Plateau Underground Water Conservation & Supply District
Groundwater Management Plan – 2024 to 2029

Plateau UWC&SD Board Approval Draft v1

July 10, 2024

Plateau Underground Water Conservation & Supply District Groundwater Management Plan – 2024 to 2029

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1.0 Introduction

1.1 Background and District Mission

The Plateau Underground Water Conservation & Supply District was created by Acts of the 59th Texas Legislature in 1965. The District was created to provide for the conservation, preservation, protection, recharge and prevention of waste of the underground water reservoirs located under the District, consistent with Article XVI, Section 59, of the Texas Constitution, and Chapter 36 of the Texas Water Code. The District strives to bring about conservation, preservation, and the efficient, beneficial and wise use of water for the benefit of the citizens and economy of the District through monitoring and protecting the quality of the groundwater. The District also strives to maintain groundwater ownership and rights of landowners as provided in Texas Water Code 36.002.

1.2 Time Period for This Plan

This plan becomes effective upon approval by the Texas Water Development Board and replaces the existing management plan adopted by the Board of Directors. The new plan remains in effect until a revised plan is approved. This plan will be reviewed and amended at least once every five years.

1.3 General Description of District

The District is governed by a Board of five Directors elected by local voters. Serving on the current Board are Steve Williams, Chairman, Kary Gibson, Vice-Chairman, John Ben Cawley, Secretary, Jerry Swift, and Kerry Joy. District rules have been in effect since 1992 which will effectuate the management plan. The District encompasses Schleicher County, Texas. Schleicher County's economy is based in agriculture with a significant contribution from the oil and gas industry.

1.4 Regional Cooperation and Coordination

In 1988, four groundwater conservation districts, Coke County UWCD, Glasscock County UWCD, Irion County WCD, and Sterling County UWCD signed an original Cooperative Agreement. More districts came in and signed this agreement, and in the fall of 1996, the original Cooperative Agreement was redrafted and the West Texas Regional Groundwater Alliance was created. The WTRGA now consists of seventeen locally created and locally funded groundwater conservation districts that encompass 29,800 square miles of West Texas. Due to the diversity of the region, each member district provides its own unique programs to best serve its constituents.

As shown in Figure 1, the following districts are currently members of the WTRGA: Coke County UWCD, Crockett County GCD, Glasscock GCD, Hill Country UWCD, Hickory UWCD, Irion County WCD, Kimble County GCD, Lipan-Kickapoo WCD, Lone Wolf GCD, Menard County UWD, Middle Pecos GCD, Permian Basin UWCD, Plateau UWC&SD, Santa Rita UWCD, Sterling County UWCD, Sutton County UWCD, and Wes-Tex GCD.

This Alliance was created because the local districts have a common objective to facilitate the conservation, preservation, and beneficial use of water and related resources. Local districts monitor

water-related activities of the state's largest industries, such as farming and ranching, oil and gas, and municipalities. The Alliance provides coordination essential to effect region wide planning in an area which has common water resource allocation problems that are unique to this part of Texas.

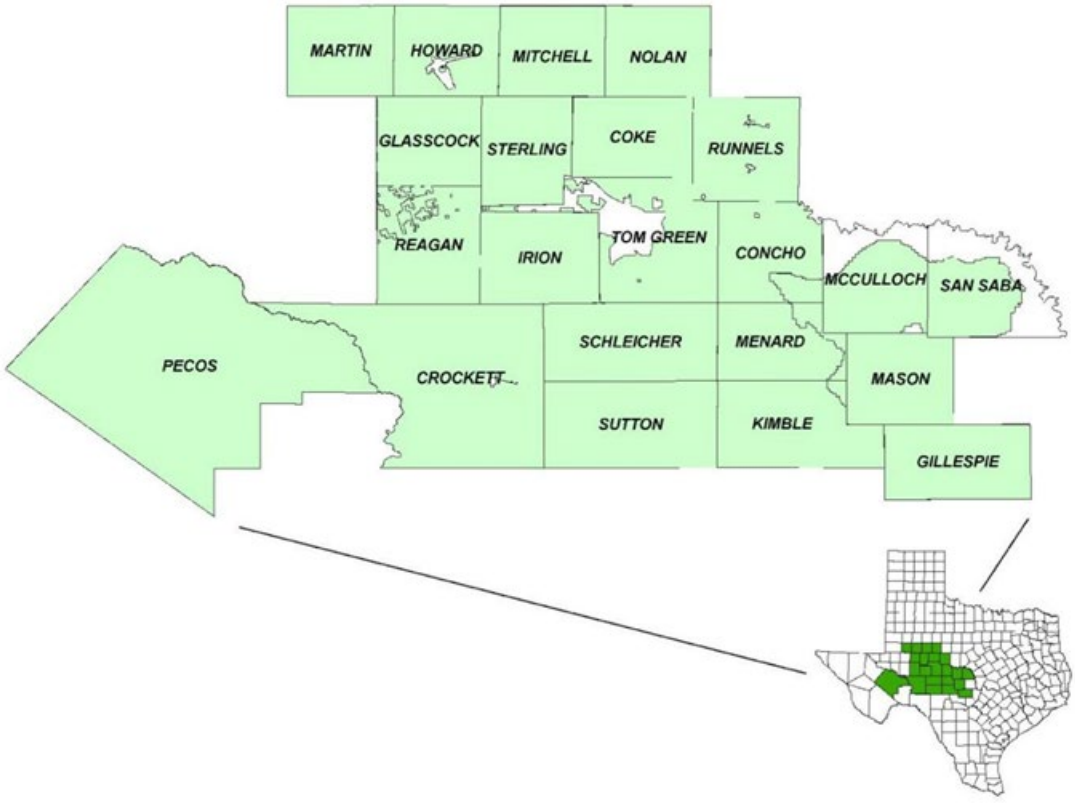


Figure 1. West Texas Regional Groundwater Alliance

2.0 District Information

2.1 Geographic Information

The District lies within the Edwards Plateau and consists of approximately 838,000 acres, and is covers the full extent of Schleicher County.

2.2 Groundwater Resources

The Edwards-Trinity (Plateau) aquifer underlies the Edwards Plateau east of the Pecos River and the Stockton Plateau west of the Pecos River, extending from the Hill Country of Central Texas to the Trans-Pecos region of West Texas, providing water to all or parts of 38 counties. The aquifer

consists of saturated sediments of lower Cretaceous age Trinity Group formations and overlying limestone and dolomites of the Comanche Peak, Edwards, and Georgetown formations.

The Edwards-Trinity (Plateau) aquifer is the fresh water source for Schleicher County and includes all rocks from the base of the Antlers to the top of the Georgetown Formation (Washita Group). Limestone is the predominant rock underlying the Edwards Plateau soils. The permeability of the limestone is not necessarily due to inter granular pore space as in sandstones, but more to joints, crevices, and solution openings that have been enlarged by solvent action of water charged with carbon dioxide.

Permian limestone contains fresh to slightly saline water in the area of the common corners of Kimble, Menard, Schleicher, and Sutton Counties. The Permian is overlain by the Edwards and associated limestone in this area and is recharged by water from the Cretaceous.

3.0 Technical Information Required by Texas Administrative Code

The information in this section is provided pursuant to statutes and rules as summarized in the TWDB Groundwater Conservation District Management Plan Checklist (dated December 6, 2012). The information is organized according to the order in the checklist.

3.1 Estimate of the Modeled Available Groundwater

The Desired Future Conditions for the aquifers located within the District boundaries and Groundwater Management Area 7 were adopted on Aug. 19, 2021. Texas Water Code 36.001 defines modeled available groundwater as "the amount of water that the executive administrator determines may be produced on an average annual basis to achieve a desired future condition established under Section 36.108".

The Lipan aquifer was classified by GMA 7 as not relevant for joint planning purposes in the Plateau UWC&SD.

The adopted DFCs for the Edwards-Trinity (Plateau) Aquifer in Schleicher County was as follows:

> ***Total net drawdown of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers not to exceed 8 feet in Schleicher County in 2070 as compared with 2010 aquifer levels.***

As developed in GAM Run 21-012 MAG (presented as Appendix A), the Modeled Available Groundwater for the Plateau UWC&SD is 8,034 AF/yr for all years from 2020 to 2070.

3.2 Estimate of the Amount of Groundwater Being Used Within District on an Annual Basis

Please refer to Appendix B: Estimated Historical Use and 2022 State Water Plan Datasets, Plateau Underground Water Conservation And Supply District, dated December 5, 2023.

3.3 Estimate of the Annual Amount of Recharge from Precipitation

Please refer to Appendix C: GAM Run 23-023, Plateau Underground Water Conservation & Supply District Management Plan, dated December 14, 2023.

3.4 Estimate of the Annual Volume of Water That Discharges to Springs and Surface Water Bodies

Please refer to Appendix C: GAM Run 23-023, Plateau Underground Water Conservation & Supply District Management Plan, dated December 14, 2023.

3.5 Estimate of the Annual Volume of Flow into the District, out of the District, and between Aquifers

Please refer to Appendix C: GAM Run 23-023, Plateau Underground Water Conservation & Supply District Management Plan, dated December 14, 2023.

3.6 Estimate of the Projected Surface Water Supply within the District

Please refer to Appendix B: Estimated Historical Use and 2022 State Water Plan Datasets, Plateau Underground Water Conservation And Supply District, dated December 5, 2023. These estimates show the only surface water supplies are for livestock (17 AF/yr from the Colorado River Basin and 6 AF/yr from the Rio Grande Basin).

3.7 Estimate of the Projected Total Demand for Water within District

Please refer to Appendix B: Estimated Historical Use and 2022 State Water Plan Datasets, Plateau Underground Water Conservation And Supply District, dated December 5, 2023. These estimates were updated to reflect plumbing code savings found in Regional and State Water Plans. The sum of total demands are declining (3,730 AF/yr in 2020 to 3,307 AF/yr in 2070). The most significant use that is expected to decline is “mining”, which includes water use for oil and gas.

3.8 Water Supply Needs

Please refer to Appendix B: Estimated Historical Use and 2022 State Water Plan Datasets, Plateau Underground Water Conservation And Supply District, dated December 5, 2023. These estimates show that for all nine categories listed, there is neither a projected need nor a projected surplus (all values are zero).

3.9 Water Management Strategies

Please refer to B: Estimated Historical Use and 2022 State Water Plan Datasets, Plateau Underground Water Conservation And Supply District, dated December 5, 2023.

Page 7 of the Appendix B includes seven specific groundwater-related water management strategies for Schleicher County:

- Demand reduction in Eldorado (municipal conservation) of 6 AF/yr
- Demand reduction in the Colorado River Basin through irrigation conservation of 58 AF/yr in 2020, increasing to 70 AF/yr in 2070
- Weather modification in the Colorado River Basin that would increase supplies by 176 AF/yr
- Demand reduction in the Rio Grande Basin through irrigation conservation of 33 AF/yr in 2020, increasing to 39 AF/yr in 2070
- Weather modification in the Rio Grande Basin that would increase supplies by 99 AF/yr
- Demand reduction for mining in the Colorado River Basin of 19 AF/yr in 2020 that would decrease to 4 AF/yr in 2070.
- Demand reduction for mining in the Rio Grande Basin of 7 AF/yr in 2020 that would decrease to 2 AF/yr in 2070.

These specific water management strategies were considered and included in the overall preparation of this management plan.

3.10 How the District Will Manage Groundwater Supplies

The District manages groundwater in order to conserve the resource while seeking to maintain the economic viability of all resource user groups, public and private. In consideration of the economic and cultural activities occurring within the District, the District will identify and engage in such activities and practices that could result in a reduction of groundwater use. An observation network shall be maintained in order to monitor changing quality and storage conditions of groundwater supplies within the District. The District will employ all technical resources at its disposal to evaluate the resources available within the District and to determine the effectiveness of management or conservation measures.

The District has adopted rules to manage groundwater withdrawals by means of spacing and production limits. The District may deny a well construction permit or limit groundwater withdrawals in accordance with the guidelines stated in the rules of the District. In deciding to approve or deny a permit or limit groundwater withdrawals, the District will consider public benefit against individual hardship after considering all appropriate testimony. The relevant factors to be considered in deciding to deny a permit or limit groundwater withdrawals include: the purpose of District rules, legal rights, equitable distribution of resource, and economic hardship to both individual surface owners and surrounding community.

3.11 Actions, Procedures, Performance, and Avoidance

The District will implement the provisions of this plan and will utilize the provisions of this plan as a guidepost for determining the direction or priority for all District activities. All operations of the District and all agreements entered into by the District will be consistent with this plan.

The District has adopted and will amend as necessary rules relating to the permitting of wells and the production of groundwater. The rules adopted by the District shall be pursuant to TWC Chapter 36 and the provisions of this plan. All rules will be adhered to and enforced. The promulgation and

enforcement of the rules will be based on the best technical evidence available. The current version of the rules is dated June 23, 2016, and is attached as Appendix D. The rules can be downloaded from the Plateau UWC&SD website:

https://www.plateauuwcsd.com/storage/UserFileFolder/plateaurules2016_(1).pdf

The District shall treat all citizens equally. Citizens may apply to the District for discretion in enforcement of the rules on grounds of adverse economic effect or unique local character. In granting discretion to any rule, the Board shall consider the potential for adverse effect on adjacent landowners. The exercise of said discretion by the Board shall not be construed as limiting the power of the Board. The District will seek cooperation in the implementation of this plan and the management of groundwater supplies within the District.

In an effort to recognize all potential contamination sources, the District will work to promote capping and plugging of abandoned water wells. The District will also coordinate efforts with the Railroad Commission in identifying abandoned oil and gas wells that pose potential threats to the integrity of the groundwater.

The methodology that the District will use to track its progress on an annual basis in achieving its management goals will be as follows: The District manager will prepare and present an annual report to the Board of Directors on District performance in regard to achieving management goals and objectives. The annual report will be maintained at the District office.

3.12 Evidence that the Plan was Adopted after Notice and Hearing

To be added after adoption and included as Appendix E.

3.13 Evidence that District Coordinated with Regional Surface Water Management Entities Following Notice and Hearing

There are no surface water management entities in the District, so this requirement is not applicable.

3.14 Site-Specific Information

Not Applicable

4.0 Management Goals

The General Manager of the District will prepare and submit an annual report ("Annual Report") to the Board of the District. The Annual Report will include an update on the District's performance in regard to achieving management goals and objectives. The General Manager of the District will present the Annual Report within ninety (90) days following the completion of the District's fiscal year audit, beginning with the fiscal year that starts October 1. Upon adoption, the Board will keep a copy of the Annual Report on file, for public inspection, at the District's offices.

4.1 Providing the most efficient use of groundwater

4.1.1 Public Education and Outreach

Objective: The District realizes the importance of public education of groundwater use and conservation practices. Public education will consist of education articles and speaking engagements.

Performance Standard: Each year, the District will publish at least one educational article identifying conservation practices for the efficient use of groundwater and keep a copy at the District office for a period of three (3) years. Each year, the District will respond to invitations to speak on groundwater topics to at least one group and keep a copy of the materials used in the speaking engagement at the District office for a period of three (3) years.

4.1.2 Well Registration and Permitting

Objective: According to District Rules, wells within the District are required to be registered and/or permitted. As part of daily operations, wells will be registered with the District upon notification by well drillers or landowners. The District will permit all wells after determination by District personnel that all well construction criteria have been met. Upon request by the Board, District personnel shall evaluate total water usage on the requested section(s) including permitted wells and exempt wells.

Performance Standard: Number of wells registered annually will be reported in the annual report to the District Board. Number of wells permitted annually will be reported in the annual report to the District Board. Number of evaluations of water usage performed will be reported in the annual report to the District Board.

4.1.3 Region F Meetings

Objective: The District is included in Region F Regional Planning Group. Each year that District will actively participate in Region F Regional Planning personnel, and serve on the Region F RWPG Board, any committee, or office.

Performance Standard: The District shall attend at least 50% of meetings and report the number of meetings attended in the annual report to the District Board.

4.1.4 West Texas Regional Groundwater Alliance Meetings

Objective: The District has entered into a Cooperative Management Agreement with the West Texas Regional Groundwater Alliance. The purpose of the WTRGA is to facilitate the conservation, preservation, protection, and most efficient use of groundwater.

Performance Standard: Each year, the District will attend at least 50% of WTRGA meetings and report the number of meeting attended in the annual report to the District Board.

4.1.5 Groundwater Quality Sampling

Objective: A water quality baseline will be established for the District through a monitor well program of approximately sixty wells.

Performance Standard: At least 33% of these wells will be sampled each year. All test results will be entered into the database and a copy mailed to landowners. An annual summary of samples and landowner reports will be included in the annual report to the District Board.

4.1.6 Field Laboratory Services

Objective: As a service to water well owners within the District, a field lab service for water analysis is available. The availability of this service will be described in a newspaper article. The District will continue to perform water quality analysis for residents of the District upon request.

Performance Standard: At least one article will be published advertising the availability of water analysis service performed by the District each year. The number of water quality analyses requested and performed and the published article will be included in the annual report to the District Board.

4.2 Controlling and preventing waste of groundwater

4.2.1 Wasteful Practices Education

Objective: Each year the District will identify and respond to reports of wasteful practices within five working days and provide public information in the form of a newspaper article.

Performance Standard: Each year at least one article will be published on wasteful practices. The article and the number of reported wasteful practices identified and responded to each year will be reported in the annual report to the District Board.

4.3 Controlling and preventing subsidence

The subsidence tool developed by the Texas Water Development Board was used to assess the potential for subsidence in the Edwards-Trinity (Plateau) Aquifer in the District using the default values provided. The tool can be accessed at:

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

The tool provides a numeric total weighted risk factor that ranges from 0 (low risk) to 10 (high risk). The results of applying the default values from the tool yield that the score for the Edwards-Trinity (Plateau) Aquifer is 2.97:

Based on applying the tool and the geologic setting, this management goal is not applicable to the District due to the low risk of subsidence in Schleicher County.

4.4 Addressing conjunctive surface water management issues

All surface water impoundments located within the District are used to supply water for livestock consumption. There are no surface water management entities with surface water storage located within the District. This management goal is not applicable to the operations of the District.

4.5 Addressing natural resource issues that impact the use and availability of groundwater and which are impacted by the use of groundwater

The definition of "natural resources" issues from the Texas Administrative Code, Chapter 356 – Natural Resource Issues":

> *"Issues related to environmental and other concerns that may be affected by a district's groundwater management plan and rules, such as impacts to endangered species, soils, oil and gas production, mining, air and water quality degradation, agriculture, and plant and animal life."*

The District has no documented occurrences of endangered or threatened species dependent on groundwater. Other issues related to air, water, and soil are not present. Oil and gas operations are present in Schleicher County. The following rules of the Plateau UWC&SD (Appendix D) highlight natural resource issues as defined above that potentially occur in the Plateau UWC&SD:

- Rule 28(d): Wells encountering undesirable water
- Rule 28(g): Well plugging and capping
- Rule 29: Reporting Undesirable water

Objective: The District will maintain files on all instances of well completions in undesirable water as required by Rule 28(d), maintain all reports of well plugging required in Rule 28(g), and maintain reports of undesirable water reported to the District.

Performance Standard: These summaries will be provided as an agenda item at the next meeting of the District Board. In addition, all reports for the year will be included in the annual report to the District Board.

4.6 Addressing drought conditions

Objective: The District will monitor the Palmer Drought Severity Index by Texas Climatic Divisions at least once a month by downloading the PDSI map at:

http://waterdatafortexas.org/drought/

Performance Standard: The monthly PDSI maps will be included as an agenda item at all Board meetings. All maps will be included in the annual report to the District Board as wells as the number of times notifications were sent to public water suppliers.

4.7 Addressing conservation, recharge enhancement, rainwater harvesting, precipitation enhancement, and brush control where appropriate and cost effective

4.7.1 Addressing Conservation

Objective: The District personnel will meet with Eldorado personnel at least once annually to discuss water usage and conservation techniques implemented including the information contained in the TWDB conservation page: http://www.twdb.texas.gov/conservation/BMPs/index.asp

Performance Standard: A summary of the annual meeting with Eldorado personnel to discuss water usage and conservation techniques implemented will be included in the annual report to the Board.

4.7.2 Addressing Recharge Enhancement

This management goal is not applicable to the District due to lack of available surface water of acceptable quality and cost effectiveness.

4.7.3 Addressing Rainwater Harvesting

This management goal is not applicable to the District due to cost effectiveness.

4.7.4 Addressing Precipitation Enhancement

Objective: Precipitation enhancement can result in reduced groundwater pumping for all users, potential increase in runoff, increased productivity of crops and rangeland, and potentially increases recharge and spring flow. The Plateau UWC&SD has been a member of the West Texas Weather Modification Association (Figure 2) since the initial season of 1996. The average rainfall for the District is 19.0 in/yr and 11.2 inches from May to September when weather modification activities occur.

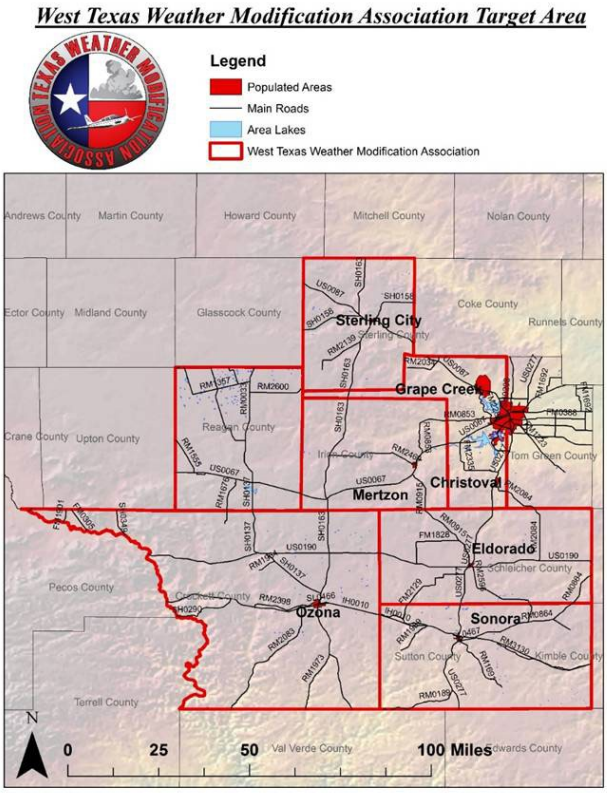


Figure 2. Area covered by West Texas Weather Modification Association

Performance Standard: A summary of precipitation enhancement activities will be included in the annual report to the Board. This summary report will include at least one newspaper article per year on the program, the number of flight paths each year, and monthly rainfall data.

4.7.5 Addressing Brush Control

This management goal is not applicable to the District because the objective is not cost effective due to the sparse nature of the vegetation in the District and the fact that much of the recharge to the District's aquifers are outside the boundaries of the District.

4.8 Addressing the desired future conditions

Objective: To address the desired future conditions adopted by GMA 7, the District will measure water levels in at least 25 monitor wells in the District at least 5 times per year and evaluate whether the average change in water levels conforms with the DFCs adopted by the District. The District will estimate total annual groundwater production based on water use reports, estimated exempt use, and other relevant information and compare these production estimates to the MAG.

Performance Standard: To record the water level data and average annual change in water levels and compare to the DFCs, and to include this information in the District's Annual Report. Also, to record the total estimated annual production and compare this to the MAG and include this information in the District's Annual Report.

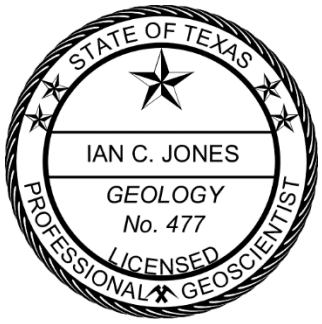
Appendix A

GAM Run 21-012 MAG: Modeled Available Groundwater for the Aquifers in Groundwater Management Area 7

August 12, 2022

GAM RUN 21-012 MAG: MODELED AVAILABLE GROUNDWATER FOR THE AQUIFERS IN GROUNDWATER MANAGEMENT AREA 7

Ian C. Jones, Ph.D., P.G.
Texas Water Development Board
Groundwater Division
Groundwater Modeling Department
512-463-6641
August 12, 2022



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GAM RUN 21-012 MAG: MODELED AVAILABLE GROUNDWATER FOR THE AQUIFERS IN GROUNDWATER MANAGEMENT AREA 7

Ian C. Jones, Ph.D., P.G.
Texas Water Development Board
Groundwater Division
Groundwater Modeling Department
512-463-6641
August 12, 2022

EXECUTIVE SUMMARY:

The Texas Water Development Board (TWDB) has prepared estimates of the modeled available groundwater for the relevant aquifers of Groundwater Management Area 7—the Capitan Reef Complex, Dockum, Edwards-Trinity (Plateau), Ellenburger-San Saba, Hickory, Ogallala, Pecos Valley, Rustler, and Trinity aquifers. The estimates are based on the desired future conditions for these aquifers adopted by the groundwater conservation districts in Groundwater Management Area 7 on August 19, 2021. The explanatory reports and other materials submitted to the TWDB were determined to be administratively complete on February 23, 2022.

The modeled available groundwater values are summarized by decade for the groundwater conservation districts (Tables 1, 3, 5, 7, 9, 11, 13) and for use in the regional water planning process (Tables 2, 4, 6, 8, 10, 12, 14). The modeled available groundwater estimates for each decade from 2020 through 2070 are:

- 26,164 acre-feet per year in the Capitan Reef Complex Aquifer,
- 2,324 acre-feet per year in the Dockum Aquifer,
- 6,570 to 7,925 acre-feet per year in the Ogallala Aquifer,
- 479,063 acre-feet per year in the undifferentiated Edwards-Trinity (Plateau), Pecos Valley, and Trinity aquifers,
- 22,616 acre-feet per year in the Ellenburger-San Saba Aquifer,
- 49,936 acre-feet per year in the Hickory Aquifer, and
- 7,040 acre-feet per year in the Rustler Aquifer.

