GTA Aquifer Assessment 10-27 MAG

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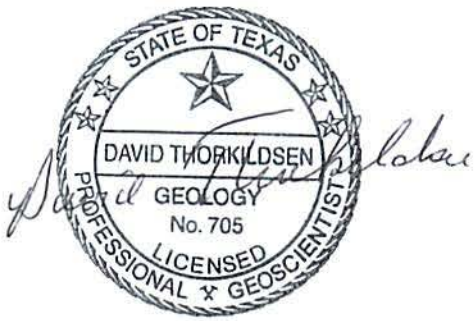

David Thorkildsen, P.G. 705, authorized the seal appearing on this document on August 19, 2011.

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EXECUTIVE SUMMARY:

The estimated total pumping from the Buda Limestone Aquifer within Uvalde County that achieves the desired future condition adopted by members of Groundwater Management Area 10 is approximately 758 acre-feet per year and is summarized by county, regional water planning area, and river basin as shown in Table 1. The estimated managed available groundwater for the Uvalde County Underground Water Conservation District (UWCD) within Groundwater Management Area 10 for the aquifer decreases from approximately 735 acre-feet per year to 718 acre-feet per year between 2010 and 2060 and is shown in Table 4. Estimated total pumping was calculated based on the desired future condition stating *"regional average well drawdown of zero (0) feet (including exempt and non-exempt use)".*

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 30, 2010, Mr. Illgner provided the Texas Water Development Board (TWDB) with the desired future condition of the Buda Limestone Aquifer within Uvalde County adopted by the members of Groundwater Management Area 10. The desired future condition for the Buda Limestone Aquifer, as described in Resolution No. 2010-11 and adopted August 23, 2010 by the groundwater conservation districts in Groundwater Management Area 10 is described below:

1) *Regional average well drawdown of zero (0) feet (including exempt and non-exempt use)*

In response to receiving the adopted desired future condition, TWDB has estimated the managed available groundwater that achieves the above desired future condition for the Uvalde County UWCD.

METHODS:

Groundwater Management Area 10, located in South Central Texas, includes part of the Buda Limestone Aquifer (Figure 2). This is neither a major nor a minor aquifer, but has been determined to be locally relevant for joint planning purposes.

There is very limited hydrogeologic data available for the Buda Limestone Aquifer in Uvalde County. Historical water level data show significant variation in aquifer storage over time. However, recent measurements (2005-2006) for one well show a degree of stabilization. A hydrograph of this well is shown in Figure 1. Southwest Research Institute (Green and others, 2009) estimated 2008 pumpage for the Buda Limestone Aquifer in Uvalde County was 758 acre-feet and, for this analysis, it is assumed that the aquifer is under a state of dynamic equilibrium and the estimated pumpage achieves the adopted desired future condition for the Buda Limestone Aquifer in Uvalde County.

The boundary of the Buda Limestone Aquifer was determined using the Digital Geologic Atlas of Texas (USGS and TWDB, 2006), the Uvalde County boundary, and the Groundwater Management Area 10 boundary. The Buda Limestone Aquifer in Uvalde County is located entirely within the Regional Water Planning Area L, the Nueces River Basin, and the Uvalde County UWCD. A regional map of the area is shown in Figure 3.

The calculations were completed in a Microsoft Excel worksheet.

PARAMETERS AND ASSUMPTIONS:

- A water-level decline of 0 feet is estimated to be uniform across the aquifer.
- The Buda Limestone Aquifer in Uvalde County is in a state of dynamic equilibrium and the 2008 estimated pumpage of 758 acre-feet (Green and others, 2009) achieves the adopted desired future condition.
- Conditions were assumed to be physically possible across the management area.

