GTA Aquifer Assessment 10-29 MAG

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David Thorkildsen, P.G. 705 authorized the seal appearing on this document on November 29, 2011.

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EXECUTIVE SUMMARY:

The modeled available groundwater for the Trinity Aquifer as a result of the desired future condition adopted by members of Groundwater Management Area 10 is approximately 59,746 acre-feet per year. This is divided by county, regional water planning area, and river basin in Table 2 for use in the regional water planning process. Modeled available groundwater is summarized by county, regional water planning area, river basin, and groundwater conservation district in tables 3 through 6. Pumping estimates, as well as parameters and assumptions to determine additional modeled available groundwater estimates were extracted from GTA Aquifer Assessment 10-06, which Groundwater Management Area 10 used as the basis for developing a desired future condition stating that "*except as otherwise provided herein: regional average well drawdown during average recharge conditions that does not exceed 25 feet; within the jurisdiction of Hays-Trinity GCD: regional average well drawdown during average recharge conditions of zero (0) feet; and in the Uvalde County part of GMA-10: regional average well drawdown during average recharge conditions of no more than twenty (20) feet*" and declaring "*the Trinity Aquifer in the part of GMA 10 that is in the Trinity-Glen Rose GCD as a non-relevant aquifer*".

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 Trinity Aquifer adopted by the members of Groundwater Management Area 10. The desired future condition for the Trinity Aquifer, as described in Resolution No. 2010-10 and adopted August 23, 2010 by the groundwater conservation districts in Groundwater Management Area 10 is described below:

1) *except as otherwise provided herein: regional average well drawdown during average recharge conditions that does not exceed 25 feet (including exempt and non-exempt well use);*
2) *within the jurisdiction of Hays-Trinity GCD: regional average well drawdown during average recharge conditions of zero (0) feet (including exempt and non-exempt use);*
3) *in the Uvalde County part of GMA-10: regional average well drawdown during average recharge conditions of no more than twenty (20) feet (including exempt and non-exempt well use);*

4) *declare the Trinity Aquifer in the part of GMA 10 that is in the Trinity-Glen Rose GCD as a non-relevant aquifer*

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 Trinity Aquifer (Figure 1). At the request of Groundwater Management Area 10 the TWDB previously analyzed several water level decline scenarios for the Trinity Aquifer, documented in GTA Aquifer Assessment 10-06. One of the scenarios included the desired future condition of 25 feet of water level decline, and one included the desired future condition of 20 feet of water level decline. For these two scenarios the pumping results presented here for Groundwater Management Area 10 are taken directly from GTA Aquifer Assessment 10-06 with the exception of the area in the Hays Trinity Groundwater Conservation District (GCD). The assessment did not include a 0 foot water level decline scenario, therefore new calculations to determine modeled available groundwater estimates were completed for this area (Table 1)

To calculate modeled available groundwater estimates for the desired future condition of 0 feet of water level decline for the Hays Trinity GCD parameters and assumptions for the volumetric storage, recharge, inflow calculations, map areas, and areal extent were obtained from GTA Aquifer Assessment 10-06 (Thorkildsen and Backhouse, 2010). It is important to note that only 3 percent (6,363 acres) of the total Hays Trinity GCD area occurs in Groundwater Management Area 10.

To calculate change in aquifer storage for the Hays Trinity GCD based on the desired future condition, map areas were multiplied by the estimated aquifer storativity or specific yield and then by a uniform water level decline of 0 feet. These volumes were then divided by 50 years to obtain a yearly volume. In cases where unconfined and confined conditions existed, those were calculated separately.

Modeled available groundwater estimates are divided by county, regional water planning area, river basin, and groundwater conservation district. These areas are shown in Figure 2.

PARAMETERS AND ASSUMPTIONS:

- Parameters, assumptions, volumetric calculations, and areas were obtained from GTA Aquifer Assessment 10-06 (Thorkildsen and Backhouse, 2010).
- Water-level declines were estimated to be uniform across the aquifer.
- The Edwards Aquifer Authority is not included in this assessment because they are restricted by their enabling legislation to manage only the Edwards 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 January 10, 2011, 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.

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.

RESULTS:

The estimated modeled available groundwater for the Trinity Aquifer in Groundwater Management Area 10 consistent with the adopted desired future condition is approximately 59,746 acre-feet per year. The volumetric calculations to determine the estimates for Hays Trinity GCD are shown in Table 1. The relatively small totals reflect the small percentage (3%) of the total district area that occurs in Groundwater Management Area 10.

Table 2 shows the modeled available groundwater by decade divided by county, regional water planning area, and river basin for use in the regional water planning process. Modeled available groundwater estimates are also summarized by county, regional water planning area, river basin, and

groundwater conservation district and are shown in tables 3, 4, 5, and 6 respectively.

