May 23, 2016

DRAFT

Explanatory Report for Proposed Desired Future Conditions of the Trinity Aquifer in Groundwater Management Area 10

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Abbreviations

DFC	Desired Future Conditions
GCD	Groundwater Conservation District
GMA	Groundwater Management Area
RWPG	Regional Water Planning Group
MAG	Modeled Available Groundwater
TWDB	Texas Water Development Board

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Explanatory Report for Proposed Desired Future Conditions of Trinity Aquifer in the Groundwater Management Area 10

1. Description of Groundwater Management Area 10

Groundwater Conservation Districts (GCDs, or districts) were created, typically by legislative action, to provide for the conservation, preservation, protection, recharging, and prevention of waste of the groundwater, and of groundwater reservoirs or their subdivisions, and to control subsidence caused by withdrawal of water from those groundwater reservoirs or their subdivisions. The individual GCDs overlying each of the major aquifers or, for some aquifers, their geographic subdivisions were aggregated by the Texas Water Development Board (TWDB) acting under legislative mandate to form Groundwater Management Areas (GMAs). Each GMA is charged with facilitating joint planning efforts for all aquifers wholly or partially within its GMA boundaries that are considered relevant to joint regional planning.

Groundwater Management Area 10 was delineated based primarily on the extents of the San Antonio and Barton Springs segments of the Fresh Edwards (Balcones Fault Zone) Aquifer, but it also includes the underlying down-dip Trinity Aquifer. Other, minor aquifers in GMA 10 include the Leona Gravel, Buda Limestone, Austin Chalk, and the Saline Edwards (Balcones Fault Zone) aquifers. The planning area of GMA 10 includes all or parts of Bexar, Caldwell, Comal, Guadalupe, Hays, Kinney, Medina, Travis, and Uvalde counties (Figure 1). GCDs in Groundwater Management Area 10 include all or parts of Barton Springs/Edwards Aquifer Conservation District, Edwards Aquifer Authority, Kinney County Groundwater Conservation District, Medina County Groundwater Conservation District, Plum Creek Conservation District, and Uvalde County Underground Water Conservation District (Figure 1).

As mandated in Texas Water Code § 36.108, districts in a GMA are required to submit Desired Future Conditions (DFCs) of the groundwater resources in their GMA to the executive administrator of the TWDB, unless that aquifer is deemed to be non-relevant for the purposes of joint planning. According to Texas Water Code § 36.108 (d-3), the district representatives shall produce a Desired Future Conditions Explanatory Report for the management area and submit to the TWDB a copy of the Explanatory Report.

GMA 10 has designated the Trinity aquifer as a relevant aquifer for purposes of joint planning. This document is the preliminary Explanatory Report for this aquifer.

