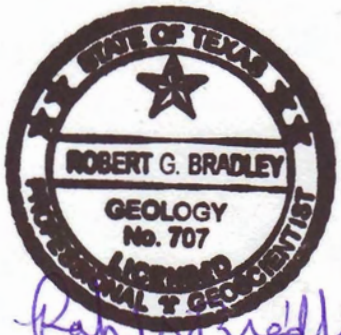
GTA Aquifer Assessment 08-03mag

by Robert G. Bradley, P.G.
Texas Water Development Board
Groundwater Technical Assistance Section
(512) 936-0870



December 10, 2009

REQUESTOR:

Cheryl Maxwell, of the Clearwater Underground Water Conservation District acting on behalf of Groundwater Management Area 8.

DESCRIPTION OF REQUEST:

In a letter dated June 10, 2008, Ms. Cheryl Maxwell provided the Texas Water Development Board (TWDB) with the desired future conditions for the Ellenburger-San Saba, Hickory, and Marble Falls aquifers in Groundwater Management Area 8 and requested that TWDB estimate managed available groundwater values. This aquifer analysis presents the managed available groundwater for the Ellenburger-San Saba Aquifer in Groundwater Management Area 8.

DESIRED FUTURE CONDITIONS:

- Burnet County should maintain approximately 100 percent of the saturated thickness after 50 years by using approximately 80 percent of the estimated recharge.
- Lampasas County should maintain approximately 90 percent of the saturated thickness after 50 years.
- Brown and Mills Counties should maintain approximately 90 percent of the available draw down after 50 years.

METHODS:

The desired future conditions requested for the Ellenburger-San Saba Aquifer were based on maintaining a percentage of the estimated saturated thickness left in 50 years.

The desired future for Burnet County adds a stipulation of using 80 percent of the estimated recharge. Because this is a volume and not a condition of the aquifer, this part of the statement was disregarded in the calculation of the managed available groundwater.

A transient hydrologic budget for the saturated portion of an aquifer is (Freeze and Cherry, 1979, p.365):

$$Q(t) = R(t) - D(t) + \frac{dS}{dt}$$

Where: Q(t)= total rate of groundwater withdrawal
R(t)= total rate of groundwater recharge to the basin
D(t)= total rate of groundwater discharge from the basin

$\frac{dS}{dt}$ = rate of change of storage in the saturated zone of the basin

For this analysis, it is assumed that:

$$R(t) = R(r) + R(e)$$

Where: R(r) = rejected recharge for the basin
R(e) = effective recharge

In addition, it is assumed that:

$$R(r) \cong D(t)$$

Then the total rate of groundwater withdrawal equals effective recharge plus the change in storage of the aquifer, or:

$$Q(t) = R(e) + \frac{dS}{dt}$$

For the desired future condition in Burnet County, in which no water can be taken from storage, then dS/dt can be set to zero and the budget is simplified to obtain,

$$Q(t) = R(e)$$

County, river basin, and groundwater conservation district boundaries subdivided the aquifer into map areas (Figure 1). The areal extent of each aquifer map area was calculated. These areas were used to calculate estimated average effective recharge and pumped volumes.

To determine the volume from storage used, the areas were multiplied by the estimated aquifer specific yield, and then by the drained saturated thickness necessary to maintain the desired future condition. This volume was then divided by 50 years to obtain a yearly volume.

Average annual effective recharge to the aquifer was calculated by multiplying each area by the average precipitation (1971 to 2000) and an estimated effective recharge rate.

Estimated saturated thicknesses were calculated by taking average water-level elevations from the TWDB groundwater database and subtracting the average base of the San Saba Limestone from by Standen and Ruggiero (2007) for each map area.

Water-levels within a one mile buffer were used to calculate the average water-level elevation for map areas 1. No wells were within this buffer for map areas 7 and 10, so two-mile buffer was used to obtain water-levels for those two areas. Map areas 2 and 3 have no water-levels nearby and an estimated water-level elevation was determined from the upgradient wells in San Saba County. The average elevation of the structural surface was calculated for each map area by using zonal statistics in ArcGIS.

The final calculations were done in a Microsoft Excel worksheet.

