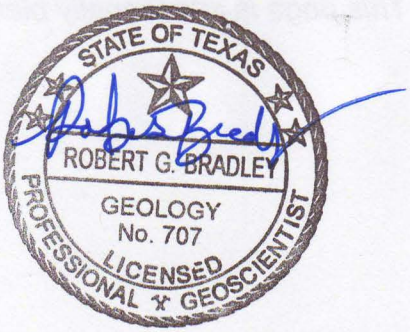
GTA Aquifer Assessment 10-07 MAG

by Robert G. Bradley
Texas Water Development Board
Groundwater Technical Assistance Section
(512) 936-0871



Robert G. Bradley, P.G. 707, authorized the seal appearing on this document on August 20, 2012.

This page is intentionally blank

EXECUTIVE SUMMARY:

The estimated modeled available groundwater from the Leona Gravel Aquifer within Medina County that achieves the desired future condition adopted by members of Groundwater Management Area 10 is approximately 16,382 acre-feet per year and is summarized by county, regional water planning area, and river basin as shown in Table 1. The modeled available groundwater estimates were extracted from GTA Aquifer Assessment 09-01, which Groundwater Management Area 10 used as the basis for developing a desired future condition.

REQUESTOR:

Mr. Rick Illgner of the Edwards Aquifer Authority acting on behalf of the member groundwater conservation districts of Groundwater Management Area 10.

DESCRIPTION OF REQUEST:

In a letter received August 11, 2010, Mr. Rick Illgner provided the Texas Water Development Board (TWDB) with the desired future condition of Leona Gravel Aquifer within Medina County, adopted by the members of Groundwater Management Area 10. The desired future condition for the Leona Gravel Aquifer, as described in Resolution No. 2010-01 and adopted May 17, 2010 by the groundwater conservation districts in Groundwater Management Area 10 is summarized below:

> *An average annual drawdown of 15 feet over the next 50 years.*

In response to receiving the adopted desired future condition, TWDB has estimated the modeled available groundwater that achieves the above desired future condition for Groundwater Management Area 10.

METHODS:

Groundwater Management Area 10, located in South Central Texas, includes part of the Leona Gravel Aquifer (Figure 1). This is neither a major nor a minor aquifer, but has been determined to be locally relevant for joint planning purposes. At the request of Groundwater Management Area 10, the TWDB previously analyzed several water level decline scenarios for the Leona Gravel Aquifer, documented in GTA Aquifer Assessment 09-01.

One of the scenarios included the desired future condition of 15 feet of water level decline, and this was adopted as the desired future condition of the Leona Gravel Aquifer within Medina County for GMA 10.

The modeled available groundwater numbers are divided by regional water planning area and river basin. Medina County is completely within the South Central Regional Water Planning Area and the Medina County Groundwater Conservation District encompasses the whole county. Regional maps of these areas are shown in Figure 2.

PARAMETERS AND ASSUMPTIONS:

- Parameters, assumptions, volumetric calculations, and areas were obtained from GTA Aquifer Assessment 09-01 (George, 2010).
- Water-level declines of 15 feet were estimated to be uniform across the aquifer.

MODELED AVAILABLE GROUNDWATER AND PERMITTING:

As defined in Chapter 36 of the Texas Water Code, “modeled available groundwater” is the estimated average amount of water that may be produced annually to achieve a desired future condition. This is distinct from “managed available groundwater,” shown in the draft version of this report dated November 9, 2010, which was a permitting value and accounted for the estimated use of the aquifer exempt from permitting. This change was made to reflect changes in statute by the 82nd Texas Legislature, effective September 1, 2011. The previous version of this report was completed prior to the readopting of the desired future conditions.

Groundwater conservation districts are required to consider modeled available groundwater, along with several other factors, when issuing permits in order to manage groundwater production to achieve the desired future condition(s).

The other factors districts must consider include annual precipitation and production patterns, the estimated amount of pumping exempt from permitting, existing permits, and a reasonable estimate of actual groundwater production under existing permits. The estimated amount of pumping exempt from permitting, which the Texas Water Development Board is now required to develop after soliciting input from applicable groundwater conservation districts, will be provided in a separate report.

