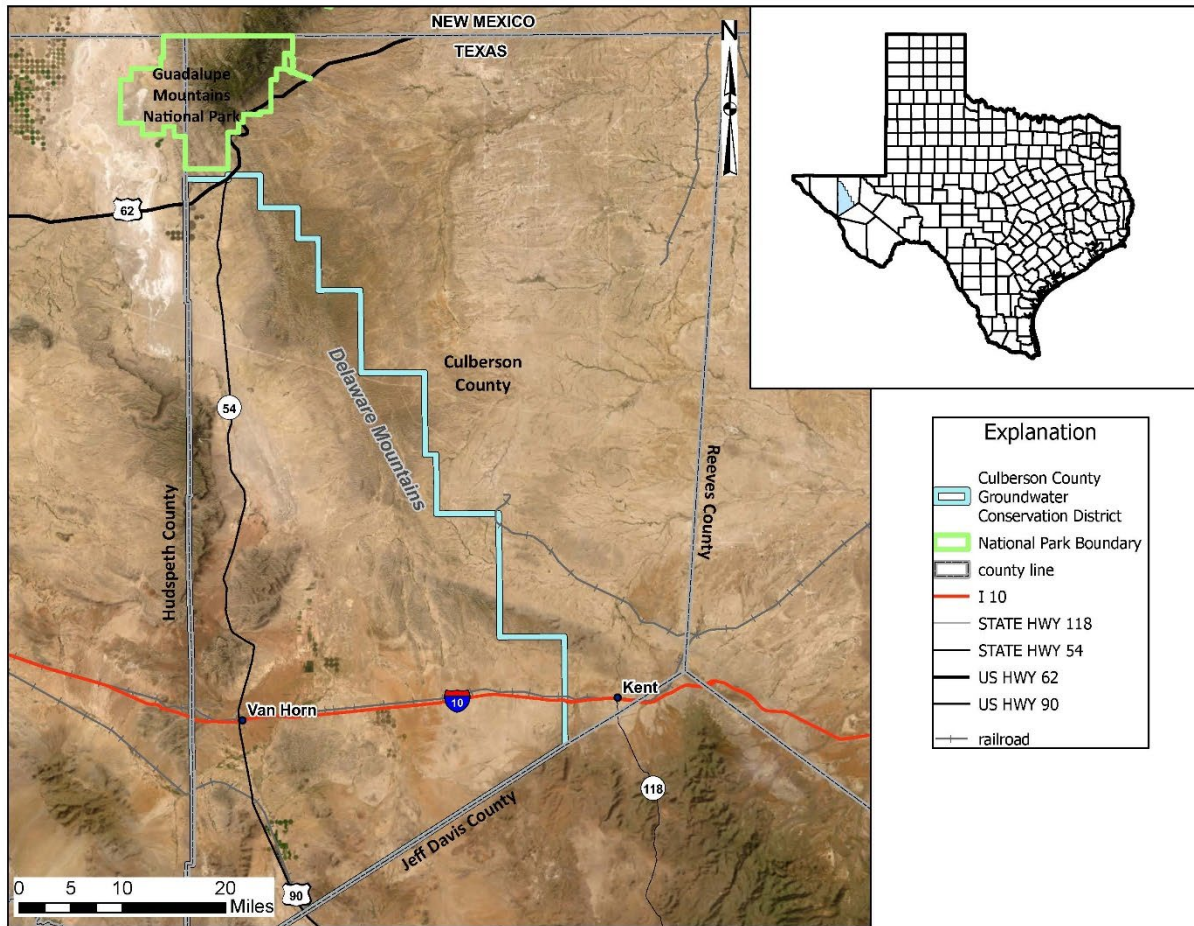


Culberson County Groundwater Conservation District Groundwater Management Plan



Haley Davis, General Manager
1300 W. Broadway Street, Van Horn, Texas 79855

1st DRAFT

June 30, 2026

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Appendix B. Agenda for Management Plan Hearing (pending)

Appendix C. Copy of Resolution Adopting Management Plan (pending)

Appendix D. Minutes from Management Plan Adoption Meeting (pending)

Appendix E. GMA-4 Resolution June 17, 2021

Appendix F. TWDB GAM Run 16-030_Addendum

Appendix G. JSAI (2026) Culberson County GCD Drawdown Analysis and MAG

Appendix H. TWDB Estimated Historical Groundwater Use and 2022 State Water Plan Datasets for
Culberson County GCD

Appendix I. TWDB GAM Run 11-018

DEFINITIONS

ac-ft/yr	acre feet per year
Culberson County GCD	Culberson County Groundwater Conservation District
CRCX	Capitan Reef Complex
The District	Culberson County Groundwater Conservation District
DFC	Desired Future Condition
GCD	Groundwater Conservation District
GMA-4	Groundwater Management Area 4
MAG	Modeled Available Groundwater
MAR	Managed Aquifer Recharge
NHUPP	Non-Historic Use Production Permits
TAC	Texas Administrative Code
TAGD	Texas Association of Groundwater Districts
TCEQ	Texas Commission on Environmental Quality
TWC	Texas Water Code
TWDB	Texas Water Development Board

1.0 DISTRICT MISSION

The Culberson County Groundwater Conservation District (The District or Culberson County GCD) is committed to manage and protect the groundwater resources of The District. The District was created to help maintain a sustainable, adequate, reliable, cost effective, and high quality source of groundwater to promote vitality, economy, and environment of the District.

2.0 PURPOSE OF MANAGEMENT PLAN

The purpose of the District is to provide a locally controlled groundwater district to conserve and preserve groundwater, protect groundwater users, protect groundwater, prevent pollution or waste of groundwater within the boundaries of the District, and regulate the transport of water out of the boundaries of the District. The District has adopted rules to regulate groundwater withdrawals based on historic and non-historic use and to achieve the desired future conditions (DFCs) for the groundwater resources within the District, as those DFCs are agreed upon by Groundwater Management Area 4 (GMA 4).

This plan shall be in effect for a period of five years from the date of approval by TWDB, unless a new or amended management plan is adopted by the District Board of Directors and approved by TWDB. The management plan will be readopted with or without changes by the District Board and submitted to TWDB for approval at least every five years. This plan provides guidelines for the operation of the Culberson County GCD.

3.0 DISTRICT INFORMATION

The Texas Legislature in 1997 authorized the creation of Culberson County Groundwater Conservation District (SB 1942), and confirmed by the citizens of Culberson County through an election in 1999. The district Bylaws and current rules can be referenced from The District website <https://www.ccgwcd.org>.

Boundaries of the District are illustrated on Figure 1 and described legally in SB 1942. In general, the boundaries of The District are limited to the western half of Culberson County, excluding Guadalupe Mountain National Park (northern boundary). The western and southern boundary of The District coincides with Hudspeth and Jeff Davis County boundaries, and the eastern boundary of the District follows the drainage divide created by the Delaware Mountains.

The District is within Groundwater Management Area 4 (GMA-4), and neighboring groundwater conservation districts include: 1) Hudspeth County Underground Water District #1, and 2) Jeff Davis County GCD.

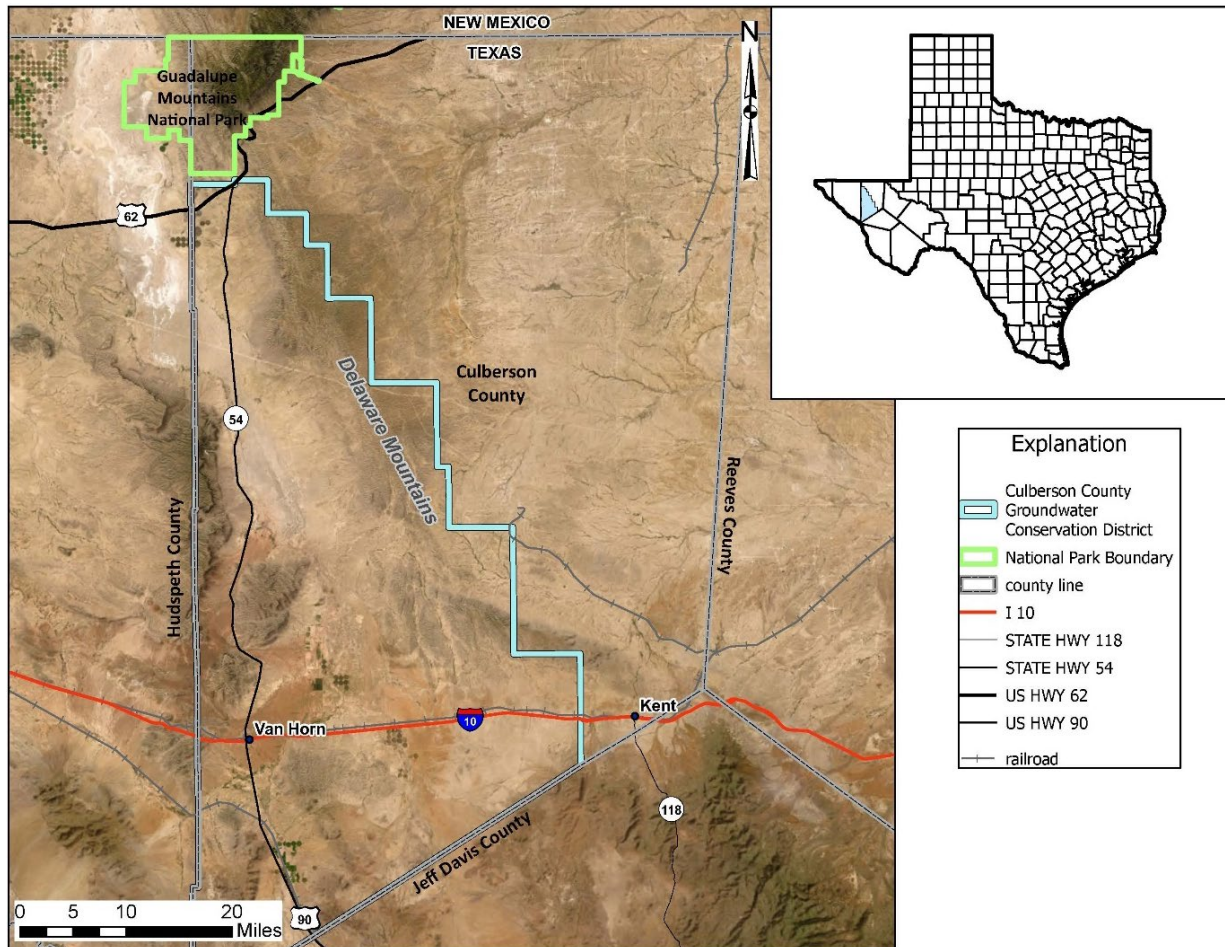


Figure 1. Map showing Culberson County GCD Boundary and geographic setting.

The District Board of Directors is composed of five directors, elected in even years on the uniform Election Day in May; the Directors each serve 4-year staggered terms. The Board of Directors hold regular meetings that are noticed public meetings held in accordance with public meeting requirements and The District Bylaws.

3.1 Authority of the District

The District derives its authority to manage groundwater use within the District by virtue of the powers granted and authorized in the District enabling act HB 1942 of the 75th Texas Legislature. The District, acting under authority of the enabling legislation, assumes all the rights and responsibilities of a groundwater conservation district specified in Chapter 36 of the Texas Water Code. The District has developed rules specifying the bounds of due process governing District actions. Current District rules are available from The District website <https://www.ccgwcd.org>.

