***Clearwater Underground Water Conservation District***

# *District Groundwater Management Plan*

**Original Plan Adopted October 24, 2000**
(Certified by TWDB February 21, 2001)

***Revisions Adopted***
**December 13, 2005** (Approved by TWDB March 6, 2006)
**February 8, 2011** (Approved by TWDB April 13, 2011)
**January 13, 2016** (Approved by TWDB February 19, 2016)
**January 9, 2019** (Approved by TWDB March 12, 2019)
**November 11, 2020** (Approved by CUWCD Board)
**December 30, 2020** (Approved by TWDB)
October 11, 2023 (Approved by CUWCD Board)

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## I. DISTRICT MISSION

The mission of the Clearwater Underground Water Conservation District (District) is to develop and implement an efficient, economical and environmentally sound groundwater management program to protect and enhance the water resources of the District.

## II. PURPOSE OF THE GROUNDWATER MANAGEMENT PLAN

Senate Bill 1 (SB 1), enacted by the 75$^{th}$ Texas Legislature in 1997, and Senate Bill 2 (SB 2), enacted by the 77$^{th}$ Texas Legislature in 2001, established a comprehensive statewide planning process and the actions necessary for districts to manage and conserve the groundwater resources of the state of Texas. These bills required all underground water conservation districts to develop a management plan which defines the water needs and supply within each district and the goals each district will use to manage the underground water in order to meet their needs. In addition, the 79$^{th}$ Texas Legislature enacted HB 1763 in 2005 that requires joint planning among districts that are in the same groundwater management area (GMA). These districts must establish the desired future conditions of the aquifers within their respective GMAs. Through this process, the districts will submit the desired future conditions to the Executive Administrator of the Texas Water Development Board (TWDB) who will provide each district with the modeled available groundwater in the groundwater management area based on the desired future conditions of the aquifers in the area. Technical information, such as the desired future conditions of the aquifers within the District's jurisdiction and the amount of modeled available groundwater from such aquifers is required to be included in the District's management plan and will guide the District's regulatory and management policies.

The District's management plan satisfies the requirements of SB 1, SB 2, HB 1763, the statutory requirements of Texas Water Code (TWC) Chapter 36, and the rules and requirements of the TWDB.

## III. DISTRICT INFORMATION

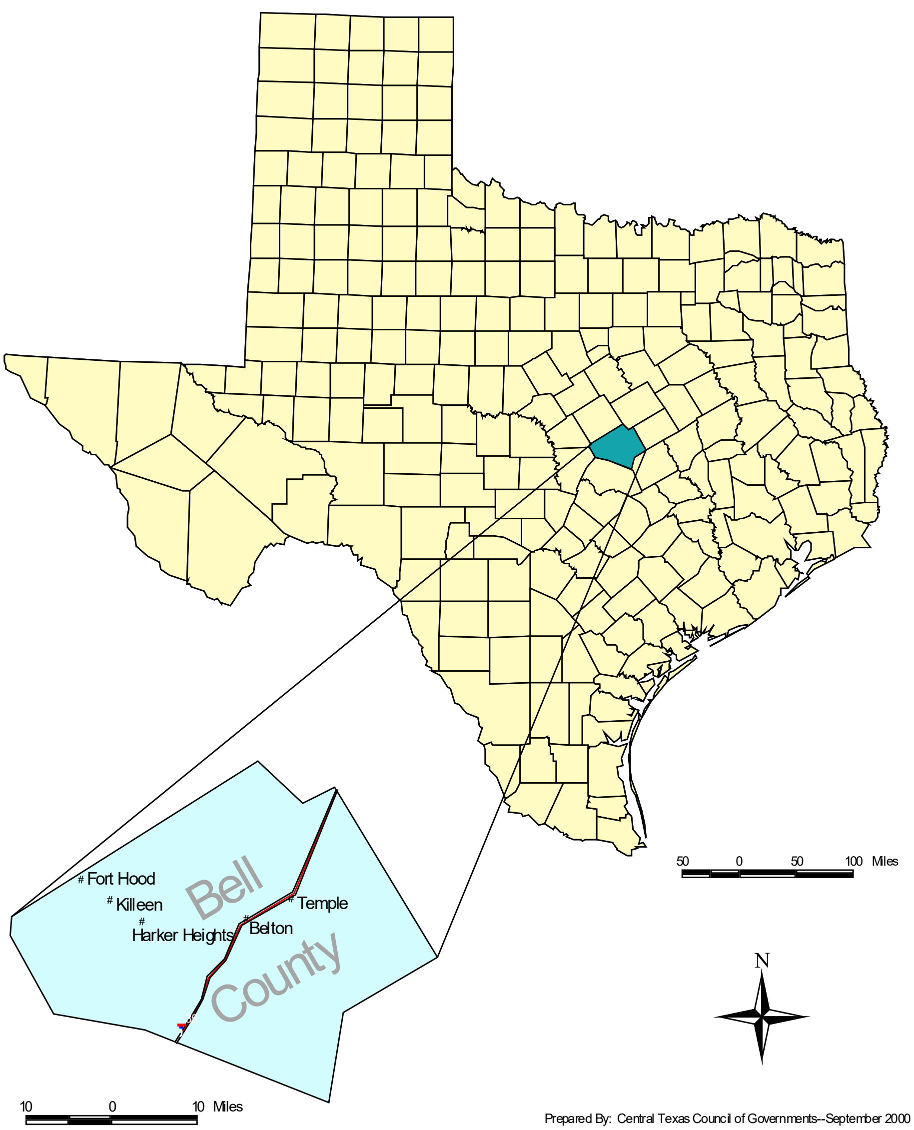
### A. Creation

Clearwater Underground Water Conservation District (CUWCD) is a political subdivision of the State of Texas and underground water conservation district created and operating under and by virtue of Article XVI, Section 59, of the Texas Constitution; Texas Water Code Chapter 36; the District's enabling act, Act of May 27, 1989, 71$^{st}$ Legislature, Regular Session, Chapter 524 (House Bill 3172), as amended by Act of April 25, 2001, 77$^{th}$ Legislature, Regular Session, Chapter 22 (Senate Bill 404), Act of May 7, 2009, 81$^{st}$ Legislature, Regular Session, Chapter 64 (Senate Bill 1755), and Act of May 27, 2015, 84$^{th}$ Legislature, Regular Session, Chapter 1196, Section 2 (Senate Bill 1336)(omnibus districts bill); and the applicable general laws of the State of Texas; and confirmed by voters of Bell County on August 21, 1999.

The District was formed to protect the underground water resources for the citizens of Bell County. Beyond its enabling legislation, the District is governed primarily by the provisions of Chapter 36 of the Texas Water Code, the District's groundwater management plan, and the District's rules.

**Exhibit A**

CLEARWATER UNDERGROUND WATER CONSERVATION DISTRICT BOUNDARY



## B. Directors

The Board of Directors consists of five members. These five directors are elected by the voters of Bell County and serve a four-year term. CUWCD observes the same precincts as the Bell County Commissioners—four precincts with one at-large position. Director terms are staggered with a two-year interval. Directors from Precincts 1 and 3 serve the same term while directors from Precincts 2, 4 and the at-large position serve the same term. Elections are held in November in even numbered years.

## C. Authority

CUWCD is governed by the provisions of TWC Chapter 36. CUWCD has the power and authority to undertake various hydrogeological studies, to adopt a management plan, to establish a program for the permitting of certain water wells, and to implement programs to achieve its statutory mandates. CUWCD has rule-making authority to implement its policies and procedures and to help ensure the management of the groundwater resources of Bell County.

## D. Location and Extent

The jurisdiction of CUWCD includes all territory located within Bell County (Exhibit A). This area encompasses approximately 1,088 square miles. CUWCD is bounded by McLennan County to the north; Falls and Milam Counties to the east; Williamson County to the south; and Burnet, Lampasas, and Coryell Counties to the west. Bell County has a vibrant economy dominated by the military, medical, manufacturing, and agricultural communities. Based on the 2012 Census of Agriculture, approximately 421,362 of Bell County's 675,200 acres, or 62.4% of this area, is farmland.

## E. Topography and Drainage

Bell County is divided into two separate ecological regions by the Balcones Escarpment, which runs from the southeast part of the county to the northwest. The region east of the Balcones Escarpment is the Blackland Prairie while the Grand Prairie is located to the west.

In the Grand Prairie area drainage flows to the Little River and its tributaries. The Leon and Lampasas rivers and Salado Creek converge at Three Forks.

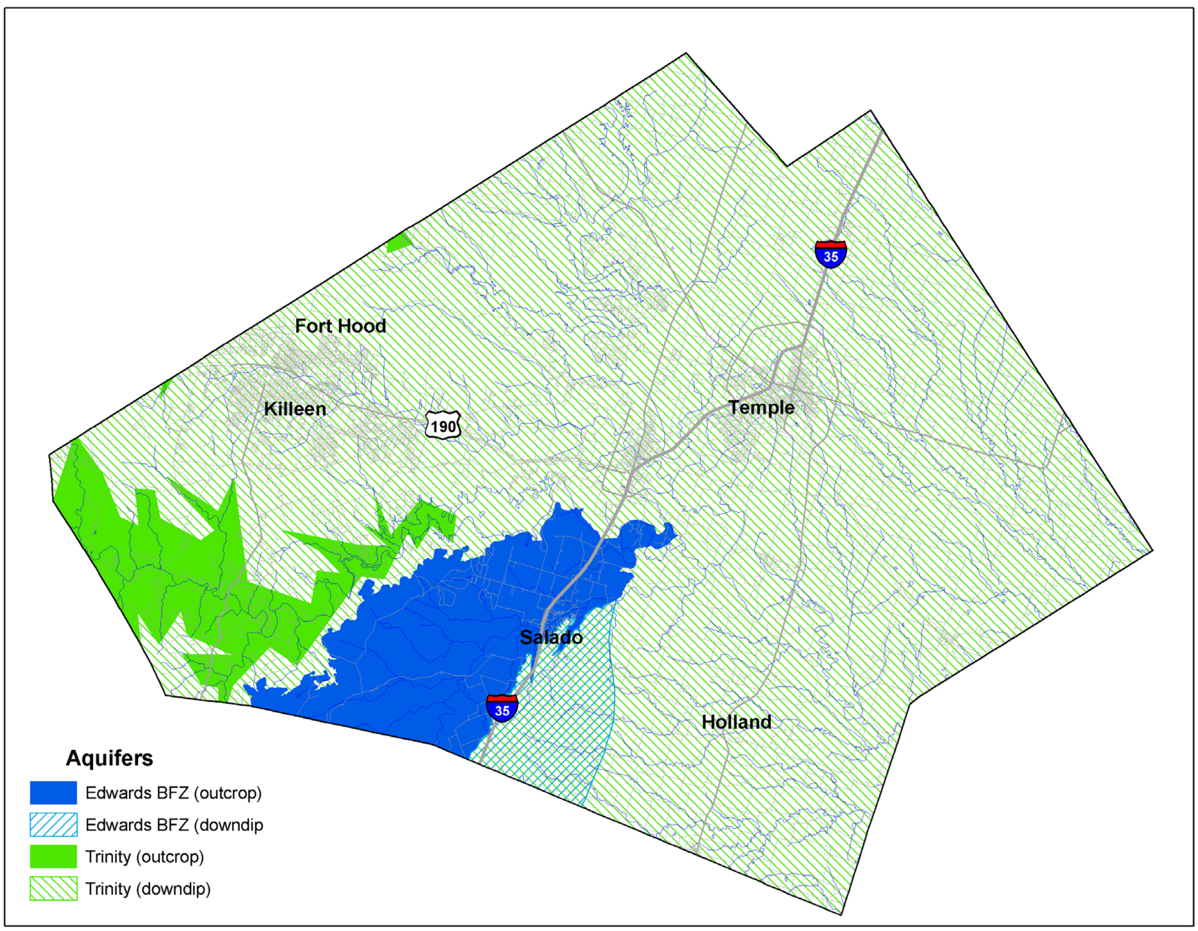
## F. Groundwater Resources of Bell County

Bell County enjoys a variety of groundwater resources. The two primary sources of groundwater in Bell County are the Edwards Balcones Fault Zone (BFZ) Aquifer and the Trinity Aquifer. These aquifers are recognized as major aquifers by the TWDB. The Edwards (BFZ) Aquifer is the source of Salado Springs and is the primary source of water supply for the City of Salado. The Trinity Aquifer consists of three distinct subdivisions. It is the primary source of groundwater in much of western Bell County. The deepest subdivision of the Trinity Aquifer also serves or has served the Cities of Rogers, Holland,

and Bartlett in eastern Bell County. The portion of Bell County east of IH-35 also has a number of groundwater sources that are not widely recognized as aquifers outside of the County but are of vital importance. Approximately 40 percent of the wells registered with the District are located in eastern Bell County and produce water from alluvium, the Lake Waco Formation (Fm), the Kemp Formation, the Ozan Formation, the Pecan Gap Formation, the Austin Chalk, or the Buda Limestone. Additionally, there are wells which produce water from the Edwards Formation and associated limestones outside of the recognized limits of the Edwards (BFZ) Aquifer which are recognized by CUWCD as producing water from the Edwards Equivalent Aquifer.

*See Appendix A1: Groundwater Resources of Bell County*
*See Appendix A2: Delineation of Proposed Management Zones within Bell County, Texas*
*See Appendix B: CUWCD - Bell County Historical Groundwater use (2011-2015).*
*See Appendix C: TWDB Estimated Historical Water Use for Bell County.*
*See Appendix D: TWDB Data Definitions*

**Exhibit B -- Major Aquifers in Bell County**



## IV. STATEMENT OF GUIDING PRINCIPLES

CUWCD recognizes that the groundwater resources of Bell County and the Central Texas region are of vital importance and that local management provides essential localized leadership, local discernment, local accountability, based on local oversite, and local expert understanding of the resource. Preservation of this most valuable resource can be managed in a prudent and cost-effective manner through education, cooperation, and developing a comprehensive understanding of the aquifers. The greatest threat to CUWCD in achieving its stated mission is the misunderstanding of the resource by elected officials, property owners, and water users. Scientific understanding can support localized management of the groundwater resources if the District continues to invest in science-based research to bolster understanding of local conditions. CUWCD's management plan is intended to serve as a tool to focus the thoughts and actions of those given the responsibility for the execution of the District's activities.

## V. CRITERIA FOR PLAN APPROVAL

### A. Planning Horizon

The time period for this plan is five years from the date of approval by the Executive Administrator or, if appealed, on approval by the TWDB. The original management plan was approved by the TWDB in February 2001. The District's Board of Directors adopted a revised groundwater management plan on December 13, 2005 and approved by TWDB in March 2006. This plan was revised and amended by the Board of Directors on February 8, 2011 and approved by TWDB April 13, 2011, will expire on April 13, 2016. The current plan was revised and amended by the Board of Directors on January 13, 2016 and approved by TWDB February 19, 2016 and will expire on February 19, 2021. The previous plan was amended for the sole purpose of incorporating the language of the second round of joint planning by GMA 8, effective December 12, 2018. This plan is being amended for the sole purpose of incorporating the language of the third round of joint planning by GMA8, effective August 23, 2023, and submitted final approval by TWDB Executive Administrator 60 days and re-adoption process as required by TWC 36.1072(e). This groundwater management plan will remain in effect until a revised management plan is approved by the Executive Administrator of the TWDB. The plan shall be reviewed (annually) and updated and readopted in accordance with the requirements of the Texas Water Code and remain effective for five years from the approval date by the Executive Administrator.

### B. Board Resolution

*Copy of the Clearwater Underground Water Conservation District resolution adopting the plan.*

A copy of the Clearwater Underground Water Conservation District resolution adopting the plan is located. S*ee Appendix E: CUWCD Resolution*

## C. Plan Adoption

*Evidence that the plan was adopted after notice and hearing.*

Public notices documenting that the plan was adopted following appropriate public meetings and hearings are located. *See Appendix F: CUWCD Notice of Public Hearing*

## D. Coordination with Surface Water Management Entities

*Evidence that following notice and hearing the District coordinated in the development of its management plan with surface water management entities.*

CUWCD reference letter documenting transmitting a copy of this plan to surface water management entities after adoption of the plan. S*ee Appendix G*: *Notice to Surface Water Management Entities.*

# VI ESTIMATES OF TECHNICAL INFORMATION REQUIRED BY TEXAS WATER CODE CHAPTER 36.

## A. Modeled available groundwater in the district based on the desired future condition established

Modeled available groundwater is defined in TWC §36.001 as the amount of water the Executive Administrator determines may be produced on an average annual basis to achieve a desired future condition established under section 36.108. The desired future condition of the aquifer may only be determined through joint planning with other groundwater conservation districts (GCDs) in the same groundwater management area (GMA) as required by the 79$^{th}$ Legislature with the passage of HB 1763 into law. The District is in GMA 8. The GCDs of GMA 8 have completed the joint planning process to determine the desired future condition of the aquifers in the GMA.

To determine the desired future conditions, the District conducted a series of simulations using the TWDB's Groundwater Availability Models (GAMs) for the Northern Edwards (BFZ) and the Northern Trinity/Woodbine aquifers. Each series of GAM simulations was conducted by iteratively applying varying amounts of simulated groundwater pumping from the aquifer over a predictive period that included a simulated repeat of the drought of record. Pumping was increased until the amount of pumping that could be sustained by the aquifer without impairing the aquifer conditions selected for consideration as the indicator of the aquifer desired future condition was identified.

*See Appendix H: TWDB Map of the GMA boundaries*

1. Edwards (BFZ) Aquifer

a. Desired Future Conditions
The desired future condition of the Edwards (BFZ) Aquifer is based on maintaining Salado Spring discharge into Salado Creek during a repeat of conditions like those in the 1950's drought of record. Under the drought of record conditions, a spring

discharge of 200 acre-feet per month is preferred and 100 acre-feet per month is the minimum acceptable spring flow.

b. Modeled Available Groundwater
The modeled available groundwater value for the Edwards (BFZ) Aquifer in Bell County, as given in TWDB GAM Run 21-013 MAG for the decades 2020-2080, is 6,469 acre-feet per year, and is based on the desired future condition discussed above. CUWCD estimates that by year 2070, exempt use of the Edwards (BFZ) Aquifer may reach approximately 825 acre-feet per year and that volume of water is allocated for exempt well users on an annual basis. This leaves approximately 5,644 acre-feet per year as the volume of groundwater available for permitting in the Edwards (BFZ) aquifer.
*See Appendix I: TWDB GAM Run 21-013 MAG*
*See Appendix J: TWDB GAM Run 15-003*

2. Trinity Aquifer

a. Desired Future Conditions
There are three recognized subdivisions in the Trinity Aquifer: the Upper, Middle and Lower Trinity aquifers. In Bell County the three subdivisions of the Trinity Aquifer are made up of several geologic units. The geologic units are the Paluxy Sand; the Glen Rose Limestone and; the Hensell Sand and Hosston Conglomerate of the Travis Peak Formation. GMA 8 developed a desired future condition for each of the water-bearing geologic units which make up the Trinity Aquifer in Bell County. The desired future conditions for the several water-bearing units describe the amount of water-level draw down which may occur after 70 years when the draw down is averaged across the area of occurrence of the water bearing unit in the District. The amount of draw down described in the desired future conditions is indexed to year 2010 water levels.

- From estimated year 2010 conditions, the average draw down of the Paluxy Aquifer should not exceed approximately 0 feet after 70 years.
- From estimated year 2010 conditions, the average draw down of the Glen Rose Aquifer should not exceed approximately 83 feet after 70 years.
- From estimated year 2010 conditions, the average draw down of the Hensell Aquifer should not exceed approximately 145 feet after 70 years.
- From estimated year 2010 conditions, the average draw down of the Hosston Aquifer should not exceed approximately 375 feet after 70 years.

For the purpose of managing groundwater in the District, CUWCD subdivides the water-bearing geologic units into the three Trinity Aquifer subdivisions as follows: the Upper Trinity (Glen Rose Limestone); the Middle Trinity (Hensell Sand); and the Lower Trinity (Hosston Conglomerate) aquifers.

b. Modeled Available Groundwater 2020
The total of modeled available groundwater values for the Trinity Aquifer in Bell County, as given in GAM Run 21-013 MAG for decades from 2020 through 2070

is 9,275 acre-feet per year which is based on the amounts of groundwater that could be pumped while maintaining the desired future conditions in each water-bearing geologic unit discussed above. CUWCD estimates that by the year 2080, total exempt use of the Trinity Aquifer may reach approximately 1,419 acre-feet per year, and that volume of water is allocated for exempt well users on an annual basis. The subdivision allocation for exempt use is currently at 400-acre feet for the Glen Rose Limestone, 650-acre feet for the Hensell Sand and 369-acre feet for the Hosston Conglomerate. This leaves a total of approximately 7,856**-acre** feet per year as an estimate of the volume of groundwater available that could be pumped to comply with the desired future conditions in the Trinity Aquifer.

The modeled available groundwater values of the several water-bearing geologic units of the Trinity Aquifer in Bell County, as given in TWDB GAM Run 21-013 MAG, are as follows:

a. Paluxy – 0 ac-ft per year
b. Glen Rose – 275 ac-ft per year
c. Hensell – 1,100 ac-ft per year
d. Hosston –7,900 ac-ft per year

These modeled available groundwater values are for 2020. For a full listing of values for every year, please refer to the MAG report TWDB GAM Run 21-013 MAG in Appendix I. CUWCD through its rules manages the Trinity Aquifer within the District by aquifer subdivision and geographic "management zones" established and identified by CUWCD's rules adopted in accordance with TWC § 36.116(d), and according to the finding of the report commissioned by CUWCD (*see Appendix A2: Delineation of Proposed Management Zones within Bell County, Texas*).
*See Appendix I: TWDB GAM Run 21-013 MAG*

3. <u>Other Water Bearing Formations</u>

Other groundwater sources in Bell County include Alluvium, the Austin Chalk, the Buda Limestone, the Edwards Group and equivalent rocks outside the recognized bounds of the Edwards (BFZ) Aquifer (Edwards Equivalent Aquifer), the Kemp, Lake Waco, Ozan, and Pecan Gap formations. These sources of groundwater produce limited water supply in limited areas in the District. GMA 8 did not find these aquifers relevant for planning purposes at the present time or develop desired future conditions for them; as a result, there are no modeled available groundwater values for these sources of groundwater. See *Appendix A1 and A2* for a more detailed discussion of these water bearing formations.

**B. Amount of groundwater being used within the district on an annual basis.**

The amount of groundwater used in Bell County from 2016 to 2022 is shown in the *Appendix B*. Data from 2002-2017 is provided by the Texas Water Development Board from their Water Use Survey database, *Appendix C*. The CUWCD data, A*ppendix B*, does distinguish between exempt and non-exempt wells. Exempt wells are wells that are used for domestic use or livestock watering (including certain additional uses defined in State law) and not capable of producing more than approximately 17 gallons per minute. Groundwater use data for 2016 through 2020 is provided from the District's records. The District began registering wells in February 2002 and began recording production from non-exempt wells during 2003. At the end of September 2019, approximately 5,794 wells were registered. Although CUWCD has made considerable progress in registering wells, it is likely there are still 1-2% of wells in Bell County that are not registered, and are therefore not considered in *Appendix B*. The District requires monthly production reports for all Classification 2 non-exempt wells (commercial). Classification 1 non-exempt wells are wells that would otherwise be considered exempt but are located on a tract of land of less than 10 acres and greater than 2 acres subdivided after March 1, 2004. Production reports are not required for Classification 1 wells; however, production cannot exceed 25,000 gallons per day. In 2004, the District began estimating production from exempt wells. *See Appendix B: CUWCD - Bell County Historical Groundwater Use (2015-2022)*

**C. Annual amount of recharge from precipitation to the groundwater resources within the district.**

The estimates of the annual amount of recharge to the groundwater resources of the District that are recognized as Major Aquifers by TWDB are based on the GAM simulations provided by TWDB to the District for use in this plan. The District has made no estimate of the amount of annual recharge to the local sources of groundwater in the District.

1. Edwards (BFZ) Aquifer Recharge 27,565 acre-feet per year

2. Trinity Aquifer Recharge 2,816 acre-feet per year

*See Appendix J: Estimate source: TWDB GAM Run 15-003; November 24, 2015*

**D. For each aquifer, annual volume of water that discharges from the aquifer to springs and any surface water bodies, including lakes, streams, and rivers.**

The estimates of the annual amount of water discharged to surface water systems by the groundwater resources of the District recognized as Major Aquifers by TWDB are based the GAM simulations provided by TWDB to the District for use in this plan. The District has made no estimate of the amount of the annual discharge to surface water systems by the minor sources of groundwater in the District.

1. Edwards (BFZ) Aquifer 27,566 acre-feet per year

2. Trinity Aquifer 11,131 acre-feet per year

*See Appendix J: Estimate source: TWDB GAM Run 15-003; November 24, 2015*

**E. Annual volume of flow into and out of the district within each aquifer and between aquifers in the district, if a groundwater availability model is available**

There are two aquifers in the District for which a TWDB GAM is available; the Trinity and the Edwards (BFZ) Aquifers. The estimates of the amount of water flowing into and out of the District within each aquifer and between aquifers in the District are based on the GAM simulations provided by TWDB to the District for use in this plan.

1. Edwards (BFZ) Aquifer

   Flow into the aquifer within the District: 5,853 acre-feet/year

   Flow out of the aquifer in the District: 1,090 acre-feet/year

   Net flow out of the aquifer to overlying units in the District: 121 acre-feet/year

   Net flow to downdip* Edwards (BFZ) Aquifer: 3,957 acre-feet/year

2. Trinity Aquifer

   Flow into the aquifer within the District: 7,230 acre-feet/year

   Flow out of the aquifer within the District: 5,659 acre-feet/year

   Net flow into the aquifer from the overlying Washita-Fredericksburg Confining Unit in the District: 5,587 acre-feet/year

*Estimate source: TWDB GAM Run 15-003; November 24, 2015*
**The model extends beyond the TWDB official Edwards (Balcones Fault Zone) Aquifer boundary. This is the amount of brackish and/or saline groundwater (greater than 1,000 total dissolved solid) that exits the downdip boundary limit of the [official] aquifer within the district boundaries and into deeper portions of the Edwards Group formations.*

**F. Projected surface water supply in the district, according to the most recently adopted state water plan.**

The most recently adopted state water plan is the 2017 State Water Plan. The 2017 State Water Plan indicates a projected surface water supply for Bell County of 93,515 acre-feet/year for year 2070.

Two major water reservoirs located in Bell County are Lake Belton and Lake Stillhouse Hollow. The 2016 Brazos G Initially Prepared Regional Water Plan (*Appendix L:* Table 3.1-1, Major Reservoirs of the Brazos River Basin) identifies 100,257 acre-feet/year as the authorized diversion, or permitted yield, from Lake Belton, and 67,768 acre-feet/year for Lake Stillhouse Hollow. This provides a total yield of 168,025 acre-feet/year for the two lakes. Currently, the Brazos River Authority has under contract approximately 113,906 acre-feet/year to Bell County entities. The US Corps of Engineers is the owner and operator of Lakes Belton and Stillhouse Hollow. The Brazos River Authority manages water rights in both lakes. The Department of the Army (Fort Cavazos) also manages the water rights from Lake Belton.

*Source Appendix C: TWDB 2017 State Water Plan Datasets for Bell County*

### G. Projected total demand for water in the district according to the most recently adopted state water plan.

The most recently adopted state water plan is the 2017 State Water Plan. The 2017 State Water Plan indicates a projected total water demand for Bell County of 134,411 acre-feet/year for year 2070. The projections are from year 2020 to 2070 and include demands that may be met by water from either or both surface water and groundwater. District records indicate that actual groundwater usage in Bell County during year 2019 by the Water Utility Groups totaled 2,417 acre-feet or approximately 3.18% of the County's projected 2020 total demand for water in the 2017 State Water Plan.

*Source Appendix C: TWDB 2017 State Water Plan Datasets for Bell County*

## VII. CONSIDER THE WATER SUPPLY NEEDS AND WATER MANAGEMENT STRATEGIES INCLUDED IN THE ADOPTED STATE WATER PLAN.

The most recently adopted state water plan is the 2017 State Water Plan. In the 2017 State Water Plan, water needs were identified for sixteen Water User Groups (WUGs) in Bell County. Water needs are identified when the projected water demand of a WUG exceeds the projected water supplies of the WUG, *Appendix C*. Positive values given in the tables indicate a water surplus and negative values (expressed as values with a " – " symbol) indicate a water need.

In the 2017 State Water Plan twenty water management strategies (WMSs) were recommended for the sixteen Bell County WUGs with identified water needs. Seven of the WMSs involved conservation of existing water supplies. Four have recommended WMSs involve the redistribution and/or increase of surface water supplies of the respective WUGs. There is the conjunctive use strategy for Georgetown Utilities, to increase groundwater with surface water based on the WMS, yet Georgetown Utilities has no groundwater wells in Bell County with no delivery of public water supply to the 65,000 acres of their respective CCN that lies in Bell County. This strategy is recommended in the 2012 State Water Plan and is stated as the WTP expansion in the 2017 State Water plan may enhance the WUGs in Bell County who serve in other counties with conjunctive use of groundwater and surface water from Bell County. The desired future conditions and amounts of groundwater available for annual use in modeled available groundwater values for the Edwards (BFZ) and Trinity Aquifers in the District will not prevent the implementation of any recommended WMS or restrict the amount of groundwater considered available in the 2017 State Water Plan.

*Source Appendix C: TWDB 2017 State Water Plan Datasets for Bell County*

### A. Water Shortages

Of the 30 Bell County WUGs identified in the 2017 State Water Plan, sixteen were projected to have water shortages by the year 2070. The projected shortage of water for these sixteen users ranges from approximately 10,026 acre-feet/year in 2020 to approximately 43,762 acre-feet/year in 2070. Nine of these users use only surface water (439 WSC, City of Belton, Kempner WSC, City of Nolanville, City of Temple; , County-Other Bell, Steam Electric Power). Four of these WUGs use a mixture of groundwater and surface water (City of Little River-Academy, Georgetown Utilities, Elm Creek WSC, Salado WSC, Manufacturing), and three use only groundwater (City of Bartlett, Mining, Agriculture Irrigation). The source of groundwater for these users is identified as the Other Alluvial groundwater formation, Trinity Aquifer and the Edwards (BFZ) Aquifer. Some of the management strategies involve purchasing additional surface water, implementing conservation measures, Trinity ASR, direct reuse and groundwater from the Carrizo-Wilcox Aquifer in both Burleson and Milam Counties. Additional use of groundwater from the Trinity and Edwards BFZ Aquifers within CUWCD's jurisdiction been identified as strategies for the named as County-Other (identified as Edwards Aquifer Development, small Municipal Water Conservation, purchases from Central Texas WSC and Williamson County ASR).

Jarrell-Schwertner WSC's service area includes southern Bell County and northern Williamson County and is in the State Water Plan identified as a water user in Williamson County. Their primary water supply is both surface and groundwater in Bell County from the Edwards (BFZ) Aquifer. Their recommended management strategies include implementing conservation measures and purchasing surface water. Additional use of groundwater in Bell County is not identified as part of the management strategies. Through participation in a local water supply planning initiative, Jarrell-Schwertner WSC is participating in the Lake Granger Conjunctive Use Project.

*Source Appendix C: TWDB 2017 State Water Plan Datasets for Bell County*

### B. Water Surplus

Fourteen of the Water User Groups identified in the Brazos G Regional Water Plan are projected to have surplus water through the year 2070. Eight of these are identified as using both surface water and groundwater (Armstrong WSC, Bell-Milam-Falls WSC, City of Holland, East Bell WSC, Morgan's Point Resort, Pendleton WSC, City of Rogers Moffat WSC; City of Troy). The source of groundwater is identified as the Hensell Layer of the Trinity Aquifer. Since these users are projected to have a surplus of water or no projected needs, no changes in water supply are recommended.

*Source Appendix C: TWDB 2017 State Water Plan Datasets for Bell County*

## VIII. MANAGEMENT OF GROUNDWATER SUPPLIES

TWC Section 36.0015 states that groundwater conservation districts (GCDs) are the state's preferred method of groundwater management and establishes that GCDs will manage groundwater resources through rules developed and implemented in accordance with TWC Chapter 36. Chapter 36 gives directives to GCDs and the statutory authority to carry out such directives, so that GCDs are provided the proper tools to protect and manage the groundwater resources within their boundaries.

CUWCD will manage the supply of groundwater within the District in order to conserve the groundwater resources while seeking to maintain the economic viability of all groundwater user groups - public and private. In consideration of the economic and cultural activities occurring within the District, CUWCD will identify and engage in such activities and practices which, if implemented, would result in a reduction of groundwater use. The existing observation network of groundwater wells will be used to monitor the changing conditions of the groundwater resources within the District. The observation network has been expanded on an annual basis as opportunities for the District to fund new wells and include permitted wells on the network.

The regulatory tools granted to GCDs by TWC Chapter 36 enable GCD's to preserve historic and existing users of groundwater. CUWCD protects historic and existing users by granting such groundwater users historic and existing use permits that have priority over operating permits. TWC Chapter 36 also allows GCDs to establish management zones within an aquifer or aquifer subdivision. The District's rules provide for the designation of "management zones" as needed to better manage and regulate the groundwater resources of Bell County.

CUWCD may deny a water well drilling permit or limit groundwater withdrawals in accordance with the requirements stated in the rules of the District. In making a determination to deny a permit or limit groundwater withdrawals, the District will consider criteria identified in TWC Section 36.113.

In accordance with CUWCD's mission of protecting the groundwater resources of Bell County, the District may require reduction of groundwater withdrawals to amounts that will not cause harm to the aquifer when considering the desired future condition of the District's aquifers and the amount of modeled available groundwater within the District. To achieve this purpose, the District may, at the discretion of the Board, amend or revoke any permits after notice and hearing. The determination to seek the amendment or revocation of a permit by the District will be based on aquifer conditions as observed by the District. The District will enforce the terms and conditions of permits and the rules of the District by injunction or other appropriate relief in a court of competent jurisdiction as provided for in TWC §36.102.

A contingency plan to cope with the effects of water supply deficits due to climatic or other conditions has been developed by CUWCD and adopted by the Board after notice and hearing. In developing the contingency plan, CUWCD considered the economic effect of conservation measures upon all water resource user groups, the local implications of the extent and effect of changes in water storage conditions, the unique hydrogeologic conditions of the aquifers within the District, and the appropriate conditions under which the voluntary drought contingency plan is implemented. CUWCD evaluates the groundwater resources available within the District and determines the effectiveness of regulatory or conservation measures.

A public or private user may appeal to the Board for discretion in enforcement of the provisions of the water supply deficit contingency plan on grounds of adverse economic hardship or unique local conditions. The exercise of said discretion by the Board shall not be construed as limiting the power of the Board.

## IX. ACTIONS, PROCEDURES, PERFORMANCE AND AVOIDANCE FOR PLAN IMPLEMENTATION

CUWCD will implement the provisions of this plan and will utilize the provisions of this plan as a guidepost for determining the direction or priority for all District activities. All operations of the District, and all agreements entered into by the District, and any additional planning efforts in which the District may participate will be consistent with the provisions of this plan.

Rules adopted by the District for the permitting of wells and the production of groundwater shall comply with TWC Chapter 36, including §36.113, and the provisions of this management plan. All rules will be adhered to and enforced. The promulgation and enforcement of the rules will be based on the best technical evidence available to the District. District Rules are available on the District website at http://www.cuwcd.org/regulatory-program/district-rules/.

## X. METHODOLOGY FOR TRACKING DISTRICT PROGRESS IN ACHIEVING MANAGEMENT GOALS.

CUWCD general manager will prepare a draft Annual Report to the Board of Directors on District performance in regard to achieving management goals and objectives in each fiscal year for consideration for adoption by the Board of Directors. The report is to be presented within 180 days following the completion of each fiscal year of the District. The Board will maintain the report on file for public inspection at the District's offices and on the District Website upon adoption.
Link to CUWCD-annual-reports

## XI. GOALS, MANAGEMENT OBJECTIVES and PERFORMANCE STANDARDS

The management goals, objectives, and performance standards of the District in the areas specified in **31TAC§356.5** are addressed below.

**Management Goals**

### A. Providing the Most Efficient Use of Groundwater –31TAC 356.52(a)(1)(A) (Implementing TWC §36.1071(a)(1))

1. Objective: Each year, CUWCD will require the registration of all wells within the District's jurisdiction.

Performance Standard: Each year, the number of new and existing wells registered with CUWCD will be presented in the District's Annual Report located or public viewing on the district's website http://www.cuwcd.org/ and maintained data base management system as an internet webpage https://clearwater.lre-up.com

2. Objective: Each year, CUWCD will require permits for all non-exempt use of groundwater in the District as defined in the District rules, in accordance with adopted procedures.

   Performance Standard: Each year, CUWCD will prepare a summary of the number of applications for the drilling of non-exempt wells, the number of applications for the permitted use of groundwater and the disposition of the applications will be will be presented in the District's annual report.

3. Objective: Each year, CUWCD will maintain a groundwater database to include information relating to well location, production volume, and other pertinent information deemed necessary by the District to enable effective monitoring of groundwater in Bell County.

   Performance Standard:
   a. Each year, CUWCD's annual report will include a status report of the database repository and enhancements to the platform.
   b. Each year, CUWCD's annual report will include a summary of changes in the water-level condition of the aquifers included in the district water-level monitoring program.

4. Objective: Each year, CUWCD will disseminate educational information on groundwater through publication of a District newsletter, Quarterly Webnews, and website.

   Performance Standard: The CUWCD annual report will include a copy of the District newsletter published each year, with select examples of the Quarterly Webnews on Mailchimp.

**B. Controlling and Preventing Waste of Groundwater –31TAC 356.52(a)(1)(B) ((Implementing TWC §36.1071(a)(2))**

Objective: Each year, CUWCD will disseminate educational information on controlling and preventing the waste of groundwater focusing on water quality protection through at least one classroom or public presentations to civic organizations and invited opportunities to speak

Performance Standard: The CUWCD annual report will include a summary of the District presentations to disseminate educational information on controlling and preventing the waste of groundwater focusing on water quality protection.

**C. Addressing Conjunctive Surface Water Management Issues-31TAC356.52 (a)(1)(D) ((Implementing TWC §36.1071(a)(4))**

Objective: Each year, CUWCD will participate in the regional planning process by attending a minimum of two meetings of the Brazos G Regional Water Planning Group per fiscal year.

Performance Standard: Each year, CUWCD will report attendance at Region G meetings by a representative of the District will be reflected in the District's annual report and will include the number of meetings attended and the dates.

**D. Addressing Natural Resource Issues that Impact the Use and Availability of Groundwater, and which are Impacted by the Use of Groundwater – 31TAC§356.52 (a)(1)(E) ((Implementing TWC §36.1071(a)(5))**

1) Objective: Each year CUWCD will monitor water quality within the District by obtaining water samples from all newly constructed wells and testing the water quality of a minimum 90% of newly constructed wells.

   Performance Standard: Each year, CUWCD's Annual Report will provide a status report on the number of wells tested, by aquifers, aquifer subdivisions and the testing results. District will document the results and make them publicly available on the district web-maps for each well tested.

**2)** Objective: Each quarter of the year, CUWCD will monitor the water quality and spring-flow of the Salado Springs Complex and the Robertson springs of Salado in accordance with the necessary agreements under the Endanger Species Act (ESA) and a proposed, soon to be negotiated 4(d)rule with United States Fish and Wildlife Service (USFWS) and such, per Chapter 36.108 GMA8 Joint Planning, to manage to the Edwards BFZ Aquifer DFC.

   Performance Standard: Each year, CUWCD's Annual Report will provide a status summary report of the quarterly water quality assessments for nitrate, nitrite and dissolved oxygen of the both Salado Spring Complex and groundwater flow from all seven of the downtown springs collectively known as the Salado Spring Complex.

3) Objective: Each year CUWCD, in accordance with the an agreed upon five year reimbursable-task-order with Texas Fish and Wildlife Conservation Office (TXFWCO), will fund and support the efforts of the assigned research biologist, to assess the status the Threatened Salado Salamander by systematically monitoring under the federal permit TE676811-9 and state permit SPR-0111-03.

   Performance Standard: Each year, CUWCD's Annual Report will provide a summary of the formal findings of the assigned research biologist and accordingly maintain such findings and formal report from TXFWCO on the district website in a defined location assessable to all parties.

**E. Addressing Drought Conditions – 31TAC356.52 (a)(1)(F) ((Implementing TWC §36.1071(a)(6))**

1. Objective: Each month, CUWCD will monitor drought conditions in the Edwards (BFZ) Aquifer through the process established in the drought management plan for the Edwards (BFZ) Aquifer adopted by the Board of Directors.
Performance Standard: Each year, a summary of CUWCD's monthly monitoring of drought conditions in the Edwards (BFZ) Aquifer and the implementation of any conservation measures will be provided in the annual report, on the District website http://cuwcd.org as well as the TWDB drought resources https://www.waterdatafortexas.org/drought . The Salado Salamander is protected by the District per the drought contingency plan in accordance with agreements with all non-exempt permit holders producing from the Edwards (BFZ) Aquifer and in accordance with elements of the pending 4(d)rule under the Endangered Species Act.

2. Objective: Each month, CUWCD will monitor drought conditions in the Trinity Aquifer through the process established in the drought management plan for the Trinity Aquifer adopted by the Board of Directors.

   Performance Standard: Each year, a summary of CUWCD's monthly monitoring of drought conditions in the Trinity Aquifer and the implementation of any conservation measures will be provided in the annual report.

**F. Addressing Conservation, Recharge Enhancement, Rainwater Harvesting, Precipitation Enhancement, and Brush Control, Where Appropriate and Cost-Effective – 31TAC356.52 (a)(1)(G) (Implementing TWC §36.1071(a)(7))**

**Conservation**

Objective: Each year, CUWCD will promote conservation by conducting and hosting educational events with AgriLife Extension Service and Texas 4-H2O Ambassadors on water conservation and by distributing conservation brochures and literature to the public at a minimum two educational events attended by district staff and directors (ex. Bell County Annual Water Symposium, Bell County Annual Grounds Conference and Bell County Annual Crops Conference)

Performance Standard: Each year, CUWCD's annual report will include a summary of the District activity during the year to promote conservation.

**Rainwater Harvesting**

Objective: Each year, CUWCD will promote rainwater harvesting by posting information on rainwater harvesting on the District website.

Performance Standard: Each year, CUWCD's annual report will include a copy of the information on rainwater harvesting that is provided on the District website.

**Brush Control**

Objective: Each year, the District will provide information relating to brush control on the District website.

Performance Standard: Each year, the District annual report will include a copy of the information that has been provided on the District website relating to brush control.

**Recharge Enhancement**

Objective: Each year, CUWCD will provide information relating to recharge enhancement on the District website.

Performance Standard: Each year, CUWCD's annual report will include a copy of the information that has been provided on the District website relating to recharge enhancement.

**G. Addressing in a Quantitative Manner the Desired Future Conditions of the Groundwater Resources – TWC §36.108, 31TAC 356.52(a)(1)(H), (Implementing TWC §36.1071(a)(8))**

1. Objective – Each month, CUWCD will operate a gauge system on Salado Creek by contract with USGS Water Science Team in Austin Texas, to accurately record the estimates of the discharge from the Edwards (BFZ) Aquifer at the Salado Springs Complex, Robertson, Big Boiling, Little Bubbly, Side Spring, Critchfield, Benedict and Anderson Springs.

   Performance Standard – Each month, CUWCD will include a summary of the monthly average discharge rate of Salado Springs and a discussion of the conservation measures implemented (if any are necessary) to avoid impairment of the Desired Future Conditions for the Edwards (BFZ) Aquifer established by GMA 8, and documented in the Annual Report to the Board of Directors.

2. Objective – Each month, CUWCD will collect at least 15 water-level measurements from the Trinity Aquifer monitor wells located in the District.
   Performance Standard
   a. Each year, the CUWCD Annual Report to the Board of Directors will post the water-level measurements collected from the Trinity Aquifer by each confining layer and identify the aquifer subdivision from which the measurement is taken.

b. Each year, the CUWCD Annual Report to the Board of Directors will include a discussion of the change in water-levels in each Trinity Aquifer subdivision for which a Desired Future Condition is stablished by GMA 8.

b. Every year, the CUWCD Annual Report to the Board of Directors will include a discussion of the trends and changes of water-levels in each Trinity Aquifer subdivision for which a Desired Future Condition is established by GMA 8 comparing the change to the incremental time-appropriate change in water-levels indicated by the established Desired Future Condition of the aquifer.

**H. Controlling and Preventing Subsidence 31TAC§356.52(a)(1)(C), TWC §36.1071(a)(6)**

This category of management goal is now applicable to the District even though the major water producing formations in the District are composed primarily of competent limestone are thought to be very low risk because the structural competency of the aquifer materials significantly limits the potential for the occurrence of land surface subsidence in the District. In 2017, the Texas Water Development Board (TWDB) released a report "Identification of the Vulnerability of the Major and Minor Aquifers of Texas to Subsidence with Regard to Groundwater Pumping - TWDB Contract Number 1648302062". This TWDB resource also includes a subsidence calculation tool known as "Subsidence Prediction Tool and User Guide". These two resources are the basis for the subsidence review completed by the district.

https://www.twdb.texas.gov/groundwater/models/research/subsidence/subsidence.asp

1) Objective – Each year the district will apply the subsidence prediction tool for the purpose of identifying and characterizing the areas of the district that might be experiencing land subsidence

   Performance Standard – Each year the district with the assistance of TWDB and LRE will deploy the tool and results after calculating subsidence predictions based on the results generated from the subsidence prediction tool and report the findings in the annual report.

## XII. MANAGEMENT GOALS DETERMINED NOT-APPLICABLE TO THE DISTRICT

**B. Precipitation Enhancement – 31TAC§356.52(a)(1)(G), TWC §36.107(a)(7)**

Precipitation enhancement is not an appropriate or cost-effective program for the District at this time because there is not an existing precipitation enhancement program operating in nearby counties in which the District could participate and share costs. The cost of operating a single-county precipitation enhancement program is prohibitive and would require the District to increase taxes in Bell County.

# APPENDIX A1

# Groundwater Resources of Bell County

The Texas Water Development Board classifies groundwater sources as major or minor aquifers. Major aquifers are aquifers that are capable of producing large yields to wells or that produce groundwater over a large area. Minor aquifers are aquifers that may be capable of producing only limited yields to wells or that produce groundwater over a limited area. Many localized sources of groundwater may not be listed as a major or minor aquifer by TWDB. However, TWDB recognizes that whether an aquifer is classified as a major aquifer, a minor aquifer or not included in either list may have no bearing on the local importance of a particular source of groundwater.

## Major Aquifers

Two major aquifers are located in Bell County. They are the Trinity and Edwards Balcones Fault Zone (BFZ) aquifers (Exhibit I). Several water supply corporations in Bell County have the ability to utilize groundwater in an emergency situation.

## Edwards (BFZ) aquifer

The Edwards (BFZ) aquifer is composed of the Edwards and Associated Limestones. It is located in the southern part of the county and serves as the water supply for the City of Salado and other communities in the area. The outcrop of the aquifer is generally found to the west of I-35 and the down-dip portion of the aquifer is generally to the east of I-35. Recharge to the Edwards aquifer generally is from percolation of storm run-off water in intermittent streams flowing across the outcrop area, as well as direct infiltration of rainfall over the outcrop area. Water quality in the Edwards aquifer is generally high; however, within a relatively short distance east of IH 35 the water quality is rapidly reduced. In Bell County water in the aquifer generally moves from the recharge zone toward natural discharge via the Salado Springs. Within Bell County the availability of groundwater from the Edwards aquifer water is based on maintaining at least a minimum spring flow at Salado Springs during a repeat of the drought of record.

## Trinity aquifer

The Trinity aquifer is composed of three subdivisions; the Upper Trinity; the Middle Trinity and the Lower Trinity aquifers. The Upper Trinity aquifer is composed of the Glen Rose Formation; the Middle Trinity aquifer is composed of the Hensell Sand and Cow Creek Limestone; and the Lower Trinity aquifer is composed of the Sligo Limestone and Hosston Sand. The Upper Trinity aquifer crops out in western Bell County and is located generally west of the Edwards aquifer outcrop. The Middle and Lower Trinity aquifers do not outcrop in Bell County. However, the Trinity aquifer underlies all of Bell County. Water quality in the Trinity aquifer is good to moderate in western Bell County. East of IH 35 the water quality in the Upper and Middle Trinity aquifers deteriorates, but the water quality of the Lower Trinity aquifer remains useable for most purposes over most of Bell County. The availability of groundwater from the subdivisions of the Trinity aquifer is based on the management of aquifer pumping to maintain the resulting draw down within acceptable limits. The Trinity aquifer has established management targets for the limit of acceptable draw down.

## Other Local Sources of Groundwater

The local sources of groundwater which are not recognized as major or minor aquifers by TWDB are particularly important to Bell County. A significant percentage of the wells registered with CUWCD are completed in formations which are not widely recognized as aquifers but are vitally important sources of water. In the area of Bell County east of IH-35, the majority of wells registered with CUWCD are completed in these water bearing formations. A brief description of these groundwater sources follows:

### Alluvium / Terrace deposits

Alluvium and Terrace deposits consist of sand, gravel, silt and clay deposited by streams. Alluvium deposits are unconsolidated; terrace deposits may have some cement. Alluvium is closely associated with stream channels and terrace deposits are found at higher elevation across the broader floodplain of the stream. Well yields range from low to moderate.

### Austin Chalk

The Austin Chalk consists of nodular chalk and marl with some clay seams. Well yields are typically low with generally fresh water.

### Buda Limestone

The Buda Limestone is a fine grained hard limestone with abundant fossils or fossil fragments. Wells completed in this formation may yield little or no water.

### Edwards Equivalent

The term Edwards Equivalent aquifer refers to the areas in Bell County where the limestones and associated formations of the Edwards Group are productive of generally limited volumes of groundwater and which are located outside of the TWDB recognized bounds of the Edwards (BFZ) aquifer.

### Kemp Clay-Marlbrook Marl / Pecan Gap Fm / Ozan Fm

These three geologic units are distinguishable from each other but consist of similar materials and have similar water bearing properties. They consist of thick beds of marl, chalky marl or calcareous clays containing thin beds of silt. Well yields are typically low with fresh to moderately saline water. These geologic units are all associated as members of the Taylor Marl.

### Lake Waco Fm

The Lake Waco Fm is a member of the Eagle Ford Group. The formation consists of limestone and shale. While not generally recognized as productive of water it appears to produce limited amounts of useable quality water in limited areas of Bell County.

**Exhibit I -- Geologic and Hydrologic Units of Bell County**

| Group | Formation | Member | Hydrologic Unit |
|---|---|---|---|
| N/A | Alluvium | | Alluvium and terrace deposits |
| | Terrace deposits | | |
| Navarro/Taylor | Kemp Clay / Marlbrook Marl | | Kemp Clay/ Marlbrook Marl |
| | Pecan Gap Chalk | | Pecan Gap Formation |
| | Ozan Formation | | Ozan Formation |
| Austin | Austin Chalk | | Austin Chalk |
| Eagle Ford | Eagle Ford Shale<br>Lake Waco Fm | | Eagle Ford not recognized as a groundwater source; Lake Waco has limited production in limited areas |
| Washita | Buda Formation | | Buda Limestone |
| | Del Rio Clay | | Not recognized as a groundwater source |
| Edwards | Georgetown | | Edwards (Balcones Fault Zone) aquifer |
| | Kiamichi | | |
| | Edwards | | |
| | Comanche Peak | | |
| | Walnut | | Not recognized as a groundwater source |
| Trinity | Paluxy | | Upper Trinity aquifer |
| | Glen Rose | | |
| | | | |
| | Travis Peak | Hensell Sand | Middle Trinity aquifer |
| | | Cow Creek Limestone | |
| | | Hammett Shale | Not recognized as a groundwater source |
| | | Sligo limestone | Lower Trinity aquifer |
| | | Hosston Sand/Conglomerate | |

*Source: Geologic and Hydrologic Units of Bell County, after Duffin and Musick, 1991*

# APPENDIX A2

# Delineation of Proposed Management Zones within Bell County, Texas

Prepared for

## CLEARWATER UNDERGROUND WATER CONSERVATION DISTRICT

Prepared by

Michael R. Keester, P.G. – R. W. Harden & Associates, Inc.

Allan R. Standen, P.G. – Allan R. Standen, LLC

Vince Clause, GISP – Allan R. Standen, LLC

Dr. Joe C. Yelderman Jr., P.G. – Baylor University

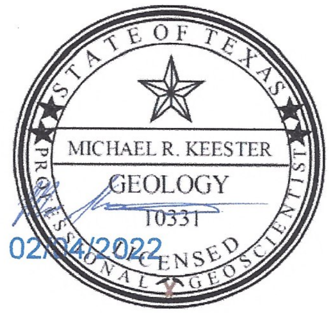
February 2022

## GEOSCIENTIST SEALS

This report documents the work of the following licensed professional geoscientists.

Michael R. Keester, P.G.

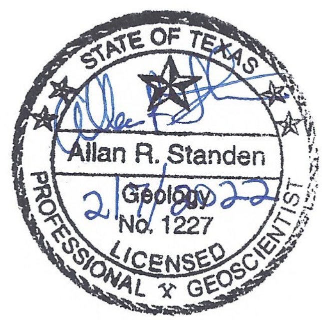
Mr. Keester was primarily responsible for preparing report sections on Water Levels, Proposed Management Areas, Proposed Rule Changes, and Summary and Conclusions.




Principal Hydrogeologist – R. W. Harden & Associates, Inc. (TX Geoscientist Firm License #50033)

Allan R. Standen, P.G.

Mr. Standen was primarily responsible for preparing the report sections on hydrostratigraphy. He also provided review and QA/QC of the final report.




Principal – Allan R Standen, LLC

Dr. Joe Yelderman, P.G.

Dr. Yelderman was primarily responsible for preparing the report sections on Hydraulic Characteristics and Water Quality. He also provided review and QA/QC of the final report.

Chair, Department of Geosciences – Baylor University

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# INTRODUCTION

Over the past several years Clearwater Underground Water Conservation District ("CUWCD") has directed hydrogeologic investigations of its managed aquifers. These investigations have helped further quantify the observations of local landowners and area water well drillers regarding the difference in the hydrogeologic conditions in southwestern Bell County compared to other parts of the county. To synthesize the scientific investigations into policy recommendations, members of CUWCD's technical consulting team applied our respective area of expertise to delineate a distinct management area in southwestern Bell County.

Our study area for this investigation focused on southwestern Bell County. The study area extended into northwestern Williamson County to allow for the investigation of the geology, structure, historical water levels, and hydraulic properties that informed how groundwater moves through the subsurface into Bell County. We also reviewed information from previous investigations across the county and extending into McLennan County. Using this information, we delineated proposed management areas with recommendations for the modification of the District Rules to account for policy variations in different parts of Bell County. Within this report, we briefly discuss the variations in hydrogeologic characteristics that dictated our recommendations for the proposed management zones.

# HYDROSTRATIGRAPHY

Standen and Clause (2021) built upon their previous research to refine the understanding of the lithology, stratigraphy, and structure of the Trinity Aquifer in southwestern Bell County. Their study area was 491 square miles and included portions of southwestern Bell County, northwestern Williamson County, and eastern Burnet County (see Figure 1). Within this area, they conducted a detailed stratigraphic investigation to identify possible geologic variabilities within the units making up the Trinity Aquifer, particularly, those units of the Middle and Lower Trinity as identified on Table 1.

The Cretaceous Hosston, Pearsall, Hammett Shale, Cow Creek Limestone, and Hensell Sand Members have historically been referred to as the Travis Peak Formation. However, this generalized classification does not account for differences in hydraulic characteristics, groundwater chemistry, and water levels between hydrologic units. Instead, the aquifer system is better described as the Middle Trinity Aquifer comprised of the Hensell Sand and Cow Creek Limestone, and the Lower Trinity Aquifer comprised of the Hosston.

