



**RED RIVER
GROUNDWATER CONSERVATION DISTRICT
FANNIN COUNTY AND GRAYSON COUNTY**



January 11, 2021

Jeff Walker
Executive Administrator
Texas Water Development Board
1700 North Congress Ave
P.O. Box 13231
Austin TX 78711-3231

RECEIVED
JAN 13 2021
Texas Water Development Board

Re: Red River Groundwater Conservation District – Fannin and Grayson Counties
Management Plan - 2020 Update

Dear Mr. Walker,

Enclosed is a copy of the Red River Groundwater Conservation District's Management Plan, 2020 update adopted at the November 19, 2020 Red River Public Hearing Board Meeting. A PDF copy is provided on the attached thumb drive as well.

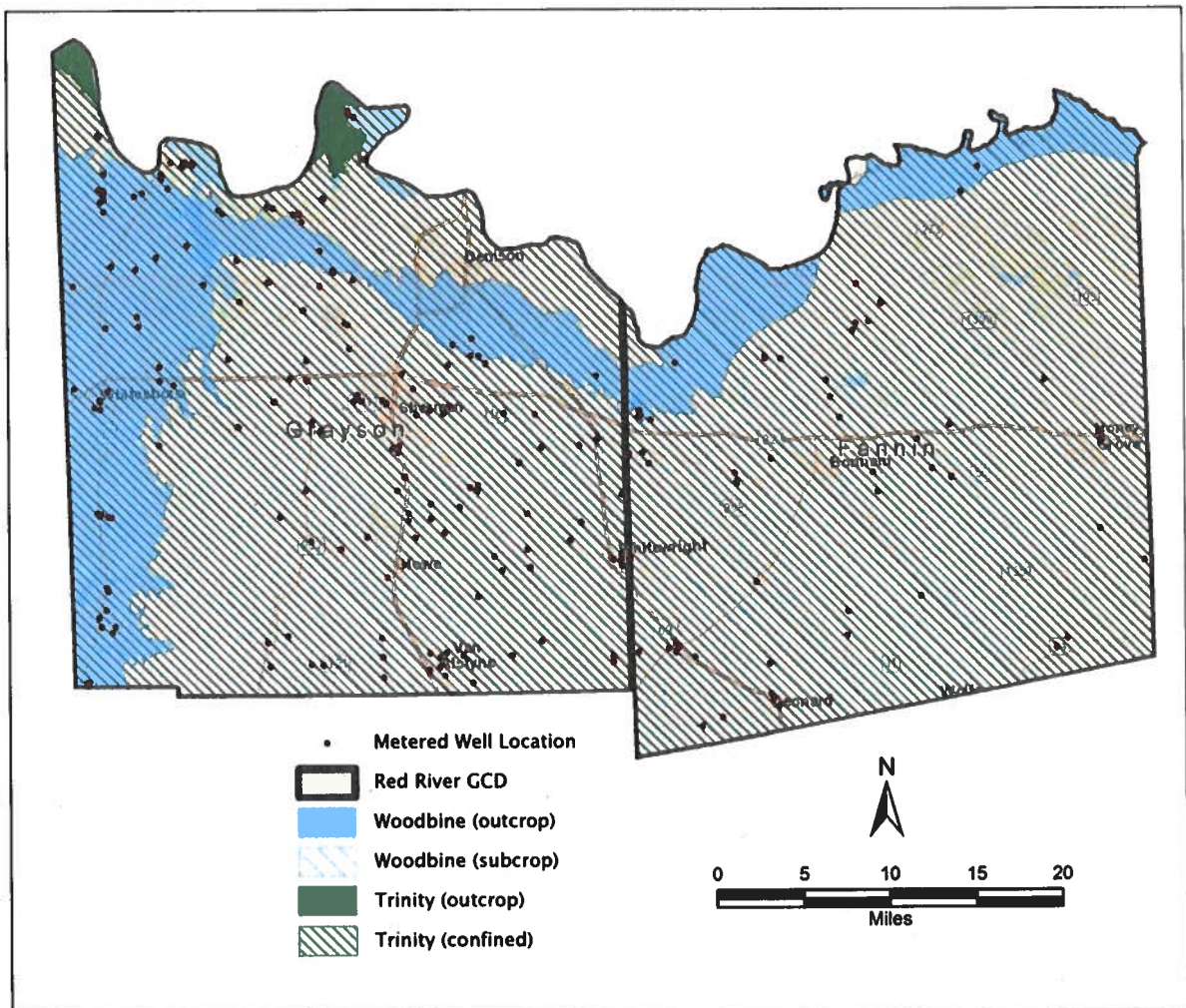
Sincerely,

Drew Satterwhite, PE
General Manager

DS:vs

Enclosure

RED RIVER GROUNDWATER CONSERVATION DISTRICT MANAGEMENT PLAN



Adopted November 19, 2020

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GLOSSARY OF SYMBOLS/TERMS/ACRONYMS IN MANAGEMENT PLAN

§:	Section (referring to a statutory provision)
Board:	Board of Directors of the Red River Groundwater Conservation District
District:	Red River Groundwater Conservation District
District Act:	Enabling legislation of Red River Groundwater Conservation District (codified at Tex. Spec. Dist. Loc. Laws Code Ch. 8859)
DFC:	Desired Future Condition
GPM:	Gallons per minute
GAM:	Groundwater Availability Model
GCD:	Groundwater Conservation District
GMA:	Groundwater Management Area
HB:	House Bill
MAG:	Modeled Available Groundwater
SB:	Senate Bill
TWDB:	Texas Water Development Board
WUG:	Water user group

1 Introduction

The Red River Groundwater Conservation District (the District), after notice and hearing, adopts this Management Plan according to the requirements of Texas Water Code § 36.1071. The Red River Groundwater Conservation District Management Plan represents the management goals of the District for the next five years, including the desired future conditions of the aquifers within the jurisdictional boundaries of the District. These desired future conditions were adopted through the joint planning process in Groundwater Management Area 8 as prescribed in Chapter 36, Texas Water Code.

1.1 District Mission

The Mission of the Red River Groundwater Conservation District is to develop rules to provide protection to existing wells, prevent waste, promote conservation, provide a framework that will allow availability and accessibility of groundwater for future generations, protect the quality of the groundwater in the recharge zone of the aquifer, insure that the residents of Fannin and Grayson Counties maintain local control over their groundwater, and operate the District in a fair and equitable manner for all residents of the District.

1.2 Guiding Principles

The District is committed to managing and protecting the groundwater resources within its jurisdiction and to working with others to ensure a sustainable, adequate, high quality and cost effective supply of water, now and in the future. The District will strive to develop, promote, and implement water conservation, augmentation, and management strategies to protect water resources for the benefit of the citizens, economy and environment of the District. The preservation of this most valuable resource can be managed in a prudent and cost effective manner through conservation, education, and management. The District will endeavor to consider and respect individual property owner rights when acting on related matters.

2 History and Purpose of the Management Plan

The 75th Texas Legislature in 1997 enacted Senate Bill 1 ("SB 1") to establish a comprehensive statewide water planning process. In particular, SB 1 contained provisions that required groundwater conservation districts to prepare management plans to identify the water supply resources and water demands that will shape the decisions of each district. SB 1 designed the management plans to include management goals for each district to manage and conserve the groundwater resources within their boundaries. In 2001, the Texas Legislature enacted Senate Bill 2 ("SB 2") to build on the planning requirements of SB 1 and to further clarify the actions necessary for districts to manage and conserve the groundwater resources of the state of Texas.

The Texas Legislature enacted significant changes to the management of groundwater resources in Texas with the passage of House Bill 1763 ("HB 1763") in 2005. HB 1763 created a long-term planning process in which groundwater conservation districts ("GCDs") in each Groundwater Management Area ("GMA") are required to meet and determine the Desired Future Conditions ("DFCs") for the groundwater resources within their boundaries by September 1, 2010. In addition, HB 1763 required GCDs to share management plans with the other GCDs in the GMA for review by the other GCDs. In 2011, Senate Bills 660 and 737 further modified these groundwater laws and GCD management requirements in Texas.

Senate Bill 660 required that GMA representatives must participate within each applicable RWPG. It also required the Regional Water Plans be consistent with the DFCs in place when the regional plans are initially developed. TWDB technical guidelines for the current round of planning establishes that the MAG (within each county and basin) is the maximum amount of groundwater that can be used for existing uses and new strategies in Regional Water Plans. In other words, the MAG volumes are a cap on groundwater production for TWDB planning purposes.

"Managed available groundwater" was redefined as "modeled available groundwater" in Senate Bill 737 by the 82nd Legislature. Modeled available groundwater is "the amount of water that can be produced on an average annual basis" to achieve a desired future condition.

All of these changes in laws have been incorporated into the Texas Water Code and used as a framework to develop this management plan.

3 District Information

3.1 Creation

The Red River Groundwater Conservation District (the "District") was created by the 81st Texas Legislature under the authority of Section 59, Article XVI, of the Texas Constitution, and in accordance with Chapter 36 of the Texas Water Code ("Water Code"), by the Act of May 25, 2009, 81st Leg., R.S., Ch. 248, 2009 Tex. Gen. Laws 686, codified at Tex. Spec. Dist. Loc. Laws Code Ch. 8859 ("the District Act").

The District is a governmental agency and a body politic and corporate. The District was created to serve a public use and benefit, and is essential to accomplish the objectives set forth in Section 59, Article XVI, of the Texas Constitution. The District's boundaries are coextensive with the boundaries of Fannin and Grayson Counties, Texas, and lands and other property within these boundaries will benefit from the works and projects that will be accomplished by the District.

3.2 Directors

The District is governed by a board of seven appointed directors. Directors serve staggered four-year terms, with the terms of three or four directors from each appointing county expiring on August 31 of each odd-numbered year. A director serves until the director's successor has qualified to serve.

3.3 Authority

The District has the rights and responsibilities provided for in Chapter 36 of the Texas Water Code and 31 Texas Administrative Code Chapter 356. The District is charged with conducting hydrogeological studies, adopting a management plan, providing for the permitting of non-exempt water wells and implementing programs to achieve statutory mandates. The District has rulemaking authority to implement the policies and procedures needed to manage the groundwater resources of Grayson and Fannin Counties.

3.4 Location and Extent

The District's boundaries are coextensive with the boundaries of Grayson and Fannin Counties, Texas. The District covers an area of approximately 1,878 square miles. A map is included as Figure 1.

3.5 Topography and Drainage

The District is located within the Red, Trinity and Sulphur River Basins. The northern two-thirds of Grayson and Fannin Counties drain north and east to the Red River, the southern portion of Grayson County drains toward the south to the Trinity River, the southeastern one-third of Fannin County drains east to the Sulphur River. Elevations in the District range from approximately 500 to 900 ft. above mean sea level (amsl) and the physiography consists primarily of gently rolling prairieland, blacklands, woodlands and wooded bottomlands in the river valleys. Average annual rainfall is about 43 inches.

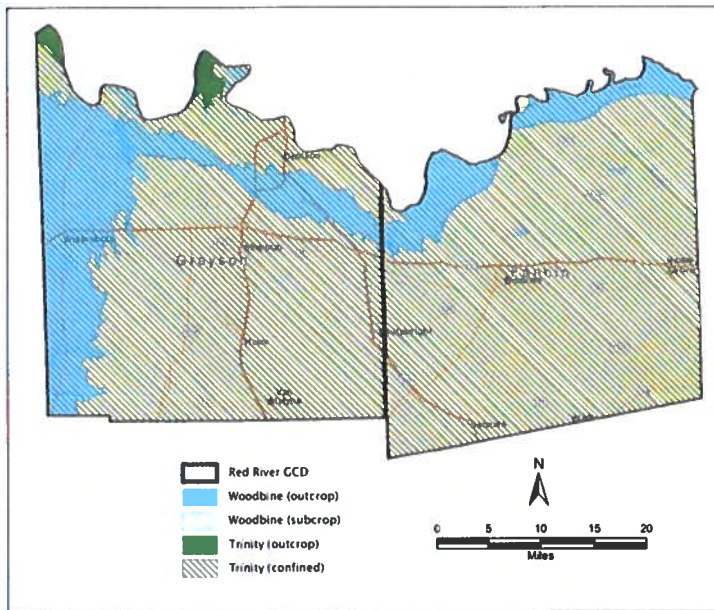


Figure 1. District Map

4 Criteria for Plan Approval

4.1 Planning Horizon

This management plan becomes effective upon adoption by the District Board of Directors and subsequent approval by the Executive Administrator of the Texas Water Development Board (TWDB). This management plan incorporates a planning period of ten years in accordance with 31 Texas Administrative Code §356.5(a).

4.2 Board Resolution

A certified copy of the Red River Groundwater Conservation District resolution adopting the plan is located in Appendix A – Resolution Adopting the Management Plan.

4.3 Plan Adoption

Public notices documenting that the plan was adopted following appropriate public meetings and hearings are located in Appendix B – Evidence that the Management Plan was adopted.

4.4 Coordination with Surface Water Management Entities

A template letter transmitting copies of this plan to the surface water management entities in the District along with a list of the surface water management entities to which the plan was sent are located in Appendix C – Evidence that the District coordinated development of the Management Plan with surface water entities.

5 Actions, Procedures, Performance, and Avoidance for Plan Implementation, and Management of Groundwater Supplies

The District is currently operating pursuant to a set of rules that became effective January 1, 2019 (Appendix D). The temporary rules are housed on the District's website <http://www.redrivergcd.org/district-information.html>. The rules were adopted under the authority of Sections 36.101 and 36.1071(f), Texas Water Code, and the District Act for the purpose of conserving, preserving, protecting, and recharging groundwater in the District in order to prevent subsidence, prevent degradation of water quality, prevent waste of groundwater, and to carry out the powers and duties of Chapter 36, Texas Water Code, and the District Act.

These rules are used by the District in the exercise of the powers conferred on the District by law and in the accomplishment of the purposes of the law creating the District. These rules may be used as guides in the exercise of discretion, where discretion is warranted. However, under no circumstances and in no particular case will they or any part therein, be construed as a limitation or restriction upon the District to exercise powers, duties and jurisdiction conferred by law. These rules create no rights or privileges in any person or water well, and shall not be construed to bind the Board in any manner in its promulgation of the District Management Plan or amendments to these Rules.

The District may amend the District rules as necessary to comply with changes to Chapter 36 of the Texas Water Code and to insure the best management of the groundwater within the District. The development and enforcement of the rules of the District has been and will continue to be based on the best scientific and technical evidence available to the District.

The District has encouraged and will continue to encourage public cooperation and coordination in the implementation of the management plan for the District, as it is amended. All operations and activities of the District have been and will be performed in a manner that best encourages cooperation with the appropriate state, regional or local water entity. The meetings of the Board of the District are noticed and conducted at all times in accordance with the Texas Open Meetings Law. The District has also made available for public inspection all official documents, reports, records and minutes of the District pursuant to the Texas Public Information Act and will continue to do so in the future.

6 Methodology to Track District Progress in Achieving Management Goals

An annual report ("Annual Report") will be created by the general manager and staff of the District and provided to the members of the Board of Directors. The Annual Report will cover the activities of the District including information on the District's performance in regards to achieving the District's management goals and objectives. The Annual Report will be delivered to the Board within 180 days following the completion of the District's fiscal year, beginning with the fiscal year

that started on January 1, 2012. A hard copy of the Annual Report will be kept on file and will be available for public inspection at the District's offices upon adoption. Annual reports will also be available via the District's website.

7 Management Objectives and Performance Standards

The following goals, management objectives, and performance standards have been developed and adopted to ensure the management and conservation of groundwater resources within the District's jurisdiction.

For purposes of this management plan, an exempt well means wells that meet any one of the following, unless a different meaning is set forth in the District rules, or the context clearly provides otherwise: (1) any well that was applied for or existed prior to January 1, 2019 that is used solely for domestic use, livestock use, or poultry use; (2) any well that was applied for or existed prior to January 1, 2019 that does not have the capacity, as equipped, to produce more than 27.7 gallons per minute and is used in whole or in part for commercial, industrial, municipal, manufacturing, or public water supply use, use for oil or gas or other hydrocarbon exploration or production, or any other purpose of use other than solely for domestic, livestock, or poultry use, except that if the total sum of the capacities of wells that operate as part of a well system is greater than 27.7 gallons per minute, the well system and individual wells that are part of it are not considered to be exempt; (3) any new well applied for after January 1, 2019 that does not have the capacity, as equipped, to produce more than 17.36 gallons per minute; or (4) leachate wells, monitoring wells, and piezometers. All wells that do not meet one of these criteria are considered to be non-exempt for purposes of this management plan. The characterization of exempt and non-exempt wells is intended to apply only to wells described in this management plan and shall not be interpreted to mean that the wells will be considered exempt or not exempt from permitting under any rules adopted by the District in the future.

Goal 1 - Providing the most efficient use of groundwater

The District, through strategies and programs adopted in this management plan and rules, strives to ensure the most efficient use of groundwater in order to sustain available resources for the future while maintaining the economic growth of the District.

Management Objective 1.1

The District will require that all wells be registered in accordance with its current rules.

Performance Standard 1.1

The Board of Directors will receive quarterly briefings by the General Manager regarding the District's well registration program. These quarterly reports will be included in the Annual Report to

the Board of Directors. The District is currently in the beginning phase of making improvements to the online geodatabase that will make additional statistics available for this report such as the aquifer in which wells are being completed. In addition, a handout will be provided annually to local realtor associations detailing the requirement of new property owners to register their existing wells within 90 days of transfer of ownership.

Management Objective 1.2

It is the goal of the District that all non-exempt wells and exempt wells be registered. In order to ensure that all wells required by District rules to be registered have been accurately registered the District's Field Technician manages a Field Inspections Program, with the objective of conducting field inspections of at least five wells per month. These inspections will confirm that a well has been registered, accuracy of well location, and accuracy of other required well registration information.

Performance Standard 1.2

Quarterly briefings by the General Manager will be provided to the Board of Directors regarding the number of well sites inspected each month to confirm well registration requirements have been met. This information will also be included in the Annual Report to the Board of Directors.

Management Objective 1.3 (a)

In order to evaluate continually the effectiveness of the District's rules in meeting the goal of ensuring the efficient use of groundwater, the District will operate a groundwater monitoring program to collect information on the quantity and quality of groundwater resources throughout the District. This monitoring program is based on the establishment of a network of monitoring wells. The District staff has assumed the responsibility of monitoring all available TWDB wells at least annually. In addition, one additional well will be added in each county, for a total of two new wells to the system in accordance with the District's well monitoring plan.

For the purpose of water quality sampling, samples collected for water quality taken by Texas Commission on Environmental Quality staff every five years will be used for monitoring purposes initially, and may be supplemented in the future as determined by the Board. All information collected in the monitoring program will be entered into the District's geodatabase after the current geodatabase improvements project is complete. The results of the monitoring program will be included in the Annual Report presented by the General Manager.

Performance Standard 1.3 (a)(1)

Track the number of wells in Fannin and Grayson counties for which water levels were measured per year as reported in the Annual Report presented by the General Manager to the Board of Directors.

Performance Standard 1.3 (a)(2)

Number of wells in Fannin and Grayson counties for which water samples were collected for the testing of water quality: The Texas Commission on Environmental Quality provides a Consumer Confidence Report that provides consumers with information about the quality of drinking water. This data may be reviewed at: <https://www.tceq.texas.gov/drinkingwater/ccr> for water systems.

Management Objective 1.3 (b)

In order to ensure the efficient use of groundwater, adequate data must be collected to facilitate groundwater availability modeling activities necessary to understand current groundwater resources and the projected availability of those resources in the future. Monitoring wells will be established by the District on a schedule determined by the Board of Directors as funds are available.

Performance Standard 1.3 (b)

Track the number of wells for which water level data is available will be accessible online after the current geodatabase improvements project is complete.

Management Objective 1.4

A critical component of the District's goal of ensuring the efficient use of groundwater is the collection of accurate water use information. The District has established by temporary rule a requirement that all non-exempt wells be equipped with meters to measure the use of groundwater. The well owner/operator is responsible for maintaining a meter log with at least monthly records of water use. Cumulative water use is to be reported to the District by the well owner/operator quarterly. All water use information will be entered and maintained in the District's geodatabase. It is the objective of the District that 95 percent of all registered non-exempt wells will report water use by the reporting deadlines established in the District's rules.

Performance Standard 1.4

Percent of registered non-exempt wells meeting reporting requirements of water use will be provided in the Annual Report to the Board of Directors.

Management Objective 1.5

In order to ensure that registered non-exempt wells have been equipped with District-approved meters and that water use is being accurately reported, the District Field Technician facilitates a meter inspection program to insure that all registered non-exempt wells will be inspected on at least a five-year cycle by District personnel. These inspections will, at a minimum, verify proper installation and operational status of meters and record the meter reading at the time of inspection. This meter reading will be compared to the most recent water use report for the inspected well. Any potential violations of District rules regarding meter installation and reporting requirements will be reported to the Board of Directors at the next practicable meeting for consideration of possible enforcement actions. Annual water use will be included in the Annual Report presented by the General Manager to the Board of Directors.

Performance Standard 1.5 (a)

Percentage of registered non-exempt wells inspected by District personnel annually is provided in the Annual Report presented by the General Manager.

Performance Standard 1.5 (b)

Comparison of annual water use versus estimates of modeled available groundwater established as a result of the adopted Desired Future Conditions shall be included in the Annual Report presented by the General Manager no later than 2021, after the current geodatabase improvements project is completed.

Management Objective 1.6

A critical component to accomplishing the District's mission is to ensure that proper data is being collected and that the data is being utilized to the fullest extent and efficiently. Shortly after the District's creation, the District hired a consultant to build an online geodatabase that would make workflows, data entry and data utilization easier and more efficient for well owners, well drillers, general public, District staff and the Board of Directors. After several years of utilizing the geodatabase the District had built, the District has identified areas in which the existing system can be upgraded.

Performance Standard 1.6

The District will make substantial upgrades and improvements to the online geodatabase, in order to make workflows, data entry and data utilization easier and more efficient.

Management Objective 1.7

The District will develop a methodology to quantify current and projected annual groundwater production from exempt wells.

Performance Standard 1.7

The District will provide the TWDB with its methodology and estimates of current and projected annual groundwater production from exempt wells. The District will also utilize the information in the future in developing and achieving desired future conditions and in developing and implementing its production allocation and permitting system and rules. Information related to implementation of this objective will be included in the Annual Report to the Board of Directors by 2019.

Goal 2 - Controlling and preventing the waste of groundwater

Another important goal of the District is to implement strategies that will control and prevent the waste of groundwater.

Management Objective 2.1

The District will annually provide information to the public on eliminating and reducing wasteful practices in the use of groundwater by publishing information on groundwater waste reduction on the District's website at least once a year.

Performance Standard 2.1

Information on groundwater waste reduction will be provided on the District's website and the information published on the website will be included in the District's Annual Report to be provided to the Board of Directors.

Management Objective 2.2

The District will encourage the elimination and reduction of groundwater waste through a collection of water-use fees for non-exempt production wells within the District.

Performance Standard 2.2

Annual reporting of the total fees paid and total groundwater used by non-exempt wells will be included in the Annual Report provided to the Board of Directors.

Management Objective 2.3

The District will identify well owners that are not in compliance with District well registration, reporting, and fee payment requirements and bring them into compliance.

Performance Standard 2.3

The District will compare existing state records and field staff observations with well registration database to identify noncompliant well owners.

Management Objective 2.4

The District will investigate instances of potential waste of groundwater.

Performance Standard 2.4

District staff will report to Board of Directors as needed regarding potential waste of groundwater and include number of investigations in Annual Report.

Goal 3 - Controlling and preventing subsidence

Due to the geology of the Northern Trinity/Woodbine Aquifers in the District, problems resulting from water level declines causing subsidence are not technically feasible and as such, a goal addressing subsidence is not applicable.

Goal 4 - Addressing conjunctive surface water management issues

Surface water resources represent a vital component in meeting current and future water demands in all water use sectors within the District. The District coordinates with surface water management entities within the region by designating a board member or the general manager to attend and coordinate on water supply and management issues with the Region C Water Planning Group.

Management Objective 4.1

Coordination with surface water management agencies - the designated board member or General Manager will attend, at a minimum, 75 percent of the meetings and events of the Region C Water Planning Group. Participation in the regional water planning process will ensure coordination with surface water management agencies that are participating in the regional water planning process.

Performance Standard 4.1

The designated board member or General Manager will report on actions of the Region C Water Planning Group as appropriate to the board, and the General Manager will document meetings attended in the Annual Report.

Management Objective 4.2

The General Manager of the District will monitor and participate in relevant stakeholder meetings concerning water resources relevant to the District.

Performance Standard 4.2

The General Manager of the District will monitor and participate in relevant stakeholder meetings that concern water resources relevant to the District. The meetings that are attended will be presented in the District's Annual Report.

Goal 5 - Addressing natural resource issues

The District understands the important nexus between water resources and natural resources. The exploration and production of natural resources such as oil and gas along with mining efforts for road aggregate materials such as sand and gravel clearly represent potential management issues for the District. For example, improperly plugged oil and gas wells may provide a conduit for various hydrocarbon and drilling fluids to potentially migrate and contaminate groundwater resources in the District.

Management Objective 5.1

The District has engaged a firm to monitor all injection well applications within the District and notify the General Manager of any potential impacts.

Performance Standard 5.1

General Manager will report to the Board of Directors any information provided by the consultant engaged to monitor injection well applications within the District to the Board of Directors and document the information in the Annual Report to the Board of Directors.

Management Objective 5.2

The District will monitor compliance by oil and gas companies of well registration, metering, production reporting, and fee payment requirements of the District's rules.

Performance Standard 5.2

As with other types of wells, instances of non-compliance by owners and operators of water wells for oil and gas activities will be reported to the Board of Directors as appropriate for enforcement action. A summary of such enforcement activities will be included in the Annual Report to the Board of Directors.

Goal 6 - Addressing drought conditions

Management Objective 6.1

The District will make available through the District's website easily accessible drought information with an emphasis on developing droughts and on any current drought conditions. Examples of links that will be provided include routine updates to the Palmer Drought Severity Index (PDSI) map for the region, the Drought Preparedness Council Situation Report (routinely posted on the Texas Water Information Network, and the TWDB Drought Page at <https://waterdatafortexas.org/drought>.

Performance Standard 6.1

Current drought conditions information from multiple resources including the Palmer Drought Severity Index (PDSI) map for the region and the Drought Preparedness Council Situation Report is available to the public through the District's website

Goal 7 - Address conservation, recharge and precipitation enhancement, rainwater harvesting, and brush control

Texas Water Code § 36.1071(a)(7) requires that a management plan include a goal that addresses conservation, recharge enhancement, rainwater harvesting, precipitation enhancement, or brush control, where appropriate and cost-effective. The District has determined that a goal addressing recharge enhancement and precipitation enhancement is not appropriate or cost-effective, and therefore is not applicable to the District.

Management Objective 7.1

The primary goal, perhaps viewed as the *"umbrella goal"* of the District is to provide for and facilitate the conservation of groundwater resources within the District. The District will include a link on the District's website to the electronic library of water conservation resources supported by the Water Conservation Advisory Council. For example, one important resource available through this internet-based resource library is the Water Conservation Best Management Practices Guide developed by the Texas Water Conservation implementation Task Force. This Guide contains over 60 Best Management Practices for municipalities, industry, and agriculture that will be beneficial to water users in the District.

Performance Standard 7.1

Link to the electronic library of water conservation resources supported by the Water Conservation Advisory Council is available on the District's website.

Management Objective 7.2

The District will submit at least one article regarding water conservation for publication each year to at least one newspaper of general circulation in the District's Counties.

Performance Standard 7.2

A copy of the article submitted by the District for publication to a newspaper of general circulation in one of the District's Counties regarding water conservation will be included in the Annual Report to the Board of Directors.

Management Objective 7.3

The District will provide educational curriculum regarding water conservation offered by the Texas Water Development Board (Major Rivers) to at least one elementary school in each county of the District.

Performance Standard 7.3

Each year the District will seek to provide water conservation curriculum to at least one elementary school in each county within the District. The elementary schools for which the curriculum is provided will be listed in the Annual Report to the Board of Directors.

Management Objective 7.4

While the District does not regulate rainwater harvesting, it has become a viable water source either as a supplemental water supply or as the primary water supply in both urban and rural areas of Texas. As a result, Texas has become internationally recognized for the widespread use and innovative technologies that have been developed, primarily through efforts at the TWDB. To ensure these educational materials are readily available to citizens in the District, a link to rainwater harvesting materials including system design specifications and water quality requirements will be maintained on the District's website.

Performance Standard 7.4

Link to rainwater harvesting resources at the TWDB is available on the District's website.

Management Objective 7.5

Educate public on importance of brush control as it relates to water table consumption.

Performance Standard 7.5

Link to information concerning brush control is available on the District's website.

Goal 8 - Achieving desired future conditions of groundwater resources

The desired future conditions of the aquifers in Groundwater Management Area 8 represent average water levels in the various aquifers at the end of 50-years based on meeting current and projected groundwater supply needs. The Board of Directors has adopted a strategic approach that includes the adoption of this management plan and rules necessary to achieve the desired future conditions. This management plan and the companion rules have been designed as an integrated program that will systematically collect and review water data on water quantity, water quality, and water use, while at the same time, implementing public awareness and public education activities that will result in a better informed constituency.

Management Objective 8.1

State statute requires GCDs to review, amend as necessary, and readopt management plans at least every five years. The General Manager will annually present a summary report on the status of achieving the adopted desired future conditions. Prior to the adoption date of the next management plan, the General Manager will work with the Board of Directors to conduct a focused review to determine if any elements of this management plan or rules need to be amended in order to achieve the adopted desired future conditions, or if the adopted desired future conditions need to be revised to better reflect the needs of the District.

Performance Standard 8.1

The General Manager will include a summary report on the status of achieving the adopted desired future conditions in the Annual Report beginning by 2021, after the geodatabase improvements project is complete. This summary report will primarily be based on data collected from the District's groundwater monitoring program.

Four years after the adoption of this management plan, and based on the annual review conducted by the General Manager and the Board of Directors, the Board of Directors will determine which of the following apply to the District; (1) the current management plan and rules are working effectively to meet the adopted desired future conditions, (2) specific amendments need to be made to this management plan and/or rules in order to achieve the adopted desired future conditions, (3) amendments are needed to the adopted desired future conditions in order to better meet the needs of the District, or (4) a combination of (2) and (3). This determination will be made at a regularly scheduled meeting of the Board of Directors.

8 Estimates of Technical Information

8.1 Modeled Available Groundwater based on Desired Future Conditions

Texas Water Code § 36.001 defines modeled available groundwater as “the amount of water that the executive administrator determines may be produced on an average annual basis to achieve a desired future condition established under Section 36.108”.

The amount of water that may be permitted from an aquifer is not the same amount as the total amount that can be pumped from an aquifer. Total pumping includes uses of water both subject to permitting and exempt from permitting (“exempt use”). Examples of exempt use include: domestic, livestock, and some types of water use associated with oil and gas exploration.

To determine the DFCs, a series of simulations using the TWDB's Groundwater Availability Model (“GAM”) for the Northern Trinity and Woodbine aquifers were completed. Each GAM simulation was done by iteratively applying various 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.

The desired future conditions of the Northern Trinity aquifer in GMA 8 are documented in GAM Run 17-029 MAG, which is included as Appendix E. The DFCs are based on average drawdown in feet after 50 years for each Trinity aquifer unit. DFCs for the Woodbine aquifer are documented in GAM Run 17-029 MAG, which is also included as Appendix E.

In the Red River District, the geologic units comprising the Trinity are: the Antlers (which includes all of the Trinity Group Formations), the Paluxy Sand, the Glen Rose Limestone, and the Twin Mountain (which includes the Hensell and the Hosston Formations that are differentiated further to the south). The District is located in Regions 1 and 2. Figure 2 presents the location of each hydrogeologic region in the area.

The joint planning process set forth in Texas Water Code § 36.108 must be collectively conducted by all groundwater conservation districts within the same GMA. The District is a member of GMA 8. During the second round of joint planning, GMA-8 passed and adopted a resolution proposing DFCs for all relevant aquifers by letter dated April 1, 2016. The adopted DFCs were then forwarded to the TWDB for development of the MAG calculations. A summary the modeled available groundwater are presented in Table 1 below.

Table 1. Estimates of Modeled Available Groundwater for pumping in the Trinity and Woodbine aquifers (GAM Run 17-029)

County	Aquifer	Modeled Available Groundwater (acre-feet per year)							
		2009	2010	2020	2030	2040	2050	2060	2070
Fannin	Antlers	389	2,087	2,092	2,087	2,092	2,087	2,092	2,087
Fannin	Woodbine	5,495	4,920	4,934	4,920	4,934	4,920	4,934	4,920
Fannin	County Total	5,884	7,007	7,026	7,007	7,026	7,007	7,026	7,007
Grayson	Antlers	6872	10,708	10,738	10,708	10,738	10,708	10,738	10,708
Grayson	Woodbine	5,056	7,521	7,541	7,521	7,541	7,521	7,541	7,521
Grayson	County Total	11,928	18,229	18,279	18,229	18,279	18,229	18,279	18,229
District Total		17,812	25,236	25,305	25,236	25,305	25,236	25,305	25,236

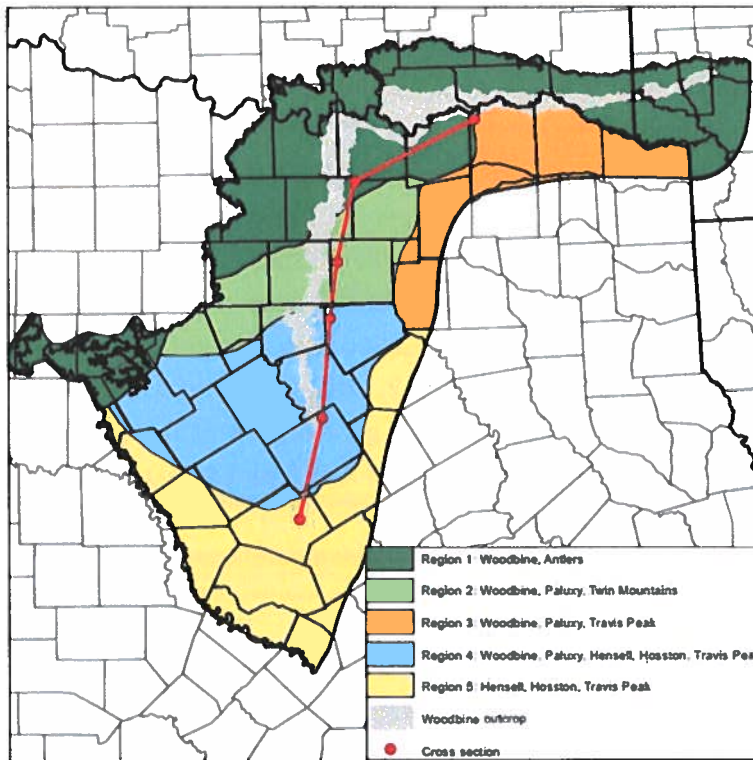


Figure 2. Hydrogeologic Region Extents

8.2 Amount of Groundwater Being Used within the District

Each year the TWDB conducts an annual survey of ground and surface water use by municipal and industrial entities within the state of Texas. The information obtained is then utilized by the TWDB for water resources planning. The historical water use estimates are subject to revision as additional data and corrections are made available to the TWDB.

Estimates of historical water use in Grayson and Fannin Counties in the years 2000 through 2015 is presented in Appendix F. TWDB data included in Appendix F do not differentiate between exempt and non-exempt use.

Estimated groundwater use in the District by category in 2015 was approximately 70 percent for municipal use, 15 percent for irrigation use, 10 percent for livestock use, 5 percent for manufacturing use, less than one percent for mining use, and zero percent for steam-electric power use. In the TWDB Water Use Survey, the municipal use category includes small water providers and rural domestic pumping in addition to municipalities.

Total groundwater use was about 21,320 acre-feet in 2000, with a gradual decline between 2001 and 2004 to a minimum of about 16,322 acre- feet in 2004. Between 2005 and 2008 water use

continued to decline on average by 490 acre-feet per year. Starting in 2009, total usage increased reaching a peak in 2012 with a maximum use of 27,638 acre-feet. Total water use decreased to 19,474 acre-feet in 2013, 18,232 acre-feet in 2014, and to 16,472 in 2015. Water use for irrigation purposes decreased to zero in 2008 and was greatest from 2009 through 2014, with a slight decline shown for 2015. Usage for mining purposes increased in 2008 through 2012. Livestock use remained between about 100 and 255 acre-feet per year from 2000 through 2004 and then increased to a maximum use of approximately 1,892 acre-feet in 2005. Water use for steam-electric power generation was greatest in 2000 at approximately 503 acre-feet. Between 2008 through 2010 usage steadily declined and reached zero acre-feet per year in 2011 through 2015. Generally, municipal water use has been greater than about 11,000 acre-feet per year throughout the historical record with maximum usage in 2009 through 2012. Historic water use from 2000 to 2015 is taken from the 2017 State Water Plan. Figure 3 and Figure 4 present the historic water usage for Fannin and Grayson Counties, respectively. Refer to Appendix F for the data table.

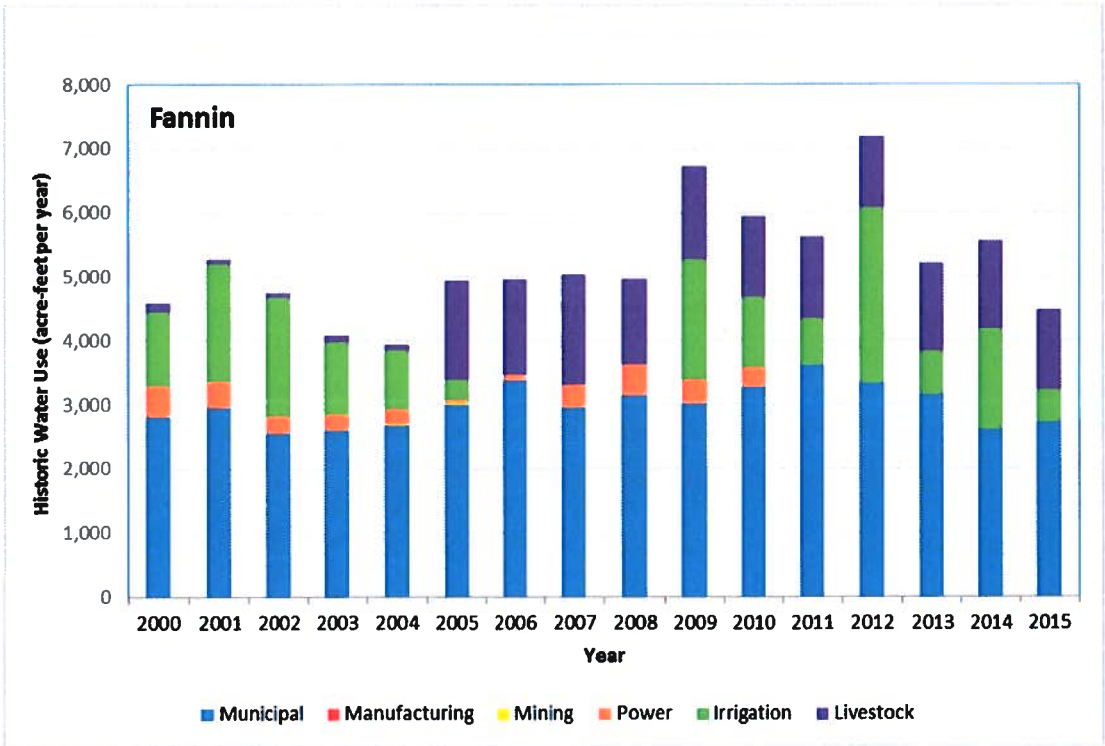


Figure 3. Historic Groundwater Use Estimate for Fannin County

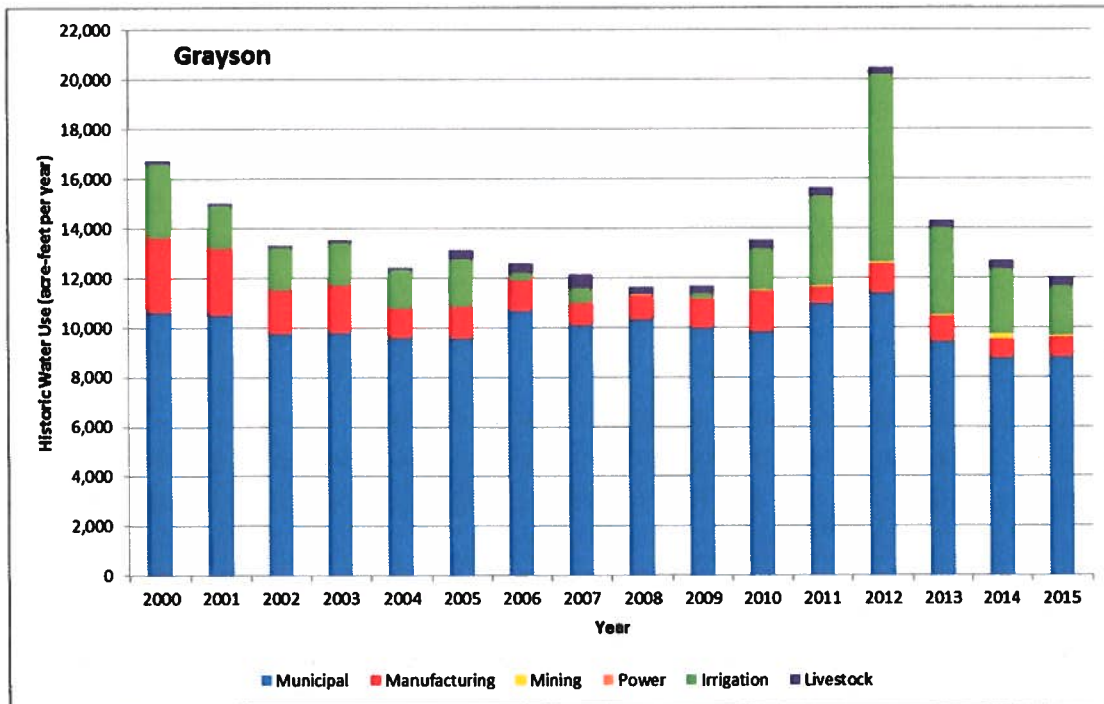


Figure 4. Historic Groundwater Use Estimate for Grayson County

8.3 Annual Amount of Recharge from Precipitation

Recharge from precipitation falling on the outcrop of the aquifer (where the aquifer is exposed to the surface) within the Red River GCD was estimated by the TWDB in the GAM Run 16-005 dated May 16, 2016. Water budget values of recharge extracted for the transient model period indicate that precipitation accounts for 428 acre-feet per year of recharge to the Trinity aquifer and 73,888 acre-feet per year of recharge to the Woodbine aquifer within the boundaries of the Red River GCD (Appendix E).

8.4 Annual Volume of Water that Discharges from the Aquifer to Springs and Surface Water Bodies

The total water discharged from the aquifer to surface water features such as streams, reservoirs and springs is defined as the surface water outflow. Water budget values of surface water outflow within the Red River GCD were estimated by the TWDB in the GAM Run 16-005 (Appendix E). Modeled values are 258 acre-feet per year of discharge from the Trinity aquifer and 46,096 acre-feet per year of discharge from the Woodbine aquifer to surface water bodies that are located within the Red River GCD.

8.5 Annual Volume of Flow In and Out of the District and Between Aquifers in the District

Flow into and out of the District is defined as the lateral flow within an aquifer between the District and adjacent counties. Flow between aquifers is defined as the vertical flow between aquifers or confining units that occurs within the boundaries of the District. The flow is controlled by hydrologic properties as well as relative water levels in the aquifers and confining units. Water budget values of flow for the Red River GCD were estimated by the TWDB in the GAM Run 16-005 (Appendix E).

8.6 Projected Surface Water Supply within the District

The 2017 Texas State Water Plan, the most recent plan available, provides an estimate of projected surface water supplies in Grayson and Fannin Counties. These estimates are included in Appendix F.

Total projected surface water supplies by county are illustrated in Figure 5. The estimated projections range from a maximum of 15,618 acre-feet in 2030 to a minimum of 14,934 acre-feet in 2020 for Fannin County, from a maximum of 30,846 acre-feet in 2070 to a minimum of 30,244 acre-feet in 2050 for Grayson County. They also indicate that projected surface water supplies for the District, which are on the order of 46,464 acre-feet per year, are even or slightly less than historical groundwater use in the District, which is on the order of 20,000 to 50,000 acre-feet per year for 2000 through 2015.

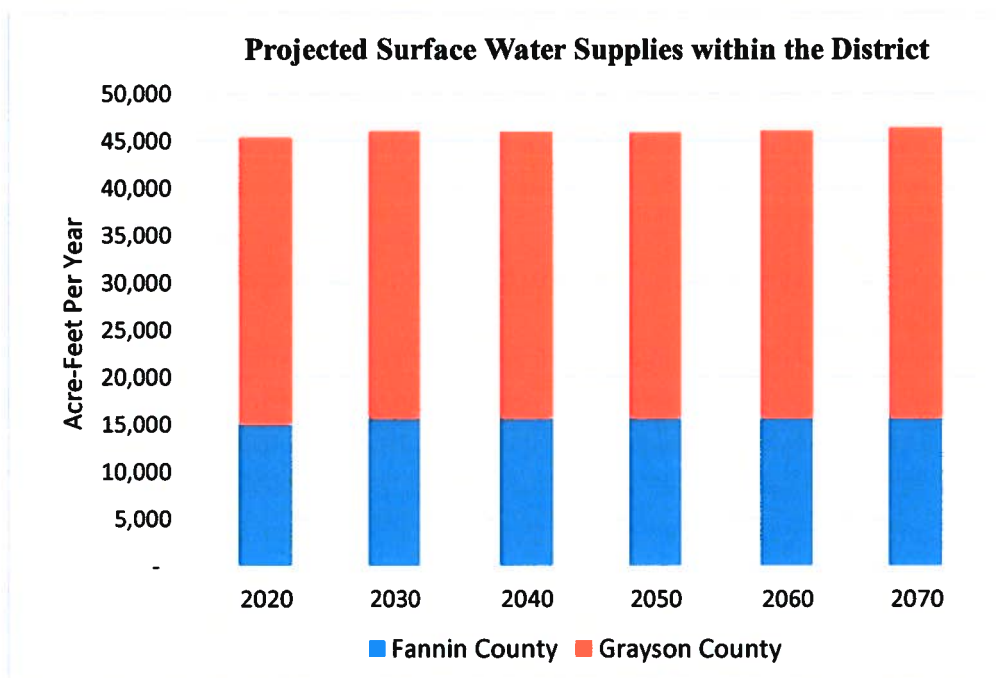


Figure 5. Projected Surface Water Supplies within the District

8.7 Projected Total Demand for Water within the District

Appendix F contains an estimate of projected net water demand in Fannin and Grayson Counties based on the 2017 Texas State Water Plan.

The analyses to develop water demand projections are primarily conducted in Texas as part of the regional water supply planning process (created by the 75th Texas Legislature through the passage of Senate Bill 1 in 1997). Water demand projections are developed for the following water user categories; municipal, rural (county-other), irrigation, livestock, manufacturing, mining, and steam-electric power generation.

Texas Water Code § 36.1071(e)(3)(G) requires that a management plan include projections of the total demand for water (surface water and groundwater) from the most recently adopted state water plan. The projected total demand for the District increases significantly from 62,140 acre-feet per year in 2020 to 126,130 acre-feet per year in 2070. Projected demands are significantly higher in Grayson than in Fannin County (Figure 6).

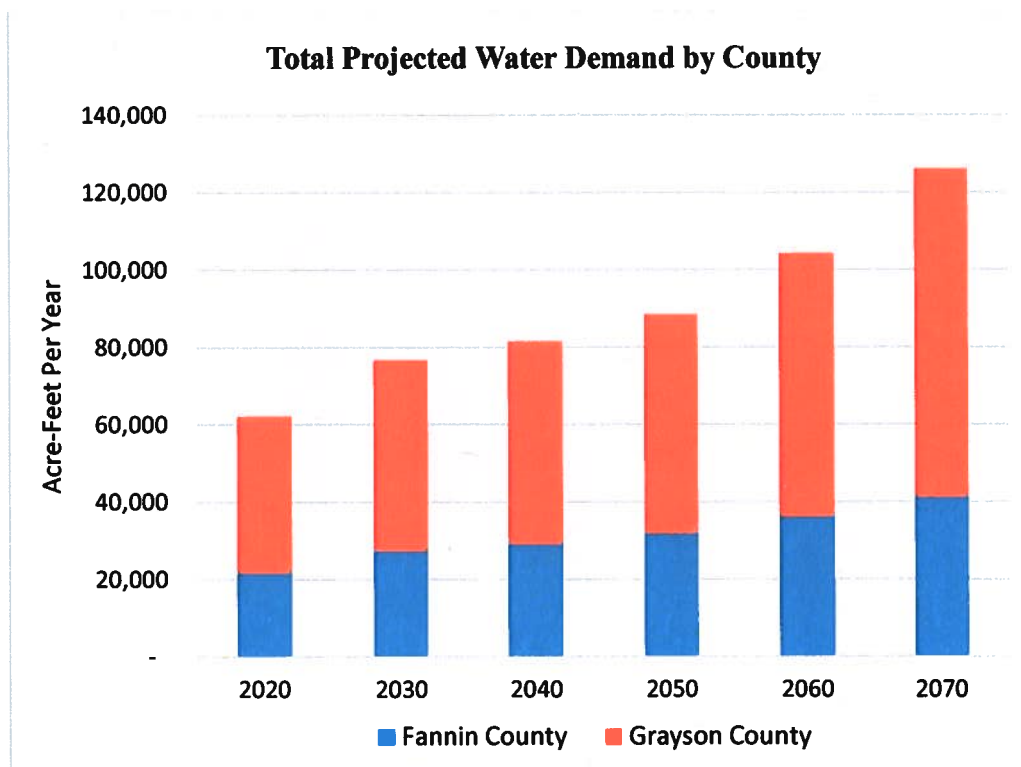


Figure 6. Total Projected Water Demand within the District

8.8 Projected Water Supply Needs

Projected water needs for the counties in the District were developed for the 2017 State Water Plan. Those needs reflect conditions when projected water demands exceed projected water supplies in the event of a drought of record. Projected water needs were estimated on the county-basin level for all water user group categories for every decade from 2020 through 2070. Appendix F lists the total water supply needs for Grayson and Fannin Counties as adopted in the TWDB 2017 State Water Plan.

Data for the 2017 State Water Plan projects future water needs for both counties in the District. There are 17 water user groups in Fannin County. A water need at some point between 2020 and 2070 is projected for all but five of those water user groups. The projected need in Fannin County increases significantly from 56 acre-feet per year in 2020 to 18,776 acre-feet per year in 2070. Of the 26 water user groups in Grayson County, a need at some point between 2020 and 2070 is projected for 20 of those water user groups. For the District as a whole, the total projected water need increases from 142 acre-feet per year in 2020 to 55,020 acre-feet per year in 2070. Figure 7 shows the total projected water needs for the District through 2070.

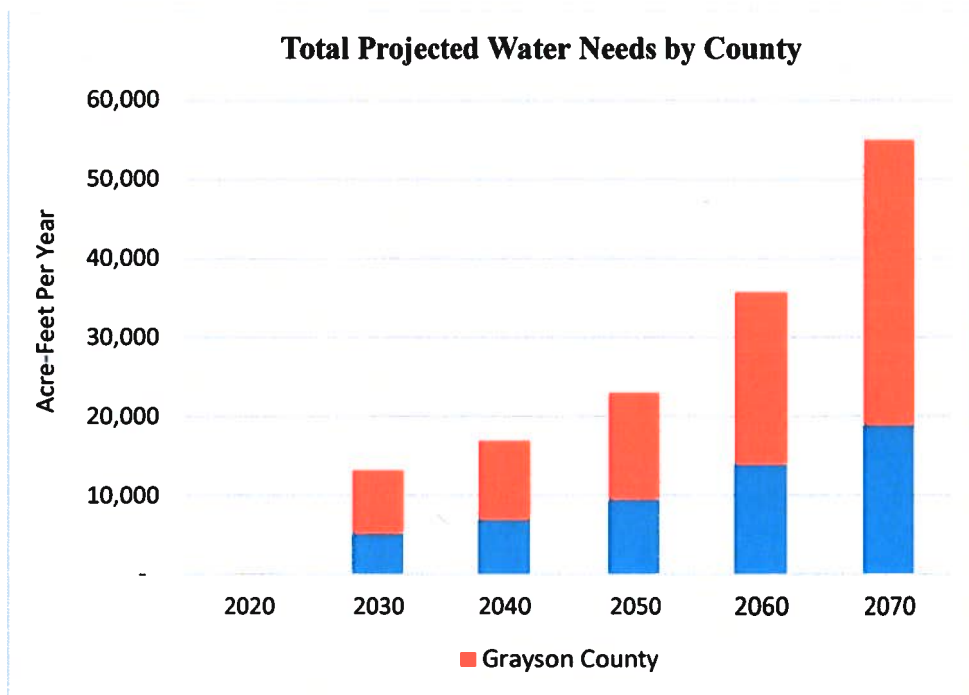


Figure 7. Total Projected Water Needs by County

8.9 Water Management Strategies

The 2017 State Water Plan assessed and recommended water management strategies to meet the identified needs for every decade from 2020 through 2070. Potential strategies include water conservation, developing additional groundwater and surface water supplies, expanding and improving management of existing water supplies, water reuse, and alternative approaches such as desalination. The projected water management strategies for the counties in the District from the 2017 State Water Plan are shown in Appendix F by water user group (WUG).

9 Groundwater Resources of Fannin and Grayson Counties

A map showing the extent of the aquifers in the District is included as Figure 8. Cross sections through the aquifers are included as Figures 9 and 10.

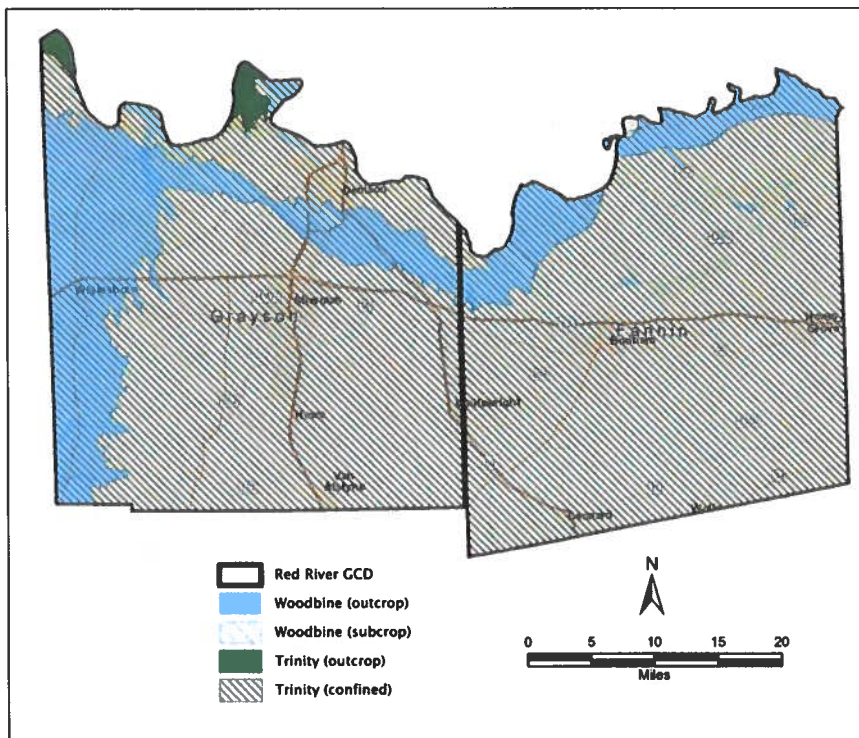


Figure 8. Red River District Aquifers

The Trinity aquifer consists of early Cretaceous age formations of the Trinity Group where they occur in a band extending through the central part of the state in all or parts of 55 counties, from the Red River in North Texas to the Hill Country of South-Central Texas. Trinity Group deposits also occur in the Panhandle and Edwards Plateau regions where they are included as part of the Edwards-Trinity (High Plains and Plateau) aquifers.