3.2 Groundwater Resources within the District

There are four Texas Water Development Board (TWDB) designated aquifers within the District (Fig. 2 and 3):

1. Capitan Reef Complex
2. Edwards-Trinity (Plateau)
3. Igneous
4. West Texas Bolsons

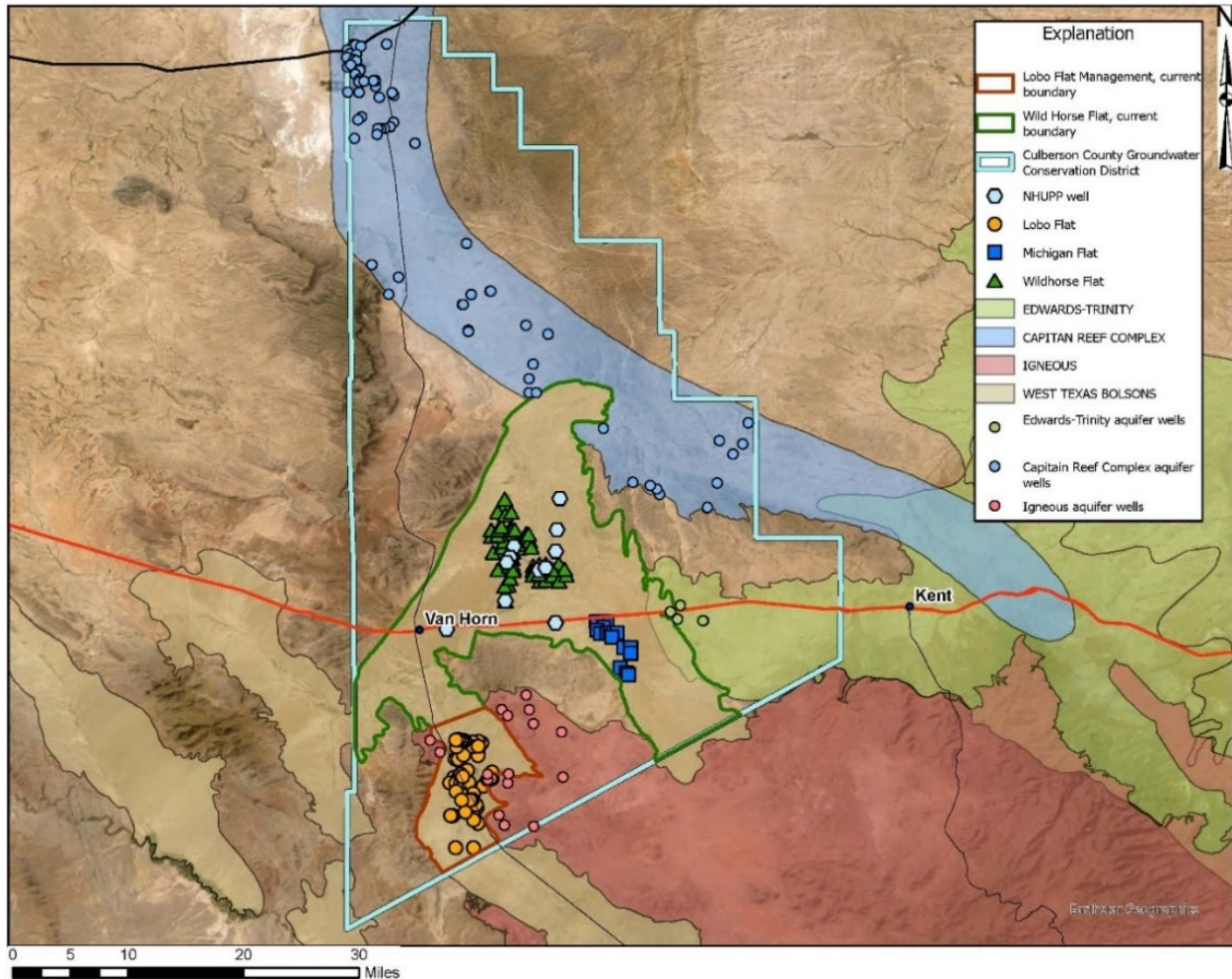


Figure 2. Map showing TWDB designated aquifers in Culberson County GCD.

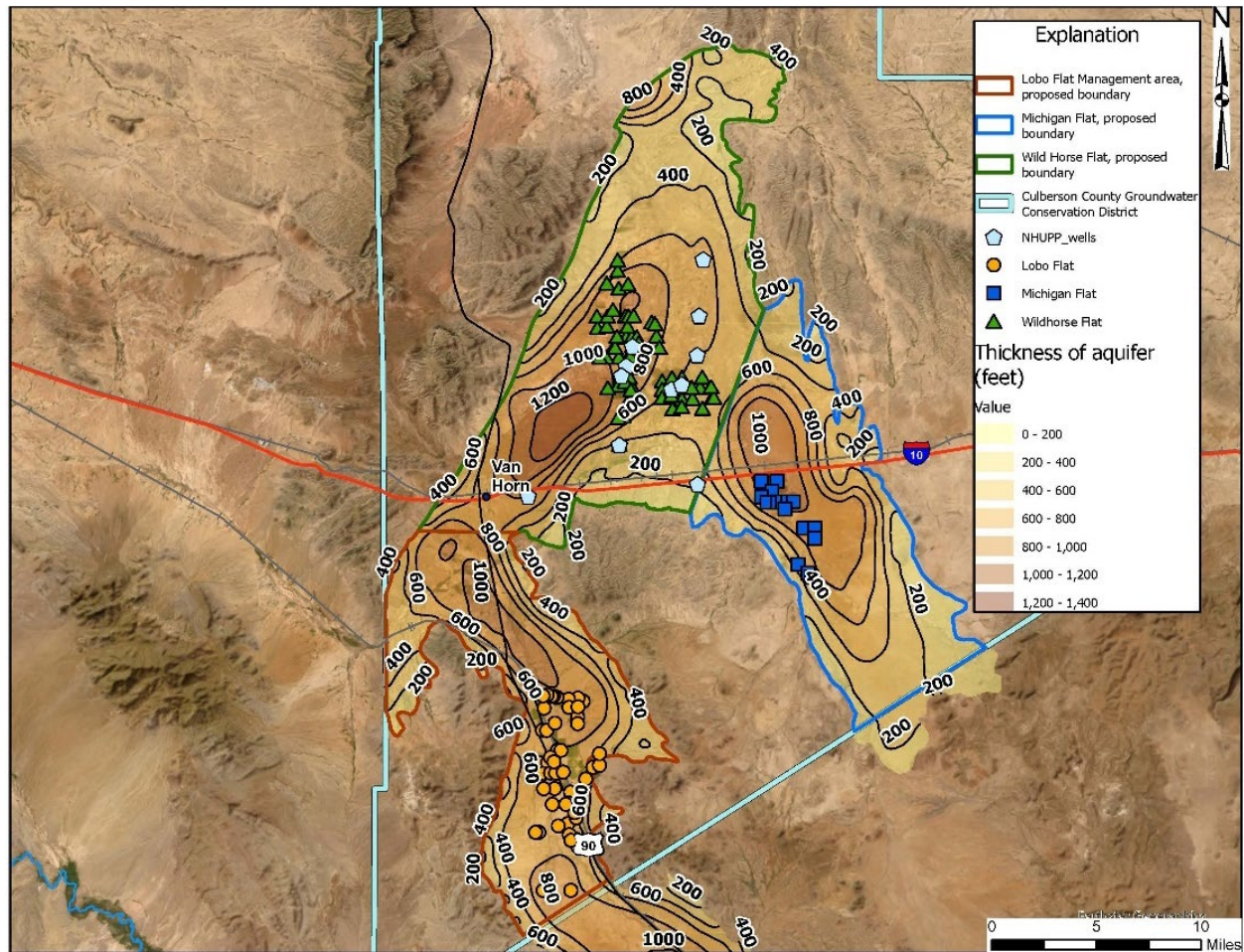


Figure 3. Map showing West Texas Bolson Aquifer in Culberson County GCD.

The western arm of the Capitan Reef Complex (CRCX) Aquifer is within the District's boundary and is classified as a minor aquifer by TWDB. The CRCX Aquifer includes the Permian-age Delaware Basin reef carbonate rocks. The CRCX Aquifer appears to be continuous as shown in Figure 2; however, it is faulted into blocks that formed the Guadalupe Mountains, Salt Basin, and Apache Mountains.

Edwards-Trinity (Plateau) Aquifer is classified as a major aquifer by the TWDB. The Edwards Trinity (Plateau) Aquifer consists of Cretaceous-age carbonate rocks. A significant area of the carbonate-rocks that make up the Edwards-Trinity (Plateau) Aquifer within the southeastern portion of Culberson County GCD is above the regional water table. Within Culberson County GCD, there are only a few exempt wells in the Edwards-Trinity (Plateau) Aquifer (Fig. 2).

The Igneous Aquifer is classified as a minor aquifer by TWDB, and is present in the southern portion of Culberson County GCD east of Lobo Flat. Culberson County GCD registered wells in the Igneous Aquifer are exempt wells used for stock and domestic purposes.

The West Texas Bolsons Aquifer is classified as a minor aquifer by TWDB, which consists of basin-fill sediments that were deposited in three distinct structural basins within Culberson County GCD: 1) Lobo Flat, 2) Wild Horse Flat, and 3) Michigan Flat (Fig. 2). The West Texas Bolson Aquifer is the primary aquifer in Culberson County GCD, which supports irrigated agriculture and the associated production permits. Each of the three structural basins (bolsons) is a Management Zone.

There are other aquifers in Culberson County GCD that are not a TWDB designated aquifer. Examples include the Permian-age rocks between the CRCX and Edwards-Trinity (Plateau) aquifers, and the northern (Upper) Salt Basin overlying the CRCX Aquifer. The Northern Salt Basin bolson largely contains brackish and saline groundwater.

As part of the most recent GMA-4 planning, Culberson County GCD has requested the West Texas Bolson Aquifer as relevant, and the other three aquifers as non-relevant.

3.4 Management Zones

The District partitioned the portion of the West Texas Bolsons Aquifer that are within the District's boundaries into three management zones consisting of the Lobo Flat area, the Wild Horse Flat area, and the Michigan Flat area (Figs. 3 and 4). The District shall maintain and enforce rules that provide for, but are not limited to, the following requirements:

1. spacing requirements for groundwater wells;
2. permits limiting the annual amount of groundwater that can be produced from nonexempt wells;
3. a limit on the maximum amount of groundwater permitted for withdrawal from the Wild Horse Management Zone;
4. a limit on the maximum amount of groundwater permitted for withdrawal from the Michigan Flat Management Zone;
5. a limit on the maximum amount of groundwater permitted for withdrawal from the Lobo Flat Management Zone; and
6. regulating well drilling, well plugging, and groundwater withdrawals in areas within and outside of the currently identified management areas to protect groundwater and groundwater users within the District.

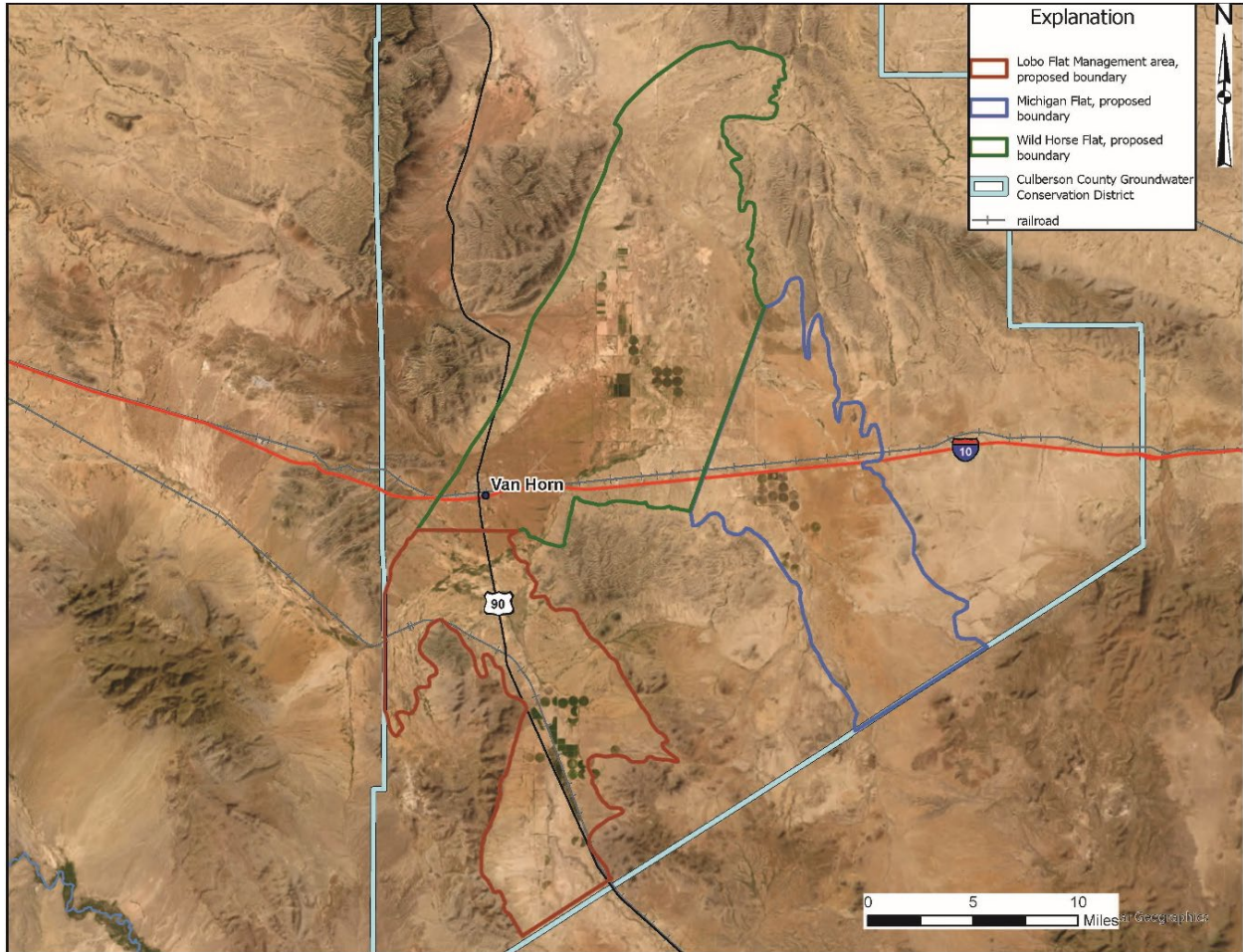


Figure 4. Map showing the three Management Zones for the West Texas Bolsons in Culberson County GCD.

