UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT

ANNUAL REPORT FOR YEAR ENDING DECEMBER 31, 2018

Upper Trinity Groundwater Conservation District

Annual Report FYE 2018

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General Manager's Report 2018

2018 was a busy year for the District, and a year filled with change. In February completion of the District's new office facility was completed and staff moved into the office in the last week of the month (in the middle of an ice storm). Also, as a result of two Director resignations in 2017, the Board appointed Shannon Nave to represent Parker County and Brent Wilson to represent Wise County.

We also added a new full time position, increasing District staff from 8 to 9. Kyle Russell was hired to fill the newly created position and we Kaitlin Adams also started with the District in January of 2018.

The second half of the year was dominated by the development of permanent District Rules. Myself, the Board and our General Counsel began the arduous task of developing proposed rules in the early summer and the District held several public meetings and hearings in the fall and early winter in regards to Rules development to receive comments on those proposed changes. No action was taken to adopt rule in 2018.

Finally, I am happy to report that the District met or exceeded each Management Plan objective, as set forth in our Management Plan, for 2018. Furthermore, an independent auditor has reported favorably in regard to the District's financial position.

Below are a few highlights from 2018:

Staff:

- Kyle Russell, Registration Coordinator, began in January;
- Kaitlin Adams, Education/PR Coordinator, started in January;
- For the second year in a row, we were able to hire 2 summer Interns;
- Blaine Hicks received his Professional Geoscientist (P.G.) license late in the year.

Other Notable Accomplishments:

- January 1, increased well registration fee;
- Move into building in February;
- Drilled 2 monitoring wells at the new office facility;
- Contracted Intera to develop several web based tools to help in accomplishing the District's mission;
- Shannon Nave and Brent Wilson, new directors in Parker and Wise Counties.
- Texas Water Development Board approved the District's amended Management Plan.

District staff is pleased to submit the remainder of this report to the Board to highlight the fulfillment of the our objectives.

Doug Shaw
General Manager

Brief History 2018

- ✓ In 2006, the Texas Water Development Board (TWDB) developed a Priority Groundwater Management Area (PGMA) for the counties of Montague, Wise, Parker, Hood, Cooke, Denton, Tarrant, Dallas, and others in the region.

- ✓ In 2007, the 80th Texas Legislature created the Upper Trinity Groundwater Conservation District (UTGCD).

- ✓ In November 2007, over 78 percent of voting residents within the District's four counties approved creation of the groundwater conservation district.

- ✓ On November 30, 2009, the Board of Directors of the UTGCD revised and adopted the Temporary Rules for Water Wells; they allow the District to enforce spacing regulations between wells and minimum distance from property boundaries for water wells drilled after January 1, 2009.

- ✓ On August 16, 2010, the Board of Directors adopted the District Management Plan. Its Objectives and Performance Standards are discussed on the following pages.

- ✓ In, 2013, the Upper Trinity Groundwater Conservation District was one of eight districts to fully achieve *all* applicable groundwater management plan goals audited by the State Auditor's Office.

- ✓ In 2017:

    - the Texas Water Development Board (TWDB) designated the Paleozoic Aquifers of North Central Texas, renamed Cross Timbers, as a Minor Aquifer

    - UTGCD acquired land with monitoring wells in Hood County

    - UTGCD purchased property in Springtown, Parker County to build a new District office and education center

    - UTGCD adopted the desired future conditions ("DFCs") for the Trinity Aquifer Group underlying Hood, Montague, Parker and Wise Counties

Entrance to new District office

Mission Statement

The Mission of the Upper Trinity Groundwater Conservation District is to develop rules to provide protection to existing wells, prevent waste, promote conservation, provide a framework that will allow availability and accessibility of groundwater for future generations, protect the quality of the groundwater in the recharge zone of the aquifer, ensure that the residents of Montague, Wise, Parker, and Hood Counties maintain local control over their groundwater, respect and protect the property rights of landowners in groundwater, and operate the District in a fair and equitable manner for all residents of the District.

District Staff

Doug Shaw
General Manager

Ann Devenney
Office Manager

Kyle Russell
Registration Coordinator

Kaitlin Adams
Education/Public Relations Coordinator

Laina Furlong
Office Assistant

Jennifer Hachtel
Data Coordinator

Blaine Hicks
Field Technician

Garrett Love
Field Technician

Jacob Dove
Field Technician

Board of Directors

The Board of Directors of the Upper Trinity Groundwater Conservation District is composed of two members, per county, appointed by their county's Commissioners' Court. In a Regular Board Meeting on July 17, 2017, the Board of Directors elected District Officers to serve two-year terms ending July 2019. The appointments are as follows:

Mike Massey – Assistant Secretary	Hood County
Donald Majka – Assistant Secretary	Wise County
Tim Watts – Secretary/Treasurer	Parker County
Mike Berkley – Assistant Secretary	Montague County
Tracy Mesler – President	Montague County
Dan Caudle – Assistant Secretary (through Jan 2018)	Parker County
Shannon Nave– Assistant Secretary (March 2018)	Parker County
Jerrod Mowery – Assistant Secretary (through Jan 2018)	Wise County
Brent Wilson– Assistant Secretary (March 2018)	Wise County
Richard English – Vice President	Hood County

Board of Directors 2018

The District's Management Plan sets forth a methodology for tracking the District's progress in achieving management goals. The Plan requires the District to prepare an Annual Report to the District's Board of Directors, which must contain an update on the District's performance in regard to achieving management goals and objectives. This report is intended to satisfy the annual reporting requirements of the District's Management Plan. After adoption by the Board of Directors, the Annual Report is made available to the public.

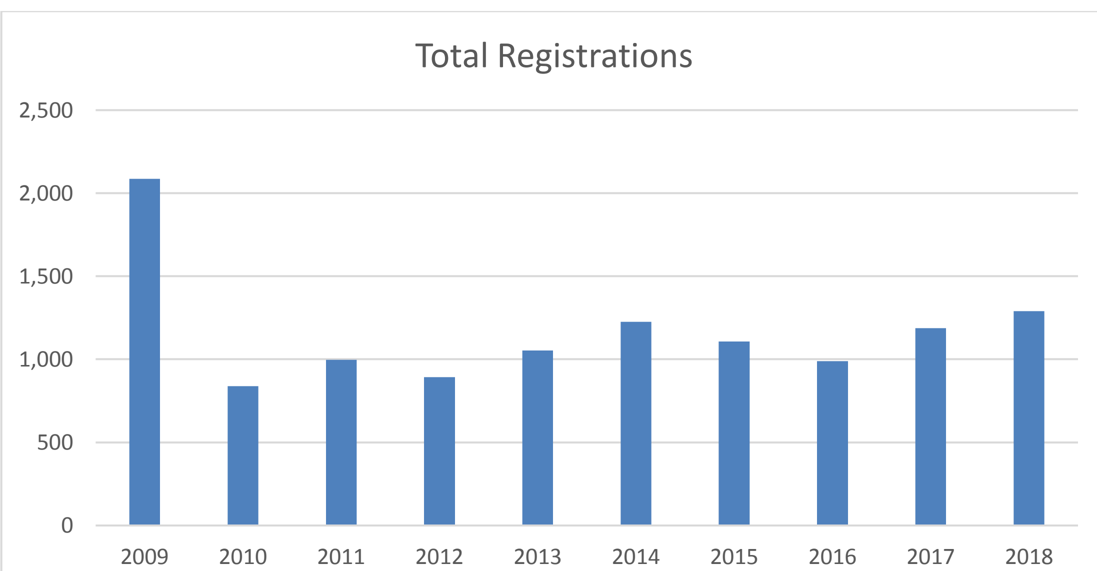
Well Registrations 2018

A1. Objective - Each year the District will require registration of all new wells within the District.

A.1 Performance Standard - Annual reporting of well registration statistics will be included in the Annual Report provided to the Board of Directors.

The Temporary Rules for Water Wells require any water well drilled on or after January 1, 2009 to be registered with the District. Furthermore, the District requires owners of all operational nonexempt wells to register their wells and report monthly usage. Owners of any exempt well drilled prior to 2009 may voluntarily register their wells. In 2018, the District received 103 more water well registrations than in 2017. Of those, the largest increase of well applications was in Wise County.

County	Exempt	Nonexempt	Existing	New	Total*
Hood	83	4	12	75	87
Montague	101	0	6	95	101
Parker	600	12	46	566	612
Wise	472	18	44	446	490
Total:	1,256	34	108	1182	1,290



Groundwater Production Report 2018

A.2 Objective - Each year the District will monitor annual production from all non-exempt wells within the District.

A.2 Performance Standard - The District will require installation of meters on all non-exempt wells and reporting of production to the District. The annual production of groundwater from non-exempt wells will be included in the Annual Report provided to the Board of Directors.

In the Groundwater Production Report for 2018, Public Water Supply production accounts for almost 85% of groundwater extracted from nonexempt water wells. Wells in Hood County produced the most water for Public Water Supply and Commercial/Business usage. Wise County lead the other counties for oil and gas production and exploration.

The District has adopted rules requiring installation of meters on all nonexempt wells. Owners must report groundwater production semi-annually and pay water usage fees, set annually by the Board. The District remains committed to ensuring that all well owners are in compliance with the District's rules, and the District will continue its efforts to ensure that non-exempt well owners comply with the District's metering and reporting requirements.

Public Water Supply	Gallons Reported	Category Percentage
Hood	1,614,923,588	40.50%
Montague	94,773,461	2.38%
Parker	1,129,350,484	28.32%
Wise	531,050,641	13.32%
Total:	**3,370,098,174**	**84.52%**

Oil & Gas Production	Gallons Reported	Category Percentage
Hood	260,000	0.01%
Montague	35,135,964	0.88%
Parker	33,083,759	0.83%
Wise	467,887,500	11.73%
Total:	**536,367,223**	**13.45%**

Commercial/Business	Gallons Reported	Category Percentage
Hood	56,803,173	1.42%
Montague	1,338,900	0.03%
Parker	17,502,403	0.44%
Wise	5,267,903	0.13%
Total:	**80,912,379**	**2.03%**

2018 Grand Total:	**3,987,377,776**	

Waste of Groundwater 2018

B.1 Objective - Annual evaluation of the rules to determine if any amendments are recommended to decrease waste of groundwater within the District.
B.1 Performance Standard - Annual discussion of the evaluation of the rules and a reporting of whether any of the District rules require amendment to prevent waste of groundwater to be included in the Annual Report provided to the Board of Directors.

To be consistent with Chapter 36 of the Texas Water Code, the District held a Public Hearing on November 20, 2017 to amend the definition of "waste" in the District's Temporary Rules, as it pertains to groundwater entering a water course. The Board unanimously agreed to revise the rules as described below:

Chapter 36 definition of waste:

Sec. 36.001. DEFINITIONS. In this chapter:

…

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

…

(E) willfully or negligently causing, suffering, or allowing groundwater to escape into any river, creek, natural watercourse, depression, lake, reservoir, drain, sewer, street, highway, road, or road ditch, or onto any land other than that of the owner of the well unless such discharge is authorized by permit, rule, or order issued by the commission under Chapter 26;

UTGCD Rules definition of waste (deleted language struck through below):

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

…

(e) willfully or negligently causing, suffering, or allowing groundwater to escape into any river, creek, natural watercourse, depression, lake, reservoir, drain, sewer, street, highway, road, or road ditch, or onto any land other than that of the owner of the well unless such discharge is authorized by permit, rule, or other order issued by the Texas Commission on Environmental Quality under Chapter~~s 11 or~~ 26 of the Texas Water Code;

If a homeowners' association or some other entity has a permit from Texas Commission Environmental Quality (TCEQ) under Chapter 11 to maintain water levels in a pond with groundwater, this revision would allow the District to require installation of a float/shut off so that the well is not pumping constantly and therefore allowing water to spill over the impoundment and flow downstream. The public may view the District rules in their entirety at http://uppertrinitygcd.com/rules/

District staff continues to monitor and evaluate the activities of well owners within the District and enforce the District's rules to promote conservation and prevent waste of groundwater. Usually, once a leak is brought to the owner's attention, the matter is fixed immediately. However, District staff will continue to evaluate whether amendments to the District's rules are necessary to decrease waste of groundwater, and impose penalties, if necessary.

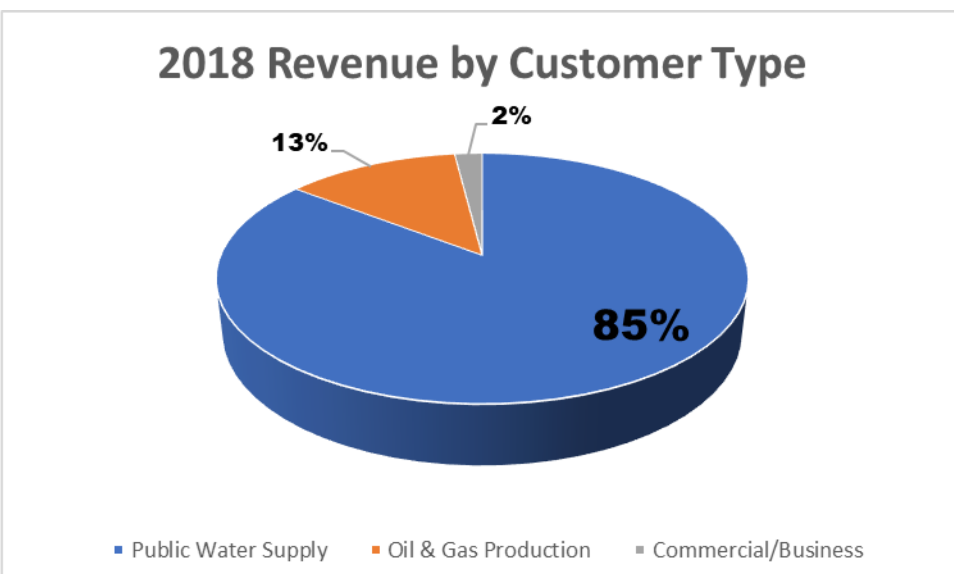
Water Use Fees 2018

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

B.2 Performance Standard - Annual reporting of the total fees paid and total groundwater used by non-exempt wells will be included in the Annual Report provided to the Board of Directors.

UTGCD's Board of Directors set the fee for groundwater usage at a rate of .22 cents per thousand gallons ($.22/1,000 gallons) for all commercial, municipal, and industrial users within the District that are not exempt from the metering, monitoring, reporting or payment requirements as set forth in the temporary rules adopted by the District. The following table and chart illustrate total water use fees collected by the District. Of all non-exempt well owners, the top four revenue-generators for the District were: Aqua Texas 18.57% (Public Water Supply), Acton Municipal Utility District 12.66% (Public Water Supply), Devon Energy 9.23% (Oil & Gas) and City of Granbury 6.97% (Public Water Supply). See Groundwater Production Report 2018 for production figures.

Year	Public Water Supply	Oil & Gas Production	Commercial/ Business	Total
2009	$691,180	$228,473	$11,088	$930,741
2010	$797,895	$339,867	$11,617	$1,149,379
2011	$889,671	$667,557	$19,813	$1,577,041
2012	$743,855	$599,122	$10,562	$1,353,539
2013	$758,401	$475,875	$17,555	$1,251,776
2014	$838,531	$494,510	$47,057	$1,380,098
2015	$718,689	$89,773	$18,056	$826,518
2016	$732,449	$9,675	$13,572	$755,697
2017	$789,705	$43,657	$16,979	$850,341
2018	$774,940	$113,967	$18,142	$907,049



Online Access 2018

B.3 Objective - Each year, the District will provide information to the public on eliminating and reducing wasteful practices in the use of groundwater by including information on groundwater waste reduction on the District's website.

B.3 Performance Standard - Each year, a copy of the information provided on the groundwater waste reduction page of the District's website will be included in the District's Annual Report to be given to the District's Board of Directors.

The Upper Trinity Groundwater Conservation District's website provides information about eliminating waste on the "Education" page, which can be found at http://uppertrinitygcd.com/education/. The website is promoted through the District's news releases, advertising, social media, and brochures.

Additionally, local educators and event coordinators can schedule a free on-site visit of the Groundwater Education Mobile (GEM) through the "Aquifer Education" page. In 2018, over 3,400 elementary school, middle school, and high school students and 1,100 people at community events toured the aquifer exhibit, well model, videos, and lessons within the GEM. Students are encouraged to engage in critical thinking about our most precious resource. In addition to touring the exhibits, staff participated in many STEM-based learning activities that included customized lesson plans with aquifer curriculum, water pollution simulations, and water conservation principles. The GEM is made available by UTGCD to local schools and entities interested in water conservation and aquifer education.

AQUIFER EDUCATION

The GEM (Groundwater Education Mobile) exhibit offers information demonstrations about native plants, rainwater harvesting, and formations of the Trinity Aquifer. Contact the District office or fill out the form below to schedule a visit from the GEM.

OVERVIEW

Education is the first step towards water conservation. Upper Trinity GCD is ready to bring aquifer education to YOU! This FREE mobile exhibit brings a high-quality STEM field-trip experience to our schools, inspiring the next generation of Texas water stewards. Housed in a 24-foot trailer, this project brings an interactive learning experience to local schools and communities. A working aquifer model allows visitors to actually see an aquifer in motion and what can happen to our water resources without conservation.

IN 2018

Over 3,400 elementary school, middle school, and high school students and 1,100 adults & children at community events toured the aquifer exhibit, well model, videos, and lessons within the GEM. Students are encouraged to engage in critical thinking about our most precious resource. In addition to touring the exhibits, staff participated in many STEM-based learning activities that included customized lesson plans with aquifer curriculum, water pollution simulations, and water conservation principles.

2019 GOALS

It is our goal to reach 4,000 Texas youth with the GEM this year! We hope to encourage water conservation by teaching aquifer maintenance and practical water stewardship. Help us reach our goals and schedule a visit today!

http://uppertrinitygcd.com/education/aquifer-trailer/

Regional Water Planning Participation 2018

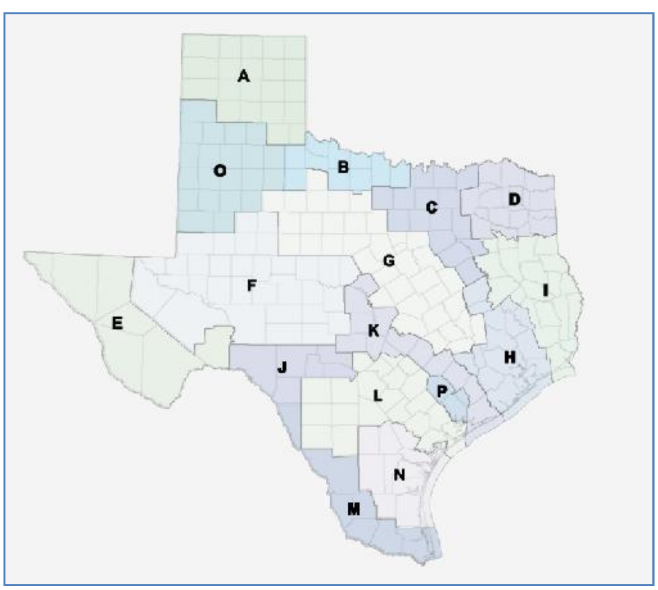
C.1 Objective - Each year the District will participate in the regional water planning process by attending at least one of the Region B, C or G Regional Water Planning Group Meetings to encourage the development of surface water supplies to meet the needs of water user groups within the District.

C.1 Performance Standard - The attendance of a District representative at any Regional Water Planning Group meeting will be noted in the Annual Report provided to the Board of Directors.

Throughout the year, the District's staff attended various water-planning meetings. Staff and Board members also participated in meetings and/or conferences concerning public outreach or other groundwater issues. A record of attendance at regional water planning meetings by District Representatives follows.

Date	Event	Location	Representative
1/10/18	RWPG-B	Wichita Falls, TX	Doug Shaw & Tracy Mesler
2/7/18	RWPG-G	Waco, TX	Doug Shaw
2/16/18	RWPG-B	Wichita Falls, TX	Tracy Mesler
3/27/18	RWPG-G	Waco, TX	Doug Shaw
4/9/18	RWPG-C	Arlington, TX	Doug Shaw
5/2/18	RWPG-B	Wichita Falls, TX	Doug Shaw & Tracy Mesler
5/9/18	RWPG-G	Waco, TX	Doug Shaw
7/17/18	RWPG-G	Waco, TX	Doug Shaw
8/22/18	RWPG-B	Wichita Falls, TX	Tracy Mesler
8/22/18	RWPG-G	Waco, TX	Doug Shaw

Regional Water Planning Group Map
(Source: http://www.twdb.texas.gov/waterplanning/rwp/regions/index.asp)



Drought Conditions 2018

D.1 Objective - Monthly review of drought conditions within the District using the Texas Water Development Board's Monthly Drought Conditions Presentation available at: http://www.twdb.texas.gov/surfacewater/conditions/report/index.asp

D.1 Performance Standard – An annual review of drought conditions within the District will be included in the Annual Report provided to the Board of Directors and on the District website.

The National Drought Mitigation Center defines drought as "a deficiency of precipitation over an extended period of time (usually a season or more) resulting in a water shortage." (Source: https://drought.unl.edu/Education/DroughtBasics.aspx). The District reviews the Texas Water Conditions Report published by the Texas Water Development Board every month. The information below is excerpted from their reports. The surface water basins/subbasins in Upper Trinity GCD remained in the Normal to High range (>70%) all year.

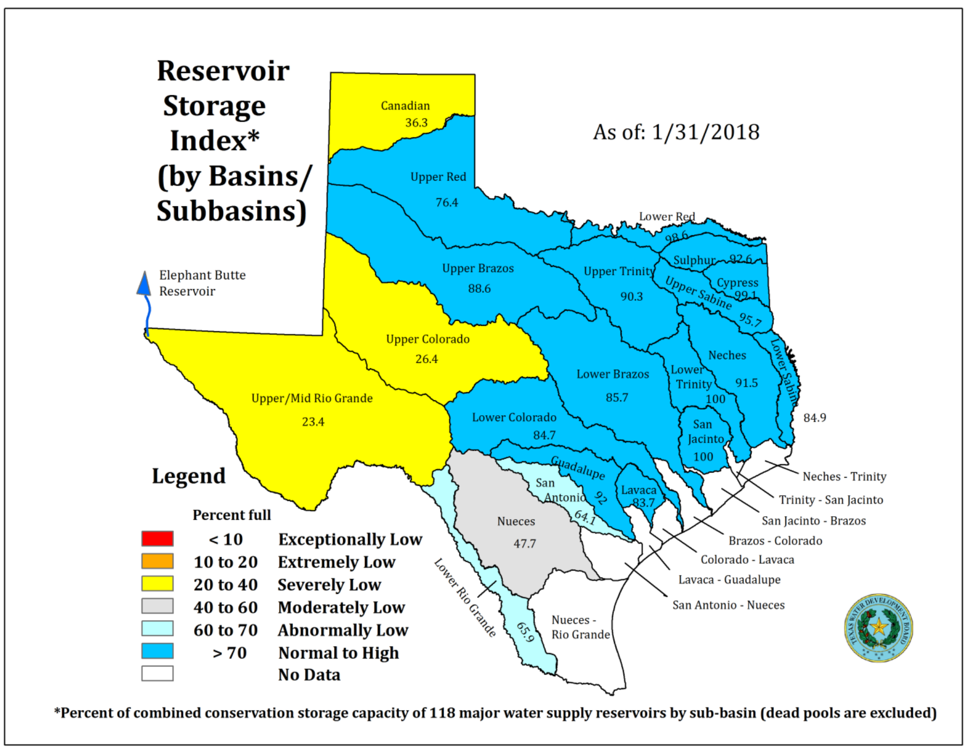
January

At the end of January 2018, total conservation storage* in 118 of the state's major water supply reservoirs was 25.8 million acre-feet or 80 percent of total conservation storage capacity. This is approximately 0.14 million acre-feet less than a month ago and 1.1 million acre-feet less than storage at this time last year.