PARAMETERS AND ASSUMPTIONS:

- An average saturated thickness for each map area is used to make volume calculations (Table 2).
- The areas for each area were calculated from the Texas Water Development Board (TWDB) shapefile for the Ellenburger-San Saba Aquifer, projected into the groundwater availably modeling (GAM) projection (Anaya, 2001).
- Areas, in acres, were calculated within ArcGIS 9.2.
- Average annual precipitation was used to calculate annual effective recharge volumes.
- The average annual precipitation (1971-2000) for the each aquifer map area (Table 1) was determined from the Texas Climatic Atlas (Narasimhan and others, 2008).
- Average effective recharge from precipitation is estimated to be 2 percent of annual precipitation (Preston and others, 1996).
- The managed available groundwater volume estimates are the sum of the annual average effective recharge amount and the volume of water depleted from the aquifer based on the desired future condition.
- Annual volumes are calculated by dividing the total volume by 50 years.
- Specific yield of the aquifer is estimated as 0.03 (LBG-Guyton Associates, 2003) and the storage coefficient is estimated as 0.002 (TWDB, 2009; Bluntzer, 1992; LBG-Guyton Associates, 2003).
- Outcrop areas are calculated as unconfined areas of the aquifer and subcrop areas are calculated as confined areas of the aquifer.
- Saturated thickness is used for both unconfined and confined map areas, where the decline in confined areas is in reality the total head plus the saturated thickness of the aquifer.

RESULTS:

The annual effective recharge estimate for the Ellenburger-San Saba Aquifer in Groundwater Management Area 8 is 6,109 acre-feet per year.

The results (Tables 2 and 3) show 8,749 acre-feet per year of managed available groundwater for the Ellenburger-San Saba Aquifer in Groundwater Management Area 8. The Saratoga Underground Water Conservation District, in Lampasas County, has 2,593 acre-feet per year of managed available groundwater in the Ellenburger-San Saba Aquifer. The Central Texas Groundwater Conservation District has 5,526 acre-feet per year and Fox Crossing Water District has 499 acre-feet per year of managed available groundwater.

Table 1. Estimated total annual effective recharge volume for the Ellenburger-San Saba Aquifer by map areas (See Figure 1).

GMA	Aquifer	County	GCD	Map area	Areal extent (acres	Average annual precipitation (inches)	Average annual precipitation (feet)	Effective recharge rate (percent)	Estimated annual effective recharge (acre-feet)
8	Ellenburger-San Saba	Lampasas	Saratoga UWCD	5	11,347	30	2.5	2	567
				7	293	31	2.6	2	15
		Burnet	Central Texas GCD	8	108,063	30	2.5	2	5,403
				10	2,372	31	2.6	2	123
								Total	6,109

UWCD = underground water conservation district GCD= groundwater conservation district
GMA = groundwater management area