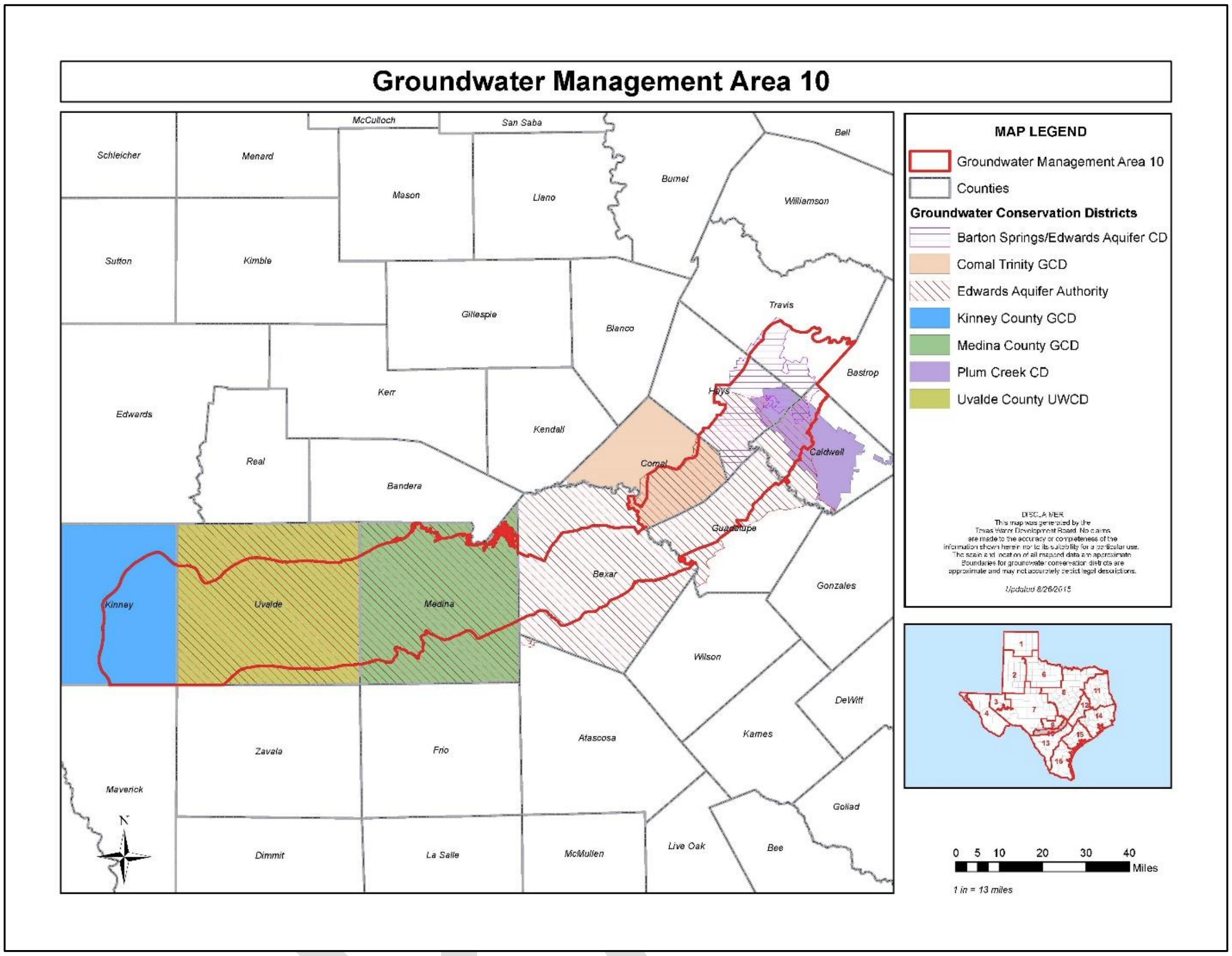

Figure 1. Map of the administrative boundaries of GMA 10 designated for joint-planning purposes and the GCDs in the GMA (From Texas Water Development Board website)

2. Aquifer Description

The Trinity Aquifer consists of Cretaceous-age formations of varying viability as water sources. The upper Trinity Aquifer (comprising the upper Glen Rose Limestone) has low yields and poor water quality due to its evaporite beds. The middle Trinity Aquifer (comprising the lower Glen Rose Limestone, the Hensel Sand, and Cow Creek Limestone) is the most widely used portion of the aquifer. The lower Trinity (comprising the Hosston Sand and Sligo Limestone) is as widely used due to its depth and water quality (SCTRWPG, 2010). The Trinity Aquifer outcrops very little within GMA 10 and exists as a confined aquifer underlying the Edwards (Balcones Fault Zone) Aquifer. It is currently used as a minor source of groundwater in Uvalde, Medina, Bexar, Comal, Guadalupe, Hays, and Travis counties, but is increasingly becoming a major source due to rapid development and increased water demands.