Table 1. Volumetric calculations estimating annual modeled available groundwater for the Trinity Aquifer in Hays Trinity GCD. Map areas and parameters were obtained from GTA Aquifer Assessment 10-06 (Thorkildsen and Backhouse, 2010).

GMA	Aquifer	County	GCD	Map Areas	Estimated storage coefficient	Areal extent (acres)	Desired total aquifer water level decline (feet)	Estimated total volume from water level decline (acre-feet)	Estimated annual volume from water level decline (acre-feet)	Estimated annual effective recharge (ac-ft/yr)	Estimated annual lateral inflow (ac-ft/yr)	Estimated annual total volume (ac-ft/yr)
10	Trinity	Hays	Hays Trinity Groundwater Conservation District	7	0.00001	994	0	0	0	0	39	39
				8	0.00001	4,342	0	0	0	0	80	80
				22	0.05	554	0	0	0	64	9	73
				23	0.05	473	0	0	0	57	9	66

GMA = groundwater management area ac-ft/yr = acre-feet per year

The formulas for this table are: storage coefficient * areal extent * desired total aquifer water level decline = estimated total volume from water level decline. Estimated total volume from water level decline/50 = estimated annual volume from water level decline. Then estimated annual volume from water level decline + estimated annual effective recharge + estimated annual lateral inflow = estimated annual total volume.

Table 2. Modeled available groundwater by decade for the Trinity 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
Bexar	L	San Antonio	19,998	19,998	19,998	19,998	19,998	19,998
Caldwell	L	Guadalupe	0	0	0	0	0	0
Comal	L	Guadalupe	27,176	27,176	27,176	27,176	27,176	27,176
		San Antonio	2,108	2,108	2,108	2,108	2,108	2,108
Guadalupe	L	Guadalupe	0	0	0	0	0	0
		San Antonio	0	0	0	0	0	0
Hays	K	Colorado	955	955	955	955	955	955
	L	Guadalupe	2,860	2,860	2,860	2,860	2,860	2,860
Medina	L	Nueces	4,373	4,373	4,373	4,373	4,373	4,373
		San Antonio	996	996	996	996	996	996
Travis	K	Colorado	634	634	634	634	634	634
		Guadalupe	7	7	7	7	7	7
Uvalde	L	Nueces	639	639	639	639	639	639
Total			**59,746**	**59,746**	**59,746**	**59,746**	**59,746**	**59,746**

Table 3. Modeled available groundwater for the Trinity Aquifer summarized by county in Groundwater Management Area 10 for each decade between 2010 and 2060. Results are in acre-feet per year.

County	Year					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**
Bexar	19,998	19,998	19,998	19,998	19,998	19,998
Caldwell	0	0	0	0	0	0
Comal	29,284	29,284	29,284	29,284	29,284	29,284
Guadalupe	0	0	0	0	0	0
Hays	3,815	3,815	3,815	3,815	3,815	3,815
Medina	5,369	5,369	5,369	5,369	5,369	5,369
Travis	641	641	641	641	641	641
Uvalde	639	639	639	639	639	639
Total	**59,746**	**59,746**	**59,746**	**59,746**	**59,746**	**59,746**

Table 4. Modeled available groundwater for the Trinity Aquifer summarized by regional water planning area in Groundwater Management Area 10 for each decade between 2010 and 2060. Results are in acre-feet per year.

Regional Water Planning Area	Year					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**
K	1,596	1,596	1,596	1,596	1,596	1,596
L	58,150	58,150	58,150	58,150	58,150	58,150
Total	**59,746**	**59,746**	**59,746**	**59,746**	**59,746**	**59,746**

Table 5. Modeled available groundwater for the Trinity Aquifer summarized by river basin in Groundwater Management Area 10 for each decade between 2010 and 2060. Results are in acre-feet per year.

River Basin	Year					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**
Colorado	1,589	1,589	1,589	1,589	1,589	1,589
Guadalupe	30,043	30,043	30,043	30,043	30,043	30,043
Nueces	5,012	5,012	5,012	5,012	5,012	5,012
San Antonio	23,102	23,102	23,102	23,102	23,102	23,102
Total	**59,746**	**59,746**	**59,746**	**59,746**	**59,746**	**59,746**

Table 6. Modeled available groundwater for the Trinity Aquifer summarized by groundwater conservation district in Groundwater Management Area 10 for each decade between 2010 and 2060. Results are in acre-feet per year.