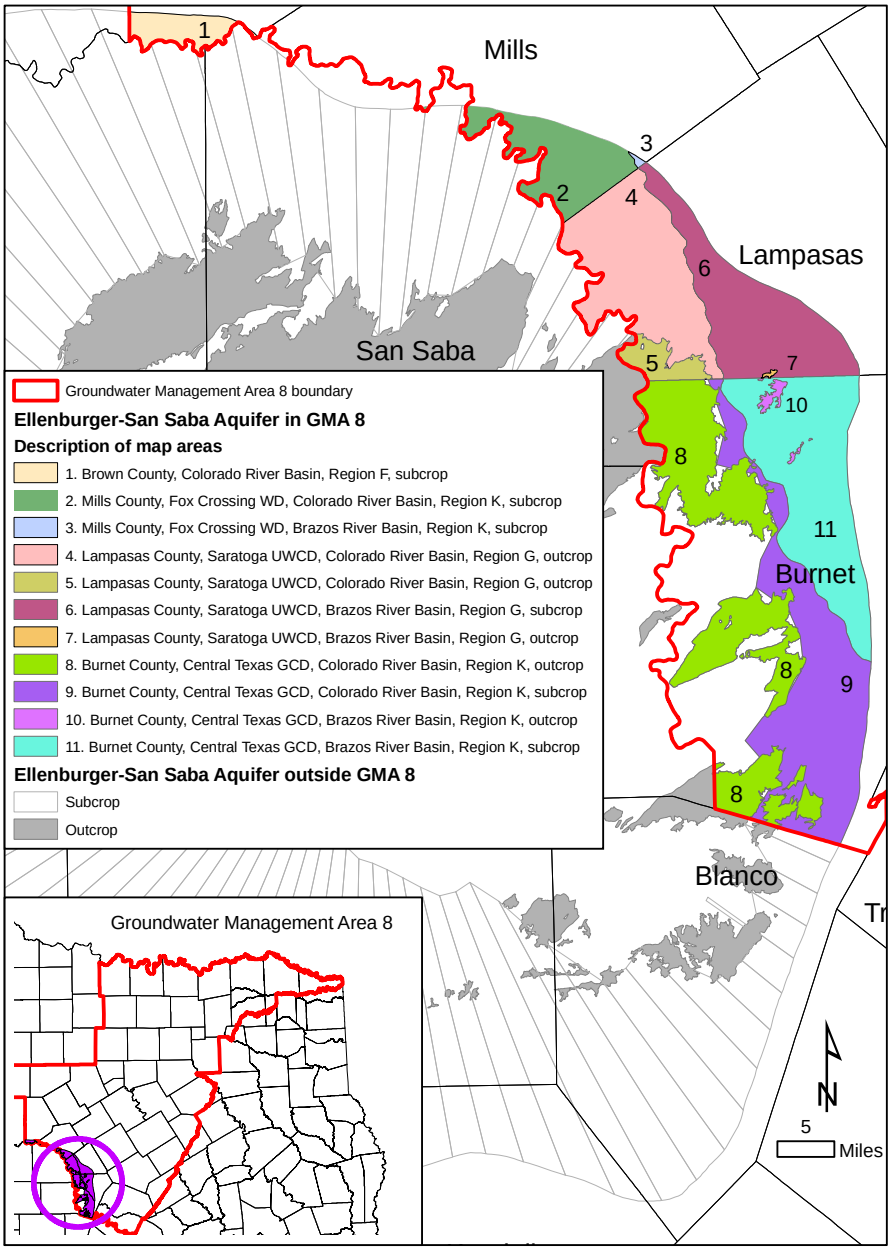


Figure 1. Map areas for analyzing managed available groundwater the Ellenburger-San Saba Aquifer in groundwater management area 8. GMA = groundwater management area, UWCD = underground water conservation district, GCD = groundwater conservation district.

Table 2. Estimates of managed available groundwater for the Ellenburger-San Saba Aquifer by map areas (see Figure 1).

GMA	Aquifer	County	GCD	Map area	Storage coefficient	Areal extent (acres)	Estimated saturated thickness (feet)	Desired future percent of saturated thickness	Desired future saturated thickness (feet)	Saturated thickness drained (feet)	Estimated total volume from storage (acre-feet)	Estimated annual volume from storage (acre-feet)	Estimated annual effective recharge (acre-feet)	Estimated annual total volume (acre-feet)
8	Ellenburger-San Saba	Brown	n/a	1	0.002	14,898	2,200	90	1,980	220	6,555	131	0	131
		Mills	Fox Crossing Water District	2	0.002	42,560	2,900	90	2,610	290	24,685	494	0	494
				3	0.002	480	2,600	90	2,340	260	250	5	0	5
		Lampasas	Saratoga UWCD	4	0.002	86,348	2,100	90	1,890	210	36,266	725	0	725
				5	0.03	11,347	1,000	90	900	100	34,041	681	567	1,248
				6	0.002	71,855	2,000	90	1,800	200	28,742	575	0	575
				7	0.03	293	1,700	90	1,530	170	1,494	30	15	45
		Burnet	Central Texas GCD	8	0.03	108,063	600	100	600	0	0	0	5,403	5,403
				9	0.002	119,220	1,200	100	1,200	0	0	0	0	0
				10	0.03	2,372	1,600	100	1,600	0	0	0	123	123
				11	0.002	101,846	1,500	100	1,500	0	0	0	0	0
											Total	1,355	6,108	8,749

GMA = groundwater management area UWCD = underground water conservation district GCD= groundwater conservation district

Table 3. Estimates of managed available groundwater for the Ellenburger-San Saba Aquifer (See Figure 1).