Twenty-two (22) reservoirs held 100 percent of conservation storage capacity, primarily in the North Central (5 reservoirs) and East (15 reservoirs) regions. Two reservoirs, Palo Duro (1 percent) and Twin Buttes (7 percent) remained below 10 percent full.

Total combined storage was at or above normal (storage ≥70 percent) in the East (93 percent), Upper Coast (91 percent), North Central (91 percent), South Central (83 percent), and Low Rolling Plains (70 percent) regions. The High Plains (34 percent) and Trans-Pecos (31 percent) regions had the lowest percentage of storage. Overall, storage increased in three and decreased in six regions over the past month.

*Storage is based on end of the month data in 117 major reservoirs that represent 96 percent of the total conservation storage capacity of 188 major water supply reservoirs in Texas plus Elephant Butte reservoir in New Mexico. Major reservoirs are defined as having a conservation storage capacity of 5,000 acre-feet or greater. Only the Texas share of storage in border reservoirs is counted.



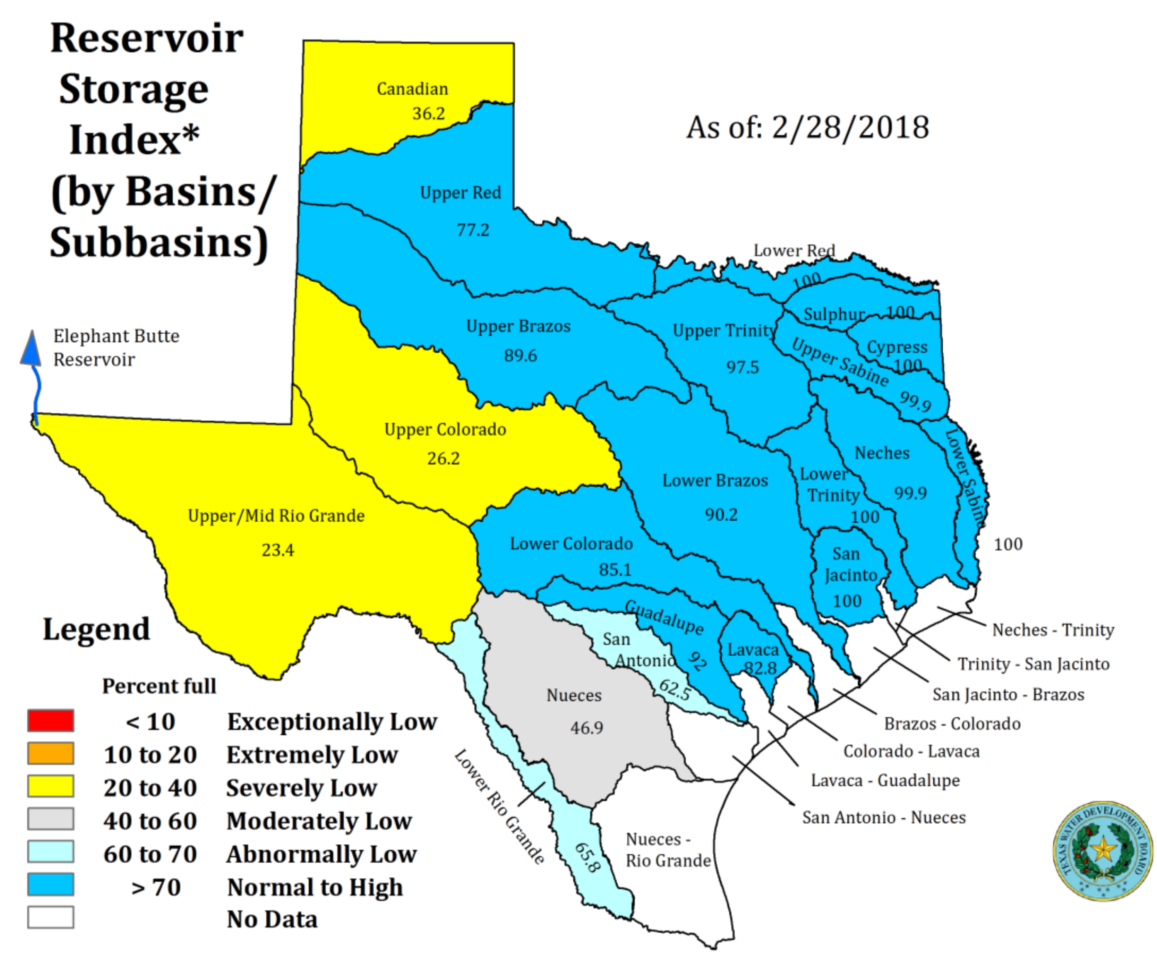
February

At the end of February 2018, total conservation storage* in 118 of the state's major water supply reservoirs was 27.07 million acre-feet or 84 percent of total conservation storage capacity. This is approximately 1.26 million acre-feet more than a month ago but 0.01 million acre-feet less than storage at this time last year.

Fifty-two (52) reservoirs held 100 percent of conservation storage capacity, primarily in the North Central (29 reservoirs) and East (21 reservoirs) regions. Two reservoirs, Palo Duro (1 percent) and Twin Buttes (7 percent) remained below 10 percent full.

Total combined storage was at or above normal (storage ≥70 percent) in the East (100 percent), Upper Coast (90 percent), North Central (96 percent), South Central (82 percent), and Low Rolling Plains (70 percent) regions. The High Plains (34 percent) and Trans-Pecos (32 percent) regions had the lowest percentage of storage. Overall, storage increased in four and decreased in five regions over the past month.

*Storage is based on end of the month data in 118 major reservoirs that represent 96 percent of the total conservation storage capacity of 188 major water supply reservoirs in Texas plus Elephant Butte reservoir in New Mexico. Major reservoirs are defined as having a conservation storage capacity of 5,000 acre-feet or greater. Only the Texas share of storage in border reservoirs is counted.



*Percent of combined conservation storage capacity of 118 major water supply reservoirs by sub-basin (dead pools are excluded)

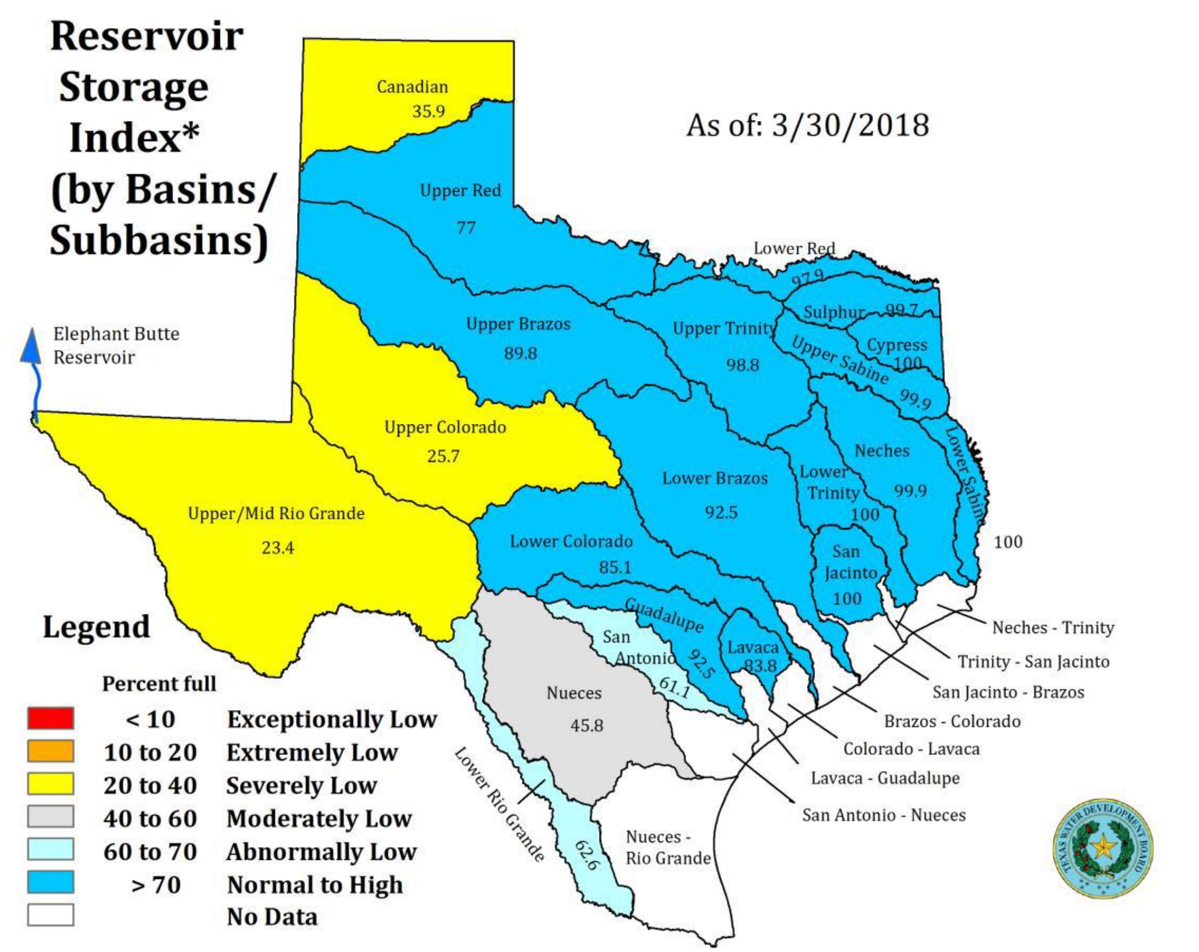
March

At the end of March 2018, total conservation storage* in 118 of the state's major water supply reservoirs was 26.99 million acre-feet or 84 percent of total conservation storage capacity. This is approximately 0.08 million acre-feet less than a month ago but 0.1 million acre-feet more than storage at this time last year.

Fifty-one (51) reservoirs held 100 percent of conservation storage capacity, primarily in the North Central (29 reservoirs) and East (20 reservoirs) regions. Two reservoirs, Palo Duro (1 percent) and Twin Buttes (7 percent) remained below 10 percent full.

Total combined storage was at or above normal (storage ≥70 percent) in the East (100 percent), North Central (97 percent), Upper Coast (91 percent), and South Central (82 percent) regions. The High Plains (33 percent) and Trans-Pecos (30 percent) regions had the lowest percentage of storage. Overall, storage increased in two and decreased in seven regions over the past month.

*Storage is based on end of the month data in 118 major reservoirs that represent 96 percent of the total conservation storage capacity of 188 major water supply reservoirs in Texas plus Elephant Butte reservoir in New Mexico. Major reservoirs are defined as having a conservation storage capacity of 5,000 acre-feet or greater. Only the Texas share of storage in border reservoirs is counted.



*Percent of combined conservation storage capacity of 118 major water supply reservoirs by sub-basin (dead pools are excluded)

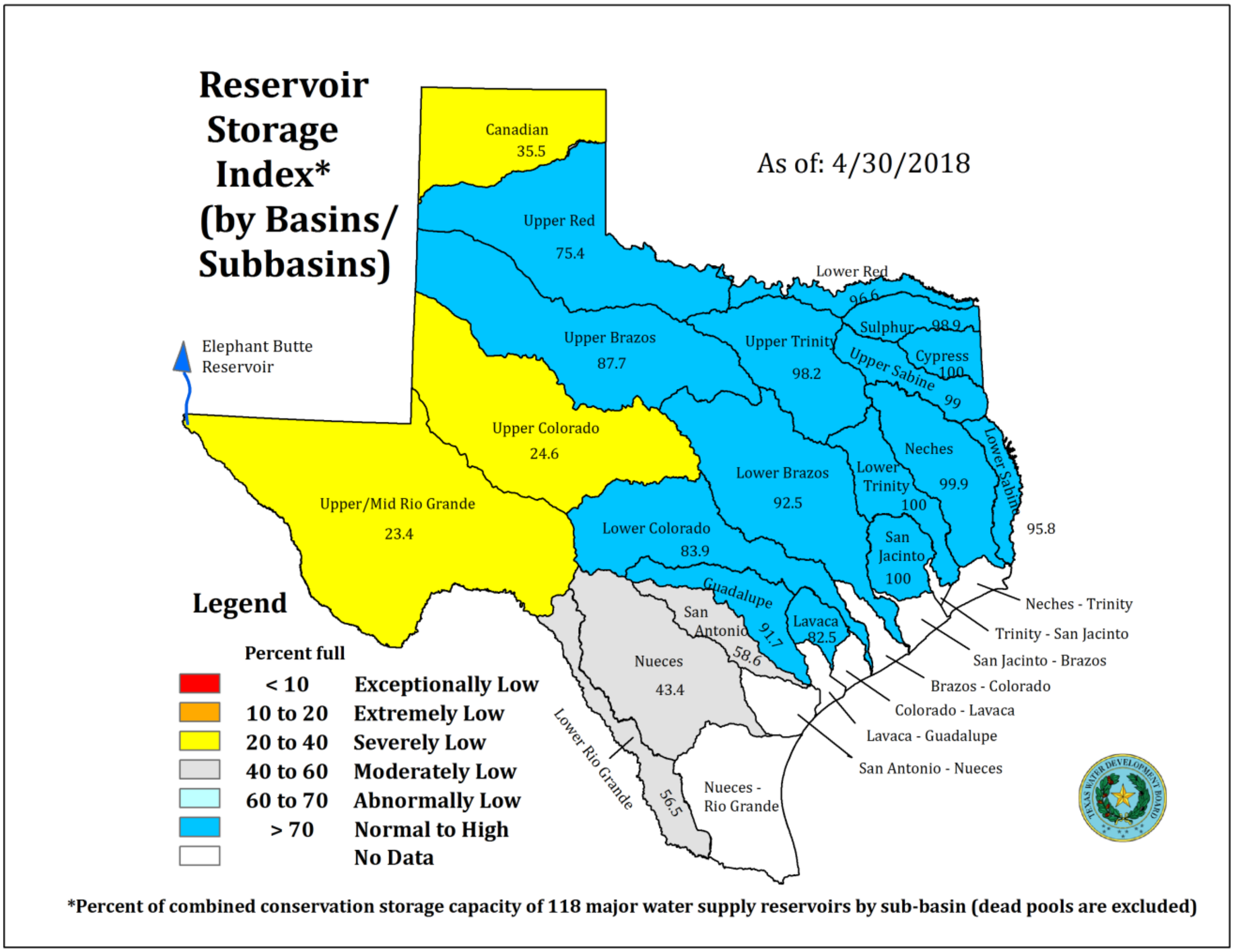
April

At the end of April 2018, total conservation storage* in 118 of the state's major water supply reservoirs was 26.68 million acre-feet or 82 percent of total conservation storage capacity. This is approximately 0.3 million acre-feet less than a month ago and 0.6 million acre-feet less than storage at this time last year.

Thirty-five (35) reservoirs held 100 percent of conservation storage capacity, primarily in the North Central (17 reservoirs) and East (16 reservoirs) regions. Three reservoirs, Palo Duro (1 percent), Twin Buttes (6 percent), and O. C. Fisher (9 percent) remained below 10 percent full.

Total combined storage was at or above normal (storage ≥70 percent) in the East (99 percent), North Central (96 percent), Upper Coast (90 percent), and South Central (81 percent) regions. The High Plains (33 percent) and Trans-Pecos (28 percent) regions had the lowest percentage of storage. Overall, storage increased in one but decreased in eight regions over the past month.

*Storage is based on end of the month data in 118 major reservoirs that represent 96 percent of the total conservation storage capacity of 188 major water supply reservoirs in Texas plus Elephant Butte reservoir in New Mexico. Major reservoirs are defined as having a conservation storage capacity of 5,000 acre-feet or greater. Only the Texas share of storage in border reservoirs is counted.



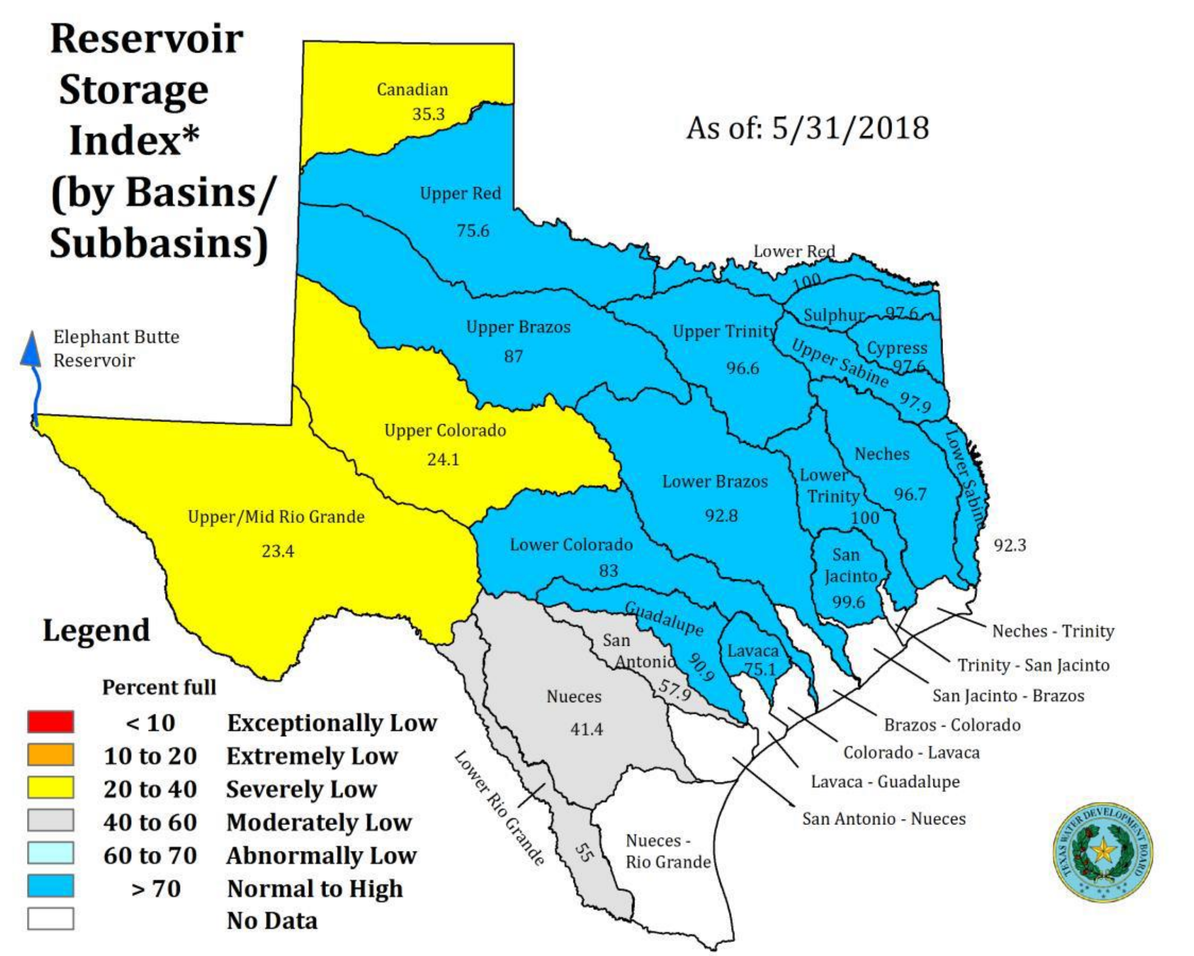
May

At the end of May 2018, total conservation storage* in 117 of the state's major water supply reservoirs plus Elephant Butte reservoir in New Mexico was 25.19 million acre-feet or 81 percent of total conservation storage capacity. This is approximately 0.69 million acre-feet less than a month ago and 1.45 million acre-feet less than storage at this time last year.

Nineteen (19) reservoirs held 100 percent of conservation storage capacity, primarily in the North Central (10 reservoirs) and East (8 reservoirs) regions. Three reservoirs, Palo Duro (1 percent), Twin Buttes (7 percent), and O. C. Fisher (9 percent) remained below 10 percent full.

Total combined storage was at or above normal (storage ≥70 percent) in the East (97 percent), North Central (96 percent), Upper Coast (86 percent), and South Central (78 percent) regions. The High Plains (33 percent) and Trans-Pecos (24 percent) regions had the lowest percentage of storage. Overall, storage increased in one but decreased in eight regions over the past month.

*Storage is based on end of the month data in 117 major reservoirs that represent 96 percent of the total conservation storage capacity of 188 major water supply reservoirs in Texas plus Elephant Butte reservoir in New Mexico. Major reservoirs are defined as having a conservation storage capacity of 5,000 acre-feet or greater. Only the Texas share of storage in border reservoirs is counted.



*Percent of combined conservation storage capacity of 118 major water supply reservoirs by sub-basin (dead pools are excluded)

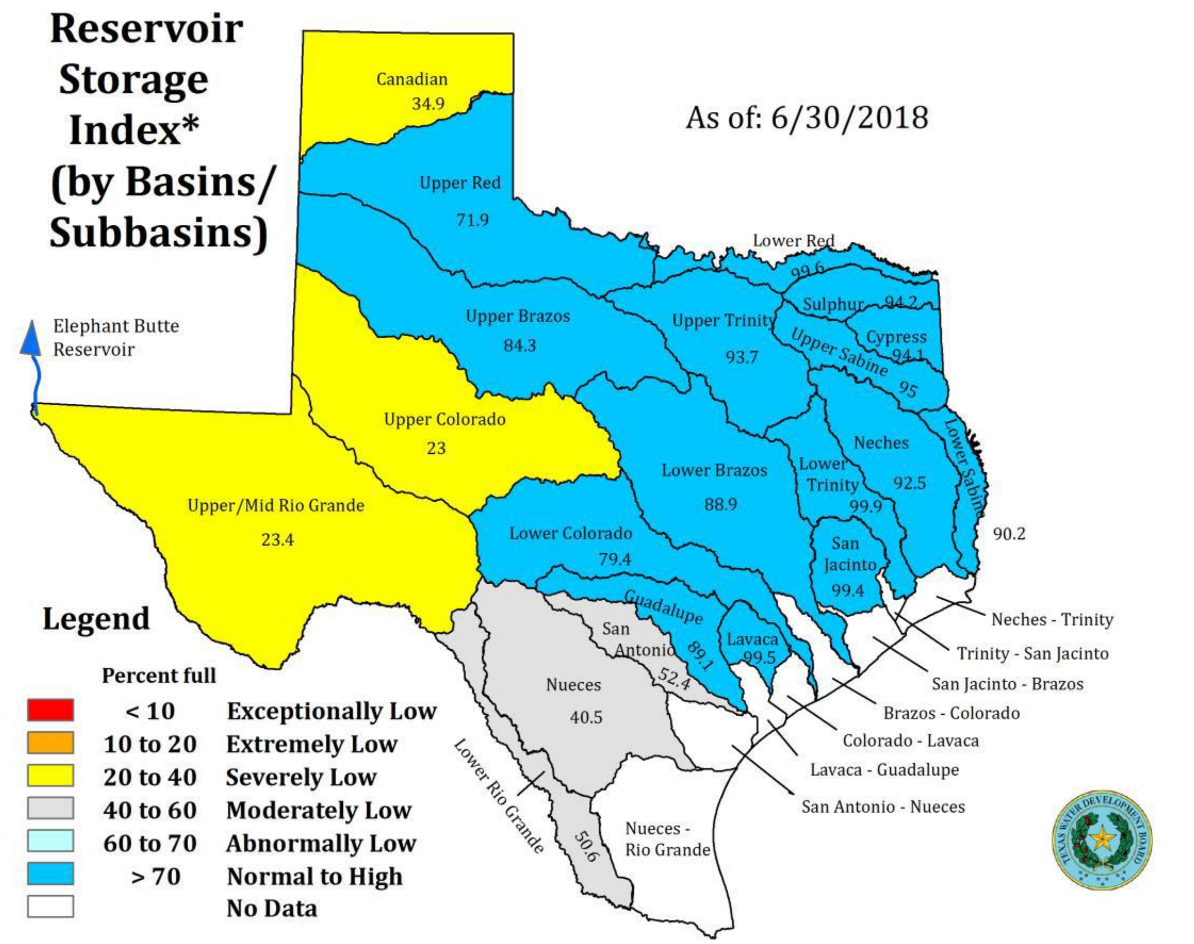
June

At the end of June 2018, total conservation storage* in 118 of the state's major water supply reservoirs plus Elephant Butte Reservoir in New Mexico was 25.29 million acre-feet or 78 percent of total conservation storage capacity. This is approximately 1.07 million acre-feet less than a month ago and 2.07 million acre-feet less than storage at this time last year.

