NORTHERN TRINITY GROUNDWATER CONSERVATION DISTRICT

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June 19, 2020

Jeff Walker
Executive Administrator
Texas Water Development Board
1700 North Congress Avenue
PO Box 13231
Austin, Texas 78711-3231

RE: Board Approved 2020.Northern Trinity GCD Management Plan

Dear Jeff:

Enclosed are the following:

- Northern Trinity GCD 2020.Management Plan
- Email with list of surface water entities, river authorities, and smaller entities
- Draft Minutes from May 20, 2020 BOD meeting (highlighted section page 6)
- Resolution #020-002 adopting District Groundwater Management Plan will be signed at the Board of Directors meeting July 23, 2020. (enclosed in MP)
- Thumb Drive containing a single file pdf of the whole plan
- Point of Contact for Northern Trinity Groundwater Conservation District:
    - Dr. Robert Patterson
      bobpatterson@ntgcd.com
      817.249.2062 office
      817.269.7566 cell

Kindest Regards,

Bob

Dr. Robert Patterson
General Manager
Northern Trinity GCD

Groundwater Management Plan

Adopted on 5/20/2020

Texas Water Development Board Executive Administrator approval on _____

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NORTHERN TRINITY GROUNDWATER CONSERVATION DISTRICT GROUNDWATER MANAGEMENT PLAN

1. District's Mission

The mission of the Northern Trinity Groundwater Conservation District ("District") is to manage, preserve, and protect the groundwater resources of Tarrant County, Texas. The District will work to minimize the further drawdown of water levels, prevent the waste of groundwater, prevent interference between wells, protect the existing and historic use of groundwater, prevent the degradation of the quality of groundwater, use public education to promote water conservation, give consideration to the needs of municipal water utilities and the agricultural community, and carry out the powers and duties conferred under Chapter 36 of the Texas Water Code ("TWC"). 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.

II. Purpose of the Management Plan

The purpose of the management plan is to provide a planning tool for the District as it moves forward with its efforts to manage and conserve groundwater resources of Tarrant County. The Management Plan contains the hydrogeological and technical information provided by the Texas Water Development Board ("TWDB") regarding the groundwater resources of Tarrant County. As the District obtains more site-specific groundwater information, the District will update and amend the Management Plan.

The development of the Management Plan for the District will enable the District to comply with the requirements of state law. The Texas Legislature created a statewide water planning process with the passage of Senate Bill 1 ("SB 1") in 1997 and Senate Bill 2 ("SB 2") in 2001. The development of management plans by each groundwater conservation district ("GCD") in Texas is an integral part of the statewide planning process. The District's Management Plan satisfies all requirements established for GCDs by SB 1, SB 2, the statutory requirements Chapter 36 of the Texas Water Code, and the administrative requirements of the rules of the TWDB.

III. District Information

A. Creation

The District was created in 2007 by the 80th Texas Legislature with the enactment of House Bill 4028 (Appendix A) and which was codified as Chapter 8820 of the Texas Special District Local Laws Code. In its enabling legislation, the District was provided the powers and duties provided by the general law of the State of Texas, including Chapter 36 of the Texas Water Code, applicable to groundwater conservation districts created under Section 59, Article XVI, of the Texas Constitution. The District's Rules and Management Plan provide the means to conserve, preserve, protect, and prevent waste of the groundwater resources of Tarrant County, Texas, and to promote recharge of the aquifers within Tarrant County.

B. Directors

The District Board of Directors consists of five directors, each serving four year staggered terms. The Tarrant County Commissioners Court shall appoint one director from each of the four commissioner's precincts in the county to represent the precinct in which the director resides. The Tarrant County Judge shall appoint one director in the District to represent the District at large.

C. Authority

The District has the rights and responsibilities provided for in Chapter 8820 of the Texas Special District Local Laws Code (which codified the District's enabling legislation – House Bill 4028), TWC Chapter 36 and 31 Texas Administrative Code (TAC) Chapter 356. The District is charged with conducting hydrogeological studies, adopting a management plan, providing for the permitting of certain water wells and implementing programs to achieve statutory mandates. The District has rule- making authority to implement the policies and procedures needed to manage the groundwater resources of Tarrant County.

The Texas Legislature established in Chapter 8820 of the Texas Special District Local Laws Code the District may not regulate the drilling or equipping of, or the completion, operation, or production of, a well located in the District and in another conservation and reclamation district created under Section 59, Article XVI, Texas Constitution, and that on January 1, 2007 had certain statutory authority to regulate groundwater wells. One conservation and reclamation district that meets the previously provided qualifications is Benbrook Water Authority. The Texas Legislature granted the District with the legal authority to assess a groundwater production fee on the owners of wells located within both the District and Benbrook Water Authority and tasked the District with meeting with Benbrook Water Authority to coordinate groundwater regulatory efforts and to exchange technical information.

D. Location and Extent

The District's boundaries are coextensive with the boundaries of Tarrant County, and all lands and other property within these boundaries will benefit from the works and projects that will be accomplished by the District. The District covers an area of approximately 863.42 square miles. Figure 1 is a map of the District showing major roads, incorporated areas and major surface water bodies.

E. Groundwater Resources of Tarrant County

Groundwater resources in Tarrant County, which makes up the District, include the Cretaceous-age northern Trinity and Woodbine aquifers (Figure 2). Sediments in the Washita and Fredericksburg Groups and the Paleozoic-age sediments are general confining units but do produce water locally. A generalized stratigraphic section representative of the hydrogeology of the District is provided in Table 1. The northern Trinity and Woodbine aquifers are recognized by the TWDB as a major and minor aquifer in Texas, respectively. The TWDB defines a major aquifer as one that supplies large quantities of water over large areas of the state and a minor aquifer as one that supplies relatively small quantities of water over large areas of the state or supplies large quantities of water over small areas of the state (George and others, 2011).

<u>Major Aquifer –Trinity Aquifer</u>

The northern Trinity Aquifer is composed of several individual aquifers contained within the

Trinity Group. In the District, the northern Trinity Aquifer consists of the aquifers of the Paluxy and Twin Mountains formations separated by the predominantly confining Glen Rose Formation (Figure 3). South of the District, the upper and lower sands of the Twin Mountains Formation are locally referred to as the Hensell and Hosston aquifers and the middle portion of the aquifer, which contains more shale relative to the upper and lower sands, is locally referred to as the Pearsall Formation (see Figure 3). The Fredericksburg and Washita groups are considered confining units, although they can be locally productive, and overlie the downdip portion of the northern Trinity Aquifer in the central portion of the District (see Figures 3 and 4). The northern Trinity Aquifer is underlain by Paleozoic-age sediments, which can be locally productive.

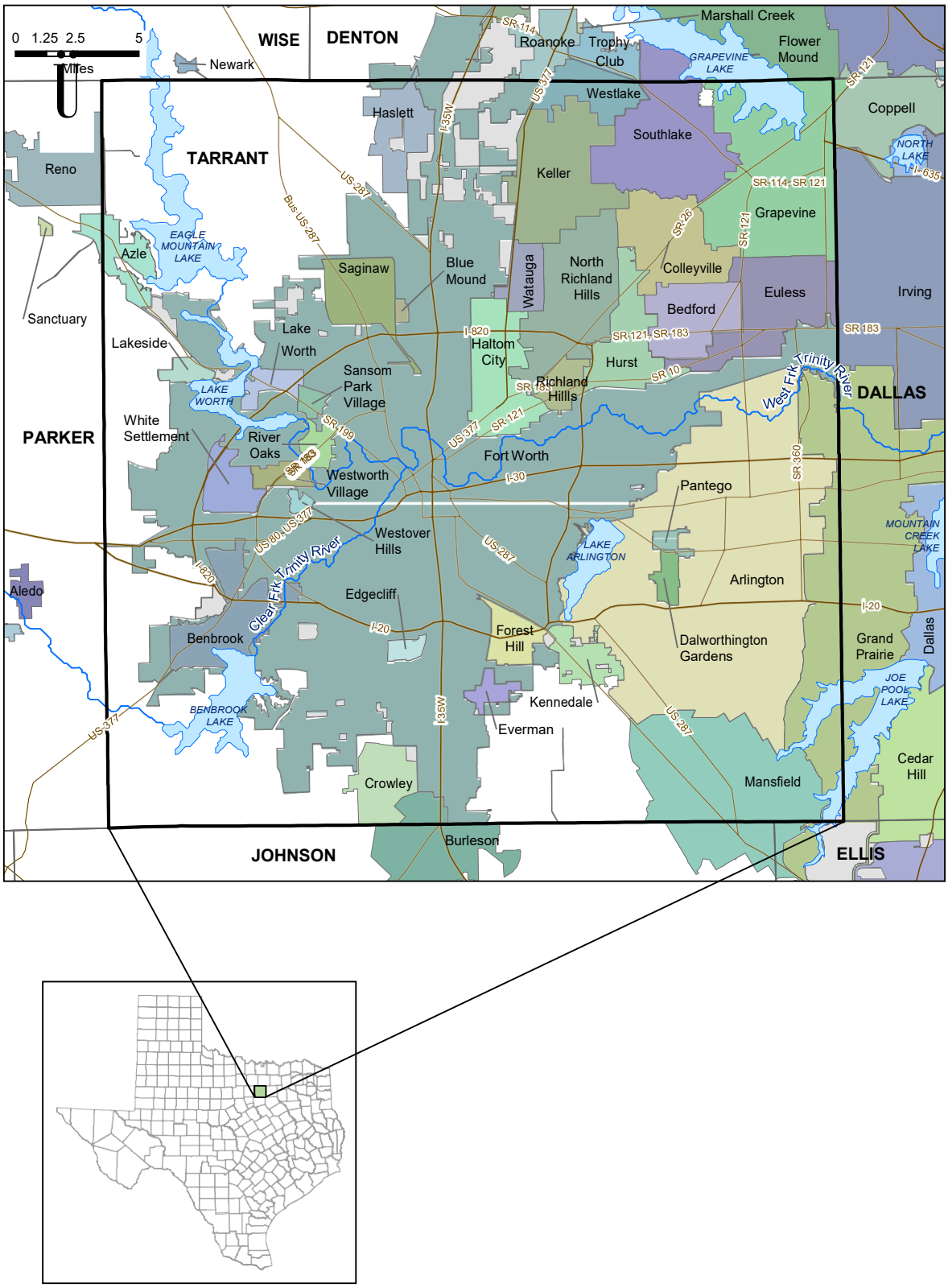


Figure 1 **Map showing the location and boundaries of the District along with cities, major roads, lakes, and major rivers in the District.**

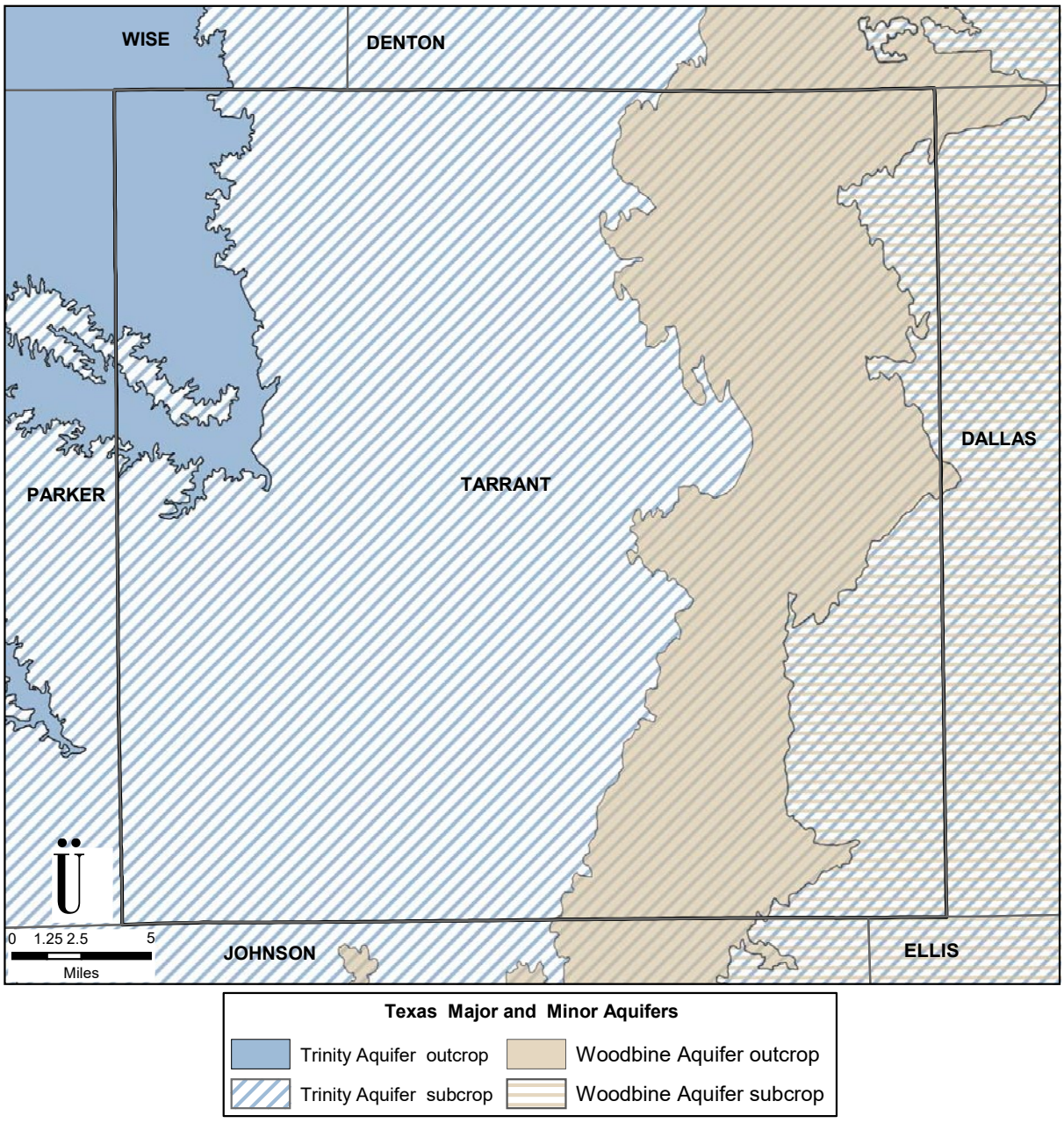
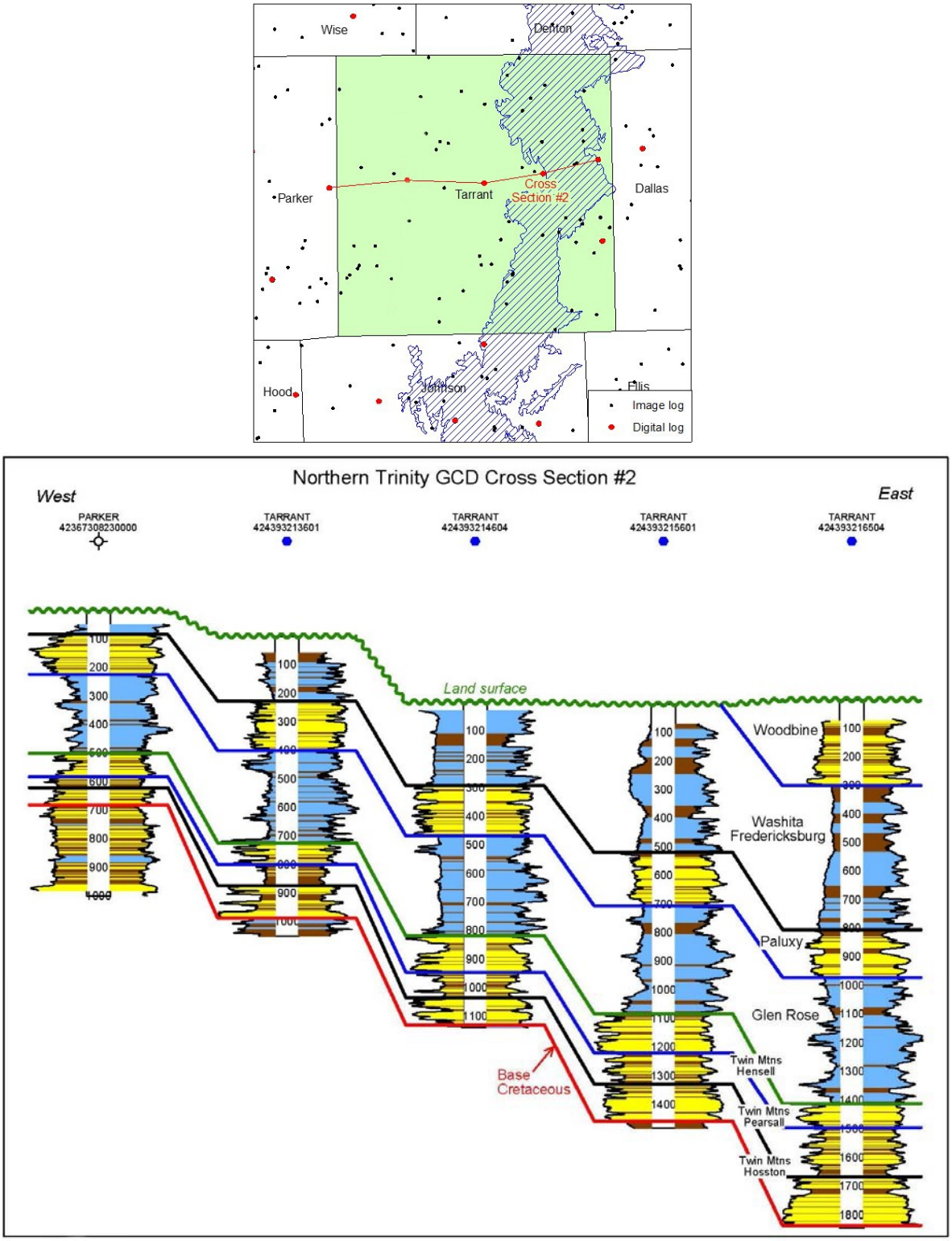


Figure 2 Outcrop and subcrop of the northern Trinity and Woodbine aquifers in the District.

Table 1 General stratigraphy and hydrogeology of the District (after Kelley and others, 2014).

System	Hydrogeologic Characteristic	Group	Formation	
Quaternary	Water-Bearing		alluvial deposits	
Cretaceous	Confining Unit	Eagle Ford	undifferentiated	
	Woodbine Aquifer	Woodbine	Lewisville	
			Dexter	
	Confining Unit (locally productive)	Washita	Grayson	
			Mainstreet	
			PawPaw	
			Weno	
			Denton	
			Fort Worth	
			Duck Creek	
	Confining Unit (locally productive)	Fredericksburg	Kiamichi	
			Edwards	
			Comanche Peak	
			Walnut	
	Trinity Aquifer	Trinity	Paluxy	
			Glen Rose	
			Twin Mountains	Hensell
				Pearsall
				Hosston
Paleozoic	Confining Unit (locally productive)	undifferentiated		

Blue highlight indicates aquifers.



yellow = greater than 50 percent sandstone, blue = greater than 50 percent limestone, brown = greater than 50 percent shale

Figure 3 Digital cross section showing the stratigraphy in the District from ground surface to the base of the northern Trinity Aquifer.

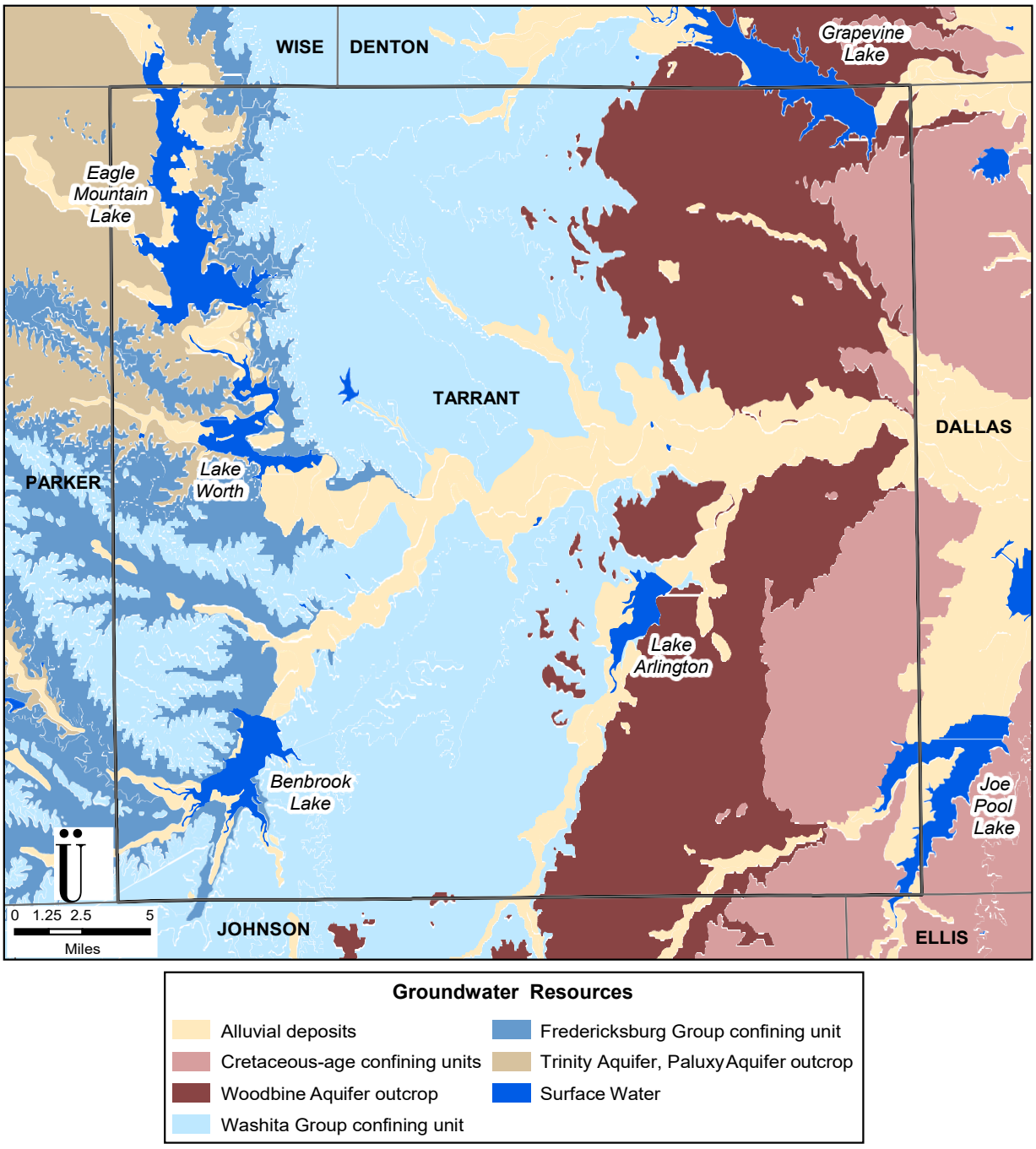


Figure 4 Surface expression of groundwater resources in the District.

The Paluxy Aquifer consists of sand, silt, and clay, with fine-grained sand dominating and the Twin Mountains Aquifer consists predominately of medium- to coarse-grained sand, silty clay, and conglomerates. The following description of the aquifers is taken from Kelley and others (2014). The sandstones in both aquifers are well developed in the District comprising greater than 60 percent of the aquifers everywhere except in the northwest corner of the District. Sandstones in the Paluxy Aquifer are located at surface to depths of 1,000 feet and in the Twin Mountains Aquifer at depths of 500 to 2,000 feet. The depth to sandstone increases from west to east across the District following the structure dip of the Trinity Group. Major, east-oriented, fluvial channel axes in the Paluxy and Twin Mountains aquifers are expressed as thick-bedded sandstones (see Figure 3). The sandstones of the Paluxy Aquifer and the lowermost sands of the Twin Mountains Formation (Hosston Aquifer equivalent) form the most hydraulically conductive and transmissive units in the District. The limestones of the Glen Rose Formation in the northern Trinity Aquifer are well developed confining layers throughout the District. However, the formation does yield small quantities of water in localized areas.

Groundwater samples from wells in the District indicate that the water quality in the northern Trinity Aquifer is fresh with total dissolved solids concentrations typically less than 1,000 milligrams per liter. The composition of the groundwater throughout the vertical extent of the aquifer is predominately sodium-bicarbonate in the District. Groundwater quality in the Woodbine in the District is highly variable with measured groundwater concentrations exceeding 1,500 milligrams per liter.

Groundwater use in the District is dominated by the Municipal Water User Group (WUG). According to the TWDB Water Use Survey Data, municipal groundwater use comprised approximately 80% of pumping in 2017. During this same time period, rural and domestic pumping has been estimated to be about 1 to 2 percent of total groundwater use in the District (Kelley and others, 2014). Mining related pumping has increased significantly as a percent of total pumping because of oil and gas related activities. In 2000, there was zero reported mining groundwater use in Tarrant County, but that grew to approximately 14% of all groundwater use by 2011. It has since declined, making up less than 1% in 2017. Groundwater usage for irrigation was essentially zero for the period from 2000-2007, but has been steadily increasing since 2008, reaching approximately 20% of total groundwater use in the District in 2017.

IV Statement of Guiding Principles

The District recognizes that the groundwater resources of Tarrant County and the local region are of vital importance. The District will strive to manage and conserve this most valuable resource in a prudent and cost-effective manner through education, cooperation, and development of a comprehensive understanding of the aquifers. The District's management plan is intended to serve as a tool to focus the objectives and of those given the responsibility for the execution of the District's activities.

V. Criteria for Plan Approval

A. Planning Horizon

The original management plan was approved by the TWDB on July 9th, 2010. The management plan for the District was re-adopted by the District and approved by the TWDB on June 11, 2015. The District also revised and re-adopted management plan in 2018 to incorporate the new Desired Future Conditions for the aquifers within Tarrant County by Groundwater Management Area 8. The plan remains in effect for five (5) years after the date of approval or until a revised plan is readopted and reapproved. The original management plan and all subsequent plans shall be reviewed and updated and readopted in accordance with the requirements of the Texas Water Code as part of the five-year review and re-adoption process as required by TWC 36.1072(e). The effective time period for this plan is 5 years from the date of approval by the TWDB Executive Administrator or, if appealed, on approval by the TWDB. This management plan will become effective upon adoption by the Northern Trinity Groundwater Conservation District Board of Directors and approved as administratively complete by the TWDB.

B. Board Resolution

A certified copy of the District Board of Directors' resolution adopting the plan is located in Appendix B - District Resolution.

C. Plan Adoption

Public notice documenting that the plan was adopted following appropriate public meetings and hearings are located in Appendix C – Notice of Hearings and Meetings.

D. Coordination with Surface Water Management Entities

Letters transmitting copies of this plan to the Trinity River Authority, the North Texas Municipal Water District, the Tarrant Regional Water District as well as other Surface Water Management Entities are located in Appendix D – Correspondence to Surface Water Management Entities.

VI. Estimates of Technical Information as Required by TWC § 36.1071 and 31 TAC § 356.52

A. Modeled Available Groundwater in the district based on the Desired Future Condition established under 31 TAC §356.52(a)(5)(A) and TWC §36.1071(e)(3)(A).

Modeled available groundwater (MAG) is defined in Section 36.001 of the Texas Water Code as "the amount of water that the executive administrator [of TWDB] determines may be produced on an average annual basis to achieve a desired future condition established under Section 36.108." The desired future condition of the aquifer may only be determined through joint planning with other GCDs in the same groundwater management area (GMA) as required by the 79th Legislature with the enactment of HB 1763. The District is part of GMA 8. The GCDs of GMA 8 completed the second round of the joint planning process and adopted DFCs for the Trinity and Woodbine Aquifers on January 31, 2016. The explantory report for the DFCs can be found at the following URL:

http://www.twdb.texas.gov/groundwater/dfc/docs/GMA8_DFCExpRep.pdf?d=11452.800000000025

The DFCs adopted by the District and GMA 8 represent the quantified, measurable conditions of the groundwater resources of the District in 61 years defined in terms of average water level decline (drawdown) from 2010 through 2070. The DFCs are summarized by aquifer in Table 2.

Table 2 Desired future conditions submitted to TWDB

Average Water Level Decrease in Tarrant County from 2010 through 2070 (feet)				
Paluxy	Glen Rose	Twin Mountains	Antlers	Woodbine
101	148	315	148	7

With the DFCs defined by GMA-8, the TWDB used the state approved GAM to estimate the MAG. The MAGs are documented in TWDB GAM Run 17-029 MAG (Appendix F). This MAG run can be found at the following link:

http://www.twdb.texas.gov/groundwater/docs/GAMruns/GR17-029_MAG.pdf?d=11452.800000000025

The MAGs for the northern Trinity and Woodbine aquifers in Tarrant County are summarized below in Table 3.

Table 3 Modeled available groundwater estimates from TWDB GAM Run 17-029 MAG

Aquifer	MAG for 2020[(1)] (acre-feet per year)	MAG for 2070[(1)] (acre-feet per year)
Paluxy	8,982	8,957
Glen Rose	795	793
Twin Mountains	6,936	6,917
Antlers	1,251	1,248
Woodbine	1,141	1,138

[(1)] Values technically vary by decade between 2020 and 2070, but are all within 0.3% of these values

B. Estimate of the Amount of Groundwater Being Used within the District on an Annual Basis—31 TAC §356.52(a)(5)(B) and TWC § 36.1071(e)(3)(B)

To estimate the annual amount of groundwater being used in the District, the District has used the TWDB Annual Water Use Survey Data provided by the TWDB and attached on Page 3 of Appendix E – Groundwater Management Plan Data. Appendix E summarizes groundwater and surface water use for years 2002 through 2017 by water user group. The only water user group not included in this survey is rural and domestic groundwater use which is a small percentage of groundwater use in Tarrant County.

The TWDB estimate of the amount of groundwater being used in the District on an annual basis is 12,073 acre-feet per year. The estimate is from the TWDB Annual Water Use Survey for the Year 2017 which is the most recent data provided. The average groundwater use from 2002

through 2017 is 15,963 acre-feet per year. For comparison, the average surface water use from 2002 through 2017 is 324,626 acre-feet per year.

C. Estimate of the Annual Amount of Recharge from Precipitation to the Groundwater Resources within the District—31 TAC § 356.52(a)(5)(C) and TWC 36.1071(e)(3)(C)

The estimated total amount of annual recharge from precipitation within the District is estimated by the TWDB to be 3,735 acre-feet per year for the Paluxy Formation within the Trinity Aquifer and 16,545 acre-feet per year for the Woodbine Aquifer. These estimates are from the updated northern Trinity and Woodbine aquifers GAM (Kelley and others, 2014) and can be found in Table 1 and 2 of GAM Run 14-001 attached as Appendix G. The recharge to the northern Trinity Aquifer (Paluxy Formation) is small relative to the Woodbine Aquifer because of the small area of outcrop of the northern Trinity Aquifer in Tarrant County (see Figure 2).

The Washita and Fredericksburg Groups lie between the top of the northern Trinity Aquifer and the Woodbine Aquifer and are generally considered confining units and are not recognized by the TWDB as either minor or major aquifers. However, most of the surface area in Tarrant County is the outcrop of the Washita and Fredericksburg Groups. These geologic units do receive recharge within the county and may act as a minor source of groundwater to wells within the District.

D. Estimate of the Annual Volume of Water that Discharges from the Aquifer to Springs and Surface Water Bodies—31 TAC § 356.52(a)(5)(D) and TWC § 36.1071(e)(3)(D)

The estimated total annual volume of groundwater that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers is 18,836 acre-feet per year. Approximately 4,560 acre-feet per year discharges from the northern Trinity Aquifer and approximately 14,276 acre-feet per year discharges from the Woodbine Aquifer in the District boundaries. These estimates are from the updated northern Trinity and Woodbine aquifers GAM (Kelley and others, 2014) and can be found in Table 1 and 2 of GAM Run 14-001 attached as Appendix G.

E. Estimate of the Annual Volume of Flow into the District, out of the District, and Between Aquifers in the District—31 TAC § 356.52(a)(5)(E) and TWC § 36.1071(e)(3)(E)

The estimates of annual volume of groundwater flow into the District, out of the District and between aquifers in the District are provided by the TWDB and documented in GAM Run GR 14-001 which is attached as Appendix G to the Management Plan. All volumes are reported as acre-feet per year rounded to the nearest acre foot. Table 4 summarizes the reported groundwater flows for the District.

Table 4 Annual volume of flow into the District, out of the District within each aquifer, and between each aquifer in the District.

Management Plan Requirement	Aquifer or confining unit	Acre-feet per year
Estimated annual volume of flow into the district within each aquifer in the district	Woodbine Aquifer	1,135
	Northern Trinity Aquifer	13,750
Estimated annual volume of flow out of the district within each aquifer in the district	Woodbine Aquifer	1,916
	Northern Trinity Aquifer	5,785
Estimated net annual volume of flow between each aquifer in the district	Flow from overlying Younger Confining Units to the Woodbine Aquifer	70
	Flow from Woodbine Aquifer to underlying Washita and Fredericksburg Confining Units	1,816
	Flow from overlying Washita and Fredericksburg Confining Units into the Trinity Aquifer	7,228
	Flow from Trinity Aquifer to underlying Older Units (Paleozoic Aquifers)	NA(1)

(1) The model assumes a no flow boundary condition at the bottom of the Trinity Aquifer

F. Projected Surface Water Supply within the District—31 TAC § 356.52(a)(5)(F) and TWC § 36.1071(e)(3)(F)

The Projected Surface Water Supply within the District was provided by the TWDB and is attached on Pages 5 through 8 of Appendix E – Groundwater Management Plan Data. The data is based upon the most current State Water Plan (SWP) data available as of January 13, 2020.

G. Projected Water Demand within the District—31 TAC § 356.52(a)(5)(G) and TWC`§ 36.1071(e)(3)(G)

The Projected Water Demand within the District was provided by the TWDB and is attached on Pages 9 and 10 of Appendix E – Groundwater Management Plan Data. The data is based upon the most current State Water Plan (SWP) data available as of January 13, 2020.