Formations comprising the Trinity Group are (from youngest to oldest) the Paluxy, Glen Rose, and Twin Mountains-Travis Peak. Up-dip, where the Glen Rose thins or is missing, the Paluxy and Twin Mountains coalesce to form the Antlers Formation. The Antlers consists of up to 900 feet of sand and gravel, with clay beds in the middle section. Water from the Antlers is mainly used for irrigation in the outcrop area of North and Central Texas. Forming the upper unit of the Trinity Group, the Paluxy Formation consists of up to 400 feet of predominantly fine-to-coarse-grained sand interbedded with clay and shale. The formation pinches out downdip and does not occur south of the Colorado River.

Underlying the Paluxy, the Glen Rose Formation forms a gulf-ward-thickening wedge of marine carbonates consisting primarily of limestone. South of the Colorado River, the Glen Rose is the upper unit of the Trinity Group and is divisible into an upper and lower member.

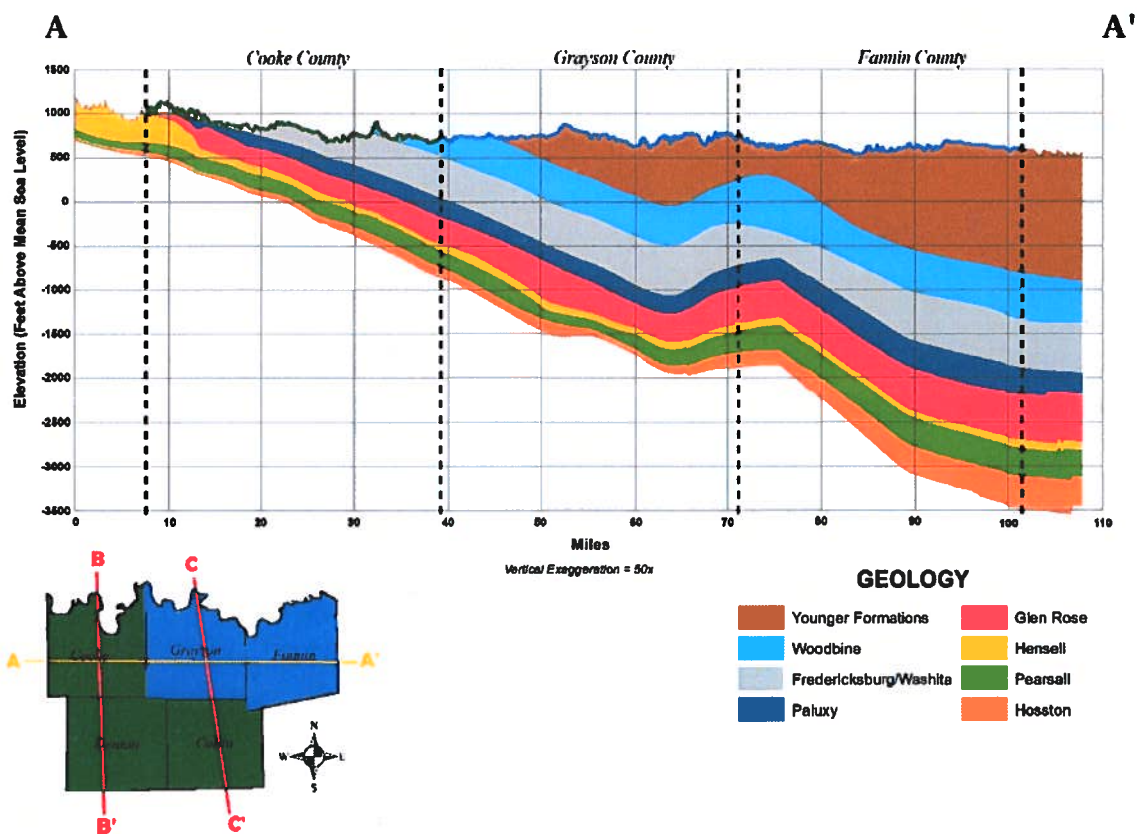


Figure 9. Cross Section A-A'

The basal unit of the Trinity Group consists of the Twin Mountains and Travis Peak formations, which are laterally separated by a facies change. To the north, the Twin Mountains formation consists mainly of medium- to coarse-grained sands, silty clays, and conglomerates. The Twin Mountains is the most prolific of the Trinity aquifers in North-Central Texas; however, the quality of the water is generally not as good as that from the Paluxy or Antlers Formations. To the south, the Travis Peak Formation contains calcareous sands and silts, conglomerates, and limestones. The formation is subdivided into the following members in descending order: Hensell, Pearsall, Cow Creek, Hammett, Sligo, Hosston, and Sycamore.

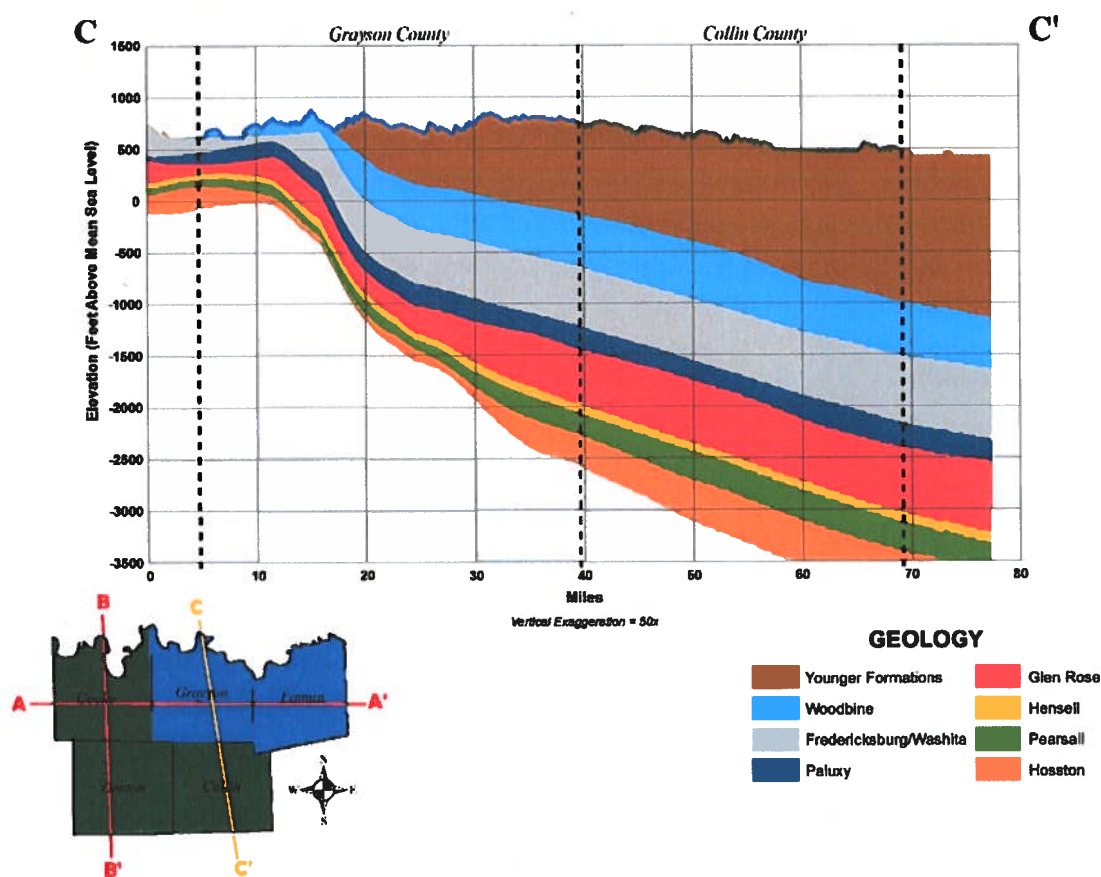


Figure 10. Cross Section C-C'

The depth to the top of the Trinity Group Antlers and Paluxy Formations ranges between approximately 500 feet in northwest Grayson County to over 3,500 feet in southeast Fannin County. The depth to the base of Cretaceous ranges between 900 ft and 4,500 feet from northwest

to southeast across Grayson and Fannin Counties. The total thickness of the Trinity Formations ranges from 400 and 1,000 feet across the District.

The Woodbine aquifer extends from McLennan County in North-Central Texas northward to Cooke County and eastward to Red River County, paralleling the Red River. Groundwater produced from the aquifer furnishes municipal, industrial, domestic, livestock, and small irrigation supplies throughout its North Texas extent. The Woodbine Formation is composed of water-bearing sandstone beds interbedded with shale and clay. Within the District, the Woodbine Formation dips eastward into the subsurface where the top of the formation reaches a maximum depth of approximately 1,200 feet below land surface and a maximum thickness of approximately 600 feet near the eastern Fannin County line.

The Woodbine aquifer is divided into three water-bearing zones that differ considerably in productivity and quality. Only the lower two zones of the aquifer are developed to supply water for domestic and municipal uses. Chemical quality deteriorates rapidly in well depths below 1,500 feet. In areas between the outcrop and this depth, quality is considered good overall as long as ground water from the upper Woodbine is sealed off. The upper Woodbine contains water of extremely poor quality in downdip locales and contains excessive iron concentrations along the outcrop.

Red River Alluvium

A review of state well reports in both northern Fannin County and the northeast corner of Grayson County indicates that significant water-bearing alluvial deposits have accumulated along the Red River Basin. The depth from land surface to the base of the river alluvium occurs up to a maximum depth of about 95 feet, with an average alluvium thickness of 50 feet. The thick deposits that parallel the sides of the river channel are a result of the river down-cutting through existing fluvial deposits, which are typically composed of clay, sand and gravel. Gravel is usually identified at the base of the alluvial sequences. The extent of the alluvial aquifer in the District is shown on Figure 11.

There are 66 wells registered within the District that have been completed in the alluvium that have not been plugged or drilled as dry holes. Ten of those wells are non-exempt. These numbers are based on District well registry data collected through October 2015.

Sand pit operations that are located in the alluvium aquifer discharge a significant amount of groundwater for dewatering operations. Other uses include irrigation and domestic use. Well yields range from one gallons per minute ("gpm") to 150 gpm, with an average yield of approximately 25 gpm.

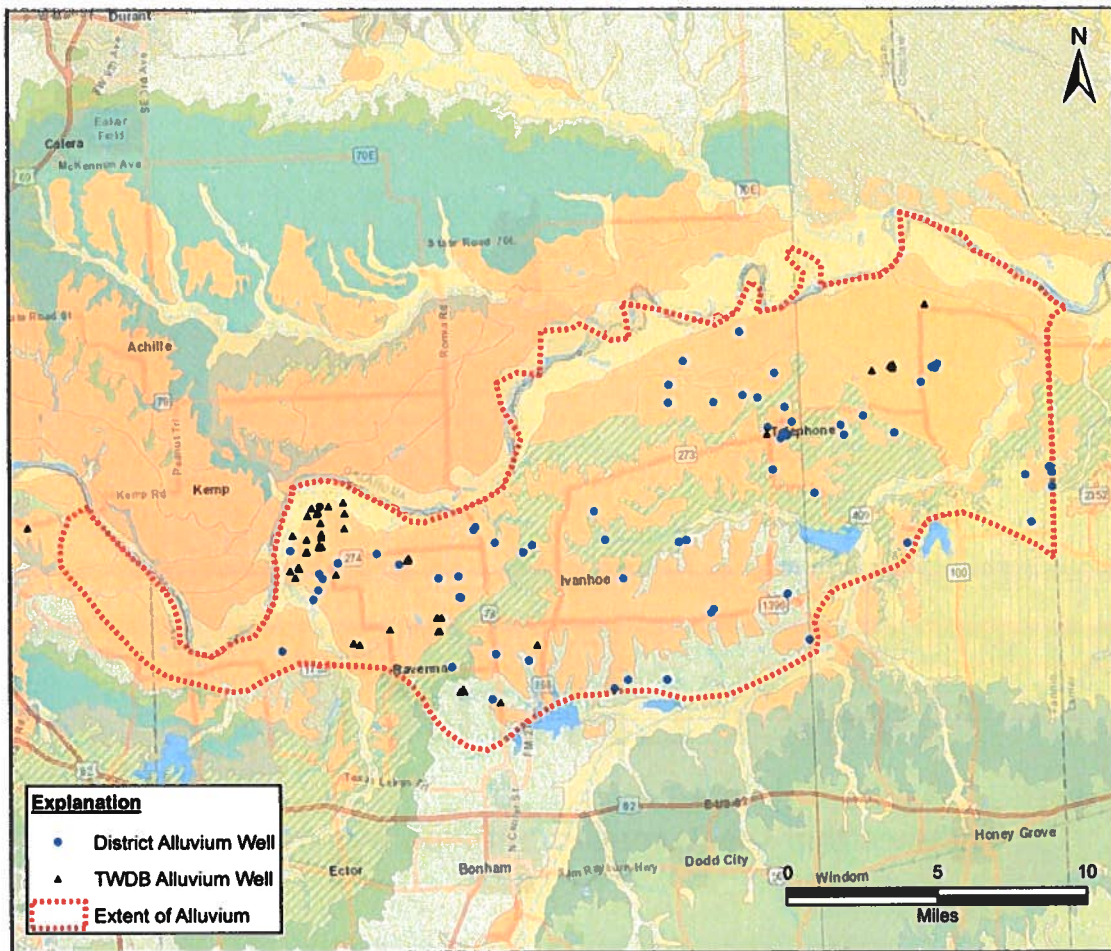


Figure 11. Extent of Alluvium within the District

APPENDIX B

Evidence that the Management Plan was Adopted

**NOTICE OF PUBLIC MEETING
OF THE
BOARD OF DIRECTORS OF THE
RED RIVER GROUNDWATER CONSERVATION DISTRICT
Thursday, November 19, 2020 at 10:00 a.m.**

**IN-PERSON MEETING LOCATION:
Greater Texoma Utility Authority Board Room
5100 Airport Drive
Denison, Texas 75020**

REMOTE ACCESS ALSO AVAILABLE AT:
Join by computer, tablet or smartphone at the following link:
<https://global.gotomeeting.com/join/694326965>

or

Join by phone 872-240-3412 with access code: 694-326-965

Notice is hereby given that, in accordance with Governor Abbott's March 16, 2020, action to temporarily suspend certain provisions of the Texas Open Meetings Act, a quorum of the Board of Directors of the Red River Groundwater Conservation District ("District") will hold public hearings and a Board meeting in-person and via telephone and video conference call beginning at 10:00 a.m. on Thursday, November 19, 2020. Please note for in-person attendance that the Board meeting location can only accommodate a limited number of attendees in order to comply with the Governor's proclamation related to in-person gatherings, and that remote access may be required in the event the capacity limitations are reached. Public comment can be provided whether participating in-person or remotely

Public Hearing to Adopt District Management Plan in Fannin and Grayson Counties, Texas

The Public Hearing will begin at 10:00 a.m.

Notice is hereby given that the Board of Directors of the Red River Groundwater Conservation District ("District") will hold a public hearing, accept public comment, and may discuss and consider adoption of the District's Management Plan in Fannin and Grayson Counties, Texas.

Agenda

1. Call to Order; establish quorum; declare hearing open to the public; introduction of Board.
2. Review of Management Plan applicable to the District.
3. Public Comment on District's Management Plan (verbal comments limited to three (3) minutes each).
4. Consider and act upon adoption of the Management Plan applicable to the District.

Public Hearing to Adopt Rules Amendments for Water Wells in Fannin and Grayson Counties, Texas

The Public Hearing will begin upon adjournment of the above noticed Public Hearing.

Notice is hereby given that the Board of Directors of the North Texas Groundwater Conservation District ("District") will hold a public hearing, accept public comment, and may discuss and consider adoption of the District's Rules Amendments for Water Wells in Fannin and Grayson Counties, Texas.

Agenda

1. Call to Order; establish quorum; declare hearing open to the public; introduction of Board.
2. Review of Rules Amendments for Water Wells applicable to the District.
3. Public Comment on District's Rules Amendments for Water Wells (verbal comments limited to three (3) minutes each).
4. Consider and act upon adoption of the Rules Amendments for Water Wells applicable to the District.

Board Meeting

The regular Board Meeting will begin upon adjournment of the above noticed Public Hearing.

Notice is hereby given that the Board of Directors of the Red River Groundwater Conservation District ("District") may discuss, consider, and take all necessary action, including expenditure of funds, regarding each of the agenda items below:

Agenda:

1. Pledge of Allegiance and Invocation.
 2. Call to order, establish quorum; declare meeting open to the public.
 3. Public Comment.
 4. Consider and act upon approval of Minutes of August 20, 2020, Board Meeting.
 5. Budget and Finance.
 - a. Review and approval of monthly invoices.
 - b. Receive monthly financial information
 6. Consider and act upon Administrative Services Contract with Greater Texoma Utility Authority.
-

7. Presentation and possible action on the Texas Water Development Board's rulemaking for the Brackish Groundwater Production Zone Rules.
 8. Consider and act upon amendments to the District's Hydrogeological Report Requirements.
 9. Consider and act upon amendments to District Flow Testing Procedure Manual.
 10. Discussion and possible action on who will pay transaction fees for the District's online fee payments software.
 11. Update and possible action regarding the process for the development of Desired Future Conditions (DFC).
 12. Consider and act upon compliance and enforcement activities for violations of District Rules.
 13. Consider and act upon approval of Investment Policy.
 14. General Manager's report: The General Manager will update the Board on operational, educational and other activities of the District.
 - a. Well Registration Summary
 - b. Update on Injection/Disposal Well Monitoring Program
 15. Open forum / discussion of new business for future meeting agendas.
 16. Adjourn.
-

¹*The Board may vote and/or act upon each of the items listed in this agenda.*

²*At any time during the meeting or work session and in compliance with the Texas Open Meetings Act, Chapter 551, Government Code, Vernon's Texas Codes, Annotated, the Red River Groundwater Conservation District Board may meet in executive session on any of the above agenda items or other lawful items for consultation concerning attorney-client matters (§551.071); deliberation regarding real property (§551.072); deliberation regarding prospective gifts (§551.073); personnel matters (§551.074); and deliberation regarding security devices (§551.076). Any subject discussed in executive session may be subject to action during an open meeting.*

³*Persons with disabilities who plan to attend this meeting, and who may need assistance, are requested to contact Velma Starks at (800) 256-0935 two (2) working days prior to the meeting, so that appropriate arrangements can be made.*

⁴*For questions regarding this notice, please contact Velma Starks at (800) 256-0935, at rrgcd@reddrivergcd.org or at 5100 Airport Drive, Denison, TX 75020.*

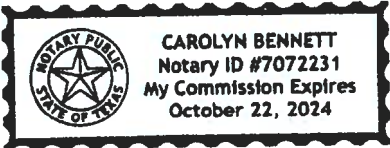
This is to certify that I, Velma Starks, posted this agenda on the outdoor bulletin board of the Administrative Offices of the Greater Texoma Utility Authority, on the west side of the building, and on our website by 10:00 a.m. on November 16, 2020.

Velma Starks
Velma Starks

Sworn and subscribed to before me this 16 day of November 2020.

Carolyn Bennett
Notary Public

(SEAL)



**MINUTES OF THE BOARD OF DIRECTORS' BOARD MEETING
RED RIVER GROUNDWATER CONSERVATION DISTRICT**

THURSDAY, NOVEMBER 19, 2020

**IN-PERSON MEETING LOCATION:
Greater Texoma Utility Authority Board Room
5100 Airport Drive
Denison, Texas 75020**

REMOTE ACCESS ALSO AVAILABLE AT:
Join by computer, tablet or smartphone at the following link:
<https://global.gotomeeting.com/join/694326965>

or

Join by phone 872-240-3412 with access code: 694-326-965

Notice is hereby given that, in accordance with Governor Abbott's March 16, 2020, action to temporarily suspend certain provisions of the Texas Open Meetings Act, a quorum of the Board of Directors of the Red River Groundwater Conservation District ("District") will hold public hearings and a Board meeting in-person and via telephone and video conference call beginning at 10:00 a.m. on Thursday, November 19, 2020. Please note for in-person attendance that the Board meeting location can only accommodate a limited number of attendees in order to comply with the Governor's proclamation related to in-person gatherings, and that remote access may be required in the event the capacity limitations are reached. Public comment can be provided whether participating in-person or remotely.

Members Present: Chuck Dodd, David Gattis, Mark Gibson, Harold Latham, Mark Newhouse, Billy Stephens, and Mark Patterson

Members Absent:

Staff: Drew Satterwhite, Allen Burks, Paul Sigle, Wayne Parkman, Debi Atkins, Theda Anderson, Carolyn Bennett, and Velma Starks

Visitors: Kristen Fancher, Fancher Legal
James Beach, WSP

Public Hearing to Adopt District Management Plan in Fannin and Grayson Counties, Texas

Agenda

1. **Call to Order; establish quorum; declare hearing open to the public; introduction of Board.**

Board President Mark Patterson called the Public Hearing to order at 10:05 a.m.

2. Review of Management Plan applicable to the District.

General Manager Drew Satterwhite reviewed the updates with the Board.

3. Public Comment on District's Management Plan (verbal comments limited to three (3) minutes each).

No public comments.

4. Consider and act upon adoption of the Management Plan applicable to the District.

Board Member David Gattis made the motion to adopt the Management Plan. Board Member Mark Newhouse seconded the motion. Motion passed unanimously.

Board President Mark Patterson adjourned the Management Plan Public Hearing at 10:14 a.m.

Public Hearing to Adopt Rules Amendments for Water Wells in Fannin and Grayson Counties, Texas

Agenda

1. Call to Order; establish quorum; declare hearing open to the public; introduction of Board.

Board President Mark Patterson called the Rules Amendments Public Hearing to order at 10:14 a.m.

2. Review of Rules Amendments for Water Wells applicable to the District.

General Manager Drew Satterwhite reviewed the amendments to the rules with the Board. Kristen Fancher, legal counsel, explained the rule reference to Brackish Water. James Beach, WSP, provided information regarding Brackish Water Production Zones. Brief discussions were held.

3. Public Comment on District's Rules Amendments for Water Wells (verbal comments limited to three (3) minutes each).

No public comment.

4. Consider and act upon adoption of the Rules Amendments for Water Wells applicable to the District.

Board Member Mark Newhouse made the motion to adopt the Rules Amendments. Board Member Chuck Dodd seconded the motion. Motion passed unanimously.

Board President Mark Patterson adjourned the Rules Amendments Public Hearing at 10:55 a.m.

Board Meeting

1. Pledge of Allegiance and Invocation.

Board President Mark Patterson led the Pledge of Allegiance and Board Member Chuck Dodd provided the invocation.

2. Call to order, establish quorum; declare meeting open to the public.

Board President Mark Patterson called the meeting to order at 10:57 a.m., established that a quorum was present, and declared the meeting open to the public.

3. Public comment

There were no public comments.

4. Consider and act upon approval of Minutes of August 20, 2020 Board Meeting.

Board Member Chuck Dodd made a motion to approve the minutes of the August 20, 2020 meeting. The motion was seconded by Board Member David Gattis. Motion passed unanimously.

5. Budget and Finance.

a. Review and approval of monthly invoices.

General Manager Drew Satterwhite reviewed monthly invoices with the Board. Board Member Mark Newhouse made the motion to approve the monthly invoices. Board Member David Gattis seconded the motion. Motion passed unanimously.

b. Receive monthly financial information.

General Manager Drew Satterwhite reviewed the monthly financial information with the Board.

6. Consider and act upon Administrative Services Contract with Greater Texoma Utility Authority.

General Manager Drew Satterwhite provided background information for the Board. In 2010, the District and GTUA entered into an agreement for administrative services to be provided by GTUA for the District. This relationship has helped the District operate with the lowest production fees in the region. Board President Mark Patterson informed the Board that NTGCD has gone to a five year agreement and asked the Board if it would like to go to five years. After a brief discussion, the Board opted to stay with the one year agreement. Board Member David Gattis made the motion to approve the contract. Board Member Mark Newhouse seconded motion. Motion passed unanimously.

7. Presentation and possible action on the Texas Water Development Board's rulemaking for the Brackish Groundwater Production Zone Rules

James Beach, WSP, provided the presentation regarding Brackish Groundwater Production Zones in relation to aquifers. Kristen Fancher, legal counsel, explained the legal issues that exist and how a petition might work. Discussion was held.

8. Consider and act upon amendments to the District's Hydrogeological Report Requirements.

General Manager Drew Satterwhite provided background information for the Board. The report was left out of the packet. The report clarifies when a hydrogeological report is necessary. Board

Member Chuck Dodd made the motion to approve the amendments to the District's Hydrogeological Report Requirements. Board Member David Gattis seconded the motion. Motion passed unanimously.

9. Consider and act upon amendments to District Flow Testing Procedure Manual.

General Manger Drew Satterwhite reviewed the amendments to the District Flow Testing Procedure. The amendment states *"Upon completion (pump installed) of the well, the well owner representative shall provide the District with at least 3 dates (Monday-Friday) and times (between 8 am and 4 pm) within the 60 days following completion to meet for the purposes of conducting the flow test. If given advance notice, the District will strive to meet the well driller or pump installer at the site during the final stages of the well development."* Board Member David Gattis made the motion to approve the amendments to the District Flow Testing Procedure Manual. Board Member Chuck Dodd seconded the motion. Motion passed unanimously.

10. Discussion and possible action on who will pay transaction fees for the District's online fee payments software.

General Manger Drew Satterwhite informed the Board of the intention to go live with new database next month. General Manager Drew Satterwhite explained that payment by credit card will be available and fees are charged with credit card usage. Discussion was held. Board Member David Gattis made the motion for the Board to cover fees and pay \$20 per month fee. Board Member Harold Latham seconded the motion. Board Members Mark Newhouse and Chuck Dodd voted against motion. Motion passed.

11. Update and possible action regarding the process for the development of Desired Future Conditions (DFC).

General Manager Drew Satterwhite informed the Board that GMA 8 approved the DFCs resolution and the 90 days for the individual District to hold their Public Hearing meeting on the DFCs started on Monday. General Manager Drew Satterwhite suggested that the Board consider having Public Hearing in February. The next GMA 8 meeting will tentatively take place in June.

12. Consider and act upon compliance and enforcement activities for violations of District Rules.

General Manger Drew Satterwhite reported none at this time.

General Manager Drew Satterwhite reported that Porter Green wells were capped by District in August. Discussion was held.

13. Consider and act upon approval of Investment Policy.

General Manager Drew Satterwhite informed the Board that we are required to look at Investment Policy every year as well as the broker/dealers and PFIA training sources. Board Member David Gattis made the motion to approve Resolution No. 2020-11-19-02. Board Member Chuck Dodd seconded the motion. Motion passed unanimously.

14. General Manager's Report: The General Manager will update the Board on operational, educational and other activities of the District.

a. Well Registration Summary

General Manager Drew Satterwhite reported wells registered in August (21), in September (8) and in October (4).

Agrilife reviewed and reported that the District's model uses sound logic. We are looking at going into Phase 2 which involves looking at sod farms and possible soil type.

The payments resolution has expired authorizing Drew and Debi to sign checks prior to this meeting.

b. Update on Injection/Disposal Well Monitoring Program

Kristen Fancher, legal counsel, explained the active protest. Discussion was held.

15. Open forum/discussion of new business for future meeting agendas.

Upper Trinity Water District submitted Hydro report and it will meet the December Permit Hearing deadline if no problems arise. The Board will meet on December 17, 2020 if there is a Permit Hearing Meeting.

10. Adjourn.

Board President Mark Patterson declared the meeting adjourned at 12:29 p.m.

#####



Recording Secretary



Secretary-Treasurer

Affidavit of Publication

STATE OF TEXAS)
COUNTY OF GRAYSON) SS:

RED RIVER GROUND CONSERVATION DISTRICT	Account #	91652
PO BOX 1214	Ad Number	0001373916
SHERMAN TX 75091		

Jeanine Sewell, being 1st duly sworn, deposes and says: That (s)he is the Legal Clerk for the Herald Democrat, a daily newspaper regularly issued, published and circulated in the City of Sherman, County of Grayson, State of Texas, and that the advertisement,

**RED RIVER GROUNDWATER CONSERVATION DISTRICT NOTICE OF HEARINGS
ON DISTRICT RULES AMENDMENTS AND DISTRICT MANAGEMENT PLAN
NOVEMBER 19, 2020 at 10:00 a.m. NOTIC**

a true copy attached for, was published in said Herald Democrat in 1 edition(s) of said newspaper issued from 10/30/2020 to 10/30/2020, on the following days:
10 / 30 / 20

ISI Jeanine Sewell
LEGAL ADVERTISEMENT REPRESENTATIVE

Subscribed and sworn to before me on this 2nd day of November, 2020

Notary Michelle Henderson



Legal Notices

Legal Notices

RED RIVER GROUNDWATER
CONSERVATION DISTRICT
NOTICE OF HEARINGS ON
DISTRICT RULES AMENDMENTS
AND DISTRICT MANAGEMENT
PLAN

NOVEMBER 19, 2020 at 10:00 a.m.

NOTICE IS HEREBY GIVEN to all interested persons in Fannin and Grayson Counties, Texas:

That the Board of Directors of the Red River Groundwater Conservation District ("District") will hold a public hearing to discuss, consider, receive public comments, and potentially act upon adoption of amendments to the District's Rules regulating water wells in Fannin and Grayson Counties, Texas. The proposed amendments to the Rules include changes and/or additions related to the following: definitions; registration of wells; administrative completeness requirements; well completion forms; well reports; smart irrigation controller requirements for certain irrigation wells; spacing exception requests; application fees; replacement wells; brackish production zones; system loss reporting; well development/rehabilitation reporting; exception to well reporting requirements; permit amendments; well report deposit; blind flanges and metering; deadline for flow testing; enforcement and penalties for violating the Rules; and organizational and conforming changes.

The District will also discuss, consider, receive public comments, and potentially act upon adoption of the District Management Plan.

The public hearings will be held on Thursday, November 19, 2020, at 10:00 a.m. In-person at the Greater Texoma Utility Authority office, located at 5100 Airport Drive, Denison, Texas 75020. Remote/virtual participation options are also provided through video conference and telephone dial in, and can be accessed on the District's website at www.redrivergcd.org. Please note for in-person attendance that the Board meeting location can only accommodate a limited number of attendees in order to comply with the Governor's proclamation related to in-person gatherings, and that remote access may be required in the event the capacity limitations are reached. Public comment can be provided whether participating in-person or remotely. Comments on the proposed Rules and/or Management Plan may be presented in written or verbal form at the hearings, and persons interested in submitting written comments in advance may do so by sending comments to the District at P.O. Box 1214, Sherman, Texas 75091 or by email at rrgcd@redrivergcd.org. Any person who desires to appear at the hearings and present comments may do so in person, by legal representative, or both. The hearings posted in this notice may be recessed from day to day or continued where appropriate. At the conclusion of the hearings or any time or date thereafter, the proposed Rules Amendments and/or Management Plan may be adopted in the form presented or as amended based upon comments received from the public, District staff, consultants, or members of the Board without any additional notice.

A copy of the proposed Rules Amendments and Management Plan will be available 20 days before the date of the hearings by requesting a copy by email to rrgcd@redrivergcd.org, by accessing the District's website at www.redrivergcd.org, or by reviewing or copying the proposed Rules Amendments and/or Management Plan in person at 5100 Airport Drive, Denison, Texas 75020. The District is committed to compliance with the Americans with Disabilities Act (ADA). Any person who needs special accommodations should contact District staff at (800) 256-0935 at least 24 hours in advance if accommodation is needed. Any person who wishes to receive more detailed information on this notice should contact District staff at (800) 256-0935 or by email at rrgcd@redrivergcd.org

**RED RIVER GROUNDWATER CONSERVATION DISTRICT
NOTICE OF HEARINGS ON DISTRICT RULES AMENDMENTS
AND DISTRICT MANAGEMENT PLAN
NOVEMBER 19, 2020 at 10:00 a.m.**

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END OF NOTICE

APPENDIX C

**Evidence that the District Coordinated Development of the
Management Plan with the Surface Water Entities**



**RED RIVER
GROUNDWATER CONSERVATION DISTRICT
FANNIN COUNTY AND GRAYSON COUNTY**



MEMO

TO: Surface Water Management Entities

FROM: Drew Satterwhite, P.E., General Manager

DATE: December 28, 2020

SUBJECT: Red River Groundwater Conservation District Management Plan

The Red River Groundwater Conservation District's Management Plan, adopted at the District's Public Hearing held November 19, 2020, is available on the District website, www.redrivergcd.org. This copy is being made available for your review and files. The Red River Groundwater Conservation District is required to provide this document available to "Political subdivisions as defined by Texas Water Code, Chapter 15, and identified from Texas Commission on Environmental Quality records which are granted authority to store, take, divert, or supply surface water either directly or by contract under Texas Water Code, Chapter 11, for use within the boundaries of a district."

DS:vs

Red River Groundwater Conservation District
Surface Water Entities

ENTITY	ADDRESS	PHONE NO.	COUNTY	EMAIL ADDRESS
BOIS D'ARC MUD	33 W ACKERBROTT DR, HAWKER WILSON & WYLAND PK, ALLER, TEXAS 75013-6079	(937) 375-7361	Fannin	boisdarcmsd@gmail.com; mwehousen@boisdarc.com
CITY OF BOHAMA	301 E 5TH, BOHAMA, TEXAS 75118-0000	(937) 583-5793	Fannin	boisdarc@boisdarc.net; boisdarc@boisdarc.com
NORTH TEXAS MWD	PO BOX 2408, WYKE, TEXAS 75098-2408	(972) 443-5405	Fannin	ntmwd@ntmwd.com; ntmdistrict@ntmwd.com; ntmdistrict@ntmwd.com
RED RIVER AUTHORITY OF TEXAS	900 8TH ST STE 320, HAMILTON BLDG, WICHITA FALLS, TEXAS	(817) 722-8877	Fannin	rra@rra.org
BOATRIGHT EMARETT & JARRETT	4779 SUSTAIN ST, SHERMAN, TEXAS 75090-2167	937 426-4225	Grayson	boisarc@boisarc.com
CITY OF COLLINSVILLE	PO BOX 649, COLLINSVILLE, TEXAS 75006-0649	(937) 462-2770	Grayson	robertson@cityofcollinsville.org
CITY OF DENISON	1777 W 10TH ST, DENISON, TEXAS 75020-0000	(937) 433-5185	Grayson	denison@cityofdenison.com; denison@cityofdenison.com
CITY OF DENVER	371 MAIN STREET, HOME, TEXAS 75043-0000	(937) 478-4882	Grayson	denison@cityofdenison.com
CITY OF GUNTER	PO BOX 849, GUNTER, TEXAS 75058-0349	(937) 513-5371	Grayson	chris@cityofgunter.net
CITY OF HENRIETTA	116 W MARSH ST, NOWLE, TEXAS 75075-0000	(937) 686-2185	Grayson	henrietta@cityofhenrietta.org
CITY OF HOWE	PO BOX 457, PILOT POINT, TEXAS 75084-0000	(937) 686-2185	Grayson	henrietta@cityofhenrietta.org
CITY OF PILOT POINT	PO BOX 1089, Pendergast, Texas 75076	(937) 686-2185	Grayson	henrietta@cityofhenrietta.org
CITY OF POTTSBORO	PO BOX 543, SANDLA, TEXAS 75084-0000	(937) 686-2185	Grayson	henrietta@cityofhenrietta.org
CITY OF SANDLER	PO BOX 1108, SHERMAN, TEXAS 75091-1108	(937) 686-2185	Grayson	henrietta@cityofhenrietta.org
CITY OF SHERMAN	PO BOX 242, VAN ALSTINE, TEXAS 75091-1108	(937) 686-2185	Grayson	henrietta@cityofhenrietta.org
CITY OF SOUTHWIND	PO BOX 340, WINTERSBORO, TEXAS 76272-0000	(937) 686-2185	Grayson	henrietta@cityofhenrietta.org
CITY OF WALSLEY	5499 BELT LINE RD STE 200, DALLAS, TEXAS 75254-7658	(937) 686-2185	Grayson	henrietta@cityofhenrietta.org
CITY OF WINTERSBORO	5420 LIB PWAY STE 1300, COATS ROSE VALE ERYMAN & LEE A PROFESSIONAL CORPORATI, DALLAS, TEXAS 75240-4299	(937) 686-2185	Grayson	henrietta@cityofhenrietta.org
DOUBLE DAMMORND UTILITIES CO	5100 AIRPORT DR, DENISON, TEXAS 75020-8899	(937) 686-2185	Grayson	henrietta@cityofhenrietta.org
GREATER PLATINUM BRANCH WCD 1 OF GRAYSON COUNTY	5420 LIB PWAY STE 1300, COATS ROSE VALE ERYMAN & LEE A PROFESSIONAL CORPORATI, DALLAS, TEXAS 75240-4299	(937) 686-2185	Grayson	henrietta@cityofhenrietta.org
IRVING CROSSING MUD	PO BOX 1037, CELINA, TEXAS 75008-1037	(937) 686-2185	Grayson	henrietta@cityofhenrietta.org
LUELLA MUD	2401 W HORTON ST STE 1300, DENISON, TEXAS 75020-1402	(937) 686-2185	Grayson	henrietta@cityofhenrietta.org
MURKIN POINT PROPERTY OWNERS ASSOCIATION	PO BOX 343, MELISSA, TEXAS 75454-0343	(937) 686-2185	Grayson	henrietta@cityofhenrietta.org
NORTH COLLIN WSC	21108 PARK RIVALE DR, SATY, TEXAS 77460-4771	(937) 686-2185	Grayson	henrietta@cityofhenrietta.org
NORTHERN HILLS DEVELOPMENT CO INC	PO BOX 715, GORDONVILLE, TEXAS 76045-0715	(937) 686-2185	Grayson	henrietta@cityofhenrietta.org
NORTHWEST GRAYSON COUNTY WCD 1	PO BOX 1383, DENISON, TEXAS 75020-0000	(937) 686-2185	Grayson	henrietta@cityofhenrietta.org
OAK RIDGE, SOUTH GALE WSC	5430 LIB PWAY STE 1300, DALLAS, TEXAS 75240-4299	(937) 686-2185	Grayson	henrietta@cityofhenrietta.org
PIPER HILL WSC	5411 LIB PWAY STE 1300, DALLAS, TEXAS 75240-4299	(937) 686-2185	Grayson	henrietta@cityofhenrietta.org
PRESTON LUMBERT MUD 1	8046 W STATE HIGHWAY 56, SOUTHWEST FARRER COUNTY MUD, SANDY, TEXAS 75479-3448	(937) 686-2185	Grayson	henrietta@cityofhenrietta.org
SANGARE BANCHE MUD 1	9511 HANCOCK RD, AUSTIN, TX 78728-2908	(937) 686-2185	Grayson	henrietta@cityofhenrietta.org
SOUTHWEST FARRER COUNTY MUD	PO BOX 551, SHERMAN, TEXAS 75091-0551	(937) 686-2185	Grayson	henrietta@cityofhenrietta.org
SOUTHWEST WATER COMPANY	PO BOX 376, SHERMAN, TEXAS 75091-0376	(937) 686-2185	Grayson	henrietta@cityofhenrietta.org
THE OAKS WATER SYSTEM	PO BOX 551, SHERMAN, TEXAS 75091-0551	(937) 686-2185	Grayson	henrietta@cityofhenrietta.org
THOMPSON HEIGHTS DEVELOPMENT COMPANY	PO BOX 551, SHERMAN, TEXAS 75091-0551	(937) 686-2185	Grayson	henrietta@cityofhenrietta.org
TWO WAYS MUD	PO BOX 551, SHERMAN, TEXAS 75091-0551	(937) 686-2185	Grayson	henrietta@cityofhenrietta.org
WSPV COMPANY	PO BOX 551, SHERMAN, TEXAS 75091-0551	(937) 686-2185	Grayson	henrietta@cityofhenrietta.org

APPENDIX D

Red River GCD Rules

Red River Groundwater Conservation District

Rules for Water Wells in Fannin and Grayson Counties, Texas

As Amended on November 19, 2020

Procedural History of Rules Adoption

These rules of the Red River Groundwater Conservation District were initially adopted by the Board of Directors on August 29, 2011, at a duly posted public meeting in compliance with the Texas Open Meetings Act and following notice and hearing in accordance with Chapter 36 of the Texas Water Code. The rules were subsequently amended, in accordance with all legal requirements, on March 21, 2012, December 12, 2012, May 15, 2014, January 1, 2017, January 1, 2019, and on November 19, 2020.

**Red River
Groundwater Conservation District
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Red River Groundwater Conservation District District Rules

PREAMBLE

The Red River Groundwater Conservation District ("District") was created in 2009 by the 81st Texas Legislature with a directive to conserve, protect and enhance the groundwater resources of Fannin and Grayson Counties, Texas. The District's boundaries are coextensive with the boundaries of Fannin and Grayson Counties, and all lands and other property within these boundaries will benefit from the works and projects that will be accomplished by the District.

The Mission of the Red River Groundwater Conservation District is to develop rules to provide protection to existing wells, prevent waste, promote conservation and recharge of the aquifers, provide a framework that will allow availability and accessibility of groundwater for future generations, protect the quality of the groundwater in the recharge zone of the aquifer, insure that the residents of Fannin and Grayson Counties maintain local control over their groundwater, and operate the District in a fair and equitable manner for all residents of the District.

The District is committed to manage and protect the groundwater resources within its jurisdiction and to work with others to ensure a sustainable, adequate, high quality and cost effective supply of water, now and in the future. The District will strive to develop, promote, and implement water conservation, augmentation, and management strategies to protect water resources for the benefit of the citizens, economy and environment of the District. The preservation of this most valuable resource can be managed in a prudent and cost effective manner through conservation, education, and management. Any action taken by the District shall only be after full consideration and respect has been afforded to the individual property rights of all citizens of the District.

SECTION 1. DEFINITION, CONCEPTS, AND GENERAL PROVISIONS

Rule 1.1 Definitions of Terms.

In the administration of its duties, the District follows the definitions of terms set forth in Chapter 36, Texas Water Code, and other definitions as follows:

- (1) "Acre foot" means the standard measurement of groundwater necessary to cover one acre of land one foot deep, or approximately 325,851 U.S. gallons.
- (2) "Aggregate Withdrawal" means the total pumpage measurement of the amount of water withdrawn from two or more wells in a well system from the same aquifer.
- (3) "Agriculture use" (or "agricultural use") means any of the following activities:
 1. cultivating the soil to produce crops for human food, animal feed, or planting seed, or for the production of fibers;
 2. the practice of floriculture, viticulture, silviculture, and horticulture, including the cultivation of sod, and the cultivation of plants in containers or non-soil media, by a nursery grower;
 3. raising, feeding, or keeping animals for breeding purposes or for the production of food or fiber, leather, pelts, or other tangible products having a commercial value;
 4. planting cover crops, including cover crops cultivated for transplantation, or leaving land idle for the purpose of participating in any governmental program or normal crop or livestock rotation procedure;
 5. wildlife management; and
 6. raising or keeping equine animals.
- (4) "Air gap" means the unobstructed vertical separation between the free flowing discharge end of the pipe supplying the well and an open or non-pressure receiving vessel.
- (5) "Animal Feeding Operation" (AFO) means: (1) a lot or facility (other than an aquatic animal production facility) where animals have been, are, or will be stabled or confined and fed or maintained for a total of 45 days or more in any 12-month period, and where the animal confinement areas do not sustain crops, vegetation, forage growth, or postharvest residues in the normal growing season over any portion of the lot or facility; or (2) any other facility regulated as an AFO or as a Concentrated Animal Feeding

Operation by the TCEQ.

- (6) "Aquifer" means a water bearing geologic formation in the District.
- (7) "Aquifer Storage and Recovery" means the injection of water into a geologic formation and the subsequent recovery for beneficial use by the project operator, as defined by TCEQ rules.
- (8) "Artificial flow restrictors" means the term used to describe the prohibited devices that are capable of altering the measurement of a well's maximum capacity or flow rate, including, but not limited to, the following types of devices: dole valves installed above the wellhead, static head reducers, artificial head devices; and fixed energy dissipaters. Dole valves installed below the wellhead are not prohibited under Rule 4.4.
- (9) "As equipped" for purposes of determining the capacity of a well means visible pipes, plumbing, and equipment attached to the wellhead or adjacent plumbing that controls the maximum rate of flow of groundwater and that is permanently affixed to the well or adjacent plumbing by welding, glue or cement, bolts or related hardware, or other reasonably permanent means.
- (10) "Beneficial use" or "beneficial purpose" means use of groundwater for:
 1. agricultural, gardening, domestic, stock raising, municipal, mining, manufacturing, industrial, commercial, or recreational purposes;
 2. exploring for, producing, handling, or treating oil, gas, sulfur, lignite, or other minerals; or
 3. any other purpose that is useful and beneficial to the user that does not constitute waste.
- (11) "Best available data" means conclusions that are logically and reasonably derived using statistical or quantitative data, techniques, analyses, and studies that are available for peer review by scientists in the field and can be employed to address a specific scientific issue.
- (12) "Board" means the Board of Directors of the District.
- (13) "Boundary survey" means a diagram showing the proposed location of a well in relation to distance from property boundaries and existing registered wells, as required by Rule 4.3(a).
- (14) "Cap or "capped well" means covering a well with a securely fixed, removable device that will prevent the entrance of surface pollutants into the well. A well that is capped must have a covering capable of preventing surface pollutants from entering the well and sustaining weight of at least 400 pounds. The cap must be constructed in such a way that the covering cannot be easily removed by hand.
- (15) "Closed-loop geothermal well" means a well used for domestic use purposes that

recirculates water or other fluids inside a sealed system for heating or cooling purposes, and where no water is produced from the well or used for any other purpose of use.

- (16) “Completed well” means a well, the construction of which has been completed, with sealed off access of undesirable water or constituents to the well bore by utilizing proper casing and annular space positive displacement or pressure tremie tube grouting or cementing (sealing) methods.
- (17) “Contiguous” means property within a continuous perimeter boundary situated within the District. The term also refers to properties that are divided by a publicly owned road or highway or other easements if the properties would otherwise share a common border.
- (18) “Desired Future Conditions” means a quantitative description, adopted in accordance with Section 36.108 of the Texas Water Code, of the desired condition of the groundwater resources at one or more specified future times.
- (19) “District” means the Red River Groundwater Conservation District created in accordance with Section 59, Article XVI, Texas Constitution, Chapter 36, Texas Water Code, and the District Act.
- (20) “District Act” means the Act of May 25, 2009, 81st Leg., R.S., ch. 884, 2009 Tex. Gen. Laws 2313, codified at Tex. Spec. Dist. Loc. Laws Code Ann. ch. 8859 (“the District Act”), as may be amended from time to time.
- (21) “Domestic use” means the use of groundwater by an individual or a household to support essential domestic activity. Such use includes water for: drinking, washing, or culinary purposes; use by multiple households that do not qualify as a Public Water System as defined in these Rules, as long as there is no consideration given or received, as set forth herein; residential landscape watering of no more than one (1) acre contiguous to one (1) residence; irrigation of a family garden and/or family orchard; recreation limited to the filling of residential swimming pools and hot tubs; or for watering of domestic animals. Domestic use does not include the following types of use: water used to support activities for which consideration is given or received or for which the product of the activity is sold; use by or for a Public Water System; irrigation of crops in fields or pastures; or water used for open-loop residential geothermal systems, but does include water for closed-loop residential geothermal systems.
- (22) “Effective Date” means January 1, 2019, which is the date of adoption of permitting rules by the District.
- (23) “Emergency purposes” means the use of groundwater to fight fires, manage chemical spills, and otherwise address emergency public safety or welfare concerns.
- (24) “Exempt well” means a new or existing well that is exempt from permitting under these Rules, and is not required to have a Historic Use Permit or Production Permit to withdraw groundwater from an aquifer within the District.

- (25) "Existing well" means a well that was in existence or for which drilling commenced on or before the Effective Date.
- (26) "Gallons per minute" or "gpm" means the maximum production capacity or flow rate of a well as equipped, which can be measured by the District in accordance with these Rules.
- (27) "General Manager" as used herein is the appointed chief administrative officer of the District, as set forth in the District's bylaws, or the District staff or other Board designee acting at the direction of the General Manager or Board to perform the duties of the General Manager.
- (28) "Groundwater" means water percolating below the surface of the earth.
- (29) "Groundwater reservoir" means a specific subsurface water-bearing stratum.
- (30) "Hearings Examiner" means a person appointed by the Board of Directors to conduct a hearing or other proceedings including but not limited to an administrative law judge employed by the State Office of Administrative Hearings (SOAH).
- (31) "Historic Use Period" means the period from January 1, 2013 through December 31, 2018, in which water produced from a well or well system was put to beneficial use at any point during the duration of the period.
- (32) "Historic Use Permit" means a permit required by the District for a non-exempt well or well system that produced water during the Historic Use Period and that has not been abandoned.
- (33) "Landowner" means the person who holds possessory rights to the land surface or to the withdrawal of groundwater from wells located on the land surface.
- (34) "Leachate well" means a well used to remove contamination from soil or groundwater
- (35) "Livestock or poultry" means the use of groundwater associated with watering, raising, feeding, or keeping non-commercial livestock and/or poultry, of any variety, for subsistence or labor. The term also includes domesticated horses, cattle, goats, sheep, swine, poultry, and other similar animals involved in farming or ranching operations, on land recorded and taxed in the county as an agricultural land use. The term does not include the use of water for any animal that is stabled, confined, or fed at a facility that is defined as an Animal Feeding Operation.
- (36) "Maintenance Purposes" means the use of water to flush mains, fire hydrants or tanks as required by TCEQ.
- (37) "Management Plan" means the District Management Plan required under Section 36.1071, Texas Water Code, and as further described in these Rules.

- (38) “Maximum Historic Use” means the largest volume of groundwater produced during a calendar year from an aquifer and beneficially used during the Historic Use Period, as demonstrated by production reports submitted to the District.
- (39) “Meter” or “measurement device” means a water flow measuring device that can measure within +/- 5% of accuracy the instantaneous rate of flow and record the amount of groundwater produced from a well or well system during a measure of time, as specifically set forth under Section 10.
- (40) “Modeled Available Groundwater” means the amount of water that the Executive Administrator of the Texas Water Development Board determines may be produced on an average annual basis to achieve a Desired Future Condition established for the groundwater resources in the District.
- (41) “Modify” or “Modified” means performing work on the physical or mechanical components of the well head assembly or downhole portion of a well.
- (42) “Monitoring well” means a well used solely for the purpose of measuring some property of the groundwater or the aquifer that it penetrates, and is not equipped with a pump. Wells with other uses can still be used to collect aquifer data in the District’s Monitoring Program and not be considered a monitoring well for the purposes of these rules.
- (43) “New well” means a water well for which an administratively complete registration application is filed with the District on or after the Effective Date, or conversion of another type of well or artificial excavation to a water well on or after the Effective Date, including but not limited to a well originally drilled for hydrocarbon production activities that is to be converted to a water well.
- (44) “Non-exempt well” means an existing or a new well that does not qualify for exempt well status under these Rules.
- (45) “Notice to Proceed” means the official registration approval form issued by the District for new exempt wells.
- (46) “Nursery grower” means a person who grows more than 50 percent of the products that the person either sells or leases, regardless of the variety sold, leased, or grown. For the purpose of this definition, “grow” means the actual cultivation or propagation of the product beyond the mere holding or maintaining of the item prior to sale or lease and typically includes activities associated with the production or multiplying of stock such as the development of new plants from cuttings, grafts, plugs, or seedlings.
- (47) “Penalty” means a reasonable civil penalty set by rule under the express authority delegated to the District through Section 36.102(b) of the Texas Water Code.
- (48) “Person” means an individual, corporation, Limited Liability Company, organization, government, governmental subdivision, agency, business trust, estate, trust, partnership, association, or other legal entity.

- (49) "Pre-Effective Date Exempt Wells" means those existing wells that were exempt from the metering, reporting, and fee payment requirements under the District's Temporary Rules in effect prior to the Effective Date because they are used solely for domestic use or livestock or poultry use, regardless of well capacity, or that are equipped with a maximum production capacity of 27.7 gpm (40,000 gallons per day) or less, but that were required to be registered under the District's Temporary Rules.
- (50) "Presiding Officer" means the President of the Board, or other Board member presiding at any hearing or other proceeding or a Hearings Examiner appointed by the Board to conduct or preside over any hearing or other District proceeding.
- (51) "Production" or "producing" means the act of extracting groundwater from an aquifer by a pump or other method.
- (52) "Production Permit" means a permit required by the District for a new, non-exempt well.
- (53) "Public Water System" or "PWS" means a system for the provision to the public of water for human consumption through pipes or other constructed conveyances, which includes all uses described under the definition for "drinking water" in 30 Texas Administrative Code, Section 290.38. Such a system must have at least 15 service connections or serve at least 25 individuals at least 60 days out of the year. This term includes any collection, treatment, storage, and distribution facilities under the control of the operator of such system and used primarily in connection with such system, and any collection or pretreatment storage facilities not under such control which are used primarily in connection with such system. Two or more systems with each having a potential to serve less than 15 connections or less than 25 individuals but owned by the same person, firm, or corporation and located on adjacent land will be considered a public water system when the total potential service connections in the combined systems are 15 or greater or if the total number of individuals served by the combined systems total 25 or greater at least 60 days out of the year. Without excluding other meanings of the terms "individual" or "served," an individual shall be deemed to be served by a water system if he lives in, uses as his place of employment, or works in a place to which drinking water is supplied from the system.
- (54) "Pump" means any facility, device, equipment, materials, or method used to obtain water from a well.
- (55) "Purpose of use" means the type of beneficial use of the groundwater produced from a well.
- (56) "Registrant" means a person required to submit a registration.
- (57) "Registration" means a well owner providing certain information about a well to the District, as more particularly described under Section 3.
- (58) "Replacement well" means a new well drilled to replace an existing registered well that meets the requirements set forth in Rule 4.5.