Seven (7) reservoirs held 100 percent of conservation storage capacity, primarily in the North Central (3 reservoirs) and East (3 reservoirs) regions. Three reservoirs, Palo Duro (1 percent), Twin Buttes (5 percent), and O. C. Fisher (9 percent) remained below 10 percent full.

Total combined storage was at or above normal (storage ≥70 percent) in the Upper Coast (100 percent), East (94 percent), North Central (93 percent), and South Central (74 percent) regions. The High Plains (32 percent) and Trans-Pecos (19 percent) regions had the lowest percentage of storage. Overall, storage increased in one but decreased in eight regions over the past month.

*Storage is based on end of the month data in 118 major reservoirs that represent 96 percent of the total conservation storage capacity of 188 major water supply reservoirs in Texas plus Elephant Butte Reservoir in New Mexico. Major reservoirs are defined as having a conservation storage capacity of 5,000 acre-feet or greater. Only the Texas share of storage in border reservoirs is counted.



*Percent of combined conservation storage capacity of 118 major water supply reservoirs by sub-basin (dead pools are excluded)

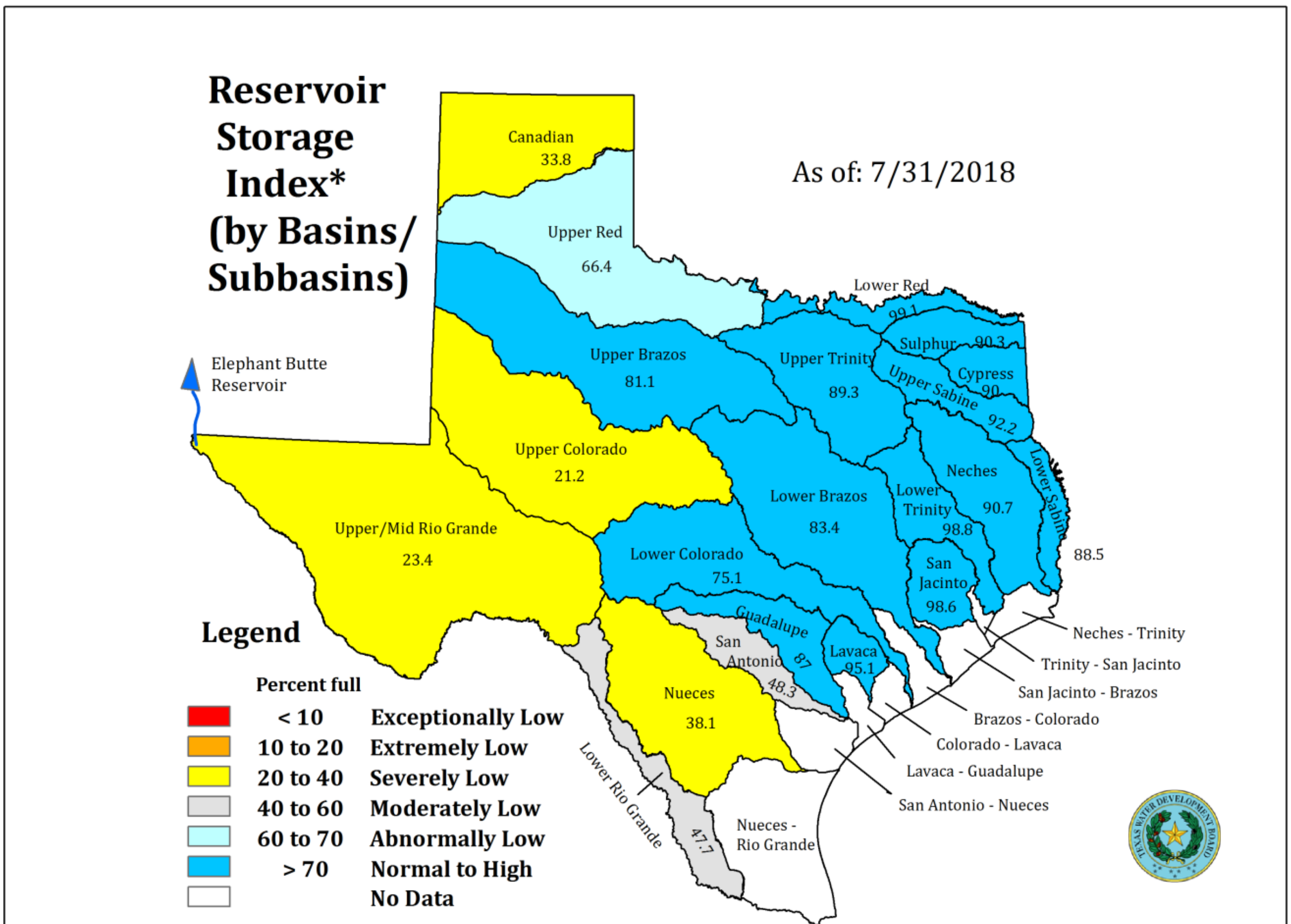
July

At the end of July 2018, total conservation storage* in 118 of the state's major water supply reservoirs plus Elephant Butte Reservoir in New Mexico was 24.31 million acre-feet or 75 percent of total conservation storage capacity. This is approximately 0.97 million acre-feet less than a month ago and 2.41 million acre-feet less than storage at this time last year.

Four (4) reservoirs held 100 percent of conservation storage capacity, primarily in the North Central (2 reservoirs) and East (1 reservoir) regions. Four reservoirs, Palo Duro (1 percent), Twin Buttes (4 percent), and O. C. Fisher (8 percent) remained below 10 percent full. Elephant Butte reservoir is 7 percent full.

Total combined storage was at or above normal (storage ≥70 percent) in the Upper Coast (97 percent), East (92 percent), North Central (89 percent), and South Central (70 percent) regions. The High Plains (31 percent) and Trans-Pecos (14 percent) regions had the lowest percentage of storage. Overall, storage decreased in all regions over the past month.

*Storage is based on end of the month data in 118 major reservoirs that represent 96 percent of the total conservation storage capacity of 188 major water supply reservoirs in Texas plus Elephant Butte Reservoir in New Mexico. Major reservoirs are defined as having a conservation storage capacity of 5,000 acre-feet or greater. Only the Texas share of storage in border reservoirs is counted.



*Percent of combined conservation storage capacity of 118 major water supply reservoirs by sub-basin (dead pools are excluded)

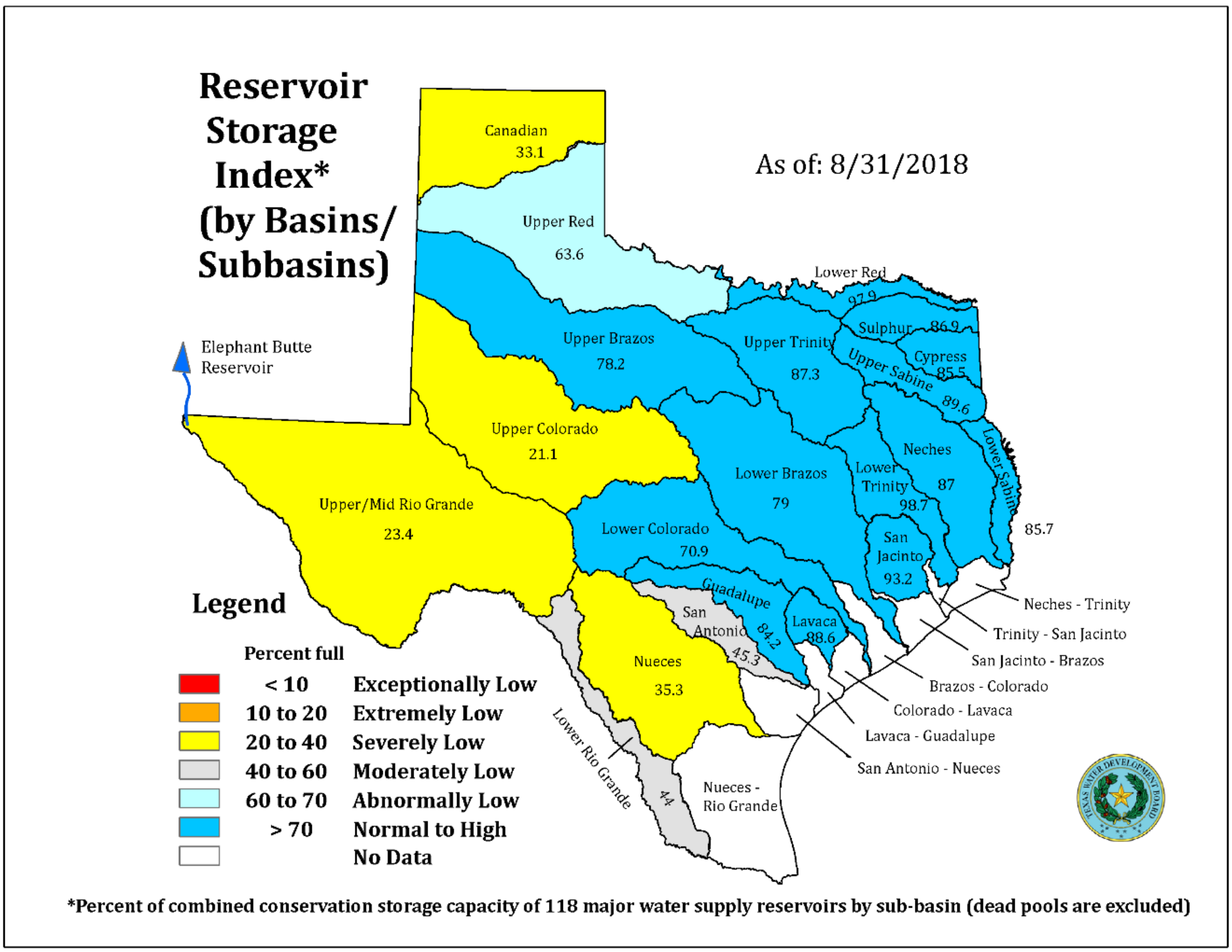
August

At the end of August 2018, total conservation storage* in 118 of the state's major water supply reservoirs plus Elephant Butte Reservoir in New Mexico was 23.44 million acre-feet or 73 percent of total conservation storage capacity. This is approximately 0.77 million acre-feet less than a month ago and 3.48 million acre-feet less than storage at this time last year.

Four (4) reservoirs held 100 percent of conservation storage capacity. Four reservoirs, Palo Duro (1 percent), Twin Buttes (3 percent), and O. C. Fisher (8 percent) remained below 10 percent full. Elephant Butte reservoir is 4 percent full.

Total combined storage was at or above normal (storage ≥70 percent) in the Upper Coast (94 percent), East (89 percent), and North Central (86 percent) regions. The High Plains (31 percent), Southern (31 percent), and Trans-Pecos (12 percent) regions had the lowest percentage of storage. Overall, storage decreased in all regions over the past month.

*Storage is based on end of the month data in 118 major reservoirs that represent 96 percent of the total conservation storage capacity of 188 major water supply reservoirs in Texas plus Elephant Butte Reservoir in New Mexico. Major reservoirs are defined as having a conservation storage capacity of 5,000 acre-feet or greater. Only the Texas share of storage in border reservoirs is counted.



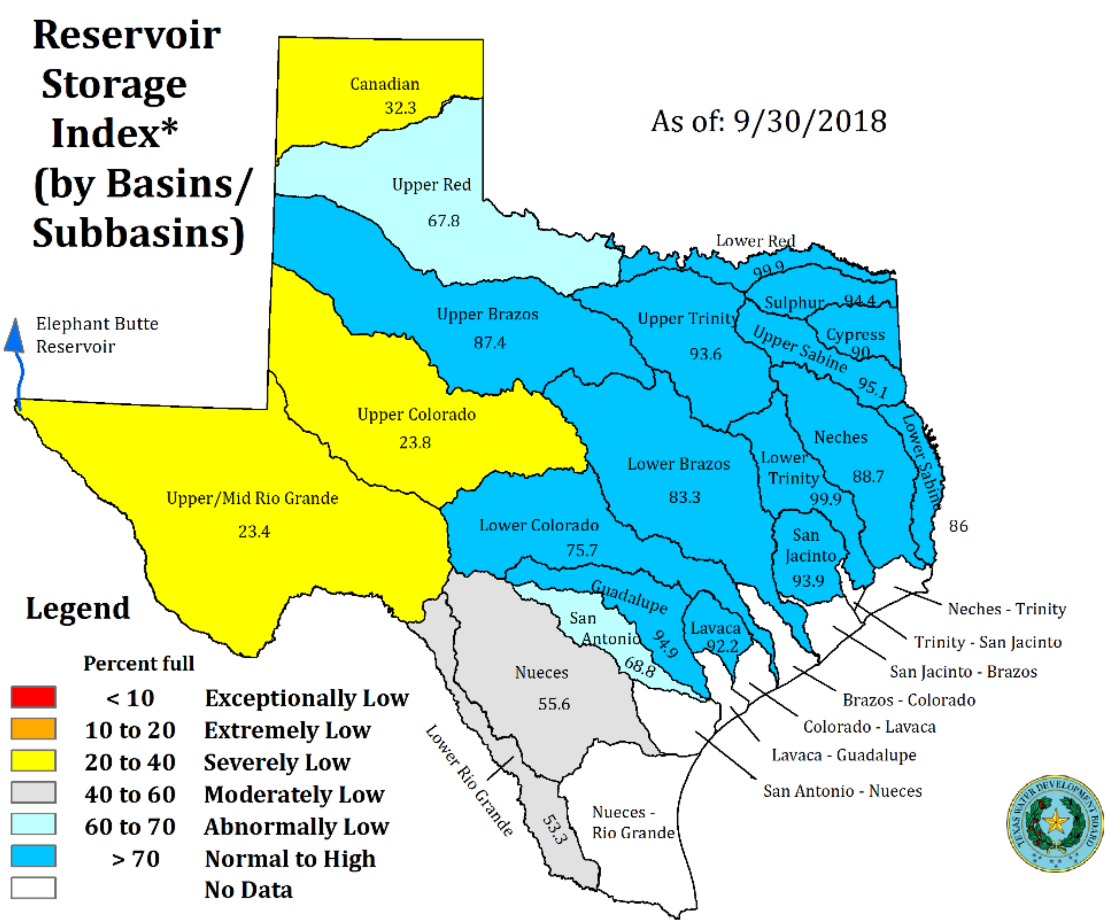
September

At the end of September 2018, total conservation storage* in 118 of the state's major water supply reservoirs plus Elephant Butte Reservoir in New Mexico was 25.09 million acre-feet or 78 percent of total conservation storage capacity. This is approximately 1.66 million acre-feet more than a month ago, an increase after a 5-month decline since April. Although this storage level is a fraction more than the historical median storage (based on records since 1990), it is 1.53 million acre-feet less than total conservation storage at the end of September 2017.

Out of 118 reservoirs in the State, 27 reservoirs held 100 percent of conservation storage capacity. Additionally, 28 were above 90 percent full. These high storage reservoirs are located in the north, central, and east Texas regions. However, two reservoirs, Palo Duro (1 percent full) and O. C. Fisher (8 percent full) remained below 10 percent full, and 8 reservoirs remained between 10-30 percent full. Low storage reservoirs (26 below 70 percent full) occurred in the Panhandle, west, and south Texas regions. Elephant Butte reservoir (located in New Mexico) was only 3 percent full.

The storage in Upper Brazos River basin was above normal at 87.4 percent full. Storage in the Canadian, Upper Colorado, and Upper/Mid Rio Grande was ranked as severely low, storage in Nueces and Lower Rio Grande was ranked as moderately low, and storage in the Upper Red and San Antonio was ranked as abnormally low.

*Storage is based on end of the month data in 118 major reservoirs that represent 96 percent of the total conservation storage capacity of 188 major water supply reservoirs in Texas plus Elephant Butte Reservoir in New Mexico. Major reservoirs are defined as having a conservation storage capacity of 5,000 acre-feet or greater. Only the Texas share of storage in border reservoirs is counted.



***Percent of combined conservation storage capacity of 118 major water supply reservoirs by sub-basin (dead pools are excluded)**

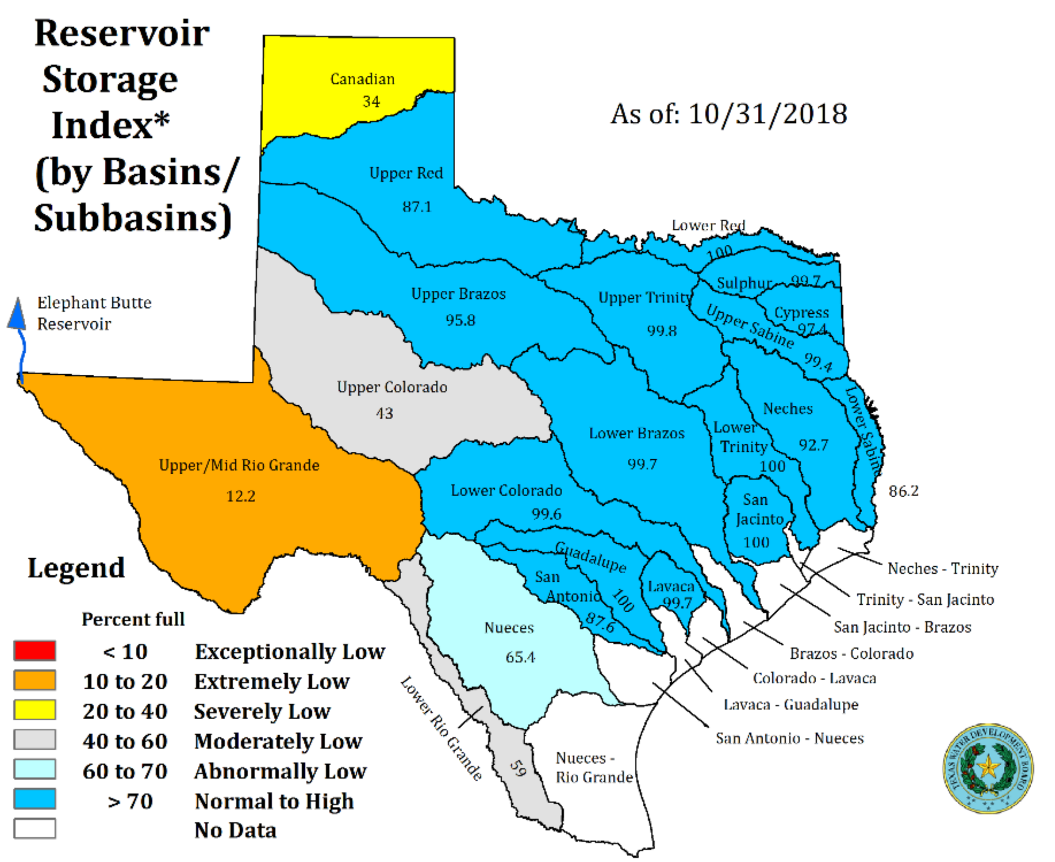
October

At the end of October 2018, total conservation storage* in 118 of the state's major water supply reservoirs plus Elephant Butte Reservoir in New Mexico was 27.36 million acre-feet or 85 percent of total conservation storage capacity. This is approximately 2.38 million acre-feet more than a month ago, continuing an increasing trend that began in September.

Out of 118 reservoirs in the state, 73 reservoirs held 100 percent of conservation storage capacity. Additionally, 29 were above 90 percent full. These high storage reservoirs are located in the North, Central, and East Texas regions. However, Palo Duro Reservoir was only 1 percent full and another five reservoirs (Mackenzie (13 percent full), O. C. Fisher (15 percent full), White River (17 percent full) Greenbelt (21 percent full), and E. V. Spence (24 percent full)) remained below 30 percent full. Low storage reservoirs (18 below 70 percent full) occurred in the Panhandle, West, and South Texas regions. Elephant Butte Reservoir (located in New Mexico) was only 4 percent full.

Storage in the Upper/Mid Rio Grande was ranked as extremely low. The Canadian River basin was ranked as severely low. Storage in Upper Colorado and Lower Rio Grande was ranked as moderately low, and storage in the Nueces was ranked as abnormally low.

*Storage is based on end of the month data in 118 major reservoirs that represent 96 percent of the total conservation storage capacity of 188 major water supply reservoirs in Texas plus Elephant Butte Reservoir in New Mexico. Major reservoirs are defined as having a conservation storage capacity of 5,000 acre-feet or greater. Only the Texas share of storage in border reservoirs is counted.