4.0 CRITERIA FOR PLAN APPROVAL

This Management Plan was prepared in accordance with the requirements of Chapter 36 of the Texas Water Code and Title 31, Chapter 356, of the Texas Administrative Code, and the information provided is pursuant to statutes and rules as summarized in the TWDB Groundwater Conservation District Management Plan checklist, effective January 6, 2025.

This plan becomes effective upon adoption by the District's Board and approval by the TWDB affirming the plan is administratively complete. The District Management Plan will remain in effect for a period of 5 years from the date of TWDB's approval, or until a revised plan is approved by the TWDB.

4.1 Notice of Hearing and Resolution Adopting 2026 Management Plan

A copy of the Culberson County GCD notice for Management Plan Hearing, Agenda for Management Plan Hearing, resolution for adopting the 2026 to 2031 management plan, and minutes from Management Plan Adoption Meeting are provided in Appendices A, B, C, and D, respectively. The management plan was made available for public comment prior to adoption by the Board of Directors of the Culberson County Groundwater Conservation District (the District).

This plan replaces the existing plan adopted by the District's Board, which was approved by the TWDB on August 8, 2021.

4.2 Coordination of Management Plan with Regional Surface Water Entities

There were no surface-water entities identified in the 2017 State Water Plan that are located within the District's boundaries. A copy of the adopted Culberson County Groundwater Conservation District Management Plan was sent to the Chair of the Far West Regional Water Planning Group.

5.0 TECHNICAL INFORMATION REQUIRED BY TEXAS ADMINISTRATIVE CODE

Technical information required by the Texas Administrative Code (TAC) is based on the requirements set forth in the TWDB Groundwater Conservation District Management Plan checklist, effective January 6, 2025.

5.1 Estimate of Modeled Available Groundwater

The Modeled Available Groundwater (MAG) was calculated by the TWDB using the established Desired Future Conditions (DFC) detailed in GMA-4 Resolution (June 17, 2021) (Appendix E). A summary of the District’s DFCs can be referenced from Table 1.

Modeled Available Groundwater for West Texas Bolsons can be referenced from TWDB GAM Run 16-030 Addendum (Appendix F) and summarized in Table 2. The entire portion of the Igneous Aquifer and West Texas Bolsons Aquifer that is within the County is also within the District.

Table 1. Summary of Culberson County GCD Desired Future Conditions

Aquifer	Culberson County GCD DFC* determined by GMA-4 in 2021
CRCX	50
Edwards-Trinity (Plateau)	not relevant
Igneous	66
West Texas Bolson	78

* the average aquifer drawdown, in feet, that should not be exceeded after 50 years

Table 2. Summary of Culberson County GCD Modeled Available Groundwater as calculated in TWDB GAM Run 16-030 Addendum

Aquifer	2020	2030	2040	2050	2060
Lobo Flat	11,112	11,112	11,097	11,092	11,087
Wild Horse Flat	20,568	20,542	20,501	20,475	20,455
Michigan Flat	4,071	4,025	4,004	3,984	3,969
West Texas Bolsons	35,751	35,679	35,602	35,551	35,510

The District recognizes there is no Groundwater Availability Model (GAM) for the CRCX Aquifer in Culberson County and the previous MAG is based on pumping estimates from Armstrong Farms as detailed in TWDB AA 09-08 (Wuerch and Others, 2011), which may, due to the lack of data, underestimate the available groundwater for other stakeholders in the District.

The MAG for West Texas Bolsons was further evaluated by District Management Zone boundaries (Figs. 3 and 4). In 2026, the District updated the rules to redefine three Management Zones (Lobo,

Wild Horse, and Michigan) that better represented the groundwater storage system of each bolson. JSAI (2026) provided an estimate of MAG for each of the three Management Zones (Appendix G), which is summarized in Table 3.

Table 3. Summary of Culberson County GCD West Texas Bolsons Management Zones MAG

Bolson (Management Zone)	MAG¹ (ac-ft/yr)
Lobo	10,670
Wild Horse	15,090
Michigan	9,271
TOTAL WTB	35,031

¹ based on JSAI (2026) (Appendix G)

5.2 Amount of Groundwater Being Used within the District

Irrigation water use makes up the large majority of the water use in the District. The District requires by rule that all groundwater pumped under production permits must be metered. The District has issued approximately 24 Historic Use Production Permits (HUPP), all for irrigation purposes, approximately five Non-Historic Use Production Permits (NHUPP), mostly for industrial purposes, and one export permit for industrial use. These production permits identify approximately 127 wells from which groundwater can be pumped for non- exempt purposes. All pumping wells must be equipped with meters approved by the district, and pumping data are gathered at least quarterly by a field technician employed by the District. A continued effort is made to ensure that all wells are metered properly, and a matching grant from the TWDB was used to purchase 57 new meters to replace meters needing replacement in the District. District meter data are summarized in Table 4.

Table 4. Summary of Culberson County GCD metered pumping from West Texas Bolsons

year	Wild Horse Management Zone (ac-ft)	Lobo Management Zone (ac-ft)	Michigan Management Zone (ac-ft)	total (ac-ft)
2021	9,415	9,270	523	19,209
2022	8,232	8,563	1,205	18,000
2023	10,959	9,018	3,246	23,223
2024	13,180	12,547	4,221	28,926
2025	17,013	8,710	2,212	27,935

All groundwater use data referenced to TWDB were obtained from TWDB Estimated Historical Groundwater Use and 2022 State Water Plan datasets obtained from the TWDB for Culberson County (see Appendix H). A summary of historical groundwater used is presented as Table 5.

Estimated historical groundwater use for the County was adjusted, where appropriate, to represent groundwater use within the District.

Table 5. Groundwater use within the District

year	Municipal ¹	Mining ²	Irrigation ³	Livestock ⁴	total
2018	967	57	35,766	116	36,906
2019	945	79	36,785	116	37,925
2020	1,007	156	30,673	116	31,952
2021	899	134	31,561	112	32,706
2022	973	70	31,215	193	32,451
2023	899	96	40,364	185	41,544

1: The City of Van Horn is located within the District and accounts for all of Municipal Use in County

2: Mining use based on meter readings for 2018 through 2023 within the District

3: 100% of irrigated land in the County is within the District, and includes West Texas Bolsons and CRCX

4: Livestock use estimate-based ratio of land within District to County (45.45%) (Appendix H)

5.3 Amount of Recharge from Precipitation

The estimated amounts of recharge within the District from precipitation were obtained from TWDB GAM Run 11-018 (Appendix I), and summarized in Table 6.

Table 6. Estimates of recharge within the District

aquifer	estimated recharge (ac-ft/yr)
Igneous ¹	671
West Texas Bolsons ¹	2,107

¹ TWDB GAM Run 11-018
ac-ft/yr - acre-feet per year

5.4 Amount of Water that Discharges to Springs

The TWDB GAM Run 11-018 (Appendix I) estimate of the annual amount of water discharged to springs from the portion of the West Texas Bolson within the District is 494 acre-feet. The location of the springs is not provided in the report and currently, there are no known springs discharging from the portion of the West Texas Bolson within the District.

Decades of research (Nicot et al., 2022) have identified the Edwards-Trinity (Plateau) and CRCX aquifers as source of water discharging to the springs at Balmorhea in Reeves County. However, the quantity of discharge from these aquifers within the District to the springs at Balmorhea has not been quantified. Nevertheless, Culberson County GCD currently has no production permits in Edwards-Trinity (Plateau) or CRCX aquifers.

5.5 Groundwater Inflow and Outflow of District

The values for groundwater flow into and out of the District were obtained from the January 23, 2019 TWDB publication GAM Run 11-018 (Appendix I), and are shown in Tables 7 and 8.

Table 7. West Texas Bolson Inflows and Outflows– TWDB GAM Run 11-018

description of inflow and outflow (Management Plan requirement)	aquifer	estimated flow ac-ft/yr
Estimated annual amount of recharge from precipitation to District	West Texas Bolsons Aquifer	2,107
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	West Texas Bolsons Aquifer	494
Estimated annual volume of flow into the District within each aquifer in the District	West Texas Bolsons Aquifer	7,453
Estimated annual volume of flow into the District within each aquifer in the District	West Texas Bolsons Aquifer	629
Estimated net annual volume of flow between each aquifer in the District	From the Igneous Aquifer and other underlying units into the West Texas Bolsons Aquifer	5,238*

* some of flow from Table 8 included in this value
ac-ft/yr - acre-feet per year

Table 8. Igneous Aquifer Inflows and Outflows– TWDB GAM Run 11-018

description of inflow and outflow (Management Plan requirement)	aquifer	estimated flow ac-ft/yr
Estimated annual amount of recharge from precipitation to the District	Igneous Aquifer	671
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Igneous Aquifer	0
Estimated annual volume of flow into the district within each aquifer in the district	Igneous Aquifer	1,037
Estimated annual volume of flow into the district within each aquifer in the district	Igneous Aquifer	463
Estimated net annual volume of flow between each aquifer in the district	From the Igneous Aquifer into the West Texas Bolsons Aquifer	1,562*

* some of flow reported in Table 8 are included in Table 7
ac-ft/yr - acre-feet per year

5.6 Projected Surface Water Supply

There are no significant sources of surface water (such as the Rio Grande) within the boundaries of the District. The primary drainage way (Wild Horse Arroyo) is an ephemeral drainage with no flow except during infrequent rainfall/runoff storm events that flow into a topographically closed basin (Salt Basin) and evaporates. Stock tanks are typically maintained with exempt wells, but can capture storm water when it occurs. Estimated historical surface water use within Culberson County ranges between 6 and 10 ac-ft/yr (Appendix H).

5.7 Projected Total Demand for Water within the District

Project total water demand for Culberson County GCD was obtained from the TWDB 2022 State Water Plan datasets (Appendix H), modified with justification, and presented as Table 9.

The District contains 100% of the irrigated agriculture and municipal use (City of Van Horn) within the County. The 55% of the County that is outside of the District primarily uses water for oil and gas development (mining), and livestock use. Therefore, the projected use for mining is likely overstated. Most all of the projected demand from within the District would come from the West Texas Bolsons and CRCX aquifers.

Table 9. Texas State Water Plan 2022 Data – Projected Water Demand within the District

type	2020	2030	2040	2050	2060	2070
	ac-ft/yr					
Irrigation ¹	37,863	37,863	37,863	37,863	37,863	37,863
Livestock	122	122	122	122	122	122
Manufacturing	2	3	3	3	3	3
Mining ¹	961	1,294	1,363	1,235	1,114	1,022
Municipal (Van Horn)	662	711	737	760	774	783
other	29	31	32	33	34	34
TOTAL	39,639	40,024	40,120	40,016	39,910	39,827

¹ Appendix H value divided by 0.4535 to represent projected use within the District
ac-ft/yr - acre-feet per year

5.8 Projected Water Supply Needs

The TWDB projected water supply needs for Culberson County, based on 2022 State Water Plan data, can be referenced from Appendix H. The projected water supply needs are listed by use category. All categories except “irrigation” show surplus supply. Irrigation water needs will likely be in Lobo Flat Management Zone of the West Texas Bolsons Aquifer. From 2020 to 2070 the total needs in Culberson County increase from 333 ac-ft/yr to 5,858 ac-ft/yr (Appendix H).

5.9 Projected Water Management Strategies

The Culberson County projected water management strategies derived from Texas State Water Plan 2022 datasets can be referenced from Appendix H. Water management strategies include agricultural conservation, and additional wells for established irrigated agriculture in Culberson County GCD. From 2020 to 2070 the total water management strategies in Culberson County are projected to be 440 ac-ft/yr (Appendix H).

5.10 Most Recently Approved DFCs

The most recently approved DFCs are summarized in Table 1 and the supporting GMA-4 resolution for adopting the DFCs June 17, 2021 is presented as Appendix E.

5.11 Monitoring and Tracking District DFCs

The District tracks DFCs by relying on water level monitoring data collected monthly by the District from wells in each of the three Management Zones, as well as water level data collected from TWDB. A detailed analysis of water level data and how DFCs are tracked for the District was performed by JSAI (2026), and is attached as Appendix G.

5.12 Achieving District DFCs

The West Texas Bolsons is the primary aquifer in the District which as a DFC of 78 ft for 50-year period. Water level data were compiled and a projected trend analysis was performed to determine if the District was achieving the West Texas Bolson Aquifer DFC of 78 ft. Results of this analysis can be referenced from table 1 in Appendix G. It was concluded that the water level trend analysis supports a DFC of 78 ft for the West Texas Bolsons in Culberson County GCD. The calculated average rate of drawdown has been 1.1 ft per year, which projects to a total drawdown of 57 ft for the next 50 years. A DFC of 78 ft should accommodate the exercise of all permitted Historical Use Production Permits in Culberson County GCD.