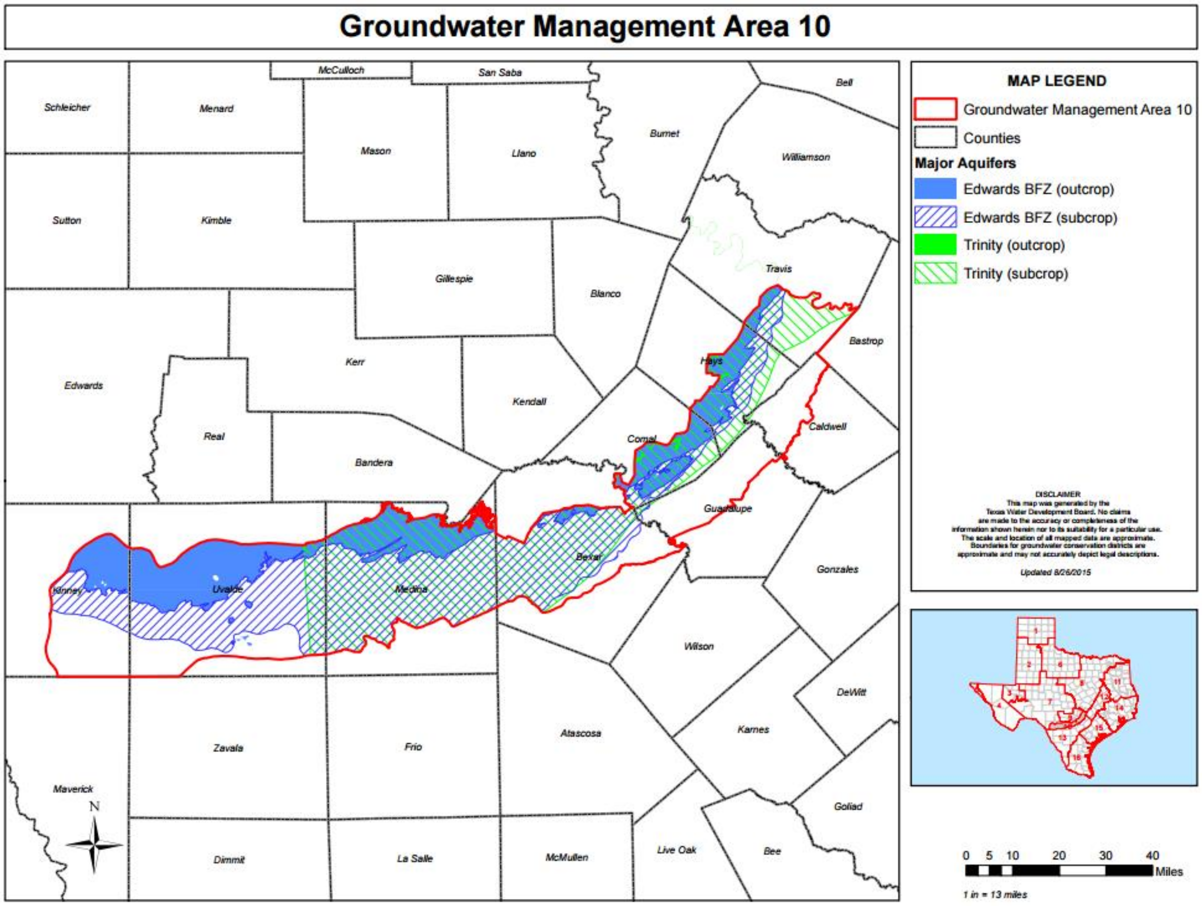

Figure 2. Map showing the extent of the Trinity aquifer in GMA 10 (From Texas Water Development Board website)

3. Desired Future Conditions

The desired future conditions (DFC) adopted on 8/23/2010 for the Trinity Aquifer are as follows: *Average regional well drawdown not exceeding 25 feet during average recharge conditions (including exempt and non-exempt use); within Hays-Trinity Groundwater Conservation District: no drawdown; within Uvalde County: 20 feet; not relevant in Trinity-Glen Rose GCD.* (TWDB, 2015)

GMA 10 has proposed to maintain the same DFCs in the second round as in the first round for this aquifer, with the exception of Hays-Trinity GCD, which is no longer in GMA 10. This second round of proposed DFCs was approved at the GMA 10 meeting on March 14, 2016 to be available for consideration during the 90-day public comment period and a public hearing held by each GCD. After the comment period and public hearings, the proposed DFCs were adopted at the GMA 10 meeting on XXXX, XX, XXXX. Resolution No. 2016-XX is attached in Appendix A.

4. Policy Justification

The DFCs in the Trinity Aquifer within GMA 10 were adopted after considering the following factors specified in Texas Water Code §36.108 (d):

1. Aquifer uses or conditions within the management area, including conditions that differ substantially from one geographic area to another;
    a. for each aquifer, subdivision of an aquifer, or geologic strata; and
    b. for each geographic area overlying an aquifer
2. The water supply needs and water management strategies included in the state water plan;
3. Hydrological conditions, including for each aquifer in the management area the total estimated recoverable storage as provided by the executive administrator, and the average annual recharge, inflows, and discharge;
4. Other environmental impacts, including impacts on spring flow and other interactions between groundwater and surface water;
5. The impact on subsidence;
6. Socioeconomic impacts reasonably expected to occur;
7. The impact on the interests and rights in private property, including ownership and the rights of management area landowners and their lessees and assigns in groundwater as recognized under Section 36.002;
8. The feasibility of achieving the DFC; and,
9. Any other information relevant to the specific DFCs.

These factors and their relevance to establishing the DFCs are discussed in detail in corresponding sections and subsections of this Explanatory Report.

5. Technical Justification

The TWDB developed a method described in GTA Aquifer Assessment 10-06 (Thorkildsen and Backhouse, 2010) that uses an analytical solution to estimate modeled available groundwater for various drawdown scenarios.

The groundwater conservation districts in GMA 10 regard the Trinity Aquifer as an alternative water supply that poses little threat to the overlying Edwards—and in fact can lessen demands placed upon it. The proposed DFC is an expression of average drawdown of the potentiometric surface. Table 1 is an estimate of modeled available groundwater using the analytical approach used by TWDB. As described in Thorkildsen and Backhouse (2010), the modeled available groundwater is estimated by multiplying the average drawdown by the storage coefficient and the area and then adding in estimated lateral inflow. As other inflows and outflows are considered to be negligible (described later in this report), this approach treats the aquifer as a closed system.

Table 1. Estimation of Modeled Available Groundwater (MAG)

County	Estimated Annual Modeled Available Groundwater (acre-feet per year)
Bexar	19,998
Caldwell	0
Comal	29,284
Guadalupe	0
Hays	3,557*
Medina	5,369
Travis	641
Uvalde	639
Total	**59,488***

*The Hays County total has been reduced by 258 ac-ft to account for the Hays-Trinity GCD, which was included in Thorkildsen and Backhouse (2010), but is no longer in GMA 10.

6. Consideration of Designated Factors

In accordance with Texas Water Code § 36.108 (d-3), the district representatives shall produce a Desired Future Condition Explanatory Report. The report must include documentation of how nine factors identified in Texas Water Code §36.108(d) were considered and how the proposed DFC impacts each factor. The following sections of the Explanatory Report summarize the information that the GCDs used in their deliberations and discussions.