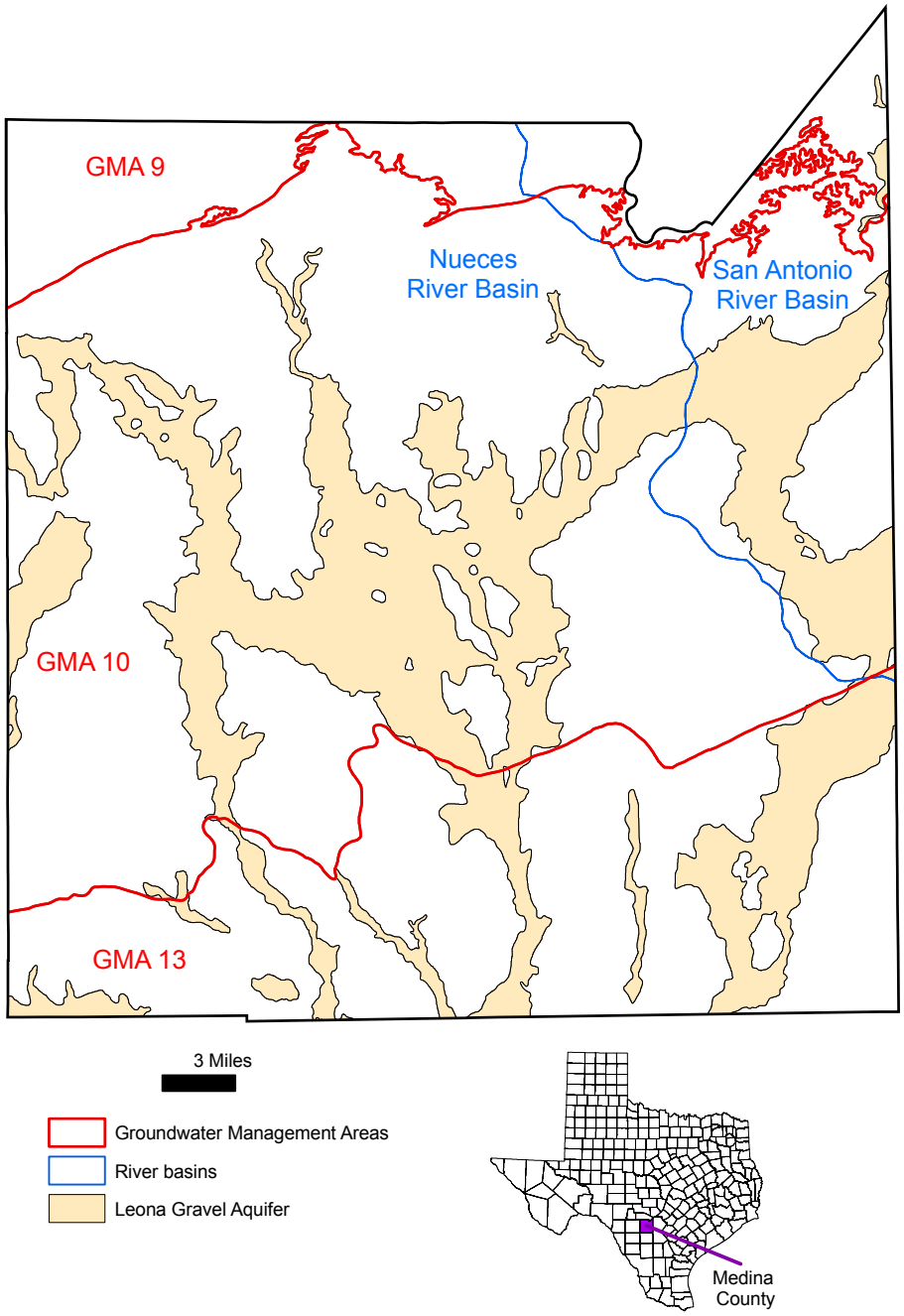


Figure 1. Map showing the groundwater management areas, river basins, and extent of the Leona Gravel Aquifer in Medina County (after George, 2010).