H. Water Supply Needs and Water Management Strategies Included in the Adopted State Water Plan—TWC § 36.1071(e)(4)

The Water Supply Needs within the District were provided by the TWDB and is attached on Pages 11 and 12 of Appendix E – Groundwater Management Plan Data. The data is based upon the most current State Water Plan (SWP) data available as of January 13, 2020. It is important to note that red numbers are needs representing a deficit in water based upon the balance between current supplies future demands. The deficits are projected to climb to 305,928 acre-feet per year by 2070.

The Water Management Strategies to meet the future demand including the projected supply deficits were provided by the TWDB and are attached on Pages 13 through 40 of Appendix E – Groundwater Management Plan Data. The data is based upon the most current State Water Plan (SWP) data available as of January 13, 2020. As can be seen in Appendix E, there is only one groundwater related management strategy – Johnson County SUD is to utilize unallocated Trinity Aquifer groundwater from the City of Grand Prairie.

VII. Management of Groundwater Supplies—31 TAC § 356.52(a)(4) and TWC §36.1071(e)(4)

The Texas Legislature has established that GCDs are the state's preferred method of groundwater management. The Texas Legislature codified this policy decision in Section 36.0015 of the Texas Water Code, which establishes that districts will manage groundwater resources through rules developed and implemented in accordance with Chapter 36 of the Texas Water Code ("Chapter 36"). Chapter 36 gives districts the tools to protect and manage the groundwater resources within their boundaries. The District will use the regulatory tools provided by Chapter 36 and the Texas Legislature to manage the groundwater resources within its boundaries.

The District places a priority on prevention of the contamination of its groundwater resources through abandoned and deteriorated water wells. Wells that have been abandoned or not properly maintained provide direct conduits or pathways that allow contamination from the surface to quickly reach the groundwater resources of the District. To address the threats to the water quality of its groundwater resources, the District intends to develop rules which require the capping and plugging of wells that are abandoned or deteriorated. The District plans to require that all abandoned, deteriorated, or replaced wells be plugged in compliance with the Water Well Drillers and Pump Installers Rules of the Texas Department of Licensing and Regulation.

The District will manage the supply of groundwater within the District in order to conserve the groundwater resources while seeking to maintain the economic viability of all groundwater user groups. In consideration of the economic and cultural activities occurring within the District, the District will identify and engage in such activities and practices which, if implemented, would result in a reduction of groundwater use. The District will develop a monitoring network within the District to monitor groundwater conditions and to be used to evaluate compliance with DFCs to the degree possible.

The District also has the authority to use the regulatory tools granted to districts by Chapter 36 to protect the existing and historic users of groundwater in the District. The District specifically has the authority to protect existing users of groundwater, which are those individuals or entities currently invested in and using groundwater or the groundwater resources within the District for a beneficial purpose, and preserve historic use by historic users, which are those individuals or entities who used groundwater beneficially in the past. The District will strive to protect such use to the extent practicable under the goals and objectives of this Management Plan. One way the District can protect existing and historic use is to create a future permitting process for groundwater use that preserves and protects the existing and historic use of groundwater in the

District. Pursuant to legislative authority, including Section 36.113(e) of the Texas Water Code, the District can protect existing use by imposing different permit conditions on new permit applications. In protecting existing users, the District may establish limitations that apply to new permit applications relative to historic use permit holders.

In order to better manage groundwater resources within its boundaries, the District may establish management zones and adopt different rules for: (1) each aquifer, subdivision of an aquifer, or geologic strata located in whole or in part within the boundaries of the District; or (2) each geographic area overlying an aquifer or subdivision of an aquifer located in whole or in part within the boundaries of the district.

VIII. Methodology to Track District Progress in Achieving Management Goals—31 TAC § 356.52(a)(4)

The District's General Manager and staff will prepare an annual report ("Annual Report") and will submit the Annual Report to members of the Board of the District. The Annual Report covers 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 120 days following the completion of the District's fiscal year. A copy of the Annual Report will be kept on file and available for public inspection at the District's offices upon approval by the Board.

IX. Actions, Procedures, Performance, and Avoidance for District Implementation of Management Plan – 31 TAC § 356.52(a)(3); 31 TAC § 356.52 (a)(4) / 36.1071(e)(2)

The District will implement this plan and will use the provisions of this plan as a means to determine the direction or priority for all District activities. All operations of the District and any additional planning efforts in which the District may participate will be consistent with the provisions of this plan. Rules adopted by the District for the permitting of wells and the production of groundwater shall comply with Chapter 36, including §36.113, and the provisions of this plan. All rules developed by the District will be adhered to and enforced in accordance with Chapter 36. The promulgation and enforcement of the rules will be based on the best scientific evidence available to the District. A copy of the District Rules (as of December 17th, 2018) can be found in Appendix H and at the following link:

http://ntgcd.com/wp-content/uploads/2018/12/NTGCD-Permanent-Rules-Effective-December-17-2018-.pdf

The District will work to encourage public cooperation and coordination in the implementation of this plan, 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 Act. The District also makes available for

public inspection all official documents, reports, records and minutes of the District pursuant with the Texas Public Information Act and will continue to do so in the future.

X. Management Goals and Performance Standards

A. Providing the Most Efficient Use of Groundwater—31 TAC § 356.52(a)(1)(A) and TWC § 36.1071(a)(1)

1. Objective – The District will require all new water wells constructed within the District to be in accordance with the District Rules.

   Performance Standard – The number of water wells registered by the District for each year will be included in the Annual Report submitted to the Board of Directors of the District.

2. Objective – The District will regulate the production of groundwater by maintaining a database of groundwater usage for non-exempt wells through the collection of groundwater production reports each year pursuant to the District Rules.

   Performance Standard – The District will include a summary of the volume of water produced in the County from non-exempt wells annually that will be included in the Annual Report.

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

1. Objective – The District will annually provide information to the public on eliminating and reducing wasteful practices in the use of groundwater by one of the following methods:

   a. Provide newspaper articles for publication;
   b. Publish a newsletter;
   c. Conduct public presentations;
   d. Set up displays at public events;
   e. Distribute brochures/literature.

   Performance Standard – The District's Annual Report will include information about the method and type of information supplied to the public.

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

   Performance Standard – Annual reporting of the total fees paid and the total volume used by users of non-exempt wells will be included in the Annual Report provided to the Board.

C. Addressing Conjunctive Surface Water Management Issues—31 TAC § 356.52(a)(1)(D) and TWC § 36.1071(a)(4)

1. Objective – Each year, the District will participate in the regional planning process by attending at least one Region C Regional Water Planning Group meeting.

   Performance Standard – The attendance of a District representative at the Region C Regional Water Planning Group meeting(s) will be noted in the Annual Report presented to the Board and will provide the total number of meetings conducted by the Region C Regional Water Planning Group for that year.

D. Addressing Natural Resource Issues that Impact the Use and Availability of Groundwater and Which are Impacted by the Use of Groundwater—31 TAC § 356.52(a)(1)(E) and TWC §36.1071(a)(6)

1. Objective – The District will collect and test groundwater quality samples from newly-drilled wells and existing wells.

   Performance Standard – Each year, District staff will sample and have analyzed the water quality in at least 5 wells. The General Manager will provide the lab analysis reports to the Board of Directors. The water quality results will also be summarized in the District Annual Report.

2. Objective – The District will submit at least one request annually to the Texas Railroad Commission asking for the location of existing salt water and/or waste disposal injection wells which have been permitted by the Texas Railroad Commission within the District within the most recent fiscal year.

   Performance Standard – A copy of each request letter that was submitted to the Texas Railroad Commission asking for the location of existing salt water or waste disposal wells permitted to operate within the District will be included in the Annual Report submitted to the Board of Directors of the District for each fiscal year and the Annual Report will also include the information supplied by the Texas Railroad Commission, if any.

E. Addressing Drought Conditions—31 TAC § 356.52(a)(1)(F) and TWC §36.1071(a)(6)

1. Objective – Quarterly, the District review drought conditions by going to TWDB Drought Page (http://www.waterdatafortexas.org/drought/) which compiles many sources of valuable information on drought conditions in Texas.

   Performance Standard – The District will make an assessment of the status of drought conditions in the District and will prepare a briefing to the Board of Directors at regular Board Meetings. Any information compiled and presented at Board Meetings will be in the District Annual Report.

F. Addressing Conservation, Recharge Enhancement, Rainwater Harvesting, and Brush Control—31 TAC § 356.52(a)(1)(G) and TWC §36.1071(a)(7)

1. Objective – The District will submit at least one article regarding water conservation for publication each year to at least one newspaper of general circulation in Tarrant County.

Performance Standard – A copy of the article submitted by the District for publication to regarding water conservation will be included in the Annual Report submitted to the Board.

2. Objective – The District will provide information on the District website relating to recharge enhancement at least once each year.

   Performance Standard – The Annual Report will include a copy of the information provided by the District related to recharge enhancement.

3. Objective – The District will provide information on rainwater harvesting on the District website at least once a year.

   Performance Standard – The Annual Report will provide a copy of the information on rainwater harvesting that was posted by the District in the previous year.

4. Objective – The District will evaluate the State Brush Control Plan on an annual basis to determine the necessity of projects within the District and whether projects within the District would increase the groundwater resources of the District.

   Performance Standard –The Annual Report will include a copy of the most recent brush control information pertaining to the District and the District's conclusions regarding necessity of projects and whether certain projects would increase the District's groundwater resources.

G. Addressing the Desired Future Conditions—31 TAC § 356.52(a)(1)(H) and TWC § 36.1071(a)(8)

1. Objective – Within 3 years of the adoption of this plan the District will develop a Groundwater Monitoring Program within the District.

   Performance Standard – The District's Annual Report will include a discussion of the District's progress on developing and implementing a Groundwater Monitoring Program.

2. Objective – Once the Groundwater Monitoring Program is established, annually, the District will measure the water levels in at least five monitoring wells within the District. At least four of the monitoring wells will be located within the Trinity Aquifer and one will be monitoring the Woodbine Aquifer.

   Performance Standard – The District's Annual Report will include the water level measurement data from the monitoring wells and an assessment of water level trends and the adequacy of the monitoring network to monitor aquifer conditions within the District and comply with the aquifer Desired Future Conditions.

3. Objective – The District will estimate non-exempt pumping within the District for use in evaluating compliance with Desired Future Conditions.

   Performance Standard – The District's Annual Report will include an estimate of groundwater use in the District by non-exempt wells.

XI. Management Goals Determined not to be Applicable to the District

A. Controlling and Preventing Subsidence – 31 TAC § 356.52(a)(1)(C) / TWC § 36.1071(a)(3)

This category of management goal is not considered applicable to the District. The Texas Water Development Board recently completed a statewide survey of the vulnerability of aquifers in Texas to subsidence (Furnans and others, 2017). This report can be found at the link below.

http://www.twdb.texas.gov/groundwater/models/research/subsidence/Final_Subsidence_Vulnerability_Report_final.pdf?d=8109.835000010207

While the report does indicate the downdip portions of the aquifer, including Tarrant County, have a somewhat higher risk of subsidence than the rest of the aquifer, as noted in Mace and others (1994), there has not been any observed subsidence in the Trinity Aquifer despite very substantial historical water level declines regionally. They concluded that even in the confined portions of the aquifer, where the largest declines have occurred, the subsidence expected would be only a small amount and would take a very long time to manifest itself.

B. Addressing Precipitation Enhancement—31 TAC § 356.52(a)(1)(G) and TWC § 36.1071(a)(7)

This management goal is not applicable to the District. Precipitation enhancement is not a cost effective or appropriate program for the District at this time since there are not precipitation enhancement programs in nearby counties or groundwater conservation districts that the District could participate with and allocate expenses for precipitation enhancement projects.

XII. References

Furnans, J., Keester, M., Colvin, D., Bauer, J., Barber, J., Gin, G., Danielson, V., Erickson, L., Ryan, R., Khorzad, K., Worsley, A., Snyder, G., 2017, Final Report: Identification of the Vulnerability of the Major and Minor Aquifers of Texas to Subsidence with Regard to Groundwater Pumping, TWDB Contract Number 1648302062, 434 p.

George, P.G, Mace, R.E., and Petrossian, R., 2011, Aquifers of Texas: TWDB, Report 380.

Kelley, V.A., Ewing, J., Jones, T.L., Young, S.C., Deeds, N. and Hamlin, S., 2014, Updated groundwater availability model of the northern Trinity and Woodbine aquifers, Final Report: prepared for the TWDB by INTERA, Inc, the University of Texas Bureau of Economic Geology, and LBG-Guyton Associates.

Leggat, E.R., 1957, Geology and ground-water resources of Tarrant County, Texas: TWDB, Bulletin 5709.

Mace, R.E., Dutton, A.R., and Nance, H.S., 1994, Water-Level Declines in the Woodbine, Paluxy, and Trinity Aquifers of North-Central Texas: Transactions of the Gulf Coast Association of Geological Societies, Vol. XLIV, pages 412-402.

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APPENDIX A

House Bill 4028

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Chapter 1126

H.B. No. 4028

AN ACT

relating to the creation of the Northern Trinity Groundwater Conservation District.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF TEXAS:

SECTION 1. Subtitle H, Title 6, Special District Local Laws Code, is amended by adding Chapter 8820 to read as follows:

CHAPTER 8820. NORTHERN TRINITY GROUNDWATER CONSERVATION DISTRICT

SUBCHAPTER A. GENERAL PROVISIONS

Sec. 8820.001. DEFINITIONS. In this chapter:

(1) "Board" means the district's board of directors.

(2) "Director" means a board member.

(3) "District" means the Northern Trinity Groundwater Conservation District.

Sec. 8820.002. NATURE OF DISTRICT. The district is a groundwater conservation district in Tarrant County created under Section 59, Article XVI, Texas Constitution.

Sec. 8820.003. DISTRICT TERRITORY. The boundaries of the district are coextensive with the boundaries of Tarrant County.

Sec. 8820.004. CONFIRMATION ELECTION NOT REQUIRED. The board is not required to hold an election to confirm the district's creation.

[Sections 8820.005-8820.050 reserved for expansion]

SUBCHAPTER B. BOARD OF DIRECTORS

Sec. 8820.051. GOVERNING BODY; TERMS. (a) The district is

governed by a board of five directors.

(b) Directors serve staggered four-year terms.

Sec. 8820.052. APPOINTMENT OF DIRECTORS. (a) The Tarrant County Commissioners Court shall appoint one director from each of the four commissioners precincts in the county to represent the precinct in which the director resides.

(b) The county judge of Tarrant County shall appoint one director who resides in the district to represent the district at large.

Sec. 8820.053. INITIAL DIRECTORS. (a) Not later than the 45th day after the effective date of this chapter:

(1) the Tarrant County Commissioners Court shall appoint one director from each of the four commissioners precincts in the county to represent the precinct in which the director resides; and

(2) the county judge of Tarrant County shall appoint one director who resides in the district to represent the district at large.

(b) The initial board may agree on which three directors serve four-year terms that expire at the end of the calendar year following the fourth anniversary of the effective date of this chapter, and which two directors serve two-year terms that expire at the end of the calendar year following the second anniversary of the effective date of this chapter. If the initial board cannot agree, the directors shall draw lots to determine which three directors serve the four-year terms and which two directors serve the two-year terms.

(c) This section expires September 1, 2014.

[Sections 8820.054-8820.100 reserved for expansion]

SUBCHAPTER C. POWERS AND DUTIES

Sec. 8820.101. GROUNDWATER CONSERVATION DISTRICT POWERS AND DUTIES. The district has the powers and duties provided by the general law of this state, including Chapter 36, Water Code, applicable to groundwater conservation districts created under Section 59, Article XVI, Texas Constitution.

Sec. 8820.102. NO EMINENT DOMAIN POWER. The district may not exercise the power of eminent domain.

[Sections 8820.103-8820.150 reserved for expansion]

SUBCHAPTER D. REGULATION OF OTHER DISTRICTS

Sec. 8820.151. REGULATION OF WELLS IN ANOTHER DISTRICT. Except as provided by this subchapter, the district may not regulate the drilling or equipping of, or the completion, operation, or production of, a well located in the district and in another conservation and reclamation district created under Section 59, Article XVI, Texas Constitution, and that on January 1, 2007:

(1) had statutory authority to require a person to obtain a permit before drilling, equipping, completing, altering, or operating a well in its boundaries; and

(2) had adopted rules to implement that statutory authority.

Sec. 8820.152. FEES ON WELLS IN ANOTHER DISTRICT. The district may assess to the owner or operator of a well located in a conservation and reclamation district described by Section

8820.151 a fee based on the amount of groundwater produced from the well in the same manner and at the same rate as other wells in the district.

Sec. 8820.153. COORDINATION WITH OTHER DISTRICTS. (a) The district and any conservation and reclamation district described by Section 8820.151 shall meet to:

(1) coordinate the adoption of rules by each district to promote consistent planning and regulation; and

(2) develop procedures to ensure the expedited exchange of technical and regulatory information between the districts.

(b) The district and a conservation and reclamation district described by Section 8820.151 may enter into one or more agreements to implement this section, including an interlocal contract under Chapter 791, Government Code.

[Sections 8820.154-8820.200 reserved for expansion]

SUBCHAPTER E. GENERAL FINANCIAL PROVISIONS

Sec. 8820.201. TAXES AND BONDS PROHIBITED. The district may not impose a tax or issue bonds.

SECTION 2. (a) The legal notice of the intention to introduce this Act, setting forth the general substance of this Act, has been published as provided by law, and the notice and a copy of this Act have been furnished to all persons, agencies, officials, or entities to which they are required to be furnished under Section 59, Article XVI, Texas Constitution, and Chapter 313, Government Code.

(b) The governor has submitted the notice and Act to the

Texas Commission on Environmental Quality.

(c) The Texas Commission on Environmental Quality has filed its recommendations relating to this Act with the governor, the lieutenant governor, and the speaker of the house of representatives within the required time.

(d) All requirements of the constitution and laws of this state and the rules and procedures of the legislature with respect to the notice, introduction, and passage of this Act are fulfilled and accomplished.

SECTION 3. This Act takes effect immediately if it receives a vote of two-thirds of all the members elected to each house, as provided by Section 39, Article III, Texas Constitution. If this Act does not receive the vote necessary for immediate effect, this Act takes effect September 1, 2007.

David Dewhurst
President of the Senate

Tom Craddick
Speaker of the House

I certify that H.B. No. 4028 was passed by the House on May 11, 2007, by the following vote: Yeas 144, Nays 0, 2 present, not voting; and that the House concurred in Senate amendments to H.B. No. 4028 on May 25, 2007, by the following vote: Yeas 140, Nays 0, 2 present, not voting.

Robert Haney
Chief Clerk of the House

I certify that H.B. No. 4028 was passed by the Senate, with amendments, on May 23, 2007, by the following vote: Yeas 31, Nays 0.

Patsy Spaw
Secretary of the Senate

APPROVED: 15 JUN 07
Date

Rick Perry
Governor

FILED IN THE OFFICE OF THE SECRETARY OF STATE
7PM O'CLOCK
JUN 15 2007
Roger Williams
Secretary of State

APPENDIX B

District Resolution Adopting Plan

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RESOLUTION #020-002

RESOLUTION ADOPTING DISTRICT GROUNDWATER MANAGEMENT PLAN

THE STATE OF TEXAS §
§
NORTHERN TRINITY GROUNDWATER CONSERVATION DISTRICT §

WHEREAS, the Northern Trinity Groundwater Conservation District ("District") was created by the Texas Legislature, pursuant to the authority of Article XVI, § 59 of the Texas Constitution, through Act of May 28, 2007, 80th Leg., R.S., ch. 1126, 2007 Tex. Gen. Laws 3794, as a groundwater conservation district operating under Chapter 36, Texas Water Code, Section 59, Article XVI of the Texas Constitution, and the Act;

WHEREAS, the Board of Directors of the District ("Board") is required to adopt a Management Plan in accordance with Sections 36.1071 and 36.1072 of the Texas Water Code and 31 Texas Administrative Code Chapter 356, and must thereafter submit the plan for TWDB approval pursuant to 31 Texas Administrative Code Sections 356.5 and 356.6;

WHEREAS, as part of the process of adopting its Management Plan, the District requested and received the assistance of the TWDB and worked with the TWDB staff to obtain the staff's recommendations and comments on the revisions to its Management Plan;

WHEREAS, the Board and the consultants of the District reviewed and analyzed the District's best available data, groundwater availability modeling, desired future conditions, and managed available groundwater information, and other information and data required by the TWDB;

WHEREAS, the District issued notice in the manner required by state law and held at least one public hearing to receive public and written comments on the Management Plan;

WHEREAS, the District will coordinate with the appropriate surface water management entities after the public hearing and adoption of its Management Plan to afford surface water management entities within the boundaries of the District the opportunity to review and provide comments to the District on its Management Plan;

WHEREAS, the Board finds that the Management Plan meets all of the requirements of Chapter 36, Texas Water Code, and 31 Texas Administrative Code Chapter 356; and

WHEREAS, the Board of Directors met in a public meeting on May 20, 2020, properly noticed in accordance with appropriate law, after holding a public hearing on the attached revised Management Plan, considered the adoption of the Management Plan, and considered approval of this resolution.

NOW, THEREFORE, BE IT ORDERED BY THE BOARD OF DIRECTORS OF NORTHERN TRINITY GROUNDWATER CONSERVATION DISTRICT THAT:

1. The above recitals are true and correct.

2. The Board of Directors of Northern Trinity Groundwater Conservation District hereby adopts the attached Management Plan as the Management Plan of the District;

3. The Board of Directors, the District's Board President, the General Manger, and the District's consultants are further authorized to take all steps necessary to implement this resolution and submit the revised Management Plan to the TWDB for its approval; and

4. The Board of Directors, the District's Board President, the General Manager, and the District's consultants are further authorized to take any and all action necessary to coordinate with the TWDB as may be required in furtherance of TWDB's approval pursuant to the provisions of Section 36.1 072 of the Texas Water Code.

AND IT IS SO ORDERED.

PASSED AND ADOPTED on this _____day of _____, 2020

NORTHERN TRINITY GROUNDWATER CONSERVATION DISTRICT

BY:_____
Board President

ATTEST:

_____
Board Secretary

APPENDIX C

Notice of Hearings and Meetings

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Star-Telegram MEDIA
Arlington Citizen-Journal | The Keller Citizen | La Estrella
Mansfield News-Mirror | Star-Telegram Northeast | Weatherford Star-Telegram
star-telegram.com | 808 Throckmorton St. | Ft Worth, Tx. 76102-6315

AFFIDAVIT OF PUBLICATION

Account #	Ad Number	Identification	PO	Amount	Cols	Depth
638789	0004635169	NORTHERN TRINITY GROUNDWATER CONSE		$566.46	1	91.00 Li

Attention: Laura Schumacher

NORTHERN TRINITY GCD
1100 CIRCLE DRIVE STE 300
FORT WORTH, TX 76119

NORTHERN TRINITY GROUNDWATER CONSERVATION DISTRICT
NOTICE OF PUBLIC HEARINGS ON AMENDMENTS TO MANAGEMENT PLAN AND DISTRICT RULES
May 20, 2020 at 2:00 p.m.

In accordance with Governor Abbott's declaration of the COVID-19 public health threat and action to temporarily suspend certain provisions of the Texas Open Meetings Act, the Northern Trinity Groundwater Conservation District (NTGCD) will hold public hearings on proposed amendments to the NTGCD's Groundwater Management Plan and the NTGCD's rules on Wednesday, May 20, 2020, at 2:00 p.m. by telephonic conference call. The public may call in to this meeting by calling 1-888-599-1357 and entering the following code: 8529.

All interested parties are encouraged to provide input, and members of the public wishing to make public comment during the meeting must register by emailing lauraschumacher@ntgcd.com prior to 2:00 p.m. on May 20, 2020. This meeting will be recorded and the audio recording will be made available upon request after the meeting by sending an email to lauraschumacher@ntgcd.com.

The proposed amendments to the Groundwater Management Plan address water quality monitoring goals for the District, injection well reporting, updated information from groundwater availability modeling and the regulatory relationship between the NTGCD and Benbrook Water Authority. At the conclusion of the hearing or any time or date thereafter, the proposed amendments to the Groundwater Management Plan may be adopted in the form presented or as amended based upon comments received from the public, the Texas Water Development Board, District staff, attorneys, geoscientists, or members of the Board of Directors without any additional notice.

The proposed amendments to the NTGCD's rules would address (1) notice issues associated with permit applications; (2) regulation of geothermal wells; and (3) permitting issues related to the transportation of groundwater outside of the boundaries of the NTGCD.

Copies of the proposed Management Plan and proposed rules amendments are available for review on the NTGCD's website at www.ntgcd.com.

The NTGCD is committed to compliance with the Americans with Disabilities Act (ADA). Reasonable accommodations

MAY 13 2020
BP

LIZBETH ALEJANDRA CORDERO
My Notary ID # 131683098
Expires January 25, 2023

THE STATE OF TEXAS

County of Tarrant

Before me, a Notary Public in and for said County and State, this day personally appeared AMBAR LIZARRAGA, Bid and Legal Coordinator for the **Star-Telegram**, published by the Star-Telegram, Inc. at Fort Worth, in Tarrant County, Texas; and who, after being duly sworn, did depose and say that the attached clipping of an advertisement was published in the above named paper on the listed dates:

1 Insertion(s)

Published On:
April 30, 2020

(Principal Clerk)

SUBSCRIBED AND SWORN TO BEFORE ME, THIS 30th day of April in the year of 2020

Notary Public -

Extra charge for lost or duplicate affidavits.
Legal document please do not destroy!

and equal opportunity for effective communications will be provided upon request. Please call 817-249-2062 at least 24 hours in advance if accommodation is needed.
For more information about the public hearings or the NTGCD please contact: Bob Patterson, General Manager at 817-249-2062

NORTHERN TRINITY GROUNDWATER CONSERVATION DISTRICT
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For more information about the public hearings or the NTGCD please contact:
Bob Patterson, General Manager at 817-249-2062

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APPENDIX D

Correspondence to Surface Water Management Entities

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The following is list of surface water, river authorities, and other entities provided a digital copy of the Northern Trinity GCD Groundwater Management Plan.

Entity	Contact Name
Tarrant Regional Water District	Jim Oliver
Benbrook Water Authority	David Smith
Army Corp of Engineers	Darlene Prochaska
Trinity River Authority	Kevin Ward
City of Fort Worth	David Cooke, City Manager
City of Arlington	Trey Yelverton, City manager
City of Mansfield	Bart VanAmburgh, director of public works
North Texas Municipal Water District	Billy George, PE Assistant Deputy-Water
Upper Trinity Regional Water District	Ronna Hartt, Manager
Greater Texoma Utility Authority	Drew Satterwhite, GM
Bethesda WSC	Steve Sievers, GM
City Of Kennedale	George Campbell, City Manager
Dalworthington Gardens	Lola Hazel, City Administrator
Town Of Pantego	Joe Ashton, City Manager
Monarch Utilities (Southwest Water)	Rob MacLean
City Of Grand Prairie	Lydia Zuckerman, Exe Assistant
Johnson County SUD	Peter Kampfer, GM
City Of Crowley	Robert Loftin, City Manager
Town Of Lakeside	Norman Cravens
Aqua Texas Inc	Darryl Waldock
City Of Azle	Tom Muir

From: Laura Schumacher
Sent: Thursday, 2 July, 2020 3:10 PM
To: Laura Schumacher <lauraschumacher@ntgcd.com>
Subject: FW: 2020. Management Plan for Northern Trinity Groundwater Conservation District

To Whom It May Concern:

This email is to notify you of the recent adoption of the Northern Trinity Groundwater Conservation District ("District") Management Plan, developed and adopted in accordance with Chapter 36 of the Texas Water Code and Title 31 Texas Administrative Code Chapter 356. The District's boundary encompasses Tarrant County. The purpose of the District Management Plan is to identify the water supplies and demands within the District and to define the goals that the District will use to manage the groundwater resources in the District. The District Management Plan is the product of a public planning process that culminated in the adoption of the plan by the District's board of directors at the conclusion of a public hearing held on May 20, 2020, following appropriate public notice.

The District submits the Management Plan to you in accordance with Section 36.1071(a) of the Texas Water Code in an effort to coordinate with you on the District's management goals. Due to the extensive size of the Management Plan, we are not mailing a hard copy but instead are providing the following link that will allow you to access the plan electronically:
https://intera.filegenius.com/downloadPublic/jy3rhhyi7xyn3cw {This link will be active for 90-days.}

For the most recent five-year joint planning cycle, Groundwater Management Area 8 ("GMA 8") developed Desired Future Conditions ("DFCs") for the Trinity and Woodbine aquifers using the Texas Water Development Board's ("TWDB's") updated Northern Trinity / Woodbine Groundwater Availability Model, and adopted revised DFCs on January 31, 2017.

Those GMA 8 DFCs were subsequently adopted by the various individual groundwater conservation districts in GMA 8. With the exception of compliance with the Water Development Board's update water use numbers from the TWDB

dataset and Regional Planning numbers; adding a reference to a recent subsidence study completed by the Water Board and adding language regarding the District's relationship to Benbrook Water Authority there are very few changes to the new management plan.

Please feel free to contact me if you have any questions or comments regarding the District Management Plan or other District activities.

Sincerely,

Dr. Robert Patterson, General Manager

A copy of the Management Plan may be found at www.NTGCD.com

Laura Schumacher

From:	*Laura Schumacher*
Sent:	*Thursday, 2 July, 2020 3:10 PM*
To:	*Laura Schumacher*
Subject:	*FW: 2020. Management Plan for Northern Trinity Groundwater Conservation District*

Tracking:	***Recipient***	***Delivery***
	Laura Schumacher	*Delivered: 7/2/2020 3:11 PM*
	joliver@trwd.com	
	smith@benbrookwater.com	
	darlene.g.prochaska@usace.army.mil	
	wardk@trinityra.org	
	David.Cooke@fortworthtexas.gov	
	PublicWorks@arlingtontx.gov	
	bart.vanamburgh@mansfieldtexas.gov	
	bgeorge@ntmwd.com	
	mail@utrwd.com	
	drews@gtua.org	
	s.sievers@flash.net	
	gcampbell@cityofkennedale.com	
	lhazel@cityofdwg.net	
	jashton@townofpantego.com	
	AskTheCEO@swwc.com	
	lzuckerman@GPTX.org	
	kelli@jcsud.com	
	rloftin@ci.crowley.tx.us	
	ncraven@lakesidetexas.us	
	DGWaldock@aquaamerica.com	
	tmuir@cityofazle.org	

To Whom It May Concern:

This email is to notify you of the recent adoption of the Northern Trinity Groundwater Conservation District ("District") Management Plan, developed and adopted in accordance with

The following is an email list of surface water, river authorities, and smaller entities provided a digital copy of the Northern Trinity GCD Groundwater Management Plan.

Tarrant Regional Water District	joliver@trwd.com	Jim Oliver
Benbrook Water Authority	smith@benbrookwater.com	David Smith
Army Corp of Engineers	darlene.g.prochaska@usace.army.mil	Darlene Prochaska
Trinity River Authority	wardk@trinityra.org	Kevin Ward
City of Fort Worth	David.Cooke@fortworthtexas.gov	David Cooke, City Manager
City of Arlington	PublicWorks@arlingtontx.gov	Trey Yelverton, City manager
City of Mansfield	bart.vanamburgh@mansfieldtexas.gov	Bart VanAmburgh, director of public works
North Texas Municipal Water District*	bgeorge@ntmwd.com	Billy George, PE Assistant Deputy-Water
Upper Trinity Regional Water District*	mail@utrwd.com	Ronna Hartt, Manager
Greater Texoma Utility Authority*	drews@gtua.org	Drew Satterwhite, GM
BETHESDA WSC	s.sievers@flash.net	Steve Sievers, GM
CITY OF KENNEDALE	gcampbell@cityofkennedale.com	George Campbell, City Manager
DALWORTHINGTON GARDENS	lhazel@cityofdwg.net	Lola Hazel, City Administrator
TOWN OF PANTEGO	jashton@townofpantego.com	Joe Ashton, City Manager
MONARCH UTILITIES (Southwest Water)	AskTheCEO@swwc.com	Rob MacLean
CITY OF GRAND PRAIRIE	lzuckerman@GPTX.org	Lydia Zuckerman, Exe Assistant
JOHNSON COUNTY SUD	kelli@jcsud.com	Peter Kampfer, GM 817.760.5200
CITY OF CROWLEY	rloftin@ci.crowley.tx.us	Robert Loftin, City Manager
TOWN OF LAKESIDE	ncraven@lakesidetexas.us	Norman Cravens
AQUA TEXAS INC	DGWaldock@aquaamerica.com	Darryl Waldock
CITY OF AZLE	tmuir@cityofazle.org	Tom Muir

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APPENDIX E

Groundwater Management Plan Data from TWDB

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Estimated Historical Water Use And 2017 State Water Plan Datasets:

Northern Trinity Groundwater Conservation District

by Stephen Allen
Texas Water Development Board
Groundwater Division
Groundwater Technical Assistance Sectior
stephen.allen@twdb.texas.gov
(512) 463-7317
January 13, 2020

GROUNDWATER MANAGEMENT PLAN DATA:

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

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

The five reports included in this part are:

1. Estimated Historical Water Use (checklist item 2)

   from the TWDB Historical Water Use Survey (WUS)
2. Projected Surface Water Supplies (checklist item 6)
3. Projected Water Demands (checklist item 7)
4. Projected Water Supply Needs (checklist item 8)
5. Projected Water Management Strategies (checklist item 9)

   from the 2017 Texas State Water Plan (SWP)

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

DISCLAIMER:

The data presented in this report represents the most up-to-date WUS and 2017 SWP data available as of 1/13/2020. Although it does not happen frequently, either of these datasets are subject to change pending the availability of more accurate WUS data or an amendment to the 2017 SWP. District personnel must review these datasets and correct any discrepancies in order to ensure approval of their groundwater management plan.