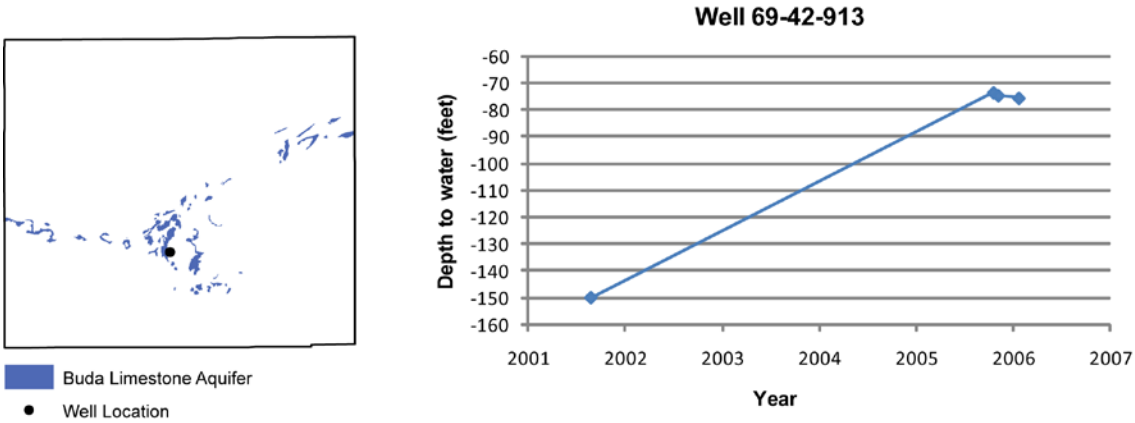

Figure 1. Water-level measurements for a selected Buda Limestone well in Uvalde County, Texas (TWDB, 2011).

DETERMINING MANAGED AVAILABLE GROUNDWATER:

As defined in Chapter 36 of the Texas Water Code, “managed available groundwater” is the amount of water that may be permitted by a groundwater conservation district. The estimated total annual volume of groundwater calculated, however, represents the total amount of pumping from the aquifer. The total pumping includes uses of water both subject to permitting and exempt from permitting. Examples of exempt uses include domestic, livestock, and oil and gas exploration. Each district may also exempt additional uses as defined by its rules or enabling legislation.

Since exempt uses are not available for permitting, it is necessary to account for them when determining managed available groundwater. To do this the Texas Water Development Board developed a standardized method for estimating exempt use for domestic and livestock purposes based on projected changes in population and the ratio of domestic and livestock wells in an area to the total number of wells. Because other exempt uses can vary significantly from district to district and there is much higher uncertainty associated with estimating use due to oil and gas exploration, estimates of exempt pumping outside domestic and livestock uses have not been included. If a district believes it has a more appropriate estimate of exempt pumping, they may submit it, along with a description of how it was developed, to the Texas Water Development Board for consideration. Once established, the estimates of exempt pumping are subtracted from the total pumping calculation to yield the estimated managed available groundwater for permitting purposes.

RESULTS:

The estimated total pumping from the Buda Limestone Aquifer within Uvalde County in Groundwater Management Area 10 that achieves the adopted desired future condition is approximately 758 acre-feet per year. Table 1 shows the total pumping estimates 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 2 shows the total pumping estimate summarized by groundwater conservation district.

Table 3 contains the estimates of exempt pumping in the Uvalde County UWCD for domestic and livestock uses. The managed available groundwater for the groundwater conservation district is the difference between the total pumping (Table 2) and the estimated exempt use (Table 3) and is shown in Table 4.

Table 1. Estimated total pumping by decade for the Buda Limestone Aquifer within Uvalde County 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
Uvalde	L	Nueces	758	758	758	758	758	758

Table 2. Estimated total pumping for the Buda Limestone Aquifer in the Uvalde County UWCD for each decade between 2010 and 2060. Results are in acre-feet per year.

Groundwater Conservation District	Year					
	2010	2020	2030	2040	2050	2060
Uvalde County Underground Water Conservation District	758	758	758	758	758	758

Table 3. Estimates of exempt use for the Buda Limestone Aquifer in the Uvalde County UWCD for each decade between 2010 and 2060. Results are in acre-feet per year.

Groundwater Conservation District	Source	Year					
		2010	2020	2030	2040	2050	2060
Uvalde County Underground Water Conservation District	TA	23	29	33	36	39	40

TA = Estimated exempt use calculated by TWDB and accepted by the district

Table 4. Estimates of managed available groundwater for the Buda Limestone Aquifer in the Uvalde County UWCD for each decade between 2010 and 2060. Results are in acre-feet per year.

Groundwater Conservation District	Year					
	2010	2020	2030	2040	2050	2060
Uvalde County Underground Water Conservation District	735	729	725	722	719	718