The modeled available groundwater estimates were extracted from results of model runs using the groundwater availability models for the Capitan Reef Complex Aquifer [Version

1.01] (Jones, 2016) for the Capitan Reef Complex Aquifer; the High Plains Aquifer System [Version 1.01] (Deeds and Jigmond, 2015) for the Dockum and Ogallala aquifers; the minor aquifers of the Llano Uplift Area [Version 1.01] (Shi and others, 2016) for the Ellenburger-San Saba and Hickory aquifers, and the Rustler Aquifer [Version 1.01] (Ewing and others, 2012) for the Rustler Aquifer. In addition, the alternative 1-layer model for the Edwards-Trinity (Plateau), Pecos Valley, and Trinity aquifers (Hutchison and others, 2011a) was used for the Edwards-Trinity (Plateau), Pecos Valley, and Trinity aquifers, except for Kinney and Val Verde counties. In these two counties, the alternative Kinney County model (Hutchison and others, 2011b) and the model associated with a hydrogeological study for Val Verde County and the City of Del Rio (EcoKai and Hutchison, 2014), respectively, were used to estimate modeled available groundwater.

REQUESTOR:

Ms. Meredith Allen, coordinator of Groundwater Management Area 7 districts.

DESCRIPTION OF REQUEST:

In an email dated August 28, 2021, Dr. William Hutchison on behalf of Groundwater Management Area 7 provided the TWDB with the desired future conditions for the Capitan, Dockum, Ellenburger-San Saba, Hickory, Ogallala, and Rustler aquifers, as well as for the undifferentiated Edwards-Trinity (Plateau), Pecos Valley and Trinity aquifers, in Groundwater Management Area 7. Groundwater Management Area 7 provided additional clarifications through an email to the TWDB on November 12, 2021, for the assumptions and model files to be used to calculate modeled available groundwater.

The final adopted desired future conditions as stated in signed resolutions for the aquifers in Groundwater Management Area 7 are as follows:

Capitan Reef Complex Aquifer *(Resolution #08-19-2021-2)*

a) Total net drawdown of the Capitan Reef Complex Aquifer not to exceed 56 feet in Pecos County (Middle Pecos GCD) in 2070 as compared with 2006 aquifer levels.
**(Reference: Scenario 4, GMA 7 Technical Memorandum 16-03)*
b) The Capitan Reef Complex Aquifer is not relevant for joint planning purposes in all other areas of GMA 7.

Dockum and Ogallala aquifers *(Resolution #08-19-2021-5)*

Ogallala Aquifer:

a) Total net drawdown of the Ogallala Aquifer not to exceed **6 feet in Glasscock County** in 2070 as compared with 2010 aquifer levels.

Dockum Aquifer:

b) Total net drawdown of the Dockum Aquifer not to exceed **52 feet in Pecos County** in 2070 as compared with 2010 aquifer levels.

c) Total net drawdown of the Dockum Aquifer not to exceed **14 feet in Reagan County** in 2070 as compared with 2010 aquifer levels.

**(Reference items a) through c): Scenario 17, GMA 7 Technical Memorandum 16-01)*

d) The Ogallala and Dockum Aquifers are not relevant for joint planning purposes in all other areas of GMA 7.

Edwards-Trinity (Plateau), Pecos Valley, and Trinity aquifers *(Resolution #08-19-2021-3)*

a) Total net drawdown of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers not to exceed **0 feet in Coke County** in 2070 as compared with 2010 aquifer levels.
b) Total net drawdown of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers not to exceed **10 feet in Crockett County** in 2070 as compared with 2010 aquifer levels.
c) Total net drawdown of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers not to exceed **4 feet in Ector County** in 2070 as compared with 2010 aquifer levels.
d) Total net drawdown of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers not to exceed **2 feet in Edwards County** in 2070 as compared with 2010 aquifer levels.
e) Total net drawdown of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers not to exceed **5 feet in Gillespie County** in 2070 as compared with 2010 aquifer levels.
f) Total net drawdown of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers not to exceed **42 feet in Glasscock County** in 2070 as compared with 2010 aquifer levels.
g) Total net drawdown of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers not to exceed **10 feet in Irion County** in 2070 as compared with 2010 aquifer levels.
h) Total net drawdown of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers not to exceed **1 foot in Kimble County** in 2070 as compared with 2010 aquifer levels.
i) Total net drawdown of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers not to exceed **1 foot in Menard County** in 2070 as compared with 2010 aquifer levels.
j) Total net drawdown of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers not to exceed **12 feet in Midland County** in 2070 as compared with 2010 aquifer levels.
k) Total net drawdown of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers not to exceed **14 feet in Pecos County** in 2070 as compared with 2010 aquifer levels.
l) Total net drawdown of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers not to exceed **42 feet in Reagan County** in 2070 as compared with 2010 aquifer levels.
m) Total net drawdown of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers not to exceed **4 feet in Real County** in 2070 as compared with 2010 aquifer levels.
n) Total net drawdown of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers not to exceed **8 feet in Schleicher County** in 2070 as compared with 2010 aquifer levels.
o) Total net drawdown of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers not to exceed **7 feet in Sterling County** in 2070 as compared with 2010 aquifer levels.
p) Total net drawdown of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers not to exceed **6 feet in Sutton County** in 2070 as compared with 2010 aquifer levels.
q) Total net drawdown of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers not to exceed **0 feet in Taylor County** in 2070 as compared with 2010 aquifer levels.
r) Total net drawdown of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers not to exceed **2 feet in Terrell County** in 2070 as compared with 2010 aquifer levels.
s) Total net drawdown of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers not to exceed **20 feet in Upton County** in 2070 as compared with 2010 aquifer levels.
t) Total net drawdown of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers not to exceed **2 feet in Uvalde County** in 2070 as compared with 2010 aquifer levels.

*(Reference items *a)* through *t)*: GMA 7 Technical Memorandum 18-01)

Edwards-Trinity (Plateau), Pecos Valley, and Trinity aquifers *(continued)*

u) Total net drawdown in **Kinney County** in 2070, as compared with 2010 aquifer levels, shall be consistent with maintenance of an annual average flow of 23.9 cfs and an annual median flow of **23.9 cfs at Las Moras Springs.**
**(Reference: Groundwater Flow Model of the Kinney County Area by W.R. Hutchison and others, 2011).*

v) Total net drawdown in **Val Verde County** in 2070, as compared with 2010 aquifer levels, shall be consistent with maintenance of an average annual flow of **73-75 mgd at San Felipe Springs.**
**(Reference: EcoKai, 2014)*

w) The Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers are not relevant for joint planning purposes in all other areas of GMA 7.

Minor Aquifers of the Llano Uplift Area *(Resolution #08-19-2021-4)*

Ellenburger-San Saba Aquifer:

a) Total net drawdown of the Ellenburger-San Saba Aquifer not to exceed **8 feet in Gillespie County** in 2070 as compared with 2010 aquifer levels.
b) Total net drawdown of the Ellenburger-San Saba Aquifer not to exceed **18 foot in Kimble County** in 2070 as compared with 2010 aquifer levels.
c) Total net drawdown of the Ellenburger-San Saba Aquifer not to exceed **14 foot in Mason County** in 2070 as compared with 2010 aquifer levels.
d) Total net drawdown of the Ellenburger-San Saba Aquifer not to exceed **29 feet in McCulloch County** in 2070 as compared with 2010 aquifer levels.
e) Total net drawdown of the Ellenburger-San Saba Aquifer not to exceed **46 feet in Menard County** in 2070 as compared with 2010 aquifer levels.
f) Total net drawdown of the Ellenburger-San Saba Aquifer not to exceed **5 feet in San Saba County** in 2070 as compared with 2010 aquifer levels.

Hickory Aquifer:

g) Total net drawdown of the Hickory Aquifer not to exceed **53 feet in Concho County** in 2070 as compared with 2010 aquifer levels.
h) Total net drawdown of the Hickory Aquifer not to exceed **9 feet in Gillespie County** in 2070 as compared with 2010 aquifer levels.
i) Total net drawdown of the Hickory Aquifer not to exceed **18 feet in Kimble County** in 2070 as compared with 2010 aquifer levels.
j) Total net drawdown of the Hickory Aquifer not to exceed **17 feet in Mason County** in 2070 as compared with 2010 aquifer levels.

Minor Aquifers of the Llano Uplift Area *(continued)*

k) Total net drawdown of the Hickory Aquifer not to exceed **29 feet in McColloch County** in 2070 as compared with 2010 aquifer levels.
l) Total net drawdown of the Hickory Aquifer not to exceed **46 feet in Menard County** in 2070 as compared with 2010 aquifer levels.
m) Total net drawdown of the Hickory Aquifer not to exceed **6 feet in San Saba County** in 2070 as compared with 2010 aquifer levels.
**(Reference items a) through m): Scenario 3, GMA 7 Technical Memorandum 16-02)*
n) The Llano Uplift Region (Ellenburger-San Saba, Hickory, Marble Falls) Aquifers are not relevant for joint planning purposes in all other areas of GMA 7.

Rustler Aquifer *(Resolution #08-19-2021-6)*

a) Total net drawdown of the Rustler Aquifer not to exceed **94 feet in Pecos County** in 2070 as compared with 2010 aquifer levels.
**(Reference: Scenario 4, GMA 7 Technical Memorandum 15-05)*
b) The Rustler Aquifer not relevant for joint planning purposes in all other areas of GMA 7.

In addition to the non-relevant statements provided above in the individual resolutions, Groundwater Management Area 7 also provided additional non-relevant documentation dated August 27, 2021 and January 20, 2022 as part of their submittal to TWDB. The following aquifers or parts of aquifers are non-relevant for the purposes of joint planning:

- The entirety of the Blaine, Cross Timbers, Igneous, Lipan, Marble Falls, and Seymour aquifers.
- The Capitan Reef Complex Aquifer outside of the boundaries of the Middle Pecos Groundwater Conservation District.
- The Edwards-Trinity (Plateau) Aquifer in Concho, Mason, McCulloch, Nolan, and Tom Green counties.
- The Ellenburger-San Saba Aquifer in Coleman, Concho, and Mason counties.
- The Hickory Aquifer in Coleman and Llano counties.
- The Dockum Aquifer outside of Reagan and Pecos counties.
- The Ogallala Aquifer outside of Glasscock County.

CLARIFICATIONS:

In response to a request for clarifications from the TWDB in 2021, the Groundwater Management Area 7 Chair, Ms. Meredith Allen, and Groundwater Management Area 7 consultant, Dr. William R. Hutchison, provided the following clarifications regarding the definition of the desired future conditions. These clarifications were necessary for verifying that the desired future conditions of the aquifers were attainable and for confirming approval of the TWDB methodology to calculate modeled available groundwater volumes in Groundwater Management Area 7:

Capitan Reef Complex Aquifer

- The calculated modeled available groundwater values are based on the official TWDB aquifer boundary.
- The modeled available groundwater calculations are based on the desired future conditions with a one-foot tolerance (that is, modeled drawdown verifications within one foot of the desired future conditions are acceptable).
- Drawdown calculations used to define the desired future conditions value take into consideration the occurrence of "dry" cells, where water levels are below the base of the aquifer.

Dockum Aquifer

- The calculated modeled available groundwater values are based on the spatial extent of the Dockum Formation, as represented in the groundwater availability model for the High Plains Aquifer System, rather than the official TWDB aquifer boundary.
- Modeled available groundwater analysis excludes model pass-through cells.
- The modeled available groundwater calculations are based on the desired future conditions with a one-foot tolerance (that is, modeled drawdown verifications within one foot of the desired future conditions are acceptable).

Ogallala Aquifer

- The calculated modeled available groundwater values are based on the official TWDB aquifer boundary and use the same model assumptions used in Groundwater Management Area 7 Technical Memorandum 16-01 (Hutchison, 2016c).
- Drawdown calculations used to define the desired future conditions do not take into consideration the occurrence of "dry" cells, where water levels are below the base of the aquifer.

- The modeled available groundwater calculations are based on the desired future conditions with a one-foot tolerance (that is, modeled drawdown verifications within one foot of the desired future conditions are acceptable).

Edwards-Trinity (Plateau), Pecos Valley, and Trinity aquifers

- The calculated modeled available groundwater values are based on the official TWDB aquifer boundaries.
- The modeled available groundwater calculations are based on the desired future conditions with a one-foot tolerance (that is, modeled drawdown verifications within one foot of the desired future conditions value are acceptable).
- Drawdown calculations used to define the desired future conditions include drawdowns for cells with water levels below the base elevation of the cell ("dry" cells).

Kinney County

- The modeled available groundwater values, model assumptions, and simulated springflow are from GAM Run 10-043 MAG Version 2 (Shi, 2012).

Val Verde County

- There is no associated drawdown as a desired future condition. The desired future condition is based solely on simulated spring flow conditions at San Felipe Spring of 73 to 75 million gallons per day. Pumping scenarios—50,000 acre-feet per year—in three well field locations and monthly hydrologic conditions for the historic period 1969 to 2012 meet the desired future conditions set by Groundwater Management Area 7 (EcoKai and Hutchison, 2014; Hutchison 2021).

Minor Aquifers of the Llano Uplift Area

- The calculated modeled available groundwater values are based on the full spatial extent of the Ellenburger-San Saba and Hickory formations in the groundwater availability model for the aquifers of the Llano Uplift Area rather than the official TWDB aquifer boundaries and use the same model assumptions used in Groundwater Management Area 7 Technical Memorandum 16-02 (Hutchison 2016b).
- The modeled available groundwater calculations are based on the desired future conditions with a one-foot tolerance (that is, modeled drawdown verifications within one foot of the desired future conditions value are acceptable).

- The drawdown calculations used to define desired future conditions did not include "dry" cells, where water levels are below the base of the aquifer.

Rustler Aquifer

- The model used to define desired future conditions and calculate modeled available groundwater assumes that the initial model heads represent the heads at the end of 2008 (the baseline for calculating desired future conditions drawdown values).
- Calculated modeled available groundwater values are based on the full spatial extent of the Rustler Formation, as represented in the groundwater availability model for the Rustler Aquifer, rather than the official TWDB aquifer boundary.
- The predictive model used to define desired future conditions and calculate modeled available groundwater uses the same model assumptions used in Groundwater Management Area 7 Technical Memorandum 15-05 (Hutchison, 2016d).
- The modeled available groundwater calculations are based on the desired future conditions with a one-foot tolerance (that is, modeled drawdown verifications within one foot of the desired future conditions value are acceptable).

METHODS:

As defined in Chapter 36 of the Texas Water Code (TWC, 2011), "modeled available groundwater" is the estimated average amount of water that may be produced annually to achieve a desired future condition. Groundwater conservation districts are required to consider modeled available groundwater, along with several other factors, when issuing permits 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.

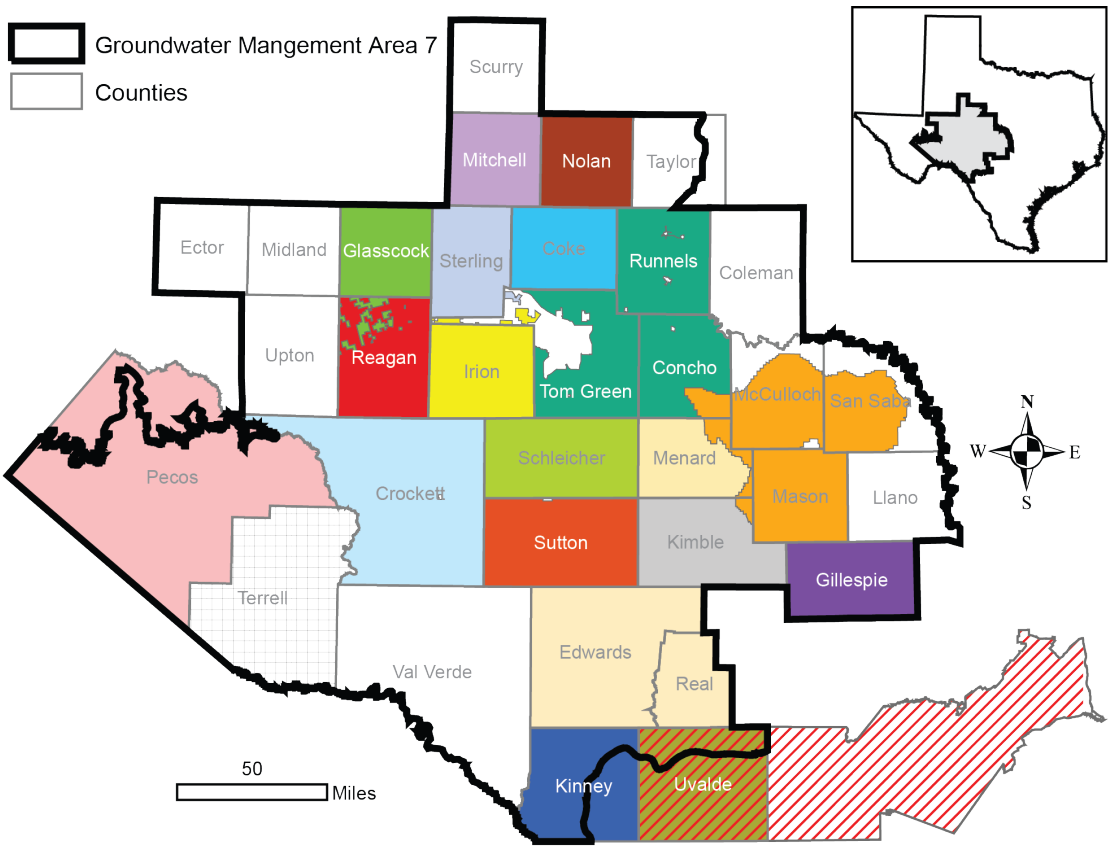
For relevant aquifers with desired future conditions based on water-level drawdown, water levels simulated at the end of the predictive simulations were compared to the water levels in the baseline year. These baseline years are 2005 in the groundwater availability model for the Capitan Reef Complex Aquifer and the alternative model for the Edwards-Trinity (Plateau) and Pecos Valley aquifers, 2012 in the groundwater availability model for the High Plains Aquifer System, 2010 in the groundwater availability model for the minor aquifers of the Llano Uplift Area, and 2008 in the groundwater availability model for the Rustler Aquifer. The predictive model runs used average pumping rates from the historical period for the respective model except in the aquifer or area of interest. In those areas, pumping rates are varied until they produce drawdowns consistent with the adopted desired future conditions. In most cases, these model runs were supplied by Groundwater Management Area 7 for review by TWDB staff before they were used to calculate the modeled available groundwater. Pumping rates or modeled available groundwater are reported in 10-year intervals.

Water-level drawdown averages were calculated for the relevant portions of each aquifer. Drawdown for model cells that became dry during the simulation—when the water level dropped below the base of the cell—were excluded from the averaging. In Groundwater Management Area 7, dry cells only occur during the predictive period in the Ogallala Aquifer of Glasscock County. Consequently, estimates of modeled available groundwater decrease over time as continued simulated pumping predicts the development of increasing numbers of dry model cells in areas of the Ogallala Aquifer in Glasscock County. The calculated water-level drawdown averages for all aquifers were compared with the desired future conditions to verify that the pumping scenario achieved the desired future conditions.

In Kinney and Val Verde counties, the desired future conditions are based on discharge from selected springs. In these cases, spring discharge was estimated based on simulated average spring discharge over a historical period, maintaining all historical hydrologic conditions—such as recharge and river stage—except pumping. In other words, we

assume that past average hydrologic conditions—the range of fluctuation—will continue in the future. In the cases of Kinney and Val Verde counties, simulated spring discharge was based on hydrologic variations that took place over the periods 1950 through 2005 and 1968 through 2013, respectively. The desired future condition for the Edwards-Trinity (Plateau) Aquifer in Kinney County is similar to the one adopted in 2010 and the associated modeled available groundwater is based on a specific model run—GAM Run 10-043 (Shi, 2012).

Modeled available groundwater values for the Ellenburger-San Saba and Hickory aquifers were determined by extracting pumping rates by decade from the model results using ZONBUDUSG Version 1.01 (Panday and others, 2013). For the remaining relevant aquifers in Groundwater Management Area 7 modeled available groundwater values were determined by extracting pumping rates by decade from the model results using ZONEBUDGET Version 3.01 (Harbaugh, 2009). Decadal modeled available groundwater for the relevant aquifers is reported by groundwater conservation district and county (Figure 1; Tables 1, 3, 5, 7, 9, 11, 13), and by county, regional water planning area, and river basin (Figures 2 and 3; Tables 2, 4, 6, 8, 10, 12, 14).



Groundwater Conservation Districts

- Coke County UWCD
- Crockett County GCD
- Edwards Aquifer Authority
- Glasscock GCD
- Hickory UWCD No. 1
- Hill Country UWCD
- Irion County WCD
- Kimble County GCD
- Kinney County GCD
- Lipan-Kickapoo WCD
- Lone Wolf GCD
- Menard County UWD
- Middle Pecos GCD
- Plateau UWC and Supply District
- Real-Edwards Conservation and Reclamation District
- Santa Rita UWCD
- Sterling County UWCD
- Sutton County UWCD
- Terrell County GCD
- Uvalde County UWCD
- Wes-Tex GCD

FIGURE 1. MAP SHOWING THE GROUNDWATER CONSERVATION DISTRICTS (GCD) IN GROUNDWATER MANAGEMENT AREA 7. NOTE: THE BOUNDARIES OF THE EDWARDS AQUIFER AUTHORITY OVERLAP WITH THE UVALDE COUNTY UNDERGROUND WATER CONSERVATION DISTRICT (UWCD).

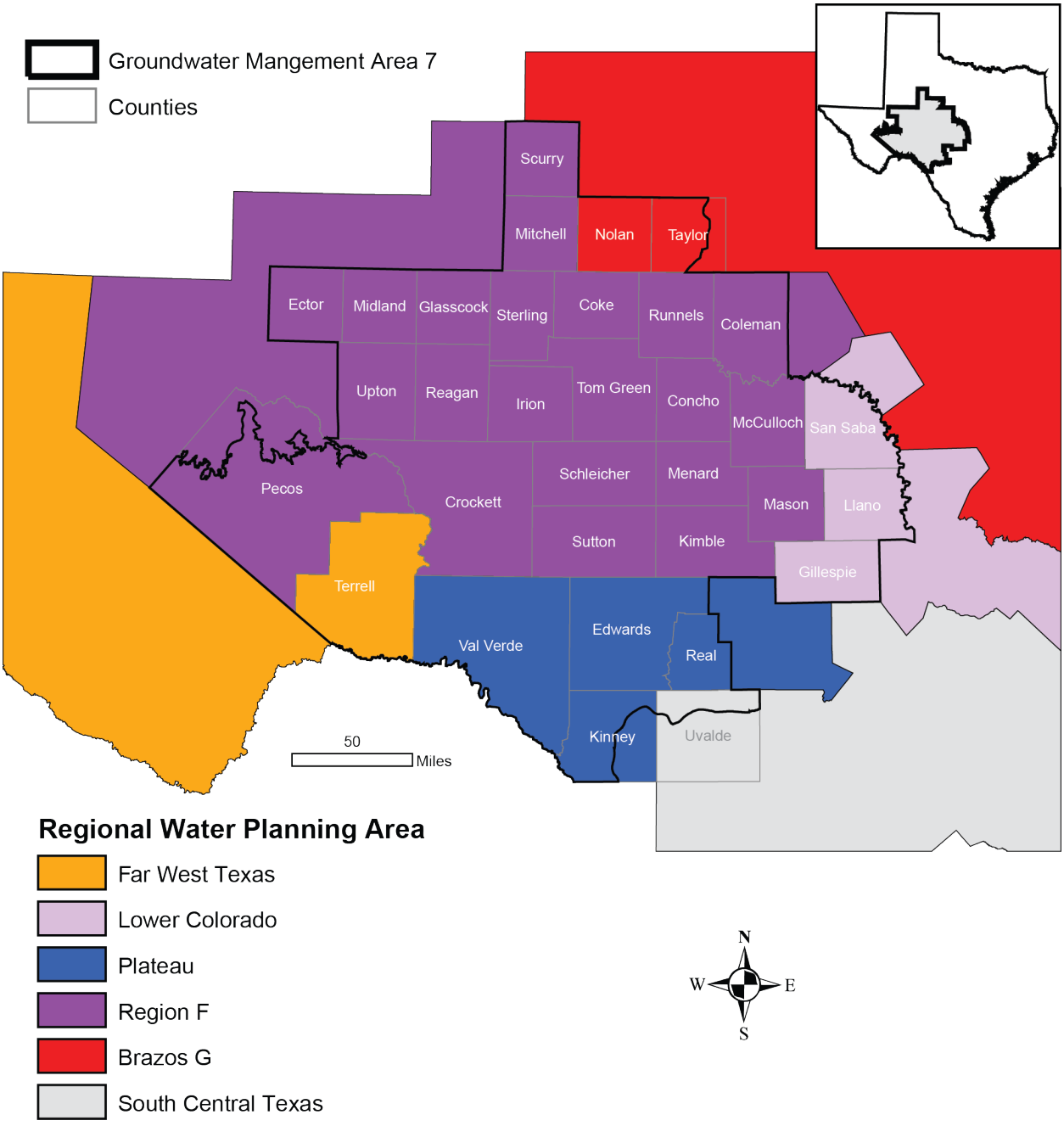


FIGURE 2. MAP SHOWING REGIONAL WATER PLANNING AREAS IN GROUNDWATER MANAGEMENT AREA 7.