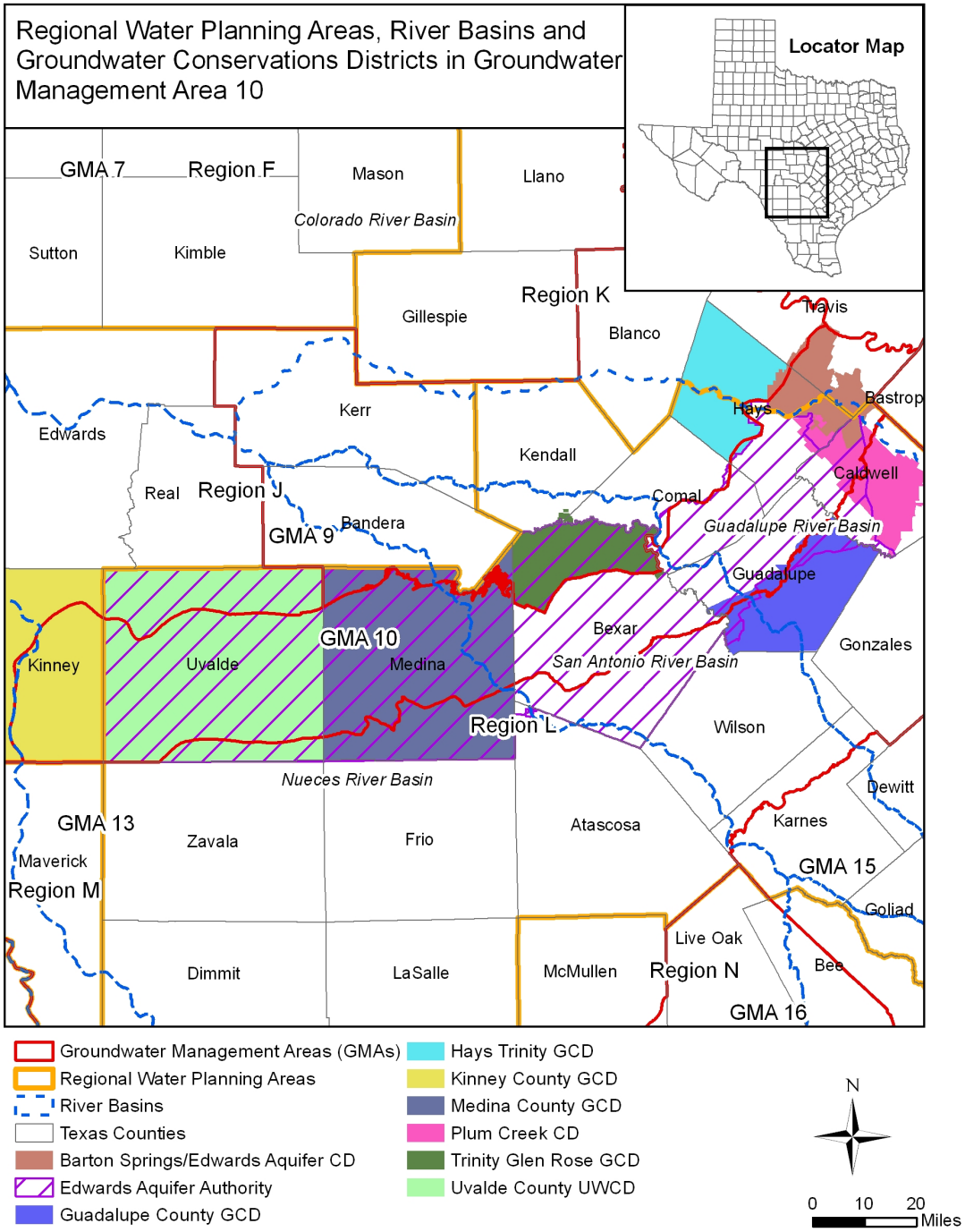


Figure 2. Map showing regional water planning areas, river basins, groundwater conservation districts, and counties in and neighboring Groundwater Management Area 10 (from Thorkildsen and Backhouse, 2010). CD = Conservation District, GCD = Groundwater Conservation District, UWCD = Underground Water Conservation District