6.1. Aquifer Uses or Conditions

6.1.1 Description of Factors for the Trinity Aquifer in GMA 10

The Trinity Aquifer does not serve as the primary source of water for counties in GMA 10. However, given restrictions on groundwater withdrawals from the Edwards Aquifer, withdrawals from the Trinity Aquifer have been growing. The aquifer is stressed due to increasing numbers of wells to supply rapidly developing areas of central Texas. In addition, wells that were poorly cased through evaporite beds in the Upper Trinity formation have diminished the water quality in parts of the Middle Trinity Aquifer (SCTRWPG, 2010). Another concern is potential movement of the “bad water line” (where total dissolved solids concentrations exceed 1,000 milligrams per liter) due to increased groundwater withdrawal. Water quality becomes progressively poorer in the downdip sections of the Trinity Aquifer, with the “bad water line” stretching east-west through southern Uvalde and Medina counties, and then southeast-northwest through central Bexar, and along the southeastern edge of Comal and Hays counties (SCTRWPG, 2010).

The TWDB provides historical groundwater pumpage values by county and aquifer. The table below provides the amount of groundwater in acre-feet supplied by the Trinity Aquifer for the period 2000-2013. The Trinity Aquifer does not provide the majority of groundwater in any county, although the Trinity Aquifer share has increased from 2000 to 2012 in Comal, Hays, and Travis counties. The TWDB does not report any pumping from the Trinity Aquifer in Caldwell or Kinney counties.

Table 1. Total groundwater pumpage values by county from the Trinity Aquifer in ac-ft. Note that pumping estimates may include areas of the Trinity Aquifer outside of GMA 10.

County	Bexar	Comal	Guadalupe	Hays	Medina	Travis	Uvalde
2000	7,974	2,895	0	2,236	42	1,868	49
2001	8,761	2,422	0	2,441	33	1,969	46
2002	9,425	2,229	0	2,212	35	1,944	45
2003	8,681	2,169	0	2,115	36	1,944	43
2004	9,301	5,642	0	2,024	35	1,754	40
2005	11,579	5,404	0	2,249	186	1,929	61
2006	11,353	6,916	4	3,497	248	3,591	96
2007	8,698	6,896	4	3,818	242	2,838	91
2008	10,020	4,270	4	3,670	220	3,461	170
2009	11,675	4,166	6	4,262	248	4,594	163
2010	15,475	2,456	9	4,985	356	8,801	246
2011	18,530	4,678	6	6,110	479	10,364	257
2012	17,854	7,119	8	5,286	338	7,636	195
2013	14,763	4,180	7	5,061	332	8,808	180

Values from https://www.twdb.texas.gov/waterplanning/waterusesurvey/historical-pumpage.asp

District-level water use numbers compiled by two GCDs in the GMA 10 area are also available, but only for recent years. Uvalde County UWCD values are sourced from their annual water use report database and provided in the table below. These numbers are higher than the county-wide values provided by the TWDB, particularly in 2009 and 2010.

Table 2 Total groundwater pumpage values in Uvalde County according the UCUWCD (2011) in ac-ft

Aquifer	2007	2008	2009	2010
Trinity	228	267	1,667	908

Values from UCUWCD (2011).

The Barton Springs Edwards Aquifer Conservation District (BSEACD) values are based on meter readings from district wells and are provided in the table below. The numbers are smaller than the county-wide numbers given by TWDB since the BSEACD only covers a portion of Travis County.

Table 3 Total groundwater pumpage values for Middle Trinity Aquifer and Lower Trinity Aquifers according to BSEACD (ac-ft)

County	Aquifer	2007	2008	2009	2010	2011
Hays	Middle Trinity	0	0	0	0	27
	Lower Trinity	--	--	--	--	--
Travis	Middle Trinity	0.4	0.3	0.4	0.3	5
	Lower Trinity	11	28	18	20	17

Values from BSEACD (2013).

6.1.2 DFC Considerations

The Trinity Aquifer in GMA 10 is not the primary water source for much of the area. However, pressure on the freshwater Edwards (Balcones Fault Zone) Aquifer has led to the need for viable alternative supplies. The proposed DFC allows for a modeled available groundwater that is significantly above the current use of the aquifer and allows room for development of the aquifer as an alternative supply while protecting existing groundwater supplies.

6.2 Water-Supply Needs

6.2.1 Description of Factors for the Trinity Aquifer in GMA 10

For estimating projected water supply needs (i.e., water demand vs. supply) the districts used data extracted from the 2017 State Water Plan and provided by the TWDB. The TWDB provides water-supply needs estimates by decade as well as by county. A summary of the projected water-supply needs is provided in Table 3 by decade in acre-ft/yr. Also shown in Table 3 are demands, existing supplies and water supply strategies. Note that these are county totals, not just the portions of each county in GMA 10.