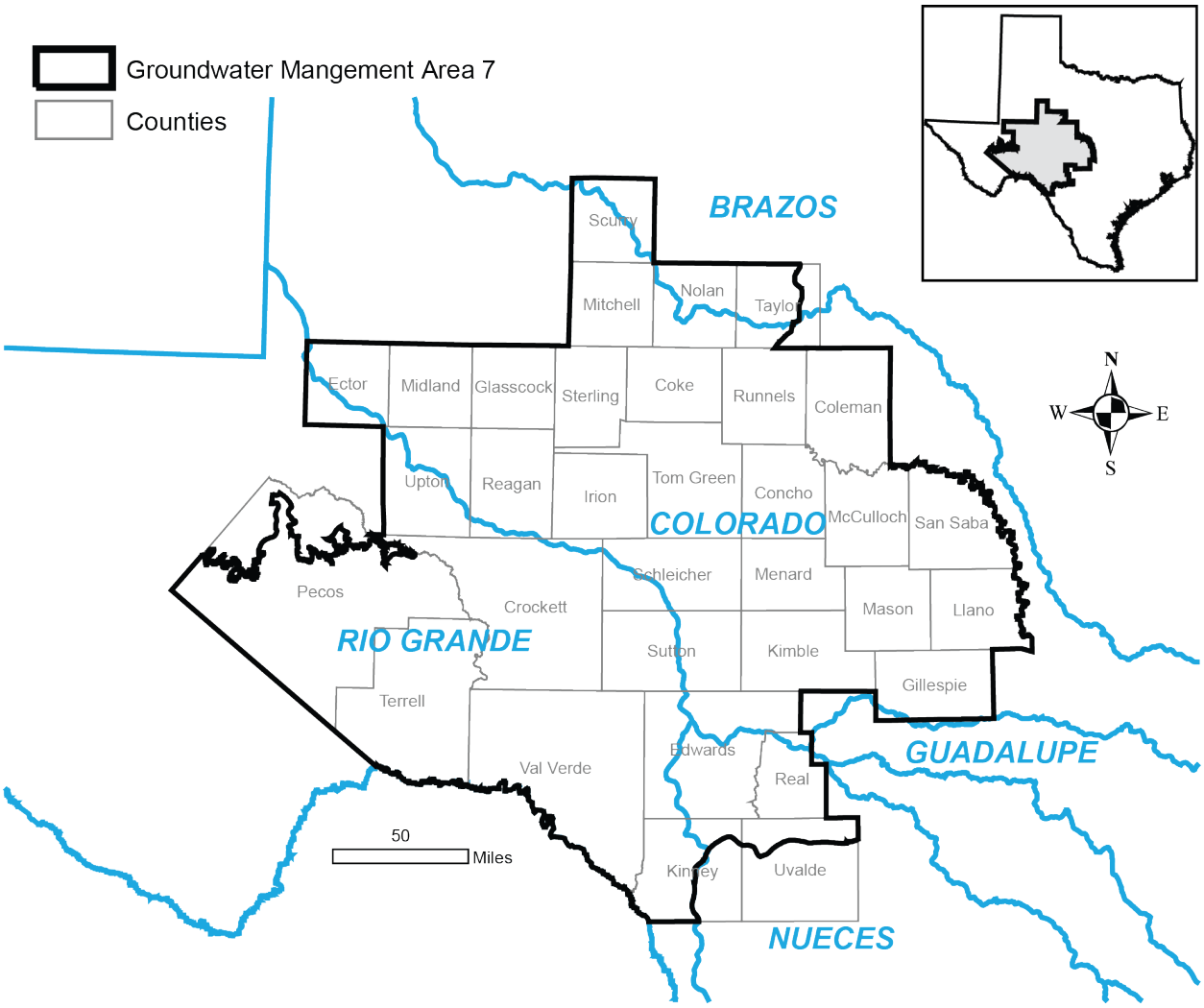


FIGURE 3. MAP SHOWING RIVER BASINS IN GROUNDWATER MANAGEMENT AREA 7. THESE INCLUDE PARTS OF THE BRAZOS, COLORADO, GUADALUPE, NUECES, AND RIO GRANDE RIVER BASINS.

PARAMETERS AND ASSUMPTIONS:

Capitan Reef Complex Aquifer

- Version 1.01 of the groundwater availability model of the eastern arm of the Capitan Reef Complex Aquifer was used. See Jones (2016) for assumptions and limitations of the groundwater availability model. See Hutchison (2016a) for details on the assumptions used for predictive simulations.
- The model has five layers: Layer 1, the Edwards-Trinity (Plateau) and Pecos Valley aquifers; Layer 2, the Dockum Aquifer and the Dewey Lake Formation; Layer 3, the Rustler Aquifer; Layer 4, a confining unit made up of the Salado and Castile formations, and the overlying portion of the Artesia Group; and Layer 5, the Capitan Reef Complex Aquifer, part of the Artesia Group, and the Delaware Mountain Group. Layers 1 through 4 are intended to act solely as boundary conditions facilitating groundwater inflow and outflow relative to the Capitan Reef Complex Aquifer (Layer 5).
- The model was run with MODFLOW-2000 (Harbaugh and others, 2000).
- The model was run for the interval 2006 through 2070 for a 64-year predictive simulation. Drawdowns were calculated by subtracting 2006 simulated water levels from 2070 simulated water levels, which were then averaged over the portion of the aquifer in Groundwater Management Area 7.
- During predictive simulations, there were no cells where water levels were below the base elevation of the cell ("dry" cells). Therefore, all drawdowns were included in the averaging.
- Drawdown averages and modeled available groundwater volumes are based on the official TWDB aquifer boundary within Groundwater Management Area 7.

Dockum and Ogallala Aquifers

- Version 1.01 of the groundwater availability model for the High Plains Aquifer System by Deeds and Jigmond (2015) was used to construct the predictive model simulation for this analysis. See Hutchison (2016c) for details of the initial assumptions.
- The model has four layers which represent the Ogallala and Pecos Valley Alluvium aquifers (Layer 1), the Edwards-Trinity (High Plains) and Edwards-Trinity (Plateau) aquifers (Layer 2), the Upper Dockum Aquifer (Layer 3), and the Lower Dockum Aquifer (Layer 4). Pass-through cells exist in layers 2 and 3 to hydraulically connect the Ogallala Aquifer to the Lower Dockum where the Edwards-Trinity (High Plains)

and Upper Dockum aquifers are absent. These pass-through cells were excluded from the calculations of drawdowns and modeled available groundwater.

- The model was run with MODFLOW-NWT (Niswonger and others, 2011). The model uses the Newton formulation and the upstream weighting package, which automatically reduces pumping as heads drop in a particular cell, as defined by the user. This feature may simulate the declining production of a well as saturated thickness decreases. Deeds and Jigmond (2015) modified the MODFLOW-NWT code to use a saturated thickness of 30 feet as the threshold—instead of percent of the saturated thickness—when pumping reductions occur during a simulation. Therefore, the groundwater management area should be aware that the modeled available groundwater values will be less than pumping input values if the modeled saturated thickness drops below that threshold.
- The model was run for the interval 2013 through 2070 for a 58-year predictive simulation. Drawdowns were calculated by subtracting initial water levels from 2070 simulated water levels, which were then averaged over the portion of the aquifer in Groundwater Management Area 7.
- During predictive simulations, there were no cells in the Dockum Aquifer where water levels were below the base elevation of the cell ("dry" cells). Therefore, all drawdowns were included in the averaging. However, in the Ogallala Aquifer, dry cells occurred during the predictive simulation. These dry cells were excluded from the modeled available groundwater calculations.
- Drawdown averages and modeled available groundwater volumes are based on the model boundary within Groundwater Management Area 7 for the Dockum Aquifer and the official TWDB aquifer boundary for the Ogallala Aquifer.

Pecos Valley, Edwards-Trinity (Plateau) and Trinity Aquifers

- The single-layer alternative groundwater flow model for the Edwards-Trinity (Plateau) and Pecos Valley aquifers was used for this analysis. This model is an update to the previously developed groundwater availability model documented in Anaya and Jones (2009). See Hutchison and others (2011a) and Anaya and Jones (2009) for assumptions and limitations of the model. See Hutchison (2016e; 2018) for details on the assumptions used for predictive simulations.
- The groundwater model has one layer representing the Pecos Valley Aquifer and the Edwards-Trinity (Plateau) Aquifer. In the relatively narrow area where both aquifers are present, the model is a lumped representation of both aquifers.
- The model was run with MODFLOW-2000 (Harbaugh and others, 2000).

- The model was run for the interval 2006 through 2070 for a 65-year predictive simulation. Drawdowns were calculated by subtracting 2010 simulated water levels from 2070 simulated water levels, which were then averaged over the portion of the aquifer in Groundwater Management Area 7.
- Because simulated water levels for the baseline year (2010) are not included in the original calibrated historical model, these water levels had to be verified against measured water levels to confirm that the predictive model satisfactorily matched real-world conditions. Comparison of 2010 simulated and measured water levels indicated a root mean squared error of 100 feet or 4 percent of the range in water-level elevations, which is within acceptable limits. Based on these results, we consider the predictive model an appropriate tool for evaluating the attainability of desired future conditions and for calculating modeled available groundwater.
- Drawdowns for cells with water levels below the base elevation of the cell ("dry" cells) were included in the averaging.
- Drawdown averages and modeled available groundwater volumes are based on the official TWDB aquifer boundaries within Groundwater Management Area 7.

Edwards-Trinity (Plateau) Aquifer of Kinney County

- All parameters and assumptions for the Edwards-Trinity (Plateau) Aquifer of Kinney County in Groundwater Management Area 7 are described in GAM Run 10-043 MAG Version 2 (Shi, 2012). This report assumes a planning period from 2010 to 2070.
- The Kinney County Groundwater Conservation District model developed by Hutchison and others (2011b) was used for this analysis. The model was calibrated to water level and spring flux collected from 1950 to 2005.
- The model has four layers representing the following hydrogeologic units (from top to bottom): Carrizo-Wilcox Aquifer (Layer 1), Upper Cretaceous Unit (Layer 2), Edwards (Balcones Fault Zone) Aquifer/Edwards portion of the Edwards-Trinity (Plateau) Aquifer (Layer 3), and Trinity portion of the Edwards-Trinity (Plateau) Aquifer (Layer 4).
- The model was run with MODFLOW-2000 (Harbaugh and others, 2000).
- The model was run for 56 annual stress periods under the conditions set in Scenario 3 in Task 10-027 (Hutchison, 2011).
- Modeled available groundwater volumes are based on the official TWDB aquifer boundary within Groundwater Management Area 7 in Kinney County.

Edwards-Trinity (Plateau) Aquifer of Val Verde County

- The single-layer numerical groundwater flow model for the Edwards-Trinity (Plateau) Aquifer of Val Verde County was used for this analysis. This model is based on the previously developed alternative groundwater model of the Kinney County area documented in Hutchison and others (2011b). See EcoKai and Hutchison (2014) for assumptions and limitations of the model. See Hutchison (2016e; 2021) for details on the assumptions used for predictive simulations, including recharge and pumping assumptions.
- The groundwater model has one layer representing the Edwards-Trinity (Plateau) Aquifer of Val Verde County.
- The model was run with MODFLOW-2005 (Harbaugh, 2005).
- The model was run for a 45-year predictive simulation representing hydrologic conditions of the interval 1968 through 2013. Simulated spring discharge from San Felipe Springs was averaged over duration of the simulation. The resultant pumping rate that met the desired future conditions was applied to the predictive period—2010 through 2070—based on the assumption that average conditions over the predictive period are the same as those over the historic period represented by the model run.
- Modeled available groundwater volumes are based on the official TWDB aquifer boundary within Groundwater Management Area 7 in Val Verde County.

Minor aquifers of the Llano Uplift Area

- We used version 1.01 of the groundwater availability model for the minor aquifers in the Llano Uplift Area. See Shi and others (2016) for assumptions and limitations of the model. See Hutchison (2016b) for details of the initial assumptions.
- The model contains eight layers: Trinity Aquifer, Edwards-Trinity (Plateau) Aquifer, and younger alluvium deposits (Layer 1), confining units (Layer 2), Marble Falls Aquifer and equivalent units (Layer 3), confining units (Layer 4), Ellenburger-San Saba Aquifer and equivalent units (Layer 5), confining units (Layer 6), Hickory Aquifer and equivalent units (Layer 7), and Precambrian units (Layer 8).
- The model was run with MODFLOW-USG beta (development) version (Panday and others, 2013). Perennial rivers and reservoirs were simulated using the MODFLOW-USG river package. Springs were simulated using the MODFLOW-USG drain package.
- The model was run for the interval 2011 through 2070 for a 60-year predictive simulation. Drawdowns were calculated by subtracting initial water levels from 2070 simulated water levels, which were then averaged over the portion of the

aquifer in Groundwater Management Area 7. During predictive simulations, there were no cells where water levels were below the base elevation of the cell ("dry" cells). Therefore, all drawdowns were included in the averaging.

- Drawdown averages and modeled available groundwater volumes are based on the model boundaries within Groundwater Management Area 7.

Rustler Aquifer

- Version 1.01 of the groundwater availability model for the Rustler Aquifer by Ewing and others (2012) was used to construct the predictive model simulation for this analysis. See Hutchison (2016d) for details of the initial assumptions, including recharge conditions.
- The model has two layers, the top one representing the Rustler Aquifer, and the other representing the Dewey Lake Formation and the Dockum Aquifer.
- The model was run with MODFLOW-NWT (Niswonger and others, 2011).
- The model was run for the interval 2009 through 2070 for a 61-year predictive simulation. Drawdowns were calculated by subtracting 2009 simulated water levels from 2070 simulated water levels, which were then averaged over the portion of the aquifer in Groundwater Management Area 7.
- The predictive model used to define desired future conditions uses 2008 recharge conditions throughout the predictive period.
- The predictive model used to define desired future conditions has general-head boundary heads that decline at a rate of 1.5 feet per year.
- During predictive simulations, there were no cells where water levels were below the base elevation of the cell ("dry" cells). Therefore, all drawdowns were included in the averaging.
- Drawdown averages and modeled available groundwater volumes are based on the model boundaries within Groundwater Management Area 7.

RESULTS:

The modeled available groundwater estimates for each decade from 2020 through 2070 are:

- 26,164 acre-feet per year in the Capitan Reef Complex Aquifer,
- 2,324 acre-feet per year in the Dockum Aquifer,
- 6,570 to 7,925 acre-feet per year in the Ogallala Aquifer,

- 479,063 acre-feet per year in the undifferentiated Edwards-Trinity (Plateau), Pecos Valley, and Trinity aquifers,
- 22,616 acre-feet per year in the Ellenburger-San Saba Aquifer,
- 49,936 acre-feet per year in the Hickory Aquifer, and
- 7,040 acre-feet per year in the Rustler Aquifer.

The modeled available groundwater for the respective aquifers has been summarized by aquifer, county, and groundwater conservation district (Tables 1, 3, 5, 7, 9, 11, and 13). The modeled available groundwater is also summarized by county, regional water planning area, river basin, and aquifer for use in the regional water planning process (Tables 2, 4, 6, 8, 10, 12, and 14). The modeled available groundwater for the Ogallala Aquifer that achieves the desired future conditions adopted by districts in Groundwater Management Area 7 decreases from 7,925 to 6,570 acre-feet per year between 2020 and 2070 (Tables 5 and 6). This decline is attributable to the occurrence of increasing numbers of cells where water levels were below the base elevation of the cell ("dry" cells) in parts of Glasscock County. Please note that MODFLOW-NWT automatically reduces pumping as water levels decline.

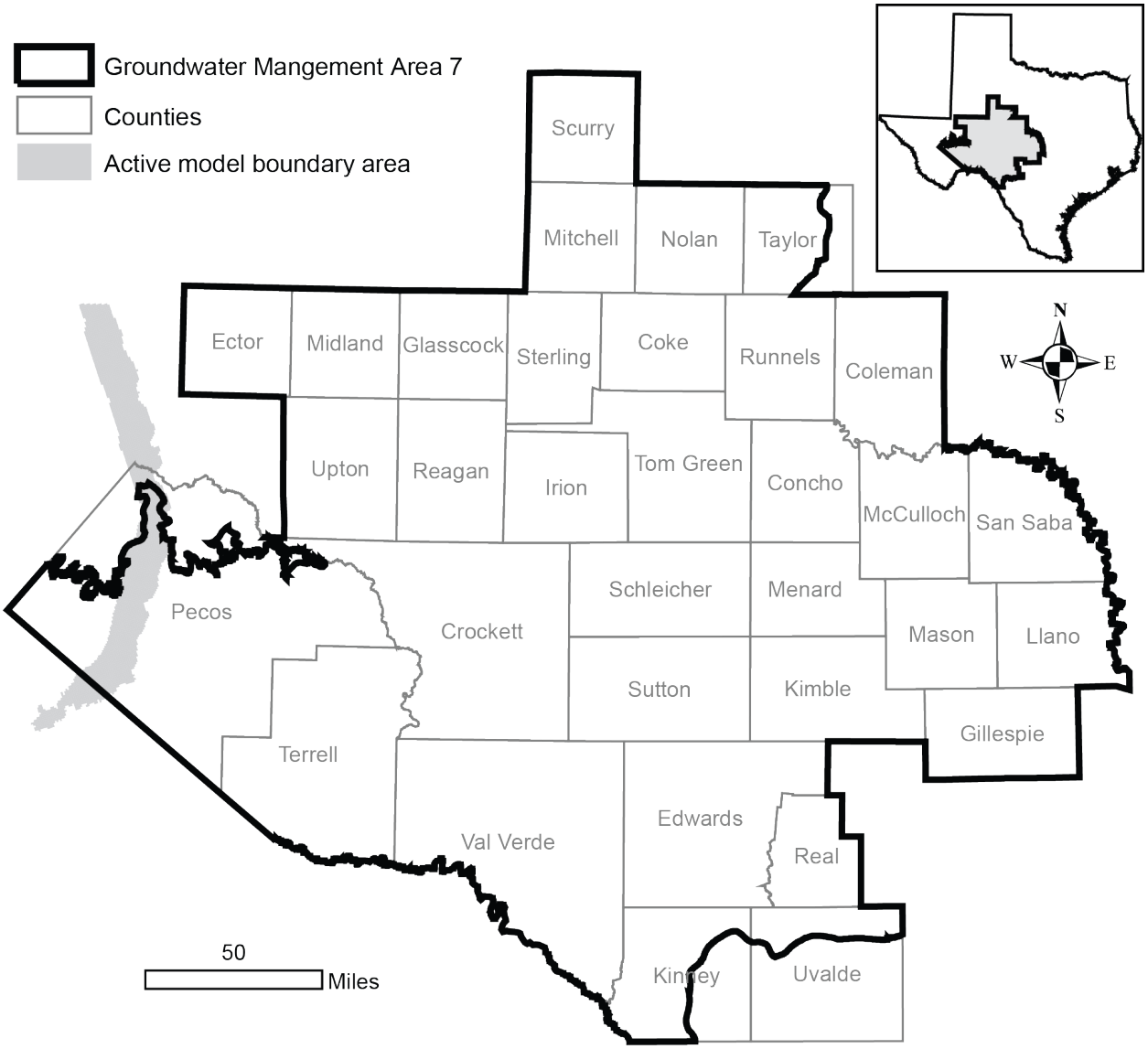


FIGURE 4. MAP SHOWING THE AREAS COVERED BY THE CAPITAN REEF COMPLEX AQUIFER IN THE GROUNDWATER AVAILABILITY MODEL FOR THE EASTERN ARM OF THE CAPITAN REEF COMPLEX AQUIFER IN GROUNDWATER MANAGEMENT AREA 7.

TABLE 1. MODELED AVAILABLE GROUNDWATER FOR THE CAPITAN REEF COMPLEX AQUIFER IN GROUNDWATER MANAGEMENT AREA 7 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR.

District	County	Year					
		2020	2030	2040	2050	2060	2070
Middle Pecos GCD	Pecos	26,164	26,164	26,164	26,164	26,164	26,164
	Total	**26,164**	**26,164**	**26,164**	**26,164**	**26,164**	**26,164**
GMA 7		**26,164**	**26,164**	**26,164**	**26,164**	**26,164**	**26,164**

TABLE 2. MODELED AVAILABLE GROUNDWATER FOR THE CAPITAN REEF COMPLEX AQUIFER IN GROUNDWATER MANAGEMENT AREA 7 SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN FOR EACH DECADE BETWEEN 2030 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR.

County	RWPA	River Basin	Year				
			2030	2040	2050	2060	2070
Pecos	F	Rio Grande	26,164	26,164	26,164	26,164	26,164
		Total	**26,164**	**26,164**	**26,164**	**26,164**	**26,164**
GMA 7			**26,164**	**26,164**	**26,164**	**26,164**	**26,164**

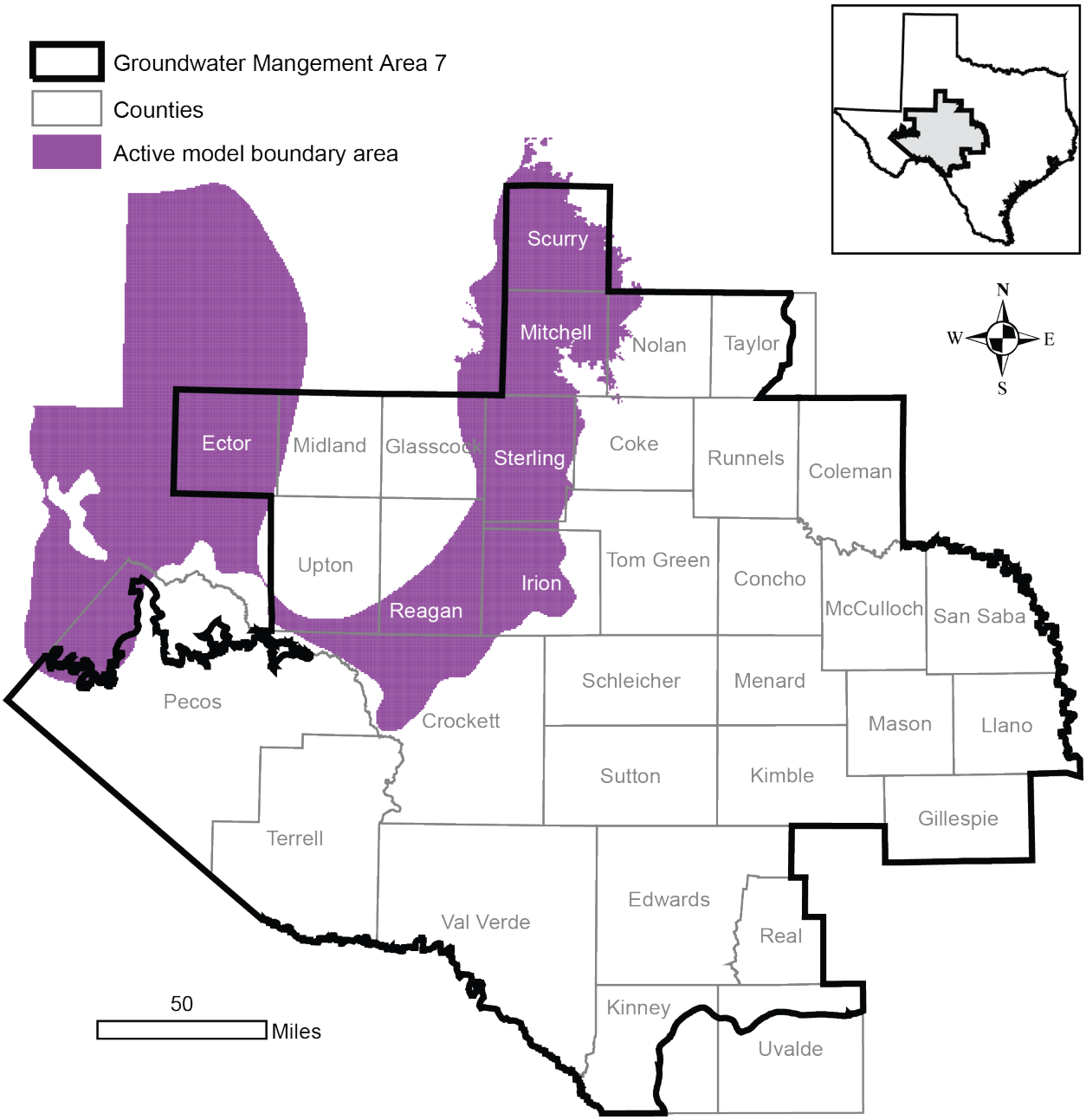


FIGURE 5. MAP SHOWING AREAS COVERED BY THE DOCKUM AQUIFER IN THE GROUNDWATER AVAILABILITY MODEL FOR THE HIGH PLAINS AQUIFER SYSTEM IN GROUNDWATER MANAGEMENT AREA 7.

TABLE 3. MODELED AVAILABLE GROUNDWATER FOR THE DOCKUM AQUIFER IN GROUNDWATER MANAGEMENT AREA 7 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR. GCD AND UWCD ARE THE ABBREVIATIONS FOR GROUNDWATER CONSERVATION DISTRICT AND UNDERGROUND WATER CONSERVATION DISTRICT, RESPECTIVELY.

District	County	Year					
		2020	2030	2040	2050	2060	2070
Middle Pecos GCD	Pecos	2,022	2,022	2,022	2,022	2,022	2,022
	Total	**2,022**	**2,022**	**2,022**	**2,022**	**2,022**	**2,022**
Santa Rita UWCD	Reagan	302	302	302	302	302	302
	Total	**302**	**302**	**302**	**302**	**302**	**302**
GMA 7		**2,324**	**2,324**	**2,324**	**2,324**	**2,324**	**2,324**

Note: The modeled available groundwater for Santa Rita Underground Water Conservation District excludes parts of Reagan County that fall within Glasscock Groundwater Conservation District.

TABLE 4. MODELED AVAILABLE GROUNDWATER FOR THE DOCKUM AQUIFER IN GROUNDWATER MANAGEMENT AREA 7 SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN FOR EACH DECADE BETWEEN 2030 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR.

County	RWPA	River Basin	Year				
			2030	2040	2050	2060	2070
Pecos	F	Rio Grande	2,022	2,022	2,022	2,022	2,022
		Total	**2,022**	**2,022**	**2,022**	**2,022**	**2,022**
Reagan	F	Colorado	302	302	302	302	302
		Rio Grande	0	0	0	0	0
		Total	**302**	**302**	**302**	**302**	**302**
GMA 7			**2,324**	**2,324**	**2,324**	**2,324**	**2,324**

Note: The modeled available groundwater for Reagan County excludes parts of Reagan County that fall outside of Santa Rita Underground Water Conservation District.