5.13 Management of Groundwater Supplies

The District will manage the production of groundwater from the West Texas Bolsons Aquifer within the District in a sustainable manner and in three Management Zones (Wildhorse, Michigan, and Lobo Flat). The Wildhorse Management Zone includes irrigated land within the District. The District will identify and engage in practices that, if implemented, would result in more efficient use of groundwater. The amount of groundwater withdrawals permitted by the District shall be tied to the modeled available groundwater to the portions of the West Texas Bolson Aquifer Management Zones within the District. The groundwater elevations measured in the District's monitoring wells are used to monitor the District's DFCs (as defined by GMA-4 resolution, see Appendix E), in accordance with the District's rules, and to protect the historic and existing uses of groundwater.

The District shall report annually to the Board on the amount of groundwater being withdrawn through non-exempt wells located within the District, measured through the District's flow metering program, for the quantification of existing and historic use of groundwater within the District's boundaries, and for the issuing of production permits for all non-exempt wells in operation. The District shall prepare an annual report summarizing District activities to be approved by the Board of Directors during the first quarter of each year. This annual report will be posted on the District's web site.

5.14 District Rules: Actions, Procedures, Performance, and Avoidance Necessary to Effectuate the Management Plan

The District's Rules contain the necessary procedures and required actions that the District must perform and avoid that are necessary to effectuate this management plan. A copy of the District's current rules can be download from: <https://www.ccgwcd.org/rules-management-plan/>.

To meet the requirements of Texas Water Code §36.1071 (e)(2), the District will act on the goals and directives established in this District Management Plan. The District will incorporate District's Management Plan into the District Rules. The District will amend rules in accordance with Chapter 36 of the Texas Water Code. The District rules and actions will be in compliance with all application sections of Chapter 36 of the Texas Water Code and Chapter 8816 of the Special District Local Laws Code. Meetings of the District's Board of Directors will be noticed (announced) and conducted in accordance with the Texas Open Meetings Act. The District will also make available for public inspection all official documents, reports, records, and minutes of the District pursuant with the Texas Public Information Act.

6.0 MANAGEMENT GOALS

The methodology that the District will use to track its progress on an annual basis in achieving all of 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 regards to achieving management goals and objectives (during the first quarterly Board of Directors meeting each fiscal year). The report will be maintained on file at the District office.

6.1 Providing the Most Efficient Use of Groundwater

Management Objective: At least quarterly, the District will provide information to the general public regarding the amount of use and depth to water change of the groundwater in the District Management Zones. In addition, an annual report will be prepared by the District Manager.

Performance Standard: The District's annual newsletter that will be posted on the District's website and will include information on the status of groundwater in the District.

Management Objective: Each year, the District will require all new exempt or permitted wells that are constructed within the boundaries of the District to be registered with the District in accordance with the District rules.

Performance Standard: Each Year the number of exempt and permitted wells registered by the District for the year will be incorporated into the Annual Report submitted to the Board of Directors of the District.

6.2 Controlling and Preventing Waste of Groundwater

Management Objective: Each year, the District will review meter data from non-exempt wells and inform District water users about the efficient use of water and potential methods to prevent waste.

Performance Standard: The District's website will be updated at least once a year to include information on conservation methods.

6.3 Controlling and Preventing Subsidence

The District has reviewed the TWDB subsidence risk report "Identification of the Vulnerability of the Major and Minor Aquifers of Texas to Subsidence with Regard to Groundwater Pumping" (<http://www.twdb.texas.gov/groundwater/models/research/subsidence/subsidence.asp>) for applicability. Figures 4.74., 4.101, and 4.140 of the report show low risk for all aquifers within the District. However, there is potential subsidence (as defined in Chapter 36 of the Texas Water Code) within the District caused by groundwater withdrawals in Lobo Flat Management Area. Fissures indicative of subsidence have been identified by the District, stakeholders have been notified, and

the District has proactively started an investigation to determine a cause such as past groundwater pumping. This management item is currently applicable to the District’s current Management Plan, and the District will continue to watch for subsidence risks, continue to investigate, and report if it is a problem or could be a problem in the future.

6.4 Addressing Conjunctive Surface Water Management Issues

There are no known conjunctive surface water management issues within the District, and this management item is not applicable to the District’s Management Plan.

6.5 Addressing Natural Resource Issues that Impact the Use and Availability of Groundwater and which are Impacted by the Use of Groundwater

On page 40 of the 1975 TWDB Report 189 “Major Springs of Texas” lists five springs in Culberson County (Bone, Pine, Independence, Delaware, and Rattlesnake). Only Rattlesnake Springs is within the District boundaries and its source of water is from the mountain front recharge area of Victorio Peak, and not related to any of the designated aquifers within the District. The district reviewed the Texas and Wildlife endangered species list for Culberson County (<https://tpwd.texas.gov/gis/rtest/>) and found no species that would be affected by the District’s groundwater management plan or rules.

Management Objective: The General Manager will report to the Board of Directors, upon observance or reporting, of any contamination or pollution of the aquifers from other natural resources being produced within the District.

Performance Standard: The General Manager will report to Board regarding observing any contamination or pollution of the aquifers, if any, at each regular board meeting.

Management Objective: The District will encourage the collection and testing of groundwater quality samples by well owner from newly-drilled wells and existing wells.

Performance Standard: The District will work with the Culberson County Extension Agent to bring in outside testing facilitators and water quality programs.

Management Objective: The District may inspect suspended and abandoned wells to ensure proper closing of wells in accordance to rules set forth by the District. Notices will be sent and fines may be assessed against well owners whose wells do not adhere to District rules.

Performance Standard: The following will be the expected key metrics used to measure progress of management objectives: The number of notices sent out and possible fines assessed to well owners or operators concerning violations of District rules and the number of wells plugged each year.

Management Objective: Identify and address legislative policies that might affect groundwater resources.

Performance Standard: The Culberson County GCD staff regularly uses Texas Association of Groundwater Districts (TAGD) as a means to monitor Texas State Legislative and judicial activity regarding groundwater issues. Staff will present to the Board annually while the Texas Legislature is in session, updates on legislative and judicial activities that may impact Culberson County GCD constituents.

6.6 Addressing Drought Conditions

Management Objective: The annual amount of groundwater permitted by the District for withdrawal from the portion of the West Texas Bolsons Aquifer located within the District may be curtailed during periods of extreme drought in the recharge zone of the aquifer or because of other conditions that cause significant declines in groundwater surface elevations. Such curtailment may be triggered by the District's Board based on the groundwater elevation measured in the District's monitoring well(s).

Performance Standard: The District's annual report will include a report on the District's monitoring well groundwater elevation based on at least one measurement per year and a report on whether the permitted withdrawals were curtailed at any time during the year because of drought conditions. The District will also include the link <https://www.waterdatafortexas.org/drought> for the TWDB drought information on our website.

6.7 Addressing Conservation, Recharge Enhancement, Rainwater Harvesting, Precipitation Enhancement, and Brush Control

Management Objective: The District shall promote the efficient application of irrigation water to field crops, such as drip-irrigation systems.

Performance Standard: The District shall assist in organizing the field demonstration of irrigation water conservation technology during one day every other year.

Management Objective: The District shall promote rainwater harvesting, precipitation enhancement, Managed Aquifer Recharge (MAR), and brush control.

Performance Standard: The District shall include articles annually on rainwater harvesting, precipitation enhancement, MAR, and brush control in its annual newsletter.

Management Objective: The District shall study the recharge process and find possible Managed Aquifer Recharge areas in the Management Zones.

Performance Standard: The District shall include articles and investigations annually on MAR on its website, and monitor wells thought to be in recharge zones, as well as documenting storm-water runoff events and observed recharge areas (Wild Horse Draw in Lobo Flat), if any.

6.8 Addressing Desired Future Conditions

The GMA 4 on September 8, 2021 adopted the following DFCs for Culberson County GCD for total drawdown from the period 2020 to 2070 of 50 feet for Capitan Reef Complex, 78 feet for the West Texas Bolsons, and 66 feet for the Igneous. The following objectives and performance standards will be used to address the District's Desired Future Conditions.

Management Objective: The District will continuously measure the water levels in at least one monitoring well and will manually measure water levels each year in at least five monitoring wells within the District and will determine the average groundwater levels annually. The District will compare the water level averages to the corresponding years' increment of its DFCs in order to track its progress in achieving the DFCs.

Performance Standard: The District's Annual Report will include the water level measurements taken each year for the purpose of measuring water levels to assess the District's progress towards achieving its DFCs. The District will include a discussion of its comparison of water level averages to the corresponding years' increments of its DFCs in order to track its progress in achieving its DFCs.

Management Objective: The District will review and calculate its total amount of groundwater pumped within the District and assess whether the District is on target to meet the DFC estimates submitted to the TWDB.

Performance Standard: The District's Annual Report will include a discussion of the amount of water pumped each year within the District and will evaluate the District's progress in achieving the DFCs of the groundwater resources within the boundaries of the District and whether the District is on track to maintain the DFC estimates over the fifty- year planning period.

7.0 REFERENCES

- Beach, J. A, Ashworth, J. B., Finch, S. T., Chastian-Howley, A., Calhoun, K, Urbanczyk, K., Sharp, J., and Olson, J., 2004, Groundwater Availability Model for the Igneous and Parts of the West Texas Bolsons (Wild Horse, Michigan, Ryan, and Lobo Flats) Aquifers: Consultant’s report prepared for the Texas Water Development Board.
- Boghici, R., and Bradley, R. G., 2018, GAM Run 16-030 Modeled Available Groundwater for the Aquifers in Groundwater Management Area 4: Texas Water Development Board GAM Run Report, 36 p.
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- Gates J. S., White, D. E., Stanley, W. D., and Ackermann, H. D., 1978, Availability of fresh and slightly saline ground water in the basins of westernmost Texas: U. S. Geological Survey, Open-File Report 78-663, 115 p.
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- LRE Water, LLC, 2017, TWDB Contract Report LRE Water, LLC, “Identification of the Vulnerability of the Major and Minor Aquifers of Texas to Subsidence with Regard to Groundwater Pumping”

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- Standen, A., Finch S, Williams, R., Lee-Brand, B, 2009, Capitan Reef Complex Structure and Stratigraphy: contract report by Daniel B. Stephens and Associates Inc., Texas Water Development Board, 53 p.
- Wade, S. C., 2020, GAM Run 16-030 _Addendum: Culberson County Groundwater Conservation District Modeled Available Groundwater for the West Texas Bolsons Aquifer: Texas Water Development Board, Groundwater Division, Groundwater Availability Modeling Department, 7 p.

APPENDICES

Appendix A.

Copy of Notice for Management Plan Hearing (pending)

Appendix B.

Agenda for Management Plan Hearing (pending)

Appendix C.

Copy of Resolution Adopting Management Plan (pending)

**Resolution of the
Culberson County Groundwater Conservation District
(the District)**

Whereas, the District in accordance with Chapter 36 of the Texas Water Code has provided public notice of hearing regarding amendment and adoption of the District’s Groundwater Management Plan;

Whereas, the District has held three public meetings soliciting public comments regarding the proposed draft amended management plan and a quorum of the board was present for all meetings;

Whereas, copies of all written comments regarding the proposed management plan have been provided to each of the District’s Board Members;

Therefore, the Board of Directors adopted the proposed management plan, as amended, and shall send a copy of the plan to the Texas Water Development Board for certification, to the Chair of the Far West Texas Water Planning Group, and to the general managers of each of the groundwater districts within Groundwater Management Area 4 of Texas.

, Chairman

, Secretary

Appendix D.

Minutes from Management Plan Adoption Meeting (pending)

Appendix E.

GMA-4 Resolution June 17, 2021

Adopted June 17, 2021

**RESOLUTION FOR ADOPTION OF THE DESIRED FUTURE CONDITIONS FOR THE
AQUIFERS IN GROUNDWATER MANAGEMENT AREA 4**

WHEREAS: Groundwater Management Area (GMA) 4 comprised of the following Groundwater Conservation Districts: Brewster County GCD, Culberson County GCD, Hudspeth County UWCD No. 1, Jeff Davis County UWCD, Presidio County UWCD have reviewed and discussed groundwater availability models and considered the nine statutory factors set forth in Section 36.108(d) of the Texas Water Code

NOW, THEREFORE, BE IT RESOLVED THAT: That the District members of Groundwater Management Area 4 have adopted the following proposed DFCs:

Brewster County GCD: for the period from 2010-2060

3 foot drawdown for the Edwards-Trinity (Plateau) Aquifer

10 foot drawdown for the Igneous Aquifer

0 foot drawdown for the Marathon Aquifer

0 foot drawdown for the Capitan Reef Complex

The Rustler was deemed non-relevant for joint planning purposes.

Culberson County GCD: for the period from 2010-2060

50 foot drawdown for the Capitan Reef Complex

78 foot drawdown for the West Texas Bolsons

66 foot drawdown for the Igneous Aquifer

The Edwards Trinity (Plateau) and Upper Salt Basin were deemed non-relevant for joint planning purposes.

Hudspeth County UWCD No. 1: for the period from 2010-2060

0 foot drawdown for the period from 2010 until 2060 for the Bone Springs-Victorio Peak Aquifer, averaged across the portion of the aquifer within the boundaries of the District.