Aquifer	Map Key	County	RWPA	River Basin	GCD	GMA	GeoArea	Year	MAG (acre-feet per year)
Ellenburger-San Saba	1	Brown	F	Colorado	n/a	8	n/a	n/a	131
Ellenburger-San Saba	2	Mills	K	Colorado	FCWD	8	n/a	n/a	494
Ellenburger-San Saba	3	Mills	K	Brazos	FCWD	8	n/a	n/a	5
Ellenburger-San Saba	4	Lampasas	G	Colorado	SUWCD	8	n/a	n/a	725
Ellenburger-San Saba	5	Lampasas	G	Colorado	SUWCD	8	n/a	n/a	1,248
Ellenburger-San Saba	6	Lampasas	G	Brazos	SUWCD	8	n/a	n/a	575
Ellenburger-San Saba	7	Lampasas	G	Brazos	SUWCD	8	n/a	n/a	45
Ellenburger-San Saba	8	Burnet	K	Colorado	CTGCD	8	n/a	n/a	5,403
Ellenburger-San Saba	9	Burnet	K	Colorado	CTGCD	8	n/a	n/a	0
Ellenburger-San Saba	10	Burnet	K	Brazos	CTGCD	8	n/a	n/a	123
Ellenburger-San Saba	11	Burnet	K	Brazos	CTGCD	8	n/a	n/a	0

RWPA = regional water planning area GCD= groundwater conservation district GMA = groundwater management area
GeoArea = Geographic areas defined by unique desired future conditions as specified by a groundwater management area.
FCWD = Fox Crossing Water District CTGCD = Central Texas Groundwater Conservation District
SUWCD = Saratoga Underground Water Conservation District MAG = Managed available groundwater in units of acre-feet per year.

STIPULATIONS:

Additional data are needed to create improved estimates; these estimates are a simplistic interpretation of the requested conditions. These solutions assume homogeneous and isotropic aquifers; however, conditions for the Ellenburger-San Saba Aquifer may not behave in a uniform manner.

Note that estimates of managed available groundwater are based on the best available scientific tools that can be used to evaluate managed available groundwater and that these estimates can be a function of assumptions made on the magnitude and distribution of pumping in the aquifer. Therefore, it is important for groundwater conservation districts to monitor whether or not they are achieving their desired future conditions and to work with the TWDB to refine managed available groundwater given the reality of how the aquifer responds to the actual magnitude and distribution of pumping now and in the future.

REFERENCES:

Anaya, R., 2001, GAM technical memo 01-01(rev a): Texas Water Development Board technical memorandum, 2p.

Bluntzer, R. L., 1992, Evaluation of ground-water resources of the Paleozoic and Cretaceous aquifers in the Hill Country of Central Texas: Texas Water Development Board Report 339, 130 p.

LBG-Guyton Associates, 2003, Brackish Groundwater Manual for Texas Regional Water Planning Groups: Texas Water Development Board contract report. 188p.

Muller, D. A. and Price, R. D., 1979, Ground-water availability in Texas, estimates and projections through 2030: Texas Department of Water Resources Report 238, 77 p.

Narasimhan, B., Srinivasan, R., Quiring, S., and Nielsen-Gammon, J.W., 2008, Digital Climatic Atlas of Texas: Texas A&M University, Texas Water Development Board Contract, Report 2005-483-5591, 108p.

Preston, R. D., Pavlicek, D. J., Bluntzer, R. L., Derton, J., 1996, The Paleozoic and related aquifers of Central Texas: Texas Water Development Board, Report 346, 85p.

Standen A. and Ruggiero R., 2007, Llano Uplift Aquifers Structure and Stratigraphy Report: Texas Water Development Board contract report, contract number 0604830614, 28p.

Texas Water Development Board, 2009, Groundwater database: Texas Water Development Board, Water Science and Conservation Division.

Williams, C.R, 2008, Adopted desired future conditions of minor aquifers: memorandum to Cheryl Maxwell, Groundwater Management Area 8, 12p.

December 10, 2009

Ms. Cheryl Maxwell, General Manager
Clearwater Underground Water Conservation District
P.O. Box 729
Belton, TX 76513

Re: Managed available groundwater estimates for the Ellenburger-San Saba Aquifer in Groundwater Management Area 8

Dear Ms. Maxwell:

The Texas Water Code, Section 36.108, Subsection (o), states that the Texas Water Development Board's executive administrator shall provide each district and regional water planning group located wholly or partly within a groundwater management area with the managed available groundwater in the management area based upon the desired future condition of the groundwater resource. This letter and the attached report (GTA Aquifer Assessment 08-03mag) are in response to this directive.

As noted in your letter dated June 9, 2008, the desired future condition submitted for the Ellenburger-San Saba Aquifer in Groundwater Management Area 8 was as follows:

- Burnet County should maintain approximately 100 percent of the saturated thickness after 50 years by using approximately 80 percent of the estimated recharge.
- Lampasas County should maintain approximately 90 percent of the saturated thickness after 50 years.
- Brown and Mills Counties should maintain approximately 90 percent of the available draw down after 50 years.