**Figure 1. Study area for Standen and Clause (2021).**

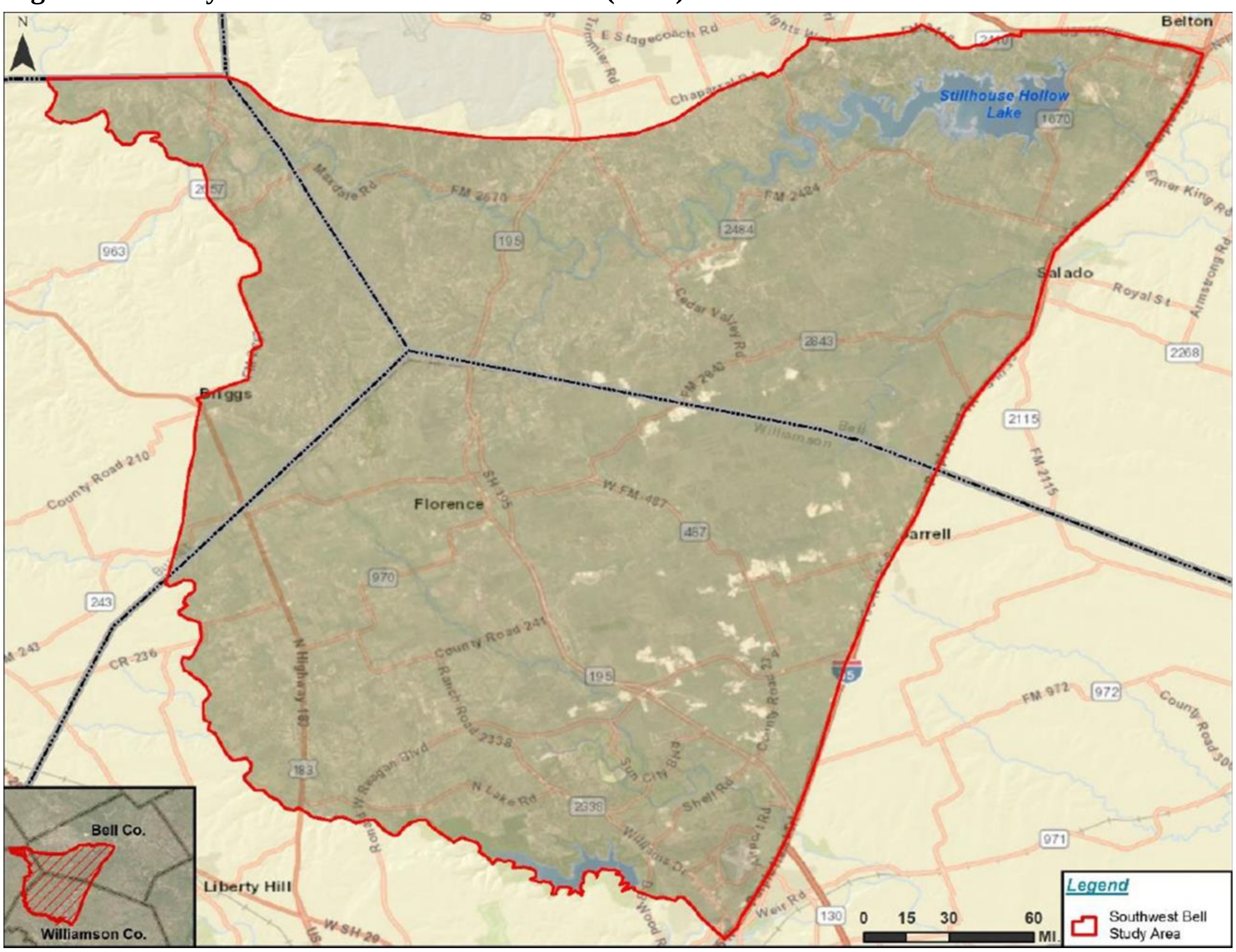


**Table 1. Study Area Middle and Lower Trinity Stratigraphic Column. Modified from Klemt and others (1975) and Duffin and Musick (1991).**

| System | Group | Stratigraphic Units | | Hydrologic Unit | Lithologic Description |
|---|---|---|---|---|---|
| Cretaceous | Middle Trinity | Travis Peak Formation | Hensell Sand Member | Middle Trinity Aquifer | Composed of sands and sandstones, gravels and conglomerates that are poorly to well cemented, and sometimes interbedded with sandy limestone lenses, multicolored clays, and gray to green shales. |
| | | | Cow Creek Limestone Member | | Cream to tan color limestones that are fossiliferous, sometimes sandy, and can locally contain fractures and cavities. |
| | | | Hammett Shale / Pearsall Member | Aquitard | Hammett Shale: Gray to dark gray silty sandy shale with streaks of dolomite. / Pearsall Member: "Redbeds" Limestones, multi-colored clays, and sand lenses |
| | Lower Trinity | | Hosston Member | Lower Trinity Aquifer | "Lower Trinity Sand," composed of poorly sorted multicolored conglomerate, poorly sorted to well sorted fine and coarse grain sand and sandstones, streaks of shale and occasional limestone. |

The stratigraphic units of the Middle and Lower Trinity are present at depth and underlie the entire study area. These units dip to the east being shallower in the northwestern portion of the study area and deeper to the east. Along the eastern edge of the study area, the Middle and Lower Trinity are approximately 900 and 1,100 feet below land surface, respectively, while in the northwestern portion of the study area along the Lampasas River, the Middle and Lower Trinity is less than 100 and 200 feet below land surface, respectively.

The Middle Trinity is composed of both the Hensell Sands and Cow Creek Limestone. It is hydrologically separated from the Lower Trinity Aquifer by the Hammett Shale or Pearsall Member. The Lower Trinity Group includes the Hosston Member which lies unconformably on an irregular erosional surface of Paleozoic strata. Within the study area, sand grain size decreases in a westward direction and calcium carbonate materials increase in both the Hensell Sands and Hosston Member, while the Cow Creek Limestones grades into the Pearsall formation. These changes occur in the Middle and Lower Trinity calcareous facies transition zone that primarily occurs west of Texas Highway 195 in Bell County.

Middle and Lower Trinity faults with a NE-SW orientation are present throughout the study area. These are normal faults with the up blocks located along the west side of each fault that follow the known Balcones Fault Zone structure and surface faults mapped in the Geologic Atlas of Texas. Although faults are observed throughout the study area, only faults near and around Stillman Valley Road and FM 2484 appear to form a noticeable boundary condition for water chemistry, groundwater production, and water level surfaces.

# HYDRAULIC CHARACTERISTICS

Through evaluations of the well spacing requirements (Keester, 2020), we have considered the hydraulic characteristics of the Middle and Lower Trinity aquifers based on the datasets used in the groundwater availability model (Kelley and others, 2014; Keester and Konetchy, 2016; Konetchy and Beach, 2020). Based on these datasets, the transmissivity of the Middle Trinity Aquifer decreases to the west and south (Figure 2). The Middle Trinity Aquifer transmissivity data for the eastern portion of the county is uncertain due to a lack of available pumping test results. However, the lower transmissivity values in the southwestern portion of the county are consistent with recent pumping test results from RS Materials and River Ridge Ranch which had transmissivity values of 1,800 gallons per day per foot (gpd/ft) and 31 gpd/ft, respectively.

For the Lower Trinity Aquifer, the transmissivity dataset from Kelley and others (2014) was not consistent with available pumping test data. To improve the transmissivity dataset, CUWCD updated the model within Bell County (Keester and Konetchy, 2016; Konetchy and Beach, 2020). The results of this work showed generally increasing transmissivity values from west to east across the county (Figure 3). However, results from recent pumping tests associated with the Brookings Ranch (Yelderman, Jr. and others, 2022) and Stillman Valley Ranchettes (Worsley, 2021) wells indicate the transmissivity values for the southwestern portion of the county are overestimated.

The pumping test at the Brookings Ranch location indicated transmissivity values of about 160 gpd/ft (Yelderman, Jr. and others, 2022) while the results at the Stillman Valley Ranchettes test was about 85 gpd/ft (Worsley, 2021). Both of these tests demonstrated our understanding of the hydraulic properties of the Lower Trinity Aquifer need to be updated. In addition, the test at the Brookings Ranch site showed the existence of a negative flow barrier which impeded flow to the well. Based on the hydrostratigraphic understanding of the area, we believe this barrier is a fault located between the wells (Figure 4).

The hydraulic properties observed in the southwest area of the county are consistent with the hydrostratigraphy for the area. The pumping tests indicate at least some of the faults identified are barriers to groundwater flow. While barriers to groundwater flow have been observed in pumping test data in other areas of the county, the low transmissivity of the aquifers in the southwest corner of Bell County along with the barriers contribute to low aquifer productivity.

**Figure 2. Middle Trinity Aquifer transmissivity (Kelley and others, 2014).**

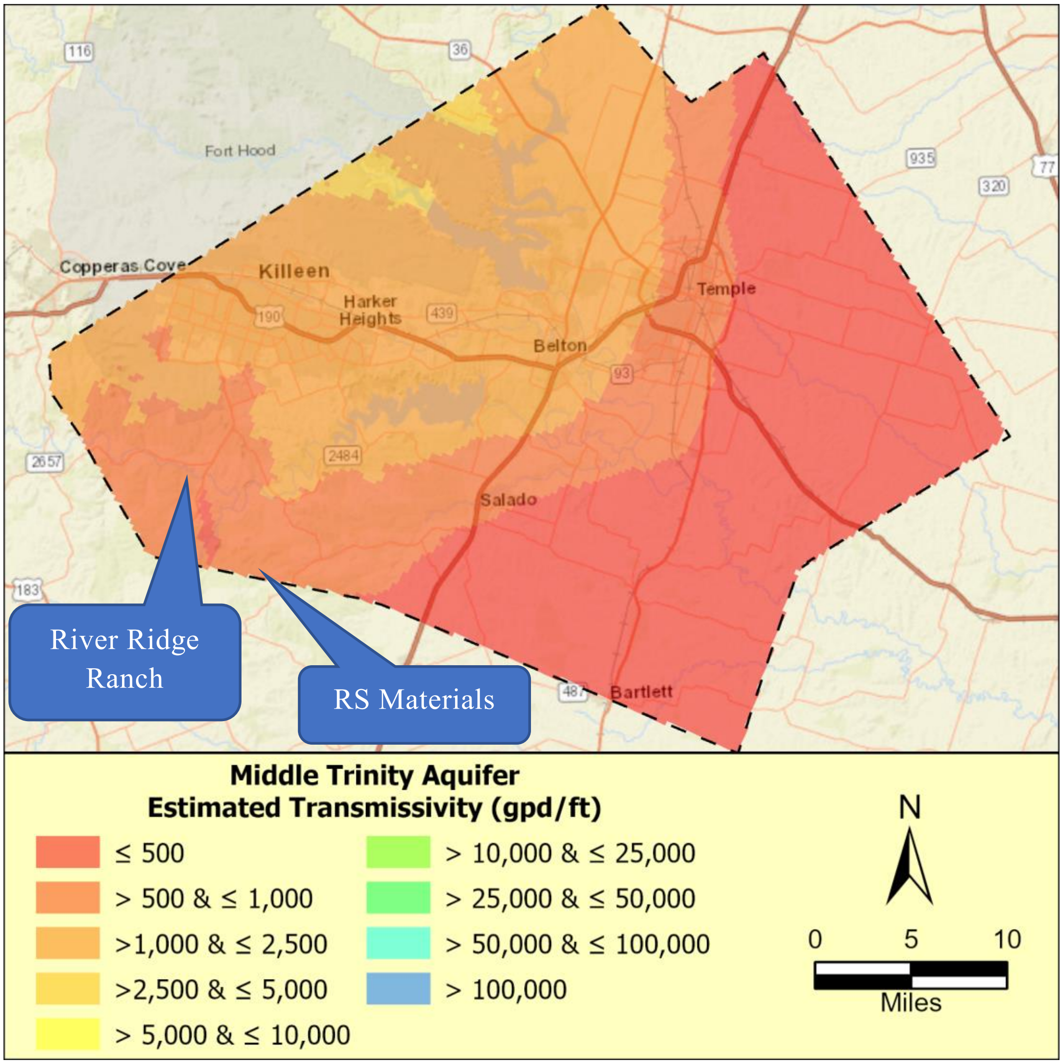


**Figure 3. Lower Trinity Aquifer transmissivity.**

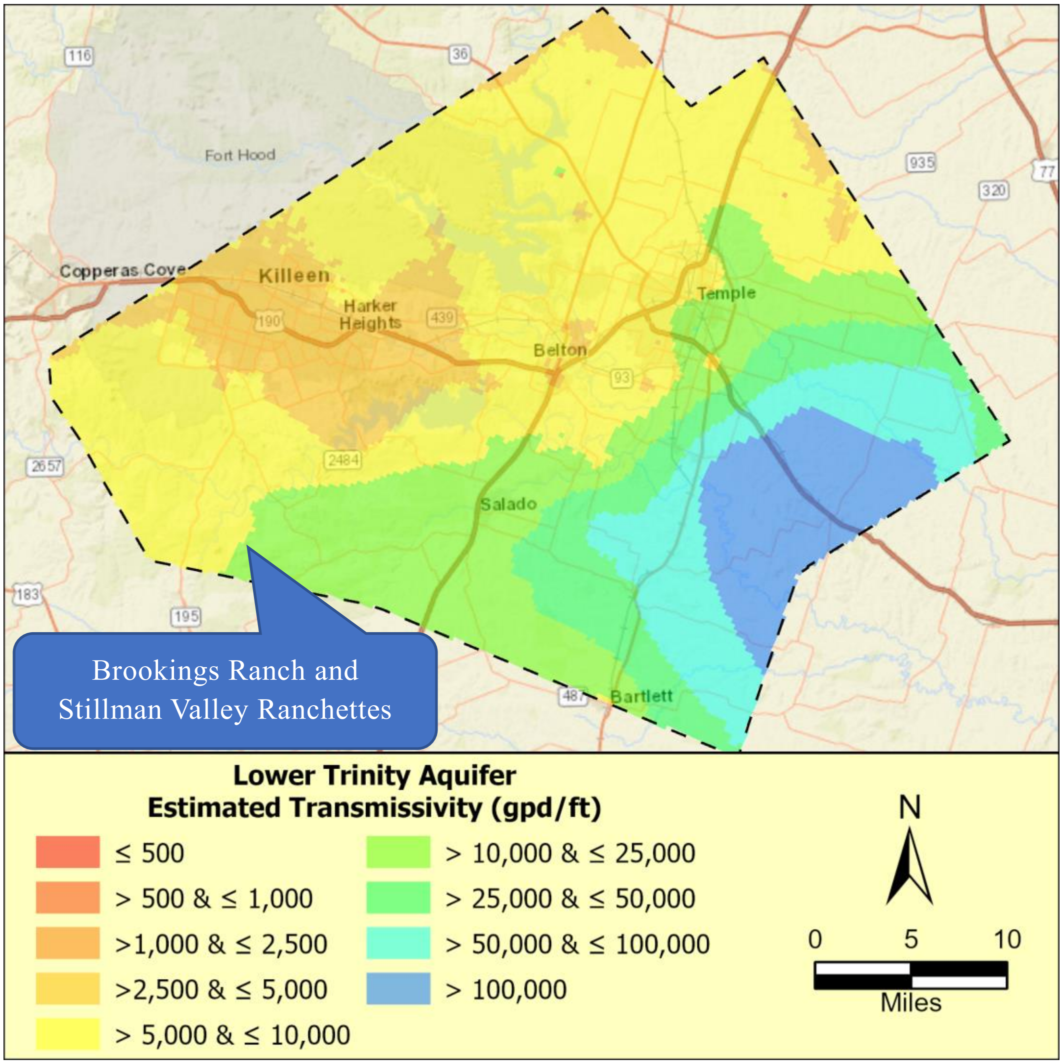


**Figure 4. Drawdown in wells completed in the Lower Trinity Aquifer at the Hines site.**

## WATER LEVELS

Since 2006, water levels in the Middle Trinity have declined by more than 150 feet in the southwest portion of Bell County (Figure 5). These declines in water levels are due to groundwater production in the area as well as in Williamson County. The water level declines in the Middle Trinity are nearly 10 feet per year in some wells and recent measurements suggest similar declines are occurring in the deeper Lower Trinity Aquifer.

In southwestern Bell County, water levels in the Middle Trinity are deeper than water levels in the Lower Trinity. As Figure 6 indicates, the depth to water is more than 700 feet in an area of southwestern Bell County with the top of the screen interval only about 50 feet below the water level. Due to the dip of the aquifer and a lower ground surface elevation, the depth to the top of the screen is deeper and the depth to water is shallower, respectively. However, in both areas we observe a general decline in water level over time.

In southwestern Bell County, water levels in wells completed the Lower Trinity Aquifer are closer to the surface than they are in wells completed the Middle Trinity. In the northern and eastern portions of the county the water levels are generally deeper due to more production from the Lower Trinity in these areas. Water levels in the Lower Trinity are deepest in the northern portion of the county exceeding 500 feet locally (Figure 7). In eastern Bell County there is an area of locally shallow water levels (less then 200 feet) associated with high-capacity water wells completed to the base of the Hosston.

**Figure 5. Middle Trinity Aquifer water level declines from 2006 through 2019.**

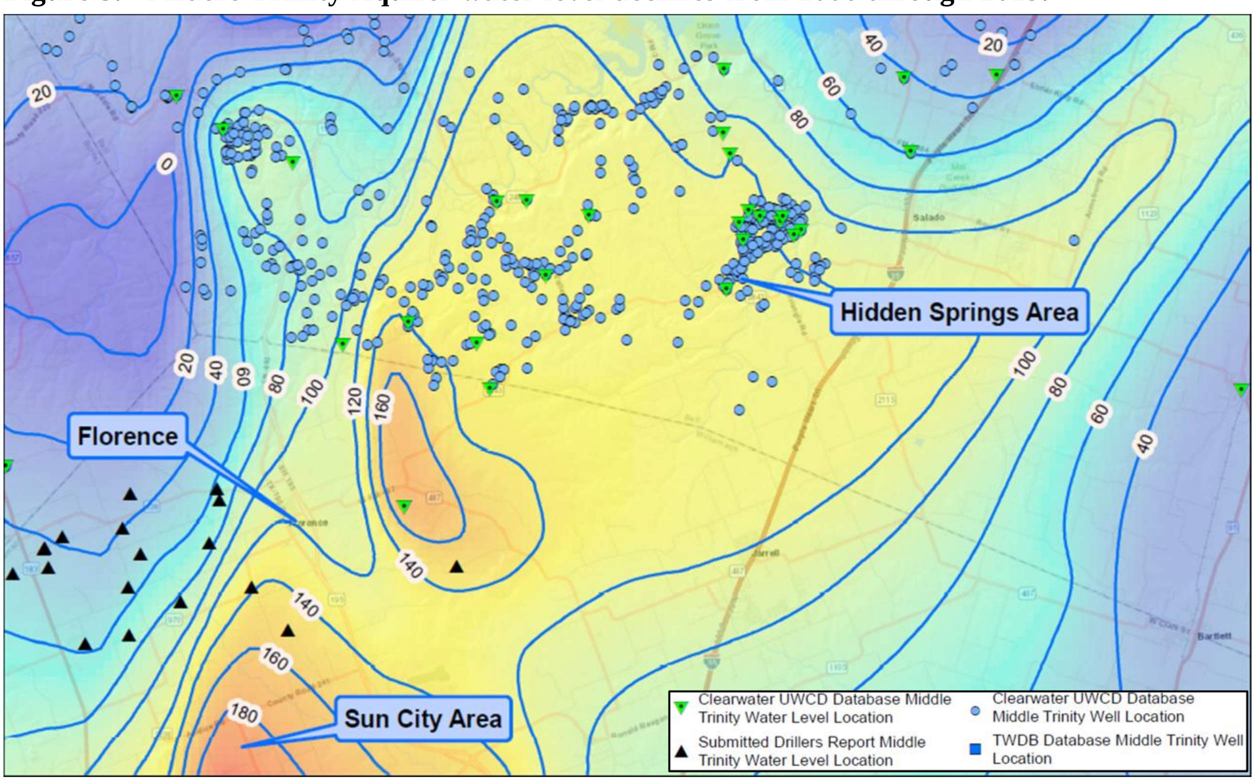


**Figure 6. December 2021 Middle Trinity Aquifer measured (hydrographs) and estimated (contour map) depth to water.**

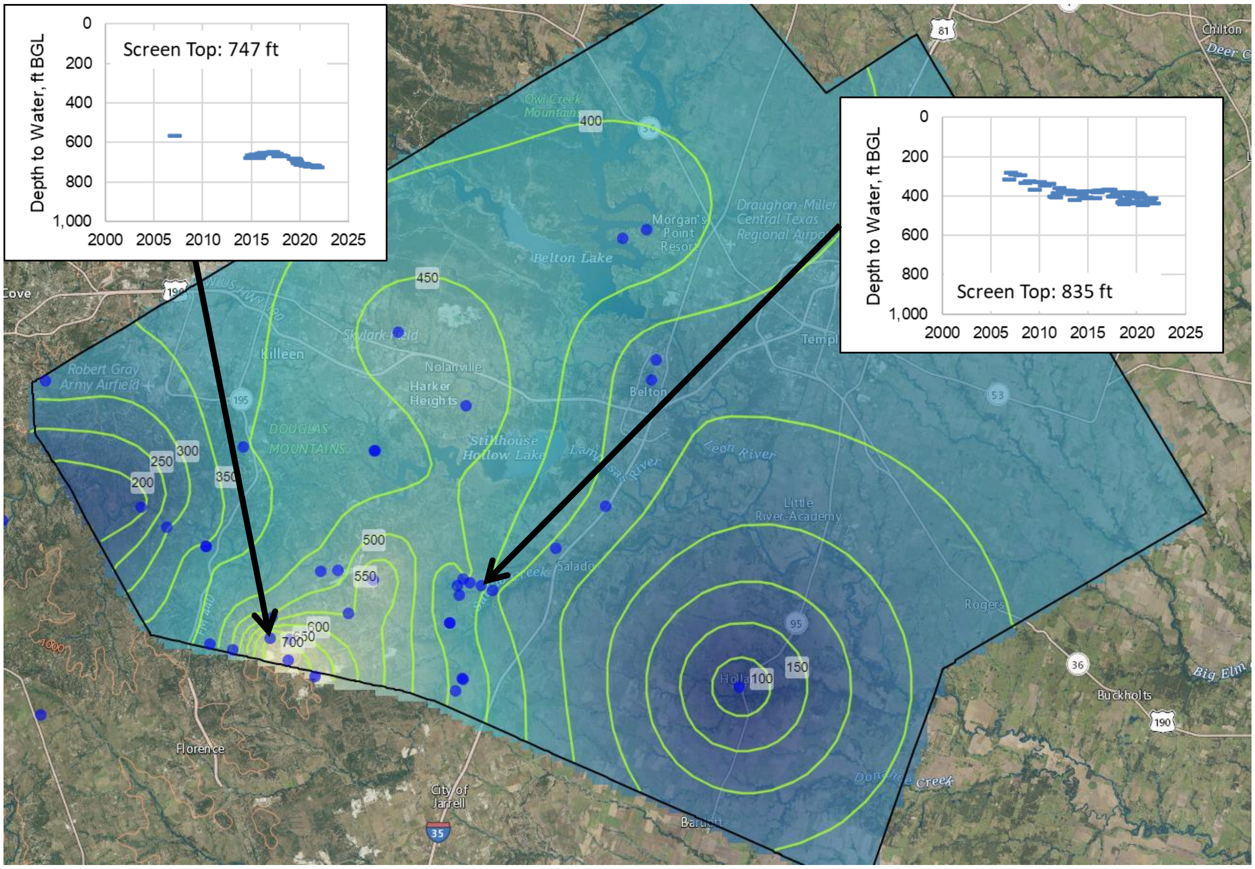
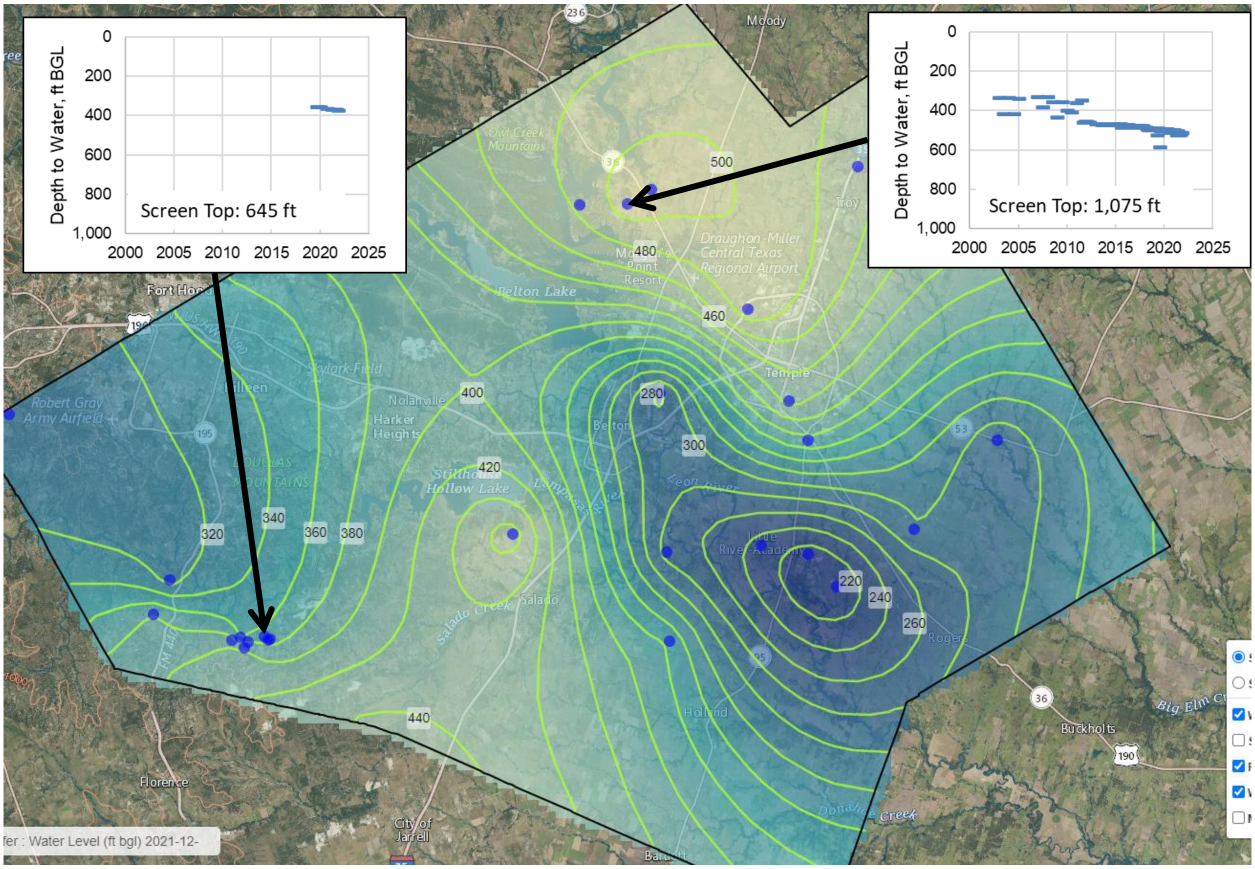


**Figure 7. December 2021 Lower Trinity Aquifer measured (hydrographs) and estimated (contour map) depth to water.**



# WATER QUALITY

Tucker (2018) discussed variations in water quality within the Middle Trinity Aquifer throughout Bell and McLennan counties. He identified an area of increasing total dissolved solids (TDS) and changing ionic concentrations from south to north across Bell County. These higher TDS concentrations are reflected in the increasing conductivity values as measured in microSiemens per centimeter (µS/cm). Figure 8 illustrates the change in groundwater conductivity and ionic concentrations in the Middle Trinity Aquifer. Figure 9 is an example of the Stiff Diagrams shown on Figure 8 illustrating the ionic constituents symbolized.

The cause of the water quality changes in the Middle Trinity Aquifer is not known. However, it may be related to surface water infiltrating through the subsurface and dissolve soluble minerals in the shallower formations. As the water seeps downward, these minerals are carried into the deeper Middle Trinity Aquifer. Additional research is needed to assess this hypothesis.

Groundwater samples from wells completed in the Lower Trinity Aquifer are mostly in the southwest portions of the county (Figure 10). There are two wells from which collected samples had a TDS concentration of more than 2,000 mg/L. However, most of the samples indicated TDS concentrations of less than 1,500 mg/L with two samples in the deeper portions of aquifer in eastern Bell County have concentrations of less than 1,000 mg/L which is indicative of fresh water.

**Figure 8. Groundwater quality in the Middle Trinity Aquifer. Modified from Tucker (2018).**

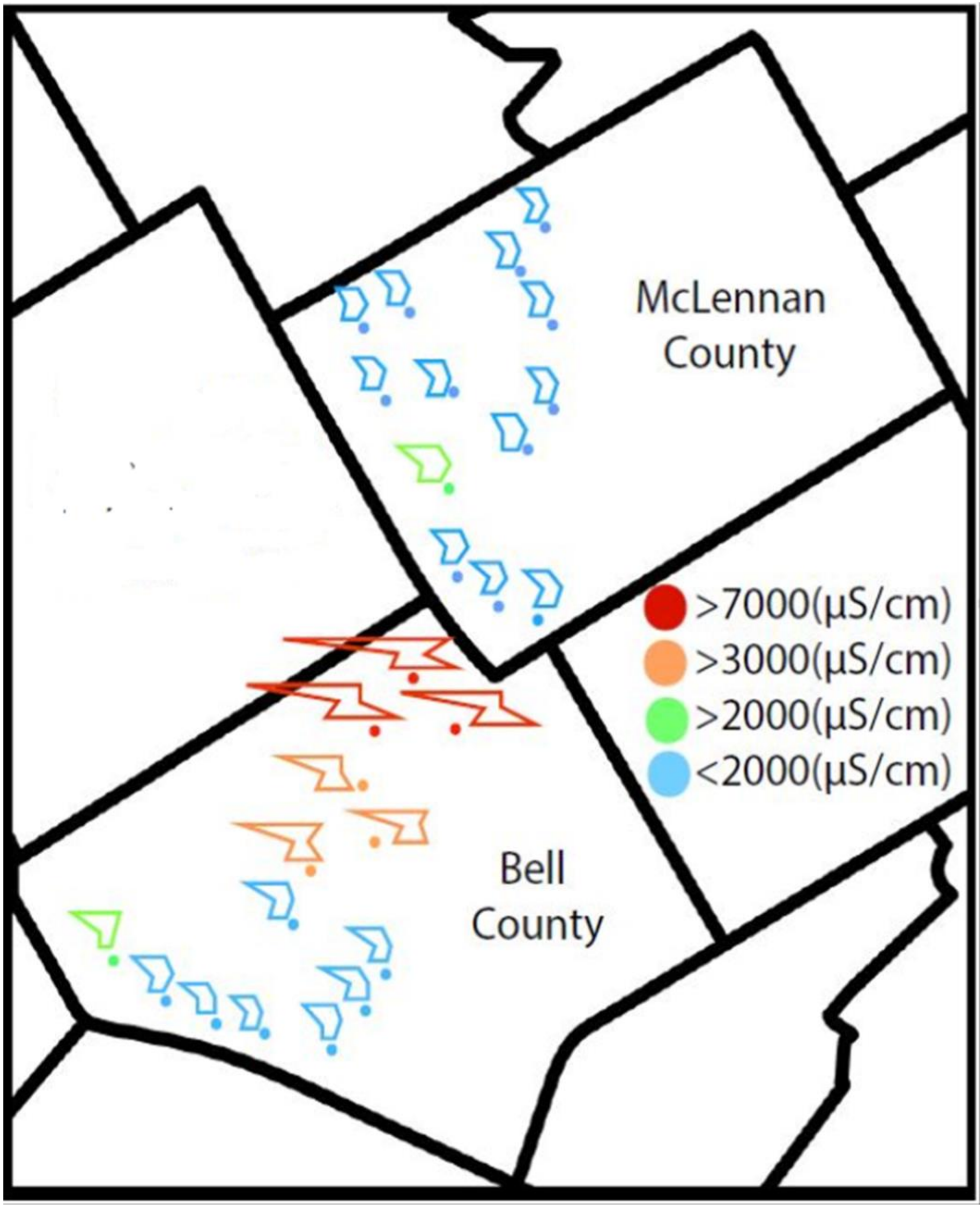


**Figure 9. Stiff diagram of the common Middle Trinity water type ($Na^{+}$ + $K^{+}$ and $HCO_3^{-}$ + $CO_3^{-}$ dominated).**

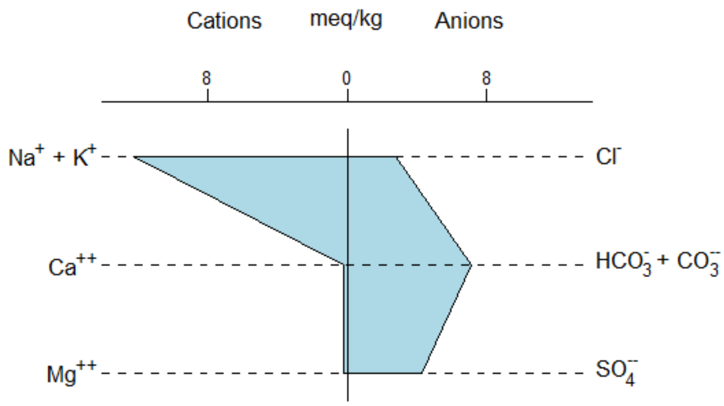
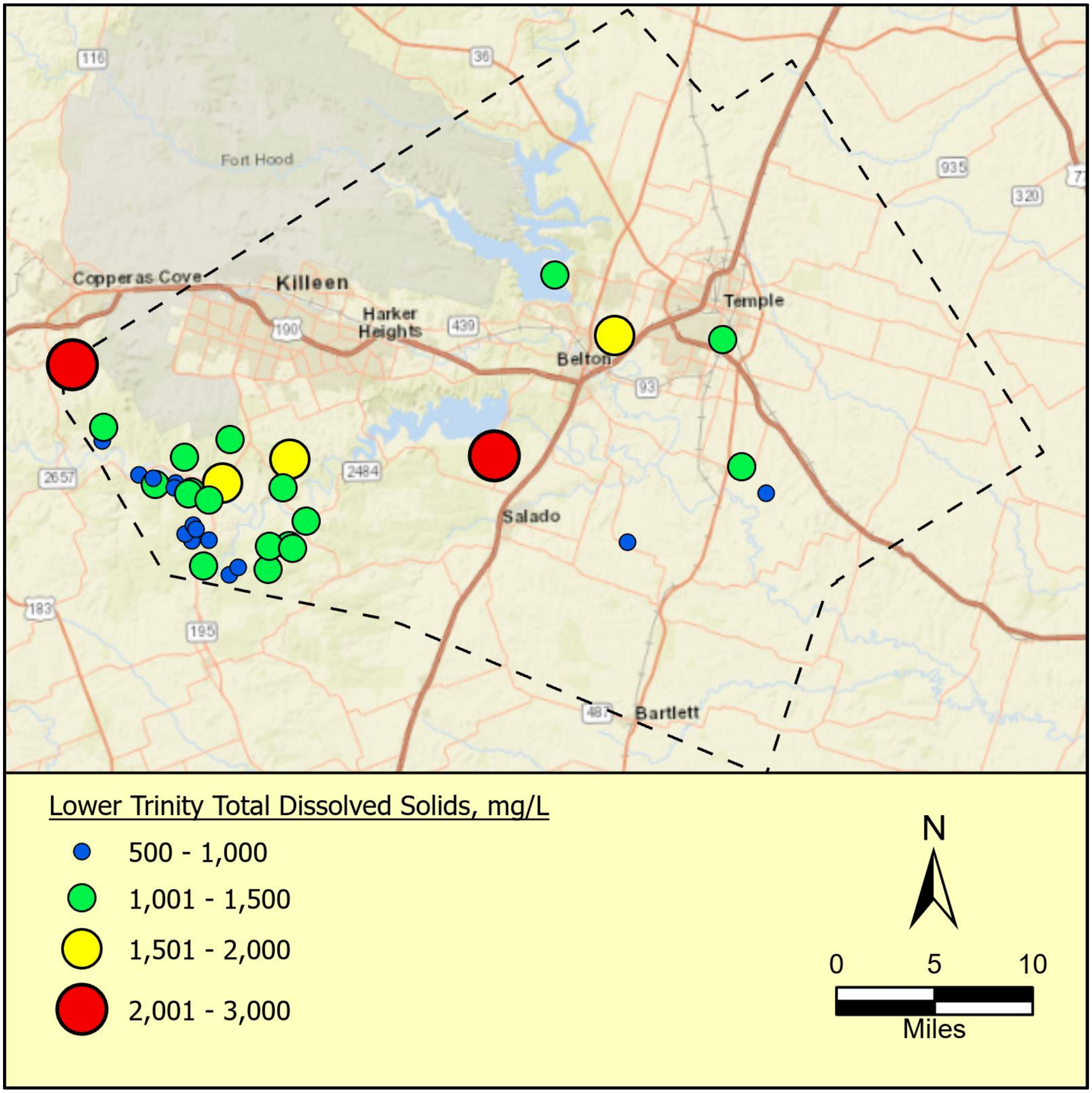


**Figure 10. Groundwater total dissolved solids concentration for samples collected from wells completed in the Lower Trinity Aquifer.**



## PROPOSED MANAGEMENT AREAS

Based on our current understanding of the hydrogeologic characteristics of the Trinity Aquifer, we identified four proposed management areas. We identified these areas based on the hydrogeologic characteristics unique to the area. We then delineated the area using existing roads and the county line to provide recognizable landmarks for each boundary and for consistency with CUWCD Rule 7.1. Figure 11 illustrates the location of each proposed Trinity Aquifer management area.

**Figure 11. Proposed Trinity Aquifer management areas.**

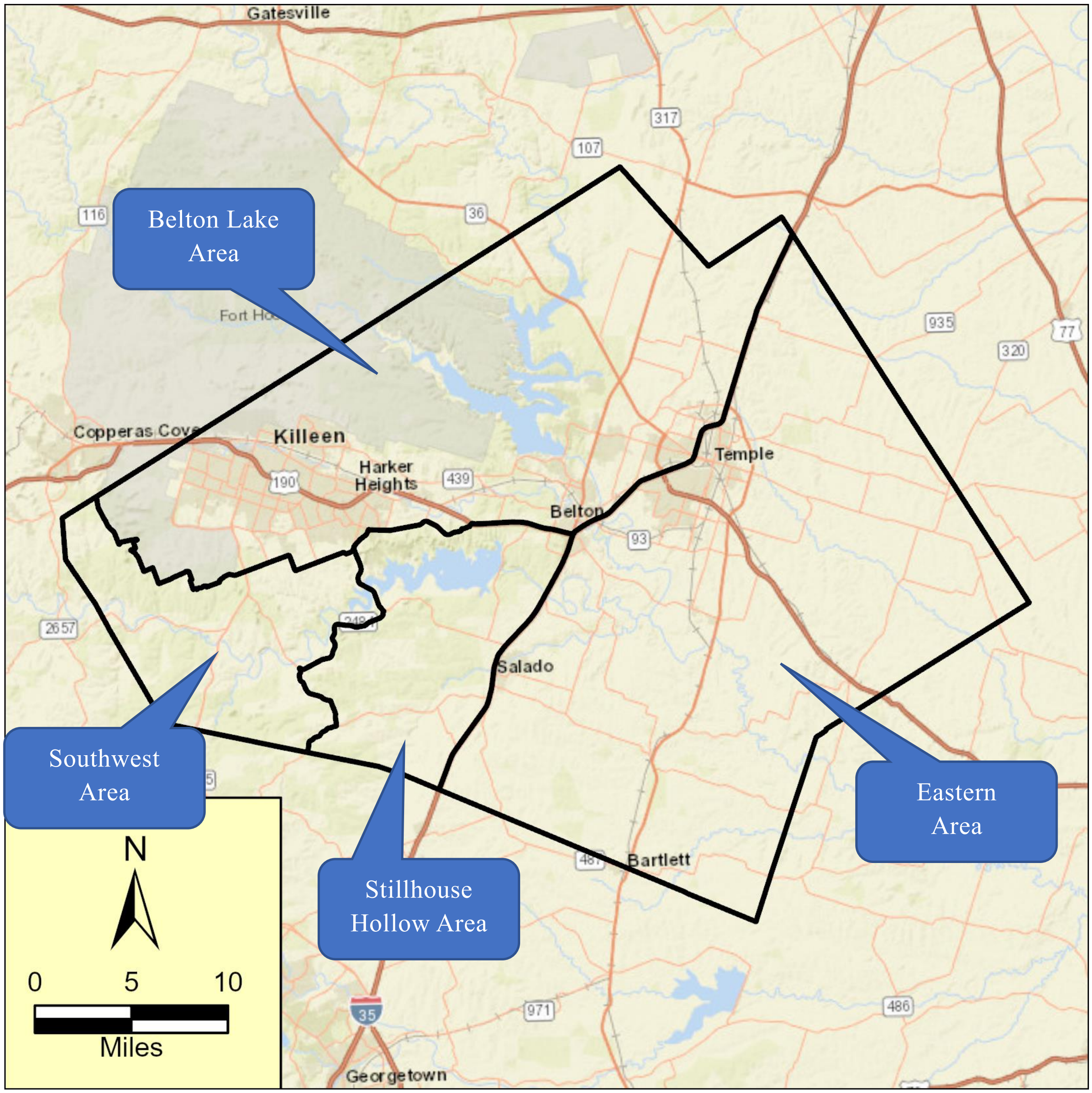


Table 2 and Table 3 summarize the aquifer characteristics for each proposed management area based on our current understanding. Each table provides the range in values for the area followed by the median value in parentheses. The depth to the top of the aquifer and aquifer thickness are based on the structural data developed for CUWCD. The transmissivity values are based on input datasets for the groundwater availability model. The available drawdown values are based on estimated water levels and the proposed definition discussed in the following section of this report.

**Table 2. Middle Trinity summary aquifer characteristics per proposed management area.***

| Management Area | Depth to Top (ft) | Thickness (ft) | Transmissivity (gpd/ft) | Available Drawdown (ft) |
|---|---|---|---|---|
| Southwest | 190–820 (470) | 0–170 (40) | 370–1,600 (830) | 70–210 (140) |
| Stillhouse Hollow | 490–1,080 (800) | 20–110 (50) | 180–1,670 (940) | 110–730 (330) |
| Belton Lake | 400–1,580 (770) | 10–280 (40) | 300–3,040 (1,610) | 70–1,110 (300) |
| Eastern | 900–2,520 (1,960) | 20–300 (80) | 20–1,500 (140) | 570–2,480 (1,840) |

*Values shown as: minimum–maximum (median)

**Table 3. Lower Trinity summary aquifer characteristics per proposed management area.***

| Management Area | Depth to Top (ft) | Thickness (ft) | Transmissivity (gpd/ft) | Available Drawdown (ft) |
|---|---|---|---|---|
| Southwest | 190–1,060 (570) | 40–150 (90) | 3,160–17,430 (6,660) | 180–590 (250) |
| Stillhouse Hollow | 680–1,410 (1,070) | 40–290 (100) | 3,020–23,320 (10,960) | 350–1,040 (640) |
| Belton Lake | 450–1,840 (920) | 0–190 (60) | 1,880–12,780 (5,750) | 190–1,320 (450) |
| Eastern | 1,080–3,050 (2,230) | 40–540 (260) | 1,520–247,470 (32,330) | 830–2,850 (1,980) |

*Values shown as: minimum–maximum (median)

The Southwest Area generally has the lowest amount of available groundwater for users. The transmissivity values in the aquifers are low and there have been large water level declines over the last several years. The stratigraphy and structure in the area are not conducive to rapidly transmitting groundwater in the subsurface to wells for production. Numerous faults and changing lithology inhibit the flow of groundwater. The range and median depth to the top of the aquifer are the lowest of the four areas. While the transmissivity range is similar to the other proposed areas, the available drawdown is lower which limits the long-term groundwater availability.

For the Lower Trinity in the Southwest Area, the transmissivity values shown in Table 3 are likely too high. Recent aquifer tests indicate the lower range of the transmissivity values in the area should be lower with recent aquifer tests indicating a transmissivity value of less than 100 gpd/ft. While these new data are not yet incorporated into the model datasets, they are applied to our understanding of the local hydrogeologic conditions.

In the Stillhouse Hollow Area, water levels have declined by more than 100 feet in the Middle Trinity Aquifer since 2006. However, due to the dip of the stratigraphic units there is more water above the top of the aquifer than there is in the Southwest Zone. As shown in Table 2, there is more than 700 feet of available drawdown in some areas with a median value of more than 300 feet. While water levels will continue to decline and reduce the available drawdown, the stress on the aquifer is not as significant as in the Southwest Zone due to less development and the availability of groundwater from the shallower Edwards Aquifer in some parts of the area.

The Lower Trinity Aquifer in the Stillhouse Hollow Area is not well understood at this time. There are few wells in this deeper zone of the aquifer. However, indication of the aquifer conditions at the Doc Curb Well near the Stillhouse Hollow Lake dam indicate the aquifer may not be as transmissive as Table 3 suggests. Also, the quality of the water from this non-exempt well does not meet potable water standards.

For the Belton Lake Area, there are some observed changes in the water quality in the Middle Trinity Aquifer compared to the areas to the south. The salinity of the groundwater generally increases from south to north within the aquifer. However, the water quality in the Lower Trinity remains fresh and is used by public water suppliers such as Moffat Water Supply Corporation and the City of Troy.

The Eastern Area is primarily for the Lower Trinity Aquifer. The area east of Interstate 35 has fewer users of the aquifer due to the depth of the formations and associated cost for completing a well. As suggested by the median transmissivity value shown in Table 3, the Lower Trinity Aquifer in the area generally is highly productive with transmissivity values several times greater than in areas to the west and well yields may exceed 1,000 gallons per minute. Faulting may limit the flow of groundwater from the west to the east, but the high transmissivity and height of water above the top of the aquifer allow for a large amount of groundwater availability.

# PROPOSED RULE MODIFICATIONS

With the unique hydrogeologic conditions associated with each Trinity Aquifer proposed management area, the groundwater resources in these areas may be managed differently. The variations in resource management may be addressed through different rules for each zone. The following provides proposed rule changes associated with each management zone.

## Proposed Management Area Rule Changes

CUWCD Rule 7.2 addresses adjusting groundwater withdrawals in a management area based on an assessment of availability. Considerations of availability in this Rule focus on the amount of recharge available for withdrawal from each aquifer in the management area. Based on the determination of the amount of recharge available for production from wells, permitted pumping may be adjusted to equal the amount of recharge available. The term “recharge” in the Rule suggests the total amount of inflows to the management area rather than just the amount of precipitation that infiltrates into the aquifer.

While we have not developed the groundwater availability values per CUWCD Rule 7.2, we have prepared proposed well spacing rules following the current framework of CUWCD Rule 9.5.2. The revised spacing requirements are designed to minimize interference drawdown as much as practicable. As the focus is on minimizing the interference drawdown between wells, we focused on the spacing from existing wells completed in the same aquifer with spacing based on column pipe size. While we propose revised spacing requirements below, we also recommend that the rules allow for an exemption when physical conditions may not allow the landowner to meet the spacing requirements.

### *Middle Trinity Aquifer*

For the Middle Trinity Aquifer, we would not expect a well to be completed with a column pipe of more four inches in diameter (Keester, 2020). As such, based on the hydrogeologic characteristics of the Middle Trinity Aquifer, we recommend the rules prohibit completion of well in the Middle Trinity Aquifer with a column pipe of more four inches in diameter. In lieu of a prohibition, the minimum spacing should be at least 5,280 feet from an existing well completed in the Middle Trinity Aquifer if the proposed well will have a pipe of more four inches in diameter. For smaller diameter column pipe diameters, Table 4 provides the recommended spacing between a new well completed in the Middle Trinity Aquifer and an existing well completed in the same aquifer.

**Table 4. Middle Trinity Aquifer proposed minimum spacing for a new well from existing wells completed in the same aquifer.**

<table>
<tr><th rowspan="2">Management Area</th><th colspan="4">District Column Pipe Diameter Range (in)*</th></tr>
<tr><th>1¼ (≤18 gpm)</th><th>1½ (≤35 gpm)</th><th>2 (≤60 gpm)</th><th>>2 to 4 (≤225 gpm)</th></tr>
<tr><td>Southwest</td><td rowspan="4">150 feet</td><td rowspan="4">660 feet (1/8 mile)</td><td>Not Allowed</td><td>Not Allowed</td></tr>
<tr><td>Stillhouse Hollow</td><td rowspan="3">1,320 feet (1/4 mile)</td><td>Not Allowed</td></tr>
<tr><td>Belton Lake</td><td>Not Allowed</td></tr>
<tr><td>Eastern</td><td>5,280 feet (1 mile)</td></tr>
</table>

*rate (gpm) associated with column pipe is for reference only

In addition to the spacing requirement, for a new Middle Trinity well in the Belton Lake area we recommend requiring water quality analysis of the produced groundwater once the well is completed. We also recommend requiring the driller to obtain a geophysical log of the open borehole prior to well completion. These items will aid in assessing the cause of the poorer water quality in the northern part of Bell County in the aquifer. As data are collected, the District may determine that new wells completed in the Middle Trinity Aquifer for domestic use in the Belton Lake should be prohibited to protect human health.

For the Stillhouse Hollow Area, all Middle Trinity wells should be completed with a measuring tube to allow for continued monitoring of water level declines. As development continues in the area, production may need to be limited to extend the duration of groundwater availability. For permitted wells in the Middle Trinity Aquifer in the Stillhouse Hollow Area, we recommend the applicant consider the duration of groundwater availability taking into consideration the current trend in water level decline, anticipated drawdown associated with the new pumping, and the minimum pumping water level to obtain the proposed pumping.

### *Lower Trinity Aquifer*

Unlike the Middle Trinity Aquifer, there are areas where production from the Lower Trinity Aquifer may require a column pipe of more than 10 inches in diameter. Generally, the current spacing requirements are sufficient for proposed wells with a column pipe diameter of 6 inches or less (Keester, 2020). However, we recommend increasing the spacing requirement for consistency with the Middle Trinity and preservation of groundwater availability. Recent pumping tests suggest wells with a proposed column pipe of more than two inches in diameter are not feasible in the Southwest Area. Table 5, for column pipe sizes up to four (4) inches, and Table 6, for column pipe sizes greater than four (4) inches, provides the recommended spacing between a new well completed in the Lower Trinity Aquifer and an existing well completed in the same aquifer based on the local hydrogeologic conditions.

**Table 5. Lower Trinity Aquifer proposed minimum spacing for a new well with a column pipe up to four (4) inches from existing wells completed in the same aquifer.**

<table>
<tr><th rowspan="2">Management Area</th><th colspan="4">District Column Pipe Diameter Range (in)*</th></tr>
<tr><th>1¼ (≤18 gpm)</th><th>1½ (≤35 gpm)</th><th>2 (≤60 gpm)</th><th>>2 to 4<br>(≤225 gpm)</th></tr>
<tr><td>Southwest</td><td rowspan="4">150 feet</td><td>660 feet (1/8 mile)</td><td colspan="2">Not Allowed</td></tr>
<tr><td>Stillhouse Hollow</td><td rowspan="3">330 feet (1/16 mile)</td><td rowspan="3">660 feet (1/8 mile)</td><td rowspan="2">1,320 feet (1/4 mile)</td></tr>
<tr><td>Belton Lake</td></tr>
<tr><td>Eastern</td><td>660 feet (1/8 mile)</td></tr>
</table>

*rate (gpm) associated with column pipe is for reference only

**Table 6. Lower Trinity Aquifer proposed minimum spacing for a new well with a column pipe greater than four (4) inches from existing wells completed in the same aquifer.**

<table>
<tr><th rowspan="2">Management Area</th><th colspan="3">District Column Pipe Diameter Range (in)*</th></tr>
<tr><th>>4 to 6<br>(≤450 gpm)</th><th>>6 to 8<br>(≤800 gpm)</th><th>>8<br>(>800 gpm)</th></tr>
<tr><td>Southwest</td><td colspan="3">Not Allowed</td></tr>
<tr><td>Stillhouse Hollow</td><td rowspan="2">2,640 feet<br>(1/2 mile)</td><td rowspan="2">5,280 feet<br>(1 mile)</td><td rowspan="3">5,280 feet<br>(1 mile)</td></tr>
<tr><td>Belton Lake</td></tr>
<tr><td>Eastern</td><td>1,320 feet<br>(1/4 mile)</td><td>2,640 feet<br>(1/4 mile)</td></tr>
</table>

*rate (gpm) associated with column pipe is for reference only

For the Stillhouse Hollow Area, we recommend the driller be required to obtain a geophysical log of the well, preferably with the open borehole though local subsurface conditions may require the well be obtained through the cased well. We also recommend obtaining a water quality sample once the well is completed to assess changes in water quality in the aquifer.

## Hydrogeologic Report

CUWCD Rule 6.9.2(e) requires the submission of a hydrogeologic report in support of an operating permit application for use of more than 37 acre-feet per year. Subsequent District Rule 6.9.2(f) lists four requirements of the hydrogeologic report which are summarized as follows:

1. Pumping test results (which can be deferred under certain circumstances)
2. Identify impacts to nearby wells
3. Describe local geology and aquifer
4. Be completed in compliance with the hydrogeologic report guidelines

The current hydrogeologic report guidelines were last revised on March 24, 2009. Since the most recent revision, CUWCD has gained additional information and understanding regarding the aquifers within Bell County. In addition, the District has developed several tools to assist with evaluating the aquifer conditions at the location where pumping associated with a proposed operating permit would occur. To take advantage of the data and analysis tools developed since the last revision of the guidelines, we recommend the District consider updating the hydrogeologic report guidelines.

### *Hydrogeologic Report Related Rules Revisions*

Before considering revisions to the hydrogeologic report guidelines, we must first consider potential revisions to the District's Rules. First, we recommend the District add a definition for a "Hydrogeologic Report" to clarify exactly what the phrase means within the Rules. A possible definition to include is:

> "Hydrogeologic Report" means a report prepared by a professional engineer or professional geoscientist licensed in the State of Texas for the purpose of improving the best available science related to the groundwater resources managed by Clearwater Underground Water Conservation District.

The District Rules currently define "best available science" as "conclusions that are logically and reasonably derived using statistical or quantitative data, techniques, analyses, and studies that are publicly available to reviewing scientists and can be employed to address a specific scientific question." By defining that the purpose of a hydrogeologic report is to improve the best available science, the report is not simply a technical hurdle for obtaining an operating permit. Rather, it is a joint effort by the applicant and the District to improve understanding of the groundwater resources and to answer the specific questions the Board may have related to the proposed production.

When acting on a permit application, the Board must consider several items including whether "the proposed use of water does or does not unreasonably affect existing groundwater and surface water resources or existing permit holders" (Rule 6.10.24(c)). It is this specific consideration that a hydrogeologic report can help to address. However, currently the Board can only consider this issue qualitatively because an "unreasonable affect" is not defined in the Rules. To quantitatively address this consideration, a possible definition to include in the District Rules or a possible addition to current District Rule 6.10.24(c) is:

> To "unreasonably affect" means:
>
> - To cause or likely cause the District to exceed an adopted Desired Future Condition;
> - To cause or likely cause a reduction in water level that prevents use of the resource by existing users;
> - To cause or likely cause more than one (1) percent reduction in available drawdown in wells completed in the same aquifer that are located beyond the spacing requirement after one (1) year of operation;
> - To cause or likely cause degradation of water quality that makes the resource unsuitable for use by existing users; or,
> - To cause or likely cause land surface subsidence that damages existing infrastructure due to land deformation or flooding resulting from land deformation, or prevents use of the land by existing users.

The third point in the above list will require the addition of a definition for "available drawdown" in the District Rules. To define "available drawdown" we recommend the District rely on its geologic model and the water level analysis tools. The geologic model provides the top and bottom elevation of the aquifer and the water-level analysis tool provides the estimated elevation of the water level in the aquifer. Using these elevations we are able to calculate the aquifer thickness, the saturated thickness (if unconfined), artesian head (if confined), or the water level above any point in the aquifer.

To account for aquifer conditions ranging from unconfined to confined, a possible definition to include in the District Rules is:

> "Available drawdown" is the amount of water-level decline that could potentially occur within an aquifer and is calculated as follows:
>
> - If the water level elevation is 200 feet or more above the top of the aquifer, it is the water level minus the top of the aquifer;
> - If the water level elevation is less than the top of the aquifer, it is the water level minus the 30 percent saturated thickness level in the aquifer; and,

- If the water level elevation is less 200 feet above the top of the aquifer and greater than the top of the aquifer, it is the water level minus the 30 percent saturated thickness level in the aquifer with a maximum value of 200 feet.

Figure 12 illustrates how the available drawdown declines with the declining water level. Based on the declining available drawdown, at no more than a one (1) percent reduction in available drawdown the impact on well could be no more than about four (4) feet after one (1) year. In wells with less available drawdown, the allowable impact would be less. Figure 13 illustrates how the pumping rate also declines when the available drawdown and the saturated thickness decline. However, Figure 13 does not consider the effect of increased lift on a pump which would likely cause pumping rates to approach zero faster than Figure 13 suggests.