The projections in Table 3 show that for the 2017 State Water Plan planning period (2020-2070), there is a progressively increasing water-supply deficit, increasing from 135,000 acre-ft in 2020 up to 497,000 acre-ft in 2060. As in prior plans, some of the water-demand deficits in the area in the out-years (the later years in the planning period) include numerous contractual shortages. These contractual shortages will be addressed on an *ad-hoc* basis, through the renewal and expansion of contracts with wholesale water suppliers and the contractual reallocation of existing supplies in order to address the projected water demands for these and other area water-user groups. But even so, it is projected that there will be unmet needs under drought-of-record conditions and in the out-years.

Table 4. 2017 State Water Plan information for counties in GMA 10 containing the Trinity Aquifer. All values are in acre-feet per year. Note that these are county totals and are not limited to the portion of each county in GMA 10.

County	Aquifer	2020	2030	2040	2050	2060	2070
Bexar	Demands	367,664	404,641	438,621	473,953	509,657	543,989
	Existing Supplies	348,478	350,452	352,909	353,419	354,103	354,936
	Needs	61,498	87,009	110,801	139,602	169,573	199,085
	Strategy Supplies	111,676	139,674	172,615	211,590	259,448	304,681
Caldwell	Demands	7,939	8,992	10,069	11,191	12,362	13,557
	Existing Supplies	10,563	10,606	10,627	10,640	10,648	10,660
	Needs	201	701	1,368	2,223	3,154	4,080
	Strategy Supplies	2,953	2,869	2,938	3,540	4,291	5,305
Comal	Demands	42,660	50,555	58,562	66,459	74,986	83,562
	Existing Supplies	41,807	43,550	45,235	46,693	48,391	50,200
	Needs	5,348	8,434	14,812	21,304	28,198	35,022
	Strategy Supplies	20,102	27,743	33,285	38,881	44,989	51,406
Guadalupe	Demands	36,487	42,642	48,287	54,229	61,977	68,632
	Existing Supplies	50,679	53,749	54,937	54,805	54,708	54,696
	Needs	1,486	4,320	7,660	12,375	17,412	22,356
	Strategy Supplies	9,021	14,143	16,304	24,352	28,173	37,388
Hays	Demands	38,017	48,140	61,376	74,249	93,141	115,037
	Existing Supplies	55,922	56,144	56,441	57,070	58,244	59,679
	Needs	580	4,148	12,635	22,756	38,594	57,222
	Strategy Supplies	14,073	28,579	40,651	51,238	69,741	88,522
Medina	Demands	68,171	66,673	65,147	63,688	62,364	61,252
	Existing Supplies	39,514	39,783	40,056	40,267	40,513	40,768
	Needs	32,510	30,527	28,580	26,707	24,938	23,445
	Strategy Supplies	2,142	2,601	3,208	3,745	4,306	4,918
Travis	Demands	290,697	346,067	398,642	436,992	470,440	509,035
	Existing Supplies	423,296	421,001	419,022	411,952	401,880	392,060
	Needs	3,199	19,203	27,658	41,766	85,617	134,438
	Strategy Supplies	148,005	193,633	228,203	275,798	306,286	338,800
Uvalde	Demands	75,595	73,694	71,705	69,993	68,451	67,179
	Existing Supplies	47,888	47,480	47,559	47,664	47,742	47,742
	Needs	30,747	28,756	26,657	24,815	23,135	21,744
	Strategy Supplies	2,642	3,109	3,791	4,559	5,168	5,797
Total	**Demands**	**927,230**	**1,041,404**	**1,152,409**	**1,250,754**	**1,353,378**	**1,462,243**
	Existing Supplies	**1,018,147**	**1,022,765**	**1,026,786**	**1,022,510**	**1,016,229**	**1,010,741**
	Needs	**135,569**	**183,098**	**230,171**	**291,548**	**390,621**	**497,392**
	Strategy Supplies	**310,614**	**412,351**	**500,995**	**613,703**	**722,402**	**836,817**

6.2.2 DFC Considerations

The population growth throughout GMA 10 is creating demand for additional water supplies from all sources. The DFC allows for drawdown of the Trinity Aquifer to allow for its use in the future as water supply of growing importance to the region.

6.3 Water-Management Strategies

6.3.1 Description of Factors for the Trinity Aquifer in GMA 10

Both Regional Water Planning Groups K and L plan to further develop the Trinity aquifer as part of their water management strategies to cover future water needs. The following table provides the proposed Trinity Aquifer withdrawals developed by Regional Water Planning Groups K and L for the 2012 State Water Plan. Additionally, Table 3 above shows the total of water management strategies developed as part of the 2017 State Water Plan.

Table 5. Proposed Trinity aquifer development in Regions L and K from 2010 to 2060

County	**Bexar**	**Hays**	**Hays**
WUG	Bexar Metropolitan Water District (BMWD)	County Line WSC	Manufacturing
RWPG	L	L	K
Water Management Strategy	Development of Local Groundwater Supplies (Trinity)	Development of Local Groundwater Supplies (Trinity)	New well field for Trinity Aquifer
Source Name	Trinity Aquifer	Trinity Aquifer	Trinity
2010	2,016	---	--
2020	2,016	1,129	--
2030	2,016	1,452	75
2040	2,016	1,613	200
2050	2,016	1,936	301
2060	2,016	2,420	400

Values from SCTRWPG (2010) and LCRWPG (2010).