*Percent of combined conservation storage capacity of 118 major water supply reservoirs by sub-basin (dead pools are excluded)

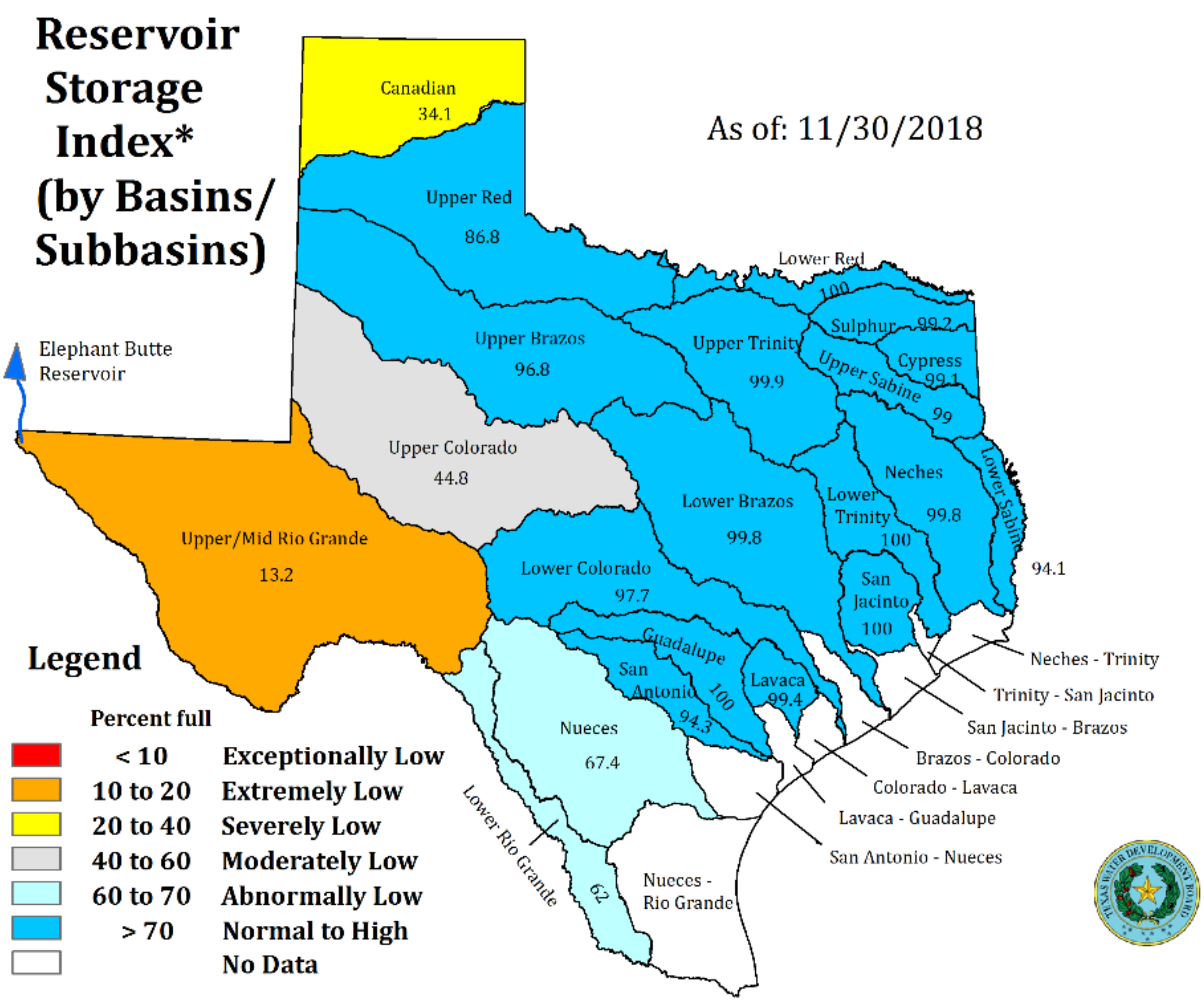
November

At the end of November 2018, total conservation storage* in 118 of the state's major water supply reservoirs plus Elephant Butte Reservoir in New Mexico was 27.96 million acre-feet or 87 percent of total conservation storage capacity. This is approximately 0.62 million acre-feet more than a month ago and 2.2 million acre-feet more than this time of a year ago, continuing an increasing trend that began in September.

Out of 118 reservoirs in the state, 74 reservoirs held 100 percent of conservation storage capacity. Additionally, 21 were above 90 percent full. These high storage reservoirs are in the North, Central, and East Texas regions. However, Palo Duro Reservoir was only 1 percent full and another five reservoirs (Mackenzie (13 percent full), O. C. Fisher (15 percent full), White River (16 percent full) Greenbelt (20 percent full), and E. V. Spence (26 percent full) remained below 30 percent full. Low storage reservoirs (16 below 70 percent full) occurred in the Panhandle, West, and South Texas regions. Elephant Butte Reservoir (located in New Mexico) was only 5 percent full.

Storage in all basins/sub-basins are normal to high (>70 percent full), except the Upper/Mid Rio Grande, which was ranked as extremely low, the Canadian River basin, which was ranked as severely low, the Upper Colorado, the Lower Rio Grande, which were ranked as moderately low, and the Nueces, which was ranked as abnormally low.

*Storage is based on end of the month data in 118 major reservoirs that represent 96 percent of the total conservation storage capacity of 188 major water supply reservoirs in Texas plus Elephant Butte Reservoir in New Mexico. Major reservoirs are defined as having a conservation storage capacity of 5,000 acre-feet or greater. Only the Texas share of storage in border reservoirs is counted.



*Percent of combined conservation storage capacity of 118 major water supply reservoirs by sub-basin (dead pools are excluded)

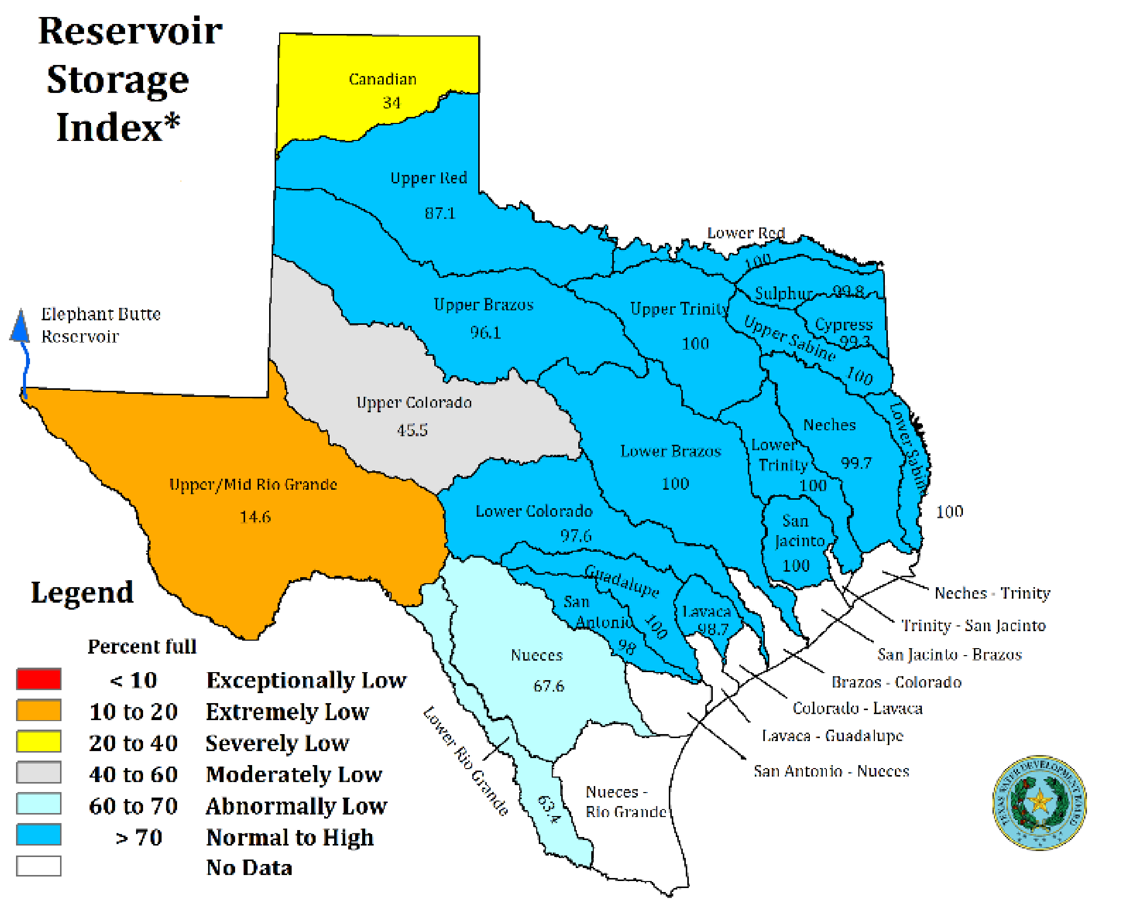
December

At the end of December 2018, total conservation storage* in 118 of the state's major water supply reservoirs plus Elephant Butte Reservoir in New Mexico was 28.21 million acre-feet or 88 percent of total conservation storage capacity. This is approximately 0.24 million acre-feet more than a month ago and 5 million acre-feet more than this time a year ago, continuing an increasing trend that began in September.

Out of 118 reservoirs in the state, 86 reservoirs held 100 percent of conservation storage capacity (Figure 3). Additionally, 9 were above 90 percent full. These high storage reservoirs are in the North, Central, and East Texas regions. However, Palo Duro Reservoir was only 1 percent full and another five reservoirs [Mackenzie (12 percent full), O. C. Fisher (14 percent full), White River (16 percent full) Greenbelt (20 percent full), and E. V. Spence (27 percent full)] remained below 30 percent full. There were 19 reservoirs with low storage (below 70 percent full) located in the Panhandle, West, and South Texas regions. Elephant Butte Reservoir (located in New Mexico) was only 6 percent full.

Storage in all basins/sub-basins are normal to high (>70 percent full), except the Upper/Mid Rio Grande, which was ranked as extremely low, the Canadian River basin, which was ranked as severely low, the Upper Colorado, the Lower Rio Grande, which were ranked as moderately low, and the Nueces, which was ranked as abnormally low.

*Storage is based on end of the month data in 118 major reservoirs that represent 96 percent of the total conservation storage capacity of 188 major water supply reservoirs in Texas plus Elephant Butte Reservoir in New Mexico. Major reservoirs are defined as having a conservation storage capacity of 5,000 acre-feet or greater. Only the Texas share of storage in border reservoirs is counted.



***Percent of combined conservation storage capacity of 118 major water supply reservoirs by sub-basin (dead pools are excluded)**

Making Headlines 2018

E.1 Objective - The District will annually submit an article regarding water conservation for publication to at least one newspaper of general circulation in the District counties.

E.1 Performance Standard - Each year, a copy of the conservation article will be included in the District's Annual Report to be given to the District's Board of Directors.

E.2 Objective - The District will annually submit an article regarding rain water harvesting for publication to at least one newspaper of general circulation in the District counties.

E.2 Performance Standard - Each year, a copy of the rain water harvesting article will be included in the District's Annual Report to be given to the District's Board of Directors.

E.3 Objective - Each year, the District will include an informative flier on water conservation within at least one mail out to groundwater non-exempt water users distributed in the normal course of business for the District.

E.3 Performance Standard - Each year, a copy of the water conservation mail-out flyer will be included in the District's Annual Report to be given to the District's Board of Directors.

There are several newspapers in the District that routinely publish information about UTGCD, including meeting notifications and conservation ideas. In addition, District staff routinely monitors the newspapers for any other water-related articles. The following pages are examples of information released by the District to fulfill our management objectives in 2018.

The Springtown Epigraph

District offers tips to handling the ongoing drought conditions

Thursday, August 9, 2018

Without necessary amounts of water – which we have not seen for months – trees either shut down or die, like these south of town on Hwy. 51. Photo by Mark K. Campbell

Texas is experiencing its second driest stretch between March and August in recorded weather history.

Drought is a common topic of conversation these days and the Upper Trinity Groundwater Conservation District (UTGCD) office has some ways to soften the lack of water blow.

Texas is no stranger to these extreme dry spells, which can have a long-lasting effect on many aspects of the environment – including our groundwater.

According to the National Integrated Drought Information System, North Texas has recently been experiencing drought conditions ranging from Abnormally Dry (D0) to Extreme (D3).

This has put a strain on many natural resources, including groundwater, which serves as the sole source of water for many people in the area through both public water systems and private wells.

In drought years, trends show that the lack of precipitation and high temperatures can lead to higher water consumption and more dependence on groundwater which can lead to faster depletion of this precious resource.

Whether relying on groundwater or surface water, water conservation is crucial the future of all Texans.

Saving water now can have a tremendous impact on the aquifer and our communities in the future.

Some of the small, everyday changes you can make to help are:

• Check for toilet and faucet leaks and repair immediately

• Install aerators on faucets and remember to turn them off when not in use

• If you do not have a low-flow toilet, use water displacement device in the tank

• While waiting for hot water to reach faucet, catch cold water in a container to water potted plants

• Only run the dishwasher and the washing machine with full loads

• Reduce shower time – On average, a shower uses about two gallons of water per minute. If you take a 30-minute shower, that's 60 gallons of water; vs. a five-minute shower, which uses 10 gallons.

According to the Texas Water Development Board, almost 31 percent of annual residential use is outside, but in the summer that number is much higher.


POWERLIFTERS WIN BIG HERE AND AT BOWIE MEETS
Thursday, January 17, 2019
The Springtown Epigraph

Alleged attacker caught in Reno
Cole sparked manhunt after incident in Wise County

Leapin' Lady Porcupine

Major accident closes FM 51
One driver found trapped in vehicle

One-of-a-kind momento

Four students All-State

Find Rest & Relaxation ...
Eagle Crest
817-444-3249

CLICK HERE TO READ Springtown Epigraph

You can help lower that percentage by:

• Watering between 8 p.m. and 8 a.m.

• Not over watering plants (According to the EPA, up to 50 percent of water is lost to evaporation, wind, or runoff due to over-watering.)

• For automatic sprinkler systems:

• Check sprinkler heads regularly to prevent clogging

• Adjust to eliminate overspray and adjust run times and frequency to respond to water schedules, changing rainfall, and temperature conditions

• For hose-end sprinklers: use sprinkler timers to limit water duration

• Use hand-held hose, drip irrigation, or soaker hoses for trees, garden, non-turf areas, and bedded plants

• Cut lawns on highest setting and leave lawn clippings on lawn instead of bagging

• Use mulch to preserve soil moisture

• Utilize supplemental water sources, such as collected rainwater, where possible

These small shifts in daily routine can affect big change, and every individual can make a difference by conserving. Help ensure that future generations will have the water they need.

Interested in registering an existing well?

Questions about free water testing?

Call the UTGCD office at (817) 523-5200 or check out their website at www.uppertrinitygcd.com for more information.

Category: News

The Springtown Epigraph

Rainwater harves ting tips from UTGCD

District encourging residents to take advantage of above-average rainfall

Thursday, November 29, 2018

With record-breaking levels of rainfall in October, the Upper Trinity Groundwater Conservation District (UTGCD) is encouraging residents to take advantage of the next rain event by harvesting rainwater for indoor and outdoor use.

In October the North Texas region broke records with 11.2 inches of rainfall, the highest monthly rainfall the area has seen since 1981, according to a UTGCD news release.

There are many benefits to rainwater harvesting: it's free, can reduce utility bills, helps to reduce corrosion or scale, and harvesting systems are financially incentivized through the state of Texas.

With the population of Texas set to double over the next 50 years, identifying new or alternative water resources will become increasingly important, according to the UTGCD.

Rainwater collection could potentially alleviate many water supply issues by reducing the strain on current groundwater and surface water sources.

Rainwater harvesting systems don't have to be fancy to be effective; they can be something as simple as a rain barrel that catches run-off from your roof, or a complex system that provides potable water throughout the home.

On average, homeowners can collect approximately 0.62 gallons of water per square foot of roof area, per inch of rainfall, according to facts from the National Weather Service and the Texas Water Development Board.

With an average yearly rainfall amount of 32 inches and 85 percent efficiency, a 2,000 square foot roof could expect to collect around 33,728 gallons of rainwater per year.

More information about rainwater harvesting and water saving ideas, visit the Upper Trinity Groundwater Conservation District's website (www.uppertrinitygcd.com) or call the office at

(817) 523-5200 and ask to speak to Kaitlin Adams, Education and PR Coordinator.

Category: News


POWERLIFTERS WIN BIG HERE AND AT BOWIE MEETS
Thursday, January 17, 2019
The Springtown Epigraph

Alleged attacker caught in Reno
Cole sparked manhunt after incident in Wise County
BY CHRISTINA DERR

Leapin' Lady Porcupine

One-of-a-kind momento

Major accident closes FM 51
One driver found trapped in vehicle
BY CHRISTINA DERR

Volume 55, Number 40
$1.00

Four students All-State
BY CHRISTINA DERR

Find Rest & Relaxation ...
Eagle Crest Villa
817-444-3249

CLICK HERE TO READ Springtown Epigraph

Old school still works

Capture water for free at home

SPRINGTOWN — According to the National Weather Service, North Texas received 11.2 inches of rain in October.

(Nocona recorded 8.92-inches of rain. That was the most in the month of October since 10.1-inches fell in October 2000. The most recorded was an estimated 19.2-inches in October of 1981. Estimated because the gauge overflowed.)

That is the most rain this area has seen in one month since 1981. What can be done with all this extra water?

During the next rain event, Upper Trinity GCD encourages you to consider collecting that rainwater. Rainwater harvesting is the collection and storage of rainwater for potable and non-potable indoor and outdoor use.

Why participate in Rainwater Harvesting?

* Rainwater is FREE (in Texas)

* Using rainwater can reduce utility bills

* Rainwater is soft, with an almost neutral ph, which can help to reduce corrosion or scale

* The State of Texas offers financial incentives for rainwater harvesting systems (http://www.twdb.texas.gov/publications/shells/RainwaterHarvesting.pdf)

Research shows that rainwater harvesting dates back thousands of years, and for many people in Texas, it is still regularly used as a primary freshwater source. With the population of the state estimated to double over the next 50 years, identifying new or alternative water resources is going to become increasingly important. Especially regarding outdoor domestic use, rainwater collection could potentially alleviate many water supply issues by reducing the strain on current groundwater and surface water sources.

Rainwater harvesting systems can vary greatly in their complexity, from something as simple as a rain barrel strategically placed to catch run-off from your roof to a complex system that provides potable water throughout your home.

On average, it is possible to collect approximately 0.62 gallons of water per square foot of roof area, per inch of rainfall. Considering factors such as evaporation, leaks, splash out, etc. and about 75-85% efficiency can be expected from a typical system.

That means, with an average yearly rainfall amount of 32 inches and 85% efficiency, a 2,000 square foot roof could expect to collect around 33,728 gallons of rainwater per year (0.62 x 0.85 x 2,000 x 32= 33,728 gallons per year).

Conserving water now is crucial to ensure we have water in the future.

For more information about rainwater harvesting and other water saving ideas, please visit the Upper Trinity Groundwater Conservation District's website (www.uppertrinitygcd.com) where you will find helpful links, videos, articles, and other tools to help conserve water.

You can also call our office at (817) 523-5200 and ask to speak to Kaitlin Adams, Education and PR Coordinator.

Facts for this article were found through the National Weather Service website (https://www.weather.gov/) and the Texas Manual on Rainwater Harvesting provided by the Texas Water Development Board (TWDB) which can be found on their website (http://www.twdb.texas.gov/)

**

Sheriff's Log

Howell

Sims

Continued from Page 3

ceed with adjudication of guilt counts 1 and 2 of sexual assault of a child, $30,000 bond.

++Jarred Kyle Howell, 31, Lebanon; Nov. 25, MCSO; motion to revoke community supervision for driving while intoxicated-third or more offense, no bond.

++Jason Ray Sims, 28, Bowie; Nov. 25, Bowie Po-

Thankful gathering . . .

-- *Montague I.S.D. photo*

Almost three people crowded into the Montague School Gymnasium for the Thanksgiving Feast as parents, siblings and grandparents joined the students, faculty and staff for the holiday luncheon.

State 'dings' jail for checking inmates more than necessary

By Tracy R. Mesler

MONTAGUE – All Sheriff Marshal Thomas could do was chuckle when an inspector for the Texas Commission on Jail Standards "wrote the jail up" for being more aggressive than state statutes require in check on mental patients.

Prior to Monday's Montague County Commissioner's Court meeting, the sheriff was proud to announce that the state's annual inspection of the jail found no deficiencies.

But, he added, there were three areas where minor items were cited in the report, one of which left him shaking his head.

"We check folks on suicide watch every 15 minutes while the state requires every 30 minutes," he explained.

"During the review of the mental disabilities/suicide prevention plan this inspector recommended the administration amend the current plan. The plan states those inmates who are potentially suicidal will be checked every 15 minutes. This inspector advised per minimum jail standards the required face to face observation on inmates who are

notation in the inspection report concluded.

Two other minor notates were named as well.

It was noted that a jailer did not sign off on the required quarterly training for the third quarter. When it was pointed out she was on vacation during the quarterly meeting going through training at a later date it was not documented.

The inspector asked that the jail administration scan and email a copy of the fourth quarter training when all the staff has been trained.

The other notation was that hard copies of electronic health service documentation were not maintained in the file. During the following 30-90 days the administration was instructed to scan and email copies of the intake screening form where a supervisor notification is warranted.

**

"He who wears the Purple Heart has given of his blood in the defense of his homeland and shall forever be revered by his fellow countrymen."

—George Washington

**

https://www.weatherforddemocrat.com/news/local_news/utgcd-stresses-importance-of-rainwater-harvesting/article_36551490-225e-52bc-83de-25884fd4d9bd.html

EDITOR'S PICK TOPICAL FEATURED

UTGCD stresses importance of rainwater harvesting

By Staff Reports Nov 23, 2018

Rainwater collection could potentially alleviate many water supply issues by reducing the strain on current groundwater and surface water sources, according to the Upper Trinity Groundwater Conservation District.

COURTESY

Upper Trinity Groundwater Conservation District is encouraging people to harvest rainwater in an effort to conserve water.

Rainwater harvesting is the collection and storage of rainwater for potable and non-potable indoor and outdoor use.

Rainwater harvesting is encouraged because rainwater is free and using it can reduce utility bills. Rainwater is soft, with an almost neutral ph, which can help to reduce corrosion or scale, according to the UTGCD.

Also, Texas offers financial incentives for rainwater harvesting systems. The process is legal and generally encouraged throughout the state, UTGCD Education and PR Coordinator Kaitlin Adams said.

Rainwater collected would need to be filtered for drinking water but can be used unfiltered for livestock, pets or lawn care, Adams said.

Research shows that rainwater harvesting dates back thousands of years, and for many people in Texas, it is still regularly used as a primary freshwater source, according to the UTGCD.

Especially regarding outdoor domestic use, rainwater collection could potentially alleviate many water supply issues by reducing the strain on current groundwater and surface water sources.

“In this area, in our district here, we deal with groundwater and water in the aquifers, and it’s not an infinite resource,” Adams said. “If you have a storage system to collect that rainwater, it can last all year, and it’s not something that we’re worried about running out of at this point. So, we feel it’s a very beneficial alternative to relying completely on groundwater.”

Rainwater harvesting systems can vary greatly in their complexity, from something as simple as a rain barrel strategically placed to catch runoff from a person’s roof to a complex system that provides potable water throughout your home. Rainwater can be collected through underground cisterns or above ground barrels placed underneath gutters, Adams said.

According to the National Weather Service, North Texas received 11.2 inches of rain in October, which is the most rain the area has seen in one month since 1981. On average, it is possible to collect approximately 0.62 gallons of water per square foot of roof area, per inch of rainfall.

Considering factors such as evaporation, leaks and splash out, about 75-85 percent efficiency can be expected from a typical system. That means, with an average yearly rainfall amount of 32 inches and 85 percent efficiency, a 2,000 square foot roof could expect to collect around 33,728 gallons of rainwater per year.

The amount of rain that can be collected varies based on the size of rain-catching barrels, Adams said.

Smaller containers, such as 50 gallons, are usually used more immediately whereas larger barrels can be stored and used a little at a time.

Barrels can be purchased from hardware stores for about $100 for a 50 gallon one, Adams said.

“It’s a good way to figure out the ins and outs of rainwater collection with a small barrel, figure out how much you need and how to hook it up if you want to create a more complicated system,” Adams said.