The WUS dataset can be verified at this web address:

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

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

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

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

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

TARRANT COUNTY

All values are in acre-feet

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2017	GW	9,464	66	70	0	2,430	43	12,073
	SW	301,066	9,251	281	400	1,679	244	312,921
2016	GW	13,368	83	56	0	2,137	62	15,706
	SW	300,115	9,509	266	875	1,557	351	312,673
2015	GW	9,878	142	282	0	1,929	62	12,293
	SW	298,040	9,569	1,280	945	2,368	350	312,552
2014	GW	13,059	114	349	0	265	71	13,858
	SW	303,020	9,507	1,395	762	4,292	402	319,378
2013	GW	14,825	94	499	0	1,842	96	17,356
	SW	297,841	10,220	2,550	856	2,683	541	314,691
2012	GW	17,830	78	1,309	0	2,456	86	21,759
	SW	324,593	10,172	5,687	1,288	2,538	485	344,763
2011	GW	23,773	54	447	0	1,755	110	26,139
	SW	342,461	11,209	2,944	1,090	4,500	626	362,830
2010	GW	9,702	608	1,932	0	591	108	12,941
	SW	305,985	11,581	3,319	1,154	3,900	612	326,551
2009	GW	15,297	723	2,317	0	842	97	19,276
	SW	292,807	9,968	3,469	764	2,758	551	310,317
2008	GW	15,517	1,015	2,701	0	90	111	19,434
	SW	324,830	11,536	4,044	1,333	4,285	568	346,596
2007	GW	11,410	746	1	0	0	136	12,293
	SW	294,340	12,350	0	2,160	1,865	711	311,426
2006	GW	14,118	790	1	0	0	136	15,045
	SW	335,324	13,954	247	3,054	6,359	617	359,555
2005	GW	12,867	822	0	0	0	256	13,945
	SW	319,518	12,265	1	3,311	6,129	704	341,928
2004	GW	11,908	854	1	0	7	234	13,004
	SW	275,384	13,500	0	3,756	3,856	248	296,744
2003	GW	13,991	820	1	0	0	254	15,066
	SW	303,371	14,225	0	1,102	4,392	243	323,333
2002	GW	13,989	880	1	0	0	345	15,215
	SW	273,035	11,889	0	1,589	10,910	333	297,756

Projected Surface Water Supplies
TWDB 2017 State Water Plan Data

TARRANT COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
C	ARLINGTON	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	66,936	63,301	56,192	49,721	44,450	39,697
C	AZLE	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	1,345	1,345	1,331	1,248	1,347	1,346
C	BEDFORD	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	8,414	8,088	7,558	7,098	6,320	5,641
C	BENBROOK	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	3,385	3,385	3,385	3,385	3,385	3,385
C	BETHESDA WSC	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	526	546	561	597	635	666
C	BURLESON	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	951	838	804	984	1,055	1,051
C	COLLEYVILLE	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	9,320	8,927	8,297	7,575	6,751	6,025
C	COMMUNITY WSC	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	347	336	317	306	295	284
C	COUNTY-OTHER, TARRANT	TRINITY	FORK LAKE/RESERVOIR	135	137	112	110	107	108
C	COUNTY-OTHER, TARRANT	TRINITY	RAY HUBBARD LAKE/RESERVOIR	133	121	90	79	71	65
C	COUNTY-OTHER, TARRANT	TRINITY	RAY ROBERTS-LEWISVILLE-GRAPEVINE LAKE/RESERVOIR SYSTEM	320	267	190	165	142	125
C	COUNTY-OTHER, TARRANT	TRINITY	TAWAKONI LAKE/RESERVOIR	469	422	306	268	237	213
C	COUNTY-OTHER, TARRANT	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	5,538	4,396	3,713	5,616	6,888	8,752
C	CROWLEY	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	1,675	1,674	1,672	1,671	1,672	1,671
C	DALWORTHINGTON GARDENS	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	570	481	416	383	361	341
C	EDGECLIFF VILLAGE	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	494	396	328	292	267	245

Projected Surface Water Supplies
TWDB 2017 State Water Plan Data

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
C	EULESS	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	7,399	6,947	5,995	5,226	4,650	4,150
C	FLOWER MOUND	TRINITY	CHAPMAN/COOPER LAKE/RESERVOIR NON-SYSTEM PORTION	8	7	6	5	4	4
C	FLOWER MOUND	TRINITY	FORK LAKE/RESERVOIR	2	2	3	3	3	3
C	FLOWER MOUND	TRINITY	RAY HUBBARD LAKE/RESERVOIR	2	2	2	2	2	2
C	FLOWER MOUND	TRINITY	RAY ROBERTS-LEWISVILLE-GRAPEVINE LAKE/RESERVOIR SYSTEM	29	28	21	17	16	13
C	FLOWER MOUND	TRINITY	TAWAKONI LAKE/RESERVOIR	8	7	7	7	6	5
C	FOREST HILL	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	1,351	1,114	990	1,048	1,219	1,459
C	FORT WORTH	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	104,336	107,208	108,184	102,672	97,616	92,524
C	GRAND PRAIRIE	TRINITY	FORK LAKE/RESERVOIR	609	647	636	618	594	597
C	GRAND PRAIRIE	TRINITY	JOE POOL LAKE/RESERVOIR	730	622	571	571	571	570
C	GRAND PRAIRIE	TRINITY	RAY HUBBARD LAKE/RESERVOIR	600	572	508	448	392	359
C	GRAND PRAIRIE	TRINITY	RAY ROBERTS-LEWISVILLE-GRAPEVINE LAKE/RESERVOIR SYSTEM	1,444	1,259	1,085	930	787	691
C	GRAND PRAIRIE	TRINITY	TAWAKONI LAKE/RESERVOIR	2,116	1,988	1,739	1,514	1,311	1,189
C	GRAND PRAIRIE	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	1,186	953	827	762	691	629
C	GRAPEVINE	TRINITY	GRAPEVINE LAKE/RESERVOIR NON-SYSTEM PORTION	1,983	1,950	1,917	1,883	1,850	1,817
C	GRAPEVINE	TRINITY	RAY ROBERTS-LEWISVILLE-GRAPEVINE LAKE/RESERVOIR SYSTEM	3,402	3,409	3,141	2,823	2,608	2,461

Projected Surface Water Supplies
TWDB 2017 State Water Plan Data

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
C	GRAPEVINE	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	10,387	10,498	9,279	8,199	7,313	6,527
C	HALTOM CITY	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	5,241	4,215	3,628	3,490	3,432	3,439
C	HASLET	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	465	469	460	939	1,216	1,282
C	HURST	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	5,793	4,841	4,008	3,563	3,253	2,990
C	IRRIGATION, TARRANT	TRINITY	TRINITY RUN-OF-RIVER	549	549	549	549	549	549
C	IRRIGATION, TARRANT	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	1,340	1,219	1,078	952	849	758
C	JOHNSON COUNTY SUD	TRINITY	BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM	174	161	148	134	119	104
C	JOHNSON COUNTY SUD	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	360	322	279	227	199	172
C	KELLER	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	11,959	10,469	8,822	7,917	7,237	6,653
C	KENNEDALE	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	356	438	543	532	516	474
C	LAKE WORTH	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	771	728	696	752	840	1,117
C	LIVESTOCK, TARRANT	TRINITY	TRINITY LIVESTOCK LOCAL SUPPLY	442	442	442	442	442	442
C	MANSFIELD	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	14,136	14,560	15,135	16,263	16,945	17,545
C	MANUFACTURING, TARRANT	TRINITY	JOE POOL LAKE/RESERVOIR	70	67	63	64	64	67
C	MANUFACTURING, TARRANT	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	18,728	17,788	17,300	17,253	17,067	16,952
C	MINING, TARRANT	TRINITY	TRINITY OTHER LOCAL SUPPLY	342	342	342	342	342	342
C	MINING, TARRANT	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	6,567	3,351	635	524	442	376

Projected Surface Water Supplies
TWDB 2017 State Water Plan Data

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
C	NORTH RICHLAND HILLS	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	5,643	6,216	6,309	6,094	5,901	5,587
C	RENO	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	1	1	0	1	0	0
C	RICHLAND HILLS	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	896	761	674	696	716	755
C	RIVER OAKS	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	850	744	635	551	489	437
C	SAGINAW	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	3,122	2,825	2,649	2,498	2,283	2,098
C	SANSOM PARK	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	0	0	10	24	41	54
C	SOUTHLAKE	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	10,829	9,940	9,789	10,054	10,343	10,562
C	STEAM ELECTRIC POWER, TARRANT	TRINITY	TRINITY RUN-OF-RIVER	959	959	959	959	959	959
C	STEAM ELECTRIC POWER, TARRANT	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	2,448	2,228	1,969	1,740	1,552	1,385
C	TROPHY CLUB	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	341	317	268	241	220	202
C	WATAUGA	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	1,895	1,642	1,426	1,416	1,414	1,372
C	WESTLAKE	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	1,335	1,645	2,021	2,191	2,346	2,463
C	WESTOVER HILLS	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	913	784	678	624	584	548
C	WESTWORTH VILLAGE	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	392	336	301	288	281	274
C	WHITE SETTLEMENT	TRINITY	TRWD LAKE/RESERVOIR SYSTEM	1,024	861	756	881	1,178	1,428
	Sum of Projected Surface Water Supplies (acre-feet)			**334,091**	**321,093**	**302,755**	**288,427**	**275,435**	**264,001**

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.

TARRANT COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
C	ARLINGTON	TRINITY	66,936	69,550	69,852	69,949	70,108	70,148
C	AZLE	TRINITY	1,486	1,566	1,654	1,758	2,117	2,712
C	BEDFORD	TRINITY	9,139	9,612	10,121	10,711	10,694	10,694
C	BENBROOK	TRINITY	5,205	5,659	6,130	7,258	10,605	10,605
C	BETHESDA WSC	TRINITY	1,903	2,093	2,289	2,491	2,705	2,917
C	BLUE MOUND	TRINITY	191	181	172	167	167	167
C	BURLESON	TRINITY	1,305	1,331	1,459	2,030	2,459	2,747
C	COLLEYVILLE	TRINITY	9,320	9,808	10,314	10,657	10,649	10,648
C	COMMUNITY WSC	TRINITY	347	369	394	430	466	502
C	COUNTY-OTHER, TARRANT	TRINITY	8,008	7,862	7,743	11,410	14,509	19,178
C	CROWLEY	TRINITY	2,417	2,762	3,254	3,886	4,961	5,666
C	DALWORTHINGTON GARDENS	TRINITY	912	922	933	947	966	984
C	EDGECLIFF VILLAGE	TRINITY	503	491	480	475	474	474
C	EULESS	TRINITY	8,978	9,212	9,031	8,932	8,913	8,913
C	EVERMAN	TRINITY	541	528	514	501	499	499
C	FLOWER MOUND	TRINITY	61	68	67	67	67	67
C	FOREST HILL	TRINITY	1,362	1,381	1,448	1,703	2,164	2,817
C	FORT WORTH	TRINITY	165,871	199,669	243,088	263,442	281,547	300,047
C	GRAND PRAIRIE	TRINITY	8,367	8,181	8,080	8,033	8,021	8,019
C	GRAPEVINE	TRINITY	18,467	20,509	20,725	20,641	20,624	20,623
C	HALTOM CITY	TRINITY	5,285	5,226	5,308	5,670	6,093	6,640
C	HASLET	TRINITY	532	644	736	1,589	2,222	2,539
C	HURST	TRINITY	6,828	6,819	6,680	6,604	6,590	6,590
C	IRRIGATION, TARRANT	TRINITY	4,466	4,466	4,466	4,466	4,466	4,466
C	JOHNSON COUNTY SUD	TRINITY	269	293	318	345	375	404
C	KELLER	TRINITY	12,182	12,981	12,906	12,862	12,847	12,846
C	KENNEDALE	TRINITY	1,413	1,588	1,840	1,909	1,961	1,961
C	LAKE WORTH	TRINITY	1,137	1,248	1,363	1,567	1,836	2,501
C	LAKESIDE	TRINITY	227	230	234	239	239	239
C	LIVESTOCK, TARRANT	TRINITY	723	723	723	723	723	723
C	MANSFIELD	TRINITY	18,975	22,013	26,431	34,762	40,104	45,857
C	MANUFACTURING, TARRANT	TRINITY	20,444	23,630	26,924	29,919	32,457	35,210

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	MINING, TARRANT	TRINITY	7,367	4,482	1,589	1,537	1,497	1,464
C	NORTH RICHLAND HILLS	TRINITY	12,733	13,375	13,172	13,059	13,036	13,034
C	PANTEGO	TRINITY	621	610	601	596	595	595
C	PELICAN BAY	TRINITY	106	108	110	112	114	116
C	RENO	TRINITY	2	2	2	3	3	4
C	RICHLAND HILLS	TRINITY	1,148	1,185	1,228	1,372	1,513	1,700
C	RIVER OAKS	TRINITY	850	817	790	775	772	772
C	SAGINAW	TRINITY	3,148	3,503	3,876	4,059	4,052	4,051
C	SANSOM PARK	TRINITY	534	545	592	617	650	683
C	SOUTHLAKE	TRINITY	11,080	12,324	14,322	16,334	18,360	20,395
C	STEAM ELECTRIC POWER, TARRANT	TRINITY	2,448	4,168	5,000	5,000	5,000	5,000
C	TROPHY CLUB	TRINITY	395	393	392	391	391	391
C	WATAUGA	TRINITY	2,899	2,794	2,707	2,659	2,650	2,650
C	WESTLAKE	TRINITY	1,359	2,039	2,957	3,560	4,164	4,755
C	WESTOVER HILLS	TRINITY	952	972	992	1,013	1,036	1,058
C	WESTWORTH VILLAGE	TRINITY	395	417	441	468	499	530
C	WHITE SETTLEMENT	TRINITY	2,081	2,108	2,146	2,472	3,132	3,798
	Sum of Projected Water Demands (acre-feet)		**431,918**	**481,457**	**536,594**	**580,170**	**620,092**	**659,399**

Projected Water Supply Needs
TWDB 2017 State Water Plan Data

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

TARRANT COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
C	ARLINGTON	TRINITY	0	-6,249	-13,660	-20,228	-25,658	-30,451
C	AZLE	TRINITY	-141	-221	-323	-510	-770	-1,366
C	BEDFORD	TRINITY	0	-799	-1,838	-2,888	-3,649	-4,328
C	BENBROOK	TRINITY	-760	-1,214	-1,685	-2,813	-6,160	-6,160
C	BETHESDA WSC	TRINITY	-534	-718	97	94	-47	-233
C	BLUE MOUND	TRINITY	0	10	19	24	24	24
C	BURLESON	TRINITY	-354	-493	-655	-1,046	-1,404	-1,696
C	COLLEYVILLE	TRINITY	0	-881	-2,017	-3,082	-3,898	-4,623
C	COMMUNITY WSC	TRINITY	0	-33	-77	-124	-171	-218
C	COUNTY-OTHER, TARRANT	TRINITY	-85	-1,184	-1,905	-3,729	-5,602	-8,439
C	CROWLEY	TRINITY	-423	-770	-1,264	-1,897	-2,971	-3,677
C	DALWORTHINGTON GARDENS	TRINITY	-17	-116	-192	-239	-280	-318
C	EDGECLIFF VILLAGE	TRINITY	-9	-95	-152	-183	-207	-229
C	EULESS	TRINITY	0	-686	-1,457	-2,127	-2,684	-3,184
C	EVERMAN	TRINITY	63	76	90	103	105	105
C	FLOWER MOUND	TRINITY	-7	-17	-23	-29	-31	-35
C	FOREST HILL	TRINITY	-11	-267	-458	-655	-945	-1,358
C	FORT WORTH	TRINITY	-6,169	-35,343	-74,863	-98,806	-119,815	-141,152
C	GRAND PRAIRIE	TRINITY	-1,286	-1,691	-2,279	-2,667	-3,054	-3,287
C	GRAPEVINE	TRINITY	-505	-2,096	-3,793	-5,156	-6,276	-7,241
C	HALTOM CITY	TRINITY	-44	-1,011	-1,680	-2,180	-2,661	-3,201
C	HASLET	TRINITY	-4	-112	-213	-587	-943	-1,194
C	HURST	TRINITY	-219	-1,162	-1,856	-2,225	-2,521	-2,784
C	IRRIGATION, TARRANT	TRINITY	2,228	2,107	1,966	1,840	1,737	1,646
C	JOHNSON COUNTY SUD	TRINITY	374	297	213	116	40	-34
C	KELLER	TRINITY	-223	-2,512	-4,084	-4,945	-5,610	-6,193
C	KENNEDALE	TRINITY	62	-47	-211	-306	-386	-442
C	LAKE WORTH	TRINITY	-21	-175	-322	-470	-651	-1,039
C	LAKESIDE	TRINITY	35	32	28	23	23	23
C	LIVESTOCK, TARRANT	TRINITY	0	0	0	0	0	0
C	MANSFIELD	TRINITY	-4,839	-7,453	-11,296	-18,499	-23,159	-28,312
C	MANUFACTURING, TARRANT	TRINITY	571	-3,542	-7,311	-10,337	-13,049	-15,900

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	MINING, TARRANT	TRINITY	342	11	188	129	87	54
C	NORTH RICHLAND HILLS	TRINITY	-7,090	-7,159	-6,863	-6,965	-7,135	-7,447
C	PANTEGO	TRINITY	111	122	131	136	137	137
C	PELICAN BAY	TRINITY	11	9	7	5	3	1
C	RENO	TRINITY	1	1	0	1	0	-1
C	RICHLAND HILLS	TRINITY	-10	-182	-312	-434	-555	-703
C	RIVER OAKS	TRINITY	0	-73	-155	-224	-283	-335
C	SAGINAW	TRINITY	-26	-678	-1,227	-1,561	-1,769	-1,953
C	SANSOM PARK	TRINITY	44	33	-4	-15	-31	-51
C	SOUTHLAKE	TRINITY	-251	-2,384	-4,533	-6,280	-8,017	-9,833
C	STEAM ELECTRIC POWER, TARRANT	TRINITY	959	-981	-2,072	-2,301	-2,489	-2,656
C	TROPHY CLUB	TRINITY	-15	-76	-124	-150	-171	-189
C	WATAUGA	TRINITY	-1,004	-1,152	-1,281	-1,243	-1,236	-1,278
C	WESTLAKE	TRINITY	-24	-394	-936	-1,369	-1,818	-2,292
C	WESTOVER HILLS	TRINITY	-39	-188	-314	-389	-452	-510
C	WESTWORTH VILLAGE	TRINITY	-3	-81	-140	-180	-218	-256
C	WHITE SETTLEMENT	TRINITY	-17	-207	-350	-551	-914	-1,330
	Sum of Projected Water Supply Needs (acre-feet)		**-24,130**	**-82,442**	**-151,925**	**-207,390**	**-257,690**	**-305,928**

Projected Water Management Strategies
TWDB 2017 State Water Plan Data

TARRANT COUNTY

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

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
ARLINGTON, TRINITY (C)							
CONSERVATION - ARLINGTON	DEMAND REDUCTION [TARRANT]	949	1,627	2,216	2,332	2,570	2,806
CONSERVATION, WATER LOSS CONTROL - ARLINGTON	DEMAND REDUCTION [TARRANT]	335	335	0	0	0	0
LAKE PALESTINE	PALESTINE LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	8,190	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	12,726
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	8,221	3,668	4,311
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	1,138	2,095	1,581	1,740	1,164
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	262	538	480	685	1,556
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	2,887	5,985	5,171	6,651	5,358
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	2,826	2,443	2,155	2,531
		1,284	**6,249**	**13,660**	**20,228**	**25,659**	**30,452**
AZLE, TRINITY (C)							
CONSERVATION - AZLE	DEMAND REDUCTION [TARRANT]	5	10	17	23	35	54
CONSERVATION, WATER LOSS CONTROL - AZLE	DEMAND REDUCTION [TARRANT]	7	7	0	0	0	0
LAKE PALESTINE	PALESTINE LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	258	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	604
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	57	118	205
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	79	54	56	43	55	55
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	50	13	14	13	22	74

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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
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	137	160	241	213	254
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	76	135	69	120
		141	**221**	**323**	**512**	**770**	**1,366**
BEDFORD, TRINITY (C)							
CONSERVATION - BEDFORD	DEMAND REDUCTION [TARRANT]	121	208	304	357	392	428
CONSERVATION, WATER LOSS CONTROL - BEDFORD	DEMAND REDUCTION [TARRANT]	914	914	0	0	0	0
DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	0	0	0	0	1,156	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	1,795
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	1,162	517	608
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	0	281	225	245	164
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	72	68	97	220
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	0	802	731	938	756
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	379	345	304	357
		1,035	**1,122**	**1,838**	**2,888**	**3,649**	**4,328**
BENBROOK, TRINITY (C)							
CONSERVATION - BENBROOK	DEMAND REDUCTION [TARRANT]	69	123	184	242	389	424
CONSERVATION – WASTE PROHIBITION, BENBROOK	DEMAND REDUCTION [TARRANT]	13	29	33	42	68	68
CONSERVATION, IRRIGATION RESTRICTIONS – BENBROOK	DEMAND REDUCTION [TARRANT]	4	8	10	12	20	20
CONSERVATION, WATER LOSS CONTROL - BENBROOK	DEMAND REDUCTION [TARRANT]	26	26	0	0	0	0
LAKE PALESTINE	PALESTINE LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	2,391	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	3,088

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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
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	71	147	256
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	396	442	430	310	508	282
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	252	102	111	94	200	378
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	1,120	1,227	1,745	1,943	1,300
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	580	965	629	614
		760	**1,850**	**2,575**	**3,481**	**6,295**	**6,430**
BETHESDA WSC, TRINITY (C)							
ARLINGTON UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	522	534	444	514	505	493
CONSERVATION - BETHESDA WSC	DEMAND REDUCTION [TARRANT]	9	16	25	29	34	39
CONSERVATION, WATER LOSS CONTROL - BETHESDA WSC	DEMAND REDUCTION [TARRANT]	4	4	0	0	0	0
FORT WORTH UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	70	0	92	80	62
LAKE PALESTINE	PALESTINE LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	134	0
MUNICIPAL WATER CONSERVATION (SUBURBAN) - BETHESDA WSC	DEMAND REDUCTION [TARRANT]	46	149	272	356	389	423
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	677
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	178	191	229
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	233	135	131	84	91	62
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	148	31	33	26	35	83
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	60	135	184	191	172
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	177	97	113	134
UNM-ROR-NECHES RUN OF RIVER	NECHES RUN-OF-RIVER [ANDERSON]	0	0	0	0	193	0
		962	**999**	**1,217**	**1,560**	**1,956**	**2,374**

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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
BLUE MOUND, TRINITY (C)							
CONSERVATION - BLUE MOUND	DEMAND REDUCTION [TARRANT]	1	1	2	2	3	3
CONSERVATION, WATER LOSS CONTROL - BLUE MOUND	DEMAND REDUCTION [TARRANT]	1	1	0	0	0	0
		2	**2**	**2**	**2**	**3**	**3**
BURLESON, TRINITY (C)							
CONSERVATION - BURLESON	DEMAND REDUCTION [TARRANT]	1	2	3	6	9	12
CONSERVATION, WATER LOSS CONTROL - BURLESON	DEMAND REDUCTION [TARRANT]	1	1	0	0	0	0
LAKE PALESTINE	PALESTINE LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	499	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	1,028
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	168	300	348
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	374	201	173	127	143	94
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	238	46	44	39	56	126
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	330	341	518	401	326
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	233	285	176	204
UNM-ROR-NECHES RUN OF RIVER	NECHES RUN-OF-RIVER [ANDERSON]	0	0	0	0	174	0
		614	**580**	**794**	**1,143**	**1,758**	**2,138**
COLLEYVILLE, TRINITY (C)							
CONSERVATION - COLLEYVILLE	DEMAND REDUCTION [TARRANT]	124	212	309	355	390	426
CONSERVATION, WATER LOSS CONTROL - COLLEYVILLE	DEMAND REDUCTION [TARRANT]	47	47	0	0	0	0
DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	0	0	0	0	1,244	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	1,932
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	1,253	557	654

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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
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	165	313	241	264	177
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	38	80	73	104	237
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	419	893	788	1,011	813
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	422	372	328	384
		171	**881**	**2,017**	**3,082**	**3,898**	**4,623**
COMMUNITY WSC, TRINITY (C)							
CONSERVATION - COMMUNITY WSC	DEMAND REDUCTION [TARRANT]	1	2	4	6	8	10
CONSERVATION, WATER LOSS CONTROL - COMMUNITY WSC	DEMAND REDUCTION [TARRANT]	2	2	0	0	0	0
LAKE PALESTINE	PALESTINE LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	57	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	96
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	14	26	32
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	8	13	10	12	9
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	1	4	4	6	12
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	20	38	59	47	40
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	18	32	15	19
		3	**33**	**77**	**125**	**171**	**218**
COUNTY-OTHER, TARRANT, TRINITY (C)							
ANRA-COL - LAKE COLUMBIA	COLUMBIA LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	57
CONSERVATION - TARRANT COUNTY	DEMAND REDUCTION [TARRANT]	20	39	57	125	208	344
CONSERVATION, WATER LOSS CONTROL - TARRANT COUNTY	DEMAND REDUCTION [TARRANT]	30	30	0	0	0	0
DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	56	38	54	150	226	151

Projected Water Management Strategies
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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
FORT WORTH UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	692	684	823	819	769
LAKE PALESTINE	PALESTINE LAKE/RESERVOIR [RESERVOIR]	0	122	170	136	1,574	108
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	3,231
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	294	681	1,095
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	118	187	224	322	296
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	27	49	67	128	395
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	301	533	1,258	1,234	1,360
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	251	696	400	642
UNM-ROR-NECHES RUN OF RIVER	NECHES RUN-OF-RIVER [ANDERSON]	0	0	0	0	54	48
		106	**1,367**	**1,985**	**3,773**	**5,646**	**8,496**
CROWLEY, TRINITY (C)							
CONSERVATION - CROWLEY	DEMAND REDUCTION [TARRANT]	8	18	33	52	82	112
CONSERVATION, WATER LOSS CONTROL - CROWLEY	DEMAND REDUCTION [TARRANT]	12	12	0	0	0	0
LAKE PALESTINE	PALESTINE LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	1,026	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	1,641
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	215	459	556
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	247	197	226	163	218	150
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	157	46	58	50	86	202
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	498	644	919	831	690
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	304	506	269	327

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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
		424	**771**	**1,265**	**1,905**	**2,971**	**3,678**
DALWORTHINGTON GARDENS, TRINITY (C)							
CONSERVATION - DALWORTHINGTON GARDENS	DEMAND REDUCTION [TARRANT]	12	20	28	32	35	40
CONSERVATION, WATER LOSS CONTROL - DALWORTHINGTON GARDENS	DEMAND REDUCTION [TARRANT]	5	5	0	0	0	0
FORT WORTH UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	62	73	59	45	32
LAKE PALESTINE	PALESTINE LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	71	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	114
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	17	32	39
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	8	17	13	15	10
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	2	4	4	7	14
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	19	48	74	57	48
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	22	40	19	23
		17	**116**	**192**	**239**	**281**	**320**
EDGECLIFF VILLAGE, TRINITY (C)							
CONSERVATION - EDGECLIFF VILLAGE	DEMAND REDUCTION [TARRANT]	7	10	15	16	17	18
CONSERVATION, WATER LOSS CONTROL - EDGECLIFF VILLAGE	DEMAND REDUCTION [TARRANT]	3	3	0	0	0	0
FORT WORTH UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	51	58	46	34	23
LAKE PALESTINE	PALESTINE LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	55	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	86
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	14	25	29
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	8	15	11	12	8

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Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	2	3	2	4	11
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	21	42	60	45	36
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	20	34	15	18
		10	**95**	**153**	**183**	**207**	**229**
EULESS, TRINITY (C)							
CONSERVATION - EULESS	DEMAND REDUCTION [TARRANT]	178	274	300	119	149	178
CONSERVATION – WASTE PROHIBITION, EULESS	DEMAND REDUCTION [TARRANT]	14	30	29	0	0	0
CONSERVATION, WATER LOSS CONTROL - EULESS	DEMAND REDUCTION [TARRANT]	45	45	0	0	0	0
DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	0	0	0	0	899	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	2,768
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	1,844	806	938
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	109	212	177	191	127
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	26	54	55	74	169
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	277	605	580	731	583
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	286	274	237	275
		237	**761**	**1,486**	**3,049**	**3,087**	**5,038**
EVERMAN, TRINITY (C)							
CONSERVATION - EVERMAN	DEMAND REDUCTION [TARRANT]	2	4	5	7	8	10
CONSERVATION, WATER LOSS CONTROL - EVERMAN	DEMAND REDUCTION [TARRANT]	3	3	0	0	0	0
		5	**7**	**5**	**7**	**8**	**10**
FLOWER MOUND, TRINITY (C)							
ANRA-COL - LAKE COLUMBIA	COLUMBIA LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	2

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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
CONSERVATION - FLOWER MOUND	DEMAND REDUCTION [TARRANT]	1	1	2	2	2	3
CONSERVATION, WATER LOSS CONTROL - FLOWER MOUND	DEMAND REDUCTION [TARRANT]	0	0	0	0	0	0
DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	1	1	2	6	7	5
DWU UNALLOCATED SUPPLY UTILIZATION	FORK LAKE/RESERVOIR [RESERVOIR]	1	1	0	0	0	0
DWU UNALLOCATED SUPPLY UTILIZATION	RAY HUBBARD LAKE/RESERVOIR [RESERVOIR]	1	0	0	0	0	0
DWU UNALLOCATED SUPPLY UTILIZATION	RAY ROBERTS-LEWISVILLE-GRAPEVINE LAKE/RESERVOIR SYSTEM [RESERVOIR]	2	1	0	0	0	0
DWU UNALLOCATED SUPPLY UTILIZATION	TAWAKONI LAKE/RESERVOIR [RESERVOIR]	3	2	1	0	0	0
LAKE PALESTINE	PALESTINE LAKE/RESERVOIR [RESERVOIR]	0	3	6	6	5	4
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	5
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	1	2
UNM-ROR-NECHES RUN OF RIVER	NECHES RUN-OF-RIVER [ANDERSON]	0	0	0	0	2	2
UTRWD - CONTRACT RENEWAL WITH COMMERCE FOR LAKE CHAPMAN WATER	INDIRECT REUSE [HOPKINS]	0	0	0	0	0	1
UTRWD - CONTRACT RENEWAL WITH COMMERCE FOR LAKE CHAPMAN WATER	CHAPMAN/COOPER LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	0	1	1	1	1
UTRWD - RALPH HALL RESERVOIR AND REUSE	INDIRECT REUSE [FANNIN]	0	2	3	5	2	3
UTRWD - RALPH HALL RESERVOIR AND REUSE	RALPH HALL LAKE/RESERVOIR [RESERVOIR]	0	6	8	9	11	7
		9	**17**	**23**	**29**	**31**	**35**
FOREST HILL, TRINITY (C)							
CONSERVATION - FOREST HILL	DEMAND REDUCTION [TARRANT]	5	9	14	23	36	56
CONSERVATION, WATER LOSS CONTROL - FOREST HILL	DEMAND REDUCTION [TARRANT]	7	7	0	0	0	0

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Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
FORT WORTH UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	143	175	162	153	135
LAKE PALESTINE	PALESTINE LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	269	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	537
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	55	120	182
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	29	49	41	57	49
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	6	13	13	22	66
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	73	141	234	217	226
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	66	129	71	107
		12	**267**	**458**	**657**	**945**	**1,358**
FORT WORTH, TRINITY (C)							
CONSERVATION - FORT WORTH	DEMAND REDUCTION [TARRANT]	4,820	7,531	10,635	12,069	13,813	15,708
CONSERVATION, WATER LOSS CONTROL - FORT WORTH	DEMAND REDUCTION [TARRANT]	16,587	17,644	7,292	5,269	2,815	0
DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	0	0	0	0	3,259	0
FORT WORTH ALLIANCE DIRECT REUSE	DIRECT REUSE [TARRANT]	0	2,400	6,696	6,547	6,436	6,345
FORT WORTH DIRECT REUSE	DIRECT REUSE [TARRANT]	793	769	766	748	736	725
FORT WORTH FUTURE DIRECT REUSE	DIRECT REUSE [TARRANT]	0	5,944	6,973	6,818	6,702	6,609
FORT WORTH UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	7,259	14,246	11,380	6,977	2,335
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	52,210
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	25,711	33,101	19,177
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	1,123	473	6,509	5,412	2,915	1,438
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	715	109	1,672	1,642	2,524	4,638

Projected Water Management Strategies
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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
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	1,201	13,029	16,173	24,162	23,284
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	14,341	7,641	15,635	10,455
UNM-ROR-NECHES RUN OF RIVER	NECHES RUN-OF-RIVER [ANDERSON]	0	0	0	0	740	0
		24,038	**43,330**	**82,159**	**99,410**	**119,815**	**142,924**
GRAND PRAIRIE, TRINITY (C)							
ANRA-COL - LAKE COLUMBIA	COLUMBIA LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	288
ARLINGTON UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	220	176	221	195	233	207
CONSERVATION - GRAND PRARIE	DEMAND REDUCTION [TARRANT]	112	177	81	107	134	160
CONSERVATION, WATER LOSS CONTROL - GRAND PRAIRIE	DEMAND REDUCTION [TARRANT]	42	35	0	0	0	0
DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	195	189	330	779	941	770
FORT WORTH UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	50	55	44	32	22
LAKE PALESTINE	PALESTINE LAKE/RESERVOIR [RESERVOIR]	0	430	898	710	724	547
MANSFIELD UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	717	476	338	295	258	225
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	443
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	155	129	150
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	42	65	44	53	33
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	10	17	13	20	45
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	106	186	230	193	154
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	88	128	62	72
UNM-ROR-NECHES RUN OF RIVER	NECHES RUN-OF-RIVER [ANDERSON]	0	0	0	0	275	243
		1,286	**1,691**	**2,279**	**2,700**	**3,054**	**3,359**