Managed available groundwater is defined in the Texas Water Code as the amount of water that may be permitted by a district for beneficial use in accordance with the desired future condition of the aquifer, as determined under Texas Water Code, Section 36.108. For various planning purposes, the managed available groundwater estimates have been reported at the combined aquifer, county, river basin, regional water planning area, groundwater management area, groundwater conservation district (if applicable), subdivision of an aquifer (if designated), geologic strata (if designated), and geographic area (if designated) level.

We understand that groundwater conservation districts have options on how to distribute managed available groundwater in a groundwater management area; therefore, we encourage open communication and coordination between groundwater conservation districts, regional water planning groups, and the TWDB to ensure that managed available groundwater reported in regional water plans and groundwater management plans are not in conflict. In addition, please note that estimates of managed available groundwater are based on the best available scientific tools that can be currently used to develop managed available groundwater and that these estimates may be based on assumptions made on the magnitude and distribution of pumping in the aquifer. Therefore, it is important for groundwater conservation districts to monitor whether their management of pumping is achieving their desired future conditions. Districts are encouraged to continue work with the TWDB to better define available groundwater as additional new data could help better assess responses of the aquifer to actual pumpage values and their distribution now and in the future.

Sincerely,

J. Kevin Ward
Executive Administrator

Attachment: GTA Aquifer Assessment 08-03mag

c w/att.: Cary Betz, Texas Commission of Environmental Quality, Water Supply Division

Kelly Mills, Texas Commission of Environmental Quality, Groundwater Planning and Assessment Division

Robert E. Mace, Ph.D., P.G., Deputy Executive Administrator, TWDB, Water Science and Conservation

Bill Hutchison, Ph.D., P.E., P.G., Director, TWDB, Groundwater Resources Division

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Angela Kennedy, Region F Project Manager, TWDB, Regional Water Planning Section

Temple McKinnon, Region D Project Manager, TWDB, Regional Water Planning Section

Simone Kiel, Freese & Nichols, Inc.

David Dunn, HDR Engineering

Mark Lowry, AECOM

December 10, 2009

Mr. Richard Bowers, General Manager
Central Texas Groundwater Conservation District
P.O. Box 870
Burnet, TX 78611

Re: Managed available groundwater estimates for the Ellenburger-San Saba Aquifer in Groundwater Management Area 8

Dear Mr. Bowers:

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December 10, 2009

Mr. Rodney Carlisle, Board President
Fox Crossing Water District
P.O. Box 926
Goldthwaite, TX 76844

Re: Managed available groundwater estimates for the Ellenburger-San Saba Aquifer in Groundwater Management Area 8

Dear Mr. Carlisle:

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TEXAS WATER DEVELOPMENT BOARD

December 10, 2009

Mr. Joe Cooper, General Manager
Middle Trinity Groundwater Conservation District
150 North Harbin Drive, Suite 434
Stephenville, TX 76401

Re: Managed available groundwater estimates for the Ellenburger-San Saba Aquifer in Groundwater Management Area 8

Dear Mr. Cooper:

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December 10, 2009

Mr. Eddy Daniel, Board President
North Texas Groundwater Conservation District
114 McKinney Street
Farmersville, TX 75442

Re: Managed available groundwater estimates for the Ellenburger-San Saba Aquifer in Groundwater Management Area 8

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Mark Lowry, AECOM

December 10, 2009

Mr. Mark Mendez, District Agent
Northern Trinity Groundwater Conservation District
100 E. Weatherford Street, Suite 404
Fort Worth, TX 76196

Re: Managed available groundwater estimates for the Ellenburger-San Saba Aquifer in Groundwater Management Area 8

Dear Mr. Mendez:

The Texas Water Code, Section 36.108, Subsection (o), states that Texas Water Development Board's executive administrator shall provide each district and regional water planning group located wholly or partly within a groundwater management area with the managed available groundwater in the management area based upon the desired future condition of the groundwater resource. This letter and the attached report (GTA Aquifer Assessment 08-03mag) are in response to this directive.

As noted in your letter dated June 9, 2008, the desired future condition submitted for the Ellenburger-San Saba Aquifer in Groundwater Management Area 8 was as follows:

- Burnet County should maintain approximately 100 percent of the saturated thickness after 50 years by using approximately 80 percent of the estimated recharge.
- Lampasas County should maintain approximately 90 percent of the saturated thickness after 50 years.
- Brown and Mills Counties should maintain approximately 90 percent of the available draw down after 50 years.