For more information about rainwater harvesting and other water saving ideas, visit the Upper Trinity GCD’s website, www.uppertrinitygcd.com.

Weatherford Democrat Reporter Madelyn Edwards contributed to this report.

Hood County News
Granbury, Texas 817-573-7066

Kaitlin Adams Education & Public Relations Coordinator, Upper Trinity Groundwater Conservation District

Collecting rainwater can save you money

KAITLIN ADAMS

GUEST COLUMN

According to the National Weather Service, North Texas received 11.2 inches of rain in October. That is the most rain this area has seen in one month since 1981.

What can be done with all this extra water?

During the next rain event, Upper Trinity Groundwater Conservation District encourages you to consider collecting that rainwater.

Rainwater harvesting is the collection and storage of rainwater for potable and non-potable indoor and outdoor use.

Why participate in rainwater harvesting?

■ Rainwater is FREE;

■ Using rainwater can reduce utility bills;

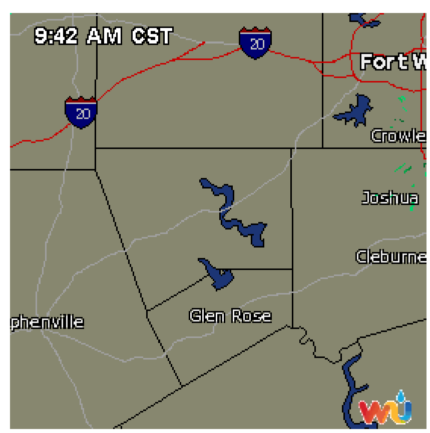
■ Rainwater is soft, with an almost neutral ph, which can help reduce corrosion or scale.

The State of Texas offers financial incentives for rainwater harvesting systems (http://www.twdb.texas.gov/publications/shells/RainwaterHarvesting.pdf)

Research shows that rainwater harvesting dates back thousands of years, and for many people in Texas it is still regularly used as a primary freshwater source.

With the population of the state estimated to double over the next 50 years, identifying new or alternative water resources is going to become increasingly

Granbury, TX 46 °F 63 °F



important.

Especially regarding outdoor domestic use, rainwater collection could potentially alleviate many water supply issues by reducing the strain on current groundwater and surface water sources.

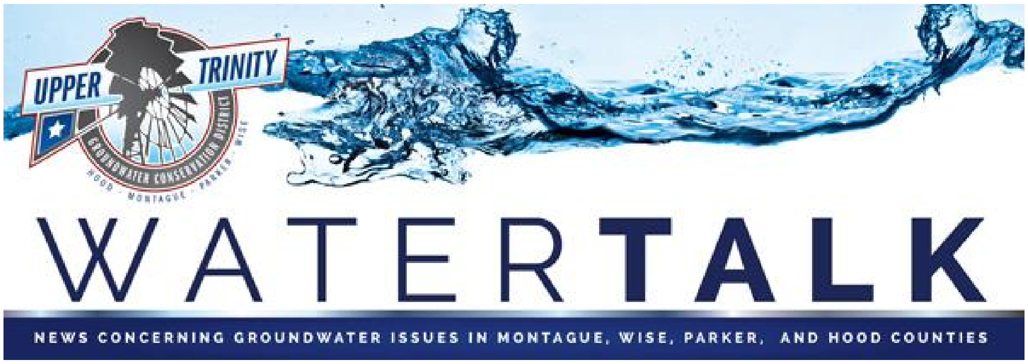
Rainwater harvesting systems can vary greatly in their complexity, from something as simple as a rain barrel strategically placed to catch runoff from your roof to a complex system that provides potable water throughout your home.

On average, it is possible to collect approximately 0.62 gallons of water per square foot of roof area, per inch of rainfall.

Considering factors such as evaporation, leaks, splash out, etc., about 75 to 85 percent efficiency can be expected from a typical system. That means, with an average yearly rainfall amount of 32 inches and 85 percent efficiency, a 2,000-square-foot roof could expect to collect around 33,728 gallons of rainwater per year (0.62 x 0.85 x 2,000 x 32 = 33,728 gallons per year).

For more information about rainwater harvesting and other water-saving ideas, please visit the Upper Trinity Groundwater Conservation District's website (www.uppertrinitygcd.com) where you will find helpful links, videos, articles and other tools to help conserve water. You can also call our office at 817-523-5200 and ask to speak to Kaitlin Adams, education and PR coordinator.

Facts for this article were found through the National Weather Service website (https://www.weather.gov/) and the Texas Manual on Rainwater Harvesting provided by the Texas Water Development Board (TWDB) that can be found on their website (http://www.twdb.texas.gov/)



latest news

We have MOVED!

In 2017, the District purchased 6 acres just west of Springtown, for the purpose of building a new office. Thus began the laborious process of developing the ideal facility, not only for a new location to conduct business, but somewhere to help the District achieve our Mission of preserving, conserving, and protecting groundwater. To that end, the District hopes to create a site to help promote groundwater education, pursue conservation awareness, provide groundwater protection and water well information. It has been a long road but we are moved in and fully operational! Stop by and let us show you around. We are open Monday-Friday 8am-5pm (closed 12-1pm).

events

February:

22nd- We MOVED! New office address:
1859 West Highway 199, Springtown, TX 76082

March:

12th-16th- Monitoring Wells #1 & #2 Installation
District Office, Springtown, TX

19th- Board Meeting
5pm, District Office, Springtown, TX

30th- Good Friday (Office Closed)

April:

16th- Board Meeting
5pm, District Office, Springtown, TX

May:

21st- Board Meeting
5pm, District Office, Springtown, TX

28th- Memorial Day

- Drilling Monitoring Wells on the UTGCD property to measure aquifer water levels and provide an educational display for the public.
- Utilize cuttings collected from these Monitoring Wells to develop visual aids to help the public better understand how groundwater is produced.
- Install a weather station, with help from the Texas Water Development Board, that the public will be agble to access, with data such as temperature, rainfall, wind speed, barometric pressure, soil moisture content, etc.
- Utilize native plant species, including grasses, for landscaping to showcase ways to have an attractive yard while conserving water.
- Rainwater Collection Systems for landscape irrigation.

Employee Spotlight - Kyle Russell & Kaitlin Adams

Please join us in welcoming the newest member to the UTGCD family: Kyle Russell and Kaitlin Adams!

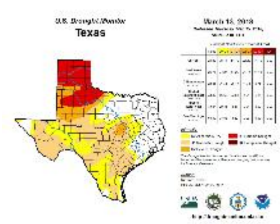
Kyle Russell- Registration Coordinator

Kyle grew up in Nocona, TX and graduated from Nocona High School in 2009. He graduated from Tarleton State University with a B.S. in Geoscience in 2012 and an MBA in 2015. While at Tarleton, he was an active member of the Tarleton Geological Society. As Registration Coordinator, Kyle will be working closely with our Field

June:
18th- Board Meeting
5pm, District Office, Springtown, TX

*Board Meetings are held at our District office at the NEW office at **1859 W Hwy 199, Springtown, TX**. They are open to the public and free to attend.*

drought **status**



District Staff

Doug Shaw,
General Manager

Ann Devenney,
Office Manager

Jennifer Hachtel,
Data Support

Laina Furlong,
Office Assistant

Kaitlin Adams,
Education & PR Coordinator

Kyle Russell,
Registration Coordinator

Garrett Love,
Field Technician

Jacob Dove,
Field Technician

Field Technician

Kaitlin Adams- Education and Public Relations Coordinator

Kaitlin is from San Diego, CA and spent the latter part of her childhood in Richmond, TX. She graduated from Tarleton State University with a B.S. in Geoscience. While at Tarleton, Kaitlin was the President of the Tarleton Geological Society and was part of the team that created the Science Tutoring Clinic. As Education and PR Coordinator, Kaitlin will attend various events, including both public community events and scheduled appearances at schools, utilizing the Districts Mobile Education Exhibit or Aquifer Trailer, to enhance public knowledge and awareness of groundwater resources within our District..

Monitoring Wells at UTGCD

Hopefully you have seen our maps showing where we have water level monitoring wells in each county. If not, keep scrolling!

What better way to learn about the water levels in the aquifer and track changes over time than to have our own Monitoring Wells at the UTGCD office? On March 13, 2018, the first well was drilled to 450ft below surface. Once the log was completed, it was determined a second well was necessary due to the presence of two distinct formations. Drilling for Monitoring Well #2 started on March 16! Throughout the drilling of both wells, Blaine and Jacob (two of our Field Technicians) collected cuttings

DON'T FORGET!

It's is important that well owner's get their well water tested at least once a year. The District offers free water testing for E. coli and coliform bacteria. We also have a list of NELAP certified laboratories available if you are interested in other types of testing. Call our office at 817-523-5200 for more information.

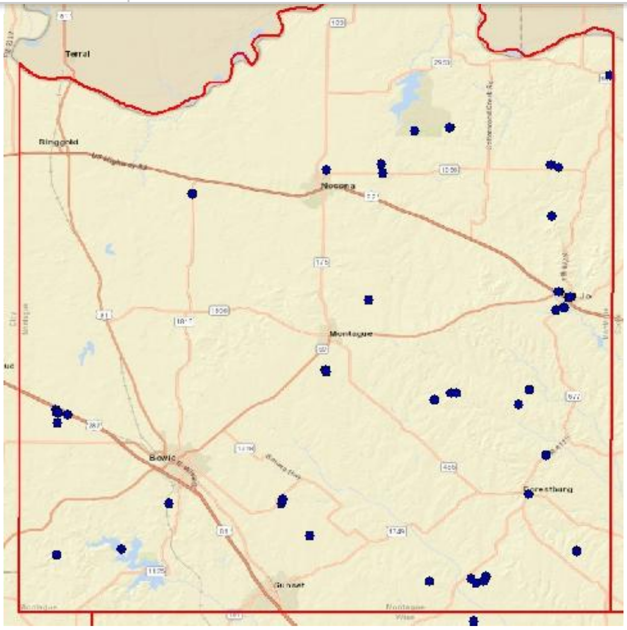
Protecting Your Rights

Is your well registered? What about your neighbors? Friends and family? Registering your well is the most effective way to protect your spacing rights. Any well that was drilled prior to January 1st, 2009 was not automatically registered with the District. Registering your well allows the District to ensure that no new wells are drilled too close to yours, which could potentially have a negative impact on your water. Registering your well is FREE. Don't wait! Call our office at 817-523-5200 to find out more or head over to our website to fill out our Existing Well Application.

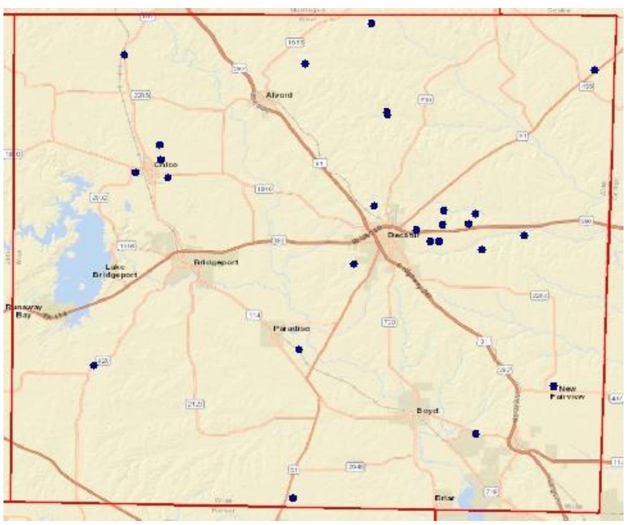
public.

Monitoring Well Program

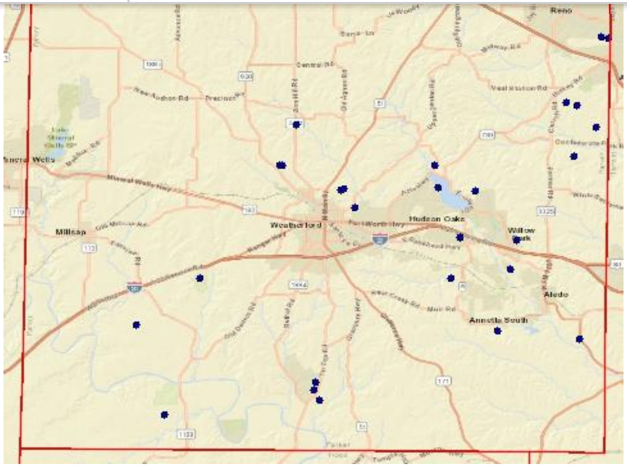
Are you a well owner interested in learning what the water level in your well is? Are you interested in seeing how that level changes over time? Consider joining our monitoring well program. Our Field Technicians come out quarterly to take measurements and help well owners understand more about the groundwater in their area. Check out the maps below or our maps page on our website to see where we currently have monitoring wells and fill out this form to apply. OR come by the office and let us show you our NEW monitoring wells!



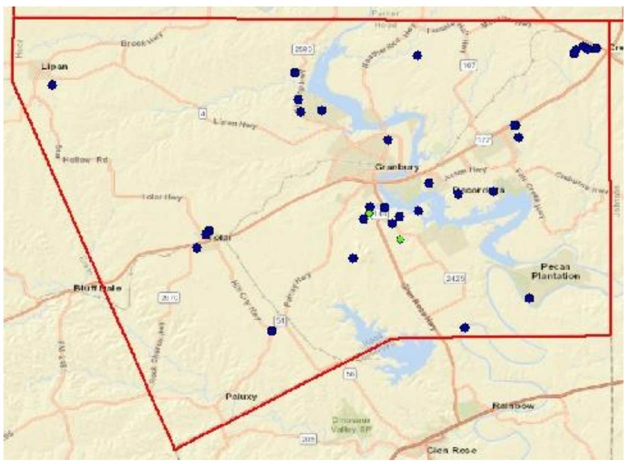
Monitoring Wells in Montague County
as of July 2017



Monitoring Wells in Wise County
as of July 2017



Monitoring Wells in Parker County
as of July 2017



Monitoring Wells in Hood County
as of July 2017

District Well Update

Below is a table that shows the number of wells drilled within the District from January 1st, 2017 to December 31, 2017.

February	5	37	29	8	
March	11	50	40	7	
April	6	47	29	7	
May	8	64	35	9	
June	6	61	47	9	
July	6	33	17	9	
August	6	52	27	7	
September	6	38	38	2	
October	9	55	23	9	
November	6	44	24	2	
December	10	91	49	22	
Total	**84**	**623**	**374**	**99**	**1,180**

We here at Upper Trinity GCD are doing our part to protect groundwater for the future and teaching others to do the same. If you have any questions about the events attended or are interested in learning more about the Aquifer Trailer, please contact Kaitlin Adams at kaitlin@uppertrinitygcd.com or submit a request online through our education page to schedule a visit.

Keep up to date by following us on social media!

UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT
HOOD · MONTAGUE · PARKER · WISE

WATERTALK

NEWS CONCERNING GROUNDWATER ISSUES IN MONTAGUE, WISE, PARKER, AND HOOD COUNTIES

latest **news**

Ribbon Cutting

On Monday May 21, 2018, the UTGCD, with the help of several Chambers of Commerce, held a ribbon cutting event and open house to give the public a chance to visit our new office facility. Thank you to everyone that was able to attend and make this such a successful event!

events

June:
18th- Board Meeting
5pm, District Office, Springtown, TX

July:
4th- Independence Day (Office Closed)
16th- Board Meeting
5pm, District Office, Springtown, TX
31st- Water Usage Reports & Fees due for the first 2018 Semi-Annual reporting period (Jan 1-June 30)

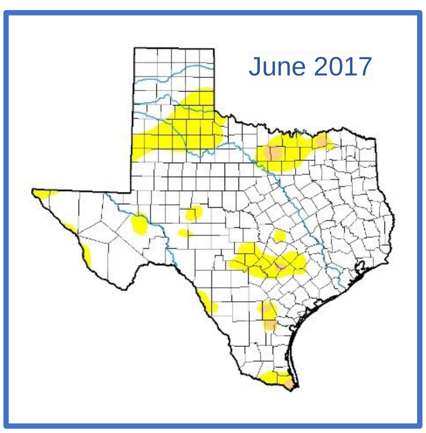
August:
20th- Board Meeting
5pm, District Office, Springtown, TX

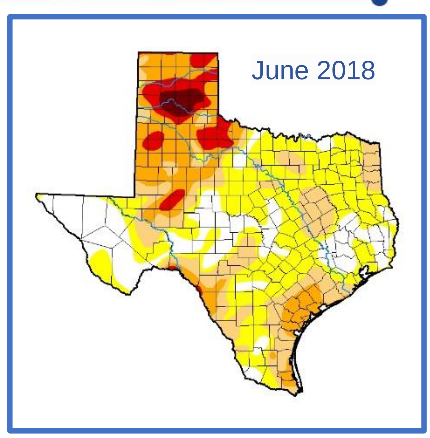
September:
3rd- Labor Day (Office Closed)
17th- Board Meeting
5pm, District Office, Springtown, TX

*Board Meetings are held at our District office at **1859 W Hwy 199, Springtown, TX at 5:00pm**. They are open to the public and free to attend.*

drought **status**

Check out our website for District news, agendas, helpful links and more! Our office hours are **Mon-Fri 8am-5pm, closed**





Upper Trinity GCD Summer Internship Program

Thanks to the success of last year's inaugural Internship Program, the District has decided to make this an annual program. The goal of the program is to provide an opportunity for undergraduate and graduate students majoring in geology, environmental science, or other related fields, to gain real world experience in the research, policy making, and management of groundwater in Texas.

This year, we are happy to announce that we have selected Leisha Mazanec (pictured left) and Sophia Dalebroux (pictured right), both undergraduates at Tarleton State University.

All of us here at Upper Trinity GCD are very excited about this opportunity and can't wait to see what the summer brings. Good luck interns!

Native Texas Grasses

In Texas, we experience long, hot, dry summers, which could mean high water usage. BUT, it is possible to have a beautiful lawn with less watering, less mowing, and less fertilizing. We feel that the best way to show that is by making our office an example! Thanks to help from the NRCS and DK Seeds, in April 2018 we planted seed composed entirely of Native Texas grasses at the new office.

On the front portion of the property, and in an attempt to cover the existing non-native Bermuda grass, we planted a Prairie seed mix developed and donated by NRCS including:

-Switchgrass	-Indiangrass	-Little/Big Bluestem
-Engelmann's Daisy	-Green Sprangletop	-Sideoats Grama
-Sand Dropseed	-Illinois Bundleflower	-Prairie Acacia

In the area immediately surrounding the office building, we planted Habiturf. Habiturf is a Native seed mix developed at the Lady Bird Johnson Wildflower Center and purchased from DK Seeds. This mix includes:

-Buffalograss -Blue Grama -Curly Mesquite

Habiturf has a relatively quick rate of establishment, good turf thickness, low mowing rate, high weed resistance, and is ideal for the hot Texas summers. Combined with a smaller water requirement than traditional non-native turf grasses, this could be a great way to save money in the summer and save water all year!

PROTECTING YOUR RIGHTS

FREE Existing Well Registration!

Any well that was drilled prior to January 1st, 2009 was NOT automatically registered with the District. Registering your well allows the District to ensure that no new wells are drilled too close to yours, which could potentially have a negative impact on your water.

Registering your existing well is **FREE.**
Don't wait! Call our office at **817-523-5200** to find out more or visit our website to fill out our Existing Well Application.

UTGCD Mobile Education Exhibit

The UTGCD is committed to enhancing public knowledge and awareness regarding the groundwater resources in the District. To that end, Education and PR Coordinator, Kaitlin Adams, has been attending various events, both community and school events, with the District's Mobile Education Exhibit or Aquifer Trailer. The Aquifer Trailer is designed to help the public visualize how an aquifer is formed, how it works, how a well is constructed and how it brings water to the surface, why groundwater conservation districts exist and how they were formed, as well as tips and tricks about water conservation and conservation practices regarding native plants and rainwater harvesting. We attend events to educate the public, to stay connected to the community, and to keep up to date on the current happenings in each county. Below are some of the events in which UTGCD staff have had the opportunity to teach children and adults about groundwater in North Texas:

*April

- -North Texas Cattleman’s Roundup- Bowie, TX
- -Kids on the Land w/ The Dixon Water Foundation- Decatur, TX
- -Springtown Intermediate School – Springtown, TX
- -Weatherford Blooms Festival – Weatherford, TX
- -Shirley Hall Middle School – Weatherford, TX
- -Springtown Elementary School – Springtown, TX
- -Tison Middle School – Weatherford, TX

*May

- -Texas Farm Bureau Wise County Ag Field Day- Decatur, TX
- -AgriLife- Leadership Montague – Montague, TX
- -Brazos River Authority Water Safety Day – Granbury, TX

*June

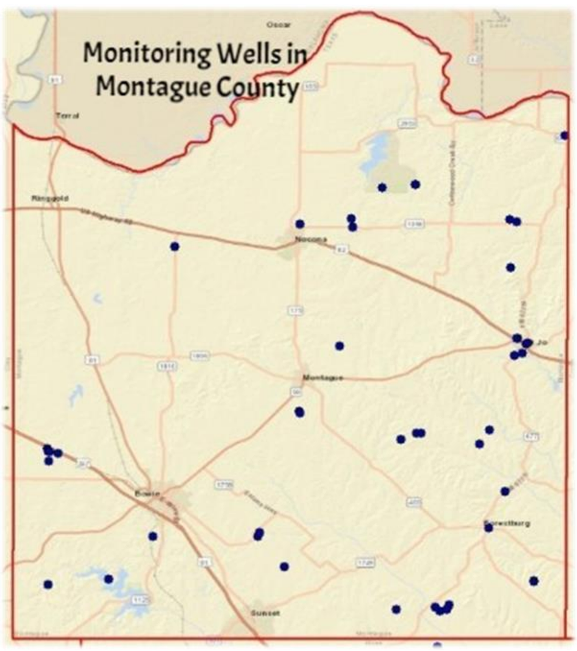
- -Botanical Research Institute of Texas – Fort Worth, TX

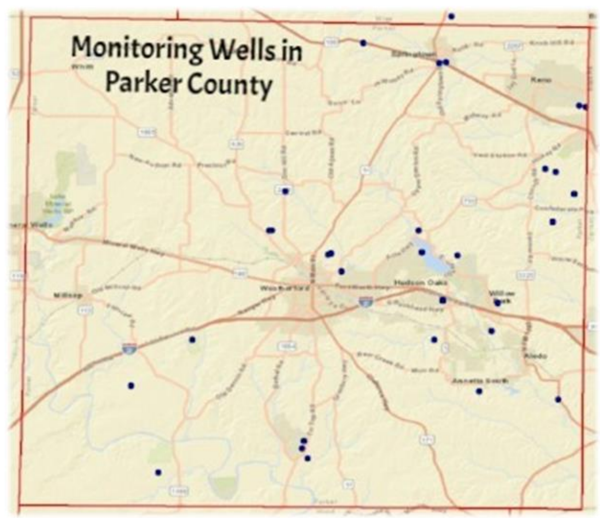
We here at Upper Trinity GCD are doing our part to protect groundwater for the future and want to teach others to do the same! If you have any questions about the events attended or would like to schedule the Trailer for an event, please contact Kaitlin Adams at **kaitlin@uppertrinitygcd.com** or call our office at **817-523-5200**.