	Year					
Groundwater Conservation District	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Barton Springs/Edwards Aquifer CD	1,288	1,288	1,288	1,288	1,288	1,288
Hays Trinity GCD	258	258	258	258	258	258
Medina County GCD	5,369	5,369	5,369	5,369	5,369	5,369
Plum Creek CD	238	238	238	238	238	238
Uvalde County UWCD	639	639	639	639	639	639
Total (excluding non-district areas)	**7,792**	**7,792**	**7,792**	**7,792**	**7,792**	**7,792**
No District	51,954	51,954	51,954	51,954	51,954	51,954
Total (including non-district areas)	**59,746**	**59,746**	**59,746**	**59,746**	**59,746**	**59,746**

GCD = Groundw ater Conservation District CD = Conservation District UWCD = Underground Water Conservation District

LIMITATIONS:

The water budget in this analysis was determined to be the best method to calculate estimates of modeled available groundwater, 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 homogeneous and isotropic aquifers; however, aquifer conditions may not be uniform. In addition, certain assumptions have been made regarding future precipitation, recharge, and streamflow in developing these pumping 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:

Thorkildsen and Backhouse, 2010, GTA Aquifer Assessment 10-06:Texas Water Development Board, GTA Aquifer Assessment 10-06 Report, 20 p.

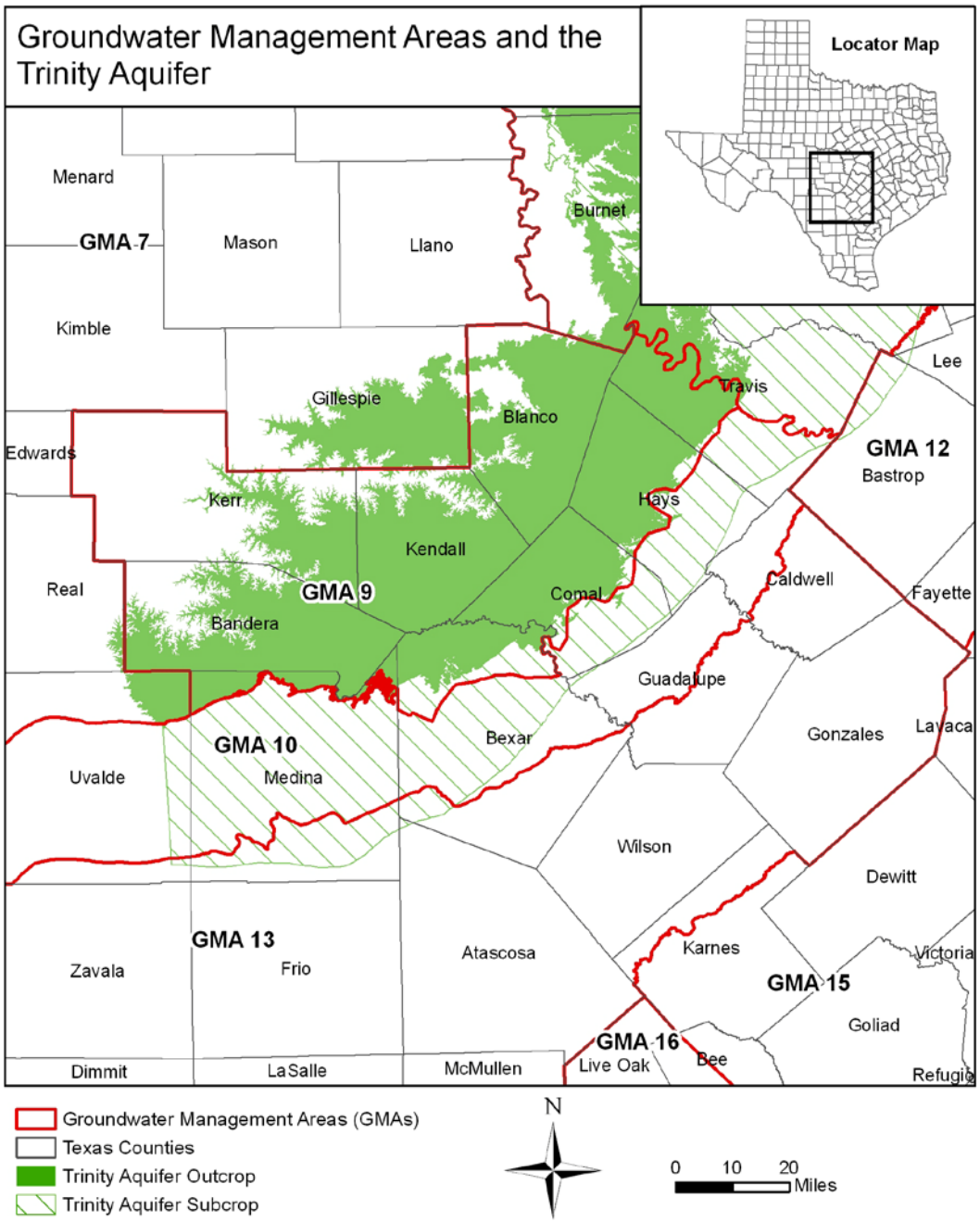

Figure 1. Map showing the areas covered by the Trinity Aquifer in and neighboring Groundwater Management Area 10.

