (Plateau) Aquifer (1980 to 1999) in the district is shown in Table 1. 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 inflow and 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.
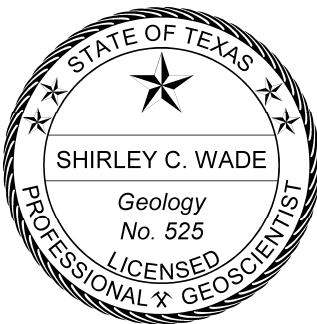
The information needed for the district's management plan is summarized in Table 1.

It is important to note that sub-regional water budgets for individual districts, such as Hill Country Underground Water Conservation District, are not exact. This is due to the one-mile spacing of the model grid and because we assumed that each model cell is assigned to a single county or district. The water budgets for an individual cell containing a county or district boundary are assigned to either one county/district or the other and therefore very minor variations in the county-wide budgets may be observed.

REFERENCES:

Anaya, R., and Jones, I., 2004, Groundwater availability model for the Edwards-Trinity (Plateau) and Cenozoic Pecos Alluvium aquifer systems, Texas: Texas Water Development Board, GAM Report, 208 p., http://www.twdb.state.tx.us/gam/eddt_p/eddt_p.htm

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

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Table 1: Summarized information needed for the Hill Country Underground Water 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	Edward (Plateau)	9,899
	Trinity (Plateau)	35,877
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Edward (Plateau)	-10,898
	Trinity (Plateau)	-31,177
Estimated annual volume of flow into the district within each aquifer in the district	Edward (Plateau)	3,633
	Trinity (Plateau)	1,091
Estimated annual volume of flow out of the district within each aquifer in the district	Edward (Plateau)	-1,884
	Trinity (Plateau)	-8,443
Estimated annual net volume of flow between each aquifer in the district	Edward (Plateau) into Trinity (Plateau)	-1,375