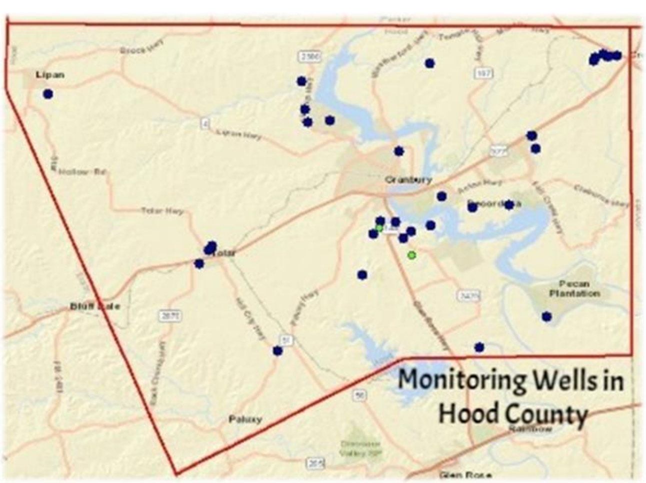
Monitoring Well Program

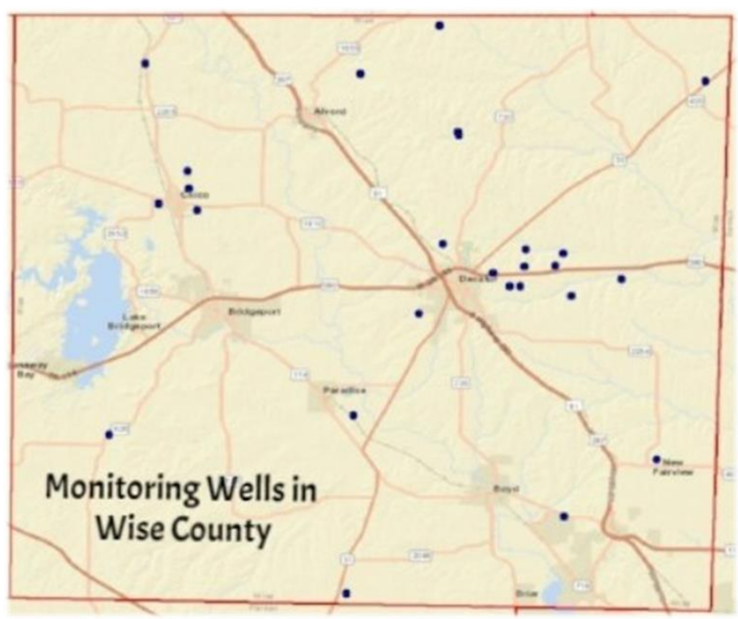
Are you a well owner interested in learning what the water level in your well is? Are you interested in seeing how the water level changes over time? Consider joining our monitoring well program. Our field technicians come out quarterly to take measurements and help well owners understand more about the groundwater in their area. Check out the maps below or the maps page on our website to see where we currently have monitoring well. To join this FREE program, you can fill out a Well Monitoring Agreement provided by our office, or fill one out online at www.uppertrinitygcd.com/forms OR come by the office and let us show you our NEW Monitoring Wells and answer any questions you may have!

1859 W Hwy 199 Springtown, TX 76082
817-523-5200









Groundwater Monitoring Program

F.1 Objective - Within 3 years of Groundwater Management Plan adoption develop a Groundwater Monitoring Program within the District.

F.1 Performance Standard - Upon development, attachment of the District Groundwater Monitoring Program to the District's Annual Report to be given to the District's Board of Directors.

F.2 Objective - Upon approval of the District Monitoring Program – conduct water level measurements at least annually on groundwater resources within the District.

F.2 Performance Standard - Annual evaluation of water-level trends and the adequacy of the monitoring network to monitor aquifer conditions within the District and comply with the aquifer resources desired future conditions. The evaluation will be included in the District's Annual Report to be given to the District's Board of Directors. The District may also take into consideration any measurements made by the TWDB groundwater measurement team.

F.3 Objective - Monitor non-exempt pumping within the District for use in evaluating District compliance with aquifer desired future conditions.

F.3 Performance Standard - Annual reporting of groundwater used by nonexempt wells will be included in the Annual Report provided to the District's Board of Directors.

F.1 & F.2:

A brief history of the monitoring program is presented here followed by a description of activities conducted in 2018.

In 2010, the District developed and instituted a Groundwater Monitoring Program in compliance with Objective and Performance Standard F.1. Phase I of the program secured 108 monitor wells within the District where water levels are measured quarterly using the Steel Tape Method, the Air Line Method, and/or the Electrical Line Method in compliance with Objective F.2. District staff was trained by personnel from the Texas Water Development Board on correct procedures for measurement of water levels. Participating well owners volunteered their wells to allow District staff to take water-level measurements. The District actively pursued additional monitoring wells to improve our ability to monitor groundwater conditions, comply with GMA-8 requirements, and meet the mission of the District as a whole. All activities regarding the District Groundwater Monitoring Program were presented for review and consent to the District Board.

A review of the Phase I Monitor Well System of wells indicated that gaps existed in the monitoring well network both spatially and vertically within the Trinity Aquifer and the Paleozoic aquifers (Cross Timbers). In response, the District contracted with INTERA Inc. to augment the monitor well network in a Phase II process. In 2011, the consultant completed a draft report that documented the hydrogeologic framework for the aquifers within the District with emphasis on the Paleozoic aquifers and also developed the strategy for assessing the Phase I monitoring well network and selecting the Phase II wells to meet the performance objectives and mission of the District. The monitoring strategy was focused to develop the data required to evaluate aquifer conditions within the boundaries of the District relative to the Trinity Aquifer DFCs and for potential future Cross Timbers aquifers DFC. This report is included as Appendix 2.

Based upon the data analysis presented in the Phase II report, 65 wells of the original 108 Phase I wells were suggested for retention in the network. An additional 120 optimally located wells were targeted for inclusion in the monitoring network. During 2013, District Staff and INTERA focused on securing agreements with owners of the identified wells. However, the process of acquiring new wells at optimal locations proved more difficult than anticipated and, as a result, progress was slower than originally expected. As of the end of December 2013, 24 new wells had been added to the monitoring network as part of the Phase II efforts.

In 2015, District staff conducted an internal assessment of the program which resulted in several wells being removed from the program due to new owners electing not to participate in the monitoring program, changes in well configuration resulting in an inability to access the well, and well collapse. Many of the wells removed from the program had not been actively monitored for several years, yet had been included in the trend analysis presented to the Board in previous annual reports. Figure A below shows all wells in which the District, at some point, has collected water level data.

In the spring of 2015, the District purchased and installed the first 14 pressure transducers, which have been recording daily water level readings since that time. A few of these transducers have been strategically relocated, and two had to be removed for a short period of time due to malfunctioning equipment, both cases have been resolved by sending the device back to the manufacturer for repair.

In the last few years, the District has installed pressure transducers in a few other wells with and two wells with well sounders. In 2018, the District also drilled two monitoring wells which are located at the District office site. Those wells are equipped with pressure transducers which take water level readings every 15 minutes and are connected to the TWDB's TexMesoNet, data from those wells can be found at https://texmesonet.org. Locations and associated aquifers for all wells equipped with transducers can be seen in Figure B. District staff visits these locations to download data on a quarterly basis. Moving forward, it is likely in the best interest of the District to continue to identify the best candidate wells for transducers to bolster the monitoring program.

In the spring of 2018, the District had INTERA begin the development of a web based water level trend analysis/DFC tracking tool to be used to streamline the process of analyzing the District's water level data and to help minimize human error in that process. This tool was used to analyze the water level data collected from the wells in the District monitoring well program in order to provide insight into long-term water-level changes in the District.

Table 1 summarizes the average water-level changes obtained from the trend analysis, by county and aquifer (outcrop and subcrop). Appendix 1, attached to this report, includes a summary report for each aquifer/county/outcrop-subcrop split with greater detail, including the Well ID and the number of wells used in the analysis. The results in Table 1 represent water level changes over a defined time period for each of the defined aquifer units (outcrop and subcrop) in each of the 4 counties.

Table 1. Average Trend of Water-Level Changes since 2010 and Number of Wells for used for Analysis

		Outcrop					Subcrop				
	County	Antlers	Paluxy	Glen Rose	Twin Mountains	Cross Timbers	Antlers	Paluxy	Glen Rose	Twin Mountains	Cross Timbers
Desired Future Conditions	**Montague**	-18	-	-	-	-	-	-	-	-	-
	Wise	-34	-	-	-	-	-142	-	-	-	-
	Parker	-11	-5	-10	-1	-	-	-1	-28	-46	-
	Hood	-	-5	-7	-4	-	-	-	-28	-46	-
1-Year Water Level Change	**Montague**	0.7	-	-	-	0.8	0.4	-	-	-	4.8
	Wise	-1.9	-	-	-	-	0.6	-	-	-	-
	Parker	0.2	0.4	2.6	11.2	2.1	3.1	-	-1.0	-1.7	-
	Hood	-	-3.1	-16.2	-1.4	-	-	-	-2.7	3.0	-
5-Year Water Level Change	**Montague**	8.9	-	-	-	13.2	17.6	-	-	-	6.6
	Wise	5.8	-	-	-	-	10.3	-	-	-	-
	Parker	8.0	-3.1	6.5	3.8	5.9	4.3	-	-1.9	-5.4	-
	Hood	-	7.5	-15.2	3.4	-	-	-	-1.1	6.4	-
Cumulative Water Level Change (2010 to Present)	**Montague**	2.3	-	-	-	42.7	5.7	-	-	-	-9.2
	Wise	-2.5	-	-	-	-	10.8	-	-	-	-
	Parker	-6.1	-6.8	7.4	-2.7	2.5	5.4	-	-4.0	0.5	-
	Hood	-	4.9	-3.3	-0.2	-	-	-	5.4	5.9	-
DFCs vs Cumulative Change	**Montague**	20.3	-	-	-	-	-	-	-	-	-
	Wise	31.5	-	-	-	-	152.8	-	-	-	-
	Parker	4.9	-1.8	17.4	-1.7	-	-	-	24.0	46.5	-
	Hood	-	9.9	3.7	3.8	-	-	-	33.4	51.9	-

Note: All Values are in feet of water level change. Positive values indicate a water level rise. Negative values indicate a water level decline.

So in the table above

- Desired Future Condition is the current adopted DFC for each of the defined formations. Remember the DFC requires no more than a certain level of water level decline (values in the table), from 2010 water levels, by 2070.
- 1-year water level change represents the change in water levels from the 2017 “aquifer year” to the 2018 “aquifer year”.
- 5-year water level change represents the change in water levels from the 2013 “aquifer year” to the 2018 “aquifer year”
- Cumulative water level change (2010 to present) represents the change in water levels from the 2010 “aquifer year” to the 2018 “aquifer year”.
- DFC vs. Cumulative change is simply a comparison of the cumulative water level change to the DFC

One of the key reasons the District monitors water levels is to track compliance with adopted desired future conditions (DFCs). The current DFCs are shown in Table 1 and describe water-level changes between 2010 and 2070. Since water level changes before water year 2010 do not apply to DFC compliance, they are removed from the analysis.

During collection of water levels, District staff note if the water level measurement was taken while the well is pumping, or has recently been pumping. Water levels taken during pumping can be valuable for characterizing aquifer properties but are not appropriate for evaluating water level trends. These measurements are removed from this analysis, but they are maintained in the District's water level database.

Water levels in wells commonly fluctuate throughout a year, which can be due to changes in demands on the aquifer, changes in rainfall, or a combination of these and other factors. Typically, water levels are lower during summer months when demands are highest. The levels then recover between late fall and early spring when demands are lower. In order to ensure that water level measurements can be reasonably compared to each other, the data used in the analysis is limited to measurements taken between October and April. Each measurement is then assigned to a "water year" (WY). For example, water level measurements between October 2010 and April 2011 are assigned as WY 2010.

Although all wells in the District's monitoring program are measured multiple times per year or continuously monitored with a transducer or other device, this analysis uses the shallowest measurement in each well in each water year (as defined above) to develop water level trends. This ensures that water levels compared across years are as comparable as possible.

The result of this process is a set of single water level measurements for each water year in each well. Where water level measurements are available for two consecutive water years, the water level change is calculated. For example, a calculated water level change for WY 2011 requires a water level measurement for the well in both WY 2010 and WY 2011.

District staff maintains aquifer assignments for each well in the monitoring program as well as whether the well represents outcrop/unconfined conditions or subcrop/confined conditions. Using these assignments, the average water level change associated with each DFC is calculated. Based on the current DFCs, the water level trends are divided by county, aquifer and outcrop/subcrop designation. One feature of this approach is that a different set of wells may be used to characterize water level changes for each year depending on availability of water level measurements. This allows for the District to make use of data from new wells added to the monitoring program or historical data for wells no longer monitored. It is worth noting that the "Antlers – Subcrop" as shown in Table 1, represents the deeper portion of the Antlers. For example, the two wells at the District office, the shallower well is considered "Antlers – Outcrop", and the deeper well "Antlers – Subcrop", even though the Antlers is not actually covered by another geologic formation.

Currently, District staff continue to review all well registration applications to evaluate the potential for addition of that well to the monitoring well program. The District is incrementally expanding and improving the monitoring network to more effectively characterize groundwater conditions throughout the District. The District has also been actively working with landowners and developers in the District to acquire sites to drill monitoring well.

F.3:

In 2015, the District staff reviewed the best available information to develop estimated exempt groundwater use volumes by county. These estimates were presented to the District's Board of Directors in the 2015 Annual Report and were also provided to the Texas Water Development Board (TWDB). The TWDB then took those estimates and developed projections for exempt groundwater use for the years 2020, 2030, 2040, 2050, 2060 & 2070. In developing this data for the TWDB, District staff was asked to estimate exempt use for both the Trinity Aquifer group and the Paleozoic formations; only estimates for the Trinity Group were reported in the 2015 Annual Report.

For the 2018 exempt use estimates, staff took the TWDB estimate for 2015 and projection for 2020, and used a linear function to calculate estimated 2018 groundwater use by county. Also, it is noteworthy to mention that staff has included estimated exempt use from the Paleozoic formations in this report, as mentioned earlier only estimates from the Trinity Group were used in the 2015 report.

Non-exempt use was also estimated at the same time, this is largely based on metered volumes reported to the District by non-exempt well owners. Table 6 provides a best estimate of exempt and non-exempt groundwater use for the District in 2018 utilizing data from the following sources:

- The Region B, C, and G 2011and 2016 Regional Water Plans;
- The report developed under contract to the TWDB titled "Total Projected Water Use in the Texas Mining and Oil and Gas Industry;
- Exempt pumping estimates from the TWDB
- Water Use Survey data from the TWDB
- Metered data reported to the District.

Table 2. Estimated Exempt and Non-exempt Groundwater Use for the District by County

Category	Groundwater Use (AFY)[1]				
	Hood	Montague	Parker	Wise	Total
Exempt Use	5,982	1,526	5,915	5,136	**18,559**
Non-Exempt Use	5131	403	3,621	3,082	**12,237**
Total	**11,113**	**1,929**	**9,536**	**8,217**	**30,796**

[1] AFY = acre-feet per year

Figure A. All wells in the District with Water Level Data

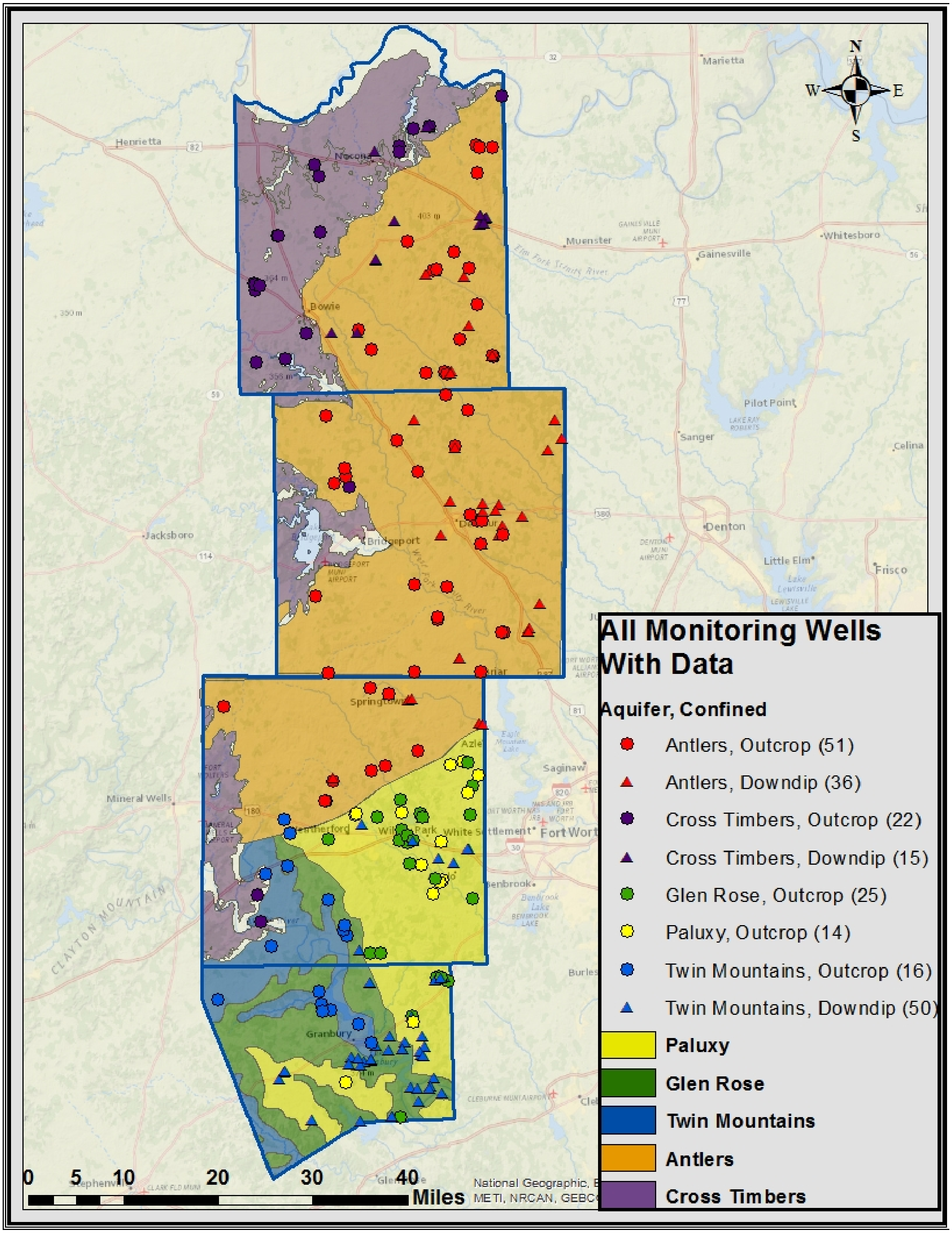
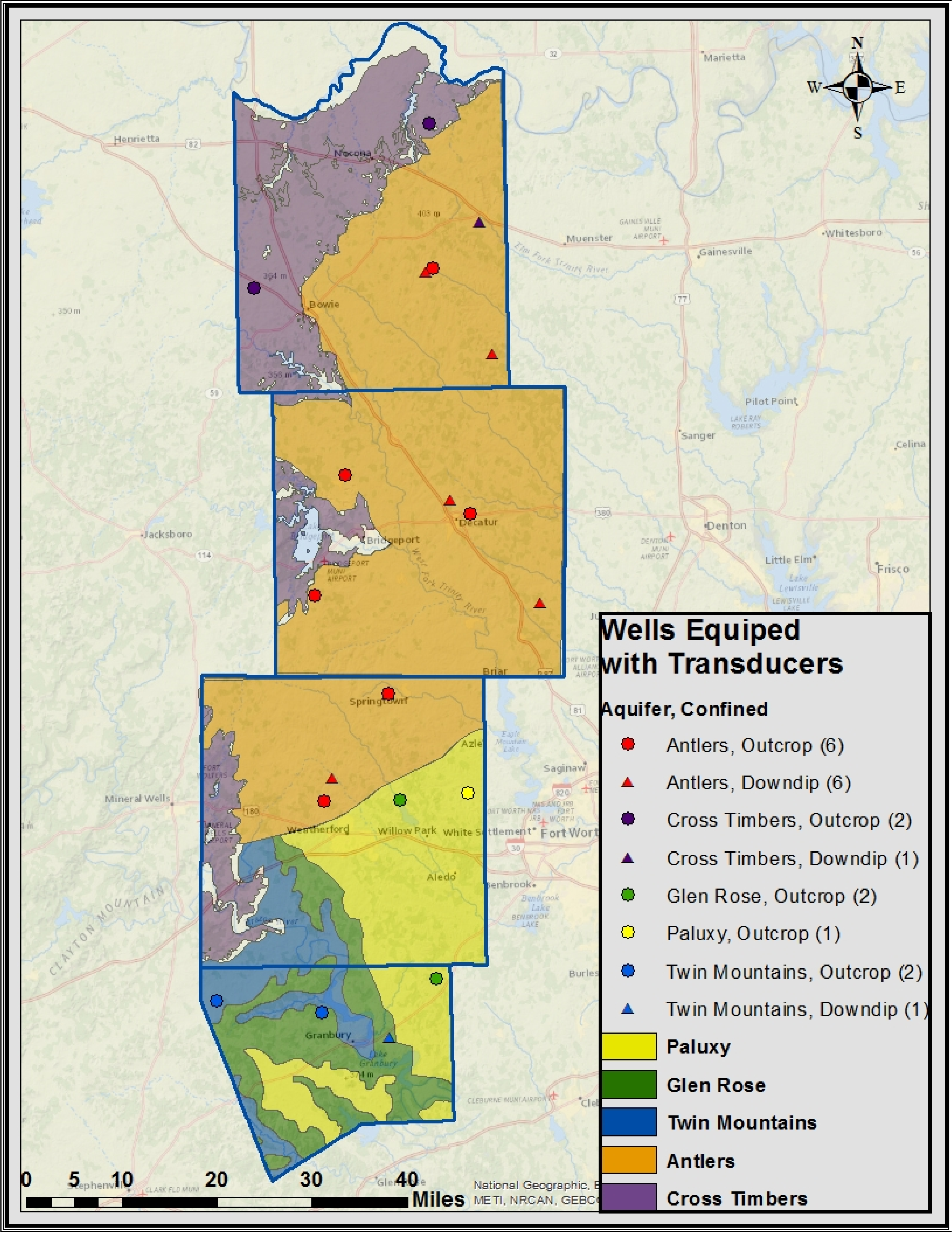


Figure B. Wells in the District's Monitoring Well Network Equipped with Transducers



APPENDIX 1

Summary of Desired Future Conditions and Water Level Trends

Upper Trinity Groundwater Conservation District

		Outcrop					Subcrop				
	County	Antlers	Paluxy	Glen Rose	Twin Mountains	Cross Timbers	Antlers	Paluxy	Glen Rose	Twin Mountains	Cross Timbers
Desired Future Conditions	**Montague**	-18	-	-	-	-	-	-	-	-	-
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	Hood	-	-5	-7	-4	-	-	-	-28	-46	-
1-Year Water Level Change	**Montague**	0.7	-	-	-	0.8	0.4	-	-	-	4.8
	Wise	-1.9	-	-	-	-	0.6	-	-	-	-
	Parker	0.2	0.4	2.6	11.2	2.1	3.1	-	-1.0	-1.7	-
	Hood	-	-3.1	-16.2	-1.4	-	-	-	-2.7	3.0	-
5-Year Water Level Change	**Montague**	8.9	-	-	-	13.2	17.6	-	-	-	6.6
	Wise	5.8	-	-	-	-	10.3	-	-	-	-
	Parker	8.0	-3.1	6.5	3.8	5.9	4.3	-	-1.9	-5.4	-
	Hood	-	7.5	-15.2	3.4	-	-	-	-1.1	6.4	-
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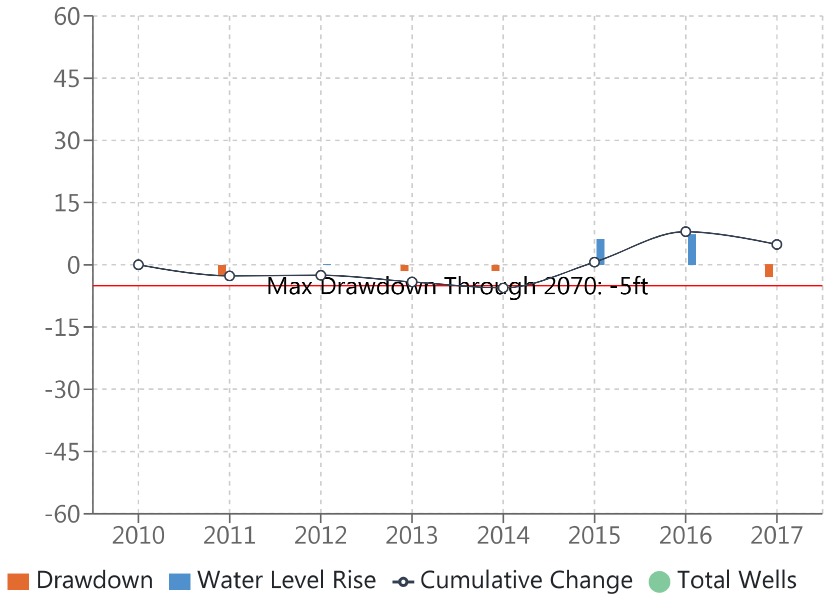
	Wise	-2.5	-	-	-	-	10.8	-	-	-	-
	Parker	-6.1	-6.8	7.4	-2.7	2.5	5.4	-	-4.0	0.5	-
	Hood	-	4.9	-3.3	-0.2	-	-	-	5.4	5.9	-
DFCs vs Cumulative Change	**Montague**	20.3	-	-	-	-	-	-	-	-	-
	Wise	31.5	-	-	-	-	152.8	-	-	-	-
	Parker	4.9	-1.8	17.4	-1.7	-	-	-	24.0	46.5	-
	Hood	-	9.9	3.7	3.8	-	-	-	33.4	51.9	-

Note: All Values are in feet of water level change. Positive values indicate a water level rise. Negative values indicate a water level decline.