- (59) “Rule” or “Rules” means these Rules of the District regulating water wells, which shall continue to be effective until amended or repealed.
- (60) “Spacing Formula” means the total spacing distance required under Rule 4.2 for new wells that have a production capacity of greater than 17.36 gpm (25,000 gallons per day), which is calculated according to the following formula: 889 feet + [2.5 x (gpm of proposed well)].
- (61) “Substantially alter” with respect to the size or capacity of a well means to increase the inside diameter of the pump discharge column pipe size of the well in any way, modify the depth or diameter of a well bore, increase the production capacity of the well, or performing work on the well that involves reaming, setting casing, or grouting.
- (62) “TCEQ” means the Texas Commission on Environmental Quality, or its predecessor or successor agency.
- (63) “Temporary Rules” means the version of the District’s Rules in effect prior to the Effective Date.
- (64) “Tract” means a contiguous parcel of land under the ownership of a single entity, such as a corporation, partnership or trust, or an individual or individuals holding as joint owners or tenants in common.
- (65) “Transfer” means a change to a registration or permit as follows, except that the term “transfer” shall have its ordinary meaning as read in context when used in other contexts:
- (a) ownership; or
 - (b) the person authorized to exercise the right to make withdrawals and place the groundwater to beneficial use.
- (66) “Variable Frequency Drive” or “VFD” means an automated adjustable speed device used to control pump motor speed.
- (67) “Waste” means one or more of the following:
- (a) withdrawal of groundwater from the aquifer at a rate and in an amount that causes or threatens to cause an intrusion into the aquifer unsuitable for agriculture, gardening, domestic, stock raising, or other beneficial purposes;
 - (b) the flowing or producing of water from the aquifer by artificial means if the water produced is not used for a beneficial purpose;
 - (c) the escape of groundwater from the aquifer to any other underground reservoir or geologic stratum that does not contain groundwater;
 - (d) pollution or harmful alteration of groundwater in the aquifer by saltwater

or by other deleterious matter admitted from another stratum or from the surface of the ground;

- (e) willfully or negligently causing, suffering, or allowing groundwater to escape into any river, creek, natural watercourse, depression, lake, reservoir, drain, sewer, street, highway, road, or road ditch, or onto any land other than that of the owner of the well unless such discharge is authorized by permit, rule, or other order issued by the Texas Commission on Environmental Quality under Chapters 11 or 26 of the Texas Water Code;
- (f) groundwater pumped for irrigation that escapes as irrigation tailwater onto land other than that of the owner of the well unless permission has been granted by the occupant of the land receiving the discharge;
- (g) for water produced from an artesian well, “waste” has the meaning assigned by Section 11.205, Texas Water Code;
- (h) operating a deteriorated well; or
- (i) producing groundwater in violation of any District rule governing the withdrawal of groundwater through production limits on wells, managed depletion, or both.

(68) “Well” means any artificial excavation located within the boundaries of the District that provides access to or causes groundwater to be withdrawn or removed from an aquifer within the District.

(69) “Well Completion Report” is a form that is developed by the District which includes information such as depth to water, permanent pump size and permanent pump production capacity.

(70) “Well owner” means the person who owns a possessory interest in: (1) the land upon which a well or well system is located or to be located; (2) the well or well system; or (3) the groundwater withdrawn from a well or well system. A well owner may delegate the responsibility to act on his or her behalf in accordance with these Rules.

(71) “Well Report” is a form provided by the Texas Department of Licensing and Regulation that includes information such as well location, casing and screen data and lithology data.

(72) “Well system” means a well or group of wells connected by piping, storage, or that share or are tied to the same distribution system. Examples of a well system include, but are not limited to, a well or group of wells connected to the same ground storage tank, pond, or swimming pool.

(73) “Withdraw” means the act of extracting or producing groundwater by pumping or other method.

(74) “Year” means a calendar year (January 1 through December 31), except where the usage of the term clearly suggests otherwise.

Rule 1.2 Authority of District.

The Red River Groundwater Conservation District is a political subdivision of the State of Texas organized and existing under Section 59, Article XVI, Texas Constitution, Chapter 36, Texas Water Code, and the District Act. The District is a governmental agency and a body politic and corporate. The District was created to serve a public use and benefit.

Rule 1.3 Purpose of Rules.

These Rules are adopted under the authority of Sections 36.101 and 36.1071(f), Texas Water Code, and the District Act for the purpose of conserving, preserving, protecting, and recharging groundwater in the District in order to prevent subsidence, prevent degradation of water quality, prevent waste of groundwater, and to carry out the powers and duties of Chapter 36, Texas Water Code, and the District Act.

Rule 1.4 Use and Effect of Rules.

- (a) These rules are used by the District in the exercise of the powers conferred on the District by law and in the accomplishment of the purposes of the law creating the District. These rules may be used as guides in the exercise of discretion, where discretion is vested. However, under no circumstances and in no particular case will they or any part therein, be construed as a limitation or restriction upon the District to exercise powers, duties and jurisdiction conferred by law. These rules create no rights or privileges in any person or water well, and shall not be construed to bind the Board in any manner in its promulgation of the District Management Plan, amendments to these Rules, or promulgation of permanent rules.
- (b) The accurate and timely reporting to the District of activities governed by these Rules is a critical component to the District's ability to effectively and prudently manage the groundwater resources that it has been charged by law with regulating. The purpose of Section 3 is to require the submission, by the appropriate person or persons, of complete, accurate, and timely registrations, records, reports, and logs as required throughout the District Rules. Because of the important role that accurate and timely reporting plays in the District's understanding of past, current and anticipated groundwater conditions within the District, the failure to comply with these rules may result in the assessment of additional fees, civil penalties, or other enforcement action by the District, as specifically set forth in these Rules.

Rule 1.5 Purpose of District.

The purpose of the District is to provide for the conservation, preservation, protection, recharging, and prevention of waste of groundwater, and of groundwater reservoirs or their

subdivisions, consistent with the objectives of Section 59, Article XVI, Texas Constitution.

Rule 1.6 Construction.

A reference to a title or chapter without further identification is a reference to a title or chapter of the Texas Water Code. A reference to a section or rule without further identification is a reference to a section or rule in these Rules. Construction of words and phrases is governed by the Code Construction Act, Subchapter B, Chapter 311, Texas Government Code. The singular includes the plural, and the plural includes the singular. The masculine includes the feminine, and the feminine includes the masculine.

Rule 1.7 Methods of Service Under the Rules.

Except as provided in these rules, any notice or document required by these rules to be served or delivered may be delivered to the recipient or the recipient's authorized representative in person, by agent, by courier receipted delivery, by certified or registered mail sent to the recipient's last known address, by fax transfer to the recipient's current fax number or by e-mail and shall be accomplished by 5:00 p.m. on the date which it is due. Service by mail is complete upon deposit in a post office depository box or other official depository of the United States Postal Service. Service by fax transfer is complete upon transfer, except that any transfer completed after 5:00 p.m. shall be deemed complete the following business day. If service or delivery is by mail and the recipient has the right or is required to do some act within a prescribed period of time after service, three days will be added to the prescribed period. If service by other methods has proved unsuccessful, service will be deemed complete upon publication of the notice or document in a newspaper of general circulation in the District.

Rule 1.8 Severability.

If a provision contained in these Rules is for any reason held to be invalid, illegal, or unenforceable in any respect, the invalidity, illegality, or unenforceability does not affect any other rules or provisions of these Rules, and these Rules shall be construed as if the invalid, illegal, or unenforceable provision had never been contained in these Rules.

Rule 1.9 Regulatory Compliance; Other Governmental Entities.

All registrants of the District shall comply with all applicable rules and regulations of the District and of all other governmental entities. If the District Rules and regulations are more stringent than those of other governmental entities, the District Rules and regulations are applicable.

Rule 1.10 Computing Time.

In computing any period of time prescribed or allowed by these Rules, order of the Board, or any applicable statute, the day of the act, event, or default from which the designated period of time begins to run is not included, but the last day of the period so computed is included, unless it is a Saturday, Sunday, or legal holiday, in which event the period runs until the end of the next day which is neither a Saturday, Sunday, or legal holiday.

Rule 1.11 Time Limits.

Applications, requests, or other papers or documents required or allowed to be filed under these Rules or by law must be received for filing by the District within the time limit for filing, if any. The date of receipt, not the date of posting, is determinative of the time of filing. Time periods set forth in these rules shall be measured by calendar days, unless otherwise specified.

Rule 1.12 Request for Reconsideration.

To appeal a decision of the District, including any determinations made by the General Manager, concerning any matter not specifically covered under any other section of these rules, a request for reconsideration may be filed with the District within twenty (20) calendar days of the date of the decision. Such request for reconsideration must be in writing and must state clear and concise grounds for the request. The Board will make a decision on the request for reconsideration within sixty (60) calendar days thereafter. The failure of the Board to grant or deny the request for reconsideration within sixty (60) calendar days of the date of filing of the request for reconsideration shall constitute a denial of the request.

Rule 1.13 Amending of Rules.

The Board may, following notice and hearing, amend or repeal these rules or adopt new rules from time to time.

**SECTION 2.
DISTRICT MANAGEMENT ACTIONS AND DUTIES**

Rule 2.1 District Management Plan.

Following notice and hearing, the District shall adopt a Management Plan. The District Management Plan shall specify the acts and procedures and performance and avoidance measures necessary to prevent waste, the reduction of artesian pressure, or the draw-down of the water table using the best available data. The District shall use the Rules to implement the Management Plan. The Board will review the Management Plan at least every five years. Upon adoption of Desired Future Conditions under Section 36.108 Texas Water Code, the District shall update its Management Plan within two years of the date of the adoption of the Desired Future Conditions. The District shall thereafter update its rules to implement the Management Plan within one year of the date the Management Plan is updated to include the adopted Desired Future Conditions. If the Board considers a new Management Plan necessary or desirable based on evidence presented at a hearing, a new Management Plan will be developed and adopted. A Management Plan, once adopted, remains in effect until the subsequent adoption of another Management Plan.

SECTION 3. WELL REGISTRATION AND PERMITTING

Rule 3.1 Well Registration Required.

- (a) Except as otherwise provided in this Section 3.1, all water wells must be registered with the District. All new, exempt wells require the issuance of a Notice to Proceed by the District prior to the drilling of the well. Issuance of a Notice to Proceed by the District evidences the District's review and approval of a registration application for a new, exempt well. All new, non-exempt wells require the issuance of a Production Permit by the District under Rule 3.9 prior to the drilling of the non-exempt well.
- (b) The following wells are not required to be registered by the District:
 - (1) Pre-Effective Date Exempt Wells in existence or for which drilling commenced prior to April 1, 2012; and
 - (2) Leachate wells, monitoring wells, and piezometers.

Wells that meet the criteria of this subsection are, however, encouraged to be registered in order to receive the benefits of being classified as an existing well under these Rules, including but not limited to a consideration of the registered well in a review of a proposed new well's spacing requirements and during the permitting process for proposed new non-exempt wells. Wells not registered with the District are not considered in a review of a proposed new well's impact on existing wells.

- (c) Failure of a well owner to timely register or amend the registration of a well under this rule shall subject the well owner to enforcement under these rules. A violation of this rule occurs on the first day that the drilling, alteration, modification, or operation occurs, and continues each day thereafter as a separate violation until cessation of the prohibited conduct, or until the well is registered or the registration is amended, as applicable.
- (d) Existing wells that are not registered or for which an administratively complete registration application has not been filed with the District prior to the Effective Date will be presumed to be wells not in existence prior to the Effective Date. Those wells that are not deemed as existing wells under these Rules are considered to be new wells that are required to comply with the spacing requirements under Rule 4.2 and, for non-exempt wells, are not eligible for a Historic Use Permit.
- (e) Test holes must be registered with the District in accordance with the terms of this rule. Test holes are not subject to registration fees charged by the District. A plugging report shall be submitted to the District within 30 days of the date the test hole is plugged in accordance with Rule 3.4(c).

Rule 3.2 Well Registration Application.

- (a) An owner or well driller, or any other person legally authorized to act on their behalf, must submit and obtain approval of a registration application, submit fees consistent with Rule 9.11. and submit a well report deposit to the District before any new well, except leachate wells or monitoring wells, may be drilled, equipped, or completed, or before an existing well may be substantially altered. For new, non-exempt wells, registration applications shall be submitted in addition to Production Permit applications.
- (b) A person seeking to register a well shall provide the District with the following information in the registration application on a form provided by the District:
 - (1) the name and mailing address of the registrant and the owner of the property, if different from the registrant, on which the well is or will be located;
 - (2) if the registrant is other than the owner of the property, documentation establishing the applicable authority to file the application for well registration, to serve as the registrant in lieu of the property owner, and to construct and operate a well for the proposed use;
 - (3) a statement of the nature and purpose of the existing or proposed use of water from the well;
 - (4) the location or proposed location of the well, identified as a specific point measured by latitudinal and longitudinal coordinates;
 - (5) the location or proposed location of the use of water from the well, if used or proposed to be used at a location other than the location of the well;
 - (6) the production capacity or proposed production capacity of the well, as equipped, in gallons per day, and the horsepower rating of the pump, as assigned by the pump manufacturer;
 - (7) a water well closure plan or a declaration that the applicant will comply with well plugging guidelines and report closure to the District;
 - (8) a statement that the water withdrawn from the well will be put to beneficial use; and
 - (9) any other information deemed reasonably necessary by the Board.
- (c) For purposes of determining applicable well spacing and permitting requirements, the information included in a timely filed, administratively complete application for well registration may be used as evidence that the well existed before the Effective Date.
- (d) Once a registration is approved as administratively complete by the District under Rule 3.3(b) and the well registration is completed, which for new wells also includes receipt by the District of the well report and well completion report required by Rule 3.4, the

registration shall be perpetual in nature, subject to being amended or transferred and subject to enforcement for violations of these Rules.

- (e) Notwithstanding any other rule to the contrary, the owner, driller, pump installer, or any other person authorized by the owner to complete or operate a new well, substantially alter any existing well, or modify, alter, or operate an existing non-exempt well are jointly responsible for ensuring that a well registration required by this section, or well registration amendment required by Rule 3.6, is timely filed with the District and contains only information that is true and accurate. Each will be subject to enforcement action if a registration or registration amendment required by this section is not timely filed by either, or by any other person legally authorized to act on his or her behalf.

Rule 3.3 General Provisions Applicable to Registrations.

- (a) Registration applications may be submitted to the District in person, by mail, by fax, or by internet submission, using the registration form provided by the District.
- (b) A determination of administrative completeness of a registration application shall be made by the General Manager within thirty (30) business days after the date of receipt of an application for registration, which for new wells must include receipt of the well report deposit and fees consistent with Rule 9.11. If an application is not administratively complete, the District shall request the applicant to complete the application. The application will expire if the applicant does not complete the application within 120 days of the date of the District's request. A registration application will be considered administratively complete and may be approved by the General Manager without notice or hearing if:
 - (1) it substantially complies with the requirements set forth under Rule 3.2(b), including providing all information required to be included in the application that may be obtained through reasonable diligence; and
 - (2) if it is a registration for a new well:
 - (A) includes the well report deposit and well registration fee; and
 - (B) proposes a well that complies with spacing, location, and well completion requirements of Section 4.

A person may appeal the General Manager's ruling on a registration application by filing a written request for a hearing before the Board. The Board will hear the applicant's appeal at the next regular Board meeting. The General Manager may set the application for consideration by the Board at the next available Board meeting or hearing in lieu of approving or denying an application.

- (c) Upon approval or denial of an application, the General Manager shall inform the registrant in writing of the approval or denial, as well as whether the well meets the exemptions provided in Rule 3.7 or whether it is subject to the permitting, metering, fee

payment, and reporting requirements of these Rules.

- (d) Except as provided under Subsection (e) of this section, a registrant for a new well has 240 days from the date of approval of the application for well registration to drill and complete the new well. If drilling has not commenced within 240 days from the date of approval of the registration application, the well registration expires. However, a registrant may apply for one extension of an additional 240 days or may resubmit an identical well registration without the need to pay any additional administrative fee associated with the submittal of well registrations for new wells. Upon the expiration of a well registration, the District may process a resubmission of an expired registration application only upon the passage of thirty (30) calendar days from the date the previous registration application expired.
- (e) A registrant for a new well that is required by state law to be approved by TCEQ prior to operation has 365 days from the date of approval of the registration application to drill and complete the new well, with up to two (2) 365-day extension options authorized under the same filing requirements under Subsection (d) if drilling has not commenced prior to the end of the applicable 365-day period. Any extension requested under this Subsection (e) shall be granted only upon the submission of proof that an extension is warranted as determined by the District. Upon the expiration of a well registration, the District may process a resubmission of an expired registration application only upon the passage of thirty (30) calendar days from the date the previous registration application expired.
- (f) A registration application for a well may be filed prior to the filing of a Production Permit application for the well as required under Rule 3.9; provided, however, the Production Permit application must be filed, be declared administratively complete, and be acted on by the District Board within a timeframe that allows the well to be drilled according to the deadline set forth in Subsection (d) or (e) of this rule, as applicable.
- (g) If the well report is timely submitted to the District, the District shall return the well report deposit to the owner or well driller. In the event that the well report required under this rule and Rule 3.4 are not filed within the deadlines set forth under Subsection (d) of this rule, the driller or owner shall forfeit the well report deposit and may be subject to enforcement by the District for violation of this rule.
- (h) All new wells must be drilled within 30 feet (10 yards) of the location specified in the Notice to Proceed.
- (i) An application pursuant to which a registration has been issued is incorporated in the registration, and the registration is valid contingent upon the accuracy of the information supplied in the registration application. A finding that false information has been supplied in the application may be grounds to refuse to approve the registration or to revoke or suspend the registration.
- (j) Submission of a registration application constitutes an acknowledgment by the registrant of receipt of the rules and regulations of the District and agreement that the registrant will

comply with all rules and regulations of the District.

- (k) The District may amend any registration, in accordance with these Rules, to accomplish the purposes of the District Rules, Management Plan, the District Act, or Chapter 36, Texas Water Code.
- (l) No person shall operate or otherwise produce groundwater from a well required under this section to be registered with the District before:
 - (1) timely submitting an accurate application for registration, or accurate application to amend an existing registration as applicable, of the well to the District; and
 - (2) obtaining a Notice to Proceed or a Production Permit issued by the District.

Rule 3.4 *Records of Drilling, Pump Installation and Alteration Activity, Plugging, and Capping.*

- (a) Each person who drills, deepens, completes, or otherwise alters a well shall make, at the time of drilling, deepening, completing, or otherwise altering the well, a legible and accurate well report recorded on forms prescribed by the District or by the Texas Department of Licensing and Regulation. As part of the well report, an accurate drillers' log shall be kept of the water well in accordance with the rules of the Texas Department of Licensing and Regulation, and a copy of the log must be included with the well report and submitted to the District under the terms of this section.
- (b) The person who drilled, deepened, completed or otherwise altered a well pursuant to this rule shall, within sixty (60) days after the date the well is drilled, deepened, completed or otherwise altered, file the well report described in Subsection (a) and the well completion report with the District. If a registrant fails to timely submit the well report within 60 days as required by this subsection, then the well registration will not be considered complete.
- (c) Not later than the 30th day after the date a well is plugged, a driller, licensed pump installer, or well owner who plugs the well shall submit a plugging report to the District, which shall be substantially similar in form to the Texas Department of Licensing and Regulation Form a004WWD (Plugging Report) and shall include all information required therein.
- (d) The District requires wells to be capped under certain conditions to prevent waste, prevent pollution, or prevent further deterioration of well casing. The well must remain capped until such a time as the condition that led to the capping requirement is eliminated or repaired. A well must be capped in accordance with this rule if the well is inactive and the pump equipment is removed from a well with the intention of re-equipping the well at a later date for future use; provided, however that the casing is not in a deteriorated condition that could result in the commingling of water strata and degradation of water quality, in which case the well must be plugged or repaired in accordance with this rule.

The cap must be capable of sustaining a weight of at least 400 pounds when installed on the well and must be constructed in such a way that the covering cannot be easily removed by hand. The driller, licensed pump installer, or well owner who caps a well shall submit to the District a well capping notice on a form provided by the District.

Rule 3.5 Transfer of Well Ownership.

- (a) Within ninety (90) days after the date of a change in ownership of a well that is required to be registered under these Rules, the new well owner (transferee) shall file with the District a Transfer of Well Ownership form that provides the name, daytime telephone number, and mailing address of the new well owner, along with any other contact or well-related information reasonably requested by the General Manager. The requirement under this rule to transfer well ownership shall also apply to capped or inactive wells.
- (b) If a registrant conveys by any lawful and legally enforceable means to another person the real property interests in one or more wells or a well system that is recognized in the registration so that the transferring party (the transferor) is no longer the "well owner" as defined herein, and if an application for change of ownership under Subsection (a) has been approved by the District, the District shall recognize the person to whom such interests were conveyed (the transferee) as the legal holder of the registration, subject to the conditions and limitations of these District Rules.
- (c) The burden of proof in any proceeding related to a question of well ownership or status as the legal holder of a registration or permit issued by the District and the rights thereunder shall be on the person claiming such ownership or status.
- (d) Notwithstanding any provision of this Rule to the contrary, no application made pursuant to Subsection (a) of this Rule shall be granted by the District unless all outstanding fees, penalties, and compliance matters have first been fully and finally paid or otherwise resolved by the transferring party (transferor) for all wells included in the application or existing registration, and each well and registration made the subject of the application is otherwise in good standing with the District.
- (e) The new owner of a well that is the subject of a transfer described in this rule (transferee) may not operate or otherwise produce groundwater from the well after ninety (90) days from the date of the change in ownership until the new owner has submitted a Transfer of Well Ownership form if required under this rule.

Rule 3.6 Amendment of Registration.

A registrant of an exempt well shall file an application to amend an existing registration and obtain approval by the District of the application prior to engaging in any activity that would constitute a substantial change from the information in the existing registration. For purposes of

this rule, a substantial change includes a change that would substantially alter the pump or well, a change in the type of use of the water produced, the addition of a new well to be included in an already registered aggregate system, a change in location of a well or proposed well, a change of the location of use of the groundwater, or a change in ownership of a well. A substantial change to a non-exempt well requires a permit amendment application under Rule 3.15. A registration amendment is not required for maintenance or repair of a well if the maintenance or repair does not increase the designed production capabilities of the pump.

Rule 3.7 Permit Exclusions and Exemptions.

- (a) The permitting requirements of these Rules do not apply to:
 - (1) Wells exempt from registration under Rule 3.1(b);
 - (2) Pre-Effective Date Exempt Wells drilled or for which an administratively complete registration application is on file with the District prior to the Effective Date;
 - (3) Wells registered and drilled on or after the Effective Date that have a capacity to produce 17.36 gallons per minute or less, as equipped; and
 - (4) Wells used for certain limited oil and gas operations as specifically exempted from permitting only under Section 36.117(b) of the Texas Water Code.
- (b) Wells exempt from the permitting requirements under Subsection (a)(4) shall meter, report and pay production fees based on groundwater produced from the well in accordance with the District Act and these Rules.

Rule 3.8 Historic Use Permits; Permit By Rule.

- (a) The owner of an existing, non-exempt water well or well system that was operational and produced groundwater during the Historic Use Period and was registered or for which an administratively complete registration application is on file with the District as of the Effective Date is eligible for a Historic Use Permit. Wells classified as non-exempt to which a Historic Use Permit may apply include those wells that were subject to the registration, metering, reporting and fee payment requirements under the District's Temporary Rules. Wells that qualify for a Historic Use Permit may be operated in the same manner as the well was operated prior to the Effective Date until such time as a Historic Use Permit is approved by the District. Any changes to a well eligible for a Historic Use Permit prior to issuance of a Historic Use Permit by the District requires a well registration amendment under Rule 3.6.
- (b) A Historic Use Permit shall be based on the Maximum Historic Use from the well during the Historic Use Period.
- (c) Failure of an owner of a well or well system to have registered and been in compliance with District Rules prior to the Effective Date shall preclude the owner from making any future claim or application to the District for historic use under these Rules, and the

owner is required to obtain a Production Permit in order to be able to produce groundwater.

- (d) The District shall review the records of those owners with wells that qualify for a Historic Use Permit. After determining the Maximum Historic Use based on District records of production reports and fee payments during the Historic Use Period, the District shall send a letter to each well owner with a well that qualifies for a Historic Use Permit that includes a draft permit for review by the owner. The draft permit shall be signed by the General Manager and shall include the terms set forth in Rule 3.16.
- (e) Wells drilled and completed within eighteen (18) months prior to the end of the Historic Use Period that have not been in operation for a full calendar year during the Historic Use Period are eligible to have the Historic Use Period extended until December 31, 2019, upon submission of a request on a form provided by the District. Such an extension is intended to allow for wells drilled within eighteen (18) months prior to the Effective Date the opportunity to demonstrate the amount of Maximum Historic Use of the well during a one (1) year period prior to the end of the extended Historic Use Period. The amount of Maximum Historic Use of a well under this Subsection (e) shall be demonstrated by meter reading and submitted on a form provided by the District.
- (f) The General Manager or well owner eligible for a Historic Use Permit may refer or appeal the matter to the Board, as applicable, through a permit hearing held in accordance with Rule 5.3 to determine the amount of beneficial use from the well during the Historic Use Period.

Rule 3.9 Production Permit.

The owner of a new, non-exempt well must obtain a Production Permit from the District prior to the drilling, construction, or operation of the well or well system. The owner of a new or existing well that is exempt from the District's permitting requirements, but is subsequently substantially altered in a manner which causes the well to lose its exempt status, must obtain a Production Permit. In addition, the owner of an existing well or well system that has obtained a Historic Use Permit for the well must obtain a Production Permit if any of the following apply:

- (1) The permit holder intends to produce groundwater in excess of the amount authorized in a Historic Use Permit;
- (2) The well or well system has been substantially altered in a manner that causes the well or well system to be capable of producing more groundwater from the same aquifer; or
- (3) The purpose of use of the groundwater produced changes to another type of use other than that authorized in the Historic Use Permit.

Rule 3.10 Application Requirements for Production Permits.

- (a) Each original application for Production Permit must contain all of the information as set forth below in this rule. Application forms will be provided on the District's website and can be furnished to the applicant upon request. For well systems, the applicant shall provide the information required in this subsection for each well that is part of the well system. All applications for a permit shall be in writing and sworn to, and shall include the following:
- (1) name, telephone number, fax number, and mailing address of the applicant and the owner of the land on which the well will be located;
 - (2) if the applicant is other than the owner of the property, documentation establishing the applicable authority to construct and operate a well for the proposed use;
 - (3) the location of each well, including a location map showing the proposed well location;
 - (4) a statement of the nature and purpose of the proposed use and the amount of water to be used for each purpose;
 - (5) a requirement that the water withdrawn under the permit be put to beneficial use at all times;
 - (6) location of the use of the water from the well;
 - (7) the estimated rate at which water will be withdrawn from the well;
 - (8) a declaration that the applicant will comply with the District's Rules and all groundwater use permits and plans promulgated pursuant to the District's Rules;
 - (9) a water conservation plan or a declaration that the applicant will comply with the District's Management Plan;
 - (10) a drought contingency plan, if the applicant is required to prepare a drought contingency plan by other law, or a declaration that the applicant will comply with the District's Drought Contingency Plan;
 - (11) a declaration that the applicant will comply with all District well plugging and capping guidelines and report closure to the District and the appropriate state agencies;
 - (12) if the groundwater is to be resold, leased, or otherwise transferred to others, whether inside or outside of the District, provide the location to which the groundwater will be delivered, the purpose for which the groundwater will be used, and a copy of the legal documents establishing the right for the groundwater

to be sold, leased, or otherwise transferred, including but not limited to any contract for the sale, lease, or transfer of groundwater;

(13) for wells or well systems with a proposed aggregate production capacity of 200 gpm and above, a Hydrogeological Report that meets all of the requirements of the District's Hydrogeological Report Requirements; and

(14) if groundwater is proposed to be transported out of the District, the applicant shall describe the following issues and provide documents relevant to these issues:

- i. availability of water in the District and in the proposed receiving area during the period for which the water supply is requested;
- ii. projected effect of the proposed transport on aquifer conditions, depletion, subsidence, or effects on existing permit holders or other groundwater users within the District; and
- iii. how the proposed transport is consistent with the approved regional water plan and District Management Plan.

(b) Hydrogeological Reports required under Subsection (a)(13) and Rule 3.15 shall be submitted simultaneously with a Production Permit application and shall include all of the required elements of the District's Hydrogeological Report Requirements in order for the Production Permit application to be deemed administratively complete.

Rule 3.11 Administrative Completeness of Production Permit Application.

The District shall promptly consider and act on each administratively complete application for a Production Permit that meets the requirements of Rule 3.10, includes the application fee established by the District under Rule 9.11, and for which the applicant is in compliance with District Rules. If an application is not administratively complete, the District may request the applicant to complete the application as required by these Rules. The application will expire if the applicant does not complete the application within 60 (sixty) days of the date of the District's request or upon conclusion of an extension granted by the General Manager of the District.

Rule 3.12 Considerations for Granting or Denying a Permit Application.

(a) Before granting or denying a Production Permit application, the District must consider whether:

- (1) the application contains accurate information, all the information requested and is accompanied by the subscribed administrative fees;
- (2) the water well(s) complies with Chapter 36 of the Texas Water Code, and these Rules, including but not limited to the spacing and production limitations identified in these Rules;
- (3) the proposed use of water unreasonably affects existing groundwater and surface water resources or existing permit holders;

- (4) the proposed use of water is dedicated to a beneficial use;
 - (5) the proposed use of water is consistent with the District's Management Plan;
 - (6) the applicant agrees to avoid waste and achieve water conservation;
 - (7) if the applicant is requesting water for the purposes of irrigating an acre or more of landscape, the applicant must agree to install and maintain a smart irrigation controller (weather or soil moisture-based) on the irrigation system;
 - (8) the applicant has agreed that reasonable diligence will be used to protect groundwater quality and that the applicant will follow well plugging guidelines at the time of well closure; and
 - (9) for those hearings conducted by the State Office of Administrative Hearings, the Board shall consider the proposal for decision issued by the State Office of Administrative Hearings.
- (b) The District, to the extent possible, shall issue permits up to the point the total volume of exempt and permitted groundwater production will achieve the applicable Desired Future Conditions established for the aquifers in the District. In issuing permits, the District shall manage total groundwater production on a long-term basis to achieve the applicable Desired Future Conditions and shall consider:
- (1) the Modeled Available Groundwater determined by the Executive Administrator of the Texas Water Development Board;
 - (2) the Executive Administrator of the Texas Water Development Board's estimate, as may be provided by the District, of the current and projected amount of groundwater produced under the exemptions in District Rule 3.7;
 - (3) the amount of groundwater authorized under permits previously issued by the District;
 - (4) a reasonable estimate of the amount of groundwater that is actually produced under permits issued by the District; and
 - (5) yearly precipitation and production patterns.

Rule 3.13 Permit Term.

Except as otherwise specifically provided in the conditions of an individual permit, all permits are perpetual in nature; provided, however, that the District will conduct inspections and will request information from a permit holder from time-to-time as required to ensure the accuracy and integrity of the District's information, and to enforce compliance with District Rules, the

District Act, and Chapter 36 of the Texas Water Code. Upon receipt of information that necessitates a permit amendment under Rule 3.15, the District shall notify the well owner in writing that a permit amendment is required prior to the initiation of the permit amendment process.

Rule 3.14 Aggregation of Withdrawal Among Multiple Wells.

Multiple wells that are part of a well system that are owned and operated by the same person or entity may be aggregated under a single permit; provided, however, that wells owned by the same person or entity that produce from different aquifers are not aggregated for purposes of authorized production. All aggregated production shall be based on the maximum amount of production authorized from the specific aquifer, or subdivision thereof, from which the well system produces.

Rule 3.15 Permit Amendment.

- (a) Prior to undertaking any action that would exceed the maximum amount of groundwater authorized to be produced under a permit issued by the District, or a change to the location or purpose of use, the capacity of the well, or any other applicable term, condition or restriction of an existing permit, the permit holder must first apply for and obtain a permit amendment. All applications for amendments to any permit issued by the District are subject to the considerations for Production Permits in Rule 3.12, and are subject to the notice and hearing procedures set forth in Rule 5.3. Changes requested to the purpose of use or to increase the amount of annual production under a Historic Use Permit require the issuance of a Production Permit prior to the changes being made.
- (b) Requests to modify or increase an existing well or well system that would result in the existing well(s), in total, being equipped to produce 200 gallons per minute or more require the submission of a Hydrogeological Report under Rule 3.10(a)(13).
- (c) A permit amendment is not required for any well, well pump, or pump motor repair or maintenance if such repair or maintenance does not substantially alter the well, well pump, or pump motor.
- (d) The District may initiate an amendment to a permit as necessary and provided by these Rules. If the District initiates an amendment to a permit, the permit as it existed before the permit amendment process shall remain in effect until the conclusion of the permit amendment or process.
- (e) For a request to amend a permit for an applicant irrigating an acre or more of landscape, the District may require the applicant to perform an Irrigation Inspection by a TCEQ Licensed Irrigation Inspector and complete an Irrigation Inspection Report on a District approved form in order to assist the District with any decision related to the permit amendment.

Rule 3.16 Permits Subject to Conditions and Restrictions.

- (a) Permits issued by the District may be subject to the conditions and restrictions placed on the

rate and amount of withdrawal, the Rules promulgated by the District, and terms and provisions with reference to the equipping of wells or pumps that may be necessary to prevent waste and achieve water conservation, minimize as far as practicable the drawdown of the water table or the reduction of artesian pressure, lessen interference between wells, or to achieve the Desired Future Conditions established for the aquifers in whole or in part within the boundaries of the District. The permittee, by accepting the permit, agrees to abide by any and all groundwater withdrawal regulations established by the District that are currently in place, as well as any and all regulations established by the District in the future. Acceptance of the permit by the person or entity to whom it is issued constitutes acknowledgment of, and agreement to comply with, all of the terms, provisions, conditions, limitations, and restrictions.

- (b) All permits shall include, at a minimum, the following conditions:
- (1) That the permit holder may not exceed the annual amount of production from a well or well system from the specific aquifer authorized under the permit, except as authorized by the District.
 - (2) The permit is granted subject to the District's rules, orders of the District Board of Directors, special provisions, permit conditions, and laws of the State of Texas, including but not limited to Chapter 36 of the Texas Water Code and the District's enabling legislation codified at Chapter 8859 of the Special District Local Laws Code.
 - (3) Acceptance of the permit and production of groundwater under the authority granted constitutes acknowledgement and agreement that the permittee is required to abide by the precise terms of this permit and comply with the District's rules, orders of the District Board of Directors, special provisions, permit conditions, and laws applicable to the permit.
 - (4) Violation of the terms of the permit shall result in enforcement in accordance with the District's Enforcement Policy and Civil Penalty Schedule, Chapter 36 of the Texas Water Code, and the District's enabling legislation codified at Chapter 8859 of the Special District Local Laws Code.
 - (5) The permit does not confer any rights and/or privileges other than those expressly set forth herein.
 - (6) The well(s) identified in the permit shall be installed, equipped, operated, maintained, plugged, capped, or closed, as may be appropriate in accordance with the District's rules.
 - (7) Production shall not exceed the amount of authorized production set forth in the permit.
 - (8) Produced groundwater shall be put to a beneficial use at all times. Operation of the well(s) under the permit shall be conducted in a manner so as to avoid waste, pollution, or harm to groundwater resources.

- (9) The well site shall be accessible to District representatives and/or agents for inspection during business hours and during emergencies. The permit holder agrees to cooperate fully in any reasonable monitoring or sampling of the well(s).
- (10) A permit holder shall provide written notice to the District of any change of ownership, name of any authorized representative, well operator, mailing address or telephone number in accordance with District rules.
- (11) The permit holder shall reduce water production as required by District rules and orders of the Board of Directors, including but not limited to proportional adjustments issued based on achievement of the District's Desired Future Conditions, and/or adjustments due to times of drought and in accordance with the District's Drought Contingency Plan, as applicable.
- (12) The application and all information pursuant to which the permit has been granted is incorporated therein, and the permit has been granted based on the accuracy thereof. A finding that false information has been supplied to the District shall be grounds for immediate revocation of the permit, and shall subject the permit holder to enforcement.
- (13) The permit contains all matters approved by the District related to the permittee's authority to use groundwater, and all other matters requested by the permit holder not included in the permit are denied.
- (14) In the event of a conflict between the terms of the permit and the application and information pursuant to which the permit was granted, the terms of the permit shall prevail.
- (15) Any other information, special conditions or restrictions deemed necessary by the District.

Rule 3.17 Emergency Authorization.

- (a) The General Manager or Board may grant an Emergency Permit authorizing the drilling, equipping, or operation of a well that complies with the spacing requirements of Rule 4.2. An Emergency Permit may be granted without notice, hearing, or further action by the Board, or with such notice and hearing as the General Manager deems practical and necessary under the circumstances.
- (b) An Emergency Permit may only be issued upon a finding that:
 - (1) No suitable surface water or permitted groundwater is immediately available to the applicant; and
 - (2) An emergency need for the groundwater exists such that issuance of the permit is necessary to prevent the loss of life or to prevent severe, imminent threats to the public health or safety.

- (c) An Emergency Permit may be issued for a term determined by the Board or General Manager based upon the nature and extent of the emergency, but which shall in no event exceed sixty (60) days. Upon expiration of the term, the permit automatically expires and is cancelled.

**SECTION 4.
SPACING AND LOCATION OF WELLS; WELL COMPLETION**

Rule 4.1 Spacing and Location of Existing Wells.

Wells drilled or for which an administratively complete registration application is filed prior to the Effective Date, shall be drilled in accordance with state law and District rules in effect on the date such drilling commenced or the administratively complete registration application was filed, and are exempt from the spacing, location, and completion requirements of these rules to the extent that they were drilled lawfully.

Rule 4.2 Spacing Requirements for All New Wells

- (a) Except as authorized under Rule 4.3, all new wells for which a registration application is filed after the Effective Date shall be required to adhere to the spacing requirements of the District. The owner of a well or well system for which significant plans or funding related to the drilling thereof have been developed prior to the Effective Date may submit evidence to the District in order for the District to consider whether the well or well system qualifies under Rule 4.1 for spacing purposes only.
- (b) The minimum distance from the property line for all new wells shall be fifty (50) feet for all aquifers within the District. The minimum distance from existing registered wells completed in the same aquifer is based upon the capacity of the proposed new well. Wells equipped so that the maximum production capacity is 17.36 gpm (25,000 gallons per day) or less are required to be located no less than one-hundred (100) feet from existing registered wells for all aquifers within the District. The Spacing Formula for new wells that are proposed to be equipped so that the maximum production capacity is more than 17.36 gpm (25,000 gallons per day) requires wells to be located at a total distance (in feet) of not less than the sum of 889 feet plus 2.5 multiplied by the maximum production capacity of the proposed well (in gpm) for all aquifers within the District. The following table summarizes the District’s spacing requirements:

Minimum Spacing Requirements for All New Wells in the District <i>Applies to all aquifers</i>		
Maximum Capacity of Well	Spacing from Property Line	Spacing from Existing Wells Completed in the Same Aquifer (in feet)

17.36 gpm or less	50 feet	100 feet
Greater than 17.36 gpm	50 feet	889 feet + [2.5 x (gpm of proposed well)]

- (c) A person who drills a well in violation of the applicable spacing requirements of this rule may be required to recomplete or reconstruct the well in accordance with the District's rules, and may be ordered to plug the well deemed to be in violation.
- (d) An administratively complete registration application approved by the District or a spacing exception granted by the District Board pursuant to Rule 4.3 shall reserve a well site for the duration of time before the well is drilled or upon expiration of the deadline set forth in Rule 3.3(d) or (e), as applicable.

Rule 4.3 Exceptions to Spacing Requirements.

- (a) If an exception to the spacing requirements of the District is desired, a person shall submit an application on a form provided by the District. In the application, the applicant must explain the circumstances justifying an exception to the spacing requirements of the District. The application must include a boundary survey or sketch, drawn to scale, one inch equaling two-hundred (200) feet. The boundary survey or sketch must show the property lines in the immediate area and show accurately, to scale, all existing wells within the applicable spacing distance under Rule 4.2 of the proposed well site. The application and boundary survey or sketch must be certified by a person acquainted with the facts who shall state that the facts contained in the application are true and correct.
- (b) An exception to the property line and existing well spacing requirements shall be automatically granted upon receipt of an application under Subsection (a) that includes evidence and a sworn statement by the landowner or well owner, as applicable, that the abutting land or existing well to which a spacing exception is requested is owned by the same person as the proposed well.
- (c) An exception may be granted by the Board after written notice has been given by the applicant by mailing notice by certified mail, return receipt requested, to all existing registered wells or all adjacent property owners, as applicable, located within the minimum required distance from the proposed well site. Such an exception may only be granted by the Board after a public hearing at which all interested parties may appear and be heard, except as otherwise provided in Subsection (d). Proof of the mailed notice shall be given to the General Manager by the applicant no less than twenty (20) days prior to the date of the public hearing on the spacing exception request. The District may require the applicant or any interested party that appears or submits information protesting the spacing exception request to provide additional information in order for the Board to further evaluate the exception request.

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- (d) If all existing well and/or property owners within the applicable spacing distance for which an exception is sought execute a certified waiver in writing, stating that they do not object to the granting of the exception, the District may proceed, upon notice to the applicant only and without hearing, and take action to grant or deny the exception in full or in part.
 - (e) Grounds for granting a spacing exception from an existing well may include evidence that the well proposed in the application will produce groundwater from a different aquifer subdivision other than that of the existing wells within the minimum required distance from the proposed well.
 - (f) If the Board approves a spacing exception for a non-exempt well, the Board may limit the production of the well under the Production Permit to prevent or limit injury to existing well owners or the applicable aquifer or subdivision thereof.

Rule 4.4 Standards of Completion for All Wells.

- (a) All wells must be completed in accordance with the well completion standards set forth under the Texas Water Well Drillers and Pump Installers Administrative Rules, Title 16, Part 4, Chapter 76, Texas Administrative Code, and under these Rules. Artificial flow restrictors that can in any way affect the measurement of the capacity of a well as equipped are strictly prohibited until after the District has been able to perform a flow test on the well. Flow tests conducted by the District shall be completed according to the District's Flow Testing Procedure manual adopted by the District Board.
- (b) In addition to the requirements under Subsection (a), all new wells, re-completed wells, and wells that are re-worked in a manner that involves removal of the pump from the well for any reason shall be equipped in such a manner as to allow the measurement of the water level in the aquifer supplying water to the well. The driller or well owner is responsible for ensuring that the completed well complies with this subsection.
- (c) After the Notice to Proceed has been issued by the District, the well may only be drilled at a location that is within 30 feet (10 yards) of the location specified in the registration.
- (d) Water well drillers shall indicate the method of completion performed on the well report and shall indicate the water level upon completion of the well.
- (e) To prevent the commingling of water between the aquifers which can result in a loss of artesian (or static) head pressure or the degradation of water quality, each well penetrating more than one aquifer or subdivision thereof must be completed in a manner so as to prevent the commingling of groundwater between aquifers or between subdivisions of an aquifer if required by the Texas Water Well Drillers and Pump Installers Administrative Rules, Title 16, Part 4, Chapter 76, Texas Administrative Code. The driller shall indicate the method of completion used to prevent the commingling of water on the well report. The well driller may use any lawful method of completion calculated to prevent the commingling of groundwater.

- (f) All wells drilled on or after January 1, 2017, must be equipped with either one of the following water quality control devices for the purpose of preventing the siphoning of external water and contaminants into the well:
 - (1) a backflow prevention device installed above ground so that it is readily accessible for maintenance or replacement; or
 - (2) an air gap installed at the well discharge location.
- (g) Wells drilled on or after January 1, 2017, shall meet at least one of the following completion standards:
 - (1) the well shall be completed in a manner that exposes fourteen (14) inches or fifteen (15) pipe diameters, whichever is greater, of straight and unobstructed discharge pipe above ground so that the District's flow metering measurement device can measure the flow rate;
 - (2) provide a threaded tee above ground with the same pipe diameter requirements as Subsection (1) and with valves arranged in a manner to divert 100% of the discharge to one side of the tee temporarily so that the District's flow metering device can measure the flow rate; or
 - (3) equip the well with a meter that is easily accessible and measures instantaneous flow rate.
- (h) The District shall test the flow rate of all new wells through one of the following methods:
 - (1) At the well head before the well is tied into the system that it will ultimately serve; or
 - (2) Through a bypass installed immediately downstream of meter, but located within fifty (50) feet downstream of wellhead.

A "bypass" as the term is used in this rule means an installation downstream of the meter that is of equal size to the discharge pipe so that there is unobstructed flow for purposes of measuring the maximum flow capacity from a well. A Variable Frequency Drive installed on a well must be set at one-hundred percent (100%) speed during the flow test performed by the District.

Rule 4.5 Replacement Wells.

- (a) No person may replace an existing well without first having obtained authorization from the District. Authorization for the construction of a replacement well may only be granted following the submission to the District of an application for registration of a replacement well on a form provided by the District. Authority to replace an existing well applies

only to wells registered as of the Effective Date. The application for registration of a replacement well shall include a diagram of the property that depicts both the proposed replacement well and the well being replaced, and any other existing structures on the property.

- (b) Applications for replacement wells submitted under this rule may be granted by the General Manager without notice or hearing. An applicant may appeal the General Manager's ruling by filing a written request for a hearing before the Board. The Board will hear such an appeal at the next available regular Board meeting or hearing called for that purpose.
- (c) A replacement well must be actually drilled and completed so that it is located within fifty (50) feet of the well being replaced. A replacement well shall be drilled in the same aquifer as the well being replaced. A replacement well shall be drilled so that it is located farther away from the nearest existing registered well than the well being replaced if possible based on property configuration. The replacement well and pump must not be larger in designed production capacity than the well and pump being replaced.
- (d) The well owner must cease all production from the well being replaced immediately upon commencing production from the replacement well, and must plug the well being replaced within ninety (90) days from the date that the replacement well is completed.
- (e) For those applications submitted to replace a well that also include a request to increase the capacity of the replacement well beyond that of the well being replaced, the spacing requirements of Rule 4.2 shall apply only to the increase in capacity over that of the well being replaced. A Production Permit or permit amendment shall also be required for the increase in capacity over that of the well being replaced if required by Rules 3.9 or 3.15. Increasing the capacity of the replacement well from that being replaced will result in forfeiture of any applicable exemptions under Rule 3.7(a).

SECTION 5. HEARINGS OF THE DISTRICT

Rule 5.1 Hearings Generally.

- (a) A public hearing may be held on any matter within the jurisdiction of the Board, or if the Board deems a hearing to be in the public interest or necessary to effectively carry out the duties and responsibilities of the District. The District conducts four general types of hearings under this Section:
 - (1) rulemaking or Management Plan hearings involving matters of general applicability that implement, interpret, or prescribe the law or District policy, or that describe the procedure or practice requirements of the District;
 - (2) hearings involving the issuance of Production Permits or permit amendments, in

which the rights, duties, or privileges of a party are determined after an opportunity for an adjudicative hearing;

- (3) show cause hearings, in which the obligation and authority of the District to impose civil penalties is considered under specific relevant circumstances, as set forth in Rule 11.6; and
 - (4) hearings on the Desired Future Conditions proposed for the District.
- (b) Any matter designated for hearing before the Board may be heard by a quorum of the Board, referred by the Board for a hearing before a hearing examiner, by a quorum of the Board along with an appointed hearing examiner who officiates during the hearing, or by the State Office of Administrative Hearings if required under Rule 5.4(b).
- (c) Any hearing may be scheduled during the District's regular business hours, Monday through Friday of each week, except District holidays. All hearings shall be held at the location set forth in the notice. Any hearing may be continued from time to time and date to date without notice after providing the initial notice.

Rule 5.2 Rulemaking Hearings

- (a) Rulemaking hearing notice shall include a brief explanation of the subject matter of the hearing, the time, date, and place of the hearing, location or internet site at which a copy of the proposed rules may be reviewed or copied, if the District has a functioning internet site, and any other information deemed relevant by the General Manager or the Board.
- (b) Not less than 20 calendar days prior to the date of the hearing, the General Manager shall:
 - (1) Post notice in a place readily accessible to the public at the District office;
 - (2) Provide notice to the county clerks within the District;
 - (3) Publish notice in one or more newspapers of general circulation in the District;
 - (4) Provide notice by mail, facsimile, or electronic mail to any person who has requested rulemaking hearing notice; and
 - (5) Make available a copy of all proposed rules at a place accessible to the public during normal business hours, and post an electronic copy on the District's internet site.
- (c) A person may submit to the District a written request for notice of a rulemaking hearing. A request is effective for the remainder of the calendar year in which the request is received by the District. To receive notice of a rulemaking hearing in a later year, a person must submit a new request. An affidavit of an officer or employee of the District establishing attempted service by first class mail, facsimile, or e-mail to the person in accordance with the information provided by the person is proof that notice was provided by the District.

- (d) Failure to provide notice under Subsection (c) does not invalidate an action taken by the District at a rulemaking hearing.
- (e) A person participating in a rulemaking hearing shall complete a hearing registration form stating the person's name, address, and whom the person represents, if applicable.
- (f) The District shall prepare and keep a record of each rulemaking hearing in the form of an audio or video recording or a court reporter transcription.
- (g) The District may use an informal conference or consultation to obtain the opinions and advice of interested persons about contemplated rules and may appoint advisory committees of experts, interested persons, or public representatives to advise the District about contemplated rules.

Rule 5.3 Permit Hearings.

- (a) If the General Manager or Board schedules a hearing on an application for a Historic Use Permit, Production Permit, permit amendment or permit revocation, the General Manager shall give notice of the hearing as provided in this section. The General Manager or Board may schedule more than one permit application for consideration at a hearing.
- (b) Any person having an interest in the subject matter of a permit hearing may receive written notice of the hearing if the person submits to the District a written request to receive notice of the hearing. The request remains valid for a period of one year from the date of the request, after which time a new request must be submitted. Failure by the District to provide written notice to a person under this Subsection does not invalidate any action taken by the Board.
- (c) Not later than the 10th day before the date of a permit hearing, the General Manager shall:
 - (1) Post notice at a place readily accessible to the public in the District office;
 - (2) Provide notice to the county clerk of all counties within the District, whereby the county clerks must post the notice on a bulletin board at a place convenient to the public;
 - (3) Provide notice by regular mail to the applicant; and
 - (4) Provide notice by mail, fax, or email to any person who has specifically requested to receive notices of permit hearings.
- (d) The notice provided under Subsection (c) must include:
 - (1) the name and address of the applicant;
 - (2) the address or approximate location of the well or proposed well;

- (3) a brief explanation, including any requested amount of groundwater, the purpose of the proposed use, and any change in use, if applicable;
 - (4) a general explanation of the manner by which a person may contest the permit, or permit amendment;
 - (5) the time, date, and location of the hearing; and
 - (6) any other information the Board or General Manager deems relevant and appropriate to include in the notice.
- (e) An administratively complete application shall be set for a hearing within sixty (60) days after the date the application is determined to be administratively complete. A hearing shall be held within thirty-five (35) days after the setting of the date, and the District shall act on the application within sixty (60) days after the date the final hearing on the application is concluded.

Rule 5.4 Contested Permit Hearings

- (a) The General Manager, the applicant, or an affected person may request a contested hearing on an application for a permit or permit amendment. A request for a contested hearing is distinguished from public comment on an application, and shall be filed not later than three (3) calendar days before the scheduled hearing date, and shall include the following information:
- (1) The name, address, telephone number and email address of the person filing the request. If the request is made by a group or association, the request must identify the primary contact person responsible for receiving all official communications on behalf of the group or association;
 - (2) The person or entity's personal justiciable interest affected by the application and proposed withdrawal, including a statement demonstrating how that interest is not common to members of the general public; and
 - (3) Specifically request a contested hearing.
- (b) A request for a contested hearing to be conducted by the State Office of Administrative Hearings pursuant to Section 36.416 of the Texas Water Code shall be made not later than three (3) calendar days before the scheduled hearing date. If timely requested under this section, the District shall contract with the State Office of Administrative Hearings to conduct the hearing on the application.

Rule 5.5 Preliminary Hearing for Contested Application.

- (a) Upon the timely filing of a contested hearing request that meets the requirements of Rule 5.4, the District shall schedule a preliminary hearing on the application. The preliminary

hearing may be conducted by a quorum of the Board, a Hearing Examiner, or the State Office of Administrative Hearings.

- (b) Parties to a contested hearing shall be designated at the preliminary hearing. Unless the District is required to contract with the State Office of Administrative Hearings to conduct the contested hearing, the District may conduct the preliminary hearing on the same day and immediately before the evidentiary hearing on an application.
- (c) If the District determines that no person requesting a contested hearing has standing or that no justiciable issues are presented, the Board may take any action authorized under Rule 5.6(a).

Rule 5.6 Action on Uncontested Application.

- (a) The Board may take action on any uncontested application at a properly noticed public meeting held at any time after the public hearing at which the application is scheduled to be heard. The Board may issue a written order to:
 - (1) grant the permit application;
 - (2) grant the permit application with special conditions; or
 - (3) deny the permit application.
- (b) An applicant may, not later than the 20th day after the date the Board issues an order granting the application, request a contested case hearing if the order:
 - (1) includes special conditions that were not part of the application as finally submitted; or
 - (2) grants a maximum amount of groundwater production that is less than the amount requested in the application.

Rule 5.7 Contested Case Hearings Conducted by the State Office of Administrative Hearings.

- (a) If timely requested by the applicant or other party to a contested case hearing, the District shall contract with the State Office of Administrative Hearings to conduct the hearing on the application. The Board shall determine whether the hearing held by the State Office of Administrative Hearings will be held in Travis County or at the District office or other regular meeting place of the Board.
- (b) The party requesting that the hearing be conducted by the State Office of Administrative Hearings shall pay all costs associated with the contract for the hearing and shall make a deposit with the District in an amount that is sufficient to pay the estimated contract amount before the hearing begins. If the total cost for the contract exceeds the amount

deposited by the paying party at the conclusion of the hearing, the party that requested the hearing shall pay the remaining amount due to pay the final price of the contract. If there are unused funds remaining from the deposit at the conclusion of the hearing, the unused funds shall be refunded to the paying party. The District may assess other costs related to hearings conducted under this rule as authorized under Chapter 36, Texas Water Code, or the District Rules.

- (c) The administrative law judge who conducts a contested case hearing shall consider applicable District rules or policies in conducting the hearing. The District shall provide the administrative law judge with a written statement of applicable rules or policies.
- (d) The District Board may change a finding of fact or conclusion of law made by the administrative law judge, or may vacate or modify an order issued by the administrative judge, only if the Board determines:
 - (1) that the administrative law judge did not properly apply or interpret applicable law, District rules, written policies provided under Section 36.416(e) of the Texas Water Code, or prior administrative decisions;
 - (2) that a prior administrative decision on which the administrative law judge relied is incorrect or should be changed; or
 - (3) that a technical error in a finding of fact should be changed.

Rule 5.8 Procedures for Permit Hearings Conducted by the District

- (a) Authority of Presiding Officer: The Presiding Officer may conduct the hearing or other proceeding in the manner the Presiding Officer deems most appropriate for the particular hearing. The Presiding Officer has the authority to:
 - (1) set hearing dates, other than the hearing date set by the General Manager or Board under Rule 5.3;
 - (2) convene the hearing at the time and place specified in the notice for public hearing;
 - (3) designate the parties to a hearing;
 - (4) admit evidence that is relevant to an issue at the hearing, exclude evidence that is irrelevant, immaterial, or unduly repetitious, and rule on motions and on the admissibility of evidence;
 - (5) establish the order for presentation of evidence;
 - (6) administer oaths to all persons presenting testimony;
 - (7) examine witnesses;

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- (8) ensure that information and testimony are introduced as conveniently and expeditiously as possible, without prejudicing the rights of any person participating in the proceeding;
 - (9) conduct public hearings in an orderly manner in accordance with these rules;
 - (10) recess any hearing from time to time and place to place; and
 - (11) exercise any other appropriate powers necessary or convenient to effectively carry out the responsibilities of Presiding Officer.
- (b) **Hearing Registration Forms:** Each person attending and participating in a permit hearing of the District must submit on a form provided by the District the following information: the person's name; the person's address; who the person represents if other than himself; whether the person wishes to provide public comment or testify; and any other information relevant to the hearing.
 - (c) **Public Comment:** Documents that are filed with the Board that comment on an application, but that do not request a hearing will be treated as public comment. The Presiding Officer may allow any person, including the General Manager or a District employee, to provide comments at a hearing on an uncontested application.
 - (d) Any interested person may appear at a hearing in person or may appear by representative provided the representative is fully authorized to speak and act for the principal. Such person or representative may present evidence, exhibits, or testimony, or make an oral presentation as determined by the Board. Any partner may appear on behalf of a partnership. A duly authorized officer or agent of a public or private corporation, political subdivision, governmental agency, municipality, association, firm, or other entity may appear on behalf of the entity. A fiduciary may appear for a ward, trust, or estate. A person appearing in a representative capacity may be required to prove proper authority.
 - (e) After the Presiding Officer calls a hearing to order, the Presiding Officer shall announce the subject matter of the hearing and the order and procedure for presentation.
 - (f) The Presiding Officer may prescribe reasonable time limits for the presentation of evidence and oral argument.
 - (g) If the Board has not acted on the application, in the discretion of the Presiding Officer, any person who testifies at a hearing may supplement that testimony by filing additional written material with the Presiding Officer within ten (10) days after the date of conclusion of the hearing. A person who files additional written material with the Presiding Officer must also provide the material, not later than the 10th day after the date of the hearing, to any person who provided comments on an uncontested application or any party to a contested hearing. A person who receives additional written material under this Subsection may file a response to the material with the Presiding Officer not later than the 10th day after the date the material was received. Cumulative, repetitive, and unduly burdensome evidence filed under this Subsection will not be considered by the Board.