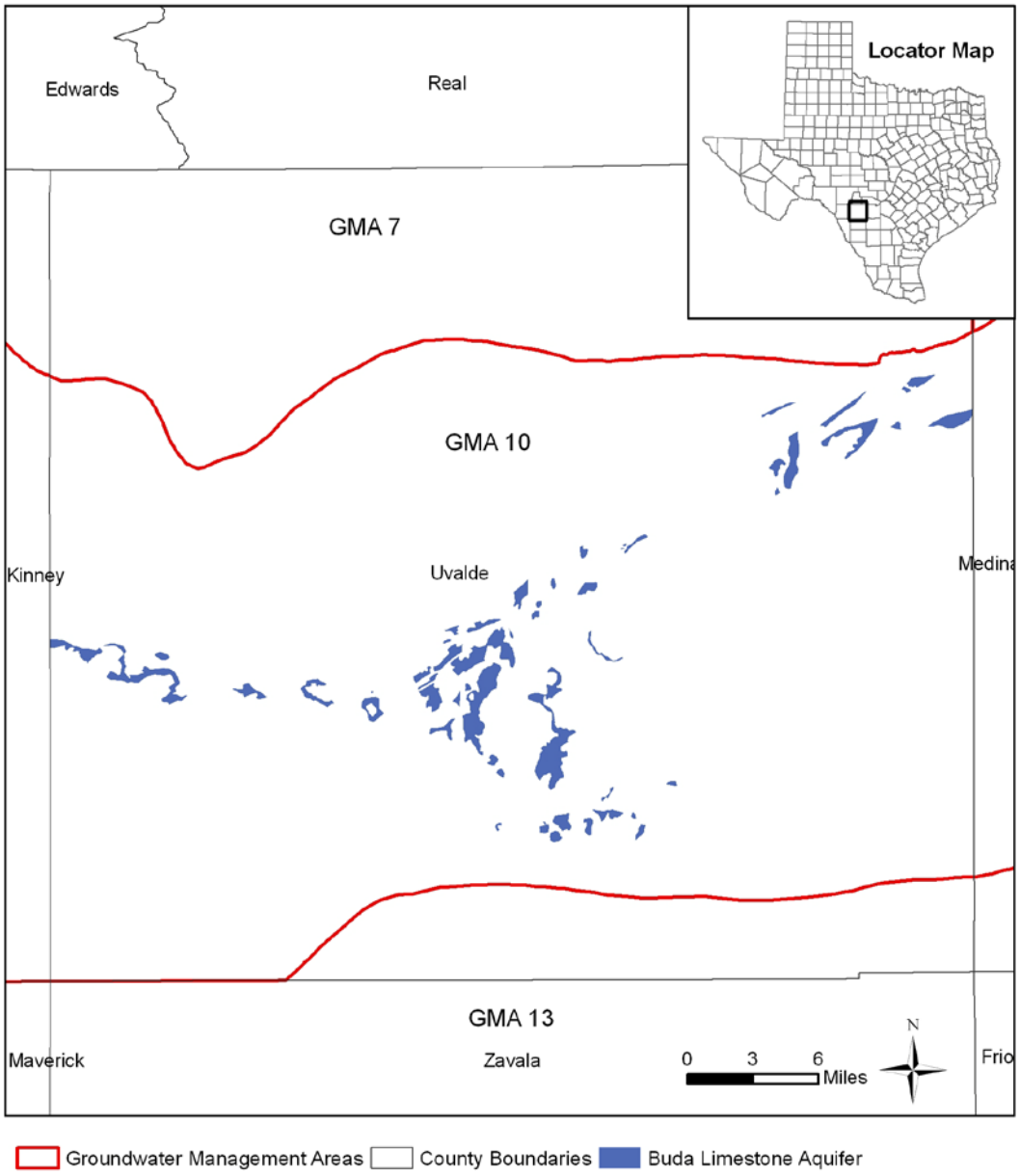

Figure 2. Map showing the outcrop extent of the Buda Limestone Aquifer within Uvalde County in Groundwater Management Area 10.