The Capitan Reef has been deemed non-relevant for joint planning purpose.

Jeff Davis County UWCD: for the period from 2010-2060

20 foot drawdown for the Igneous Aquifer

72 foot drawdown for the West Texas Bolsons

The Edwards-Trinity (Plateau), Pecos Valley Aquifer, Capitan Reef Complex, and the Rustler were deemed non-relevant for joint planning purposes.


Presidio County UWCD: for the period from 2010-2060

14 foot drawdown for the Igneous Aquifer


72 foot drawdown for the West Texas Bolsons

72 foot drawdown for the Presidio-Redford Bolson

AND IT IS SO ORDERED AND PASSED THIS 17th DAY OF JUNE 2021.

SIGNED  6-17-21
Joan Johnson Brewster County GCD

SIGNED  6-17-21
Summer Webb Culberson County GCD

SIGNED  6-17-2021


Randy Barker

Hudspeth County UWCD No 1

SIGNED  6-17-21

Janet Adams

Jeff Davis County UWCD

SIGNED  6-17-2021

Carolyn Macartney

Presidio County UWCD

Appendix F.

TWDB GAM Run 16-030_Addendum

**GAM RUN 16-030_ADDENDUM:
CULBERSON COUNTY GROUNDWATER
CONSERVATION DISTRICT MODELED
AVAILABLE GROUNDWATER FOR THE
WEST TEXAS BOLSONS AQUIFER**

By Shirley C. Wade, Ph. D., P.G.
Texas Water Development Board
Groundwater Division
Groundwater Availability Modeling Department
(512) 936-0883
June 24, 2020



Shirley C. Wade
6/24/2020

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GAM RUN 16-030_ADDENDUM: CULBERSON COUNTY GROUNDWATER CONSERVATION DISTRICT MODELED AVAILABLE GROUNDWATER FOR THE WEST TEXAS BOLSONS AQUIFER

By Shirley C. Wade, Ph.D., P.G.
Texas Water Development Board
Groundwater Division
Groundwater Availability Modeling Department
(512) 936-0883
June 24, 2020

EXECUTIVE SUMMARY:

Culberson County Groundwater Conservation District requested via email on June 8, 2020 that the TWDB provide the modeled available groundwater for the West Texas Bolsons Aquifer with their district divided into three geographic areas. The three geographic areas are the Lobo Flat, the Michigan Flat, and the Wild Horse Flat (Figure 1). Culberson County Groundwater Conservation District provided Geographic Information System (GIS) shapefiles for each area.

We used the geographic area shapefiles to update the (GIS) grid file for the groundwater availability model for the Igneous and parts of the West Texas Bolsons Aquifer. In addition, we made small adjustments to the geographic area assignments in the (GIS) grid file to fully capture the extent of the bolsons used for the original modeled available groundwater analysis (Figure 1; Boghici and Bradley, 2018; Oliver, 2011, Oliver, 2010a; Oliver, 2010b). We then used the revised grid to extract the modeled available groundwater values from the previous model results (Table 1).

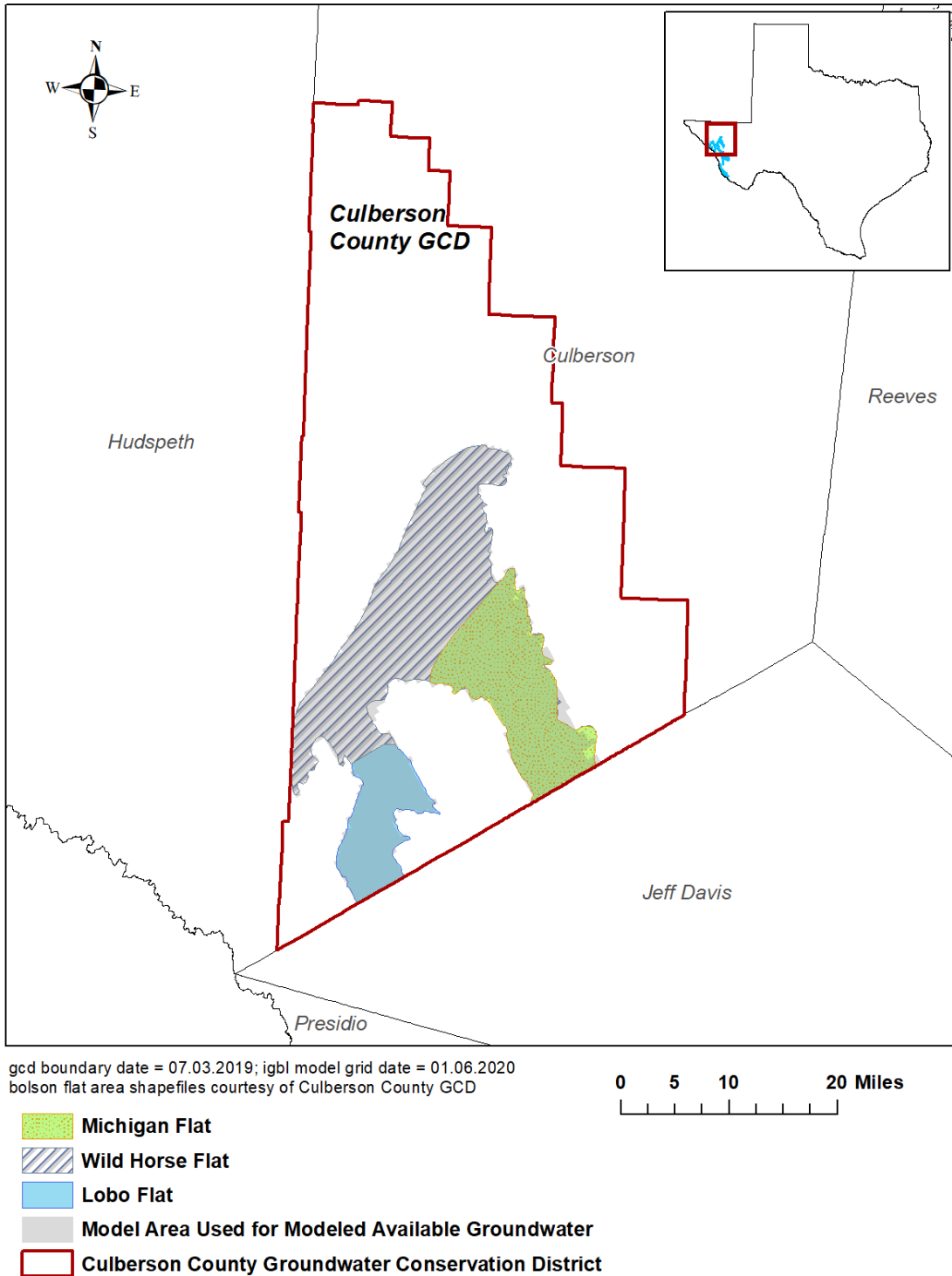


FIGURE 1: LOCATION OF THE GEOGRAPHIC AREAS OF THE WEST TEXAS BOLSONS AQUIFER LOCATED IN CULBERSON COUNTY GROUNDWATER CONSERVATION DISTRICT (GCD).

TABLE 1: MODELED AVAILABLE GROUNDWATER FOR THE WEST TEXAS BOLSONS AQUIFER SPLIT BETWEEN GEOGRAPHIC AREAS IN CULBERSON COUNTY GROUNDWATER CONSERVATION DISTRICT. ALL VALUES ARE REPORTED IN ACRE-FOOT PER YEAR AND ROUNDED TO THE NEAREST 1 ACRE-FOOT.

Area	2020	2030	2040	2050	2060
Lobo Flat	11,112	11,112	11,097	11,092	11,087
Wild Horse Flat	20,568	20,542	20,501	20,475	20,455
Michigan Flat	4,071	4,025	4,004	3,984	3,969
Culberson County Groundwater Conservation District Total	35,751	35,679	35,602	35,551	35,510

LIMITATIONS:

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

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

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

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

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

REFERENCES:

- Boghici, R., and Bradley, R. G., 2018, GAM Run 16-030 Modeled Available Groundwater for the Aquifers in Groundwater Management Area 4: Texas Water Development Board GAM Run Report, 36 p.,
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<http://www.twdb.texas.gov/groundwater/docs/GAMruns/Task10-026.pdf>
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http://www.twdb.texas.gov/groundwater/docs/GAMruns/GR10-037_MAG.pdf

Appendix G.

JSAI (2026) Culberson County GCD Drawdown Analysis and MAG



Texas Firm Registration 50308

TECHNICAL MEMORANDUM

To: Haley Davis, General Manager
Culberson County GCD generalmanager@ccgwcd.com

From: Steven T. Finch, CPG, PG, Principal Hydrogeologist

Date: April 14, 2026

Subject: Culberson County GCD Drawdown Analysis and MAG

Within the boundaries of Culberson County Groundwater Conservation District (Culberson County GCD) there are three Texas Water Development Board (TWDB) designated minor aquifers and one TWDB designated major aquifer:

Minor Aquifers

1. Capitan Reef Complex
2. Igneous
3. West Texas Bolsons

Major Aquifer

1. Edwards-Trinity (Plateau)

A map showing the distribution of these designated aquifers in Culberson County GCD is presented as Figure 1. The fringes of the Igneous and Edwards-Trinity (Plateau) aquifers appear in the rural undeveloped portions of Culberson County GCD, populated with very few exempt wells and extremely limited water level data.

The primary aquifer in Culberson County GCD with production permits is the West Texas Bolsons, in particular the portions referred to as Lobo, Wildhorse, and Michigan Bolsons. The Capitan Reef Complex aquifer is primarily used to support ranching, with the exception of one irrigation farm the straddles the Hudspeth-Culberson County line.

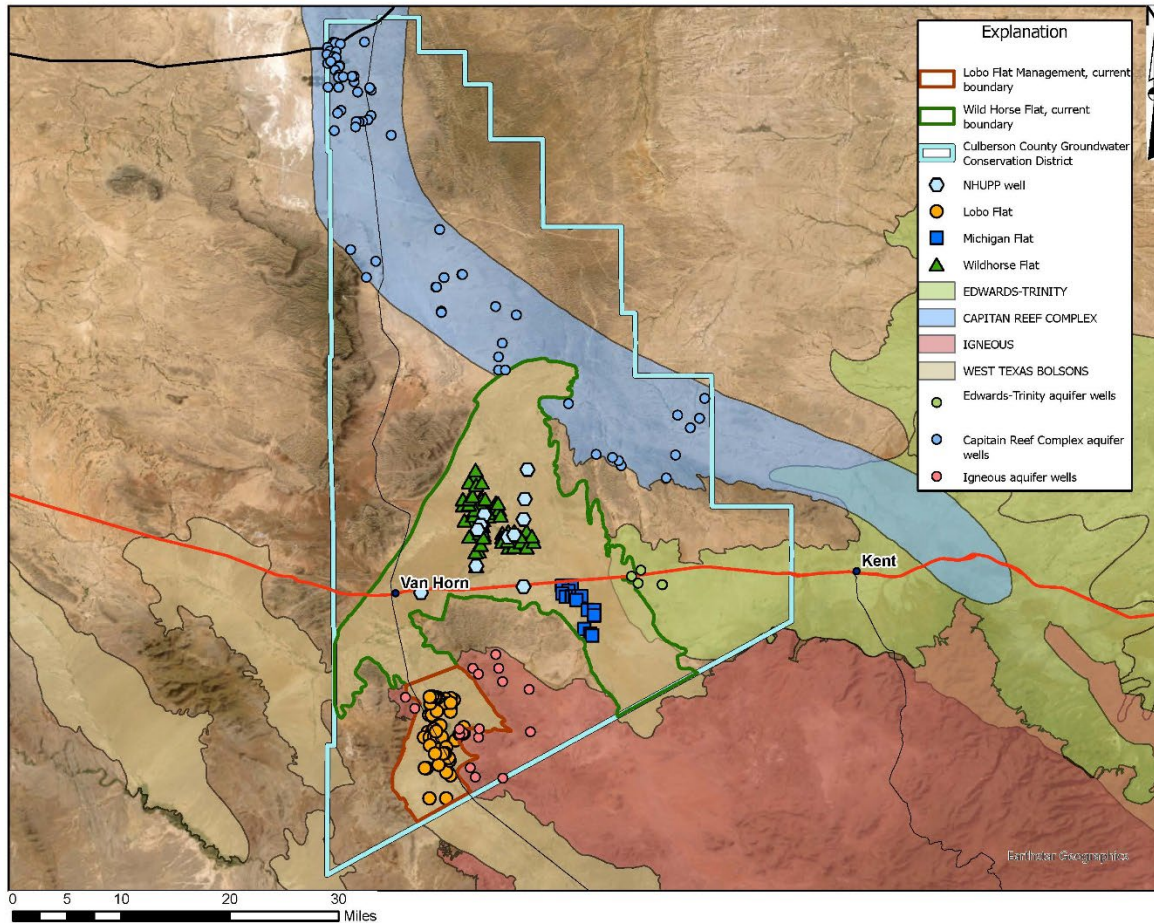


Figure 1. Map showing Culberson County GCD boundary, designated aquifers, HUPP wells, and wells with water level data.