Projected Water Management Strategies
TWDB 2017 State Water Plan Data

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

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
GRAPEVINE, TRINITY (C)							
ANRA-COL - LAKE COLUMBIA	COLUMBIA LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	188
CONSERVATION - GRAPEVINE	DEMAND REDUCTION [TARRANT]	247	445	622	688	756	824
CONSERVATION, WATER LOSS CONTROL - GRAPEVINE	DEMAND REDUCTION [TARRANT]	92	92	0	0	0	0
DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	166	229	343	676	2,007	707
LAKE PALESTINE	PALESTINE LAKE/RESERVOIR [RESERVOIR]	0	293	572	456	408	356
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	2,021
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	1,297	581	685
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	570	789	762	276	185
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	39	84	76	109	247
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	428	939	816	1,053	851
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	444	385	906	1,019
UNM-ROR-NECHES RUN OF RIVER	NECHES RUN-OF-RIVER [ANDERSON]	0	0	0	0	180	158
		505	**2,096**	**3,793**	**5,156**	**6,276**	**7,241**
HALTOM CITY, TRINITY (C)							
CONSERVATION - HALTOM CITY	DEMAND REDUCTION [TARRANT]	18	35	53	76	102	133
CONSERVATION, WATER LOSS CONTROL - HALTOM CITY	DEMAND REDUCTION [TARRANT]	26	26	0	0	0	0
FORT WORTH UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	541	642	540	431	318
LAKE PALESTINE	PALESTINE LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	755	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	1,266

Projected Water Management Strategies
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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
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	182	338	429
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	109	180	138	160	116
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	25	47	43	63	155
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	275	515	778	613	533
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	243	429	199	252
		44	**1,011**	**1,680**	**2,186**	**2,661**	**3,202**
HASLET, TRINITY (C)							
CONSERVATION - HASLET	DEMAND REDUCTION [TARRANT]	2	10	18	53	81	102
CONSERVATION – WASTE PROHIBITION, HASLET	DEMAND REDUCTION [TARRANT]	0	3	8	19	27	31
CONSERVATION, WATER LOSS CONTROL - HASLET	DEMAND REDUCTION [TARRANT]	3	3	0	0	0	0
FORT WORTH UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	60	81	146	153	119
LAKE PALESTINE	PALESTINE LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	242	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	434
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	43	108	147
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	9	19	33	51	40
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	2	6	9	19	53
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	25	55	184	197	183
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	26	101	65	86
		5	**112**	**213**	**588**	**943**	**1,195**
HURST, TRINITY (C)							
CONSERVATION - HURST	DEMAND REDUCTION [TARRANT]	185	240	293	311	332	354

Projected Water Management Strategies
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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
CONSERVATION, WATER LOSS CONTROL - HURST	DEMAND REDUCTION [TARRANT]	34	34	0	0	0	0
FORT WORTH UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	623	709	551	408	277
LAKE PALESTINE	PALESTINE LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	632	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	991
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	158	283	336
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	70	157	120	134	91
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	16	40	37	52	121
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	179	447	678	513	417
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	211	375	167	197
		219	**1,162**	**1,857**	**2,230**	**2,521**	**2,784**
IRRIGATION, TARRANT, TRINITY (C)							
CONSERVATION, IRRIGATION - TARRANT COUNTY	DEMAND REDUCTION [TARRANT]	8	138	266	334	396	459
DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	0	0	0	0	103	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	489
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	82	142	166
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	14	24	19	22	15
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	2	6	6	8	20
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	35	67	110	85	68
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	32	60	27	32
		8	**189**	**395**	**611**	**783**	**1,249**

Projected Water Management Strategies
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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
JOHNSON COUNTY SUD, TRINITY (C)							
ANRA-COL - LAKE COLUMBIA	COLUMBIA LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	4
ARLINGTON UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	5	4	4	4	4	3
CONSERVATION - JOHNSON COUNTY SUD	DEMAND REDUCTION [TARRANT]	1	2	4	5	7	10
CONSERVATION, WATER LOSS CONTROL - JOHNSON COUNTY SUD	DEMAND REDUCTION [TARRANT]	1	1	0	0	0	0
DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	3	3	5	12	77	11
FORT WORTH UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	1	1	0	0	0
GRAND PRAIRIE UNALLOCATED SUPPLY UTILIZATION	TRINITY AQUIFER [DALLAS]	110	107	105	101	98	95
GRAND PRAIRIE UNALLOCATED SUPPLY UTILIZATION	TRINITY AQUIFER [TARRANT]	110	107	105	101	98	95
GRAND PRAIRIE UNALLOCATED SUPPLY UTILIZATION	INDIRECT REUSE [DENTON]	6	7	7	8	9	10
GRAND PRAIRIE UNALLOCATED SUPPLY UTILIZATION	FORK LAKE/RESERVOIR [RESERVOIR]	10	10	10	9	9	8
GRAND PRAIRIE UNALLOCATED SUPPLY UTILIZATION	JOE POOL LAKE/RESERVOIR [RESERVOIR]	12	10	9	9	8	8
GRAND PRAIRIE UNALLOCATED SUPPLY UTILIZATION	RAY HUBBARD LAKE/RESERVOIR [RESERVOIR]	9	9	8	7	6	5
GRAND PRAIRIE UNALLOCATED SUPPLY UTILIZATION	RAY ROBERTS-LEWISVILLE-GRAPEVINE LAKE/RESERVOIR SYSTEM [RESERVOIR]	23	20	17	14	12	10
GRAND PRAIRIE UNALLOCATED SUPPLY UTILIZATION	TAWAKONI LAKE/RESERVOIR [RESERVOIR]	33	31	27	23	19	17
GRAND PRAIRIE UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	21	16	14	13	11	10
LAKE PALESTINE	PALESTINE LAKE/RESERVOIR [RESERVOIR]	0	8	15	11	10	8
MANSFIELD UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	19	15	12	11	10	9
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	94
		363	**377**	**414**	**450**	**481**	**496**

Projected Water Management Strategies
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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
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	17	29	32
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	1	2	2	2	1
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	0	0	2
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	25	46	65	51	40
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	23	38	17	20
UNM-ROR-NECHES RUN OF RIVER	NECHES RUN-OF-RIVER [ANDERSON]	0	0	0	0	4	4
		363	**377**	**414**	**450**	**481**	**496**
KELLER, TRINITY (C)							
CONSERVATION - KELLER	DEMAND REDUCTION [TARRANT]	163	282	387	428	471	514
CONSERVATION, WATER LOSS CONTROL - KELLER	DEMAND REDUCTION [TARRANT]	61	61	0	0	0	0
FORT WORTH UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	1,345	1,560	1,225	908	616
LAKE PALESTINE	PALESTINE LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	1,502	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	2,331
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	1,513	672	790
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	219	391	291	319	213
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	51	101	88	124	285
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	555	1,117	951	1,219	981
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	528	449	395	464
		224	**2,513**	**4,084**	**4,945**	**5,610**	**6,194**
KENNEDALE, TRINITY (C)							
ARLINGTON UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	280	255	225	199	177	158

Projected Water Management Strategies
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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
CONSERVATION - KENNEDALE	DEMAND REDUCTION [TARRANT]	5	27	46	63	72	78
CONSERVATION, WATER LOSS CONTROL - KENNEDALE	DEMAND REDUCTION [TARRANT]	7	7	0	0	0	0
FORT WORTH UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	56	97	82	65	44
LAKE PALESTINE	PALESTINE LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	130	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	203
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	59	58	69
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	11	30	23	28	18
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	18	34	29	27	43
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	27	86	116	106	86
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	41	61	35	40
		292	**401**	**559**	**632**	**698**	**739**

LAKE WORTH, TRINITY (C)

CONSERVATION - LAKE WORTH	DEMAND REDUCTION [TARRANT]	15	27	41	52	68	100
CONSERVATION, WATER LOSS CONTROL - LAKE WORTH	DEMAND REDUCTION [TARRANT]	6	6	0	0	0	0
FORT WORTH UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	94	123	117	105	103
LAKE PALESTINE	PALESTINE LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	170	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	385
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	35	76	130
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	13	29	27	36	35
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	3	7	8	13	47

Projected Water Management Strategies
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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
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	32	83	150	139	162
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	39	83	45	77
		21	**175**	**322**	**472**	**652**	**1,039**
LAKESIDE, TRINITY (C)							
CONSERVATION - LAKESIDE	DEMAND REDUCTION [TARRANT]	1	2	2	3	4	5
CONSERVATION, WATER LOSS CONTROL - LAKESIDE	DEMAND REDUCTION [TARRANT]	1	1	0	0	0	0
		2	**3**	**2**	**3**	**4**	**5**
MANSFIELD, TRINITY (C)							
CONSERVATION - MANSFIELD	DEMAND REDUCTION [TARRANT]	243	456	756	1,106	1,399	1,741
CONSERVATION, WATER LOSS CONTROL - MANSFIELD	DEMAND REDUCTION [TARRANT]	92	91	0	0	0	0
DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	0	0	0	0	4,755	0
MANSFIELD UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	4,695	5,527	6,142	8,311	8,360	8,297
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	8,413
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	1,056	2,130	2,850
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	366	806	802	1,011	769
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	84	208	243	397	1,029
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	929	2,300	4,516	3,861	3,540
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	1,086	2,499	1,246	1,673
		5,030	**7,453**	**11,298**	**18,533**	**23,159**	**28,312**
MANUFACTURING, TARRANT, TRINITY (C)							
ANRA-COL - LAKE COLUMBIA	COLUMBIA LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	34
ARLINGTON UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	24	22	24	22	26	25

Projected Water Management Strategies
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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
CONSERVATION, MANUFACTURING - TARRANT COUNTY	DEMAND REDUCTION [TARRANT]	0	47	556	834	919	999
DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	16	17	32	88	1,352	92
FORT WORTH UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	1,934	2,567	2,247	1,808	1,333
LAKE PALESTINE	PALESTINE LAKE/RESERVOIR [RESERVOIR]	0	54	99	79	657	362
MANSFIELD UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	73	55	34	30	27	24
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	5,974
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	1,124	1,578	2,023
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	507	783	628	747	551
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	116	200	190	297	734
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	1,279	2,222	3,321	2,859	2,523
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	1,054	1,816	2,748	1,197
UNM-ROR-NECHES RUN OF RIVER	NECHES RUN-OF-RIVER [ANDERSON]	0	0	0	0	31	29
		113	**4,031**	**7,571**	**10,379**	**13,049**	**15,900**
MINING, TARRANT, TRINITY (C)							
DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	0	0	0	0	91	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	133
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	25	41	45
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	88	28	19	19	12
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	20	7	5	8	16
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	223	81	107	73	56

Projected Water Management Strategies
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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
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	38	58	24	26
		0	**331**	**154**	**214**	**256**	**288**
NORTH RICHLAND HILLS, TRINITY (C)							
CONSERVATION - NORTH RICHLAND HILLS	DEMAND REDUCTION [TARRANT]	169	290	395	435	478	522
CONSERVATION, WATER LOSS CONTROL - NORTH RICHLAND HILLS	DEMAND REDUCTION [TARRANT]	64	64	0	0	0	0
DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	0	0	0	0	507	0
FORT WORTH UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	1,817	1,642	1,426	1,416	871	417
LAKE PALESTINE	PALESTINE LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	1,015	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	3,737
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	404	682	801
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	4,154	3,026	923	976	432	216
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	886	178	150	94	126	288
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	1,960	1,669	2,352	1,648	996
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	2,300	1,298	1,376	471
		7,090	**7,160**	**6,863**	**6,975**	**7,135**	**7,448**
PANTEGO, TRINITY (C)							
CONSERVATION - PANTEGO	DEMAND REDUCTION [TARRANT]	2	4	6	8	10	12
CONSERVATION, WATER LOSS CONTROL - PANTEGO	DEMAND REDUCTION [TARRANT]	3	3	0	0	0	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	22
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	6	8	8
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	21	15	8	6	3

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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
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	6	5	2	2	5
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	54	42	39	23	14
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	20	21	8	6
UNM-ROR-NECHES RUN OF RIVER	NECHES RUN-OF-RIVER [ANDERSON]	0	0	0	0	17	0
		5	**88**	**88**	**84**	**74**	**70**
PELICAN BAY, TRINITY (C)							
CONSERVATION - PELICAN BAY	DEMAND REDUCTION [TARRANT]	0	1	1	1	2	2
CONSERVATION, WATER LOSS CONTROL - PELICAN BAY	DEMAND REDUCTION [TARRANT]	1	1	0	0	0	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	5
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	1	1	2
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	3	2	1	0	0
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	1	0	0	1
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	7	5	5	3	2
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	2	2	1	1
UNM-ROR-NECHES RUN OF RIVER	NECHES RUN-OF-RIVER [ANDERSON]	0	0	0	0	3	0
		1	**12**	**11**	**10**	**10**	**13**
RENO, TRINITY (C)							
CONSERVATION - RENO	DEMAND REDUCTION [TARRANT]	0	0	0	0	0	0
CONSERVATION, WATER LOSS CONTROL - RENO	DEMAND REDUCTION [TARRANT]	0	0	0	0	0	0
DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	0	0	0	0	0	0
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	1
		0	**0**	**0**	**0**	**0**	**1**

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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
RICHLAND HILLS, TRINITY (C)							
CONSERVATION - RICHLAND HILLS	DEMAND REDUCTION [TARRANT]	4	8	12	18	25	34
CONSERVATION, WATER LOSS CONTROL - RICHLAND HILLS	DEMAND REDUCTION [TARRANT]	6	6	0	0	0	0
FORT WORTH UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	97	119	107	90	70
LAKE PALESTINE	PALESTINE LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	155	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	435
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	36	70	93
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	19	33	27	34	25
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	4	8	9	13	34
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	48	95	153	127	116
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	45	85	41	55
		10	**182**	**312**	**435**	**555**	**862**
RIVER OAKS, TRINITY (C)							
CONSERVATION - RIVER OAKS	DEMAND REDUCTION [TARRANT]	3	5	8	10	13	15
CONSERVATION, WATER LOSS CONTROL - RIVER OAKS	DEMAND REDUCTION [TARRANT]	4	4	0	0	0	0
DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	0	0	0	0	96	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	147
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	25	43	50
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	17	27	19	20	13
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	3	7	6	9	19
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	44	77	107	77	62

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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
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	36	58	25	29
		7	**73**	**155**	**225**	**283**	**335**
SAGINAW, TRINITY (C)							
CONSERVATION - SAGINAW	DEMAND REDUCTION [TARRANT]	10	23	39	54	68	81
CONSERVATION, WATER LOSS CONTROL - SAGINAW	DEMAND REDUCTION [TARRANT]	16	16	0	0	0	0
FORT WORTH UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	363	469	387	286	194
LAKE PALESTINE	PALESTINE LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	503	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	772
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	130	225	262
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	73	132	99	106	71
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	17	33	30	42	94
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	186	376	558	407	325
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	178	308	132	154
		26	**678**	**1,227**	**1,566**	**1,769**	**1,953**
SANSOM PARK, TRINITY (C)							
CONSERVATION - SANSOM PARK	DEMAND REDUCTION [TARRANT]	2	4	6	8	11	14
CONSERVATION, WATER LOSS CONTROL - SANSOM PARK	DEMAND REDUCTION [TARRANT]	3	3	0	0	0	0
FORT WORTH UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	1	4	5	5
LAKE PALESTINE	PALESTINE LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	6	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	15
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	1	2	5

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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
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	0	0	0	1	1
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	0	0	3
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	0	0	2	4	6
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	2	3
		5	**7**	**7**	**15**	**31**	**52**
SOUTHLAKE, TRINITY (C)							
CONSERVATION - SOUTHLAKE	DEMAND REDUCTION [TARRANT]	196	322	493	618	755	907
CONSERVATION, WATER LOSS CONTROL - SOUTHLAKE	DEMAND REDUCTION [TARRANT]	56	56	0	0	0	0
FORT WORTH UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	1,277	1,731	1,556	1,297	978
LAKE PALESTINE	PALESTINE LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	2,116	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	3,658
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	1,885	948	1,239
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	194	423	363	449	335
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	44	109	109	178	449
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	492	1,206	1,187	1,719	1,540
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	571	562	555	727
		252	**2,385**	**4,533**	**6,280**	**8,017**	**9,833**
STEAM ELECTRIC POWER, TARRANT, TRINITY (C)							
DWU - MAIN STEM REUSE	INDIRECT REUSE [DALLAS]	0	0	0	0	318	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	489
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	82	142	166

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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
TARRANT COUNTY SEP DIRECT REUSE	DIRECT REUSE [TARRANT]	0	1,528	2,360	2,360	2,360	2,360
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	58	88	63	67	45
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	14	23	18	26	60
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	148	250	353	258	206
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	118	195	84	97
		0	**1,748**	**2,839**	**3,071**	**3,255**	**3,423**
TROPHY CLUB, TRINITY (C)							
CONSERVATION - TROPHY CLUB	DEMAND REDUCTION [TARRANT]	13	16	20	21	22	23
CONSERVATION, WATER LOSS CONTROL - TROPHY CLUB	DEMAND REDUCTION [TARRANT]	2	2	0	0	0	0
FORT WORTH UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	41	47	37	28	19
LAKE PALESTINE	PALESTINE LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	43	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	67
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	11	19	23
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	5	10	8	9	6
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	1	3	2	4	8
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	11	30	46	35	28
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	14	26	11	15
		15	**76**	**124**	**151**	**171**	**189**
WATAUGA, TRINITY (C)							
CONSERVATION - WATAUGA	DEMAND REDUCTION [TARRANT]	10	19	27	35	44	53
CONSERVATION, WATER LOSS CONTROL - WATAUGA	DEMAND REDUCTION [TARRANT]	14	14	0	0	0	0
FORT WORTH UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	941	901	685	469	261	128

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Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
LAKE PALESTINE	PALESTINE LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	328	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	505
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	85	147	171
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	980	959	844	539	70	174
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	13	23	20	28	62
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	147	263	365	267	213
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	191	201	91	100
		1,945	**2,053**	**2,033**	**1,714**	**1,236**	**1,406**
WESTLAKE, TRINITY (C)							
CONSERVATION - WESTLAKE	DEMAND REDUCTION [TARRANT]	18	44	89	119	153	190
CONSERVATION, WATER LOSS CONTROL - WESTLAKE	DEMAND REDUCTION [TARRANT]	7	7	0	0	0	0
FORT WORTH UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	211	358	339	294	227
LAKE PALESTINE	PALESTINE LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	486	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	863
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	106	218	292
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	35	89	81	104	78
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	8	24	24	41	107
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	89	256	452	396	363
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	120	252	127	172
		25	**394**	**936**	**1,373**	**1,819**	**2,292**

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Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
WESTOVER HILLS, TRINITY (C)							
CONSERVATION - WESTOVER HILLS	DEMAND REDUCTION [TARRANT]	13	21	30	34	38	42
CONSERVATION – WASTE PROHIBITION, WESTOVER HILLS	DEMAND REDUCTION [TARRANT]	7	15	15	16	16	16
CONSERVATION, WATER LOSS CONTROL - WESTOVER HILLS	DEMAND REDUCTION [TARRANT]	19	49	45	46	47	48
FORT WORTH UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	101	120	96	73	51
LAKE PALESTINE	PALESTINE LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	99	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	162
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	23	44	55
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	1	19	17	20	15
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	5	6	8	20
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	2	54	98	80	68
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	26	54	27	33
		39	**189**	**314**	**390**	**452**	**510**
WESTWORTH VILLAGE, TRINITY (C)							
CONSERVATION - WESTWORTH VILLAGE	DEMAND REDUCTION [TARRANT]	1	3	4	6	8	11
CONSERVATION, WATER LOSS CONTROL - WESTWORTH VILLAGE	DEMAND REDUCTION [TARRANT]	2	2	0	0	0	0
FORT WORTH UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	44	54	45	35	26
LAKE PALESTINE	PALESTINE LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	62	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	101
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	15	28	34
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	9	15	11	13	9

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All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	1	4	4	6	13
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	22	43	64	50	42
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	20	36	16	20
		3	**81**	**140**	**181**	**218**	**256**
WHITE SETTLEMENT, TRINITY (C)							
CONSERVATION - WHITE SETTLEMENT	DEMAND REDUCTION [TARRANT]	7	14	21	33	52	76
CONSERVATION, WATER LOSS CONTROL - WHITE SETTLEMENT	DEMAND REDUCTION [TARRANT]	10	10	0	0	0	0
FORT WORTH UNALLOCATED SUPPLY UTILIZATION	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	111	134	137	148	133
LAKE PALESTINE	PALESTINE LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	253	0
SULPHUR BASIN SUPPLY	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	516
SULPHUR BASIN SUPPLY	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	44	113	175
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	INDIRECT REUSE [NAVARRO]	0	19	36	34	54	47
TRWD - ADDITIONAL CEDAR CREEK AND RICHLAND-CHAMBERS	TRWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	5	9	10	21	63
TRWD - CEDAR CREEK WETLANDS	INDIRECT REUSE [HENDERSON]	0	48	102	189	206	217
TRWD - TEHUACANA	TEHUACANA LAKE/RESERVOIR [RESERVOIR]	0	0	48	105	67	103
		17	**207**	**350**	**552**	**914**	**1,330**
Sum of Projected Water Management Strategies (acre-feet)		**47,382**	**95,546**	**164,782**	**214,394**	**263,236**	**315,996**

APPENDIX F

GAM Run 17-029 MAG

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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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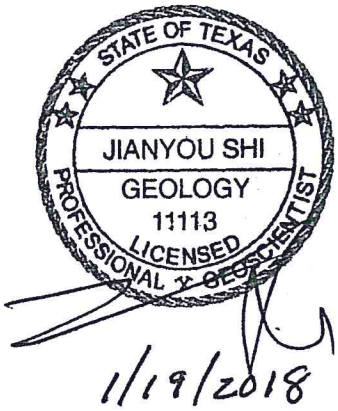
Texas Water Development Board
Groundwater Division
Groundwater Availability Modeling Department
(512) 463-5076
January 19, 2018



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

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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

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 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

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	—	—	—

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

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.

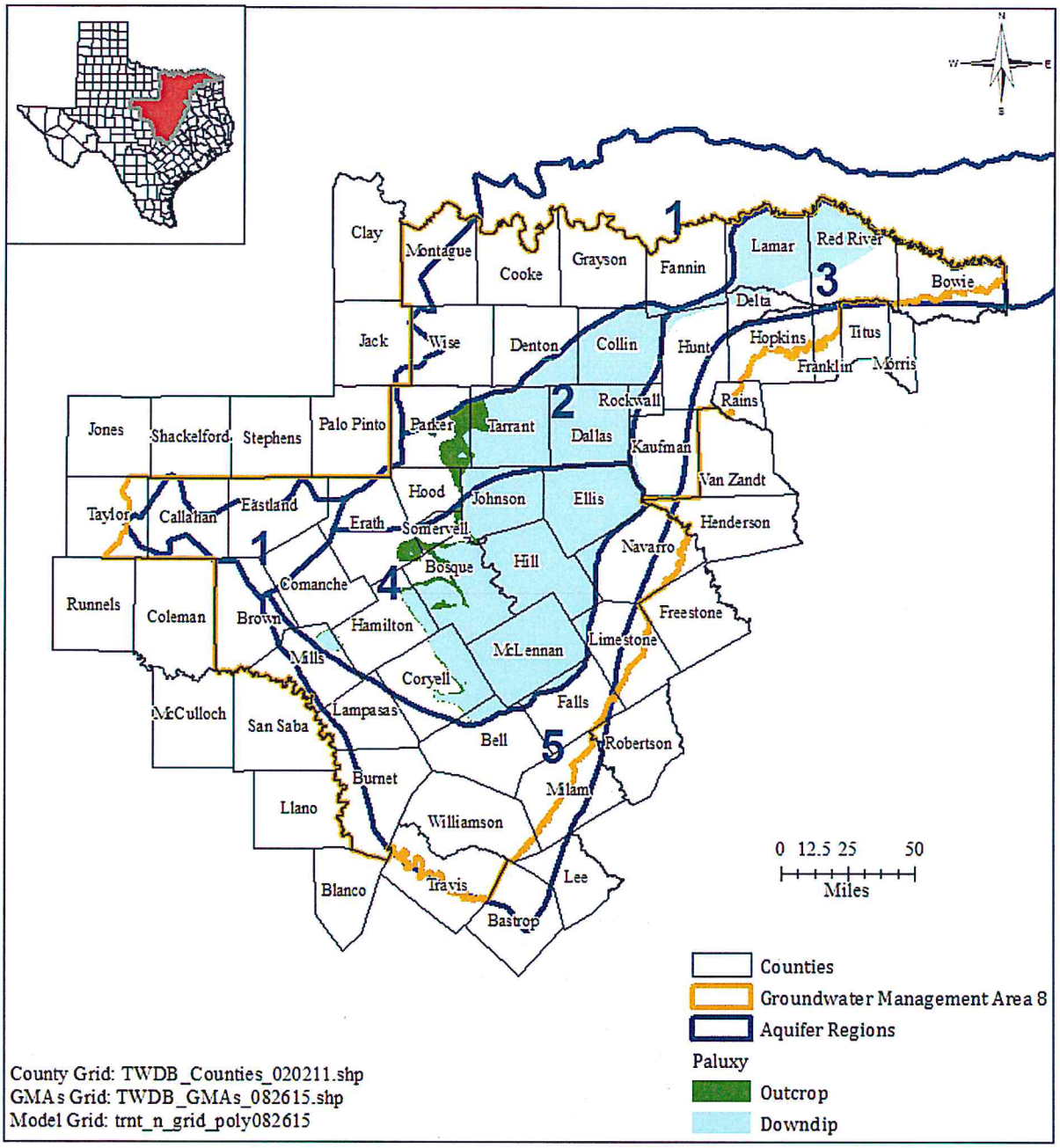

FIGURE 1. MAP SHOWING THE TRINITY AQUIFER (PALUXY) WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF THE TRINITY AND WOODBINE AQUIFERS.

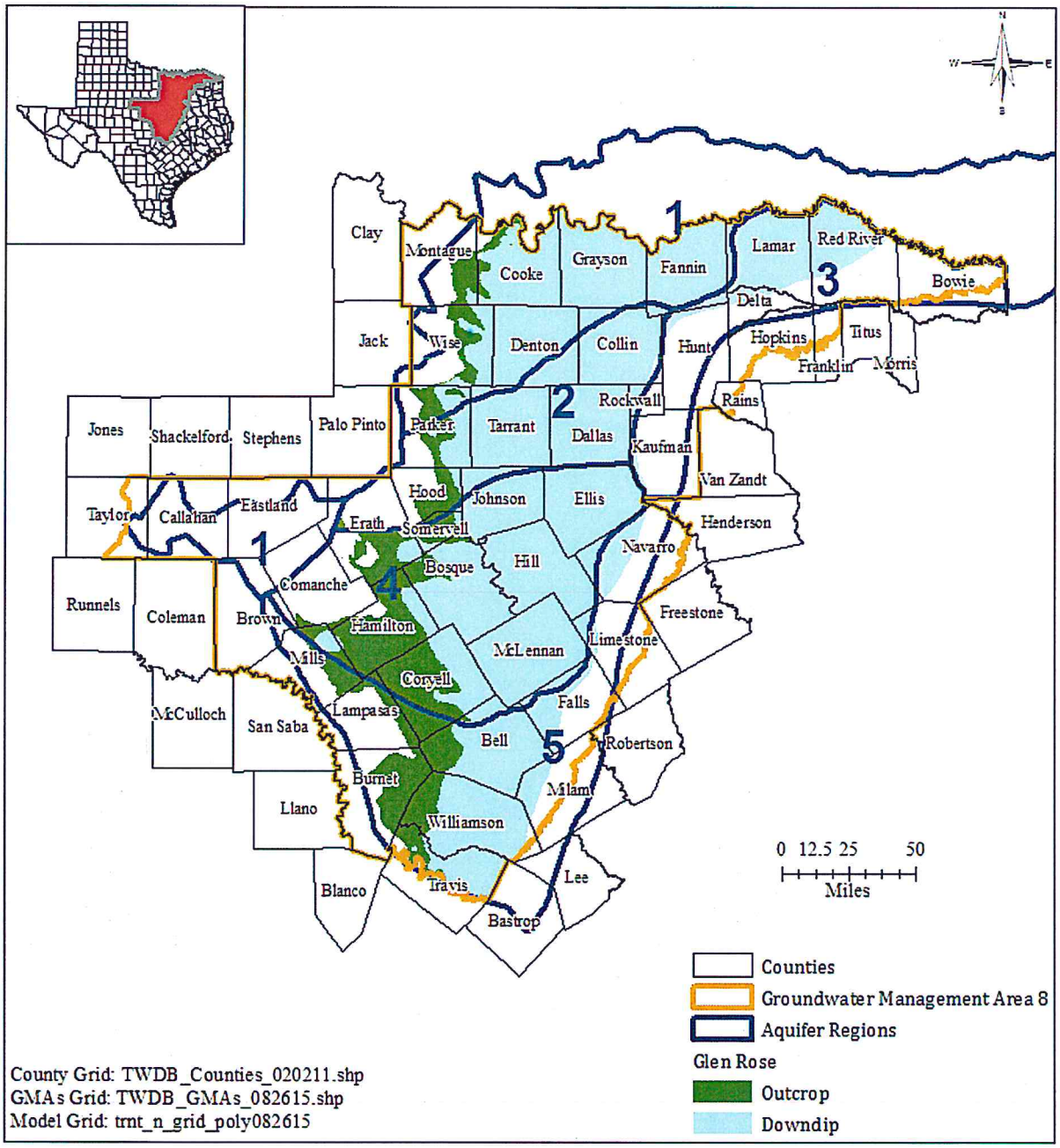

FIGURE 2. MAP SHOWING THE TRINITY AQUIFER (GLEN ROSE) WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF THE TRINITY AND WOODBINE AQUIFERS.

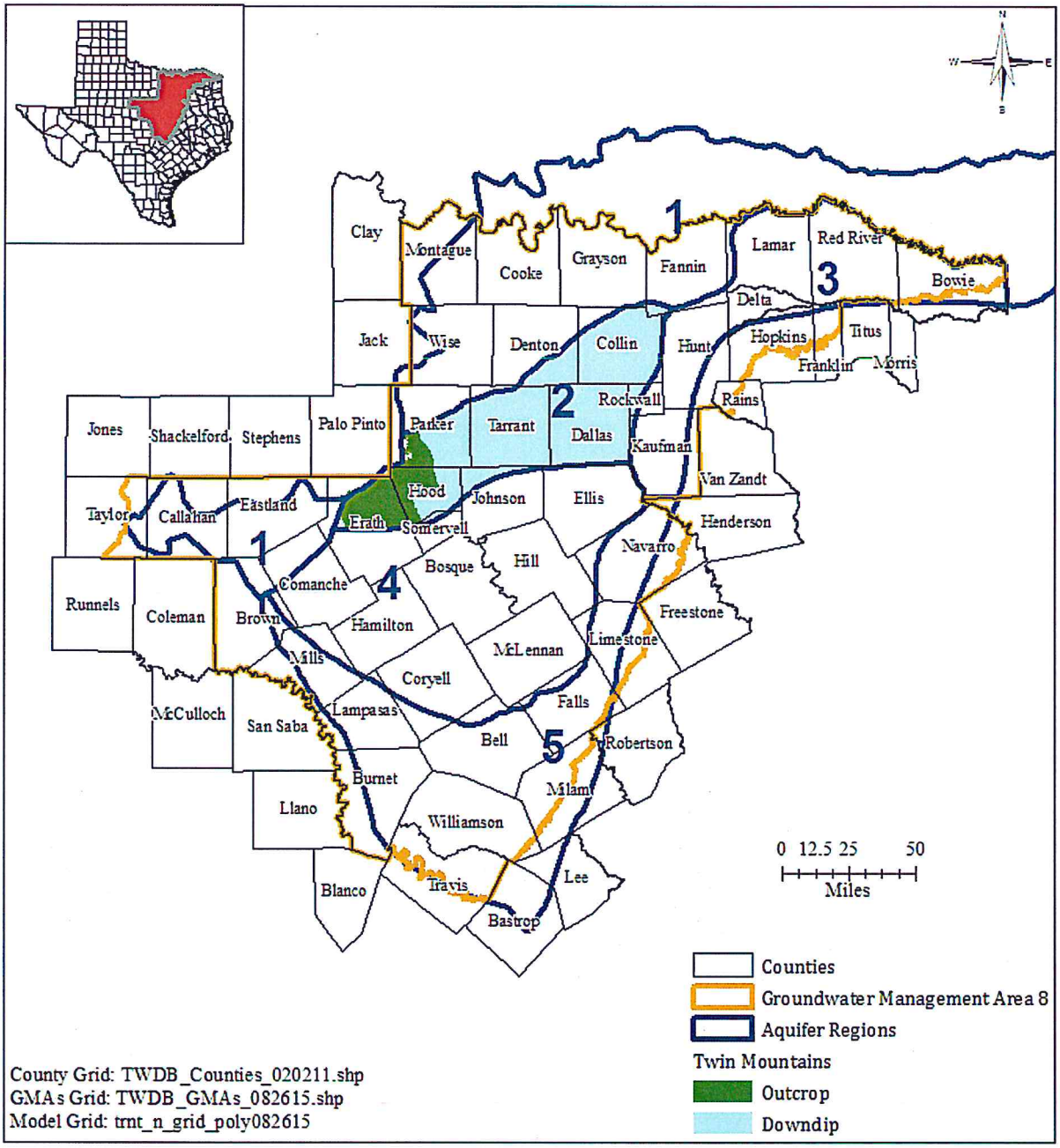

FIGURE 3. MAP SHOWING THE TRINITY AQUIFER (TWIN MOUNTAINS) WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF THE TRINITY AND WOODBINE AQUIFERS.