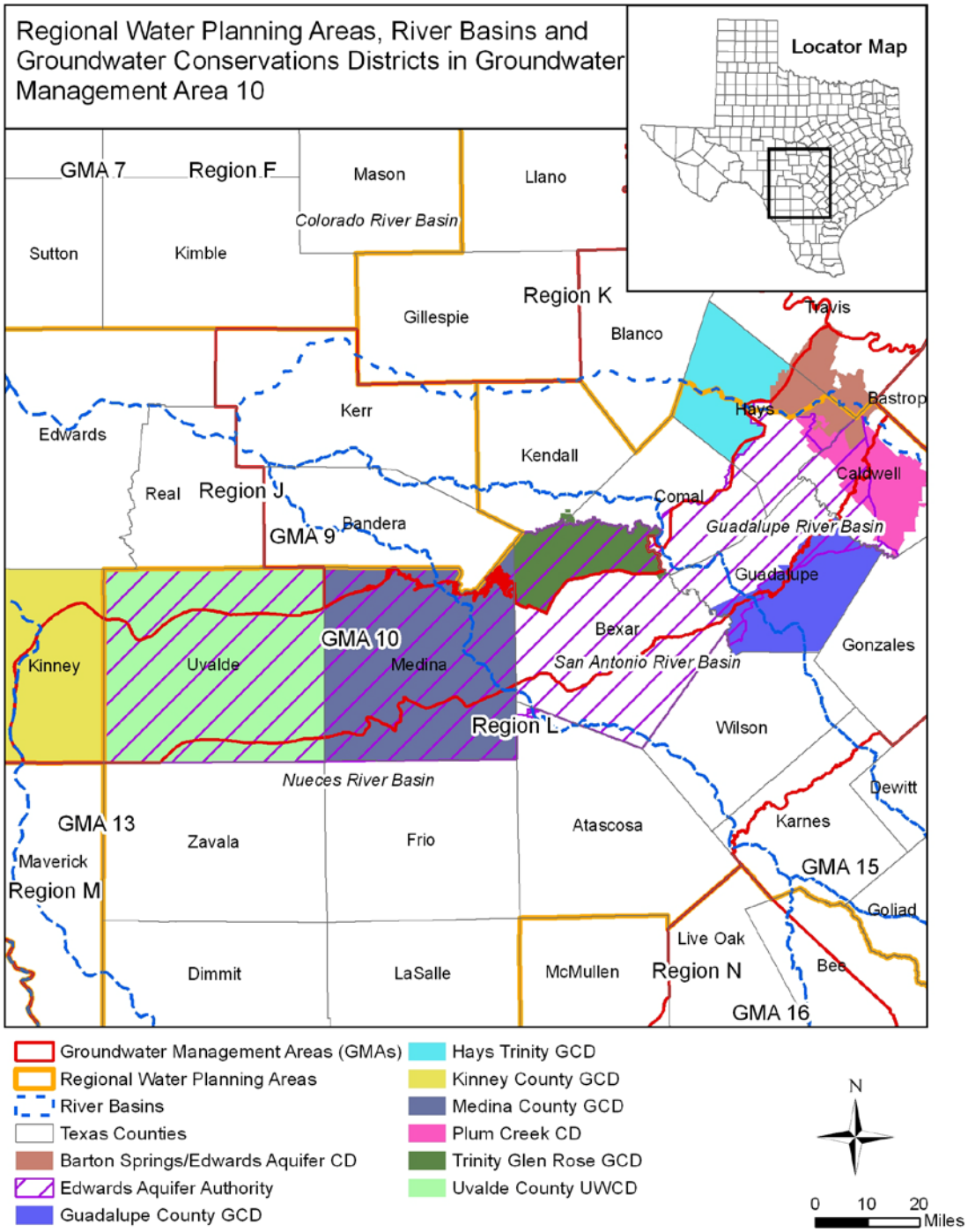

Figure 3. Map showing regional water planning areas, river basins, groundwater conservation districts and counties in Groundwater Management Area 10. CD = Conservation District, GCD = Groundwater Conservation District, UWCD = Underground Water Conservation District

LIMITATIONS:

Managed available groundwater numbers included in this report are the result of subtracting the estimated future exempt use from the estimated total pumping that would achieve the desired future condition adopted by the groundwater conservation districts in the groundwater management area. These numbers, therefore, are the result of (1) the assumption that the aquifer is under a state of dynamic equilibrium and the estimated 2008 pumpage achieves the desired future condition and (2) estimating the future exempt use in the area.

This analysis was determined to be the best method to calculate a total pumping estimate, however this method has limitations and should be replaced with better tools, including groundwater models and additional data that are not currently available, whenever possible. This analysis assumes that the aquifer is in a state of dynamic equilibrium. This assumption needs to be considered and compared to actual future data when evaluating achievement of the desired future condition.

In the case of TWDB's estimates of future exempt use, key assumptions were made as to the pattern of population growth relative to the need for domestic wells or supplied water, per capita use from domestic wells, and livestock use of water. In the case of district estimates of future exempt use, including exempt use associated with the exploration of oil and gas, the assumptions are specific to that district. In any case, these assumptions will need to be considered when reviewing future data related to exempt use.

Given these limitations, users of this information are cautioned that the total pumping 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 managed 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:

Green, R.T., Bertetti, F.P., and McGinnis, R., 2009, Analysis of the Water Resources of the Area Centered Within and Near Uvalde and Zavala Counties and Review of a Report on a Potential Well Field and Pipeline in Uvalde County, Texas: SwRI Project No. 20-14842, 53 p.

Texas Water Development Board, 2011, Groundwater database: Texas Water Development Board, Groundwater Resources Division.

USGS and TWDB, 2006, Digital Geologic Atlas of Texas: U.S. Geological Survey and Texas Water Development Board, available through the Texas Natural Resources Information System.