- (h) Every person, representative, witness, and other participant in a proceeding must conform to ethical standards of conduct and must exhibit courtesy and respect for all other participants. No person may engage in any activity during a proceeding that interferes with the orderly conduct of District business. If in the judgment of the Presiding Officer, a person is acting in violation of this provision, the Presiding Officer will first warn the person to refrain from engaging in such conduct. Upon further violation by the same person, the Presiding Officer may exclude that person from the proceeding for such time and under such conditions as the Presiding Officer deems necessary.
- (i) Written testimony: When a proceeding will be expedited and the interest of the persons participating in the hearing will not be prejudiced substantially, testimony may be received in written form. The written testimony of a witness, either in narrative or question and answer form, may be admitted into evidence upon the witness being sworn and identifying the testimony as a true and accurate record of what the testimony would be if given orally. On the motion of a party to the hearing, the Presiding Officer may exclude written testimony if the person who submits the testimony is not available for cross-examination by phone, a deposition before the hearing, or other reasonable means.
- (j) No person will be allowed to appear in any hearing or other proceeding whose appearance, in the opinion of the Presiding Officer, is for the sole purpose of unduly broadening the issues to be considered in the hearing or other proceeding. A record of a hearing in the form of an audio or video recording or a court reporter transcription shall be prepared and kept by the Presiding Officer in a contested hearing. The Presiding Officer shall have the hearing transcribed by a court reporter upon a request by a party to a contested hearing. The Presiding Officer may assess court reporter transcription costs against the party requesting the transcription or among the parties to the hearing. The Presiding Officer may exclude a party from further participation in a hearing for failure to pay in a timely manner costs assessed against that party under this rule, unless the parties have agreed that the costs assessed against such party will be paid by another party.

Rule 5.9 Board Action.

The Board shall act on a permit or permit amendment application not later than the 60th day after the date the final hearing on the application is concluded. For hearings conducted by the State Office of Administrative Hearings, the Board shall make the final decision on the application within 60 days after the issuance of the proposal for decision by the State Office of Administrative Hearings. In a hearing in which the District has contracted with the State Office of Administrative Hearings to conduct the contested case hearing, the Board has the authority to make a final decision on consideration of a proposal for decision issued by the State Office of Administrative Hearings administrative law judge consistent with Section 2001.058, Texas Government Code.

Rule 5.10 Request for Rehearing or Findings and Conclusions.

- (a) An applicant in a contested or uncontested hearing on an application or a party to a contested hearing may appeal a decision of the Board by requesting written findings of fact and conclusions of law within twenty (20) calendar days of the date of the Board's

decision. On receipt of a timely written request, the Board shall make written findings of fact and conclusions of law regarding a decision of the Board on a permit or permit amendment application. The Board shall provide certified copies of the findings and conclusions to the party who requested them, and to each designated party, not later than the 35th day after the date the Board receives the request.

- (b) A party who receives a certified copy of the findings and conclusions from the Board may request a rehearing before the Board not later than the 20th day after the date the Board issues the findings and conclusions. In a contested case, a party must first make a request for written findings and conclusions under District Rule 5.10 before any party to the contested case may submit a request for rehearing under this rule.
- (c) A request for rehearing must be filed with the District in writing and must state clear and concise grounds for the request. The person requesting a rehearing must provide copies of the request to all parties to the hearing. With respect to any decision or action of the Board in a contested case, such a request for rehearing is mandatory before any appeal to District Court may be brought. Any appeal to District Court shall be limited to the issues and grounds raised in the motion for rehearing.

Rule 5.11 Final Decision.

- (a) A decision by the Board on a permit or permit amendment application is final:
 - (1) If a request for rehearing is not filed on time, on the expiration of the period for filing a request for rehearing; or
 - (2) If a request for rehearing is filed on time, on the date:
 - (A) the Board denies the request for rehearing either expressly or by operation of law; or
 - (B) the Board renders a written decision after rehearing.
- (b) Except as provided by Subsection (c), an applicant or a party to a contested hearing may file suit against the District under Section 36.251, Texas Water Code, to appeal a decision on a permit or permit amendment application not later than the 60th day after the date on which the decision becomes final.
- (c) An applicant or a party to a contested hearing may not file suit against the District under Section 36.251, Texas Water Code, if a request for rehearing was not filed on time.

**SECTION 6.
PRODUCTION LIMITATIONS; DROUGHT BUFFER;
MANAGEMENT ZONE AND PROPORTIONAL REDUCTION
AUTHORITY**

Rule 6.1 Production Limits for Permits.

The District shall designate the maximum quantity of groundwater authorized to be produced on an annual basis under each Historic Use Permit and Production Permit issued by the District pursuant to the conditions of the District Act, Chapter 36 of the Texas Water Code, the Desired Future Conditions established by Groundwater Management Area 8, as adopted by the District, in which the District is located for the aquifers located in whole or in part within the boundaries of the District, and these Rules. Except as otherwise provided in these Rules, the quantity withdrawn under a Historic Use Permit or Production Permit shall not exceed the maximum amount of groundwater designated in the permit issued by the District.

Rule 6.2 Temporary Drought Buffer.

- (a) The District shall adopt a Drought Contingency Plan that establishes voluntary conservation strategies applicable to various drought stages declared by the District. The drought stages set forth in the Drought Contingency Plan shall be based upon those recognized by the Texas Water Development Board, as follows:
- (1) Abnormally dry conditions;
 - (2) Drought – Moderate;
 - (3) Drought – Severe;
 - (4) Drought – Extreme; and
 - (5) Drought - Exceptional
- (b) The declaration of each drought stage under the Drought Contingency Plan shall occur based on the most recent Texas Water Development Board Monthly Drought Report as specified for the counties within the District. In the event one or more of the counties within the District are at least partially included in a Drought-Extreme or Drought-Exceptional status, the District's Drought Buffer shall apply to some or all of the permits issued by the District as determined according to the District's Drought Contingency Plan. Issuance of a Drought Buffer declaration by the District according to the Drought Contingency Plan shall result in the affected permits' production limits set forth under Rule 6.1 being adjusted upward by fifteen percent (15%) of the maximum quantity of groundwater authorized under the permit. The Drought Buffer shall remain in place until the District suspends the Drought Buffer under this rule based upon improvement of the drought status according to the Texas Water Development Board Monthly Drought

Report.

Rule 6.3 Authority to Establish Management Zones.

- (a) Using the best hydrogeologic and other relevant scientific data readily available, the Board by resolution may create specific management zones within the District based on geographically or hydrogeologically defined areas, aquifers, or aquifer subdivisions, in whole or in part, within which the District may:
 - (1) assess water availability;
 - (2) assess water quality;
 - (3) establish more restrictive spacing requirements;
 - (4) authorize total production and make proportional adjustments to permitted withdrawals; and
 - (5) otherwise undertake efforts to manage the groundwater resources in a manner that is consistent with the District Act, Chapter 36, Texas Water Code, and that aids in the attainment of all applicable Desired Future Conditions established for the aquifers located in whole or in part within the boundaries of the District.
- (b) In creating management zones, the Board shall attempt to establish zone boundaries that will promote fairness and efficiency by the District in its management of groundwater, while considering hydrogeologic conditions and the Desired Future Conditions established for the aquifers located in whole or in part within the boundaries of the District.

Rule 6.4 Proportional Adjustment.

- (a) The Board, by resolution, may establish proportional adjustment reductions to alter the amount of production allowed from an aquifer within the District if reductions are required under these rules, and/or if reductions are required within one or more Management Zones, if necessary to avoid impairment of and to achieve the applicable Desired Future Conditions established for the aquifers located in whole or in part within the boundaries of the District.
- (b) When establishing proportional adjustment restrictions, the Board shall first set aside an amount of groundwater equal to an estimate of total exempt use for each aquifer. If the proportional adjustment restrictions are to be imposed for a particular aquifer in a particular Management Zone, the Board shall first set aside an amount of groundwater equal to an estimate of total exempt use for each aquifer within that particular Management Zone.
- (c) After first setting aside an amount of groundwater for exempt use for each aquifer, the Board shall allocate groundwater next to Historic Use Permits according to the permitted

amount in each or a proportion thereof, and then to Production Permits according to the permitted amount in each or a proportion thereof.

- (d) When establishing proportional adjustment restrictions that contemplate the reduction of authorized production, the Board may choose to proportionately reduce existing permits on a pro rata basis according to the order stated herein to allow for new production.

Rule 6.5 Issuance of New Production Permits.

In a management zone where the Board has already established proportional adjustment regulations, new Production Permits may be issued by the District for production in the management zone only if the management zone contains groundwater available for permitting after the District has made any and all proportional adjustments to existing permits in a manner that is consistent with the achievement of the Desired Future Conditions established for the aquifers located in whole or in part within the boundaries of the District.

SECTION 7. AQUIFER STORAGE AND RECOVERY WELLS AND BRACKISH PRODUCTION ZONES

Rule 7.1 Registration Required.

A project operator of an Aquifer Storage and Recovery project shall register the injection and recovery wells associated with the project with the District, and shall provide the District with all reports required to be submitted to TCEQ under Sections 27.155-.156 of the Texas Water Code.

Rule 7.2 No Permit Required; No Water Use Fee Imposed on Authorized Recovery.

Except as provided by Rule 7.3, no permit is required for the drilling, equipping, or operation of an Aquifer Storage and Recovery injection or recovery well authorized by TCEQ. Similarly, no water use fee or transport fee will be imposed on the volume of groundwater authorized by TCEQ to be recovered under an Aquifer Storage and Recovery project. The District may, however, assess a well registration fee or other similar administrative fee for an Aquifer Storage and Recovery well.

Rule 7.3 Exceeding Authorized Recovery Volume.

- (a) If an Aquifer Storage and Recovery project recovers an amount of groundwater that exceeds the volume authorized by the TCEQ to be recovered under the project, the project operator shall immediately report to the District the volume of groundwater recovered that exceeds the volume authorized to be recovered in addition to providing the reports required by Rule 7.1.

- (b) The recovery wells associated with an Aquifer Storage and Recovery project are subject to the District's spacing, permitting, metering, production and fee payment requirements if the amount of groundwater recovered from the wells exceeds the authorized volume to be recovered under the project. The District's spacing, permitting, metering, production and fee payment requirements only apply to the volume of groundwater recovered that exceeds the recovery volume authorized by the TCEQ.

Rule 7.4 *Desired Future Conditions Planning.*

The District may consider hydrogeologic conditions related to the injection and recovery of water as part of an Aquifer Storage and Recovery project in the planning related to, and monitoring of the achievement of, a Desired Future Condition for the aquifer in which the injection and recovery wells associated with the project are located.

Rule 7.5 *Adoption of Rules for Permits in Brackish Production Zones*

Upon receipt of a petition meeting the requirements of Section 36.1015, Texas Water Code, the District shall adopt rules governing the issuance of permits authorizing the completion and operation of a water well used for the withdrawal of brackish groundwater from a brackish groundwater production zone designated by the Texas Water Development Board, or its successor agency.

**SECTION 8.
TRANSPORTATION OF GROUNDWATER OUT OF THE
DISTRICT**

Rule 8.1 *General Provisions.*

- (a) A person who produces or wishes to produce water from a well located within the District and transport such water for use outside of the District must report and submit timely payment of any applicable Groundwater Transport Fee to the District under Rule 9.3 for any water transported out of the District. The District may require the person to install any meters necessary to report the total amount of groundwater transported outside of the District for reporting purposes and for purposes of calculating the Groundwater Transport Fee.
- (b) The District may not, in a manner inconsistent with rules and fees applied to production and use occurring wholly within the boundaries of the District, regulate production of groundwater or assess fees against the transport of water produced in an area of a retail public utility that is located inside the District boundaries and transported for use to an area that is within the same retail public utility but that is located outside the District boundaries.

Rule 8.2 Reporting.

A person transporting groundwater for use outside of the District and subject to the requirement to pay the Groundwater Transport Fee shall file quarterly reports with the District describing the amount of water transported and used outside the District. The report shall be filed with the District in the same manner, for the same reporting periods, and by the same deadlines set forth for Water Production Reports under Rule 9.1. The report for groundwater transported shall be on the appropriate form provided by the District and shall state the following:

- (1) the name of the person;
- (2) the well registration numbers of each well from which the person has produced groundwater transported for use outside the District;
- (3) the total amount of groundwater produced from each well or well system during the immediately preceding reporting period;
- (4) the total amount of groundwater transported outside of the District from each well, well system or surface impoundment containing produced groundwater during each month of the immediately preceding reporting period;
- (5) the purposes for which the water was transported; and
- (6) any other information requested by the District.

SECTION 9. WATER PRODUCTION REPORTING AND FEES

Rule 9.1 Water Production Reports.

The owner of any non-exempt well within the District must submit, through regular mail, facsimile, electronic mail, hand delivery, or the District's online reporting system, a quarterly report on a form provided by the District. The District may also review and consider annual water system loss reports submitted by public water systems to the Texas Water Development Board, which are publicly available on the Texas Water Development Board's website.

- (a) There shall be four quarterly reporting periods each year: January 1 to March 31, April 1 to June 30, July 1 to September 30, and October 1 to December 31. The report for each quarter shall be due no later than 30 days after the last day of the applicable quarterly reporting period. To comply with this rule, each water meter required to be installed under these Rules shall be read and recorded on a meter log within ten (10) days before or after the last day of each month, which shall be reported to the District on a quarterly basis. Additionally, to comply with this rule, all applicable information required under

Subsection (a) must be contained in the water production report filed with the District.

- (b) The report required by Subsection (a) must also include a true and correct copy of the meter log required by District Rule 10.5. Once the District makes on-line submission of water production reports and meter logs available by internet to well owners, all such reports and logs may be submitted via internet.
- (c) If a non-exempt well owner is not using an existing well and would like to be exempt from the requirement to submit quarterly production reports, the well owner can enter the well into the District's Well Monitoring Program. The well owner must contact the District to first see if the well is a candidate for the District's Well Monitoring Program. By entering the well into the program, the well owner agrees that District staff will visit the site at least annually to collect data and to confirm no usage on the meter during the visit(s).

Rule 9.2 Water Use Fees.

- (a) A water use fee rate schedule shall be established by Board resolution annually at least 60 days before the end of the calendar year. The Board may adopt a different water use fee rate for water used for agricultural purposes than for water used for non-agricultural purposes. The rate shall be applied to the groundwater pumpage in the ensuing calendar year for each non-exempt well. The District will review the account of any person changing the use of a well from non-exempt to exempt or vice versa to determine if additional water use fees are due or if a refund of water use fees is warranted.
- (b) No later than 30 days prior to the end of the calendar year, the District shall send by regular mail or e-mail to the owner or operator of each registered well that is required to pay the Water Use Fee a reminder statement setting forth the water use fee rate applicable to the water produced in the ensuing year, setting forth deadlines for submission of fee payments and production reports of meter readings, and other information deemed appropriate by the District.
- (c) Groundwater produced from a well during its development or rehabilitation, including groundwater used in a pump test, is exempt from the requirements relating to the payment of fees under Section 9 and the requirement to install and maintain a meter under Section 10. A Water Production Report that complies with Rule 9.1 must be submitted to the District providing all usage under this subsection. For unmetered usage, the Water Production Report submitted under this subsection shall provide an estimated amount of use based on acceptable estimation methods, including but not limited to electricity usage or calculation of usage based on run time at the known flow measurement rate. A well no longer qualifies for the fee payment and metering exemptions authorized by this subsection once the well is placed into operation, unless the well is otherwise exempt under Rule 3.7(a).

Rule 9.3 Groundwater Transport Fees.

The District may impose a Groundwater Transport Fee in accordance with the authority set forth in Section 36.122(e) of the Texas Water Code. The procedures, requirements, and penalties related to payment of the Water Use Fee shall apply to payment of the Groundwater Transport Fee. Groundwater Transport Fees shall not be imposed on a water supplier that withdraws groundwater from a well located in the District and that distributes the water to any part of the territory within the water supplier's certificate of convenience and necessity (CCN) issued by the Texas Commission on Environmental Quality, or its predecessor or successor agency, that is outside the boundaries of the District. Groundwater Transport Fees shall also not be imposed on a person that produces groundwater from a well located in the District, but who uses the water outside the boundaries of the District, only if the property where the well is located and the water is used is contiguous and owned by the same person.

Rule 9.4 Payments of Water Use and Groundwater Transport Fees.

- (a) All fees for groundwater production or transport in a calendar year must be paid to the District based on quarterly production. All water production reports, monthly logs, and groundwater transport reports will be due no later than 30 days from the end of the applicable quarterly reporting period in accordance with Rule 9.1. All payments that are due to the District must be paid no later than 60 days from the end of the applicable quarterly reporting period.
- (b) Any well that is subject to fee payment under this Rule and that provides water for both agricultural and non-agricultural purposes shall pay the water use fee rate applicable to non-agricultural purposes for all water produced from the well, unless the applicant can demonstrate through convincing evidence to the satisfaction of the District that a system is or will be in place so as to assure an accurate accounting of water for each purpose of use.

Rule 9.5 Summary of Applicable Meter Reading, Reporting and Water Use Fee Payment Deadlines.

The following chart summarizes Rules 9.1, 9.4, and 10.5 regarding the deadlines for meter readings, production reporting and water use fee payments that must occur on a quarterly basis:

Applicable Quarterly Reporting Period	Water Meter Reading Must Occur and Be Recorded on Monthly Meter Log Between	Water Production Report Deadlines (Date by Which Report of Monthly Usage Must be Submitted to District)	Water Use Payment Deadlines
Quarter 1: January 1 to March 31	January 21 to February 10 February 18 to March 11 (additional day added into end of timeframe to account for leap years)	April 30	May 30

	March 21 to April 10		
Quarter 2: April 1 to June 30	April 20 to May 10 May 21 to June 10 June 20 to July 10	July 30	August 29
Quarter 3: July 1 to September 30	July 21 to August 10 August 21 to September 10 September 20 to October 10	October 30	November 29
Quarter 4: October 1 to December 31	October 21 to November 10 November 20 to December 10 December 21 to January 10	January 30	March 1* *deadline automatically extended by one day during leap years for consistency

Rule 9.6 Failure to Make Fee Payments.

- (a) Payments not received pursuant to the deadline established under Rule 9.4(a) will be subject to a late payment fee of fifteen percent (15%) of the total amount of water use fees due and owing to the District.
- (b) Persons failing to remit all Water Use Fees or Groundwater Transport Fees due and owing to the District within 60 days of the date such fees are due pursuant to Rule 9.4(a) shall be subject to a civil penalty not to exceed three times the amount of the outstanding fees due and owing, in addition to the late fee penalty prescribed in Subsection (a) of this Rule, and may be subject to additional enforcement measures provided for by these Rules or by order of the Board.

Rule 9.7 Failure to Submit Water Production Reports

- (a) Water Production Reports not received by the deadline of not later than thirty (30) days after the last day of the applicable quarterly reporting period pursuant to Rule 9.1 will be subject to a late fee of fifty dollars (\$50.00) per billing account.
- (b) Persons failing to submit Water Production Reports within sixty (60) days after the last day of the applicable quarterly reporting period pursuant to Rule 9.1 shall be subject to a civil penalty as set forth in the District's Enforcement Policy and Civil Penalty Schedule in Appendix A.

Rule 9.8 Penalty for Production in Excess of Maximum Amount Authorized by Permit or Rule.

- (a) Except as specifically authorized under Rule 6.2, no person may withdraw, or cause to be withdrawn, groundwater within the District's boundaries in an amount that exceeds the maximum amount specifically authorized by these Rules or in any permit issued by the District. Persons withdrawing, or causing to be withdrawn, groundwater in an amount that exceeds the specific amount authorized for withdrawal in the applicable District permit shall be subject to an automatic penalty of three (3) times the applicable water use fee rate for the first occurrence. Such excess production penalty shall accrue in addition to, and shall be due at the same time as, the final quarterly production payment due to the District under Rule 9.4 for production from the previous calendar year.
- (b) Any production in violation of Subsection (a) of this section that occurs within three (3) calendar years of a first occurrence of excess production shall result in an automatic penalty of ten (10) times the applicable water use fee rate, and shall result in initiation of an automatic permit amendment by the District.

Rule 9.9 Returned Check Fee.

The Board, by resolution may establish a fee for checks returned to the District for insufficient funds, accounts closed, signature missing, or any other reason causing a check to be returned by the District's depository.

Rule 9.10 Well Report Deposit.

The Board, by resolution, may establish a well report deposit to be held by the District as part of the well registration procedures. The District shall return the deposit to the depositor if all relevant well report and well completion reports are timely submitted to the District in accordance with Rule 3.4(b). In the event the District does not timely receive all relevant well report and well completion reports, or if rights granted within the registration are not timely used, the deposit shall become the property of the District. In addition, the well report deposit will not be returned until the District has flow tested the new well.

Rule 9.11 Well Registration and Permit Fees.

The owner of any new well shall submit payment to the District of a non-refundable well registration fee established by the Board per well, which is due by the same deadline established under these rules for registration of the well. The owner of a non-exempt well that requires a permit shall also be required to pay the permit application fee established by the Board. A fee required under this rule and established by the Board must be received by the District in order for the District to find a registration application administratively complete. The purpose of such fees is to cover the administrative costs to the District associated with registering and permitting the well, where applicable, and administering the rules of the District related to the well.

Rule 9.12 Enforcement.

After a well is determined to be in violation of these rules for failure to make payment of water use fees on or before the 60th day following the date such fees are due, all enforcement mechanisms provided by law and these Rules shall be available to prevent unauthorized use of the well and may be initiated by the General Manager without further authorization from the Board.

Rule 9.13 Meter Sealing Fee.

The Board, by resolution, may establish a fee to recover all or part of its costs for removing and reapplying a District seal and verifying relevant well and meter information in situations where a well owner or operator submits a request to move a meter from one well to another.

**SECTION 10.
METERING**

Rule 10.1 Water Meter Required.

- (a) The owner of a well located in the District and not exempt under Rule 3.7(a) shall equip the well with a flow measurement device meeting the specifications of these Rules and shall operate the meter on the well to measure the cumulative amount of groundwater withdrawn from the well.
- (b) Except as otherwise provided in these Rules, all meters installed on new, non-exempt wells must be installed prior to production from the well and must be located within fifty (50) feet of the wellhead. The meter (or blind flange) must be installed the same day the well is completed and must be sealed in place by the District with a District seal upon completion of the well. For purposes of this Section 10, "completion" shall mean construction of the well and installation of the pump. If a newly drilled well has a pump installed, but is not capable of pumping due to lack of power service or other reason, the well must be equipped with a meter or bolted blind flange so that the District can place a seal on the well for the interim period until a flow test can be performed. The well report deposit reference in Section 9.10 of these rules will not be returned until the District has completed a flow test. Except as provided by Rule 10.4, the meter must remain with the well except in cases where the well is modified or the meter no longer meets the accuracy standards set forth under this rule and Rule 10.3. In the event a well owner wants to move a meter from one well to another, the well owner must submit a request to the District to remove its meter seal. The District shall remove or provide authorization to remove the seal within five (5) business days of receiving a request from the well owner. The District may seal the well from which the meter was removed to prevent its operation without a meter, in addition to sealing the meter on the new well. The readings on the meter must be recorded immediately prior to removal and at the time of reinstallation.

- (c) A mechanically driven, magnetic, or ultrasonic totalizing water meter is the only type of meter that may be installed on a well registered with the District unless an approval for another type of reliable meter or alternative measuring method is applied for and granted by the District. The totalizer must not be resettable by the registrant and must be capable of a maximum reading greater than the maximum expected annual pumpage. Battery operated registers must have a minimum five-year life expectancy and must be permanently hermetically sealed. Battery operated registers must visibly display the expiration date of the battery. All meters must meet the requirements for registration accuracy set forth in the American Water Works Association standards for cold-water meters as those standards existed on the date of adoption of these Rules.
- (d) All meters must be installed within fifty (50) feet of the wellhead. The water meter must be installed according to the manufacturer's published specifications in effect at the time of the meter installation, or the meter's accuracy must be verified by the registrant in accordance with Rule 10.3. If no specifications are published, there must be a minimum length of five pipe diameters of straight pipe upstream of the water meter and two pipe diameter of straight pipe downstream of the water meter. These lengths of straight pipe must contain no check valves, tees, gate valves, back flow preventers, blow-off valves, or any other fixture other than those flanges or welds necessary to connect the straight pipe to the meter. In addition, the pipe must be completely full of water throughout the region. All installed meters must measure only groundwater.
- (e) Each meter shall be installed, operated, maintained, and repaired in accordance with the manufacturer's standards, instructions, or recommendations, and shall be calibrated to ensure an accuracy reading range of 95% to 105% of actual flow.
- (f) The owner of a well is responsible for the purchase, installation, operation, maintenance, and repair of the meter associated with the well.
- (g) All water produced from a well must go through a single meter that must record all production from the well.

Rule 10.2 Water Meter Exemption.

Wells exempt from permitting under Rule 3.7(a) shall be exempt from the requirement to obtain a water meter under Rule 10.1.

Rule 10.3 Accuracy Verification.

- (a) **Meter Accuracy to be Tested:** The General Manager may require the registrant, at the registrant's expense, to test the accuracy of a water meter and submit a certificate of the test results. The certificate shall be on a form provided by the District. The General Manager may further require that such test be performed by a third party qualified to perform such tests. The third party must be approved by the General Manager prior to the test. Except as otherwise provided herein, certification tests will be required no more than once every three years for the same meter. If the test results indicate that the water meter

is registering an accuracy reading outside the range of 95% to 105% of the actual flow, then appropriate steps shall be taken by the registrant to repair or replace the water meter within 90 calendar days from the date of the test. The District, at its own expense, may undertake random tests and other investigations at any time for the purpose of verifying water meter readings. If the District's tests or investigations reveal that a water meter is not registering within the accuracy range of 95% to 105% of the actual flow, or is not properly recording the total flow of groundwater withdrawn from the well or wells, the registrant shall reimburse the District for the cost of those tests and investigations within 90 calendar days from the date of the tests or investigations, and the registrant shall take appropriate steps to bring the meter or meters into compliance with these Rules within 90 calendar days from the date of the tests or investigations. If a water meter or related piping or equipment is tampered with or damaged so that the measurement of accuracy is impaired, the District may require the registrant, at the registrant's expense, to take appropriate steps to remedy the problem and to retest the water meter within 90 calendar days from the date the problem is discovered and reported to the registrant.

- (b) Meter Testing and Calibration Equipment: Only equipment capable of accuracy results of plus or minus two percent of actual flow may be used to calibrate or test meters.
- (c) Calibration of Testing Equipment: All approved testing equipment must be calibrated every two years by an independent testing laboratory or company capable of accuracy verification. A copy of the accuracy verification must be presented to the District before any further tests may be performed using that equipment.

Rule 10.4 Removal of Meter for Repairs.

A water meter may be removed for repairs and the well may remain operational. A water meter may also be removed if necessary to modify the well. A water meter may be removed by the owner according to this Section 10 and the owner must provide notice to the District within three (3) business days of the removal. If the well is to remain operational, the repairs must be completed in a timely manner; provided, however, that a well shall not be operated without a meter for more than fourteen (14) days from the date of removal. If the meter on the well has already been sealed by the District, the District shall remove or provide authorization to remove the seal within five (5) business days of receiving a request from the well owner. The readings on the meter must be recorded immediately prior to removal and at the time of reinstallation, and the owner must either make the previous meter available for inspection by District staff or have a photo available evidencing the last reading prior to removal of the meter. The record of pumpage must include an estimate of the amount of groundwater withdrawn during the period the meter was not installed and operating.

Rule 10.5 Water Meter Readings.

Each meter must be read and the actual amount of pumpage recorded in a log at least monthly. The logs containing the recordings shall be available for inspection by the District at reasonable business hours. Copies of the logs must be included with the Water Production Report required by District Rule 9.1, along with fee payments as set forth under Section 9. The registrant of a well shall read each water meter associated with a well within 10 (ten) days before or after the

last day of each month, and shall report the readings to the District on a form provided by the District along with copies of the monthly logs and payment of all Water Use Fees by the deadlines set forth for fee payment under Rule 9.4.

Rule 10.6 Enforcement.

It is a major violation of these Rules to fail to meter a well and report meter readings in accordance with this Section. After a well is determined to be in violation of these rules for failure to meter or maintain and report meter readings, all enforcement mechanisms provided by law and these Rules shall be available to prevent unauthorized use of the well and may be initiated by the General Manager without further authorization from the Board.

**SECTION 11.
INSPECTION AND ENFORCEMENT OF RULES**

Rule 11.1 Purpose and Policy.

The District's ability to effectively and efficiently manage the limited groundwater resources within its boundaries depends entirely upon the adherence to the rules promulgated by the Board to carry out the District's purposes. Those purposes include providing for the conservation, preservation, protection and recharge of the groundwater resources within the District, to protect against subsidence, degradation of water quality, and to prevent waste of those resources. Without the ability to enforce these rules in a fair, effective manner, it would not be possible to accomplish the District's express groundwater management purposes. The enforcement rules and procedures that follow are consistent with the responsibilities delegated to the District by the Texas Legislature through the District Act and through Chapter 36 of the Texas Water Code.

Rule 11.2 Rules Enforcement.

- (a) If it appears that a person has violated, is violating, or is threatening to violate any provision of the District Rules, the Board may institute and conduct a suit in a court of competent jurisdiction in the name of the District for injunctive relief, recovery of a civil penalty in an amount set by District Rule per violation, both injunctive relief and a civil penalty, or any other appropriate remedy. A violation of any of the prohibitions in these Rules occurs on the first day that the prohibited action begins and continues each day thereafter as a separate violation.

- (b) Unless otherwise provided in these rules, the penalty for a violation of any District rule shall be either:
 - (1) \$10,000.00 per violation; or
 - (2) A lesser amount, based on the severity of the violation, as set forth in an

Enforcement Policy that may include a Civil Penalty Schedule, which is attached to these Rules as Appendix A and adopted as a Rule of the District for all purposes.

- (c) In determining the amount of a civil penalty, the Board of Directors shall consider the following factors:
 - (1) compliance history;
 - (2) efforts to correct the violation and whether the violator makes a good faith effort to cooperate with the District;
 - (3) the penalty amount necessary to ensure future compliance and deter future noncompliance;
 - (4) any enforcement costs related to the violation; and
 - (5) any other matters deemed necessary by the Board.
- (d) A penalty under this section is in addition to any other penalty provided by law and may be enforced by filing a complaint in a court of competent jurisdiction in the county in which the District's principal office or meeting place is located.
- (e) If the District prevails in a suit to enforce its Rules, the District may seek, in the same action, recovery of attorney's fees, costs for expert witnesses, and other costs incurred by the District before the court. The amount of attorney's fees awarded by a court under this Rule shall be fixed by the court.

Rule 11.3 Failure to Report Pumpage and/or Transported Volumes.

The accurate reporting and timely submission of pumpage and/or transported volumes is necessary for the proper management of water resources in the District. Failure of a well owner required by these Rules to submit complete, accurate, and timely pumpage and transportation reports may result in:

- (1) the assessment of any fees or penalties adopted under Rule 11.2 for meter reading and inspection as a result of District inspections to obtain current and accurate pumpage volumes; and
- (2) additional enforcement measures provided by these Rules or by order of the Board.

Rule 11.4 District Inspections.

No person shall unreasonably interfere with the District's efforts to conduct inspections or otherwise comply with the requirements, obligations, and authority provided in Section 36.123 of the Texas Water Code.

All new and altered wells are required to undergo a flow test consistent with the District's Flow Testing Procedure manual adopted by the District Board. A flow test is required to be performed within the 60-day deadline for submitting reports as set forth in Rule 3.4(b).

Rule 11.5 Notices of Violation.

Whenever the District determines that any person has violated or is violating any provision of the District's Rules, including the terms of any rule or order issued by the District, it may use any of the following means of notifying the person or persons of the violation:

- (a) **Informal Notice:** The officers, staff or agents of the District acting on behalf of the District or the Board may inform the person of the violation by telephone by speaking or attempting to speak to the appropriate person to explain the violation and the steps necessary to satisfactorily remedy the violation. The information received by the District through this informal notice concerning the violation will be documented, along with the date and time of the call, and will be kept on file with the District. Nothing in this subsection shall limit the authority of the District to take action, including emergency actions or any other enforcement action, without first providing notice under this subsection.
- (b) **Notice of Violation:** The District may inform the person of the violation through a written notice of violation issued pursuant to this rule. Each notice of violation issued hereunder shall explain the basis of the violation, identify the rule or order that has been violated or is being violated, and list specific required actions that must be satisfactorily completed—which may include the payment of applicable civil penalties—to address each violation raised in the notice. Notices of violation issued hereunder shall be tendered by a delivery method that complies with District Rule 1.7. Nothing in this rule subsection shall limit the authority of the District to take action, including emergency actions or any other enforcement action, without first issuing a notice of violation.
- (c) **Compliance Meeting:** The District may hold a meeting with any person whom the District believes to have violated, or to be violating, a District Rule or District order to discuss each such violation and the steps necessary to satisfactorily remedy each such violation. The information received in any meeting conducted pursuant to this rule subsection concerning the violation will be documented, along with the date and time of the meeting, and will be kept on file with the District. Nothing in this rule subsection shall limit the authority of the District to take action, including emergency actions or any other enforcement action, without first conducting a meeting under this subsection.

Rule 11.6 Show Cause Hearing.

- (a) Upon recommendation of the General Manager to the Board or upon the Board's own motion, the Board may order any person that it believes has violated or is violating any provision of the District's Rules a District notice to appear before the Board at a public meeting called for such purpose and show cause why an enforcement action, including

the initiation of a suit in a court of competent jurisdiction, should not be pursued by the District against the person or persons made the subject of the show cause hearing.

- (b) No show cause hearing under Subsection (a) of this Rule may be held unless the District first mails each person to be made the subject of the hearing, written notice not less than twenty (20) days prior to the date of the hearing. Such notice shall include the following:
 - (1) the time and place for the hearing;
 - (2) the basis of each asserted violation;
 - (3) the rule or order that the District believes has been violated or is being violated; and
 - (4) a request that the person cited duly appear and show cause why enforcement action should not be pursued.
- (c) The District may pursue immediate enforcement action against the person cited to appear in any show cause order issued by the District where the person so cited fails to appear and show cause why an enforcement action should not be pursued.
- (d) Nothing in this rule shall limit the authority of the District to take action, including emergency actions or any other enforcement action, against a person at any time regardless of whether the District holds a hearing under this rule.

SECTION 12. EFFECTIVE DATE

Rule 12.1. Effective Date.

The District's Temporary Rules took effect on August 29, 2011, which was the date of their original adoption. Pursuant to the District Act and Chapter 36 of the Texas Water Code, the District adopted permanent rules on January 1, 2019, the Effective Date of these Rules. An amendment to these Rules takes effect on the date of its original adoption, or upon a specific effective date for the amendment as approved by the Board of Directors. It is the District's intention that the rules and amendments thereto be applied retroactively to activities involving the production and use of groundwater resources located in the District, as specifically authorized by state law and as set forth in these Rules.

APPENDIX A. Enforcement Policy and Civil Penalty Schedule.

Red River Groundwater Conservation District ENFORCEMENT POLICY AND CIVIL PENALTY SCHEDULE

General Guidelines

When the General Manager discovers a violation of the District Rules that either (1) constitutes a Major Violation, or (2) constitutes a Minor Violation that the General Manager is unable to resolve within 60 days of discovering the Minor Violation, the General Manager shall bring the Major Violation or the unresolved Minor Violation and the pertinent facts surrounding it to the attention of the Board. Violations related to water well construction and completion requirements shall also be brought to the attention of the Board.

The General Manager shall recommend to the Board of Directors an appropriate settlement offer to settle the violation in lieu of litigation based upon the Civil Penalty Schedule set forth below. The Board may instruct the General Manager to tender an offer to settle the violation or to institute a civil suit in the appropriate court to seek civil penalties, injunctive relief, and costs of court and expert witnesses, damages, and attorneys' fees.

I. Minor Violations

The following acts each constitute a minor violation:

1. Failure to conduct a meter reading within the required period.
2. Failure to timely submit a Transfer of Ownership form to the District.
3. Failure to timely file a Well Report.
4. Failure to timely submit required documentation reflecting alterations or increased production.
5. Operating a meter that is not accurately calibrated.

CIVIL PENALTY SCHEDULE FOR MINOR VIOLATIONS

First Violation:	\$100.00
Second Violation:	\$200.00
Third Violation:	Major Violation

A second violation shall be any minor violation within 3 years of the first minor violation. A third violation shall be any minor violation following the second minor violation within 5 years of the first minor violation. Each day of a continuing violation constitutes a separate violation.

II. Major Violations

The following acts each constitute a major violation:

1. Failure to register or permit a well or amend the registration of a well where mandated by rules, including drilling, equipping, completing, altering, or operating a well without an approved registration, as evidenced through a Notice to Proceed or permit issued by the District.
2. Drilling an exempt or non-exempt well with an expired well registration.
3. Failure to timely meter or blind flange a well when required.
4. Failure to submit accurate Water Production Report within 60 days of the date the report is due.
5. Failure to submit accurate Groundwater Transport Report within the required period.
6. Drilling a well in a different location than authorized or in violation of spacing requirements.*
7. Failure to close or cap an open or uncovered well.
8. Failure to submit Water Use Fees within 60 days of the date the fees are due.**
9. Failure to timely submit Groundwater Transport Fees within 60 days of the date the fees are due.**
10. Committing waste.
11. Tampering with or disabling a required meter or tampering with a District seal.
12. Failure to timely make a well available within 60 days of completion for a required flow test.

CIVIL PENALTY SCHEDULE FOR MAJOR VIOLATIONS

First Violation:	\$500.00
Second Violation:	\$1,000.00
Third Violation:	Civil Suit for injunction, damages, and escalated penalties

A second violation shall be any major violation within 3 years of the first major violation of the same level. A third violation shall be any major violation following the second major violation

within 5 years of the first major violation. Each day of a continuing violation constitutes a separate violation. Multiple violations by the same person or entity shall result in escalated fines assessed in order to deter such continued noncompliance.

* In addition to the applicable penalty provided for in the Civil Penalty Schedule for Major Violations, persons who drill a well in violation of applicable spacing requirements may be required to plug the well.

** In addition to the applicable penalty provided for in the Civil Penalty Schedule for Major Violations, persons who do not submit all Water Use Fees and Groundwater Transport Fees due and owing within 60 days of the date the fees are due pursuant to Rule 9.4(a) will be assessed a civil penalty equal to three times the total amount of outstanding Water Use Fees that are due and owing.

III. Water Well Construction and Completion Requirements

Failure to use approved construction materials: \$500.00 and total costs of remediation, with costs of remediation of well to be borne by the well owner.

Failure to properly cement annular space: \$1,000.00 and total costs of remediation, with costs of remediation to be borne by well owner.

In addition to the civil penalties provided for in this schedule, persons who drill a well in violation of applicable spacing or completion requirements may be required to re-drill, re-complete or re-construct the well in accordance with the District's rules, or may be ordered to plug the well.

IV. Production in Excess of Maximum Amount Authorized in Permit

In accordance with Rule 9.8, an automatic penalty of three (3) times the applicable water use fee rate for a calendar year shall be applied in addition to the standard water use fee rate owed for those persons that produce groundwater in excess of the maximum amount authorized in a District-issued permit. A second occurrence of production in excess of the maximum amount authorized within three (3) calendar years of the first occurrence shall result in an automatic penalty of ten (10) times the applicable water use fee rate, which shall be applied in addition to the standard water use fee rate owed for the production.

V. Other Violations of District Rules Not Specifically Listed Herein

Any violation of a District Rule not specifically set forth herein shall be presented to the Board of Directors for a determination of whether the violation is Minor or Major, based upon the severity of the violation and the particular facts and issues involved, whereupon the procedures and the appropriate civil penalty amount set forth herein for Minor and Major Violations shall apply to the violation.

APPENDIX B. List of Commonly Used Acronyms.

The following acronyms are commonly used in the District Rules, District Management Plan, and/or the daily operations of the District:

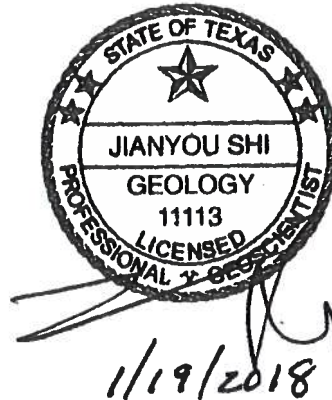
AFO	Animal Feeding Operation
ASR	Aquifer Storage and Recovery
BOD	District Board of Directors
CCN	Certificate of Convenience and Necessity
DCP	Drought Contingency Plan
DFC	Desired Future Condition
GAM	Groundwater Availability Model
GCD	Groundwater Conservation District
GMA	Groundwater Management Area
GPM	Gallons per minute
HUP	Historic Use Permit
MAG	Modeled Available Groundwater
MP	District Management Plan
NTP	Notice to Proceed
PGMA	Priority Groundwater Management Area
PIA	Public Information Act
PFD	Proposal for Decision
PP	Production Permit
PWS	Public Water System
RRC	Railroad Commission of Texas
RRGCD	Red River Groundwater Conservation District
SOAH	State Office of Administrative Hearings
TCEQ	Texas Commission on Environmental Quality
TOMA	Texas Open Meetings Act
TWDB	Texas Water Development Board

APPENDIX E

GAM Runs

**GAM RUN 17-029 MAG:
MODELED AVAILABLE GROUNDWATER FOR THE
TRINITY, WOODBINE, EDWARDS
(BALCONES FAULT ZONE), MARBLE
FALLS, ELLENBURGER-SAN SABA, AND
HICKORY AQUIFERS IN
GROUNDWATER MANAGEMENT AREA 8**

Jerry Shi, Ph.D., P.G.
Texas Water Development Board
Groundwater Division
Groundwater Availability Modeling Department
(512) 463-5076
January 19, 2018



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**GAM RUN 17-029 MAG:
MODELED AVAILABLE GROUNDWATER FOR THE
TRINITY, WOODBINE, EDWARDS
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Jerry Shi, Ph.D., P.G.
Texas Water Development Board
Groundwater Division
Groundwater Availability Modeling Department
(512) 463-5076
January 19, 2018

EXECUTIVE SUMMARY:

The Texas Water Development Board (TWDB) has calculated the modeled available groundwater estimates 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 desired future conditions for these aquifers adopted by groundwater conservation district representatives in Groundwater Management Area 8 on January 31, 2017. The district representatives declared the Nacatoch, Blossom, and Brazos River Alluvium aquifers to be non-relevant for purposes of joint planning. The TWDB determined that the explanatory report and other materials submitted by the district representatives were administratively complete on November 2, 2017.

The modeled available groundwater values for the following relevant aquifers in Groundwater Management Area 8 are summarized below:

- Trinity Aquifer (Paluxy) – The modeled available groundwater ranges from approximately 24,500 to 24,600 acre-feet per year between 2010 and 2070, and is

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summarized by groundwater conservation districts and counties in [Table 1](#), and by river basins, regional planning areas, and counties in [Table 13](#).

- Trinity Aquifer (Glen Rose) – The modeled available groundwater is approximately 12,700 acre-feet per year between 2010 and 2070, and is summarized by groundwater conservation districts and counties in [Table 2](#), and by river basins, regional planning areas, and counties in [Table 14](#).
- Trinity Aquifer (Twin Mountains) – The modeled available groundwater ranges from approximately 40,800 to 40,900 acre-feet per year between 2010 and 2070, and is summarized by groundwater conservation districts and counties in [Table 3](#), and by river basins, regional planning areas, and counties in [Table 15](#).
- Trinity Aquifer (Travis Peak) – The modeled available groundwater ranges from approximately 93,800 to 94,000 acre-feet per year between 2010 and 2070, and is summarized by groundwater conservation districts and counties in [Table 4](#), and by river basins, regional planning areas, and counties in [Table 16](#).
- Trinity Aquifer (Hensell) – The modeled available groundwater is approximately 27,300 acre-feet per year from 2010 to 2070, and is summarized by groundwater conservation districts and counties in [Table 5](#), and by river basins, regional planning areas, and counties in [Table 17](#).
- Trinity Aquifer (Hosston) – The modeled available groundwater ranges from approximately 64,900 to 65,100 acre-feet per year from 2010 to 2070, and is summarized by groundwater conservation districts and counties in [Table 6](#), and by river basins, regional planning areas, and counties in [Table 18](#).
- Trinity Aquifer (Antlers) – The modeled available groundwater ranges from approximately 74,500 to 74,700 acre-feet per year between 2010 and 2070, and is summarized by groundwater conservation districts and counties in [Table 7](#), and by river basins, regional planning areas, and counties in [Table 19](#).
- Woodbine Aquifer – The modeled available groundwater is approximately 30,600 acre-feet per year from 2010 to 2070, and is summarized by groundwater conservation districts and counties in [Table 8](#), and by river basins, regional planning areas, and counties in [Table 20](#).
- Edwards (Balcones Fault Zone) Aquifer – The modeled available groundwater is 15,168 acre-feet per year from 2010 to 2060, and is summarized by groundwater conservation districts and counties in [Table 9](#), and by river basins, regional planning areas, and counties in [Table 21](#).

- Marble Falls Aquifer – The modeled available groundwater is approximately 5,600 acre-feet per year from 2010 to 2070, and is summarized by groundwater conservation districts and counties in [Table 10](#), and by river basins, regional planning areas, and counties in [Table 22](#).
- Ellenburger-San Saba Aquifer – The modeled available groundwater is approximately 14,100 acre-feet per year between 2010 and 2070, and is summarized by groundwater conservation districts and counties in [Table 11](#), and by river basins, regional planning areas, and counties in [Table 23](#).
- Hickory Aquifer – The modeled available groundwater is approximately 3,600 acre-feet per year from 2010 to 2070, and is summarized by groundwater conservation districts and counties in [Table 12](#), and by river basins, regional planning areas, and counties in [Table 24](#).

The modeled available groundwater values for the Trinity Aquifer (Paluxy, Glen Rose, Twin Mountains, Travis Peak, Hensell, Hosston, and Antlers subunits), Woodbine Aquifer, and Edwards (Balcones Fault Zone) Aquifer are based on the official aquifer boundaries defined by the TWDB. The modeled available groundwater values for the Marble Falls, Ellenburger-San Saba, and Hickory aquifers are based on the modeled extent, as clarified by Groundwater Management Area 8 on October 9, 2017.

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. The modeled available groundwater values for the longer leap years (2020, 2040, and 2060) are slightly higher than shorter non-leap years (2010, 2030, 2050, and 2070).

REQUESTOR:

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

DESCRIPTION OF REQUEST:

In a letter dated February 17, 2017, Mr. Drew Satterwhite provided the TWDB with the desired future conditions of the Trinity (Paluxy), Trinity (Glen Rose), Trinity (Twin Mountains), Trinity (Travis Peak), Trinity (Hensell), Trinity (Hosston), Trinity (Antlers), Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory aquifers. The desired future conditions were adopted as Resolution No. 2017-01 on January 31, 2017 by the groundwater conservation district representatives in

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Groundwater Management Area 8. The following sections present the adopted desired future conditions for these aquifers:

Trinity and Woodbine Aquifers

The desired future conditions for the Trinity and Woodbine aquifers are expressed as water level decline or drawdown in feet over the planning period 2010 to 2070 relative to the baseline year 2009, based on a predictive simulation by Beach and others (2016).

The county-based desired future conditions for the Trinity Aquifer subunits, excluding counties in the Upper Trinity Groundwater Conservation District, are listed below (dashes indicate areas where the subunits do not exist and therefore no desired future condition was proposed):

County	Adopted Desired Future Condition (feet of drawdown below 2009 levels)							
	Woodbine	Paluxy	Glen Rose	Twin Mountains	Travis Peak	Hensell	Hosston	Antlers
Bell	—	19	83	—	300	137	330	—
Bosque	—	6	49	—	167	129	201	—
Brown	—	—	2	—	1	1	1	2
Burnet	—	—	2	—	16	7	20	—
Callahan	—	—	—	—	—	—	—	1
Collin	459	705	339	526	—	—	—	570
Comanche	—	—	1	—	2	2	3	9
Cooke	2	—	—	—	—	—	—	176
Coryell	—	7	14	—	99	66	130	—
Dallas	123	324	263	463	348	332	351	—
Delta	—	264	181	—	186	—	—	—
Denton	22	552	349	716	—	—	—	395
Eastland	—	—	—	—	—	—	—	3
Ellis	61	107	194	333	301	263	310	—
Erath	—	1	5	6	19	11	31	12
Falls	—	144	215	—	462	271	465	—
Fannin	247	688	280	372	269	—	—	251
Grayson	160	922	337	417	—	—	—	348
Hamilton	—	2	4	—	24	13	35	—
Hill	20	38	133	—	298	186	337	—
Hunt	598	586	299	370	324	—	—	—

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County	Adopted Desired Future Condition (feet of drawdown below 2009 levels)							
	Woodbine	Paluxy	Glen Rose	Twin Mountains	Travis Peak	Hensell	Hosston	Antlers
Johnson	2	-61	58	156	179	126	235	—
Kaufman	208	276	269	381	323	309	295	—
Lamar	38	93	97	—	114	—	—	122
Lampasas	—	—	1	—	6	1	11	—
Limestone	—	178	271	—	392	183	404	—
McLennan	6	35	133	—	471	220	542	—
Milam	—	—	212	—	345	229	345	—
Mills	—	1	1	—	7	2	13	—
Navarro	92	119	232	—	290	254	291	—
Red River	2	21	36	—	51	—	—	13
Rockwall	243	401	311	426	—	—	—	—
Somervell	—	1	4	31	51	26	83	—
Tarrant	7	101	148	315	—	—	—	148
Taylor	—	—	—	—	—	—	—	0
Travis	—	—	85	—	141	50	146	—
Williamson	—	—	77	—	173	74	177	—

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 below (dashes indicate areas where the subunits do not exist):

Upper Trinity GCD County (crop)	Adopted Desired Future Conditions (feet of drawdown below 2009 levels)			
	Antlers	Paluxy	Glen Rose	Twin Mountains
Hood (outcrop)	—	5	7	4
Hood (downdip)	—	—	28	46
Montague (outcrop)	18	—	—	—
Montague (downdip)	—	—	—	—
Parker (outcrop)	11	5	10	1
Parker (downdip)	—	1	28	46
Wise (outcrop)	34	—	—	—
Wise (downdip)	142	—	—	—

Edwards (Balcones Fault Zone) Aquifer

The desired future conditions adopted by Groundwater Management Area 8 for the Edwards (Balcones Fault Zone) Aquifer are intended to maintain minimum stream and spring flows under the drought of record in Bell, Travis, and Williamson counties over the planning period 2010 to 2070. The desired future conditions are listed below:

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 intended to maintain 90 percent of the aquifer saturated thickness over the planning period 2010 to 2070 relative to the baseline year 2009.

Supplemental Information from Groundwater Management Area 8

After review of the explanatory report and model files, the TWDB emailed a request for clarifications to Mr. Drew Satterwhite on August 7, 2017. On September 8, 2017, Mr. Satterwhite provided the TWDB with a technical memorandum from James Beach, Jeff Davis, and Brant Konetchy of LBG-Guyton Associates. On October 9, 2017, Mr. Satterwhite sent the TWDB two emails with additional information and clarifications. The information and clarifications are summarized below:

- a. For the Trinity and Woodbine aquifers, an additional error tolerance defined as five feet of drawdown between the adopted desired future condition and the simulated drawdown is included with the original error tolerance of five percent. Thus, if the drawdown from the predictive simulation is within five feet or five percent from the desired future condition, then the predictive simulation is considered to meet the desired future condition.

Groundwater Management Area 8 provided a new MODFLOW-NWT well package, simulated head file, and simulated budget file on October 9, 2017. The TWDB determined that the distribution of pumping in the new model files was consistent with the explanatory report.

The TWDB evaluates if the simulated drawdown from the predictive simulation meets the desired future condition by county. However, Groundwater Management Area 8 also provided desired future conditions based on groundwater conservation district and the whole groundwater management area.

- b. For the Edwards (Balcones Fault Zone) Aquifer in Bell, Travis, and Williamson counties, the coordinator for Groundwater Management Area 8 clarified that TWDB uses GAM Run 08-010 MAG by Anaya (2008) from the last cycle of desired future conditions with all associated assumptions including a baseline year of 2000.
- c. For the Marble Falls, Ellenburger-San Saba, and Hickory aquifers in Brown, Burnet, Lampasas, and Mills counties, Groundwater Management Area 8 adjusted the desired future condition from “maintain 90 percent of the saturated thickness” to “maintain *at least* 90 percent of the saturated thickness”. Groundwater Management Area 8 also provided estimated pumping to use for the predictive simulation by TWDB.
- d. The Trinity, Woodbine, and Edwards (Balcones Fault Zone) aquifers are based on the official aquifer boundary while the Marble Falls, Ellenburger-San Saba, and Hickory aquifers include the portions both inside and outside the official aquifer boundaries (modeled extent).
- e. The sliver of the Edwards-Trinity (Plateau) Aquifer was declared to be non-relevant by Groundwater Management Area 8.

METHODS:

The desired future conditions for Groundwater Management Area 8 are based on multiple criteria. For the Trinity and Woodbine aquifers, the desired future conditions are defined as water-level declines or drawdowns over the course of the planning period 2010 through 2070 relative to the baseline year 2009. The desired future conditions for the Edwards (Balcones Fault Zone) Aquifer are based on stream and spring flows under the drought of record over the planning period 2010 to 2070. For the Marble Falls, Ellenburger-San Saba, and Hickory aquifers, the desired future conditions are to maintain aquifer saturated thickness between 2010 and 2070 relative to the baseline year 2009. 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 a predictive simulation by Beach and others (2016), which used the groundwater availability model for the northern portion of the Trinity and Woodbine aquifers (Kelley and others, 2014). The predictive simulation contained 61 annual stress periods corresponding to 2010 through 2070, with an initial head equal to 2009 of the calibrated groundwater availability model. The desired future conditions are the drawdowns between 2009 and 2070.

Because the baseline year 2009 for the desired future conditions falls within the calibration period 1890 to 2012 of the groundwater availability model, the water levels for the baseline year have been calibrated to observed data and, thus, they were directly used as the initial water level (head) condition of the predictive simulation.

The drawdowns between 2009 and 2070 are calculated from composite heads. [Appendix A](#) presents additional details on methods used to calculate composite head and associated average drawdown values for the Trinity and Woodbine aquifers.