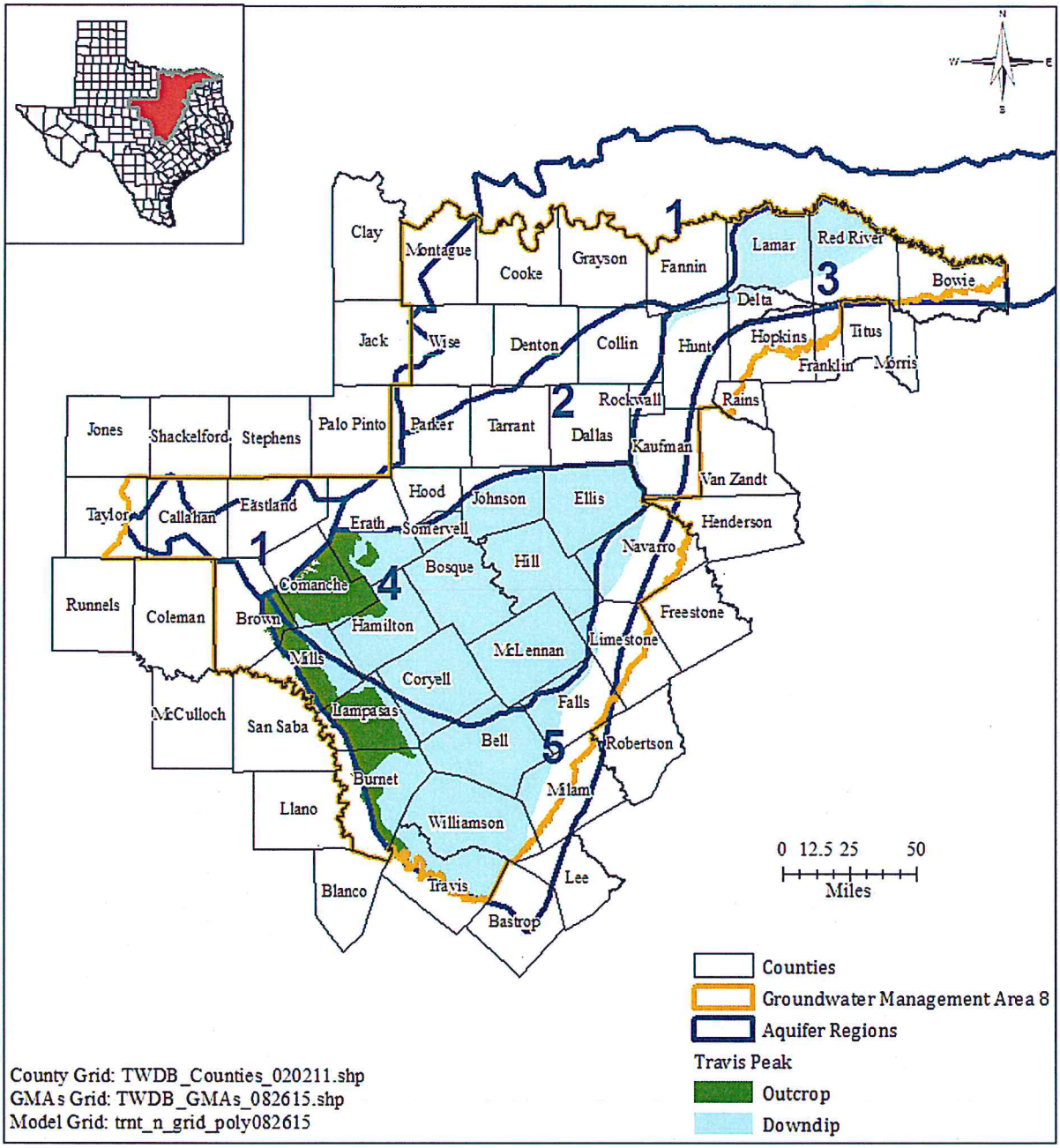

FIGURE 4. MAP SHOWING THE TRINITY AQUIFER (TRAVIS PEAK) WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF THE TRINITY AND WOODBINE AQUIFERS.

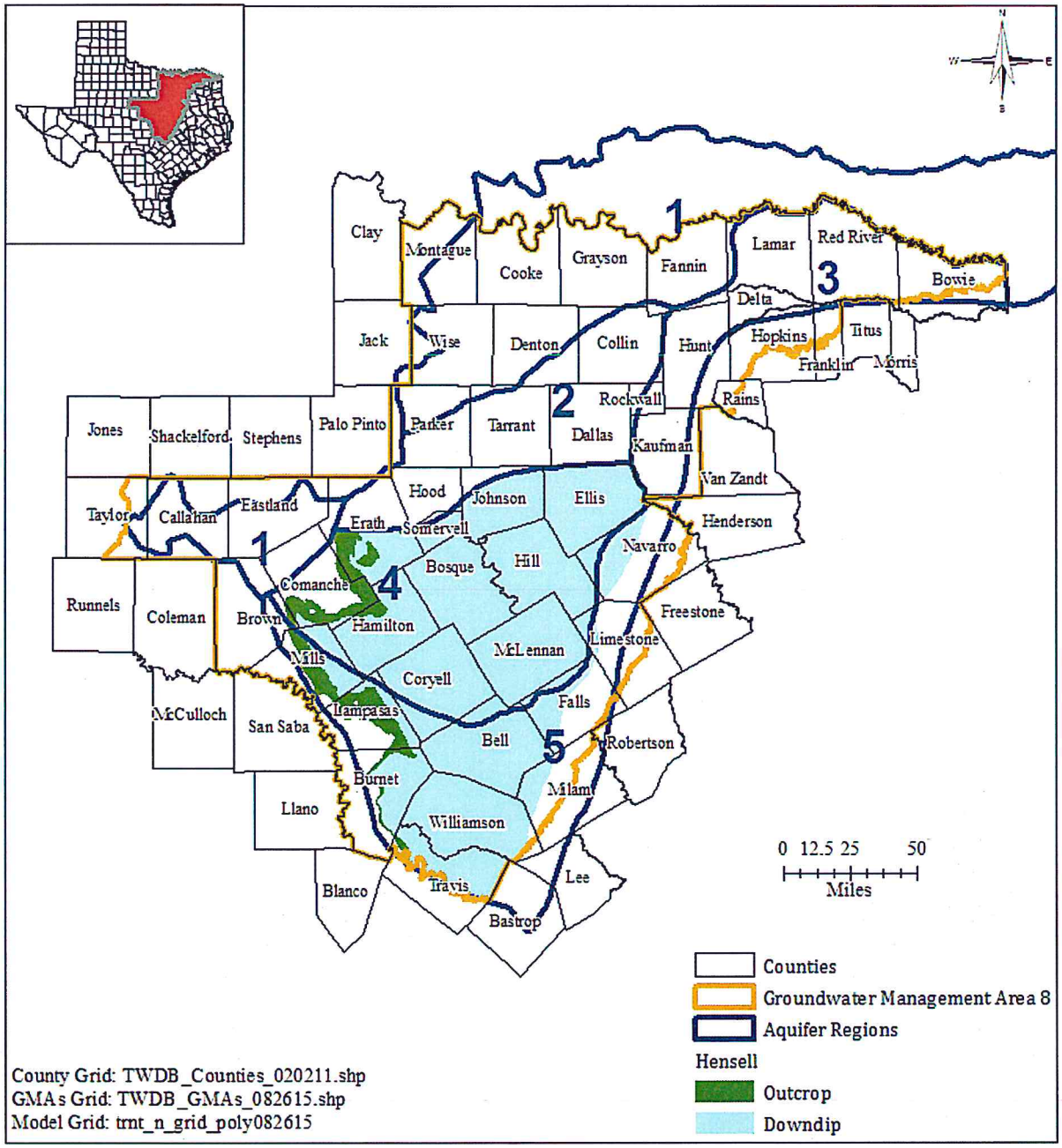

FIGURE 5. MAP SHOWING THE TRINITY AQUIFER (HENSELL) WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF THE TRINITY AND WOODBINE AQUIFERS.

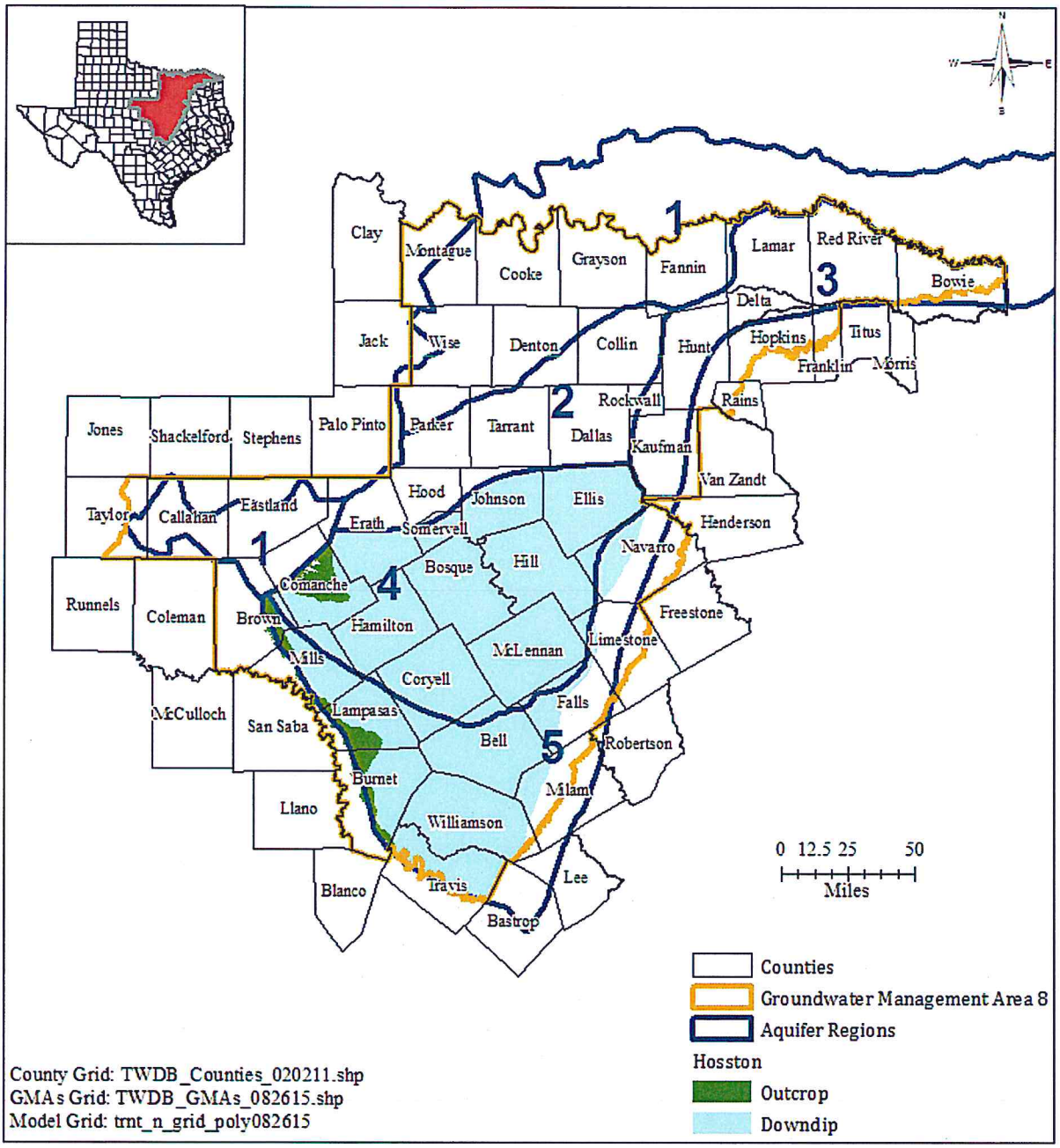

FIGURE 6. MAP SHOWING THE TRINITY AQUIFER (HOSSTON) WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF THE TRINITY AND WOODBINE AQUIFERS.

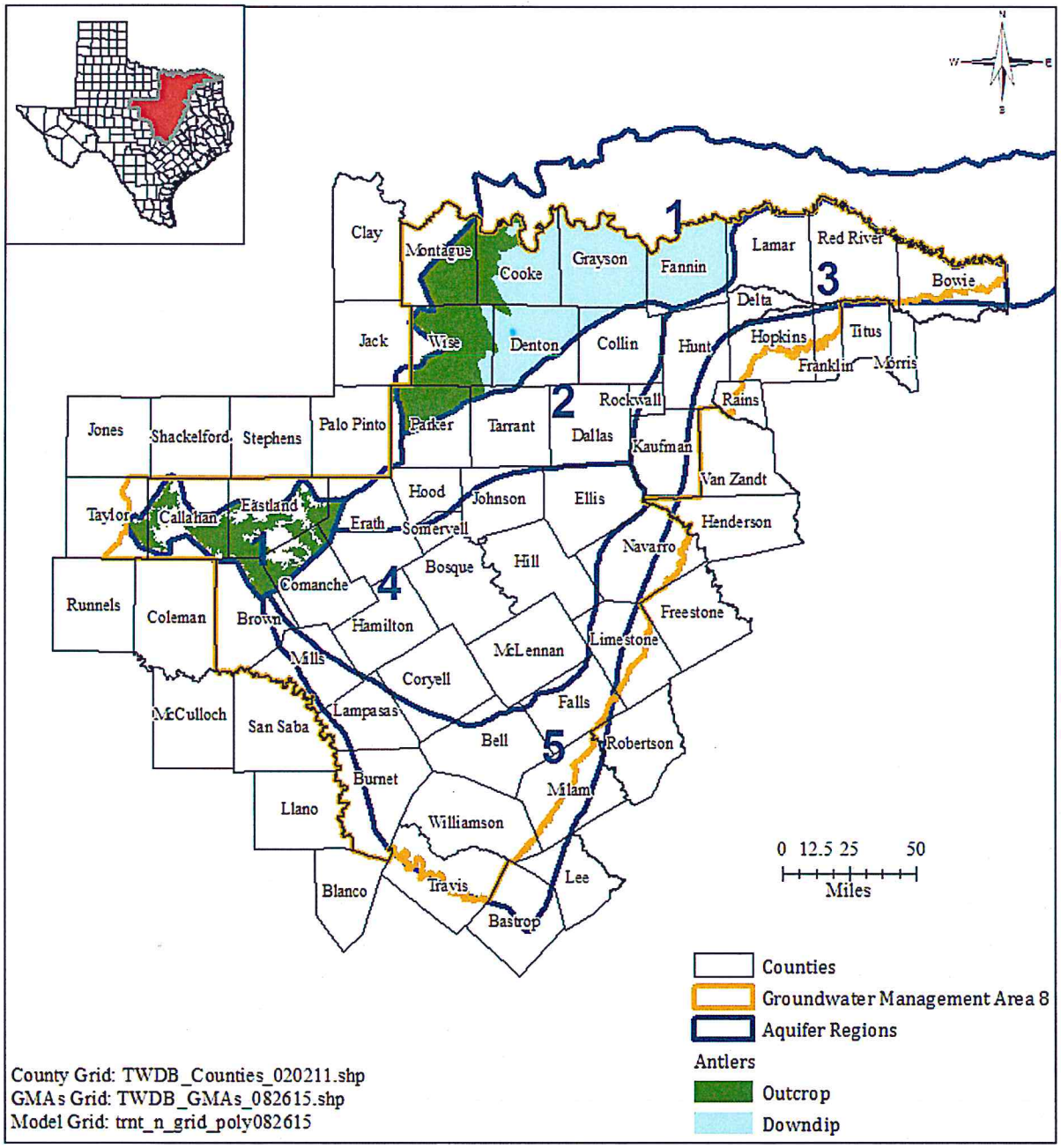

FIGURE 7. MAP SHOWING THE TRINITY AQUIFER (ANTLERS) WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF THE TRINITY AND WOODBINE AQUIFERS.

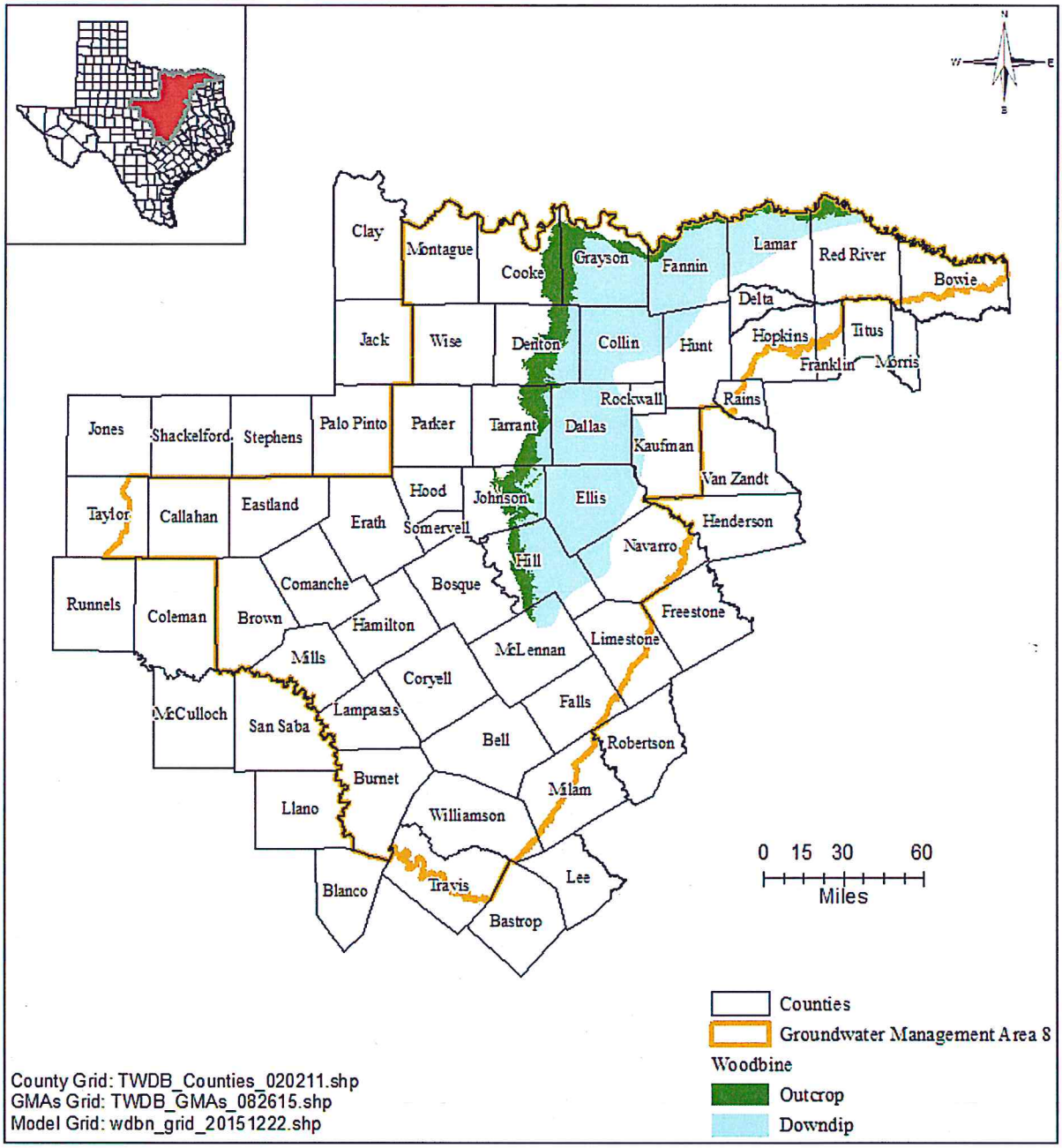

FIGURE 8. MAP SHOWING THE WOODBINE AQUIFER WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF THE TRINITY AND WOODBINE AQUIFERS.

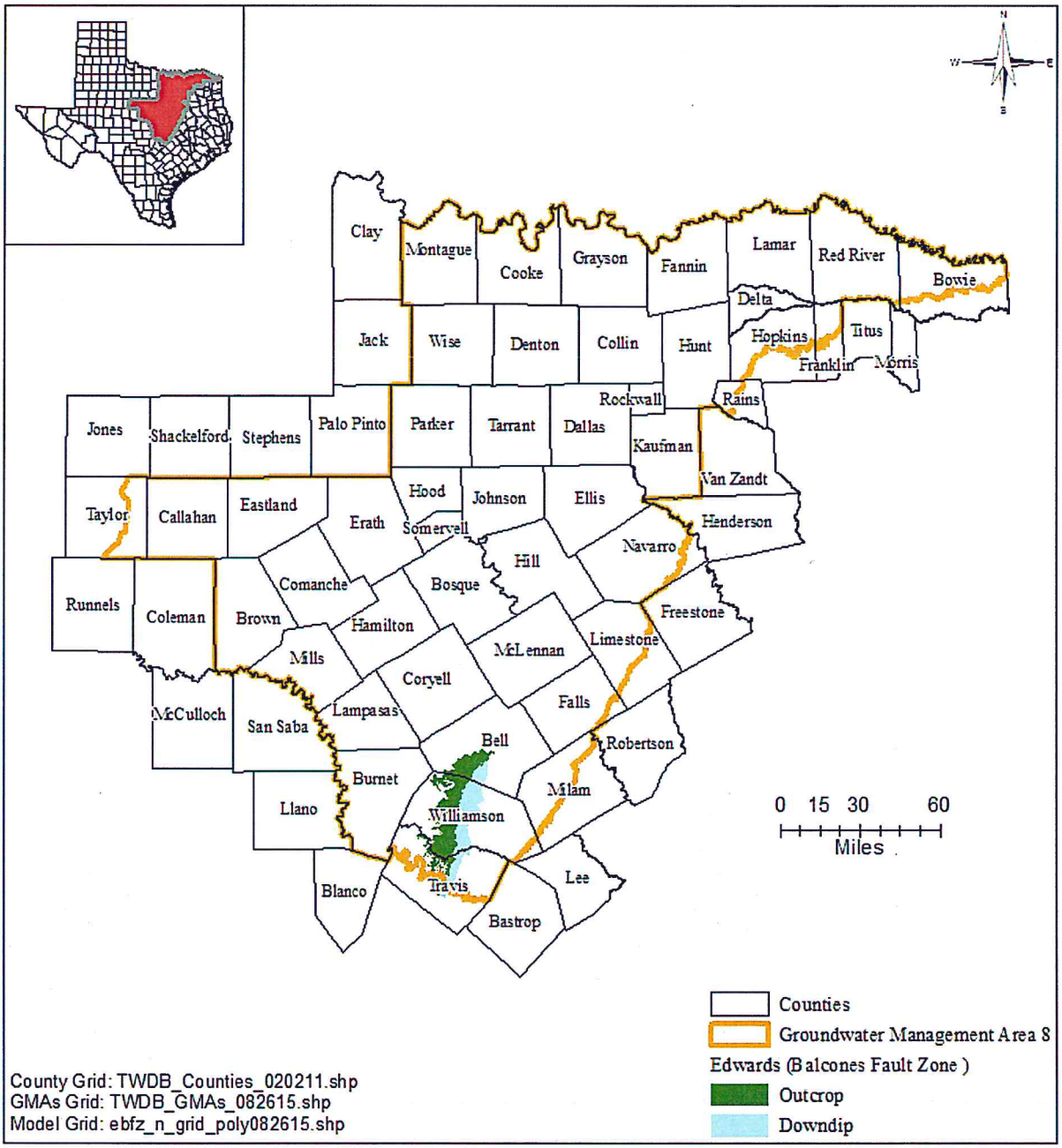

FIGURE 9. MAP SHOWING THE EDWARDS (BALCONES FAULT ZONE) AQUIFER WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN SEGMENT OF THE EDWARDS (BALCONES FAULT ZONE) AQUIFER.

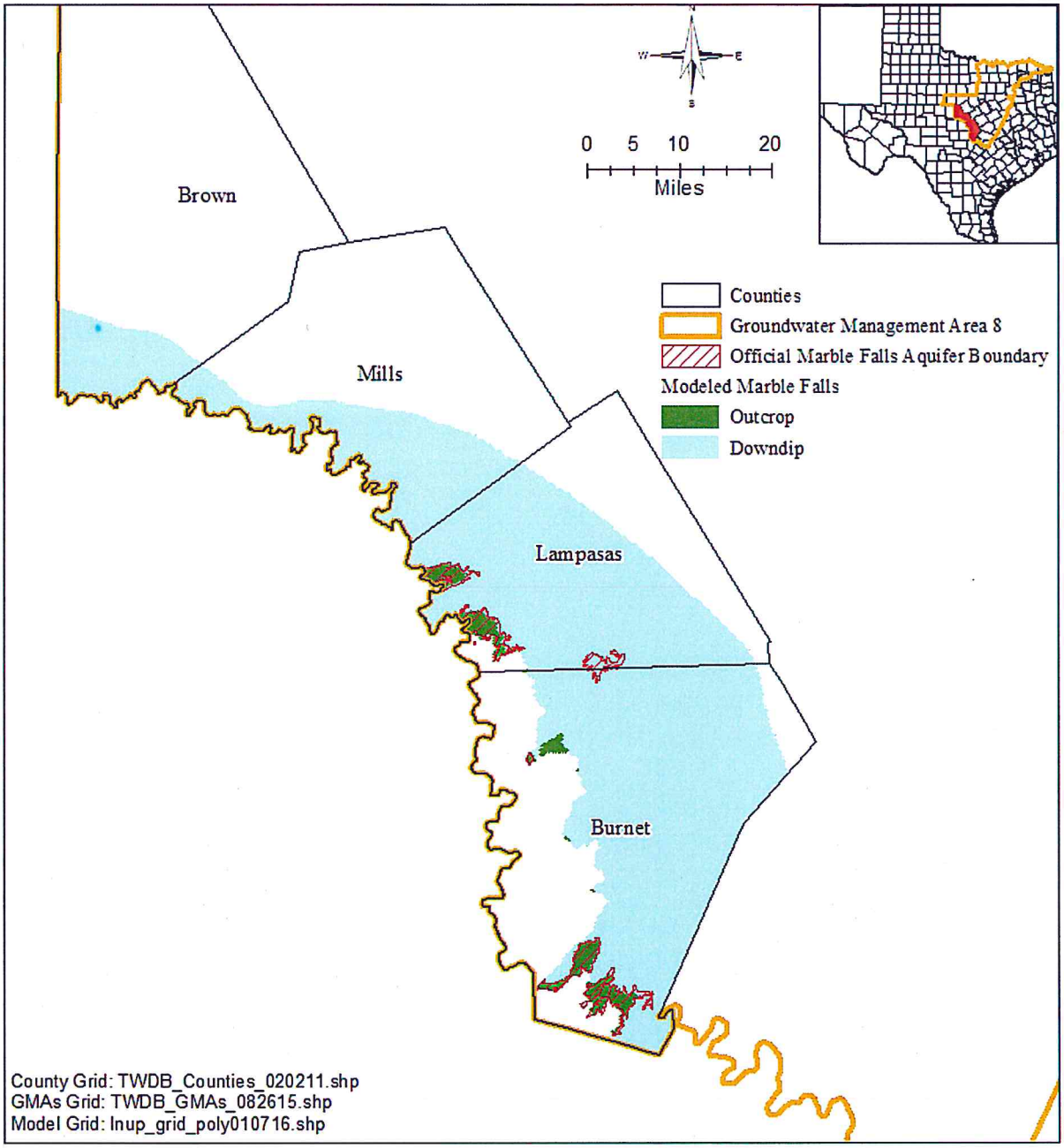

FIGURE 10. MAP SHOWING THE MARBLE FALLS AQUIFER WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE MINOR AQUIFERS IN LLANO UPLIFT REGION.

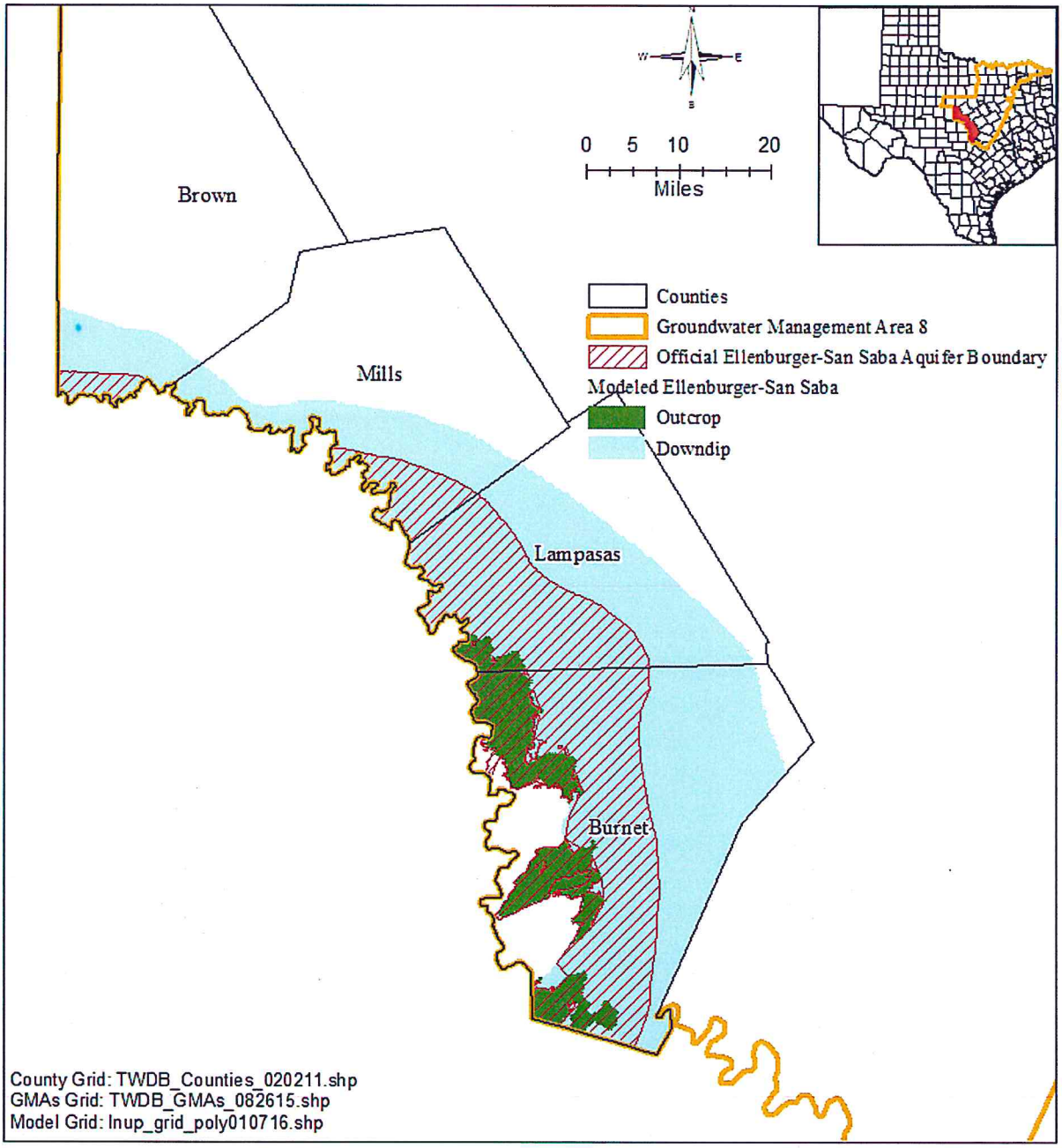

FIGURE 11. MAP SHOWING THE ELLENBURGER-SAN SABA AQUIFER WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE MINOR AQUIFERS IN LLANO UPLIFT REGION.

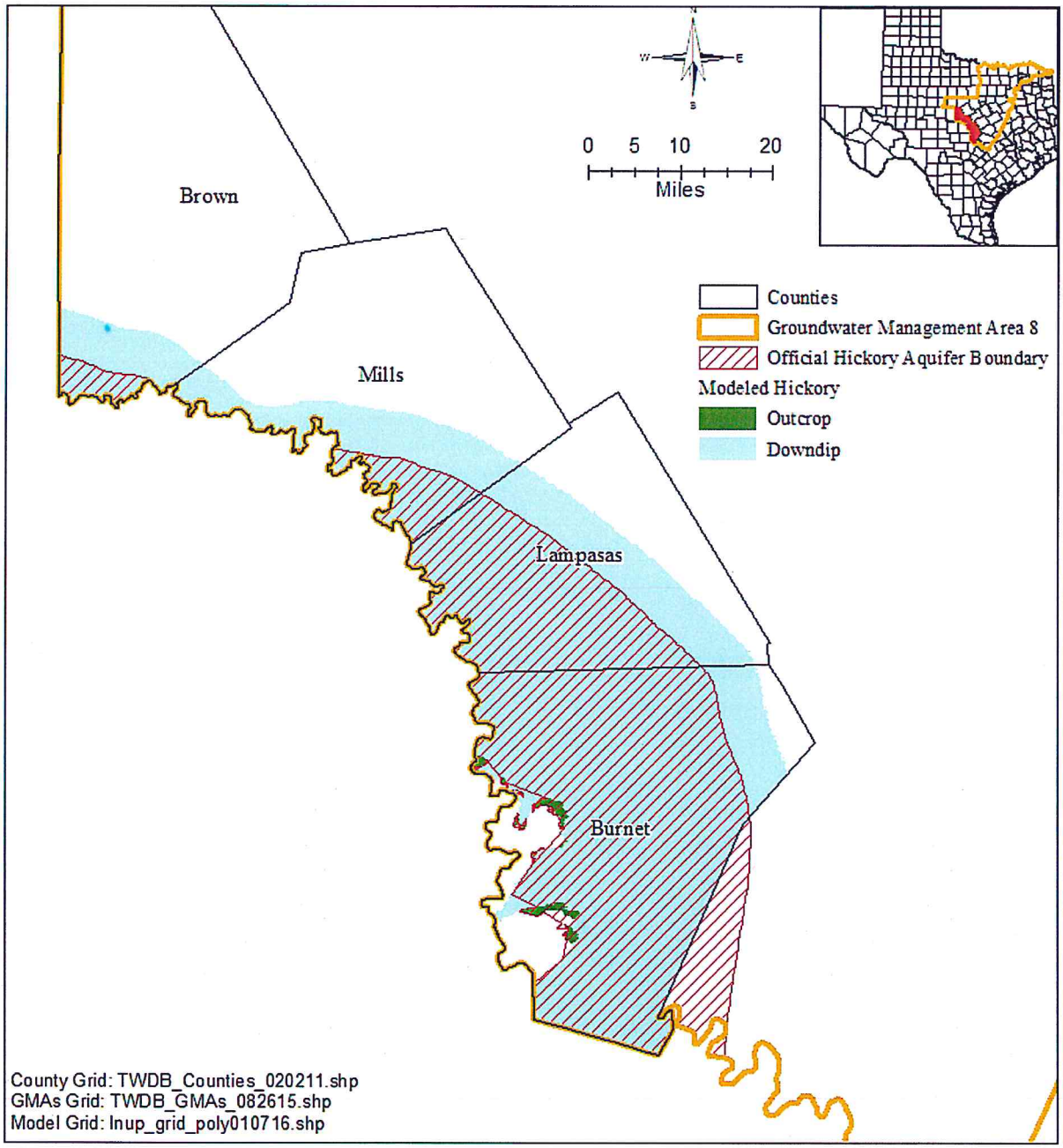

FIGURE 12. MAP SHOWING THE HICKORY AQUIFER WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE MINOR AQUIFERS IN LLANO UPLIFT REGION.