Previous GMA-4 planning cycle (Hutchison, 2021) the following Culberson County GCD DFCs were proposed and adopted for the period from 2010-2060:

- 50-ft drawdown for the Capitan Reef Complex
- 78-ft drawdown for the Salt Basin portion of the West Texas Bolsons
- 66-ft drawdown for the Igneous Aquifer
- The Edwards Trinity (Plateau) and Upper Salt Basin were classified as non-relevant for joint planning purposes.

For the current planning cycle (2030-2080), Culberson County GCD proposes to retain the DFC of 78 ft for West Texas Bolsons, and proposes the remaining designated aquifers to be considered non-relevant, for the reasons described above.

Aquifer Drawdown Analysis

Culberson County GCD performs monthly water level monitoring on four wells in the West Texas Bolsons, and the TWDB performs monitoring on 21 wells completed in the West Texas Bolsons within Culberson County GCD. Figure 2 is a map showing the locations of water level monitoring points for the West Texas Bolsons aquifer.

A drawdown trend analysis was performed on the wells with current and historical water level data. Table 1 is a summary of the trend analysis.

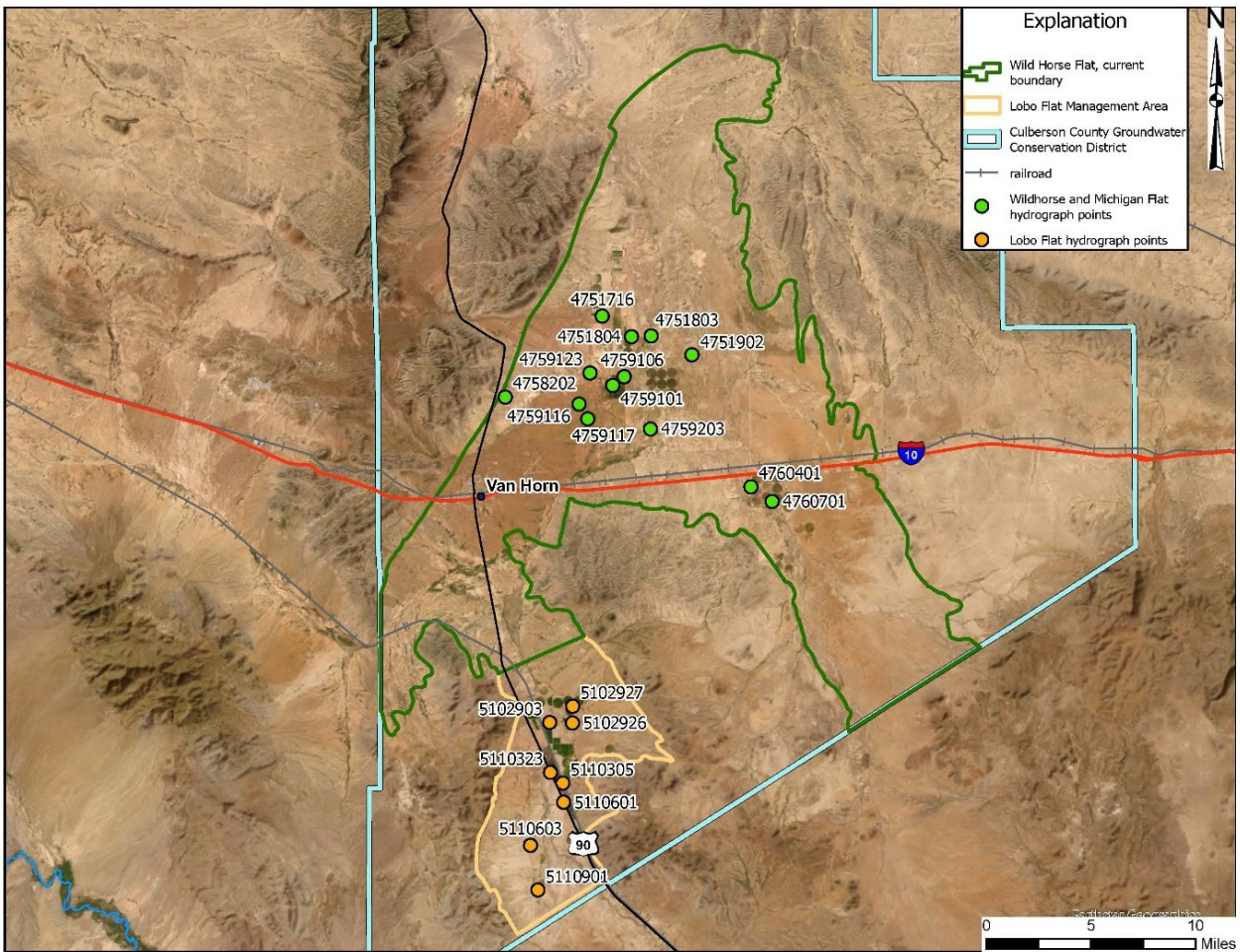


Figure 2. Map of West Texas Bolsons in Culberson County GCD and wells with data used for water level trend analysis.

Table 1. Summary of water level trend analysis for West Texas Bolsons in Culberson County GCD

TWDB #	bolson	Number of points	timeframe	Current water-level trend (ft), positive = decline; negative = rise	drawdown rate (ft/yr)	50 year Projected drawdown (FT)
4751803	Wildhorse	76	1953-2026	50.81	0.70	35
4759123	Wildhorse	3223	1994-2025	14.99	0.48	24
4759203	Wildhorse	81	1950-2025	49.80	0.66	33
4751716	Wildhorse	58	1953-2025	50.60	0.70	35
4751804	Wildhorse	54	1953-2020	21.45	0.32	16
4751902	Wildhorse	58	1953-2025	45.22	0.63	32
4758202	Wildhorse	19	1980-2023	14.97	0.35	18
4759101	Wildhorse	57	1953-2021	46.89	0.69	35
4759106	Wildhorse	60	1953-2023	22.28	0.32	16
4759116	Wildhorse	23	1993-2024	39.47	1.27	64
4759117	Wildhorse	34	1993-2025	20.34	0.64	32
4760701	Michigan	42	1970-2024	30.51	0.55	28
4760401	Michigan	51	2021-2026	1.51	0.30	15
5110901	Lobo	54	1953-2014	67.60	1.11	56
5110603	Lobo	65	1951-2025	86.43	1.17	59
5102926	Lobo	55	1957-2025	162.38	2.39	120
5102927	Lobo	68	1958-2026	162.01	2.38	119
5110305	Lobo	478	1960-2026	87.85	1.33	67
5102903	Lobo	62	1950-2025	168.16	2.24	112
5110323	Lobo	59	1954-2020	142.13	4.30	215
5110601	Lobo	163	1949-2006	72.88	1.28	64
average =				64.7	1.1	57
median =				49.8	0.7	35
proposed DFC =						78

Proposed Method for Calculating the MAG

For the current GMA-4 planning cycle, there is not an available representative and calibrated Groundwater Availability Model (GAM) for the Igneous-Bolsons aquifers. For the West Texas Bolsos in Culberson County GCD, a groundwater storage calculation is proposed for calculating the fresh groundwater storage and Modeled Available Groundwater (MAG). The storage calculation method is described as follows:

1. Using available GIS datasets from Beach et al. (2006), define the total depth of the unconsolidated fill for the WTB area
2. Using recent water-level data, calculate the saturated thickness of the WTB aquifer in Culberson County GCD (Fig. 3).
3. Calculate the area for each saturated thickness interval of 200 ft.
4. Use a storage coefficient of 0.08 for calculating the groundwater volume
5. Calculate the available groundwater storage (Table 2)
6. Use the area for 0 to 200 ft saturated thickness and DFC of 78 to calculate the MAG [MAG= $((78 \text{ ft} \cdot \text{area ft}^2 \cdot 0.08) / (43,560 \text{ ft/acre})) / 50 \text{ years} = \text{ac-ft/yr}$]

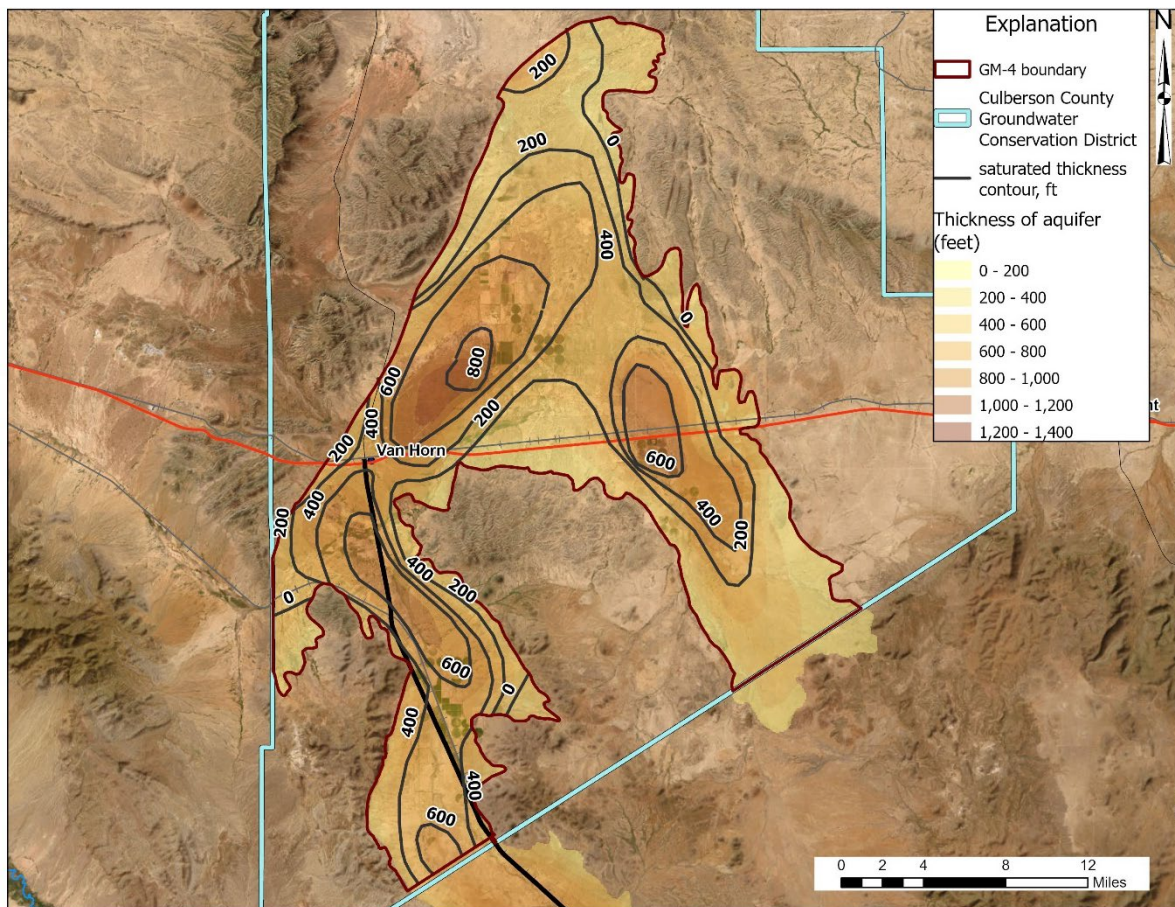


Figure 3. Saturated thickness of West Texas Bolson aquifer in Culberson County GCD.

Table 2. Summary of groundwater volume calculations for West Texas Bolsons in Culberson County GCD

saturated thickness Contour interval (ft)	area (mi ²)	area (acres)	average saturated thickness (ft)	S=0.08 interval volume (ac-ft)
0	33.60	21,501	0	0
0-200	438.59	280,698	100	2,245,581
200-400	294.41	188,422	200	3,014,758
400-600	187.27	119,853	200	1,917,645
600-800	71.72	45,901	200	734,413
>800	4.52	2,895	100	23,163
TOTAL =				7,935,560

The Modeled Available Groundwater (MAG) was calculated as follows

$$\text{DFC} = 78 \text{ ft over } 50 \text{ years}$$

$$= 1.56 \text{ avg rate (ft/yr)}$$

$$\text{DFC_vol (MAG)} = 78 \text{ ft} * 280,698 \text{ acres} * 0.08 = 1,751,553 \text{ acre feet for } 50 \text{ years}$$

$$\text{DFC_MAG} = 1,751,553 \text{ acre feet} / 50 \text{ years} = 35,031 \text{ ac-ft/yr}$$

Summary

The water level trend analysis supports a DFC of 78 ft for the West Texas Bolsons in Culberson County GCD. The calculated average rate of drawdown has been 1.1 ft per year, which projects to a total drawdown of 57 ft for the next 50 years. A DFC of 78 ft should accommodate the exercise of all permitted Historical Use Production Permits in Culberson County GCD.