**Figure 12. Illustration of changing available drawdown with changing water levels assuming the top and bottom of the aquifer are at 100 and 0 feet MSL, respectively.**

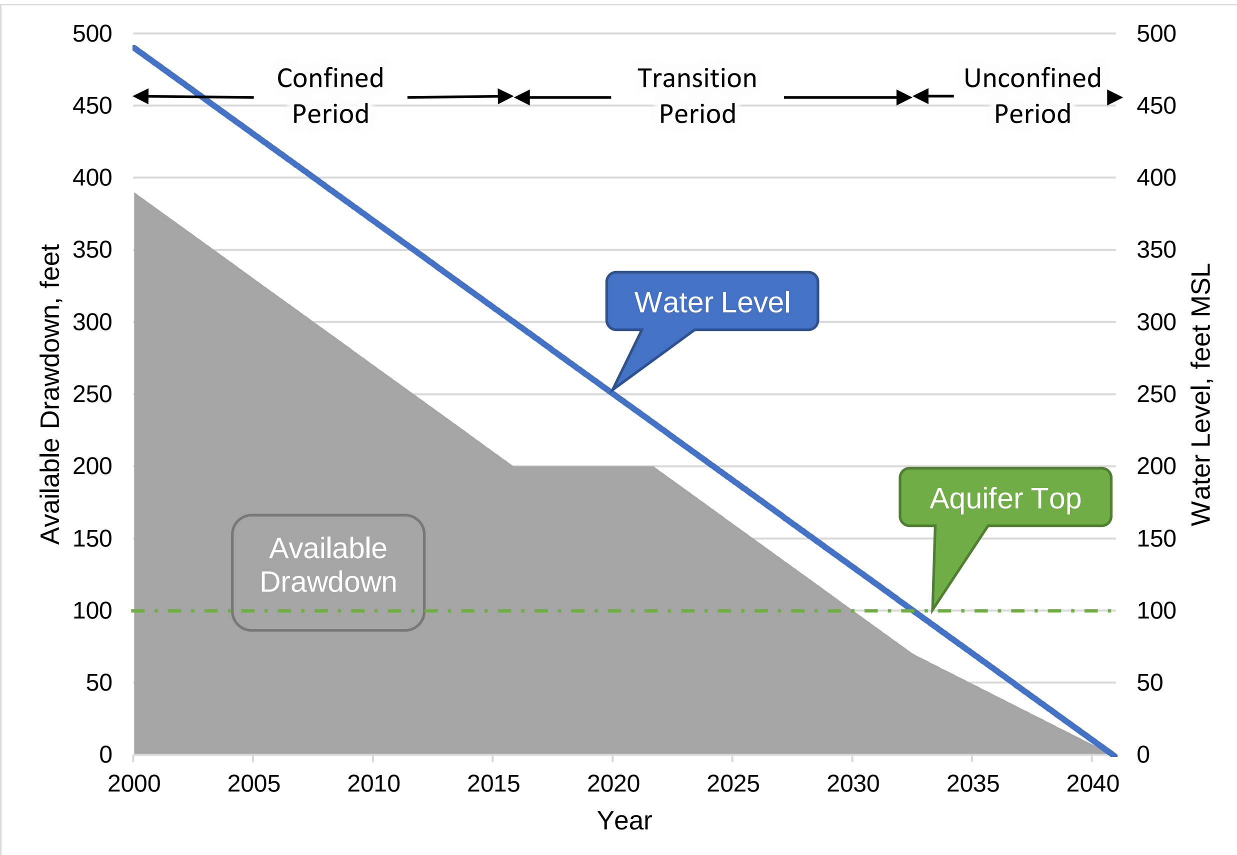
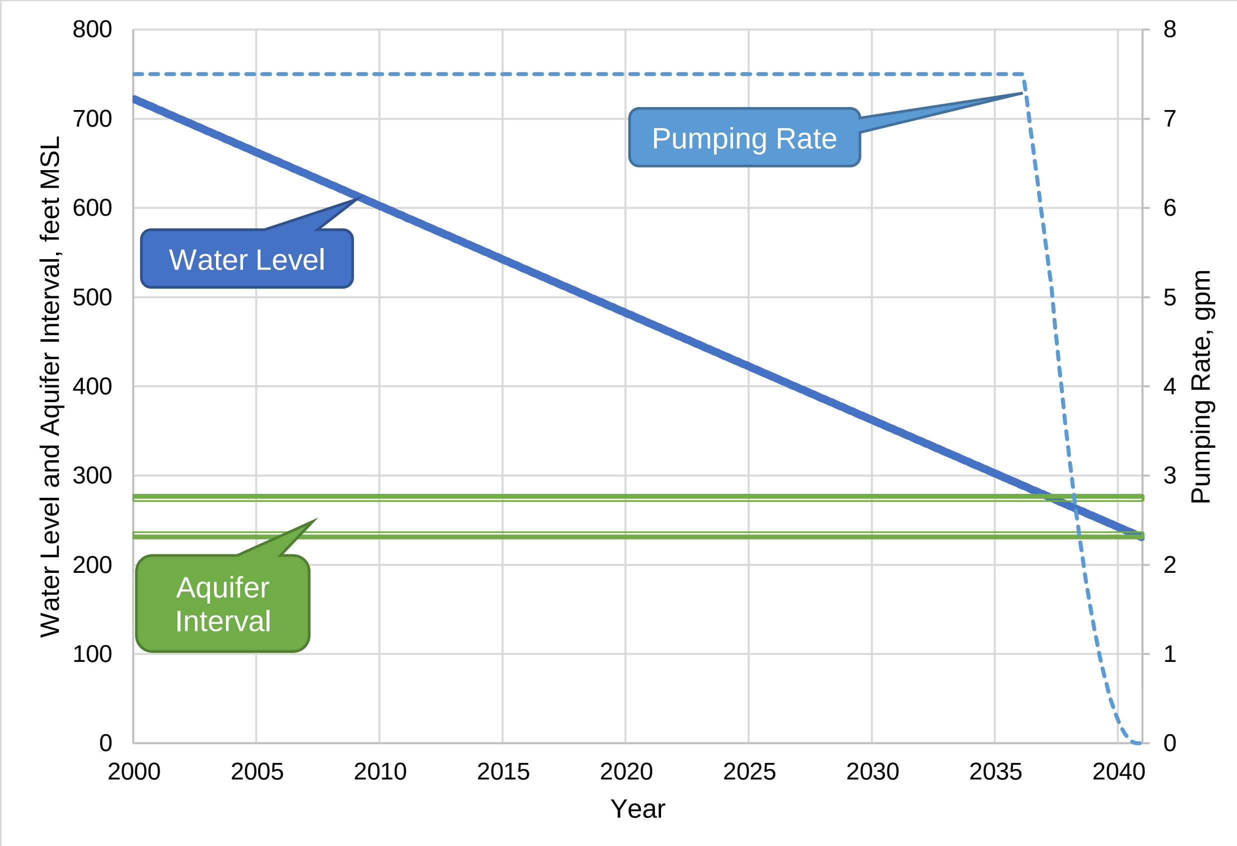


**Figure 13. Illustration of changing water levels relative to the aquifer interval. The change in pumping rate reflects the effect of declining available drawdown and the change in aquifer transmissivity with the declining water level.**




The variables presented provide a starting point for District consideration. For future permit applications, inclusion of these definitions will help the Board quantifiably consider whether "the proposed use of water does or does not unreasonably affect existing groundwater and surface water resources or existing permit holders." In addition, for the hydrogeologic report to address each of the potential unreasonable effects, the list of hydrogeologic report requirements under current District Rule 6.9.2(f) should be expanded to include: "Describe the results of a water quality analysis for a sample collected from the well for which a permit is being requested."

### *Hydrogeologic Report Guideline Revisions*

We recommend a simplification of the Hydrogeologic Report Guidelines so that they reflect both the District's need for site-specific aquifer data and the District's practical approach to permit application review. As such, for a new well we recommend that in lieu of a hydrogeologic report the District require a well completion report as part of the operating permit application for production greater than annual volume defined by the Board. This well completion report should include:

- A lithology log based on the cuttings collected during drilling;
- Chip trays containing samples of the formation cuttings collected during drilling with depth interval for each sample clearly marked;

- Geophysical log with the well name, location, depth, and drilling fluid properties recorded on the log header
- Well completion diagram identifying (as applicable) the open and cased intervals, casing and screen type and size, filter pack interval, cement interval, pump and motor (model number, pump bowls, horsepower, etc.), pump setting, column pipe type and size, pump head, and other pertinent information related to the well construction
- Pump curve for the final or proposed pump
- Data and analysis from a minimum 24-hour pumping test
- Water quality analysis results

While the report may also include the predicted impacts of the proposed production from the well, District staff or consultants will also perform an analysis of the predicted effects of production using analytical or numerical modeling tools. As such, it may not be necessary for the applicant to perform the impact analysis and the applicant may focus on providing the well and aquifer data to the District.

# SUMMARY AND CONCLUSIONS

The hydrogeologic investigations directed by CUWCD over the last several years have verified distinct hydrogeologic conditions in different parts of Bell County. Pumping tests associated with permit applications have also informed the District's understanding of groundwater flow. In addition, ongoing monitoring efforts have shown water level declines in some areas that may soon limit the ability of landowners to produce groundwater.

The conditions identified support the delineation of management areas within Bell County. For effectively managing the groundwater resources of the District, we have delineated these proposed management areas. Within each of these areas, CUWCD may adopt different rules or guidelines for permitting and assessing groundwater availability.

As a first step, we recommend adopting revised spacing requirements to help minimize the interference drawdown on existing wells from a proposed well being completed in the same aquifer. While we recommend revised spacing requirements, we also recommend that the rules allow for an exemption when physical conditions may not allow the landowner to meet the spacing requirements.

Along with the spacing requirement, we recommend CUWCD work with its legal council to develop a definition of what it means to the Board to "Unreasonably Affect" an existing user. Including such a definition in the District Rules would help clarify the District's management of the groundwater resources.

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# APPENDIX B

Clearwater

*Every drop counts!*

**Clearwater Underground Water Conservation District**
*P.O. Box 1989, Belton, Texas 76513*
*Phone: 254/933-0120 Fax: 254/933-8396*
*www.cuwcd.org*

## 2016-2020
## Historical Groundwater Use by WUG's
### *All Values in acre-feet/year*
***(Non-Exempt and Exempt Use Combined)***

Table 1

| Year | Municipal | Manu | Mining | Steam Electric | Irrigation | Livestock | Domestic | *Other | Total GW USE |
|---|---|---|---|---|---|---|---|---|---|
| 2020 YTD | 1,336.21 | 0 | 72.33 | 0 | 348.38 | 363.61 | 729.00 | 1.16 | 2,850.69 |
| 2019 | 2,566.89 | 0 | 117.66 | 0 | 350.72 | 768.32 | 1,169.00 | 1.84 | 4,974.43 |
| 2018 | 2,795.91 | 0 | 294.90 | 0 | 809.90 | 575.03 | 1,133.00 | 1.83 | 5,610.57 |
| 2017 | 2,410.38 | 0 | 96.95 | 0 | 540.24 | 573.45 | 1,088.00 | 3.30 | 4,712.32 |
| 2016 | 2,197.31 | 18.19 | 52.52 | 0 | 448.61 | 571.94 | 1,612.00 | 3.13 | 4,903.70 |

## 2016-2020
## Historical Groundwater Use by Non-Exempt Permittees
### *All Values in acre-feet/year*

Table 2

| Year | Edwards BFZ Aquifer | Trinity Aquifer Glen Rose Layer | Trinity Aquifer Hensell Layer | Trinity Aquifer Hosston Layer | Other | Total GW USE |
|---|---|---|---|---|---|---|
| 2020 YTD | 1,141.90 | 11.96 | 51.81 | 395.54 | 167.61 | 1,768.82 |
| 2019 | 1,994.46 | 48.25 | 91.20 | 1,008.17 | 256.72 | 3,398.80 |
| 2018 | 2,077.92 | 49.88 | 89.61 | 1,345.30 | 356.96 | 3,919.67 |
| 2017 | 1,969.76 | 58.00 | 91.99 | 858.76 | 102.27 | 3,080.78 |
| 2016 | 1,775.78 | 23.80 | 101.32 | 713.17 | 123.71 | 2,737.78 |

## 2016-2020
## Historical (Estimates) of Groundwater Use by Source Aquifer
## by Exempt Well Owners
### *All Values in acre-feet/year*

Table 3

| Year | Edwards BFZ Aquifer | Trinity Aquifer Glen Rose Layer | Trinity Aquifer Hensell Layer | Trinity Aquifer Hosston Layer | Other Formations | Total GW USE |
|---|---|---|---|---|---|---|
| 2020 YTD | 256 | 145 | 202 | 32 | 448 | 1,083 |
| 2019 | 361 | 223 | 490 | 52 | 790 | 1,916 |
| 2018 | 484 | 223 | 258 | 48 | 676 | 1,689 |
| 2017 | 453 | 223 | 243 | 49 | 677 | 1,645 |
| 2016 | 455 | 327 | 392 | 70 | 926 | 2,107 |

## 2016-2020
## Historical Groundwater Beneficial Use
## By Exempt Well Owners
### *All Values in acre-feet/year*

Table 4

| Year | Domestic Use | Livestock & Poultry | Total GW USE |
|---|---|---|---|
| 2020 YTD | 729 | 353 | 1,082 |
| 2019 | 1,169 | 747 | 1,916 |
| 2018 | 1,133 | 556 | 1,689 |
| 2017 | 1,088 | 557 | 1,645 |
| 2016 | 1,612 | 558 | 2,170 |

*Source: CUWCD annual estimates and CUWCD annual production reports*
**represents production for small business, restaurants, funeral homes, auto repairs, churches*

# APPENDIX C

# Estimated Historical Water Use And 2017 State Water Plan Datasets:

## Clearwater Underground Water Conservation District

by Stephen Allen
Texas Water Development Board
Groundwater Division
Groundwater Technical Assistance Section
stephen.allen@twdb.texas.gov
(512) 463-7317
June 29, 2020

## *GROUNDWATER MANAGEMENT PLAN DATA:*

This package of water data reports (part 1 of a 2-part package of information) is being provided to groundwater conservation districts to help them meet the requirements for approval of their five-year groundwater management plan. Each report in the package addresses a specific numbered requirement in the Texas Water Development Board's groundwater management plan checklist. The checklist can be viewed and downloaded from this web address:

*http://www.twdb.texas.gov/groundwater/docs/GCD/GMPChecklist0113.pdf*

The five reports included in this part are:

1. Estimated Historical Water Use (checklist item 2)

   *from the TWDB Historical Water Use Survey (WUS)*

2. Projected Surface Water Supplies (checklist item 6)
3. Projected Water Demands (checklist item 7)
4. Projected Water Supply Needs (checklist item 8)
5. Projected Water Management Strategies (checklist item 9)

   *from the 2017 Texas State Water Plan (SWP)*

Part 2 of the 2-part package is the groundwater availability model (GAM) report for the District (checklist items 3 through 5). The District should have received, or will receive, this report from the Groundwater Availability Modeling Section. Questions about the GAM can be directed to Dr. Shirley Wade, shirley.wade@twdb.texas.gov, (512) 936-0883.

## ***DISCLAIMER:***

The data presented in this report represents the most up-to-date WUS and 2017 SWP data available as of 6/29/2020. Although it does not happen frequently, either of these datasets are subject to change pending the availability of more accurate WUS data or an amendment to the 2017 SWP. District personnel must review these datasets and correct any discrepancies in order to ensure approval of their groundwater management plan.

The WUS dataset can be verified at this web address:

*http://www.twdb.texas.gov/waterplanning/waterusesurvey/estimates/*

The 2017 SWP dataset can be verified by contacting Sabrina Anderson (sabrina.anderson@twdb.texas.gov or 512-936-0886).

For additional questions regarding this data, please contact Stephen Allen (stephen.allen@twdb.texas.gov or 512-463-7317).

# Estimated Historical Water Use
# TWDB Historical Water Use Survey (WUS) Data

Groundwater and surface water historical use estimates are currently unavailable for calendar year 2018. TWDB staff anticipates the calculation and posting of these estimates at a later date.

## BELL COUNTY

All values are in acre-feet

| Year | Source | Municipal | Manufacturing | Mining | Steam Electric | Irrigation | Livestock | Total |
|---|---|---|---|---|---|---|---|---|
| 2017 | GW | 2,663 | 13 | 11 | 0 | 817 | 218 | 3,722 |
| | SW | 50,719 | 604 | 0 | 0 | 2,653 | 509 | 54,485 |
| 2016 | GW | 2,490 | 2 | 11 | 0 | 585 | 271 | 3,359 |
| | SW | 48,391 | 618 | 0 | 0 | 2,210 | 632 | 51,851 |
| 2015 | GW | 2,411 | 2 | 10 | 0 | 839 | 259 | 3,521 |
| | SW | 48,857 | 769 | 0 | 565 | 1,002 | 604 | 51,797 |
| 2014 | GW | 2,497 | 2 | 9 | 0 | 693 | 250 | 3,451 |
| | SW | 52,531 | 639 | 0 | 0 | 1,762 | 583 | 55,515 |
| 2013 | GW | 3,616 | 2 | 6 | 0 | 1,259 | 233 | 5,116 |
| | SW | 50,974 | 608 | 0 | 0 | 1,500 | 544 | 53,626 |
| 2012 | GW | 4,046 | 0 | 6 | 0 | 897 | 242 | 5,191 |
| | SW | 58,035 | 601 | 0 | 0 | 1,618 | 564 | 60,818 |
| 2011 | GW | 4,619 | 0 | 0 | 0 | 1,474 | 524 | 6,617 |
| | SW | 63,159 | 559 | 0 | 0 | 1,658 | 1,222 | 66,598 |
| 2010 | GW | 3,568 | 0 | 1,155 | 0 | 1,560 | 510 | 6,793 |
| | SW | 51,877 | 521 | 1,383 | 0 | 1,300 | 1,190 | 56,271 |
| 2009 | GW | 3,110 | 0 | 1,106 | 0 | 583 | 311 | 5,110 |
| | SW | 58,056 | 652 | 1,562 | 0 | 1,836 | 727 | 62,833 |
| 2008 | GW | 2,592 | 0 | 1,056 | 0 | 63 | 293 | 4,004 |
| | SW | 49,832 | 664 | 1,515 | 0 | 1,769 | 684 | 54,464 |
| 2007 | GW | 2,158 | 0 | 0 | 0 | 308 | 292 | 2,758 |
| | SW | 41,932 | 706 | 140 | 0 | 2,013 | 681 | 45,472 |
| 2006 | GW | 2,489 | 0 | 0 | 0 | 60 | 311 | 2,860 |
| | SW | 46,584 | 818 | 306 | 0 | 2,119 | 727 | 50,554 |
| 2005 | GW | 2,182 | 50 | 0 | 0 | 222 | 306 | 2,760 |
| | SW | 43,973 | 490 | 305 | 0 | 2,103 | 715 | 47,586 |
| 2004 | GW | 2,305 | 0 | 0 | 0 | 173 | 92 | 2,570 |
| | SW | 41,056 | 542 | 193 | 0 | 749 | 828 | 43,368 |
| 2003 | GW | 2,550 | 0 | 0 | 0 | 454 | 92 | 3,096 |
| | SW | 42,117 | 517 | 456 | 0 | 2,553 | 828 | 46,471 |
| 2002 | GW | 2,551 | 0 | 0 | 0 | 611 | 94 | 3,256 |
| | SW | 42,248 | 491 | 552 | 0 | 1,241 | 846 | 45,378 |

# Projected Surface Water Supplies
# TWDB 2017 State Water Plan Data

## BELL COUNTY

All values are in acre-feet

| RWPG | WUG | WUG Basin | Source Name | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 |
|---|---|---|---|---|---|---|---|---|---|
| G | 439 WSC | BRAZOS | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM | 1,499 | 1,489 | 1,475 | 1,398 | 1,443 | 1,550 |
| G | ARMSTRONG WSC | BRAZOS | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM | 392 | 392 | 392 | 392 | 392 | 392 |
| G | BELL-MILAM FALLS WSC | BRAZOS | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM | 475 | 471 | 474 | 478 | 476 | 474 |
| G | BELTON | BRAZOS | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM | 7,349 | 7,305 | 7,235 | 6,864 | 6,771 | 6,625 |
| G | CHISHOLM TRAIL SUD | BRAZOS | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM | 259 | 238 | 216 | 197 | 180 | 165 |
| G | COUNTY-OTHER, BELL | BRAZOS | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM | 1,297 | 1,293 | 1,286 | 1,248 | 1,238 | 1,223 |
| G | DOG RIDGE WSC | BRAZOS | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM | 1,638 | 1,631 | 1,623 | 1,583 | 1,573 | 1,557 |
| G | EAST BELL WSC | BRAZOS | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM | 317 | 320 | 323 | 326 | 327 | 329 |
| G | ELM CREEK WSC | BRAZOS | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM | 334 | 337 | 339 | 336 | 335 | 331 |
| G | FORT HOOD | BRAZOS | BRAZOS RUN-OF-RIVER | 5,732 | 5,479 | 5,290 | 5,102 | 4,913 | 4,725 |

# Projected Surface Water Supplies

# TWDB 2017 State Water Plan Data

| RWPG | WUG | WUG Basin | Source Name | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 |
|---|---|---|---|---|---|---|---|---|---|
| G | HARKER HEIGHTS | BRAZOS | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM | 7,155 | 7,103 | 7,103 | 7,565 | 8,112 | 7,935 |
| G | HOLLAND | BRAZOS | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM | 166 | 166 | 166 | 166 | 166 | 166 |
| G | IRRIGATION, BELL | BRAZOS | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM | 308 | 307 | 304 | 288 | 284 | 278 |
| G | IRRIGATION, BELL | BRAZOS | BRAZOS RUN-OF-RIVER | 355 | 355 | 356 | 356 | 357 | 357 |
| G | JARRELL-SCHWERTNER WSC | BRAZOS | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM | 457 | 466 | 485 | 444 | 412 | 381 |
| G | KEMPNER WSC | BRAZOS | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM | 277 | 283 | 293 | 302 | 311 | 319 |
| G | KILLEEN | BRAZOS | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM | 39,957 | 39,761 | 39,377 | 37,343 | 36,833 | 36,028 |
| G | LITTLE RIVER-ACADEMY | BRAZOS | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM | 323 | 323 | 323 | 323 | 323 | 323 |
| G | LIVESTOCK, BELL | BRAZOS | BRAZOS LIVESTOCK LOCAL SUPPLY | 1,009 | 1,009 | 1,009 | 1,009 | 1,009 | 1,009 |
| G | MANUFACTURING, BELL | BRAZOS | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM | 497 | 497 | 497 | 497 | 497 | 497 |
| G | MINING, BELL | BRAZOS | BRAZOS RUN-OF-RIVER | 0 | 0 | 0 | 0 | 0 | 0 |
| G | MOFFAT WSC | BRAZOS | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM | 1,112 | 1,107 | 1,095 | 1,059 | 1,044 | 1,021 |

# Projected Surface Water Supplies
# TWDB 2017 State Water Plan Data

| RWPG | WUG | WUG Basin | Source Name | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 |
|---|---|---|---|---|---|---|---|---|---|
| G | MORGAN'S POINT RESORT | BRAZOS | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM | 1,935 | 1,935 | 1,935 | 1,935 | 1,935 | 1,935 |
| G | NOLANVILLE | BRAZOS | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM | 990 | 985 | 976 | 925 | 913 | 893 |
| G | PENDLETON WSC | BRAZOS | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM | 380 | 378 | 373 | 361 | 355 | 345 |
| G | ROGERS | BRAZOS | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM | 400 | 400 | 400 | 400 | 400 | 400 |
| G | SALADO WSC | BRAZOS | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM | 183 | 183 | 183 | 183 | 183 | 183 |
| G | TEMPLE | BRAZOS | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM | 19,952 | 18,494 | 19,018 | 18,384 | 18,158 | 19,586 |
| G | TEMPLE | BRAZOS | BRAZOS RUN-OF-RIVER | 1,706 | 1,739 | 1,771 | 1,804 | 1,836 | 1,869 |
| G | TROY | BRAZOS | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM | 959 | 959 | 959 | 959 | 959 | 959 |
| G | WEST BELL COUNTY WSC | BRAZOS | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM | 1,660 | 1,660 | 1,660 | 1,660 | 1,660 | 1,660 |
| | **Sum of Projected Surface Water Supplies (acre-feet)** | | | **99,073** | **97,065** | **96,936** | **93,887** | **93,395** | **93,515** |

# Projected Water Demands
# TWDB 2017 State Water Plan Data

Please note that the demand numbers presented here include the plumbing code savings found in the Regional and State Water Plans.

## BELL COUNTY

All values are in acre-feet

| RWPG | WUG | WUG Basin | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 |
|---|---|---|---|---|---|---|---|---|
| G | 439 WSC | BRAZOS | 1,044 | 1,134 | 1,233 | 1,351 | 1,489 | 1,644 |
| G | ARMSTRONG WSC | BRAZOS | 406 | 418 | 434 | 454 | 478 | 502 |
| G | BARTLETT | BRAZOS | 159 | 179 | 202 | 226 | 252 | 277 |
| G | BELL-MILAM FALLS WSC | BRAZOS | 344 | 356 | 371 | 390 | 411 | 432 |
| G | BELTON | BRAZOS | 3,807 | 4,306 | 4,872 | 5,480 | 6,099 | 6,715 |
| G | CHISHOLM TRAIL SUD | BRAZOS | 553 | 632 | 721 | 814 | 906 | 998 |
| G | COUNTY-OTHER, BELL | BRAZOS | 870 | 1,716 | 2,711 | 3,733 | 4,719 | 5,668 |
| G | DOG RIDGE WSC | BRAZOS | 438 | 488 | 547 | 613 | 682 | 751 |
| G | EAST BELL WSC | BRAZOS | 442 | 497 | 560 | 630 | 702 | 775 |
| G | ELM CREEK WSC | BRAZOS | 254 | 288 | 327 | 370 | 413 | 457 |
| G | FORT HOOD | BRAZOS | 3,954 | 3,870 | 3,815 | 3,810 | 3,804 | 3,804 |
| G | HARKER HEIGHTS | BRAZOS | 6,224 | 7,079 | 8,042 | 9,061 | 10,087 | 11,106 |
| G | HOLLAND | BRAZOS | 112 | 108 | 106 | 105 | 106 | 107 |
| G | IRRIGATION, BELL | BRAZOS | 2,205 | 2,174 | 2,147 | 2,117 | 2,086 | 2,058 |
| G | JARRELL-SCHWERTNER WSC | BRAZOS | 186 | 209 | 235 | 264 | 294 | 324 |
| G | KEMPNER WSC | BRAZOS | 350 | 398 | 451 | 507 | 565 | 622 |
| G | KILLEEN | BRAZOS | 19,467 | 21,902 | 24,713 | 27,748 | 30,864 | 33,969 |
| G | LITTLE RIVER-ACADEMY | BRAZOS | 377 | 409 | 447 | 490 | 534 | 578 |
| G | LIVESTOCK, BELL | BRAZOS | 1,009 | 1,009 | 1,009 | 1,009 | 1,009 | 1,009 |
| G | MANUFACTURING, BELL | BRAZOS | 1,370 | 1,490 | 1,607 | 1,711 | 1,847 | 1,994 |
| G | MINING, BELL | BRAZOS | 3,242 | 3,980 | 4,599 | 5,349 | 6,105 | 6,968 |
| G | MOFFAT WSC | BRAZOS | 479 | 481 | 487 | 500 | 517 | 536 |
| G | MORGAN'S POINT RESORT | BRAZOS | 595 | 684 | 787 | 897 | 1,009 | 1,121 |
| G | NOLANVILLE | BRAZOS | 1,382 | 1,749 | 2,154 | 2,575 | 2,991 | 3,401 |
| G | PENDLETON WSC | BRAZOS | 245 | 246 | 255 | 266 | 277 | 289 |
| G | ROGERS | BRAZOS | 172 | 177 | 183 | 192 | 202 | 213 |
| G | SALADO WSC | BRAZOS | 1,726 | 1,863 | 2,017 | 2,182 | 2,348 | 2,514 |
| G | STEAM ELECTRIC POWER, BELL | BRAZOS | 4,220 | 4,934 | 5,804 | 6,865 | 8,157 | 9,693 |
| G | TEMPLE | BRAZOS | 19,485 | 22,186 | 25,212 | 28,415 | 31,644 | 34,842 |
| G | TROY | BRAZOS | 169 | 180 | 193 | 209 | 228 | 247 |

# Projected Water Demands
# TWDB 2017 State Water Plan Data

Please note that the demand numbers presented here include the plumbing code savings found in the Regional and State Water Plans.

| RWPG | WUG | WUG Basin | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 |
|---|---|---|---|---|---|---|---|---|
| G | WEST BELL COUNTY WSC | BRAZOS | 789 | 816 | 800 | 798 | 797 | 797 |
| | | **Sum of Projected Water Demands (acre-feet)** | **76,075** | **85,958** | **97,041** | **109,131** | **121,622** | **134,411** |

# Projected Water Supply Needs
# TWDB 2017 State Water Plan Data

Negative values (in red) reflect a projected water supply need, positive values a surplus.

**BELL COUNTY**

All values are in acre-feet

| RWPG | WUG | WUG Basin | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 |
|---|---|---|---|---|---|---|---|---|
| G | 439 WSC | BRAZOS | 455 | 355 | 242 | 47 | -46 | -94 |
| G | ARMSTRONG WSC | BRAZOS | 865 | 853 | 837 | 817 | 793 | 769 |
| G | BARTLETT | BRAZOS | -126 | -145 | -166 | -189 | -215 | -240 |
| G | BELL-MILAM FALLS WSC | BRAZOS | 713 | 690 | 683 | 673 | 648 | 623 |
| G | BELTON | BRAZOS | 3,592 | 3,049 | 2,413 | 1,434 | 722 | -40 |
| G | CHISHOLM TRAIL SUD | BRAZOS | -263 | -366 | -478 | -592 | -703 | -811 |
| G | COUNTY-OTHER, BELL | BRAZOS | 1,084 | 234 | -768 | -1,828 | -2,824 | -3,788 |
| G | DOG RIDGE WSC | BRAZOS | 1,200 | 1,143 | 1,076 | 970 | 891 | 806 |
| G | EAST BELL WSC | BRAZOS | 893 | 850 | 800 | 742 | 676 | 610 |
| G | ELM CREEK WSC | BRAZOS | 80 | 49 | 12 | -34 | -78 | -126 |
| G | FORT HOOD | BRAZOS | 1,778 | 1,609 | 1,475 | 1,292 | 1,109 | 921 |
| G | HARKER HEIGHTS | BRAZOS | 931 | 24 | -939 | -1,496 | -1,975 | -3,171 |
| G | HOLLAND | BRAZOS | 377 | 381 | 383 | 384 | 383 | 382 |
| G | IRRIGATION, BELL | BRAZOS | -1,157 | -1,127 | -1,102 | -1,088 | -1,060 | -1,038 |
| G | JARRELL-SCHWERTNER WSC | BRAZOS | 288 | 270 | 259 | 185 | 119 | 57 |
| G | KEMPNER WSC | BRAZOS | -73 | -115 | -158 | -205 | -254 | -303 |
| G | KILLEEN | BRAZOS | 20,490 | 17,859 | 14,664 | 9,595 | 5,969 | 2,059 |
| G | LITTLE RIVER-ACADEMY | BRAZOS | 11 | -21 | -59 | -102 | -146 | -190 |
| G | LIVESTOCK, BELL | BRAZOS | 0 | 0 | 0 | 0 | 0 | 0 |
| G | MANUFACTURING, BELL | BRAZOS | -873 | -993 | -1,110 | -1,214 | -1,350 | -1,497 |
| G | MINING, BELL | BRAZOS | -3,242 | -3,980 | -4,599 | -5,349 | -6,105 | -6,968 |
| G | MOFFAT WSC | BRAZOS | 839 | 832 | 814 | 765 | 733 | 691 |
| G | MORGAN'S POINT RESORT | BRAZOS | 1,340 | 1,251 | 1,148 | 1,038 | 926 | 814 |
| G | NOLANVILLE | BRAZOS | -72 | -444 | -858 | -1,330 | -1,758 | -2,188 |
| G | PENDLETON WSC | BRAZOS | 257 | 254 | 240 | 217 | 200 | 178 |
| G | ROGERS | BRAZOS | 435 | 430 | 424 | 415 | 405 | 394 |
| G | SALADO WSC | BRAZOS | 510 | 373 | 219 | 54 | -112 | -278 |
| G | STEAM ELECTRIC POWER, BELL | BRAZOS | -4,220 | -4,934 | -5,804 | -6,865 | -8,157 | -9,693 |
| G | TEMPLE | BRAZOS | 2,223 | -1,903 | -4,373 | -8,177 | -11,600 | -13,337 |
| G | TROY | BRAZOS | 1,011 | 1,000 | 987 | 971 | 952 | 933 |
| G | WEST BELL COUNTY WSC | BRAZOS | 871 | 844 | 860 | 862 | 863 | 863 |
| | **Sum of Projected Water Supply Needs (acre-feet)** | | **-10,026** | **-14,028** | **-20,414** | **-28,469** | **-36,383** | **-43,762** |

# Projected Water Management Strategies
# TWDB 2017 State Water Plan Data

## BELL COUNTY

**WUG, Basin (RWPG)**

All values are in acre-feet

| Water Management Strategy | Source Name [Origin] | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 |
|---|---|---|---|---|---|---|---|
| **439 WSC, BRAZOS (G)** | | | | | | | |
| BRA SYSTEM OPERATIONS-LITTLE RIVER | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM [RESERVOIR] | 0 | 4 | 11 | 49 | 59 | 74 |
| REUSE- BCWCID #1 SOUTH | DIRECT REUSE [BELL] | 0 | 0 | 0 | 0 | 0 | 20 |
| | | **0** | **4** | **11** | **49** | **59** | **94** |
| **ARMSTRONG WSC, BRAZOS (G)** | | | | | | | |
| MUNICIPAL WATER CONSERVATION (SUBURBAN) - ARMSTRONG WSC | DEMAND REDUCTION [BELL] | 14 | 39 | 32 | 29 | 30 | 32 |
| | | **14** | **39** | **32** | **29** | **30** | **32** |
| **BARTLETT, BRAZOS (G)** | | | | | | | |
| ADDITIONAL ADVANCED CONSERVATION - BARTLETT | DEMAND REDUCTION [BELL] | 0 | 0 | 0 | 3 | 18 | 34 |
| MUNICIPAL WATER CONSERVATION (SUBURBAN) - BARTLETT | DEMAND REDUCTION [BELL] | 5 | 19 | 29 | 31 | 34 | 37 |
| TRINITY AQUIFER DEVELOPMENT | TRINITY AQUIFER [BELL] | 144 | 151 | 156 | 159 | 323 | 327 |
| | | **149** | **170** | **185** | **193** | **375** | **398** |
| **BELTON, BRAZOS (G)** | | | | | | | |
| MUNICIPAL WATER CONSERVATION (SUBURBAN) - BELTON | DEMAND REDUCTION [BELL] | 119 | 340 | 318 | 321 | 347 | 379 |
| TRINITY - WILLIAMSON COUNTY ASR | TRINITY AQUIFER ASR [WILLIAMSON] | 0 | 29 | 87 | 390 | 466 | 586 |
| | | **119** | **369** | **405** | **711** | **813** | **965** |
| **CHISHOLM TRAIL SUD, BRAZOS (G)** | | | | | | | |
| ADDITIONAL ADVANCED CONSERVATION - CHISHOLM TRAIL SUD | DEMAND REDUCTION [BELL] | 0 | 0 | 1 | 45 | 96 | 153 |
| CHISHOLM TRAIL SUD WTP EXPANSION | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM [RESERVOIR] | 387 | 340 | 344 | 407 | 490 | 583 |
| GEORGETOWN WTP EXPANSION | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM [RESERVOIR] | 0 | 0 | 38 | 35 | 0 | 0 |
| MUNICIPAL WATER CONSERVATION (SUBURBAN) - CHISHOLM TRAIL SUD | DEMAND REDUCTION [BELL] | 23 | 76 | 100 | 110 | 122 | 134 |
| | | **410** | **416** | **483** | **597** | **708** | **870** |

# Projected Water Management Strategies
# TWDB 2017 State Water Plan Data

**WUG, Basin (RWPG)** All values are in acre-feet

| Water Management Strategy | Source Name [Origin] | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 |
|---|---|---|---|---|---|---|---|
| **COUNTY-OTHER, BELL, BRAZOS (G)** | | | | | | | |
| EDWARDS AQUIFER DEVELOPMENT | EDWARDS-BFZ AQUIFER [BELL] | 0 | 0 | 161 | 718 | 1,417 | 2,081 |
| MUNICIPAL WATER CONSERVATION (RURAL) - COUNTY-OTHER, BELL | DEMAND REDUCTION [BELL] | 14 | 62 | 73 | 94 | 117 | 138 |
| PURCHASE FROM CENTRAL TEXAS WSC | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM [RESERVOIR] | 0 | 0 | 500 | 500 | 500 | 500 |
| TRINITY - WILLIAMSON COUNTY ASR | TRINITY AQUIFER ASR [WILLIAMSON] | 0 | 4 | 34 | 516 | 790 | 1,069 |
| | | **14** | **66** | **768** | **1,828** | **2,824** | **3,788** |
| **ELM CREEK WSC, BRAZOS (G)** | | | | | | | |
| BRA SYSTEM OPERATIONS-LITTLE RIVER | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM [RESERVOIR] | 0 | 0 | 0 | 34 | 78 | 126 |
| | | **0** | **0** | **0** | **34** | **78** | **126** |
| **FORT HOOD, BRAZOS (G)** | | | | | | | |
| MUNICIPAL WATER CONSERVATION (SUBURBAN) - FORT HOOD | DEMAND REDUCTION [BELL] | 152 | 432 | 705 | 998 | 1,094 | 1,094 |
| | | **152** | **432** | **705** | **998** | **1,094** | **1,094** |
| **HARKER HEIGHTS, BRAZOS (G)** | | | | | | | |
| BRA SYSTEM OPERATIONS-LITTLE RIVER | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM [RESERVOIR] | 1,645 | 1,697 | 1,697 | 1,235 | 688 | 865 |
| KILLEEN REDUCTION TO HARKER HEIGHTS | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM [RESERVOIR] | 0 | 0 | 0 | 0 | 0 | 302 |
| MUNICIPAL WATER CONSERVATION (SUBURBAN) - HARKER HEIGHTS | DEMAND REDUCTION [BELL] | 262 | 836 | 1,367 | 1,499 | 1,656 | 1,819 |
| REUSE- BCWCID #1 SOUTH | DIRECT REUSE [BELL] | 185 | 185 | 185 | 185 | 185 | 185 |
| | | **2,092** | **2,718** | **3,249** | **2,919** | **2,529** | **3,171** |
| **IRRIGATION, BELL, BRAZOS (G)** | | | | | | | |
| EDWARDS AQUIFER DEVELOPMENT | EDWARDS-BFZ AQUIFER [BELL] | 1,091 | 1,019 | 953 | 940 | 915 | 754 |
| IRRIGATION WATER CONSERVATION | DEMAND REDUCTION [BELL] | 66 | 109 | 150 | 148 | 146 | 144 |
| TRINITY AQUIFER DEVELOPMENT | TRINITY AQUIFER [BELL] | 0 | 0 | 0 | 0 | 0 | 140 |
| | | **1,157** | **1,128** | **1,103** | **1,088** | **1,061** | **1,038** |

# Projected Water Management Strategies
# TWDB 2017 State Water Plan Data

**WUG, Basin (RWPG)** All values are in acre-feet

| Water Management Strategy | Source Name [Origin] | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 |
|---|---|---|---|---|---|---|---|
| **KEMPNER WSC, BRAZOS (G)** | | | | | | | |
| BRA SYSTEM OPERATIONS-LITTLE RIVER | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM [RESERVOIR] | 554 | 570 | 589 | 636 | 653 | 673 |
| MUNICIPAL WATER CONSERVATION (SUBURBAN) - KEMPNER WSC | DEMAND REDUCTION [BELL] | 14 | 34 | 33 | 34 | 37 | 40 |
| | | **568** | **604** | **622** | **670** | **690** | **713** |
| **KILLEEN, BRAZOS (G)** | | | | | | | |
| REUSE- BCWCID #1 SOUTH | DIRECT REUSE [BELL] | 563 | 563 | 563 | 563 | 563 | 543 |
| REUSE-BCWCID #1 NORTH | DIRECT REUSE [BELL] | 1,925 | 1,925 | 1,925 | 1,925 | 1,925 | 1,925 |
| | | **2,488** | **2,488** | **2,488** | **2,488** | **2,488** | **2,468** |
| **LITTLE RIVER-ACADEMY, BRAZOS (G)** | | | | | | | |
| BRA SYSTEM OPERATIONS-LITTLE RIVER | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM [RESERVOIR] | 0 | 180 | 180 | 180 | 180 | 180 |
| MUNICIPAL WATER CONSERVATION (SUBURBAN) - LITTLE RIVER-ACADEMY | DEMAND REDUCTION [BELL] | 12 | 19 | 13 | 11 | 11 | 11 |
| | | **12** | **199** | **193** | **191** | **191** | **191** |
| **MANUFACTURING, BELL, BRAZOS (G)** | | | | | | | |
| EDWARDS AQUIFER DEVELOPMENT | EDWARDS-BFZ AQUIFER [BELL] | 1,000 | 1,000 | 1,000 | 1,360 | 1,360 | 1,360 |
| INDUSTRIAL WATER CONSERVATION | DEMAND REDUCTION [BELL] | 41 | 75 | 112 | 120 | 129 | 140 |
| | | **1,041** | **1,075** | **1,112** | **1,480** | **1,489** | **1,500** |
| **MINING, BELL, BRAZOS (G)** | | | | | | | |
| EDWARDS AQUIFER DEVELOPMENT | EDWARDS-BFZ AQUIFER [BELL] | 2,104 | 2,176 | 2,081 | 1,177 | 503 | 0 |
| INDUSTRIAL WATER CONSERVATION | DEMAND REDUCTION [BELL] | 97 | 199 | 322 | 374 | 427 | 488 |
| TRINITY AQUIFER DEVELOPMENT | TRINITY AQUIFER [BELL] | 582 | 582 | 582 | 582 | 260 | 120 |
| | | **2,783** | **2,957** | **2,985** | **2,133** | **1,190** | **608** |
| **NOLANVILLE, BRAZOS (G)** | | | | | | | |
| BRA SYSTEM OPERATIONS-LITTLE RIVER | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM [RESERVOIR] | 0 | 5 | 14 | 65 | 77 | 97 |
| MUNICIPAL WATER CONSERVATION (SUBURBAN) - NOLANVILLE | DEMAND REDUCTION [BELL] | 67 | 224 | 444 | 721 | 884 | 1,003 |

# Projected Water Management Strategies
# TWDB 2017 State Water Plan Data

**WUG, Basin (RWPG)** — All values are in acre-feet

| Water Management Strategy | Source Name [Origin] | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 |
|---|---|---|---|---|---|---|---|
| VOLUNTARY REDISTRIBUTION OF BELL COUNTY WCID#1 SUPPLY | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM [RESERVOIR] | 5 | 215 | 401 | 544 | 798 | 1,088 |
| | | **72** | **444** | **859** | **1,330** | **1,759** | **2,188** |
| **SALADO WSC, BRAZOS (G)** | | | | | | | |
| MUNICIPAL WATER CONSERVATION (SUBURBAN) - SALADO WSC | DEMAND REDUCTION [BELL] | 97 | 255 | 431 | 624 | 830 | 1,044 |
| | | **97** | **255** | **431** | **624** | **830** | **1,044** |
| **STEAM ELECTRIC POWER, BELL, BRAZOS (G)** | | | | | | | |
| REUSE- TEMPLE | DIRECT REUSE [BELL] | 8,407 | 8,407 | 8,407 | 8,407 | 8,407 | 9,707 |
| | | **8,407** | **8,407** | **8,407** | **8,407** | **8,407** | **9,707** |
| **TEMPLE, BRAZOS (G)** | | | | | | | |
| BRA SYSTEM OPERATIONS-LITTLE RIVER | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM [RESERVOIR] | 3,080 | 4,262 | 3,994 | 314 | 2,447 | 2,245 |
| MUNICIPAL WATER CONSERVATION (URBAN) - TEMPLE | DEMAND REDUCTION [BELL] | 914 | 2,740 | 5,015 | 7,724 | 10,771 | 11,850 |
| TRINITY - WILLIAMSON COUNTY ASR | TRINITY AQUIFER ASR [WILLIAMSON] | 4,761 | 3,759 | 3,323 | 7,727 | 5,730 | 4,504 |
| | | **8,755** | **10,761** | **12,332** | **15,765** | **18,948** | **18,599** |
| **Sum of Projected Water Management Strategies (acre-feet)** | | **28,330** | **32,532** | **36,370** | **41,534** | **45,563** | **48,594** |

# APPENDIX D

# Data Definitions*

1. <u>Projected Water Demands*</u>

From the 2012 State Water Plan Glossary: "**WATER DEMAND** Quantity of water projected to meet the overall necessities of a water user group in a specific future year." (See 2012 State Water Plan Chapter 3 for more detail.)

**Additional explanation:** These are water demand volumes as projected for specific Water User Groups in the 2011 Regional Water Plans. This is NOT groundwater pumpage or demand based on any existing water source. This demand is how much water each Water User Group is projected to require in each decade over the planning horizon.

2. <u>Projected Surface Water Supplies*</u>

From the 2012 State Water Plan Glossary: "**EXISTING *[surface]* WATER SUPPLY -** Maximum amount of *[surface]* water available from existing sources for use during drought of record conditions that is physically and legally available for use." (See 2012 State Water Plan Chapter 5 for more detail.)

**Additional explanation:** These are the existing surface water supply volumes that, without implementing any recommended WMSs, could be used during a drought (in each planning decade) by Water User Groups located within the specified geographic area.

3. <u>Projected Water Supply Needs*</u>

From the 2012 State Water Plan Glossary: "**NEEDS -**Projected water demands in excess of existing water supplies for a water user group or a wholesale water provider." (See 2012 State Water Plan Chapter 6 for more detail.)

**Additional explanation:** These are the volumes of water that result from comparing each Water User Group's projected existing water supplies to its projected water demands. If the volume listed is a negative number, then the Water User Group shows a projected need during a drought if they do not implement any water management strategies. If the volume listed is a positive number, then the Water User Group shows a projected surplus. Note that if a Water User Group shows a need in any decade, then they are considered to have a potential need during the planning horizon, even if they show a surplus elsewhere.

4. <u>Projected Water Management Strategies*</u>

From the 2012 State Water Plan Glossary: "**RECOMMENDED WATER MANAGEMENT STRATEGY -** Specific project or action to increase water supply or maximize existing supply to meet a specific need." (See 2012 State Water Plan Chapter 7 for more detail.)

**Additional explanation:** These are the specific water management strategies (with associated water volumes) that were recommended in the 2011 Regional Water Plans.

**Terminology used by TWDB staff in providing data for 'Estimated Historical Water Use And 2012 State Water Plan Datasets' reports issued by TWDB.*

# APPENDIX E

# RESOLUTION
# OF THE BOARD OF DIRECTORS OF THE
# CLEARWATER UNDERGROUND WATER CONSERVATION DISTRICT
# MEETING HELD OCTOBER 11, 2023

## A RESOLUTION ADOPTING AMENDED MANAGEMENT PLAN

**WHEREAS,** Clearwater Underground Water Conservation District is a political subdivision of the State of Texas and underground water conservation district created and operating under and by virtue of Article XVI, Section 59, of the Texas Constitution; Texas Water Code Chapter 36; the District's enabling act, Act of May 27, 1989, 71st Legislature, Regular Session, Chapter 524 (House Bill 3172), as amended by Act of April 25, 2001, 77th Legislature, Regular Session, Chapter 22 (Senate Bill 404), Act of May 7, 2009, 81st Legislature, Regular Session, Chapter 64 (Senate Bill 1755), and Act of May 27, 2015, 84th Legislature, Regular Session, Chapter 1196, Section 2 (Senate Bill 1336)(omnibus districts bill); and the applicable general laws of the State of Texas; and confirmed by voters of Bell County in 1999.

**WHEREAS,** under the direction of the Board of Directors, and in accordance with Texas Water Code §§ 36.1071 and 36.1072, Title 31, Chapter 356 of the Texas Administrative Code, and the District's rules, the District has timely undertaken the requisite five-year review of its existing Groundwater Management Plan, initially adopted by the District's Board on October 24, 2000, and certified by the Texas Water Development Board (the "TWDB") on February 21, 2001, and revised and readopted by the District's Board on December 13, 2005, and certified by TWDB on March 6, 2006; and revised and readopted by the District's Board on February 8, 2011 and certified by TWDB on April 13, 2011, and revised and readopted by the Districts Board on January 13, 2016 and certified by TWDB on February 19, 2016, and revised and readopted by the District's Board on January 9, 2019 and certified by TWDB on March 12, 2019 revised and readopted by the District's Board on November 11, 2020 and certified by TWDB on December 30, 2020;

**WHEREAS,** in conducting a the requisite five-year review of its existing Groundwater Management Plan, the District and its consultants reviewed, analyzed, and factored in the District's best available data, the groundwater availability modeling information provided by the TWDB, the technical information and estimates required by the TWDB, for Third Round of Desired Future Conditions GMA8 of the aquifers within the District, and the available site-specific information that has previously been provided by the District to the TWDB for review and comment;

**WHEREAS,** the District issued the appropriate notices and held a public hearing to receive public comments on the proposed amendments to the Groundwater Management Plan at the District's office located at 700 Kennedy Court, Belton, Texas, on October 11, 202;

**WHEREAS,** the District obtained comments from the TWDB through a preliminary review process the District's Groundwater Management Plan conducted by TWDB staff, and the District has considered and addressed all such comments in the development of its Management Plan;

**WHEREAS,** the District requested, received, reviewed, and took into consideration comments from the Brazos River Authority and all other Surface Water Management Entities during preparation of its Groundwater Management Plan;

**WHEREAS,** the Board of Directors finds that the Groundwater Management Plan meets all of the requirements of Chapter 36 of the Texas Water Code, the District's enabling act, Chapter 356, Title 31, Texas Administrative Code, and the District's rules; and

**WHEREAS,** the Board of Directors, upon proper notice and in an open meeting, seeks to readopt its amended Groundwater Management Plan pursuant to Texas Water Code § 36.1072(e).

**NOW THEREFORE BE IT RESOLVED THAT:**

The above recitals are true and correct;

The Groundwater Management Plan is hereby readopted with those changes reflected in the proposed, draft Groundwater Management Plan before the District's Board of Directors on this date, along with those changes agreed upon during deliberation and after formal action on this date by the District's Board of Directors;

The Board of Directors further instructs the General Manager to compile a final, readopted Groundwater Management Plan, and file it with the TWDB's Executive Director within 60 calendar days from the date of re-adoption, pursuant to Texas Water Code § 36.1072(e); and

The Board of Directors and General Manager are further authorized to take any and all action necessary to coordinate with the TWDB as may be required in furtherance of TWDB's approval pursuant to the provisions of § 36.1072 of the Texas Water Code.

**AND IT IS SO ORDERED.**

Upon motion duly made by Gary Young, and seconded by Director James Brown and upon discussion, the Board of Directors voted 5 in favor and 0 opposed, 0 abstained, and 0 absent, and the motion thereby PASSED on this 11th day of October 2023.

**CLEARWATER UNDERGROUND WATER CONSERVATION DISTRICT**

By: [signature]
Leland Gersbach, Board President

ATTEST:

[signature]
C. Gary Young, Board Secretary
Dirk Aaron, Assistant Secretary

# APPENDIX F

**NOTICE OF PUBLIC HEARING**

The Clearwater Underground Water Conservation District (CUWCD) will hold a public hearing and consider adopting proposed update with revisions to the District Groundwater Management Plan at 1:30 p.m., October 11, 2023, in the District Headquarters Building located at 700 Kennedy Court, Belton, Texas. Copies of the revised Management Plan are available for review at the CUWCD Headquarters Building and on the CUWCD website at https://www.cuwcd.org . Contact the CUWCD at 254/933-0120 for additional information.

# KILLEEN DAILY HERALD

Serving The Growing Central Texas Area

**PUBLISHER'S AFFIDAVIT**

**THE STATE OF TEXAS**

**COUNTY OF BELL**

Personally appeared before the undersigned authority

**Anthony Edwards** who being sworn says that the attached ad for: **Clearwater Underground Water Conservation District** published in the **Killeen Daily Herald on** the following dates to-wit: **September 20, 2023** and at a cost of **$110.50.**

Anthony M. Edwards

**Advertising Representative**

Subscribed and sworn before me on October 16, 2023.

Judy Lee Rivera

**Notary Public, Bell, Texas**

NOTARY PUBLIC STATE OF TEXAS
JUDY LEE RIVERA
Notary ID #133239100
My Commission Expires
July 28, 2025

**NOTICE OF PUBLIC HEARING**

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(Legal notice published in the Killeen Daily Herald on September 20, 2023.)

Killeen Daily Herald
**CLASSIFIED DEPARTMENT**
**(254) 501-7500**

**CLASSIFIED ERRORS**
The Killeen Daily Herald will not be responsible for more than one (1) incorrect insertion of any Classified ad. Errors must be reported immediately to the Classified Department so that they can be corrected and proper credit be given. Please be sure you proof your ad prior to the first publication date. The Killeen Daily Herald does not assume responsibility beyond the cost of the ad.

**CLASSIFIED CANCELLATIONS**
All cancellations to any Classified ad must be made during normal business hours Monday – Friday 8:00am – 5:00pm. No cancellations can be made Saturday or Sunday.

**CLASSIFIED HOURS**
Monday – Friday
8:00 am – 5:00 pm
Closed - Saturday & Sunday

**DEADLINES**
5:00pm the day prior to publication date

www.KDHNEWS.com

## 11 Rentals

### 110 Apartments

**Killeen 1 BRs; $425/up**
**Hartland Realty, 634-0508**

**QUIET 1BR's $470-$520**
Elec, Gas & Water Paid
(254) 526-4445
1702 N. 2nd, Killeen

**Weekly/Monthly Leasing**
**1 Week Free**
**All Bills Paid**
201 E. Bryce, # 29.
Killeen. (254) 220-7355.



## 11 Rentals

### 111 Houses

**Killeen 2 BR, $495-$650. Hartland Realty, 634-0508**

**Killeen, 3 bdrm, 2 car garage $1595 rent, $1595 dep. Call 254-338-7000.**

### 112 Duplexes/ Townhomes

**Killeen: 3BR townhouse. $1100/mo. $1100 dep. 254-338-7000.**

## 12 Notices

### 127 Legal Notices

NOTICE OF PUBLIC HEARING

The Clearwater Underground Water Conservation District (CUWCD) will hold a public hearing and consider adopting proposed update with revisions to the District Groundwater Management Plan at 1:30 p.m., October 11, 2023, in the District Headquarters Building located at 700 Kennedy Court, Belton, Texas. Copies of the revised Management Plan are available for review at the CUWCD Headquarters Building and on the CUWCD website at https://www.cuwcd.org . Contact the CUWCD at 254/933-0120 for additional information.

(Legal notice published in the Killeen Daily Herald on September 20, 2023.)



## 12 Notices

### 127 Legal Notices

**Clearwater Underground Water Conservation District Notice of Public Hearing on District Rules**

Notice is hereby given that the Board of Directors of the Clearwater Underground Water Conservation District ("District") will hold a public hearing on Wednesday, October 11, 2023, 1:30 p.m. at the District Office located at 700 Kennedy Court, Belton, Texas 76513 to discuss, consider, receive public comment, and potentially act on proposed amendments to the District Rules to comply with action by the Texas Legislature. The proposed amendments to the District Rules include changes to (1) the District's procedure for finalizing a decision in a groundwater permit contested case hearing; (2) the list of wells exempt from permitting requirements; (3) the allowable rate at which the District may assess a transport fee; (4) the rulemaking process; (5) defines Well Completion Inspection and (6) additional non-substantive changes.

All interested members of the public are invited to participate and comment orally and in writing. A copy of the proposed amendments to the District Rules may be requested by email at schapman@cuwcd.org and may be reviewed or copied on the District's website at https://cuwcd.org/.

(Legal notice published in the Killeen Daily Herald on September 20, 2023.)



## 12 Notices

### 127 Legal Notices

**Application has been made with the Texas Alcoholic Beverage Commission for a Mixed Beverage Permit & Late Hours Certificate by Alexander's Music Box LLC dba Alexander's Music Box to be located at 313 N. 8th Street, Killeen, Bell Co., Texas. Manager of said LLC is Jessica A Gonzalez – Manager.**

(Legal notice published in the Killeen Daily Herald on September 20 & 21, 2023.)