Managed available groundwater is defined in the Texas Water Code as the amount of water that may be permitted by a district for beneficial use in accordance with the desired future condition of the aquifer as determined under Texas Water Code, Section 36.108. For various planning purposes the managed available groundwater estimates have been reported at the combined aquifer, county, river basin, regional water planning area, groundwater management area, groundwater conservation district (if applicable), subdivision of an aquifer (if designated), geologic strata (if designated), and geographic area (if designated) level.

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Sincerely,

J. Kevin Ward
Executive Administrator

Attachment: GTA Aquifer Assessment 08-03mag

c w/att.: Cary Betz, Texas Commission of Environmental Quality, Water Supply Division

Kelly Mills, Texas Commission of Environmental Quality, Groundwater Planning and Assessment Division

Robert E. Mace, Ph.D., P.G., Deputy Executive Administrator, TWDB, Water Science and Conservation

Bill Hutchison, Ph.D., P.E., P.G., Director, TWDB, Groundwater Resources Division

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Edward G. Vaughan, *Member*

J. Kevin Ward
Executive Administrator

Jack Hunt, *Vice Chairman*
Thomas Weir Labatt III, *Member*
Joe M. Crutcher, *Member*

December 10, 2009

Mr. Gary Westbrook, General Manager
Post Oak Savannah Groundwater Conservation District
P.O. Box 92
Milano, TX 76556

Re: Managed available groundwater estimates for the Ellenburger-San Saba Aquifer in Groundwater Management Area 8

Dear Mr. Westbrook:

The Texas Water Code, Section 36.108, Subsection (o), states that Texas Water Development Board's executive administrator shall provide each district and regional water planning group located wholly or partly within a groundwater management area with the managed available groundwater in the management area based upon the desired future condition of the groundwater resource. This letter and the attached report (GTA Aquifer Assessment 08-03mag) are in response to this directive.

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J. Kevin Ward
Executive Administrator

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Kelly Mills, Texas Commission of Environmental Quality, Groundwater Planning and Assessment Division

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Temple McKinnon, Region D Project Manager, TWDB, Regional Water Planning Section

Simone Kiel, Freese & Nichols, Inc.

David Dunn, HDR Engineering

Mark Lowry, AECOM

December 10, 2009

Mr. Brian Sledge, Attorney
Prairielands Groundwater Conservation District
816 Congress Avenue, Suite 1900
Austin, TX 78701

Re: Managed available groundwater estimates for the Ellenburger-San Saba Aquifer in Groundwater Management Area 8

Dear Mr. ~~Sledge~~ Brian:

The Texas Water Code, Section 36.108, Subsection (o), states that Texas Water Development Board's executive administrator shall provide each district and regional water planning group located wholly or partly within a groundwater management area with the managed available groundwater in the management area based upon the desired future condition of the groundwater resource. This letter and the attached report (GTA Aquifer Assessment 08-03mag) are in response to this directive.

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Simone Kiel, Freese & Nichols, Inc.

David Dunn, HDR Engineering

Mark Lowry, AECOM

December 10, 2009

The Honorable Eileen Cox, Fannin County Judge
Red River Groundwater Conservation District
101 E. Rayburn Drive, Suite 101
Bonham, TX 75418

Re: Managed available groundwater estimates for the Ellenburger-San Saba Aquifer in Groundwater Management Area 8

Dear Judge Cox:

The Texas Water Code, Section 36.108, Subsection (o), states that Texas Water Development Board's executive administrator shall provide each district and regional water planning group located wholly or partly within a groundwater management area with the managed available groundwater in the management area based upon the desired future condition of the groundwater resource. This letter and the attached report (GTA Aquifer Assessment 08-03mag) are in response to this directive.

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Simone Kiel, Freese & Nichols, Inc.

David Dunn, HDR Engineering

Mark Lowry, AECOM

December 10, 2009

Mr. Randy McGuire, Board President
Saratoga Underground Water Conservation District
P.O. Box 231
Lampasas, TX 76550

Re: Managed available groundwater estimates for the Ellenburger-San Saba Aquifer in Groundwater Management Area 8

Dear Mr. McGuire:

The Texas Water Code, Section 36.108, Subsection (o), states that Texas Water Development Board's executive administrator shall provide each district and regional water planning group located wholly or partly within a groundwater management area with the managed available groundwater in the management area based upon the desired future condition of the groundwater resource. This letter and the attached report (GTA Aquifer Assessment 08-03mag) are in response to this directive.