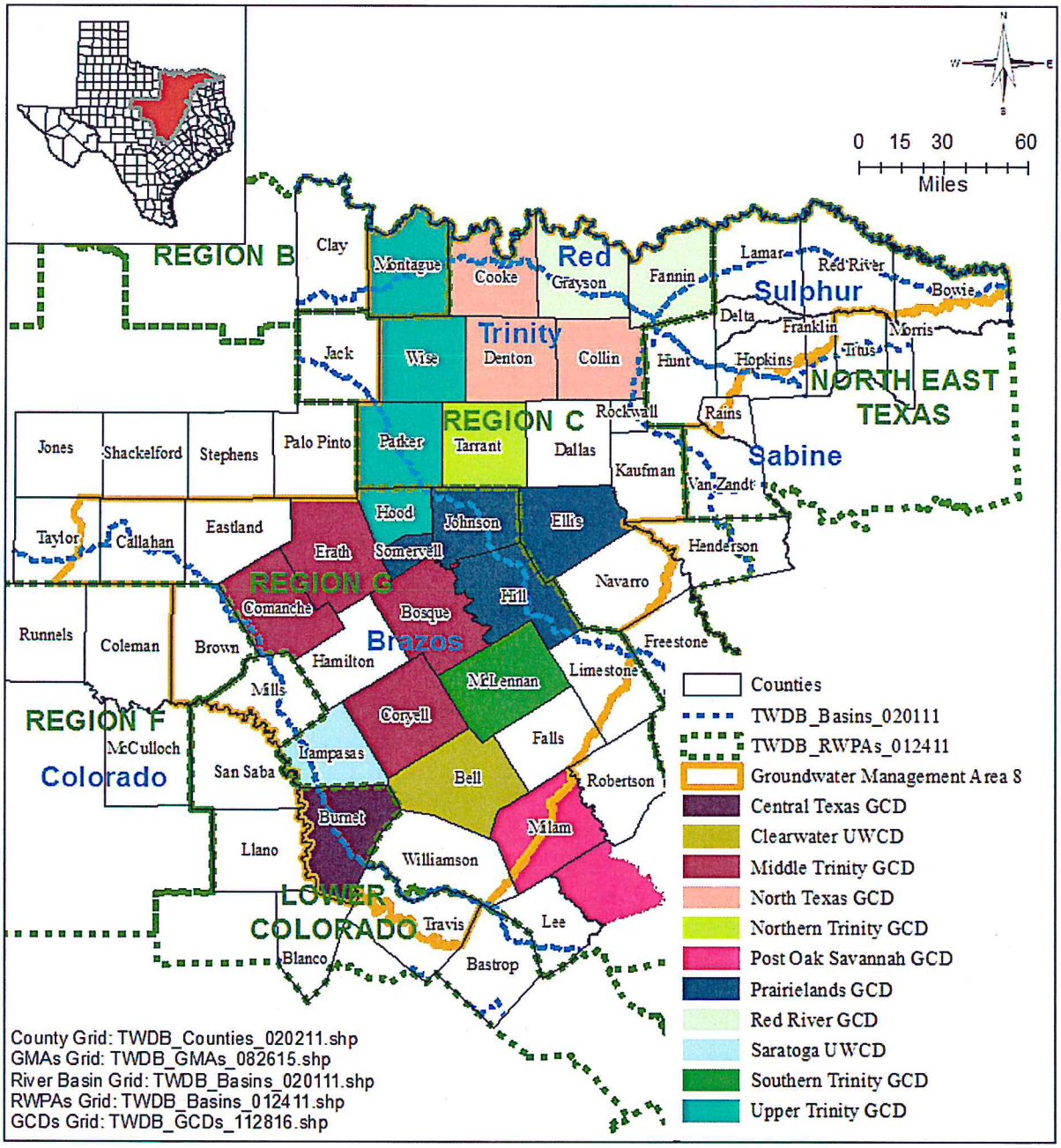

FIGURE 13. MAP SHOWING REGIONAL WATER PLANNING AREAS (RWPAS), GROUNDWATER CONSERVATION DISTRICTS (GCDS), AND RIVER BASINS ASSOCIATED WITH GROUNDWATER MANAGEMENT AREA 8.

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

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.

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**

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.

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**

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

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.

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 (downdip)	**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.

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 (downdip)	**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.

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**

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.

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.

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

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**

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

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**

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**

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

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

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**

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

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

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**

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**

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**

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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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).

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

Vertically, the Trinity and Woodbine aquifers could contain multiple model layers and some of the model cells are pass-through cells with a thickness of one foot. To account for variable model cells from multiple model layers for the same aquifer, 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:

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

Where:

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

Hc_County_{2070} = 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.

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).

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

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.

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.

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%	—	—	—	—

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.

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.

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	—	—	—	—

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.

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.

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 TOLERRANCES 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	—

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.

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 TOLERRANCES 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:

$$ST = \frac{\sum_{i=1}^{n}(h2070_i - e_i)}{\sum_{i=1}^{n}(h2009_i - e_i)}$$

Where:

n = Total model cells in a county

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

$h2070_i$ = 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.

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.

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

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

County	Aquifer	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

Appendix C

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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 G

GAM Run GR 14-001

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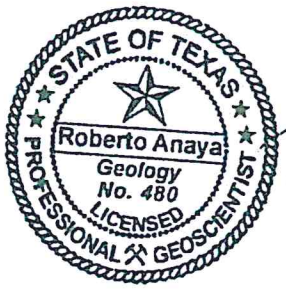
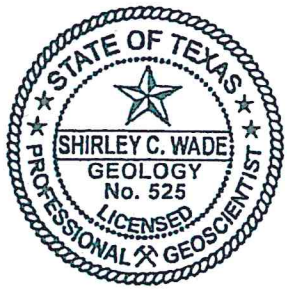
GAM Run 14-001: Northern Trinity Groundwater Conservation District Management Plan

by Roberto Anaya, P.G. and Shirley C. Wade, Ph.D., P.G.
Texas Water Development Board
Groundwater Resources Division
Groundwater Availability Modeling Section
(512) 463-6115
March 31, 2015



Roberto Anaya
3/31/2015



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GAM Run 14-001: Northern Trinity Groundwater Conservation District Management Plan

by Roberto Anaya, P.G. and Shirley C. Wade, Ph.D., P.G.
Texas Water Development Board
Groundwater Resources Division
Groundwater Availability Modeling Section
(512) 463-6115
March 31, 2015

EXECUTIVE SUMMARY:

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

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

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

The groundwater management plan for the Northern Trinity Groundwater Conservation District should be adopted by the district on or before April 10, 2015 and submitted to the executive administrator of the TWDB on or before May 10, 2015. The current management plan for the Northern Trinity Groundwater Conservation District expires on July 9, 2015.

This report discusses the methods, assumptions, and results from a model run using the recently adopted groundwater availability model (approved by the TWDB executive administrator on November 21, 2014) for the Trinity (northern portion) and Woodbine aquifers, version 2.01 (Kelley and others, 2014). This model run replaces the results of GAM Run 08-65 (Oliver, 2008) that used version 1.01 of the groundwater availability model for the Trinity (northern portion) and Woodbine aquifers (Bené and others, 2004). Tables 1 and 2 summarize the groundwater availability model data required by statute to be included in the district's groundwater conservation management plan, and Figures 1 and 2 show the areas of the model from which the values in the table were extracted. If after review of the figures, Northern Trinity Groundwater Conservation District determines that the district boundaries used in the assessment do not reflect current conditions, please notify the TWDB at your earliest convenience.

METHODS:

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

PARAMETERS AND ASSUMPTIONS:

Northern portion of the Trinity Aquifer and Woodbine Aquifer

- We used the updated groundwater availability model for the northern portion of the Trinity Aquifer and Woodbine Aquifer. See Kelley and others (2014) for assumptions and limitations of the updated groundwater availability model.

- The groundwater availability model includes eight layers, that generally correspond to:
    - the surficial outcrop area of the units in layers 2 through 8 and the younger formations overlying the downdip portions of the Woodbine Aquifer and Washita and Fredericksburg groups (Layer 1),
    - the Woodbine Aquifer (Layer 2),
    - the Washita and Fredericksburg groups (Layer 3),
    - the Paluxy Aquifer (Layer 4),
    - the Glen Rose Formation (Layer 5),
    - the Hensell Sand (Layer 6),
    - the Pearsall Formation (Layer 7), and
    - The Hosston Formation (Layer 8).
- The Trinity Aquifer is the major source of groundwater in the Northern Trinity Groundwater Conservation District. Most of the Trinity Aquifer occurs as subcrop within the district boundaries. A small amount of the aquifer outcrops in the northwest portion of the district. All of the eight numerical layers in the model are designated as active in the Northern Trinity Groundwater Conservation District. The Trinity Aquifer is represented by Model Layers 1 through 8 in the outcrop area and by Model Layers 4 through 8 in the subcrop area. These layers were combined to calculate water budget values for the Trinity Aquifer in the district.
- Groundwater in the Trinity Aquifer within Northern Trinity Groundwater Conservation District is primarily fresh water, with total dissolved solids concentrations less than 1,000 milligrams per liter (see Figures 4.4.11 through 4.4.15 in Kelley and others (2014)).
- The Woodbine Aquifer is considered a minor source of groundwater in the Northern Trinity Groundwater Conservation District. Most of the Woodbine Aquifer outcrops in a north-south trend through the eastern portion of the district. A lesser amount of the aquifer is present as subcrop along the eastern district boundary. The Woodbine Aquifer is represented by Model Layers 1 and 2 in the outcrop area and by Model Layer 2 in the subcrop

area. These layers were combined to calculate water budget values for the Woodbine Aquifer in the district.

- Groundwater in the Woodbine Aquifer within Northern Trinity Groundwater Conservation District is generally fresh water, with total dissolved solids concentrations less than 1,000 milligrams per liter (see Figures 4.4.11 through 4.4.15 in Kelley and others (2014)).

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

RESULTS:

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

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

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

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

- Flow between aquifers—the net vertical flow between aquifers or confining units. This flow is controlled by the relative water levels in each aquifer or confining unit and hydraulic properties of each aquifer or confining unit. In the Northern Trinity Groundwater Conservation District, this net vertical flow represents the net groundwater flow between the Trinity Aquifer and the immediate geologic unit overlying the aquifer in the subcrop area or the net groundwater flow between the Woodbine Aquifer and the immediate geologic units overlying and underlying the aquifer in the subcrop area.

The information needed for the Northern Trinity Groundwater Conservation District's management plan is summarized in Tables 1 and 2. It is important to note that sub-regional water budgets are approximate. This is due to the size of the model cells and the approach used to extract data from the model. To avoid double accounting, a model cell that straddles a political boundary, such as a district or county boundary,

is assigned to one side of the boundary based on the location of the centroid of the model cell. For example, if a cell contains two counties, the cell is assigned to the county where the centroid of the cell is located (Figures 1 and 2). Please note that the results of this model run are different from the results of the model run 08-65 that were obtained from the older groundwater availability model. The changes can be attributed to several characteristics of the new model, such as differences in model layering, geologic boundaries, hydraulic properties distribution, and the use of different MODFLOW modeling packages.

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

Management Plan requirement	*Aquifer or confining unit*	*Results*
Estimated annual amount of recharge from precipitation to the district	Trinity Aquifer	3,735
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Trinity Aquifer	4,560
Estimated annual volume of flow into the district within each aquifer in the district	Trinity Aquifer	13,750
Estimated annual volume of flow out of the district within each aquifer in the district	Trinity Aquifer	5,785
Estimated net annual volume of flow between each aquifer in the district	From overlying Washita and Fredericksburg Confining Units into the Trinity Aquifer	7,228
	From Trinity Aquifer into underlying Older Units	n/a*

* n/a: Not Applicable. The model assumes a no flow condition at the base of the Trinity Aquifer.

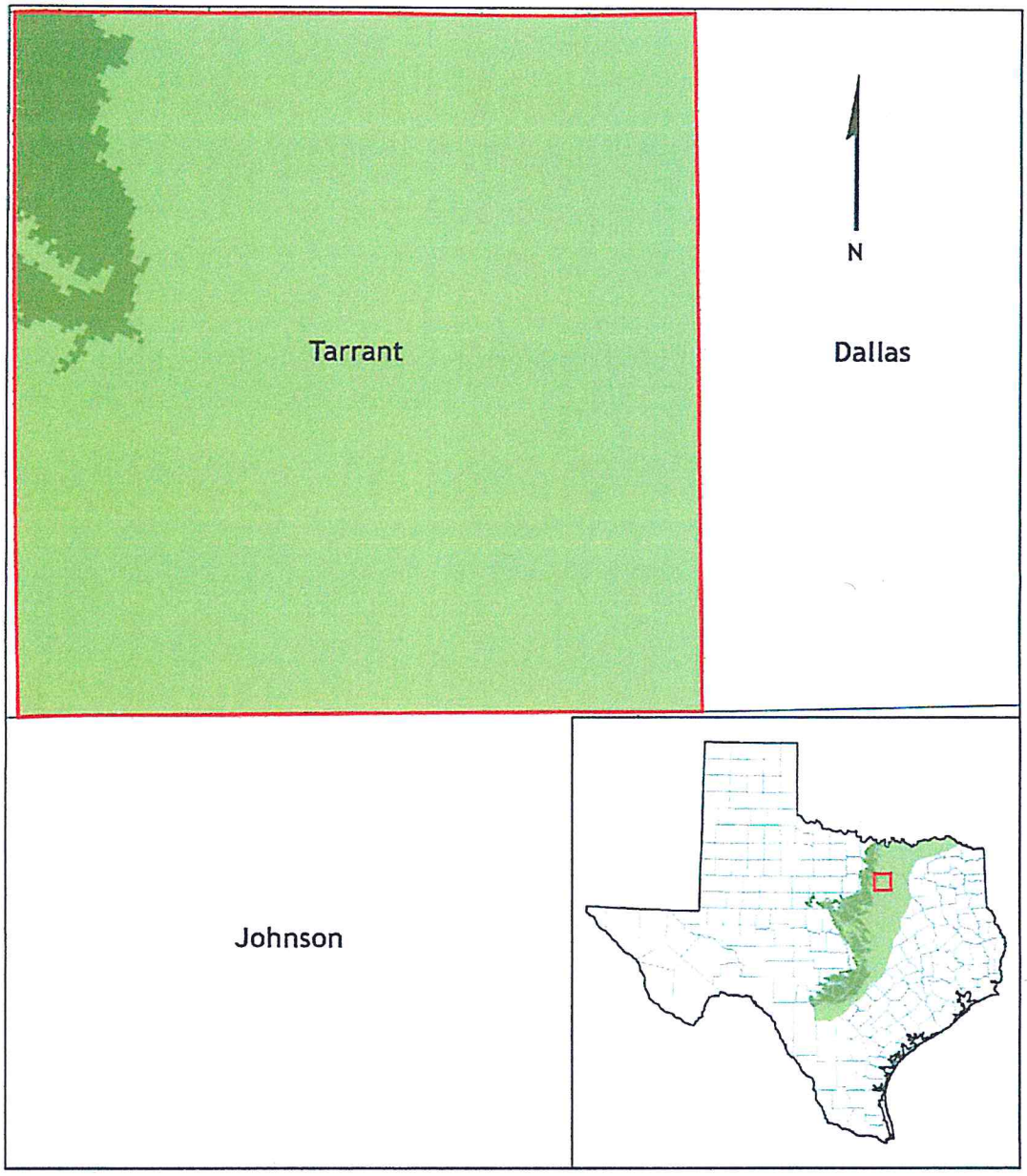

FIGURE 1: AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF THE TRINITY AQUIFER AND WOODBINE AQUIFER FROM WHICH THE INFORMATION IN TABLE 1 WAS EXTRACTED (THE TRINITY AQUIFER FOOTPRINT EXTENT WITHIN THE DISTRICT BOUNDARY).

TABLE 2: SUMMARIZED INFORMATION FOR THE WOODBINE AQUIFER THAT IS NEEDED FOR THE NORTHERN TRINITY GROUNDWATER CONSERVATION DISTRICT'S GROUNDWATER MANAGEMENT PLAN. ALL VALUES ARE REPORTED IN ACRE-FEET PER YEAR AND ROUNDED TO THE NEAREST 1 ACRE-FOOT.

Management Plan requirement	*Aquifer or confining unit*	*Results*
Estimated annual amount of recharge from precipitation to the district	Woodbine Aquifer	16,545
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Woodbine Aquifer	14,276
Estimated annual volume of flow into the district within each aquifer in the district	Woodbine Aquifer	1,135
Estimated annual volume of flow out of the district within each aquifer in the district	Woodbine Aquifer	1,916
Estimated net annual volume of flow between each aquifer in the district	From overlying Younger Confining Units into the Woodbine Aquifer	70
	From Woodbine Aquifer into underlying Washita and Fredericksburg Confining Units	1,816

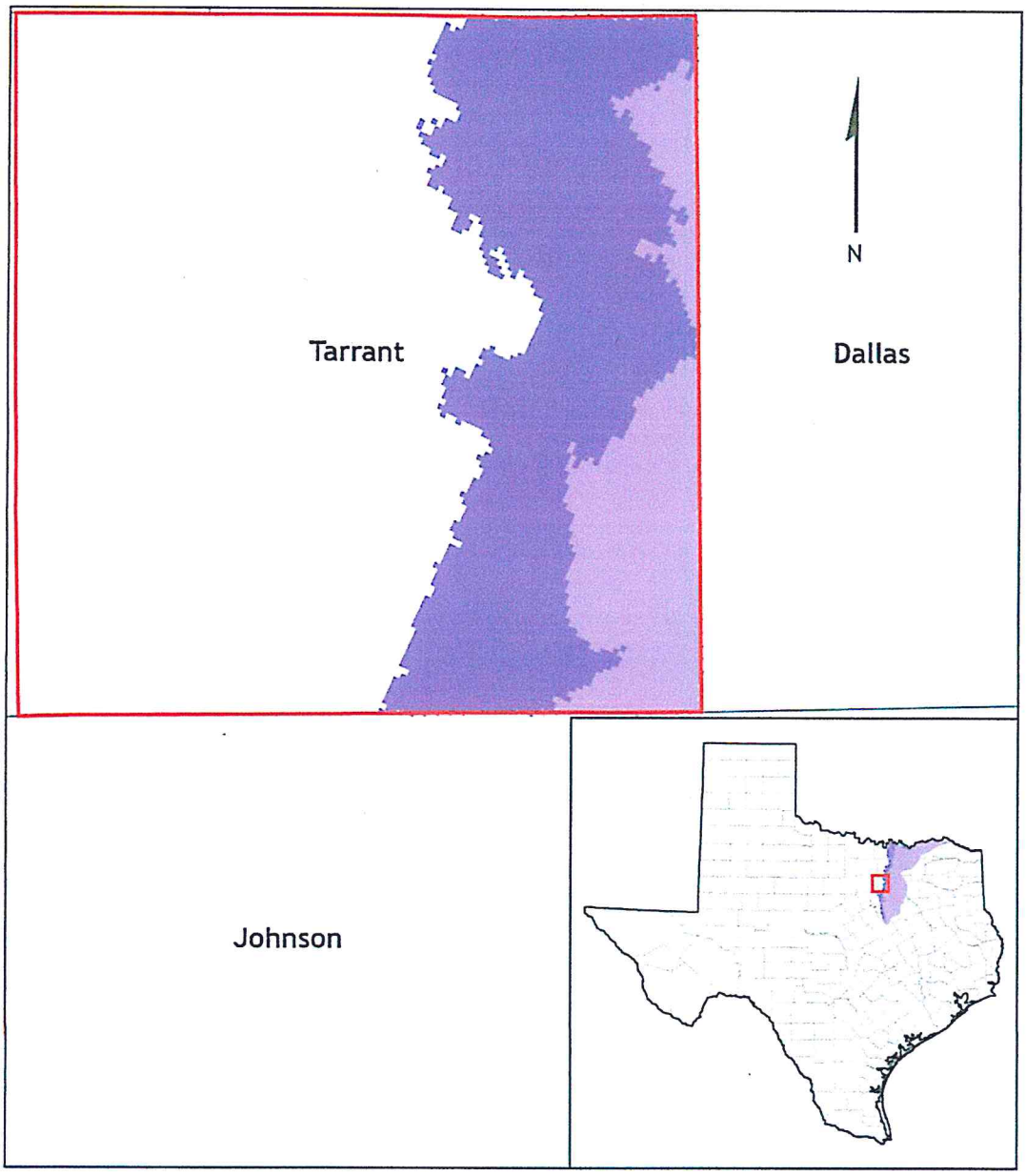

FIGURE 2: AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF THE TRINITY AQUIFER AND WOODBINE AQUIFER FROM WHICH THE INFORMATION IN TABLE 2 WAS EXTRACTED (THE WOODBINE AQUIFER FOOTPRINT EXTENT WITHIN THE DISTRICT BOUNDARY).

LIMITATIONS

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

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

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

Because the application of the groundwater models was designed to address regional scale questions, the results are most effective on a regional scale. The TWDB makes no warranties or representations related to the actual conditions of any aquifer at a particular location or at a particular time.

It is important for groundwater conservation districts to monitor groundwater pumping and overall conditions of the aquifer. Because of the limitations of the groundwater model and the assumptions in this analysis, it is important that the groundwater conservation districts work with the TWDB to refine this analysis in the future given the reality of how the aquifer responds to the actual amount and location of pumping now and in the future. Historic precipitation patterns also need to be placed in context as future climatic conditions, such as dry and wet year precipitation patterns, may differ and affect groundwater flow conditions.

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APPENDIX H

Adopted Rules of the District

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NORTHERN TRINITY GROUNDWATER CONSERVATION DISTRICT

RULES

Effective December 17, 2018

Amended May 20, 2020

TARRANT COUNTY, TEXAS

TABLE OF CONTENTS

PREAMBLE

The Northern Trinity Groundwater Conservation District ("District") was created in 2007 by the 80th Texas Legislature in order to conserve, preserve, protect, and prevent waste of the groundwater resources of Tarrant County, Texas, and to promote recharge of the aquifers within Tarrant County. The District's boundaries are coextensive with the boundaries of Tarrant County, and all lands and other property within these boundaries will benefit from the works and projects that will be accomplished by the District. These District Rules are adopted to enable the District to accomplish those purposes. 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. 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 DEFINITION 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:

(a) "Agricultural irrigation" means the application of produced groundwater to soil for beneficial purposes as part of 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 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.

The definition of the "agricultural irrigation" does not include the application of produced groundwater to a golf course for any purpose.

(b) "Aquifer" means a water bearing geologic formation in the District.

(c) “Aquifer storage and recovery project” means a project involving the injection of water into a geologic formation for the purpose of subsequent recovery and beneficial use by the project operator.

(d) “Aquifer Storage Recovery (ASR) injection well” means a Class V injection well used for the injection of water into a geologic formation as part of an aquifer storage and recovery project.

(e) “Aquifer Storage Recovery (ASR) recovery well” means a well used for the recovery of water from a geologic formation as part of an aquifer storage and recovery project.

(f) "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.

(g) "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.

(h) “Board” means the Board of Directors of the District.

(i) “Certificate of Convenience and Necessity (“CCN”)” means a permit issued by the Public Utility Commission of Texas which authorizes and obligates a retail public utility to furnish, make available, render, or extend continuous and adequate retail water or sewer utility service to a specified geographic area.

(j) “Connection” means a single family residential unit or each commercial or industrial establishment to which drinking water is supplied from the system. As an example, the number of service connections in an apartment complex would be equal to the number of individual apartment units. When enough data is not available to accurately determine the number of connections to be served or being served, the population served divided by three will be used as the number of connections for calculating system capacity requirements. Conversely, if only the number of connections is known, the connection total multiplied by three will be the number used for population served.

(k) "District" means the Northern Trinity Groundwater Conservation District created in accordance with Section 59, Article XVI, Texas Constitution, Chapter 36, Texas Water Code, and the District Act.

(l) "District Act" means the Act of May 28, 2007, 80th Leg., R.S., ch. 1126, 2007 Tex. Gen. Laws 3794, codified at TEX. SPEC. DIST. LOC. LAWS CODE ANN. ch. 8820 ("the District Act"), as may be amended from time to time.

(m) "Domestic use" means the use of groundwater by an individual or a household to support domestic activity. Such use may include water for drinking, washing, or culinary purposes; for irrigation of lawns, or of a family garden and/or family orchard; for watering of domestic animals. Domestic use does not include water used to support activities for which consideration is given or received or for which the product of the activity is sold. Domestic use does not include use by or for a public water system. Domestic use does not include irrigation of crops in fields or pastures. Domestic use does not include water used for open-loop residential geothermal heating and cooling systems, but does include water used for closed-loop residential geothermal systems. Domestic use does not include pumping groundwater into a pond or other surface water impoundment unless the impoundment is fully lined with an impervious artificial liner and has a surface area equal to or smaller than one-third of a surface acre (14,520 square feet).

(n) "Dry hole" means wells which do not encounter groundwater.

(o) "Existing Groundwater Regulatory Authority" means a conservation and reclamation district described by Section 8820.151 of the District Act.

(p) "Effective Date" means December 17, 2018, which was the date of adoption of the permanent rules for the District.

(q) "General Manager" as used herein is the appointed chief administrative officer of the District, or the District staff or a third party acting at the direction of the General Manager or Board. Additionally, the Board President may perform the functions set forth herein to be performed by the General Manager.

(r) "Golf Course Use" means the use of groundwater for any purpose associated with a golf course.

(s) "Grandfathered Use Period" means the time period from January 1, 2014 until December 17, 2018 in which groundwater produced from a well or well system was put to beneficial use at any point during the duration of the period.

(t) "Grandfathered Use Permit" means a permit required by the District for a non-exempt, existing well or well system that produced water during the Grandfathered Use Period and has not been abandoned.

(u) "Grandfathered Use Verification Period" means the period from December 17, 2018, the Effective Date of these Rules, to December 31, 2023 by which well owners may seek Grandfathered Use Permit status for a well or well system within the District.

(v) "Groundwater" means water percolating below the surface of the earth.

(w) "Groundwater reservoir" means a specific subsurface water-bearing stratum.

(x) "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.

(y) "Livestock" means, in the singular or plural, grass- or plant-eating, single- or cloven-hooved mammals raised in an agricultural setting for subsistence, profit or for its labor, or to make produce such as food or fiber, including cattle, horses, mules, asses, sheep, goats, llamas, alpacas, and hogs, as well as species known as ungulates that are not indigenous to this state from the swine, horse, tapir, rhinoceros, elephant, deer, and antelope families, but does not mean a mammal defined as a game animal in section 63.001, Parks and Wildlife Code, or as a fur-bearing animal in section 71.001, Parks and Wildlife Code, or any other indigenous mammal regulated by the Texas Department of Parks and Wildlife as an endangered or threatened species. The term does not include any animal that is stabled, confined, or fed at a facility that is defined by Texas Commission on Environmental Quality ("TCEQ") rules as an Animal Feeding Operation or a Concentrated Animal Feeding Operation.

(z) "Maximum Grandfathered Use" means the largest volume of groundwater produced from an aquifer and beneficially used by an applicant for a Grandfathered Use Permit for an existing well during a calendar year in the Grandfathered Use Period. For applicants seeking a Grandfathered Use Permit for an existing well who did not commence the beneficial use of water from an aquifer until less than one calendar year before the end of the Grandfathered Use Period, the term means the calculated amount of groundwater that the applicant would in all reasonable likelihood have beneficially used during the entire final calendar year of the Grandfathered Use Period for the applied-for purpose, had the applicant commenced the activities that required the groundwater production on the first day of the final calendar year of the Grandfathered Use Period.

(aa) "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, except as provided under Rule 7.1.

(bb) “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.

(cc) “Operating Permit” means a permit required by the District for the following:

1) the equipping or completing of a non-exempt water well or water well system for production and such equipping or completing occurred after December 17, 2018;

2) the production of groundwater from any non-exempt water well for which a Grandfathered Use Permit has not been issued; or

3) the substantial alteration of an existing water well that has been granted a Grandfathered Use Permit as that term is defined in Rule 1.1(t).

(dd) “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.

(ee) “Person” means an individual, corporation, limited liability company, organization, government, governmental subdivision, agency, business trust, estate, trust, partnership, association, or other legal entity.

(ff) “Poultry” means chickens, turkeys, nonmigratory game birds, and other domestic nonmigratory fowl, but does not include any other bird regulated by the Parks and Wildlife as an endangered or threatened species. The term does not include any animal that is stabled, confined, or fed at a facility that is defined by TCEQ rules as an Animal Feeding Operation or a Concentrated Animal Feeding Operation.

(gg) “Project operator” means a person holding an authorization to undertake an aquifer storage and recovery project.

(hh) “Production” or “producing” means the act of extracting groundwater from an aquifer by a pump or other method.

(ii) “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

(jj) "Pump" means any facility, device, equipment, materials, or method used to obtain water from a well.

(kk) "Registrant" means a person required to submit a registration.

(ll) "Registration" means a well owner providing certain information about a well to the District, as more particularly described under Section 3.

(mm) "Rule" or "Rules" means these Rules of the District regulating water wells, which shall continue to be effective until amended or repealed.

(nn) "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 or to increase the size of the pump on the well, but, shall not apply to an increase in the size of the pump if the maximum designed production capacity of the new pump is 17.36 gpm or less.

(oo) "Transfer" means a change in a registration as follows, except that the term "transfer" shall have its ordinary meaning as read in context when used in other contexts:

1) ownership; or

2) the person authorized to exercise the right to make withdrawals and place the groundwater to beneficial use.

(pp) Types of wells:

1) "ASR injection well" is defined in Rule 1.1 (d) of these Rules.

2) "ASR recovery well" is defined in Rule 1.1(e) of these Rules.

3) "Artesian well" means an artificial water well in which the water, when properly cased, will rise by natural pressure above the first impervious

stratum below the surface of the ground. This definition is derived from Section 11.201 of the Texas Water Code.

4) "Exempt well" means a new or an existing well that is exempt under Rule 2.1 from certain regulatory requirements in these rules.

5) "Existing well" means a well that was in existence or for which drilling commenced prior to December 17, 2018.

6) "Geothermal well" means a well that is part of a system used to generate energy powered by geothermal resources (including steam and other gasses, hot water, and hot brines). An open loop geothermal system uses two wells—one supply well and one return well—and circulates water via pipes between the two wells. A closed loop geothermal system uses one closed borehole to circulate fluids including water through the earth as a heat source or heat sink.

7) "Leachate well" means a well used to remove contamination from soil or groundwater.

8) "Monitoring well" means a well installed to measure some property of the groundwater or the aquifer that it penetrates, and does not produce more than 5,000 gallons per year.

9) "New well" means a well for which drilling or artificial excavation commenced on or after December 17, 2018.

10) "Public water supply well" means a well that supplies water to a public water system.

11) "Capped well" means a well that is closed or capped with a covering capable of preventing surface pollutants from entering the well and sustaining weight of at least 400 pounds and constructed in such a way that the covering cannot be easily removed by hand.

(qq) "Waste" means one or more of the following:

1) 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;

2) the flowing or producing of water from the aquifer by artificial means if the water produced is not used for a beneficial purpose;

3) the escape of groundwater from the aquifer to any other underground reservoir or geologic stratum that does not contain groundwater;

4) 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, including the use of human waste for commercial or agricultural fertilizer;

5) 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

6) of the well unless such discharge is authorized by permit, rule, or other order issued by the TCEQ under Chapters 11 or 26 of the Texas Water Code;

7) 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;

8) for water produced from an artesian well, "waste" has the meaning assigned by Section 11.205, Texas Water Code;

9) operating a deteriorated well; or producing groundwater in violation of any District rule governing the withdrawal of groundwater through production limits on wells, managed depletion, or both.

(rr) "Well" means any artificial excavation located within the boundaries of the District dug or drilled for the purpose of exploring for or withdrawing groundwater from the aquifer.

(ss) "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.

(tt) "Well report" means a water well driller's report and/or a State of Texas Well Report submitted by a driller in compliance with the requirements of the Texas Department of Licensing and Regulations.