Edwards (Balcones Fault Zone) Aquifer

Per Groundwater Management Area 8 (clarification dated September 1, 2017), the results from GAM Run 08-010 MAG by Anaya (2008) are used for the current round of joint planning. The following summarizes the approach used:

- Ran the model for 141 years, starting with a 100-year initial stress period (pre-1980) followed by 21 years of historical monthly stress periods (1980 to 2000), then 10 years of predictive annual stress periods (2001 to 2010), and ending with 10 years of predictive monthly stress periods (2011 to 2020) to represent a simulated repeat of the 1950s' drought of record.
- Used pumpage and recharge distributions provided to TWDB by the Groundwater Management Area 8 consultant.
- Adjusted pumpage in Williamson County to meet the desired future conditions.
- Extracted projected discharge for drain cells representing Salado Creek in Bell County and drain cells representing aggregated springs and streams in Williamson and Travis counties, respectively, for each of the stress periods from 2011 through 2020 to verify that the desired future conditions were met.

- Determined which stress period reflected the worst case monthly scenario for Salado Springs during a repeat of the 1950s' drought of record.
- Generated modeled available groundwater for all three desired future conditions based on the lowest monthly springflow volume for Salado Springs during a simulated repeat of the 1950s' drought of record.

Marble Falls, Ellenburger-San Saba, and Hickory Aquifers

The TWDB constructed a predictive simulation to analyze 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. This simulation used the groundwater availability model for the minor aquifers in the Llano Uplift region by Shi and others (2016). The predictive simulation contains 61 annual stress periods corresponding to the planning period 2010 through 2070 with an initial head condition from 2009.

Because the baseline year 2009 for the desired future conditions falls within the model calibration period 1980 to 2010, and the water levels for the baseline year have been calibrated to observed data, the simulated head from 2009 of the calibrated groundwater availability model was directly used as the initial water level (head) condition of the predictive simulation.

Additional details on the predictive simulation and methods to estimate the drawdowns between 2009 and 2070 are described in [Appendix B](#).

Modeled Available Groundwater

Once the predictive simulations met the desired future conditions, the modeled available groundwater values were extracted from the MODFLOW cell-by-cell budget files. Annual pumping rates were then divided by county, river basin, regional water planning area, and groundwater conservation district within Groundwater Management Area 8 ([Figures 1](#) through [13](#) and [Tables 1](#) through [24](#)).

Modeled Available Groundwater and Permitting

As defined in Chapter 36 of the Texas Water Code, "modeled available groundwater" is the estimated average amount of water that may be produced annually to achieve a desired future condition. 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 by Kelley and others (2014) was used to construct the predictive model simulation for this analysis (Beach and others, 2016).
- 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).
- Multiple model layers could represent an aquifer where it outcrops. For example, the Woodbine Aquifer could span Layers 1 to 2 and the Trinity Aquifer (Hosston) could contain Layers 1 through 8. The aquifer designation in model layers was defined in the model grid files produced by TWDB.
- The predictive model simulation contains 61 transient annual stress periods with an initial head equal to 2009 of the calibrated groundwater availability model.
- The predictive simulation had the same hydrogeological properties and hydraulic boundary conditions as the calibrated groundwater availability model except groundwater recharge and pumping.
- The groundwater recharge for the predictive model simulation was the same as stress period 1 of the calibrated groundwater availability model (steady state period) except stress periods representing 2058 through 2060, which contained lower recharge representing severe drought conditions.
- In the predictive simulation, additional pumping was added to certain counties and some pumping in Layer 1 was moved to lower layer(s) to avoid the automatic pumping reduction enacted by the MODFLOW-NWT code (Beach and others, 2016).

- During the predictive simulation model run, some model cells went dry ([Appendix C](#)). Dry cells occur during a model run when the simulated water level in a cell falls below the bottom of the cell.
- 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 (Jones, 2003) was used to construct the predictive model simulation for the analysis by Anaya (2008).
- 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 predictive model simulation contains the calibrated groundwater availability model (253 monthly stress periods), stabilization (10 annual stress periods), and drought conditions (120 monthly stress periods).
- The boundary conditions for the stabilization and drought periods (except recharge and pumping) were the same in the predictive simulation as the last stress period (stress period 253) of the calibrated groundwater availability model.
- The groundwater recharge for the stabilization and drought periods and pumping information were from Groundwater Management Area 8 consultant.
- The groundwater pumping in Williamson County was adjusted as needed during the predictive model run simulation to match the desired future conditions.
- Estimates of modeled spring and stream flows 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 Llano Uplift region by Shi and others (2016) was used to develop the predictive model simulation used for this analysis.
- 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).
- The predictive model simulation contains 61 annual stress periods (2010 to 2070) with the initial head equal to 2009 of the calibrated groundwater availability model.
- The boundary conditions for the predictive model except recharge and pumping were the same in the predictive simulation of the last stress period of the calibrated groundwater availability model.
- The groundwater recharge for the predictive model simulation was set equal to the average of all stress periods (1982 to 2010) of the calibrated model except the first stress period.
- The groundwater pumping was initially set to the last stress period of the calibrated groundwater availability model. Additional pumping per county was then added to the model cells of the three aquifers based on the modeled extent to match the total pumping data for each aquifer provided by Groundwater Management area 8.
- During the predictive model run, some active model cells went dry ([Appendix D](#)). Dry cells occur during a model run when the simulated water level in a cell falls below the bottom of the cell.
- Estimates of modeled saturated aquifer thickness values were rounded to one decimal point.

RESULTS:

The modeled available groundwater for the Trinity Aquifer (Paluxy) that achieves the desired future condition adopted by Groundwater Management Area 8 ranges from 24,499 acre-feet per year for the non-leap (shorter) years (2010, 2030, 2050, and 2070) to 24,565 acre-feet per year for the leap (longer) years (2020, 2040, and 2060). The modeled available groundwater is summarized by groundwater conservation district and county in [Table 1](#). [Table 13](#) summarizes the modeled available groundwater by county, river basin, and regional water planning area for use in the regional water planning process.

The modeled available groundwater for the Trinity Aquifer (Glen Rose) that achieves the desired future condition adopted by Groundwater Management Area 8 ranges from 12,701 acre-feet per year for the non-leap years (2010, 2030, 2050, and 2070) to 12,736 acre-feet per year for the leap years (2020, 2040, and 2060). The modeled available groundwater is summarized by groundwater conservation district and county in [Table 2](#). [Table 14](#)

summarizes the modeled available groundwater by county, river basin, and regional water planning area for use in the regional water planning process.

The modeled available groundwater for the Trinity Aquifer (Twin Mountains) that achieves the desired future condition adopted by Groundwater Management Area 8 ranges from 40,827 acre-feet per year for the non-leap years (2010, 2030, 2050, and 2070) to 40,939 acre-feet per year for the leap years (2020, 2040, and 2060). The modeled available groundwater is summarized by groundwater conservation district and county in [Table 3](#). [Table 15](#) summarizes the modeled available groundwater by county, river basin, and regional water planning area for use in the regional water planning process.

The modeled available groundwater for the Trinity Aquifer (Travis Peak) that achieves the desired future condition adopted by Groundwater Management Area 8 ranges from 93,757 acre-feet per year for the non-leap years (2010, 2030, 2050, and 2070) to 94,016 acre-feet per year for the leap years (2020, 2040, and 2060). The modeled available groundwater is summarized by groundwater conservation district and county in [Table 4](#). [Table 16](#) summarizes the modeled available groundwater by county, river basin, and regional water planning area for use in the regional water planning process.

The modeled available groundwater for the Trinity Aquifer (Hensell) that achieves the desired future condition adopted by Groundwater Management Area 8 ranges from 27,257 acre-feet per year for the non-leap years (2010, 2030, 2050, and 2070) to 27,331 acre-feet per year for the leap years (2020, 2040, and 2060). The modeled available groundwater is summarized by groundwater conservation district and county in [Table 5](#). [Table 17](#) summarizes the modeled available groundwater by county, river basin, and regional water planning area for use in the regional water planning process.

The modeled available groundwater for the Trinity Aquifer (Hosston) that achieves the desired future condition adopted by Groundwater Management Area 8 ranges from 64,922 acre-feet per year for the non-leap years (2010, 2030, 2050, and 2070) to 65,098 acre-feet per year for the leap years (2020, 2040, and 2060). The modeled available groundwater is summarized by groundwater conservation district and county in [Table 6](#). [Table 18](#) summarizes the modeled available groundwater by county, river basin, and regional water planning area for use in the regional water planning process.

The modeled available groundwater for the Trinity Aquifer (Antlers) that achieves the desired future condition adopted by Groundwater Management Area 8 ranges from 74,471 acre-feet per year for the non-leap years (2010, 2030, 2050, and 2070) to 74,677 acre-feet per year for the leap years (2020, 2040, and 2060). The modeled available groundwater is

summarized by groundwater conservation district and county in [Table 7](#). [Table 19](#) summarizes the modeled available groundwater by county, river basin, and regional water planning area for use in the regional water planning process.

The modeled available groundwater for the Woodbine Aquifer that achieves the desired future condition adopted by Groundwater Management Area 8 ranges from 30,554 acre-feet per year for the non-leap years (2010, 2030, 2050, and 2070) to 30,636 acre-feet per year for the leap years (2020, 2040, and 2060). The modeled available groundwater is summarized by groundwater conservation district and county in [Table 8](#). [Table 20](#) summarizes the modeled available groundwater by county, river basin, and regional water planning area for use in the regional water planning process.

The modeled available groundwater for the Edwards (Balcones Fault Zone) Aquifer that achieves the desired future condition adopted by Groundwater Management Area 8 remains at 15,168 acre-feet per year from 2010 to 2060. The modeled available groundwater is summarized by groundwater conservation district and county in [Table 9](#). [Table 21](#) summarizes the modeled available groundwater by county, river basin, and regional water planning area for use in the regional water planning process.

The modeled available groundwater for the Marble Falls Aquifer that achieves the desired future condition adopted by Groundwater Management Area 8 ranges from 5,623 acre-feet per year for the non-leap years (2010, 2030, 2050, and 2070) to 5,639 acre-feet per year for the leap years (2020, 2040, and 2060). The modeled available groundwater is summarized by groundwater conservation district and county in [Table 10](#). [Table 22](#) summarizes the modeled available groundwater by county, river basin, and regional water planning area for use in the regional water planning process.

The modeled available groundwater for the Ellenburger-San Saba Aquifer that achieves the desired future condition adopted by Groundwater Management Area 8 ranges from 14,050 acre-feet per year for the non-leap years (2010, 2030, 2050, and 2070) to 14,089 acre-feet per year for the leap years (2020, 2040, and 2060). The modeled available groundwater is summarized by groundwater conservation district and county in [Table 11](#). [Table 23](#) summarizes the modeled available groundwater by county, river basin, and regional water planning area for use in the regional water planning process.

The modeled available groundwater for the Hickory Aquifer that achieves the desired future condition adopted by Groundwater Management Area 8 ranges from 3,574 acre-feet per year for the non-leap years (2010, 2030, 2050, and 2070) to 3,585 acre-feet per year for the leap years (2020, 2040, and 2060). The modeled available groundwater is

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summarized by groundwater conservation district and county in [Table 12](#). [Table 24](#) summarizes the modeled available groundwater by county, river basin, and regional water planning area for use in the regional water planning process.

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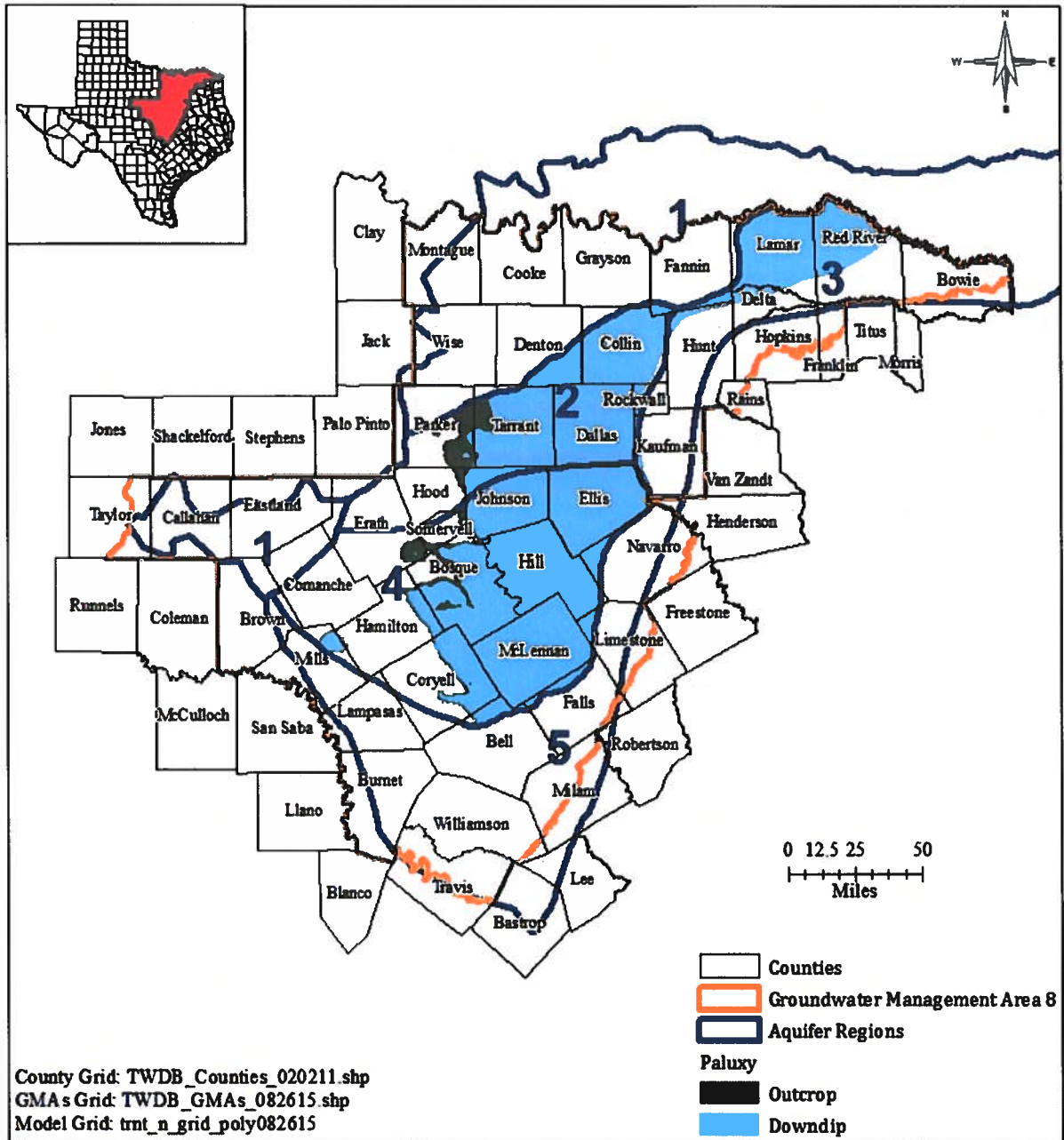


FIGURE 1. MAP SHOWING THE TRINITY AQUIFER (PALUXY) WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF THE TRINITY AND WOODBINE AQUIFERS.

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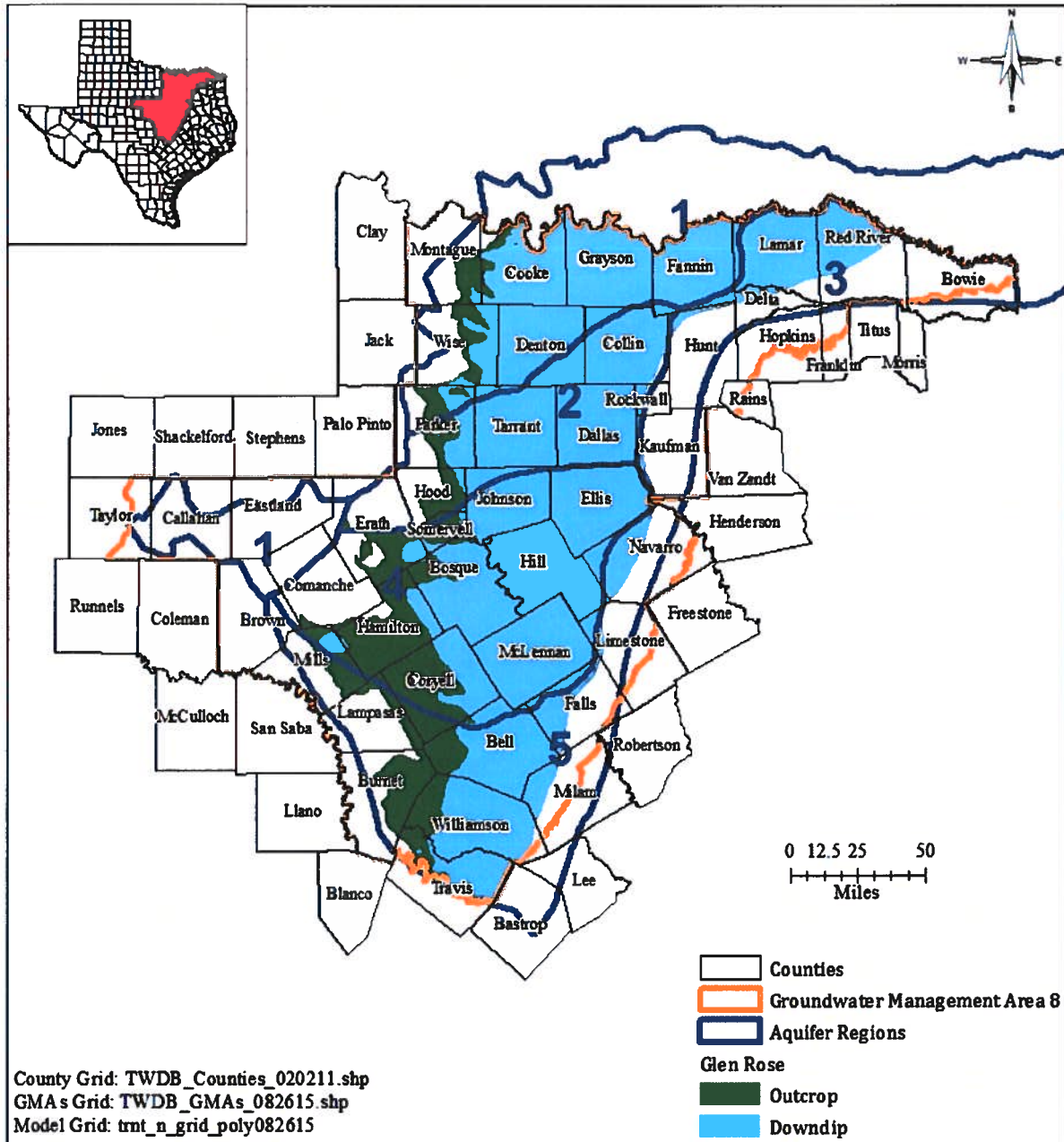


FIGURE 2. MAP SHOWING THE TRINITY AQUIFER (GLEN ROSE) WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF THE TRINITY AND WOODBINE AQUIFERS.

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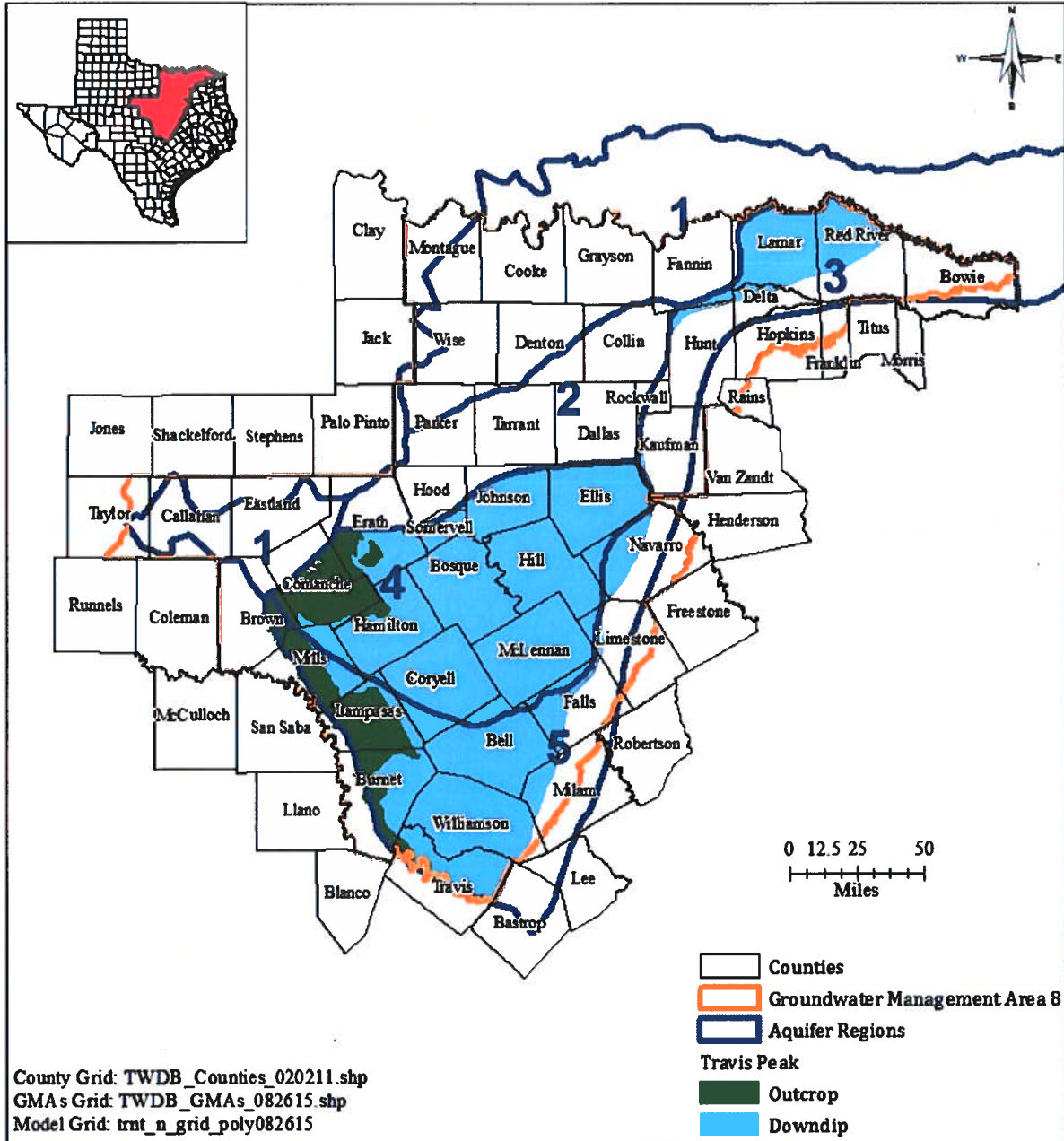


FIGURE 4. MAP SHOWING THE TRINITY AQUIFER (TRAVIS PEAK) WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF THE TRINITY AND WOODBINE AQUIFERS.

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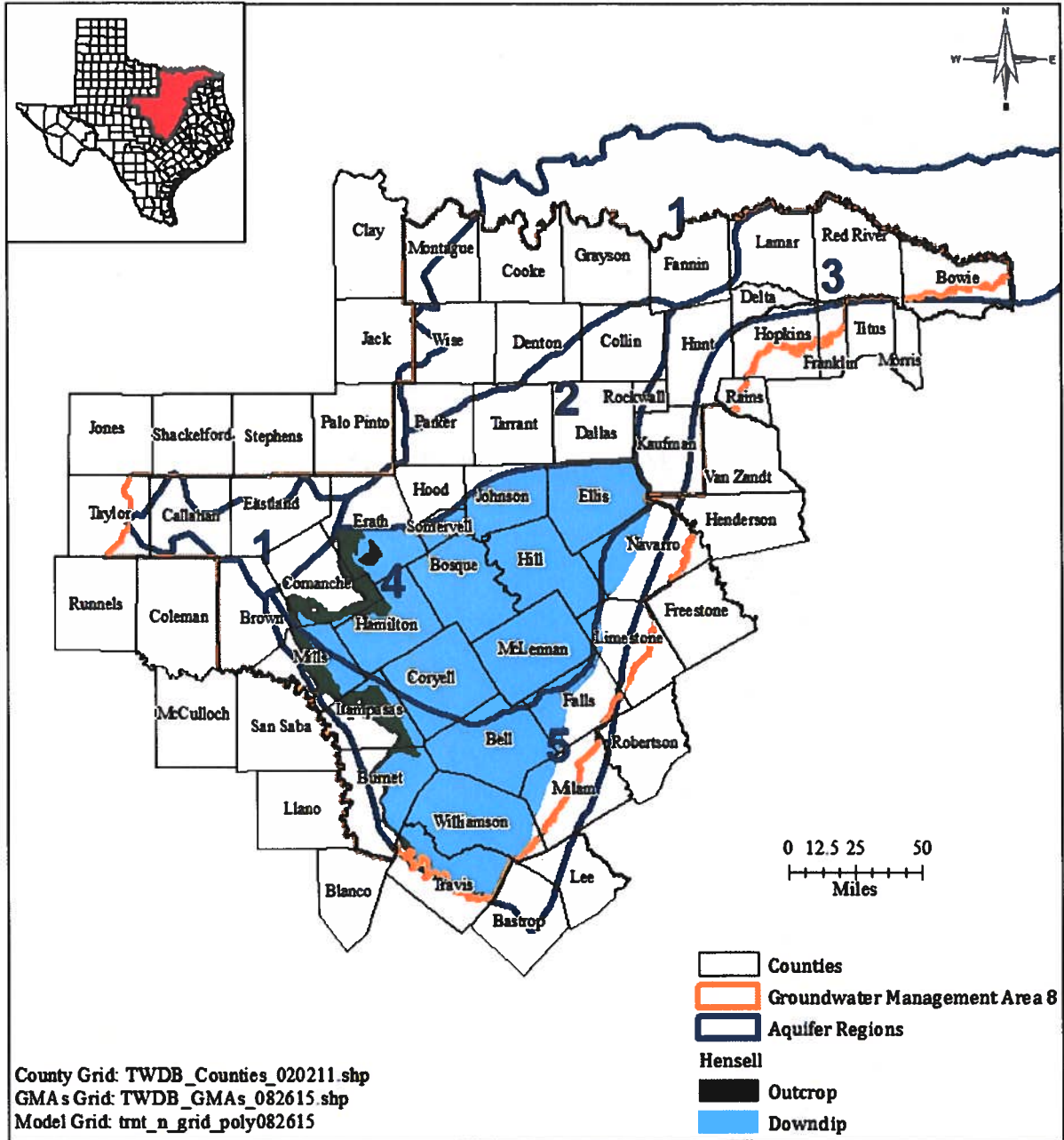


FIGURE 5. MAP SHOWING THE TRINITY AQUIFER (HENSELL) WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF THE TRINITY AND WOODBINE AQUIFERS.

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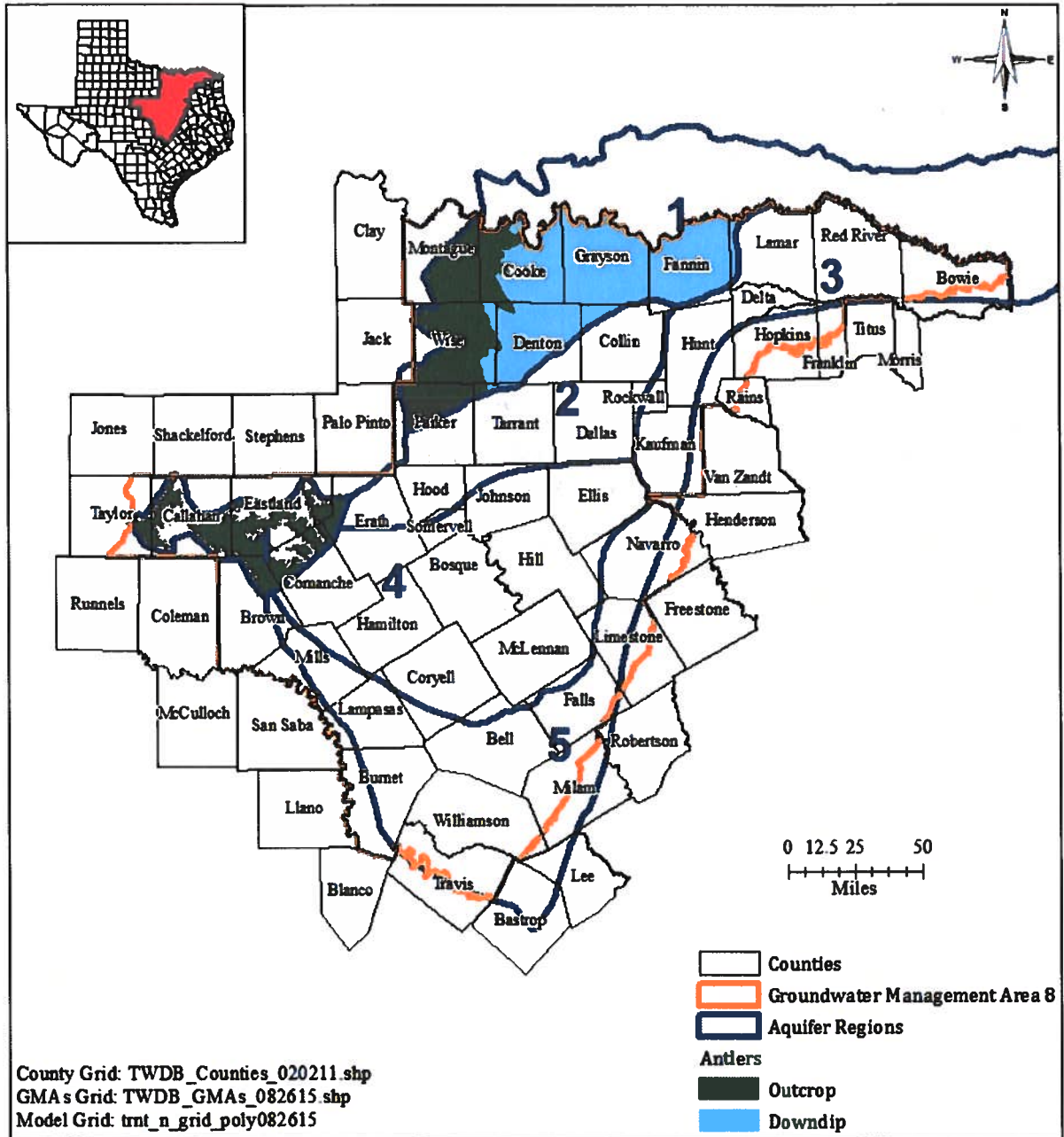


FIGURE 7. MAP SHOWING THE TRINITY AQUIFER (ANTLERS) WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF THE TRINITY AND WOODBINE AQUIFERS.

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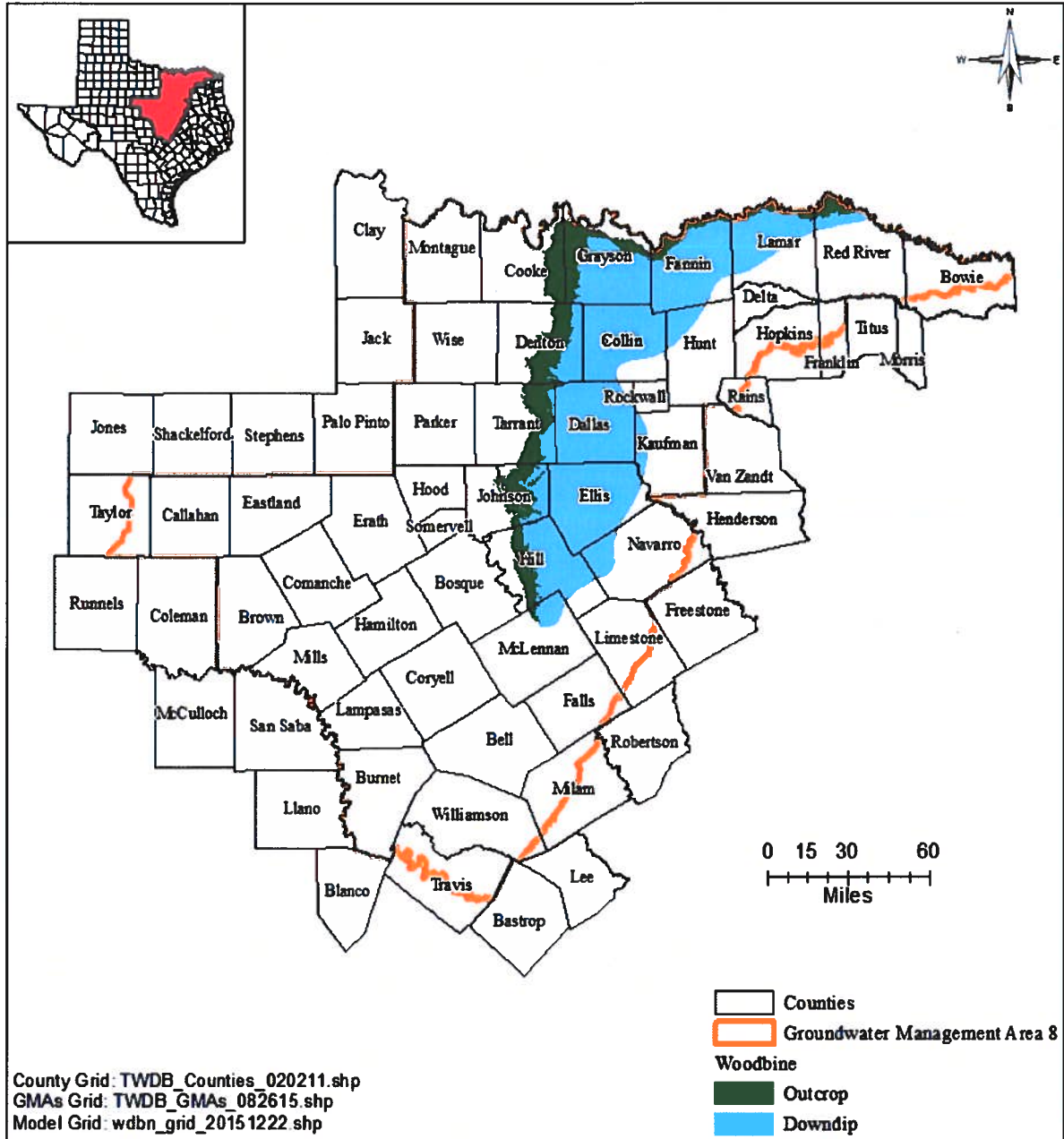


FIGURE 8. MAP SHOWING THE WOODBINE AQUIFER WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF THE TRINITY AND WOODBINE AQUIFERS.

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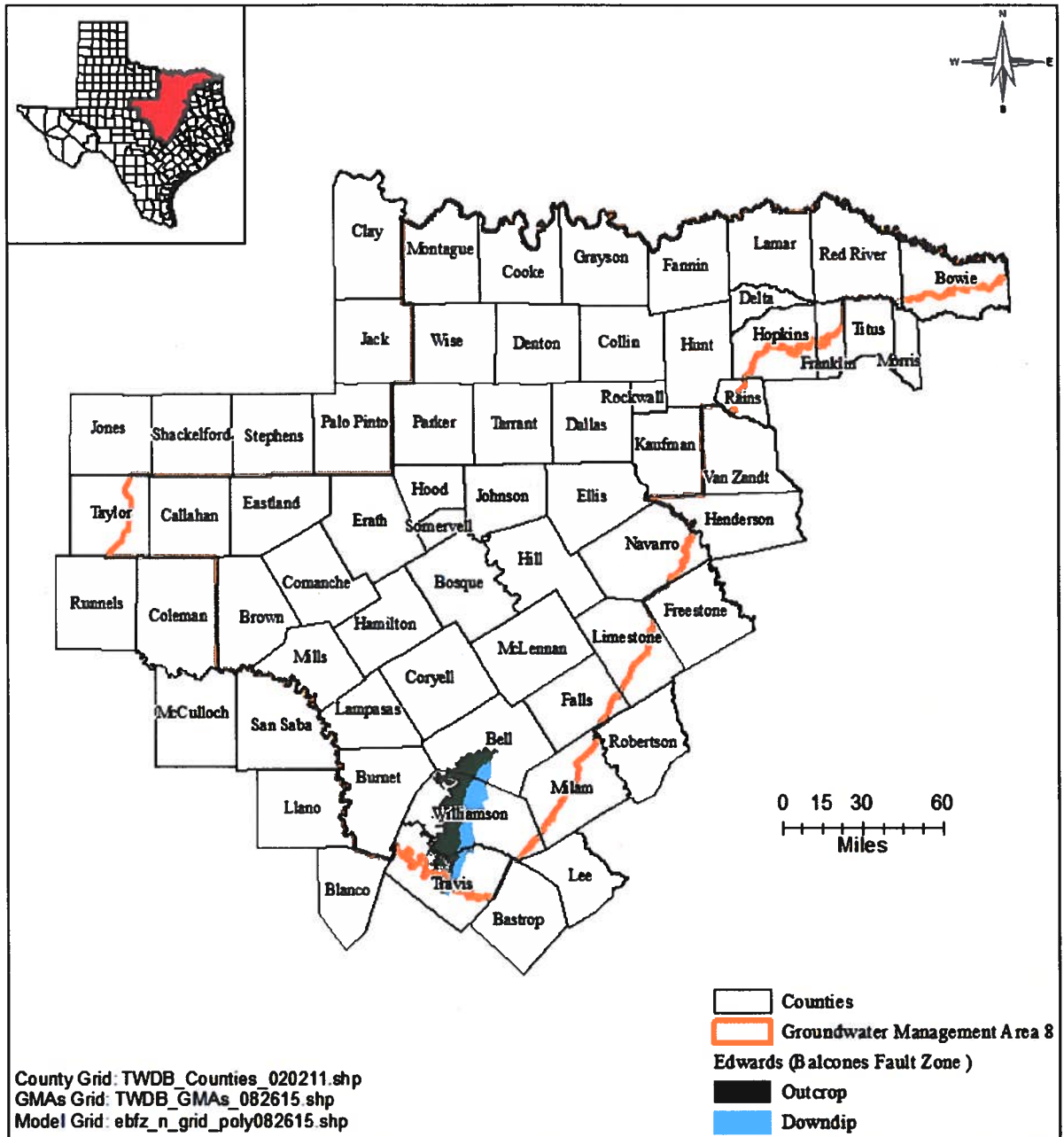


FIGURE 9. MAP SHOWING THE EDWARDS (BALCONES FAULT ZONE) AQUIFER WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN SEGMENT OF THE EDWARDS (BALCONES FAULT ZONE) AQUIFER.

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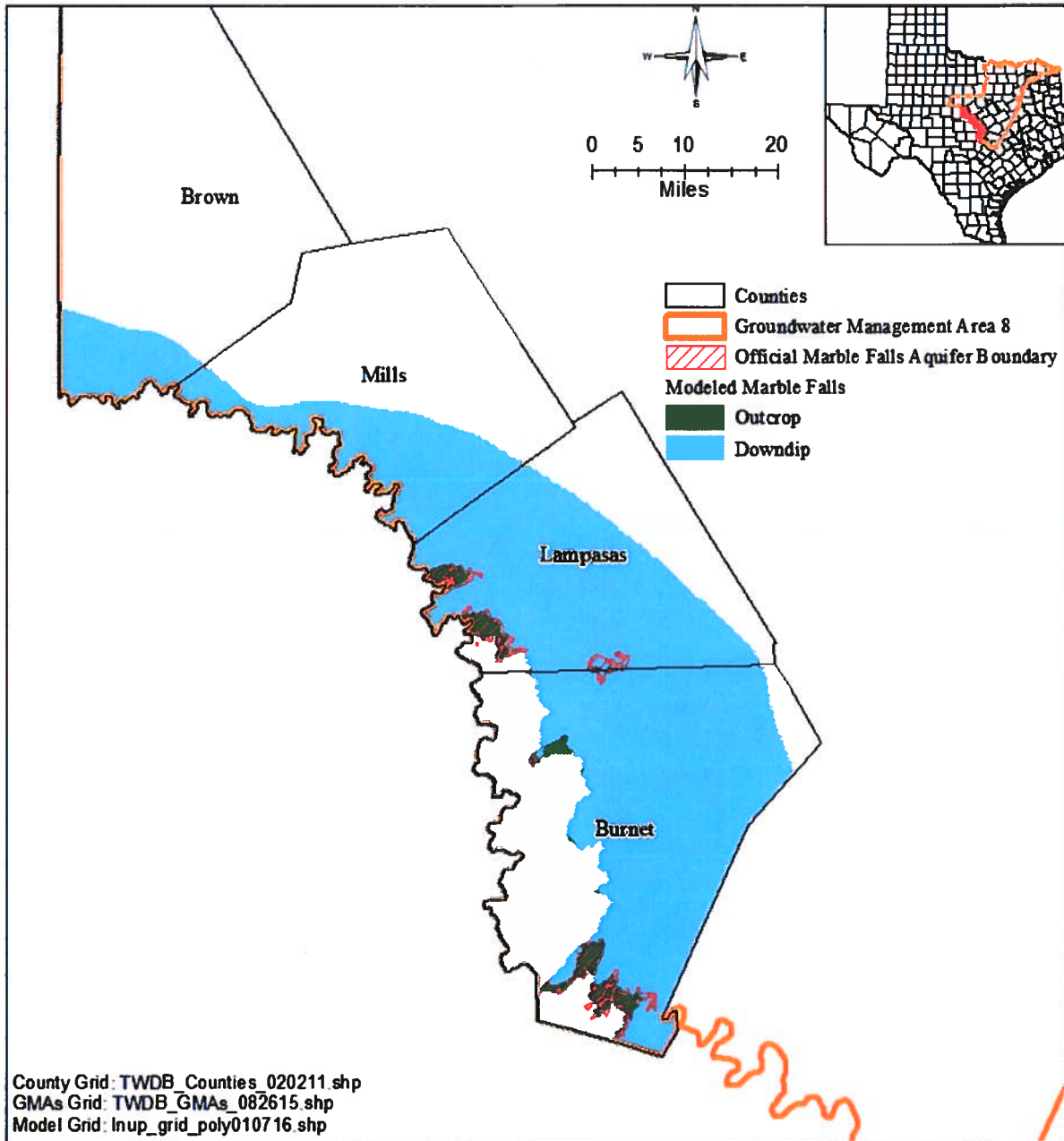


FIGURE 10. MAP SHOWING THE MARBLE FALLS AQUIFER WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE MINOR AQUIFERS IN LLANO UPLIFT REGION.

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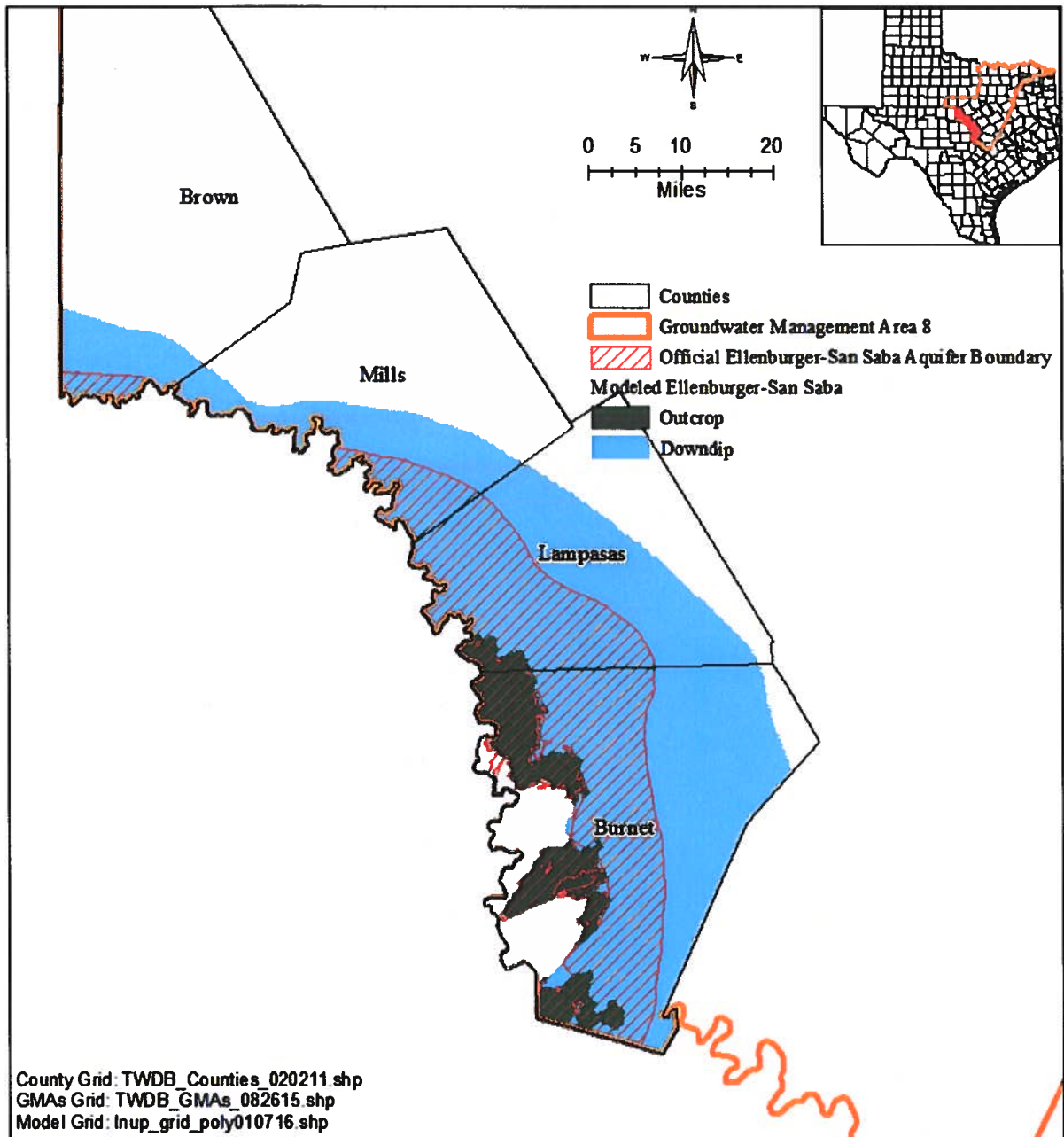


FIGURE 11. MAP SHOWING THE ELLENBURGER-SAN SABA AQUIFER WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE MINOR AQUIFERS IN LLANO UPLIFT REGION.

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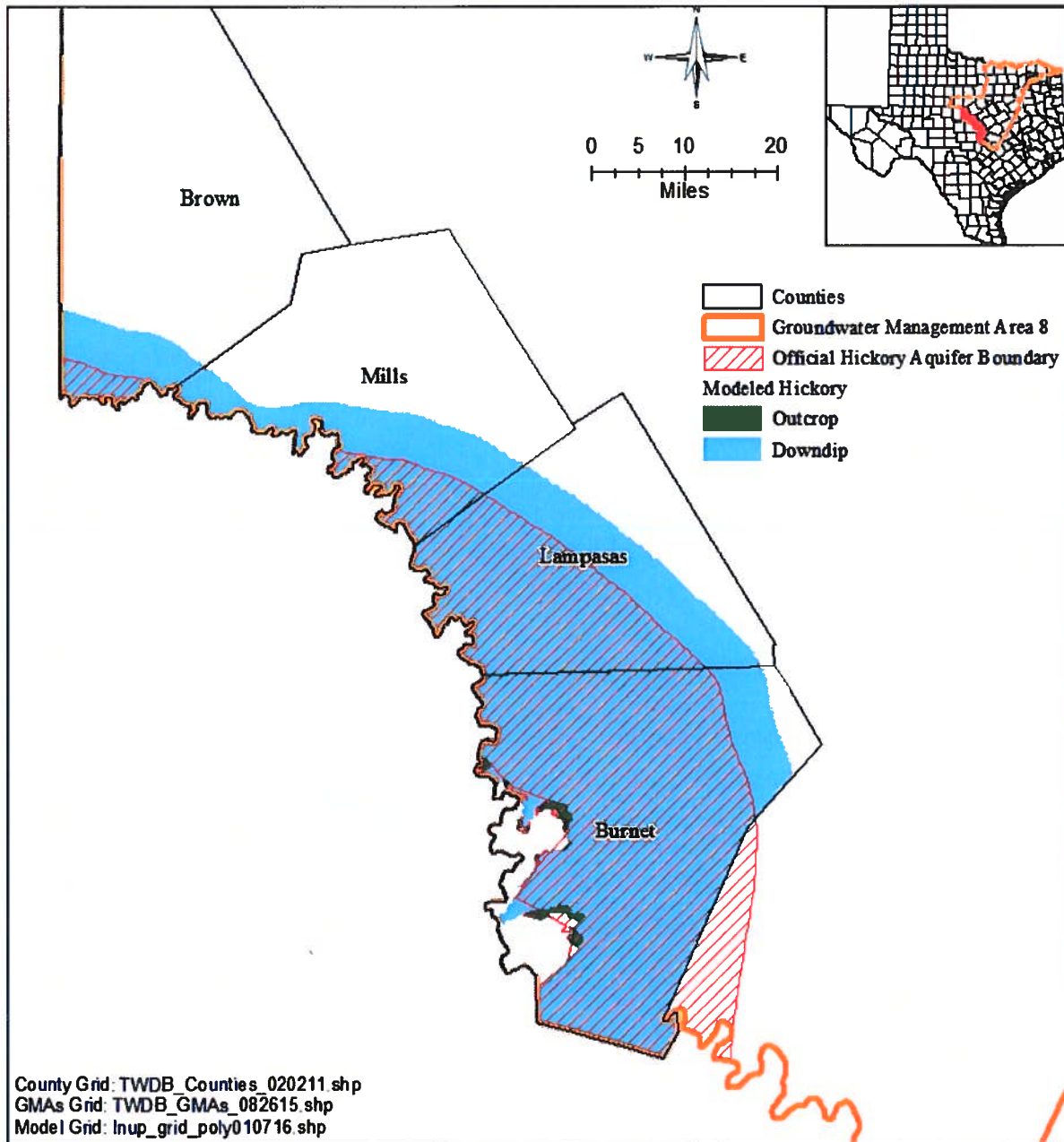


FIGURE 12. MAP SHOWING THE HICKORY AQUIFER WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE MINOR AQUIFERS IN LLANO UPLIFT REGION.

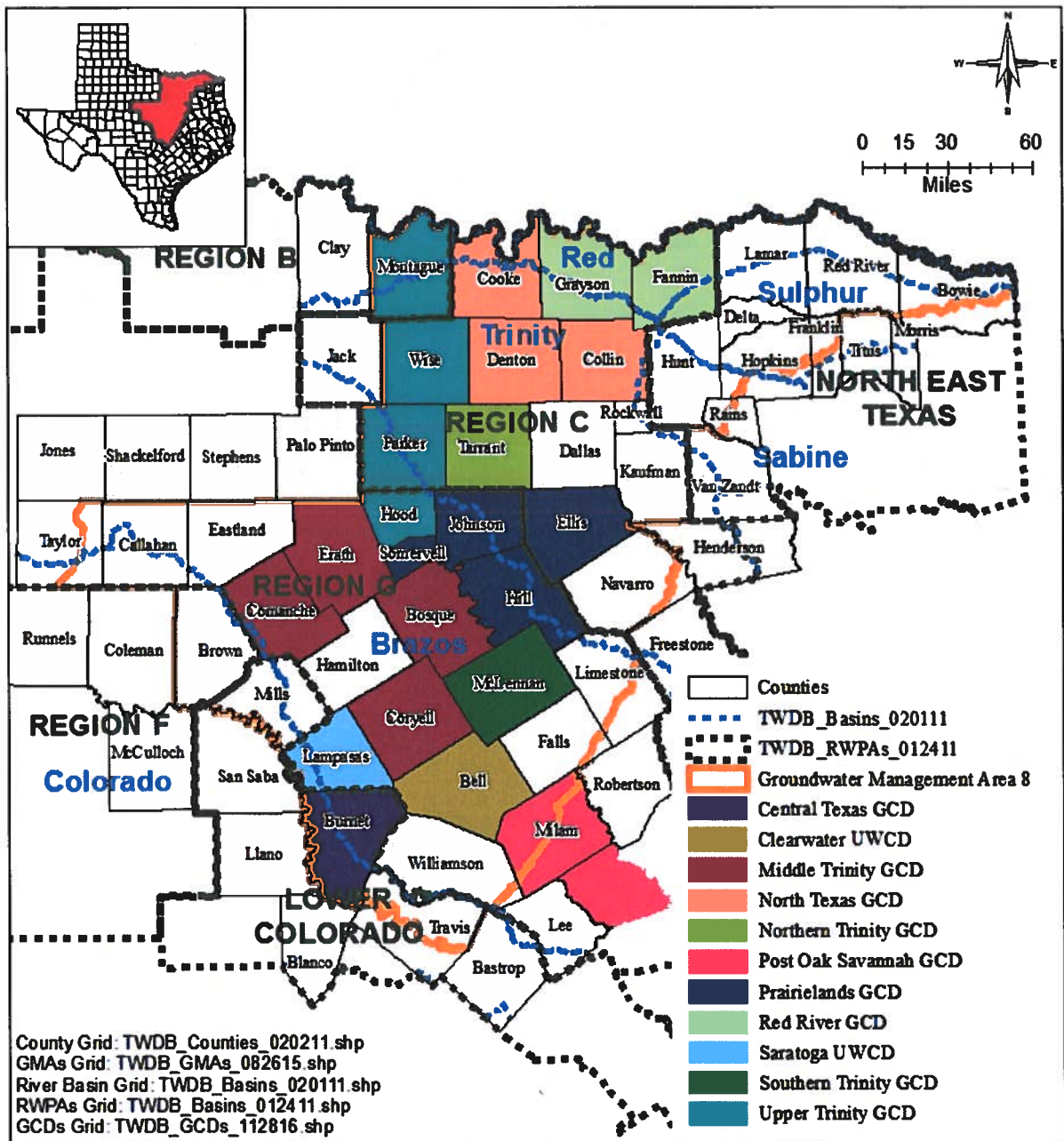


FIGURE 13. MAP SHOWING REGIONAL WATER PLANNING AREAS (RWPAs), GROUNDWATER CONSERVATION DISTRICTS (GCDs), AND RIVER BASINS ASSOCIATED WITH GROUNDWATER MANAGEMENT AREA 8.

GAM Run 17-029 MAG: Modeled Available Groundwater for the Trinity, Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory Aquifers in Groundwater Management Area 8

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TABLE 1. MODELED AVAILABLE GROUNDWATER FOR THE TRINITY AQUIFER (PALUXY) IN GROUNDWATER MANAGEMENT AREA 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2070 WITH BASELINE YEAR 2009. VALUES ARE IN ACRE-FEET PER YEAR.