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Simone Kiel, Freese & Nichols, Inc.

David Dunn, HDR Engineering

Mark Lowry, AECOM

December 10, 2009

Ms. Tricia Law, General Manager
Southern Trinity Groundwater Conservation District
P.O. Box 2205
Waco, TX 76703

Re: Managed available groundwater estimates for the Ellenburger-San Saba Aquifer in Groundwater Management Area 8

Dear Ms. Law:

The Texas Water Code, Section 36.108, Subsection (o), states that Texas Water Development Board's executive administrator shall provide each district and regional water planning group located wholly or partly within a groundwater management area with the managed available groundwater in the management area based upon the desired future condition of the groundwater resource. This letter and the attached report (GTA Aquifer Assessment 08-03mag) are in response to this directive.

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Temple McKinnon, Region D Project Manager, TWDB, Regional Water Planning Section

Simone Kiel, Freese & Nichols, Inc.

David Dunn, HDR Engineering

Mark Lowry, AECOM

December 10, 2009

Mr. Mike Massey, Board President
Upper Trinity Groundwater Conservation District
P.O. Box 1786
Granbury, TX 76048

Re: Managed available groundwater estimates for the Ellenburger-San Saba Aquifer in Groundwater Management Area 8

Dear Mr. Massey:

The Texas Water Code, Section 36.108, Subsection (o), states that Texas Water Development Board's executive administrator shall provide each district and regional water planning group located wholly or partly within a groundwater management area with the managed available groundwater in the management area based upon the desired future condition of the groundwater resource. This letter and the attached report (GTA Aquifer Assessment 08-03mag) are in response to this directive.

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Simone Kiel, Freese & Nichols, Inc.

David Dunn, HDR Engineering

Mark Lowry, AECOM

December 10, 2009

Mr. John Grant, Region F Chairman
Colorado River Municipal Water District
P.O. Box 869
Big Spring, TX 79721

Re: Managed available groundwater estimates for the Ellenburger-San Saba Aquifer in Groundwater Management Area 8

Dear Mr. Grant:

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J. Kevin Ward
Executive Administrator

Jack Hunt, *Vice Chairman*
Thomas Weir Labatt III, *Member*
Joe M. Crutcher, *Member*

December 10, 2009

The Honorable Dale Spurgin, Region G Chairman
Jones County Judge
P.O. Box 148
Anson, TX 79501

Re: Managed available groundwater estimates for the Ellenburger-San Saba Aquifer in Groundwater Management Area 8

Dear Judge Spurgin:

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Simone Kiel, Freese & Nichols, Inc.

David Dunn, HDR Engineering

Mark Lowry, AECOM

December 10, 2009

Mr. John Burke, Region K Chairman
Aqua Water Supply Corporation
P.O. Drawer P
Bastrop, TX 78602

Re: Managed available groundwater estimates for the Ellenburger-San Saba Aquifer in Groundwater Management Area 8

Dear Mr. Burke:

The Texas Water Code, Section 36.108, Subsection (o), states that Texas Water Development Board's executive administrator shall provide each district and regional water planning group located wholly or partly within a groundwater management area with the managed available groundwater in the management area based upon the desired future condition of the groundwater resource. This letter and the attached report (GTA Aquifer Assessment 08-03mag) are in response to this directive.

As noted in your letter dated June 9, 2008, the desired future condition submitted for the Ellenburger-San Saba Aquifer in Groundwater Management Area 8 was as follows:

- Burnet County should maintain approximately 100 percent of the saturated thickness after 50 years by using approximately 80 percent of the estimated recharge.
- Lampasas County should maintain approximately 90 percent of the saturated thickness after 50 years.
- Brown and Mills Counties should maintain approximately 90 percent of the available draw down after 50 years.

Managed available groundwater is defined in the Texas Water Code as the amount of water that may be permitted by a district for beneficial use in accordance with the desired future condition of the aquifer as determined under Texas Water Code, Section 36.108. For various planning purposes the managed available groundwater estimates have been reported at the combined aquifer, county, river basin, regional water planning area, groundwater management area, groundwater conservation district (if applicable), subdivision of an aquifer (if designated), geologic strata (if designated), and geographic area (if designated) level.