(uu) "Well system" means a well or group of wells tied to the same distribution system through common pipes

(vv) "Withdraw" means the act of extracting or producing groundwater by pumping or other method.

(ww) "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 Northern Trinity 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

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.

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 email (electronic mail), or by fax transfer to the recipient’s current fax number 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 NOTIFICATION TO WELL OWNERS

As soon as practicable after October 1, 2010, the District published notice to inform the well owners of the management authority of the District and the well owners' duties and responsibilities under these Rules. This provision does not apply to the adoption of amendments to these Rules.

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.

RULE 1.14 OWNERSHIP OF GROUNDWATER

The District recognizes that a landowner owns the groundwater below the surface of the landowner's land as real property, and nothing in these rules shall be construed as depriving or divesting a landowner, including a landowner's lessees, heirs, or assigns, of the groundwater ownership and rights described by Section 36.002 of the Texas Water Code.

RULE 1.15 AUTHORITY OF GENERAL MANAGER

Unless otherwise provided by these Rules, Chapter 36 of the Texas Water Code, the laws of the State of Texas, or unless determined unsuitable by the Board, the General Manager of the District shall have the authority to carry out the purposes and conduct the necessary activities of the District promulgated by these Rules without action by the Board. The purpose of this authority is to allow the General Manager to properly conduct the daily and managerial activities of the District in order to allow the District to efficiently and effectively manage and preserve the groundwater resources of Tarrant County.

RULE 1.16 REQUESTS FOR RECONSIDERATION AND APPEAL

To appeal a decision of the District, including any determinations made by the General Manager, concerning any matter not 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 decision is final if no request for reconsideration is timely filed, upon the Board's denial of the request for reconsideration, or upon rendering a decision after rehearing the request for reconsideration. If the rehearing request is granted by the Board, the date of the rehearing will be within forty-five (45) calendar days thereafter. The failure of the Board to grant or deny the request for reconsideration within forty-five 45 calendar days of the date of submission shall constitute a denial of the request.

SECTION 2. APPLICABILITY OF REGULATORY REQUIREMENTS; EXEMPTIONS

RULE 2.1 WELLS EXEMPT FROM WATER USE FEE PAYMENT, METERING, REPORTING, AND PERMITTING REQUIREMENTS

(a) The requirements of these Rules relating to the permits issued under Section 5, payment of water use fees under Section 6, the requirement to install and maintain a meter under Section 7, and the requirement to report to the District the amount of water produced from a well under Section 3 do not apply to the following types of wells:

1) All wells, existing or new, of any size or capacity that are used solely for domestic use, livestock use, poultry use, or agricultural irrigation use

(use of groundwater for any purpose associated with a golf course is not agricultural irrigation use);

2) An existing well or new well that is not a public water supply well and:

i) does not have the capacity, as equipped, to produce more than 17.36 gallons per minute, except as provided by Subsection (b) of this rule; and

ii) is used in whole or in part for any purpose of use other than solely for domestic, livestock, poultry, or agricultural irrigation use; or

3) Leachate wells and monitoring wells. Wells that qualify for this exemption pursuant to this subsection are still subject to the reporting requirements in District Rule 3.8 and metering requirements of District Rule 7.1 for the purposes of verifying the exemption claimed under this subsection. Any monitoring well that produces over 5,000 gallons per year loses its exempt status under this subsection and is otherwise subject to District Rule 2.2.

4) The owners of a closed loop geothermal wells must provide written notice of the existence of such a well to all owners of registered wells located within 200 feet of the closed loop geothermal well.

Any well that produces groundwater for use associated with a golf course must comply with Sections 5, 6, and 7 of the District's rules.

(b) For purposes of determining whether the exemption set forth under Subsection (a)(2) applies, the capacity of a well that is part of a well system shall be determined by taking the sum of the capacities of each of the individual wells, as equipped, in the system. If the total sum of the capacities is greater than 17.36 gallons per minute, the well system and the individual wells that are part of it are not exempt from the water use fee payment, metering, and reporting requirements of these rules.

(c) A well exempted under Subsection (a) will lose its exempt status if the well is subsequently used for a purpose or in a manner that is not exempt under Subsection (a).

(d) A well exempted under Subsection (a)(2) will lose its exempt status if, while the well was registered as an exempt well, the District determines that the well had the capacity, as equipped, to produce more than 17.36 gallons per minute. Such wells are subject to the water use fee payment, metering, reporting, and other requirements of these Rules, and may be subject to enforcement under Section 8.

(e) The owner of a new well that is exempt under this Rule shall nonetheless register the well with the District, as required under Section 3.

RULE 2.2 WELLS SUBJECT TO WATER USE FEE PAYMENT, METERING, REPORTING, AND PERMITTING REQUIREMENTS

(a) All wells not described as exempt under Rule 2.1 are subject to the permitting, water use fee payment, metering, reporting, and other requirements of these Rules, except as provided under Rule 2.3. Such wells include all public water supply wells and all wells or well systems with a capacity, as equipped, to produce more than 17.36 gallons per minute that are used in whole or in part for any purpose of use other than solely for domestic use, livestock use, poultry use, or agricultural irrigation use. Wells equipped to produce groundwater for golf course use must comply with this Section.

(b) Any well that is subject to fee payment under this rule and that provides water for both exempt purposes and purposes not exempt under Rule 2.1 or Rule 2.3 shall pay the water use fee rate established by the District for all water produced from the well, unless the owner or operator 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. Subject to the District's discretion, a well owner or operator that can demonstrate an accurate accounting of water produced for each purpose of use shall only be subject to the water use fee payment and reporting requirements of these Rules for water produced from the well for nonexempt purposes of use.

RULE 2.3 LIMITED EXEMPTION FOR CERTAIN HYDROCARBON-RELATED WATER WELLS

The requirements of these Rules relating to production limitations under Section 5 and to the payment of water use fees under Section 6 do not apply to a well exempt from permitting under Section 36.117(b)(2) or (b)(3), Water Code, which relate to water wells used in certain oil and gas drilling or exploration operations and surface coal mining. However, such a well shall be subject to the other requirements of these rules, including without limitation the well registration, drilling records, metering, water production reporting, and new well registration fee and deposit provisions of these rules, unless such a well is exempted from certain of those requirements because its limited production capacity qualifies for an exemption under Rule 2.1.

RULE 2.4 APPLICABILITY OF RULES IN EXISTING GROUNDWATER REGULATORY AUTHORITY

The District may not regulate the drilling or equipping of, or the completion, operation, or production of, a well located within the District and within the boundaries of an Existing Groundwater Regulatory Authority, as defined under Rule 1.1. However, such a well located within the District and within the boundaries of an Existing Groundwater Regulatory

Authority that is not exempt under Rule 2.1 shall be subject to the Water Use Fee payment requirements of these Rules. The District and an Existing Groundwater Regulatory Authority shall cooperate to provide for the sharing of information and the registration of such wells and payment of Water Use Fees to the District in a manner that accomplishes the intent and purposes of these Rules and the District Act but is not unduly burdensome on the owners of such wells, who may have already drilled, registered, or permitted their wells in accordance with the water well rules of the Existing Groundwater Regulatory Authority or who may do so in the future.

SECTION 3. REGISTRATIONS, RECORDS, REPORTS, AND LOGS

RULE 3.1 PURPOSE AND POLICY

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 under Section 8.

RULE 3.2 WELL REGISTRATION

(a) The following wells must be registered with the District:

1) all new wells, including new wells exempt under Rules 2.1 or 2.3; and

2) all existing wells that are not exempt under Rule 2.1.

(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 minute;

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 at all times; and

9) any other information deemed necessary by the Board.

(c) The timely filing of an application for registration shall provide the owner of a well described under Subsection (a)(2) with evidence that a well existed before December 17, 2018, for purposes of grandfathering the well from the requirement to comply with any well location or spacing requirements of the District and any other entitlements that existing wells may receive under these Rules or under permanent rules adopted by the District. A well that is required to be registered under this Rule and that is not exempt under Rule 2.1 shall not be operated, without first complying with the metering provisions set forth under Section 7.

(d) Once a registration is complete, which for new wells also includes receipt by the District of the well report required by Rule 3.7 and the well registration fee, the registration shall be perpetual in nature, subject to being amended or transferred and subject to enforcement for violations of these Rules.

RULE 3.3 REGISTRATION OF NEW WELLS OR ALTERATIONS TO EXISTING WELLS REQUIRED PRIOR TO DRILLING OR ALTERATION

(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 and submit a well registration fee under Rule 6.3 and a well report deposit under Rule 6.6 with 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 with respect to size or capacity.

(b) A registrant for a new well has 120 days from the date of approval of its application for well registration to drill and complete the new well, and must file the well report with the District within 60 days of completion. However, if the well is for a public water system, the registrant shall have 240 days to drill and complete the new well from the date of approval of its application for well

registration, in order to allow time for TCEQ approval(s), and must file the well report within 60 days of well completion. Such a public water system registrant may apply for one extension of an additional 240 days or may resubmit an identical well registration without the need to pay an additional well registration fee.

(c) 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 3.5 is not filed within the deadlines set forth under Subsection (b) of this rule, the driller or owner shall forfeit the well report deposit and shall be subject to enforcement by the District for violation of this rule.

(d) Notwithstanding any other rule to the contrary, the owner and driller of a new well are jointly responsible for ensuring that a well registration required by this section 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 required by this section is not timely filed by either, or by any other person legally authorized to act on the behalf of either.

RULE 3.4 GENERAL PROVISIONS APPLICABLE TO REGISTRATIONS

(a) Registration applications may be submitted to the District by any method described in Rule 1.7, 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, or his designee, within five business days after the date of receipt of an application for registration and receipt of the well registration fee. 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. An 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:

i) includes the well report deposit and well registration fee; and

ii) proposes a well that complies with the location and well completion requirements of Section 4.

A person may appeal the General Manager's ruling 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 by a method described in Rule 1.7, of the approval or denial, as well as whether the well meets an exemption provided in Rule 2.1 or Rule 2.3 and whether it is subject to the metering, water use fee payment, or reporting requirements of these Rules.

(d) 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.

(e) 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.

(f) 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.

(g) If multiple wells have been aggregated under one registration and one or more wells

(h) under the registration will be transferred, the District will require separate registration applications from each new owner for the wells retained or obtained by that person.

(i) 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 for new wells or existing wells not exempt under Rule 2.1, or submitting an accurate application to amend an existing registration as applicable, of the well to the District; and

2) obtaining approval from the District of the application for registration or amendment application, if such approval is required under these Rules.

(j) District approval of a registration application may not automatically grant the registrant the authority to drill, complete, or operate a well under another governmental entity's rules or regulations. The registrant should refer to the rules and regulations of other governmental entities with jurisdiction over the drilling and operation of water wells at the location specified on the District registration

application, including but not limited to, the county, the city, the Texas Department of Licensing and Regulation, and/or the TCEQ, where applicable, to determine whether there are any other requirements or prohibitions in addition to those of the District that apply to the drilling and operation of water wells.

RULE 3.5 RECORDS OF DRILLING, PUMP INSTALLATION AND ALTERATION ACTIVITY, AND PLUGGING

(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.

(b) Each well report required by subsection (a) of this Rule shall contain:

1) the name and physical address of the well owner;

2) the well driller's state license number, business address and phone number;

3) the location of the drilled, deepened, completed or otherwise altered well, including the physical address of the property on which the well will be located, as well as the coordinates of the wellhead location, as determined by a properly functioning and calibrated global positioning system (GPS) unit;

4) the type of work being undertaken on the well;

5) the type of use or proposed use of water from the well;

6) the diameter of the well bore;

7) the date that drilling was commenced and completed, along with a description of the depth, thickness, and character of each strata penetrated;

8) the drilling method used;

9) the borehole completion method performed on the well, including the depth, size and character of the casing installed;

10) a description of the annular seals installed in the well;

11) the surface completion method performed on the well;

12) the location of water bearing strata, including the static level and the date the level was encountered, as well as the measured rate of any artesian flow encountered;

13) the type and depth of any packers installed;

14) a description of the plugging methods used, if plugging a well;

15) the type of pump installed on the well, including the horsepower rating of the pump, as assigned by the pump manufacturer;

16) the type and results of any water test conducted on the well, including the yield, in gallons per minute, of the pump operated under optimal conditions in a pump test of the well; and

17) a description of the water quality encountered in the well.

(c) The person who drilled, deepened, completed or otherwise altered a well pursuant to this rule shall, within 60 days after the date the well is completed, file a well report described in Subsections (a) and (b) of this Rule with the District.

(d) 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.

(e) The plugging report described in Subsection (d) must be in substantially similar form to the Texas Department of Licensing and Regulation Form a004WWD (Plugging Report) and shall include all information required therein.

RULE 3.6 TRANSFER OF WELL OWNERSHIP

(a) Within 90 days after the date of a change in ownership of a new well exempt under Rule 2.1, the new well owner (transferee) shall notify the District in writing of the effective date of the change in ownership, the name, daytime telephone number, and mailing address of the transferee, along with any other contact or well-related information reasonably requested by the General Manager. The transferee may, in addition, be required to submit an application for registration of an existing well if a registration does not yet exist for the well.

(b) Within 90 days after the date of a change in ownership of a well that is not exempt under District Rule 2.1 from the water use fee payment, metering, and reporting requirements of these rules, the new well owner (transferee) shall submit to the District, on a form provided by the District staff, a signed and sworn-to application for transfer of ownership.

(c) 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 (b) 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.

(d) The burden of proof in any proceeding related to a question of well ownership or status as the legal holder of a registration issued by the District and the rights thereunder shall be on the person claiming such ownership or status. Notwithstanding anything to the contrary herein, any question of well ownership shall be determined pursuant to the laws of the State of Texas, regarding common law for real property rights in groundwater. Taking into consideration the very limited rights legislated to groundwater conservation districts, and nothing shall be construed in these Rules to effectively remove the real property right in water beneath the landowner, as well, ownership shall not be confused with water ownership under this provision, recognizing the two may be different.

(e) Notwithstanding any provision of this Rule to the contrary, no application made pursuant to Subsection (b) 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.

(f) 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 90 days from the date of the change in ownership until the new owner has:

1) submitted written notice to the District of the change in ownership, for wells described in subsection (a); or

2) submitted to the District a completed application for transfer of ownership, for wells described in subsection (b).

A new owner of a well that intends to alter or use the well in a manner that would constitute a substantial change from the information in the existing registration or that would trigger the requirement to register the well under these Rules must also submit and obtain District approval of a registration application or registration amendment application, as applicable, prior to altering or operating the well in the new manner.

RULE 3.7 AMENDMENT OF REGISTRATION

A registrant 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 size or capacity of a pump or well, but shall not apply to an increase in the size of the pump if the maximum designed production capacity of the new pump is 17.36 gpm or less, 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 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 or pump systems in place as October 1, 2010.

RULE 3.8 WATER PRODUCTION REPORTS

(a) Not later than January 31 and July 31 of each calendar year beginning in 2019, the owner of any well within the District that is not exempt under Rule 2.1 must submit, on a form provided by the District, a report containing the following:

1) the name of the registrant;

2) the well numbers of each registered well within the District owned or operated by the registrant;

3) the total amount of groundwater produced by each well or well system during the immediately preceding reporting period;

4) the total amount of groundwater produced by each well or well system during each month of the immediately preceding reporting period; and

5) the purposes for which the water was used.

(b) Beginning in calendar year 2019 and thereafter, the report due January 31 shall report groundwater produced during the period of the immediately preceding July 1 to December 31, and the report due July 31 shall report groundwater produced during the period of the immediately preceding January 1 to June 30. To comply with this rule, the registrant of a well shall read each water meter associated with a well within 15 days before or after June 30th and within 15 days before or after December 31st each year and report the readings to the District on the form described in Subsection (a). 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.

(c) The report required by Subsection (a) must also include a true and correct copy of the meter log required by District Rule 7.6.

RULE 3.9 REPLACEMENT WELLS

(a) No person may replace an existing well without first having obtained authorization for such work from the District first and, if required, by TCEQ. 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, subject to the TCEQ exclusion herein.

(b) Each application described in Subsection (a) shall include the information required under Rule 3.2(b), as well as any other information, fees, and deposits required by these rules for the registration of a new well. In addition, information submitted in the application must demonstrate to the satisfaction of the General Manager each of the following:

1) the proposed location of the replacement well is within 50 feet of the location of the well being replaced;

2) the replacement well and pump will not be larger in designed production capacity than the well and pump being replaced, unless the maximum designed production capacity is 17.36 gpm or less; and

3) immediately upon commencing operation of the replacement well, the well owner will cease all production from the well being replaced and will begin efforts to plug the well being replaced, which plugging shall be completed within 90 days of commencing operation of the replacement well.

(c) Except as required under Subsection (d), applications for registration of replacement wells submitted under this rule may be granted by the General Manager without notice or hearing. A person may appeal the General Manager's ruling by filing a written request for a hearing before the Board. The Board will hear the applicant's

(d) appeal at the next available regular Board meeting or hearing called for that purpose, as determined by the General Manager in his discretion

(e) Notwithstanding Subsection (b)(1) of this Rule, the General Manager may authorize the drilling of a replacement well at a location that is beyond 50 feet of the location of the well being replaced if the applicant demonstrates to the satisfaction of the General Manager that water quality, sanitation, or other issues prevent the replacement well from being located within 50 feet of the location of the well being replaced. Requests to locate a replacement well beyond 100 feet of the location of the well being replaced may be granted only by the Board.

RULE 3.10 AQUIFER STORAGE AND RECOVERY PROJECTS

(a) The provisions of District Rule 3.10 apply to an ASR recovery well that also functions as an ASR injection well.

(b) A project operator shall:

1) register the ASR injection wells and ASR recovery wells associated with the aquifer storage and recovery project with the District;

2) each calendar month by the deadline established by the TCEQ for reporting to the TCEQ, provide the District with a copy of the written or electronic report required to be provided to the TCEQ under Section 27.155 of the Water Code; and

3) annually by the deadline established by the TCEQ for reporting to the TCEQ, provide the District with a copy of the written or electronic report required to be provided to the TCEQ under Section 27.156 of the Water Code.

(c) 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 report to the District the volume of groundwater recovered that exceeds the volume authorized to be recovered in addition to providing the report required by Rule 3.11(b)(2).

(d) The District does not require a permit for the drilling, equipping, operation, or completion of an ASR injection well or an ASR recovery well that is authorized by the TCEQ.

(e) The ASR recovery wells that are associated with an aquifer storage and recovery project are subject to the spacing and production requirements of the District if the amount of groundwater recovered from the wells exceeds the volume authorized by the TCEQ to be recovered under the project. The requirements of the District apply only to the portion of the volume of groundwater recovered from the ASR recovery wells that exceeds the volume authorized by the TCEQ to be recovered.

(f) A project operator may not recover groundwater by an aquifer storage and recovery project in an amount that exceeds the volume authorized by the TCEQ to be recovered under the project unless the project operator complies with the applicable requirements of the District as described by its Rules.

(g) The District may not assess a Water Use Fee, a transportation or export fee, or a surcharge for groundwater recovered from an ASR recovery well, except to the extent that the amount of groundwater recovered under the aquifer storage and recovery project exceeds the volume authorized by the TCEQ to be recovered.

(h) The District may assess a well registration fee or other administrative fee for an ASR recovery well in the same manner that the District assesses those fees under other District Rules.

(i) The District may consider hydrogeologic conditions related to the injection and recovery of groundwater as part of an aquifer storage and recovery project in the planning for and monitoring of the achievement of a Desired Future

Condition for the aquifer in which the wells associated with the project are located.

SECTION 4. SPACING AND LOCATION OF WELLS; WELL COMPLETION

RULE 4.1 SPACING AND LOCATION OF EXISTING WELLS

Wells drilled prior to December 17, 2018, shall be drilled in accordance with state law in effect, if any, including any requirements established by the Texas Water Well Drillers and Pump Installers Administrative Rules, on the date such drilling commenced and are exempt from the spacing and location requirements of these rules to the extent that they were drilled lawfully.

RULE 4.2 SPACING AND LOCATION OF NEW WELLS

(a) To minimize as far as practicable the drawdown of the water table and the reduction of artesian pressure, to prevent interference between water wells, to prevent degradation of water quality, and to prevent waste, all new wells drilled within the boundaries of the District after December 17, 2018 must comply with the spacing and location requirements as follows:

1) All water wells must comply with the regulations set forth under the Texas Water Well Drillers and Pump Installers Administrative Rules, Title 16, Part 4, Chapter 76, Texas Administrative Code, unless a written variance is granted by the Texas Department of Licensing and Regulation and a copy of the variance is forwarded to the District by the applicant or registrant, and must be drilled and located in compliance with applicable rules and regulations of other political subdivisions.

2) All water wells must comply with the following minimum spacing requirements:

Maximum Production Capacity (gallons per minute)	**Minimum Spacing from Registered Wells**
< 20	200
20-39	600
40-59	1000
60-79	1400
80-99	1800

100 or more	2500

* **Vertical Spacing**: If the screened interval of the proposed well is separated vertically by more than fifty (50) feet from the screened interval of a registered well, that registered well is not considered when evaluating compliance with horizontal well spacing requirements.

(b) After authorization to drill a new well has been granted by the District, the well may only be drilled at a location that is within ten (10) yards (30 feet) of the location specified in the registration.

(c) Replacement wells must be actually drilled and completed so that they are located no more than 50 feet from the well being replaced, unless otherwise authorized by Rule 3.10(d).

(d) Compliance with the spacing and location requirements of these rules does not necessarily authorize a person to drill a well at a specified location in the District. Agencies or other political subdivisions of the State of Texas that are located in whole or in part within the boundaries of the District may impose additional requirements related to the drilling or completion of water wells.

(e) The owner and driller of a well are jointly responsible for ensuring that the well is drilled at a location that strictly complies with the location requirements of Subsection (b). If the board determines that a well is drilled at a location that does not strictly comply with the location requirements of Subsection (b), the Board may, in addition to taking all other appropriate enforcement action, require the well to be permanently closed or authorize the institution of legal action to enjoin any continued drilling activity or the operation of the well.

(f) Exception to Spacing Requirements. A well that is to be drilled or operated solely for domestic use, livestock use, poultry use or agricultural irrigation use overlying a tract of land regardless of tract size that is to be either drilled, equipped, or completed so that the well is incapable of producing more than 17.36 gallons per minute of groundwater and that:

1) the tract of land was part of an original application for development; a planned development of real property; or an approved plat prior to December 17, 2018; and

2) the tract of land is not further configured or subdivided into smaller tracts of land after December 17, 2018 and prior to the drilling, completion, or equipping of the well, unless required by a change in city or county requirements.

All water wells drilled within the District are still required to comply with all the requirements provided in the rules of the Texas Department of Licensing and Regulation, including the spacing requirements located in 16 Texas Administrative Code Section 17.100.

RULE 4.3 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, and must be completed in compliance with applicable rules and regulations of other political subdivisions.

(b) Water well drillers shall indicate the method of completion performed on the well report.

(c) 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.

(d) In order to protect water quality, the integrity of the well, or loss of groundwater from the well, the District may impose additional well completion requirements on any well as determined necessary or appropriate by the Board.

SECTION 5. PERMITTING

RULE 5.1 GENERAL PERMITTING PROCEDURES; OPERATING PERMITS REQUIRED FOR CERTAIN WELLS

(a) In addition to the well registration, well registration fee and well report deposit requirements in Rules 3.2, 3.4 and 6.6, the owner of a well or well system not exempt from the permitting requirements under Rule 2.1 and that is completed and operational after December 17, 2018 must obtain an Operating Permit from the District prior to drilling, construction or operating of the non-exempt well or well system.

The owner of a 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 nonexempt status must obtain an Operating Permit. In addition, the owner of an existing well or well system that has obtained a Grandfathered Use Permit for the well must obtain an Operating Permit if 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 than is authorized in the Grandfathered Use Permit for the well or well system.

(b) The right to produce groundwater from a well or well system permitted by the District may not be transferred to any other well or well system unless authorized by the District or in accordance with Rule 12.1(a)(3).

(c) A violation of any of the prohibitions in this Rule occurs on the first day that the prohibited drilling, alteration, operation or production begins and continues each day thereafter as a separate violation until appropriate authorization from the District is formally granted by the Board.

(d) A violation of any of the prohibitions in this Rule occurs on the first day that the prohibited drilling, alteration, operation or production begins and continues each day thereafter as a separate violation until appropriate authorization from the District is formally granted by the Board.

(e) A permit confers only the right to use the permit under the provisions of these Rules and according to its terms. A permit's terms may be modified or amended pursuant to the provisions of these Rules. A permit does not become a vested right of the permit holder. The Board may revoke or amend a permit in accordance with these Rules when reasonably necessary to accomplish the purposes of the District, the District's Rules, Management Plan, the Desired Future Conditions established for the aquifers located in whole or in part within the boundaries of the District, or Chapter 36, Texas Water Code.

(f) An application pursuant to which a permit or registration has been issued is incorporated in the permit or registration, and the permit or registration is granted on the basis of and contingent upon the accuracy of the information supplied in that application. A finding that false information has been supplied in the application may be grounds to refuse or deny the application or for immediate revocation of the permit or registration.

(g) Violation of a permit's terms, conditions, requirements, or special provisions is a violation of these Rules and shall be grounds for enforcement.

(h) For any applications submitted to the District and for which the applicant has requested in writing that such applications be processed concurrently, the District will process and the Board will consider such applications concurrently according to the standards and Rules applicable to each.

(i) All permits issued by the District are subject to the District's Rules, proportional adjustment regulations, if any, and District Management Plan.

RULE 5.2 GRANDFATHERED USE PERMITS

(a) An owner of a non-exempt water well or well system that was completed and operational prior to December 17, 2018 and that produced groundwater at any time during the Grandfathered Use Period shall apply to the District for a Grandfathered Use Permit during the Grandfathered Use Verification Period. Failure of an owner of such a well or well system to apply for a Grandfathered Use Permit during the Grandfathered Use Verification Period shall preclude the owner from making any future claim or application to the District for grandfathered use under these Rules.

All wells or well systems that are not exempt from the District's permitting requirements as provided in Rule 2.1 that do not obtain a Grandfathered Use Permit in accordance with these Rules must obtain an Operating Permit in order to be able to produce groundwater from the well or well system. Grandfathered Use Permit applications shall be on forms prescribed by the District.

(b) An application for a Grandfathered Use Permit, in addition to the information required under Rule 5.2, shall include the following information to the extent that the information exists and is available to the applicant through the exercise of reasonable and diligent efforts:

1) Year in which the well was drilled or the year in which each well in a well system was drilled;

2) Purpose for which the well or well system was drilled and any type of subsequent use of the water;

3) Year in which the well was drilled or the year in which each well in a well system was drilled;

4) Purpose for which the well or well system was drilled and any type of subsequent use of the water;

5) Maximum Grandfathered Use of the well or well system;

6) Evidence of historic and/or existing use to support the Maximum Grandfathered Use of the well or well system;

7) Legal description of the tract of land on which the well or well system is located; and

8) Any other information determined necessary by the Board.

RULE 5.3 APPLICATION REQUIREMENTS FOR ALL PERMITS

(a) Each original application for an Operating Permit or Grandfathered Use Permit must contain information as set forth below. Application forms will be provided at the District's office 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) A location map showing the proposed well location and an alternative well location that meets, if applicable, the District's minimum spacing and location requirements, and showing all wells in existence on the date of application within a quarter (1/4) mile radius of the location(s) of the proposed well or well to be modified, which the District may require to be shown on a 7.5 minute United States Department of Interior Topographic Map and/or by latitude and longitude coordinates as measured by a calibrated GPS instrument;

4) A statement that the water withdrawn under the permit put to beneficial use at all times;

5) Location of the use of the water from the well;

6) The estimated rate at which water will be withdrawn from the well, the maximum pumping capacity of the well, method of withdrawal, size of well (inside diameter of the pump [discharge] column pipe and diameter of the well casing), size of well pump, and estimated depth of each well;

7) 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;

8) A water conservation plan or a declaration that the applicant will comply with the District's management plan;

9) Drought contingency plan, if the applicant is required to prepare a Drought Contingency Plan by other law;

10) 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;

11) Duration the permit is proposed to be in effect;

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; and

13) 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 certified district management plan.

(b) Permit applications meeting any of the criteria in Rule 5.10 shall submit a Hydrogeologic Report to the District that meets the requirements in Rule 5.10.

(c) All permit applicants must provide notice to all landowners and to all well owners of existing registered or permitted wells that are located within the distance radius provided for well spacing in Rule 4.2(a) of the existing well or proposed well that is the subject of the application. Notice must be provided by one of the following methods:

1) by certified mail, return receipt requested;

2) by first class mail with a certificate of mailing; or

3) by providing the District with a document(s) signed by all landowners and well owners within the designated radius that indicates landowners and well owners received notice of the application.

(d) If any one permit application results in required notifications that exceed 30 entities or individuals or that results in $100.00 or more of postal expense, the District may allow for notification by public notice in a local newspaper of general circulation in the District. Proof of publication in the local newspaper must be provided to the District before an application is deemed administratively complete.

This notice must be approved by the District prior to mailing or publishing in the local paper and shall contain:

1) the name and address of the applicant;

2) the date the application was filed;

3) the location and a description of the well that is the subject of the application; and

4) a brief summary of the information in the application, including requested annual production from the proposed well.

(e) The applicant must provide the District with the following information for the District to declare that the application is administratively complete:

1) Information contained in this section, and if the application is for a Grandfathered Use Permit, the information contained in Rule 5.2(b);

2) Proof that notice was provided to landowners and well owners to whom notice is required under this Section;

3) A list of the names and addresses of the property owners notified, if notice was provided by certified mail, return receipt requested, or first class mail with a certificate of mailing; and

4) A Hydrogeologic Report, if required by Rule 5.10.

RULE 5.4 COMPLETION OF PERMIT APPLICATION REQUIRED

The District shall promptly consider and act on each administratively complete application for a permit. If an application is not administratively complete, the District may request the applicant to complete the application. The application will expire if the applicant does not complete the application within ninety (90) days of the date of the District's request or upon conclusion of an extension granted by the District.

RULE 5.5 PERMITS SUBJECT TO CONDITIONS AND RESTRICTIONS

Permits issued by the District for permitted wells may be subject to 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.

RULE 5.6 CONSIDERATIONS FOR GRANTING OR DENYING A PERMIT APPLICATION

(a) Before granting or denying a 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 does or does not unreasonably affect 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) 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

8) For those hearings conducted by the State Office of Administrative Hearings under Rule 12.5, 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 calculations determined by the Executive Administrator of the Texas Water Development Board;

2) The Executive Administrator of the Texas Water Development Board's estimate of the current and projected amount of groundwater produced under the exemptions in District Rule 2.1;

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 5.7 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 change the ownership of a well or permit, the location of a proposed well, the purpose of or location of use of the groundwater produced, or any other applicable term, condition or restriction of an existing permit, the permit holder must first apply for and obtain a permit amendment.

(b) A major amendment to a permit includes, but is not limited to, a change that would substantially alter the size or capacity of a well, an increase in the annual quantity of groundwater authorized to be withdrawn, a change in the purpose or place of use of the water produced, or a change of location of groundwater withdrawal, except for a replacement well, and any other change that is not a minor amendment. A major amendment to a permit shall not be made prior to notice and hearing.

(c) All applications for major amendments to any permit issued by the District shall be subject to the considerations in Rule 5.6.

(d) Amendments that are not major, such as a change in ownership of the land the well or well system is located on or an amendment sought by the permit holder for a decrease in the quantity of groundwater authorized for withdrawal and beneficial use, are minor amendments that may be reviewed and approved by the District. The District is authorized to approve minor permit amendments and may approve such minor amendments without notice and hearing. Such decision by the District must be administratively appealed to the Board of Directors prior to filing suit against the District to overturn the District's decision. The District may also send an application for a minor permit amendment to the Board for consideration, and must do so if the District proposes to deny the application. Any minor amendment sent to the Board for consideration shall be set on the Board's agenda and shall comply with the notice requirements of the Texas Open Meetings Act.

(e) 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.

(f) Changes in the purpose of use from wells authorized under Grandfathered Use Permits require an application for Operating Permit to authorize the new purpose of use from the well(s).

RULE 5.8 EMERGENCY AUTHORIZATION BY GENERAL MANAGER OR BOARD

(a) The General Manager or Board may grant an Emergency Permit authorizing the drilling, equipping, completion, substantial altering with respect to size or capacity, or operation of a well.

(b) The General Manager or Board shall only issue an Emergency Permit 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 granted without notice, hearing, or further action by the Board, or with such notice and hearing as the General Manager or Board deems practical and necessary under the circumstances.

(d) Emergency Permits may be issued for a term determined by the General Manager or Board based upon the nature and extent of the emergency, such term not to exceed sixty (60) days. Upon expiration of the term, the permit automatically expires and is cancelled.

RULE 5.9 PERMITS ISSUED BY DISTRICT; DURATION OF PERMIT; RENEWAL

(a) Grandfathered Use Permits and Operating Permits that are issued will be valid only for the term set by the District, not to exceed five years from the date of issuance for Grandfathered Use Permits and not to exceed two years from the date of issuance for Operating Permits, or until revoked or amended. Permits issued that provide for the transportation of groundwater outside the District shall have the terms as provided in Rule 13.3.

(b) At least ninety (90) days prior to the date of expiration of a permit, the District shall provide the permit holder notice that an application for renewal is due, along with a renewal application. Renewal applications and any Permit Renewal Fee required by the District shall be submitted to the District no later than sixty (60) days prior to the date of expiration of the permit. Renewal applications shall be reviewed and determinations on renewal shall be made by the District, unless the District determines that a hearing is necessary on a renewal application.

(c) The District and, specifically the General Manager of the District on behalf of the District, shall, without a hearing, renew or approve an application to renew an Operating Permit or a Grandfathered Use Permit before the date on which the permit expires, provided that:

1) The application is submitted in a timely manner and accompanied by any required fees in accordance with District rules; and

2) The permit holder is not requesting a change related to the renewal that would require a permit amendment under District rules.