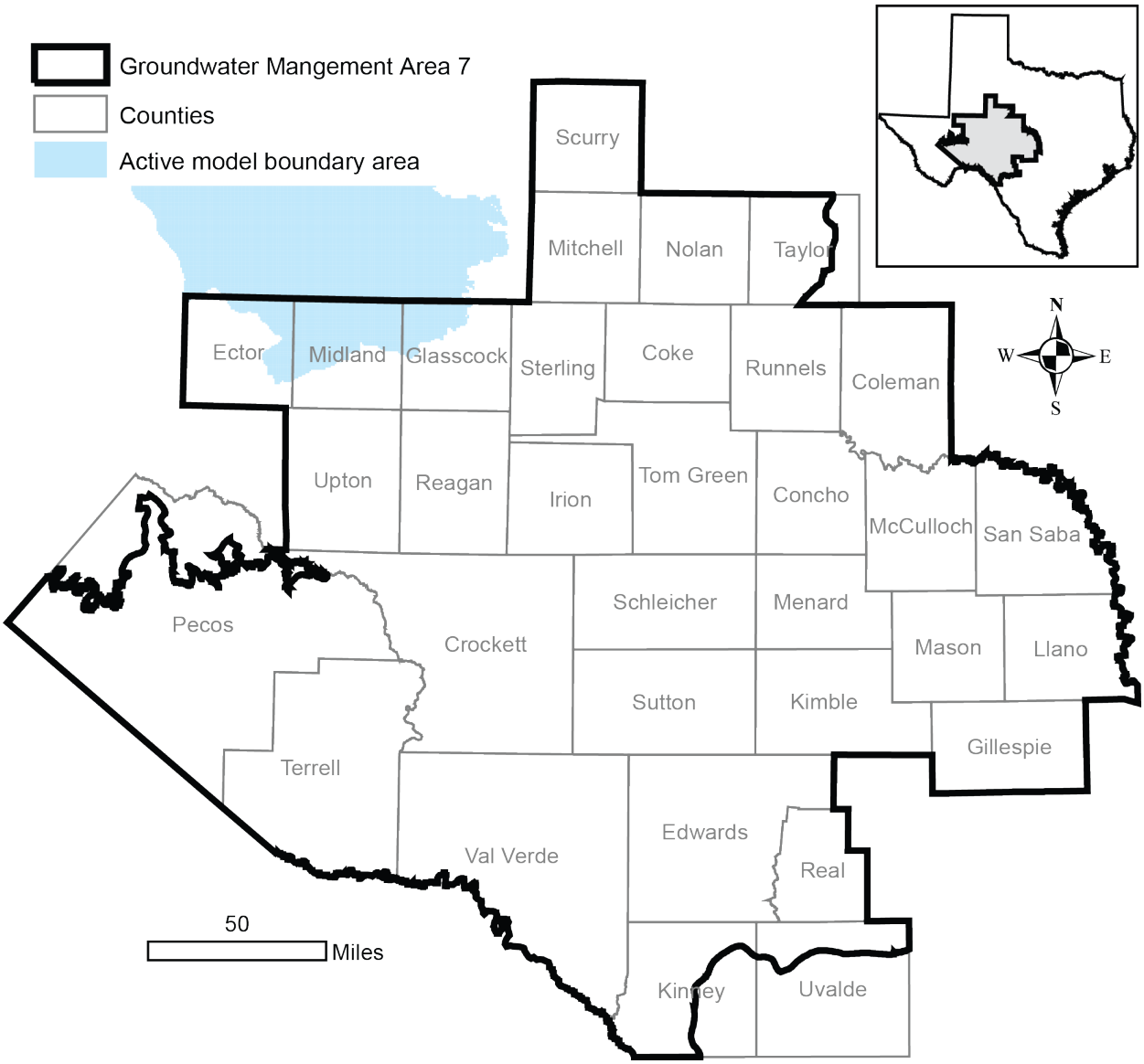


FIGURE 6. MAP SHOWING THE AREAS COVERED BY THE OGALLALA AQUIFER IN THE GROUNDWATER AVAILABILITY MODEL FOR THE HIGH PLAINS AQUIFER SYSTEM IN GROUNDWATER MANAGEMENT AREA 7.

TABLE 5. MODELED AVAILABLE GROUNDWATER FOR THE OGALLALA AQUIFER IN GROUNDWATER MANAGEMENT AREA 7 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR.

District	County	Year					
		2020	2030	2040	2050	2060	2070
Glasscock GCD	Glasscock	7,925	7,673	7,372	7,058	6,803	6,570
	Total	**7,925**	**7,673**	**7,372**	**7,058**	**6,803**	**6,570**
GMA 7		**7,925**	**7,673**	**7,372**	**7,058**	**6,803**	**6,570**

TABLE 6. MODELED AVAILABLE GROUNDWATER FOR THE OGALLALA AQUIFER IN GROUNDWATER MANAGEMENT AREA 7 SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN FOR EACH DECADE BETWEEN 2030 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR.

County	RWPA	River Basin	Year				
			2030	2040	2050	2060	2070
Glasscock	F	Colorado	7,673	7,372	7,058	6,803	6,570
		Total	**7,673**	**7,372**	**7,058**	**6,803**	**6,570**
GMA 7			**7,673**	**7,372**	**7,058**	**6,803**	**6,570**

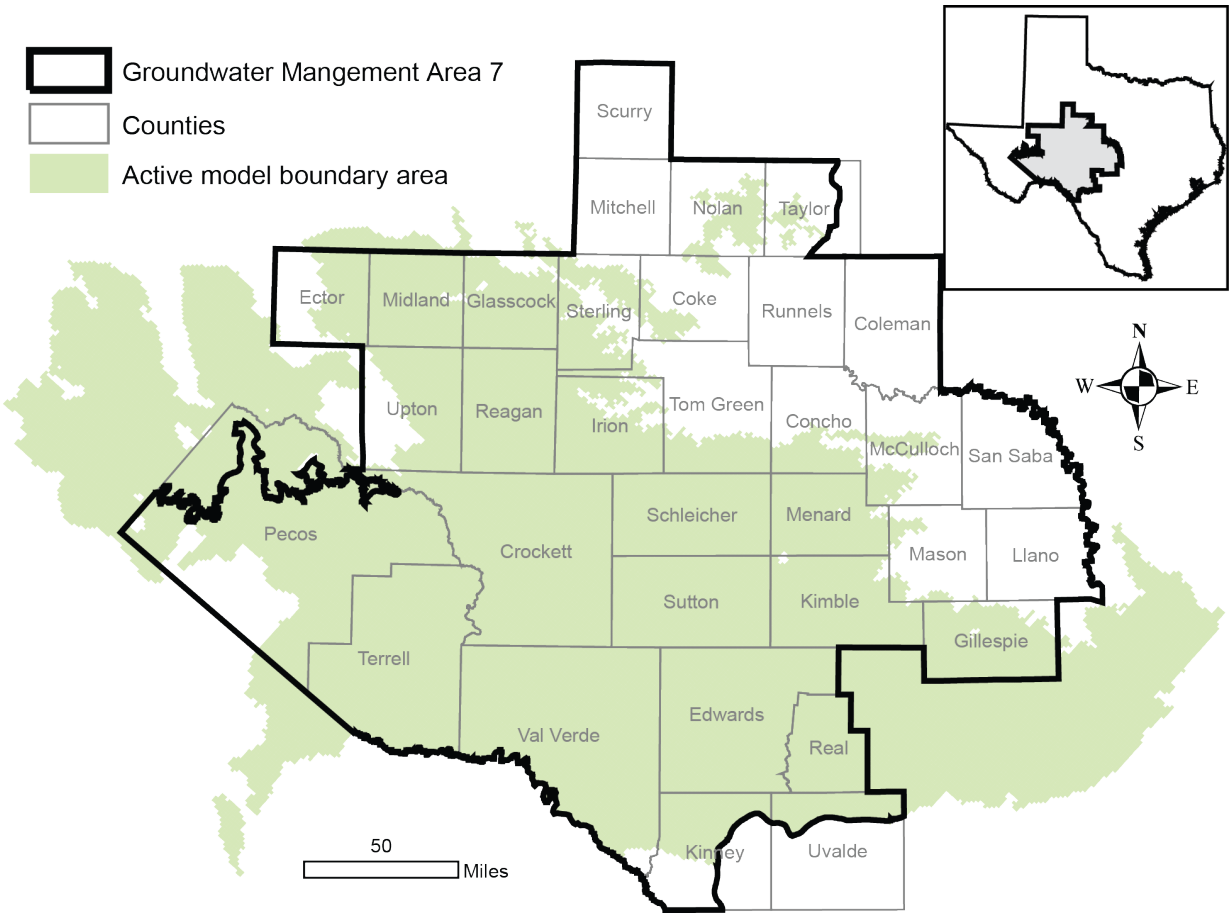


FIGURE 7. MAP SHOWING THE AREAS COVERED BY THE UNDIFFERENTIATED EDWARDS-TRINITY (PLATEAU), PECOS VALLEY, AND TRINITY AQUIFERS IN THE GROUNDWATER AVAILABILITY MODEL FOR THE EDWARDS-TRINITY (PLATEAU) AND PECOS VALLEY AQUIFERS IN GROUNDWATER MANAGEMENT AREA 7.

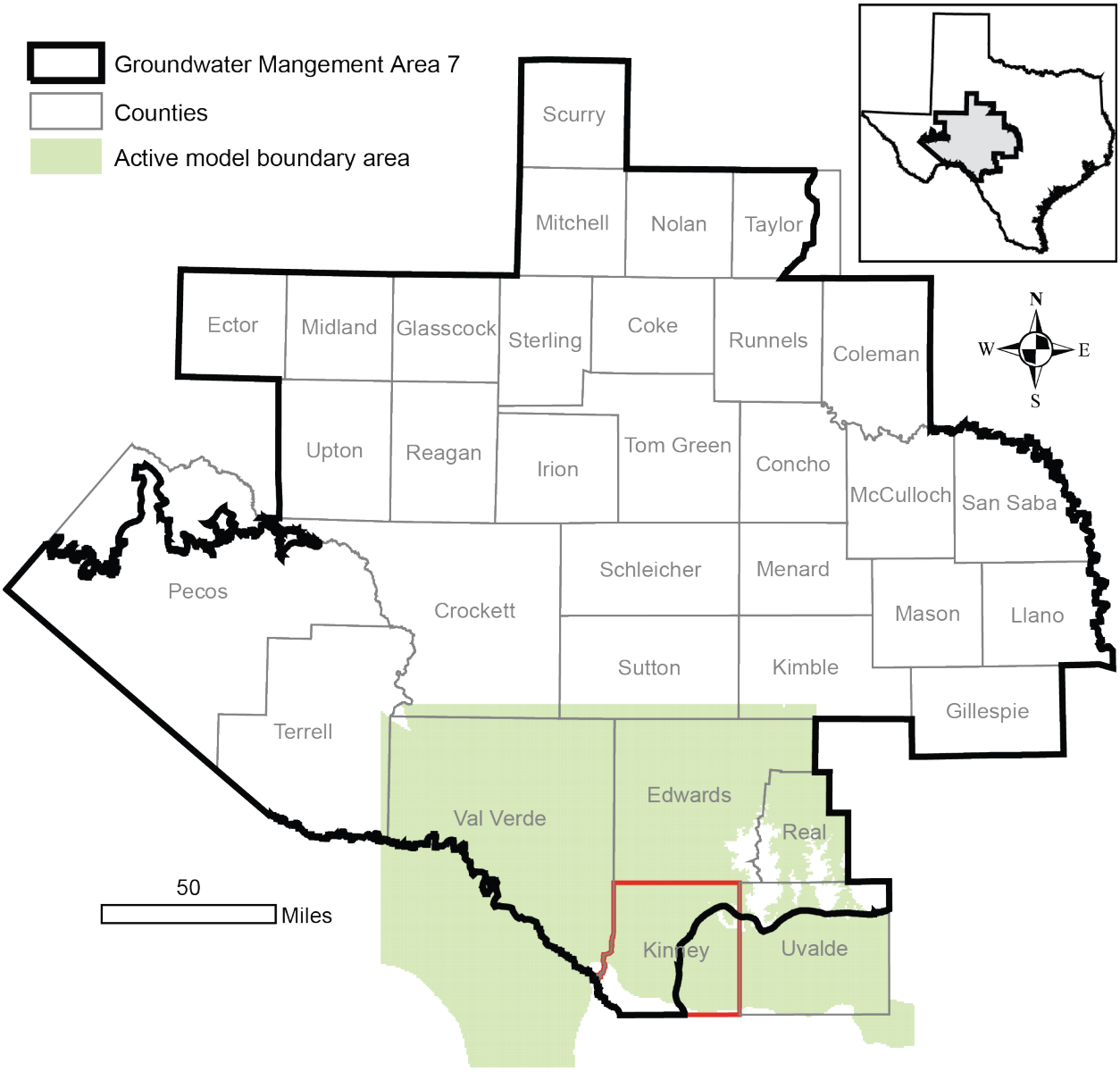


FIGURE 8. MAP SHOWING THE AREAS COVERED BY THE EDWARDS-TRINITY (PLATEAU) AQUIFER IN THE ALTERNATIVE MODEL FOR THE EDWARDS-TRINITY (PLATEAU) AQUIFER IN KINNEY COUNTY [HIGHLIGHTED IN RED].

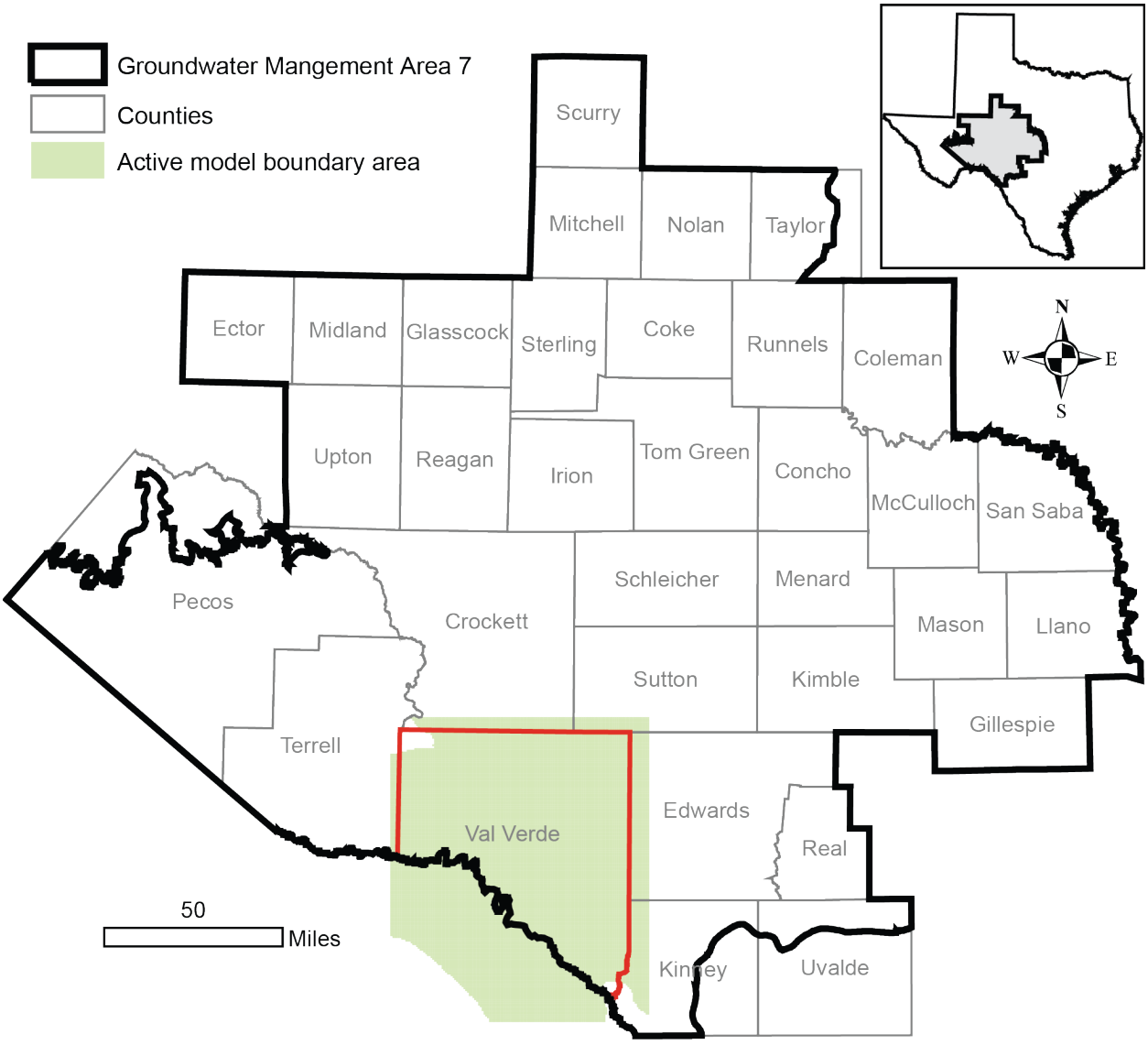


FIGURE 9. MAP SHOWING THE AREAS COVERED BY THE EDWARDS-TRINITY (PLATEAU) AQUIFER IN THE GROUNDWATER FLOW MODEL FOR THE EDWARDS-TRINITY (PLATEAU) AQUIFER IN VAL VERDE COUNTY [HIGHLIGHTED IN RED].

TABLE 7. MODELED AVAILABLE GROUNDWATER FOR THE UNDIFFERENTIATED EDWARDS-TRINITY (PLATEAU), PECOS VALLEY, AND TRINITY AQUIFERS IN GROUNDWATER MANAGEMENT AREA 7 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY, FOR EACH DECADE BETWEEN 2020 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR. UWCD IS ABBREVIATION FOR UNDERGROUND WATER CONSERVATION DISTRICT, WCD IS WATER CONSERVATION DISTRICT, UWD IS UNDERGROUND WATER DISTRICT, UWC IS UNDERGROUND WATER CONSERVATION, AND C AND R DISTRICT IS CONSERVATION AND RECLAMATION DISTRICT.

District	County	Year					
		2020	2030	2040	2050	2060	2070
Coke County UWCD	Coke	997	997	997	997	997	997
	Total	**997**	**997**	**997**	**997**	**997**	**997**
Crockett County GCD	Crockett	4,675	4,675	4,675	4,675	4,675	4,675
	Total	**4,675**	**4,675**	**4,675**	**4,675**	**4,675**	**4,675**
Glasscock GCD	Glasscock	65,186	65,186	65,186	65,186	65,186	65,186
	Reagan	40,835	40,835	40,835	40,835	40,835	40,835
	Total	**106,021**	**106,021**	**106,021**	**106,021**	**106,021**	**106,021**
Hickory UWCD No. 1	Kimble	104	104	104	104	104	104
	Menard	380	380	380	380	380	380
	Total	**484**	**484**	**484**	**484**	**484**	**484**
Hill Country UWCD	Gillespie	4,979	4,979	4,979	4,979	4,979	4,979
	Total	**4,979**	**4,979**	**4,979**	**4,979**	**4,979**	**4,979**
Irion County WCD	Irion	3,289	3,289	3,289	3,289	3,289	3,289
	Total	**3,289**	**3,289**	**3,289**	**3,289**	**3,289**	**3,289**
Kimble County GCD	Kimble	1,282	1,282	1,282	1,282	1,282	1,282
	Total	**1,282**	**1,282**	**1,282**	**1,282**	**1,282**	**1,282**

TABLE 7. (CONTINUED).

District	County	Year					
		2020	2030	2040	2050	2060	2070
Kinney County GCD	Kinney	70,341	70,341	70,341	70,341	70,341	70,341
	Total	**70,341**	**70,341**	**70,341**	**70,341**	**70,341**	**70,341**
Menard County UWD	Menard	2,217	2,217	2,217	2,217	2,217	2,217
	Total	**2,217**	**2,217**	**2,217**	**2,217**	**2,217**	**2,217**
Middle Pecos GCD	Pecos	117,309	117,309	117,309	117,309	117,309	117,309
	Total	**117,309**	**117,309**	**117,309**	**117,309**	**117,309**	**117,309**
Plateau UWC and Supply District	Schleicher	8,034	8,034	8,034	8,034	8,034	8,034
	Total	**8,034**	**8,034**	**8,034**	**8,034**	**8,034**	**8,034**
Real-Edwards C and R District	Edwards	5,676	5,676	5,676	5,676	5,676	5,676
	Real	7,523	7,523	7,523	7,523	7,523	7,523
	Total	**13,199**	**13,199**	**13,199**	**13,199**	**13,199**	**13,199**

TABLE 7. (CONTINUED).

District	County	Year					
		2020	2030	2040	2050	2060	2070
Santa Rita UWCD	Reagan	27,398	27,398	27,398	27,398	27,398	27,398
	Total	**27,398**	**27,398**	**27,398**	**27,398**	**27,398**	**27,398**
Sterling County UWCD	Sterling	2,495	2,495	2,495	2,495	2,495	2,495
	Total	**2,495**	**2,495**	**2,495**	**2,495**	**2,495**	**2,495**
Sutton County UWCD	Sutton	6,400	6,400	6,400	6,400	6,400	6,400
	Total	**6,400**	**6,400**	**6,400**	**6,400**	**6,400**	**6,400**
Terrell County GCD	Terrell	1,420	1,420	1,420	1,420	1,420	1,420
	Total	**1,420**	**1,420**	**1,420**	**1,420**	**1,420**	**1,420**
Uvalde County UWCD	Uvalde	1,993	1,993	1,993	1,993	1,993	1,993
	Total	**1,993**	**1,993**	**1,993**	**1,993**	**1,993**	**1,993**
No district		102,703	102,703	102,703	102,703	102,703	102,703
GMA 7		**475,236**	**475,236**	**475,236**	**475,236**	**475,236**	**475,236**

TABLE 8. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE UNDIFFERENTIATED EDWARDS-TRINITY (PLATEAU), PECOS VALLEY, AND TRINITY AQUIFERS IN GROUNDWATER MANAGEMENT AREA 7 SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN FOR EACH DECADE BETWEEN 2030 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR.

County	RWPA	River Basin	Year				
			2030	2040	2050	2060	2070
Coke	F	Colorado	997	997	997	997	997
		Total	**997**	**997**	**997**	**997**	**997**
Crockett	F	Colorado	20	20	20	20	20
		Rio Grande	5,427	5,427	5,427	5,427	5,427
		Total	**5,447**	**5,447**	**5,447**	**5,447**	**5,447**
Ector	F	Colorado	4,925	4,925	4,925	4,925	4,925
		Rio Grande	617	617	617	617	617
		Total	**5,542**	**5,542**	**5,542**	**5,542**	**5,542**
Edwards	J	Colorado	2,305	2,305	2,305	2,305	2,305
		Nueces	1,631	1,631	1,631	1,631	1,631
		Rio Grande	1,740	1,740	1,740	1,740	1,740
		Total	**5,676**	**5,676**	**5,676**	**5,676**	**5,676**
Gillespie	K	Colorado	4,843	4,843	4,843	4,843	4,843
		Guadalupe	136	136	136	136	136
		Total	**4,979**	**4,979**	**4,979**	**4,979**	**4,979**
Glasscock	F	Colorado	65,186	65,186	65,186	65,186	65,186
		Total	**65,186**	**65,186**	**65,186**	**65,186**	**65,186**

TABLE 8. (CONTINUED).

County	RWPA	River Basin	Year				
			2030	2040	2050	2060	2070
Irion	F	Colorado	3,289	3,289	3,289	3,289	3,289
		Total	**3,289**	**3,289**	**3,289**	**3,289**	**3,289**
Kimble	F	Colorado	1,386	1,386	1,386	1,386	1,386
		Total	**1,386**	**1,386**	**1,386**	**1,386**	**1,386**
Kinney	J	Nueces	12	12	12	12	12
		Rio Grande	70,329	70,329	70,329	70,329	70,329
		Total	**70,341**	**70,341**	**70,341**	**70,341**	**70,341**
Menard	F	Colorado	2,597	2,597	2,597	2,597	2,597
		Total	**2,597**	**2,597**	**2,597**	**2,597**	**2,597**
Midland	F	Colorado	23,233	23,233	23,233	23,233	23,233
		Total	**23,233**	**23,233**	**23,233**	**23,233**	**23,233**
Pecos	F	Rio Grande	117,309	117,309	117,309	117,309	117,309
		Total	**117,309**	**117,309**	**117,309**	**117,309**	**117,309**

TABLE 8. (CONTINUED).

County	RWPA	River Basin	Year				
			2030	2040	2050	2060	2070
Reagan	F	Colorado	68,205	68,205	68,205	68,205	68,205
		Rio Grande	28	28	28	28	28
		Total	**68,233**	**68,233**	**68,233**	**68,233**	**68,233**
Real	J	Colorado	277	277	277	277	277
		Guadalupe	3	3	3	3	3
		Nueces	7,243	7,243	7,243	7,243	7,243
		Total	**7,523**	**7,523**	**7,523**	**7,523**	**7,523**
Schleicher	F	Colorado	6,403	6,403	6,403	6,403	6,403
		Rio Grande	1,631	1,631	1,631	1,631	1,631
		Total	**8,034**	**8,034**	**8,034**	**8,034**	**8,034**
Sterling	F	Colorado	2,495	2,495	2,495	2,495	2,495
		Total	**2,495**	**2,495**	**2,495**	**2,495**	**2,495**
Sutton	F	Colorado	388	388	388	388	388
		Rio Grande	6,022	6,022	6,022	6,022	6,022
		Total	**6,410**	**6,410**	**6,410**	**6,410**	**6,410**
Taylor	G	Brazos	331	331	331	331	331
		Colorado	158	158	158	158	158
		Total	**489**	**489**	**489**	**489**	**489**
Terrell	E	Rio Grande	1,420	1,420	1,420	1,420	1,420
		Total	**1,420**	**1,420**	**1,420**	**1,420**	**1,420**

TABLE 8. (CONTINUED).