Summary of Desired Future Conditions and Water Level Trends
Upper Trinity Groundwater Conservation District
September 10, 2019

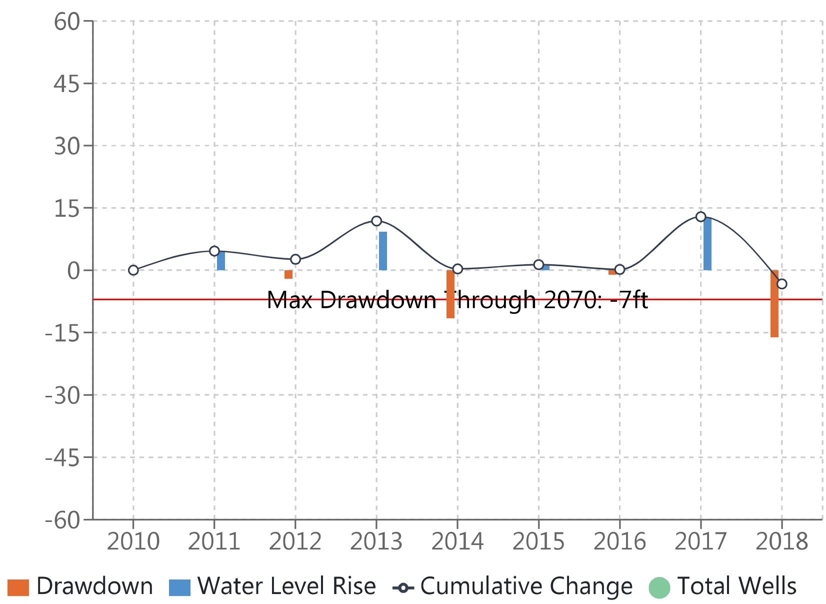
Hood County-Paluxy-Outcrop



	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions	-5	Not Applicable	Not Applicable
1-Year Water Level Change	-3.1	1	8870
5-Year Water Level Change	7.5	1	8870
Cumulative Water Level Change (2010 to Present)	4.9	1	8870
DFCs vs Cumulative Change	9.9	Not Applicable	Not Applicable

Note: All Values are in feet of water level change. Positive values indicate a water level rise. Negative values indicate a water level decline.

Hood County-Glen Rose-Outcrop

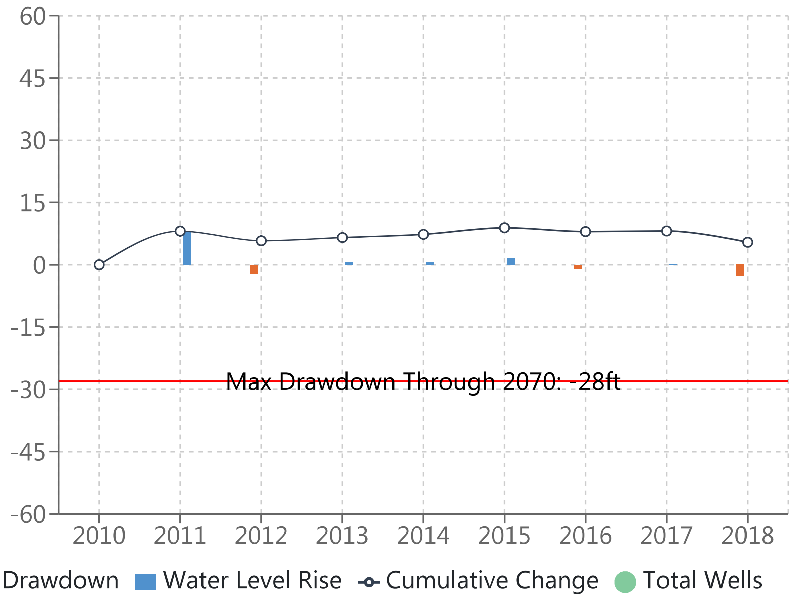


	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions	-7	Not Applicable	Not Applicable
1-Year Water Level Change	-16.2	2	10, 3
5-Year Water Level Change	-15.2	2	10, 3
Cumulative Water Level Change (2010 to Present)	-3.3	2	10, 3
DFCs vs Cumulative Change	3.7	Not Applicable	Not Applicable

Note: All Values are in feet of water level change. Positive values indicate a water level rise. Negative values indicate a water level decline.

Summary of Desired Future Conditions and Water Level Trends
Upper Trinity Groundwater Conservation District
September 10, 2019

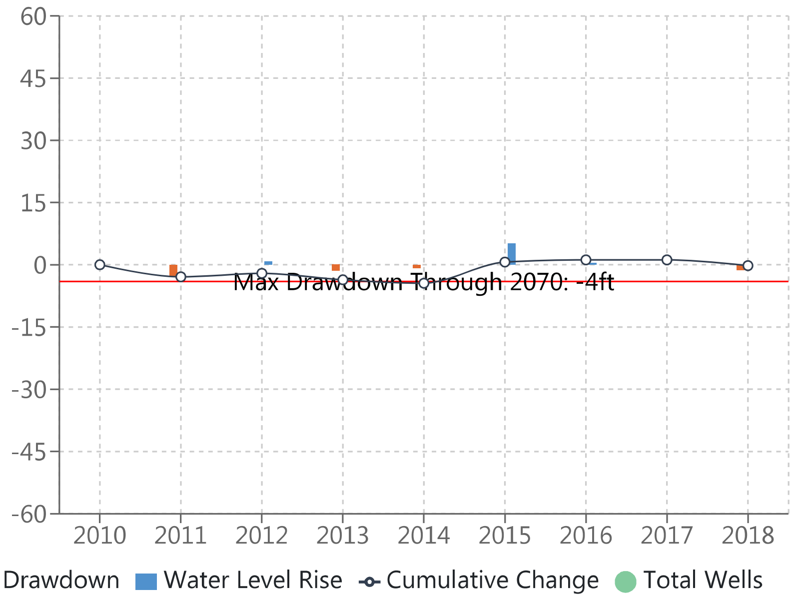
Hood County-Glen Rose-Subcrop



	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions	-28	Not Applicable	Not Applicable
1-Year Water Level Change	-2.7	3	312, 311, 310
5-Year Water Level Change	-1.1	3	312, 311, 310
Cumulative Water Level Change (2010 to Present)	5.4	3	312, 311, 310
DFCs vs Cumulative Change	33.4	Not Applicable	Not Applicable

Note: All Values are in feet of water level change. Positive values indicate a water level rise. Negative values indicate a water level decline.

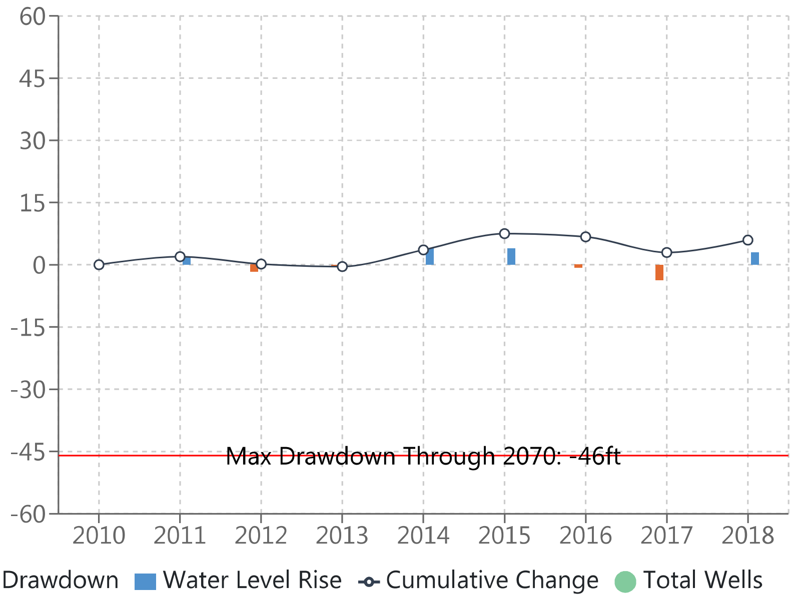
Hood County-Twin Mountains-Outcrop



	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions	-4	Not Applicable	Not Applicable
1-Year Water Level Change	-1.4	6	1009, 8869, 990, 2181, 8867, 8868
5-Year Water Level Change	3.4	7	8869, 990, 981, 8867, 8868, 2181, 1009
Cumulative Water Level Change (2010 to Present)	-0.2	7	1009, 8869, 990, 981, 8867, 8868, 2181
DFCs vs Cumulative Change	3.8	Not Applicable	Not Applicable

Note: All Values are in feet of water level change. Positive values indicate a water level rise. Negative values indicate a water level decline.

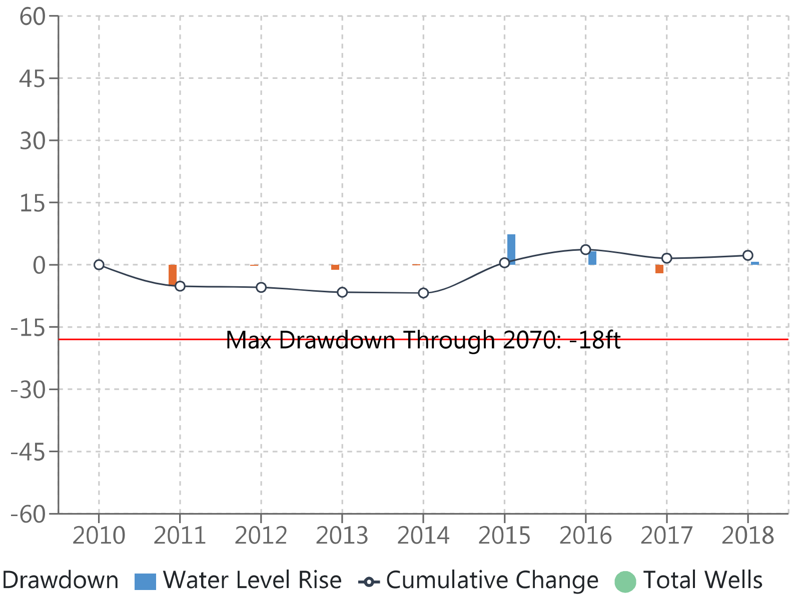
Hood County-Twin Mountains-Subcrop



	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions	-46	Not Applicable	Not Applicable
1-Year Water Level Change	3.0	14	984, 1002, 992, 7100, 4, 11, 8865, 2341, 8891, 17, 243, 239, 325, 322
5-Year Water Level Change	6.4	23	1001, 999, 1002, 4, 11, 992, 17, 240, 243, 239, 8871, 325, 324, 322, 327, 581, 984, 2341, 1006, 8865, 993, 8891, 7100
Cumulative Water Level Change (2010 to Present)	5.9	24	1003, 1002, 992, 993, 4, 11, 8865, 17, 240, 243, 239, 8871, 325, 324, 327, 322, 1001, 999, 581, 984, 2341, 1006, 8891, 7100
DFCs vs Cumulative Change	51.9	Not Applicable	Not Applicable

Note: All Values are in feet of water level change. Positive values indicate a water level rise. Negative values indicate a water level decline.

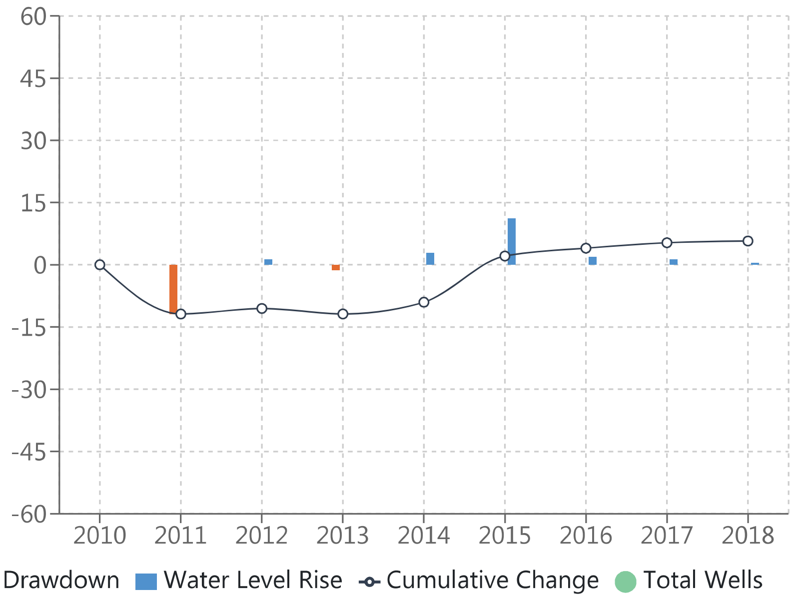
Montague County-Antlers-Outcrop



	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions	-18	Not Applicable	Not Applicable
1-Year Water Level Change	0.7	9	2097, 200, 2897, 2813, 1495, 1501, 8882, 9505, 8890
5-Year Water Level Change	8.9	12	2097, 200, 3973, 1495, 1501, 8882, 2897, 2813, 8890, 4107, 4402, 9505
Cumulative Water Level Change (2010 to Present)	2.3	12	2097, 200, 3973, 1495, 1501, 8882, 2897, 2813, 8890, 4107, 4402, 9505
DFCs vs Cumulative Change	20.3	Not Applicable	Not Applicable

Note: All Values are in feet of water level change. Positive values indicate a water level rise. Negative values indicate a water level decline.

Montague County-Antlers-Subcrop

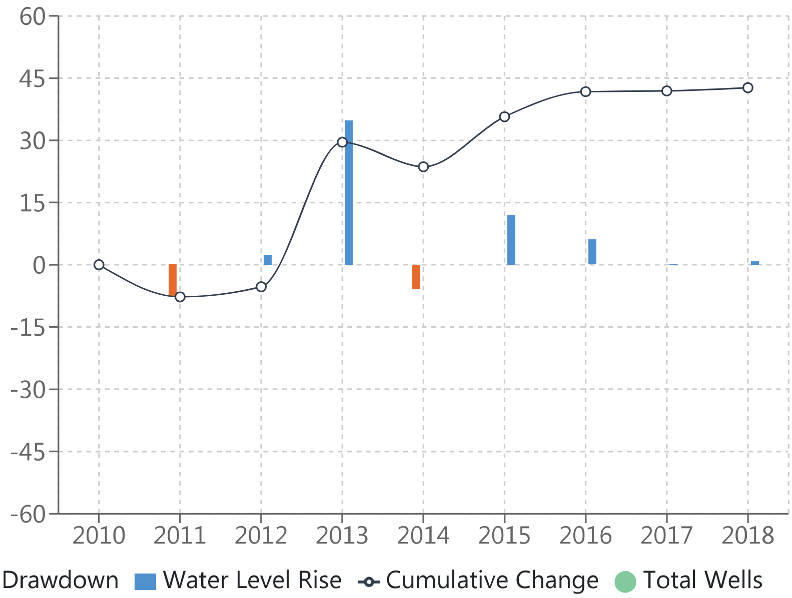


	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions		Not Applicable	Not Applicable
1-Year Water Level Change	0.4	10	196, 2899, 4062, 2898, 2096, 1410, 304, 1500, 1497, 632
5-Year Water Level Change	17.6	10	196, 2096, 1500, 1497, 632, 4062, 2898, 1410, 304, 2899
Cumulative Water Level Change (2010 to Present)	5.7	10	196, 2096, 304, 1500, 1497, 632, 4062, 2898, 1410, 2899
DFCs vs Cumulative Change	Not Avaliable	Not Applicable	Not Applicable

Note: All Values are in feet of water level change. Positive values indicate a water level rise. Negative values indicate a water level decline.

Summary of Desired Future Conditions and Water Level Trends
Upper Trinity Groundwater Conservation District
September 10, 2019

Montague County-Cross Timbers-Outcrop

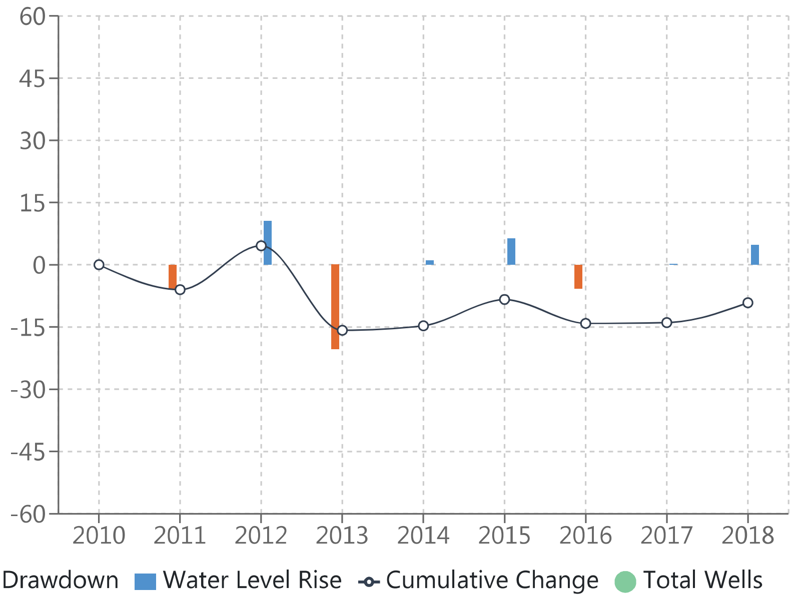


	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions		Not Applicable	Not Applicable
1-Year Water Level Change	0.8	15	5199, 6433, 6604, 2608, 6605, 8866, 2196, 6208, 1015, 1016, 1295, 593, 1298, 592, 8881
5-Year Water Level Change	13.2	16	1295, 1298, 8881, 592, 5199, 6433, 6604, 6605, 8866, 2608, 2196, 593, 9366, 6208, 1015, 1016
Cumulative Water Level Change (2010 to Present)	42.7	16	8866, 2608, 1295, 1298, 8881, 592, 5199, 6433, 6604, 6605, 2196, 593, 9366, 6208, 1015, 1016
DFCs vs Cumulative Change	Not Avaliable	Not Applicable	Not Applicable

Note: All Values are in feet of water level change. Positive values indicate a water level rise. Negative values indicate a water level decline.

Summary of Desired Future Conditions and Water Level Trends
Upper Trinity Groundwater Conservation District
September 10, 2019

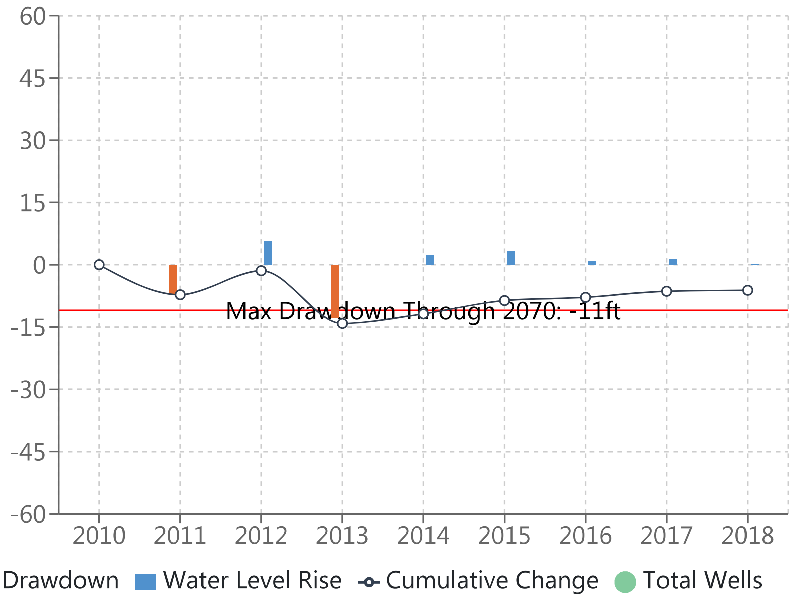
Montague County-Cross Timbers-Subcrop



	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions		Not Applicable	Not Applicable
1-Year Water Level Change	4.8	11	4202, 4401, 637, 638, 635, 636, 633, 666, 3970, 1296, 2728
5-Year Water Level Change	6.6	15	637, 634, 638, 636, 633, 1297, 2413, 1296, 4202, 635, 2427, 3970, 666, 2728, 4401
Cumulative Water Level Change (2010 to Present)	-9.2	15	637, 634, 638, 635, 1297, 2413, 1296, 636, 633, 4202, 2427, 3970, 666, 2728, 4401
DFCs vs Cumulative Change	Not Avaliable	Not Applicable	Not Applicable

Note: All Values are in feet of water level change. Positive values indicate a water level rise. Negative values indicate a water level decline.