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Sincerely,

J. Kevin Ward
Executive Administrator

Attachment: GTA Aquifer Assessment 08-03mag

c w/att.: Cary Betz, Texas Commission of Environmental Quality, Water Supply Division

Kelly Mills, Texas Commission of Environmental Quality, Groundwater Planning and Assessment Division

Robert E. Mace, Ph.D., P.G., Deputy Executive Administrator, TWDB, Water Science and Conservation

Bill Hutchison, Ph.D., P.E., P.G., Director, TWDB, Groundwater Resources Division

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Simone Kiel, Freese & Nichols, Inc.

David Dunn, HDR Engineering

Mark Lowry, AECOM

December 10, 2009

Mr. Curtis Campbell, Region B Chairman
Red River Authority of Texas
P.O. Box 240
Wichita Falls, TX 76307

Re: Managed available groundwater estimates for the Ellenburger-San Saba Aquifer in Groundwater Management Area 8

Dear Mr. Campbell:

The Texas Water Code, Section 36.108, Subsection (o), states that Texas Water Development Board's executive administrator shall provide each district and regional water planning group located wholly or partly within a groundwater management area with the managed available groundwater in the management area based upon the desired future condition of the groundwater resource. This letter and the attached report (GTA Aquifer Assessment 08-03mag) are in response to this directive.

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Executive Administrator

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Simone Kiel, Freese & Nichols, Inc.

David Dunn, HDR Engineering

Mark Lowry, AECOM

December 10, 2009

Mr. James Parks, Region C Chairman
North Texas Municipal Water District
P.O. Box 2408
Wylie, TX 75098

Re: Managed available groundwater estimates for the Ellenburger-San Saba Aquifer in Groundwater Management Area 8

Dear Mr. Parks:

The Texas Water Code, Section 36.108, Subsection (o), states that Texas Water Development Board's executive administrator shall provide each district and regional water planning group located wholly or partly within a groundwater management area with the managed available groundwater in the management area based upon the desired future condition of the groundwater resource. This letter and the attached report (GTA Aquifer Assessment 08-03mag) are in response to this directive.

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Sincerely,

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Executive Administrator

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Simone Kiel, Freese & Nichols, Inc.

David Dunn, HDR Engineering

Mark Lowry, AECOM

December 10, 2009

Mr. Richard LeTourneau, Region D Chairman
Regional Water Planning Group D
P.O. Box 12071
Longview, TX 75607

Re: Managed available groundwater estimates for the Ellenburger-San Saba Aquifer in Groundwater Management Area 8

Dear Mr. LeTourneau:

The Texas Water Code, Section 36.108, Subsection (o), states that Texas Water Development Board's executive administrator shall provide each district and regional water planning group located wholly or partly within a groundwater management area with the managed available groundwater in the management area based upon the desired future condition of the groundwater resource. This letter and the attached report (GTA Aquifer Assessment 08-03mag) are in response to this directive.

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Simone Kiel, Freese & Nichols, Inc.

David Dunn, HDR Engineering

Mark Lowry, AECOM

December 10, 2009

Mr. Phil Ford, General Manager
Brazos River Authority
P.O. Box 7555
Waco, TX 76714

Re: Managed available groundwater estimates for the Ellenburger-San Saba Aquifer in Groundwater Management Area 8

Dear Mr. Ford:

The Texas Water Code, Section 36.108, Subsection (o), states that Texas Water Development Board's executive administrator shall provide each district and regional water planning group located wholly or partly within a groundwater management area with the managed available groundwater in the management area based upon the desired future condition of the groundwater resource. This letter and the attached report (GTA Aquifer Assessment 08-03mag) are in response to this directive.

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Simone Kiel, Freese & Nichols, Inc.

David Dunn, HDR Engineering

Mark Lowry, AECOM

TEXAS WATER DEVELOPMENT BOARD

December 10, 2009

Mr. Thomas G. Mason, General Manager
Lower Colorado River Authority
P.O. Box 220
Austin, TX 78767

Re: Managed available groundwater estimates for the Ellenburger-San Saba Aquifer in Groundwater Management Area 8

Dear Mr. Mason:

The Texas Water Code, Section 36.108, Subsection (o), states that Texas Water Development Board's executive administrator shall provide each district and regional water planning group located wholly or partly within a groundwater management area with the managed available groundwater in the management area based upon the desired future condition of the groundwater resource. This letter and the attached report (GTA Aquifer Assessment 08-03mag) are in response to this directive.

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