Using the DFC, current water level data, and groundwater storage calculations results in a calculated MAG that allows for reasonable management of permitted Historical Use Production Permits in Culberson County GCD. The calculated MAG of 35,031 ac-ft/yr is similar to the last planning cycle, and represents the West Texas Bolson aquifer system in Culberson County GCD.

References

- Beach, J.A., Ashworth, J.B., Finch, S.T., Chastain-Howley, A., Calhoun, K., Urbanczyk, K.M., Sharp, J.M., and Olson, J., 2004, Groundwater availability model for the igneous and parts of the west Texas Bolsons (Wild Horse Flat, Michigan Flat, Ryan Flat and Lobo Flat) aquifers: Contract report to the Texas Water Development Board, 407 p., http://www.twdb.texas.gov/gam/bol_ig/IGBL_GAM_Full_Report.pdf
- Finch, S. T., and Armour, J., 2001, Hydrogeologic analysis and ground-water flow model of the Wild Horse Flat area, Culberson County, Texas: Consultant's report prepared by John Shomaker & Associates, Inc. for Beldon Foundation and Culberson County Groundwater Conservation District, 37 p.
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- HB-2078, House Bill relating to the joint planning of desired future conditions in groundwater management areas.
- Hutchison, 2021, Explanatory report for desired future conditions (Final) Groundwater Management Area 4: consultants report prepared for GMA-4, June24, 2021, 148 p.
- TWDB database, twdb.texas.gov

Appendix H.

**TWDB Estimated Historical Groundwater Use and
2022 State Water Plan Datasets for Culberson County GCD**

TWDB Estimated Historical Groundwater Use and 2022 State Water Plan Datasets

Culberson County Groundwater Conservation District

Texas Water Development Board
Groundwater Division
Groundwater Technical Assistance Department

stephen.allen@twdb.texas.gov

(512) 463-7317

April 30, 2026

GROUNDWATER MANAGEMENT PLAN DATA

This set of water data tables (part one of a two-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 table addresses a specific numbered requirement in the Texas Water Development Board's groundwater management plan review checklist. The checklist can be found at this web address:

https://www.twdb.texas.gov/groundwater/docs/GCD/GCD_Mgmt_Plan_Checklist_2025.pdf

The five tables included in part one of this data package are:

TWDB Historical Water Use Survey (WUS)

- Estimated Historical Water Use (checklist item 2)

State Water Plan (SWP)

- Projected Surface Water Supplies (checklist item 6),
- Projected Water Demands (checklist item 7),
- Projected Water Supply Needs (checklist item 8),
- Projected Water Management Strategies (checklist item 9)

Part two of the two-part package is the groundwater availability model (GAM) run report for the district (checklist items 3 through 5). The district should have received, or will receive, this report from the TWDB Groundwater Modeling Department. Questions about the GAM can be directed to the Groundwater Modeling Team at GAM@twdb.texas.gov.

DISCLAIMER:

Data presented in these tables are the most up to date WUS and SWP data available as of 4/30/2026. Although it does not happen often, these data are subject to change pending the availability of more accurate WUS data or an amendment to the 2022 SWP. District personnel should review the data table values and correct any discrepancies to ensure approval of their groundwater management plan.

The WUS data can be verified at this web address:

<https://www.twdb.texas.gov/waterplanning/waterusesurvey/estimates/>

The 2022 SWP data can be verified by contacting WRPdatarequests@twdb.texas.gov

The values presented in the data tables 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 offer districts the opportunity to review this determination).

The county values in two of the SWP tables (Projected Water Supply Needs and Projected Water Management Strategies) are not apportioned because district-specific values are not required to be presented in the groundwater management plan. However, a district is required to “consider” the county values in these two tables by drafting a short summary of the needs and strategies values in the groundwater management plan.

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 are more accurate, they 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 GWMPlans (GWMPlans@twdb.texas.gov)

Estimated Historical Water Use

TWDB Historical Water Use Survey (WUS) Data

CULBERSON COUNTY

45.35% (multiplier)

All values are in acre-feet

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2023	GW	294	0	692	0	18,305	185	19,476
	SW	0	0	0	0	0	10	10
2022	GW	341	0	473	0	14,156	193	15,163
	SW	0	0	0	0	0	10	10
2021	GW	268	0	556	0	14,313	112	15,249
	SW	0	0	0	0	0	6	6
2020	GW	349	0	283	0	13,910	116	14,658
	SW	0	0	0	0	0	6	6
2019	GW	295	0	831	0	16,682	116	17,924
	SW	0	0	0	0	0	6	6
2018	GW	338	0	616	0	16,220	116	17,290
	SW	0	0	0	0	0	6	6
2017	GW	229	1	427	0	19,103	111	19,871
	SW	0	0	0	0	0	6	6
2016	GW	322	0	156	0	16,042	127	16,647
	SW	0	0	0	0	0	7	7
2015	GW	325	0	196	0	20,716	125	21,362
	SW	0	0	0	0	0	6	6
2014	GW	297	0	90	0	13,288	122	13,797
	SW	0	0	0	0	0	6	6

Projected Surface Water Supplies TWDB 2022 State Water Plan Data

Estimated Historical Water Use and 2022 State Water Plan Dataset:

Culberson County Groundwater Conservation District

April 30, 2026

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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.

CULBERSON COUNTY

45.35% (multiplier)

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
E	County-Other, Culberson	Rio Grande	29	31	32	33	34	34
E	Irrigation, Culberson	Rio Grande	17,171	17,171	17,171	17,171	17,171	17,171
E	Livestock, Culberson	Rio Grande	122	122	122	122	122	122
E	Manufacturing, Culberson	Rio Grande	2	3	3	3	3	3
E	Mining, Culberson	Rio Grande	961	1,294	1,363	1,235	1,114	1,022
E	Van Horn	Rio Grande	662	711	737	760	774	783
Sum of Projected Water Demands (acre-feet)			18,947	19,332	19,428	19,324	19,218	19,135

Projected Water Supply Needs

TWDB 2022 State Water Plan Data

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

CULBERSON COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
E	County-Other, Culberson	Rio Grande	92	88	86	84	83	82
E	Irrigation, Culberson	Rio Grande	-333	-333	-5,858	-5,858	-5,858	-5,858
E	Livestock, Culberson	Rio Grande	15	15	15	15	15	15
E	Manufacturing, Culberson	Rio Grande	1	0	0	0	0	0
E	Mining, Culberson	Rio Grande	1,926	1,192	1,039	1,322	1,589	1,792
E	Van Horn	Rio Grande	354	305	279	256	242	233
Sum of Projected Water Supply Needs (acre-feet)			-333	-333	-5,858	-5,858	-5,858	-5,858

Projected Water Management Strategies

TWDB 2022 State Water Plan Data

CULBERSON COUNTY

WUG, Basin (RWPG)

All values are in acre-feet

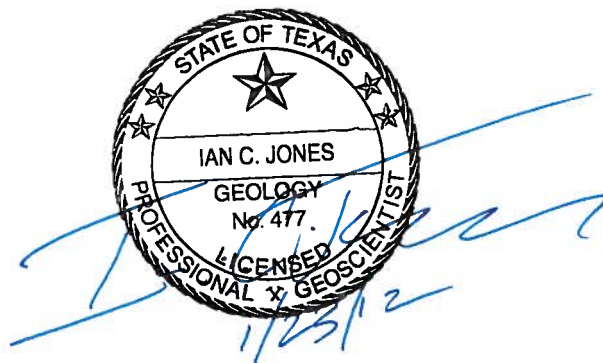
Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
Irrigation, Culberson, Rio Grande (E)							
Culberson County Irrigation - Additional Well in the West Texas Bolsons Aquifer	West Texas Bolsons Aquifer [Culberson]	333	333	333	333	333	333
Culberson County Irrigation - Irrigation Scheduling	DEMAND REDUCTION [Culberson]	107	107	107	107	107	107
Sum of Projected Water Management Strategies (acre-feet)		440	440	440	440	440	440

Appendix I.

TWDB GAM Run 11-018

GAM RUN 11-018: CULBERSON COUNTY GROUNDWATER CONSERVATION DISTRICT MANAGEMENT PLAN

by Ian C. Jones, Ph.D., P.G.
Texas Water Development Board
Groundwater Resources Division
Groundwater Availability Modeling Section
(512) 463-6641
January 23, 2012



The seal appearing on this document was authorized by Ian C. Jones, Ph.D., P.G. 477 on January 23, 2012.

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GAM RUN 11-018: CULBERSON COUNTY GROUNDWATER CONSERVATION DISTRICT MANAGEMENT PLAN

by Ian C. Jones, Ph.D., P.G.
Texas Water Development Board
Groundwater Resources Division
Groundwater Availability Modeling Section
(512) 463-6641
January 23, 2012

EXECUTIVE SUMMARY:

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

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

The purpose of this report is to provide Part 2 of a two-part package of information from the Texas Water Development Board to Culberson County Groundwater Conservation District management plan to fulfill the requirements noted above.

The groundwater management plan for Culberson County Groundwater Conservation District is due for approval by the Executive Administrator of the Texas Water Development Board before January 29, 2013. This report discusses the method, assumptions, and results from the model runs using the groundwater availability models for the Igneous Aquifer and the Red Light Draw, Green River Valley, Eagle Flat, Wild Horse Flat, Michigan Flat and Lobo Flat parts of the West Texas Bolsons Aquifer. Tables 1 and 2 summarize the groundwater availability model data required by the statute, and figures 1 and 2 show the area of each model layer from which the

values in the respective tables were extracted. This model run replaces the results of GAM Run 06-02. GAM Run 11-018 meets current standards set after GAM Run 06-02. Differences in the results of the two model runs are due to differences in the method of extracting data from the model(s). If after review of the figures, Culberson County Groundwater Conservation District determines that the district boundaries used in the assessment do not reflect current conditions, please notify the Texas Water Development Board immediately.

METHODS:

The groundwater availability models for the Igneous Aquifer and the Wild Horse Flat, Michigan Flat and Lobo Flat parts of the West Texas Bolsons Aquifer (1980 through 1999) and the Red Light Draw, Green River Valley, and Eagle Flat parts of the West Texas Bolsons (30-year simulation) were run for this analysis. In the case of the groundwater availability model for the Igneous Aquifer and the Wild Horse Flat, Michigan Flat and Lobo Flat parts of the West Texas Bolsons Aquifer, water budgets for each year of the transient model period were extracted and the average annual water budget values for recharge, surface water outflow, inflow to the district, outflow from the district, net inter-aquifer flow for the portions of the aquifers located within the district are summarized in this report. In the case of the groundwater availability model for the Red Light Draw, Green River Valley, and Eagle Flat parts of the West Texas Bolsons water budget data was extracted from the transient 30-year stress period.

PARAMETERS AND ASSUMPTIONS:

Igneous and West Texas Bolsons Aquifers (Wild Horse Flat, Michigan Flat and Lobo Flat)

- Version 1.01 of the groundwater availability model for the Igneous Aquifer and the Wild Horse Flat, Michigan Flat and Lobo Flat parts of the West Texas Bolsons Aquifer was used for this analysis. See Beach and others (2004) for assumptions and limitations of the groundwater availability model for the Igneous Aquifer and the Wild Horse Flat, Michigan Flat and Lobo Flat parts of the West Texas Bolsons Aquifer.
- This groundwater availability model includes three layers, which generally correspond to (from top to bottom):
 - 1 the Wild Horse Flat, Michigan Flat and Lobo Flat parts of the West Texas Bolsons Aquifer,

- 2 the Igneous Aquifer, and
 - 3 underlying Cretaceous and Permian units.
- Of the three layers listed above, individual water budgets for the district were determined for the West Texas Bolsons Aquifer (Layer 1), and the Igneous Aquifer (Layer 2).
 - The root mean square error (a measure of the difference between simulated and actual water levels during model calibration) in the groundwater availability model is 35 feet for the West Texas Bolsons Aquifer, and 35 feet for the Igneous Aquifer for the calibration period (1950 to 1990) and 35 and 150 feet for the same aquifers, respectively, in the verification period (1991 to 2000) (Beach and others, 2004). These root mean square errors are between three and five percent of the range of measured water levels (Beach and others, 2004).
 - Groundwater in the Igneous and West Texas Bolsons aquifers ranges from fresh to brackish in composition (Beach and others, 2004). Groundwater with total dissolved solids of less than 1,000 milligrams per liter are considered fresh and total dissolved solids of 1,000 to 10,000 milligrams per liter are considered brackish.
 - Processing MODFLOW for Windows (PMWIN) version 5.3 (Chiang and Kinzelbach, 1998) was used as the interface to process model output.