County	RWPA	River Basin	Year				
			2030	2040	2050	2060	2070
Upton	F	Colorado	21,243	21,243	21,243	21,243	21,243
		Rio Grande	1,126	1,126	1,126	1,126	1,126
		Total	**22,369**	**22,369**	**22,369**	**22,369**	**22,369**
Uvalde	L	Nueces	1,993	1,993	1,993	1,993	1,993
		Total	**1,993**	**1,993**	**1,993**	**1,993**	**1,993**
Val Verde	J	Rio Grande	50,000	50,000	50,000	50,000	50,000
		Total	**50,000**	**50,000**	**50,000**	**50,000**	**50,000**
GMA 7			**479,063**	**479,063**	**479,063**	**479,063**	**479,063**

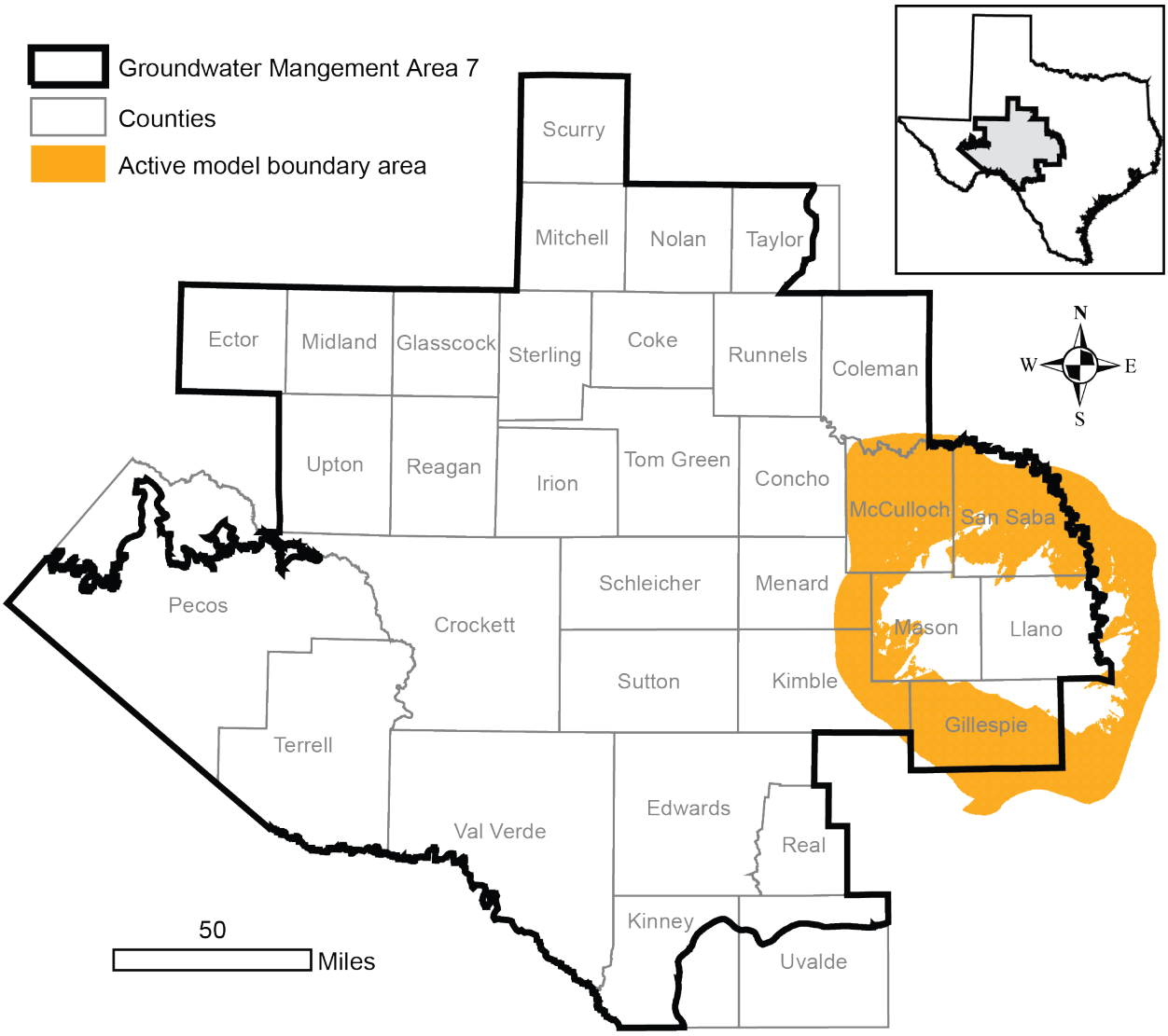


FIGURE 10. MAP SHOWING THE AREAS COVERED BY THE ELLENBURGER-SAN SABA AQUIFER IN THE GROUNDWATER AVAILABILITY MODEL FOR THE MINOR AQUIFERS OF THE LLANO UPLIFT AREA IN GROUNDWATER MANAGEMENT AREA 7.

TABLE 9. MODELED AVAILABLE GROUNDWATER FOR THE ELLENBURGER-SAN SABA AQUIFER IN GROUNDWATER MANAGEMENT AREA 7 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR. UWCD IS THE ABBREVIATION FOR UNDERGROUND WATER CONSERVATION DISTRICT AND UWD IS UNDERGROUND WATER DISTRICT.

District	County	Year					
		2020	2030	2030	2050	2060	2070
Hickory UWCD No. 1	Kimble	344	344	344	344	344	344
	Mason	3,237	3,237	3,237	3,237	3,237	3,237
	McCulloch	3,466	3,466	3,466	3,466	3,466	3,466
	Menard	282	282	282	282	282	282
	San Saba	5,559	5,559	5,559	5,559	5,559	5,559
	Total	**12,887**	**12,887**	**12,887**	**12,887**	**12,887**	**12,887**
Hill Country UWCD	Gillespie	6,294	6,294	6,294	6,294	6,294	6,294
	Total	**6,294**	**6,294**	**6,294**	**6,294**	**6,294**	**6,294**
Kimble County GCD	Kimble	178	178	178	178	178	178
	Total	**178**	**178**	**178**	**178**	**178**	**178**
Menard County UWD	Menard	27	27	27	27	27	27
	Total	**27**	**27**	**27**	**27**	**27**	**27**
No District	McCulloch	898	898	898	898	898	898
	San Saba	2,331	2,331	2,331	2,331	2,331	2,331
	Total	**3,229**	**3,229**	**3,229**	**3,229**	**3,229**	**3,229**
GMA 7		**22,615**	**22,615**	**22,615**	**22,615**	**22,615**	**22,615**

TABLE 10. MODELED AVAILABLE GROUNDWATER FOR THE ELLENBURGER-SAN SABA AQUIFER IN GROUNDWATER MANAGEMENT AREA 7 SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN FOR EACH DECADE BETWEEN 2030 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR.

County	RWPA	River Basin	Year				
			2030	2040	2050	2060	2070
Gillespie	K	Colorado	6,294	6,294	6,294	6,294	6,294
		Total	**6,294**	**6,294**	**6,294**	**6,294**	**6,294**
Kimble	F	Colorado	521	521	521	521	521
		Total	**521**	**521**	**521**	**521**	**521**
Mason	F	Colorado	3,237	3,237	3,237	3,237	3,237
		Total	**3,237**	**3,237**	**3,237**	**3,237**	**3,237**
McCulloch	F	Colorado	4,364	4,364	4,364	4,364	4,364
		Total	**4,364**	**4,364**	**4,364**	**4,364**	**4,364**
Menard	F	Colorado	309	309	309	309	309
		Total	**309**	**309**	**309**	**309**	**309**
San Saba	K	Colorado	7,890	7,890	7,890	7,890	7,890
		Total	**7,890**	**7,890**	**7,890**	**7,890**	**7,890**
GMA 7			**22,615**	**22,615**	**22,615**	**22,615**	**22,615**

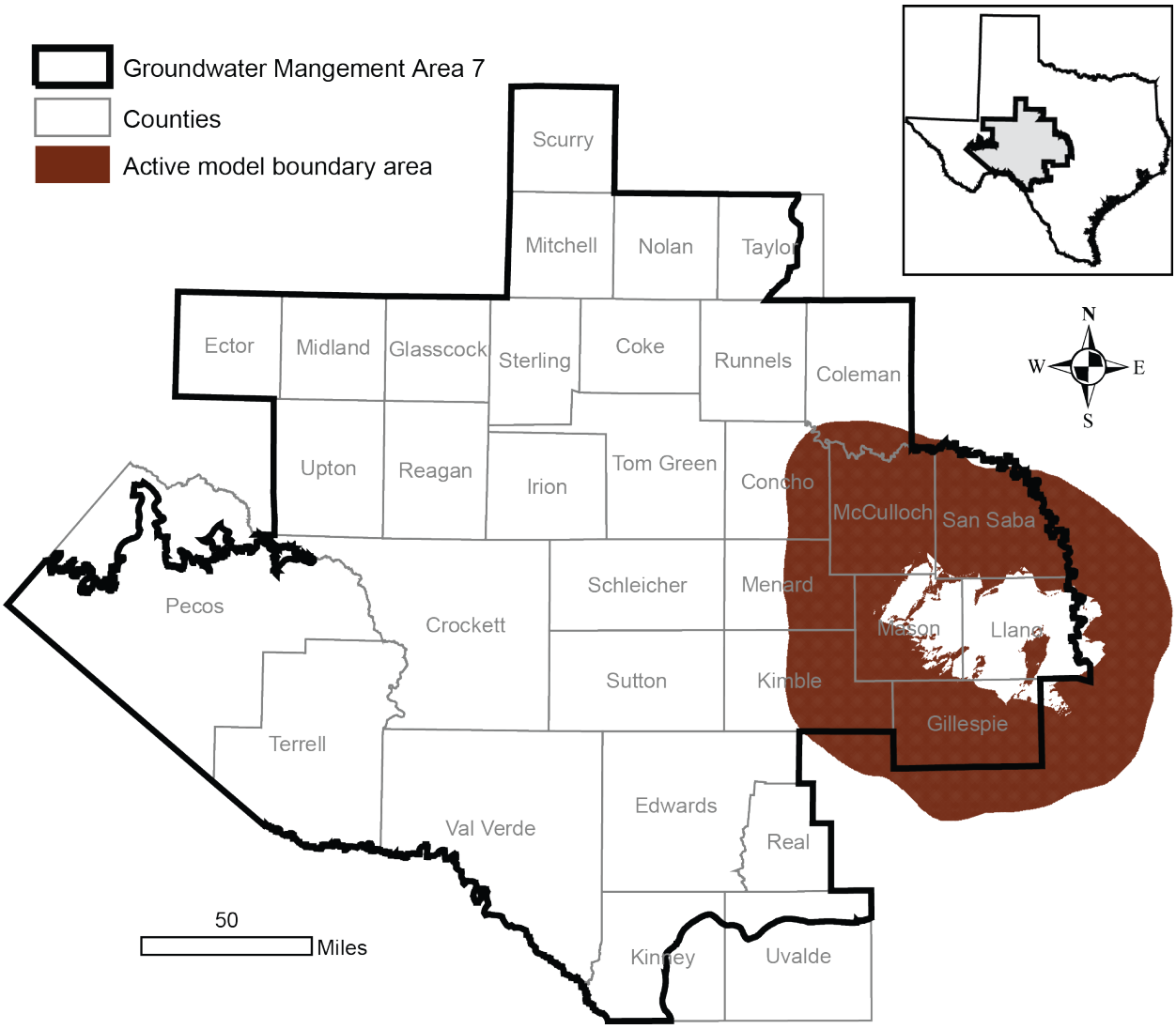


FIGURE 11. MAP SHOWING AREAS COVERED BY THE HICKORY AQUIFER IN THE GROUNDWATER AVAILABILITY MODEL FOR THE MINOR AQUIFERS OF THE LLANO UPLIFT AREA IN GROUNDWATER MANAGEMENT AREA 7.

TABLE 11. MODELED AVAILABLE GROUNDWATER FOR THE HICKORY AQUIFER IN GROUNDWATER MANAGEMENT AREA 7 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR. UWCD IS THE ABBREVIATION FOR UNDERGROUND WATER CONSERVATION DISTRICT AND UWD IS UNDERGROUND WATER DISTRICT.

District	County	Year					
		2020	2030	2040	2050	2060	2070
Hickory UWCD No. 1	Concho	13	13	13	13	13	13
	Kimble	42	42	42	42	42	42
	Mason	13,212	13,212	13,212	13,212	13,212	13,212
	McCulloch	21,950	21,950	21,950	21,950	21,950	21,950
	Menard	2,600	2,600	2,600	2,600	2,600	2,600
	San Saba	7,027	7,027	7,027	7,027	7,027	7,027
	Total	**44,843**	**44,843**	**44,843**	**44,843**	**44,843**	**44,843**
Hill Country UWCD	Gillespie	1,751	1,751	1,751	1,751	1,751	1,751
	Total	**1,751**	**1,751**	**1,751**	**1,751**	**1,751**	**1,751**
Kimble County GCD	Kimble	123	123	123	123	123	123
	Total	**123**	**123**	**123**	**123**	**123**	**123**
Lipan-Kickapoo WCD	Concho	13	13	13	13	13	13
	Total	**13**	**13**	**13**	**13**	**13**	**13**
Menard County UWD	Menard	126	126	126	126	126	126
	Total	**126**	**126**	**126**	**126**	**126**	**126**
No District	McCulloch	2,427	2,427	2,427	2,427	2,427	2,427
	San Saba	652	652	652	652	652	652
	Total	**3,080**	**3,080**	**3,080**	**3,080**	**3,080**	**3,080**
GMA 7		**49,937**	**49,937**	**49,937**	**49,937**	**49,937**	**49,937**

TABLE 12. MODELED AVAILABLE GROUNDWATER FOR THE HICKORY AQUIFER IN GROUNDWATER MANAGEMENT AREA 7 SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN FOR EACH DECADE BETWEEN 2030 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR.

County	RWPA	River Basin	Year				
			2030	2040	2050	2060	2070
Concho	F	Colorado	27	27	27	27	27
		Total	**27**	**27**	**27**	**27**	**27**
Gillespie	K	Colorado	1,751	1,751	1,751	1,751	1,751
		Total	**1,751**	**1,751**	**1,751**	**1,751**	**1,751**
Kimble	F	Colorado	165	165	165	165	165
		Total	**165**	**165**	**165**	**165**	**165**
Mason	F	Colorado	13,212	13,212	13,212	13,212	13,212
		Total	**13,212**	**13,212**	**13,212**	**13,212**	**13,212**
McCulloch	F	Colorado	24,377	24,377	24,377	24,377	24,377
		Total	**24,377**	**24,377**	**24,377**	**24,377**	**24,377**
Menard	F	Colorado	2,725	2,725	2,725	2,725	2,725
		Total	**2,725**	**2,725**	**2,725**	**2,725**	**2,725**
San Saba	K	Colorado	7,680	7,680	7,680	7,680	7,680
		Total	**7,680**	**7,680**	**7,680**	**7,680**	**7,680**
GMA 7			**49,937**	**49,937**	**49,937**	**49,937**	**49,937**

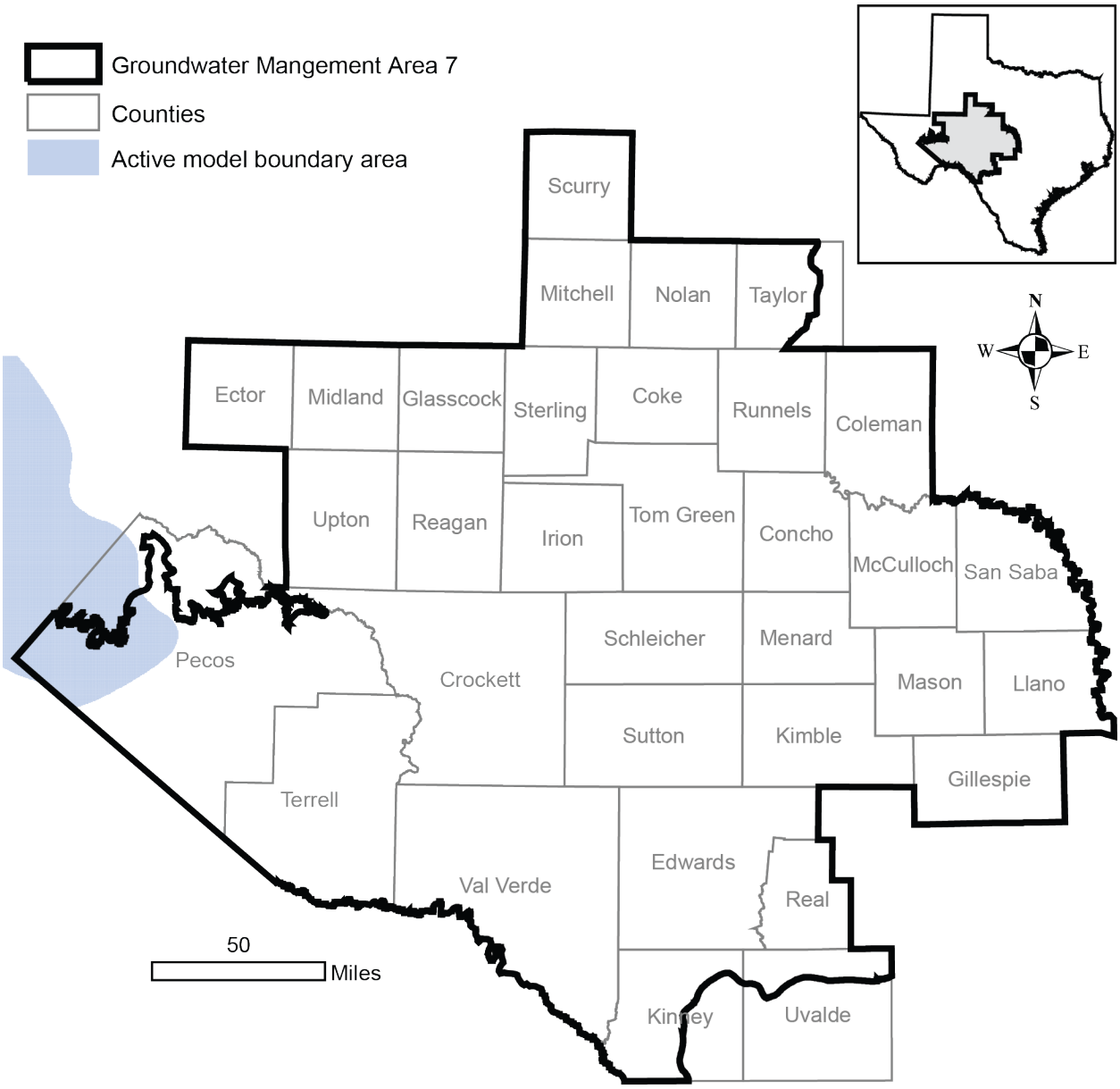


FIGURE 13. MAP SHOWING AREAS COVERED BY THE RUSTLER AQUIFER IN THE GROUNDWATER AVAILABILITY MODEL FOR THE RUSTLER AQUIFER IN GROUNDWATER MANAGEMENT AREA 7.

TABLE 13. MODELED AVAILABLE GROUNDWATER FOR THE RUSTLER AQUIFER IN GROUNDWATER MANAGEMENT AREA 7 SUMMARIZED BY DISTRICT AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR.

District	County	Year					
		2020	2030	2040	2050	2060	2070
Middle Pecos GCD	Pecos	7,040	7,040	7,040	7,040	7,040	7,040
	Total	**7,040**	**7,040**	**7,040**	**7,040**	**7,040**	**7,040**

TABLE 14. MODELED AVAILABLE GROUNDWATER FOR THE RUSTLER AQUIFER IN GROUNDWATER MANAGEMENT AREA 7 SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN FOR EACH DECADE BETWEEN 2030 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR.

County	RWPA	River Basin	Year				
			2030	2040	2050	2060	2070
Pecos	F	Rio Grande	7,040	7,040	7,040	7,040	7,040
		Rio Grande	**7,040**	**7,040**	**7,040**	**7,040**	**7,040**

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 historical groundwater flow conditions includes the assumptions about the location in the aquifer where historic pumping was placed. Understanding the amount and location of historical 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 historical 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.

Model "Dry" Cells

In some cases, the predictive model run for this analysis could result in water levels in some model cells dropping below the base elevation of the cell during the simulation. In terms of water level, the cells have gone dry. However, as noted in the model assumptions the transmissivity of the cell remains constant and will produce water. This would mean that the modeled available groundwater would include imaginary "pumping" values that are coming from cells that are actually dry.

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Appendix B

Estimated Historic Groundwater Use and 2022 State Water Plan Datasets:

Plateau Underground Water Conservation and Supply District

December 5, 2023

Estimated Historical Groundwater Use And 2022 State Water Plan Datasets:

Plateau Underground Water Conservation And Supply District

Texas Water Development Board
Groundwater Division
Groundwater Technical Assistance Section
stephen.allen@twdb.texas.gov
(512) 463-7317
December 5, 2023

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 Groundwater 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 2022 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 Grayson Dowlearn, grayson.dowlearn@twdb.texas.gov, (512) 475-1552.

DISCLAIMER:

The data presented in this report represents the most up to date WUS and 2022 SWP data available as of 12/5/2023. 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 2022 SWP. District personnel must review these datasets and correct any discrepancies 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 2022 SWP dataset can be verified by contacting Sabrina Anderson (sabrina.anderson@twdb.texas.gov or 512-936-0886).

The values presented in the data tables of this report are county-based. In cases where groundwater conservation districts cover only a portion of one or more counties the data values are modified with an apportioning multiplier to create new values that more accurately represent conditions within district boundaries. The multiplier used in the following formula is a land area ratio: (data value * (land area of district in county / land area of county)). For two of the four SWP tables (Projected Surface Water Supplies and Projected Water Demands) only the county-wide water user group (WUG) data values (county other, manufacturing, steam electric power, irrigation, mining and livestock) are modified using the multiplier. WUG values for municipalities, water supply corporations, and utility districts are not apportioned; instead, their full values are retained when they are located within the district, and eliminated when they are located outside (we ask each district to identify these entity locations).

The remaining SWP tables (Projected Water Supply Needs and Projected Water Management Strategies) are not modified because district-specific values are not statutorily required. Each district needs only "consider" the county values in these tables.

In the WUS table every category of water use (including municipal) is apportioned. Staff determined that breaking down the annual municipal values into individual WUGs was too complex.

TWDB recognizes that the apportioning formula used is not ideal but it is the best available process with respect to time and staffing constraints. If a district believes it has data that is more accurate it can add those data to the plan with an explanation of how the data were derived. Apportioning percentages that the TWDB used are listed above each applicable table.

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 2020. TWDB staff anticipates the calculation and posting of these estimates at a later date.

SCHLEICHER COUNTY

100% (multiplier)

All values are in acre-feet

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2019	GW	430	0	0	0	2,399	448	3,277
	SW	0	0	0	0	0	24	24
2018	GW	465	0	0	0	2,362	448	3,275
	SW	0	0	0	0	0	24	24
2017	GW	474	0	0	0	2,368	434	3,276
	SW	0	0	0	0	0	23	23
2016	GW	467	0	7	0	2,209	338	3,021
	SW	0	0	0	0	0	17	17
2015	GW	491	0	37	0	1,751	336	2,615
	SW	0	0	0	0	0	17	17
2014	GW	731	0	84	0	1,924	343	3,082
	SW	0	0	0	0	0	18	18
2013	GW	626	0	158	0	1,729	304	2,817
	SW	0	0	0	0	0	16	16
2012	GW	652	0	98	0	2,020	364	3,134
	SW	0	0	0	0	0	19	19
2011	GW	807	0	15	0	1,941	415	3,178
	SW	0	0	0	0	0	21	21
2010	GW	617	0	72	0	1,442	421	2,552
	SW	0	0	12	0	0	23	35
2009	GW	614	0	58	0	1,432	463	2,567
	SW	0	0	9	0	0	24	33
2008	GW	611	0	44	0	1,095	467	2,217
	SW	0	0	7	0	0	24	31
2007	GW	484	0	17	0	500	508	1,509
	SW	0	0	0	0	0	27	27
2006	GW	481	0	18	0	1,005	506	2,010
	SW	0	0	0	0	0	27	27
2005	GW	473	0	18	0	762	477	1,730
	SW	0	0	0	0	0	25	25
2004	GW	485	0	18	0	734	247	1,484
	SW	0	0	0	0	0	253	253

Projected Surface Water Supplies
TWDB 2022 State Water Plan Data

SCHLEICHER COUNTY

100% (multiplier)

All values are in acre-feet

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
F	Livestock, Schleicher	Colorado	Colorado Livestock Local Supply	17	17	17	17	17	17
F	Livestock, Schleicher	Rio Grande	Rio Grande Livestock Local Supply	6	6	6	6	6	6
	Sum of Projected Surface Water Supplies (acre-feet)			**23**	**23**	**23**	**23**	**23**	**23**

Projected Water Demands
TWDB 2022 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.