6.3.2 DFC Considerations

The proposed DFCs allow for development of the Trinity Aquifer in GMA 10 as contemplated in the water management strategies in the 2012 State Water Plan. The estimated modeled available groundwater of 59,488 acre-feet per year is greater than estimated current use and water management strategies targeting the aquifer.

6.4 Hydrological Conditions

6.4.1 Description of Factors for the Trinity Aquifer in GMA 10

6.4.1.1 Total Estimated Recoverable Storage

Texas statute requires that the total estimated recoverable storage of relevant aquifers be determined (Texas Water Code § 36.108) by the TWDB. Texas Administrative Code Rule §356.10 (Texas Administrative Code, 2011) defines the total estimated recoverable storage as the estimated amount of groundwater within an aquifer that accounts for hypothetical recovery scenarios that range between 25 percent and 75 percent of the porosity-adjusted aquifer volume.

Total estimated recoverable storage values may include a mixture of water-quality types, including fresh, brackish, and saline groundwater, because the available data and the existing Groundwater Availability Models do not permit the differentiation between different water-quality types. The total estimated recoverable storage values do not take into account the effects of land surface subsidence, degradation of water quality, or any changes to surface-water/groundwater interaction that may occur due to pumping.

Table 6 provides the total estimated recoverable storage values for the Trinity Aquifer in GMA 10. The percentage values for the 25 percent of total storage and 75 percent total storage shown here were rounded within one percent of the total.

Table 6. Total estimate by county of recoverable storage for the Trinity Aquifer within the GMA 10 limits (Values in acre-feet; Reference: Jones et al., 2013)

County	Total Storage	25 percent of Total Storage	75 percent of Total Storage
Bexar	5,500,000	1,375,000	4,125,000
Comal	24,000	6,000	18,000
Guadalupe	2,300,000	575,000	1,725,000
Hays	43,000	10,750	32,250
Kinney	2,400,000	600,000	1,800,000
Medina	11,000,000	2,750,000	8,250,000
Travis	690,000	172,500	517,500
Uvalde	1,100,000	275,000	825,000
Total	**23,057,000**	**5,764,250**	**17,292,750**

6.4.1.2 Average Annual Recharge

The Trinity Aquifer is confined throughout most of the extent of GMA 10 and so does not receive direct recharge in this area. Rather the aquifer is recharged in the Trinity Aquifer outcrop area, north and west of the GMA 10 area. Recharge estimates from previous studies varied from 1.5 to 11 percent of the annual rainfall falling on Trinity Aquifer outcrop areas. Recharge also occurs from losing streams crossing the aquifer outcrop (Jones et al., 2009). Table 7 includes recharge values calculated for the Medina County Groundwater Conservation District. Note that this district includes some Trinity outcrop area that falls outside the GMA 10 boundary and this recharge occurs in that area, rather than within the GMA 10 extent. As shown in TWDB Aquifer Assessment 10-06 (Thorkildsen and Backhouse, 2010), there are small outcrop areas within GMA 10. In this assessment, TWDB estimates recharge to the aquifer to be approximately 4 percent of precipitation.

Table 7. Recharge value report for the Trinity Aquifer provided by the Medina County Groundwater Conservation District (ac-fit) and TWDB Aquifer Assessment 10-06.

Area	Source	Aquifer	Estimated annual amount of recharge from precipitation to the district
MCGCD	GAM Run 09-31	Trinity Aquifer	6,918
Uvalde Co. UWCD	TWDB Aquifer Assessment 10-06	Trinity Aquifer	36
Comal County	TWDB Aquifer Assessment 10-06	Trinity Aquifer	206
Hays County	TWDB Aquifer Assessment 10-06	Trinity Aquifer	107

6.4.1.3 Inflows

Lateral Inflow Table 8 provides the estimated annual volume of flow into the Trinity aquifer in GMA 10 from the Hill Country portion of the Trinity Aquifer across the Balcones Fault Zone (from Thorkildsen and Backhouse, 2010).

Table 8. Lateral inflow to the Trinity Aquifer in GMA 10 (all values in acre-feet)

Aquifer	County	Lateral Inflow from Hill Country Trinity
Upper Trinity	Bexar	8530
Upper Trinity	Caldwell	0
Upper Trinity	Comal	15346
Upper Trinity	Guadalupe	0
Upper Trinity	Hays	2512
Upper Trinity	Medina	1576
Upper Trinity	Travis	267
Upper Trinity	Uvalde	176
Middle Trinity	Bexar	11560
Middle Trinity	Caldwell	0
Middle Trinity	Comal	13678
Middle Trinity	Guadalupe	0
Middle Trinity	Hays	913
Middle Trinity	Medina	3751
Middle Trinity	Travis	374
Middle Trinity	Uvalde	417
Total		**59,100**