West Texas Bolsons Aquifers (Red Light Draw, Green River Valley, and Eagle Flat)

- Version 1.01 of the groundwater availability model for the Red Light Draw, Green River Valley, and Eagle Flat parts of the West Texas Bolsons Aquifer was used for this analysis. See Beach and others (2008) for assumptions and limitations of the groundwater availability model for the Red Light Draw, Green River Valley, and Eagle Flat parts of the West Texas Bolsons Aquifer.
- This groundwater availability model includes three layers, which generally correspond to (from top to bottom):
 - 1 the Red Light Draw, Green River Valley, and Eagle Flat parts of the West Texas Bolsons Aquifer,
 - 2 Cretaceous, Permian and Paleozoic units, and

3 Cretaceous, Paleozoic and basement units.

- Of the three layers listed above, individual water budgets for the district were determined for the West Texas Bolsons Aquifer (Layer 1).
- The mean absolute error (a measure of the difference between simulated and actual water levels during model calibration) in the groundwater availability model is 56 feet for the West Texas Bolsons Aquifer, and 99 and 119 feet for the underlying layers for the calibration (steady-state) period (Beach and others, 2008). These root mean square errors are between four and eleven percent of the range of measured water levels (Beach and others, 2008).
- Groundwater in the West Texas Bolsons aquifers displays fresh compositions with total dissolved solids of less than 1,000 milligrams per liter (Beach and others, 2008).
- Groundwater Vistas version 5 (Environmental Sciences, Inc., 2007) was used as the interface to process model output.

RESULTS:

A groundwater budget summarizes the amount of water entering and leaving the aquifer according to the groundwater availability models. Selected components were extracted from the groundwater budget for the aquifers located within the district and averaged over the period 1980 through 1999, as shown in tables 1 and 2. Water budgets for the West Texas Bolsons Aquifer from the two groundwater availability models are combined. The groundwater availability model for the Red Light Draw, Green River Valley, and Eagle Flat extends into Wild Horse Flat where it overlaps with the groundwater availability model for the Igneous Aquifer and the Wild Horse Flat, Michigan Flat and Lobo Flat parts of the West Texas Bolsons Aquifer. Only the water budget from the groundwater availability model for the Igneous Aquifer and the Wild Horse Flat, Michigan Flat and Lobo Flat parts of the West Texas Bolsons Aquifer was used in the overlap area due to limitations in the groundwater availability model for the Red Light Draw, Green River Valley, and Eagle Flat parts of the West Texas Bolsons Aquifer. The components of the modified budget shown in tables 1 and 2 include:

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

- Surface water outflow—The total water discharging from the aquifer (outflow) to surface water features such as streams, reservoirs, and drains (springs).
- Flow into and out of district—The lateral flow within the aquifer between the district and adjacent areas.
- Flow between aquifers—The net vertical flow between aquifers or confining units. This flow is controlled by the relative water levels in each aquifer or confining unit and aquifer properties of each aquifer or confining unit that define the amount of leakage that occurs. “Inflow” to an aquifer from an overlying or underlying aquifer will always equal the “Outflow” from the other aquifer.

The information needed for the District’s management plan is summarized 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 (see figures 1 and 2).

TABLE 1: SUMMARIZED INFORMATION FOR THE WEST TEXAS BOLSONS AQUIFER THAT IS NEEDED FOR CULBERSON COUNTY GROUNDWATER CONSERVATION DISTRICT'S GROUNDWATER MANAGEMENT PLAN. ALL VALUES ARE REPORTED IN ACRE-FEET PER YEAR AND ROUNDED TO THE NEAREST 1 ACRE-FOOT. THESE FLOWS INCLUDE BRACKISH WATERS.

<i>Management Plan requirement</i>		
Estimated annual amount of recharge from precipitation to the district	West Texas Bolsons Aquifer	2,107
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	West Texas Bolsons Aquifer	494
Estimated annual volume of flow into the district within each aquifer in the district	West Texas Bolsons Aquifer	7,453
Estimated annual volume of flow out of the district within each aquifer in the district	West Texas Bolsons Aquifer	629
Estimated net annual volume of flow between each aquifer in the district	From the Igneous Aquifer and other underlying units into the West Texas Bolsons Aquifer	5,238*

*Note some of the flow reported in Table 2 is included in this value.

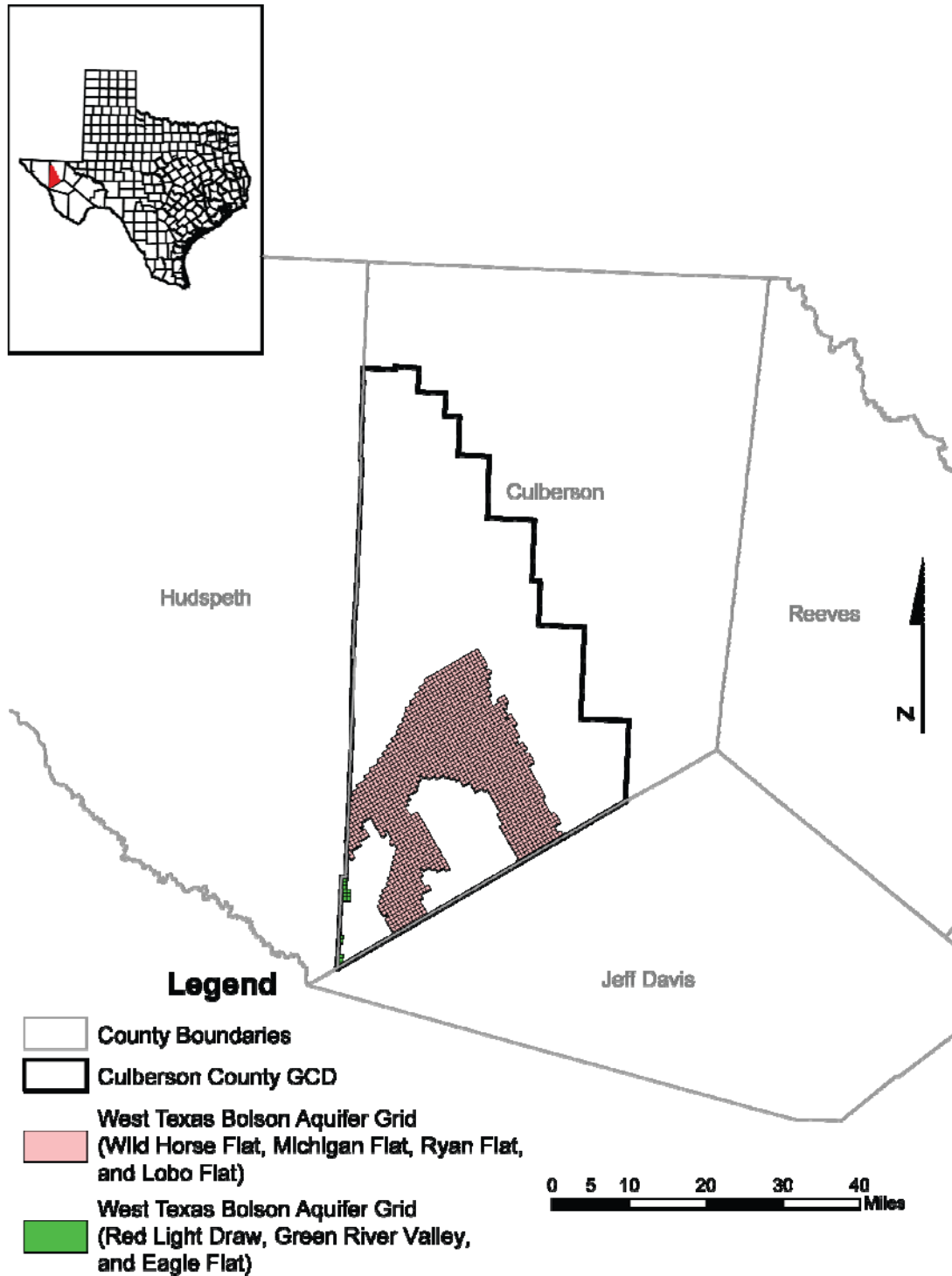


FIGURE 1: AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE WEST TEXAS BOLSONS AQUIFER FROM WHICH THE INFORMATION IN TABLE 1 WAS EXTRACTED (THE AQUIFER EXTENT WITHIN THE DISTRICT BOUNDARY).

TABLE 2: SUMMARIZED INFORMATION FOR THE IGNEOUS AQUIFER THAT IS NEEDED FOR CULBERSON COUNTY GROUNDWATER CONSERVATION DISTRICT'S GROUNDWATER MANAGEMENT PLAN. ALL VALUES ARE REPORTED IN ACRE-FEET PER YEAR AND ROUNDED TO THE NEAREST 1 ACRE-FOOT. THESE FLOWS MAY INCLUDE FRESH AND BRACKISH WATERS.

<i>Management Plan requirement</i>		
Estimated annual amount of recharge from precipitation to the district	Igneous Aquifer	671
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Igneous Aquifer	0
Estimated annual volume of flow into the district within each aquifer in the district	Igneous Aquifer	1,037
Estimated annual volume of flow out of the district within each aquifer in the district	Igneous Aquifer	463
Estimated net annual volume of flow between each aquifer in the district	From the Igneous Aquifer into the West Texas Bolsons Aquifer	1,562*

- Some of the flow reported in Table 2 are included in Table 1.

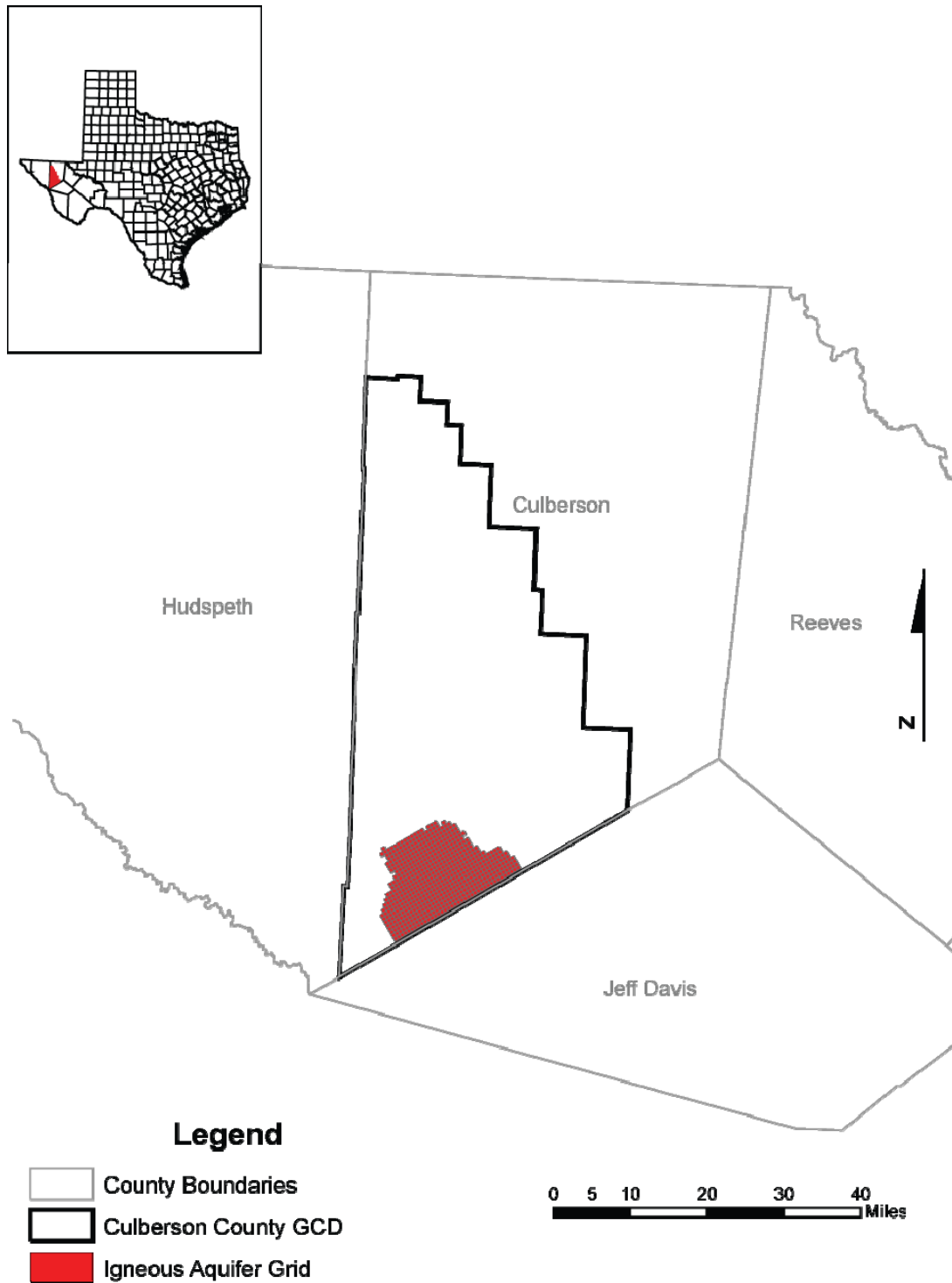


FIGURE 2: AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE IGNEOUS AQUIFER FROM WHICH THE INFORMATION IN TABLE 2 WAS EXTRACTED (THE AQUIFER EXTENT WITHIN THE DISTRICT BOUNDARY).

LIMITATIONS

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

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

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

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

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

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