## 17 Employment

### 175 General

**YESTER'S CONSTRUCTION COMPANY**
**Is now hiring for active positions.**
Looking for multi-talented **REMODELERS & PAINTERS for Indoor work. Heated homes during Winter and A/C homes during the Summer.** Must be dependable, hard working w/reliable transportation for long-term project
Must have proper hand tools for each task.
**Fort Hood JOB!!!**
**Must have valid ID to get on base**
**Email resume to tdyesterconst@aol.com or Call: (254) 681-0612**

### 187 Garage Sales /Estate Sales

**Killeen Garage Sale:**
**117 N 8TH ST**
**(The Savings Furniture Store)**
**Fri-Sat-Sun, Sep 22-24, 6am-7pm. Brand New Furniture, Used Furniture, Home Decor, Antiques, Collectibles, Military Clothes, and much, much more. Everything Must Go! Don't Miss This One! Pennies on the Dollar!**

## 19 Pets

### 190 Dogs

**REG. YORKIE PUPS S/W. Hlth guar. Reduced $. 254-722-2565. Lic# 148.**





# Publisher's Affidavit

**State of Texas**
**County of Bell**

Before Me, The Undersigned Authority, this day personally appeared Jane Moon after being by me duly sworn, says that she is the Classified Manager Inside Sales of the Temple Daily Telegram, a newspaper published in Bell County, Texas and that the stated advertisement was published in said newspaper on the following date(s):

September 20, 2023

For: Clearwater Underground Water Conservation District
Ad #: 16687489
Cost: $54.90
Times Published: 1

**NOTICE OF PUBLIC HEARING**

The Clearwater Underground Water Conservation District (CUWCD) will hold a public hearing and consider adopting proposed update with revisions to the District Groundwater Management Plan at 1:30 p.m., October 11, 2023 at the District Headquarters Building located at 700 Kennedy Court, Belton, Texas. Copies of the revised Management Plan are available for review at the CUWCD Headquarters Building and on the CUWCD website at http://www.cuwcd.org. Contact CUWCD at 254-933-0120 for additional information.

Jane Moon
Classified Manager Inside Sales

Subscribed and sworn to before me, this day: October 16, 2023

Notary Public in and for
Bell County, Texas

(Seal)

TERI ZAMORA
Notary Public, State of Texas
Comm. Expires 11-05-2023
Notary ID 10837339

## BUSINESS DIGEST

### Did your kids buy gear in Fortnite without asking you? The FTC says you could get a refund

**WASHINGTON** — Parents whose kids bought virtual gear without their knowledge on the popular Fortnite video game could soon be able to get a refund.

U.S. regulators are starting to notify more than 37 million people by email that they may be eligible for compensation as part of a legal settlement with Fortnite's maker, Epic Games Inc.

The Federal Trade Commission announced late last year that Epic Games would pay $520 million in penalties and refunds to settle complaints revolving around children's privacy and its payment methods that tricked players into making unintended purchases.

Part of that $520 million consists of $245 million in customer refunds, as part of a settlement finalized in March. It's meant to cover some of the costs of unwanted V-Bucks, the game's in-game currency, or virtual items such as outfits or cartoonish purple llama loot crates.

Consumers have until Jan. 17 to submit a claim.

Epic Games had also agreed to pay a $275 million fine for allegedly collecting personal information on Fortnite players under the age of 13 without informing their parents or getting their consent. It was the biggest penalty ever imposed for breaking an FTC rule.

According to the FTC, those eligible for refunds include Fortnite users charged in-game currency for items they didn't want between January 2017 and September 2022; those whose child made charges to their credit card without their knowledge between January 2017 and November 2018; and those whose account was locked after they complained to their credit card company about wrongful charges.

Epic Games said after settling the case in December that it implemented additional safeguards to prevent unintended purchases. In an updated statement Tuesday, it referred people to the FTC's page.

### For filmmakers, $900M-plus haul of 'Oppenheimer' is important

Hopes were always high for Christopher Nolan's "Oppenheimer." The studio knew the film was great, and commercial. But no one in the industry expected that a long, talky, R-rated drama released at the height of the summer movie season would earn over $900 million at the box office.

After an early screening, "Dune" filmmaker Denis Villeneuve said he knew he'd just seen "a masterpiece." He even remembered saying that it would be a big success.

"But where it is right now has blown the roof off of my projection," Villeneuve told The Associated Press. "It's a three-hour movie about people talking about nuclear physics."

As of Monday, "Oppenheimer's" global total was nearly $913 million, making it Nolan's third highest grossing film, trailing only the "Dark Knight" sequels. It's also the third biggest film of the year behind "Barbie" and "The Super Mario Bros. Movie" and the most successful biopic ever, surpassing "Bohemian Rhapsody." It's a staggering sum that has been driven by audiences of all ages and an enthusiasm for film and large format screenings.

"When you make a film, you hope that you're going to connect with an audience in some form or another," "Oppenheimer" producer Emma Thomas told the AP. "But, particularly with a three-hour film that has a serious subject and is challenging in many ways, this sort of success is beyond our wildest imaginings."

Even after nine weeks in theaters, 11 of the 25 screens capable of projecting the coveted IMAX 70mm prints (Nolan's preferred format) continued to play the film on some of the busiest screens, such as the TCL Chinese Theatre in Los Angeles and the AMC Lincoln Square in New York.

"The reason we're still in those theaters is because the audience is demanding it," Thomas said. "This is not something that we can impose — I wish we could, but it's genuine."

Thomas, who is married to Nolan, has produced all of his films going back to his short "Doodlebug." From "Memento" and "The Prestige" to "Inception," "Interstellar" and "Dunkirk," their original films often have defied conventional box-office logic. With "Oppenheimer," they felt good about what they'd made but also knew that the marketplace, and box-office tracking, has been a little unpredictable since the pandemic.

"Chris has always made films that challenge audiences," Thomas said. "He has faith in his audiences and, generally, they've met him where he is."

Their "pipe dream," she said, was that it would beat "Dunkirk's" opening weekend. Instead, it nearly doubled it.

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## SELECTED STOCKS

NEW YORK (AP) - Closing stocks.

| | | Sales | Close | Change |
|---|---|---|---|---|
| AT&T Inc | 1.11 | 331676 | 15.21 | +.12 |
| AEP | 3.32 | 16587 | 80.06 | -.17 |
| ATMOS | 2.96 | 5823 | 114.09 | -.41 |
| BP PLC | 1.74f | 84769 | 38.82 | +.26 |
| BkofAm | .96f | 333661 | 28.65 | -.11 |
| Caterpillar | 5.20 | 23093 | 279.67 | -1.27 |
| CenterPnt | .76f | 47223 | 28.98 | -.17 |
| Chevron | 6.04f | 66033 | 167.20 | -.02 |
| Citigroup | 2.12f | 109331 | 42.68 | +.04 |
| CocaCola | 1.84f | 118123 | 58.18 | -.12 |
| ColgPalm | 1.92 | 30159 | 73.22 | -.63 |
| CmclMtls | .54f | 9483 | 51.64 | -.07 |
| ConocoPhil | 2.80e | 41164 | 123.16 | -1.32 |
| Dillards | 1.00f | 1009 | 312.44 | +3.55 |
| DuPont | 1.44f | 18875 | 74.47 | -.31 |
| EastChem | 3.16 | 9671 | 78.71 | +.26 |
| Entergy | 4.28 | 8632 | 98.46 | -.32 |
| ExxonMbl | 3.64 | 125229 | 117.33 | -.31 |
| FootLockr | 1.60 | 28158 | 18.15 | +.28 |
| GenDynam | 5.28 | 9717 | 222.85 | -1.48 |
| GenElec | .32 | 30980 | 116.21 | -.36 |
| GenMills | 2.36f | 57345 | 65.88 | -.22 |
| Goodyear | | 15610 | 12.43 | +.07 |
| Hallibrtn | .64 | 74627 | 41.43 | -1.21 |
| HomeDp | 8.36 | 27741 | 314.61 | -2.65 |
| HonwllIntl | 4.12 | 23475 | 195.43 | +.97 |
| IBM | 6.64f | 39258 | 146.52 | +1.43 |
| IntPap | 1.85 | 27678 | 34.10 | -.06 |
| JohnJn | 5.19f | 55501 | 162.20 | -.27 |
| Kroger | 1.16f | 37436 | 46.09 | -.45 |
| Lowes | 4.40f | 34457 | 217.50 | -.22 |
| MarathnO | .40f | 102091 | 26.75 | -.15 |
| Medtrnic | 2.72f | 46528 | 82.63 | -.17 |
| NCR Corp | | 9896 | 27.26 | +.62 |
| PNM Res | 1.47f | 7494 | 44.29 | +.49 |
| PepsiCo | 5.06f | 33374 | 178.32 | -1.06 |
| ProctGam | 3.76 | 46781 | 153.60 | -.45 |
| ScrippsEW | .20 | 2664 | 6.68 | -.22 |
| Shrwin | 2.42f | 11873 | 261.42 | +1.47 |
| SouthnCo | 2.72 | 39614 | 70.91 | -.04 |
| SwstAirl | .72 | 65070 | 28.91 | -.17 |
| TexInst | 4.96 | 32216 | 163.14 | +.31 |
| Textron | .08 | 12874 | 75.64 | -.49 |
| Trinity | .92f | 4658 | 24.60 | +.58 |
| TylerTech | | 2013 | 392.65 | +2.49 |
| UnionPac | 5.20 | 21560 | 211.77 | -1.38 |
| USSteel | .20 | 121575 | 31.66 | +1.13 |
| VerizonCm | 2.66f | 232118 | 33.40 | -.13 |
| WalMart | 2.28 | 46684 | 163.38 | -.04 |
| WellsFargo | 1.20f | 145132 | 43.22 | -.21 |
| XeroxHld | 1.00 | 11631 | 16.08 | +.30 |
| YumBrnds | 2.42f | 12872 | 126.77 | -.80 |

DIVIDEND FOOTNOTES:
e - amount declared or paid in last 12 months
f - current annual rate, which was increased by most recent dividend announcement

## LOCAL INTEREST STOCKS

| | Symbol | Close | Change |
|---|---|---|---|
| Alcoa | AA | 28.34 | -0.51 |
| Blacksktone | BX | 115.12 | +0.75 |
| Dine Equity Inc. | DIN | 53.28 | +0.14 |
| Dover | DOV | 143.75 | +0.22 |
| Ill. Tool Works | ITW | 237.52 | -0.19 |
| Manpower | MAN | 74.50 | +0.10 |
| McDonald's | MCD | 278.13 | +0.41 |
| Molson Coors | TAP | 63.85 | -0.57 |
| Morgan Stanley | MS | 88.51 | -0.20 |
| Raymond James | RJF | 106.46 | -0.70 |
| Teleglobe | BCE | 40.57 | -0.21 |
| Tractor Supply | TSCO | 210.15 | +0.66 |
| Tupperware | TUP | 1.86 | +0.17 |
| Valero | VLO | 142.66 | -3.62 |
| Wendy's | WEN | 20.41 | -0.04 |

## COTTON FUTURES

Cotton No. 2 Futures on the New York Board of Trade Tuesday:

| | Open | High | Low | Settle | Chg. |
|---|---|---|---|---|---|
| Oct 23 | 86.53 | 86.53 | 86.06 | 86.06 | +.52 |
| Nov 23 | ... | ... | ... | 87.52 | +.52 |
| Dec 23 | 87.00 | 88.42 | 86.79 | 87.52 | +.52 |
| Jan 24 | ... | ... | ... | 88.26 | +.37 |
| Mar 24 | 87.87 | 89.09 | 87.70 | 88.26 | +.37 |
| May 24 | 88.23 | 89.40 | 88.16 | 88.68 | +.27 |
| Jul 24 | 87.75 | 88.75 | 87.68 | 88.26 | +.32 |
| Sep 24 | ... | ... | ... | 81.24 | +.50 |
| Oct 24 | ... | ... | ... | 83.30 | +.36 |
| Nov 24 | ... | ... | ... | 81.24 | +.50 |
| Dec 24 | 80.60 | 81.50 | 80.60 | 81.24 | +.50 |
| Jan 25 | ... | ... | ... | 81.37 | +.53 |
| Mar 25 | ... | ... | ... | 81.37 | +.53 |
| May 25 | ... | ... | ... | 81.27 | +.53 |
| Jul 25 | ... | ... | ... | 81.17 | +.53 |
| Sep 25 | ... | ... | ... | 78.17 | +.53 |
| Oct 25 | ... | ... | ... | 79.17 | +.53 |
| Nov 25 | ... | ... | ... | 78.17 | +.53 |
| Dec 25 | ... | ... | ... | 78.17 | +.53 |
| Jan 26 | ... | ... | ... | 78.42 | +.53 |
| Mar 26 | ... | ... | ... | 78.42 | +.53 |
| May 26 | ... | ... | ... | 78.67 | +.53 |
| Jul 26 | ... | ... | ... | 78.92 | +.53 |

Est. sales 23,385 Tue's sales 21,308
Tue's open interest -185

## METAL PRICES

NEW YORK (AP) - (troy oz.)

| | Tuesday | Monday |
|---|---|---|
| NY Merc G old | $1,931.855 | $1,933.48 |
| NY Merc Silver | $23.475 | $23.525 |

## STOCK MARKETS

### Wall Street slips ahead of Fed decision on rates


**NEW YORK** — U.S. stocks edged lower, and yields climbed Tuesday as Wall Street waits for the Federal Reserve's latest decision on interest rates.

The S&P 500 slipped 9.58 points, or 0.2%, to 4,443.95. The Dow Jones Industrial Average dropped 106.57, or 0.3%, to 34,517.73, and the Nasdaq composite lost 32.05, or 0.2%, to 13,678.19.

Stocks have been see-sawing for weeks on uncertainty about whether the Fed is done with its market-shaking hikes to interest rates. By pulling its main interest rate to the highest level in more than two decades, the Fed has helped inflation to cool from its peak last year but at the cost of hurting prices for investments and damaging some corners of the economy.

The Fed began its latest meeting on interest rates Tuesday, with an announcement scheduled for Wednesday. The overwhelming expectation is for the Fed to announce no change to rates. More focus will be on updated projections Fed officials give for where they see rates heading in upcoming years.

Traders are split on whether the Fed may raise rates again this year, but they're largely expecting the Fed to begin cutting rates next year. Such cuts can act like steroids for financial markets, giving a lift to all kinds of investments.

Optimists say inflation has come down enough for the Fed to cut rates meaningfully next year, while the economy continues to hum due to a solid job market. Others say the Fed may need to keep rates higher for longer than investors expect to get inflation down to its 2% target, while the threat of a recession still looms.

A soft landing, where inflation gets back to the Fed's target without the economy having to suffer a painful recession, "is still possible, but not probable in our view," according to Joe Davis, chief global economist and head of Vanguard's investment strategy group.

A risk remains that the Fed could misread a temporary slowdown in inflation as having accomplished its mission, which could lead to a cycle reminiscent of the late 1960s where inflation reaccelerates, the Fed hikes rates further and a recession eventually hits.

High rates have already hit the manufacturing and housing industries. A report Tuesday showed that homebuilders broke ground on fewer new homes in August than economists expected. The 11.3% drop from July's level was much worse than the 0.8% forecasted. But activity for building permits, a possible indicator of future activity, rose more than expected.

On Wall Street, shares of Instacart climbed 12.3% in their first day of trading. The company raised $660 million in its initial public offering, which priced the stock at $30 per share.

It arrived on the heels of another highly anticipated IPO by chip designer Arm Holdings. The offerings could mark a warming environment for IPOs, which fell off sharply after stocks tumbled last year with worries about higher interest rates. Arm jumped in its first day of trading on Thursday but has since followed that with three days of losses.

The Walt Disney Co. fell 3.6% for one of the largest losses in the S&P 500 after it announced a big investment plan for its theme parks and cruise lines. It plans to double its investment in its parks, experiences and products business to $60 billion over the next 10 years versus the prior decade.

Shares of AutoZone slipped 1.9% despite its reporting stronger profit for the latest quarter than analysts expected. The auto parts retailer said growth in its domestic commercial business was weaker during the quarter than expected.

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# CLASSIFIEDS

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## Announcements

### Public Notices & Legals 30

**NOTICE OF PUBLIC HEARING**

The Clearwater Underground Water Conservation District (CUWCD) will hold a public hearing and consider adopting proposed update with revisions to the District Groundwater Management Plan at 1:30 p.m., October 11, 2023 at the District Headquarters Building located at 700 Kennedy Court, Belton, Texas. Copies of the revised Management Plan are available for review at the CUWCD Headquarters Building and on the CUWCD website at http://www.cuwcd.org. Contact CUWCD at 254-933-0120 for additional information.

# APPENDIX G

| WSC | Contact | Phone | Address | City | State | Zip | Email |
|---|---|---|---|---|---|---|---|
| 439 WSC | Jamie Davlin | 254-933-2133 | 5041 West Dr | Belton | TX | 76513 | 439water@439watersupply.com |
| Armstrong WSC | Billy James Smith | 254-657-2429 | P.O. Box 155 | Holland | Texas | 76534 | bsmith@embarqmail.com |
| Bell County MUD #1 | Roger Hunter | 512-435-2300 | 100 Congress Avenue | Austin | Texas | 78701 | |
| Bell County MUD #2 | Roger Hunter | 512-435-2300 | 100 Congress Avenue | Austin | Texas | 78701 | |
| Bell County WCID #1 | Ricky Garrett | 254-501-9243 | 201 S. 38th Street | Killeen | Texas | 76543 | r.garrett@wcid1.org |
| Bell County WCID #2 | Bill Easley | 254-982-4685 | P.O. Box 338 | Little River | Texas | 76554 | belcountywater@embarqmail.com |
| Bell County WCID #3 | Blake Stapp | 254-771-0061 | 303 N Main Street | Nolanville | Texas | 76559 | bstapp@lms-cpa.com |
| Bell County WCID #5 | Robert Jekel | 254-697-4016 | P. O. Drawer 150 | Cameron | Texas | 76520 | dlservice@farm-market.net |
| Bell County WCID #6 | Glen Grandy | 254-290-0222 | P.O. Box 817 | Killeen | Texas | 76540 | |
| Bell Milam Falls WSC | Robert Jekel | 254-697-4016 | P. O. Drawer 150 | Cameron | Texas | 76520 | dlservice@farm-market.net |
| Central Texas WSC | Lee Kelley | 254-698-3583 | 4020 Lakecliff Drive | Harker Heights | Texas | 76548 | ctwscgm@embarqmail.com |
| City of Troy | Gary O. Smith | 254-938-2505 | P.O. Box 389 | Troy | Texas | 76579 | gsmith@cityoftroy.us |
| Dog Ridge WSC | Michelle | 254-939-6533 | P.O. Box 232 | Belton | Texas | 76513 | Michelle@dogridgewsc.com |
| Donahoe Creek Watershed Authority | Jon Fischer | 254-527-3271 | PO Box Q | Bartlett | Texas | 76511 | |
| East Bell WSC | Cheryl Walden | 254-985-2611 | 16490 Hwy 53 | Temple | Texas | 76501 | eastbellwsc@embarqmail.com |
| Elm Creek WSC | Kyle Bloodworth | 254-853-3838 | 603 Avenue E. | Moody | Texas | 76557 | kyle@elmcreekwatersupply.com |
| Jarrell Schwertner WSC | Joe Simmons | 903-391-2730 | P.O. Box 40 | Jarrell | Texas | 76537 | gm@jswatersupply.com |
| Kempner WSC | Bruce Sorenson | 512-932-3701 | PO Box 103 | Kempner | Texas | 76539 | bruce@kempnerwsc.com |
| Little Elm Valley WSC | Robert Jekel | 254-697-4016 | P. O. Drawer 150 | Cameron | Texas | 76520 | dlservice@farm-market.net |
| Moffat WSC | Damon Boniface | 254-986-2457 | 5456 Lakeaire Blvd | Temple | Texas | 76502 | dboniface@moffatwatersupply.com |
| Oenavile & Belfalls WSC | Randy Frei | 254-985-2243 | 11821 State Hwy 53 | Temple | Texas | 76501 | freienterprises@embarqmail.com |
| Pendleton WSC | Velva Moody | 254-773-5876 | P.O. Box 100 | Pendleton | Texas | 76564 | pwsc@mygrande.net |
| Salado WSC | Ricky Preston | 254-947-5425 | P.O. Box 128 | Salado | Texas | 76571 | swsc1@embarqmail.com |
| The Grove WSC | Amy Veazey | 254-865-5567 | 1903 Straws Mills Rd | Gatesville | Texas | 76528 | thegrovewsc@icloud.com |
| West Bell County WSC | Bob Whitson | 254-634-1727 | 4201 Chaparral Road | Killeen | Texas | 76542 | westbellwater@hotmail.com |
| Brazos River Authority | David Collinsworth | 254-761-3100 | 4600 Cobbs Drive | Waco | Texas | 76710 | david.collinsworth@brazos.org |
| City of Bartlett | Sabra Davis | 254-527-0196 | P.O. Drawer H | Bartlett | Texas | 76511 | cityadmin@bartlett-tx.us |
| City of Belton | Matthew Bates | 254-933-5818 | P.O. Box 120 | Belton | Texas | 76513 | MBates@BeltonTexas.Gov |
| City of Gatesville | Scott Albert | 254-290-0545 | 803 Main Street | Gatesville | Texas | 76528 | salbert@gatesvilletx.com |
| City of Harker Heights | David Mitchell | 254-953-5600 | 305 Millers Crossing | Harker Heights | Texas | 76548 | dmitchell@harkerheights.gov |
| River Farm MUD #1 | Rex Baird | 972-788-1600 | 16000 North Dallas Parkway, Suite 350 | Dallas | Texas | 75248 | rfmud1@districtdirectory.org |
| City of Holland | Johnny Kallus | 254-657-2460 | P.O. Box 157 | Holland | Texas | 76534 | jkallus@cityofholland.org |
| City of Lampasas | Finley deGraffenried | 512-556-6831 | 312 E. Third St. | Lampasas | Texas | 76550 | finley@cityoflampasas.com |
| City of Killeen | Steve Kana | 254-501-6500 | 101 N. College Street | Killeen | Texas | 76541 | skana@killeentexas.gov |
| City of Morgan's Point Resort | Camille Browser | 254-780-1334 | 8 Morgan's Point Blvd. | Morgan's Point Resort | Texas | 76513 | Camille.Bowser@mprtx.us |
| City of Rogers | Tammy Cockrum | 254-642-3312 | P.O. Box 250 | Rogers | Texas | 76569 | cityadministrator@CityOfRogersTX.gov |
| City of Temple | David Olson | 254-298-5600 | 2 North Main Street | Temple | Texas | 76501 | dolson@templetx.gov |

Every drop counts!

**_Clearwater Underground Water Conservation District_**
**_P.O. Box 1989, Belton, Texas 76513_**
**_Phone: 254/933-0120 Fax: 254/933-8396_**
**_www.cuwcd.org_**



September 20, 2023

David Collinsworth, General Manager david.Collinsworth@brazos.org *(via email)*
Brazos River Authority
P.O. Box 7555
Waco, TX 76714-7555

Dear Mr. Collinsworth,

The Clearwater Underground Water Conservation District (CUWCD) is conducting a review of its management plan as required by Texas Water Code (TWC) Chapter 36.1072(e). Standard revisions are proposed to update this plan. One major component of the plan is evidence of its coordination with surface water management entities pursuant to TWC 36.1071 (a):

> *Evidence that following notice and hearing the Clearwater Underground Water Conservation District coordinated in the development of its Management plan with surface water management entities.*

The draft of the revised management plan is at located at https://cuwcd.org/district-management-plan/ and notice will hold a public hearing on October 11, 2023 at 1:30 p.m. at our District Headquarters located at 700 Kennedy Court in Belton. We are looking forward to your input regarding this plan. After your review, please provide us with a letter confirming your review of the revised plan and any comments or concerns you may have.

The District will after conducting the public hearing of the draft plan on October 11, 2023 will deliberate the same day for final adoption of all proposed and agreed upon revisions to the plan at our District Headquarters located at 700 Kennedy Court in Belton.

We are looking forward to your input regarding this plan. After your review, please provide us with a letter confirming your review of the revised plan and any comments or concerns you may have.

Sincerely,

Dirk Aaron
General Manager
Clearwater UWCD
Electronic copy to: Brad Brunett (bradb@brazos.org); Stephen Allen stephen.allen@twdb.texas.gov

Brazos River Authority

QUALITY • CONSERVATION • SERVICE

September 26, 2023

RECEIVED
OCT 05 2023
BY:

Mr. Dirk Aaron
General Manager
Clearwater Underground Water
Conservation District
P.O. Box 1989
Belton, Texas 76513

Re: Proposed Groundwater Management Plan Revisions

Dear Mr. ~~Aaron~~ Dirk:

The Brazos River Authority (BRA) appreciates the opportunity to review and provide comments on the proposed revisions to the Groundwater Management Plan for the Clearwater Underground Water Conservation District (CUWCD). We have reviewed the revised plan and do not have any comments at this time. The BRA supports the efforts of the CUWCD to manage its groundwater resources through local control in a scientifically sound manner.

Sincerely,

BRAD BRUNETT
Regional Manager, Central & Lower Basin

BB:kld

4600 Cobbs Drive • P.O. Box 7555 • Waco, Texas 76714-7555
254-761-3100 • FAX 254-761-3202

Clearwater
Every drop counts!

**Clearwater Underground Water Conservation District**
P.O. Box 1989, Belton, Texas 76513
Phone: 254/933-0120 Fax: 254/933-8396
www.cuwcd.org



September 20, 2023

TO: Surface Water Management Entities (via email)

RE: Revised Management Plan

Dear Manager:

The Clearwater Underground Water Conservation District (CUWCD) is conducting a review of its management plan as required by Texas Water Code (TWC) Chapter 36.1072(e). Standard revisions are proposed to update this plan. One major component of the plan is evidence of its coordination with surface water management entities pursuant to TWC 36.1071 (a):

> *Evidence that following notice and hearing the Clearwater Underground Water Conservation District coordinated in the development of its Management plan with surface water management entities.*

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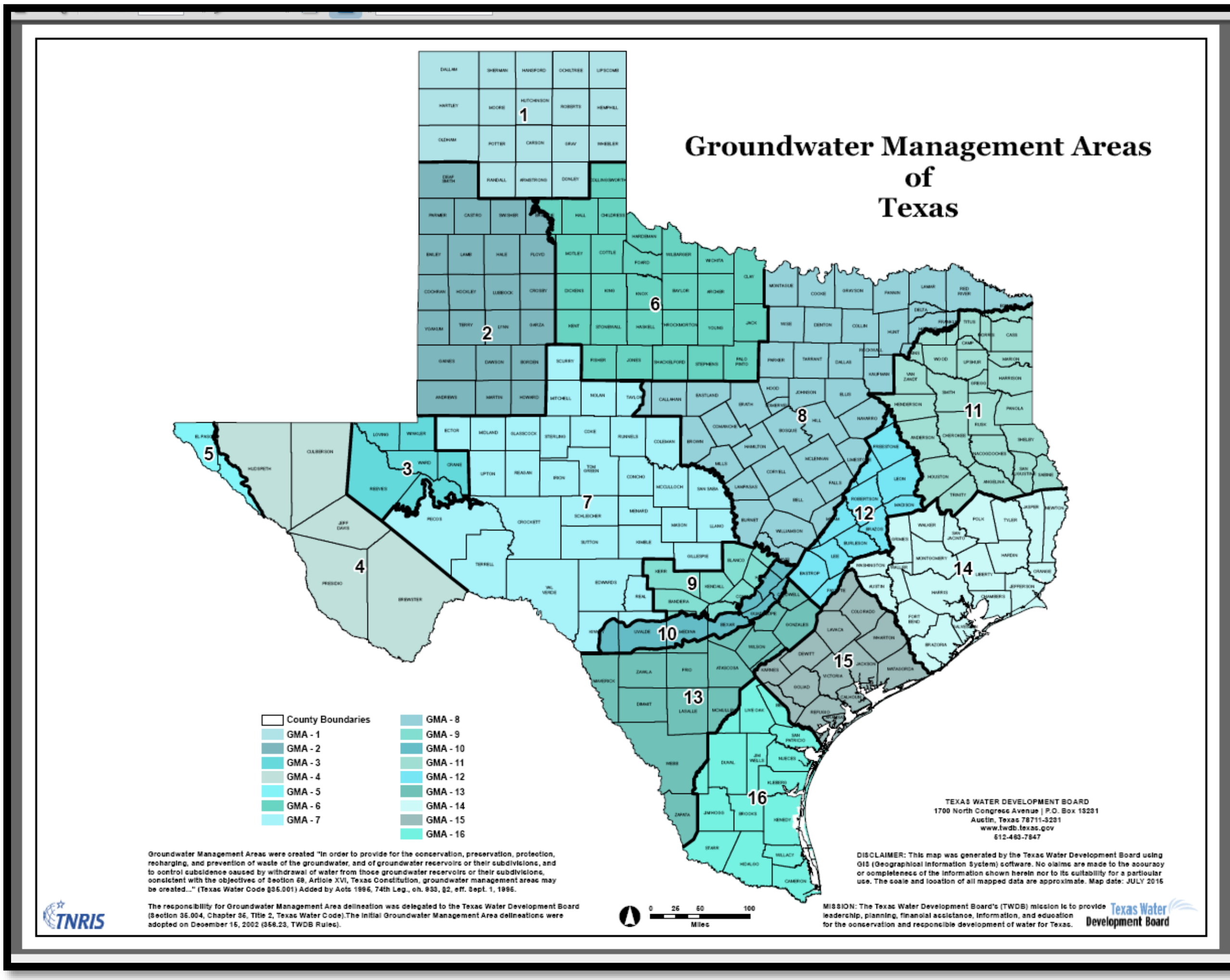
We are looking forward to your input regarding this plan. After your review, please provide us with a letter confirming your review of the revised plan and any comments or concerns you may have.

Sincerely,

Dirk Aaron
General Manager
Clearwater UWCD

Electronic copy to: Stephen Allen stephen.allen@twdb.texas.gov

# <u>APPENDIX H</u>


Groundwater Management Areas
of
Texas
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
County Boundaries
GMA - 1
GMA - 2
GMA - 3
GMA - 4
GMA - 5
GMA - 6
GMA - 7
GMA - 8
GMA - 9
GMA - 10
GMA - 11
GMA - 12
GMA - 13
GMA - 14
GMA - 15
GMA - 16
Groundwater Management Areas were created "In order 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, consistent with the objectives of Section 59, Article XVI, Texas Constitution, groundwater management areas may be created..." (Texas Water Code §35.001) Added by Acts 1995, 74th Leg., ch. 933, §2, eff. Sept. 1, 1995.
The responsibility for Groundwater Management Area delineation was delegated to the Texas Water Development Board (Section 35.004, Chapter 36, Title 2, Texas Water Code).The initial Groundwater Management Area delineations were adopted on December 15, 2002 (356.23, TWDB Rules).
TNRIS
0 25 50 100
Miles
TEXAS WATER DEVELOPMENT BOARD
1700 North Congress Avenue | P.O. Box 13231
Austin, Texas 78711-3231
www.twdb.texas.gov
512-463-7847
DISCLAIMER: This map was generated by the Texas Water Development Board using GIS (Geographical Information System) software. No claims are made to the accuracy or completeness of the information shown herein nor to its suitability for a particular use. The scale and location of all mapped data are approximate. Map date: JULY 2015
MISSION: The Texas Water Development Board's (TWDB) mission is to provide leadership, planning, financial assistance, information, and education for the conservation and responsible development of water for Texas.
Texas Water Development Board

# APPENDIX I

# GAM RUN 21-013 MAG: MODELED AVAILABLE GROUNDWATER FOR THE AQUIFERS IN GROUNDWATER MANAGEMENT AREA 8

Jerry Shi, Ph.D., P.G. and Jevon Harding, P.G.
Texas Water Development Board
Groundwater Division
Groundwater Modeling Department
512-463-5076
November 1, 2022

*This page is intentionally left blank.*

## Geoscientist Seals

The following professional geoscientists contributed to this conceptual model report and associated data compilation and analyses:

Jianyou (Jerry) Shi, Ph.D., P.G.

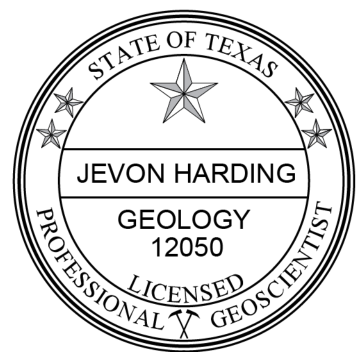
Dr. Shi was responsible for the calculations to verify the attainability of desired future conditions and the calculations of modeled available groundwater values. He was the primary author of the report.


Signature 11/10/2022 Date

Jevon Harding, P.G.

Ms. Harding was responsible for editing the report and adding additional documentation as necessary to meet TWDB standards after Dr. Shi had left the agency.

Signature 11/3/2022 Date



# GAM RUN 21-013 MAG: MODELED AVAILABLE GROUNDWATER FOR THE AQUIFERS IN GROUNDWATER MANAGEMENT AREA 8

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November 1, 2022

## *EXECUTIVE SUMMARY:*

The Texas Water Development Board (TWDB) has prepared estimates of the modeled available groundwater for the Trinity, Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory aquifers in Groundwater Management Area 8. The modeled available groundwater estimates are based on the revised desired future conditions for these aquifers adopted by groundwater conservation districts in Groundwater Management Area 8 on July 26, 2022. The district representatives declared the Nacatoch, Blossom, Brazos River Alluvium, and Cross Timbers aquifers to be non-relevant for purposes of joint planning. After review, the TWDB determined that the explanatory report and other materials submitted by the district representatives were administratively complete on September 23, 2022.

The modeled available groundwater values are summarized by decade by groundwater conservation district and county (Tables 1 through 12) and by county, regional water planning area, and river basin for use in the regional water planning process (Tables 13 through 24). The modeled available groundwater in Groundwater Management Area 8 is described below:

- Trinity Aquifer (Paluxy aquifer) – The modeled available groundwater is approximately 24,520 acre-feet per year during the period from 2020 to 2080.
- Trinity Aquifer (Glen Rose Formation) – The modeled available groundwater is approximately 12,410 acre-feet per year during the period from 2020 to 2080.

- Trinity Aquifer (Twin Mountains Formation) – The modeled available groundwater is approximately 45,510 acre-feet per year during the period from 2020 to 2080.
- Trinity Aquifer (Travis Peak Formation) – The modeled available groundwater is approximately 98,230 acre-feet per year during the period from 2020 to 2080.
- Trinity Aquifer (Hensell aquifer) – The modeled available groundwater is approximately 27,120 acre-feet per year during the period from 2020 to 2080.
- Trinity Aquifer (Hosston aquifer) – The modeled available groundwater is approximately 67,730 acre-feet per year during the period from 2020 to 2080.
- Trinity Aquifer (Antlers Formation) – The modeled available groundwater is approximately 78,440 acre-feet per year during the period from 2020 to 2080.
- Woodbine Aquifer – The modeled available groundwater is approximately 30,570 acre-feet per year during the period from 2020 to 2080.
- Edwards (Balcones Fault Zone) Aquifer – The modeled available groundwater is approximately 15,170 acre-feet per year during the period from 2020 to 2080.
- Marble Falls Aquifer – The modeled available groundwater is approximately 5,630 acre-feet per year during the period from 2020 to 2080.
- Ellenburger-San Saba Aquifer – The modeled available groundwater is approximately 14,060 acre-feet per year during the period from 2020 to 2080.
- Hickory Aquifer – The modeled available groundwater is approximately 3,580 acre-feet per year during the period from 2020 to 2080.

Modeled available groundwater estimates are also provided by outcrop and downdip areas for the counties within Upper Trinity Groundwater Conservation District to be consistent with that district's desired future conditions statements.

The modeled available groundwater values estimated for counties may be slightly different from those estimated for groundwater conservation districts because of the process for rounding the values.

## *REQUESTOR:*

Mr. Drew Satterwhite, General Manager of North Texas Groundwater Conservation District and Groundwater Management Area 8 Coordinator at the time of request.

## *DESCRIPTION OF REQUEST:*

In a letter dated January 4, 2022, Mr. Drew Satterwhite provided the TWDB with the desired future conditions of the Trinity Aquifer subunits (Paluxy, Glen Rose, Twin Mountains, Travis Peak, Hensell, Hosston, and Antlers formations), and the Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory aquifers. After review of the submittal, the TWDB identified missing or corrupted model files and received updated versions from Groundwater Management Area 8 on March 3, 2022. Following the TWDB analysis to verify the achievability of the adopted desired future conditions, the TWDB identified desired future conditions that were unachievable. Groundwater Management Area 8 confirmed that these were typos and adopted a revised version of the desired future conditions resolution on July 26, 2022. The following sections present the final adopted desired future conditions:

### Trinity and Woodbine aquifers

The desired future conditions for the Trinity and Woodbine aquifers are expressed as water level decline, or drawdown, in feet from January 1, 2010, to December 31, 2080 (Groundwater Management Area 8, 2021).

The county-based desired future conditions for the Trinity Aquifer subunits, excluding counties in the Upper Trinity Groundwater Conservation District, are listed in Table 1 (dashes indicate areas where the subunits do not exist):

**TABLE 1. DESIRED FUTURE CONDITIONS IN GROUNDWATER MANAGEMENT AREA (GMA) 8 SUMMARIZED BY COUNTY FOR THE NORTHERN TRINITY AND WOODBINE AQUIFERS. VALUES REPRESENT AVERAGE DRAWDOWN IN FEET BETWEEN JANUARY 1, 2010, AND DECEMBER 31, 1980.**

| County | Woodbine | Paluxy | Glen Rose | Twin Mountains | Travis Peak | Hensell | Hosston | Antlers |
|---|---|---|---|---|---|---|---|---|
| Bell | — | 17 | 83 | — | 333 | 145 | 375 | — |
| Bosque | — | 6 | 53 | — | 189 | 139 | 232 | — |
| Bowie | — | — | — | — | — | — | — | — |
| Brown | — | — | 1 | — | 2 | 1 | 1 | 2 |
| Burnet | — | — | 2 | — | 19 | 7 | 21 | — |
| Callahan | — | — | — | — | — | — | — | 1 |
| Collin | 482 | 729 | 366 | 560 | — | — | — | 596 |
| Comanche | — | — | 2 | — | 4 | 2 | 3 | 12 |

**TABLE 2 (CONT). DESIRED FUTURE CONDITIONS IN GROUNDWATER MANAGEMENT AREA (GMA) 8 SUMMARIZED BY COUNTY FOR THE NORTHERN TRINITY AND WOODBINE AQUIFERS. VALUES REPRESENT AVERAGE DRAWDOWN IN FEET BETWEEN JANUARY 1, 2010, AND DECEMBER 31, 1980.**

| County | Woodbine | Paluxy | Glen Rose | Twin Mountains | Travis Peak | Hensell | Hosston | Antlers |
|---|---|---|---|---|---|---|---|---|
| Cooke | 2 | — | — | — | — | — | — | 191 |
| Coryell | — | 5 | 15 | — | 107 | 70 | 141 | — |
| Dallas | 137 | 346 | 288 | 515 | 415 | 362 | 419 | — |
| Delta | — | 279 | 198 | — | 202 | — | — | — |
| Denton | 22 | 558 | 367 | 752 | — | — | — | 416 |
| Eastland | — | — | — | — | — | — | — | 4 |
| Ellis | 76 | 128 | 220 | 413 | 380 | 290 | 390 | — |
| Erath | — | 6 | 6 | 8 | 25 | 12 | 35 | 14 |
| Falls | — | 159 | 238 | — | 505 | 296 | 511 | — |
| Fannin | 259 | 709 | 305 | 400 | 291 | — | — | 269 |
| Franklin | — | — | — | — | — | — | — | — |
| Grayson | 163 | 943 | 364 | 445 | — | — | — | 364 |
| Hamilton | — | 2 | 4 | — | 26 | 14 | 38 | — |
| Hill | 20 | 45 | 149 | — | 365 | 211 | 413 | — |
| Hopkins | — | — | — | — | — | — | — | — |
| Hunt | 631 | 610 | 326 | 399 | 350 | — | — | — |
| Johnson | 4 | -57 | 66 | 184 | 235 | 120 | 329 | — |
| Kaufman | 242 | 311 | 305 | 427 | 372 | 349 | 345 | — |
| Lamar | 42 | 100 | 107 | — | 125 | — | — | 132 |
| Lampasas | — | — | 1 | — | 6 | 1 | 11 | — |
| Limestone | — | 199 | 301 | — | 433 | 214 | 445 | — |
| McLennan | 6 | 41 | 148 | — | 504 | 242 | 582 | — |
| Milam | — | — | 241 | — | 412 | 261 | 412 | — |
| Mills | — | 1 | 1 | — | 9 | 2 | 13 | — |
| Navarro | 110 | 139 | 266 | — | 343 | 295 | 343 | — |
| Rains | — | — | — | — | — | — | — | — |
| Red River | 2 | 24 | 40 | — | 57 | — | — | 15 |
| Rockwall | 275 | 433 | 343 | 466 | — | — | — | — |
| Somervell | — | 4 | 4 | 50 | 64 | 17 | 120 | — |
| Tarrant | 6 | 105 | 163 | 348 | — | — | — | 177 |
| Taylor | — | — | — | — | — | — | — | 0 |
| Travis | — | — | 90 | — | 219 | 68 | 226 | — |
| Williamson | — | — | 78 | — | 220 | 89 | 225 | — |

The desired future conditions for the counties in the Upper Trinity Groundwater Conservation District are further divided into outcrop and downdip areas, and are listed in Table 2 (dashes indicate areas where the subunits do not exist):

**TABLE 2. THE DESIRED FUTURE CONDITIONS FOR THE UPPER TRINITY GROUNDWATER CONSERVTION DISTRICT IN GROUNDWATER MANAGEMENT AREA (GMA) 8 SUMMARIZED BY AQUIFER. VALUES REPRESENT AVERAGE DRAWDOWN IN FEET BETWEEN JANUARY 1, 2010, AND DECEMBER 31, 1980.**

| County | Antlers | Paluxy | Glen Rose | Twin Mountains |
|---|---|---|---|---|
| Hood -Outcrop | — | 6 | 9 | 13 |
| Hood-Downdip | — | — | 39 | 72 |
| Montague-Outcrop | 40 | — | — | — |
| Montague-Downdip | — | — | — | — |
| Parker-Outcrop | 42 | 6 | 20 | 7 |
| Parker-Downdip | — | 2 | 50 | 68 |
| Wise-Outcrop | 60 | — | — | — |
| Wise-Downdip | 154 | — | — | — |

## Edwards (Balcones Fault Zone) Aquifer

The desired future conditions adopted by Groundwater Management Area 8 for the Edwards (Balcones Fault Zone) Aquifer are to maintain minimum streamflow and springflow under a repeat of the drought of record in Bell, Travis, and Williamson counties from January 1, 2010, to December 31, 2080 (Groundwater Management Area 8, 2021). The desired future conditions are listed in Table 3:

**TABLE 3. THE DESIRED FUTURE CONDITIONS IN GROUNDWATER MANAGEMENT AREA (GMA) 8 BASED ON SPRING/STREAM FLOW FOR SELECTED COUNTIES. THESE CONDITIONS ARE TO BE MAINTAINED BETWEEN JANUARY 1, 2010, AND DECEMBER 31, 1980.**

| County | Adopted Desired Future Condition |
|---|---|
| Bell | Maintain at least 100 acre-feet per month of stream/spring flow in Salado Creek during a repeat of the drought of record |
| Travis | Maintain at least 42 acre-feet per month of aggregated stream/spring flow during a repeat of the drought of record |
| Williamson | Maintain at least 60 acre-feet per month of aggregated stream/spring flow during a repeat of the drought of record |

## Marble Falls, Ellenburger-San Saba, and Hickory aquifers

The desired future conditions for the Marble Falls, Ellenburger-San Saba, and Hickory aquifers in Brown, Burnet, Lampasas, and Mills counties are defined as water level decline, or drawdown, in feet from January 1, 2010, to December 31, 2080 (Groundwater Management Area 8, 2021). The desired future conditions are listed in Table 4:

**TABLE 4. DESIRED FUTURE CONDITIONS IN GROUNDWATER MANAGEMENT AREA (GMA) 8 SUMMARIZED BY COUNTY FOR THE LLANO UPLIFT AQUIFERS. VALUES REPRESENT AVERAGE DRAWDOWN IN FEET BETWEEN JANUARY 1, 2010, AND DECEMBER 31, 1980.**

| County | Ellenburger-San Saba | Hickory | Marble Falls |
|---|---|---|---|
| Brown | 3 | 3 | 3 |
| Burnet | 12 | 11 | 11 |
| Lampasas | 16 | 16 | 16 |
| Mills | 9 | 9 | 9 |

## *METHODS:*

The desired future conditions for Groundwater Management Area 8 are based on multiple criteria. The methods to calculate the desired future conditions are discussed below.

### Trinity and Woodbine aquifers

The desired future conditions for the Trinity and Woodbine aquifers in Groundwater Management Area 8 are based on the predictive simulation “Run 11” (Groundwater Management area 8, 2021), which was constructed as an extension of the groundwater availability model for the northern portion of the Trinity and Woodbine aquifers (Kelley and others, 2014).

The average drawdowns between January 1, 2010 (initial water levels) and December 31, 2080 (stress period 71) were calculated using a composite water levels methodology, described in Appendix A. Appendix A also presents the calculated average drawdown results for the Trinity and Woodbine aquifers that the TWDB used to verify that the pumping scenario in the submitted model files achieved the desired future conditions. The modeled available groundwater values were determined by extracting pumping rates by decade from the MODFLOW cell-by-cell budget files using custom Fortran scripts developed by the TWDB.

### Edwards (Balcones Fault Zone) Aquifer

Groundwater Management Area 8 requested that the results from the previous GAM Run 08-010 MAG (Anaya, 2008) be used, unchanged, for the current round of joint planning. That model run includes a ten-year predictive period that represents a simulated repeat of the drought of record in the 1950s. The modeled available groundwater values were determined using the monthly stress period within that predictive period with the lowest monthly springflow volume, which was assumed to represent the worst-case scenario for Salado Springs during a potential repeat of the 1950s drought of record.

### Marble Falls, Ellenburger-San Saba, and Hickory aquifers

The desired future conditions for the Marble Falls, Ellenburger-San Saba, and Hickory aquifers in Brown, Burnet, Lampasas, and Mills counties within Groundwater Management Area 8 are based on a predictive simulation constructed by Groundwater Management Area 8 for planning purposes (Groundwater Management Area 8, 2021). This simulation is an extension of the groundwater availability model for the minor aquifers in the Llano Uplift region by Shi and others (2016). Modeled water levels were extracted for January 1, 2010 (initial water levels) and December 31, 2080 (stress period 71) and drawdown calculated as the difference in water level between those two endpoints. Drawdown averages were calculated by aquifer for each area specified in the desired future conditions. Additional details on the predictive simulation and methods to calculate the drawdowns are described in Appendix B. Appendix B also presents the calculated average drawdown results for the Marble Falls, Ellenburger-San Saba, and Hickory aquifers that the TWDB used to verify that the pumping scenario in the submitted model files achieved the desired future conditions. The modeled available groundwater values were determined by extracting pumping rates by decade from the MODFLOW cell-by-cell budget files using custom Fortran scripts developed by the TWDB.

### Modeled Available Groundwater and Permitting

As defined in Chapter 36 of the Texas Water Code (2011), "modeled available groundwater" is the estimated average amount of water that may be produced annually to achieve a desired future condition. 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.

## *PARAMETERS AND ASSUMPTIONS:*

The parameters and assumptions for the groundwater availability simulations are described below:

### Trinity and Woodbine Aquifers

- Version 2.01 of the updated groundwater availability model for the northern Trinity and Woodbine aquifers was the base model for this analysis. See Kelley and others (2014) for the assumptions and limitations of the historical calibrated model. Groundwater Management Area 8 constructed a predictive model simulation to extend the base model to 2080 for planning purposes. See Appendix E of Groundwater Management Area 8 (2021) for the assumptions of this predictive model simulation.

- The predictive model was run with MODFLOW-NWT (Niswonger and others, 2011).
- The model has eight layers that represent units younger than the Woodbine Aquifer and the shallow outcrop of all aquifers (Layer 1), the Woodbine Aquifer (Layer 2), the Fredericksburg and Washita units (Layer 3), and various combinations of the subunits that comprise the Trinity Aquifer (Layers 4 to 8).
- To be consistent with Groundwater Management Area 8, the TWDB model grid files dated August 26, 2015 (*trnt_n_grid_poly082615.csv* and *wdbn_grid_poly082615.csv* for the Trinity and Woodbine aquifers, respectively) were used to assign model cells to counties, groundwater management areas, groundwater conservation districts, river basins, and regional water planning areas.
- Drawdown was calculated as the difference in modeled water levels between the baseline date of January 1, 2010 (initial water levels) and the final date of December 31, 2080 (stress period 71) using a composite water level methodology described in Appendix A.
- During the predictive simulation model run, some model cells went dry, meaning the modeled water level fell below the bottom of the cell. The dry cell count at the baseline date of January 1, 2010 (initial water levels) and final date of December 31, 2080 (stress period 71) is presented in Table C1 of Appendix C. Appendix A describes how dry cells were handled in the drawdown calculations using the composite water level methodology. Pumping in dry cells was excluded from the modeled available groundwater calculations.
- The drawdown averages and modeled available groundwater values were calculated using the official TWDB boundaries for the Trinity and Woodbine aquifers.
- Estimates of modeled drawdown and available groundwater from the model simulation were rounded to whole numbers.

### Edwards (Balcones Fault Zone) Aquifer

- Version 1.01 of the groundwater availability model for the northern segment of the Edwards (Balcones Fault Zone) Aquifer was the base model for this analysis. See Jones (2003) for the assumptions and limitations of the historical calibrated model. During the previous planning cycle, a predictive model simulation was constructed to extend the base model and include a simulated repeat of the 1950s drought of record for planning purposes. See the previous GAM Run 08-010 MAG (Anaya, 2008) for the assumptions of this predictive model simulation.

- The model has one layer that represents the Edwards (Balcones Fault Zone) Aquifer.
- The model was run with MODFLOW-96 (Harbaugh and McDonald, 1996).
- The modeled available groundwater values were determined using the monthly stress period within the predictive drought period with the lowest monthly springflow volume, which was assumed to represent the worst-case scenario for Salado Springs during a potential repeat of the 1950s drought of record.
- The modeled available groundwater values were calculated using the official TWDB Edwards (Balcones Fault Zone) Aquifer boundary.
- To be consistent with Groundwater Management Area 8, the TWDB model grid file dated August 26, 2015 (*ebfz_n_grid_poly082615.csv*) was used to assign model cells to counties, groundwater management areas, groundwater conservation districts, river basins, and regional water planning areas.
- Estimates of modeled streamflow and springflow from the model simulation were rounded to whole numbers.

**Marble Falls, Ellenburger-San Saba, and Hickory Aquifers**

- Version 1.01 of the groundwater availability model for the minor aquifers in the Llano Uplift region was the base model for this analysis. See Shi and others (2016) for the assumptions and limitations of the historical calibrated model. Groundwater Management Area 8 constructed a predictive model simulation to extend the base model to 2080 for planning purposes. See Groundwater Management Area 8 (2021) for the assumptions of this predictive model simulation.
- The model has eight layers: Layer 1 (the Trinity Aquifer, Edwards-Trinity (Plateau) Aquifer, and younger alluvium deposits), Layer 2 (confining units), Layer 3 (the Marble Falls Aquifer and equivalent unit), Layer 4 (confining units), Layer 5 (Ellenburger-San Saba Aquifer and equivalent unit), Layer 6 (confining units), Layer 7 (the Hickory Aquifer and equivalent unit), and Layer 8 (Precambrian units).
- The model was run with MODFLOW-USG beta (development) version (Panday and others, 2013).
- To be consistent with Groundwater Management Area 8, the TWDB model grid file dated January 7, 2016 (*lnup_grid_poly010716.csv*) was used to assign model cells to

counties, groundwater management areas, groundwater conservation districts, river basins, and regional water planning areas.

- Drawdown was calculated as the difference in modeled water level between the baseline date of January 1, 2010 (initial water levels) and the final date of December 31, 2080 (stress period 71), using the methodology described in Appendix B.
- During the predictive model run, some active model cells went dry, meaning the modeled water level fell below the bottom of the cell. The dry cell count at the baseline date of January 1, 2010 (initial water levels) and final date of December 31, 2080 (stress period 71) is presented in Table C2 of Appendix C). Appendix B describes how dry cells were handled in the drawdown calculations. Pumping in dry cells was excluded from the modeled available groundwater.
- To be consistent with the desired future conditions defined by Groundwater Management Area 8, the drawdown averages and modeled available groundwater values were calculated using the active model extent of Layers 3, 5, and 7 (Figures 10 through 12) for the Marble Falls, Ellenburger-San Saba, and Hickory aquifers, respectively, rather than the official TWDB boundaries for these aquifers.
- Estimates of modeled drawdown and available groundwater from the model simulation were rounded to whole numbers.

## *RESULTS:*

The modeled available groundwater for the Trinity, Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory aquifers are listed below:

- Trinity Aquifer (Paluxy aquifer) – The modeled available groundwater is approximately 24,520 acre-feet per year during the period from 2020 to 2080. Values are summarized by groundwater conservation district and county (Table 5) and by county, regional water planning group, and river basin (Table 17).
- Trinity Aquifer (Glen Rose Formation) – The modeled available groundwater is approximately 12,410 acre-feet per year during the period from 2020 to 2080. Values are summarized by groundwater conservation district and county (Table 6) and by county, regional water planning group, and river basin (Table 18).
- Trinity Aquifer (Twin Mountains Formation) – The modeled available groundwater is approximately 45,510 acre-feet per year during the period from 2020 to 2080. Values are summarized by groundwater conservation district and county (Table 7) and by county, regional water planning group, and river basin (Table 19).

- Trinity Aquifer (Travis Peak Formation) – The modeled available groundwater is approximately 98,230 acre-feet per year during the period from 2020 to 2080. Values are summarized by groundwater conservation district and county (Table 8) and by county, regional water planning group, and river basin (Table 20).
- Trinity Aquifer (Hensell aquifer) – The modeled available groundwater is approximately 27,120 acre-feet per year during the period from 2020 to 2080. Values are summarized by groundwater conservation district and county (Table 9) and by county, regional water planning group, and river basin (Table 21).
- Trinity Aquifer (Hosston aquifer) – The modeled available groundwater is approximately 67,730 acre-feet per year during the period from 2020 to 2080. Values are summarized by groundwater conservation district and county (Table 10) and by county, regional water planning group, and river basin (Table 22).
- Trinity Aquifer (Antlers Formation) – The modeled available groundwater is approximately 78,440 acre-feet per year during the period from 2020 to 2080. Values are summarized by groundwater conservation district and county (Table 11) and by county, regional water planning group, and river basin (Table 23).
- Woodbine Aquifer – The modeled available groundwater is approximately 30,570 acre-feet per year during the period from 2020 to 2080. Values are summarized by groundwater conservation district and county (Table 12) and by county, regional water planning group, and river basin (Table 24).
- Edwards (Balcones Fault Zone) Aquifer – The modeled available groundwater is approximately 15,170 acre-feet per year during the period from 2020 to 2080. Values are summarized by groundwater conservation district and county (Table 13) and by county, regional water planning group, and river basin (Table 25).
- Marble Falls Aquifer – The modeled available groundwater is approximately 5,630 acre-feet per year during the period from 2020 to 2080. Values are summarized by groundwater conservation district and county (Table 14) and by county, regional water planning group, and river basin (Table 26).
- Ellenburger-San Saba Aquifer – The modeled available groundwater is approximately 14,060 acre-feet per year during the period from 2020 to 2080. Values are summarized by groundwater conservation district and county (Table 15) and by county, regional water planning group, and river basin (Table 27).
- Hickory Aquifer – The modeled available groundwater is approximately 3,580 acre-feet per year during the period from 2020 to 2080. Values are summarized by groundwater conservation district and county (Table 16) and by county, regional water planning group, and river basin (Table 28).

Figures 1 through 7 show the extent of the Trinity Aquifer subunits (Paluxy, Glen Rose, Twin Mountains, Travis Peak, Hensell, Hosston, and Antlers formations, respectively). Figures 8 through 12 show the extent of the Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory aquifers, respectively. Figure 13 shows the county, groundwater conservation district, regional water planning area, and river basin boundaries represented by the divisions in Tables 5 to 28.