SCHLEICHER COUNTY

100% (multiplier)

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
F	County-Other, Schleicher	Colorado	216	247	262	272	278	281
F	County-Other, Schleicher	Rio Grande	31	35	37	38	39	40
F	Eldorado	Colorado	662	652	643	639	638	638
F	Irrigation, Schleicher	Colorado	1,160	1,160	1,160	1,160	1,160	1,160
F	Irrigation, Schleicher	Rio Grande	651	651	651	651	651	651
F	Livestock, Schleicher	Colorado	293	293	293	293	293	293
F	Livestock, Schleicher	Rio Grande	96	96	96	96	96	96
F	Mining, Schleicher	Colorado	460	542	416	290	179	110
F	Mining, Schleicher	Rio Grande	161	190	146	102	62	38
	Sum of Projected Water Demands (acre-feet)		**3,730**	**3,866**	**3,704**	**3,541**	**3,396**	**3,307**

Projected Water Supply Needs
TWDB 2022 State Water Plan Data

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

SCHLEICHER COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
F	County-Other, Schleicher	Colorado	0	0	0	0	0	0
F	County-Other, Schleicher	Rio Grande	0	0	0	0	0	0
F	Eldorado	Colorado	0	0	0	0	0	0
F	Irrigation, Schleicher	Colorado	0	0	0	0	0	0
F	Irrigation, Schleicher	Rio Grande	0	0	0	0	0	0
F	Livestock, Schleicher	Colorado	0	0	0	0	0	0
F	Livestock, Schleicher	Rio Grande	0	0	0	0	0	0
F	Mining, Schleicher	Colorado	0	0	0	0	0	0
F	Mining, Schleicher	Rio Grande	0	0	0	0	0	0
	Sum of Projected Water Supply Needs (acre-feet)		**0**	**0**	**0**	**0**	**0**	**0**

Projected Water Management Strategies
TWDB 2022 State Water Plan Data

SCHLEICHER COUNTY

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

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
Eldorado, Colorado (F)							
Municipal Conservation - El Dorado	DEMAND REDUCTION [Schleicher]	6	6	6	6	6	6
		6	**6**	**6**	**6**	**6**	**6**
Irrigation, Schleicher, Colorado (F)							
Irrigation Conservation - Schleicher County	DEMAND REDUCTION [Schleicher]	58	70	70	70	70	70
Weather Modification	Weather Modification [Atmosphere]	176	176	176	176	176	176
		234	**246**	**246**	**246**	**246**	**246**
Irrigation, Schleicher, Rio Grande (F)							
Irrigation Conservation - Schleicher County	DEMAND REDUCTION [Schleicher]	33	39	39	39	39	39
Weather Modification	Weather Modification [Atmosphere]	99	99	99	99	99	99
		132	**138**	**138**	**138**	**138**	**138**
Mining, Schleicher, Colorado (F)							
Mining Conservation - Schleicher County	DEMAND REDUCTION [Schleicher]	19	23	18	12	7	4
		19	**23**	**18**	**12**	**7**	**4**
Mining, Schleicher, Rio Grande (F)							
Mining Conservation - Schleicher County	DEMAND REDUCTION [Schleicher]	7	8	6	4	3	2
		7	**8**	**6**	**4**	**3**	**2**
Sum of Projected Water Management Strategies (acre-feet)		**398**	**421**	**414**	**406**	**400**	**396**

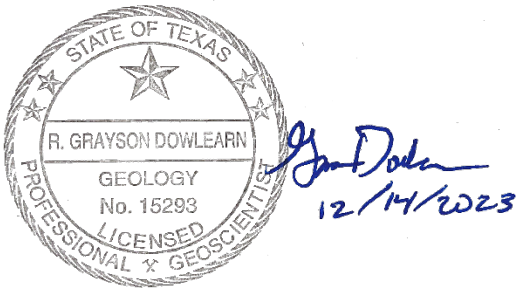
Appendix C

GAM Run 23-023: Plateau Underground Water Conservation and Supply District Management Plan

December 14, 2023

GAM RUN 23-023: PLATEAU UNDERGROUND WATER CONSERVATION & SUPPLY DISTRICT MANAGEMENT PLAN

Saheli Majumdar, Ph.D. and Grayson Dowlearn, P.G.
Texas Water Development Board
Groundwater Division
Groundwater Modeling Department
512-936-2404
December 14, 2023



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GAM RUN 23-023: PLATEAU UNDERGROUND WATER CONSERVATION & SUPPLY DISTRICT MANAGEMENT PLAN

Saheli Majumdar, Ph.D. and Grayson Dowlearn, P.G.
Texas Water Development Board
Groundwater Division
Groundwater Modeling Department
512-936-2404
December 14, 2023

EXECUTIVE SUMMARY:

Texas Water Code § 36.1071(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.

The TWDB provides data and information to the Plateau Underground Water Conservation & Supply District in two parts. Part 1 is the Estimated Historical Water Use/State Water Plan dataset report, which will be provided to you separately by the TWDB Groundwater Technical Assistance Department. Please direct questions about the water data report to Mr. Stephen Allen at 512-463-7317 or stephen.allen@twdb.texas.gov. Part 2 is the required groundwater availability modeling information, which includes:

1. the annual amount of recharge from precipitation, if any, to the groundwater resources within the district;

2. the annual volume of water that discharges from the aquifer to springs and any surface-water bodies, including lakes, streams, and rivers, for each aquifer within the district; and

3. the annual volume of flow into and out of the district within each aquifer and between aquifers in the district.

The groundwater management plan for the Plateau Underground Water Conservation & Supply District should be adopted by the district on or before February 9, 2024, and submitted to the executive administrator of the TWDB on or before March 10, 2024. The current management plan for the Plateau Underground Water Conservation & Supply District expires on May 9, 2024.

We used two groundwater availability models for the Plateau Underground Water Conservation & Supply District. Information for the Edwards-Trinity (Plateau) Aquifer is from version 1.01 of the groundwater availability model for the Edwards-Trinity (Plateau) and Pecos Valley aquifers (Anaya and Jones, 2009). Information for the Lipan Aquifer is from version 1.01 of the groundwater availability model for the Lipan Aquifer (Beach and others, 2004).

This report replaces the results of GAM Run 13-009 (Boghici, 2013). Values may differ from the previous report as a result of routine updates to the spatial grid file used to define county, groundwater conservation district, and aquifer boundaries, which can impact the calculated water budget values. Additionally, the approach used for analyzing model results is reviewed during each update and may have been refined to better delineate groundwater flows. Tables 1 and 2 summarize the groundwater availability model data required by statute. Figures 1 and 3 show the area of the models from which the values in Tables 1 and 2 were extracted. Figures 2 and 4 provide a generalized diagram of the groundwater flow components provided in Tables 1 and 2. If the Plateau Underground Water Conservation & Supply District determines that the district boundaries used in the assessment do not reflect current conditions after reviewing the figures, please notify the TWDB Groundwater Modeling Department at your earliest convenience.

The flow components presented in this report do not represent the full groundwater budget. If additional inflow and outflow information would be helpful for planning purposes, the district may submit a request in writing to the TWDB Groundwater Modeling Department for the full groundwater budget.

METHODS:

In accordance with the provisions of the Texas Water Code § 36.1071(h), the groundwater availability models mentioned above were used to estimate information for the Plateau Underground Water Conservation & Supply District management plan. Water budgets were extracted for the historical model periods in the respective groundwater availability models. Water budgets were extracted for the historical calibration periods of the Edwards-Trinity (Plateau) Aquifer (1981 through 2000) and for the Lipan Aquifer (1980 through 1998) 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, and the flow between aquifers within the district are summarized in this report.

PARAMETERS AND ASSUMPTIONS:

Groundwater availability model for the Edwards-Trinity (Plateau) and Pecos Valley aquifers

- We used version 1.01 of the groundwater availability model for the Edwards-Trinity (Plateau) and Pecos Valley aquifers (Anaya and Jones, 2009) to analyze the Edwards-Trinity (Plateau) Aquifer. See Anaya and Jones (2009) for assumptions and limitations of the model.
- The groundwater availability model for the Edwards-Trinity (Plateau) and Pecos Valley aquifers contains the following two layers in the Plateau Underground Water Conservation & Supply District:
    - Layer 1 represents the Edwards hydrostratigraphic unit of the Edwards-Trinity (Plateau) Aquifer.
    - Layer 2 represents the Trinity hydrostratigraphic unit of the Edwards-Trinity (Plateau) Aquifer.
- The two layers were combined for calculating water budget flows in the Edwards-Trinity (Plateau) Aquifer within the district.
- Water budget terms were averaged for the period 1981 through 2000 (stress periods 2 through 21).
- The model was run with MODFLOW-96 (Harbaugh and McDonald, 1996).

Groundwater availability model for Lipan aquifer

- We used version 1.01 of the groundwater availability model for the Lipan aquifer (Beach and others, 2004) to analyze the Lipan aquifer. See Beach and others, (2004) for assumptions and limitations of the model.

- The groundwater availability model for the Lipan contains one layer with a constant thickness of 400 feet. The layer represents portions of the Quaternary Leona Formation, underlying Permian units, adjacent Permian units, and overlying Edwards-Trinity (Plateau) Aquifer.

- Streams, rivers, and springs were incorporated into the model using the MODFLOW Stream-routing package. The MODFLOW reservoir package was used to include the reservoirs. The North Concho River was simulated using the MODFLOW Drain package as it is a non-perennial river. For this management plan model run, there is no groundwater discharge to surface water though lateral groundwater flows in or out of the aquifer.

- Water budget terms were averaged for the period 1980 through 1998 (stress periods 2 through 20). The last stress period in the historical calibration, representing the year 1999, was not included because of incorrect pumping values applied to the model.

- The model was run with MODFLOW-96 (Harbaugh and McDonald, 1996).

RESULTS:

A groundwater budget summarizes the amount of water entering and leaving the aquifer according to the groundwater availability model. Selected groundwater budget components listed below were extracted from the groundwater availability model results for the Edwards-Trinity (Plateau) and Lipan aquifers located within the Plateau Underground Water Conservation & Supply District and averaged over the historical calibration period, as shown in Tables 1 and 2.

1. Precipitation recharge—the areally distributed recharge sourced from precipitation falling on the outcrop areas of the aquifers (where the aquifer is exposed at the land surface) within the district.

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

3. Flow into and out of the district—the lateral flow within the aquifer between the district and adjacent counties.

4. Flow between aquifers—the net vertical flow between the aquifer and adjacent aquifers or confining units. This flow is controlled by the relative water levels in each aquifer and aquifer properties of each aquifer or confining unit that defines the amount of leakage that occurs.

The information needed for the district's management plan is summarized in Tables 1 and 2. Figures 1 and 3 show the area of the models from which the values in Tables 1 and 2 were extracted. Figures 2 and 4 provide a generalized diagram of the groundwater flow components provided in Tables 1 and 2. It is important to note that sub-regional water budgets are not exact. 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.

Table 1: Summarized information for the Edwards-Trinity (Plateau) Aquifer that is needed for the Plateau Underground Water Conservation & Supply District groundwater management plan. All values are reported in acre-feet per year and rounded to the nearest 1 acre-foot.

Management plan requirement	Aquifer	Results
Estimated annual amount of recharge from precipitation to the district	Edwards-Trinity (Plateau) Aquifer	22,505
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Edwards-Trinity (Plateau) Aquifer	8,317
Estimated annual volume of flow into the district within each aquifer in the district	Edwards-Trinity (Plateau) Aquifer	7,490
Estimated annual volume of flow out of the district within each aquifer in the district	Edwards-Trinity (Plateau) Aquifer	28,565
Estimated net annual volume of flow within each aquifer in the district	Not applicable	Not applicable

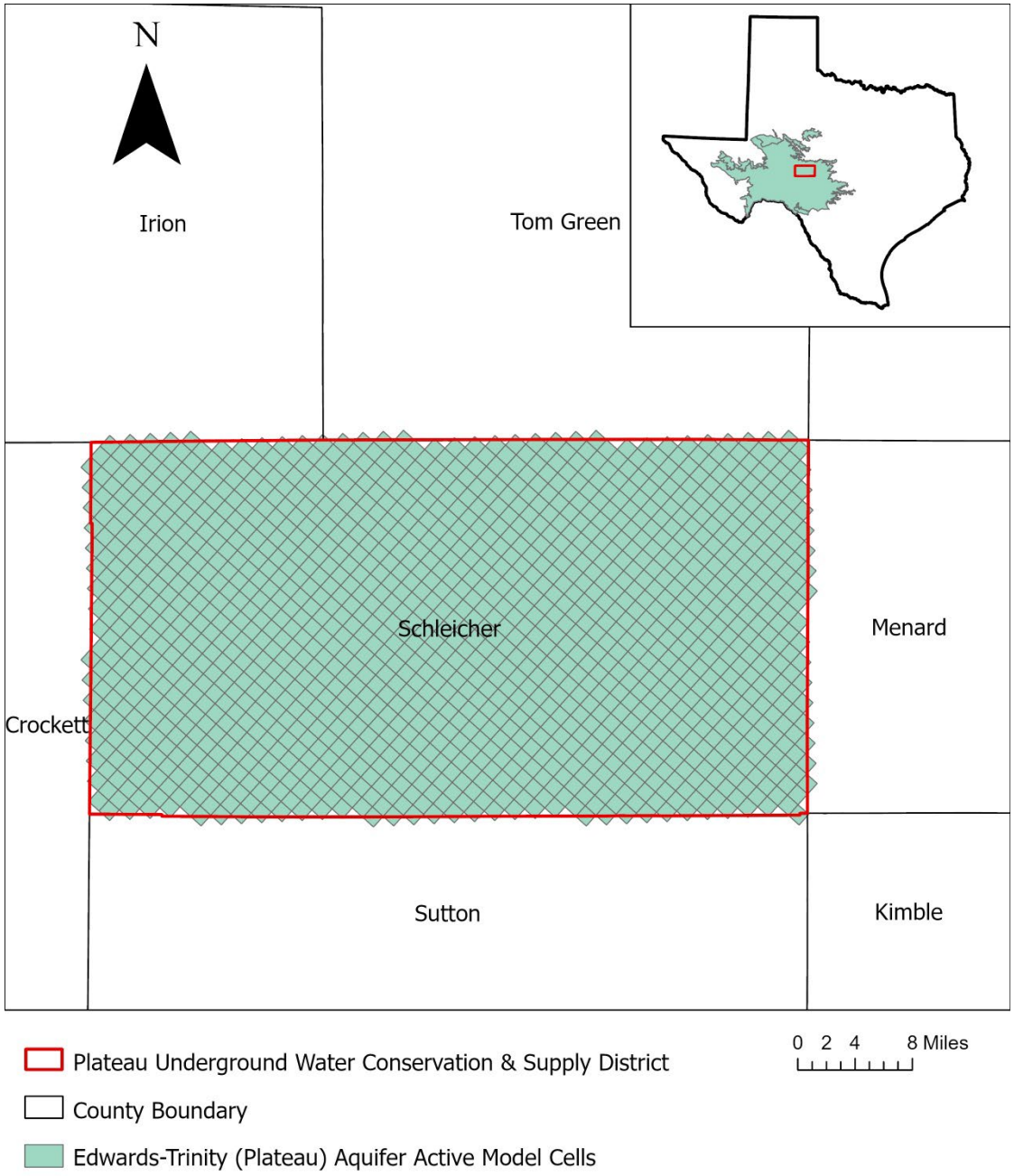

Figure 1: Area of the groundwater availability model for the Edwards-Trinity (Plateau) and Pecos Valley aquifers from which the information in Table 1 was extracted (the Edwards-Trinity [Plateau] Aquifer extent within the district boundary).

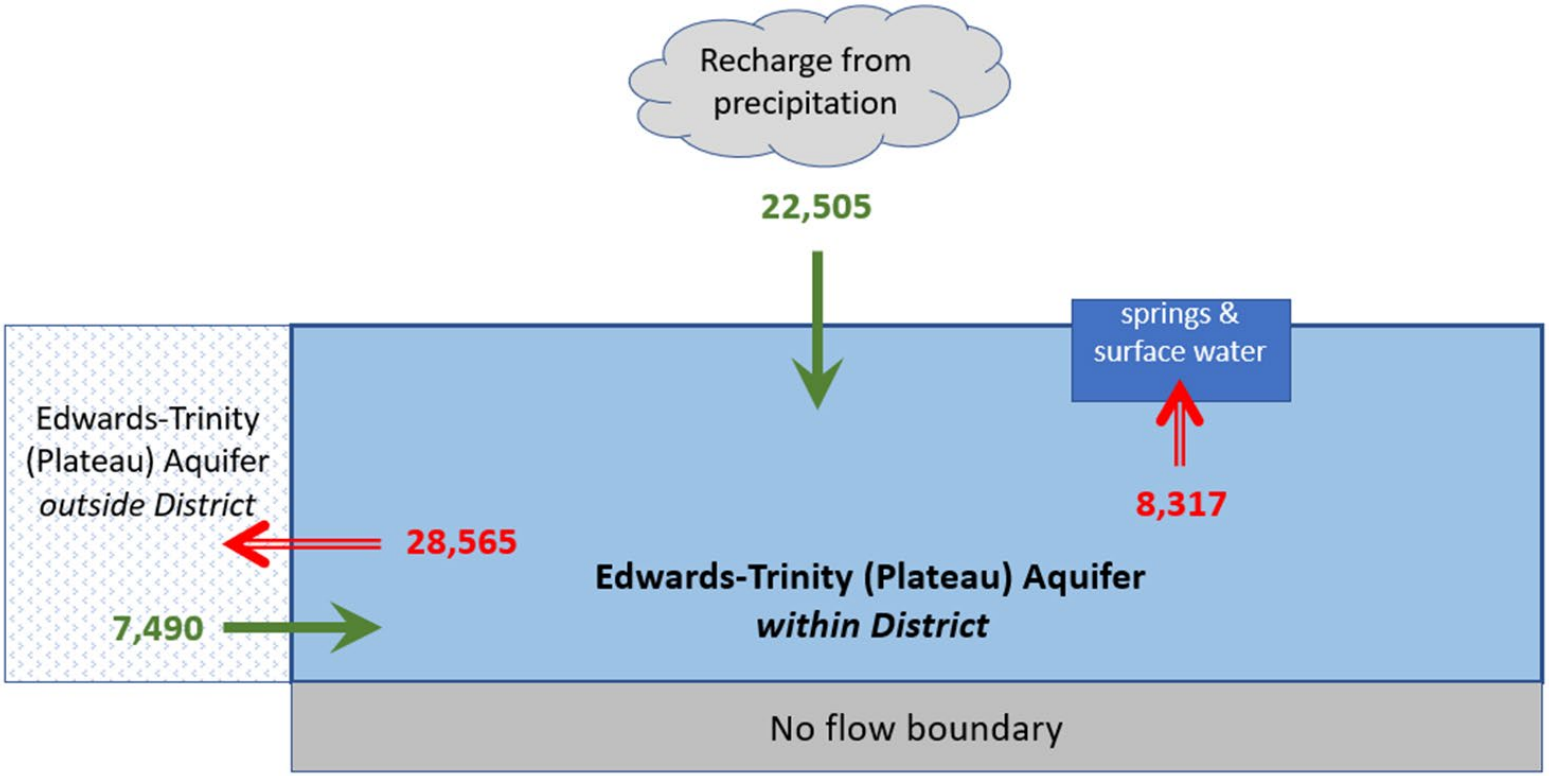

Figure 2: Generalized diagram of the summarized budget information from Table 1, representing directions of flow for the Edwards-Trinity (Plateau) Aquifer within the Plateau Underground Water Conservation & Supply District. Flow values are expressed in acre-feet per year.

Table 2: Summarized information for the Lipan Aquifer that is needed for the Plateau Underground Water Conservation & Supply District groundwater management plan. All values are reported in acre-feet per year and rounded to the nearest 1 acre-foot.

Management plan requirement	Aquifer	Results
Estimated annual amount of recharge from precipitation to the district	Lipan Aquifer	0*
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Lipan Aquifer	0
Estimated annual volume of flow into the district within each aquifer in the district	Lipan Aquifer	18
Estimated annual volume of flow out of the district within each aquifer in the district	Lipan Aquifer	413
Estimated net annual volume of flow within each aquifer in the district	Not applicable	Not applicable

* The portion of the Lipan Aquifer within the Plateau Underground Water Conservation & Supply District lies below the Edwards-Trinity (Plateau) Aquifer. Therefore, the 384 acre-feet per year of recharge from precipitation calculated from the groundwater availability model for the Lipan Aquifer is already included in the recharge value for the Edwards-Trinity (Plateau) Aquifer in Table 1, and recharge within this table is set to 0 acre-feet per year.

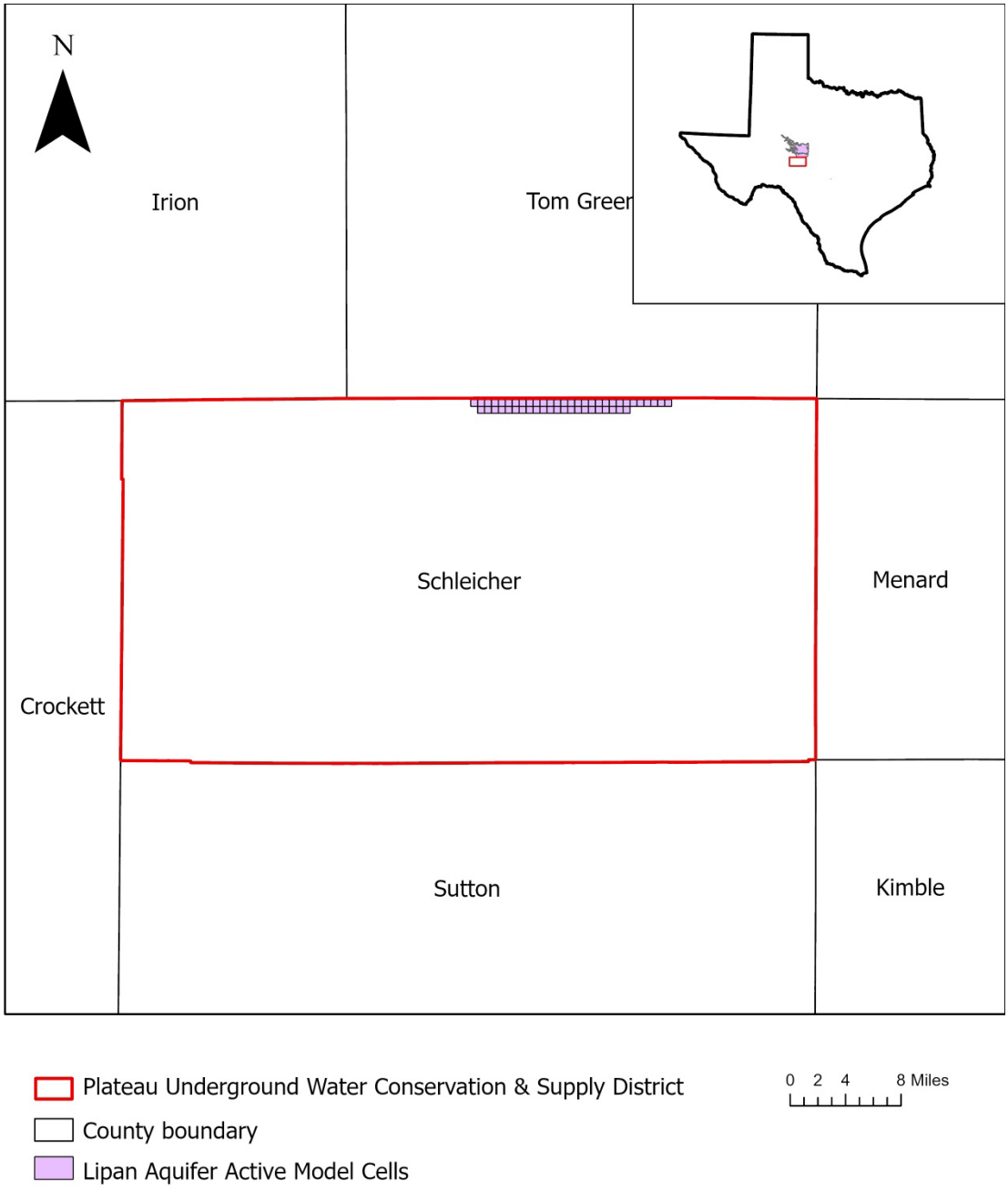

Figure 3: Area of the groundwater availability model for the Lipan Aquifer from which the information in Table 2 was extracted (the Lipan Aquifer extent within the district boundary).

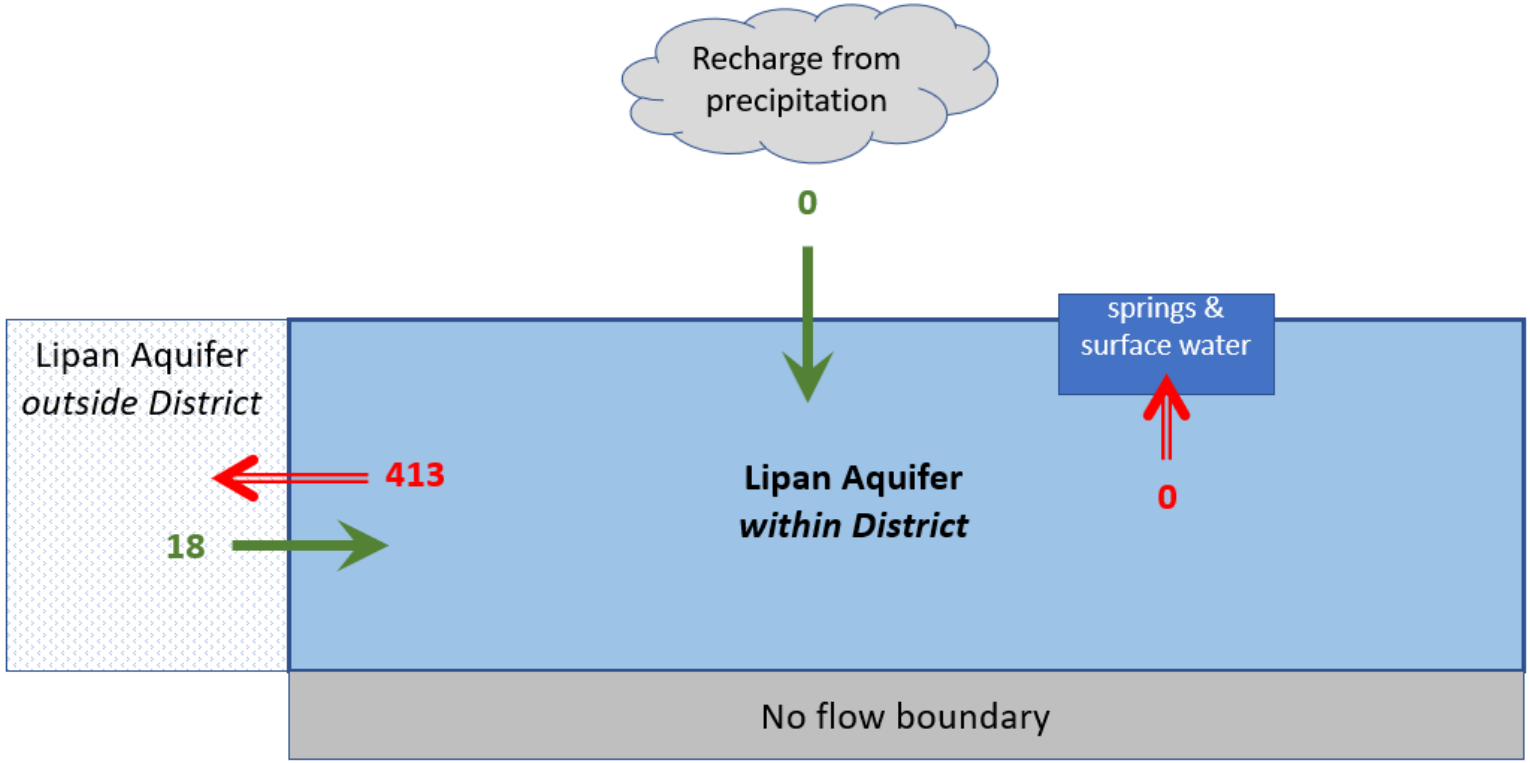

Figure 4: Generalized diagram of the summarized budget information from Table 2, representing directions of flow for the Lipan Aquifer within the Plateau Underground Water Conservation & Supply District. Flow values are expressed in acre-feet per year.