RESULTS:

The estimated modeled available groundwater from the Leona Gravel Aquifer within Medina County in Groundwater Management Area 10 that achieves the adopted desired future condition is approximately 16,382 acre-feet per year. This pumping has been divided by county, regional water planning area, and river basin for each decade between 2010 and 2060 for use in the regional water planning process (Table 1). In addition, the modeled available groundwater estimates are tabulated for the Medina County Groundwater Conservation District in Table 2.

Table 1. Estimated modeled available groundwater by decade for the Leona Gravel Aquifer in Groundwater Management Area 10. Results are in acre-feet per year and are divided by county, regional water planning area, and river basin.

County	Regional Water Planning Area	River Basin	Year					
			2010	2020	2030	2040	2050	2060
Medina	L	Nueces	12,369	12,369	12,369	12,369	12,369	12,369
		San Antonio	4,013	4,013	4,013	4,013	4,013	4,013
Total			16,382	16,382	16,382	16,382	16,382	16,382

Table 2. Estimated modeled available groundwater for the Leona Gravel Aquifer in the Medina County Groundwater Conservation District for each decade between 2010 and 2060. Results are in acre-feet per year.

County	Year					
	2010	2020	2030	2040	2050	2060
Medina County Groundwater Conservation District	16,382	16,382	16,382	16,382	16,382	16,382

Limitations:

As indicated by George (2010), additional data are needed to create improved estimates; these estimates are a basic interpretation of the requested conditions. This analysis assumes homogeneous and isotropic aquifers; however, conditions for the Leona Gravel Aquifer may not behave in a uniform manner. There is uncertainty with respect to the distribution of the sand and gravel in the aquifer (Lowry and Couch, 2002; Green, 2003). The analysis further assumes that precipitation is the only source of aquifer recharge and that lateral inflow to the aquifer is equal to lateral outflow from the aquifer, and that future pumping will not alter this balance.

Discharge and recharge from other aquifers, such as the Edwards BFZ aquifer, are unknown as is recharge from streams. Discharge to streams from the Leona Gravel Aquifer is assumed to be 15,000 acre-feet per year (George, 2010), but this number needs to be investigated with gain-loss streamflow assessment research. The recharge rate is also a rough estimate as is the specific yield.

In addition, certain assumptions have been made regarding future precipitation, recharge, and streamflow in developing modeled available groundwater estimates. These assumptions need to be considered and compared to actual future data when evaluating achievement of the desired future condition.

Given these limitations, users of this information are cautioned that the modeled available groundwater numbers should not be considered a definitive, permanent description of the amount of groundwater that can be pumped to meet the adopted desired future condition. The TWDB makes no warranties or representations relating to the actual conditions of any aquifer at a particular location or at a particular time.

It is important for groundwater conservation districts to monitor future groundwater pumping and water levels to know if they are achieving their desired future conditions. Because of the limitations and assumptions in this analysis, it is important that the groundwater conservation districts work with the TWDB to refine these modeled available groundwater numbers given the reality of how the aquifer responds to the actual amount and location of pumping now and in the future.

REFERENCES:

George, P., 2010, GTA Aquifer Assessment 09-01: Texas Water Development Board, GTA Aquifer Assessment Report 09-01 Report, 14 p.

Green, R.T., 2003, Geophysical survey to determine the depth and lateral extent of the Leona Aquifer in the Leona river floodplain, south of Uvalde, Texas: Prepared for the Edwards Aquifer Authority by the Southwest Research Institute, 21 p.

Lowry, M.V., and Couch, B. E., 2002, Phase I Leona Gravel Aquifer Study: Prepared for the Medina County Groundwater Conservation District by Turner Collie & Braden Inc., 51 p.

Thorkildsen D. and Backhouse S., 2010, GTA Aquifer Assessment 10-29: Texas Water Development Board, GTA Aquifer Assessment 10-29 Report, 11 p.