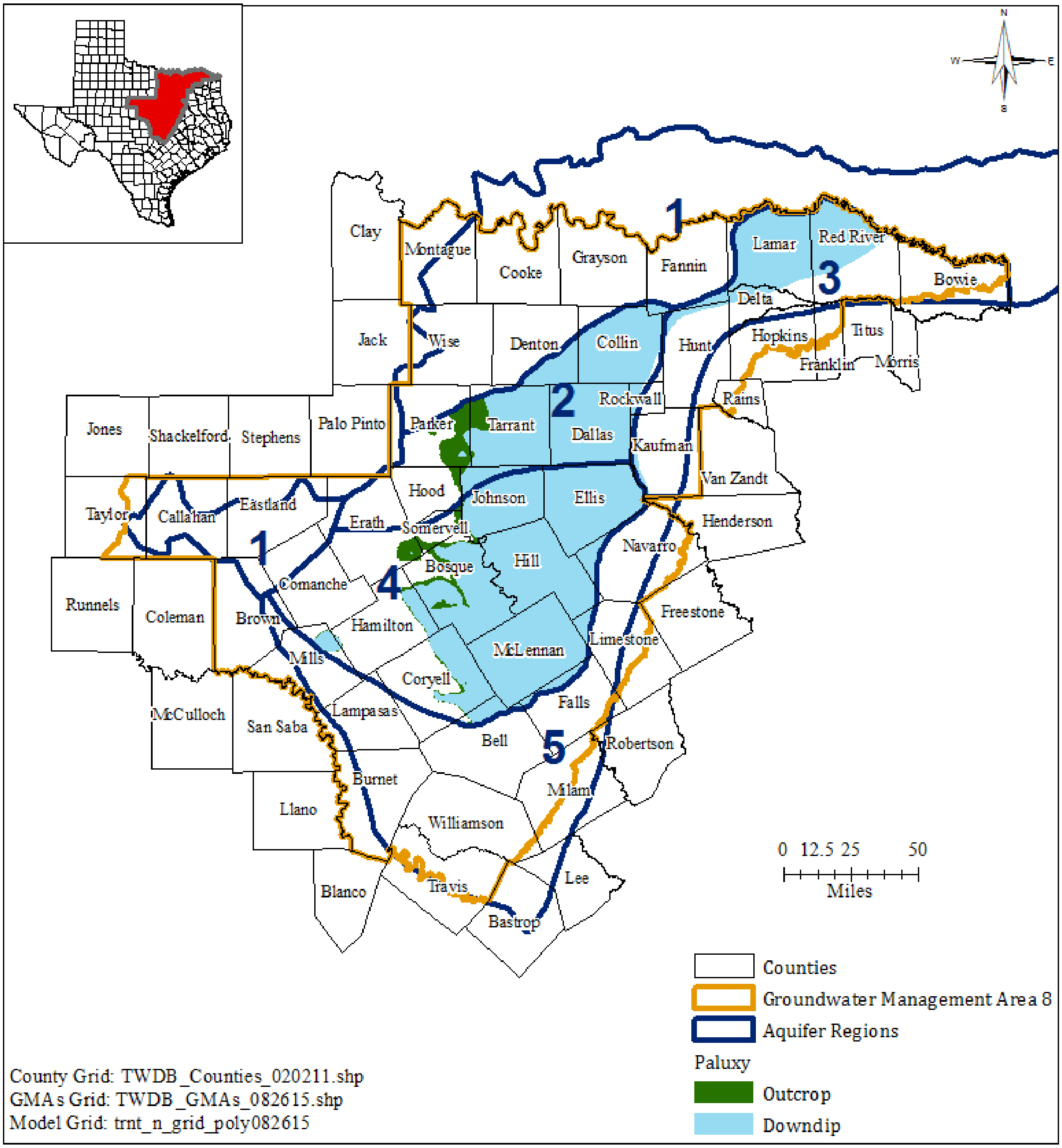


**FIGURE 1.** **MAP SHOWING THE TRINITY AQUIFER (PALUXY) WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR NORTHERN PORTION OF TRINITY AND WOODBINE AQUIFERS. SEE APPENDIX A FOR AQUIFER REGION DETAILS.**

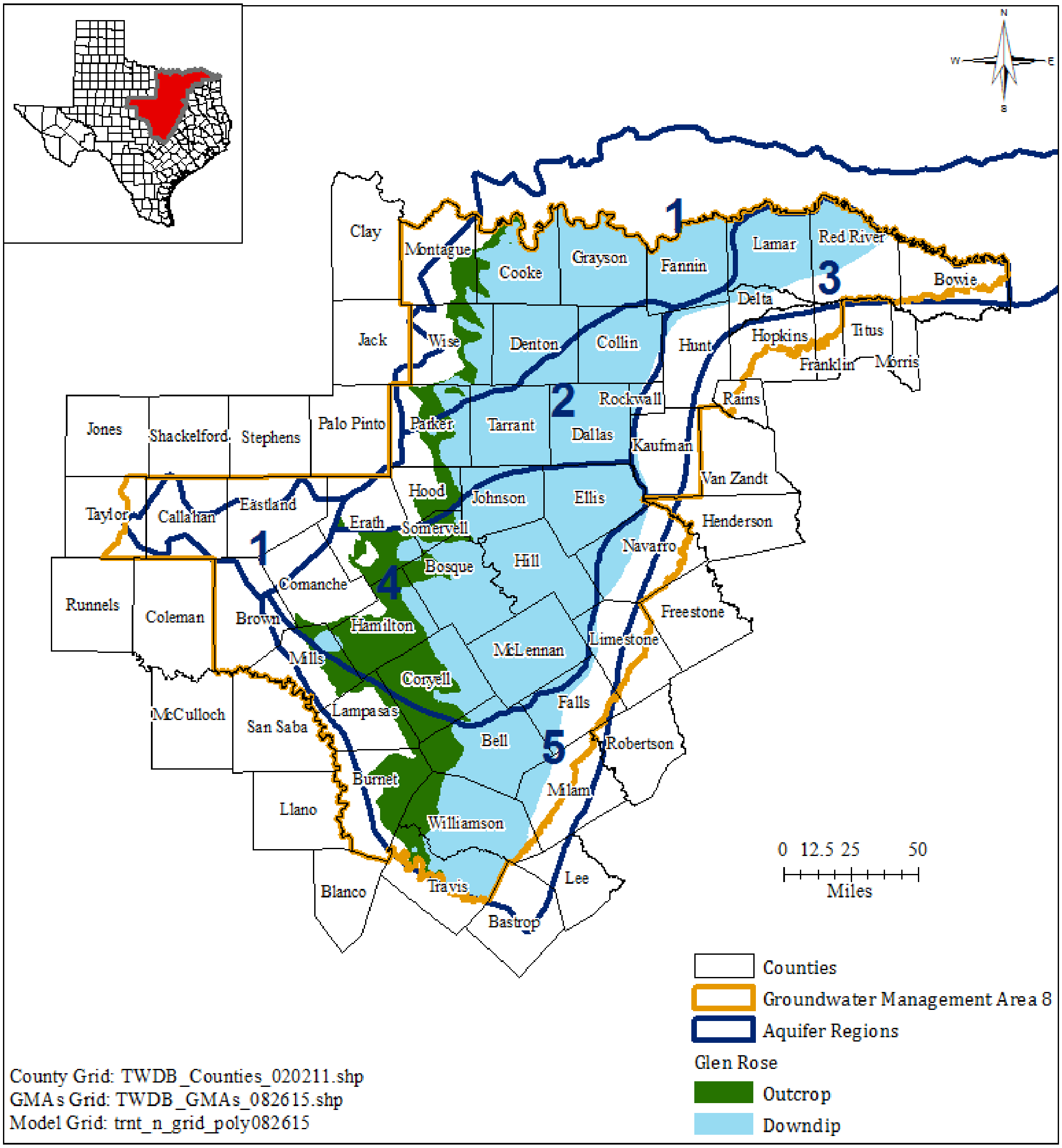


**FIGURE 2.** **MAP SHOWING THE TRINITY AQUIFER (GLEN ROSE) WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF TRINITY AND WOODBINE AQUIFERS. SEE APPENDIX A FOR AQUIFER REGION DETAILS.**

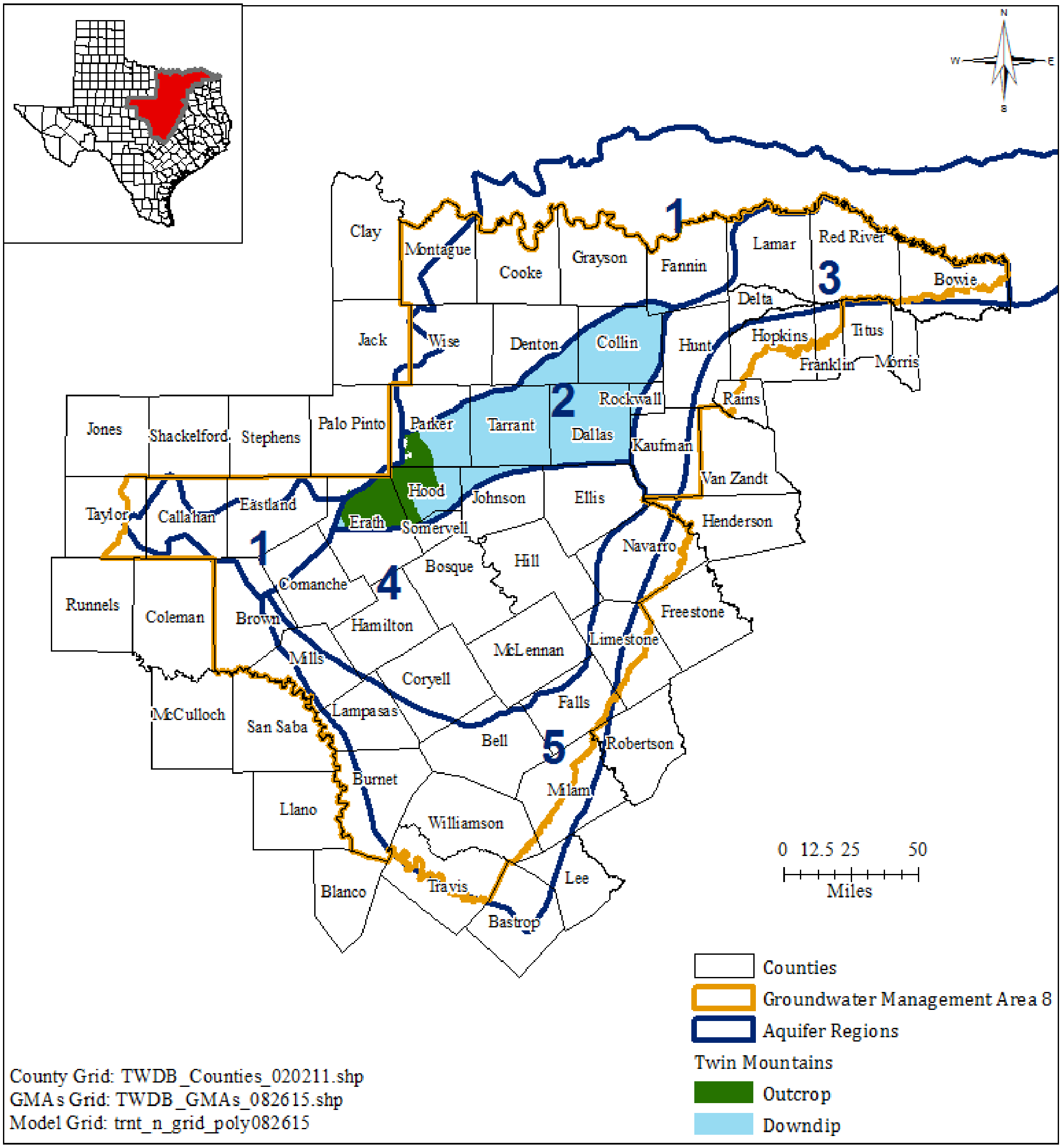


**FIGURE 3.** **MAP SHOWING THE TRINITY AQUIFER (TWIN MOUNTAINS) WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF TRINITY AND WOODBINE AQUIFERS. SEE APPENDIX A FOR AQUIFER REGION DETAILS.**

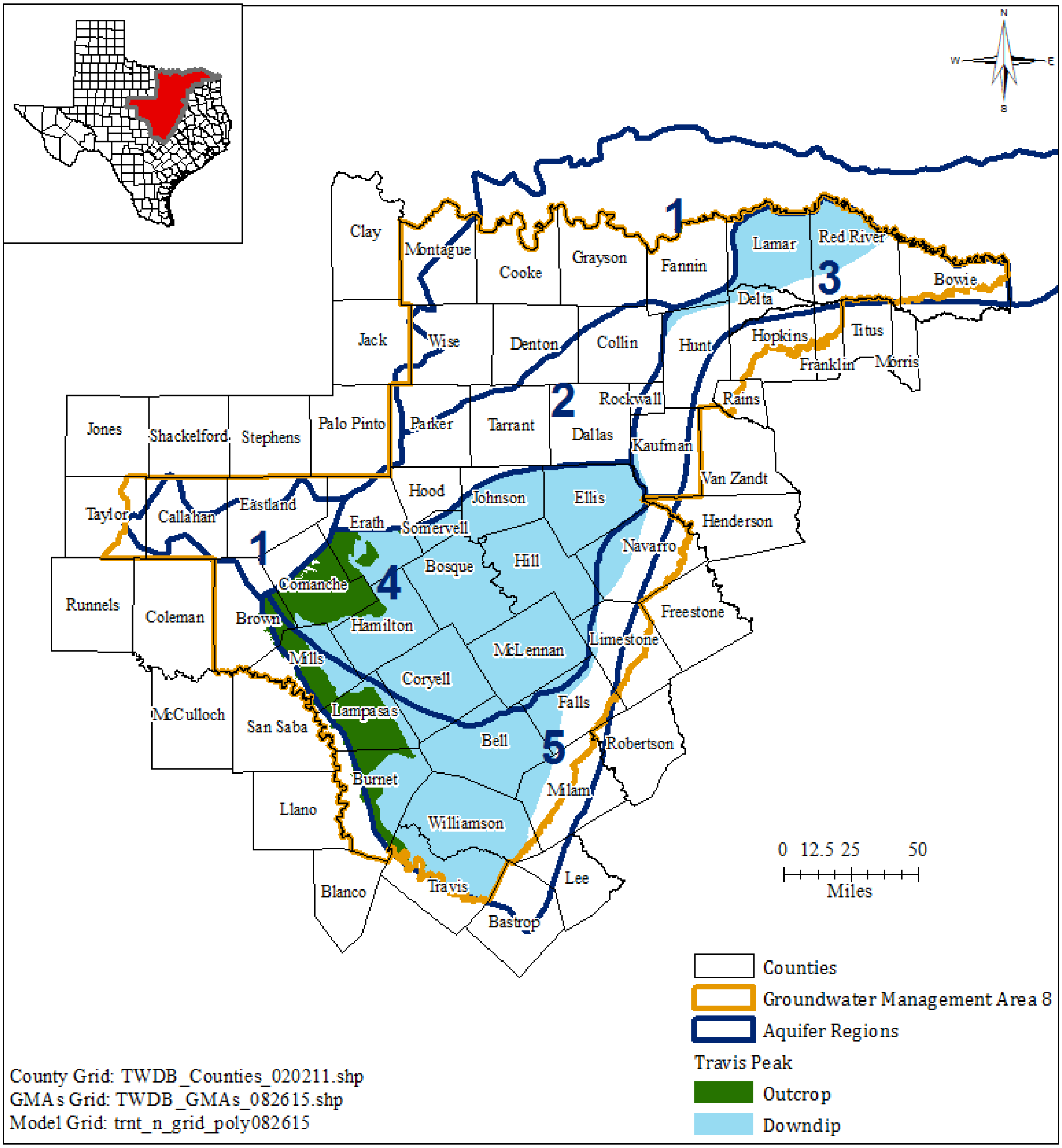


**FIGURE 4. MAP SHOWING THE TRINITY AQUIFER (TRAVIS PEAK) WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF TRINITY AND WOODBINE AQUIFERS. SEE APPENDIX A FOR AQUIFER REGION DETAILS.**

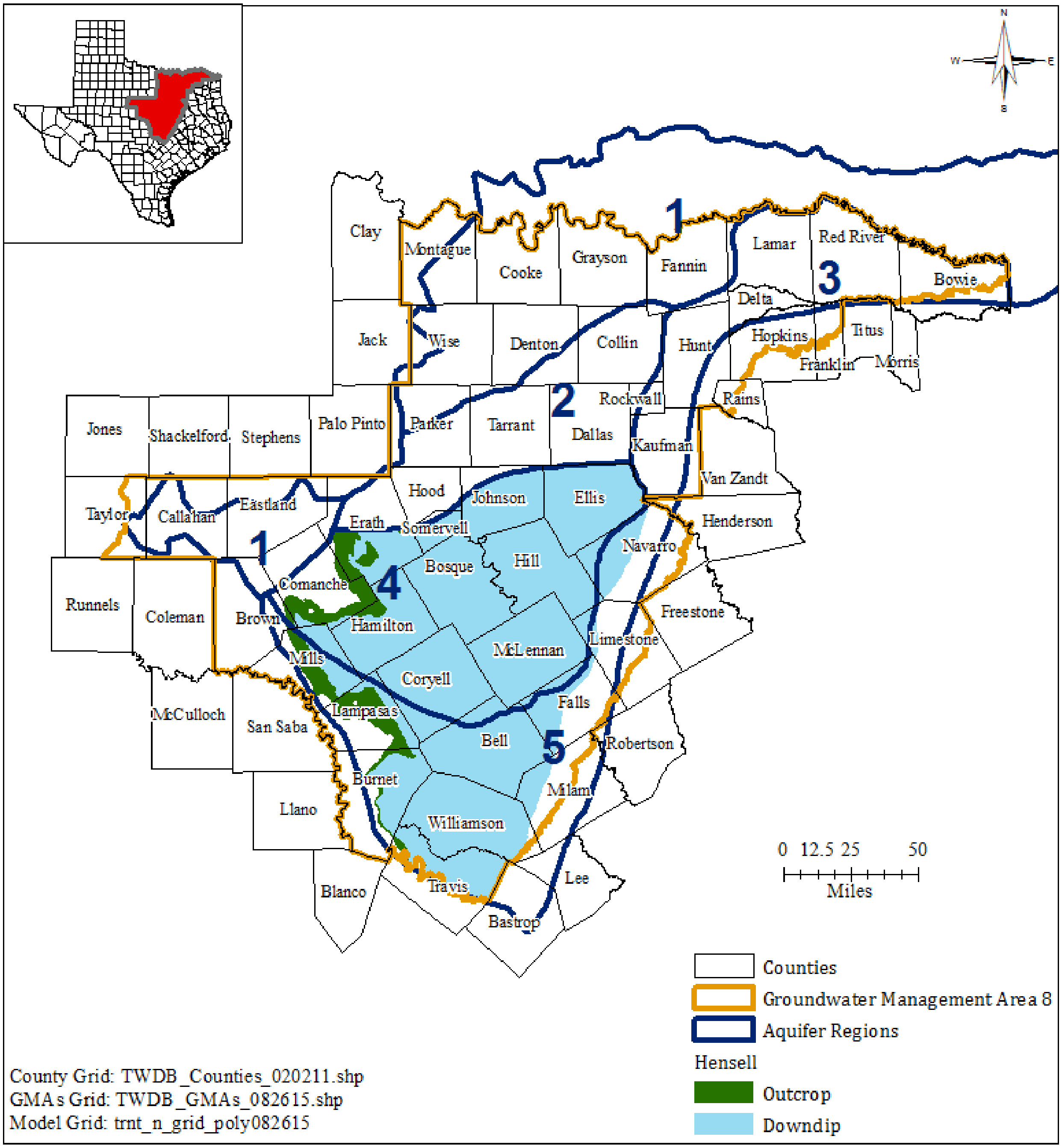


**FIGURE 5.** **MAP SHOWING THE TRINITY AQUIFER (HENSELL) WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF TRINITY AND WOODBINE AQUIFERS. SEE APPENDIX A FOR AQUIFER REGION DETAILS.**

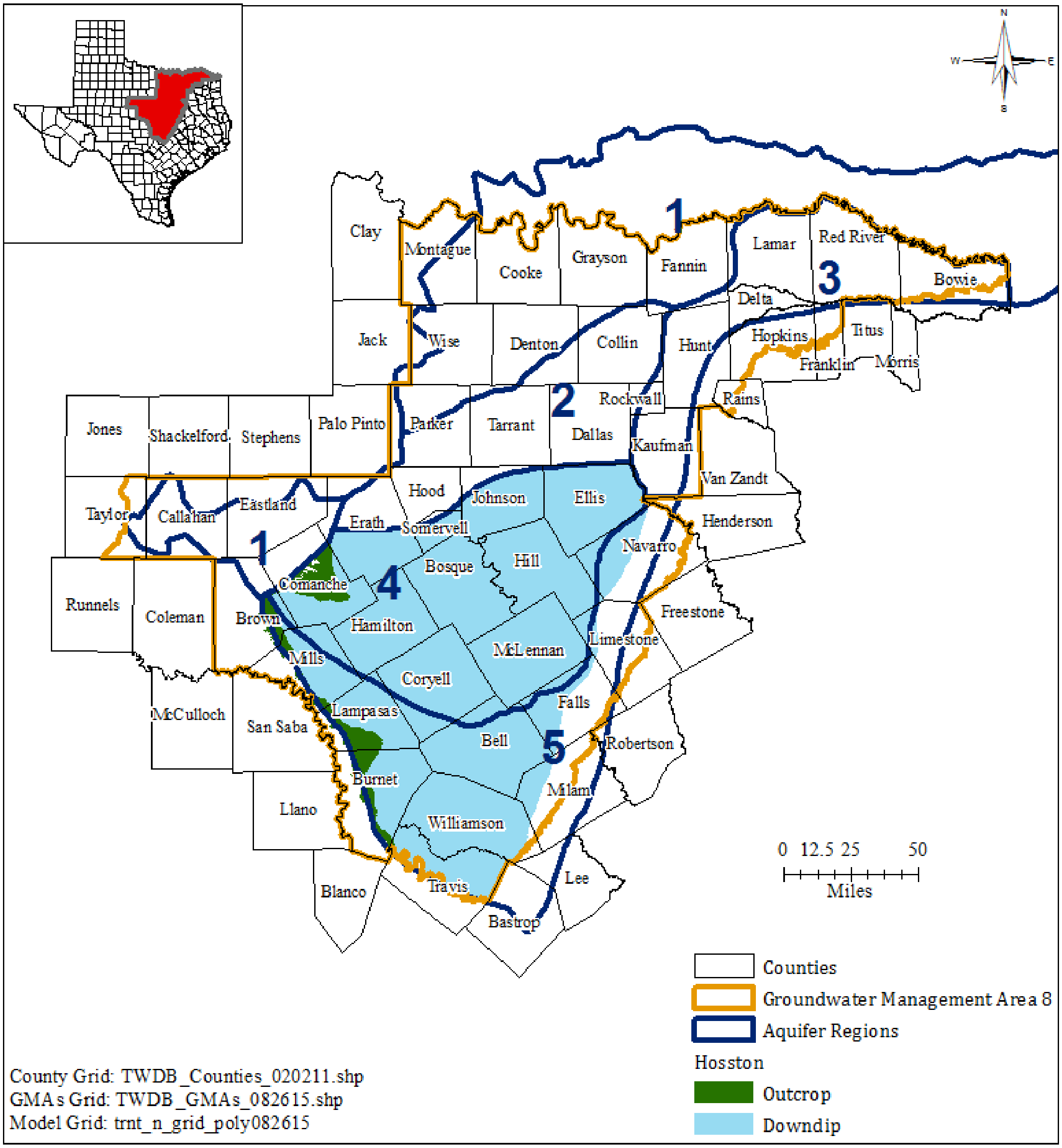


**FIGURE 6. MAP SHOWING THE TRINITY AQUIFER (HOSSTON) WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR NORTHERN PORTION OF THE TRINITY AND WOODBINE AQUIFERS. SEE APPENDIX A FOR AQUIFER REGION DETAILS.**

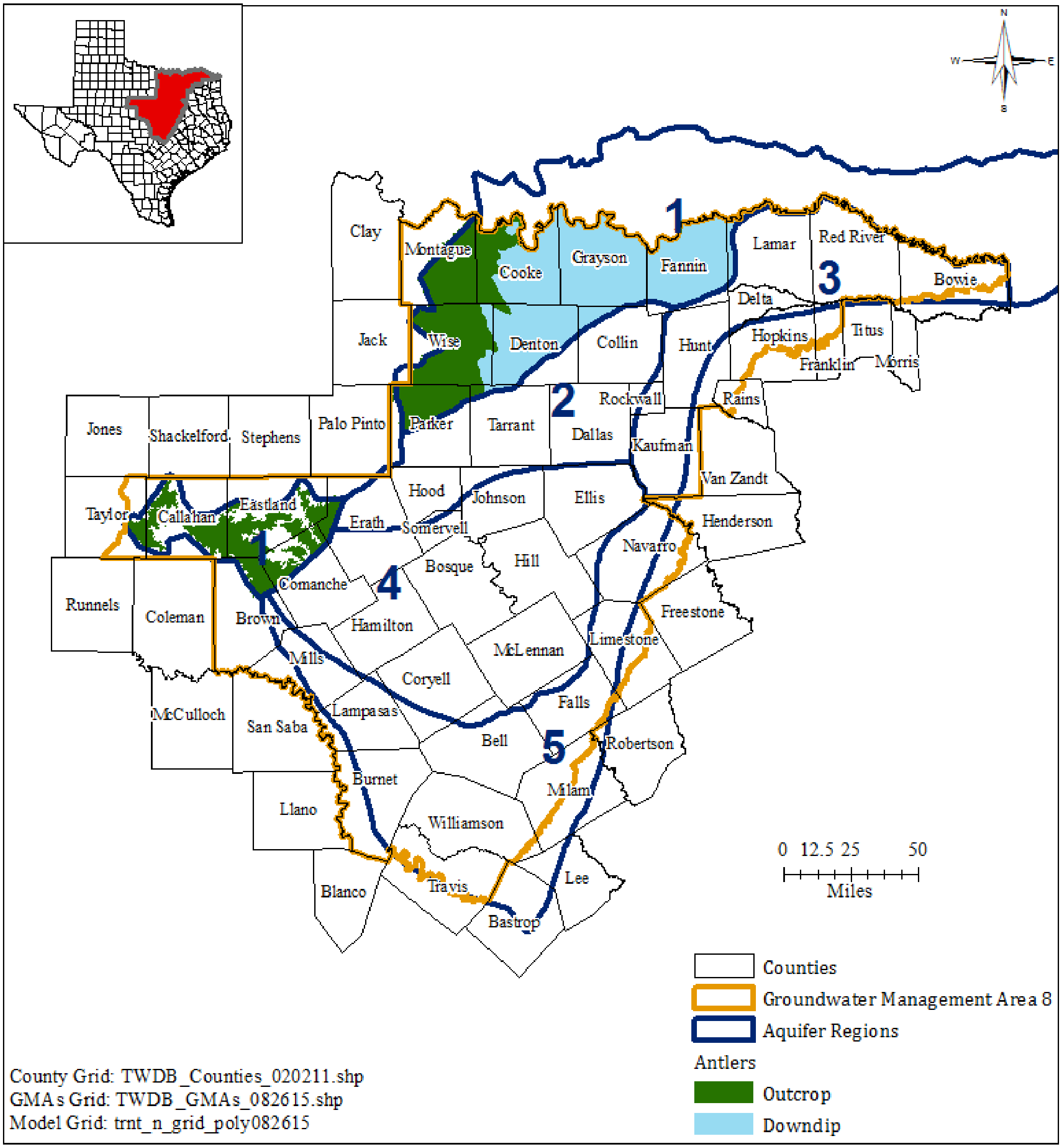


**FIGURE 7. MAP SHOWING THE TRINITY AQUIFER (ANTLERS) WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF TRINITY AND WOODBINE AQUIFERS. SEE APPENDIX A FOR AQUIFER REGION DETAILS.**

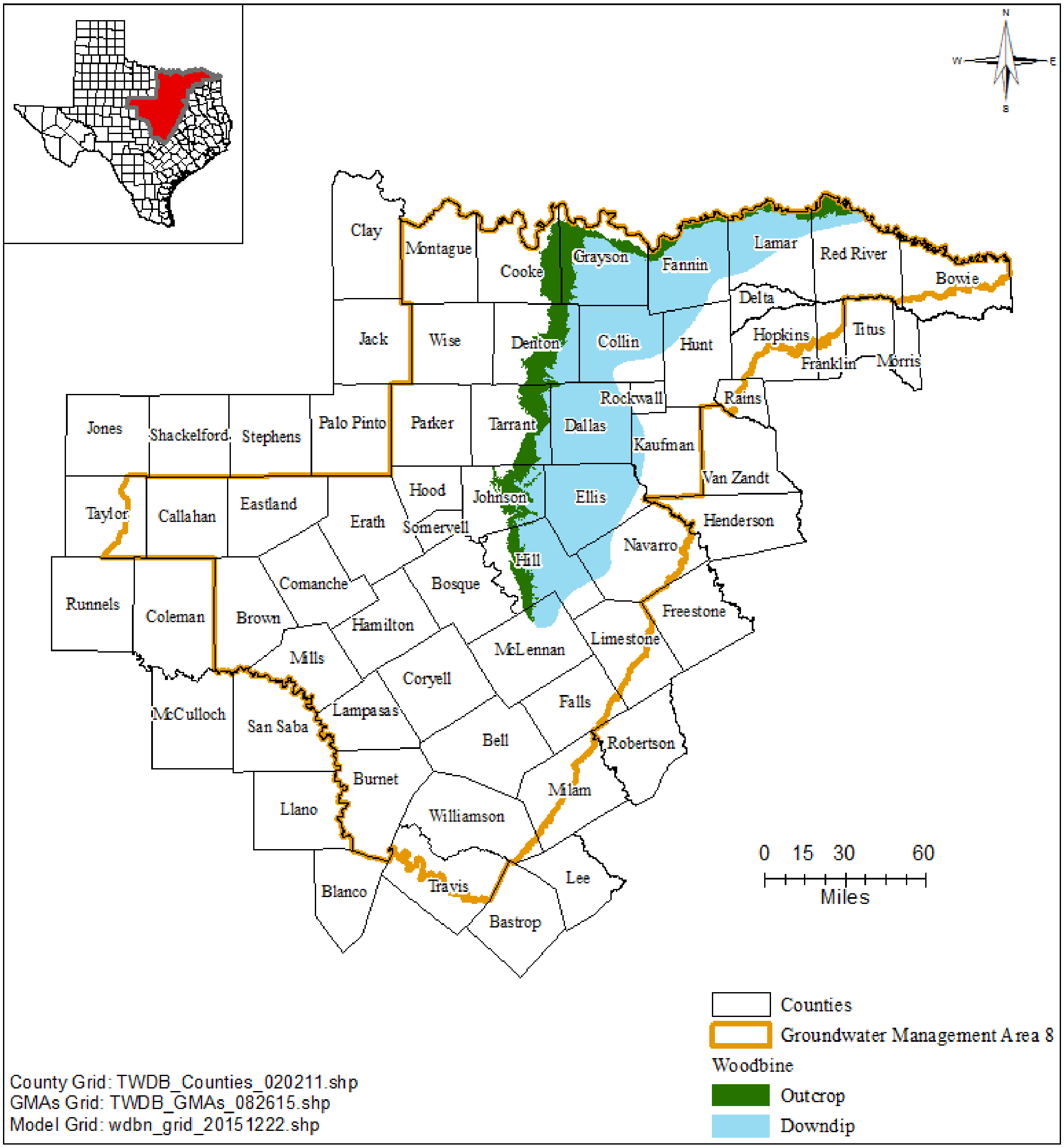


**FIGURE 8. MAP SHOWING THE WOODBINE AQUIFER WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF TRINITY AND WOODBINE AQUIFERS.**

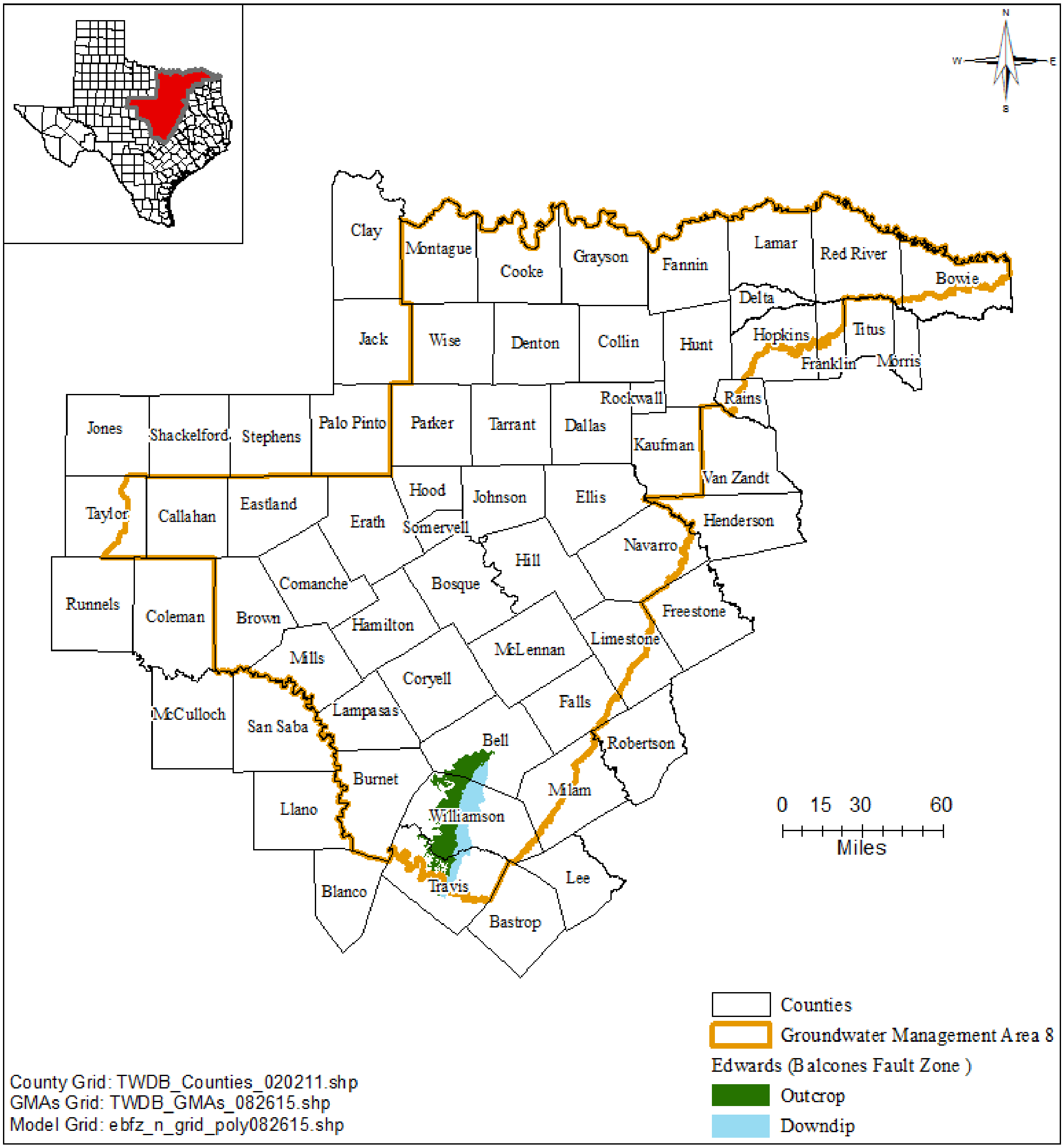


**FIGURE 9. MAP SHOWING THE EDWARDS (BALCONES FAULT ZONE) AQUIFER WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN SEGMENT OF EDWARDS (BALCONES FAULT ZONE) AQUIFER.**

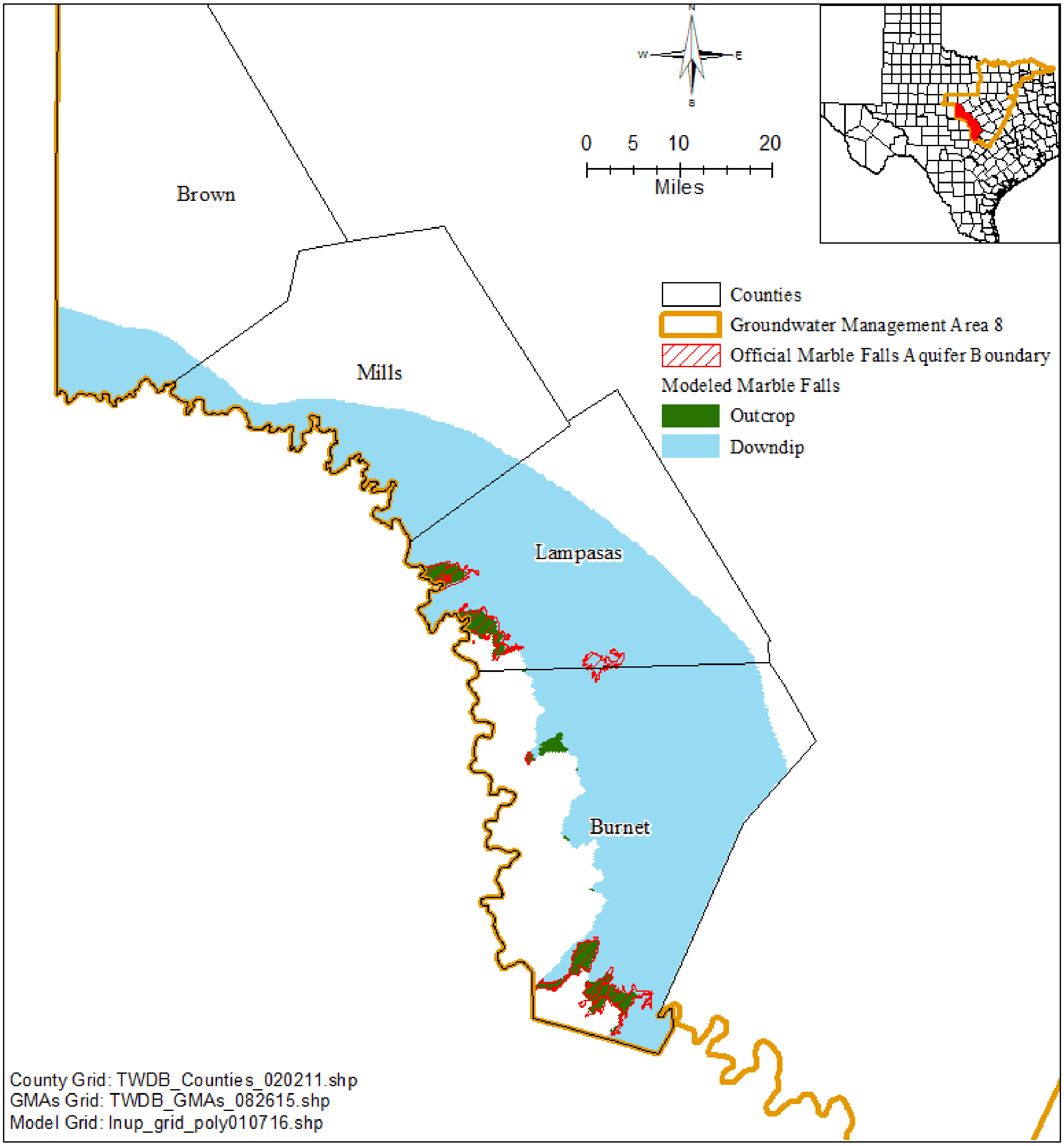


**FIGURE 10. MAP SHOWING THE MARBLE FALLS AQUIFER WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE MINOR AQUIFERS IN THE LLANO UPLIFT REGION.**

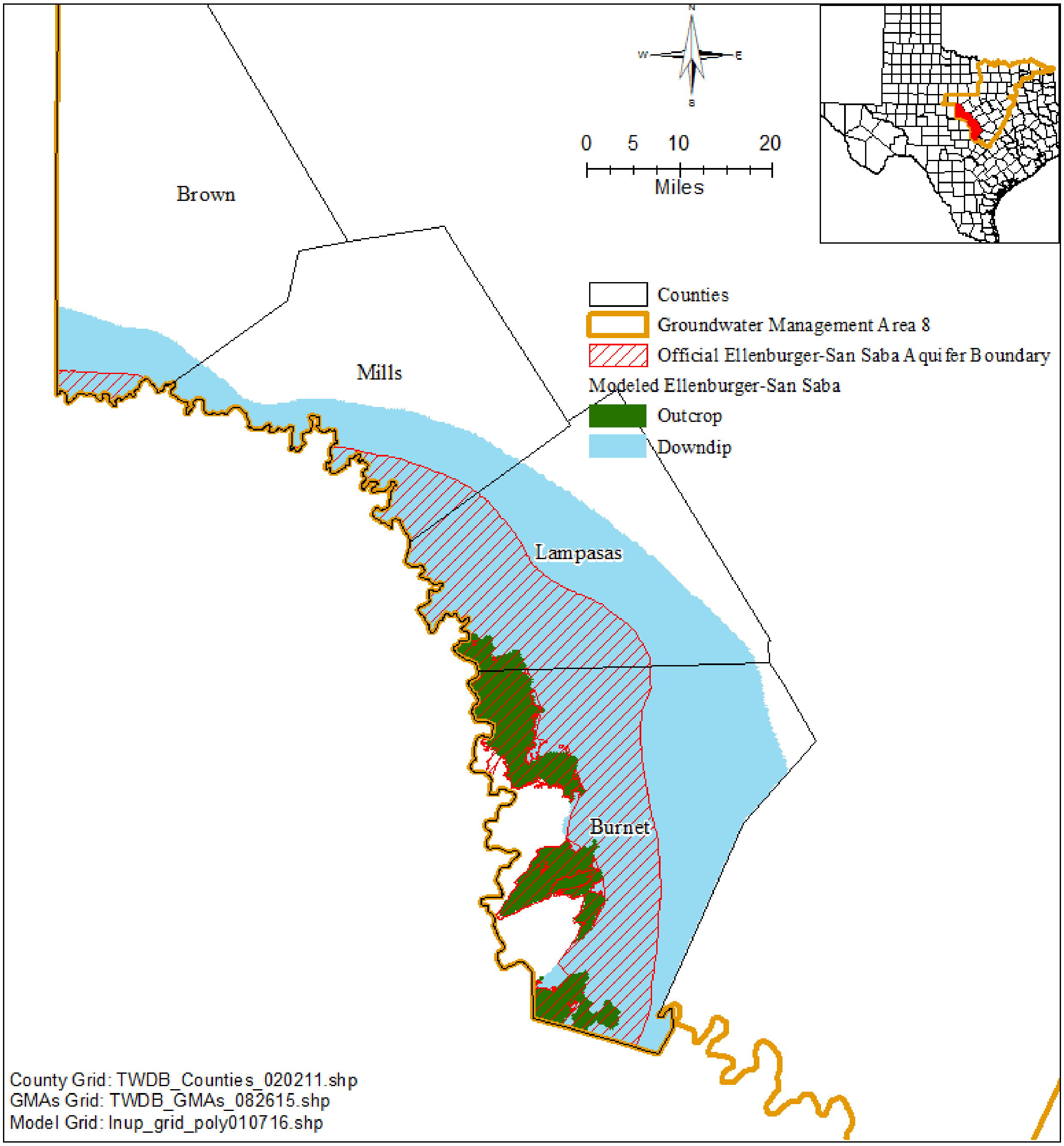


**FIGURE 11. MAP SHOWING THE ELLENBURGER-SAN SABA AQUIFER WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE MINOR AQUIFERS IN THE LLANO UPLIFT REGION.**

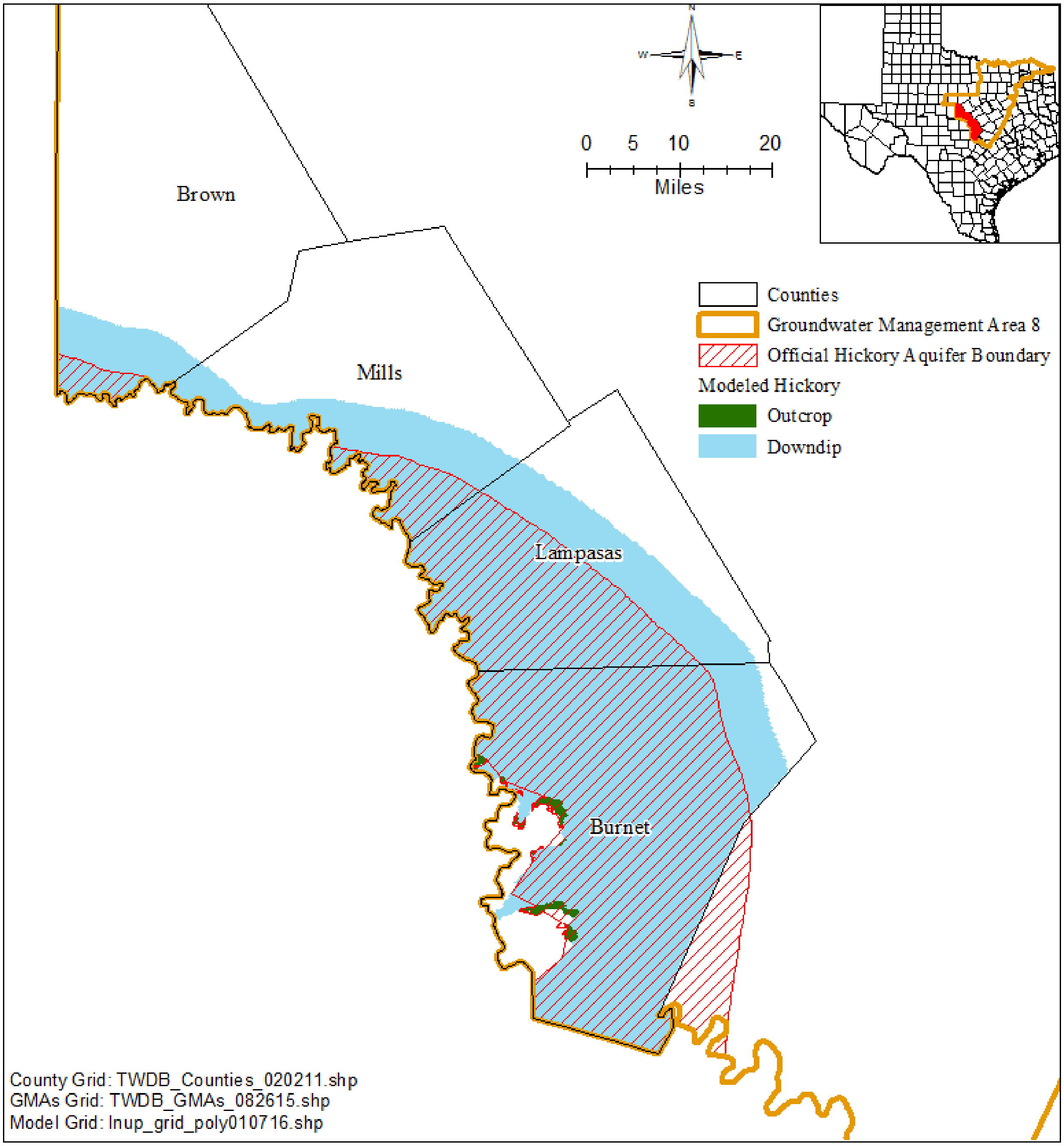


**FIGURE 12. MAP SHOWING THE HICKORY AQUIFER WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE MINOR AQUIFERS IN THE LLANO UPLIFT REGION.**

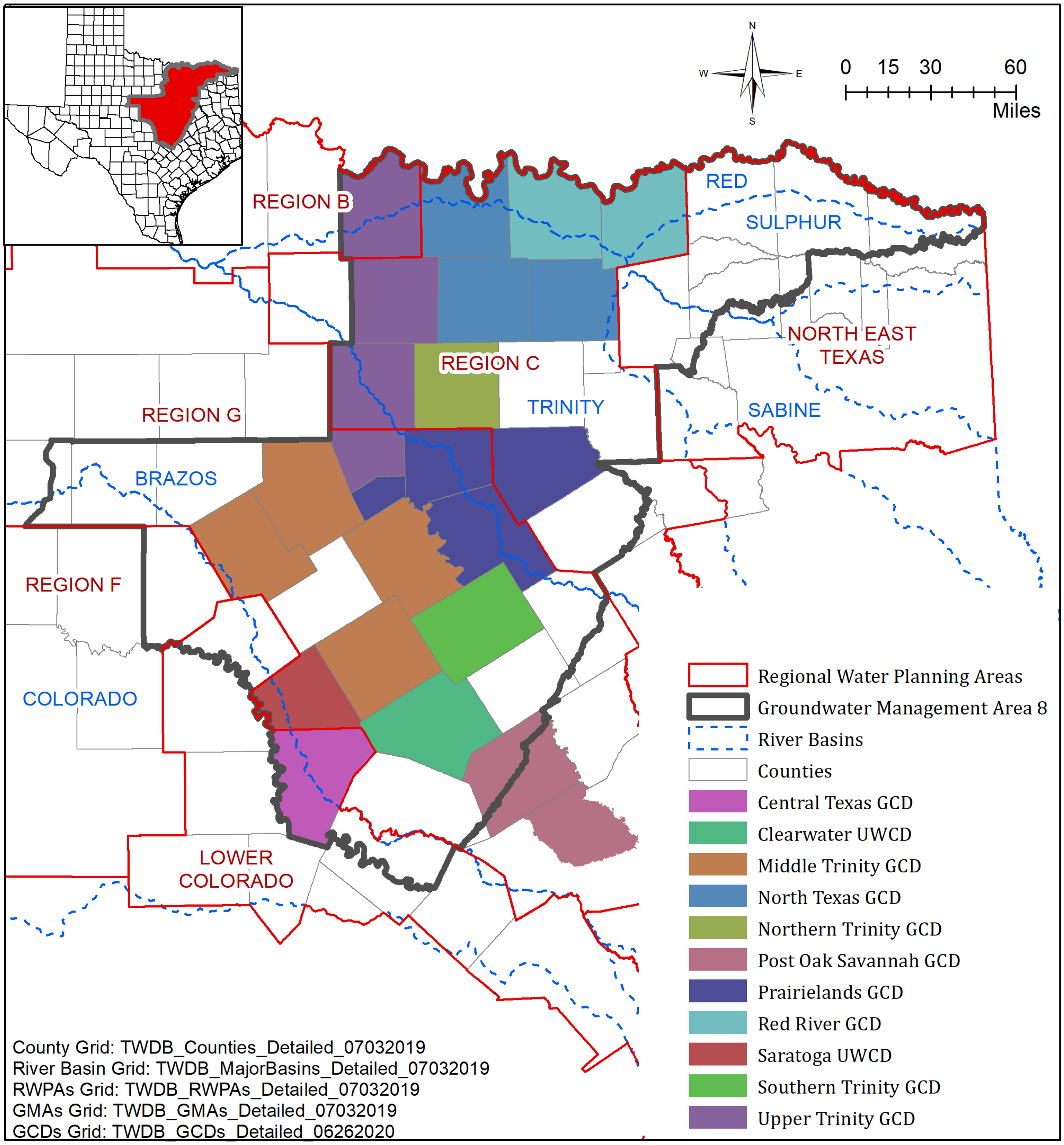


**FIGURE 13. MAP SHOWING REGIONAL WATER PLANNING AREAS (RWPAs), GROUNDWATER CONSERVATION DISTRICTS (GCDs), AND RIVER BASINS ASSOCIATED WITH GROUNDWATER MANAGEMENT AREA 8.**

**TABLE 5. MODELED AVAILABLE GROUNDWATER FOR THE TRINITY AQUIFER (PALUXY) IN GROUNDWATER MANAGEMENT AREA (GMA) 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.**

| GCD | County | Aquifer | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 |
|---|---|---|---|---|---|---|---|---|---|
| Clearwater UWCD* | Bell | Paluxy | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Clearwater UWCD Total** | | **Paluxy** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| Middle Trinity GCD | Bosque | Paluxy | 357 | 357 | 357 | 357 | 357 | 357 | 357 |
| Middle Trinity GCD | Coryell | Paluxy | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Middle Trinity GCD | Erath | Paluxy | 61 | 61 | 61 | 61 | 61 | 61 | 61 |
| **Middle Trinity GCD Total** | | **Paluxy** | **418** | **418** | **418** | **418** | **418** | **418** | **418** |
| North Texas GCD | Collin | Paluxy | 1,548 | 1,548 | 1,548 | 1,548 | 1,548 | 1,548 | 1,548 |
| North Texas GCD | Denton | Paluxy | 4,823 | 4,823 | 4,823 | 4,823 | 4,823 | 4,823 | 4,823 |
| **North Texas GCD Total** | | **Paluxy** | **6,371** | **6,371** | **6,371** | **6,371** | **6,371** | **6,371** | **6,371** |
| Northern Trinity GCD | Tarrant | Paluxy | 8,963 | 8,963 | 8,963 | 8,963 | 8,963 | 8,963 | 8,963 |
| **Northern Trinity GCD Total** | | **Paluxy** | **8,963** | **8,963** | **8,963** | **8,963** | **8,963** | **8,963** | **8,963** |
| Prairielands GCD | Ellis | Paluxy | 442 | 442 | 442 | 442 | 442 | 442 | 442 |
| Prairielands GCD | Hill | Paluxy | 352 | 352 | 352 | 352 | 352 | 352 | 352 |
| Prairielands GCD | Johnson | Paluxy | 2,442 | 2,442 | 2,442 | 2,442 | 2,442 | 2,442 | 2,442 |
| Prairielands GCD | Somervell | Paluxy | 14 | 14 | 14 | 14 | 14 | 14 | 14 |
| **Prairielands GCD Total** | | **Paluxy** | **3,250** | **3,250** | **3,250** | **3,250** | **3,250** | **3,250** | **3,250** |
| Red River GCD | Fannin | Paluxy | 2,088 | 2,088 | 2,088 | 2,088 | 2,088 | 2,088 | 2,088 |
| Red River GCD | Grayson | Paluxy | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Red River GCD Total** | | **Paluxy** | **2,088** | **2,088** | **2,088** | **2,088** | **2,088** | **2,088** | **2,088** |
| Southern Trinity GCD | McLennan | Paluxy | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Southern Trinity GCD Total** | | **Paluxy** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |

**TABLE 5 (CONT). MODELED AVAILABLE GROUNDWATER FOR THE TRINITY AQUIFER (PALUXY) IN GROUNDWATER MANAGEMENT AREA (GMA) 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.**

| GCD | County | Aquifer | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 |
|---|---|---|---|---|---|---|---|---|---|
| Upper Trinity GCD | Hood | Paluxy (outcrop) | 159 | 159 | 159 | 159 | 159 | 159 | 159 |
| Upper Trinity GCD | Parker | Paluxy (outcrop) | 2,609 | 2,609 | 2,609 | 2,609 | 2,609 | 2,609 | 2,609 |
| Upper Trinity GCD | Parker | Paluxy (downdip) | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| **Upper Trinity GCD Total** | | **Paluxy** | **2,818** | **2,818** | **2,818** | **2,818** | **2,818** | **2,818** | **2,818** |
| No District | Dallas | Paluxy | 359 | 359 | 359 | 359 | 359 | 359 | 359 |
| No District | Delta | Paluxy | 56 | 56 | 56 | 56 | 56 | 56 | 56 |
| No District | Falls | Paluxy | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| No District | Hamilton | Paluxy | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| No District | Hunt | Paluxy | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| No District | Kaufman | Paluxy | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| No District | Lamar | Paluxy | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| No District | Limestone | Paluxy | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| No District | Mills | Paluxy | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| No District | Navarro | Paluxy | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| No District | Red River | Paluxy | 177 | 177 | 177 | 177 | 177 | 177 | 177 |
| No District | Rockwall | Paluxy | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **No District Total** | | **Paluxy** | **609** | **609** | **609** | **609** | **609** | **609** | **609** |
| **GMA 8 Total** | | **Paluxy** | **24,517** | **24,517** | **24,517** | **24,517** | **24,517** | **24,517** | **24,517** |

*UWCD: Underground Water Conservation District.