GCD	County	2009	2010	2020	2030	2040	2050	2060	2070
Clearwater UWCD	Bell	0	0	0	0	0	0	0	0
Middle Trinity GCD	Bosque	204	356	358	356	358	356	358	356
Middle Trinity GCD	Coryell	0	0	0	0	0	0	0	0
Middle Trinity GCD	Erath	38	61	61	61	61	61	61	61
Middle Trinity GCD Total		242	417	419	417	419	417	419	417
North Texas GCD	Collin	616	1,547	1,551	1,547	1,551	1,547	1,551	1,547
North Texas GCD	Denton	1,532	4,819	4,832	4,819	4,832	4,819	4,832	4,819
North Texas GCD Total		2,148	6,366	6,383	6,366	6,383	6,366	6,383	6,366
Northern Trinity GCD	Tarrant	11,285	8,957	8,982	8,957	8,982	8,957	8,982	8,957
Prairielands GCD	Ellis	510	442	443	442	443	442	443	442
Prairielands GCD	Hill	400	352	353	352	353	352	353	352
Prairielands GCD	Johnson	4,851	2,440	2,447	2,440	2,447	2,440	2,447	2,440
Prairielands GCD	Somervell	3	14	14	14	14	14	14	14
Prairielands GCD Total		5,764	3,248	3,257	3,248	3,257	3,248	3,257	3,248
Red River GCD	Fannin	389	2,087	2,092	2,087	2,092	2,087	2,092	2,087
Red River GCD	Grayson	0	0	0	0	0	0	0	0
Red River GCD Total		389	2,087	2,092	2,087	2,092	2,087	2,092	2,087
Southern Trinity GCD	McLennan	319	0	0	0	0	0	0	0
Upper Trinity GCD	Hood (outcrop)	106	159	159	159	159	159	159	159
Upper Trinity GCD	Parker (outcrop)	2,100	2,607	2,614	2,607	2,614	2,607	2,614	2,607
Upper Trinity GCD	Parker (downdip)	221	50	50	50	50	50	50	50
Upper Trinity GCD Total		2,427	2,816	2,823	2,816	2,823	2,816	2,823	2,816
No District	Dallas	231	358	359	358	359	358	359	358
No District	Delta	56	56	56	56	56	56	56	56
No District	Falls	0	0	0	0	0	0	0	0
No District	Hamilton	0	0	0	0	0	0	0	0
No District	Hunt	3	3	3	3	3	3	3	3
No District	Kaufman	0	0	0	0	0	0	0	0
No District	Lamar	16	8	8	8	8	8	8	8

GAM Run 17-029 MAG: Modeled Available Groundwater for the Trinity, Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory Aquifers in Groundwater Management Area 8

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GCD	County	2009	2010	2020	2030	2040	2050	2060	2070
No District	Limestone	0	0	0	0	0	0	0	0
No District	Mills	3	6	6	6	6	6	6	6
No District	Navarro	0	0	0	0	0	0	0	0
No District	Red River	190	177	177	177	177	177	177	177
No District	Rockwall	0	0	0	0	0	0	0	0
No District Total		499	608	609	608	609	608	609	608
Groundwater Management Area 8		23,073	24,499	24,565	24,499	24,565	24,499	24,565	24,499

UWCD: Underground Water Conservation District.

GAM Run 17-029 MAG: Modeled Available Groundwater for the Trinity, Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory Aquifers in Groundwater Management Area 8

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TABLE 2. MODELED AVAILABLE GROUNDWATER FOR THE TRINITY AQUIFER (GLEN ROSE) IN GROUNDWATER MANAGEMENT AREA 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2070 WITH BASELINE YEAR 2009. VALUES ARE IN ACRE-FEET PER YEAR.

GCD	County	2009	2010	2020	2030	2040	2050	2060	2070
Central Texas GCD	Burnet	35	423	425	423	425	423	425	423
Clearwater UWCD	Bell	775	971	974	971	974	971	974	971
Middle Trinity GCD	Bosque	576	728	731	728	731	728	731	728
Middle Trinity GCD	Comanche	3	41	41	41	41	41	41	41
Middle Trinity GCD	Coryell	0	120	120	120	120	120	120	120
Middle Trinity GCD	Erath	263	1,078	1,081	1,078	1,081	1,078	1,081	1,078
Middle Trinity GCD Total		842	1,967	1,973	1,967	1,973	1,967	1,973	1,967
North Texas GCD	Collin	84	83	83	83	83	83	83	83
North Texas GCD	Denton	121	338	339	338	339	338	339	338
North Texas GCD Total		205	421	422	421	422	421	422	421
Northern Trinity GCD	Tarrant	1,070	793	795	793	795	793	795	793
Post Oak Savannah GCD	Milam	0	0	0	0	0	0	0	0
Prairielands GCD	Ellis	58	50	50	50	50	50	50	50
Prairielands GCD	Hill	116	115	115	115	115	115	115	115
Prairielands GCD	Johnson	1,780	1,632	1,636	1,632	1,636	1,632	1,636	1,632
Prairielands GCD	Somervell	81	146	146	146	146	146	146	146
Prairielands GCD Total		2,035	1,943	1,947	1,943	1,947	1,943	1,947	1,943
Red River GCD	Fannin	0	0	0	0	0	0	0	0
Red River GCD	Grayson	0	0	0	0	0	0	0	0
Red River GCD Total		0	0	0	0	0	0	0	0
Saratoga UWCD	Lampasas	65	68	68	68	68	68	68	68
Southern Trinity GCD	McLennan	845	0	0	0	0	0	0	0
Upper Trinity GCD	Hood (outcrop)	483	653	655	653	655	653	655	653
Upper Trinity GCD	Hood (downdip)	81	103	103	103	103	103	103	103
Upper Trinity GCD	Parker (outcrop)	2,593	2,289	2,295	2,289	2,295	2,289	2,295	2,289
Upper Trinity GCD	Parker (downdip)	1,063	873	876	873	876	873	876	873
Upper Trinity GCD Total		4,220	3,918	3,929	3,918	3,929	3,918	3,929	3,918

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GCD	County	2009	2010	2020	2030	2040	2050	2060	2070
No District	Brown	0	0	0	0	0	0	0	0
No District	Dallas	135	131	132	131	132	131	132	131
No District	Delta	0	0	0	0	0	0	0	0
No District	Falls	0	0	0	0	0	0	0	0
No District	Hamilton	168	218	218	218	218	218	218	218
No District	Hunt	0	0	0	0	0	0	0	0
No District	Kaufman	0	0	0	0	0	0	0	0
No District	Lamar	0	0	0	0	0	0	0	0
No District	Limestone	0	0	0	0	0	0	0	0
No District	Mills	12	189	189	189	189	189	189	189
No District	Navarro	0	0	0	0	0	0	0	0
No District	Red River	0	0	0	0	0	0	0	0
No District	Rockwall	0	0	0	0	0	0	0	0
No District	Travis	898	971	974	971	974	971	974	971
No District	Williamson	695	688	690	688	690	688	690	688
No District Total		1,908	2,197	2,203	2,197	2,203	2,197	2,203	2,197
Groundwater Management Area 8		12,000	12,701	12,736	12,701	12,736	12,701	12,736	12,701

UWCD: Underground Water Conservation District.

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TABLE 3. MODELED AVAILABLE GROUNDWATER FOR THE TRINITY AQUIFER (TWIN MOUNTAINS) IN GROUNDWATER MANAGEMENT AREA 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2070 WITH BASELINE YEAR 2009. VALUES ARE IN ACRE-FEET PER YEAR.

GCD	County	2009	2010	2020	2030	2040	2050	2060	2070
Middle Trinity GCD	Erath	3,443	5,017	5,031	5,017	5,031	5,017	5,031	5,017
North Texas GCD	Collin	163	2,201	2,207	2,201	2,207	2,201	2,207	2,201
North Texas GCD	Denton	997	8,366	8,389	8,366	8,389	8,366	8,389	8,366
North Texas GCD Total		1,160	10,567	10,596	10,567	10,596	10,567	10,596	10,567
Northern Trinity GCD	Tarrant	7,329	6,917	6,936	6,917	6,936	6,917	6,936	6,917
Prairielands GCD	Ellis	0	0	0	0	0	0	0	0
Prairielands GCD	Johnson	539	384	385	384	385	384	385	384
Prairielands GCD	Somervell	150	174	174	174	174	174	174	174
Prairielands GCD Total		689	558	559	558	559	558	559	558
Red River GCD	Fannin	0	0	0	0	0	0	0	0
Red River GCD	Grayson	0	0	0	0	0	0	0	0
Red River GCD Total		0	0	0	0	0	0	0	0
Upper Trinity GCD	Hood (outcrop)	3,379	3,662	3,672	3,662	3,672	3,662	3,672	3,662
Upper Trinity GCD	Hood (downdip)	7,143	7,759	7,780	7,759	7,780	7,759	7,780	7,759
Upper Trinity GCD	Parker (outcrop)	1,600	1,066	1,069	1,066	1,069	1,066	1,069	1,066
Upper Trinity GCD	Parker (downdip)	3,459	2,082	2,088	2,082	2,088	2,082	2,088	2,082
Upper Trinity GCD Total		15,581	14,569	14,609	14,569	14,609	14,569	14,609	14,569
No District	Dallas	2,282	3,199	3,208	3,199	3,208	3,199	3,208	3,199
No District	Hunt	0	0	0	0	0	0	0	0
No District	Kaufman	0	0	0	0	0	0	0	0
No District	Rockwall	0	0	0	0	0	0	0	0
No District Total		2,282	3,199	3,208	3,199	3,208	3,199	3,208	3,199
Groundwater Management Area 8		30,484	40,827	40,939	40,827	40,939	40,827	40,939	40,827

GAM Run 17-029 MAG: Modeled Available Groundwater for the Trinity, Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory Aquifers in Groundwater Management Area 8

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TABLE 4. MODELED AVAILABLE GROUNDWATER FOR THE TRINITY AQUIFER (TRAVIS PEAK) IN GROUNDWATER MANAGEMENT AREA 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2070 WITH BASELINE YEAR 2009. VALUES ARE IN ACRE-FEET PER YEAR.

GCD	County	2009	2010	2020	2030	2040	2050	2060	2070
Central Texas GCD	Burnet	1,906	3,464	3,474	3,464	3,474	3,464	3,474	3,464
Clearwater UWCD	Bell	1,957	8,270	8,293	8,270	8,293	8,270	8,293	8,270
Middle Trinity GCD	Bosque	5,255	7,678	7,699	7,678	7,699	7,678	7,699	7,678
Middle Trinity GCD	Comanche	9,793	6,160	6,177	6,160	6,177	6,160	6,177	6,160
Middle Trinity GCD	Coryell	3,350	4,371	4,383	4,371	4,383	4,371	4,383	4,371
Middle Trinity GCD	Erath	8,263	11,815	11,849	11,815	11,849	11,815	11,849	11,815
Middle Trinity GCD Total		26,661	30,024	30,108	30,024	30,108	30,024	30,108	30,024
Post Oak Savannah GCD	Milam	0	0	0	0	0	0	0	0
Prairielands GCD	Ellis	5,583	5,032	5,046	5,032	5,046	5,032	5,046	5,032
Prairielands GCD	Hill	3,700	3,550	3,559	3,550	3,559	3,550	3,559	3,550
Prairielands GCD	Johnson	5,602	4,941	4,955	4,941	4,955	4,941	4,955	4,941
Prairielands GCD	Somervell	2,560	2,847	2,854	2,847	2,854	2,847	2,854	2,847
Prairielands GCD Total		17,445	16,370	16,414	16,370	16,414	16,370	16,414	16,370
Red River GCD	Fannin	0	0	0	0	0	0	0	0
Saratoga UWCD	Lampasas	1,669	1,599	1,603	1,599	1,603	1,599	1,603	1,599
Southern Trinity GCD	McLennan	13,252	20,635	20,691	20,635	20,691	20,635	20,691	20,635
Upper Trinity GCD	Hood (downdip)	70	89	89	89	89	89	89	89
No District	Brown	680	394	395	394	395	394	395	394
No District	Dallas	0	0	0	0	0	0	0	0
No District	Delta	0	0	0	0	0	0	0	0
No District	Falls	1,158	1,434	1,438	1,434	1,438	1,434	1,438	1,434
No District	Hamilton	1,685	2,207	2,213	2,207	2,213	2,207	2,213	2,207
No District	Hunt	0	0	0	0	0	0	0	0
No District	Kaufman	0	0	0	0	0	0	0	0
No District	Lamar	0	0	0	0	0	0	0	0
No District	Limestone	0	0	0	0	0	0	0	0
No District	Mills	1,011	2,275	2,282	2,275	2,282	2,275	2,282	2,275
No District	Navarro	0	0	0	0	0	0	0	0
No District	Red River	0	0	0	0	0	0	0	0
No District	Travis	3,442	4,113	4,125	4,113	4,125	4,113	4,125	4,113
No District	Williamson	3,026	2,883	2,891	2,883	2,891	2,883	2,891	2,883

GAM Run 17-029 MAG: Modeled Available Groundwater for the Trinity, Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory Aquifers in Groundwater Management Area 8

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GCD	County	2009	2010	2020	2030	2040	2050	2060	2070
No District Total		11,002	13,306	13,344	13,306	13,344	13,306	13,344	13,306
Groundwater Management Area 8		73,962	93,757	94,016	93,757	94,016	93,757	94,016	93,757

UWCD: Underground Water Conservation District.

GAM Run 17-029 MAG: Modeled Available Groundwater for the Trinity, Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory Aquifers in Groundwater Management Area 8

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TABLE 5. MODELED AVAILABLE GROUNDWATER FOR THE TRINITY AQUIFER (HENSELL) IN GROUNDWATER MANAGEMENT AREA 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2070 WITH BASELINE YEAR 2009. VALUES ARE IN ACRE-FEET PER YEAR.

GCD	County	2009	2010	2020	2030	2040	2050	2060	2070
Central Texas GCD	Burnet	51	1,888	1,894	1,888	1,894	1,888	1,894	1,888
Clearwater UWCD	Bell	355	1,096	1,099	1,096	1,099	1,096	1,099	1,096
Middle Trinity GCD	Bosque	2,909	3,835	3,845	3,835	3,845	3,835	3,845	3,835
Middle Trinity GCD	Comanche	188	204	204	204	204	204	204	204
Middle Trinity GCD	Coryell	1,679	2,196	2,202	2,196	2,202	2,196	2,202	2,196
Middle Trinity GCD	Erath	3,446	5,137	5,151	5,137	5,151	5,137	5,151	5,137
Middle Trinity GCD Total		8,222	11,372	11,402	11,372	11,402	11,372	11,402	11,372
Post Oak Savannah GCD	Milam	0	0	0	0	0	0	0	0
Prairielands GCD	Ellis	0	0	0	0	0	0	0	0
Prairielands GCD	Hill	237	225	226	225	226	225	226	225
Prairielands GCD	Johnson	1,530	1,083	1,086	1,083	1,086	1,083	1,086	1,083
Prairielands GCD	Somervell	1,822	1,973	1,978	1,973	1,978	1,973	1,978	1,973
Prairielands GCD Total		3,589	3,281	3,290	3,281	3,290	3,281	3,290	3,281
Saratoga UWCD	Lampasas	730	712	715	712	715	712	715	712
Southern Trinity GCD	McLennan	3,018	4,698	4,711	4,698	4,711	4,698	4,711	4,698
Upper Trinity GCD	Hood (down dip)	45	36	36	36	36	36	36	36
No District	Brown	6	4	4	4	4	4	4	4
No District	Dallas	0	0	0	0	0	0	0	0
No District	Falls	0	0	0	0	0	0	0	0
No District	Hamilton	1,221	1,671	1,675	1,671	1,675	1,671	1,675	1,671
No District	Kaufman	0	0	0	0	0	0	0	0
No District	Limestone	0	0	0	0	0	0	0	0
No District	Mills	224	607	608	607	608	607	608	607
No District	Navarro	0	0	0	0	0	0	0	0
No District	Travis	919	1,141	1,144	1,141	1,144	1,141	1,144	1,141
No District	Williamson	772	751	753	751	753	751	753	751
No District Total		3,142	4,174	4,184	4,174	4,184	4,174	4,184	4,174
Groundwater Management Area 8		19,152	27,257	27,331	27,257	27,331	27,257	27,331	27,257

UWCD: Underground Water Conservation District.

GAM Run 17-029 MAG: Modeled Available Groundwater for the Trinity, Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory Aquifers in Groundwater Management Area 8

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TABLE 6. MODELED AVAILABLE GROUNDWATER FOR THE TRINITY AQUIFER (HOSSTON) IN GROUNDWATER MANAGEMENT AREA 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2070 WITH BASELINE YEAR 2009. VALUES ARE IN ACRE-FEET PER YEAR.

GCD	County	2009	2010	2020	2030	2040	2050	2060	2070
Central Texas GCD	Burnet	1,799	1,379	1,382	1,379	1,382	1,379	1,382	1,379
Clearwater UWCD	Bell	1,375	7,174	7,193	7,174	7,193	7,174	7,193	7,174
Middle Trinity GCD	Bosque	2,289	3,762	3,772	3,762	3,772	3,762	3,772	3,762
Middle Trinity GCD	Comanche	9,504	5,864	5,881	5,864	5,881	5,864	5,881	5,864
Middle Trinity GCD	Coryell	1,661	2,161	2,167	2,161	2,167	2,161	2,167	2,161
Middle Trinity GCD	Erath	4,637	6,383	6,400	6,383	6,400	6,383	6,400	6,383
Middle Trinity GCD Total		18,091	18,170	18,220	18,170	18,220	18,170	18,220	18,170
Post Oak Savannah GCD	Milam	0	0	0	0	0	0	0	0
Prairielands GCD	Ellis	5,575	5,026	5,040	5,026	5,040	5,026	5,040	5,026
Prairielands GCD	Hill	3,413	3,272	3,281	3,272	3,281	3,272	3,281	3,272
Prairielands GCD	Johnson	4,061	3,853	3,863	3,853	3,863	3,853	3,863	3,853
Prairielands GCD	Somervell	736	843	845	843	845	843	845	843
Prairielands GCD Total		13,785	12,994	13,029	12,994	13,029	12,994	13,029	12,994
Saratoga UWCD	Lampasas	907	857	859	857	859	857	859	857
Southern Trinity GCD	McLennan	10,212	15,937	15,980	15,937	15,980	15,937	15,980	15,937
Upper Trinity GCD	Hood (down dip)	25	53	53	53	53	53	53	53
No District	Brown	624	356	358	356	358	356	358	356
No District	Dallas	0	0	0	0	0	0	0	0
No District	Falls	1,157	1,434	1,438	1,434	1,438	1,434	1,438	1,434
No District	Hamilton	325	385	386	385	386	385	386	385
No District	Kaufman	0	0	0	0	0	0	0	0
No District	Limestone	0	0	0	0	0	0	0	0
No District	Mills	650	1,467	1,471	1,467	1,471	1,467	1,471	1,467
No District	Navarro	0	0	0	0	0	0	0	0
No District	Travis	2,357	2,783	2,791	2,783	2,791	2,783	2,791	2,783
No District	Williamson	2,050	1,933	1,938	1,933	1,938	1,933	1,938	1,933
No District Total		7,163	8,358	8,382	8,358	8,382	8,358	8,382	8,358
Groundwater Management Area 8		53,357	64,922	65,098	64,922	65,098	64,922	65,098	64,922

UWCD: Underground Water Conservation District.

GAM Run 17-029 MAG: Modeled Available Groundwater for the Trinity, Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory Aquifers in Groundwater Management Area 8

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TABLE 7. MODELED AVAILABLE GROUNDWATER FOR THE TRINITY AQUIFER (ANTLERS) IN GROUNDWATER MANAGEMENT AREA 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2070 WITH BASELINE YEAR 2009. VALUES ARE IN ACRE-FEET PER YEAR.

GCD	County	2009	2010	2020	2030	2040	2050	2060	2070
Middle Trinity GCD	Comanche	9,320	5,839	5,855	5,839	5,855	5,839	5,855	5,839
Middle Trinity GCD	Erath	1,663	2,628	2,636	2,628	2,636	2,628	2,636	2,628
Middle Trinity GCD Total		10,983	8,467	8,491	8,467	8,491	8,467	8,491	8,467
North Texas GCD	Collin	629	1,961	1,966	1,961	1,966	1,961	1,966	1,961
North Texas GCD	Cooke	4,117	10,514	10,544	10,514	10,544	10,514	10,544	10,514
North Texas GCD	Denton	11,427	16,545	16,591	16,545	16,591	16,545	16,591	16,545
North Texas GCD Total		16,173	29,020	29,101	29,020	29,101	29,020	29,101	29,020
Northern Trinity GCD	Tarrant	1,908	1,248	1,251	1,248	1,251	1,248	1,251	1,248
Red River GCD	Fannin	0	0	0	0	0	0	0	0
Red River GCD	Grayson	6,872	10,708	10,738	10,708	10,738	10,708	10,738	10,708
Red River GCD Total		6,872	10,708	10,738	10,708	10,738	10,708	10,738	10,708
Upper Trinity GCD	Montague (outcrop)	1,421	3,875	3,886	3,875	3,886	3,875	3,886	3,875
Upper Trinity GCD	Parker (outcrop)	3,321	2,897	2,905	2,897	2,905	2,897	2,905	2,897
Upper Trinity GCD	Wise (outcrop)	9,080	7,677	7,698	7,677	7,698	7,677	7,698	7,677
Upper Trinity GCD	Wise (downdip)	3,699	2,057	2,062	2,057	2,062	2,057	2,062	2,057
Upper Trinity GCD Total		17,521	16,506	16,551	16,506	16,551	16,506	16,551	16,506
No District	Brown	1,743	1,052	1,055	1,052	1,055	1,052	1,055	1,052
No District	Callahan	1,804	1,725	1,730	1,725	1,730	1,725	1,730	1,725
No District	Eastland	5,613	5,732	5,747	5,732	5,747	5,732	5,747	5,732
No District	Lamar	0	0	0	0	0	0	0	0
No District	Red River	0	0	0	0	0	0	0	0
No District	Taylor	17	13	13	13	13	13	13	13
No District Total		9,177	8,522	8,545	8,522	8,545	8,522	8,545	8,522
Groundwater Management Area 8		62,634	74,471	74,677	74,471	74,677	74,471	74,677	74,471

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TABLE 8. MODELED AVAILABLE GROUNDWATER FOR THE WOODBINE AQUIFER IN GROUNDWATER MANAGEMENT AREA 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2070 WITH BASELINE YEAR 2009. VALUES ARE IN ACRE-FEET PER YEAR.

GCD	County	2009	2010	2020	2030	2040	2050	2060	2070
North Texas GCD	Collin	2,427	4,251	4,263	4,251	4,263	4,251	4,263	4,251
North Texas GCD	Cooke	1,646	800	802	800	802	800	802	800
North Texas GCD	Denton	3,797	3,607	3,616	3,607	3,616	3,607	3,616	3,607
North Texas GCD Total		7,870	8,658	8,681	8,658	8,681	8,658	8,681	8,658
Northern Trinity GCD	Tarrant	2,646	1,138	1,141	1,138	1,141	1,138	1,141	1,138
Prairielands GCD	Ellis	2,471	2,073	2,078	2,073	2,078	2,073	2,078	2,073
Prairielands GCD	Hill	752	586	588	586	588	586	588	586
Prairielands GCD	Johnson	3,880	1,980	1,985	1,980	1,985	1,980	1,985	1,980
Prairielands GCD Total		7,103	4,639	4,651	4,639	4,651	4,639	4,651	4,639
Red River GCD	Fannin	5,495	4,920	4,934	4,920	4,934	4,920	4,934	4,920
Red River GCD	Grayson	5,056	7,521	7,541	7,521	7,541	7,521	7,541	7,521
Red River GCD Total		10,551	12,441	12,475	12,441	12,475	12,441	12,475	12,441
Southern Trinity GCD	McLennan	0	0	0	0	0	0	0	0
No District	Dallas	1,957	2,796	2,804	2,796	2,804	2,796	2,804	2,796
No District	Hunt	463	763	765	763	765	763	765	763
No District	Kaufman	0	0	0	0	0	0	0	0
No District	Lamar	61	49	49	49	49	49	49	49
No District	Navarro	65	68	68	68	68	68	68	68
No District	Red River	3	2	2	2	2	2	2	2
No District	Rockwall	0	0	0	0	0	0	0	0
No District Total		2,549	3,678	3,688	3,678	3,688	3,678	3,688	3,678
Groundwater Management Area 8		30,719	30,554	30,636	30,554	30,636	30,554	30,636	30,554

TABLE 9. MODELED AVAILABLE GROUNDWATER FOR THE EDWARDS (BALCONES FAULT ZONE) AQUIFER IN GROUNDWATER MANAGEMENT AREA 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2070 WITH BASELINE YEAR 2009. VALUES ARE IN ACRE-FEET PER YEAR.

GCD	County	2000	2010	2020	2030	2040	2050	2060	2070
Clearwater UWCD	Bell	949	6,469	6,469	6,469	6,469	6,469	6,469	6,469
No District	Travis	1,201	5,237	5,237	5,237	5,237	5,237	5,237	5,237
No District	Williamson	13,813	3,462	3,462	3,462	3,462	3,462	3,462	3,462
Groundwater Management Area 8		15,981	15,168	15,168	15,168	15,168	15,168	15,168	15,168

UWCD: Underground Water Conservation District.

TABLE 10. MODELED AVAILABLE GROUNDWATER FOR THE MARBLE FALLS AQUIFER IN GROUNDWATER MANAGEMENT AREA 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2070 WITH BASELINE YEAR 2009. VALUES ARE IN ACRE-FEET PER YEAR.

GCD	County	2009	2010	2020	2030	2040	2050	2060	2070
Central Texas GCD	Burnet	2,220	2,736	2,744	2,736	2,744	2,736	2,744	2,736
Saratoga UWCD	Lampasas	363	2,837	2,845	2,837	2,845	2,837	2,845	2,837
No District	Brown	0	25	25	25	25	25	25	25
No District	Mills	20	25	25	25	25	25	25	25
No District Total		20	50	50	50	50	50	50	50
Groundwater Management Area 8		2,603	5,623	5,639	5,623	5,639	5,623	5,639	5,623

UWCD: Underground Water Conservation District.

GAM Run 17-029 MAG: Modeled Available Groundwater for the Trinity, Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory Aquifers in Groundwater Management Area 8

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TABLE 11. MODELED AVAILABLE GROUNDWATER FOR THE ELLENBURGER-SAN SABA AQUIFER IN GROUNDWATER MANAGEMENT AREA 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2070 WITH BASELINE YEAR 2009. VALUES ARE IN ACRE-FEET PER YEAR.

GCD	County	2009	2010	2020	2030	2040	2050	2060	2070
Central Texas GCD	Burnet	5,256	10,827	10,857	10,827	10,857	10,827	10,857	10,827
Saratoga UWCD	Lampasas	351	2,593	2,601	2,593	2,601	2,593	2,601	2,593
No District	Brown	1	131	131	131	131	131	131	131
No District	Mills	0	499	500	499	500	499	500	499
No District Total		1	630	631	630	631	630	631	630
Groundwater Management Area 8		5,608	14,050	14,089	14,050	14,089	14,050	14,089	14,050

UWCD: Underground Water Conservation District.

TABLE 12. MODELED AVAILABLE GROUNDWATER FOR THE HICKORY AQUIFER IN GROUNDWATER MANAGEMENT AREA 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2070 WITH BASELINE YEAR 2009. VALUES ARE IN ACRE-FEET PER YEAR.

GCD	County	2009	2010	2020	2030	2040	2050	2060	2070
Central Texas GCD	Burnet	1,088	3,413	3,423	3,413	3,423	3,413	3,423	3,413
Saratoga UWCD	Lampasas	0	113	114	113	114	113	114	113
No District	Brown	0	12	12	12	12	12	12	12
No District	Mills	0	36	36	36	36	36	36	36
No District Total		0	48	48	48	48	48	48	48
Groundwater Management Area 8		1,088	3,574	3,585	3,574	3,585	3,574	3,585	3,574

UWCD: Underground Water Conservation District.

GAM Run 17-029 MAG: Modeled Available Groundwater for the Trinity, Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory Aquifers in Groundwater Management Area 8

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TABLE 13. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE TRINITY AQUIFER (PALUXY) IN GROUNDWATER MANAGEMENT AREA 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	2020	2030	2040	2050	2060	2070
Counties Not in Upper Trinity GCD								
Bell	Region G	Brazos	0	0	0	0	0	0
Bosque	Region G	Brazos	358	356	358	356	358	356
Collin	Region C	Sabine	0	0	0	0	0	0
Collin	Region C	Trinity	1,551	1,547	1,551	1,547	1,551	1,547
Coryell	Region G	Brazos	0	0	0	0	0	0
Dallas	Region C	Trinity	359	358	359	358	359	358
Delta	Northeast Texas	Sulphur	56	56	56	56	56	56
Denton	Region C	Trinity	4,832	4,819	4,832	4,819	4,832	4,819
Ellis	Region C	Trinity	443	442	443	442	443	442
Erath	Region G	Brazos	61	61	61	61	61	61
Falls	Region G	Brazos	0	0	0	0	0	0
Fannin	Region C	Sulphur	2,092	2,087	2,092	2,087	2,092	2,087
Fannin	Region C	Trinity	0	0	0	0	0	0
Grayson	Region C	Trinity	0	0	0	0	0	0
Hamilton	Region G	Brazos	0	0	0	0	0	0
Hill	Region G	Brazos	348	347	348	347	348	347
Hill	Region G	Trinity	5	5	5	5	5	5
Hunt	Northeast Texas	Sabine	0	0	0	0	0	0
Hunt	Northeast Texas	Sulphur	3	3	3	3	3	3
Hunt	Northeast Texas	Trinity	0	0	0	0	0	0
Johnson	Region G	Brazos	880	878	880	878	880	878
Johnson	Region G	Trinity	1,567	1,562	1,567	1,562	1,567	1,562
Kaufman	Region C	Trinity	0	0	0	0	0	0
Lamar	Northeast Texas	Red	0	0	0	0	0	0
Lamar	Northeast Texas	Sulphur	8	8	8	8	8	8
Limestone	Region G	Brazos	0	0	0	0	0	0
Limestone	Region G	Trinity	0	0	0	0	0	0
McLennan	Region G	Brazos	0	0	0	0	0	0
Mills	Lower Colorado	Brazos	6	6	6	6	6	6
Mills	Lower Colorado	Colorado	0	0	0	0	0	0
Navarro	Region C	Trinity	0	0	0	0	0	0
Red River	Northeast Texas	Red	52	52	52	52	52	52
Red River	Northeast Texas	Sulphur	125	125	125	125	125	125

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County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Rockwall	Region C	Trinity	0	0	0	0	0	0
Somervell	Region G	Brazos	14	14	14	14	14	14
Tarrant	Region C	Trinity	8,982	8,957	8,982	8,957	8,982	8,957
Subtotal			21,742	21,683	21,742	21,683	21,742	21,683
Counties in Upper Trinity GCD								
Hood (outcrop)	Region G	Brazos	159	158	159	158	159	158
Hood (outcrop)	Region G	Trinity	0	0	0	0	0	0
Parker (outcrop)	Region C	Brazos	34	34	34	34	34	34
Parker (outcrop)	Region C	Trinity	2,580	2,573	2,580	2,573	2,580	2,573
Parker (downdip)	Region C	Trinity	50	50	50	50	50	50
Subtotal			2,823	2,815	2,823	2,815	2,823	2,815
Groundwater Management Area 8			24,565	24,498	24,565	24,498	24,565	24,498

GAM Run 17-029 MAG: Modeled Available Groundwater for the Trinity, Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory Aquifers in Groundwater Management Area 8

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TABLE 14. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE TRINITY AQUIFER (GLEN ROSE) IN GROUNDWATER MANAGEMENT AREA 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	2020	2030	2040	2050	2060	2070
Counties Not in Upper Trinity GCD								
Bell	Region G	Brazos	974	971	974	971	974	971
Bosque	Region G	Brazos	731	728	731	728	731	728
Brown	Region F	Colorado	0	0	0	0	0	0
Burnet	Lower Colorado	Brazos	188	188	188	188	188	188
Burnet	Lower Colorado	Colorado	236	235	236	235	236	235
Collin	Region C	Sabine	0	0	0	0	0	0
Collin	Region C	Trinity	83	83	83	83	83	83
Comanche	Region G	Brazos	22	22	22	22	22	22
Comanche	Region G	Colorado	18	18	18	18	18	18
Coryell	Region G	Brazos	120	120	120	120	120	120
Dallas	Region C	Trinity	132	131	132	131	132	131
Delta	Northeast Texas	Sulphur	0	0	0	0	0	0
Denton	Region C	Trinity	339	338	339	338	339	338
Ellis	Region C	Trinity	50	50	50	50	50	50
Erath	Region G	Brazos	1,081	1,078	1,081	1,078	1,081	1,078
Falls	Region G	Brazos	0	0	0	0	0	0
Fannin	Region C	Sulphur	0	0	0	0	0	0
Fannin	Region C	Trinity	0	0	0	0	0	0
Grayson	Region C	Trinity	0	0	0	0	0	0
Hamilton	Region G	Brazos	218	218	218	218	218	218
Hill	Region G	Brazos	115	114	115	114	115	114
Hill	Region G	Trinity	1	1	1	1	1	1
Hunt	Northeast Texas	Sabine	0	0	0	0	0	0
Hunt	Northeast Texas	Sulphur	0	0	0	0	0	0
Hunt	Northeast Texas	Trinity	0	0	0	0	0	0
Johnson	Region G	Brazos	953	950	953	950	953	950
Johnson	Region G	Trinity	683	681	683	681	683	681
Kaufman	Region C	Trinity	0	0	0	0	0	0
Lamar	Northeast Texas	Red	0	0	0	0	0	0
Lamar	Northeast Texas	Sulphur	0	0	0	0	0	0
Lampasas	Region G	Brazos	68	68	68	68	68	68
Limestone	Region G	Brazos	0	0	0	0	0	0
Limestone	Region G	Trinity	0	0	0	0	0	0

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County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
McLennan	Region G	Brazos	0	0	0	0	0	0
Milam	Region G	Brazos	0	0	0	0	0	0
Mills	Lower Colorado	Brazos	96	96	96	96	96	96
Mills	Lower Colorado	Colorado	93	93	93	93	93	93
Navarro	Region C	Trinity	0	0	0	0	0	0
Red River	Northeast Texas	Red	0	0	0	0	0	0
Red River	Northeast Texas	Sulphur	0	0	0	0	0	0
Rockwall	Region C	Trinity	0	0	0	0	0	0
Somervell	Region G	Brazos	146	146	146	146	146	146
Tarrant	Region C	Trinity	795	793	795	793	795	793
Travis	Lower Colorado	Brazos	0	0	0	0	0	0
Travis	Lower Colorado	Colorado	974	971	974	971	974	971
Williamson	Region G	Brazos	623	621	623	621	623	621
Williamson	Region G	Colorado	0	0	0	0	0	0
Williamson	Lower Colorado	Brazos	0	0	0	0	0	0
Williamson	Lower Colorado	Colorado	67	67	67	67	67	67
Subtotal			8,806	8,781	8,806	8,781	8,806	8,781
Counties in Upper Trinity GCD								
Hood (outcrop)	Region G	Brazos	655	653	655	653	655	653
Hood (downdip)	Region G	Brazos	83	83	83	83	83	83
Hood (downdip)	Region G	Trinity	20	20	20	20	20	20
Parker (outcrop)	Region C	Brazos	87	87	87	87	87	87
Parker (downdip)	Region C	Brazos	7	7	7	7	7	7
Parker (outcrop)	Region C	Trinity	2,208	2,202	2,208	2,202	2,208	2,202
Parker (downdip)	Region C	Trinity	869	866	869	866	869	866
Subtotal			3,929	3,918	3,929	3,918	3,929	3,918
Groundwater Management Area 8			12,735	12,699	12,735	12,699	12,735	12,699

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TABLE 15. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE TRINITY AQUIFER (TWIN MOUNTAINS) IN GROUNDWATER MANAGEMENT AREA 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	2020	2030	2040	2050	2060	2070
Counties Not in Upper Trinity GCD								
Collin	Region C	Sabine	0	0	0	0	0	0
Collin	Region C	Trinity	2,207	2,201	2,207	2,201	2,207	2,201
Dallas	Region C	Trinity	3,208	3,199	3,208	3,199	3,208	3,199
Denton	Region C	Trinity	8,389	8,366	8,389	8,366	8,389	8,366
Ellis	Region C	Trinity	0	0	0	0	0	0
Erath	Region G	Brazos	5,031	5,017	5,031	5,017	5,031	5,017
Fannin	Region C	Sulphur	0	0	0	0	0	0
Fannin	Region C	Trinity	0	0	0	0	0	0
Grayson	Region C	Trinity	0	0	0	0	0	0
Hunt	Northeast Texas	Sabine	0	0	0	0	0	0
Hunt	Northeast Texas	Trinity	0	0	0	0	0	0
Johnson	Region G	Brazos	133	133	133	133	133	133
Johnson	Region G	Trinity	252	251	252	251	252	251
Kaufman	Region C	Trinity	0	0	0	0	0	0
Rockwall	Region C	Trinity	0	0	0	0	0	0
Somervell	Region G	Brazos	174	174	174	174	174	174
Tarrant	Region C	Trinity	6,936	6,917	6,936	6,917	6,936	6,917
Subtotal			26,330	26,258	26,330	26,258	26,330	26,258
Counties in Upper Trinity GCD								
Hood (outcrop)	Region G	Brazos	3,672	3,662	3,672	3,662	3,672	3,662
Hood (downdip)	Region G	Brazos	7,761	7,740	7,761	7,740	7,761	7,740
Hood (downdip)	Region G	Trinity	19	19	19	19	19	19
Parker (outcrop)	Region C	Brazos	1,069	1,066	1,069	1,066	1,069	1,066
Parker (downdip)	Region C	Brazos	778	776	778	776	778	776
Parker (downdip)	Region C	Trinity	1,310	1,306	1,310	1,306	1,310	1,306
Subtotal			14,609	14,569	14,609	14,569	14,609	14,569
Groundwater Management Area 8			40,939	40,827	40,939	40,827	40,939	40,827

GAM Run 17-029 MAG: Modeled Available Groundwater for the Trinity, Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory Aquifers in Groundwater Management Area 8

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TABLE 16. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE TRINITY AQUIFER (TRAVIS PEAK) IN GROUNDWATER MANAGEMENT AREA 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	2020	2030	2040	2050	2060	2070
Counties Not in Upper Trinity GCD								
Bell	Region G	Brazos	8,293	8,270	8,293	8,270	8,293	8,270
Bosque	Region G	Brazos	7,699	7,678	7,699	7,678	7,699	7,678
Brown	Region F	Brazos	3	3	3	3	3	3
Brown	Region F	Colorado	392	391	392	391	392	391
Burnet	Lower Colorado	Brazos	2,950	2,943	2,950	2,943	2,950	2,943
Burnet	Lower Colorado	Colorado	523	521	523	521	523	521
Comanche	Region G	Brazos	6,128	6,111	6,128	6,111	6,128	6,111
Comanche	Region G	Colorado	49	49	49	49	49	49
Coryell	Region G	Brazos	4,383	4,371	4,383	4,371	4,383	4,371
Dallas	Region C	Trinity	0	0	0	0	0	0
Delta	Northeast Texas	Sulphur	0	0	0	0	0	0
Ellis	Region C	Trinity	5,046	5,032	5,046	5,032	5,046	5,032
Erath	Region G	Brazos	11,849	11,815	11,849	11,815	11,849	11,815
Falls	Region G	Brazos	1,438	1,434	1,438	1,434	1,438	1,434
Fannin	Region C	Sulphur	0	0	0	0	0	0
Fannin	Region C	Trinity	0	0	0	0	0	0
Hamilton	Region G	Brazos	2,213	2,207	2,213	2,207	2,213	2,207
Hill	Region G	Brazos	3,304	3,295	3,304	3,295	3,304	3,295
Hill	Region G	Trinity	256	255	256	255	256	255
Hunt	Northeast Texas	Sabine	0	0	0	0	0	0
Hunt	Northeast Texas	Sulphur	0	0	0	0	0	0
Hunt	Northeast Texas	Trinity	0	0	0	0	0	0
Johnson	Region G	Brazos	1,932	1,927	1,932	1,927	1,932	1,927
Johnson	Region G	Trinity	3,022	3,014	3,022	3,014	3,022	3,014
Kaufman	Region C	Trinity	0	0	0	0	0	0
Lamar	Northeast Texas	Red	0	0	0	0	0	0
Lamar	Northeast Texas	Sulphur	0	0	0	0	0	0
Lampasas	Region G	Brazos	1,528	1,523	1,528	1,523	1,528	1,523
Lampasas	Region G	Colorado	76	75	76	75	76	75
Limestone	Region G	Brazos	0	0	0	0	0	0
Limestone	Region G	Trinity	0	0	0	0	0	0
McLennan	Region G	Brazos	20,691	20,635	20,691	20,635	20,691	20,635
Milam	Region G	Brazos	0	0	0	0	0	0

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County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Mills	Lower Colorado	Brazos	706	703	706	703	706	703
Mills	Lower Colorado	Colorado	1,576	1,572	1,576	1,572	1,576	1,572
Navarro	Region C	Trinity	0	0	0	0	0	0
Red River	Northeast Texas	Red	0	0	0	0	0	0
Red River	Northeast Texas	Sulphur	0	0	0	0	0	0
Somervell	Region G	Brazos	2,854	2,847	2,854	2,847	2,854	2,847
Travis	Lower Colorado	Brazos	1	1	1	1	1	1
Travis	Lower Colorado	Colorado	4,124	4,112	4,124	4,112	4,124	4,112
Williamson	Region G	Brazos	2,885	2,877	2,885	2,877	2,885	2,877
Williamson	Region G	Colorado	5	5	5	5	5	5
Williamson	Lower Colorado	Brazos	0	0	0	0	0	0
Williamson	Lower Colorado	Colorado	0	0	0	0	0	0
Subtotal			93,926	93,666	93,926	93,666	93,926	93,666
Counties in Upper Trinity GCD								
Hood (downdip)	Region G	Brazos	89	89	89	89	89	89
Subtotal			89	89	89	89	89	89
Groundwater Management Area 8			94,015	93,755	94,015	93,755	94,015	93,755

TABLE 17. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE TRINITY AQUIFER (HENSELL) IN GROUNDWATER MANAGEMENT AREA 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	2020	2030	2040	2050	2060	2070
Counties Not in Upper Trinity GCD								
Bell	Region G	Brazos	1,099	1,096	1,099	1,096	1,099	1,096
Bosque	Region G	Brazos	3,845	3,835	3,845	3,835	3,845	3,835
Brown	Region F	Colorado	4	4	4	4	4	4
Burnet	Lower Colorado	Brazos	1,761	1,757	1,761	1,757	1,761	1,757
Burnet	Lower Colorado	Colorado	133	132	133	132	133	132
Comanche	Region G	Brazos	181	180	181	180	181	180
Comanche	Region G	Colorado	24	24	24	24	24	24
Coryell	Region G	Brazos	2,202	2,196	2,202	2,196	2,202	2,196
Dallas	Region C	Trinity	0	0	0	0	0	0
Ellis	Region C	Trinity	0	0	0	0	0	0
Erath	Region G	Brazos	5,151	5,137	5,151	5,137	5,151	5,137
Falls	Region G	Brazos	0	0	0	0	0	0
Hamilton	Region G	Brazos	1,675	1,671	1,675	1,671	1,675	1,671
Hill	Region G	Brazos	225	224	225	224	225	224
Hill	Region G	Trinity	1	1	1	1	1	1
Johnson	Region G	Brazos	618	616	618	616	618	616
Johnson	Region G	Trinity	468	467	468	467	468	467
Kaufman	Region C	Trinity	0	0	0	0	0	0
Lampasas	Region G	Brazos	713	711	713	711	713	711
Lampasas	Region G	Colorado	1	1	1	1	1	1
Limestone	Region G	Brazos	0	0	0	0	0	0
Limestone	Region G	Trinity	0	0	0	0	0	0
McLennan	Region G	Brazos	4,711	4,698	4,711	4,698	4,711	4,698
Milam	Region G	Brazos	0	0	0	0	0	0
Mills	Lower Colorado	Brazos	172	172	172	172	172	172
Mills	Lower Colorado	Colorado	436	435	436	435	436	435
Navarro	Region C	Trinity	0	0	0	0	0	0
Somervell	Region G	Brazos	1,978	1,973	1,978	1,973	1,978	1,973
Travis	Lower Colorado	Brazos	1	1	1	1	1	1
Travis	Lower Colorado	Colorado	1,144	1,141	1,144	1,141	1,144	1,141
Williamson	Region G	Brazos	753	751	753	751	753	751
Williamson	Region G	Colorado	0	0	0	0	0	0
Williamson	Lower Colorado	Brazos	0	0	0	0	0	0

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County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Williamson	Lower Colorado	Colorado	0	0	0	0	0	0
Subtotal			27,296	27,223	27,296	27,223	27,296	27,223
Counties in Upper Trinity GCD								
Hood (downdip)	Region G	Brazos	36	36	36	36	36	36
Subtotal			36	36	36	36	36	36
Groundwater Management Area 8			27,332	27,259	27,332	27,259	27,332	27,259

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TABLE 18. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE TRINITY AQUIFER (HOSSTON) IN GROUNDWATER MANAGEMENT AREA 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	2020	2030	2040	2050	2060	2070
Counties Not in Upper Trinity GCD								
Bell	Region G	Brazos	7,193	7,174	7,193	7,174	7,193	7,174
Bosque	Region G	Brazos	3,772	3,762	3,772	3,762	3,772	3,762
Brown	Region F	Brazos	3	3	3	3	3	3
Brown	Region F	Colorado	355	353	355	353	355	353
Burnet	Lower Colorado	Brazos	1,027	1,025	1,027	1,025	1,027	1,025
Burnet	Lower Colorado	Colorado	355	354	355	354	355	354
Comanche	Region G	Brazos	5,875	5,858	5,875	5,858	5,875	5,858
Comanche	Region G	Colorado	6	6	6	6	6	6
Coryell	Region G	Brazos	2,167	2,161	2,167	2,161	2,167	2,161
Dallas	Region C	Trinity	0	0	0	0	0	0
Ellis	Region C	Trinity	5,040	5,026	5,040	5,026	5,040	5,026
Erath	Region G	Brazos	6,400	6,383	6,400	6,383	6,400	6,383
Falls	Region G	Brazos	1,438	1,434	1,438	1,434	1,438	1,434
Hamilton	Region G	Brazos	386	385	386	385	386	385
Hill	Region G	Brazos	3,026	3,018	3,026	3,018	3,026	3,018
Hill	Region G	Trinity	255	254	255	254	255	254
Johnson	Region G	Brazos	1,311	1,307	1,311	1,307	1,311	1,307
Johnson	Region G	Trinity	2,553	2,546	2,553	2,546	2,553	2,546
Kaufman	Region C	Trinity	0	0	0	0	0	0
Lampasas	Region G	Brazos	786	783	786	783	786	783
Lampasas	Region G	Colorado	72	72	72	72	72	72
Limestone	Region G	Brazos	0	0	0	0	0	0
Limestone	Region G	Trinity	0	0	0	0	0	0
McLennan	Region G	Brazos	15,980	15,937	15,980	15,937	15,980	15,937
Milam	Region G	Brazos	0	0	0	0	0	0
Mills	Lower Colorado	Brazos	376	375	376	375	376	375
Mills	Lower Colorado	Colorado	1,096	1,093	1,096	1,093	1,096	1,093
Navarro	Region C	Trinity	0	0	0	0	0	0
Somervell	Region G	Brazos	845	843	845	843	845	843
Travis	Lower Colorado	Brazos	0	0	0	0	0	0
Travis	Lower Colorado	Colorado	2,791	2,783	2,791	2,783	2,791	2,783
Williamson	Region G	Brazos	1,933	1,928	1,933	1,928	1,933	1,928
Williamson	Region G	Colorado	5	5	5	5	5	5

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County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Williamson	Lower Colorado	Brazos	0	0	0	0	0	0
Williamson	Lower Colorado	Colorado	0	0	0	0	0	0
Subtotal			65,046	64,868	65,046	64,868	65,046	64,868
Counties in Upper Trinity GCD								
Hood (downdip)	Region G	Brazos	53	53	53	53	53	53
Subtotal			53	53	53	53	53	53
Groundwater Management Area 8			65,099	64,921	65,099	64,921	65,099	64,921

TABLE 19. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE TRINITY AQUIFER (ANTLERS) IN GROUNDWATER MANAGEMENT AREA 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	2020	2030	2040	2050	2060	2070
Counties Not in Upper Trinity GCD								
Brown	Region F	Brazos	48	48	48	48	48	48
Brown	Region F	Colorado	1,007	1,004	1,007	1,004	1,007	1,004
Callahan	Region G	Brazos	444	443	444	443	444	443
Callahan	Region G	Colorado	1,285	1,282	1,285	1,282	1,285	1,282
Collin	Region C	Trinity	1,966	1,961	1,966	1,961	1,966	1,961
Comanche	Region G	Brazos	5,855	5,839	5,855	5,839	5,855	5,839
Cooke	Region C	Red	2,191	2,184	2,191	2,184	2,191	2,184
Cooke	Region C	Trinity	8,353	8,330	8,353	8,330	8,353	8,330
Denton	Region C	Trinity	16,591	16,545	16,591	16,545	16,591	16,545
Eastland	Region G	Brazos	5,194	5,180	5,194	5,180	5,194	5,180
Eastland	Region G	Colorado	553	552	553	552	553	552
Erath	Region G	Brazos	2,636	2,628	2,636	2,628	2,636	2,628
Fannin	Region C	Red	0	0	0	0	0	0
Fannin	Region C	Sulphur	0	0	0	0	0	0
Fannin	Region C	Trinity	0	0	0	0	0	0
Grayson	Region C	Red	6,678	6,660	6,678	6,660	6,678	6,660
Grayson	Region C	Trinity	4,059	4,048	4,059	4,048	4,059	4,048
Lamar	Northeast Texas	Red	0	0	0	0	0	0
Lamar	Northeast Texas	Sulphur	0	0	0	0	0	0
Red River	Northeast Texas	Red	0	0	0	0	0	0
Tarrant	Region C	Trinity	1,251	1,248	1,251	1,248	1,251	1,248
Taylor	Region G	Brazos	5	5	5	5	5	5
Taylor	Region G	Colorado	9	9	9	9	9	9
Subtotal			58,125	57,966	58,125	57,966	58,125	57,966
Counties in Upper Trinity GCD								
Montague (outcrop)	Region B	Red	154	154	154	154	154	154
Montague (outcrop)	Region B	Trinity	3,732	3,721	3,732	3,721	3,732	3,721
Parker (outcrop)	Region C	Brazos	257	256	257	256	257	256
Parker (outcrop)	Region C	Trinity	2,648	2,640	2,648	2,640	2,648	2,640
Wise (outcrop)	Region C	Trinity	7,698	7,677	7,698	7,677	7,698	7,677

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County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Wise (downdip)	Region C	Trinity	2,062	2,057	2,062	2,057	2,062	2,057
Subtotal			16,551	16,505	16,551	16,505	16,551	16,505
Groundwater Management Area 8			74,676	74,471	74,676	74,471	74,676	74,471

GAM Run 17-029 MAG: Modeled Available Groundwater for the Trinity, Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory Aquifers in Groundwater Management Area 8

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TABLE 20. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE WOODBINE AQUIFER IN GROUNDWATER MANAGEMENT AREA 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	2020	2030	2040	2050	2060	2070
Collin	Region C	Sabine	0	0	0	0	0	0
Collin	Region C	Trinity	4,263	4,251	4,263	4,251	4,263	4,251
Cooke	Region C	Red	262	261	262	261	262	261
Cooke	Region C	Trinity	540	538	540	538	540	538
Dallas	Region C	Trinity	2,804	2,796	2,804	2,796	2,804	2,796
Denton	Region C	Trinity	3,616	3,607	3,616	3,607	3,616	3,607
Ellis	Region C	Trinity	2,078	2,073	2,078	2,073	2,078	2,073
Fannin	Region C	Red	3,553	3,544	3,553	3,544	3,553	3,544
Fannin	Region C	Sulphur	551	550	551	550	551	550
Fannin	Region C	Trinity	829	827	829	827	829	827
Grayson	Region C	Red	5,615	5,599	5,615	5,599	5,615	5,599
Grayson	Region C	Trinity	1,926	1,922	1,926	1,922	1,926	1,922
Hill	Region G	Brazos	285	284	285	284	285	284
Hill	Region G	Trinity	303	302	303	302	303	302
Hunt	Northeast Texas	Sabine	269	268	269	268	269	268
Hunt	Northeast Texas	Sulphur	165	165	165	165	165	165
Hunt	Northeast Texas	Trinity	330	329	330	329	330	329
Johnson	Region G	Brazos	24	24	24	24	24	24
Johnson	Region G	Trinity	1,961	1,956	1,961	1,956	1,961	1,956
Kaufman	Region C	Trinity	0	0	0	0	0	0
Lamar	Northeast Texas	Red	0	0	0	0	0	0
Lamar	Northeast Texas	Sulphur	49	49	49	49	49	49
McLennan	Region G	Brazos	0	0	0	0	0	0
Navarro	Region C	Trinity	68	68	68	68	68	68
Red River	Northeast Texas	Red	2	2	2	2	2	2
Rockwall	Region C	Trinity	0	0	0	0	0	0
Tarrant	Region C	Trinity	1,141	1,138	1,141	1,138	1,141	1,138
Groundwater Management Area 8			30,634	30,553	30,634	30,553	30,634	30,553

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TABLE 21. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE EDWARDS (BALCONES FAULT ZONE) AQUIFER IN GROUNDWATER MANAGEMENT AREA 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	2020	2030	2040	2050	2060	2070
Bell	Region G	Brazos	6,469	6,469	6,469	6,469	6,469	6,469
Travis	Lower Colorado	Brazos	275	275	275	275	275	275
Travis	Lower Colorado	Colorado	4,962	4,962	4,962	4,962	4,962	4,962
Williamson	Region G	Brazos	3,351	3,351	3,351	3,351	3,351	3,351
Williamson	Region G	Colorado	101	101	101	101	101	101
Williamson	Lower Colorado	Brazos	6	6	6	6	6	6
Williamson	Lower Colorado	Colorado	4	4	4	4	4	4
Groundwater Management Area 8			15,168	15,168	15,168	15,168	15,168	15,168

TABLE 22. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE MARBLE FALLS AQUIFER IN GROUNDWATER MANAGEMENT AREA 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	2020	2030	2040	2050	2060	2070
Brown	Region F	Colorado	25	25	25	25	25	25
Burnet	Lower Colorado	Brazos	1,387	1,383	1,387	1,383	1,387	1,383
Burnet	Lower Colorado	Colorado	1,357	1,353	1,357	1,353	1,357	1,353
Lampasas	Region G	Brazos	1,958	1,952	1,958	1,952	1,958	1,952
Lampasas	Region G	Colorado	887	885	887	885	887	885
Mills	Lower Colorado	Brazos	1	1	1	1	1	1
Mills	Lower Colorado	Colorado	24	24	24	24	24	24
Groundwater Management Area 8			5,639	5,623	5,639	5,623	5,639	5,623

GAM Run 17-029 MAG: Modeled Available Groundwater for the Trinity, Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory Aquifers in Groundwater Management Area 8

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TABLE 23. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE ELLENBURGER-SAN SABA AQUIFER IN GROUNDWATER MANAGEMENT AREA 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	2020	2030	2040	2050	2060	2070
Brown	Region F	Colorado	131	131	131	131	131	131
Burnet	Lower Colorado	Brazos	3,833	3,822	3,833	3,822	3,833	3,822
Burnet	Lower Colorado	Colorado	7,024	7,005	7,024	7,005	7,024	7,005
Lampasas	Region G	Brazos	1,685	1,680	1,685	1,680	1,685	1,680
Lampasas	Region G	Colorado	916	913	916	913	916	913
Mills	Lower Colorado	Brazos	93	93	93	93	93	93
Mills	Lower Colorado	Colorado	407	406	407	406	407	406
Groundwater Management Area 8			14,089	14,050	14,089	14,050	14,089	14,050

TABLE 24. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE HICKORY AQUIFER IN GROUNDWATER MANAGEMENT AREA 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	2020	2030	2040	2050	2060	2070
Brown	Region F	Colorado	12	12	12	12	12	12
Burnet	Lower Colorado	Brazos	1,240	1,236	1,240	1,236	1,240	1,236
Burnet	Lower Colorado	Colorado	2,183	2,177	2,183	2,177	2,183	2,177
Lampasas	Region G	Brazos	80	79	80	79	80	79
Lampasas	Region G	Colorado	34	34	34	34	34	34
Mills	Lower Colorado	Brazos	7	7	7	7	7	7
Mills	Lower Colorado	Colorado	29	29	29	29	29	29
Groundwater Management Area 8			3,585	3,574	3,585	3,574	3,585	3,574

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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[http://www.twdb.texas.gov/groundwater/models/gam/llano/Llano Uplift Numerical Model Report Final.pdf?d=1503601525245](http://www.twdb.texas.gov/groundwater/models/gam/llano/Llano_Uplift_Numerical_Model_Report_Final.pdf?d=1503601525245).