(d) The District is not required to renew a permit under District Rule 5.9(c) if the applicant:

1) Is delinquent in paying a fee required by the District;

2) Is subject to a pending enforcement action for a substantive violation of a District permit, order, or rule that has not been settled by agreement with the District or a final adjudication; or

3) Has not paid a civil penalty or has otherwise failed to comply with an order resulting from a final adjudication of a violation of a District permit, order, or rule.

(e) If the District is not required to renew a permit under District Rule 5.9(d), the permit remains in effect until the final settlement or adjudication on the matter of the substantive violation.

(f) If the holder of an operating permit, in connection with the renewal of a permit or otherwise, requests a change that requires an amendment to the permit under District Rule 5.7, the permit as it existed before the permit amendment process remains in effect until the later of:

1) The conclusion of the permit amendment or renewal process, as applicable; or

2) A final settlement or adjudication on the matter of whether the change to the permit requires a permit amendment.

(g) If the permit amendment process results in the denial of an amendment, the permit as it existed before the permit amendment process shall be renewed under District Rule 5.9(c) without penalty, unless subsection (d) of District Rule 5.9 applies to the applicant.

(h) The district may initiate an amendment to an operating permit, in connection with the renewal of a permit or otherwise, in accordance with District Rule 5.7. If the District initiates an amendment to an operating permit, the permit as it existed before the permit amendment process shall remain in effect until the conclusion of the permit amendment or renewal process, as applicable.

(i) All permits issued by the District shall state the following:

1) The name of the person to whom the permit is issued.

2) The date the permit is issued.

3) The date the permit is to expire.

4) The conditions and restrictions, if any, placed on the rate and amount of withdrawal of groundwater.

5) This permit is granted in accordance with the provisions of the District Rules, and acceptance of this permit constitutes an acknowledgment and agreement that the permittee will comply with the Rules of the District.

6) This permit confers only the right to operate under the terms and conditions of the permit, and its terms may be modified or amended pursuant to the District Rules or Chapter 36 of the Texas Water Code, as they exist or may be amended, and the directives of the Texas Legislature, or if necessary to achieve the goals and objectives of the District Management Plan. Within sixty (60) calendar days after the date of sale, the Grandfathered Use Permit or Operating Permit holder should notify the District in writing of the name of the new owner of a permitted well. In order for the District to have the most accurate information possible, any person who becomes the owner of a currently permitted well should, within sixty (60) calendar days from the date of the change in ownership, file an application for a permit amendment to effect a transfer of the permit.

7) The operation of the well for the authorized withdrawal must be conducted in a non-wasteful manner.

8) The permitted well site must be accessible to District representatives for inspection or to perform water level monitoring, water quality testing, and well investigations in accordance with Rules 8.4, and the permittee agrees to cooperate fully in any reasonable inspection of the well and well site by the District representatives.

9) The application pursuant to which this permit has been issued is incorporated in the permit, and the permit is granted on the basis of, and contingent upon, the accuracy of the information supplied in that application. A finding that false information has been supplied is grounds for immediate revocation of the permit.

10) Violation of a permit's terms, conditions, requirements, or special provisions is punishable by permit revocation, civil penalties, and other enforcement as provided by Section 8 of the District Rules.

11) Any other conditions or restrictions the District prescribes; and

12) Any other information the District determines necessary.

RULE 5.10 HYDROGEOLOGIC REPORT REQUIREMENTS

(a) Any permit application or well registration application that meets the following conditions shall be required to submit a Hydrogeologic Report to the District prior to operating the well(s):

1) An application or registration that requests to operate a well that is equipped to produce 75 gallons per minute or more;

2) An application or registration that requests to transport groundwater produced within the District's boundaries to a location of use outside of the District's boundaries;

3) An application that requests to modify or increase production capacity of a well if such increase would equip the well to produce 75 gallons per minute or more; or

4) An application(s) or registration(s) for two or more wells that request:

   i) Approval to drill and produce from wells that are owned or operated by the same person or entity and that would be located within 1/4 mile from one another; and

   ii) A combined total production capacity from the wells of 75 gallons per minute or more, where the proposed production capacity of the wells subject to the application(s) or registration(s) shall be added to that of any existing wells owned or operated by the same person or entity within 1/4 mile for purposes of reaching the 75 gallons per minute production threshold.

(b) Hydrogeologic Reports completed under these Rules shall be completed in a manner that complies with the hydrologic reporting guidelines approved and adopted by the District Board of Directors for this purpose. The guidelines referenced herein are incorporated by reference into these rules and shall constitute a rule of the District for all purposes.

(c) Applicants required to complete a Hydrogeologic Report must publish notice in a newspaper of general circulation within Tarrant County. The newspaper notice must be published within fourteen (14) days of the date an applicable well registration or permit application is submitted to the District. The newspaper notice shall contain:

1) Name and address of the applicant;

2) Date the application was filed;

3) Location and a description of the well that is the subject of the application; and

4) A brief summary of the information in the application, including requested annual production from the proposed well and that the applicant will conduct a hydrogeologic report in accordance with the District's Rules.

SECTION 6. FEES AND PAYMENT OF FEES

RULE 6.1 WATER USE FEES

(a) A water use fee shall be established by the Board annually at least 60 days before the end of the calendar year to be applied to the groundwater pumpage in the ensuing calendar year for each well not exempt under Rule 2.1 or Rule 2.3. The Board may adjust the rate from time to time.

(b) Wells exempt under Rule 2.1 or Rule 2.3 shall be exempt from payment of water use fees. However, if exempt well status is withdrawn, the District may assess fees and penalties in accordance with the District Rules.

(c) No later than 60 days prior to the end of the calendar year, beginning with calendar year 2010, the District shall send by regular 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.

RULE 6.2 PAYMENT OF WATER USE FEES; DEADLINES

Fees for water produced between January 1st and June 30th each year are due to the District by July 31st of the same calendar year; fees for water produced between July 1st and December 31st each year are due to the District by January 31st of the following calendar year. Fee payments shall be submitted in conjunction with the Water Production Reports and monthly logs.

RULE 6.3 WELL REGISTRATION FEES

The owner of any new well, including a new well exempt under Rule 2.1, shall submit payment to the District of a $500 non-refundable well registration fee per well, which is due by the same deadline established under these rules for registration of the well. The well registration fee must be received by the District in order for the District to find a registration application administratively complete. The purpose of the well registration fee is to cover the administrative costs to the District associated with registering the well and administering the rules of the District related to the well. The amount of the well registration fee has been determined by the District to be less than the actual administrative costs to the District of registering the well and administering the rules of the District with respect to the well, even in light of anticipated revenues to be received from the Water Use Fee.

RULE 6.4 FAILURE TO MAKE FEE PAYMENTS

(a) Payments not received within 30 days following the date that Water Use Fees are due and owing to the District will be subject to a late payment fee of the greater of the following:

1) $25.00; or

2) Ten percent (10 %) of the total amount of water use fees due and owing to the District.

(b) Persons failing to remit all water use fees due and owing to the District within 60 days of the date such fees are due shall be subject to a civil penalty not to exceed three times the amount of the outstanding water use 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 6.5 RETURNED CHECK FEE

The District may assess a fee not to exceed $25 for checks returned to the District for insufficient funds, account closed, signature missing, or any other reason causing a check to be returned by the District's depository.

RULE 6.6 WELL REPORT DEPOSIT

For all new wells and certain alterations of existing wells, as specifically described under Rule 3.3(a), the District shall assess a $200 well report deposit per well to be held by the District as part of the well registration procedures. The District shall return the deposit to the depositor if the completed well report is timely submitted to the District in accordance with these Rules. In the event the District does not timely receive the completed well report, or if rights granted within the registration are not timely used, the deposit shall become the property of the District.

RULE 6.7 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 pursuant to Rule 6.2, 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 7. METERING

RULE 7.1 WATER METER REQUIRED

(a) Except as provided in Rule 7.2, the owner of a well located in the District and not exempt under Rule 2.1 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 flow rate and cumulative amount of groundwater withdrawn from the well. All meters that were existing on October 1, 2010, and at a minimum have the ability to measure the cumulative amount of

groundwater withdrawn from the well, shall be considered existing and will not have to be replaced with meters that can also measure the flow rate, provided that the meter meets all other requirements herein. Except as provided in Rule 7.2, the owner of a new or existing well not exempt under Rule 2.1 that is located in the District shall install a meter on the well prior to producing groundwater from the well.

(b) A mechanically driven, magnetic or ultrasonic totalizing water meter must be installed on a well registered with the District unless an approval for another type of meter or measuring method is 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.

(c) 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 7.4. If no specifications are published, there must be a minimum length of five pipe diameters of straight pipe upstream of the water meter and one 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.

(d) 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.

(e) The owner of a well is responsible for the purchase, installation, operation, maintenance, and repair of the meter associated with the well.

(f) Bypasses are prohibited unless they are also metered.

RULE 7.2 WATER METER EXEMPTION

Wells exempt under Rule 2.1 shall be exempt from the requirement to obtain a water meter under Rule 7.1.

RULE 7.3 METERING AGGREGATE WITHDRAWAL

Where wells are part of an aggregate system, one or more water meters may be used for the aggregate well system if the water meter or meters are installed so as to measure the groundwater production from all wells included in the system. The provisions of Rule 7.1 apply to meters measuring aggregate pumpage. The water meters referenced in this rule are required to be installed on the aggregate well system at a location that measures the water used before any water is pumped into an impoundment.

RULE 7.4 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 7.5 REMOVAL OF METER FOR REPAIRS

A water meter may be removed for repairs and the well remain operational provided that the District is notified prior to removal and the repairs are completed in a timely manner. The readings on the meter must be recorded immediately prior to removal and at the time of reinstallation. 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 7.6 WATER METER READINGS

The registrant of a well not exempt under Rule 2.1 must read each water meter associated with the well and record the meter readings and the actual amount of pumpage 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 3.8, along with fee payments as set forth under Section 6. The registrant of a well shall read each water meter associated with a well within 15 days before or after June 30th and within 15 days before or after December 31st each year, as applicable to the respective immediately preceding semi-annual reporting period, and 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 6.2.

RULE 7.7 INSTALLATION OF METERS

A meter required to be installed under these Rules shall be installed before producing water from the well.

RULE 7.8 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 8. INSPECTION AND ENFORCEMENT OF RULES

RULE 8.1 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 it by the Texas Legislature through the District Act, and through Chapter 36 of the Texas Water Code.

RULE 8.2 RULES ENFORCEMENT

(a) If it appears that a person or entity has violated, is violating, or is threatening to violate any provision of the District Rules, including failure to pay any assessed penalty or fee, 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. Each day of a continuing violation constitutes a separate violation.

(b) Unless otherwise provided in these rules, the penalty for a violation of any District rule shall be either:

1) 1) $10,000.00 per violation; or

2) 2) a lesser amount, based on the severity of the violation, as set forth in the Enforcement Policy and Civil Penalty Schedule under Rule 8.7.

(c) 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.

(d) 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 8.3 FAILURE TO REPORT PUMPAGE AND/OR TRANSPORTED VOLUMES

The accurate reporting and timely submission of pumpage 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 reports may result in:

(a) the assessment of any fees or penalties adopted under Rule 8.2 for meter reading and inspection as a result of District inspections to obtain current and accurate pumpage volumes; and

(b) additional enforcement measures provided by these Rules or by order of the Board.

RULE 8.4 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.

RULE 8.5 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 Enforcement Policy and Civil Penalty Schedule referenced in Rule 8.7 herein 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 as well as the timetable to complete any remedial work or enforce the penalty. 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 8.6 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 order 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 serves, on each person to be made the subject of the hearing, written notice not less than 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; and

3) the rule or order that the District believes has been violated or is being violated; and

4) 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.

RULE 8.7 ENFORCEMENT POLICY AND CIVIL PENALTY SCHEDULE

(a) 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.

(b) Minor Violations.

The following acts each constitute a Minor Violation:

1) Failure to timely file a registration on a new well that qualifies for an exemption under Rule 2.1.

2) Failure to conduct a meter reading within the required period.

3) Failure to timely notify District regarding change of ownership.

4) Failure to timely file a Well Report or a Plugging Report with the District.

5) Failure to timely submit required documentation reflecting alterations or increased production.

6) 6) Operating a meter that is not accurately calibrated.

CIVIL PENALTY SCHEDULE FOR MINOR VIOLATIONS

First Violation:	***$100***
Second Violation:	***$200***
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.

(c) Major Violations.

The following acts each constitute a Major Violation:

1) Failure to register a well where mandated by rules, including drilling, equipping, completing, altering, or operating a well without a compliant and approved registration.

2) Failure to timely meter a well when required.

3) Drilling a well in violation of spacing or location requirements.*

4) Failure to close or cap an open or uncovered well.

5) Failure to submit Water Use Fees within 60 days of the date the fees are due.**

6) Committing waste.

7) Failure to submit accurate Groundwater Production report within the required period.

8) Intentionally or knowingly submitting inaccurate and untruthful information on District forms or to the Board.

CIVIL PENALTY SCHEDULE FOR MAJOR VIOLATIONS

First Violation:	***$500***
Second Violation:	***$1000***
Third Violation:	***Civil Suit for injunction and damages***

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.

* 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 due and owing within 60 days of the date the fees are due will be assessed a civil penalty of up to three times the total amount of outstanding Water Use Fees that are due and owing.

(d) Water Well Construction and Completion Requirements.

Failure to use approved construction materials: $250 + total costs of remediation

Failure to properly cement annular space: $500 + total costs of remediation

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

(e) 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.

SECTION 9. OTHER DISTRICT MANAGEMENT ACTIONS AND DUTIES

RULE 9.1 DISTRICT MANAGEMENT PLAN

Following notice and hearing, the District shall adopt a comprehensive 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 draw-down of the water table. The District shall use the Rules to implement the Management Plan. The Board must review the Management Plan at least every five years. 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 10. PROHIBITION AGAINST WASTE

RULE 10.1 WASTE OR POLLUTION OF GROUNDWATER PROHIBITED

(a) Groundwater shall not be produced within and used within the District, or produced within the District and used outside the District, in such a manner as to constitute waste or in such a manner that will pollute the groundwater resources of the District.

(b) A person producing or using groundwater within the District shall use every possible precaution to stop and prevent the waste and pollution of water.

(c) A person shall not pollute or harmfully alter the character of the aquifer within the boundaries of the District by means of saltwater or other deleterious matter admitted to the aquifer from some other stratum or strata or from the surface of the ground.

(d) A person under the jurisdiction of the District shall not commit waste as defined in Chapter 36 of the Texas Water Code and these Rules.

RULE 10.2 ORDERS TO PREVENT WASTE OR POLLUTION

Upon notice to any affected parties and opportunity for a hearing, the Board may adopt orders to prohibit, prevent, or remedy waste or pollution. If the factual basis for the order is disputed, the Board shall direct that an evidentiary hearing be conducted prior to entry of the order. If the Board determines that an emergency exists, requiring the immediate entry of an order to prohibit waste or pollution and protect the public health, safety, and/or welfare, the Board may enter a temporary order without notice and hearing. Such a temporary order shall continue in effect for the lesser of fifteen (15) days or until notice can be provided and a hearing can be conducted by the District.

RULE 10.3 AUTHORITY TO INVESTIGATE VIOLATION OF DISTRICT RULES

The District has the authority to investigate violations of the District's Rules, including but not limited to suspected waste or pollution violations prohibited under this Section. Pursuant to Rule 8.4, no person shall interfere with the District's efforts to conduct inspections.

SECTION 11. SECTION 11. CAPPING AND PLUGGING OF WELLS

RULE 11.1 CAPPING OF WELLS

The District may require a well to be capped to prevent waste, prevent pollution, or prevent further deterioration of a well casing. The well must remain capped until such time as the conditions that led to the capping requirement are eliminated. If well pump equipment is removed from a well and the well will be re-equipped at a later date, the well must be capped, provided however that the casing is not in a deteriorated condition that would permit comingling of water strata, in which case the well must be plugged. The cap must be capable of sustaining a weight of at least 400 pounds and must be constructed with a water tight seal to prevent entrance of surface pollutants into the well itself, either through the well bore or well casing.

RULE 11.2 PLUGGING OF WELLS

(a) In this Rule, "abandoned well" means a well that is not in use for a period of at least one year. A well is considered to be in use if:

1) The well is not a deteriorated well and contains the casing, pump, and pump column in good condition;

2) The well is not a deteriorated well and has been capped;

3) The water from the well has been put to an authorized beneficial use, as defined by the Texas Water Code and these Rules;

4) The well is used in the normal course and scope and with the intensity and frequency of other similar users in the general community; or

5) The owner is participating in a federal conservation program as defined by Chapter 36, Texas Water Code or a similar governmental program.

(b) A deteriorated or abandoned well must be plugged in accordance with the Texas Department of Licensing and Regulation, Water Well Drillers and Pump Installers Rules (16 Texas Administrative Code, Chapter 76). It is the responsibility of the landowner to see that such a well is plugged to prevent pollution of groundwater and to prevent injury to persons and animals. Registration of the well is required prior to, or in conjunction with, well plugging.

(c) Any person that plugs a well in the District must submit a copy of the plugging report required by the rules of the Texas Department of Licensing and Regulation to the District within thirty (30) days of plugging completion.

(d) If the owner or lessee fails or refuses to plug or cap the well in compliance with this rule and District standards within thirty (30) days after being requested to do so in writing by an officer, agent, or employee of the District, then, upon Board approval, any person, firm, or corporation employed by the District may go on the land and plug or cap the well safely and securely, pursuant to Section 36.118 of the Texas Water Code.

RULE 11.3 EXPENSES INCURRED BY THE DISTRICT

Reasonable expenses incurred by the District in plugging or capping a well constitute a lien on the land on which the well is located.

SECTION 12. HEARINGS

RULE 12.1 HEARINGS GENERALLY

(a) A public hearing may be held on any matter within the jurisdiction of the Board, 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) Hearings involving the issuance of permits or permit amendments, in which the rights, duties, or privileges of a party are determined after an opportunity for an adjudicative hearing;

2) Rulemaking 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;

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 8.6; and

4) Hearings on the Desired Future Conditions proposed for the District, as set forth in Rule 12.13.

(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 the State Office of Administrative Hearings if required under Rule 12.5.

(c) Any hearing may or may not 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.

(d) The District may continue hearings or other proceedings from time to time and from place to place without the necessity of publishing, serving, mailing, or otherwise issuing a new notice. If a hearing or other proceeding is continued and a time and place for the hearing or other proceeding to reconvene are not publicly announced at the hearing or other proceeding before it is recessed, a notice of any further setting of the hearing or other proceeding will be delivered at a reasonable time to persons who request notice at the initial hearing, and any other person deemed appropriate, but it is not necessary to post or publish a notice of the new setting.

(e) Permit Hearings:

1) Permit Applications and Amendments: The District shall hold a hearing for each activity for which a permit or permit amendment is required pursuant to Section 5 of these Rules, subject to the exception in Rule 5.8. A hearing involving permit matters may be scheduled before a Hearing Examiner.

2) The District shall hold a permit hearing on major permit amendments and may hold a hearing on minor permit amendments, permit revocations, and permit renewals.

(f) Rulemaking Hearings:

1) District Management Plan: The Board shall hold a hearing to consider adoption of a new District Management Plan.

2) Rules: The Board shall hold a hearing to consider adoption of rules or any revisions to the District's Rules.

3) Other Matters: A public hearing may be held on any matter within the jurisdiction of the Board if the Board determines that a hearing is in the public interest or necessary to effectively carry out the duties and responsibilities of the District.

RULE 12.2 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 Board or the District staff.

(b) Not less than twenty (20) calendar days prior to the date of the hearing, the District shall:

1) Post notice in a place readily accessible to the public at the district office;

2) Provide notice to the county clerk of Tarrant County;

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 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, if the District has a functioning 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, fax, or email 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 Presiding Officer 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 12.3 PERMIT HEARINGS

(a) If the Board or District staff schedules a hearing on an application for a permit or permit amendment, the District shall give notice of the hearing as provided in this Section.

(b) Notice may be provided under this Rule for permit renewals minor amendments and revocations if the District staff determines that a hearing is required.

(c) The Board or District staff may schedule more than one permit application for consideration at a hearing.

(d) Not later than the tenth (10th) day before the date of a permit hearing, the District shall:

1) Post notice at a place readily accessible to the public in the District office;

2) Provide notice of the hearing to the county clerk in Tarrant County, whereupon the county clerk shall post the notice on a bulletin board at a place convenient to the public in the county courthouse;

3) Provide notice by regular mail to the applicant; and

4) Provide notice by mail, fax, or email to any person who has requested notice under this Section.

(e) The notice provided under Subsection (d) 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, permit amendment, or permit renewal, including information regarding the need to appear at the hearing or submit a motion for continuance on good cause;

5) The time, date, and location of the hearing; and

6) Any other information the Board or District staff deems relevant and appropriate to include in the notice.

(f) Any person having an interest in the subject matter of a 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. An affidavit of an officer or employee of the District establishing attempted service by first class mail, fax, or e-mail to the person in accordance with the information provided by the person is proof that notice was provided by the District. Failure by the District to provide written notice to a person under this subsection does not invalidate any action taken by the Board.

(g) An administratively complete application shall be set for a hearing on a specific date within sixty (60) days after the date it is 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.

(h) 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 application;

2) Grant the application with special conditions; or

3) Deny the application.

i) An applicant may, not later than the 20th day after the date the board issues an order granting the application, demand a contested case hearing if the order:

4) Includes special conditions that were not part of the application as finally submitted; or

5) Grants a maximum amount of groundwater production that is less than the amount requested in the application.

RULE 12.4 CONTESTED CASE PERMIT HEARINGS AND DESIGNATION OF PARTIES

(a) The following may request a contested case hearing on an application for a permit or permit amendment:

1) District staff;

2) The applicant; or

3) An affected person.

(b) A request for a contested case hearing must substantially comply with the following:

1) Give the name, address, and daytime telephone number of the person who files the request. If the request is made by a group or association, the request must identify one person by name, address, daytime telephone number, and, where possible, fax number, who shall be responsible for receiving all official communications and documents for the group;

2) Identify the person's personal justiciable interest affected by the application, including a brief, but specific, written statement explaining in plain language how and why the requestor believes he or she will be affected by the activity in a manner not common to members of the general public;

3) Set forth the grounds on which the person is protesting the application;

4) Request a contested case hearing;

5) Be timely under Subsection (d); and

6) Provide any other information required by the public notice of application.

(c) If a person or entity is requesting a contested case hearing on more than one application, a separate request must be filed in connection with each application.

(d) A hearing request is considered timely if it complies with Subsection (b) and:

1) Is submitted in writing to and received by the District prior to the date of the hearing and action by the Board on the application; or

2) The person appears before the Board at the hearing and opposes the application.

3) Requests for contested case hearings to be conducted by the State Office of Administrative Hearings made under Rule 12.5 shall be made in writing and submitted to the District by fax, mail, hand delivery, or email no later than five days prior to the date the hearing on the application is scheduled to begin.

(e) The written or oral submittal of a hearing request does not, in itself, mean that a hearing will be declared to be a contested case. The Presiding Officer will evaluate the contested case hearing request at the hearing and may:

1) Determine that a hearing request does not meet the requirements of Subsection (b) and deny the request;

2) Determine that the person requesting the hearing is not an affected person related to the application and deny the hearing request;

3) Determine that a hearing request meets the requirements of Subsection (b), and designate the matter as a contested hearing upon determining that the person is an affected person; or

4) Refer the case to an evidentiary hearing. The Presiding Officer may hold a hearing on any issue related to the determination of whether to declare a matter as a contested case.

(f) A matter is considered to be contested if a hearing request is made pursuant to Subsection (b), made in a timely manner pursuant to Subsection (d), and declared as such by the Presiding Officer. Any case not declared a contested case under this Rule is an uncontested case.

(g) Preliminary Hearing to Designate Parties:

1) Parties to a contested permit hearing shall be designated as determined by the Presiding Officer. The Presiding Officer shall make a decision on party status at a preliminary hearing held prior to the commencement of the evidentiary hearing on the application. Unless the District is required to contract with the State Office of Administrative Hearings under Rule 12.5, the District may conduct the preliminary hearing to determine party status on the same day and immediately before the evidentiary hearing on the application is scheduled to begin.

2) The District's General Manager and the applicant are automatically designated as parties.

3) In order to be admitted as a party, persons other than the automatic parties must appear at the hearing in person or by representation and seek to be designated as a party.

4) A person requesting a contested case hearing that is unable to attend the first day of the proceeding must submit a continuance request to the Board, in writing, stating good cause for his inability to appear at the proceeding. The Presiding Officer may grant or deny the request, at his discretion.

5) If the Board determines that no person who requested a contested case hearing has standing or that no justiciable issues are raised, the Board may take any action authorized under District Rule 12.3(h).

(h) After parties are designated, no other person may be admitted as a party unless, in the judgment of the Presiding Officer, there exists good cause and the hearing will not be unreasonably delayed.

(i) All testimony presented in a contested case hearing shall be subject to cross-examination.

(j) Neither the Presiding Officer nor a Board member may communicate, directly or indirectly, in connection with any issue of fact or law in a contested case with any agency, person, party, or representative, except with notice and an opportunity for all parties to participate. This provision does not prevent communication with District staff.

(k) If, during a contested case hearing, all parties contesting the application withdraw their protests or the parties reach a negotiated or agreed settlement which, in the judgment of the Presiding Officer, settles the facts or issue in controversy, the proceeding will be deemed an uncontested case.

RULE 12.5 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.

(b) 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.

(c) 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.

(d) An administrative law judge who conducts a contested case hearing shall consider applicable District Rules or policies in conducting the hearing, but the District may not supervise the administrative law judge.

(e) The District shall provide the administrative law judge with a written statement of applicable rules or policies.

(f) The District may not attempt to influence the finding of facts or the administrative law judge's application of the law in a contested case except by proper evidence and legal argument.

(g) The 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), 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) 3) That a technical error in a finding of fact should be changed.

RULE 12.6 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 Board or District staff under Rule 12.3;

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;

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 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 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 any 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 tenth (10^{th}) 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 tenth (10^{th}) 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.

RULE 12.7 RECORDING

(a) 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.

(b) Uncontested Hearings: In an uncontested hearing, the Presiding Officer may use the means available in Subsection (a) to record a proceeding or may substitute meeting minutes or the report required under Rule 12.8 for a method of recording the hearing.

RULE 12.8 PROPOSAL FOR DECISION

(a) The Presiding Officer shall determine whether to submit a Proposal for Decision to the Board under this Rule. If the Presiding Officer determines to submit a Proposal for Decision, it must:

1) Be submitted within thirty (30) days after the date the hearing is finally concluded; and

2) Include a summary of the subject matter of the hearing, a summary of the evidence or public comments received, and the Presiding Officer's recommendations for Board action on the subject matter of the hearing. A copy of the report shall be provided by the Presiding Officer or District staff to the applicant, each designated party, and each person who provided comments. A person who receives a copy of the report may submit written exceptions to the report to the Board.

(b) The Presiding Officer may direct a District representative or employee to prepare the hearing report and recommendations under this Rule.

(c) The Board shall consider the proposal for decision at a final hearing. Additional evidence may not be presented during a final hearing. The parties may present

oral argument at a final hearing to summarize the evidence, present legal argument, or argue an exception to the proposal for decision.

RULE 12.9 BOARD ACTION

The Board shall act on a permit or permit amendment application not later than the sixtieth (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 sixty (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, Government Code.

RULE 12.10 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 a rehearing or written findings and conclusions within twenty (20) calendar days of the date of the Board's decision.

(b) A rehearing request must be mailed to the District in writing and must state clear and concise grounds for the request. If the original hearing was a contested hearing, the person requesting a rehearing must provide copies of the request to all parties to the hearing. Such a hearing is mandatory with respect to any decision or action of the Board 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.

(c) If the hearing on the application was considered uncontested and the decision of the Board on the application is materially inconsistent with the relief sought in the application, the applicant shall be afforded an opportunity to submit a request for a contested case in conjunction with the request for rehearing. If the request for rehearing is timely filed, the accompanying request for a contested case hearing shall be deemed timely filed for all purposes under these Rules. On receipt of a timely written request, the Board shall make written findings and conclusions regarding a decision of the Board on a permit or permit amendment application.

(d) The Board shall provide certified copies of the findings and conclusions to the person who requested them, and to each person who provided comments or each designated party, not later than the thirty-fifth (35th) day after the date the Board receives the request. A person who receives a certified copy of the findings and conclusions from the Board may request a rehearing before the Board not

later than the twentieth (20th) day after the date the Board issues the findings and conclusions.

(e) The Board's decision is final if no request for rehearing is made within the specified time, upon the Board's denial of the request for rehearing, or upon rendering a decision after rehearing. If the rehearing request is granted by the Board, the date of the rehearing will be within forty-five (45) calendar days thereafter. The failure of the Board to grant or deny the request for rehearing within ninety (90) calendar days of the date of submission shall constitute a denial of the request.

RULE 12.11 DECISION; WHEN FINAL

(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:

i) The Board denies the request for rehearing; or

ii) 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 sixtieth (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.

RULE 12.12 CONSOLIDATED NOTICE AND HEARING ON PERMIT APPLICATIONS

(a) Except as provided by Subsection (b), the Board shall process applications from a single applicant under consolidated notice and hearing procedures on written request by the applicant.

(b) The Board is not required to use consolidated notice and hearing procedures to process separate permit or permit amendment applications from a single applicant if the Board cannot adequately evaluate one application until it has acted on another application.

RULE 12.13 HEARINGS ON ADOPTION OF DESIRED FUTURE CONDITIONS

(a) For hearings that the District is required to hold for the adoption of its Desired Future Conditions, not less than ten (10) days prior to the date of the hearing, the District shall post notice that includes the following information:

1) The proposed Desired Future Condition(s) and a list of any other agenda items;

2) The date, time, and location of the meeting or hearing;

3) The name, telephone number, and address of the person to whom questions or requests for additional information may be submitted;

4) The name of the other groundwater districts in the same Groundwater Management Area as the District; and

5) Information on how the public may submit comments.

(b) The notice required under this subsection shall be provided in the same manner as that for rulemaking hearings under Rule 12.2(b).

SECTION 13. TRANSPORTATION OF GROUNDWATER OUT OF DISTRICT

RULE 13.1 GENERAL TRANSPORTATION PROVISIONS

(a) A person who produces or wishes to produce water from a well located or to be located within the District and transport such water for use outside of the District must take the following action:

1) Register the well with the District;

2) Obtain an Operating Permit or Grandfathered Use Permit from the District or an amendment to such a permit; and

3) Submit timely payment of the Groundwater Transportation Fee to the District for any water transported out of the District. The holder of a permit authorized to transport water outside the boundaries of the District shall, in accordance with Rule 3.8, report the total amount of groundwater transported outside of the District for reporting purposes and for purposes of calculating the Groundwater Transportation Fee.

(b) A Groundwater Transportation Fee shall not be assessed for production in an area of a retail public utility's CCN located inside the District that is transported for use to an area of the same CCN that is located outside the District.

(c) Applications that request authorization to transport water outside the boundaries of the District shall automatically be considered by the District after notice and hearing.

RULE 13.2 CONSIDERATIONS FOR TRANSPORTATION OF GROUNDWATER

(a) In reviewing a proposed transportation of groundwater out of the District, the District shall consider the following:

1) The availability of water in the District and in the proposed receiving area during the period for which the water supply is requested;

2) The 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

3) The approved regional water plan and certified District management plan.

(b) The District may not impose more restrictive permit conditions on transporters than the District imposes on in-district users.

RULE 13.3 PERMIT TERMS FOR TRANSPORTATION OF GROUNDWATER

(a) For permits that authorize the transportation of groundwater the term of the permit shall be:

(1) at least three years if construction of a conveyance system has not been initiated prior to the issuance of the permit; or

(2) up to and including 30 years if construction of a conveyance system has been initiated prior to the issuance of the permit.

(b) A term under Subsection (a) shall automatically be extended to the terms agreed to under Subsection (a) if construction of a conveyance system is begun before the expiration of the initial term.

SECTION 14. AUTHORITY TO DEFINE MANAGEMENT ZONES AND PRODUCTION-BASED LIMITATIONS

RULE 14.1 MANAGEMENT ZONES

(a) Using the best hydrogeologic and other relevant scientific data readily available, the Board by resolution may create certain 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) Authorize total production and make proportional adjustments to permitted withdrawals;

3) Allow for the transfer of permits; and

4) 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.

(c) Where practicable, the Board may consider the ability of the public to readily identify the boundaries of designated zones based on features on the land surface.

RULE 14.2 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 setting aside an amount of groundwater for exempt use for each aquifer, to the extent of remaining groundwater availability, the Board shall allocate groundwater to Grandfathered Use Permits according to the permitted or claimed Grandfathered use in each, depending upon whether the Grandfathered Use Permit applied for has yet been issued.

(d) If there is sufficient groundwater to satisfy all Grandfathered Use Permits and exempt use for a particular aquifer within a management zone, the Board shall then allocate remaining water availability among existing Operating Permits, based on their previously permitted amounts.

(e) If there is sufficient groundwater to satisfy exempt use and all Grandfathered Use Permits, and existing Operating Permits authorizing withdrawal from a particular aquifer, the Board may then allocate remaining groundwater availability to applications for new or amended Operating Permits.

(f) When establishing proportional adjustment restrictions that contemplate the reduction of authorized production or a prohibition on authorization for new or increased production from one or more aquifers, the Board may also choose to proportionately reduce any existing Operating Permits on a pro rata basis in

order to make groundwater available for new applications for Operating Permits.

RULE 14.3 ISSUANCE OF NEW OPERATING PERMITS

In a management zone where the Board has already established proportional adjustment regulations, new Operating 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.

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