**TABLE 6. MODELED AVAILABLE GROUNDWATER FOR THE TRINITY AQUIFER (GLEN ROSE) IN GROUNDWATER MANAGEMENT AREA (GMA) 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.**

| GCD | County | Aquifer | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 |
|---|---|---|---|---|---|---|---|---|---|
| Central Texas GCD | Burnet | Glen Rose | 148 | 148 | 148 | 148 | 148 | 148 | 148 |
| **Central Texas GCD Total** | | **Glen Rose** | **148** | **148** | **148** | **148** | **148** | **148** | **148** |
| Clearwater UWCD | Bell | Glen Rose | 275 | 275 | 275 | 275 | 275 | 275 | 275 |
| **Clearwater UWCD Total** | | **Glen Rose** | **275** | **275** | **275** | **275** | **275** | **275** | **275** |
| Middle Trinity GCD | Bosque | Glen Rose | 729 | 729 | 729 | 729 | 729 | 729 | 729 |
| Middle Trinity GCD | Comanche | Glen Rose | 41 | 41 | 41 | 41 | 41 | 41 | 41 |
| Middle Trinity GCD | Coryell | Glen Rose | 120 | 120 | 120 | 120 | 120 | 120 | 120 |
| Middle Trinity GCD | Erath | Glen Rose | 1,078 | 1,078 | 1,078 | 1,078 | 1,078 | 1,078 | 1,078 |
| **Middle Trinity GCD Total** | | **Glen Rose** | **1,968** | **1,968** | **1,968** | **1,968** | **1,968** | **1,968** | **1,968** |
| North Texas GCD | Collin | Glen Rose | 83 | 83 | 83 | 83 | 83 | 83 | 83 |
| North Texas GCD | Denton | Glen Rose | 339 | 339 | 339 | 339 | 339 | 339 | 339 |
| **North Texas GCD Total** | | **Glen Rose** | **422** | **422** | **422** | **422** | **422** | **422** | **422** |
| Northern Trinity GCD | Tarrant | Glen Rose | 793 | 793 | 793 | 793 | 793 | 793 | 793 |
| **Northern Trinity GCD Total** | | **Glen Rose** | **793** | **793** | **793** | **793** | **793** | **793** | **793** |
| Post Oak Savannah GCD | Milam | Glen Rose | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Post Oak Savannah GCD Total** | | **Glen Rose** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| Prairielands GCD | Ellis | Glen Rose | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Prairielands GCD | Hill | Glen Rose | 115 | 115 | 115 | 115 | 115 | 115 | 115 |
| Prairielands GCD | Johnson | Glen Rose | 1,633 | 1,633 | 1,633 | 1,633 | 1,633 | 1,633 | 1,633 |
| Prairielands GCD | Somervell | Glen Rose | 146 | 146 | 146 | 146 | 146 | 146 | 146 |
| **Prairielands GCD Total** | | **Glen Rose** | **1,944** | **1,944** | **1,944** | **1,944** | **1,944** | **1,944** | **1,944** |
| Red River GCD | Fannin | Glen Rose | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Red River GCD | Grayson | Glen Rose | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Red River GCD Total** | | **Glen Rose** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |

**TABLE 6 (CONT). MODELED AVAILABLE GROUNDWATER FOR THE TRINITY AQUIFER (GLEN ROSE) IN GROUNDWATER MANAGEMENT AREA (GMA) 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.**

| GCD | County | Aquifer | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 |
|---|---|---|---|---|---|---|---|---|---|
| Saratoga UWCD | Lampasas | Glen Rose | 68 | 68 | 68 | 68 | 68 | 68 | 68 |
| **Saratoga UWCD Total** | | **Glen Rose** | **68** | **68** | **68** | **68** | **68** | **68** | **68** |
| Southern Trinity GCD | McLennan | Glen Rose | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Southern Trinity GCD Total** | | **Glen Rose** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| Upper Trinity GCD | Hood | Glen Rose (outcrop) | 790 | 790 | 790 | 790 | 790 | 790 | 790 |
| Upper Trinity GCD | Hood | Glen Rose (downdip) | 124 | 124 | 124 | 124 | 124 | 124 | 124 |
| Upper Trinity GCD | Parker | Glen Rose (outcrop) | 3,685 | 3,685 | 3,685 | 3,685 | 3,685 | 3,685 | 3,685 |
| Upper Trinity GCD | Parker | Glen Rose (downdip) | 1,406 | 1,406 | 1,406 | 1,406 | 1,406 | 1,406 | 1,406 |
| **Upper Trinity GCD Total** | | | **6,005** | **6,005** | **6,005** | **6,005** | **6,005** | **6,005** | **6,005** |
| No District | Brown | Glen Rose | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| No District | Dallas | Glen Rose | 131 | 131 | 131 | 131 | 131 | 131 | 131 |
| No District | Delta | Glen Rose | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| No District | Falls | Glen Rose | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| No District | Hamilton | Glen Rose | 218 | 218 | 218 | 218 | 218 | 218 | 218 |
| No District | Hunt | Glen Rose | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| No District | Kaufman | Glen Rose | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| No District | Lamar | Glen Rose | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| No District | Limestone | Glen Rose | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| No District | Mills | Glen Rose | 189 | 189 | 189 | 189 | 189 | 189 | 189 |
| No District | Navarro | Glen Rose | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| No District | Red River | Glen Rose | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| No District | Rockwall | Glen Rose | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| No District | Travis | Glen Rose | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| No District | Williamson | Glen Rose | 149 | 149 | 149 | 149 | 149 | 149 | 149 |
| **No District Total** | | **Glen Rose** | **787** | **787** | **787** | **787** | **787** | **787** | **787** |
| **GMA 8 Total** | | **Glen Rose** | **12,410** | **12,410** | **12,410** | **12,410** | **12,410** | **12,410** | **12,410** |

*UWCD: Underground Water Conservation District.

**TABLE 7. MODELED AVAILABLE GROUNDWATER FOR THE TRINITY AQUIFER (TWIN MOUNTAINS) IN GROUNDWATER MANAGEMENT AREA (GMA) 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.**

| GCD | County | Aquifer | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 |
|---|---|---|---|---|---|---|---|---|---|
| Middle Trinity GCD | Erath | Twin Mountains | 5,017 | 5,017 | 5,017 | 5,017 | 5,017 | 5,017 | 5,017 |
| **Middle Trinity GCD Total** | | **Twin Mountains** | **5,017** | **5,017** | **5,017** | **5,017** | **5,017** | **5,017** | **5,017** |
| North Texas GCD | Collin | Twin Mountains | 2,202 | 2,202 | 2,202 | 2,202 | 2,202 | 2,202 | 2,202 |
| North Texas GCD | Denton | Twin Mountains | 8,372 | 8,372 | 8,372 | 8,372 | 8,372 | 8,372 | 8,372 |
| **North Texas GCD Total** | | **Twin Mountains** | **10,574** | **10,574** | **10,574** | **10,574** | **10,574** | **10,574** | **10,574** |
| Northern Trinity GCD | Tarrant | Twin Mountains | 6,922 | 6,922 | 6,922 | 6,922 | 6,922 | 6,922 | 6,922 |
| **Northern Trinity GCD Total** | | **Twin Mountains** | **6,922** | **6,922** | **6,922** | **6,922** | **6,922** | **6,922** | **6,922** |
| Prairielands GCD | Ellis | Twin Mountains | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Prairielands GCD | Johnson | Twin Mountains | 278 | 278 | 278 | 278 | 278 | 278 | 278 |
| Prairielands GCD | Somervell | Twin Mountains | 65 | 65 | 65 | 65 | 65 | 65 | 65 |
| **Prairielands GCD Total** | | **Twin Mountains** | **343** | **343** | **343** | **343** | **343** | **343** | **343** |
| Red River GCD | Fannin | Twin Mountains | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Red River GCD | Grayson | Twin Mountains | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Red River GCD Total** | | **Twin Mountains** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| Upper Trinity GCD | Hood (outcrop) | Twin Mountains (outcrop) | 5,024 | 5,024 | 5,024 | 5,024 | 5,024 | 5,024 | 5,024 |
| Upper Trinity GCD | Hood | Twin Mountains (downdip) | 10,619 | 10,619 | 10,619 | 10,619 | 10,619 | 10,619 | 10,619 |
| Upper Trinity GCD | Parker | Twin Mountains (outcrop) | 1,282 | 1,282 | 1,282 | 1,282 | 1,282 | 1,282 | 1,282 |
| Upper Trinity GCD | Parker | Twin Mountains (downdip) | 2,528 | 2,528 | 2,528 | 2,528 | 2,528 | 2,528 | 2,528 |
| **Upper Trinity GCD Total** | | **Twin Mountains** | **19,453** | **19,453** | **19,453** | **19,453** | **19,453** | **19,453** | **19,453** |

**TABLE 7 (CONT). MODELED AVAILABLE GROUNDWATER FOR THE TRINITY AQUIFER (TWIN MOUNTAINS) IN GROUNDWATER MANAGEMENT AREA (GMA) 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.**

| GCD | County | Aquifer | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 |
|---|---|---|---|---|---|---|---|---|---|
| No District | Dallas | Twin Mountains | 3,201 | 3,201 | 3,201 | 3,201 | 3,201 | 3,201 | 3,201 |
| No District | Hunt | Twin Mountains | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| No District | Kaufman | Twin Mountains | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| No District | Rockwall | Twin Mountains | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **No District Total** | | **Twin Mountains** | **3,201** | **3,201** | **3,201** | **3,201** | **3,201** | **3,201** | **3,201** |
| **GMA 8 Total** | | **Twin Mountains** | **45,510** | **45,510** | **45,510** | **45,510** | **45,510** | **45,510** | **45,510** |

**TABLE 8. MODELED AVAILABLE GROUNDWATER FOR THE TRINITY AQUIFER (TRAVIS PEAK) IN GROUNDWATER MANAGEMENT AREA (GMA) 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.**

| GCD | County | Aquifer | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 |
|---|---|---|---|---|---|---|---|---|---|
| Central Texas GCD | Burnet | Travis Peak | 3,742 | 3,742 | 3,742 | 3,742 | 3,742 | 3,742 | 3,742 |
| **Central Texas GCD Total** | | **Travis Peak** | **3,742** | **3,742** | **3,742** | **3,742** | **3,742** | **3,742** | **3,742** |
| Clearwater UWCD[1] | Bell | Travis Peak | 9,000 | 9,000 | 9,000 | 9,000 | 9,000 | 9,000 | 9,000 |
| **Clearwater UWCD Total** | | **Travis Peak** | **9,000** | **9,000** | **9,000** | **9,000** | **9,000** | **9,000** | **9,000** |
| Middle Trinity GCD | Bosque | Travis Peak | 7,683 | 7,683 | 7,683 | 7,683 | 7,683 | 7,683 | 7,683 |
| Middle Trinity GCD | Comanche | Travis Peak | 6,164 | 6,164 | 6,164 | 6,164 | 6,164 | 6,164 | 6,164 |
| Middle Trinity GCD | Coryell | Travis Peak | 4,374 | 4,374 | 4,374 | 4,374 | 4,374 | 4,374 | 4,374 |
| Middle Trinity GCD | Erath | Travis Peak | 11,824 | 11,824 | 11,824 | 11,824 | 11,824 | 11,824 | 11,824 |
| **Middle Trinity GCD Total** | | **Travis Peak** | **30,045** | **30,045** | **30,045** | **30,045** | **30,045** | **30,045** | **30,045** |
| Post Oak Savannah GCD | Milam | Travis Peak | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Post Oak Savannah GCD Total** | | **Travis Peak** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| Prairielands GCD | Ellis | Travis Peak | 5,676 | 5,676 | 5,676 | 5,676 | 5,676 | 5,676 | 5,676 |
| Prairielands GCD | Hill | Travis Peak | 4,685 | 4,685 | 4,685 | 4,685 | 4,685 | 4,685 | 4,685 |
| Prairielands GCD | Johnson | Travis Peak | 4,472 | 4,472 | 4,472 | 4,472 | 4,472 | 4,472 | 4,472 |
| Prairielands GCD | Somervell | Travis Peak | 1,763 | 1,763 | 1,763 | 1,763 | 1,763 | 1,763 | 1,763 |
| **Prairielands GCD Total** | | **Travis Peak** | **16,596** | **16,596** | **16,596** | **16,596** | **16,596** | **16,596** | **16,596** |
| Red River GCD | Fannin | Travis Peak | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Red River GCD Total** | | **Travis Peak** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| Saratoga UWCD | Lampasas | Travis Peak | 1,593 | 1,593 | 1,593 | 1,593 | 1,593 | 1,593 | 1,593 |
| **Saratoga UWCD Total** | | **Travis Peak** | **1,593** | **1,593** | **1,593** | **1,593** | **1,593** | **1,593** | **1,593** |
| Southern Trinity GCD | McLennan | Travis Peak | 20,649 | 20,649 | 20,649 | 20,649 | 20,649 | 20,649 | 20,649 |
| **Southern Trinity GCD Total** | | **Travis Peak** | **20,649** | **20,649** | **20,649** | **20,649** | **20,649** | **20,649** | **20,649** |
| Upper Trinity GCD[2] | Hood | Travis Peak | 122 | 122 | 122 | 122 | 122 | 122 | 122 |
| **Upper Trinity GCD Total[2]** | | **Travis Peak** | **122** | **122** | **122** | **122** | **122** | **122** | **122** |

**TABLE 8 (CONT). MODELED AVAILABLE GROUNDWATER FOR THE TRINITY AQUIFER (TRAVIS PEAK) IN GROUNDWATER MANAGEMENT AREA (GMA) 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.**

| GCD | County | Aquifer | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 |
|---|---|---|---|---|---|---|---|---|---|
| No District | Brown | Travis Peak | 384 | 384 | 384 | 384 | 384 | 384 | 384 |
| No District | Dallas | Travis Peak | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| No District | Delta | Travis Peak | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| No District | Falls | Travis Peak | 1,435 | 1,435 | 1,435 | 1,435 | 1,435 | 1,435 | 1,435 |
| No District | Hamilton | Travis Peak | 2,209 | 2,209 | 2,209 | 2,209 | 2,209 | 2,209 | 2,209 |
| No District | Hunt | Travis Peak | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| No District | Kaufman | Travis Peak | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| No District | Lamar | Travis Peak | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| No District | Limestone | Travis Peak | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| No District | Mills | Travis Peak | 2,264 | 2,264 | 2,264 | 2,264 | 2,264 | 2,264 | 2,264 |
| No District | Navarro | Travis Peak | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| No District | Red River | Travis Peak | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| No District | Travis | Travis Peak | 6,644 | 6,644 | 6,644 | 6,644 | 6,644 | 6,644 | 6,644 |
| No District | Williamson | Travis Peak | 3,548 | 3,548 | 3,548 | 3,548 | 3,548 | 3,548 | 3,548 |
| **No District Total** | | **Travis Peak** | **16,484** | **16,484** | **16,484** | **16,484** | **16,484** | **16,484** | **16,484** |
| **GMA 8 Total** | | **Travis Peak** | **98,231** | **98,231** | **98,231** | **98,231** | **98,231** | **98,231** | **98,231** |

[1]UWCD: Underground Water Conservation District.
[2]Splits for Upper Trinity GCD are presented since they are included in the GMA 8-wide desired future conditions.

**TABLE 9. MODELED AVAILABLE GROUNDWATER FOR THE TRINITY AQUIFER (HENSELL) IN GROUNDWATER MANAGEMENT AREA (GMA) 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.**

| GCD | County | Aquifer | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 |
|---|---|---|---|---|---|---|---|---|---|
| Central Texas GCD | Burnet | Hensell | 2,662 | 2,662 | 2,662 | 2,662 | 2,662 | 2,662 | 2,662 |
| **Central Texas GCD Total** | | **Hensell** | **2,662** | **2,662** | **2,662** | **2,662** | **2,662** | **2,662** | **2,662** |
| Clearwater UWCD[1] | Bell | Hensell | 1,100 | 1,100 | 1,100 | 1,100 | 1,100 | 1,100 | 1,100 |
| **Clearwater UWCD Total** | | **Hensell** | **1,100** | **1,100** | **1,100** | **1,100** | **1,100** | **1,100** | **1,100** |
| Middle Trinity GCD | Bosque | Hensell | 3,837 | 3,837 | 3,837 | 3,837 | 3,837 | 3,837 | 3,837 |
| Middle Trinity GCD | Comanche | Hensell | 204 | 204 | 204 | 204 | 204 | 204 | 204 |
| Middle Trinity GCD | Coryell | Hensell | 2,197 | 2,197 | 2,197 | 2,197 | 2,197 | 2,197 | 2,197 |
| Middle Trinity GCD | Erath | Hensell | 5,141 | 5,141 | 5,141 | 5,141 | 5,141 | 5,141 | 5,141 |
| **Middle Trinity GCD Total** | | **Hensell** | **11,379** | **11,379** | **11,379** | **11,379** | **11,379** | **11,379** | **11,379** |
| Post Oak Savannah GCD | Milam | Hensell | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Post Oak Savannah GCD Total** | | **Hensell** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| Prairielands GCD | Ellis | Hensell | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Prairielands GCD | Hill | Hensell | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| Prairielands GCD | Johnson | Hensell | 119 | 119 | 119 | 119 | 119 | 119 | 119 |
| Prairielands GCD | Somervell | Hensell | 217 | 217 | 217 | 217 | 217 | 217 | 217 |
| **Prairielands GCD Total** | | **Hensell** | **361** | **361** | **361** | **361** | **361** | **361** | **361** |
| Saratoga UWCD | Lampasas | Hensell | 713 | 713 | 713 | 713 | 713 | 713 | 713 |
| **Saratoga UWCD Total** | | **Hensell** | **713** | **713** | **713** | **713** | **713** | **713** | **713** |
| Southern Trinity GCD | McLennan | Hensell | 4,701 | 4,701 | 4,701 | 4,701 | 4,701 | 4,701 | 4,701 |
| **Southern Trinity GCD Total** | | **Hensell** | **4,701** | **4,701** | **4,701** | **4,701** | **4,701** | **4,701** | **4,701** |
| Upper Trinity GCD[2] | Hood | Hensell | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| **Upper Trinity GCD Total[2]** | | **Hensell** | **50** | **50** | **50** | **50** | **50** | **50** | **50** |

**TABLE 9 (CONT). MODELED AVAILABLE GROUNDWATER FOR THE TRINITY AQUIFER (HENSELL) IN GROUNDWATER MANAGEMENT AREA (GMA) 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.**

| GCD | County | Aquifer | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 |
|---|---|---|---|---|---|---|---|---|---|
| No District | Brown | Hensell | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| No District | Dallas | Hensell | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| No District | Falls | Hensell | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| No District | Hamilton | Hensell | 1,672 | 1,672 | 1,672 | 1,672 | 1,672 | 1,672 | 1,672 |
| No District | Kaufman | Hensell | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| No District | Limestone | Hensell | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| No District | Mills | Hensell | 607 | 607 | 607 | 607 | 607 | 607 | 607 |
| No District | Navarro | Hensell | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| No District | Travis | Hensell | 2,269 | 2,269 | 2,269 | 2,269 | 2,269 | 2,269 | 2,269 |
| No District | Williamson | Hensell | 1,599 | 1,599 | 1,599 | 1,599 | 1,599 | 1,599 | 1,599 |
| **No District Total** | | **Hensell** | **6,151** | **6,151** | **6,151** | **6,151** | **6,151** | **6,151** | **6,151** |
| **GMA 8 Total** | | **Hensell** | **27,117** | **27,117** | **27,117** | **27,117** | **27,117** | **27,117** | **27,117** |

[1]UWCD: Underground Water Conservation District.
[2]Splits for Upper Trinity GCD are presented since they are included in the GMA 8-wide desired future conditions.
*Note that the Hensell values in this table represent a portion of the total Travis Peak values already provided in Table 8 and do not represent an additional source of water.

**TABLE 10. MODELED AVAILABLE GROUNDWATER FOR THE TRINITY AQUIFER (HOSSTON) IN GROUNDWATER MANAGEMENT AREA (GMA) 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.**

| GCD | County | Aquifer | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 |
|---|---|---|---|---|---|---|---|---|---|
| Central Texas GCD | Burnet | Hosston | 883 | 883 | 883 | 883 | 883 | 883 | 883 |
| **Central Texas GCD Total** | | **Hosston** | **883** | **883** | **883** | **883** | **883** | **883** | **883** |
| Clearwater UWCD[1] | Bell | Hosston | 7,900 | 7,900 | 7,900 | 7,900 | 7,900 | 7,900 | 7,900 |
| **Clearwater UWCD Total** | | **Hosston** | **7,900** | **7,900** | **7,900** | **7,900** | **7,900** | **7,900** | **7,900** |
| Middle Trinity GCD | Bosque | Hosston | 3,765 | 3,765 | 3,765 | 3,765 | 3,765 | 3,765 | 3,765 |
| Middle Trinity GCD | Comanche | Hosston | 5,869 | 5,869 | 5,869 | 5,869 | 5,869 | 5,869 | 5,869 |
| Middle Trinity GCD | Coryell | Hosston | 2,163 | 2,163 | 2,163 | 2,163 | 2,163 | 2,163 | 2,163 |
| Middle Trinity GCD | Erath | Hosston | 6,387 | 6,387 | 6,387 | 6,387 | 6,387 | 6,387 | 6,387 |
| **Middle Trinity GCD Total** | | **Hosston** | **18,184** | **18,184** | **18,184** | **18,184** | **18,184** | **18,184** | **18,184** |
| Post Oak Savannah GCD | Milam | Hosston | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Post Oak Savannah GCD Total** | | **Hosston** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| Prairielands GCD | Ellis | Hosston | 5,545 | 5,545 | 5,545 | 5,545 | 5,545 | 5,545 | 5,545 |
| Prairielands GCD | Hill | Hosston | 3,610 | 3,610 | 3,610 | 3,610 | 3,610 | 3,610 | 3,610 |
| Prairielands GCD | Johnson | Hosston | 4,251 | 4,251 | 4,251 | 4,251 | 4,251 | 4,251 | 4,251 |
| Prairielands GCD | Somervell | Hosston | 930 | 930 | 930 | 930 | 930 | 930 | 930 |
| **Prairielands GCD Total** | | **Hosston** | **14,336** | **14,336** | **14,336** | **14,336** | **14,336** | **14,336** | **14,336** |
| Saratoga UWCD | Lampasas | Hosston | 849 | 849 | 849 | 849 | 849 | 849 | 849 |
| **Saratoga UWCD Total** | | **Hosston** | **849** | **849** | **849** | **849** | **849** | **849** | **849** |
| Southern Trinity GCD | McLennan | Hosston | 15,948 | 15,948 | 15,948 | 15,948 | 15,948 | 15,948 | 15,948 |
| **Southern Trinity GCD Total** | | **Hosston** | **15,948** | **15,948** | **15,948** | **15,948** | **15,948** | **15,948** | **15,948** |
| Upper Trinity GCD[2] | Hood | Hosston | 72 | 72 | 72 | 72 | 72 | 72 | 72 |
| **Upper Trinity GCD Total[2]** | | **Hosston** | **72** | **72** | **72** | **72** | **72** | **72** | **72** |

**TABLE 10 (CONT). MODELED AVAILABLE GROUNDWATER FOR THE TRINITY AQUIFER (HOSSTON) IN GROUNDWATER MANAGEMENT AREA (GMA) 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.**

| GCD | County | Aquifer | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 |
|---|---|---|---|---|---|---|---|---|---|
| No District | Brown | Hosston | 346 | 346 | 346 | 346 | 346 | 346 | 346 |
| No District | Dallas | Hosston | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| No District | Falls | Hosston | 1,435 | 1,435 | 1,435 | 1,435 | 1,435 | 1,435 | 1,435 |
| No District | Hamilton | Hosston | 385 | 385 | 385 | 385 | 385 | 385 | 385 |
| No District | Kaufman | Hosston | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| No District | Limestone | Hosston | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| No District | Mills | Hosston | 1,455 | 1,455 | 1,455 | 1,455 | 1,455 | 1,455 | 1,455 |
| No District | Navarro | Hosston | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| No District | Travis | Hosston | 4,185 | 4,185 | 4,185 | 4,185 | 4,185 | 4,185 | 4,185 |
| No District | Williamson | Hosston | 1,750 | 1,750 | 1,750 | 1,750 | 1,750 | 1,750 | 1,750 |
| **No District Total** | | **Hosston** | **9,556** | **9,556** | **9,556** | **9,556** | **9,556** | **9,556** | **9,556** |
| **GMA 8 Total** | | **Hosston** | **67,728** | **67,728** | **67,728** | **67,728** | **67,728** | **67,728** | **67,728** |

[1]UWCD: Underground Water Conservation District.
[2]Splits for Upper Trinity GCD are presented since they are included in the GMA 8-wide desired future conditions.
*Note that the Hosston values in this table represent a portion of the total Travis Peak values already provided in Table 8 and do not represent an additional source of water.

**TABLE 11. MODELED AVAILABLE GROUNDWATER FOR THE TRINITY AQUIFER (ANTLERS) IN GROUNDWATER MANAGEMENT AREA (GMA) 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.**

| GCD | County | Aquifer | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 |
|---|---|---|---|---|---|---|---|---|---|
| Middle Trinity GCD | Comanche | Antlers | 5,843 | 5,843 | 5,843 | 5,843 | 5,843 | 5,843 | 5,843 |
| Middle Trinity GCD | Erath | Antlers | 2,627 | 2,627 | 2,627 | 2,627 | 2,627 | 2,627 | 2,627 |
| **Middle Trinity GCD Total** | | **Antlers** | **8,470** | **8,470** | **8,470** | **8,470** | **8,470** | **8,470** | **8,470** |
| North Texas GCD | Collin | Antlers | 1,962 | 1,962 | 1,962 | 1,962 | 1,962 | 1,962 | 1,962 |
| North Texas GCD | Cooke | Antlers | 10,522 | 10,522 | 10,522 | 10,522 | 10,522 | 10,522 | 10,522 |
| North Texas GCD | Denton | Antlers | 16,557 | 16,557 | 16,557 | 16,557 | 16,557 | 16,557 | 16,557 |
| **North Texas GCD Total** | | **Antlers** | **29,041** | **29,041** | **29,041** | **29,041** | **29,041** | **29,041** | **29,041** |
| Northern Trinity GCD | Tarrant | Antlers | 1,248 | 1,248 | 1,248 | 1,248 | 1,248 | 1,248 | 1,248 |
| **Northern Trinity GCD Total** | | **Antlers** | **1,248** | **1,248** | **1,248** | **1,248** | **1,248** | **1,248** | **1,248** |
| Red River GCD | Fannin | Antlers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Red River GCD | Grayson | Antlers | 10,716 | 10,716 | 10,716 | 10,716 | 10,716 | 10,716 | 10,716 |
| **Red River GCD Total** | | **Antlers** | **10,716** | **10,716** | **10,716** | **10,716** | **10,716** | **10,716** | **10,716** |
| Upper Trinity GCD | Montague | Antlers (outcrop) | 6,103 | 6,103 | 6,103 | 6,103 | 6,103 | 6,103 | 6,103 |
| Upper Trinity GCD | Parker | Antlers (outcrop) | 2,889 | 2,889 | 2,889 | 2,889 | 2,889 | 2,889 | 2,889 |
| Upper Trinity GCD | Wise | Antlers (outcrop) | 9,013 | 9,013 | 9,013 | 9,013 | 9,013 | 9,013 | 9,013 |
| Upper Trinity GCD | Wise | Antlers (downdip) | 2,439 | 2,439 | 2,439 | 2,439 | 2,439 | 2,439 | 2,439 |
| **Upper Trinity GCD Total** | | **Antlers** | **20,444** | **20,444** | **20,444** | **20,444** | **20,444** | **20,444** | **20,444** |
| No District | Brown | Antlers | 1,043 | 1,043 | 1,043 | 1,043 | 1,043 | 1,043 | 1,043 |
| No District | Callahan | Antlers | 1,726 | 1,726 | 1,726 | 1,726 | 1,726 | 1,726 | 1,726 |
| No District | Eastland | Antlers | 5,736 | 5,736 | 5,736 | 5,736 | 5,736 | 5,736 | 5,736 |
| No District | Lamar | Antlers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| No District | Red River | Antlers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| No District | Taylor | Antlers | 13 | 13 | 13 | 13 | 13 | 13 | 13 |
| **No District Total** | | **Antlers** | **8,518** | **8,518** | **8,518** | **8,518** | **8,518** | **8,518** | **8,518** |
| **GMA 8 Total** | | **Antlers** | **78,437** | **78,437** | **78,437** | **78,437** | **78,437** | **78,437** | **78,437** |

**TABLE 12. MODELED AVAILABLE GROUNDWATER FOR THE WOODBINE AQUIFER IN GROUNDWATER MANAGEMENT AREA (GMA) 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.**

| GCD | County | Aquifer | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 |
|---|---|---|---|---|---|---|---|---|---|
| North Texas GCD | Collin | Woodbine | 4,254 | 4,254 | 4,254 | 4,254 | 4,254 | 4,254 | 4,254 |
| North Texas GCD | Cooke | Woodbine | 800 | 800 | 800 | 800 | 800 | 800 | 800 |
| North Texas GCD | Denton | Woodbine | 3,609 | 3,609 | 3,609 | 3,609 | 3,609 | 3,609 | 3,609 |
| **North Texas GCD Total** | | **Woodbine** | **8,663** | **8,663** | **8,663** | **8,663** | **8,663** | **8,663** | **8,663** |
| Northern Trinity GCD | Tarrant | Woodbine | 1,139 | 1,139 | 1,139 | 1,139 | 1,139 | 1,139 | 1,139 |
| **Northern Trinity GCD Total** | | **Woodbine** | **1,139** | **1,139** | **1,139** | **1,139** | **1,139** | **1,139** | **1,139** |
| Prairielands GCD | Ellis | Woodbine | 2,074 | 2,074 | 2,074 | 2,074 | 2,074 | 2,074 | 2,074 |
| Prairielands GCD | Hill | Woodbine | 587 | 587 | 587 | 587 | 587 | 587 | 587 |
| Prairielands GCD | Johnson | Woodbine | 1,981 | 1,981 | 1,981 | 1,981 | 1,981 | 1,981 | 1,981 |
| **Prairielands GCD Total** | | **Woodbine** | **4,642** | **4,642** | **4,642** | **4,642** | **4,642** | **4,642** | **4,642** |
| Red River GCD | Fannin | Woodbine | 4,924 | 4,924 | 4,924 | 4,924 | 4,924 | 4,924 | 4,924 |
| Red River GCD | Grayson | Woodbine | 7,526 | 7,526 | 7,526 | 7,526 | 7,526 | 7,526 | 7,526 |
| **Red River GCD Total** | | **Woodbine** | **12,450** | **12,450** | **12,450** | **12,450** | **12,450** | **12,450** | **12,450** |
| Southern Trinity GCD | McLennan | Woodbine | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Southern Trinity GCD Total** | | **Woodbine** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| No District | Dallas | Woodbine | 2,798 | 2,798 | 2,798 | 2,798 | 2,798 | 2,798 | 2,798 |
| No District | Hunt | Woodbine | 763 | 763 | 763 | 763 | 763 | 763 | 763 |
| No District | Kaufman | Woodbine | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| No District | Lamar | Woodbine | 49 | 49 | 49 | 49 | 49 | 49 | 49 |
| No District | Navarro | Woodbine | 68 | 68 | 68 | 68 | 68 | 68 | 68 |
| No District | Red River | Woodbine | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| No District | Rockwall | Woodbine | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **No District Total** | | **Woodbine** | **3,680** | **3,680** | **3,680** | **3,680** | **3,680** | **3,680** | **3,680** |
| **GMA 8 Total** | | **Woodbine** | **30,574** | **30,574** | **30,574** | **30,574** | **30,574** | **30,574** | **30,574** |

**TABLE 13. MODELED AVAILABLE GROUNDWATER FOR THE EDWARDS (BALCONES FAULT ZONE) AQUIFER IN GROUNDWATER MANAGEMENT AREA (GMA) 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.**

| GCD | County | Aquifer | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 |
|---|---|---|---|---|---|---|---|---|---|
| Clearwater UWCD* | Bell | Edwards (Balcones Fault Zone) | 6,469 | 6,469 | 6,469 | 6,469 | 6,469 | 6,469 | 6,469 |
| **Clearwater UWCD Total** | | **Edwards (Balcones Fault Zone)** | **6,469** | **6,469** | **6,469** | **6,469** | **6,469** | **6,469** | **6,469** |
| No District | Travis | Edwards (Balcones Fault Zone) | 5,237 | 5,237 | 5,237 | 5,237 | 5,237 | 5,237 | 5,237 |
| No District | Williamson | Edwards (Balcones Fault Zone) | 3,462 | 3,462 | 3,462 | 3,462 | 3,462 | 3,462 | 3,462 |
| **No District Total** | | **Edwards (Balcones Fault Zone)** | **8,699** | **8,699** | **8,699** | **8,699** | **8,699** | **8,699** | **8,699** |
| **GMA 8 Total** | | **Edwards (Balcones Fault Zone)** | **15,168** | **15,168** | **15,168** | **15,168** | **15,168** | **15,168** | **15,168** |

*UWCD: Underground Water Conservation District.

**TABLE 14. MODELED AVAILABLE GROUNDWATER FOR THE MARBLE FALLS AQUIFER IN GROUNDWATER MANAGEMENT AREA (GMA) 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.**

| GCD | County | Aquifer | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 |
|---|---|---|---|---|---|---|---|---|---|
| Central Texas GCD | Burnet | Marble Falls | 2,738 | 2,738 | 2,738 | 2,738 | 2,738 | 2,738 | 2,738 |
| **Central Texas GCD Total** | | **Marble Falls** | **2,738** | **2,738** | **2,738** | **2,738** | **2,738** | **2,738** | **2,738** |
| Saratoga UWCD* | Lampasas | Marble Falls | 2,839 | 2,839 | 2,839 | 2,839 | 2,839 | 2,839 | 2,839 |
| **Saratoga UWCD Total** | | **Marble Falls** | **2,839** | **2,839** | **2,839** | **2,839** | **2,839** | **2,839** | **2,839** |
| No District | Brown | Marble Falls | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| No District | Mills | Marble Falls | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| **No District Total** | | **Marble Falls** | **50** | **50** | **50** | **50** | **50** | **50** | **50** |
| **GMA 8 Total** | | **Marble Falls** | **5,627** | **5,627** | **5,627** | **5,627** | **5,627** | **5,627** | **5,627** |

*UWCD: Underground Water Conservation District.

**TABLE 15. MODELED AVAILABLE GROUNDWATER FOR ELLENBURGER-SAN SABA AQUIFER IN GROUNDWATER MANAGEMENT AREA (GMA) 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.**

| GCD | County | Aquifer | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 |
|---|---|---|---|---|---|---|---|---|---|
| Central Texas GCD | Burnet | Ellenburger-San Saba | 10,835 | 10,835 | 10,835 | 10,835 | 10,835 | 10,835 | 10,835 |
| **Central Texas GCD Total** | | **Ellenburger-San Saba** | **10,835** | **10,835** | **10,835** | **10,835** | **10,835** | **10,835** | **10,835** |
| Saratoga UWCD* | Lampasas | Ellenburger-San Saba | 2,595 | 2,595 | 2,595 | 2,595 | 2,595 | 2,595 | 2,595 |
| **Saratoga UWCD Total** | | **Ellenburger-San Saba** | **2,595** | **2,595** | **2,595** | **2,595** | **2,595** | **2,595** | **2,595** |
| No District | Brown | Ellenburger-San Saba | 131 | 131 | 131 | 131 | 131 | 131 | 131 |
| No District | Mills | Ellenburger-San Saba | 499 | 499 | 499 | 499 | 499 | 499 | 499 |
| **No District Total** | | **Ellenburger-San Saba** | **630** | **630** | **630** | **630** | **630** | **630** | **630** |
| **GMA 8 Total** | | **Ellenburger-San Saba** | **14,060** | **14,060** | **14,060** | **14,060** | **14,060** | **14,060** | **14,060** |

*UWCD: Underground Water Conservation District.

**TABLE 16. MODELED AVAILABLE GROUNDWATER FOR THE HICKORY AQUIFER IN GROUNDWATER MANAGEMENT AREA (GMA) 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.**

| GCD | County | Aquifer | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 |
|---|---|---|---|---|---|---|---|---|---|
| Central Texas GCD | Burnet | Hickory | 3,415 | 3,415 | 3,415 | 3,415 | 3,415 | 3,415 | 3,415 |
| **Central Texas GCD Total** | | **Hickory** | **3,415** | **3,415** | **3,415** | **3,415** | **3,415** | **3,415** | **3,415** |
| Saratoga UWCD* | Lampasas | Hickory | 113 | 113 | 113 | 113 | 113 | 113 | 113 |
| **Saratoga UWCD Total** | | **Hickory** | **113** | **113** | **113** | **113** | **113** | **113** | **113** |
| No District | Brown | Hickory | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| No District | Mills | Hickory | 36 | 36 | 36 | 36 | 36 | 36 | 36 |
| **No District Total** | | **Hickory** | **48** | **48** | **48** | **48** | **48** | **48** | **48** |
| **GMA 8 Total** | | **Hickory** | **3,576** | **3,576** | **3,576** | **3,576** | **3,576** | **3,576** | **3,576** |

*UWCD: Underground Water Conservation District.

**TABLE 17. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE TRINITY AQUIFER (PALUXY) IN GROUNDWATER MANAGEMENT AREA (GMA) 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN.**

| County | RWPA | River Basin | Aquifer | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 |
|---|---|---|---|---|---|---|---|---|---|
| **Counties Not in Upper Trinity GCD** | | | | | | | | | |
| Bell | G | Brazos | Paluxy | 0 | 0 | 0 | 0 | 0 | 0 |
| Bosque | G | Brazos | Paluxy | 357 | 357 | 357 | 357 | 357 | 357 |
| Collin | C | Sabine | Paluxy | 0 | 0 | 0 | 0 | 0 | 0 |
| Collin | C | Trinity | Paluxy | 1,548 | 1,548 | 1,548 | 1,548 | 1,548 | 1,548 |
| Coryell | G | Brazos | Paluxy | 0 | 0 | 0 | 0 | 0 | 0 |
| Dallas | C | Trinity | Paluxy | 359 | 359 | 359 | 359 | 359 | 359 |
| Delta | D | Sulphur | Paluxy | 56 | 56 | 56 | 56 | 56 | 56 |
| Denton | C | Trinity | Paluxy | 4,823 | 4,823 | 4,823 | 4,823 | 4,823 | 4,823 |
| Ellis | C | Trinity | Paluxy | 442 | 442 | 442 | 442 | 442 | 442 |
| Erath | G | Brazos | Paluxy | 61 | 61 | 61 | 61 | 61 | 61 |
| Falls | G | Brazos | Paluxy | 0 | 0 | 0 | 0 | 0 | 0 |
| Fannin | C | Sulphur | Paluxy | 2,088 | 2,088 | 2,088 | 2,088 | 2,088 | 2,088 |
| Fannin | C | Trinity | Paluxy | 0 | 0 | 0 | 0 | 0 | 0 |
| Grayson | C | Trinity | Paluxy | 0 | 0 | 0 | 0 | 0 | 0 |
| Hamilton | G | Brazos | Paluxy | 0 | 0 | 0 | 0 | 0 | 0 |
| Hill | G | Brazos | Paluxy | 347 | 347 | 347 | 347 | 347 | 347 |
| Hill | G | Trinity | Paluxy | 5 | 5 | 5 | 5 | 5 | 5 |
| Hunt | D | Sabine | Paluxy | 0 | 0 | 0 | 0 | 0 | 0 |
| Hunt | D | Sulphur | Paluxy | 3 | 3 | 3 | 3 | 3 | 3 |
| Hunt | D | Trinity | Paluxy | 0 | 0 | 0 | 0 | 0 | 0 |
| Johnson | G | Brazos | Paluxy | 878 | 878 | 878 | 878 | 878 | 878 |
| Johnson | G | Trinity | Paluxy | 1,563 | 1,563 | 1,563 | 1,563 | 1,563 | 1,563 |
| Kaufman | C | Trinity | Paluxy | 0 | 0 | 0 | 0 | 0 | 0 |
| Lamar | D | Red | Paluxy | 0 | 0 | 0 | 0 | 0 | 0 |
| Lamar | D | Sulphur | Paluxy | 8 | 8 | 8 | 8 | 8 | 8 |
| Limestone | G | Brazos | Paluxy | 0 | 0 | 0 | 0 | 0 | 0 |
| Limestone | G | Trinity | Paluxy | 0 | 0 | 0 | 0 | 0 | 0 |
| McLennan | G | Brazos | Paluxy | 0 | 0 | 0 | 0 | 0 | 0 |
| Mills | K | Brazos | Paluxy | 6 | 6 | 6 | 6 | 6 | 6 |
| Mills | K | Colorado | Paluxy | 0 | 0 | 0 | 0 | 0 | 0 |
| Navarro | C | Trinity | Paluxy | 0 | 0 | 0 | 0 | 0 | 0 |
| Red River | D | Red | Paluxy | 52 | 52 | 52 | 52 | 52 | 52 |
| Red River | D | Sulphur | Paluxy | 125 | 125 | 125 | 125 | 125 | 125 |
| Rockwall | C | Trinity | Paluxy | 0 | 0 | 0 | 0 | 0 | 0 |
| Somervell | G | Brazos | Paluxy | 14 | 14 | 14 | 14 | 14 | 14 |
| Tarrant | C | Trinity | Paluxy | 8,963 | 8,963 | 8,963 | 8,963 | 8,963 | 8,963 |
| **Subtotal** | | | **Paluxy** | **21,698** | **21,698** | **21,698** | **21,698** | **21,698** | **21,698** |

**TABLE 17 (CONT). MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE TRINITY AQUIFER (PALUXY) IN GROUNDWATER MANAGEMENT AREA (GMA) 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN.**

| County | RWPA | River Basin | Aquifer | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 |
|---|---|---|---|---|---|---|---|---|---|
| **Counties in Upper Trinity GCD** | | | | | | | | | |
| Hood | G | Brazos | Paluxy (outcrop) | 159 | 159 | 159 | 159 | 159 | 159 |
| Hood | G | Trinity | Paluxy (outcrop) | 0 | 0 | 0 | 0 | 0 | 0 |
| Parker | C | Brazos | Paluxy (outcrop) | 34 | 34 | 34 | 34 | 34 | 34 |
| Parker | C | Trinity | Paluxy (outcrop) | 2,575 | 2,575 | 2,575 | 2,575 | 2,575 | 2,575 |
| Parker | C | Trinity | Paluxy (downdip) | 50 | 50 | 50 | 50 | 50 | 50 |
| **Subtotal** | | | **Paluxy** | **2,818** | **2,818** | **2,818** | **2,818** | **2,818** | **2,818** |
| **GMA 8 Total** | | | **Paluxy** | **24,516** | **24,516** | **24,516** | **24,516** | **24,516** | **24,516** |

**TABLE 18. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE TRINITY AQUIFER (GLEN ROSE) IN GROUNDWATER MANAGEMENT AREA (GMA) 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN.**

| County | RWPA | River Basin | Aquifer | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 |
|---|---|---|---|---|---|---|---|---|---|
| **Counties Not in Upper Trinity GCD** | | | | | | | | | |
| Bell | G | Brazos | Glen Rose | 275 | 275 | 275 | 275 | 275 | 275 |
| Bosque | G | Brazos | Glen Rose | 729 | 729 | 729 | 729 | 729 | 729 |
| Brown | F | Colorado | Glen Rose | 0 | 0 | 0 | 0 | 0 | 0 |
| Burnet | K | Brazos | Glen Rose | 66 | 66 | 66 | 66 | 66 | 66 |
| Burnet | K | Colorado | Glen Rose | 82 | 82 | 82 | 82 | 82 | 82 |
| Collin | C | Sabine | Glen Rose | 0 | 0 | 0 | 0 | 0 | 0 |
| Collin | C | Trinity | Glen Rose | 83 | 83 | 83 | 83 | 83 | 83 |
| Comanche | G | Brazos | Glen Rose | 22 | 22 | 22 | 22 | 22 | 22 |
| Comanche | G | Colorado | Glen Rose | 18 | 18 | 18 | 18 | 18 | 18 |
| Coryell | G | Brazos | Glen Rose | 120 | 120 | 120 | 120 | 120 | 120 |
| Dallas | C | Trinity | Glen Rose | 131 | 131 | 131 | 131 | 131 | 131 |
| Delta | D | Sulphur | Glen Rose | 0 | 0 | 0 | 0 | 0 | 0 |
| Denton | C | Trinity | Glen Rose | 339 | 339 | 339 | 339 | 339 | 339 |
| Ellis | C | Trinity | Glen Rose | 50 | 50 | 50 | 50 | 50 | 50 |
| Erath | G | Brazos | Glen Rose | 1,078 | 1,078 | 1,078 | 1,078 | 1,078 | 1,078 |
| Falls | G | Brazos | Glen Rose | 0 | 0 | 0 | 0 | 0 | 0 |
| Fannin | C | Sulphur | Glen Rose | 0 | 0 | 0 | 0 | 0 | 0 |
| Fannin | C | Trinity | Glen Rose | 0 | 0 | 0 | 0 | 0 | 0 |
| Grayson | C | Trinity | Glen Rose | 0 | 0 | 0 | 0 | 0 | 0 |
| Hamilton | G | Brazos | Glen Rose | 218 | 218 | 218 | 218 | 218 | 218 |
| Hill | G | Brazos | Glen Rose | 114 | 114 | 114 | 114 | 114 | 114 |
| Hill | G | Trinity | Glen Rose | 1 | 1 | 1 | 1 | 1 | 1 |
| Hunt | D | Sabine | Glen Rose | 0 | 0 | 0 | 0 | 0 | 0 |
| Hunt | D | Sulphur | Glen Rose | 0 | 0 | 0 | 0 | 0 | 0 |
| Hunt | D | Trinity | Glen Rose | 0 | 0 | 0 | 0 | 0 | 0 |
| Johnson | G | Brazos | Glen Rose | 951 | 951 | 951 | 951 | 951 | 951 |
| Johnson | G | Trinity | Glen Rose | 682 | 682 | 682 | 682 | 682 | 682 |
| Kaufman | C | Trinity | Glen Rose | 0 | 0 | 0 | 0 | 0 | 0 |
| Lamar | D | Red | Glen Rose | 0 | 0 | 0 | 0 | 0 | 0 |
| Lamar | D | Sulphur | Glen Rose | 0 | 0 | 0 | 0 | 0 | 0 |
| Lampasas | G | Brazos | Glen Rose | 68 | 68 | 68 | 68 | 68 | 68 |
| Limestone | G | Brazos | Glen Rose | 0 | 0 | 0 | 0 | 0 | 0 |
| Limestone | G | Trinity | Glen Rose | 0 | 0 | 0 | 0 | 0 | 0 |
| McLennan | G | Brazos | Glen Rose | 0 | 0 | 0 | 0 | 0 | 0 |
| Milam | G | Brazos | Glen Rose | 0 | 0 | 0 | 0 | 0 | 0 |
| Mills | K | Brazos | Glen Rose | 96 | 96 | 96 | 96 | 96 | 96 |
| Mills | K | Colorado | Glen Rose | 93 | 93 | 93 | 93 | 93 | 93 |
| Navarro | C | Trinity | Glen Rose | 0 | 0 | 0 | 0 | 0 | 0 |
| Red River | D | Red | Glen Rose | 0 | 0 | 0 | 0 | 0 | 0 |

**TABLE 18 (CONT). MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE TRINITY AQUIFER (GLEN ROSE) IN GROUNDWATER MANAGEMENT AREA (GMA) 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN.**

| County | RWPA | River Basin | Aquifer | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 |
|---|---|---|---|---|---|---|---|---|---|
| Red River | D | Sulphur | Glen Rose | 0 | 0 | 0 | 0 | 0 | 0 |
| Rockwall | C | Trinity | Glen Rose | 0 | 0 | 0 | 0 | 0 | 0 |
| Somervell | G | Brazos | Glen Rose | 146 | 146 | 146 | 146 | 146 | 146 |
| Tarrant | C | Trinity | Glen Rose | 793 | 793 | 793 | 793 | 793 | 793 |
| Travis | K | Brazos | Glen Rose | 0 | 0 | 0 | 0 | 0 | 0 |
| Travis | K | Colorado | Glen Rose | 100 | 100 | 100 | 100 | 100 | 100 |
| Williamson | G | Brazos | Glen Rose | 135 | 135 | 135 | 135 | 135 | 135 |
| Williamson | G | Colorado | Glen Rose | 0 | 0 | 0 | 0 | 0 | 0 |
| Williamson | K | Brazos | Glen Rose | 0 | 0 | 0 | 0 | 0 | 0 |
| Williamson | K | Colorado | Glen Rose | 15 | 15 | 15 | 15 | 15 | 15 |
| **Subtotal** | | | **Glen Rose** | **6,405** | **6,405** | **6,405** | **6,405** | **6,405** | **6,405** |
| **Counties in Upper Trinity GCD** | | | | | | | | | |
| Hood | G | Brazos | Glen Rose (outcrop) | 790 | 790 | 790 | 790 | 790 | 790 |
| Hood | G | Brazos | Glen Rose (downdip) | 100 | 100 | 100 | 100 | 100 | 100 |
| Hood | G | Trinity | Glen Rose (downdip) | 24 | 24 | 24 | 24 | 24 | 24 |
| Parker | C | Brazos | Glen Rose (outcrop) | 140 | 140 | 140 | 140 | 140 | 140 |
| Parker | C | Brazos | Glen Rose (downdip) | 11 | 11 | 11 | 11 | 11 | 11 |
| Parker | C | Trinity | Glen Rose (outcrop) | 3,545 | 3,545 | 3,545 | 3,545 | 3,545 | 3,545 |
| Parker | C | Trinity | Glen Rose (downdip) | 1,395 | 1,395 | 1,395 | 1,395 | 1,395 | 1,395 |
| **Subtotal** | | | **Glen Rose** | **6,005** | **6,005** | **6,005** | **6,005** | **6,005** | **6,005** |
| **GMA 8 Total** | | | **Glen Rose** | **12,410** | **12,410** | **12,410** | **12,410** | **12,410** | **12,410** |

**TABLE 19. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE TRINITY AQUIFER (TWIN MOUNTAINS) IN GROUNDWATER MANAGEMENT AREA (GMA) 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN.**

| County | RWPA | River Basin | Aquifer | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 |
|---|---|---|---|---|---|---|---|---|---|
| **Counties Not in Upper Trinity GCD** | | | | | | | | | |
| Collin | C | Sabine | Twin Mountains | 0 | 0 | 0 | 0 | 0 | 0 |
| Collin | C | Trinity | Twin Mountains | 2,202 | 2,202 | 2,202 | 2,202 | 2,202 | 2,202 |
| Dallas | C | Trinity | Twin Mountains | 3,201 | 3,201 | 3,201 | 3,201 | 3,201 | 3,201 |
| Denton | C | Trinity | Twin Mountains | 8,372 | 8,372 | 8,372 | 8,372 | 8,372 | 8,372 |
| Ellis | C | Trinity | Twin Mountains | 0 | 0 | 0 | 0 | 0 | 0 |
| Erath | G | Brazos | Twin Mountains | 5,017 | 5,017 | 5,017 | 5,017 | 5,017 | 5,017 |
| Fannin | C | Sulphur | Twin Mountains | 0 | 0 | 0 | 0 | 0 | 0 |
| Fannin | C | Trinity | Twin Mountains | 0 | 0 | 0 | 0 | 0 | 0 |
| Grayson | C | Trinity | Twin Mountains | 0 | 0 | 0 | 0 | 0 | 0 |
| Hunt | D | Sabine | Twin Mountains | 0 | 0 | 0 | 0 | 0 | 0 |
| Hunt | D | Trinity | Twin Mountains | 0 | 0 | 0 | 0 | 0 | 0 |
| Johnson | G | Brazos | Twin Mountains | 127 | 127 | 127 | 127 | 127 | 127 |
| Johnson | G | Trinity | Twin Mountains | 152 | 152 | 152 | 152 | 152 | 152 |
| Kaufman | C | Trinity | Twin Mountains | 0 | 0 | 0 | 0 | 0 | 0 |
| Rockwall | C | Trinity | Twin Mountains | 0 | 0 | 0 | 0 | 0 | 0 |
| Somervell | G | Brazos | Twin Mountains | 65 | 65 | 65 | 65 | 65 | 65 |
| Tarrant | C | Trinity | Twin Mountains | 6,922 | 6,922 | 6,922 | 6,922 | 6,922 | 6,922 |
| **Subtotal** | | | **Twin Mountains** | **26,058** | **26,058** | **26,058** | **26,058** | **26,058** | **26,058** |

**TABLE 19 (CONT). MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE TRINITY AQUIFER (TWIN MOUNTAINS) IN GROUNDWATER MANAGEMENT AREA (GMA) 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN.**

| County | RWPA | River Basin | Aquifer | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 |
|---|---|---|---|---|---|---|---|---|---|
| **Counties in Upper Trinity GCD** | | | | | | | | | |
| Hood | G | Brazos | Twin Mountains (outcrop) | 5,024 | 5,024 | 5,024 | 5,024 | 5,024 | 5,024 |
| Hood | G | Brazos | Twin Mountains (downdip) | 10,594 | 10,594 | 10,594 | 10,594 | 10,594 | 10,594 |
| Hood | G | Trinity | Twin Mountains (downdip) | 26 | 26 | 26 | 26 | 26 | 26 |
| Parker | C | Brazos | Twin Mountains (outcrop) | 1,282 | 1,282 | 1,282 | 1,282 | 1,282 | 1,282 |
| Parker | C | Brazos | Twin Mountains (downdip) | 942 | 942 | 942 | 942 | 942 | 942 |
| Parker | C | Trinity | Twin Mountains (downdip) | 1,586 | 1,586 | 1,586 | 1,586 | 1,586 | 1,586 |
| **Subtotal** | | | **Twin Mountains** | **19,454** | **19,454** | **19,454** | **19,454** | **19,454** | **19,454** |
| **GMA 8 Total** | | | **Twin Mountains** | **45,512** | **45,512** | **45,512** | **45,512** | **45,512** | **45,512** |

**TABLE 20. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE TRINITY AQUIFER (TRAVIS PEAK) IN GROUNDWATER MANAGEMENT AREA (GMA) 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN.**

| County | RWPA | River Basin | Aquifer | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 |
|---|---|---|---|---|---|---|---|---|---|
| **Counties Not in Upper Trinity GCD** | | | | | | | | | |
| Bell | G | Brazos | Travis Peak | 9,000 | 9,000 | 9,000 | 9,000 | 9,000 | 9,000 |
| Bosque | G | Brazos | Travis Peak | 7,683 | 7,683 | 7,683 | 7,683 | 7,683 | 7,683 |
| Brown | F | Brazos | Travis Peak | 3 | 3 | 3 | 3 | 3 | 3 |
| Brown | F | Colorado | Travis Peak | 381 | 381 | 381 | 381 | 381 | 381 |
| Burnet | K | Brazos | Travis Peak | 3,297 | 3,297 | 3,297 | 3,297 | 3,297 | 3,297 |
| Burnet | K | Colorado | Travis Peak | 445 | 445 | 445 | 445 | 445 | 445 |
| Comanche | G | Brazos | Travis Peak | 6,115 | 6,115 | 6,115 | 6,115 | 6,115 | 6,115 |
| Comanche | G | Colorado | Travis Peak | 49 | 49 | 49 | 49 | 49 | 49 |
| Coryell | G | Brazos | Travis Peak | 4,374 | 4,374 | 4,374 | 4,374 | 4,374 | 4,374 |
| Dallas | C | Trinity | Travis Peak | 0 | 0 | 0 | 0 | 0 | 0 |
| Delta | D | Sulphur | Travis Peak | 0 | 0 | 0 | 0 | 0 | 0 |
| Ellis | C | Trinity | Travis Peak | 5,676 | 5,676 | 5,676 | 5,676 | 5,676 | 5,676 |
| Erath | G | Brazos | Travis Peak | 11,824 | 11,824 | 11,824 | 11,824 | 11,824 | 11,824 |
| Falls | G | Brazos | Travis Peak | 1,435 | 1,435 | 1,435 | 1,435 | 1,435 | 1,435 |
| Fannin | C | Sulphur | Travis Peak | 0 | 0 | 0 | 0 | 0 | 0 |
| Fannin | C | Trinity | Travis Peak | 0 | 0 | 0 | 0 | 0 | 0 |
| Hamilton | G | Brazos | Travis Peak | 2,209 | 2,209 | 2,209 | 2,209 | 2,209 | 2,209 |
| Hill | G | Brazos | Travis Peak | 4,404 | 4,404 | 4,404 | 4,404 | 4,404 | 4,404 |
| Hill | G | Trinity | Travis Peak | 281 | 281 | 281 | 281 | 281 | 281 |
| Hunt | D | Sabine | Travis Peak | 0 | 0 | 0 | 0 | 0 | 0 |
| Hunt | D | Sulphur | Travis Peak | 0 | 0 | 0 | 0 | 0 | 0 |
| Hunt | D | Trinity | Travis Peak | 0 | 0 | 0 | 0 | 0 | 0 |

**TABLE 20 (CONT). MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE TRINITY AQUIFER (TRAVIS PEAK) IN GROUNDWATER MANAGEMENT AREA (GMA) 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN.**

| County | RWPA | River Basin | Aquifer | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 |
|---|---|---|---|---|---|---|---|---|---|
| Johnson | G | Brazos | Travis Peak | 1,581 | 1,581 | 1,581 | 1,581 | 1,581 | 1,581 |
| Johnson | G | Trinity | Travis Peak | 2,891 | 2,891 | 2,891 | 2,891 | 2,891 | 2,891 |
| Kaufman | C | Trinity | Travis Peak | 0 | 0 | 0 | 0 | 0 | 0 |
| Lamar | D | Red | Travis Peak | 0 | 0 | 0 | 0 | 0 | 0 |
| Lamar | D | Sulphur | Travis Peak | 0 | 0 | 0 | 0 | 0 | 0 |
| Lampasas | G | Brazos | Travis Peak | 1,525 | 1,525 | 1,525 | 1,525 | 1,525 | 1,525 |
| Lampasas | G | Colorado | Travis Peak | 68 | 68 | 68 | 68 | 68 | 68 |
| Limestone | G | Brazos | Travis Peak | 0 | 0 | 0 | 0 | 0 | 0 |
| Limestone | G | Trinity | Travis Peak | 0 | 0 | 0 | 0 | 0 | 0 |
| McLennan | G | Brazos | Travis Peak | 20,649 | 20,649 | 20,649 | 20,649 | 20,649 | 20,649 |
| Milam | G | Brazos | Travis Peak | 0 | 0 | 0 | 0 | 0 | 0 |
| Mills | K | Brazos | Travis Peak | 704 | 704 | 704 | 704 | 704 | 704 |
| Mills | K | Colorado | Travis Peak | 1,560 | 1,560 | 1,560 | 1,560 | 1,560 | 1,560 |
| Navarro | C | Trinity | Travis Peak | 0 | 0 | 0 | 0 | 0 | 0 |
| Red River | D | Red | Travis Peak | 0 | 0 | 0 | 0 | 0 | 0 |
| Red River | D | Sulphur | Travis Peak | 0 | 0 | 0 | 0 | 0 | 0 |
| Somervell | G | Brazos | Travis Peak | 1,763 | 1,763 | 1,763 | 1,763 | 1,763 | 1,763 |
| Travis | K | Brazos | Travis Peak | 1 | 1 | 1 | 1 | 1 | 1 |
| Travis | K | Colorado | Travis Peak | 6,642 | 6,642 | 6,642 | 6,642 | 6,642 | 6,642 |
| Williamson | G | Brazos | Travis Peak | 3,543 | 3,543 | 3,543 | 3,543 | 3,543 | 3,543 |
| Williamson | G | Colorado | Travis Peak | 5 | 5 | 5 | 5 | 5 | 5 |
| Williamson | K | Brazos | Travis Peak | 0 | 0 | 0 | 0 | 0 | 0 |

**TABLE 20 (CONT). MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE TRINITY AQUIFER (TRAVIS PEAK) IN GROUNDWATER MANAGEMENT AREA (GMA) 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN.**

| County | RWPA | River Basin | Aquifer | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 |
|---|---|---|---|---|---|---|---|---|---|
| Williamson | K | Colorado | Travis Peak | 0 | 0 | 0 | 0 | 0 | 0 |
| **Subtotal** | | | **Travis Peak** | **98,108** | **98,108** | **98,108** | **98,108** | **98,108** | **98,108** |
| **Counties in Upper Trinity GCD[1]** | | | | | | | | | |
| Hood | G | Brazos | Travis Peak | 122 | 122 | 122 | 122 | 122 | 122 |
| **Subtotal** | | | **Travis Peak** | **122** | **122** | **122** | **122** | **122** | **122** |
| **GMA 8 Total** | | | **Travis Peak** | **98,230** | **98,230** | **98,230** | **98,230** | **98,230** | **98,230** |

[1]Splits for Upper Trinity GCD are presented since they are included in the GMA 8-wide desired future conditions.