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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 2070 were based on the simulated head values at individual model cells extracted from predictive simulation head 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).

Model Layer	Region 1	Region 2	Region 3	Region 4	Region 5	
2	Woodbine			Woodbine (no sand)		
3	Washita/Fredericksburg					
4	Paluxy			Paluxy (no sand)		
5	Glen Rose					
6	Antlers	Twin Mountains	Travis Peak	Hensell	Travis Peak	Hensell
7				Pearsall/Sligo		Pearsall/Sligo
8				Hosston		Hosston

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, Beach and others (2016) adopted a method presented by Van Kelley of INTERA, Inc., which calculated a single composite head from multiple model cells with each adjusted by transmissivity. This composite head took both the head and hydraulic transmissivity at each cell into calculation, as shown in the following equation:

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

Where:

H_c = Composite Head (feet above mean sea level)

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

H_i = Head 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.

The average head 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 head for a county
(feet above mean sea level)

Hc_i = Composite Head 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:

$$DD_County = Hc_County_{2009} - Hc_County_{2070}$$

Where:

Hc_County₂₀₀₉ = Average head of an aquifer in a county in 2009
as defined above (feet above mean sea level)

Hc_County₂₀₇₀ = Average head of an aquifer in a county in 2070
as defined above (feet above mean sea level).

Model cells with head values below the cell bottom in 2009 were excluded from the calculation. Also, head was set at the cell bottom if it fell below the cell bottom at 2070.

In comparison with a simple average calculation based on total model cell count, use of composite head 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 head and drawdown calculation.

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Per Groundwater Management Area 8, a desired future condition was met if the simulated drawdown from the desired future condition was within five percent or five feet. Using the head output file submitted by Groundwater Management Area 8 and the method described above, the TWDB calculated the drawdowns (Tables [A1](#) and [A2](#)) and performed the comparison against the corresponding desired future conditions by county (Tables [A3](#), [A4](#), [A5](#), and [A6](#)). The review by the TWDB indicates that the predictive simulation meets the desired future conditions (Tables [A7](#) and [A8](#)).

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TABLE A1. SIMULATED DRAWDOWN VALUES OF THE TRINITY AND WOODBINE AQUIFERS FOR COUNTIES NOT IN THE UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT. DRAWDOWNS ARE IN FEET.

County	Woodbine	Paluxy	Glen Rose	Twin Mountains	Travis Peak	Hensell	Hosston	Antlers
Bell	—	19	83	—	294	137	330	—
Bosque	—	6	49	—	167	129	201	—
Brown	—	—	2	—	1	1	1	2
Burnet	—	—	2	—	16	7	20	—
Callahan	—	—	—	—	—	—	—	1
Collin	459	705	339	526	—	—	—	570
Comanche	—	—	1	—	2	2	3	9
Cooke	2	—	—	—	—	—	—	179
Coryell	—	7	14	—	100	66	130	—
Dallas	123	324	263	463	350	332	351	—
Delta	—	264	181	—	186	—	—	—
Denton	19	552	349	716	—	—	—	398
Eastland	—	—	—	—	—	—	—	3
Ellis	61	107	194	333	305	263	310	—
Erath	—	1	5	6	19	11	31	11
Falls	—	144	215	—	460	271	465	—
Fannin	247	688	280	372	269	—	—	251
Grayson	157	922	337	417	—	—	—	348
Hamilton	—	2	4	—	24	13	35	—
Hill	16	38	133	—	299	186	337	—
Hunt	598	586	299	370	324	—	—	—
Johnson	3	-61	58	156	184	126	235	—
Kaufman	208	276	269	381	323	309	295	—
Lamar	38	93	97	—	114	—	—	122
Lampasas	—	—	1	—	6	1	11	—
Limestone	—	178	271	—	393	183	404	—
McLennan	6	35	133	—	468	220	542	—
Milam	—	—	212	—	344	229	345	—
Mills	—	1	1	—	7	2	13	—
Navarro	92	119	232	—	291	254	291	—
Red River	2	21	36	—	51	—	—	13
Rockwall	243	401	311	426	—	—	—	—
Somervell	—	1	4	31	52	26	83	—
Tarrant	6	101	148	315	—	—	—	149

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County	Woodbine	Paluxy	Glen Rose	Twin Mountains	Travis Peak	Hensell	Hosston	Antlers
Taylor	—	—	—	—	—	—	—	0
Travis	—	—	85	—	142	51	148	—
Williamson	—	—	76	—	172	73	176	—

—: Not available.

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TABLE A2. SIMULATED DRAWDOWN VALUES OF THE TRINITY AQUIFER FOR COUNTIES IN THE UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT. DRAWDOWNS ARE IN FEET.

County	Paluxy	Glen Rose	Twin Mountains	Antlers
Hood (outcrop)	5	7	4	—
Hood (downdip)	—	27	46	—
Montague (outcrop)	—	—	—	18
Montague (downdip)	—	—	—	—
Parker (outcrop)	5	10	1	11
Parker (downdip)	1	28	46	—
Wise (outcrop)	—	—	—	35
Wise (downdip)	—	—	—	142

—: Not available.

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TABLE A3. RELATIVE DIFFERENCE BETWEEN SIMULATED DRAWDOWNS AND DESIRED FUTURE CONDITIONS OF THE TRINITY AND WOODBINE AQUIFERS FOR COUNTIES NOT IN THE UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT. VALUES GREATER THAN THE ERROR TOLERANCE OF FIVE PERCENT ARE HIGHLIGHTED.

County	Woodbine	Paluxy	Glen Rose	Twin Mountains	Travis Peak	Hensell	Hosston	Antlers
Bell	—	0%	0%	—	-2%	0%	0%	—
Bosque	—	0%	0%	—	0%	0%	0%	—
Brown	—	—	0%	—	0%	0%	0%	0%
Burnet	—	—	0%	—	0%	0%	0%	—
Callahan	—	—	—	—	—	—	—	0%
Collin	0%	0%	0%	0%	—	—	—	0%
Comanche	—	—	0%	—	0%	0%	0%	0%
Cooke	0%	—	—	—	—	—	—	2%
Coryell	—	0%	0%	—	1%	0%	0%	—
Dallas	0%	0%	0%	0%	1%	0%	0%	—
Delta	—	0%	0%	—	0%	—	—	—
Denton	-16%	0%	0%	0%	—	—	—	1%
Eastland	—	—	—	—	—	—	—	0%
Ellis	0%	0%	0%	0%	1%	0%	0%	—
Erath	—	0%	0%	0%	0%	0%	0%	-9%
Falls	—	0%	0%	—	0%	0%	0%	—
Fannin	0%	0%	0%	0%	0%	—	—	0%
Grayson	-2%	0%	0%	0%	—	—	—	0%
Hamilton	—	0%	0%	—	0%	0%	0%	—
Hill	-25%	0%	0%	—	0%	0%	0%	—
Hunt	0%	0%	0%	0%	0%	—	—	—
Johnson	33%	0%	0%	0%	3%	0%	0%	—
Kaufman	0%	0%	0%	0%	0%	0%	0%	—
Lamar	0%	0%	0%	—	0%	—	—	0%
Lampasas	—	—	0%	—	0%	0%	0%	—
Limestone	—	0%	0%	—	0%	0%	0%	—
McLen—n	0%	0%	0%	—	-1%	0%	0%	—
Milam	—	—	0%	—	0%	0%	0%	—
Mills	—	0%	0%	—	0%	0%	0%	—
—varro	0%	0%	0%	—	0%	0%	0%	—
Red River	0%	0%	0%	—	0%	—	—	0%
Rockwall	0%	0%	0%	0%	—	—	—	—

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County	Woodbine	Paluxy	Glen Rose	Twin Mountains	Travis Peak	Hensell	Hosston	Antlers
Somervell	—	0%	0%	0%	2%	0%	0%	—
Tarrant	-17%	0%	0%	0%	—	—	—	1%
Taylor	—	—	—	—	—	—	—	0%
Travis	—	—	0%	—	1%	2%	1%	—
Williamson	—	—	-1%	—	-1%	-1%	-1%	—

—: Not available.

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TABLE A4. RELATIVE DIFFERENCE BETWEEN SIMULATED DRAWDOWNS AND DESIRED FUTURE CONDITIONS OF THE TRINITY AQUIFER FOR COUNTIES IN THE UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT. VALUES GREATER THAN THE ERROR TOLERANCE OF FIVE PERCENT ARE HIGHLIGHTED.

County	Paluxy	Glen Rose	Twin Mountains	Antlers
Hood (outcrop)	0%	0%	0%	—
Hood (downdip)	—	-4%	0%	—
Montague (outcrop)	—	—	—	0%
Montague (downdip)	—	—	—	—
Parker (outcrop)	0%	0%	0%	0%
Parker (downdip)	0%	0%	0%	—
Wise (outcrop)	—	—	—	3%
Wise (downdip)	—	—	—	0%

—: Not available.

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TABLE A5. DIFFERENCE BETWEEN SIMULATED DRAWDOWNS AND DESIRED FUTURE CONDITIONS OF THE TRINITY AND WOODBINE AQUIFERS FOR COUNTIES NOT IN THE UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT. VALUES GREATER THAN THE ERROR TOLERANCE OF FIVE FEET ARE HIGHLIGHTED.

County	Woodbine	Paluxy	Glen Rose	Twin Mountains	Travis Peak	Hensell	Hosston	Antlers
Bell	—	0	0	—	-6	0	0	—
Bosque	—	0	0	—	0	0	0	—
Brown	—	—	0	—	0	0	0	0
Burnet	—	—	0	—	0	0	0	—
Callahan	—	—	—	—	—	—	—	0
Collin	0	0	0	0	—	—	—	0
Comanche	—	—	0	—	0	0	0	0
Cooke	0	—	—	—	—	—	—	3
Coryell	—	0	0	—	1	0	0	—
Dallas	0	0	0	0	2	0	0	—
Delta	—	0	0	—	0	—	—	—
Denton	-3	0	0	0	—	—	—	3
Eastland	—	—	—	—	—	—	—	0
Ellis	0	0	0	0	4	0	0	—
Erath	—	0	0	0	0	0	0	-1
Falls	—	0	0	—	-2	0	0	—
Fannin	0	0	0	0	0	—	—	0
Grayson	-3	0	0	0	—	—	—	0
Hamilton	—	0	0	—	0	0	0	—
Hill	-4	0	0	—	1	0	0	—
Hunt	0	0	0	0	0	—	—	—
Johnson	1	0	0	0	5	0	0	—
Kaufman	0	0	0	0	0	0	0	—
Lamar	0	0	0	—	0	—	—	0
Lampasas	—	—	0	—	0	0	0	—
Limestone	—	0	0	—	1	0	0	—
McLennan	0	0	0	—	-3	0	0	—
Milam	—	—	0	—	-1	0	0	—
Mills	—	0	0	—	0	0	0	—
Navarro	0	0	0	—	1	0	0	—
Red River	0	0	0	—	0	—	—	0
Rockwall	0	0	0	0	—	—	—	—

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County	Woodbine	Paluxy	Glen Rose	Twin Mountains	Travis Peak	Hensell	Hosston	Antlers
Somervell	—	0	0	0	1	0	0	—
Tarrant	-1	0	0	0	—	—	—	1
Taylor	—	—	—	—	—	—	—	0
Travis	—	—	0	—	1	1	2	—
Williamson	—	—	-1	—	-1	-1	-1	—

—: Not available.

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TABLE A6. DIFFERENCE BETWEEN SIMULATED DRAWDOWNS AND DESIRED FUTURE CONDITIONS OF THE TRINITY AQUIFER FOR COUNTIES IN THE UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT. NO VALUES ARE GREATER THAN THE ERROR TOLERANCE OF FIVE FEET.

County	Paluxy	Glen Rose	Twin Mountains	Antlers
Hood (outcrop)	0	0	0	—
Hood (downdip)	—	-1	0	—
Montague (outcrop)	—	—	—	0
Montague (downdip)	—	—	—	—
Parker (outcrop)	0	0	0	0
Parker (downdip)	0	0	0	—
Wise (outcrop)	—	—	—	1
Wise (downdip)	—	—	—	0

—: Not available.

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TABLE A7. COMPARISON OF SIMULATED DRAWDOWNS WITH THE DESIRED FUTURE CONDITIONS OF THE TRINITY AND WOODBINE AQUIFERS FOR COUNTIES NOT IN THE UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT. NO VALUES ARE GREATER THAN BOTH ERROR TOLLERRANCES OF FIVE PERCENT AND FIVE FEET AT THE SAME TIME. THUS, PREDICTIVE SIMULATION MEETS ALL DESIRED FUTURE CONDITIONS.

County	Woodbine	Paluxy	Glen Rose	Twin Mountains	Travis Peak	Hensell	Hosston	Antlers
Bell	—	MEET	MEET	—	MEET	MEET	MEET	—
Bosque	—	MEET	MEET	—	MEET	MEET	MEET	—
Brown	—	—	MEET	—	MEET	MEET	MEET	MEET
Burnet	—	—	MEET	—	MEET	MEET	MEET	—
Callahan	—	—	—	—	—	—	—	MEET
Collin	MEET	MEET	MEET	MEET	—	—	—	MEET
Comanche	—	—	MEET	—	MEET	MEET	MEET	MEET
Cooke	MEET	—	—	—	—	—	—	MEET
Coryell	—	MEET	MEET	—	MEET	MEET	MEET	—
Dallas	MEET	MEET	MEET	MEET	MEET	MEET	MEET	—
Delta	—	MEET	MEET	—	MEET	—	—	—
Denton	MEET	MEET	MEET	MEET	—	—	—	MEET
Eastland	—	—	—	—	—	—	—	MEET
Ellis	MEET	MEET	MEET	MEET	MEET	MEET	MEET	—
Erath	—	MEET	MEET	MEET	MEET	MEET	MEET	MEET
Falls	—	MEET	MEET	—	MEET	MEET	MEET	—
Fannin	MEET	MEET	MEET	MEET	MEET	—	—	MEET
Grayson	MEET	MEET	MEET	MEET	—	—	—	MEET
Hamilton	—	MEET	MEET	—	MEET	MEET	MEET	—
Hill	MEET	MEET	MEET	—	MEET	MEET	MEET	—
Hunt	MEET	MEET	MEET	MEET	MEET	—	—	—
Johnson	MEET	MEET	MEET	MEET	MEET	MEET	MEET	—
Kaufman	MEET	MEET	MEET	MEET	MEET	MEET	MEET	—
Lamar	MEET	MEET	MEET	—	MEET	—	—	MEET
Lampasas	—	—	MEET	—	MEET	MEET	MEET	—
Limestone	—	MEET	MEET	—	MEET	MEET	MEET	—
McLennan	MEET	MEET	MEET	—	MEET	MEET	MEET	—
Milam	—	—	MEET	—	MEET	MEET	MEET	—
Mills	—	MEET	MEET	—	MEET	MEET	MEET	—
Navarro	MEET	MEET	MEET	—	MEET	MEET	MEET	—

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County	Woodbine	Paluxy	Glen Rose	Twin Mountains	Travis Peak	Hensell	Hosston	Antlers
Red River	MEET	MEET	MEET	—	MEET	—	—	MEET
Rockwall	MEET	MEET	MEET	MEET	—	—	—	—
Somervell	—	MEET	MEET	MEET	MEET	MEET	MEET	—
Tarrant	MEET	MEET	MEET	MEET	—	—	—	MEET
Taylor	—	—	—	—	—	—	—	MEET
Travis	—	—	MEET	—	MEET	MEET	MEET	—
Williamson	—	—	MEET	—	MEET	MEET	MEET	—

—: Not available.

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TABLE A8. COMPARISON OF SIMULATED DRAWDOWNS WITH THE DESIRED FUTURE CONDITIONS OF THE TRINITY AQUIFER FOR COUNTIES IN THE UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT. NO VALUES ARE GREATER THAN BOTH ERROR TOLERANCES OF FIVE PERCENT AND FIVE FEET AT THE SAME TIME. THUS, PREDICTIVE SIMULATION MEETS ALL DESIRED FUTURE CONDITIONS.

County	Paluxy	Glen Rose	Twin Mountains	Antlers
Hood (outcrop)	MEET	MEET	MEET	—
Hood (downdip)	—	MEET	MEET	—
Montague (outcrop)	—	—	—	MEET
Montague (downdip)	—	—	—	—
Parker (outcrop)	MEET	MEET	MEET	MEET
Parker (downdip)	MEET	MEET	MEET	—
Wise (outcrop)	—	—	—	MEET
Wise (downdip)	—	—	—	MEET

—: Not available.

Appendix B

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

The predictive simulation used to evaluate the desired future conditions and the modeled available groundwater values for the Marble Falls, Ellenburger-San Saba, and Hickory aquifers in Brown, Burnet, Lampasas, and Mills counties within Groundwater Management Area 8 involves rewriting all relevant MODFLOW-USG packages to reflect the predictive simulation. The initial pumping for the predictive simulation was based on the last stress period of the groundwater availability model. In its clarification, Groundwater Management Area 8 also provided estimated pumping to use for the predictive simulation by TWDB ([Table B1](#)).

These pumping values from Groundwater Management Area 8 are more than the pumpage from the last stress period of the groundwater availability model. This surplus pumping for each aquifer was redistributed uniformly in each county according to its modeled extent.

The head file from the model output was used to calculate the remaining saturated thickness (ST) within the modeled extent for each aquifer between 2009 and 2070 using the following equation:

$$ST = \frac{\sum_{i=1}^n (h_{2070_i} - e_i)}{\sum_{i=1}^n (h_{2009_i} - e_i)}$$

Where:

n = Total model cells in a county

h_{2009_i} = Head of 2009 at model cell i (feet)

h_{2070_i} = Head of 2070 at model cell i (feet)

e_i = Bottom elevation of model cell i (feet).

Model cells with head values below the cell bottom in 2009 were excluded from the calculation. Also, head was set at the cell bottom if it fell below the cell bottom at 2070.

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The comparison between the simulated remaining saturated thickness and the desired future conditions is presented in [Table B2](#). [Table B2](#) 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.

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TABLE B1. GROUNDWATER PUMPING RATES FOR THE MARBLE FALLS, ELLENBURGER-SAN SABA, AND HICKORY AQUIFERS IN BROWN, BURNET, LAMPASAS, AND MILLS COUNTIES PROVIDED BY GROUNDWATER MNAAGMENT AREA 8.

County	Aquifer	2010 to 2070 (acre-feet per year)
Burnet	Marble Falls	2,736
Lampasas	Marble Falls	2,837
Brown	Marble Falls	25
Mills	Marble Falls	25
Burnet	Ellenburger-San Saba	10,827
Lampasas	Ellenburger-San Saba	2,593
Brown	Ellenburger-San Saba	131
Mills	Ellenburger-San Saba	499
Burnet	Hickory	3,413
Lampasas	Hickory	113
Brown	Hickory	12
Mills	Hickory	36

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TABLE B2. COMPARISON BETWEEN SIMULATED REMAINING AQUIFER SATURATED THICKNESS AND DESIRED FUTURE CONDITIONS OF MARBLE FALLS, ELLENBURGER-SAN SABA, AND HICKORY AQUIFERS IN BROWN, BURNET, LAMPASAS, AND MILLS COUNTIES.

County	Aquifer	Remaining Aquifer Saturated Thickness Defined by Desired Future Condition	Simulated Remaining Aquifer Saturated Thickness	Is Desired Future Condition Met?
Brown	Marble Falls	at least 90%	99.8%	Yes
Brown	Ellenburger-San Saba	at least 90%	99.9%	Yes
Brown	Hickory	at least 90%	99.9%	Yes
Burnet	Marble Falls	at least 90%	98.8%	Yes
Burnet	Ellenburger-San Saba	at least 90%	99.3%	Yes
Burnet	Hickory	at least 90%	99.5%	Yes
Lampasas	Marble Falls	at least 90%	98.2%	Yes
Lampasas	Ellenburger-San Saba	at least 90%	99.0%	Yes
Lampasas	Hickory	at least 90%	99.5%	Yes
Mills	Marble Falls	at least 90%	99.5%	Yes
Mills	Ellenburger-San Saba	at least 90%	99.7%	Yes
Mills	Hickory	at least 90%	99.8%	Yes

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Appendix C

Summary of Dry Model Cell Count for the Trinity and Woodbine Aquifers

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TABLE C1. SUMMARY OF DRY MODEL CELLS FOR THE TRINITY AQUIFER (PALUXY) FROM THE REVISED PREDICTIVE SIMULATION.

Year	Collin	Dallas	Denton	Johnson	Tarrant
Total Active Official Aquifer Model Cells	12,062	14,532	3,520	11,627	15,389
2009 (baseline)	0	0	0	17	3
2010	0	0	9	0	3
2011	1	0	49	0	3
2012	4	0	83	0	17
2013	8	0	140	0	47
2014	35	0	196	0	91
2015	49	0	264	0	146
2016	64	0	306	0	209
2017	72	0	349	0	291
2018	83	0	385	0	373
2019	93	0	428	0	460
2020	99	0	482	0	555
2021	109	0	550	0	620
2022	115	0	622	0	684
2023	125	0	695	0	746
2024	129	0	780	0	802
2025	138	0	879	0	862
2026	147	0	957	0	919
2027	151	0	1,018	0	964
2028	159	0	1,087	0	995
2029	166	0	1,171	0	1,038
2030	173	0	1,262	0	1,072
2031	176	0	1,326	0	1,101
2032	180	0	1,379	0	1,137
2033	187	0	1,420	0	1,156
2034	193	0	1,461	0	1,194
2035	201	0	1,492	0	1,224
2036	204	0	1,520	0	1,240
2037	209	0	1,554	0	1,274
2038	212	0	1,584	0	1,292
2039	215	0	1,607	0	1,317
2040	217	0	1,627	0	1,347
2041	224	0	1,659	0	1,362
2042	228	0	1,682	0	1,377

GAM Run 17-029 MAG: Modeled Available Groundwater for the Trinity, Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory Aquifers in Groundwater Management Area 8

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Year	Collin	Dallas	Denton	Johnson	Tarrant
2043	235	0	1,710	0	1,409
2044	239	0	1,735	0	1,425
2045	242	0	1,755	0	1,438
2046	247	0	1,777	0	1,455
2047	250	0	1,790	0	1,477
2048	251	0	1,807	0	1,497
2049	253	0	1,823	0	1,517
2050	254	0	1,834	0	1,530
2051	258	2	1,847	0	1,539
2052	264	2	1,860	0	1,562
2053	266	2	1,874	0	1,585
2054	270	3	1,883	0	1,594
2055	272	3	1,893	0	1,606
2056	275	3	1,902	0	1,621
2057	276	3	1,923	0	1,634
2058	280	4	1,929	0	1,650
2059	282	4	1,934	0	1,666
2060	286	4	1,943	0	1,679
2061	288	4	1,947	0	1,693
2062	288	4	1,961	0	1,701
2063	290	5	1,973	0	1,712
2064	291	5	1,977	0	1,726
2065	292	5	1,988	0	1,739
2066	295	5	1,996	0	1,752
2067	297	6	2,002	0	1,760
2068	300	7	2,009	0	1,769
2069	304	7	2,017	0	1,778
2070	305	7	2,024	0	1,784

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TABLE C2. SUMMARY OF DRY MODEL CELLS FOR THE TRINITY AQUIFER (GLEN ROSE) FROM THE REVISED PREDICTIVE SIMULATION.

Year	Bell	Burnet	Coryell	Erath	Hamilton	Hood	Johnson	Mills	Parker	Travis
Total Active Official Aquifer Model Cells	23,737	22,534	41,647	20,905	36,944	14,461	12,342	10,615	11,389	14,552
2009 (baseline)	0	0	11	0	0	0	15	0	8	25
2010	0	0	11	0	0	0	15	0	9	29
2011	0	0	11	0	0	0	15	0	12	29
2012	0	0	11	0	0	0	15	0	15	29
2013	0	0	11	1	0	0	15	1	19	29
2014	0	1	11	1	0	1	15	1	22	31
2015	0	1	11	1	0	1	15	1	23	32
2016	0	1	12	1	0	1	15	1	30	33
2017	0	1	12	2	0	2	15	1	37	34
2018	0	1	12	3	0	2	15	1	38	34
2019	0	1	14	3	0	2	16	1	44	34
2020	0	1	14	3	0	2	16	1	46	34
2021	0	1	14	3	0	3	16	1	48	35
2022	0	1	14	3	0	3	16	1	49	38
2023	0	1	14	3	0	3	17	1	54	41
2024	0	1	15	3	0	3	17	1	58	45
2025	0	1	15	3	0	3	17	1	65	47
2026	0	1	15	3	0	5	19	1	72	48
2027	0	1	15	4	0	5	21	1	78	50
2028	0	1	15	4	0	5	21	1	82	51
2029	0	1	15	4	0	6	22	1	84	51
2030	0	1	15	4	0	6	22	1	90	54
2031	0	1	15	8	0	6	22	1	99	54
2032	0	1	15	8	0	8	23	1	103	55
2033	0	1	15	8	0	8	23	1	105	56
2034	0	1	15	9	0	9	23	1	108	56
2035	0	1	15	9	0	10	23	1	109	57
2036	0	1	15	9	0	12	23	1	110	58
2037	0	1	15	9	0	13	23	1	110	58
2038	0	1	15	9	0	14	23	1	113	59

GAM Run 17-029 MAG: Modeled Available Groundwater for the Trinity, Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory Aquifers in Groundwater Management Area 8

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Year	Bell	Burnet	Coryell	Erath	Hamilton	Hood	Johnson	Mills	Parker	Travis
2039	0	2	15	9	0	14	23	1	113	59
2040	0	2	15	9	0	14	23	1	116	60
2041	0	2	15	9	0	16	23	1	119	60
2042	0	2	15	10	1	16	23	1	122	61
2043	0	2	15	10	2	16	23	1	124	61
2044	0	2	15	10	2	18	24	1	125	62
2045	0	2	15	10	2	18	25	1	131	63
2046	0	2	15	10	2	18	25	1	131	63
2047	0	2	16	10	3	18	25	1	134	64
2048	0	2	16	10	4	18	26	1	137	64
2049	0	2	16	11	4	20	26	1	139	65
2050	0	2	16	11	4	22	26	1	143	65
2051	0	2	16	12	5	22	29	1	144	66
2052	1	2	16	12	5	22	31	1	147	66
2053	3	2	16	12	7	24	32	1	149	67
2054	4	2	17	12	7	27	32	1	151	67
2055	4	2	17	12	7	27	34	1	152	67
2056	4	2	17	12	7	30	34	1	152	68
2057	6	2	17	13	7	31	34	1	156	69
2058	7	2	17	13	7	31	34	1	159	69
2059	7	2	17	13	7	31	34	1	164	69
2060	7	2	17	13	8	34	34	1	166	69
2061	7	2	17	13	8	34	34	1	165	69
2062	7	2	17	13	9	35	34	1	168	69
2063	7	2	17	14	9	36	34	1	168	69
2064	7	2	17	16	9	36	34	1	172	69
2065	8	2	17	16	9	36	34	2	176	69
2066	8	2	17	16	10	36	34	2	180	69
2067	8	3	17	19	10	36	34	2	184	69
2068	8	3	17	19	11	38	34	2	188	69
2069	8	3	17	20	11	38	34	2	191	69
2070	8	4	17	20	11	41	34	2	194	69

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TABLE C3. SUMMARY OF DRY MODEL CELLS FOR THE TRINITY AQUIFER (TWIN MOUNTAINS) FROM THE REVISED PREDICTIVE SIMULATION.

Year	Denton	Erath	Hood	Johnson	Parker	Tarrant
Total Active Official Aquifer Model Cells	10,560	46,642	37,444	6,816	30,830	40,713
2009 (baseline)	0	20	0	0	0	0
2010	0	27	0	0	0	0
2011	0	33	0	0	0	0
2012	0	40	0	0	0	0
2013	0	44	0	0	0	0
2014	0	48	0	0	0	0
2015	0	53	0	0	0	0
2016	0	56	0	0	0	0
2017	0	61	0	0	0	0
2018	0	65	0	0	0	0
2019	0	68	1	0	0	0
2020	0	71	1	0	0	0
2021	0	76	1	0	1	0
2022	0	80	1	0	4	0
2023	0	81	1	0	8	2
2024	0	85	4	0	13	6
2025	0	88	7	0	16	10
2026	0	91	15	0	17	16
2027	0	94	18	0	18	25
2028	0	97	23	0	18	32
2029	0	101	28	0	23	36
2030	0	107	33	0	24	41
2031	1	108	41	0	25	48
2032	1	111	46	0	25	53
2033	1	119	56	0	26	56
2034	1	122	64	0	27	66
2035	1	123	68	0	27	74
2036	2	126	75	0	29	93
2037	2	131	82	0	29	127
2038	2	134	95	0	30	170
2039	2	136	100	0	31	231
2040	2	137	114	0	32	289
2041	2	143	129	0	32	354

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Year	Denton	Erath	Hood	Johnson	Parker	Tarrant
2042	2	146	137	0	32	426
2043	2	150	150	0	32	500
2044	2	154	165	0	32	587
2045	3	157	178	0	34	648
2046	4	161	194	0	35	711
2047	4	167	212	0	36	767
2048	4	171	228	0	38	832
2049	5	174	242	0	38	889
2050	7	176	251	0	38	930
2051	8	178	262	0	38	996
2052	8	181	272	2	38	1,057
2053	9	184	282	7	38	1,114
2054	9	186	297	13	39	1,169
2055	9	189	313	19	40	1,234
2056	10	194	320	26	40	1,303
2057	11	196	330	33	41	1,366
2058	14	207	336	41	42	1,435
2059	14	211	341	49	42	1,508
2060	15	221	351	57	42	1,595
2061	16	221	363	67	43	1,681
2062	17	223	368	75	43	1,783
2063	18	224	375	83	43	1,899
2064	20	228	385	94	45	1,988
2065	22	229	393	105	46	2,104
2066	23	231	401	115	47	2,188
2067	24	233	408	130	47	2,285
2068	27	236	416	139	47	2,364
2069	31	240	424	155	47	2,468
2070	35	242	429	168	47	2,553

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TABLE C4. SUMMARY OF DRY MODEL CELLS FOR THE TRINITY AQUIFER (TRAVIS PEAK) FROM THE REVISED PREDICTIVE SIMULATION.

Year	Burnet	Comanche	Erath	Johnson	Lampasas	McLennan	Travis
Total Active Official Aquifer Model Cells	46,474	78,137	39,220	28,386	63,905	50,973	30,318
2009 (baseline)	217	0	0	0	1	0	57
2010	176	0	1	0	1	0	59
2011	186	0	1	0	1	0	60
2012	218	0	1	0	1	0	63
2013	249	0	1	0	1	0	65
2014	271	0	1	0	1	0	68
2015	291	0	1	0	1	0	68
2016	314	0	3	0	1	0	70
2017	331	0	4	0	1	0	70
2018	345	0	5	0	1	0	71
2019	363	0	6	0	1	0	72
2020	378	0	11	0	1	0	72
2021	394	0	17	0	1	0	74
2022	400	0	29	0	1	0	74
2023	414	0	59	0	1	0	76
2024	424	0	93	0	1	0	77
2025	438	1	114	0	1	0	77
2026	450	9	130	0	1	0	79
2027	463	14	160	0	1	0	80
2028	474	14	183	0	1	0	80
2029	483	18	205	0	1	0	82
2030	494	30	238	0	1	0	82
2031	505	34	266	0	1	0	83
2032	512	35	299	0	1	0	83
2033	520	41	328	0	1	0	84
2034	527	54	343	0	1	0	85
2035	533	67	351	0	1	0	85
2036	543	72	370	0	1	0	87
2037	545	77	398	0	1	0	88
2038	554	85	414	0	1	0	88
2039	564	94	421	0	1	0	90
2040	571	103	435	0	1	1	90
2041	579	111	453	0	1	1	91
2042	588	116	481	0	1	1	92

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Year	Burnet	Comanche	Erath	Johnson	Lampasas	McLennan	Travis
2043	599	116	497	0	1	1	93
2044	604	121	507	0	1	1	93
2045	609	128	520	0	1	1	94
2046	618	138	538	0	1	1	95
2047	623	146	557	0	1	2	97
2048	629	152	590	0	1	2	97
2049	634	160	606	0	1	2	98
2050	640	166	620	0	1	2	99
2051	644	172	638	1	1	2	100
2052	648	180	651	1	1	2	100
2053	654	186	665	1	1	2	101
2054	658	190	678	1	1	2	102
2055	670	194	690	1	1	2	103
2056	675	196	699	1	1	2	103
2057	678	199	711	1	1	2	104
2058	692	206	723	1	1	2	105
2059	702	216	746	1	1	2	106
2060	717	222	774	1	1	2	106
2061	714	225	776	1	1	2	106
2062	719	227	790	1	1	2	107
2063	723	231	799	1	1	3	107
2064	728	235	813	2	1	3	109
2065	730	238	822	3	1	3	109
2066	730	245	832	3	1	3	109
2067	734	252	841	3	1	3	110
2068	741	258	850	3	1	3	110
2069	745	264	861	6	1	3	111
2070	748	269	871	7	1	3	112

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TABLE C5. SUMMARY OF DRY MODEL CELLS FOR THE TRINITY AQUIFER (HENSELL) FROM THE REVISED PREDICTIVE SIMULATION.

Year	Erath	Lampasas
Total Active Official Aquifer Model Cells	21,880	25,364
2009 (baseline)	0	1
2010	0	1
2011	0	1
2012	0	1
2013	0	1
2014	0	1
2015	0	1
2016	0	1
2017	0	1
2018	0	1
2019	0	1
2020	0	1
2021	0	1
2022	0	1
2023	0	1
2024	0	1
2025	0	1
2026	0	1
2027	0	1
2028	0	1
2029	0	1
2030	0	1
2031	0	1
2032	0	1
2033	0	1
2034	0	1
2035	0	1
2036	0	1
2037	0	1
2038	0	1
2039	0	1
2040	1	1
2041	1	1
2042	3	1
2043	3	1

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Year	Erath	Lampasas
2044	3	1
2045	6	1
2046	7	1
2047	7	1
2048	12	1
2049	14	1
2050	14	1
2051	18	1
2052	20	1
2053	22	1
2054	24	1
2055	25	1
2056	25	1
2057	30	1
2058	31	1
2059	35	1
2060	37	1
2061	37	1
2062	40	1
2063	42	1
2064	42	1
2065	44	1
2066	46	1
2067	46	1
2068	48	1
2069	50	1
2070	52	1

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TABLE C6. SUMMARY OF DRY MODEL CELLS FOR THE TRINITY AQUIFER (HOSSTON) FROM THE REVISED PREDICTIVE SIMULATION.

Year	Burnet	Comanche	Erath	Johnson	McLennan	Travis
Total Active Official Aquifer Model Cells	24,354	41,062	8,464	9,462	16,991	9,480
2009 (baseline)	217	0	0	0	0	57
2010	176	0	1	0	0	59
2011	186	0	1	0	0	60
2012	218	0	1	0	0	63
2013	247	0	1	0	0	65
2014	269	0	1	0	0	68
2015	288	0	1	0	0	68
2016	310	0	1	0	0	70
2017	325	0	1	0	0	70
2018	338	0	1	0	0	71
2019	353	0	1	0	0	72
2020	368	0	1	0	0	72
2021	382	0	2	0	0	74
2022	387	0	9	0	0	74
2023	400	0	25	0	0	76
2024	409	0	51	0	0	77
2025	423	1	66	0	0	77
2026	433	9	75	0	0	79
2027	444	14	93	0	0	80
2028	455	14	99	0	0	80
2029	463	18	105	0	0	82
2030	473	30	111	0	0	82
2031	484	34	118	0	0	83
2032	491	35	127	0	0	83
2033	498	41	132	0	0	84
2034	505	54	138	0	0	85
2035	511	67	143	0	0	85
2036	520	72	151	0	0	87
2037	522	77	158	0	0	88
2038	531	85	162	0	0	88
2039	541	94	162	0	0	90
2040	547	103	166	0	1	90
2041	555	111	174	0	1	91
2042	563	116	183	0	1	92
2043	570	116	187	0	1	93

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Year	Burnet	Comanche	Erath	Johnson	McLennan	Travis
2044	575	121	192	0	1	93
2045	579	128	198	0	1	94
2046	588	138	206	0	1	95
2047	591	146	211	0	2	97
2048	597	152	219	0	2	97
2049	602	160	222	0	2	98
2050	607	166	227	0	2	99
2051	609	172	229	1	2	100
2052	613	180	232	1	2	100
2053	619	186	239	1	2	101
2054	623	190	246	1	2	102
2055	633	194	253	1	2	103
2056	637	196	259	1	2	103
2057	640	199	263	1	2	104
2058	651	206	269	1	2	105
2059	659	216	283	1	2	106
2060	673	222	294	1	2	106
2061	671	225	295	1	2	106
2062	675	227	297	1	2	107
2063	679	231	299	1	3	107
2064	684	235	305	2	3	109
2065	686	238	307	3	3	109
2066	686	245	310	3	3	109
2067	689	252	315	3	3	110
2068	696	258	317	3	3	110
2069	700	264	320	6	3	111
2070	703	269	323	7	3	112

GAM Run 17-029 MAG: Modeled Available Groundwater for the Trinity, Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory Aquifers in Groundwater Management Area 8

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TABLE C7. SUMMARY OF DRY MODEL CELLS FOR THE TRINITY AQUIFER (ANTLERS) FROM THE REVISED PREDICTIVE SIMULATION.

Year	Collin	Comanche	Cooke	Denton	Eastland	Erath	Grayson	Montague	Parker	Tarrant	Wise
Total Active Official Aquifer Model Cells	7,055	23,711	77,143	59,107	44,009	9,287	77,954	56,141	42,539	5,009	92,333
2009 (baseline)	0	123	0	0	74	0	0	0	0	0	0
2010	1	80	0	0	91	6	0	0	0	0	1
2011	3	85	0	5	94	13	0	0	0	0	5
2012	7	92	0	29	99	29	0	0	0	0	6
2013	11	99	0	95	108	34	0	0	0	1	6
2014	16	103	1	201	110	36	0	0	0	6	6
2015	22	111	2	341	111	36	0	0	0	15	8
2016	30	120	3	500	113	36	0	0	0	28	67
2017	37	130	4	616	115	36	2	0	0	40	221
2018	44	141	7	721	117	39	6	0	1	58	372
2019	47	156	10	806	120	44	10	0	1	78	484
2020	53	167	17	901	125	48	22	0	2	94	574
2021	57	176	27	1,017	127	51	29	0	2	111	654
2022	62	186	37	1,199	130	52	36	0	2	124	741
2023	67	202	49	1,375	130	60	48	0	6	140	810
2024	71	230	64	1,543	133	74	57	0	9	151	879
2025	77	270	76	1,692	137	81	72	0	19	158	947
2026	79	294	95	1,803	139	90	90	0	54	162	995
2027	83	327	111	1,903	149	102	101	0	84	167	1,053
2028	86	373	123	1,983	156	110	106	0	112	171	1,109
2029	90	422	140	2,056	162	128	117	0	141	179	1,180
2030	94	448	152	2,121	179	171	122	0	166	183	1,236

GAM Run 17-029 MAG: Modeled Available Groundwater for the Trinity, Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory Aquifers in Groundwater Management Area 8

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Year	Collin	Comanche	Cooke	Denton	Eastland	Erath	Grayson	Montague	Parker	Tarrant	Wise
2031	96	478	164	2,180	204	185	134	0	184	190	1,294
2032	100	517	175	2,244	221	197	140	0	206	195	1,368
2033	103	554	185	2,299	233	208	148	0	218	202	1,479
2034	105	617	199	2,364	236	222	152	0	234	208	1,551
2035	110	669	216	2,436	242	225	161	0	244	215	1,628
2036	111	710	222	2,517	249	232	168	0	254	222	1,713
2037	113	771	234	2,623	259	246	175	0	262	229	1,809
2038	116	836	245	2,708	282	262	184	0	270	236	1,879
2039	121	865	256	2,788	304	283	191	0	278	244	1,952
2040	122	913	264	2,879	321	303	195	0	285	256	2,029
2041	123	957	276	2,951	331	313	201	0	292	291	2,085
2042	126	998	292	3,038	344	326	205	0	295	349	2,130
2043	128	1,032	300	3,119	363	334	210	0	303	383	2,174
2044	130	1,074	307	3,189	380	351	215	0	305	414	2,214
2045	131	1,129	314	3,251	397	359	221	0	309	446	2,253
2046	131	1,171	323	3,336	412	372	230	0	312	472	2,291
2047	136	1,221	333	3,405	442	390	233	0	318	501	2,349
2048	137	1,266	340	3,465	453	415	239	0	319	533	2,382
2049	139	1,320	353	3,524	474	440	240	0	325	558	2,413
2050	141	1,351	361	3,589	502	455	244	0	326	583	2,442
2051	141	1,389	367	3,633	525	468	247	0	327	608	2,458
2052	143	1,435	376	3,688	548	482	254	0	331	632	2,480
2053	146	1,469	379	3,745	590	493	257	0	332	652	2,496
2054	147	1,510	384	3,788	619	506	258	0	334	671	2,518
2055	148	1,548	392	3,849	645	526	264	0	335	697	2,533
2056	149	1,585	399	3,897	668	548	267	0	337	719	2,545

GAM Run 17-029 MAG: Modeled Available Groundwater for the Trinity, Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory Aquifers in Groundwater Management Area 8

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Year	Collin	Comanche	Cooke	Denton	Eastland	Erath	Grayson	Montague	Parker	Tarrant	Wise
2057	150	1,626	402	3,948	681	564	270	0	340	754	2,558
2058	150	1,703	407	3,981	715	578	274	0	340	788	2,574
2059	152	1,750	411	4,028	733	606	280	1	346	817	2,586
2060	154	1,813	416	4,067	751	627	283	1	346	845	2,594
2061	155	1,846	424	4,115	756	637	283	1	350	872	2,607
2062	156	1,909	428	4,152	777	646	287	1	350	898	2,616
2063	158	1,944	434	4,193	793	673	288	1	350	930	2,629
2064	158	1,968	441	4,232	807	711	292	1	350	953	2,635
2065	158	2,001	448	4,260	821	744	294	1	350	966	2,642
2066	158	2,065	450	4,295	842	770	298	1	352	984	2,653
2067	160	2,117	454	4,335	854	792	301	1	354	1,005	2,665
2068	162	2,154	455	4,360	863	802	303	1	355	1,016	2,676
2069	162	2,198	459	4,395	876	825	303	1	359	1,017	2,684
2070	164	2,268	462	4,438	881	846	307	1	360	1,019	2,691

GAM Run 17-029 MAG: Modeled Available Groundwater for the Trinity, Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory Aquifers in Groundwater Management Area 8

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TABLE C8. SUMMARY OF DRY MODEL CELLS FOR THE WOODBINE AQUIFER FROM THE REVISED PREDICTIVE SIMULATION.

Year	Collin	Cooke	Denton	Fannin	Grayson	Johnson	Tarrant
Total Active Model Cells in Official Aquifer Boundary	11,762	5,700	11,991	15,443	17,911	8,407	8,901
2009 (baseline)	0	0	3	3	2	14	2
2010	0	4	3	3	3	16	2
2011	0	4	3	4	3	16	2
2012	0	4	3	4	5	16	2
2013	0	4	3	4	5	19	2
2014	0	4	3	5	6	23	2
2015	0	4	3	6	7	23	2
2016	0	5	3	6	8	23	2
2017	0	5	3	8	9	24	2
2018	0	5	3	9	10	26	2
2019	0	5	3	10	11	26	2
2020	0	5	3	11	11	26	2
2021	0	5	3	12	13	27	2
2022	0	5	3	12	14	28	2
2023	0	5	3	12	14	28	2
2024	0	5	4	13	14	29	2
2025	0	5	5	14	15	29	2
2026	0	5	5	15	15	30	2
2027	0	5	5	15	15	31	2
2028	0	6	5	15	15	33	2
2029	0	6	5	15	15	34	2
2030	0	6	5	15	15	36	2
2031	0	6	5	16	15	37	2
2032	0	6	5	17	16	37	2
2033	0	6	5	18	17	38	2
2034	0	6	5	20	18	40	2
2035	0	6	5	21	19	40	2
2036	0	6	5	22	19	41	2
2037	0	6	5	24	19	41	2
2038	0	6	5	25	23	42	2
2039	0	6	5	26	25	42	2
2040	0	6	5	27	25	42	2
2041	0	6	5	27	25	42	2

GAM Run 17-029 MAG: Modeled Available Groundwater for the Trinity, Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory Aquifers in Groundwater Management Area 8

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Year	Collin	Cooke	Denton	Fannin	Grayson	Johnson	Tarrant
2042	0	6	5	27	27	42	2
2043	0	6	5	27	27	42	2
2044	0	6	5	28	30	42	2
2045	0	6	5	29	31	43	2
2046	0	6	6	30	31	43	2
2047	0	6	6	30	31	43	2
2048	0	6	7	32	34	43	2
2049	0	6	8	35	34	43	2
2050	0	7	8	35	35	43	2
2051	0	8	8	35	35	43	2
2052	0	8	8	37	35	43	2
2053	0	8	8	38	35	44	2
2054	0	8	8	38	37	45	2
2055	0	9	8	38	38	45	2
2056	0	10	8	38	38	46	2
2057	0	10	9	39	38	46	2
2058	0	10	9	42	39	50	3
2059	0	10	9	44	40	52	3
2060	0	13	9	47	41	54	3
2061	0	14	9	47	41	53	3
2062	0	14	9	47	41	53	3
2063	0	17	9	47	42	55	3
2064	0	20	9	47	42	55	3
2065	0	21	9	47	42	56	3
2066	1	23	9	47	42	57	3
2067	1	23	9	48	45	58	3
2068	2	24	9	49	45	59	3
2069	2	24	9	50	45	59	3
2070	2	24	9	50	45	60	3

GAM Run 17-029 MAG: Modeled Available Groundwater for the Trinity, Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory Aquifers in Groundwater Management Area 8

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Appendix D

Summary of Dry Model Cell Count for the Marble Falls, Ellenburger-San Saba, and Hickory Aquifers in Brown, Burnet, Lampasas, and Mills Counties

GAM Run 17-029 MAG: Modeled Available Groundwater for the Trinity, Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory Aquifers in Groundwater Management Area 8

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TABLE D1. SUMMARY OF DRY MODEL CELLS FOR THE MARBLE FALLS, ELLENBURGER-SAN SABA, AND HICKORY AQUIFERS IN BROWN, BURNET, LAMPASAS, AND MILLS COUNTIES FROM THE PREDICTIVE SIMULATION.

Year	Burnet	Lampasas	Burnet	Burnet
	Marble Falls		Ellenburger-San Saba	Hickory
Total Active Cells in modeled extent	10,810	7,614	13,618	14,334
2009 (baseline)	2298	611	709	111
2010	2353	631	724	112
2011	2363	638	735	112
2012	2376	641	744	113
2013	2386	642	758	113
2014	2391	646	769	113
2015	2395	650	776	113
2016	2397	653	781	115
2017	2405	654	787	117
2018	2406	657	795	117
2019	2409	659	801	118
2020	2413	661	804	118
2021	2419	661	809	118
2022	2419	661	810	118
2023	2421	661	811	118
2024	2422	662	813	119
2025	2423	662	817	120
2026	2425	664	821	120
2027	2426	665	821	120
2028	2428	666	823	120
2029	2433	667	824	122
2030	2433	669	824	123
2031	2435	670	825	123
2032	2436	671	828	123
2033	2438	671	830	123
2034	2440	672	832	124
2035	2441	673	832	124
2036	2441	675	833	124
2037	2442	676	833	124
2038	2442	677	834	125
2039	2443	678	837	126
2040	2443	678	837	126

GAM Run 17-029 MAG: Modeled Available Groundwater for the Trinity, Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory Aquifers in Groundwater Management Area 8

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Year	Burnet	Lampasas	Burnet	Burnet
	Marble Falls		Ellenburger-San Saba	Hickory
2041	2443	680	839	126
2042	2443	680	840	126
2043	2443	680	842	127
2044	2444	680	842	127
2045	2445	680	842	128
2046	2446	680	843	128
2047	2446	680	843	128
2048	2446	680	843	128
2049	2446	680	844	128
2050	2446	680	845	128
2051	2446	681	846	128
2052	2446	681	846	128
2053	2446	681	846	130
2054	2446	681	846	130
2055	2447	681	846	130
2056	2447	681	847	130
2057	2447	681	848	130
2058	2447	682	848	130
2059	2448	682	849	130
2060	2448	682	849	130
2061	2448	682	849	130
2062	2448	682	849	130
2063	2448	682	849	130
2064	2449	682	849	130
2065	2449	683	849	130
2066	2449	683	849	130
2067	2449	683	850	130
2068	2449	683	850	130
2069	2450	683	850	130
2070	2450	683	850	130

APPENDIX F

Estimated Historical Water Use and 2017 State Water Plan Data Sets

Estimated Historical Water Use And 2017 State Water Plan Datasets:

Red River Groundwater Conservation District

by Stephen Allen
Texas Water Development Board
Groundwater Division
Groundwater Technical Assistance Section
stephen.allen@twdb.texas.gov
(512) 463-7317
January 19, 2017

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 1/19/2017. 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) or Rima Petrossian (rima.petrossian@twdb.texas.gov or 512-936-2420).

Estimated Historical Water Use

TWDB Historical Water Use Survey (WUS) Data

Groundwater and surface water historical use estimates are currently unavailable for calendar year 2015. TWDB staff anticipates the calculation and posting of these estimates at a later date.