6.4.1.1 Discharge

Cross-formational flow: BSEACD (2013) suggests that there might be some vertical leakage from the Edwards into the Trinity Aquifer, but this input is likely limited to the top 100 feet of the Upper Trinity, as the bottom portion of the Upper Trinity acts as an aquitard and prevents leakage from reaching the Middle Trinity. In general, cross-formational flow is out of, not into, the Trinity Aquifer in GMA 10. Jones et al. (2011) estimated that cross-formational discharge from the Hill Country portion of the Trinity Aquifer to the Barton Springs and San Antonio segments of the Edwards Aquifer were 660 acre-feet per year per mile of aquifer boundary in Uvalde and Medina counties; 2,400 in Bexar and Comal counties; and 350 in Hays and Travis counties. Table 9 provides the estimated value of cross-formational flow from the Trinity Aquifer to the Edwards Aquifer within the Edwards Aquifer Authority (EAA).

Table 9. Estimated value of cross-formational flow from the Trinity Aquifer to the Edwards Aquifer (ac-ft)

District	Source	Aquifer	Estimated net annual volume of flow between each aquifer in the district
EAA	GAM Run 08-67	from Trinity Aquifer to Edwards and associated limestones	13,622

Natural Discharge: Since the Trinity Aquifer is confined in the GMA 10 study area, no direct discharge from the aquifer is expected. Discharge occurs in the outcrop areas, north and northwest of GMA 10, where springs flow from the Trinity and streams are net gaining from Trinity Aquifer discharge (Jones et al., 2009). No major springs issue from the Trinity Aquifer itself within GMA 10. BSEACD (2013) does mention that some Upper Trinity water may flow laterally or vertically into the Edwards Aquifer and thus, indirectly, feed Edwards springs, such as Barton Springs. However, Middle Trinity does not appear to discharge in the Balcones Fault Zone.

6.4.1.2 Other Environmental Impacts Including Springflow and Groundwater/Surface-Water Interaction

As described in previous sections relating to inflows and discharges, the Trinity Aquifer in GMA 10 is confined and largely separated from surficial processes and the overlying Edwards Aquifer except the upper portion of the Upper Trinity. While the current conceptualization of the aquifer includes flow from the Hill Country portion of the Trinity Aquifer (GMA 9) into the Trinity Aquifer in GMA 10, it is possible that large-scale development in GMA 10 could impact up-dip areas outside the GMA. There is not currently a groundwater availability model to evaluate the extent to which these impacts could occur.

6.5 DFC Considerations

Analysis of the hydrological conditions of the Trinity Aquifer in GMA 10 indicates that the aquifer can continue to serve as an alternative water supply to the freshwater Edwards (Balcones Fault Zone) Aquifer. However, since it has not seen large development historically in many areas of GMA 10, there is limited information on how the aquifer will respond to significant pumping. The proposed DFC allows for considerable drawdown and a significantly larger modeled available groundwater than is the current amount of groundwater use.

7 Subsidence Impacts

Subsidence has historically not been an issue with the Trinity Aquifer in GMA 10. The aquifer matrix in the northern subdivision is well-indurated and the amount of pumping does not create compaction of the host rock and/or subsidence of the land surface. Hence, the proposed DFCs are not affected by and do not affect land-surface subsidence or compaction of the aquifer.

8 Socioeconomic Impacts Reasonably Expected to Occur

8.1 Description of Factors for the Trinity Aquifer in GMA 10

Administrative rules require that regional water planning groups evaluate the impacts of not meeting water needs as part of the regional water planning process. The executive administrator shall provide available technical assistance to the regional water planning groups, upon request, on water supply and demand analysis, including methods to evaluate the social and economic impacts of not meeting needs [§357.7 (4)]. Staff of the TWDB's Water Resources Planning Division designed and conducted a report in support of the South Central Texas Regional Water Planning Group (Region L) and also the Lower Colorado Regional Water Planning Group (Region K). The report "Socioeconomic Impacts of Projected Water Shortages for the South Central Texas Regional Water Planning Area (Region L)" was prepared by the TWDB in support of the 2011 South Central Texas Regional Water Plan and is illustrative of these types of analyses.

The report on socioeconomic impacts summarizes the results of the TWDB analysis and discusses the methodology used to generate the results for Region L. The socioeconomic impact report for Water Planning Group L is included in Appendix C as an example. These reports are supportive of a cost-benefit assessment of the water management strategies and the socioeconomic impact of not promulgating those strategies.

8.2 DFC Considerations

The proposed DFC allows for development of the Trinity Aquifer above what is called for in the water management strategies in the 2012 State Water Plan. For this reason, the proposed DFC will not have a socioeconomic impact associated with an unmet water need.

9 Private Property Impacts

9.1 Description of Factors for the Trinity Aquifer in GMA 10

The interests and rights in private property, including ownership and the rights of GMA10 landowners and their lessees and assigns in groundwater, are recognized under Texas Water Code Section 36.002. The legislature affirmed that a landowner owns the groundwater below the surface of the landowner's land as real property. Joint planning must take into account the impacts on those rights in the process of establishing DFCs, including the property rights of both existing and future groundwater users. Nothing should be construed as granting the authority to deprive or divest a landowner, including a landowner's lessees, heirs, or assigns, of the groundwater ownership and rights described by this section. At the same time, the law holds that no landowner is guaranteed a certain amount of such groundwater below the surface of his/her land.