**TABLE 21. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE TRINITY AQUIFER (HENSELL) IN GROUNDWATER MANAGEMENT AREA (GMA) 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN.**

| County | RWPA | River Basin | Aquifer | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 |
|---|---|---|---|---|---|---|---|---|---|
| **Counties Not in Upper Trinity GCD[1]** | | | | | | | | | |
| Bell | G | Brazos | Hensell | 1,100 | 1,100 | 1,100 | 1,100 | 1,100 | 1,100 |
| Bosque | G | Brazos | Hensell | 3,837 | 3,837 | 3,837 | 3,837 | 3,837 | 3,837 |
| Brown | F | Colorado | Hensell | 4 | 4 | 4 | 4 | 4 | 4 |
| Burnet | K | Brazos | Hensell | 2,477 | 2,477 | 2,477 | 2,477 | 2,477 | 2,477 |
| Burnet | K | Colorado | Hensell | 186 | 186 | 186 | 186 | 186 | 186 |
| Comanche | G | Brazos | Hensell | 180 | 180 | 180 | 180 | 180 | 180 |
| Comanche | G | Colorado | Hensell | 24 | 24 | 24 | 24 | 24 | 24 |
| Coryell | G | Brazos | Hensell | 2,197 | 2,197 | 2,197 | 2,197 | 2,197 | 2,197 |
| Dallas | C | Trinity | Hensell | 0 | 0 | 0 | 0 | 0 | 0 |
| Ellis | C | Trinity | Hensell | 0 | 0 | 0 | 0 | 0 | 0 |
| Erath | G | Brazos | Hensell | 5,141 | 5,141 | 5,141 | 5,141 | 5,141 | 5,141 |
| Falls | G | Brazos | Hensell | 0 | 0 | 0 | 0 | 0 | 0 |
| Hamilton | G | Brazos | Hensell | 1,672 | 1,672 | 1,672 | 1,672 | 1,672 | 1,672 |
| Hill | G | Brazos | Hensell | 25 | 25 | 25 | 25 | 25 | 25 |
| Hill | G | Trinity | Hensell | 0 | 0 | 0 | 0 | 0 | 0 |
| Johnson | G | Brazos | Hensell | 68 | 68 | 68 | 68 | 68 | 68 |
| Johnson | G | Trinity | Hensell | 51 | 51 | 51 | 51 | 51 | 51 |
| Kaufman | C | Trinity | Hensell | 0 | 0 | 0 | 0 | 0 | 0 |
| Lampasas | G | Brazos | Hensell | 712 | 712 | 712 | 712 | 712 | 712 |
| Lampasas | G | Colorado | Hensell | 1 | 1 | 1 | 1 | 1 | 1 |
| Limestone | G | Brazos | Hensell | 0 | 0 | 0 | 0 | 0 | 0 |
| Limestone | G | Trinity | Hensell | 0 | 0 | 0 | 0 | 0 | 0 |
| McLennan | G | Brazos | Hensell | 4,701 | 4,701 | 4,701 | 4,701 | 4,701 | 4,701 |
| Milam | G | Brazos | Hensell | 0 | 0 | 0 | 0 | 0 | 0 |
| Mills | K | Brazos | Hensell | 172 | 172 | 172 | 172 | 172 | 172 |
| Mills | K | Colorado | Hensell | 435 | 435 | 435 | 435 | 435 | 435 |
| Navarro | C | Trinity | Hensell | 0 | 0 | 0 | 0 | 0 | 0 |
| Somervell | G | Brazos | Hensell | 217 | 217 | 217 | 217 | 217 | 217 |
| Travis | K | Brazos | Hensell | 1 | 1 | 1 | 1 | 1 | 1 |
| Travis | K | Colorado | Hensell | 2,268 | 2,268 | 2,268 | 2,268 | 2,268 | 2,268 |
| Williamson | G | Brazos | Hensell | 1,599 | 1,599 | 1,599 | 1,599 | 1,599 | 1,599 |
| Williamson | G | Colorado | Hensell | 0 | 0 | 0 | 0 | 0 | 0 |
| Williamson | K | Brazos | Hensell | 0 | 0 | 0 | 0 | 0 | 0 |
| Williamson | K | Colorado | Hensell | 0 | 0 | 0 | 0 | 0 | 0 |
| **Subtotal** | | | **Hensell** | **27,068** | **27,068** | **27,068** | **27,068** | **27,068** | **27,068** |

**TABLE 21 (CONT).** **MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE TRINITY AQUIFER (HENSELL) IN GROUNDWATER MANAGEMENT AREA (GMA) 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN.**

| County | RWPA | River Basin | Aquifer | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 |
|---|---|---|---|---|---|---|---|---|---|
| **Counties in Upper Trinity GCD[1]** | | | | | | | | | |
| Hood | G | Brazos | Hensell | 50 | 50 | 50 | 50 | 50 | 50 |
| **Subtotal** | | | **Hensell** | **50** | **50** | **50** | **50** | **50** | **50** |
| **GMA 8 Total** | | | **Hensell** | **27,118** | **27,118** | **27,118** | **27,118** | **27,118** | **27,118** |

[1]Splits for Upper Trinity GCD are presented since they are included in the GMA 8-wide desired future conditions.
*Note that the Hensell values in this table represent a portion of the total Travis Peak values already provided in Table 20 and do not represent an additional source of water.

**TABLE 22.** **MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE TRINITY AQUIFER (HOSSTON) IN GROUNDWATER MANAGEMENT AREA (GMA) 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN.**

| County | RWPA | River Basin | Aquifer | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 |
|---|---|---|---|---|---|---|---|---|---|
| **Counties Not in Upper Trinity GCD[1]** | | | | | | | | | |
| Bell | G | Brazos | Hosston | 7,900 | 7,900 | 7,900 | 7,900 | 7,900 | 7,900 |
| Bosque | G | Brazos | Hosston | 3,765 | 3,765 | 3,765 | 3,765 | 3,765 | 3,765 |
| Brown | F | Brazos | Hosston | 3 | 3 | 3 | 3 | 3 | 3 |
| Brown | F | Colorado | Hosston | 343 | 343 | 343 | 343 | 343 | 343 |
| Burnet | K | Brazos | Hosston | 659 | 659 | 659 | 659 | 659 | 659 |
| Burnet | K | Colorado | Hosston | 224 | 224 | 224 | 224 | 224 | 224 |
| Comanche | G | Brazos | Hosston | 5,863 | 5,863 | 5,863 | 5,863 | 5,863 | 5,863 |
| Comanche | G | Colorado | Hosston | 6 | 6 | 6 | 6 | 6 | 6 |
| Coryell | G | Brazos | Hosston | 2,163 | 2,163 | 2,163 | 2,163 | 2,163 | 2,163 |
| Dallas | C | Trinity | Hosston | 0 | 0 | 0 | 0 | 0 | 0 |
| Ellis | C | Trinity | Hosston | 5,545 | 5,545 | 5,545 | 5,545 | 5,545 | 5,545 |
| Erath | G | Brazos | Hosston | 6,387 | 6,387 | 6,387 | 6,387 | 6,387 | 6,387 |
| Falls | G | Brazos | Hosston | 1,435 | 1,435 | 1,435 | 1,435 | 1,435 | 1,435 |
| Hamilton | G | Brazos | Hosston | 385 | 385 | 385 | 385 | 385 | 385 |
| Hill | G | Brazos | Hosston | 3,330 | 3,330 | 3,330 | 3,330 | 3,330 | 3,330 |
| Hill | G | Trinity | Hosston | 280 | 280 | 280 | 280 | 280 | 280 |
| Johnson | G | Brazos | Hosston | 1,442 | 1,442 | 1,442 | 1,442 | 1,442 | 1,442 |
| Johnson | G | Trinity | Hosston | 2,809 | 2,809 | 2,809 | 2,809 | 2,809 | 2,809 |
| Kaufman | C | Trinity | Hosston | 0 | 0 | 0 | 0 | 0 | 0 |
| Lampasas | G | Brazos | Hosston | 785 | 785 | 785 | 785 | 785 | 785 |
| Lampasas | G | Colorado | Hosston | 65 | 65 | 65 | 65 | 65 | 65 |
| Limestone | G | Brazos | Hosston | 0 | 0 | 0 | 0 | 0 | 0 |
| Limestone | G | Trinity | Hosston | 0 | 0 | 0 | 0 | 0 | 0 |
| McLennan | G | Brazos | Hosston | 15,948 | 15,948 | 15,948 | 15,948 | 15,948 | 15,948 |
| Milam | G | Brazos | Hosston | 0 | 0 | 0 | 0 | 0 | 0 |
| Mills | K | Brazos | Hosston | 375 | 375 | 375 | 375 | 375 | 375 |
| Mills | K | Colorado | Hosston | 1,081 | 1,081 | 1,081 | 1,081 | 1,081 | 1,081 |

**TABLE 22 (CONT). MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE TRINITY AQUIFER (HOSSTON) IN GROUNDWATER MANAGEMENT AREA (GMA) 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN.**

| County | RWPA | River Basin | Aquifer | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 |
|---|---|---|---|---|---|---|---|---|---|
| Navarro | C | Trinity | Hosston | 0 | 0 | 0 | 0 | 0 | 0 |
| Somervell | G | Brazos | Hosston | 930 | 930 | 930 | 930 | 930 | 930 |
| Travis | K | Brazos | Hosston | 0 | 0 | 0 | 0 | 0 | 0 |
| Travis | K | Colorado | Hosston | 4,185 | 4,185 | 4,185 | 4,185 | 4,185 | 4,185 |
| Williamson | G | Brazos | Hosston | 1,746 | 1,746 | 1,746 | 1,746 | 1,746 | 1,746 |
| Williamson | G | Colorado | Hosston | 5 | 5 | 5 | 5 | 5 | 5 |
| Williamson | K | Brazos | Hosston | 0 | 0 | 0 | 0 | 0 | 0 |
| Williamson | K | Colorado | Hosston | 0 | 0 | 0 | 0 | 0 | 0 |
| **Subtotal** | | | **Hosston** | **67,659** | **67,659** | **67,659** | **67,659** | **67,659** | **67,659** |
| **Counties in Upper Trinity GCD[1]** | | | | | | | | | |
| Hood | G | Brazos | Hosston | 72 | 72 | 72 | 72 | 72 | 72 |
| **Subtotal** | | | **Hosston** | **72** | **72** | **72** | **72** | **72** | **72** |
| **GMA 8 Total** | | | **Hosston** | **67,731** | **67,731** | **67,731** | **67,731** | **67,731** | **67,731** |

[1]Splits for Upper Trinity GCD are presented since they are included in the GMA 8-wide desired future conditions.
*Note that the Hosston values in this table represent a portion of the total Travis Peak values already provided in Table 20 and do not represent an additional source of water.

**TABLE 23. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE TRINITY AQUIFER (ANTLERS) IN GROUNDWATER MANAGEMENT AREA (GMA) 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN.**

| County | RWPA | River Basin | Aquifer | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 |
|---|---|---|---|---|---|---|---|---|---|
| **Counties Not in Upper Trinity GCD** | | | | | | | | | |
| Brown | F | Brazos | Antlers | 48 | 48 | 48 | 48 | 48 | 48 |
| Brown | F | Colorado | Antlers | 995 | 995 | 995 | 995 | 995 | 995 |
| Callahan | G | Brazos | Antlers | 443 | 443 | 443 | 443 | 443 | 443 |
| Callahan | G | Colorado | Antlers | 1,283 | 1,283 | 1,283 | 1,283 | 1,283 | 1,283 |
| Collin | C | Trinity | Antlers | 1,962 | 1,962 | 1,962 | 1,962 | 1,962 | 1,962 |
| Comanche | G | Brazos | Antlers | 5,843 | 5,843 | 5,843 | 5,843 | 5,843 | 5,843 |
| Cooke | C | Red | Antlers | 2,186 | 2,186 | 2,186 | 2,186 | 2,186 | 2,186 |
| Cooke | C | Trinity | Antlers | 8,335 | 8,335 | 8,335 | 8,335 | 8,335 | 8,335 |
| Denton | C | Trinity | Antlers | 16,557 | 16,557 | 16,557 | 16,557 | 16,557 | 16,557 |
| Eastland | G | Brazos | Antlers | 5,184 | 5,184 | 5,184 | 5,184 | 5,184 | 5,184 |
| Eastland | G | Colorado | Antlers | 552 | 552 | 552 | 552 | 552 | 552 |
| Erath | G | Brazos | Antlers | 2,627 | 2,627 | 2,627 | 2,627 | 2,627 | 2,627 |
| Fannin | C | Red | Antlers | 0 | 0 | 0 | 0 | 0 | 0 |
| Fannin | C | Sulphur | Antlers | 0 | 0 | 0 | 0 | 0 | 0 |
| Fannin | C | Trinity | Antlers | 0 | 0 | 0 | 0 | 0 | 0 |
| Grayson | C | Red | Antlers | 6,665 | 6,665 | 6,665 | 6,665 | 6,665 | 6,665 |
| Grayson | C | Trinity | Antlers | 4,051 | 4,051 | 4,051 | 4,051 | 4,051 | 4,051 |
| Lamar | D | Red | Antlers | 0 | 0 | 0 | 0 | 0 | 0 |
| Lamar | D | Sulphur | Antlers | 0 | 0 | 0 | 0 | 0 | 0 |
| Red River | D | Red | Antlers | 0 | 0 | 0 | 0 | 0 | 0 |
| Tarrant | C | Trinity | Antlers | 1,248 | 1,248 | 1,248 | 1,248 | 1,248 | 1,248 |
| Taylor | G | Brazos | Antlers | 5 | 5 | 5 | 5 | 5 | 5 |
| Taylor | G | Colorado | Antlers | 9 | 9 | 9 | 9 | 9 | 9 |
| **Subtotal** | | | **Antlers** | **57,993** | **57,993** | **57,993** | **57,993** | **57,993** | **57,993** |
| **Counties in Upper Trinity GCD** | | | | | | | | | |
| Montague | B | Red | Antlers (outcrop) | 238 | 238 | 238 | 238 | 238 | 238 |
| Montague | B | Trinity | Antlers (outcrop) | 5,866 | 5,866 | 5,866 | 5,866 | 5,866 | 5,866 |
| Parker | C | Brazos | Antlers (outcrop) | 247 | 247 | 247 | 247 | 247 | 247 |
| Parker | C | Trinity | Antlers (outcrop) | 2,642 | 2,642 | 2,642 | 2,642 | 2,642 | 2,642 |
| Wise | C | Trinity | Antlers (outcrop) | 9,013 | 9,013 | 9,013 | 9,013 | 9,013 | 9,013 |
| Wise | C | Trinity | Antlers (downdip) | 2,439 | 2,439 | 2,439 | 2,439 | 2,439 | 2,439 |
| **Subtotal** | | | **Antlers** | **20,445** | **20,445** | **20,445** | **20,445** | **20,445** | **20,445** |
| **GMA 8 Total** | | | **Antlers** | **78,438** | **78,438** | **78,438** | **78,438** | **78,438** | **78,438** |

**TABLE 24. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE WOODBINE AQUIFER IN GROUNDWATER MANAGEMENT AREA (GMA) 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN.**

| County | RWPA | River Basin | Aquifer | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 |
|---|---|---|---|---|---|---|---|---|---|
| Collin | C | Sabine | Woodbine | 0 | 0 | 0 | 0 | 0 | 0 |
| Collin | C | Trinity | Woodbine | 4,254 | 4,254 | 4,254 | 4,254 | 4,254 | 4,254 |
| Cooke | C | Red | Woodbine | 262 | 262 | 262 | 262 | 262 | 262 |
| Cooke | C | Trinity | Woodbine | 539 | 539 | 539 | 539 | 539 | 539 |
| Dallas | C | Trinity | Woodbine | 2,798 | 2,798 | 2,798 | 2,798 | 2,798 | 2,798 |
| Denton | C | Trinity | Woodbine | 3,609 | 3,609 | 3,609 | 3,609 | 3,609 | 3,609 |
| Ellis | C | Trinity | Woodbine | 2,074 | 2,074 | 2,074 | 2,074 | 2,074 | 2,074 |
| Fannin | C | Red | Woodbine | 3,547 | 3,547 | 3,547 | 3,547 | 3,547 | 3,547 |
| Fannin | C | Sulphur | Woodbine | 550 | 550 | 550 | 550 | 550 | 550 |
| Fannin | C | Trinity | Woodbine | 827 | 827 | 827 | 827 | 827 | 827 |
| Grayson | C | Red | Woodbine | 5,603 | 5,603 | 5,603 | 5,603 | 5,603 | 5,603 |
| Grayson | C | Trinity | Woodbine | 1,923 | 1,923 | 1,923 | 1,923 | 1,923 | 1,923 |
| Hill | G | Brazos | Woodbine | 284 | 284 | 284 | 284 | 284 | 284 |
| Hill | G | Trinity | Woodbine | 302 | 302 | 302 | 302 | 302 | 302 |
| Hunt | D | Sabine | Woodbine | 268 | 268 | 268 | 268 | 268 | 268 |
| Hunt | D | Sulphur | Woodbine | 165 | 165 | 165 | 165 | 165 | 165 |
| Hunt | D | Trinity | Woodbine | 330 | 330 | 330 | 330 | 330 | 330 |
| Johnson | G | Brazos | Woodbine | 24 | 24 | 24 | 24 | 24 | 24 |
| Johnson | G | Trinity | Woodbine | 1,957 | 1,957 | 1,957 | 1,957 | 1,957 | 1,957 |
| Kaufman | C | Trinity | Woodbine | 0 | 0 | 0 | 0 | 0 | 0 |
| Lamar | D | Red | Woodbine | 0 | 0 | 0 | 0 | 0 | 0 |
| Lamar | D | Sulphur | Woodbine | 49 | 49 | 49 | 49 | 49 | 49 |
| McLennan | G | Brazos | Woodbine | 0 | 0 | 0 | 0 | 0 | 0 |
| Navarro | C | Trinity | Woodbine | 68 | 68 | 68 | 68 | 68 | 68 |
| Red River | D | Red | Woodbine | 2 | 2 | 2 | 2 | 2 | 2 |
| Rockwall | C | Trinity | Woodbine | 0 | 0 | 0 | 0 | 0 | 0 |
| Tarrant | C | Trinity | Woodbine | 1,139 | 1,139 | 1,139 | 1,139 | 1,139 | 1,139 |
| **GMA 8 Total** | | | **Woodbine** | **30,574** | **30,574** | **30,574** | **30,574** | **30,574** | **30,574** |

**TABLE 25. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE EDWARDS (BALCONES FAULT ZONE) AQUIFER IN GROUNDWATER MANAGEMENT AREA (GMA) 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN. MODELED AVAILABLE GROUNDWATER VALUES ARE FROM GAM RUN 08-010MAG BY ANAYA (2008).**

| County | RWPA | River Basin | Aquifer | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 |
|---|---|---|---|---|---|---|---|---|---|
| Bell | G | Brazos | Edwards (Balcones Fault Zone) | 6,469 | 6,469 | 6,469 | 6,469 | 6,469 | 6,469 |
| Travis | K | Brazos | Edwards (Balcones Fault Zone) | 275 | 275 | 275 | 275 | 275 | 275 |
| Travis | K | Colorado | Edwards (Balcones Fault Zone) | 4,962 | 4,962 | 4,962 | 4,962 | 4,962 | 4,962 |
| Williamson | G | Brazos | Edwards (Balcones Fault Zone) | 3,351 | 3,351 | 3,351 | 3,351 | 3,351 | 3,351 |
| Williamson | G | Colorado | Edwards (Balcones Fault Zone) | 101 | 101 | 101 | 101 | 101 | 101 |
| Williamson | K | Brazos | Edwards (Balcones Fault Zone) | 6 | 6 | 6 | 6 | 6 | 6 |
| Williamson | K | Colorado | Edwards (Balcones Fault Zone) | 4 | 4 | 4 | 4 | 4 | 4 |
| **GMA 8 Total** | | | Edwards (Balcones Fault Zone) | **15,168** | **15,168** | **15,168** | **15,168** | **15,168** | **15,168** |

**TABLE 26. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE MARBLE FALLS AQUIFER IN GROUNDWATER MANAGEMENT AREA (GMA) 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN.**

| County | RWPA | River Basin | Aquifer | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 |
|---|---|---|---|---|---|---|---|---|---|
| Brown | F | Colorado | Marble Falls | 25 | 25 | 25 | 25 | 25 | 25 |
| Burnet | K | Brazos | Marble Falls | 1,384 | 1,384 | 1,384 | 1,384 | 1,384 | 1,384 |
| Burnet | K | Colorado | Marble Falls | 1,354 | 1,354 | 1,354 | 1,354 | 1,354 | 1,354 |
| Lampasas | G | Brazos | Marble Falls | 1,954 | 1,954 | 1,954 | 1,954 | 1,954 | 1,954 |
| Lampasas | G | Colorado | Marble Falls | 885 | 885 | 885 | 885 | 885 | 885 |
| Mills | K | Brazos | Marble Falls | 1 | 1 | 1 | 1 | 1 | 1 |
| Mills | K | Colorado | Marble Falls | 24 | 24 | 24 | 24 | 24 | 24 |
| **GMA 8 Total** | | | **Marble Falls** | **5,627** | **5,627** | **5,627** | **5,627** | **5,627** | **5,627** |

**TABLE 27. MODELED AVAILABLE GROUNDWATER BY DECADE FOR ELLENBURGER-SAN SABA AQUIFER IN GROUNDWATER MANAGEMENT AREA (GMA) 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN.**

| County | RWPA | River Basin | Aquifer | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 |
|---|---|---|---|---|---|---|---|---|---|
| Brown | F | Colorado | Ellenburger-San Saba | 131 | 131 | 131 | 131 | 131 | 131 |
| Burnet | K | Brazos | Ellenburger-San Saba | 3,825 | 3,825 | 3,825 | 3,825 | 3,825 | 3,825 |
| Burnet | K | Colorado | Ellenburger-San Saba | 7,010 | 7,010 | 7,010 | 7,010 | 7,010 | 7,010 |
| Lampasas | G | Brazos | Ellenburger-San Saba | 1,681 | 1,681 | 1,681 | 1,681 | 1,681 | 1,681 |
| Lampasas | G | Colorado | Ellenburger-San Saba | 914 | 914 | 914 | 914 | 914 | 914 |
| Mills | K | Brazos | Ellenburger-San Saba | 93 | 93 | 93 | 93 | 93 | 93 |
| Mills | K | Colorado | Ellenburger-San Saba | 406 | 406 | 406 | 406 | 406 | 406 |
| **GMA 8 Total** | | | Ellenburger-San Saba | **14,060** | **14,060** | **14,060** | **14,060** | **14,060** | **14,060** |

**TABLE 28. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE HICKORY AQUIFER IN GROUNDWATER MANAGEMENT AREA (GMA) 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN.**

| County | RWPA | River Basin | Aquifer | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 |
|---|---|---|---|---|---|---|---|---|---|
| Brown | F | Colorado | Hickory | 12 | 12 | 12 | 12 | 12 | 12 |
| Burnet | K | Brazos | Hickory | 1,237 | 1,237 | 1,237 | 1,237 | 1,237 | 1,237 |
| Burnet | K | Colorado | Hickory | 2,178 | 2,178 | 2,178 | 2,178 | 2,178 | 2,178 |
| Lampasas | G | Brazos | Hickory | 79 | 79 | 79 | 79 | 79 | 79 |
| Lampasas | G | Colorado | Hickory | 34 | 34 | 34 | 34 | 34 | 34 |
| Mills | K | Brazos | Hickory | 7 | 7 | 7 | 7 | 7 | 7 |
| Mills | K | Colorado | Hickory | 29 | 29 | 29 | 29 | 29 | 29 |
| **GMA 8 Total** | | | **Hickory** | **3,576** | **3,576** | **3,576** | **3,576** | **3,576** | **3,576** |

## *LIMITATIONS:*

The groundwater model used in completing this analysis is the best available scientific tool that can be used to meet the stated objectives. To the extent that this analysis will be used for planning purposes and/or regulatory purposes related to pumping in the past and into the future, it is important to recognize the assumptions and limitations associated with the use of the results. In reviewing the use of models in environmental regulatory decision making, the National Research Council (2007) noted:

> *"Models will always be constrained by computational limitations, assumptions, and knowledge gaps. They can best be viewed as tools to help inform decisions rather than as machines to generate truth or make decisions. Scientific advances will never make it possible to build a perfect model that accounts for every aspect of reality or to prove that a given model is correct in all respects for a particular regulatory application. These characteristics make evaluation of a regulatory model more complex than solely a comparison of measurement data with model results."*

A key aspect of using the groundwater model to evaluate historic groundwater flow conditions includes the assumptions about the location in the aquifer where historic pumping was placed. Understanding the amount and location of historic pumping is as important as evaluating the volume of groundwater flow into and out of the district, between aquifers within the district (as applicable), interactions with surface water (as applicable), recharge to the aquifer system (as applicable), and other metrics that describe the impacts of that pumping. In addition, assumptions regarding precipitation, recharge, and streamflow are specific to a particular historic time period.

Because the application of the groundwater model was designed to address regional scale questions, the results are most effective on a regional scale. 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 groundwater pumping and groundwater levels in the aquifer. Because of the limitations of the groundwater model and the assumptions in this analysis, it is important that the groundwater conservation districts work with the TWDB to refine this analysis in the future given the reality of how the aquifer responds to the actual amount and location of pumping now and in the future. Historic precipitation patterns also need to be placed in context as future climatic conditions, such as dry and wet year precipitation patterns, may differ and affect groundwater flow conditions.

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## *Appendix A*

**Comparison between Desired Future Conditions and Simulated Drawdowns for the Trinity and Woodbine Aquifers**

Drawdown values for the Trinity and Woodbine aquifers between 2009 and 2080 were based on the simulated water level values at individual model cells extracted from predictive simulation water level file submitted by Groundwater Management Area 8.

The Paluxy, Glen Rose, Twin Mountains, Travis Peak, Hensell, Hosston, and Antlers are subunits of the Trinity Aquifer. These subunits and Woodbine Aquifer exist in both outcrop and downdip areas (Figures 1 through 8). Kelley and others (2014) further divided these aquifers into five (5) regions, each with unique aquifer combinations and properties (table below and Figures 1 through 8).

<table>
<tr><th>Model Layer</th><th>Region 1</th><th>Region 2</th><th>Region 3</th><th colspan="2">Region 4</th><th colspan="2">Region 5</th></tr>
<tr><td>2</td><td colspan="4">Woodbine</td><td colspan="3">Woodbine (no sand)</td></tr>
<tr><td>3</td><td colspan="7">Washita/Fredericksburg</td></tr>
<tr><td>4</td><td rowspan="5">Antlers</td><td colspan="4">Paluxy</td><td colspan="2">Paluxy (no sand)</td></tr>
<tr><td>5</td><td colspan="6">Glen Rose</td></tr>
<tr><td>6</td><td rowspan="3">Twin Mountains</td><td rowspan="3" colspan="2">Travis Peak</td><td>Hensell</td><td rowspan="3">Travis Peak</td><td>Hensell</td></tr>
<tr><td>7</td><td>Pearsall/Sligo</td><td>Pearsall/Sligo</td></tr>
<tr><td>8</td><td>Hosston</td><td>Hosston</td></tr>
</table>

Vertically, the Trinity and Woodbine aquifers could contain multiple model layers and some of the model cells are pass-through cells with a thickness of one foot. To account for variable model cells from multiple model layers for the same aquifer, Groundwater Management Area 8 (2021) adopted a method presented by Van Kelley of INTERA, Inc., which calculated a single composite water level from multiple model cells with each adjusted by transmissivity. This composite water level took both the water level and hydraulic transmissivity at each cell into calculation, as shown in the following equation:

$$Hc = \frac{\sum_{i=UL}^{LL} T_i H_i}{\sum_{i=UL}^{LL} T_i}$$

Where:

$H_C$ = Composite Water Level (feet above mean sea level)

$T_i$ = Transmissivity of model layer $i$ (square feet per day)

$H_i$ = Water Level of model layer $i$ (feet above mean sea level)

$LL$ = Lowest model layer representing the regional aquifer

$UL$ = Uppermost model layer representing the regional aquifer.

Note that multiple model layers can represent a single aquifer or subunit, so the aquifer or subunit designation should be determined by the IBOUND value of a model cell rather than the model layer. When a model cell goes dry, the water level was set to the cell bottom. However, if an aquifer completely goes dry, TWDB assigns the bottom elevation from the lowest model cell of the aquifer to the composite water level.

The average water level for the same aquifer in a county (*Hc_County*) was then calculated using the following equation:

$$Hc\_County = \frac{\sum_{i=1}^{n} Hc_i}{n}$$

Where:

$Hc\_County$ = Average composite water level for a county (feet above mean sea level)

$Hc_i$ = Composite Water Level at a lateral location as defined in last step (feet above mean sea level)

$n$ = Total lateral (row, column) locations of an aquifer in a county.

Drawdown of the aquifer in a county (*DD_County*) was calculated using the following equation:

$$DD\_County = Hc\_County_{2009} - Hc\_County_{2080}$$

Where:

$Hc\_County_{2009}$ = Average water level of an aquifer in a county in 2009 as defined above (feet above mean sea level)

$Hc\_County_{2080}$ = Average water level of an aquifer in a county in 2080 as defined above (feet above mean sea level).

If an aquifer went dry in 2009, that lateral location was excluded from the calculation.

In comparison with a simple average calculation based on total model cell count, use of composite water level gives less weight to cells with lower transmissivity values (such as pass-through cells, cells with low saturation in outcrop area, or cells with lower hydraulic conductivity) in water level and drawdown calculation.

Per Groundwater Management Area 8, a desired future condition was met if the simulated drawdown was within five percent or five feet of the desired future condition. Using the water level output file submitted by Groundwater Management Area 8 and the method described above, the TWDB calculated the drawdowns and then compared with the correlated desired future conditions. The comparisons are presented in Tables A1, A2, A3, and A4. The comparison indicates that the predictive simulation meets the desired future conditions of the Trinity and Woodbine aquifers in Groundwater Management Area 8.

**TABLE A1. COMPARISON BETWEEN DRAWDOWN AND DESIRED FUTURE CONDITIONS BY GROUNDWATER CONSERVATION DISTRICT (GCD), EXCLUDING UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT.**

| GCD | Aquifer | Desired Future Condition (feet of drawdown between January 1, 2010 and December 31, 2080) | Simulated Drawdown between Initial Water Levels and Stress Period 71 (feet) | Is Desired Future Condition Violated (Exceeded by 5 feet and 5%)? |
|---|---|---|---|---|
| Central Texas GCD | Woodbine | — | — | — |
| | Paluxy | — | — | — |
| | Glen Rose | 2 | 2 | No |
| | Twin Mountains | — | — | — |
| | Travis Peak | 19 | 11 | No |
| | Hensell | 7 | 9 | No |
| | Hosston | 21 | 21 | No |
| | Antlers | — | — | — |
| Clearwater UWCD | Woodbine | — | — | — |
| | Paluxy | 17 | 18 | No |
| | Glen Rose | 83 | 83 | No |
| | Twin Mountains | — | — | — |
| | Travis Peak | 333 | 333 | No |
| | Hensell | 145 | 145 | No |
| | Hosston | 375 | 375 | No |
| | Antlers | — | — | — |
| Middle Trinity GCD | Woodbine | — | — | — |
| | Paluxy | 5 | 7 | No |
| | Glen Rose | 29 | 29 | No |
| | Twin Mountains | 8 | 6 | No |
| | Travis Peak | 98 | 98 | No |
| | Hensell | 77 | 77 | No |
| | Hosston | 124 | 124 | No |
| | Antlers | 12 | 12 | No |
| North Texas GCD | Woodbine | 263 | 263 | No |
| | Paluxy | 690 | 690 | No |
| | Glen Rose | 366 | 366 | No |
| | Twin Mountains | 601 | 601 | No |
| | Travis Peak | — | — | — |
| | Hensell | — | — | — |
| | Hosston | — | — | — |
| | Antlers | 305 | 296 | No |

**TABLE A1 (CONT). COMPARISON BETWEEN DRAWDOWN AND DESIRED FUTURE CONDITIONS BY GROUNDWATER CONSERVATION DISTRICT (GCD), EXCLUDING UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT.**

| GCD | Aquifer | Desired Future Condition (feet of drawdown between January 1, 2010 and December 31, 2080) | Simulated Drawdown between Initial Water Levels and Stress Period 71 (feet) | Is Desired Future Condition Violated (Exceeded by 5 feet and 5%)? |
|---|---|---|---|---|
| Northern Trinity GCD | Woodbine | 6 | 6 | No |
| | Paluxy | 105 | 105 | No |
| | Glen Rose | 163 | 163 | No |
| | Twin Mountains | 348 | 232 | No |
| | Travis Peak | — | — | — |
| | Hensell | — | — | — |
| | Hosston | — | — | — |
| | Antlers | 177 | 83 | No |
| Post Oak Savannah GCD | Woodbine | — | — | — |
| | Paluxy | — | — | — |
| | Glen Rose | 241 | 241 | No |
| | Twin Mountains | — | — | — |
| | Travis Peak | 412 | 412 | No |
| | Hensell | 261 | 261 | No |
| | Hosston | 412 | 412 | No |
| | Antlers | — | — | — |
| Prairielands GCD | Woodbine | 44 | 44 | No |
| | Paluxy | 44 | 46 | No |
| | Glen Rose | 142 | 142 | No |
| | Twin Mountains | 170 | 46 | No |
| | Travis Peak | 323 | 311 | No |
| | Hensell | 201 | 207 | No |
| | Hosston | 364 | 369 | No |
| | Antlers | — | — | — |
| Red River GCD | Woodbine | 209 | 211 | No |
| | Paluxy | 830 | 720 | No |
| | Glen Rose | 335 | 308 | No |
| | Twin Mountains | 405 | 405 | No |
| | Travis Peak | 291 | 291 | No |
| | Hensell | — | — | — |
| | Hosston | — | — | — |
| | Antlers | 321 | 321 | No |
| Saratoga UWCD | Woodbine | — | — | — |
| | Paluxy | — | — | — |
| | Glen Rose | 1 | 1 | No |
| | Twin Mountains | — | — | — |
| | Travis Peak | 6 | 6 | No |
| | Hensell | 1 | 2 | No |
| | Hosston | 11 | 12 | No |
| | Antlers | — | — | — |

**TABLE A1 (CONT). COMPARISON BETWEEN DRAWDOWN AND DESIRED FUTURE CONDITIONS BY GROUNDWATER CONSERVATION DISTRICT (GCD), EXCLUDING UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT.**

| GCD | Aquifer | Desired Future Condition (feet of drawdown between January 1, 2010 and December 31, 2080) | Simulated Drawdown between Initial Water Levels and Stress Period 71 (feet) | Is Desired Future Condition Violated (Exceeded by 5 feet and 5%)? |
|---|---|---|---|---|
| Southern Trinity GCD | Woodbine | 6 | 6 | No |
| | Paluxy | 41 | 41 | No |
| | Glen Rose | 148 | 148 | No |
| | Twin Mountains | — | — | — |
| | Travis Peak | 504 | 499 | No |
| | Hensell | 242 | 242 | No |
| | Hosston | 582 | 582 | No |
| | Antlers | — | — | — |

**TABLE A2. COMPARISON BETWEEN DRAWDOWN AND DESIRED FUTURE CONDITIONS FOR UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT.**

| GCD | Portion | Aquifer | Desired Future Condition (feet of drawdown between January 1, 2010 and December 31, 2080) | Simulated Drawdown between Initial Water Levels and Stress Period 71 (feet) | Is Desired Future Condition Violated (Exceeded by 5 feet and 5%)? |
|---|---|---|---|---|---|
| Upper Trinity GCD | outcrop | Woodbine | — | — | — |
| | | Paluxy | 6 | 6 | No |
| | | Glen Rose | 15 | 14 | No |
| | | Twin Mountains | 10 | 6 | No |
| | | Travis Peak | — | — | — |
| | | Hensell | — | — | — |
| | | Hosston | — | — | — |
| | | Antlers | 47 | 16 | No |
| Upper Trinity GCD | subcrop | Woodbine | — | — | — |
| | | Paluxy | 2 | 2 | No |
| | | Glen Rose | 45 | 49 | No |
| | | Twin Mountains | 70 | 46 | No |
| | | Travis Peak | — | — | — |
| | | Hensell | — | — | — |
| | | Hosston | — | — | — |
| | | Antlers | 154 | 92 | No |

**TABLE A3. COMPARISON BETWEEN DRAWDOWN AND DESIRED FUTURE CONDITIONS BY COUNTY, EXCLUDING COUNTIES IN UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT.**

| County | Aquifer | Desired Future Condition (feet of drawdown between January 1, 2010 and December 31, 2080) | Simulated Drawdown between Initial Water Levels and Stress Period 71 (feet) | Is Desired Future Condition Violated (Exceeded by 5 feet and 5%)? |
|---|---|---|---|---|
| Bell | Woodbine | — | — | — |
| | Paluxy | 17 | 18.46 | No |
| | Glen Rose | 83 | 82.74 | No |
| | Twin Mountains | — | — | — |
| | Travis Peak | 333 | 332.79 | No |
| | Hensell | 145 | 144.73 | No |
| | Hosston | 375 | 374.76 | No |
| | Antlers | — | — | — |
| Bosque | Woodbine | — | — | — |
| | Paluxy | 6 | 6.78 | No |
| | Glen Rose | 53 | 53.38 | No |
| | Twin Mountains | — | — | — |
| | Travis Peak | 189 | 188.88 | No |
| | Hensell | 139 | 139.01 | No |
| | Hosston | 232 | 232.23 | No |
| | Antlers | — | — | — |
| Brown | Woodbine | — | — | — |
| | Paluxy | — | — | — |
| | Glen Rose | 1 | 1.9 | No |
| | Twin Mountains | — | — | — |
| | Travis Peak | 2 | 1.23 | No |
| | Hensell | 1 | 1.14 | No |
| | Hosston | 1 | 1.3 | No |
| | Antlers | 2 | 2.56 | No |
| Burnet | Woodbine | — | — | — |
| | Paluxy | — | — | — |
| | Glen Rose | 2 | 2.39 | No |
| | Twin Mountains | — | — | — |
| | Travis Peak | 19 | 10.76 | No |
| | Hensell | 7 | 8.89 | No |
| | Hosston | 21 | 21.2 | No |
| | Antlers | — | — | — |
| Callahan | Woodbine | — | — | — |
| | Paluxy | — | — | — |
| | Glen Rose | — | — | — |
| | Twin Mountains | — | — | — |
| | Travis Peak | — | — | — |
| | Hensell | — | — | — |
| | Hosston | — | — | — |
| | Antlers | 1 | 1.38 | No |

**TABLE A3 (CONT). COMPARISON BETWEEN DRAWDOWN AND DESIRED FUTURE CONDITIONS BY COUNTY, EXCLUDING COUNTIES IN UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT.**

| County | Aquifer | Desired Future Condition (feet of drawdown between January 1, 2010 and December 31, 2080) | Simulated Drawdown between Initial Water Levels and Stress Period 71 (feet) | Is Desired Future Condition Violated (Exceeded by 5 feet and 5%)? |
|---|---|---|---|---|
| Collin | Woodbine | 482 | 481.88 | No |
| | Paluxy | 729 | 728.64 | No |
| | Glen Rose | 366 | 365.79 | No |
| | Twin Mountains | 560 | 559.87 | No |
| | Travis Peak | — | — | — |
| | Hensell | — | — | — |
| | Hosston | — | — | — |
| | Antlers | 596 | 583.45 | No |
| Comanche | Woodbine | — | — | — |
| | Paluxy | — | — | — |
| | Glen Rose | 2 | 1.44 | No |
| | Twin Mountains | — | — | — |
| | Travis Peak | 4 | 2.4 | No |
| | Hensell | 2 | 1.76 | No |
| | Hosston | 3 | 2.86 | No |
| | Antlers | 12 | 12.08 | No |
| Cooke | Woodbine | 2 | 2.41 | No |
| | Paluxy | — | — | — |
| | Glen Rose | — | — | — |
| | Twin Mountains | — | — | — |
| | Travis Peak | — | — | — |
| | Hensell | — | — | — |
| | Hosston | — | — | — |
| | Antlers | 191 | 178.36 | No |
| Coryell | Woodbine | — | — | — |
| | Paluxy | 5 | 7.5 | No |
| | Glen Rose | 15 | 15.37 | No |
| | Twin Mountains | — | — | — |
| | Travis Peak | 107 | 107.32 | No |
| | Hensell | 70 | 70.02 | No |
| | Hosston | 141 | 140.6 | No |
| | Antlers | — | — | — |
| Dallas | Woodbine | 137 | 137.41 | No |
| | Paluxy | 346 | 345.58 | No |
| | Glen Rose | 288 | 288.24 | No |
| | Twin Mountains | 515 | 515.09 | No |
| | Travis Peak | 415 | 414.61 | No |
| | Hensell | 362 | 361.55 | No |
| | Hosston | 419 | 418.84 | No |
| | Antlers | — | — | — |

**TABLE A3 (CONT). COMPARISON BETWEEN DRAWDOWN AND DESIRED FUTURE CONDITIONS BY COUNTY, EXCLUDING COUNTIES IN UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT.**

| County | Aquifer | Desired Future Condition (feet of drawdown between January 1, 2010 and December 31, 2080) | Simulated Drawdown between Initial Water Levels and Stress Period 71 (feet) | Is Desired Future Condition Violated (Exceeded by 5 feet and 5%)? |
|---|---|---|---|---|
| Delta | Woodbine | — | — | — |
| | Paluxy | 279 | 278.97 | No |
| | Glen Rose | 198 | 197.8 | No |
| | Twin Mountains | — | — | — |
| | Travis Peak | 202 | 202.1 | No |
| | Hensell | — | — | — |
| | Hosston | — | — | — |
| | Antlers | — | — | — |
| Denton | Woodbine | 22 | 20.37 | No |
| | Paluxy | 558 | 557.89 | No |
| | Glen Rose | 367 | 367.03 | No |
| | Twin Mountains | 752 | 742.97 | No |
| | Travis Peak | — | — | — |
| | Hensell | — | — | — |
| | Hosston | — | — | — |
| | Antlers | 416 | 404.5 | No |
| Eastland | Woodbine | — | — | — |
| | Paluxy | — | — | — |
| | Glen Rose | — | — | — |
| | Twin Mountains | — | — | — |
| | Travis Peak | — | — | — |
| | Hensell | — | — | — |
| | Hosston | — | — | — |
| | Antlers | 4 | 4.11 | No |
| Ellis | Woodbine | 76 | 76.07 | No |
| | Paluxy | 128 | 127.51 | No |
| | Glen Rose | 220 | 220.03 | No |
| | Twin Mountains | 413 | 413.29 | No |
| | Travis Peak | 380 | 380.25 | No |
| | Hensell | 290 | 290.49 | No |
| | Hosston | 390 | 390.34 | No |
| | Antlers | — | — | — |
| Erath | Woodbine | — | — | — |
| | Paluxy | 6 | 1.01 | No |
| | Glen Rose | 6 | 5.07 | No |
| | Twin Mountains | 8 | 6.4 | No |
| | Travis Peak | 25 | 20.18 | No |
| | Hensell | 12 | 11.45 | No |
| | Hosston | 35 | 35 | No |
| | Antlers | 14 | 13.56 | No |

**TABLE A3 (CONT). COMPARISON BETWEEN DRAWDOWN AND DESIRED FUTURE CONDITIONS BY COUNTY, EXCLUDING COUNTIES IN UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT.**

| County | Aquifer | Desired Future Condition (feet of drawdown between January 1, 2010 and December 31, 2080) | Simulated Drawdown between Initial Water Levels and Stress Period 71 (feet) | Is Desired Future Condition Violated (Exceeded by 5 feet and 5%)? |
|---|---|---|---|---|
| Falls | Woodbine | — | — | — |
| | Paluxy | 159 | 159.35 | No |
| | Glen Rose | 238 | 238.09 | No |
| | Twin Mountains | — | — | — |
| | Travis Peak | 505 | 504.77 | No |
| | Hensell | 296 | 296.31 | No |
| | Hosston | 511 | 511.14 | No |
| | Antlers | — | — | — |
| Fannin | Woodbine | 259 | 259.23 | No |
| | Paluxy | 709 | 708.85 | No |
| | Glen Rose | 305 | 305.1 | No |
| | Twin Mountains | 400 | 400.17 | No |
| | Travis Peak | 291 | 291.45 | No |
| | Hensell | — | — | — |
| | Hosston | — | — | — |
| | Antlers | 269 | 268.98 | No |
| Grayson | Woodbine | 163 | 162.86 | No |
| | Paluxy | 943 | 942.74 | No |
| | Glen Rose | 364 | 363.85 | No |
| | Twin Mountains | 445 | 445.2 | No |
| | Travis Peak | — | — | — |
| | Hensell | — | — | — |
| | Hosston | — | — | — |
| | Antlers | 364 | 363 | No |
| Hamilton | Woodbine | — | — | — |
| | Paluxy | 2 | 2.77 | No |
| | Glen Rose | 4 | 4.25 | No |
| | Twin Mountains | — | — | — |
| | Travis Peak | 26 | 25.93 | No |
| | Hensell | 14 | 13.99 | No |
| | Hosston | 38 | 38.2 | No |
| | Antlers | — | — | — |
| Hill | Woodbine | 20 | 19.71 | No |
| | Paluxy | 45 | 44.9 | No |
| | Glen Rose | 149 | 148.93 | No |
| | Twin Mountains | — | — | — |
| | Travis Peak | 365 | 364.39 | No |
| | Hensell | 211 | 211.07 | No |
| | Hosston | 413 | 412.6 | No |
| | Antlers | — | — | — |

**TABLE A3 (CONT). COMPARISON BETWEEN DRAWDOWN AND DESIRED FUTURE CONDITIONS BY COUNTY, EXCLUDING COUNTIES IN UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT.**

| County | Aquifer | Desired Future Condition (feet of drawdown between January 1, 2010 and December 31, 2080) | Simulated Drawdown between Initial Water Levels and Stress Period 71 (feet) | Is Desired Future Condition Violated (Exceeded by 5 feet and 5%)? |
|---|---|---|---|---|
| Hunt | Woodbine | 631 | 630.96 | No |
| | Paluxy | 610 | 610.15 | No |
| | Glen Rose | 326 | 326.15 | No |
| | Twin Mountains | 399 | 398.85 | No |
| | Travis Peak | 350 | 349.84 | No |
| | Hensell | — | — | — |
| | Hosston | — | — | — |
| | Antlers | — | — | — |
| Johnson | Woodbine | 4 | 3.55 | No |
| | Paluxy | -57 | -57.56 | No |
| | Glen Rose | 66 | 65.87 | No |
| | Twin Mountains | 184 | 33.24 | No |
| | Travis Peak | 235 | 178.04 | No |
| | Hensell | 120 | 120.41 | No |
| | Hosston | 329 | 329.41 | No |
| | Antlers | — | — | — |
| Kaufman | Woodbine | 242 | 241.7 | No |
| | Paluxy | 311 | 311.43 | No |
| | Glen Rose | 305 | 304.98 | No |
| | Twin Mountains | 427 | 427 | No |
| | Travis Peak | 372 | 371.84 | No |
| | Hensell | 349 | 348.53 | No |
| | Hosston | 345 | 344.74 | No |
| | Antlers | — | — | — |
| Lamar | Woodbine | 42 | 42.07 | No |
| | Paluxy | 100 | 100.09 | No |
| | Glen Rose | 107 | 106.9 | No |
| | Twin Mountains | — | — | — |
| | Travis Peak | 125 | 124.5 | No |
| | Hensell | — | — | — |
| | Hosston | — | — | — |
| | Antlers | 132 | 132.31 | No |
| Lampasas | Woodbine | — | — | — |
| | Paluxy | — | — | — |
| | Glen Rose | 1 | 1.22 | No |
| | Twin Mountains | — | — | — |
| | Travis Peak | 6 | 6.31 | No |
| | Hensell | 1 | 1.56 | No |
| | Hosston | 11 | 11.64 | No |
| | Antlers | — | — | — |

**TABLE A3 (CONT). COMPARISON BETWEEN DRAWDOWN AND DESIRED FUTURE CONDITIONS BY COUNTY, EXCLUDING COUNTIES IN UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT.**

| County | Aquifer | Desired Future Condition (feet of drawdown between January 1, 2010 and December 31, 2080) | Simulated Drawdown between Initial Water Levels and Stress Period 71 (feet) | Is Desired Future Condition Violated (Exceeded by 5 feet and 5%)? |
|---|---|---|---|---|
| Limestone | Woodbine | — | — | — |
| | Paluxy | 199 | 198.7 | No |
| | Glen Rose | 301 | 300.8 | No |
| | Twin Mountains | — | — | — |
| | Travis Peak | 433 | 433.11 | No |
| | Hensell | 214 | 214.2 | No |
| | Hosston | 445 | 444.63 | No |
| | Antlers | — | — | — |
| McLennan | Woodbine | 6 | 6.49 | No |
| | Paluxy | 41 | 41.02 | No |
| | Glen Rose | 148 | 147.65 | No |
| | Twin Mountains | — | — | — |
| | Travis Peak | 504 | 498.88 | No |
| | Hensell | 242 | 242.36 | No |
| | Hosston | 582 | 581.81 | No |
| | Antlers | — | — | — |
| Milam | Woodbine | — | — | — |
| | Paluxy | — | — | — |
| | Glen Rose | 241 | 240.72 | No |
| | Twin Mountains | — | — | — |
| | Travis Peak | 412 | 411.52 | No |
| | Hensell | 261 | 260.7 | No |
| | Hosston | 412 | 412.3 | No |
| | Antlers | — | — | — |
| Mills | Woodbine | — | — | — |
| | Paluxy | 1 | 0.64 | No |
| | Glen Rose | 1 | 1.2 | No |
| | Twin Mountains | — | — | — |
| | Travis Peak | 9 | 7.36 | No |
| | Hensell | 2 | 2.16 | No |
| | Hosston | 13 | 13.67 | No |
| | Antlers | — | — | — |
| Navarro | Woodbine | 110 | 110.34 | No |
| | Paluxy | 139 | 139.22 | No |
| | Glen Rose | 266 | 265.96 | No |
| | Twin Mountains | — | — | — |
| | Travis Peak | 343 | 343.14 | No |
| | Hensell | 295 | 295.18 | No |
| | Hosston | 343 | 343.41 | No |
| | Antlers | — | — | — |

**TABLE A3 (CONT). COMPARISON BETWEEN DRAWDOWN AND DESIRED FUTURE CONDITIONS BY COUNTY, EXCLUDING COUNTIES IN UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT.**

| County | Aquifer | Desired Future Condition (feet of drawdown between January 1, 2010 and December 31, 2080) | Simulated Drawdown between Initial Water Levels and Stress Period 71 (feet) | Is Desired Future Condition Violated (Exceeded by 5 feet and 5%)? |
|---|---|---|---|---|
| Red River | Woodbine | 2 | 2.28 | No |
| | Paluxy | 24 | 23.74 | No |
| | Glen Rose | 40 | 39.58 | No |
| | Twin Mountains | — | — | — |
| | Travis Peak | 57 | 56.88 | No |
| | Hensell | — | — | — |
| | Hosston | — | — | — |
| | Antlers | 15 | 14.51 | No |
| Rockwall | Woodbine | 275 | 274.86 | No |
| | Paluxy | 433 | 432.69 | No |
| | Glen Rose | 343 | 342.57 | No |
| | Twin Mountains | 466 | 466.49 | No |
| | Travis Peak | — | — | — |
| | Hensell | — | — | — |
| | Hosston | — | — | — |
| | Antlers | — | — | — |
| Somervell | Woodbine | — | — | — |
| | Paluxy | 4 | 1.62 | No |
| | Glen Rose | 4 | 4.45 | No |
| | Twin Mountains | 50 | 50.27 | No |
| | Travis Peak | 64 | 64.26 | No |
| | Hensell | 17 | 16.57 | No |
| | Hosston | 120 | 120.22 | No |
| | Antlers | — | — | — |
| Tarrant | Woodbine | 6 | 6.41 | No |
| | Paluxy | 105 | 105.14 | No |
| | Glen Rose | 163 | 163.16 | No |
| | Twin Mountains | 348 | 231.93 | No |
| | Travis Peak | — | — | — |
| | Hensell | — | — | — |
| | Hosston | — | — | — |
| | Antlers | 177 | 83.43 | No |
| Taylor | Woodbine | — | — | — |
| | Paluxy | — | — | — |
| | Glen Rose | — | — | — |
| | Twin Mountains | — | — | — |
| | Travis Peak | — | — | — |
| | Hensell | — | — | — |
| | Hosston | — | — | — |
| | Antlers | 0 | 0.26 | No |

**TABLE A3 (CONT). COMPARISON BETWEEN DRAWDOWN AND DESIRED FUTURE CONDITIONS BY COUNTY, EXCLUDING COUNTIES IN UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT.**

| County | Aquifer | Desired Future Condition (feet of drawdown between January 1, 2010 and December 31, 2080) | Simulated Drawdown between Initial Water Levels and Stress Period 71 (feet) | Is Desired Future Condition Violated (Exceeded by 5 feet and 5%)? |
|---|---|---|---|---|
| Travis | Woodbine | — | — | — |
| | Paluxy | — | — | — |
| | Glen Rose | 90 | 89.73 | No |
| | Twin Mountains | — | — | — |
| | Travis Peak | 219 | 215.69 | No |
| | Hensell | 68 | 69.19 | No |
| | Hosston | 226 | 224.15 | No |
| | Antlers | — | — | — |
| Williamson | Woodbine | — | — | — |
| | Paluxy | — | — | — |
| | Glen Rose | 78 | 79.23 | No |
| | Twin Mountains | — | — | — |
| | Travis Peak | 220 | 220.43 | No |
| | Hensell | 89 | 90.6 | No |
| | Hosston | 225 | 225.78 | No |
| | Antlers | — | — | — |

**TABLE A4. COMPARISON BETWEEN DRAWDOWN AND DESIRED FUTURE CONDITIONS BY COUNTY IN UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT.**

| County | Portion | Aquifer | Desired Future Condition (feet of drawdown between January 1, 2010 and December 31, 2080) | Simulated Drawdown between Initial Water Levels and Stress Period 71 (feet) | Is Desired Future Condition Violated (Exceeded by 5 feet and 5%)? |
|---|---|---|---|---|---|
| Hood | outcrop | Antlers | — | — | — |
| | | Paluxy | 6 | 5.68 | No |
| | | Glen Rose | 9 | 9.41 | No |
| | | Twin Mountains | 13 | 8.14 | No |
| | subcrop | Antlers | — | — | — |
| | | Paluxy | — | — | — |
| | | Glen Rose | 39 | 39.41 | No |
| | | Twin Mountains | 72 | 20.57 | No |
| Montague | outcrop | Antlers | 40 | 20.37 | No |
| | | Paluxy | — | — | — |
| | | Glen Rose | — | — | — |
| | | Twin Mountains | — | — | — |
| | subcrop | Antlers | — | — | — |
| | | Paluxy | — | — | — |
| | | Glen Rose | — | — | — |
| | | Twin Mountains | — | — | — |
| Parker | outcrop | Antlers | 42 | 8.76 | No |
| | | Paluxy | 6 | 5.69 | No |
| | | Glen Rose | 20 | 20.06 | No |
| | | Twin Mountains | 7 | 2.42 | No |
| | subcrop | Antlers | — | — | — |
| | | Paluxy | 2 | 1.81 | No |
| | | Glen Rose | 50 | 50.41 | No |
| | | Twin Mountains | 68 | 61.87 | No |
| Wise | outcrop | Antlers | 60 | 16.44 | No |
| | | Paluxy | — | — | — |
| | | Glen Rose | — | — | — |
| | | Twin Mountains | — | — | — |
| | subcrop | Antlers | 154 | 92.38 | No |
| | | Paluxy | — | — | — |
| | | Glen Rose | — | — | — |
| | | Twin Mountains | — | — | — |

# *Appendix B*

**Comparison between Desired Future Conditions and Drawdowns for the Marble Falls, Ellenburger-San Saba, and Hickory Aquifers in Brown, Burnet, Lampasas, and Mills Counties**

The water level file from the predictive model output was used to calculate the drawdown (D) within the modeled extent for each aquifer between 2009 and 2080 using the following equation:

$$D = \frac{\sum_{i=1}^{n}(h2009_i - h2080_i)}{n}$$

Where:

$n$ = Total model cells in a county

$h2009_i$ = Water level of 2009 at model cell $i$ (feet)

$h2080_i$ = Water level of 2080 at model cell $i$ (feet)

Model cells with water level values below the cell bottom in 2009 were excluded from the calculation. Also, water level was set at the cell bottom if it fell below the cell bottom in 2080.