FANNIN COUNTY

All values are in acre-feet

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2014	GW	2,615	0	0	0	1,578	1,356	5,549
	SW	1,447	0	224	0	11,374	151	13,196
2013	GW	3,158	0	0	0	676	1,364	5,198
	SW	1,594	0	505	0	12,081	150	14,330
2012	GW	3,326	0	0	0	2,757	1,092	7,175
	SW	1,517	5	449	0	10,818	121	12,910
2011	GW	3,607	0	0	0	743	1,272	5,622
	SW	1,764	12	574	0	6,013	141	8,504
2010	GW	3,269	0	2	319	1,090	1,259	5,939
	SW	1,540	0	428	65	8,800	140	10,973
2009	GW	3,010	0	2	373	1,888	1,445	6,718
	SW	1,475	0	127	307	14,346	160	16,415
2008	GW	3,140	0	2	486	0	1,321	4,949
	SW	1,603	0	132	285	9,153	147	11,320
2007	GW	2,945	0	1	373	0	1,705	5,024
	SW	1,620	0	0	0	4,324	188	6,132
2006	GW	3,377	0	6	80	0	1,495	4,958
	SW	1,596	5	0	281	5,567	166	7,615
2005	GW	2,986	0	19	71	322	1,539	4,937
	SW	1,632	5	0	0	5,907	171	7,715
2004	GW	2,677	0	7	243	921	86	3,934
	SW	1,564	5	8	1	78	1,418	3,074
2003	GW	2,592	0	0	259	1,132	88	4,071
	SW	1,733	5	24	0	6,506	1,449	9,717
2002	GW	2,553	0	0	261	1,862	70	4,746
	SW	1,772	5	50	302	5,585	1,140	8,854
2001	GW	2,947	0	0	405	1,848	73	5,273
	SW	2,000	39	84	2,363	5,543	1,194	11,223
2000	GW	2,800	0	0	503	1,158	125	4,586
	SW	1,758	58	75	3,194	3,450	1,143	9,678

Estimated Historical Water Use and 2017 State Water Plan Dataset:

Red River Groundwater Conservation District

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GRAYSON COUNTY

All values are in acre-feet

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2014	GW	8,759	758	229	0	2,632	305	12,683
	SW	7,891	617	57	0	611	915	10,091
2013	GW	9,405	1,029	42	0	3,533	267	14,276
	SW	7,907	1,019	10	0	619	804	10,359
2012	GW	11,392	1,183	76	0	7,589	223	20,463
	SW	8,779	861	17	0	707	667	11,031
2011	GW	10,935	696	22	0	3,668	319	15,640
	SW	14,594	557	57	0	750	958	16,916
2010	GW	9,818	1,649	18	0	1,690	314	13,489
	SW	7,250	978	48	0	450	940	9,666
2009	GW	9,979	1,171	15	0	222	293	11,680
	SW	7,397	435	39	0	1,326	877	10,074
2008	GW	10,324	993	12	0	0	281	11,610
	SW	8,358	436	31	0	394	844	10,063
2007	GW	10,078	904	0	0	616	536	12,134
	SW	7,231	919	0	0	327	1,608	10,085
2006	GW	10,649	1,234	0	0	334	360	12,577
	SW	9,844	1,008	0	0	937	1,080	12,869
2005	GW	9,542	1,290	0	0	1,911	353	13,096
	SW	9,182	2,227	0	0	311	1,058	12,778
2004	GW	9,579	1,193	0	0	1,546	70	12,388
	SW	9,583	800	0	0	144	1,212	11,739
2003	GW	9,770	1,937	0	0	1,733	70	13,510
	SW	8,708	1,016	0	0	467	1,212	11,403
2002	GW	9,720	1,780	0	0	1,738	68	13,306
	SW	14,584	1,061	0	0	237	1,196	17,078
2001	GW	10,478	2,728	0	0	1,720	71	14,997
	SW	10,203	2,110	0	0	234	1,242	13,789
2000	GW	10,602	3,030	0	0	2,972	130	16,734
	SW	9,479	2,704	0	0	410	1,167	13,760

Projected Surface Water Supplies

TWDB 2017 State Water Plan Data

FANNIN COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
C	BONHAM	RED	BONHAM LAKE/RESERVOIR	2,024	2,492	2,636	2,665	2,747	2,813
C	COUNTY-OTHER, FANNIN	RED	BONHAM LAKE/RESERVOIR	299	443	365	352	289	240
C	COUNTY-OTHER, FANNIN	RED	RED RUN-OF-RIVER	15	14	15	15	14	14
C	COUNTY-OTHER, FANNIN	RED	SULPHUR RUN-OF-RIVER	36	36	38	37	36	35
C	COUNTY-OTHER, FANNIN	SULPHUR	BONHAM LAKE/RESERVOIR	29	47	69	91	68	57
C	COUNTY-OTHER, FANNIN	SULPHUR	RED RUN-OF-RIVER	1	2	3	4	4	4
C	COUNTY-OTHER, FANNIN	SULPHUR	SULPHUR RUN-OF-RIVER	4	4	7	10	9	9
C	COUNTY-OTHER, FANNIN	TRINITY	BONHAM LAKE/RESERVOIR	71	117	43	21	31	30
C	COUNTY-OTHER, FANNIN	TRINITY	RED RUN-OF-RIVER	4	4	2	1	2	2
C	COUNTY-OTHER, FANNIN	TRINITY	SULPHUR RUN-OF-RIVER	9	9	4	2	4	5
C	IRRIGATION, FANNIN	RED	RED RUN-OF-RIVER	4,281	4,281	4,281	4,281	4,281	4,281
C	IRRIGATION, FANNIN	SULPHUR	RED RUN-OF-RIVER	81	81	81	81	81	81
C	IRRIGATION, FANNIN	TRINITY	RED RUN-OF-RIVER	251	251	251	251	251	251
C	LIVESTOCK, FANNIN	RED	RED LIVESTOCK LOCAL SUPPLY	725	725	725	725	725	725
C	LIVESTOCK, FANNIN	RED	SULPHUR LIVESTOCK LOCAL SUPPLY	202	202	202	202	202	202
C	LIVESTOCK, FANNIN	RED	TRINITY LIVESTOCK LOCAL SUPPLY	45	45	45	45	45	45
C	LIVESTOCK, FANNIN	SULPHUR	RED LIVESTOCK LOCAL SUPPLY	202	202	202	202	202	202
C	LIVESTOCK, FANNIN	SULPHUR	SULPHUR LIVESTOCK LOCAL SUPPLY	57	57	57	57	57	57
C	LIVESTOCK, FANNIN	SULPHUR	TRINITY LIVESTOCK LOCAL SUPPLY	13	13	13	13	13	13
C	LIVESTOCK, FANNIN	TRINITY	RED LIVESTOCK LOCAL SUPPLY	46	46	46	46	46	46
C	LIVESTOCK, FANNIN	TRINITY	SULPHUR LIVESTOCK LOCAL SUPPLY	13	13	13	13	13	13
C	LIVESTOCK, FANNIN	TRINITY	TRINITY LIVESTOCK LOCAL SUPPLY	3	3	3	3	3	3

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Red River Groundwater Conservation District

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Projected Surface Water Supplies TWDB 2017 State Water Plan Data

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
C	MANUFACTURING, FANNIN	RED	BONHAM LAKE/RESERVOIR	88	96	82	66	60	55
C	MINING, FANNIN	RED	RED RUN-OF-RIVER	55	55	55	55	55	55
C	MINING, FANNIN	SULPHUR	RED RUN-OF-RIVER	17	17	17	17	17	17
C	STEAM ELECTRIC POWER, FANNIN	RED	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION	6,363	6,363	6,363	6,363	6,363	6,363
Sum of Projected Surface Water Supplies (acre-feet)				14,934	15,618	15,618	15,618	15,618	15,618

GRAYSON COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
C	COUNTY-OTHER, GRAYSON	RED	RANDELL LAKE/RESERVOIR	57	57	57	57	58	59
C	COUNTY-OTHER, GRAYSON	RED	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION	5,057	4,827	4,432	3,929	3,358	3,642
C	COUNTY-OTHER, GRAYSON	TRINITY	RANDELL LAKE/RESERVOIR	3	3	3	3	2	1
C	COUNTY-OTHER, GRAYSON	TRINITY	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION	246	240	225	238	105	65
C	DENISON	RED	RANDELL LAKE/RESERVOIR	604	541	481	430	352	268
C	DENISON	RED	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION	5,920	5,905	5,947	6,038	6,177	6,330
C	HOWE	RED	CHAPMAN/COOPER LAKE/RESERVOIR NORTH TEXAS MWD SYSTEM	0	1	2	2	3	3
C	HOWE	RED	LAVON LAKE/RESERVOIR NORTH TEXAS MWD SYSTEM	0	1	4	5	6	7
C	HOWE	RED	TEXOMA LAKE/RESERVOIR NORTH TEXAS MWD SYSTEM	0	2	3	4	5	6
C	HOWE	TRINITY	CHAPMAN/COOPER LAKE/RESERVOIR NORTH TEXAS MWD SYSTEM	1	3	4	6	7	9

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Projected Surface Water Supplies TWDB 2017 State Water Plan Data

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
C	HOWE	TRINITY	LAVON LAKE/RESERVOIR NORTH TEXAS MWD SYSTEM	1	4	10	12	16	18
C	HOWE	TRINITY	TEXOMA LAKE/RESERVOIR NORTH TEXAS MWD SYSTEM	1	4	7	10	13	15
C	IRRIGATION, GRAYSON	RED	RED RUN-OF-RIVER	593	593	593	593	593	593
C	IRRIGATION, GRAYSON	RED	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION	82	81	81	82	82	82
C	IRRIGATION, GRAYSON	TRINITY	RED RUN-OF-RIVER	498	498	498	498	498	498
C	IRRIGATION, GRAYSON	TRINITY	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION	68	69	69	68	68	68
C	LIVESTOCK, GRAYSON	RED	RED LIVESTOCK LOCAL SUPPLY	439	439	439	439	439	439
C	LIVESTOCK, GRAYSON	RED	TRINITY LIVESTOCK LOCAL SUPPLY	248	248	248	248	248	248
C	LIVESTOCK, GRAYSON	TRINITY	RED LIVESTOCK LOCAL SUPPLY	248	248	248	248	248	248
C	LIVESTOCK, GRAYSON	TRINITY	TRINITY LIVESTOCK LOCAL SUPPLY	140	140	140	140	140	140
C	MANUFACTURING, GRAYSON	RED	CHAPMAN/COOPER LAKE/RESERVOIR NORTH TEXAS MWD SYSTEM	6	5	5	5	5	4
C	MANUFACTURING, GRAYSON	RED	LAVON LAKE/RESERVOIR NORTH TEXAS MWD SYSTEM	14	12	10	9	9	10
C	MANUFACTURING, GRAYSON	RED	RANDELL LAKE/RESERVOIR	732	795	855	905	983	1,067
C	MANUFACTURING, GRAYSON	RED	RED RUN-OF-RIVER	30	30	30	30	30	30
C	MANUFACTURING, GRAYSON	RED	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION	3,601	3,699	3,577	3,281	2,775	2,089
C	MANUFACTURING, GRAYSON	RED	TEXOMA LAKE/RESERVOIR NORTH TEXAS MWD SYSTEM	11	9	8	8	8	8
C	MANUFACTURING, GRAYSON	TRINITY	CHAPMAN/COOPER LAKE/RESERVOIR NORTH TEXAS MWD SYSTEM	0	0	0	0	0	0

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Projected Surface Water Supplies TWDB 2017 State Water Plan Data

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
C	MANUFACTURING, GRAYSON	TRINITY	LAVON LAKE/RESERVOIR NORTH TEXAS MWD SYSTEM	0	0	0	0	0	0
C	MANUFACTURING, GRAYSON	TRINITY	RANDELL LAKE/RESERVOIR	4	4	4	5	5	5
C	MANUFACTURING, GRAYSON	TRINITY	RED RUN-OF-RIVER	0	0	0	0	0	0
C	MANUFACTURING, GRAYSON	TRINITY	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION	18	19	18	16	14	11
C	MANUFACTURING, GRAYSON	TRINITY	TEXOMA LAKE/RESERVOIR NORTH TEXAS MWD SYSTEM	0	0	0	0	0	0
C	MARILEE SUD	TRINITY	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION	105	100	89	78	60	42
C	MINING, GRAYSON	RED	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION	100	100	100	100	100	100
C	POTTSBORO	RED	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION	362	441	458	419	357	288
C	SHERMAN	RED	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION	5,086	5,124	5,485	6,067	6,982	7,610
C	STEAM ELECTRIC POWER, GRAYSON	RED	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION	3,698	3,698	3,698	3,698	3,698	3,698
C	STEAM ELECTRIC POWER, GRAYSON	TRINITY	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION	2,465	2,465	2,465	2,465	2,465	2,465
C	VAN ALSTYNE	TRINITY	CHAPMAN/COOPER LAKE/RESERVOIR NORTH TEXAS MWD SYSTEM	0	9	16	22	126	141
C	VAN ALSTYNE	TRINITY	LAVON LAKE/RESERVOIR NORTH TEXAS MWD SYSTEM	0	19	33	47	261	292
C	VAN ALSTYNE	TRINITY	TEXOMA LAKE/RESERVOIR NORTH TEXAS MWD SYSTEM	0	16	27	39	220	247

Estimated Historical Water Use and 2017 State Water Plan Dataset:

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Projected Surface Water Supplies TWDB 2017 State Water Plan Data

Sum of Projected Surface Water Supplies (acre-feet)	30,438	30,449	30,369	30,244	30,516	30,846
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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.

FANNIN COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
C	BONHAM	RED	2,024	2,506	3,393	4,598	5,663	6,883
C	COUNTY-OTHER, FANNIN	RED	1,098	1,031	1,045	1,400	2,989	4,757
C	COUNTY-OTHER, FANNIN	SULPHUR	107	109	197	361	703	1,142
C	COUNTY-OTHER, FANNIN	TRINITY	261	271	122	85	318	604
C	ECTOR	RED	87	92	96	101	109	118
C	HICKORY CREEK SUD	SULPHUR	27	29	30	32	35	38
C	HICKORY CREEK SUD	TRINITY	2	2	2	2	2	2
C	HONEY GROVE	RED	61	62	61	60	60	60
C	HONEY GROVE	SULPHUR	213	218	213	211	211	211
C	IRRIGATION, FANNIN	RED	7,703	7,703	7,703	7,703	7,703	7,703
C	IRRIGATION, FANNIN	SULPHUR	146	146	146	146	146	146
C	IRRIGATION, FANNIN	TRINITY	452	452	452	452	452	452
C	LADONIA	SULPHUR	120	144	155	175	210	209
C	LEONARD	RED	3	3	3	4	4	4
C	LEONARD	SULPHUR	7	7	7	8	8	9
C	LEONARD	TRINITY	321	342	358	374	405	439
C	LIVESTOCK, FANNIN	RED	1,243	1,243	1,243	1,243	1,243	1,243
C	LIVESTOCK, FANNIN	SULPHUR	347	347	347	347	347	347
C	LIVESTOCK, FANNIN	TRINITY	78	78	78	78	78	78
C	MANUFACTURING, FANNIN	RED	88	97	106	114	124	135
C	MINING, FANNIN	RED	97	97	97	97	97	97
C	MINING, FANNIN	SULPHUR	31	31	31	31	31	31
C	NORTH HUNT SUD	SULPHUR	36	39	42	44	48	52
C	SAVOY	RED	88	92	94	98	106	115
C	SOUTHWEST FANNIN COUNTY SUD	RED	363	386	405	426	507	598
C	SOUTHWEST FANNIN COUNTY SUD	TRINITY	18	19	20	21	26	30
C	STEAM ELECTRIC POWER, FANNIN	RED	6,363	11,474	11,910	12,443	13,092	13,775
C	TRENTON	RED	1	1	2	3	3	4
C	TRENTON	TRINITY	130	178	607	1,038	1,384	1,729

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Red River Groundwater Conservation District

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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
C	WHITEWRIGHT	RED	2	2	2	2	2	2
Sum of Projected Water Demands (acre-feet)			21,517	27,201	28,967	31,697	36,106	41,013

GRAYSON COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
C	BELLS	RED	175	199	223	254	588	783
C	COLLINSVILLE	TRINITY	233	285	338	401	513	666
C	COUNTY-OTHER, GRAYSON	RED	2,619	2,517	2,431	2,391	3,388	5,698
C	COUNTY-OTHER, GRAYSON	TRINITY	127	125	123	145	106	103
C	DENISON	RED	6,641	7,251	7,868	8,629	10,158	12,688
C	GUNTER	TRINITY	355	473	624	776	930	1,085
C	HOWE	RED	77	86	95	105	116	128
C	HOWE	TRINITY	210	232	257	285	316	346
C	IRRIGATION, GRAYSON	RED	1,325	1,442	1,559	1,677	1,795	1,912
C	IRRIGATION, GRAYSON	TRINITY	1,113	1,212	1,311	1,409	1,508	1,607
C	KENTUCKY TOWN WSC	RED	184	213	242	278	348	434
C	KENTUCKY TOWN WSC	TRINITY	183	211	240	276	345	431
C	LIVESTOCK, GRAYSON	RED	932	932	932	932	932	932
C	LIVESTOCK, GRAYSON	TRINITY	526	526	526	526	526	526
C	LUELLA SUD	RED	346	384	424	474	531	595
C	LUELLA SUD	TRINITY	54	60	66	74	83	92
C	MANUFACTURING, GRAYSON	RED	4,880	5,302	5,700	6,035	6,551	7,111
C	MANUFACTURING, GRAYSON	TRINITY	25	27	29	30	33	36
C	MARILEE SUD	TRINITY	405	399	387	386	380	379
C	MINING, GRAYSON	RED	79	91	107	123	142	163
C	POTTSBORO	RED	491	621	751	977	1,624	2,921
C	SHERMAN	RED	10,543	10,881	11,928	13,741	17,732	24,800
C	SOUTH GRAYSON WSC	TRINITY	408	424	478	495	511	526
C	SOUTHMAYD	RED	97	103	110	119	159	238
C	SOUTHWEST FANNIN COUNTY SUD	RED	178	259	338	431	585	766
C	STEAM ELECTRIC POWER, GRAYSON	RED	3,698	7,627	7,627	7,627	7,627	7,627

Estimated Historical Water Use and 2017 State Water Plan Dataset:

Red River Groundwater Conservation District

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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
C	STEAM ELECTRIC POWER, GRAYSON	TRINITY	2,465	5,084	5,084	5,084	5,084	5,084
C	TIOGA	TRINITY	119	124	131	139	444	608
C	TOM BEAN	RED	27	30	33	36	44	65
C	TOM BEAN	TRINITY	195	215	235	261	315	473
C	TWO WAY SUD	RED	440	550	661	791	1,048	1,309
C	TWO WAY SUD	TRINITY	258	322	387	464	613	767
C	VAN ALSTYNE	TRINITY	517	608	700	811	2,337	3,243
C	WHITESBORO	RED	202	197	193	193	241	312
C	WHITESBORO	TRINITY	267	261	257	256	319	414
C	WHITEWRIGHT	RED	218	212	208	208	220	233
C	WHITEWRIGHT	TRINITY	2	2	2	2	2	2
C	WOODBINE WSC	TRINITY	9	10	11	12	13	14
Sum of Projected Water Demands (acre-feet)			40,623	49,497	52,616	56,853	68,207	85,117

Projected Water Supply Needs

TWDB 2017 State Water Plan Data

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

FANNIN COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
C	BONHAM	RED	0	-14	-757	-1,933	-2,916	-4,070
C	COUNTY-OTHER, FANNIN	RED	0	191	137	-239	-1,907	-3,739
C	COUNTY-OTHER, FANNIN	SULPHUR	0	21	27	-61	-447	-896
C	COUNTY-OTHER, FANNIN	TRINITY	0	51	16	-15	-201	-474
C	ECTOR	RED	0	-5	-9	-14	-22	-31
C	HICKORY CREEK SUD	SULPHUR	18	7	-4	-11	-19	-24
C	HICKORY CREEK SUD	TRINITY	1	0	0	0	-2	-2
C	HONEY GROVE	RED	0	-1	0	1	1	1
C	HONEY GROVE	SULPHUR	0	-5	0	2	2	2
C	IRRIGATION, FANNIN	RED	1	1	1	1	1	1
C	IRRIGATION, FANNIN	SULPHUR	0	0	0	0	0	0
C	IRRIGATION, FANNIN	TRINITY	0	0	0	0	0	0
C	LADONIA	SULPHUR	0	-24	-35	-55	-90	-89
C	LEONARD	RED	0	0	0	-1	-1	-1
C	LEONARD	SULPHUR	0	-1	-1	-1	-1	-2
C	LEONARD	TRINITY	0	-20	-36	-53	-84	-118
C	LIVESTOCK, FANNIN	RED	0	0	0	0	0	0
C	LIVESTOCK, FANNIN	SULPHUR	0	0	0	0	0	0
C	LIVESTOCK, FANNIN	TRINITY	0	0	0	0	0	0
C	MANUFACTURING, FANNIN	RED	0	-1	-24	-48	-64	-80
C	MINING, FANNIN	RED	-42	-42	-42	-42	-42	-42
C	MINING, FANNIN	SULPHUR	-14	-14	-14	-14	-14	-14
C	NORTH HUNT SUD	SULPHUR	16	0	0	0	0	0
C	SAVOY	RED	0	-4	-6	-10	-18	-27
C	SOUTHWEST FANNIN COUNTY SUD	RED	33	-31	-82	-129	-231	-336
C	SOUTHWEST FANNIN COUNTY SUD	TRINITY	2	-2	-4	-7	-12	-17
C	STEAM ELECTRIC POWER, FANNIN	RED	200	-4,911	-5,347	-5,880	-6,529	-7,212
C	TRENTON	RED	0	0	-2	-3	-3	-4
C	TRENTON	TRINITY	0	-48	-476	-907	-1,253	-1,598
C	WHITEWRIGHT	RED	1	1	1	1	1	1
Sum of Projected Water Supply Needs (acre-feet)			-56	-5,123	-6,839	-9,423	-13,856	-18,776

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Red River Groundwater Conservation District

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Projected Water Supply Needs

TWDB 2017 State Water Plan Data

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

GRAYSON COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
C	BELLS	RED	0	-24	-48	-79	-413	-608
C	COLLINSVILLE	TRINITY	9	-43	-96	-159	-271	-424
C	COUNTY-OTHER, GRAYSON	RED	3,973	3,844	3,533	3,057	1,532	-475
C	COUNTY-OTHER, GRAYSON	TRINITY	194	191	180	184	47	-9
C	DENISON	RED	4	-684	-1,319	-2,040	-3,508	-5,969
C	GUNTER	TRINITY	0	-118	-269	-421	-575	-730
C	HOWE	RED	-1	-3	-5	-9	-14	-22
C	HOWE	TRINITY	1	-7	-15	-27	-42	-59
C	IRRIGATION, GRAYSON	RED	1,343	1,225	1,107	991	873	756
C	IRRIGATION, GRAYSON	TRINITY	1,128	1,030	932	832	733	634
C	KENTUCKY TOWN WSC	RED	250	222	192	156	86	0
C	KENTUCKY TOWN WSC	TRINITY	248	219	191	155	86	0
C	LIVESTOCK, GRAYSON	RED	51	51	51	51	51	51
C	LIVESTOCK, GRAYSON	TRINITY	30	30	30	30	30	30
C	LUELLA SUD	RED	249	210	171	120	63	0
C	LUELLA SUD	TRINITY	38	33	26	19	10	0
C	MANUFACTURING, GRAYSON	RED	721	456	-5	-584	-1,529	-2,691
C	MANUFACTURING, GRAYSON	TRINITY	4	3	0	-4	-7	-13
C	MARILEE SUD	TRINITY	105	106	107	97	86	68
C	MINING, GRAYSON	RED	43	31	15	-1	-20	-41
C	POTTSBORO	RED	0	-51	-164	-429	-1,138	-2,504
C	SHERMAN	RED	-85	-385	-1,071	-2,302	-5,378	-11,818
C	SOUTH GRAYSON WSC	TRINITY	204	161	80	42	5	-30
C	SOUTHMAYD	RED	64	58	51	42	2	-77
C	SOUTHWEST FANNIN COUNTY SUD	RED	16	-21	-67	-132	-265	-431
C	STEAM ELECTRIC POWER, GRAYSON	RED	0	-3,929	-3,929	-3,929	-3,929	-3,929
C	STEAM ELECTRIC POWER, GRAYSON	TRINITY	0	-2,619	-2,619	-2,619	-2,619	-2,619
C	TIOGA	TRINITY	0	-5	-12	-20	-325	-489
C	TOM BEAN	RED	0	-3	-6	-9	-17	-38
C	TOM BEAN	TRINITY	0	-20	-40	-66	-120	-278

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Projected Water Supply Needs TWDB 2017 State Water Plan Data

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

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
C	TWO WAY SUD	RED	0	-109	-218	-348	-604	-865
C	TWO WAY SUD	TRINITY	0	-63	-128	-204	-353	-506
C	VAN ALSTYNE	TRINITY	0	-21	-54	-98	-685	-1,435
C	WHITESBORO	RED	34	38	42	42	-6	-77
C	WHITESBORO	TRINITY	44	51	55	56	-7	-102
C	WHITEWRIGHT	RED	60	66	70	70	58	45
C	WHITEWRIGHT	TRINITY	1	1	1	1	1	1
C	WOODBINE WSC	TRINITY	0	-1	-2	-3	-4	-5
Sum of Projected Water Supply Needs (acre-feet)			-86	-8,106	-10,067	-13,483	-21,829	-36,244

Projected Water Management Strategies

TWDB 2017 State Water Plan Data

FANNIN COUNTY

WUG, Basin (RWPG)

All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
BONHAM, RED (C)							
CONSERVATION - BONHAM	DEMAND REDUCTION [FANNIN]	7	17	34	61	94	138
CONSERVATION, WATER LOSS CONTROL - BONHAM	DEMAND REDUCTION [FANNIN]	28	10	0	0	0	0
NTMWD - LOWER BOIS D'ARC CREEK RESERVOIR	LOWER BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	0	0	0	416	1,741	3,013
NTMWD UNALLOCATED SUPPLY UTILIZATION	BONHAM LAKE/RESERVOIR [RESERVOIR]	0	15	757	1,456	1,081	919
		35	42	791	1,933	2,916	4,070
COUNTY-OTHER, FANNIN, RED (C)							
CONSERVATION - FANNIN COUNTY	DEMAND REDUCTION [FANNIN]	4	6	11	19	50	95
CONSERVATION, WATER LOSS CONTROL - FANNIN COUNTY	DEMAND REDUCTION [FANNIN]	5	5	0	0	0	0
NTMWD - LOWER BOIS D'ARC CREEK RESERVOIR	LOWER BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	0	0	0	342	1,298	2,977
NTMWD UNALLOCATED SUPPLY UTILIZATION	BONHAM LAKE/RESERVOIR [RESERVOIR]	0	3	105	118	793	897
		9	14	116	479	2,141	3,969
COUNTY-OTHER, FANNIN, SULPHUR (C)							
CONSERVATION - FANNIN COUNTY	DEMAND REDUCTION [FANNIN]	0	1	2	5	12	23
CONSERVATION, WATER LOSS CONTROL - FANNIN COUNTY	DEMAND REDUCTION [FANNIN]	1	1	0	0	0	0
NTMWD - LOWER BOIS D'ARC CREEK RESERVOIR	LOWER BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	0	0	0	88	305	715
NTMWD UNALLOCATED SUPPLY UTILIZATION	BONHAM LAKE/RESERVOIR [RESERVOIR]	0	0	20	31	187	215
		1	2	22	124	504	953
COUNTY-OTHER, FANNIN, TRINITY (C)							
CONSERVATION - FANNIN COUNTY	DEMAND REDUCTION [FANNIN]	1	2	1	1	5	12
CONSERVATION, WATER LOSS CONTROL - FANNIN COUNTY	DEMAND REDUCTION [FANNIN]	1	1	0	0	0	0

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WUG, Basin (RWPG)

All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
NTMWD - LOWER BOIS D'ARC CREEK RESERVOIR	LOWER BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	0	0	0	21	138	378
NTMWD UNALLOCATED SUPPLY UTILIZATION	BONHAM LAKE/RESERVOIR [RESERVOIR]	0	1	12	7	84	114
		2	4	13	29	227	504
ECTOR, RED (C)							
CONSERVATION - ECTOR	DEMAND REDUCTION [FANNIN]	0	1	1	1	2	2
CONSERVATION, WATER LOSS CONTROL - ECTOR	DEMAND REDUCTION [FANNIN]	0	0	0	0	0	0
NTMWD - LOWER BOIS D'ARC CREEK RESERVOIR	LOWER BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	0	46	50	55	62	71
		0	47	51	56	64	73
HICKORY CREEK SUD, SULPHUR (C)							
CONSERVATION - HICKORY CREEK SUD	DEMAND REDUCTION [FANNIN]	0	0	0	0	0	0
CONSERVATION, WATER LOSS CONTROL - HICKORY CREEK SUD	DEMAND REDUCTION [FANNIN]	0	0	0	0	0	0
DRILL NEW WELLS (HICKORY CREEK SUD, WOODBINE, SABINE)	WOODBINE AQUIFER [HUNT]	0	0	4	11	19	24
		0	0	4	11	19	24
HICKORY CREEK SUD, TRINITY (C)							
CONSERVATION - HICKORY CREEK SUD	DEMAND REDUCTION [FANNIN]	0	0	0	0	0	0
CONSERVATION, WATER LOSS CONTROL - HICKORY CREEK SUD	DEMAND REDUCTION [FANNIN]	0	0	0	0	0	0
DRILL NEW WELLS (HICKORY CREEK SUD, WOODBINE, SABINE)	WOODBINE AQUIFER [HUNT]	0	0	0	0	2	2
		0	0	0	0	2	2
HONEY GROVE, RED (C)							
CONSERVATION - HONEY GROVE	DEMAND REDUCTION [FANNIN]	0	0	1	1	1	1
CONSERVATION, WATER LOSS CONTROL - HONEY GROVE	DEMAND REDUCTION [FANNIN]	4	4	0	0	0	0
NTMWD - LOWER BOIS D'ARC CREEK RESERVOIR	LOWER BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	0	41	54	52	52	52
		4	45	55	53	53	53

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Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
HONEY GROVE, SULPHUR (C)							
CONSERVATION - HONEY GROVE	DEMAND REDUCTION [FANNIN]	1	2	2	3	4	4
CONSERVATION, WATER LOSS CONTROL - HONEY GROVE	DEMAND REDUCTION [FANNIN]	15	15	0	0	0	0
NTMWD - LOWER BOIS D'ARC CREEK RESERVOIR	LOWER BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	0	144	187	185	184	184
		16	161	189	188	188	188
LADONIA, SULPHUR (C)							
ANRA-COL - LAKE COLUMBIA	COLUMBIA LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	3
CONSERVATION - LADONIA	DEMAND REDUCTION [FANNIN]	0	1	2	2	4	4
CONSERVATION, WATER LOSS CONTROL - LADONIA	DEMAND REDUCTION [FANNIN]	1	1	0	0	0	0
DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	0	0	1	6	9	8
LAKE PALESTINE	PALESTINE LAKE/RESERVOIR [RESERVOIR]	0	1	3	6	8	6
REMOVAL OF CHAPMAN SILT BARRIER	CHAPMAN/COOPER LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	0	0	1	1	1
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	17
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	3	6
UNM-ROR-NECHES RUN OF RIVER	NECHES RUN-OF-RIVER [ANDERSON]	0	0	0	0	3	3
UTRWD - CONTRACT RENEWAL WITH COMMERCE FOR LAKE CHAPMAN WATER	INDIRECT REUSE [HOPKINS]	0	0	0	1	1	2
UTRWD - CONTRACT RENEWAL WITH COMMERCE FOR LAKE CHAPMAN WATER	CHAPMAN/COOPER LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	0	1	2	2	4
UTRWD - RALPH HALL RESERVOIR AND REUSE	INDIRECT REUSE [FANNIN]	0	1	5	9	12	11
UTRWD - RALPH HALL RESERVOIR AND REUSE	RALPH HALL LAKE/RESERVOIR [RESERVOIR]	0	4	11	20	35	20

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Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
UTRWD UNALLOCATED SUPPLY UTILIZATION	INDIRECT REUSE [HOPKINS]	0	3	4	5	7	7
UTRWD UNALLOCATED SUPPLY UTILIZATION	CHAPMAN/COOPER LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	6	8	10	14	12
UTRWD UNALLOCATED SUPPLY UTILIZATION	RAY ROBERTS-LEWISVILLE-GRAPEVINE LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	19	24	29	39	33
		1	36	59	91	138	137
LEONARD, RED (C)							
CONSERVATION - LEONARD	DEMAND REDUCTION [FANNIN]	0	0	0	0	0	0
CONSERVATION, WATER LOSS CONTROL - LEONARD	DEMAND REDUCTION [FANNIN]	0	0	0	0	0	0
NTMWD - LOWER BOIS D'ARC CREEK RESERVOIR	LOWER BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	0	1	1	3	2	3
		0	1	1	3	2	3
LEONARD, SULPHUR (C)							
CONSERVATION - LEONARD	DEMAND REDUCTION [FANNIN]	0	0	0	0	0	0
CONSERVATION, WATER LOSS CONTROL - LEONARD	DEMAND REDUCTION [FANNIN]	0	0	0	0	0	0
NTMWD - LOWER BOIS D'ARC CREEK RESERVOIR	LOWER BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	0	3	4	4	5	5
		0	3	4	4	5	5
LEONARD, TRINITY (C)							
CONSERVATION - LEONARD	DEMAND REDUCTION [FANNIN]	1	2	4	5	7	9
CONSERVATION, WATER LOSS CONTROL - LEONARD	DEMAND REDUCTION [FANNIN]	2	2	0	0	0	0
NTMWD - LOWER BOIS D'ARC CREEK RESERVOIR	LOWER BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	0	144	189	204	233	265
		3	148	193	209	240	274
MANUFACTURING, FANNIN, RED (C)							
NTMWD - LOWER BOIS D'ARC CREEK RESERVOIR	LOWER BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	0	1	24	48	64	80
		0	1	24	48	64	80

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Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
MINING, FANNIN, RED (C)							
NTMWD - ADDITIONAL LAKE LAVON	LAVON LAKE/RESERVOIR NORTH TEXAS MWD SYSTEM [RESERVOIR]	10	5	4	4	2	2
NTMWD - LOWER BOIS D'ARC CREEK RESERVOIR	LOWER BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	7	27	24	25	17	10
NTMWD - MAIN STEM PUMP STATION	INDIRECT REUSE [COLLIN]	23	9	5	3	0	0
NTMWD - OKLAHOMA	OKLAHOMA RUN-OF-RIVER [OKLAHOMA]	0	0	0	0	0	5
NTMWD - TEXOMA BLENDING	TEXOMA LAKE/RESERVOIR NORTH TEXAS MWD SYSTEM [RESERVOIR]	0	0	8	8	10	7
NTMWD - TOLEDO BEND PHASE I	TOLEDO BEND LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	9	10
REMOVAL OF CHAPMAN SILT BARRIER	CHAPMAN/COOPER LAKE/RESERVOIR NORTH TEXAS MWD SYSTEM [RESERVOIR]	2	1	1	2	1	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	6
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	3	2
		42	42	42	42	42	42
MINING, FANNIN, SULPHUR (C)							
NTMWD - ADDITIONAL LAKE LAVON	LAVON LAKE/RESERVOIR NORTH TEXAS MWD SYSTEM [RESERVOIR]	3	1	1	1	1	0
NTMWD - LOWER BOIS D'ARC CREEK RESERVOIR	LOWER BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	3	10	8	9	6	5
NTMWD - MAIN STEM PUMP STATION	INDIRECT REUSE [COLLIN]	8	3	2	1	0	0
NTMWD - OKLAHOMA	OKLAHOMA RUN-OF-RIVER [OKLAHOMA]	0	0	0	0	0	1
NTMWD - TEXOMA BLENDING	TEXOMA LAKE/RESERVOIR NORTH TEXAS MWD SYSTEM [RESERVOIR]	0	0	3	3	3	2
NTMWD - TOLEDO BEND PHASE I	TOLEDO BEND LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	3	3

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Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	2
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	1	1
		14	14	14	14	14	14

NORTH HUNT SUD, SULPHUR (C)

CONSERVATION - NORTH HUNT SUD	DEMAND REDUCTION [FANNIN]	0	0	0	0	0	0
CONSERVATION, WATER LOSS CONTROL - NORTH HUNT SUD	DEMAND REDUCTION [FANNIN]	0	0	0	0	0	0
		0	0	0	0	0	0

SAVOY, RED (C)

CONSERVATION - SAVOY	DEMAND REDUCTION [FANNIN]	0	1	1	1	2	2
CONSERVATION, WATER LOSS CONTROL - SAVOY	DEMAND REDUCTION [FANNIN]	0	0	0	0	0	0
NTMWD - LOWER BOIS D'ARC CREEK RESERVOIR	LOWER BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	0	31	43	47	54	63
		0	32	44	48	56	65

SOUTHWEST FANNIN COUNTY SUD, RED (C)

CONSERVATION - SOUTHWEST FANNIN COUNTY SUD	DEMAND REDUCTION [FANNIN]	1	2	4	6	9	12
CONSERVATION, WATER LOSS CONTROL - SOUTHWEST FANNIN COUNTY SUD	DEMAND REDUCTION [FANNIN]	2	2	0	0	0	0
NTMWD - LOWER BOIS D'ARC CREEK RESERVOIR	LOWER BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	0	195	231	264	353	449
SOUTHWEST FANNIN CO SUD ADDITIONAL GROUNDWATER (WITH TRANSMISSION FACILITIES)	WOODBINE AQUIFER [GRAYSON]	0	58	53	49	45	43
		3	257	288	319	407	504

SOUTHWEST FANNIN COUNTY SUD, TRINITY (C)

CONSERVATION - SOUTHWEST FANNIN COUNTY SUD	DEMAND REDUCTION [FANNIN]	0	0	0	0	0	1
CONSERVATION, WATER LOSS CONTROL - SOUTHWEST FANNIN COUNTY SUD	DEMAND REDUCTION [FANNIN]	0	0	0	0	0	0
NTMWD - LOWER BOIS D'ARC CREEK RESERVOIR	LOWER BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	0	10	11	13	18	22

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Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
SOUTHWEST FANNIN CO SUD ADDITIONAL GROUNDWATER (WITH TRANSMISSION FACILITIES)	WOODBINE AQUIFER [GRAYSON]	0	3	3	2	2	2
		0	13	14	15	20	25

STEAM ELECTRIC POWER, FANNIN, RED (C)

FANNIN COUNTY SEP - CONNECT TO AND PURCHASE WATER FROM LAKE TEXOMA	TEXOMA LAKE/RESERVOIR NON- SYSTEM PORTION [RESERVOIR]	0	9,000	9,000	9,000	9,000	9,000
		0	9,000	9,000	9,000	9,000	9,000

TRENTON, RED (C)

CONSERVATION - TRENTON	DEMAND REDUCTION [FANNIN]	0	0	0	0	0	0
CONSERVATION, WATER LOSS CONTROL - TRENTON	DEMAND REDUCTION [FANNIN]	0	0	0	0	0	0
NTMWD - LOWER BOIS D'ARC CREEK RESERVOIR	LOWER BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	0	0	2	3	3	4
		0	0	2	3	3	4

TRENTON, TRINITY (C)

CONSERVATION - TRENTON	DEMAND REDUCTION [FANNIN]	0	3	15	35	51	70
CONSERVATION, WATER LOSS CONTROL - TRENTON	DEMAND REDUCTION [FANNIN]	1	1	0	0	0	0
NTMWD - LOWER BOIS D'ARC CREEK RESERVOIR	LOWER BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	0	89	506	917	1,247	1,574
TRENTON NEW WELLS IN WOODBINE AQUIFER	WOODBINE AQUIFER [FANNIN]	0	25	25	25	25	25
		1	118	546	977	1,323	1,669

WHITEWRIGHT, RED (C)

CONSERVATION - WHITEWRIGHT	DEMAND REDUCTION [FANNIN]	0	0	0	0	0	0
CONSERVATION, WATER LOSS CONTROL - WHITEWRIGHT	DEMAND REDUCTION [FANNIN]	0	0	0	0	0	0
GTUA - GRAYSON COUNTY WSP	TEXOMA LAKE/RESERVOIR NON- SYSTEM PORTION [RESERVOIR]	0	0	0	0	1	1
		0	0	0	0	1	1
Sum of Projected Water Management Strategies (acre-feet)		131	9,980	11,472	13,646	17,429	21,659

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TWDB 2017 State Water Plan Data

GRAYSON COUNTY

WUG, Basin (RWPG)

All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
BELLS, RED (C)							
BELLS NEW WELL IN WOODBINE AQUIFER	WOODBINE AQUIFER [GRAYSON]	0	145	145	145	145	145
CONSERVATION - BELLS	DEMAND REDUCTION [GRAYSON]	1	1	2	3	10	16
CONSERVATION, WATER LOSS CONTROL - BELLS	DEMAND REDUCTION [GRAYSON]	1	1	0	0	0	0
GTUA - GRAYSON COUNTY WSP	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	22	46	76	403	592
		2	169	193	224	558	753
COLLINSVILLE, TRINITY (C)							
CONSERVATION - COLLINSVILLE	DEMAND REDUCTION [GRAYSON]	1	2	3	5	9	13
CONSERVATION, WATER LOSS CONTROL - COLLINSVILLE	DEMAND REDUCTION [GRAYSON]	1	1	0	0	0	0
GTUA - GRAYSON COUNTY WSP	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	40	93	154	262	411
		2	43	96	159	271	424
COUNTY-OTHER, GRAYSON, RED (C)							
CONSERVATION - GRAYSON COUNTY	DEMAND REDUCTION [GRAYSON]	9	17	25	32	56	114
CONSERVATION, WATER LOSS CONTROL - GRAYSON COUNTY	DEMAND REDUCTION [GRAYSON]	13	13	0	0	0	0
GTUA - GRAYSON COUNTY WSP	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	12	841	1,136	1,443	1,899	3,106
		34	871	1,161	1,475	1,955	3,220
COUNTY-OTHER, GRAYSON, TRINITY (C)							
CONSERVATION - GRAYSON COUNTY	DEMAND REDUCTION [GRAYSON]	0	1	1	2	2	2
CONSERVATION, WATER LOSS CONTROL - GRAYSON COUNTY	DEMAND REDUCTION [GRAYSON]	1	1	0	0	0	0
GTUA - GRAYSON COUNTY WSP	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	1	42	57	87	59	56
		2	44	58	89	61	58

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WUG, Basin (RWPG)		All values are in acre-feet						
Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070	
DENISON, RED (C)								
CONSERVATION - DENISON	DEMAND REDUCTION [GRAYSON]	88	157	236	288	372	508	
CONSERVATION, WATER LOSS CONTROL - DENISON	DEMAND REDUCTION [GRAYSON]	144	397	395	433	510	637	
DENISON UNALLOCATED SUPPLY UTILIZATION	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	2,191	2,140	2,101	4,281	6,454	
		232	2,745	2,771	2,822	5,163	7,599	
GUNTER, TRINITY (C)								
CONSERVATION - GUNTER	DEMAND REDUCTION [GRAYSON]	1	3	6	10	16	22	
CONSERVATION, WATER LOSS CONTROL - GUNTER	DEMAND REDUCTION [GRAYSON]	2	17	0	0	0	0	
GTUA - GRAYSON COUNTY WSP	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	97	263	411	559	708	
GUNTER NEW WELLS	TRINITY AQUIFER [GRAYSON]	50	100	100	100	100	100	
		53	217	369	521	675	830	
HOWE, RED (C)								
CONSERVATION - HOWE	DEMAND REDUCTION [GRAYSON]	0	1	1	1	2	2	
CONSERVATION, WATER LOSS CONTROL - HOWE	DEMAND REDUCTION [GRAYSON]	0	0	0	0	0	0	
NTMWD - ADDITIONAL LAKE LAVON	LAVON LAKE/RESERVOIR NORTH TEXAS MWD SYSTEM [RESERVOIR]	0	0	1	1	1	1	
NTMWD - LOWER BOIS D'ARC CREEK RESERVOIR	LOWER BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	1	2	2	4	5	6	
NTMWD - MAIN STEM PUMP STATION	INDIRECT REUSE [COLLIN]	0	0	1	1	0	0	
NTMWD - OKLAHOMA	OKLAHOMA RUN-OF-RIVER [OKLAHOMA]	0	0	0	0	0	2	
NTMWD - TEXOMA BLENDING	TEXOMA LAKE/RESERVOIR NORTH TEXAS MWD SYSTEM [RESERVOIR]	0	0	1	2	3	3	
NTMWD - TOLEDO BEND PHASE I	TOLEDO BEND LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	3	4	

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All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	3
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	1	1
		1	3	6	9	15	22

HOWE, TRINITY (C)

CONSERVATION - HOWE	DEMAND REDUCTION [GRAYSON]	1	1	3	4	5	7
CONSERVATION, WATER LOSS CONTROL - HOWE	DEMAND REDUCTION [GRAYSON]	1	1	0	0	0	0
NTMWD - ADDITIONAL LAKE LAVON	LAVON LAKE/RESERVOIR NORTH TEXAS MWD SYSTEM [RESERVOIR]	0	0	1	2	2	2
NTMWD - LOWER BOIS D'ARC CREEK RESERVOIR	LOWER BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	0	4	8	15	15	13
NTMWD - MAIN STEM PUMP STATION	INDIRECT REUSE [COLLIN]	0	1	1	1	0	0
NTMWD - OKLAHOMA	OKLAHOMA RUN-OF-RIVER [OKLAHOMA]	0	0	0	0	0	6
NTMWD - TEXOMA BLENDING	TEXOMA LAKE/RESERVOIR NORTH TEXAS MWD SYSTEM [RESERVOIR]	0	0	2	4	9	8
NTMWD - TOLEDO BEND PHASE I	TOLEDO BEND LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	8	12
REMOVAL OF CHAPMAN SILT BARRIER	CHAPMAN/COOPER LAKE/RESERVOIR NORTH TEXAS MWD SYSTEM [RESERVOIR]	0	0	0	1	0	1
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	8
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	3	3
		2	7	15	27	42	60

IRRIGATION, GRAYSON, RED (C)

CONSERVATION, IRRIGATION - GRAYSON COUNTY	DEMAND REDUCTION [GRAYSON]	0	2	5	7	9	10
		0	2	5	7	9	10

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Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
IRRIGATION, GRAYSON, TRINITY (C)							
CONSERVATION, IRRIGATION - GRAYSON COUNTY	DEMAND REDUCTION [GRAYSON]	0	2	4	5	7	9
		0	2	4	5	7	9
KENTUCKY TOWN WSC, RED (C)							
CONSERVATION - KENTUCKY TOWN WSC	DEMAND REDUCTION [GRAYSON]	1	2	3	4	6	9
CONSERVATION, WATER LOSS CONTROL - KENTUCKY TOWN WSC	DEMAND REDUCTION [GRAYSON]	1	1	0	0	0	0
GTUA - GRAYSON COUNTY WSP	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	0	48	47	44	42
		2	3	51	51	50	51
KENTUCKY TOWN WSC, TRINITY (C)							
CONSERVATION - KENTUCKY TOWN WSC	DEMAND REDUCTION [GRAYSON]	0	1	2	3	6	8
CONSERVATION, WATER LOSS CONTROL - KENTUCKY TOWN WSC	DEMAND REDUCTION [GRAYSON]	1	1	0	0	0	0
GTUA - GRAYSON COUNTY WSP	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	0	47	46	44	41
		1	2	49	49	50	49
LUELLA SUD, RED (C)							
CONSERVATION - LUELLA SUD	DEMAND REDUCTION [GRAYSON]	1	3	4	6	9	12
CONSERVATION, WATER LOSS CONTROL - LUELLA SUD	DEMAND REDUCTION [GRAYSON]	2	2	0	0	0	0
GTUA - GRAYSON COUNTY WSP	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	0	169	167	251	248
		3	5	173	173	260	260
LUELLA SUD, TRINITY (C)							
CONSERVATION - LUELLA SUD	DEMAND REDUCTION [GRAYSON]	0	0	1	1	1	2
CONSERVATION, WATER LOSS CONTROL - LUELLA SUD	DEMAND REDUCTION [GRAYSON]	0	0	0	0	0	0
GTUA - GRAYSON COUNTY WSP	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	0	26	26	39	38
		0	0	27	27	40	40

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Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
MANUFACTURING, GRAYSON, RED (C)							
CONSERVATION, MANUFACTURING - GRAYSON COUNTY	DEMAND REDUCTION [GRAYSON]	0	11	121	174	186	202
GTUA - GRAYSON COUNTY WSP	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	60	270	606	1,115	1,997	3,091
NTMWD - ADDITIONAL LAKE LAVON	LAVON LAKE/RESERVOIR NORTH TEXAS MWD SYSTEM [RESERVOIR]	1	2	2	2	2	1
NTMWD - LOWER BOIS D'ARC CREEK RESERVOIR	LOWER BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	1	8	9	11	9	7
NTMWD - MAIN STEM PUMP STATION	INDIRECT REUSE [COLLIN]	2	3	2	1	0	0
NTMWD - OKLAHOMA	OKLAHOMA RUN-OF-RIVER [OKLAHOMA]	0	0	0	0	0	3
NTMWD - TEXOMA BLENDING	TEXOMA LAKE/RESERVOIR NORTH TEXAS MWD SYSTEM [RESERVOIR]	0	0	3	4	5	4
NTMWD - TOLEDO BEND PHASE I	TOLEDO BEND LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	5	6
REMOVAL OF CHAPMAN SILT BARRIER	CHAPMAN/COOPER LAKE/RESERVOIR NORTH TEXAS MWD SYSTEM [RESERVOIR]	0	0	0	0	0	1
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	4
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	2	2	1
		64	294	743	1,309	2,206	3,320
MANUFACTURING, GRAYSON, TRINITY (C)							
CONSERVATION, MANUFACTURING - GRAYSON COUNTY	DEMAND REDUCTION [GRAYSON]	0	0	1	1	1	1
GTUA - GRAYSON COUNTY WSP	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	1	3	3	10	16
		0	1	4	4	11	17

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Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070	
MARILEE SUD, TRINITY (C)								
CONSERVATION - MARILEE SUD	DEMAND REDUCTION [GRAYSON]	1	3	4	5	6	8	
CONSERVATION, WATER LOSS CONTROL - MARILEE SUD	DEMAND REDUCTION [GRAYSON]	2	2	0	0	0	0	
GTUA - GRAYSON COUNTY WSP	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	3	14	24	40	57	
		3	8	18	29	46	65	
MINING, GRAYSON, RED (C)								
GRAYSON COUNTY MINING NEW WELL IN TRINITY AQUIFER	TRINITY AQUIFER [GRAYSON]	0	0	0	41	41	41	
		0	0	0	41	41	41	
POTTSBORO, RED (C)								
CONSERVATION - POTTSBORO	DEMAND REDUCTION [GRAYSON]	2	4	16	28	59	116	
CONSERVATION, WATER LOSS CONTROL - POTTSBORO	DEMAND REDUCTION [GRAYSON]	2	2	0	0	0	0	
DENISON UNALLOCATED SUPPLY UTILIZATION	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	51	102	141	203	272	
GTUA - GRAYSON COUNTY WSP	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	0	47	260	876	2,116	
		4	57	165	429	1,138	2,504	
SHERMAN, RED (C)								
CONSERVATION - SHERMAN	DEMAND REDUCTION [GRAYSON]	140	236	358	458	651	992	
CONSERVATION, WATER LOSS CONTROL - SHERMAN	DEMAND REDUCTION [GRAYSON]	53	53	0	0	0	0	
GTUA - GRAYSON COUNTY WSP	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	97	713	1,844	4,728	10,826	
		193	386	1,071	2,302	5,379	11,818	
SOUTH GRAYSON WSC, TRINITY (C)								
CONSERVATION - SOUTH GRAYSON WSC	DEMAND REDUCTION [GRAYSON]	1	3	5	6	9	11	
CONSERVATION, WATER LOSS CONTROL - SOUTH GRAYSON WSC	DEMAND REDUCTION [GRAYSON]	2	2	0	0	0	0	

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Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
GTUA - GRAYSON COUNTY WSP	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	70	66	63	58	54	49
		73	71	68	64	63	60
SOUTHMAYD, RED (C)							
CONSERVATION - SOUTHMAYD	DEMAND REDUCTION [GRAYSON]	0	1	1	2	3	5
CONSERVATION, WATER LOSS CONTROL - SOUTHMAYD	DEMAND REDUCTION [GRAYSON]	0	0	0	0	0	0
GTUA - GRAYSON COUNTY WSP	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	0	49	48	72	95
SOUTHMAYD NEW WELL IN WOODBINE	WOODBINE AQUIFER [GRAYSON]	0	0	0	0	0	77
		0	1	50	50	75	177
SOUTHWEST FANNIN COUNTY SUD, RED (C)							
CONSERVATION - SOUTHWEST FANNIN COUNTY SUD	DEMAND REDUCTION [GRAYSON]	1	2	4	6	10	15
CONSERVATION, WATER LOSS CONTROL - SOUTHWEST FANNIN COUNTY SUD	DEMAND REDUCTION [GRAYSON]	1	1	0	0	0	0
NTMWD - LOWER BOIS D'ARC CREEK RESERVOIR	LOWER BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	0	131	192	268	407	574
SOUTHWEST FANNIN CO SUD ADDITIONAL GROUNDWATER (WITH TRANSMISSION FACILITIES)	WOODBINE AQUIFER [GRAYSON]	0	39	44	49	53	55
		2	173	240	323	470	644
STEAM ELECTRIC POWER, GRAYSON, RED (C)							
TEXOMA RAW WATER TO GRAYSON CO. SEP	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	3,929	3,929	3,929	3,929	3,929
		0	3,929	3,929	3,929	3,929	3,929
STEAM ELECTRIC POWER, GRAYSON, TRINITY (C)							
TEXOMA RAW WATER TO GRAYSON CO. SEP	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	2,619	2,619	2,619	2,619	2,619
		0	2,619	2,619	2,619	2,619	2,619

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Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
TIOGA, TRINITY (C)							
CONSERVATION - TIOGA	DEMAND REDUCTION [GRAYSON]	0	1	1	2	7	12
CONSERVATION, WATER LOSS CONTROL - TIOGA	DEMAND REDUCTION [GRAYSON]	1	1	0	0	0	0
GTUA - GRAYSON COUNTY WSP	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	4	11	18	318	477
		1	6	12	20	325	489
TOM BEAN, RED (C)							
CONSERVATION - TOM BEAN	DEMAND REDUCTION [GRAYSON]	0	0	1	1	2	3
CONSERVATION, WATER LOSS CONTROL - TOM BEAN	DEMAND REDUCTION [GRAYSON]	0	2	7	8	9	14
GTUA - GRAYSON COUNTY WSP	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	2	4	7	13	33
		0	4	12	16	24	50
TOM BEAN, TRINITY (C)							
CONSERVATION - TOM BEAN	DEMAND REDUCTION [GRAYSON]	1	4	6	9	11	19
CONSERVATION, WATER LOSS CONTROL - TOM BEAN	DEMAND REDUCTION [GRAYSON]	1	17	50	56	68	101
GTUA - GRAYSON COUNTY WSP	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	12	31	51	96	241
		2	33	87	116	175	361
TWO WAY SUD, RED (C)							
CONSERVATION - TWO WAY SUD	DEMAND REDUCTION [GRAYSON]	1	4	7	11	18	27
CONSERVATION, WATER LOSS CONTROL - TWO WAY SUD	DEMAND REDUCTION [GRAYSON]	3	3	0	0	0	0
GTUA - GRAYSON COUNTY WSP	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	103	211	337	586	838
		4	110	218	348	604	865
TWO WAY SUD, TRINITY (C)							
CONSERVATION - TWO WAY SUD	DEMAND REDUCTION [GRAYSON]	1	2	4	6	10	15

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Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
CONSERVATION, WATER LOSS CONTROL - TWO WAY SUD	DEMAND REDUCTION [GRAYSON]	1	1	0	0	0	0
GTUA - GRAYSON COUNTY WSP	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	60	124	198	343	491
		2	63	128	204	353	506

VAN ALSTYNE, TRINITY (C)

CONSERVATION - VAN ALSTYNE	DEMAND REDUCTION [GRAYSON]	2	4	7	11	39	65
CONSERVATION, WATER LOSS CONTROL - VAN ALSTYNE	DEMAND REDUCTION [GRAYSON]	3	3	0	0	0	0
NTMWD - ADDITIONAL LAKE LAVON	LAVON LAKE/RESERVOIR NORTH TEXAS MWD SYSTEM [RESERVOIR]	0	2	5	8	39	44
NTMWD - LOWER BOIS D'ARC CREEK RESERVOIR	LOWER BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	0	9	27	53	256	303
NTMWD - MAIN STEM PUMP STATION	INDIRECT REUSE [COLLIN]	0	3	6	6	1	0
NTMWD - OKLAHOMA	OKLAHOMA RUN-OF-RIVER [OKLAHOMA]	0	0	0	0	0	134
NTMWD - TEXOMA BLENDING	TEXOMA LAKE/RESERVOIR NORTH TEXAS MWD SYSTEM [RESERVOIR]	0	0	9	18	149	173
NTMWD - TOLEDO BEND PHASE I	TOLEDO BEND LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	144	258
NTMWD UNALLOCATED SUPPLY UTILIZATION	INDIRECT REUSE [COLLIN]	0	0	0	0	0	47
NTMWD UNALLOCATED SUPPLY UTILIZATION	INDIRECT REUSE [DALLAS]	0	0	0	0	0	67
NTMWD UNALLOCATED SUPPLY UTILIZATION	CHAPMAN/COOPER LAKE/RESERVOIR NORTH TEXAS MWD SYSTEM [RESERVOIR]	0	0	0	0	0	26
NTMWD UNALLOCATED SUPPLY UTILIZATION	LAVON LAKE/RESERVOIR NORTH TEXAS MWD SYSTEM [RESERVOIR]	0	0	0	0	0	53
NTMWD UNALLOCATED SUPPLY UTILIZATION	TEXOMA LAKE/RESERVOIR NORTH TEXAS MWD SYSTEM [RESERVOIR]	0	0	0	0	0	46

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Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
REMOVAL OF CHAPMAN SILT BARRIER	CHAPMAN/COOPER LAKE/RESERVOIR NORTH TEXAS MWD SYSTEM [RESERVOIR]	0	0	0	2	8	9
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	169
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	49	57
		5	21	54	98	685	1,451

WHITESBORO, RED (C)

CONSERVATION - WHITESBORO	DEMAND REDUCTION [GRAYSON]	1	1	2	3	4	6
CONSERVATION, WATER LOSS CONTROL - WHITESBORO	DEMAND REDUCTION [GRAYSON]	1	1	0	0	0	0
GTUA - GRAYSON COUNTY WSP	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	0	0	0	2	71
		2	2	2	3	6	77

WHITESBORO, TRINITY (C)

CONSERVATION - WHITESBORO	DEMAND REDUCTION [GRAYSON]	1	2	3	3	5	9
CONSERVATION, WATER LOSS CONTROL - WHITESBORO	DEMAND REDUCTION [GRAYSON]	1	1	0	0	0	0
GTUA - GRAYSON COUNTY WSP	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	0	0	0	2	93
		2	3	3	3	7	102

WHITEWRIGHT, RED (C)

CONSERVATION - WHITEWRIGHT	DEMAND REDUCTION [GRAYSON]	1	1	2	3	4	5
CONSERVATION, WATER LOSS CONTROL - WHITEWRIGHT	DEMAND REDUCTION [GRAYSON]	1	1	0	0	0	0
GTUA - GRAYSON COUNTY WSP	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	0	48	47	94	93
		2	2	50	50	98	98

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Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
WHITEWRIGHT, TRINITY (C)							
CONSERVATION - WHITEWRIGHT	DEMAND REDUCTION [GRAYSON]	0	0	0	0	0	0
CONSERVATION, WATER LOSS CONTROL - WHITEWRIGHT	DEMAND REDUCTION [GRAYSON]	0	0	0	0	0	0
GTUA - GRAYSON COUNTY WSP	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	0	0	0	1	1
		0	0	0	0	1	1
WOODBINE WSC, TRINITY (C)							
CONSERVATION - WOODBINE WSC	DEMAND REDUCTION [GRAYSON]	0	0	1	1	1	1
CONSERVATION, WATER LOSS CONTROL - WOODBINE WSC	DEMAND REDUCTION [GRAYSON]	0	0	0	0	0	0
GAINESVILLE UNALLOCATED SUPPLY UTILIZATION	HUBERT H MOSS LAKE/RESERVOIR [RESERVOIR]	0	1	1	2	3	4
		0	1	2	3	4	5
Sum of Projected Water Management Strategies (acre-feet)		693	11,897	14,453	17,598	27,415	42,584

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