Texas Water Code Section 36.002 does not: (1) prohibit a district from limiting or prohibiting the drilling of a well by a landowner for failure or inability to comply with minimum well spacing or tract size requirements adopted by the district; (2) affect the ability of a district to regulate groundwater production as authorized under Section 36.113, 36.116, or 36.122 or otherwise under this chapter or a special law governing a district; or (3) require that a rule adopted by a district allocate to each landowner a proportionate share of available groundwater for production from the aquifer based on the number of acres owned by the landowner.

9.2 DFC Considerations

The DFC is designed to allow for additional development of the aquifer as an alternative water supply in a manner that does not harm other property owners. The DFC does not prevent use of the groundwater by landowners either now or in the future, although ultimately total use of the groundwater in the aquifer is restricted by the aquifer condition, and that may affect the amount of water that any one landowner could use, either at particular times or all of the time.

10. Feasibility of Achieving the DFCs

The feasibility of achieving a DFC directly relates to the ability of the Groundwater Conservation Districts to manage the Trinity Aquifer to achieve the DFC, including promulgating and enforcing rules and other board actions that support the DFC. The feasibility of achieving this goal is limited by (1) the finite nature of the resource and how it responds to drought; and (2) the pressures placed on this resource by the high level of economic and population growth within the area served by this resource.

Texas state law provides Groundwater Conservation Districts with the responsibility and authority to conserve, preserve, and protect these resources and to ensure the recharge and prevention of waste of groundwater and control of subsidence in the management area. State law also provides that GMAs assist in that endeavor by joint regional planning that balances aquifer protection and highest practicable production of groundwater. The feasibility of achieving these goals could be altered if state law is revised or interpreted differently than is currently the case.

The caveats above notwithstanding, there are no current hydrological or regulatory conditions that call into question the feasibility of achieving the DFC.

11 Discussion of Other Desired Future Conditions Considered

No other expression of DFC of the Trinity Aquifer in GMA 10 was considered. GMA 10 evaluated alternative amounts of drawdown for the DFC expression, including larger amounts of drawdown. The proposed DFC specifies an amount of drawdown that is not unreasonably large or small, and that should be readily achieved on the basis of currently known information about the aquifer.

12 Discussion of Other Recommendations

12.1 Advisory Committees

An Advisory Committee for GMA10 has not been established.

12.2 Public Comments

Each GCD must hold a public meeting within 90 days after the GMA approves its DFCs. During this meeting, the GCD needs to document stakeholder input. This input is to be submitted by a report from the GCD to the GMA within 90 days after the GMA approves its DFC.

GCDs in GMA 10 have not yet approved its second round of DFCs. The GCDs have not yet held public meetings to gather public comment on the DFCs. No public comments have yet been offered regarding the Trinity Aquifer.

This draft chapters of the Explanatory Report may be used as supporting documents to inform the public before such hearings and meetings are held.

13 Any other information relevant to the specific desired future conditions.

During the process of DFC development the GCDs in GMA 10 reviewed and evaluated the potential impacts of a planned development of the Cow Creek formation of the Middle Trinity Aquifer in central Hays County. The evaluation focused on 1) the potential for drawdown impacts within the Cow Creek to propagate to other portions of the Trinity and Edwards aquifers, and 2) the viability of production over the 50-year planning period at a wide range of pumping rates. This evaluation is documented in Appendix D.

14 Provide a balance between the highest practicable level of groundwater production and the conservation, preservation, protection, recharging, and prevention of waste of groundwater and control of subsidence in the management area.

The "DFC Considerations" discussed in previous sections (especially 6.x.2, 8.2, 9.2, 10, and 11) provide the context in which the balancing factor is being addressed. But the Texas Water Development Board has not developed guidance on how to approach this factor. It is up to the Groundwater Conservation Districts to determine how to approach it for each relevant aquifer, whether in a qualitative, quantitative, or combination manner. In addition, the Groundwater Conservation Districts need to include stakeholder input so that this factor can be more confidently addressed. Groundwater Conservation District management plans will also be used to complete this requirement.

Each Groundwater Conservation District must hold a public meeting within 90 days after the Groundwater Management Area approves its Desired Future Conditions. During this meeting, the Groundwater Conservation District will document stakeholder input regarding whether the Desired Future Conditions provide a balance between the highest practicable level of groundwater production and the conservation, preservation, protection, recharging, and prevention of waste of groundwater and control of subsidence in the management area. This input is to be submitted by a report from the Groundwater Conservation District to the Groundwater Management Area within 90 days after the Groundwater Management Area approves its Desired Future Conditions. The information in the aggregated reports from the GCDs in GMA 10 will then be incorporated into the final Explanatory Report submitted to the TWDB for promulgation and use in calculating modeled available groundwater.

15 References

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