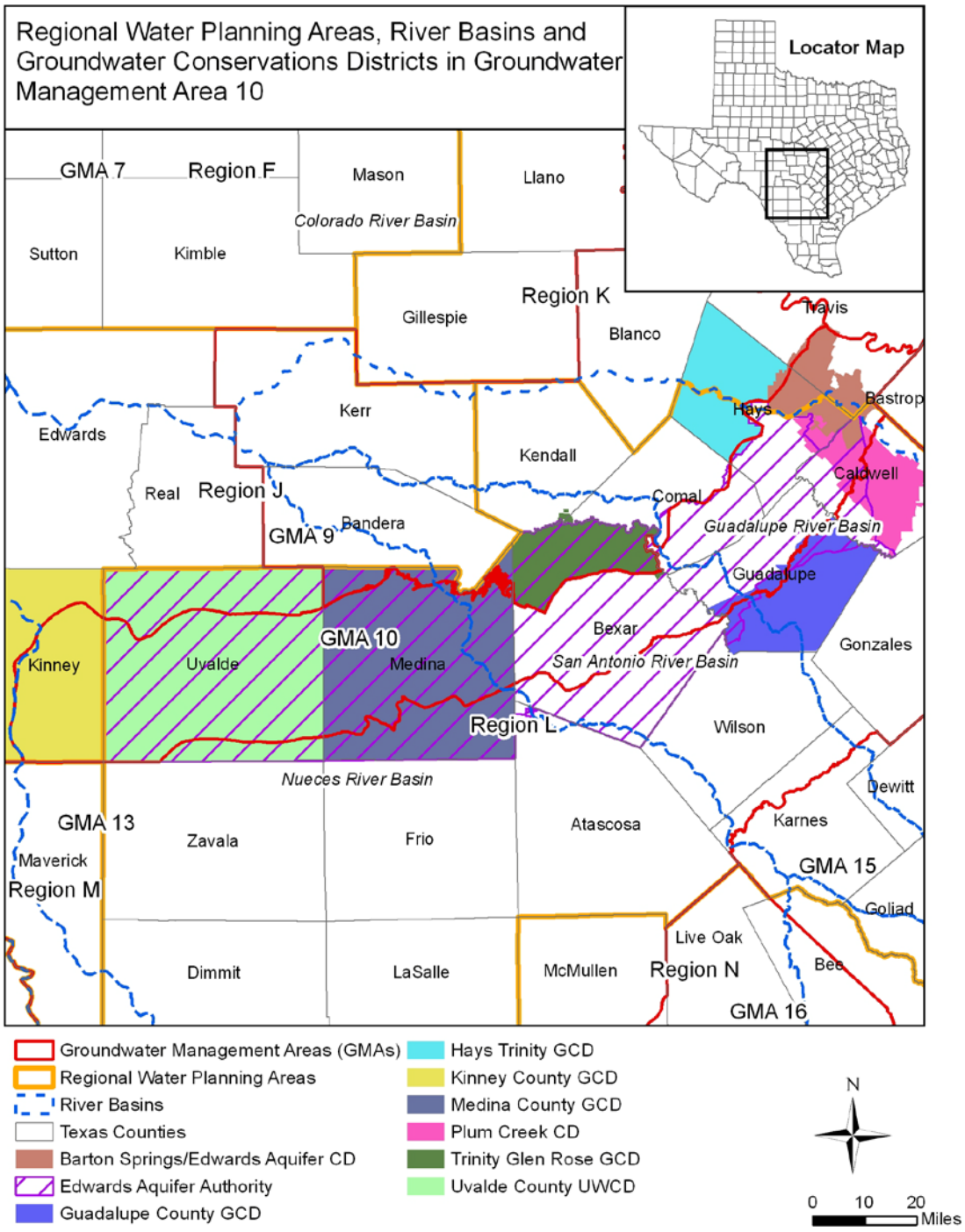

Figure 2. Map showing regional water planning areas, river basins, groundwater conservation districts and counties in and neighboring Groundwater Management Area 10. CD = Conservation District, GCD = Groundwater Conservation District, UWCD = Underground Water Conservation District