LIMITATIONS:

The groundwater models used in completing this analysis are the best available scientific tools 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 historical 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.

REFERENCES:

Anaya, R., and Jones, I., 2009, Groundwater availability model for the Edwards-Trinity (Plateau) and Pecos Valley aquifers of Texas: Texas Water Development Board, Report 373, 103 p., www.twdb.texas.gov/groundwater/models/gam/eddt_p/ET-Plateau_Full.pdf

Beach, J.A., Burton, S., and Kolarik, B., 2004, Groundwater availability model for the Lipan Aquifer in Texas: final report prepared for the Texas Water Development Board by LBG-Guyton Associates, 246 p., www.twdb.texas.gov/groundwater/models/gam/lipn/LIPN_Model_Report.pdf

Boghici, R., 2013, GAM Run 13-009: Texas Water Development Board, GAM Run 13-009 Report, 12 p., www.twdb.texas.gov/groundwater/docs/GAMruns/GR13-009.pdf

Harbaugh, A. W., 2009, Zonebudget Version 3.01, A computer program for computing subregional water budgets for MODFLOW ground-water flow models, U.S. Geological Survey Groundwater Software.

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National Research Council, 2007, Models in Environmental Regulatory Decision Making Committee on Models in the Regulatory Decision Process, National Academies Press, Washington D.C., 287 p., http://www.nap.edu/catalog.php?record_id=11972.

Texas Water Code § 36.1071

Appendix D

Plateau Underground Water Conservation and Supply District Rules

June 23, 2016

Plateau Underground Water Conservation & Supply District

Rules Adopted 1/28/93
Rules Amended 1/26/01
Rules Amended 8/04
Rules Amended 3/11/2011
Rules Amended 5/17/2012
Rules Amended 6/23/2016

RULE - 1 Unless the context hereof indicates a contrary meaning, the words hereinafter defined shall have the following meaning in these Rules:

(1) **"Abandoned well"** shall mean a water well that has not been used for six consecutive months. A water well is considered to be in use in the following cases:
(a) a non-deteriorated well which contains the casing, pump, and pump column in good condition; or
(b) a non-deteriorated well which has been capped.

(2) **"Agent"** means the person authorized to act on behalf of the landowner with respect to obtaining drilling permits and registering wells.

(3) **"Applicant"** means the owner of the land on which the well(s) or proposed well(s) are located, unless the landowner authorizes another person to act on his/her behalf with respect to obtaining drilling permits and registering the wells.

(4) **"Aquifer"** shall mean a geologic formation that contains sufficient saturate material to be capable of storing water and transmitting water in usable quantities to a well.

(5) **"Area of hydrologic impact"** shall mean, as projected on the land surface, the aerial extent of the migration of a subsurface water-bearing reservoir having ascertainable boundaries.

(6) **"Artesian Well"** shall mean 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.

(7) **"Authorized Well Site"** shall be:
(a) the location of a proposed non exempt water well on an application duly filed with the District until such application is denied; or

(b) the location of a proposed non exempt water well on a valid permit. (An authorized well site is not a permit to drill).
(c) a non exempt well which produced in excess of 25,000 gallons of water per day and which was in existence at the time the District was created or at the time the area was annexed into the District and is not considered to be an abandoned well or deteriorated well; or
(d) a non exempt well drilled after the District was created or after the area was annexed into the District that has a properly completed Well Registration on file in the District office and such well has not been "abandoned" by the well owner.

(8) **"Beneficial use"** or **"Beneficial purpose"** shall mean use for:
(a) agricultural, gardening, domestic, stock raising, municipal, mining, manufacturing, industrial, commercial, recreational, or pleasure purposes;
(b) exploring for, producing, handling, or treating oil, gas, sulphur, or other minerals; or
(c) any other purpose that is useful and beneficial to the users that does not commit waste as defined in this rule.

(9) **"The Board"** shall mean the Board of Directors of the Plateau Underground Water Conservation & Supply District, consisting of five (5) duly elected members.

(10) **"Capped Well"** shall mean a well that is closed or capped with a covering capable of preventing surface pollutants from entering the well and sustaining a weight of at least four hundred (400) pounds, or, in the case of an artesian well, an artesian pressure of up to four hundred (400) pounds, as necessary to effectively prevent water from flowing out of the well and running over the surface of the ground above the well or wasting through the strata through which it passes.

(11) **"Casing"** shall mean a tubular watertight structure installed in the excavated or drilled hole, temporarily or permanently, to maintain hole sidewalls against caving and, along with cementing and/or bentonite grouting, to prevent surface contaminant infiltration

(12) **"Cement"** shall mean a neat Portland or construction cement mixture of not more than seven (7) gallons of water per ninety-four (94) pound sack of dry cement, or a cement slurry which contains cement along with bentonite, gypsum, or other additives; the well driller will adhere to the manufacturer's recommended water content for the mix.

(13) **"Completion"** shall mean sealing off access of undesirable water to the well bore by proper casing and/or cementing procedures and adhering to State standards for completion.

(14) **"Conservation"** shall mean:

(a) the development of water resources; and

(b) those practices, techniques, and technologies that will reduce the consumption of water, reduce the loss or waste of water, improve the efficiency in the use of water, or increase the recycling and reuse of water so that a water supply is made available for future or alternative uses.

(15) **"Deteriorated Well"** shall mean a water well, the condition of which will cause, or is likely to cause, pollution of any water in the District.

(16) **"District"** shall mean the Plateau Underground Water Conservation & Supply District. When applications, reports, and other papers are required to be filed with or sent to "the District," this means the District's headquarters in Eldorado, Texas.

(17) **"Domestic Well"** shall mean a well that will produce water to be used to supply the needs of a single household. This includes the use of water for home landscapes and home gardening.

(18) **"Drilled to Density"** shall mean no more than a cumulative total of four (4) wells shall be permitted per survey section.

(19) **"Driller's Log or Well Log"** shall mean a log, accurately kept, on forms prescribed by the Texas Department of Licensing and Regulation, or any successor regulatory agency with jurisdiction therefor, at the time of drilling showing the depth, thickness, character of the different strata penetrated, location of water-bearing strata, depth, size and character of casing installed, together with any other data or information required by the Texas Department of Licensing and Regulation or of this Board.

(20) **" Permit"** shall mean a permit issued by the District for a properly spaced non exempt well that may produce more than 25,000 gallons of water per day.

(21) **"Exempt Well"** shall mean a well that is exempt from permitting as defined under Chapter 36, Texas Water Code.

(22) **"Existing Well"** shall mean a well which was drilled before the date of passage of these Rules and which is not abandoned or sealed, or a well which was not completed on said date but for which a registration was on file with the District on such date.

(23) **"Fresh Water"** shall mean water in which the bacteriological, physical, and

chemical properties are such that it is suitable and feasible for beneficial use.

(24) **"Installer"** shall mean an individual who installs or repairs pumps and equipment for hire or compensation and holds a current pump installers license with the Texas Department of Licensing and Regulation.

(25) **"Licensed Water Well Driller"** shall mean any person who holds a license issued by the State of Texas pursuant to the provisions of the Texas Water Well Drillers Act, as amended, and the substantive rules of the Texas Department of Licensing and Regulation or its successors.

(26) **"Monitoring Well"** shall mean a well installed to measure some property of the groundwater or aquifer which it penetrates that does not produce groundwater for the purpose of water supply.

(27) **"Mud"** shall mean a relatively homogeneous, relatively viscous fluid produced by the suspension of clay-size particles in water. Specifically, it shall be a ten (10) pounds per gallon mud or heavier, with a marsh funnel viscosity of fifty (50) seconds or equivalent.

(28) **"New well"** shall mean a well for which a notice of intention to drill or a permit is required pursuant to these Rules.

(29) **"Open or Uncovered Water Well"** shall mean any artificial excavation drilled or dug for the purpose of producing water from the underground reservoir, not capped or covered as required by these Rules, and which is at least ten (10') feet deep and no more than six feet (6') in diameter.

(30) **"Owner"** shall mean and include any person, as defined herein, who has the right to produce water from the land either by ownership, contract, lease, easement, or any other estate in the land.

(31) **"Permitted Well"** shall mean a well not exempt by state law (as defined in these rules - Rule 1 and Chapter 36.113) and which has been either permitted or validated by the District.

(32) **"Person"** shall mean and include any individual, partnership, firm, corporation, entity, municipal corporation, unincorporated area, government, or governmental subdivision or agency, business trust, estate, trust, or any other legal entity or association.

(33) **"Plugging"** shall mean an absolute sealing of the well bore.

(34) **"Pollution"** shall mean the alteration of the physical, thermal, chemical, or

biological quality of, or the contamination of, any water in the District, that renders the water harmful, detrimental, or injurious to humans, animal life, vegetation, or property, or to public health, safety, or welfare, or impairs the usefulness or public enjoyment of the water for any lawful or reasonable purpose.

(35) **"Pump Installation"** shall mean procedure employed in the placement, and preparation for operation, of equipment and materials used to obtain water from a well, including construction involved in establishing seals and safeguards as necessary to protect the water from contamination. The term includes repairs to an existing pump.

(36) **"Underground Water"** shall mean water suitable for agricultural, gardening, domestic, or stock raising uses, percolating below the earth's surface, but shall not include water in a defined subterranean stream or in the underflow of a river.

(37) **"Undesirable Water"** shall mean water that is injurious to human health, vegetation, to land, or to fresh water, or water that can cause pollution.

(38) **"Waste"** as used herein shall have the same meaning as defined by the Legislature, as follows:

(1) the withdrawal of underground water from an underground water reservoir at a rate and in an amount that causes or threatens to cause intrusion into the reservoir of water unsuitable for agricultural, gardening, domestic, or stock raising purposes;

(2) the flowing or producing of wells from an underground water reservoir if the water produced is not used for a beneficial purpose;

(3) the escape of underground water from an underground water reservoir to any other reservoir that does not contain underground water;

(4) the pollution or harmful alteration of underground water in an underground water reservoir by salt water, other deleterious matter admitted from another stratum, or from the surface of the ground;

(5) willfully or negligently causing, suffering, or permitting underground water to escape into any river, creek, natural watercourse, depression, lake, reservoir, drain, sewer, street, highway, road, or road ditch, or onto any land other than that of the owner of the well;

(6) 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.

(7) for water produced from an artesian well.

(8) the flowing or producing of wells from an underground water reservoir if the water produced is not used for beneficial use.

(39) **"Water"** shall mean groundwater.

(40) **"Well" or "Water Well"** shall mean and include any artificial excavation constructed for the purpose of exploring for or producing groundwater.

(41) **"Well Location"** shall mean the location of a proposed water well on an application duly filed until such application is granted or denied, or the location of a well on a valid permit.

(42) **"Well Registration"** shall mean District recording of exempt well information e.g. owner-address, location, type, use, log, yield, quality and any additional information owner/operator or District may feel pertinent.

(43) and **"Well Validation"** shall mean confirmation and permitting of well location wellhead equipment by District personnel.

RULE 2 - WASTE

(a) Groundwater shall not be produced within, or used within or without the District is such a manner or under such conditions as to constitute waste as defined in Rule 1 hereof.

(b) Any person producing or using groundwater shall use every possible precaution, in accordance with the most approved methods, to stop and prevent waste of such water.

(c) No person shall pollute or harmfully alter the character of the groundwater reservoir of the District by means of salt water or other deleterious matter and/or substance admitted from some other stratum or strata or from the surface of the ground.

RULE 3 - WELL REGISTRATION

Registration Required: The owner or agent of an exempt well located in the District must register the exempt well with the District. It is a violation of these Rules for any person to operate an exempt well without having registered the well with the District. A registration is perpetual in nature, subject to cancellation for violation of these Rules.

WHERE TO REGISTER - An owner must file the required registration information at the District's principal office in Eldorado, Texas.

REREGISTRATION - If the owner of a registered well plans to change the use of the

water, increase the production rate of the water, or to substantially alter the size of the well or well pump in a manner that does not require a permit, the owner must reregister the well.

Reports: The following categories of exempt wells shall report production.

(1) Any well related to hydrocarbon activity.

(2) Any other exempt well which exceeds 25,000 gallons/day.

An exempt well status shall be withdrawn if, while the well was registered as an exempt well, the District determines that the well was pumping water in excess of an annualized average of 9,125,000 gallons of water per year.

If an exempt well status is withdrawn, the District may assess penalties in accordance with District Rules.

RULE 3A - REGISTRATION OF NEW EXEMPT WELLS

It is a violation of these rules for a well owner, well operator, or water well driller to drill any well without a "Notice of Intent to Drill" form approved by and on file with the District.

The staff will review the "Notice of Intent to Drill" and make a determination whether the well meets the exemptions definition. If it is determined that the well is exempt and otherwise complies with the District rules, the registrant may begin drilling and other activity upon receipt of an accepted Notice of Intent to Drill form, which shall be provided by the District no later than the third business day following the initial receipt of the Notice of Intent to Drill. The District shall also send a registration form to the well owner for completion.

The "Notice of Intent to Drill" shall include the following information, submitted on forms provided by the District:

1. Name and address of well owner
2. Location of well or proposed location, including county, section, block, survey, abstract, acreage or lot size and number of feet to the nearest non-parallel property lines.
3. Distance in feet to nearest well
4. Well use or proposed use.
5. Signed statement by the applicant that:
   - the proposed well is to be for domestic use on 2 acres or less of land or is exempt from permitting; and
   - the applicant will furnish the District with a completed Well Registration form within 30 days after completion of the well.

If the well is not exempt, District staff shall notify the registrant immediately, and no later than three business days following receipt of the "Notice of Intent to Drill" form, in which

case the well must be permitted prior to drilling or operation. A violation of this rule occurs on the first day the drilling, equipping, completion or alteration without the appropriate registration or permit begins and continues each day thereafter untilt he appropriate registration or permit is issued.

A well is considered registered when a completed well registration form provided by the District is returned to the District Office.

Exempt wells to be drilled on less than ten acres are NOT considered exempt and must file for a permit.

RULE 4 - PERMIT REQUIRED

A. No person shall hereafter begin to drill or drill a well, or increase the size of a well or pump therein, for a use other than domestic or livestock, without having first applied to the Board, and had issued a permit to do so, unless the drilling and operation of the well is exempt by the law or by these rules. Water wells without a permit or operating a well at a higher rate of production than the rate approved for the well is declared to be illegal, wasteful per se, and a nuisance.

B. No permit shall be required for the drilling of temporary wells exempt by Subsection 117 of Chapter 36, Texas Water Code (being generally wells used for the production of oil, gas or other minerals and water wells used in conjunction therewith).

C. All permitted wells or authorized well sites issued under these Rules are conditional, and the Board may revoke its authorization if the person to whom the authorization was issued does not comply with the Rules of the District; does not comply with the terms and conditions stated in the drilling permit; or abandons the well. The District shall provide reasonable notice and opportunity for hearing before revoking the authorization.

D. After an application for a permit has been granted, the well, if drilled, must be drilled in compliance with all District rules. If the well should be commenced or drilled at a different location than the location given on the permit application and the new location is in violation of the District rules, the drilling or operation of such well may be enjoined by the District pursuant to Chapter 36, Texas Water Code, as amended and/or the District may initiate enforcement proceedings under Rule 14. The District shall have the right to confirm reported distances and inspect the wells or well locations.

E. An exempt well which ceases to be used solely for domestic or livestock use must apply for a permit from the District.

RULE 5 - PERMIT TERM

A. A permit grants a right to the well owner to produce water in the amount, and in accordance with the terms of the permit until there is a change, or proposed change, in any of the following:

1. Ownership of well, except for irrigation wells for orchards established before 1993
2. Amount of water used
3. Location of well
4. Use of water
5. Location of use of water

Upon the occurrence, or proposed occurrence of any of these events, a new application for a well permit must be filed with the District to be acted upon, in the same manner, and in accordance with the same procedures hereinabove set forth in Rule 10 as for an original permit application.

B. A permit may be forfeited, for three (3) years non-production from a permitted well.

RULE 6 - REPORT OF ANNUAL WATER USE

All permit holders shall annually report to the District the total amount of groundwater pumped per well during the previous year. To facilitate reporting the District will make available forms to report the water used annually. Reports must be completed and returned to the District office in Eldorado, Texas by March 1st of the year following the reporting period. Failure to timely file the annual report will subject the permit holder to civil penalty and other sanctions provided in these rules.

RULE 7 - LIMITATIONS OF PERMITTING

In order to conserve, preserve and protect the underground water resources of the District, for the purposes of protecting the human and wildlife environment of the District, total combined permitting under Rule 10 will be limited to the total annual production of annual recharge which shall be determined by Texas Water Development Board data, scientific research, or any other resource available to the District. Once a total annual recharge of production has been realized through exempt and permitted wells as determined by the Board of Directors, no further permits will be issued until either a permit terminates because of the occurrence of one of the events set forth in Rule 5 or a permit has been forfeited pursuant to Rule 5.

A. The average water level increase/decline will be reviewed by the Board of Directors at least once a year at which time production allowances for permitted wells may be adjusted to insure for the conservation and preservation of the groundwater. The Board may choose one of the following: 1. If an adjustment is administered, all production of non grandfathered permits will be altered in like manner regardless of beneficial use, or

2. If total combined water usage within the District has not met the annual recharge amount then all subsequent permits will be set at a reduced production

allowable as necessary.

B. Grandfathered Permits - will include wells that are in existence as of the date Plateau UWCSD rules are adopted (1/28/93) and/or amended (1/26/2001).

1. Wells with grandfather status shall have a maximum production rate of 150 acre feet per year or that amount which has been used on a yearly basis and can be proven through Farm Service Agency records or electrical consumption records.
2. Wells with grandfather status shall abide by all District rules except Rule 7 (A).
3. Changes in permit conditions, i.e. ownership of well, except as stated in Rule 5A(1), amount of water used, location of well, use of water or location of use of water, are considered a forfeiture of grandfather status and a new permit application must be filed with the District.

C. For permits issued but not considered grandfathered, the quantity of groundwater produced annually shall be limited to the maximum amount for which the applicant can demonstrate a need and ability to apply the groundwater produced to a beneficial use, not to exceed one acre foot per contiguous acre owned per year, and not to exceed 250 acre feet per year. The maximum production rate shall be subject to production increases/decreases as aquifer levels are assessed by the Board of Directors. The maximum production per survey section shall be one acre foot per contiguous acre owned per year.

D. The District may require permit holders to supply electrical records to verify the amount of water produced annually. The District also reserves the right to require the permit holder to install a water metering device as part the of the permit specifications. This right may be exercised at the time of permit application or any time during the term of the permit. When a water metering device installation is required the time period of metering will also be established.

E. The District reserves the right to require that the well completion of a permitted well include a 3/4" bore hole with cap for water level measurement entry into the well.

RULE 8 - EXCEPTION TO PRODUCTION RATE

A permit holder may apply to the District for an exception to the maximum production rate. All exceptions are subject to Board approval and shall be reviewed every three years.

RULE 9 - ISSUANCE OF PERMITS

(a) The Board shall issue or cause to be issued a permit for a well properly spaced upon proper application executed and filed by the owner or his/her agent with the District and accompanied by the required deposits or fees and containing the matters specified below. An application shall be considered filed

when properly made out, completed, and signed and tendered to the District or a person duly designated by such District to receive the same.
Such applications shall be on forms provided by the District and shall be in writing and shall be prepared in accordance with and contain the information called for in the form of application, if any, prescribed by the Board, and all instructions which may have been issued by the Board with respect to the filing of an application. Otherwise, the application will not be considered.

(b) Rules for filing of applications:

(1) If the applicant is an individual, the application shall be signed by the applicant or his duly appointed agent. The agent may be requested to present satisfactory evidence of his authority to represent the applicant.

(2) If the application is by a partnership, the applicant shall be designated by the firm name followed by the words "a Partnership" and the application shall be signed by at least one of the general partners who is duly authorized to bind all of the partners.

(3) In the case of a corporation, public district, county or municipality, the application shall be signed by a duly authorized official. A copy of the resolution or other authorization to make the application may be required by the officer or agent receiving the application.

(4) In the case of an estate or guardianship, the application shall be signed by the duly appointed guardian or representative of the estate.

c. Such applications shall set forth the following:

(1) The exact proposed location of the well to be drilled as provided in the application including the county, the section, block, survey and township, labor and league, and exact number of yards to the nearest non-parallel property lines (legal survey line) or other adequate legal description.

(2) The proposed use of the well to be drilled, whether municipal, industrial, or irrigation.

(3) The size of the pump.

(4) The approximate date drilling operations are to begin.

(5) The location of the three (3) nearest wells within a quarter of a mile of the proposed location, and the names of the owners thereof.

(6) An agreement by the applicant that a completed well registration form and log will be furnished to the District (on forms furnished by it) by the applicant upon completion of this well and prior to the production of water therefrom (except for such production as may be necessary to the drilling and testing of such well.)

(7) Such additional data as may be required by the Board.

(8) The name and address of the fee owner of the land upon which the well location is to be made.

(9) The proposed depth or water-bearing formation from which applicant shall complete and produce from said well;

(10) The proposed amount of groundwater to be used.

RULE 10 - REQUIREMENT OF DRILLER'S LOG, CASING AND PUMP DATA

(a) Complete records shall be kept and reports thereof made to the District concerning the drilling, maximum production potential, equipping and completion of all wells drilled. Such records shall include an accurate driller's log, any electric log which shall have been made and such additional data concerning the description of the well, its potential, hereinafter referred to as "maximum rate of production" and its actual equipment and rate of discharge permitted by said equipment as may be required by the Board. Such records shall be filed with the District Board within 30 days after the completion of the well.

(b) No person shall produce water from any well hereafter drilled and equipped within the District, except that necessary to the drilling and testing of such well and equipment, unless or until the District has been furnished an accurate driller's log, any electric log which shall have been made, and a registration of the well correctly furnishing all available information required on the forms furnished by the District.

RULE 11 - MINIMUM SPACING OF WELLS

I. Permitted Wells (Non-Exempt Wells)

(A) Distance Requirements

(1) No well to be drilled subsequent to the date of enactment of this rule shall be drilled such that said well shall be located nearer than thirteen hundred twenty (1320') feet from the nearest existing permitted well on the same contiguous owned acreage nor closer than fifty (50') feet to the property line, provided that the Board, in order to prevent waste or to prevent confiscation of property, may grant exceptions to permit drilling within shorter distances than those above described when the Board shall determine that such exceptions are necessary either to prevent waste or to prevent confiscation of property.

(2) In the interest of protecting life and for the purpose of preventing waste and preventing confiscation of property, the Board reserves the right in particular subterranean water zones and/or reservoirs to enter special orders increasing or decreasing distances provided by this rule.

(B) Well Density. Subject to paragraph (a) et seq. above, no more than a cumulative total of four wells, whether drilled prior to or subsequent to enactment of this rule, shall be permitted per contiguously owned survey section Hereinafter referred to as "drilled to density"). For a new permit to be approved on a section already drilled to density, one of the existing permitted wells in the section may be required by the Board to be plugged.

II. Domestic/Livestock Wells (Exempt Wells) - Distance Requirements

(A) No exempt well shall be drilled nearer than fifty (50') feet to any property line. However, this distance may be decreased to a minimum of

five (5') feet to any property line provided the annular space between the casing and the borehole wall is cemented from the land surface to the top of the production layer.

(B) These distances for exempt wells are the State requirements (State Water Well Drillers Rules) and are listed here as a convenience. They are subject to change at any time by the State.

RULE 12 - EXCEPTION TO SPACING RULE

(a) In order to protect vested property rights, to prevent waste, to prevent confiscation of property, or to protect correlative rights, the Board may grant exception to the above spacing regulations. This rule shall not be construed so as to limit the power of the Board, and the powers stated are cumulative only of all other powers possessed by the Board.

(b) If an exception to such spacing regulations is desired, application thereof shall be submitted by the applicant in writing to the Board at its District Office on forms furnished by the District. The application shall be accompanied by a plat or sketch, drawn to scale of one (1) inch equaling six hundred (600) feet. The plat or sketch shall show thereon the property lines in the immediate area and shall show accurately to scale all wells within a quarter mile of the proposed well site. The application shall also contain the names and addresses of all property owners adjoining the tract on which the well is to be located and the ownership of the wells within a quarter mile of the proposed location. Such application and plat shall be certified by some person actually acquainted with the facts who shall state that all the facts therein are true and accurate.

(c) Such exception may be granted ten (10) days after written notice has been given to the applicant and all adjoining owners and all well owners within a quarter mile of the proposed location and after a public hearing at which all interested parties may appear and be heard, and after the Board has decided that an exception should be granted. Provided, however, that if all such owners execute a waiver in writing stating that they do not object to the granting of such exception, the Board may thereupon proceed to decide upon the granting or refusing of such application without notice of hearing except to the applicant. The applicant may also waiver notice or hearing or both.

RULE 13 - ENFORCEMENT OF RULES

All rules duly adopted, promulgated and published by this District shall be enforced as provided for under Texas Water Code, Chapter 36 and subsequent changes thereto.

A. The District may enforce this chapter, and its Rules, by injunction, mandatory injunction, or other appropriate remedy, in a court of competent jurisdiction.

B. The Board may set civil penalties for breach of any rule of the District that shall not exceed the jurisdiction of a justice court, as provided by Section 27.031, Government Code.

C. A penalty under this section is in addition to any other penalty provided by the law of this state and may be enforced by complaints filed in a court of competent jurisdiction in Schleicher County, Texas.

D. If the District prevails in any suit to enforce its Rules, it may, in the same action, recover reasonable fees for attorneys, expert witnesses, and other costs incurred by the District before the Court. The amount of the attorney's fees shall be fixed by the court.

RULE 14 - PLACE OF DRILLING OF WELL

After an application for a well permit has been granted, the well, if drilled, must be drilled within thirty (30) feet of location specified in the permit, and not elsewhere. If the well should be commenced or drilled at a different location, the drilling or operation of such well may be enjoined by the Board pursuant to Chapter 36, Texas Water Code.