The comparison between the simulated drawdowns and the desired future conditions is presented in Table B1. The comparison indicates that the predictive simulation meets the desired future conditions of the Marble Falls, Ellenburger-San Saba, and Hickory aquifers in Brown, Burnet, Lampasas, and Mills counties.

**TABLE B1. COMPARISON BETWEEN SIMULATED REMAINING AQUIFER SATURATED THICKESS AND DESIRED FUTURE CONDITIONS OF MARBLE FALLS, ELLENBURGER-SAN SABA, AND HICKORY AQUIFERS IN BROWN, BURNET, LAMPASAS, AND MILLS COUNTIES.**

| County | Aquifer | Desired Future Condition (feet of drawdown between 2009 and 2080) | Simulated Drawdown between 2009 and 2080 (feet) | Is Desired Future Condition Violated? |
|---|---|---|---|---|
| Brown | Marble Falls | 3 | 3 | no |
| | Ellenburger-San Saba | 3 | 3 | no |
| | Hickory | 3 | 3 | no |
| Burnet | Marble Falls | 11 | 11 | no |
| | Ellenburger-San Saba | 12 | 9 | no |
| | Hickory | 11 | 11 | no |
| Lampasas | Marble Falls | 16 | 16 | no |
| | Ellenburger-San Saba | 16 | 16 | no |
| | Hickory | 16 | 16 | no |
| Mills | Marble Falls | 9 | 9 | no |
| | Ellenburger-San Saba | 9 | 9 | no |
| | Hickory | 9 | 9 | no |

# *Appendix C*

## Summary of Dry Model Cell Count for the Trinity, Woodbine, Marble Falls, Ellenburger-San Saba, and Hickory Aquifers

**TABLE C1. SUMMARY OF DRY MODEL CELLS FOR TRINITY AND WOODBINE AQUIFERS FROM PREDICTIVE SIMULATION.**

| County | Aquifer | Year | Total Aquifer Cells | Dry Cells |
|---|---|---|---|---|
| Bell | Paluxy | 2009 | 1,767 | 0 |
| | | 2080 | 1,767 | 0 |
| | Glen Rose | 2009 | 23,737 | 0 |
| | | 2080 | 23,737 | 8 |
| | Hensell | 2009 | 17,390 | 0 |
| | | 2080 | 17,390 | 0 |
| | Hosston | 2009 | 17,390 | 0 |
| | | 2080 | 17,390 | 0 |
| | Travis Peak | 2009 | 52,170 | 0 |
| | | 2080 | 52,170 | 0 |
| Bosque | Paluxy | 2009 | 13,818 | 0 |
| | | 2080 | 13,818 | 0 |
| | Glen Rose | 2009 | 22,360 | 0 |
| | | 2080 | 22,360 | 0 |
| | Hensell | 2009 | 16,034 | 0 |
| | | 2080 | 16,034 | 0 |
| | Hosston | 2009 | 16,034 | 0 |
| | | 2080 | 16,034 | 0 |
| | Travis Peak | 2009 | 48,102 | 0 |
| | | 2080 | 48,102 | 0 |
| Brown | Glen Rose | 2009 | 36 | 0 |
| | | 2080 | 36 | 0 |
| | Hensell | 2009 | 1,608 | 0 |
| | | 2080 | 1,608 | 0 |
| | Hosston | 2009 | 10,258 | 0 |
| | | 2080 | 10,258 | 0 |
| | Travis Peak | 2009 | 15,847 | 0 |
| | | 2080 | 15,847 | 0 |
| | Antlers | 2009 | 12,354 | 0 |
| | | 2080 | 12,354 | 0 |

**TABLE C1 (CONT). SUMMARY OF DRY MODEL CELLS FOR TRINITY AND WOODBINE AQUIFERS FROM PREDICTIVE SIMULATION.**

| County | Aquifer | Year | Total Aquifer Cells | Dry Cells |
|---|---|---|---|---|
| Burnet | Glen Rose | 2009 | 22,534 | 0 |
| | | 2080 | 22,534 | 0 |
| | Hensell | 2009 | 12,332 | 0 |
| | | 2080 | 12,332 | 0 |
| | Hosston | 2009 | 22,320 | 217 |
| | | 2080 | 22,320 | 765 |
| | Travis Peak | 2009 | 44,433 | 217 |
| | | 2080 | 44,433 | 828 |
| Callahan | Antlers | 2009 | 34,576 | 0 |
| | | 2080 | 34,576 | 0 |
| Collin | Woodbine | 2009 | 11,762 | 0 |
| | | 2080 | 11,762 | 2 |
| | Paluxy | 2009 | 12,062 | 0 |
| | | 2080 | 12,062 | 319 |
| | Glen Rose | 2009 | 12,062 | 0 |
| | | 2080 | 12,062 | 0 |
| | Twin Mountains | 2009 | 36,186 | 0 |
| | | 2080 | 36,186 | 0 |
| | Antlers | 2009 | 7,055 | 0 |
| | | 2080 | 7,055 | 172 |
| Comanche | Glen Rose | 2009 | 1,440 | 0 |
| | | 2080 | 1,440 | 0 |
| | Hensell | 2009 | 22,362 | 0 |
| | | 2080 | 22,362 | 0 |
| | Hosston | 2009 | 41,062 | 0 |
| | | 2080 | 41,062 | 353 |
| | Travis Peak | 2009 | 78,137 | 0 |
| | | 2080 | 78,137 | 353 |
| | Antlers | 2009 | 23,711 | 123 |
| | | 2080 | 23,711 | 3,149 |
| Cooke | Woodbine | 2009 | 5,700 | 0 |
| | | 2080 | 5,700 | 26 |
| | Antlers | 2009 | 77,047 | 0 |
| | | 2080 | 77,047 | 839 |

**TABLE C1 (CONT). SUMMARY OF DRY MODEL CELLS FOR TRINITY AND WOODBINE AQUIFERS FROM PREDICTIVE SIMULATION.**

| County | Aquifer | Year | Total Aquifer Cells | Dry Cells |
|---|---|---|---|---|
| Coryell | Paluxy | 2009 | 6,512 | 0 |
| | | 2080 | 6,512 | 0 |
| | Glen Rose | 2009 | 41,647 | 11 |
| | | 2080 | 41,647 | 25 |
| | Hensell | 2009 | 16,914 | 0 |
| | | 2080 | 16,914 | 0 |
| | Hosston | 2009 | 16,914 | 0 |
| | | 2080 | 16,914 | 0 |
| | Travis Peak | 2009 | 50,742 | 0 |
| | | 2080 | 50,742 | 0 |
| Dallas | Woodbine | 2009 | 14,152 | 0 |
| | | 2080 | 14,152 | 0 |
| | Paluxy | 2009 | 14,532 | 0 |
| | | 2080 | 14,532 | 10 |
| | Glen Rose | 2009 | 14,532 | 0 |
| | | 2080 | 14,532 | 0 |
| | Hensell | 2009 | 80 | 0 |
| | | 2080 | 80 | 0 |
| | Hosston | 2009 | 80 | 0 |
| | | 2080 | 80 | 0 |
| | Twin Mountains | 2009 | 43,353 | 0 |
| | | 2080 | 43,353 | 0 |
| | Travis Peak | 2009 | 243 | 0 |
| | | 2080 | 243 | 0 |
| Delta | Paluxy | 2009 | 1,217 | 0 |
| | | 2080 | 1,217 | 0 |
| | Glen Rose | 2009 | 1,217 | 0 |
| | | 2080 | 1,217 | 0 |
| | Travis Peak | 2009 | 3,651 | 0 |
| | | 2080 | 3,651 | 0 |

**TABLE C1 (CONT). SUMMARY OF DRY MODEL CELLS FOR TRINITY AND WOODBINE AQUIFERS FROM PREDICTIVE SIMULATION.**

| County | Aquifer | Year | Total Aquifer Cells | Dry Cells |
|---|---|---|---|---|
| Denton | Woodbine | 2009 | 11,991 | 3 |
| | | 2080 | 11,991 | 10 |
| | Paluxy | 2009 | 3,520 | 0 |
| | | 2080 | 3,520 | 2,115 |
| | Glen Rose | 2009 | 3,520 | 0 |
| | | 2080 | 3,520 | 0 |
| | Twin Mountains | 2009 | 10,560 | 0 |
| | | 2080 | 10,560 | 84 |
| | Antlers | 2009 | 59,107 | 0 |
| | | 2080 | 59,107 | 5,738 |
| Eastland | Antlers | 2009 | 44,009 | 74 |
| | | 2080 | 44,009 | 1,116 |
| Ellis | Woodbine | 2009 | 14,207 | 0 |
| | | 2080 | 14,207 | 0 |
| | Paluxy | 2009 | 15,173 | 0 |
| | | 2080 | 15,173 | 0 |
| | Glen Rose | 2009 | 15,209 | 0 |
| | | 2080 | 15,209 | 0 |
| | Hensell | 2009 | 15,120 | 0 |
| | | 2080 | 15,120 | 0 |
| | Hosston | 2009 | 15,120 | 0 |
| | | 2080 | 15,120 | 0 |
| | Twin Mountains | 2009 | 225 | 0 |
| | | 2080 | 225 | 0 |
| | Travis Peak | 2009 | 45,402 | 0 |
| | | 2080 | 45,402 | 0 |

**TABLE C1 (CONT). SUMMARY OF DRY MODEL CELLS FOR TRINITY AND WOODBINE AQUIFERS FROM PREDICTIVE SIMULATION.**

| County | Aquifer | Year | Total Aquifer Cells | Dry Cells |
|---|---|---|---|---|
| Erath | Paluxy | 2009 | 1,443 | 0 |
| | | 2080 | 1,443 | 0 |
| | Glen Rose | 2009 | 20,905 | 0 |
| | | 2080 | 20,905 | 32 |
| | Hensell | 2009 | 21,880 | 0 |
| | | 2080 | 21,880 | 83 |
| | Hosston | 2009 | 8,464 | 0 |
| | | 2080 | 8,464 | 372 |
| | Twin Mountains | 2009 | 46,114 | 20 |
| | | 2080 | 46,114 | 286 |
| | Travis Peak | 2009 | 39,220 | 0 |
| | | 2080 | 39,220 | 1,006 |
| | Antlers | 2009 | 8,983 | 0 |
| | | 2080 | 8,983 | 962 |
| Falls | Paluxy | 2009 | 1,439 | 0 |
| | | 2080 | 1,439 | 0 |
| | Glen Rose | 2009 | 5,840 | 0 |
| | | 2080 | 5,840 | 0 |
| | Hensell | 2009 | 5,840 | 0 |
| | | 2080 | 5,840 | 0 |
| | Hosston | 2009 | 5,840 | 0 |
| | | 2080 | 5,840 | 0 |
| | Travis Peak | 2009 | 17,520 | 0 |
| | | 2080 | 17,520 | 0 |
| Fannin | Woodbine | 2009 | 15,443 | 3 |
| | | 2080 | 15,443 | 60 |
| | Paluxy | 2009 | 1,582 | 0 |
| | | 2080 | 1,582 | 0 |
| | Glen Rose | 2009 | 1,582 | 0 |
| | | 2080 | 1,582 | 0 |
| | Twin Mountains | 2009 | 1,758 | 0 |
| | | 2080 | 1,758 | 0 |
| | Travis Peak | 2009 | 2,988 | 0 |
| | | 2080 | 2,988 | 0 |
| | Antlers | 2009 | 63,730 | 0 |
| | | 2080 | 63,730 | 0 |

**TABLE C1 (CONT). SUMMARY OF DRY MODEL CELLS FOR TRINITY AND WOODBINE AQUIFERS FROM PREDICTIVE SIMULATION.**

| County | Aquifer | Year | Total Aquifer Cells | Dry Cells |
|---|---|---|---|---|
| Grayson | Woodbine | 2009 | 17,911 | 2 |
| | | 2080 | 17,911 | 58 |
| | Paluxy | 2009 | 77 | 0 |
| | | 2080 | 77 | 0 |
| | Glen Rose | 2009 | 77 | 0 |
| | | 2080 | 77 | 0 |
| | Twin Mountains | 2009 | 231 | 0 |
| | | 2080 | 231 | 0 |
| | Antlers | 2009 | 77,954 | 0 |
| | | 2080 | 77,954 | 327 |
| Hamilton | Paluxy | 2009 | 1,897 | 0 |
| | | 2080 | 1,897 | 0 |
| | Glen Rose | 2009 | 36,944 | 0 |
| | | 2080 | 36,944 | 13 |
| | Hensell | 2009 | 16,890 | 0 |
| | | 2080 | 16,890 | 0 |
| | Hosston | 2009 | 13,373 | 0 |
| | | 2080 | 13,373 | 0 |
| | Travis Peak | 2009 | 43,636 | 0 |
| | | 2080 | 43,636 | 0 |
| Hill | Woodbine | 2009 | 12,602 | 0 |
| | | 2080 | 12,602 | 0 |
| | Paluxy | 2009 | 15,648 | 0 |
| | | 2080 | 15,648 | 0 |
| | Glen Rose | 2009 | 15,766 | 0 |
| | | 2080 | 15,766 | 0 |
| | Hensell | 2009 | 15,766 | 0 |
| | | 2080 | 15,766 | 0 |
| | Hosston | 2009 | 15,766 | 0 |
| | | 2080 | 15,766 | 0 |
| | Travis Peak | 2009 | 47,298 | 0 |
| | | 2080 | 47,298 | 157 |

**TABLE C1 (CONT). SUMMARY OF DRY MODEL CELLS FOR TRINITY AND WOODBINE AQUIFERS FROM PREDICTIVE SIMULATION.**

| County | Aquifer | Year | Total Aquifer Cells | Dry Cells |
|---|---|---|---|---|
| Hood | Paluxy | 2009 | 434 | 0 |
| | | 2080 | 434 | 0 |
| | Glen Rose | 2009 | 14,461 | 0 |
| | | 2080 | 14,461 | 74 |
| | Hensell | 2009 | 117 | 0 |
| | | 2080 | 117 | 0 |
| | Hosston | 2009 | 117 | 0 |
| | | 2080 | 117 | 5 |
| | Twin Mountains | 2009 | 37,444 | 0 |
| | | 2080 | 37,444 | 1,710 |
| | Travis Peak | 2009 | 351 | 0 |
| | | 2080 | 351 | 5 |
| Hunt | Woodbine | 2009 | 2,193 | 0 |
| | | 2080 | 2,193 | 0 |
| | Paluxy | 2009 | 1,362 | 0 |
| | | 2080 | 1,362 | 0 |
| | Glen Rose | 2009 | 1,362 | 0 |
| | | 2080 | 1,362 | 0 |
| | Twin Mountains | 2009 | 492 | 0 |
| | | 2080 | 492 | 0 |
| | Travis Peak | 2009 | 3,594 | 0 |
| | | 2080 | 3,594 | 0 |
| Johnson | Woodbine | 2009 | 8,407 | 14 |
| | | 2080 | 8,407 | 68 |
| | Paluxy | 2009 | 11,627 | 17 |
| | | 2080 | 11,627 | 0 |
| | Glen Rose | 2009 | 12,342 | 15 |
| | | 2080 | 12,342 | 37 |
| | Hensell | 2009 | 9,462 | 0 |
| | | 2080 | 9,462 | 0 |
| | Hosston | 2009 | 9,462 | 0 |
| | | 2080 | 9,462 | 1,278 |
| | Twin Mountains | 2009 | 6,816 | 0 |
| | | 2080 | 6,816 | 1,836 |
| | Travis Peak | 2009 | 28,386 | 0 |
| | | 2080 | 28,386 | 1,278 |

**TABLE C1 (CONT). SUMMARY OF DRY MODEL CELLS FOR TRINITY AND WOODBINE AQUIFERS FROM PREDICTIVE SIMULATION.**

| County | Aquifer | Year | Total Aquifer Cells | Dry Cells |
|---|---|---|---|---|
| Kaufman | Woodbine | 2009 | 1,616 | 0 |
| | | 2080 | 1,616 | 0 |
| | Paluxy | 2009 | 1,321 | 0 |
| | | 2080 | 1,321 | 0 |
| | Glen Rose | 2009 | 1,331 | 0 |
| | | 2080 | 1,331 | 0 |
| | Hensell | 2009 | 82 | 0 |
| | | 2080 | 82 | 0 |
| | Hosston | 2009 | 82 | 0 |
| | | 2080 | 82 | 0 |
| | Twin Mountains | 2009 | 960 | 0 |
| | | 2080 | 960 | 0 |
| | Travis Peak | 2009 | 3,033 | 0 |
| | | 2080 | 3,033 | 0 |
| Lamar | Woodbine | 2009 | 9,839 | 0 |
| | | 2080 | 9,839 | 0 |
| | Paluxy | 2009 | 12,260 | 0 |
| | | 2080 | 12,260 | 0 |
| | Glen Rose | 2009 | 12,260 | 0 |
| | | 2080 | 12,260 | 0 |
| | Travis Peak | 2009 | 36,780 | 0 |
| | | 2080 | 36,780 | 0 |
| | Antlers | 2009 | 7,995 | 0 |
| | | 2080 | 7,995 | 0 |
| Lampasas | Glen Rose | 2009 | 8,692 | 0 |
| | | 2080 | 8,692 | 0 |
| | Hensell | 2009 | 25,364 | 1 |
| | | 2080 | 25,364 | 1 |
| | Hosston | 2009 | 23,100 | 0 |
| | | 2080 | 23,100 | 0 |
| | Travis Peak | 2009 | 62,529 | 1 |
| | | 2080 | 62,529 | 1 |

**TABLE C1 (CONT). SUMMARY OF DRY MODEL CELLS FOR TRINITY AND WOODBINE AQUIFERS FROM PREDICTIVE SIMULATION.**

| County | Aquifer | Year | Total Aquifer Cells | Dry Cells |
|---|---|---|---|---|
| Limestone | Paluxy | 2009 | 962 | 0 |
| | | 2080 | 962 | 0 |
| | Glen Rose | 2009 | 1,760 | 0 |
| | | 2080 | 1,760 | 0 |
| | Hensell | 2009 | 1,760 | 0 |
| | | 2080 | 1,760 | 0 |
| | Hosston | 2009 | 1,760 | 0 |
| | | 2080 | 1,760 | 0 |
| | Travis Peak | 2009 | 5,280 | 0 |
| | | 2080 | 5,280 | 0 |
| McLennan | Woodbine | 2009 | 1,909 | 0 |
| | | 2080 | 1,909 | 0 |
| | Paluxy | 2009 | 16,952 | 0 |
| | | 2080 | 16,952 | 0 |
| | Glen Rose | 2009 | 16,991 | 0 |
| | | 2080 | 16,991 | 0 |
| | Hensell | 2009 | 16,991 | 0 |
| | | 2080 | 16,991 | 0 |
| | Hosston | 2009 | 16,991 | 0 |
| | | 2080 | 16,991 | 16 |
| | Travis Peak | 2009 | 50,973 | 0 |
| | | 2080 | 50,973 | 16 |
| Milam | Glen Rose | 2009 | 2,579 | 0 |
| | | 2080 | 2,579 | 0 |
| | Hensell | 2009 | 2,579 | 0 |
| | | 2080 | 2,579 | 0 |
| | Hosston | 2009 | 2,579 | 0 |
| | | 2080 | 2,579 | 0 |
| | Travis Peak | 2009 | 7,737 | 0 |
| | | 2080 | 7,737 | 0 |

**TABLE C1 (CONT). SUMMARY OF DRY MODEL CELLS FOR TRINITY AND WOODBINE AQUIFERS FROM PREDICTIVE SIMULATION.**

| County | Aquifer | Year | Total Aquifer Cells | Dry Cells |
|---|---|---|---|---|
| Mills | Paluxy | 2009 | 936 | 0 |
| | | 2080 | 936 | 0 |
| | Glen Rose | 2009 | 10,615 | 0 |
| | | 2080 | 10,615 | 2 |
| | Hensell | 2009 | 18,539 | 0 |
| | | 2080 | 18,539 | 0 |
| | Hosston | 2009 | 14,226 | 0 |
| | | 2080 | 14,226 | 0 |
| | Travis Peak | 2009 | 42,934 | 0 |
| | | 2080 | 42,934 | 0 |
| Montague | Antlers | 2009 | 52,693 | 0 |
| | | 2080 | 52,693 | 417 |
| Navarro | Woodbine | 2009 | 1,578 | 0 |
| | | 2080 | 1,578 | 0 |
| | Paluxy | 2009 | 1,755 | 0 |
| | | 2080 | 1,755 | 0 |
| | Glen Rose | 2009 | 6,326 | 0 |
| | | 2080 | 6,326 | 0 |
| | Hensell | 2009 | 6,326 | 0 |
| | | 2080 | 6,326 | 0 |
| | Hosston | 2009 | 6,326 | 0 |
| | | 2080 | 6,326 | 0 |
| | Travis Peak | 2009 | 18,978 | 0 |
| | | 2080 | 18,978 | 0 |
| Parker | Paluxy | 2009 | 5,637 | 0 |
| | | 2080 | 5,637 | 0 |
| | Glen Rose | 2009 | 11,389 | 8 |
| | | 2080 | 11,389 | 753 |
| | Twin Mountains | 2009 | 30,326 | 0 |
| | | 2080 | 30,326 | 223 |
| | Antlers | 2009 | 40,600 | 0 |
| | | 2080 | 40,600 | 435 |

**TABLE C1 (CONT). SUMMARY OF DRY MODEL CELLS FOR TRINITY AND WOODBINE AQUIFERS FROM PREDICTIVE SIMULATION.**

| County | Aquifer | Year | Total Aquifer Cells | Dry Cells |
|---|---|---|---|---|
| Red River | Woodbine | 2009 | 4,222 | 0 |
| | | 2080 | 4,222 | 0 |
| | Paluxy | 2009 | 8,494 | 0 |
| | | 2080 | 8,494 | 0 |
| | Glen Rose | 2009 | 8,494 | 0 |
| | | 2080 | 8,494 | 0 |
| | Travis Peak | 2009 | 25,482 | 0 |
| | | 2080 | 25,482 | 0 |
| | Antlers | 2009 | 1,065 | 0 |
| | | 2080 | 1,065 | 0 |
| Rockwall | Woodbine | 2009 | 33 | 0 |
| | | 2080 | 33 | 0 |
| | Paluxy | 2009 | 711 | 0 |
| | | 2080 | 711 | 0 |
| | Glen Rose | 2009 | 711 | 0 |
| | | 2080 | 711 | 0 |
| | Twin Mountains | 2009 | 2,133 | 0 |
| | | 2080 | 2,133 | 0 |
| Somervell | Paluxy | 2009 | 851 | 0 |
| | | 2080 | 851 | 0 |
| | Glen Rose | 2009 | 11,274 | 0 |
| | | 2080 | 11,274 | 0 |
| | Hensell | 2009 | 3,045 | 0 |
| | | 2080 | 3,045 | 0 |
| | Hosston | 2009 | 2,640 | 0 |
| | | 2080 | 2,640 | 0 |
| | Twin Mountains | 2009 | 1,660 | 0 |
| | | 2080 | 1,660 | 0 |
| | Travis Peak | 2009 | 8,325 | 0 |
| | | 2080 | 8,325 | 0 |

**TABLE C1 (CONT). SUMMARY OF DRY MODEL CELLS FOR TRINITY AND WOODBINE AQUIFERS FROM PREDICTIVE SIMULATION.**

| County | Aquifer | Year | Total Aquifer Cells | Dry Cells |
|---|---|---|---|---|
| Tarrant | Woodbine | 2009 | 8,901 | 2 |
| | | 2080 | 8,901 | 3 |
| | Paluxy | 2009 | 15,389 | 3 |
| | | 2080 | 15,389 | 1,926 |
| | Glen Rose | 2009 | 13,571 | 0 |
| | | 2080 | 13,571 | 0 |
| | Twin Mountains | 2009 | 40,713 | 0 |
| | | 2080 | 40,713 | 6,065 |
| | Antlers | 2009 | 5,009 | 0 |
| | | 2080 | 5,009 | 1,033 |
| Taylor | Antlers | 2009 | 6,176 | 0 |
| | | 2080 | 6,176 | 0 |
| Travis | Glen Rose | 2009 | 14,314 | 25 |
| | | 2080 | 14,314 | 0 |
| | Hensell | 2009 | 11,310 | 0 |
| | | 2080 | 11,310 | 0 |
| | Hosston | 2009 | 9,400 | 57 |
| | | 2080 | 9,400 | 123 |
| | Travis Peak | 2009 | 30,124 | 57 |
| | | 2080 | 30,124 | 124 |
| Williamson | Glen Rose | 2009 | 24,271 | 0 |
| | | 2080 | 24,271 | 0 |
| | Hensell | 2009 | 17,454 | 0 |
| | | 2080 | 17,454 | 0 |
| | Hosston | 2009 | 17,454 | 0 |
| | | 2080 | 17,454 | 0 |
| | Travis Peak | 2009 | 52,362 | 0 |
| | | 2080 | 52,362 | 0 |
| Wise | Antlers | 2009 | 90,469 | 0 |
| | | 2080 | 90,469 | 3,563 |

**TABLE C2. SUMMARY OF DRY MODEL CELLS FOR MARBLE FALLS, ELLENBURGER-SAN SABA, AND HICKORY AQUIFERS IN BROWN, BURNET, LAMPASAS, AND MILLS COUNTIES FROM PREDICTIVE SIMULATION.**

| County | Aquifer | Active Cells | Dry Cells (2009) | Dry Cells (2080) |
|---|---|---|---|---|
| Brown | Marble Falls | 1,635 | 0 | 0 |
| | Ellenburger-San Saba | 1,635 | 0 | 0 |
| | Hickory | 1,635 | 0 | 0 |
| Burnet | Marble Falls | 10,810 | 2,298 | 2,450 |
| | Ellenburger-San Saba | 13,618 | 709 | 851 |
| | Hickory | 14,334 | 111 | 131 |
| Lampasas | Marble Falls | 7,614 | 611 | 683 |
| | Ellenburger-San Saba | 7,895 | 0 | 0 |
| | Hickory | 7,895 | 0 | 0 |
| Mills | Marble Falls | 3,540 | 0 | 0 |
| | Ellenburger-San Saba | 3,540 | 0 | 0 |
| | Hickory | 3,540 | 0 | 0 |

# APPENDIX J

# GAM Run 15-003: Clearwater Underground Water Conservation District Management Plan

by Roberto Anaya, P.G.
Texas Water Development Board
Groundwater Resources Division
Groundwater Availability Modeling Section
(512) 463-6115
November 24, 2015

STATE OF TEXAS
Roberto Anaya
Geology
No. 480
LICENSED
PROFESSIONAL GEOSCIENTIST

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# GAM Run 15-003: Clearwater Underground Water Conservation District Management Plan

by Roberto Anaya, P.G.
Texas Water Development Board
Groundwater Resources Division
Groundwater Availability Modeling Section
(512) 463-6115
November 24, 2015

## *EXECUTIVE SUMMARY:*

Texas State Water Code, Section 36.1071, Subsection (h), states that, in developing its groundwater management plan, a groundwater conservation district shall use groundwater availability modeling information provided by the executive administrator of the Texas Water Development Board (TWDB) in conjunction with any available site-specific information provided by the district for review and comment to the executive administrator. Information derived from groundwater availability models that shall be included in the groundwater management plan includes:

- the annual amount of recharge from precipitation to the groundwater resources within the district, if any;
- for each aquifer within the district, the annual volume of water that discharges from the aquifer to springs and any surface water bodies, including lakes, streams, and rivers; and
- the annual volume of flow into and out of the district within each aquifer and between aquifers in the district.

This report — Part 2 of a two-part package of information from the TWDB to Clearwater Underground Water Conservation District — fulfills the requirements noted above. Part 1 of the two-part package is the Estimated Historical Water Use/State Water Plan data report. The district will receive, or received, this data report from the TWDB Groundwater Technical Assistance Section. Questions about the data report can be directed to Mr. Stephen Allen, Stephen.Allen@twdb.texas.gov, (512) 463-7317.

The groundwater management plan for the Clearwater Underground Water Conservation District should be adopted by the district on or before January 14, 2016 and submitted to the executive administrator of the TWDB on or before February 13, 2016. The current management plan for the Clearwater Underground Water Conservation District expires on April 13, 2016.

This report discusses the methods, assumptions, and results from a model run using the most current groundwater availability models for the Trinity (northern portion) and Woodbine aquifers, version 2.01 (Kelley and others, 2014) and the northern segment of the Edwards (Balcones Fault Zone) Aquifer (Jones, 2003). This model run replaces the results of GAM Run 10-009 (Hassan, 2010) that used version 1.01 of the groundwater availability model for the Trinity (northern portion) and Woodbine aquifers (Bené and others, 2004). Tables 1 and 2 summarize the groundwater availability model data required by statute to be included in the district's groundwater conservation management plan, and Figures 1 and 2 show the areas of the model from which the values in the table were extracted. If after review of the figures, Clearwater Underground Water Conservation District determines that the district boundaries used in the assessment do not reflect current conditions, please notify the TWDB at your earliest convenience.

## *METHODS:*

In accordance with the provisions of the Texas State Water Code, Section 36.1071, Subsection (h), the updated groundwater availability model for the northern portion of the Trinity and Woodbine aquifers (Kelley and others, 2014) and the original groundwater availability model for the northern segment of the Edwards (Balcones Fault Zone) Aquifer (Jones, 2003) was used for this analysis. Water budgets for the Clearwater Underground Water Conservation District were extracted for the historical model calibration periods of 1980-2012 for the Trinity Aquifer and 1980-2000 for the Edwards (Balcones Fault Zone) Aquifer using ZONEBUDGET Version 3.01 (Harbaugh, 2009). The average annual water budget values for recharge, surface water outflow, inflow to the district, outflow from the district, net inter-aquifer flow (upper), and net inter-aquifer flow (lower) for the portion of the aquifers located within the district are summarized in this report.

## *PARAMETERS AND ASSUMPTIONS:*

### *Northern portion of the Trinity Aquifer and Woodbine Aquifer*

- We used the updated groundwater availability model for the northern portion of the Trinity Aquifer and Woodbine Aquifer (Version 2.01). See

Kelley and others (2014) for assumptions and limitations of the updated groundwater availability model.

- The groundwater availability model includes eight layers, that generally correspond to:
    - the surficial outcrop area of the units in layers 2 through 8 and the younger formations overlying the downdip portions of the Woodbine Aquifer and Washita and Fredericksburg groups (Layer 1),
    - the Woodbine Aquifer (Layer 2),
    - the Washita and Fredericksburg groups (Layer 3),
    - the Paluxy Aquifer (Layer 4),
    - the Glen Rose Formation (Layer 5),
    - the Hensell Sand (Layer 6),
    - the Pearsall Formation (Layer 7), and
    - The Hosston Formation (Layer 8).
- The Trinity Aquifer is a major source of groundwater in the Clearwater Underground Water Conservation District. Most of the Trinity Aquifer occurs as subcrop within the district boundaries. A small amount of the aquifer outcrops in the western portion of the district. All of the eight numerical layers in the model are designated as active in the Clearwater Underground Water Conservation District. The Trinity Aquifer is represented by Model Layers 1 through 8 in the outcrop area and by Model Layers 4 through 8 in the subcrop area. These layers were combined to calculate water budget values for the Trinity Aquifer in the district.
- Groundwater in the Trinity Aquifer within the Clearwater Underground Water Conservation District is primarily fresh water, with total dissolved solids concentrations less than 1,000 milligrams per liter (see Figures 4.4.11 through 4.4.15 in Kelley and others (2014)).
- The Woodbine Aquifer does not exist within the Clearwater Underground Water Conservation District and thus water budgets for this aquifer were not calculated or included for this report.

- The model was run with MODFLOW-NWT (Niswonger and others, 2011).

### *Northern Segment of the Edwards (Balcones Fault Zone) Aquifer*

- We used the original groundwater availability model for the northern segment of the Edwards (Balcones Fault Zone) Aquifer (Version 1.01). See Jones (2003) for assumptions and limitations of the groundwater availability model.
- The groundwater availability model includes one layer, that generally corresponds to:
    - The Edwards (Balcones Fault Zone) Aquifer.
- The Edwards (Balcones Fault Zone) Aquifer is a major source of groundwater in the Clearwater Underground Water Conservation District. Most of the Edwards (Balcones Fault Zone) Aquifer occurs as outcrop within the district boundaries (72 percent). The remainder of the aquifer subcrops to the southwest. The single numerical layer in the model is designated as active in the Clearwater Underground Water Conservation District. This layer was used to calculate water budget values for the Edwards (Balcones Fault Zone) Aquifer in the district.
- Groundwater in the Edwards (Balcones Fault Zone) Aquifer within the Clearwater Underground Water Conservation District is primarily fresh water, with total dissolved solids concentrations less than 1,000 milligrams per liter (see pages 37 through 39 in Jones (2003)).
- The model was run with MODFLOW-96 (Harbaugh and McDonald, 1996).

## *RESULTS:*

A groundwater budget summarizes the amount of water entering and leaving the aquifer according to the groundwater availability model. Selected groundwater budget components listed below were extracted from the model results for the Trinity Aquifer and Edwards (Balcones Fault Zone) Aquifer located within the district and averaged over the duration of the calibration and verification portion of the model run, as shown in Tables 1 and 2.

- Precipitation recharge—the areally-distributed recharge sourced from precipitation falling on the outcrop areas of the Trinity Aquifer or Edwards (Balcones Fault Zone) Aquifer (where the aquifers are exposed at land surface) within the district.

- Surface water outflow—the total volume of water discharging from the aquifer (outflow) to surface water features such as streams, reservoirs, and drains (springs).

- Flow into and out of district—the lateral flow within the aquifers between the district and adjacent counties.

- Flow between aquifers—the net vertical flow between aquifers or confining units. This flow is controlled by the relative water levels in each aquifer or confining unit and hydraulic properties of each aquifer or confining unit. In the Clearwater Underground Water Conservation District, this net vertical flow represents the net groundwater flow between the Trinity Aquifer and the immediate geologic unit overlying the aquifer in the subcrop area or the net groundwater flow between the Edwards (Balcones Fault Zone) Aquifer and the immediate geologic units overlying and underlying the aquifer in the subcrop area.

The information needed for the Clearwater Underground Water Conservation District's management plan is summarized in Tables 1 and 2. It is important to note that sub-regional water budgets are approximate. This is due to the size of the model cells and the approach used to extract data from the model. To avoid double accounting, a model cell that straddles a political boundary, such as a district or county boundary, is assigned to one side of the boundary based on the location of the centroid of the model cell. For example, if a cell contains two counties, the cell is assigned to the county where the centroid of the cell is located (Figures 1 and 2). Please note that the results of this model run are different from the results of the model run 10-009 that were obtained from the older groundwater availability model for the Trinity Aquifer. The changes can be attributed to several characteristics of the new model, such as differences in model layering, geologic boundaries, hydraulic properties distribution, and the use of different MODFLOW modeling packages.

**TABLE 1: SUMMARIZED INFORMATION FOR THE TRINITY AQUIFER THAT IS NEEDED FOR THE CLEARWATER UNDERGROUND WATER CONSERVATION DISTRICT'S GROUNDWATER MANAGEMENT PLAN. ALL VALUES ARE REPORTED IN ACRE-FEET PER YEAR AND ROUNDED TO THE NEAREST 1 ACRE-FOOT.**

| *Management Plan requirement* | *Aquifer or confining unit* | *Results* |
|---|---|---|
| Estimated annual amount of recharge from precipitation to the district | Trinity Aquifer | 2,816 |
| Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers | Trinity Aquifer | 11,131 |
| Estimated annual volume of flow into the district within each aquifer in the district | Trinity Aquifer | 7230 |
| Estimated annual volume of flow out of the district within each aquifer in the district | Trinity Aquifer | 5659 |
| Estimated net annual volume of flow between each aquifer in the district | From younger overlying Washita and Fredericksburg Confining Units into the Trinity Aquifer | 5,587 |

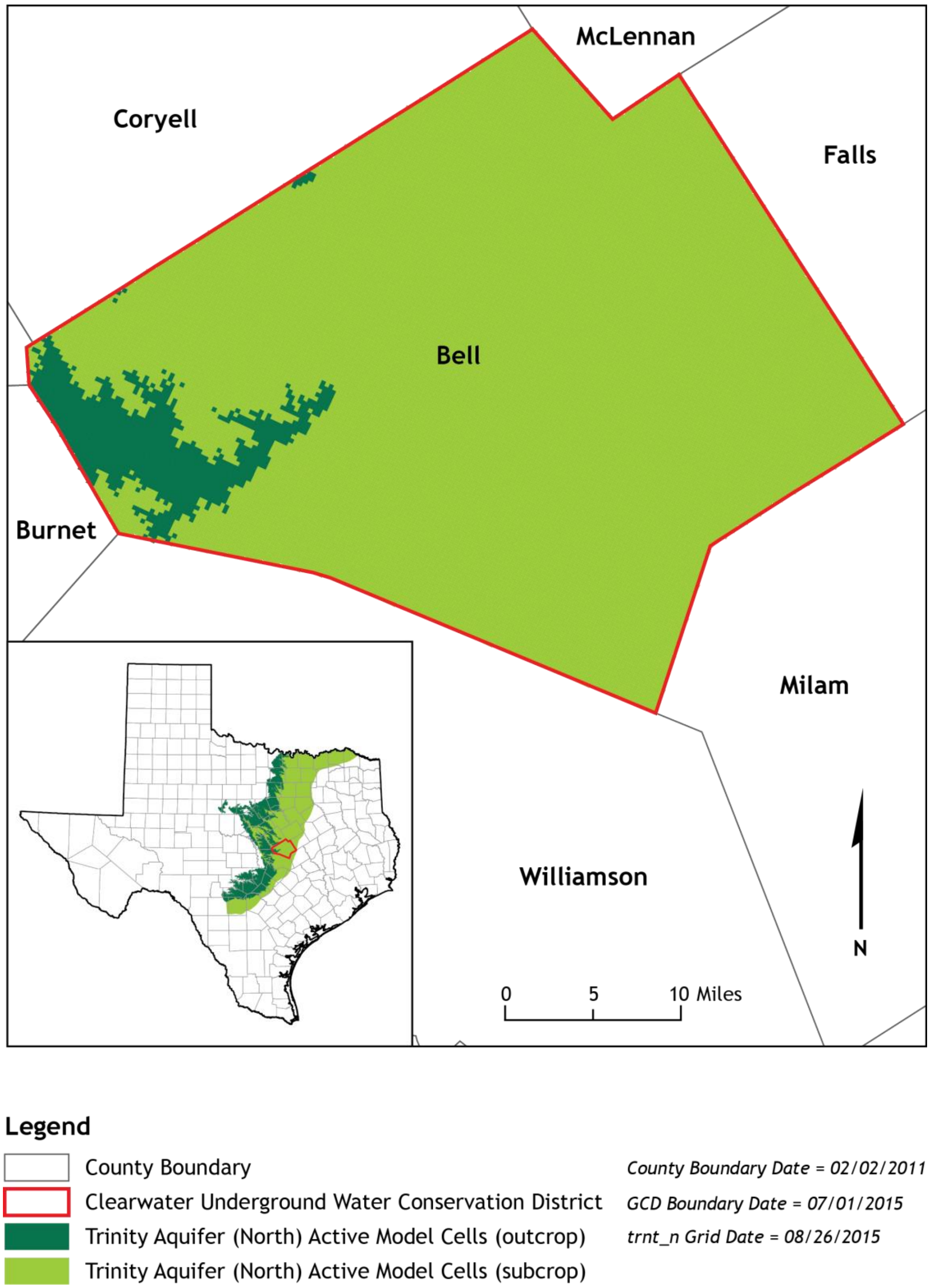


**FIGURE 1: AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF THE TRINITY AQUIFER AND WOODBINE AQUIFER FROM WHICH THE INFORMATION IN TABLE 1 WAS EXTRACTED (THE TRINITY AQUIFER FOOTPRINT EXTENT WITHIN THE DISTRICT BOUNDARY).**

**TABLE 2: SUMMARIZED INFORMATION FOR THE EDWARDS (BALCONES FAULT ZONE) AQUIFER THAT IS NEEDED FOR THE CLEARWATER UNDERGROUND WATER CONSERVATION DISTRICT'S GROUNDWATER MANAGEMENT PLAN. ALL VALUES ARE REPORTED IN ACRE-FEET PER YEAR AND ROUNDED TO THE NEAREST 1 ACRE-FOOT.**

| *Management Plan requirement* | *Aquifer or confining unit* | *Results* |
|---|---|---|
| Estimated annual amount of recharge from precipitation to the district | Edwards (Balcones Fault Zone) Aquifer | 27,565 |
| Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers | Edwards (Balcones Fault Zone) Aquifer | 27,566 |
| Estimated annual volume of flow into the district within each aquifer in the district | Edwards (Balcones Fault Zone) Aquifer | 5,853 |
| Estimated annual volume of flow out of the district within each aquifer in the district | Edwards (Balcones Fault Zone) Aquifer | 1,090 |
| Estimated net annual volume of flow between each aquifer in the district | From Edwards (Balcones Fault Zone) Aquifer to the overlying younger units | 121 |
| | From Edwards (Balcones Fault Zone) Aquifer to the downdip portion of the Edwards (Balcones Fault Zone) Aquifer | 3,957* |

* The model extends beyond the TWDB official Edwards (Balcones Fault Zone) Aquifer boundary. This is the amount of saline groundwater (greater than 1,000 total dissolved solid) that exits in the downdip boundary limit of the aquifer within the district boundaries and into deeper portions of the Edwards Group formations.

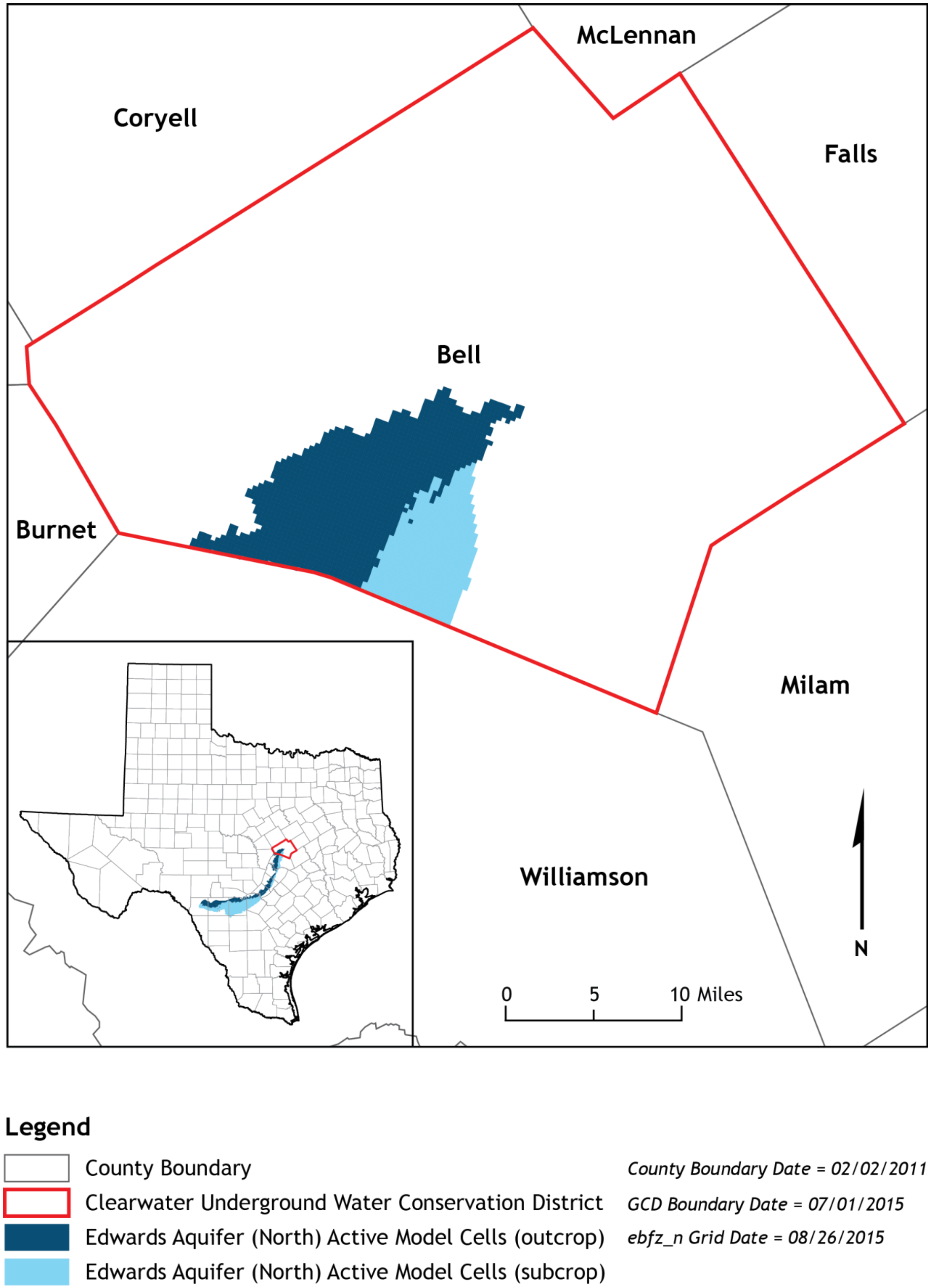


**FIGURE 2: AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN SEGMENT OF THE EDWARDS (BALCONES FAULT ZONE) AQUIFER FROM WHICH THE INFORMATION IN TABLE 2 WAS EXTRACTED (THE EDWARDS (BALCONES FAULT ZONE) AQUIFER FOOTPRINT EXTENT WITHIN THE DISTRICT BOUNDARY).**

## *LIMITATIONS*

The groundwater model used in completing this analysis is the best available scientific tool that can be used to meet the stated objectives. To the extent that this analysis will be used for planning purposes and/or regulatory purposes related to pumping in the past and into the future, it is important to recognize the assumptions and limitations associated with the use of the results. In reviewing the use of models in environmental regulatory decision making, the National Research Council (2007) noted:

> *"Models will always be constrained by computational limitations, assumptions, and knowledge gaps. They can best be viewed as tools to help inform decisions rather than as machines to generate truth or make decisions. Scientific advances will never make it possible to build a perfect model that accounts for every aspect of reality or to prove that a given model is correct in all respects for a particular regulatory application. These characteristics make evaluation of a regulatory model more complex than solely a comparison of measurement data with model results."*

A key aspect of using the groundwater model to evaluate historic groundwater flow conditions includes the assumptions about the location in the aquifer where historic pumping was placed. Understanding the amount and location of historic pumping is as important as evaluating the volume of groundwater flow into and out of the district, between aquifers within the district (as applicable), interactions with surface water (as applicable), recharge to the aquifer system (as applicable), and other metrics that describe the impacts of that pumping. In addition, assumptions regarding precipitation, recharge, and interaction with streams are specific to particular historic time periods.

Because the application of the groundwater models was designed to address regional scale questions, the results are most effective on a regional scale. The TWDB makes no warranties or representations related 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 groundwater pumping and overall conditions of the aquifer. Because of the limitations of the groundwater model and the assumptions in this analysis, it is important that the groundwater conservation districts work with the TWDB to refine this analysis in the future given the reality of how the aquifer responds to the actual amount and location of pumping now and in the future. Historic precipitation patterns also need to be placed in context as future climatic conditions, such as dry and wet year precipitation patterns, may differ and affect groundwater flow conditions.

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Texas Water Code, 2011, http://www.statutes.legis.state.tx.us/docs/WA/pdf/WA.36.pdf

# APPENDIX K

## Table 3.1-1. Major Reservoirs[1] of the Brazos River Basin

| Reservoir | Water Right Owner | Authorized Storage (acft) | Authorized Diversion (acft) | Priority Date | County | Planning Region |
|---|---|---|---|---|---|---|
| Alan Henry | City of Lubbock | 115,937 | 35,200 | 10/5/1981 | Garza | O |
| Allens Creek | Brazos River Authority/City of Houston | 145,553 | 202,000 | 9/1/1999 | Austin | H |
| Aquilla | Brazos River Authority | 52,400 | 13,896 | 10/25/1976 | Hill | G |
| Belton | Brazos River Authority | 457,600 | 100,257 | 12/16/1963 | Bell | G |
| Belton | U.S. Dept. of the Army[2] | 12,000 | 10,000<br>2,000 | 8/24/1953<br>8/23/1954 | Bell | G |
| Dow - Brazoria Reservoir | Dow Chemical[3] | 21,973 | -- | 4/7/1952 | Brazoria | H |
| Dow - Harris Reservoir | Dow Chemical[3] | 10,200 | -- | 2/14/1942 | Brazoria | H |
| Cisco | City of Cisco | 45,110 | 1,971<br>1,000 | 4/16/1920<br>11/8/1954 | Eastland | G |
| Daniel | City of Breckenridge | 11,400 | 2,100 | 4/26/1946 | Stephens | G |
| Dansby Power Plant | City of Bryan | 15,227 | 850 | 5/30/1972 | Brazos | G |
| Eagle Nest Lake | U.S. Dept. of the Interior | 11,315 | 1,800 | 1/15/1948 | Brazoria | H |
| Fort Phantom Hill | City of Abilene | 73,960 | 30,690 | 3/25/1937 | Jones | G |
| Georgetown | Brazos River Authority | 37,100 | 13,610 | 2/12/1968 | Williamson | G |
| Gibbons Creek Power | Texas Municipal Power Agency | 26,824<br>5,260 | 9,740 | 2/22/1977<br>3/9/1989 | Grimes | G |
| Graham/Eddleman | City of Graham | 4,503<br>39,000<br>8,883 | 5,000<br>15,000 | 11/21/1927<br>11/15/1954<br>9/16/1957 | Young | G |
| Granbury | Brazos River Authority | 155,000 | 64,712 | 2/13/1964 | Hood | G |
| Granger | Brazos River Authority | 65,500 | 19,840 | 2/12/1968 | Williamson | G |
| Hubbard Creek Lake | West Central Texas MWD | 317,750 | 52,800<br>3,200 | 5/28/1957<br>8/14/1972 | Stephens | G |
| Leon | Eastland Co WSD | 28,000 | 1,265<br>2,438<br>2,597 | 5/17/1931<br>3/21/1952<br>3/25/1986 | | |

## Table 3.1-1. Major Reservoirs[1] of the Brazos River Basin

| Reservoir | Water Right Owner | Authorized Storage (acft) | Authorized Diversion (acft) | Priority Date | County | Planning Region |
|---|---|---|---|---|---|---|
| Limestone | Brazos River Authority | 225,400 | 65,074 | 5/6/1974 | Robertson | G |
| Miller's Creek | North Central Texas MWA | 30,696 | 5,000 | 10/1/1958 | Baylor | B |
| Palo Pinto | Palo Pinto County MWD No. 1 | 44,100<br>24 | 16,000<br>2,500 | 7/3/1962<br>9/8/1964 | Palo Pinto | G |
| Pat Cleburne Reservoir | City of Cleburne | 25,600 | 5,760<br>240 | 8/6/1962<br>3/29/1976 | Johnson | G |
| Possum Kingdom | Brazos River Authority | 724,739 | 230,750 | 4/6/1938 | Palo Pinto | G |
| Proctor | Brazos River Authority | 59,400 | 19,658 | 12/16/1963 | Comanche | G |
| Smithers Lake | Houston L&P | 18,750 | 28,711 | 12/16/1955 | Fort Bend | H |
| Somerville | Brazos River Authority | 160,110 | 48,000 | 12/16/1963 | Washington | G |
| Squaw Creek Reservoir | Luminant | 151,500 | 23,180 | 4/25/1973 | Somervell | G |
| Stamford | City of Stamford | 60,000 | 10,000 | 6/8/1949 | Haskell | G |
| Stillhouse Hollow | Brazos River Authority | 235,700 | 67,768 | 12/16/1963 | Bell | G |
| Sweetwater | City of Sweetwater | 10,000 | 3,740 | 10/17/1927 | Nolan | G |
| Tradinghouse Steam | Luminant | 37,800 | 12,000<br>15,000 | 8/21/1926<br>9/16/1966 | McLennan | G |
| Twin Oak Steam Electric | Luminant | 30,319 | 13,200 | 7/1/1974 | Robertson | G |
| Waco | City of Waco | 104,100<br><br><br>87,962 | 39,100<br>19,100<br>900<br>20,770 | 1/10/1929<br>4/16/1985<br>2/21/1979<br>9/12/1986 | McLennan | G |
| Whitney | Brazos River Authority | 50,000 | 18,336 | 8/30/1982 | Hill | G |
| White River Reservoir | White River MWD | 33,160<br>5,072<br>6,665 | 6,000 | 9/22/1958<br>11/21/1960<br>8/16/1971 | Crosby | O |

1 – A major reservoir is defined as one with an authorized capacity equal to or greater than 5,000 acft

2 – The Dept. of the Army (Fort Hood) owns water rights in Lake Belton alongside the BRA.

3 – The Dow Chemical Company holds diversion rights from the Brazos River totaling 238,156 acft/yr with priority dates ranging from 1929 to 1976, which are used in conjunction with the two off-channel reservoirs.