RULE 15 - REWORKING OR REPLACING OF WELL

(a) No person shall rework, redrill, or reequip a well in a manner that would increase the maximum rate of production of such well as established by Rule 11 above without first having made an application to the Board, and having been granted a permit by the Board to do so; nor shall any person replace a well without a permit by the Board. A replacement well, in order to be considered such, must be drilled within one hundred fifty (150) feet of the old well and not elsewhere. It must not be located toward any other well or authorized well site unless the new location complies with the minimum spacing requirements set out in Rule 12; otherwise the replacement well shall be considered to be a new well for which application must be made under Rule 10 above. Provided, however, that the Board may grant an exception without notice or hearing in any instance where the replacement well is placed farther away from any existing wells or authorized well sites.

The location of the old well (the well being replaced) shall be protected in accordance with the spacing rules of the District until the replacement well is drilled and tested. The landowner or his agent must within 90 days of the issuance of the permit declare in writing to the District which one of these two wells he desires to produce. If the landowner does not notify the District of his choice within this 90 days, then it will be conclusively presumed that the new well is the well he desires to retain. Immediately after determining which well will be retained for production, the other well shall be:

(1) plugged and abandoned, or

(2) properly equipped in such a manner that it cannot produce more than 25,000 gallons of water a day; or

(3) closed in accordance with article 9202, Vernon's Annotated Civil Statutes, as amended. Violation of such articles is made punishable

thereby a fine of not less than $100.00 nor more than $500.00.

An application to rework, reequip, redrill, or replace an existing well may be granted by the Board without notice or hearing.

(b) The size or maximum rate of production of a well shall not be hereafter changed to a larger size or capacity so as to substantially increase the rate of production of a well without a permit from the Board. (For example, increasing the size of the well bore from six inches to eight inches.)

(c) In the event that application meets all spacing requirements, the Board may grant such application without further notice.

RULE 16 - TIME DURING WHICH A PERMIT SHALL REMAIN VALID

Any permit granted hereunder shall be valid if the work permitted shall have been completed within two (2) months from the filing date of the application. It shall thereafter be void. Provided, however, that the Board, for good cause, may extend the life of such permit for an additional two (2) months if an application for such extension shall be made to the District during the first two (2) months period. Provided further, that when it is made known to the Board that a proposed project will take more time to complete, the Board, upon receiving written application may grant such time as is reasonably necessary to complete such project.

RULE 17 - CHANGED CONDITIONS

The decision of the Board on any matter contained herein may be reconsidered by it on its own motion or upon motion showing changed conditions, or upon the discovery of new or different conditions or facts after the hearing or decision on such matter. If the Board should decide to reconsider a matter after having announced a ruling or decision, or after having finally granted or denied an application, it shall give notice to persons who were proper parties to the original action, and such persons shall be entitled to a hearing thereon if they file a request therefor within fifteen days from the date of the mailing of such notice.

RULE 18 - RIGHT TO INSPECT AND TEST WELLS

Any authorized officer, employee, agent or representative of the District shall have the right at all reasonable times to enter upon the lands which a well or wells may be located within the boundaries of the District, to inspect such well or wells and to read, or interpret any meter, weir box or other instrument for the purpose of measuring production of water from said well or wells or for determining the pumping capacity of said well or wells or for determining the pumping capacity of said well or wells; and any authorized officer, employee, agent, or representative of the District shall have the right at reasonable times to enter upon any lands upon which a well or well may be located within the boundaries of the District for the purposes of testing the pump and the power unit of the well or wells and of making any other reasonable and necessary inspections and tests that may be required or necessary for the District. The operation of any well may be enjoined by the Board immediately upon refusal to permit the gathering of information as above provided from such well.

RULE 19 - SEALING OF WELLS

(a) Pursuant to a court order, the District may, upon orders from the judge of the courts, seal wells that are prohibited from withdrawing groundwater within the District, to ensure that a well is not operated in violation of the District Rules.

A well may be sealed when:

(1) no application has been made for a permit to drill a new water well which is not excluded or exempted; or

(2) no application form has been filed for a permit to withdraw groundwater from an existing well which is not excluded or exempted; or

(3) the Board has denied, canceled or revoked a permit application.

(b) The well may be sealed by physical means, and tagged to indicate that the well has been sealed by the District, and other appropriate action may be taken as necessary to preclude operation of the well or to identify unauthorized operation of the well.

C Tampering with, altering, damaging, or removing the seal of a sealed well, or in any other way violating the integrity of the seal, or pumping of groundwater from a well that has been sealed constitutes a violation of these rules and subjects the person performing that action, as well as any well owner or primary operator who authorizes or allows that action, to such penalties as provided by the District Rules.

RULE 20 - OPEN WELLS TO BE CAPPED

Every owner or operator of any land within the District upon which is located any open or uncovered well is, and shall be, required to close or cap the same permanently with a covering capable of sustaining weight of not less than four hundred (400) pounds, except when said well is in actual used by the owner or operator thereof; and no such well owner or operator shall permit or allow any open or uncovered well to exist in violation of this requirement. Officers, agents and employees of the District are authorized to serve or cause to be served written notice upon any owner or operator of a well in violation of this rule, thereby requesting such owner and/or operator to close or cap such well permanently with a covering in compliance herewith. In the event any owner or operator fails to comply with such request within ten (10) days after such written notice, any officer, agent, or employee of the District may go upon said land and close or cap said well in a manner complying with this rule and all expenditures thereby incurred shall constitute a lien upon the land where such well is located, provided, however, no such lien shall exceed $500 for any single closing. Any officer, agent, or employee of the District, is authorized to perfect said lien.

RULE 21 - FINAL ORDERS OF THE BOARD

The orders of the Board in any non-contested application of proceeding shall become the final order of the Board on the day it is entered by the Board. All orders of the Board in contested applications, appeals or other proceedings shall contain a statement that

the same was contested. In such event the order will become final after fifteen (15) days from the entry thereof and be binding on the parties thereto unless a motion for rehearing is filed under Rule 19 hereof.

RULE 22 - REHEARING

A. Any person whose application is denied, whose contest is overrruled, or who is not grated the relief desired, may file with the Board a motion for rehearing withing fifteen (15) days from the announcement by the Board of its decision or action. The Board shall act thereon within a reasonable time. If such a motion for rehearing is filed and is overrruled, the order of the Board shall be final on the date the motion is overruled.

B. The Board may, in a proper case, find that an emergency exists and that substantial injustice will result from delay. In that event, and upon recitation of such finding, the order of the Board will become final on the date of the announcement of the order by the Board, and no motion for rehearing will be considered thereon.

C. If an application or contest is denied by the Board, and if the applicant or contestant shall not have had and shall not have been afforded an opportunity for a hearing before the Board, as elsewhere provided by these rules, the applicant or contestant shall be entitled to a hearing before the Board. A written request to the Board for such a hearing, stating such facts, must be filed with the Board within the above fifteen (15) day period. If such motion is in order and is duly filed, the Board shall give notice to the applicant and all proper and necessary parties of the time and place of such hearing, and shall proceed to conduct such a hearing.

RULE 23 - RULES OF GOVERNING PROTESTS

A. Notice of Protest - In the event anyone should desire to protest or oppose any pending matter before the Board, a written notice of protest or opposition shall be filed with the Board on or before the date on which such application or matter has been set for hearing. For the convenience of the Board, it is urgent that protests be filed at least five (5) days before the hearing date.

B. Protest Requirements - Protests shall be submitted in writing with a duplicate copy to the opposite parties and shall comply in substance with the following requirements:

(1) Each protest shall show the name and address of the protestant and show that protestant has read either the application or a notice relative thereto published by the Board.

(2) There shall be an allegation of injury to protestant which will result from the proposed action or matter to be considered by the Board.

(3) If the protest is based upon claim of interference with some present right of protestant, it shall include a statement of the basis of protestant's claim of right.

(4) Protestant should call attention to any amendment of the application of adjustment which, if made, would result in withdrawal of the protest.

C. Contested Applications or Proceedings Defined - An application, appeal, motion, or proceeding pending before the Board is considered contested when either protestants or interveners, or both, files the notice of protest as above set out and appears at the hearing held on the application, motion or proceeding and presents testimony or

evidence in support of their contentions, or present a question or questions of law with regard to the application, motion or proceedings. Where neither protestants nor interveners so appear and a question of law with reference to any pending application, motion or proceeding, the same shall be considered as non-contested.
D. In the event of a contested hearing, each party shall furnish other parties to the proceeding with a copy of all motions, amendments or briefs filed by him with the Board.

RULE 24 - GENERAL RULES OF PROCEDURE FOR HEARING

A. Hearings - Hearings will be conducted in such a manner as the Board deems most suitable to the particular case, and technical rules of legal and court procedure need not be applied. It is the purpose of the Board to obtain all the relevant information and testimony pertaining to the issue before it as conveniently, inexpensively and expeditiously as possible without prejudicing the rights of either applicants or protestants.
B. Who May Appear - Any party at interest in a proceeding may appear either in person or by attorney or both in such proceedings. A party at interest is any person owning a water right within the bounds of the District who is or may be affected by such proceeding. At the discretion of the Board, anyone not a party at interest in a proceeding may appear.
C. Admissibility - Evidence will be admitted if it is of that quality upon which reasonable persons are accustomed to rely in the conduct of serious affairs. It is intended that needful and proper evidence shall be conveniently, inexpensively, and speedily produced while preserving the substantial rights of the parties to the proceedings.
D. Testimony Shall Be Pertinent - The testimony shall be confined to the subject matter contained in the application or contest. In the event that any party at a hearing shall pursue a line of testimony or interrogation of a witness that is clearly irrelevant, incompetent or immaterial, the person conducting the hearing may forthwith terminate such line of interrogation.
E. A Stipulation - Evidence may be stipulated by agreement of all parties at interest.
F. Limiting Number of Witnesses - The right is reserved to the Board in any proceeding to limit the number of witnesses appearing whose testimony may be merely cumulative.

RULE 25 - GENERAL RULES

A. Computing Time - In computing any period of time prescribed or allowed by these rules, by order of the board, or by any applicable statute, the day of the act, event or default from which the designated period of time begins to run, is not to be included, but the last day of the period so computed is to be included, unless it be a Sunday or legal holiday, in which event the period runs until the end of the next day which is neither a Sunday nor a legal holiday.
B. Time Limit - Applications, requests, or other papers or documents required or permitted to be filed under these rules or by law must be received for filing at the Board's offices in Eldorado, Texas. The date of receipt and not the date of posting is determinative.
C. Show Cause Orders and Complaints - The Board, either on its own motion or upon

receipt of sufficient written protest or complaint, may at any time, after due notice to all interested parties, cite any person operating within the District to appear before it in a public hearing and require him to show cause why his operating authority or permit should not be suspended, canceled, or otherwise restricted and limited, for failure to comply with the orders or rules of the Board or the relevant statutes of the State, or for failure to abide by the terms and provisions of the permit or operating authority itself. The matter of evidence and all other matters of procedure at any such hearing will be conducted in accordance with these rules of procedures and practice.

RULE 26 - WELL VALIDATION

In order to provide for the validation of existing water wells that are subject to the rules and regulations of the District, it shall be the policy of this Board that a certificate of validation for a well can be issued only after the location of the well and the wellhead equipment of the well has been determined by field survey by the District personnel, and/or designated agents acting for said District.

It is the privilege of this Board to cause to be issued a validation certification for wells drilled and equipped within the District for which the landowner or his agent has not applied for an Application For Water Well Permit; or for wells not otherwise properly permitted, provided that such wells were not drilled, equipped and operated in such a manner as to violate any other rules and regulations of the District; and provided that the costs of such well validation are paid to the District as provided by this resolution. Nothing in this resolution is intended to limit the powers of this Board to any other course of action granted within Texas Law, or within its rules and regulations, or within the prerogative of the Board.

RULE 27 - TRANSPORTATION OF WATER FROM THE DISTRICT

I. Every person must obtain a permit from the District for the transporting of water by pipeline, channel, ditch, watercourse or other natural or artificial facilities, or any combination of such facilities, if such water is produced from wells located or to be located within the District, and if all or part of such water is used or is intended for use outside of the boundaries of the District. However, the requirement for a permit hereunder shall not apply to any well currently in operation located within the District prior to the effective date of this Rule provided that amount of water transported from such well annually shall not exceed the greatest amount of water transported in any one of the previous three (3) calendar years.

(a) The permit provided for herein must be applied for and filed with the District in the form or forms promulgated by the District hereunder and such permit must be obtained from the District prior to the proposed transporting of water, all in accordance with the provisions of this rule.

(b) An application for the transportation of water for which a permit is required under this Rule must:

(1) be in writing and sworn to;
(2) contain the name, post office address and place of residence or principal office of the applicant;
(3) identify the location of the well or wells including latitude and longitude and physical directions to each well from which the water to be transported is produced or to be produced;
(4) describe specifically the proposed transportation facilities which includes, but is not limited to:

(i) a technical description of the proposed well(s) and production facility, including the depth of the well(s), casing diameter, type and setting of casing, perforation interval of casing, cementing information and size of pump.

(ii) a technical description of the facilities to be used for the transportation of the water.

(5) state the nature and purposes of the proposed use and the amount of water to be used for each purpose;
(6) state the time within which the proposed construction or alteration is to begin;
(7) state the length of time required for the proposed use of the water;
(8) provide scientific evidence showing that the proposed operation will not cause pollution, cause waste or cause a significant decline in water levels within a ten (10) mile radius of the operation.
(9) identify any other possible sources which could be used for the stated purposes, including quality and quantity of such alternate sources;
(10) identify any other liquids that could be substituted for the fresh ground water and possible sources of such liquid including quantity and quality.
(11) state the names and addresses of the property owners within one-half (½) mile of the location of the well(s) from which water is to be transported and the location of any wells on those properties;
(12) provide information showing the effect of the proposed transportation on the quantity and quality of water available within the District;
(13) include a water conservation plan and a drought management plan.

(c) The application must accompanied by a map or plat drawn on a scale not less than one inch equals 4,000 feet, showing substantially:

(1) the location of the existing or proposed well(s); and
(2) the location of the existing or proposed water transporting facilities; and
(3) the location of the proposed or increased use or uses.

(d) The application must be accompanied by an application fee in the amount of $500.00.
(e) The District shall determine whether the application, maps, and other materials comply with the requirements of this Act. The District may require amendment of the application, maps, or other materials to achieve necessary

compliance.
(f) The District shall conduct a hearing on each application within thirty (30) days of the filing of the complete application.
(g) The District shall give notice of the hearing on the application as prescribed by this Rule, stating:

(1) the name and address of the applicant;
(2) the date the application was filed;
(3) the location and purpose of the well from which the water to be transported is produced or to be produced;
(4) the time and place of the hearing; and
(5) any additional information the District considers necessary.

(h) At the time and place stated in the notice, the District shall hold a hearing on the application. The hearing may be held in conjunction with any regular or special meeting of the District, or a special meeting may be called for the purpose of holding a hearing. Any person may appear at the hearing, in person or by attorney, or may enter his appearance in writing. Any person who appears may present evidence, orally or by affidavit, in support or in opposition to the issuance of the permit, and may hear arguments.
(i) After the hearing, the District shall make a written decision granting or denying the application. The application may be granted in whole or in part. Any decision to grant a permit, in whole or in part, shall require a majority vote of Directors present.
(j) Such application shall not be approved unless the Board of Directors finds and determines that the transporting of water for use outside the District applied for will not substantially affect the quantity or quality of water available to any person or property within the District; that all other feasible sources of water available to the person requesting a permit have been developed and used to the fullest; that no other liquid could be feasibly substituted for the fresh groundwater; and that the proposed use, or any part of the proposed use, will not constitute waste as defined under the laws of the State of Texas. In evaluating the application, the District shall consider the quantity of water proposed to be transported; the term for which the transporting is requested; the safety of the proposed transportation facilities with respect to the contamination of the aquifer; the nature of the proposed use; the effect of the proposed use of the water to be transported on District residents taking into account all beneficial use of District residents, including municipal, agricultural, industrial, recreational and other categories; and such other factors as are consistent with the purposes of the District.
(k) On approval of an application, the District shall issue a permit to the applicant. The applicant's right to transport shall be limited to the extent and purposes stated in the permit. A permit shall not be transferable.
(l) The permit shall be in writing and attested by the seal of the District and it shall contain substantially the following information:

(1) the name of the person to whom the permit is issued;
(2) the date the permit is issued;

(3) the term for which the permit is issued;
(4) the date the original application was filed;
(5) the destination and use or purpose for which the water is to be transported;
(6) the maximum quantity of water to be transported annually;
(7) the time within which construction or work on the well transportation facilities must begin and the time within which it must be completed;
(8) the annual fee assessment for each acre foot withdrawn for the purposes of transportation outside the District as dictated by Chapter 36, Texas Water Code; and

(m) The permittee shall file with the District quarterly reports describing the amount of water transported and used for the permitted purpose. Such report shall be filed on the appropriate form or forms provided by the District within ten (10) days of March 31, June 30, September 30, and December 31 following the commencement of transporting of water, and within ten (10) days of each such quarterly date thereafter.

(n) All transporting facilities for wells subject to the requirements of this subsection shall be equipped with flow monitoring devices approved by the District and be available for District inspection at any time.

(o) Any permit granted under this subsection shall be subject to revocation for waste by the permittee, or for substantial deviation from the purposes or other terms stated in the permit.

(p) A permit for transportation of water carries the same date and term as the well permit and follows the same stipulations as set forth in Rule 5 Permit Term.

II. Any person transporting water produced from wells located within the District for use outside of the District, regardless of the amount of water so transported, must register such transporting with the District. Such registration shall be made within one hundred eight (180) days after the effective date of this Rule.

(a) Any person subject to the requirements of the Subsection II shall file with the District quarterly reports describing the amount of water transported, the destination and use of such water. Such report shall be filed on the appropriate form or forms provided by the District within ten (10) days of March 31, June 30, September 30 and December 31 following the commencement of transporting of water and within ten (10) days of each such quarterly date thereafter.

(b) All transporting facilities for wells subject to the requirements of this Subsection shall be equipped with flow monitoring devices approved by the District and available for District inspection at any time.

RULE 28 - WELL DRILLING, COMPLETION, CAPPING AND PLUGGING

(a) Responsibility - All well drillers and persons having a well drilled, deepened, or otherwise altered shall adhere to the provisions of this Rule prescribing the location of wells and proper drilling, completion, capping, and plugging of wells.

(b) Location of Domestic, Industrial, Injection, and Irrigation Wells

(1) Except as noted in paragraph (c)(1) of this Rule (relating to Standards of Completion for Domestic, Industrial, Injection, and Irrigation Wells), a well shall be located a minimum horizontal distance of 50 feet from any water-tight sewage and liquid-waste collection facility.

(2) Except as noted in paragraph (c)(1) of this Rule (relating to Standards of Completion for Domestic, Industrial, Injection, and Irrigation Wells), a well shall be located a minimum horizontal distance of 150 feet from any concentrated sources of contamination, such as existing or proposed livestock or poultry yards, privies, and septic system absorption fields.

(3) A well shall be located at a site not generally subject to flooding; provided, however, that if a well must be placed in a flood prone area, it shall be completed with a watertight sanitary well seal and steel casing extending a minimum of 24 inches above the known flood level.

(c) Standards of Completion for Domestic, Industrial, Injection, and Irrigation Wells

Domestic, industrial, injection, and irrigation wells shall be completed in accordance with the following specifications and in compliance with local county and/or incorporated city ordinances:

(1) The annular space between the borehole and the casing shall be filled from the ground level to a depth of not less than 10 feet below the land surface or well head with cement slurry. The distances given in Paragraph (b)(1) and (2) of this Paragraph (relating to Location of Domestic, Industrial, Injection, and Irrigation Wells) may be decreased provided the total depth of cement slurry is increased by twice the horizontal reduction. In areas of shallow, unconfined groundwater aquifers, the cement need not be placed below the static water level. In areas of shallow, confined groundwater aquifers having artesian head, the cement need not be placed below the top of the water-bearing strata.

(2) In all wells where plastic casing is used, a concrete slab or sealing block shall be placed above the cement slurry around the well at the ground surface.

(i) The slab or block shall extend at least two (2) feet from the well in all directions and have a minimum thickness of four inches and shall be separated form the well casing by a plastic or mastic coating or sleeve to prevent bonding of the slab to the casing.

(ii) The surface of the slab shall be sloped to drain away from the well.

(iii) The top of the casing shall extend a minimum of one foot above the top of the slab.

(3) In all wells where steel casing is used:

(i) The casing shall extend a minimum of one foot above the original ground surface; and

(ii) A slab or block as described in Paragraph (2)(I) is required

above the cement slurry except where a pitless adapter is used.

(4) Pitless adapters may be used in such wells provided that:

(i) the adapter is welded to the casing or fitted with another suitable effective seal; and

(ii) the annular space between the borehole and the casing is filled with cement to a depth not less than 15 feet below the adapter connection.

(5) All wells, especially those that are gravel packed, shall be completed so that aquifers or zones containing waters that are know to differ significantly in chemical quality are not allowed to commingle through the borehole-casing annulus or the gravel pack and cause quality degradation of any aquifer or zone.

(6) The well casing shall be capped or completed in a manner that will prevent pollutants from entering the well.

(d) Standards for completion for Wells Encountering Undesirable Water.

(1) If a well encounters undesirable water and the well is not plugged, the licensed well driller or owner shall see that the well drilled, deepened or otherwise altered is forthwith completed in accordance with the following:

(i) When undesirable water is encountered in a well, the undesirable water shall be sealed off and confined to the zone(s) of origin.

(ii) When undesirable water is encountered in a zone overlaying fresh water, the well shall be cased from top of the fresh water zone to the land surface.

(iii) The annular space between the casing and the wall of the borehole shall be cemented to the land surface.

(iv) When undesirable water is encountered in a zone underlying a fresh water zone, the part of the well bore opposite the undesirable water zone shall be filled with cement to a height that will prevent the entrance of the undesirable water into the pumping well.

(2) The person who performs the well completion on a well containing undesirable water shall, within 30 days after completing the well, submit a well completion report to the District Manager, on forms supplied by the District.

(e) Standards for Wells Producing Undesirable Water

(1) Wells completed to produce undesirable water shall be cased from the top of the undesirable water zone or 50 feet below the lowermost fresh water zone to the land surface.

(2) The annular space between the casing and the wall of the borehole shall be cemented to the land surface, or as a minimum, to a height greater than the hydrostatic head of the undesirable water aquifer plus the uppermost 10 feet of casing.

(3) If the undesirable water does not enter the cased part of the well, the lowermost of uppermost 10 feet (minimum) of the casing shall be

cemented in order to seal off all other water-bearing or other permeable sections from the well.

(f) Recompletions

(1) The landowner shall have the continuing responsibility of ensuring that a well does not allow the commingling of undesirable water and fresh water or the unwanted loss of water through the well bore to other porous strata.

(2) If a well is allowing the commingling of undesirable water and fresh water or the unwanted loss of water, and the casing in the well cannot be removed and the well recompleted with the applicable rules, the casing in the well shall be perforated and squeeze cemented in a manner that will prevent the commingling or loss of water. If such a well has no casing, then the well shall be cased and cemented, or plugged in a manner that will prevent such commingling or loss of water.

(3) the District Manager may direct the landowner to take proper steps to prevent the commingling of undesirable water and fresh water, or the unwanted loss of water.

(g) Well Plugging and Capping

(1) It is the responsibility of the landowner or person having the well drilled, deepened, or otherwise altered, to plug or have plugged a well which is abandoned..

(2) It is the responsibility of the landowner or person having the well drilled, deepened, or otherwise altered, to see that any well which encounters undesirable water is plugged under the standards set forth in this Rule. (Relating to Well Drilling, Completion, Capping, and Plugging).

(3) The person that plugs such a well shall, within 30 days after completion of plugging is complete, submit a well completion and plugging report to the District Manager, on forms supplied by the District Manger.

(h) Standards for Plugging Wells

(1) If the use of a well that does not contain any undesirable water zones is permanently discontinued, all removable casing shall be removed from the well and the entire well filled with cement to the land surface.

(2) In lieu of the procedure in subsection (1) of this paragraph, the well may be filled with heavy mud followed by a cement plug extending from the land surface to a depth of not less than 10 feet.

(i) Standards for Plugging Wells That Penetrate Undesirable Water Zones

(1) If the use of a well that penetrates undesirable water is to be permanently discontinued, all removable casing shall be removed from the well and the entire well filled with cement to the land surface.

(2) In lieu of the procedure in subsection (1) of this paragraph, either the zone(s) contributing undesirable water, or the fresh water zone(s), shall be isolated with cement plugs and the remainder of the well bore filled with heavy mud to form a base for a cement plug extending from the land surface to a depth of not less than 10 feet. If a well is plugged under this

subsection, prior approval of the plugging procedure must be obtained from the District.

RULE 29 - REPORTING UNDESIRABLE WATER

(a) Each licensed well driller shall immediately inform the landowner or person having a well drilled, deepened, or otherwise altered when undesirable water has been encountered.

(b) The well driller shall submit to the District Manager and the landowner or person having the well drilled, deepened, or otherwise altered, on forms supplied by the District Manager, a statement signed by the well driller indicating that the landowner or person having the well drilled, deepened, or otherwise altered, has been informed that undesirable water has been encountered and shall note on all logs filed that such water was found.

(c) The statement indicated in subsection (b) of this Rule must be submitted within 10 days after encountering undesirable water.

RULE 30 - AMENDMENTS TO RULES

All changes or amendments to the District Rules shall include the following requirements:

(a) those requirements as set forth in Chapter 36, Texas Water Code; and

(b) a summarization of rule changes published in the local newspaper with a notice of public hearing on proposed rule changes.

(c) a complete copy of the District Rules shall be filed at the County Clerk's Office.

REPEAL OF PRIOR REGULATIONS

All of the previous rules and regulations of the District have been revised and amended; and except as they are herein republished, they are repealed. Any previous rule or regulation which conflicts with or is contrary to these rules is hereby repealed.

SAVINGS CLAUSE

If any section, sentence, paragraph, clause, or part of these rules and regulations should be held or declared invalid for any reason by a final judgment of the courts of this state or of the United States, such decision or holding shall not affect the validity of the remaining portions of these rules; and the Board does hereby declare that it would have adopted and promulgated such remaining portions of such rules irrespective of the fact that any other sentence, section, paragraph, clause or part thereof may be declared invalid.