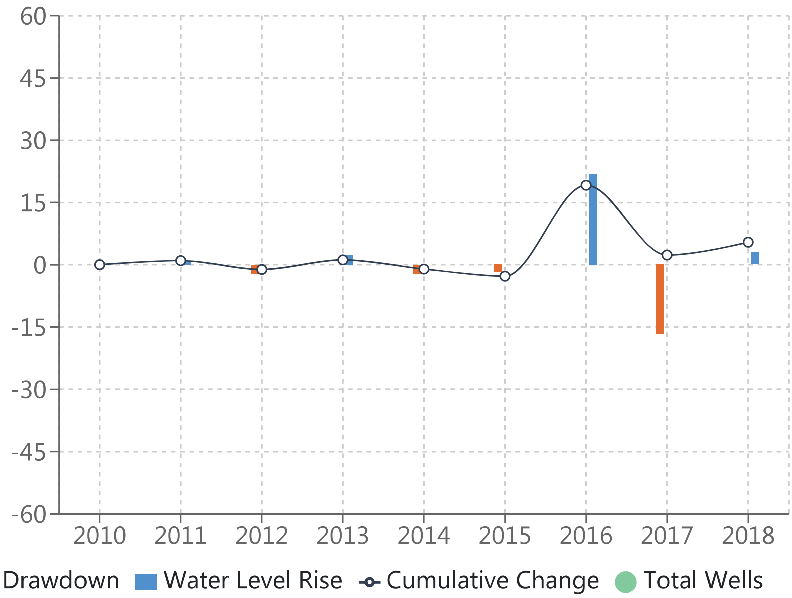
Parker County-Antlers-Outcrop



	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions	-11	Not Applicable	Not Applicable
1-Year Water Level Change	0.2	4	10885, 975, 565, 8872
5-Year Water Level Change	8.0	5	996, 975, 8872, 10885, 565
Cumulative Water Level Change (2010 to Present)	-6.1	5	996, 975, 8872, 10885, 565
DFCs vs Cumulative Change	4.9	Not Applicable	Not Applicable

Note: All Values are in feet of water level change. Positive values indicate a water level rise. Negative values indicate a water level decline.

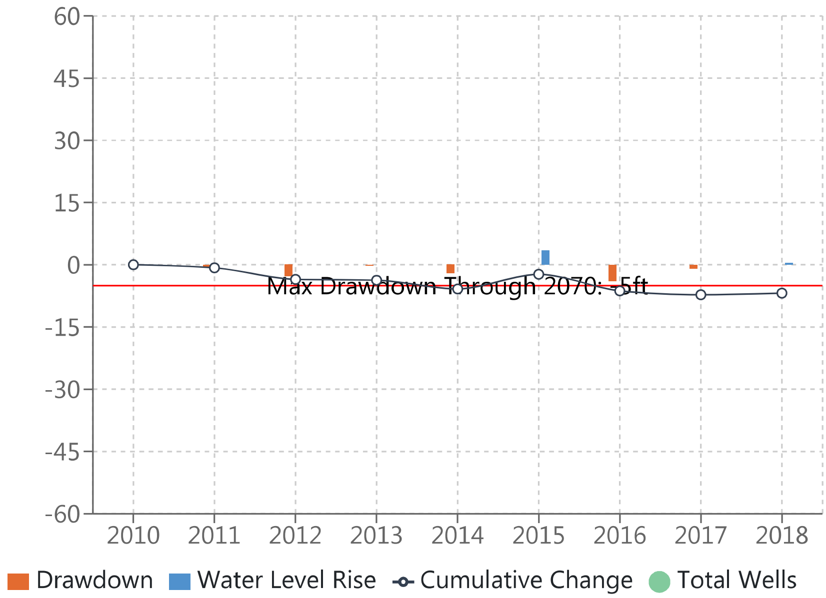
Parker County-Antlers-Subcrop



	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions		Not Applicable	Not Applicable
1-Year Water Level Change	3.1	5	1809, 10884, 8864, 2200, 630
5-Year Water Level Change	4.3	6	8864, 985, 1809, 630, 2200, 10884
Cumulative Water Level Change (2010 to Present)	5.4	6	8864, 985, 1809, 630, 2200, 10884
DFCs vs Cumulative Change	Not Avaliable	Not Applicable	Not Applicable

Note: All Values are in feet of water level change. Positive values indicate a water level rise. Negative values indicate a water level decline.

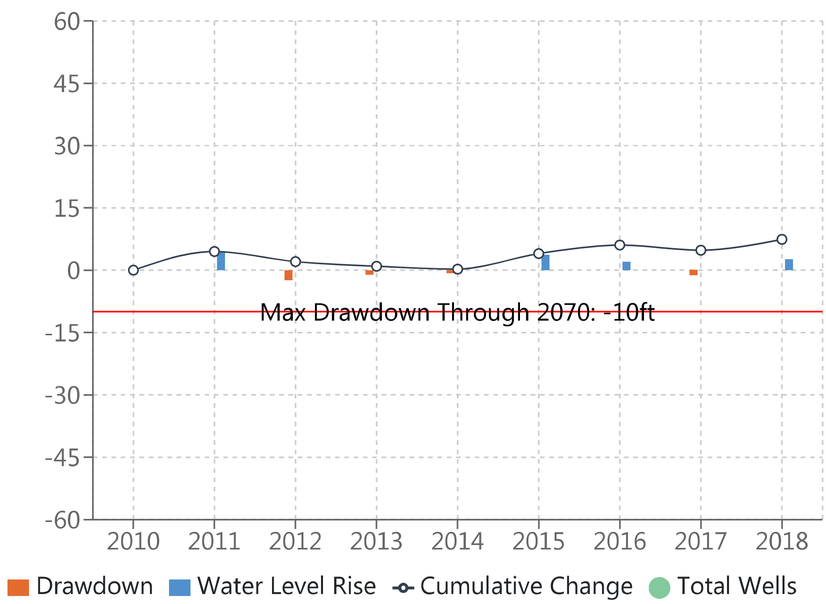
Parker County-Paluxy-Outcrop



	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions	-5	Not Applicable	Not Applicable
1-Year Water Level Change	0.4	10	4365, 995, 8718, 2596, 6178, 8568, 6638, 5212, 1653, 4993
5-Year Water Level Change	-3.1	10	995, 4365, 6638, 5212, 1653, 6178, 4993, 8718, 2596, 8568
Cumulative Water Level Change (2010 to Present)	-6.8	10	995, 4365, 6638, 5212, 1653, 6178, 4993, 8718, 2596, 8568
DFCs vs Cumulative Change	-1.8	Not Applicable	Not Applicable

Note: All Values are in feet of water level change. Positive values indicate a water level rise. Negative values indicate a water level decline.

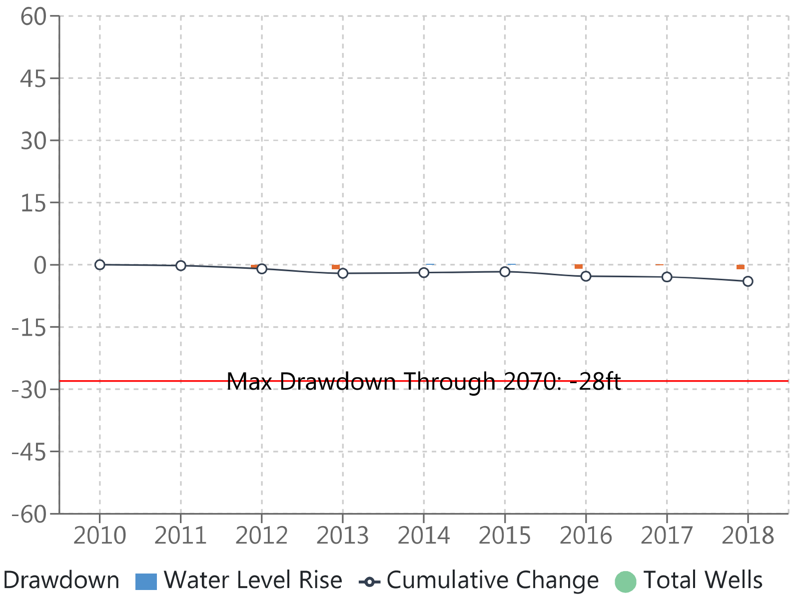
Parker County-Glen Rose-Outcrop



	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions	-10	Not Applicable	Not Applicable
1-Year Water Level Change	2.6	6	8874, 8873, 8875, 8889, 1660, 8878
5-Year Water Level Change	6.5	8	8874, 8873, 6338, 8875, 905, 8889, 8878, 1660
Cumulative Water Level Change (2010 to Present)	7.4	8	8874, 8873, 8875, 905, 8889, 8878, 6338, 1660
DFCs vs Cumulative Change	17.4	Not Applicable	Not Applicable

Note: All Values are in feet of water level change. Positive values indicate a water level rise. Negative values indicate a water level decline.

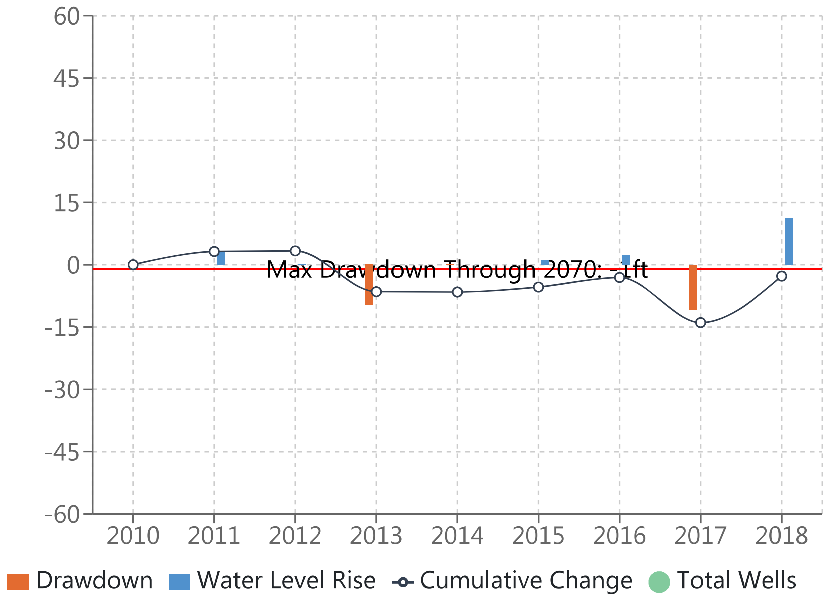
Parker County-Glen Rose-Subcrop



	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions	-28	Not Applicable	Not Applicable
1-Year Water Level Change	-1.0	1	8876
5-Year Water Level Change	-1.9	1	8876
Cumulative Water Level Change (2010 to Present)	-4.0	1	8876
DFCs vs Cumulative Change	24.0	Not Applicable	Not Applicable

Note: All Values are in feet of water level change. Positive values indicate a water level rise. Negative values indicate a water level decline.

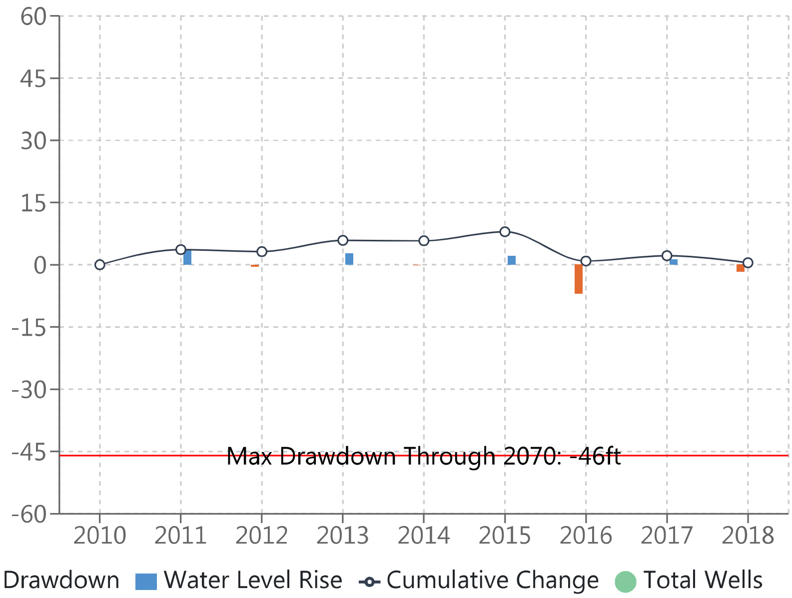
Parker County-Twin Mountains-Outcrop



	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions	-1	Not Applicable	Not Applicable
1-Year Water Level Change	11.2	3	1774, 8880, 2484
5-Year Water Level Change	3.8	5	1774, 979, 978, 8880, 2484
Cumulative Water Level Change (2010 to Present)	-2.7	5	1774, 979, 978, 8880, 2484
DFCs vs Cumulative Change	-1.7	Not Applicable	Not Applicable

Note: All Values are in feet of water level change. Positive values indicate a water level rise. Negative values indicate a water level decline.

Parker County-Twin Mountains-Subcrop

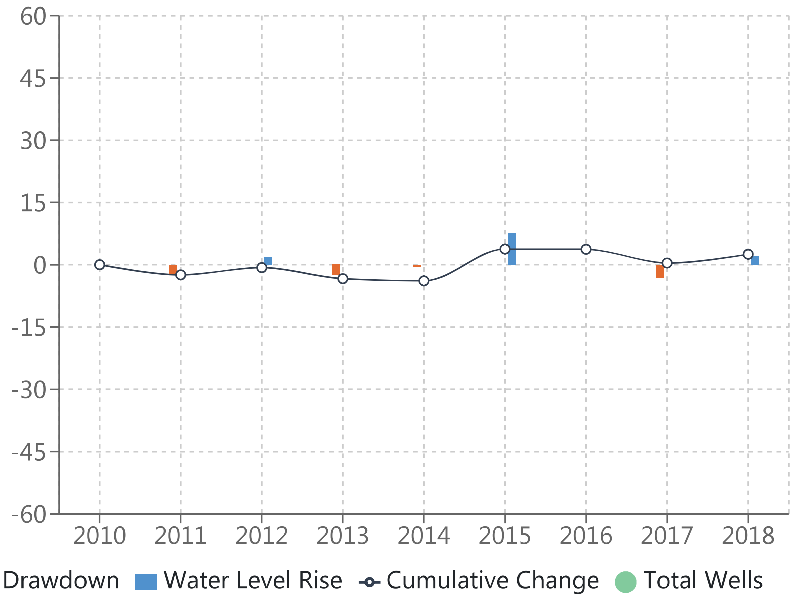


	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions	-46	Not Applicable	Not Applicable
1-Year Water Level Change	-1.7	4	6534, 4144, 4142, 8879
5-Year Water Level Change	-5.4	4	6534, 8879, 4144, 4142
Cumulative Water Level Change (2010 to Present)	0.5	5	6534, 1761, 8879, 4144, 4142
DFCs vs Cumulative Change	46.5	Not Applicable	Not Applicable

Note: All Values are in feet of water level change. Positive values indicate a water level rise. Negative values indicate a water level decline.

Summary of Desired Future Conditions and Water Level Trends
Upper Trinity Groundwater Conservation District
September 10, 2019

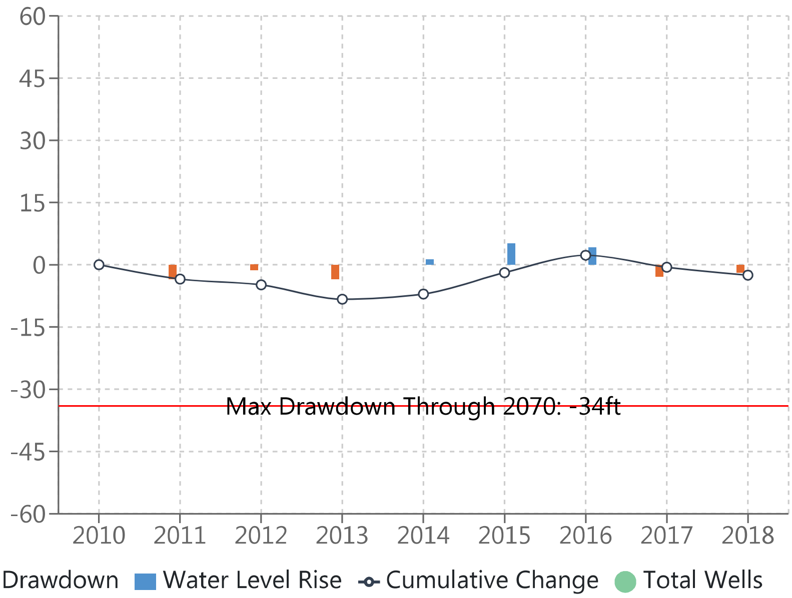
Parker County-Cross Timbers-Outcrop



	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions		Not Applicable	Not Applicable
1-Year Water Level Change	2.1	2	8877, 4416
5-Year Water Level Change	5.9	2	8877, 4416
Cumulative Water Level Change (2010 to Present)	2.5	2	8877, 4416
DFCs vs Cumulative Change	Not Avaliable	Not Applicable	Not Applicable

Note: All Values are in feet of water level change. Positive values indicate a water level rise. Negative values indicate a water level decline.

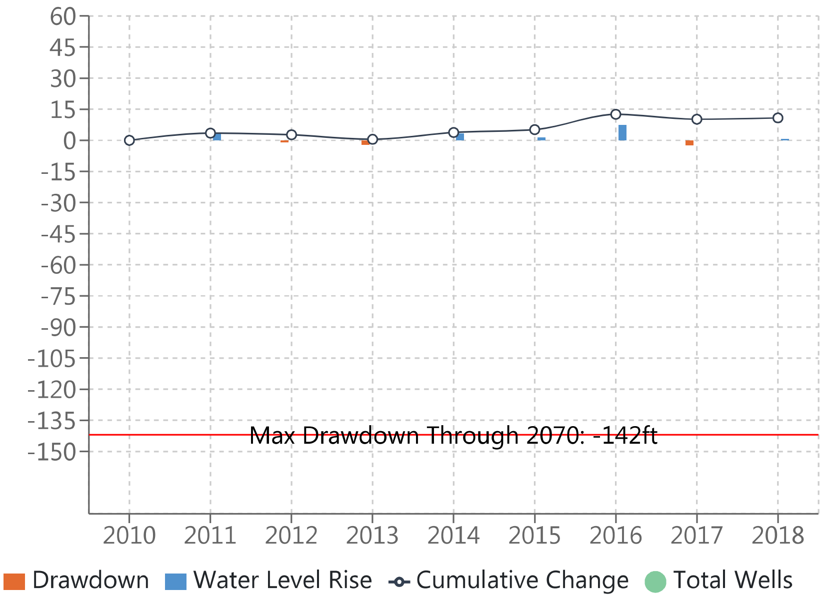
Wise County-Antlers-Outcrop



	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions	-34	Not Applicable	Not Applicable
1-Year Water Level Change	-1.9	15	7010, 8863, 1076, 1075, 4404, 8883, 1010, 1011, 3841, 8887, 1102, 3056, 10425, 3055, 8886
5-Year Water Level Change	5.8	18	8885, 8863, 8883, 1010, 8887, 8886, 1075, 4404, 4405, 3055, 3056, 7010, 2010, 1076, 3841, 1102, 1011, 10425
Cumulative Water Level Change (2010 to Present)	-2.5	22	2531, 2010, 8863, 1076, 1075, 9429, 1010, 1011, 10187, 9428, 8887, 8886, 8885, 8883, 4404, 4405, 3055, 3056, 7010, 3841, 1102, 10425
DFCs vs Cumulative Change	31.5	Not Applicable	Not Applicable

Note: All Values are in feet of water level change. Positive values indicate a water level rise. Negative values indicate a water level decline.

Wise County-Antlers-Subcrop



	Water Level Change (feet)	Number of Wells Used	IDs for Wells Used
Desired Future Conditions	-142	Not Applicable	Not Applicable
1-Year Water Level Change	0.6	12	1106, 3308, 1114, 7011, 8884, 4344, 8888, 1138, 1759, 1108, 1128, 1115
5-Year Water Level Change	10.3	12	8884, 8888, 4344, 1759, 7011, 1106, 3308, 1114, 1138, 1108, 1128, 1115
Cumulative Water Level Change (2010 to Present)	10.8	12	8884, 8888, 4344, 1759, 7011, 1106, 3308, 1114, 1138, 1108, 1128, 1115
DFCs vs Cumulative Change	152.8	Not Applicable	Not Applicable

Note: All Values are in feet of water level change. Positive values indicate a water level rise. Negative values indicate a water level decline.

APPENDIX 2

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List of Figures

1.0 Introduction

The District is undertaking the establishment of a monitor well network at key locations throughout the four counties to monitor water levels and aquifer conditions over time. The collection of District-scale hydrogeologic data such as water levels is key to the District's Mission and all resulting policies, management objectives and rules. Information from the well network will be assimilated along with groundwater production and use reports and estimates, well location and completion data, information on aquifer recharge rates and other hydrogeologic properties, and other information in a database that the District is continuing to develop to better understand and manage the groundwater resources of the area. Information gleaned from these efforts will be used by the District in the future establishment of desired future conditions (DFC) for the aquifers, in the monitoring of actual conditions of the aquifers, in the improvement of a future groundwater availability model (GAM), in making planning decisions, and in the development of permanent District rules that may include a permitting system for water wells.

The Upper Trinity Groundwater Conservation District (UTGCD) has completed Phase I of their Monitor Well Program. There are currently 108 wells identified by the UTGCD as monitor wells and the monitor well database contains a total of 146 wells. The District started quarterly monitoring of the Phase I monitoring network in the fourth quarter of 2010. **Figure 1** plots the wells in the UTGCD monitor well database along with the surface geology in the District. From a review of Figure 1 it can be seen that the distribution of wells both areally and by aquifer is not uniform across the District.

Building on the success of the Phase I monitor well network, the District recognized that the Phase I monitoring network and data collected to date must be evaluated in context to a monitoring strategy based upon meeting the management goals of the District. To this end, the District developed a set of goals for the Phase II monitoring plan which are listed below:

1. Analysis of all data collected to date including water levels and locations of the wells;
2. Expansion of the current monitoring program to collect data in locations not adequately represented in Phase I;
3. Determine appropriate layers of the District's aquifers that need study (including the Paleozoic);
4. Provide a model for the District's Board and staff to expand its monitoring program.

Based upon the stated objectives, INTERA developed a work scope for the performance of Phase II which is based upon a task structure comprised of five tasks. The five tasks are listed below:

- Task 1 – Development of a Hydrogeologic Framework for Management
- Task 2 – Development of a Monitoring Strategy
- Task 3 –Analysis of Phase I Monitor Wells and Collected Data
- Task 4 – Recommendations for Phase II Monitor Wells
- Task 5 – Phase II Monitor Well Survey and Initial Sampling

The task structure follows a sequential process by which the background data and the monitoring strategy (Tasks 1 and 2) are developed first. These are followed by Task 3 which is an assessment of the Phase I wells based upon the monitoring strategy laid out in Task 2. Based upon that analysis, the Phase I monitor well network will be augmented through the search for new monitor wells and potentially through the deletion of some Phase I wells considered of limited value. Finally, in Task 5 the new wells are brought into the network through a site visit, initial measurement and documentation.

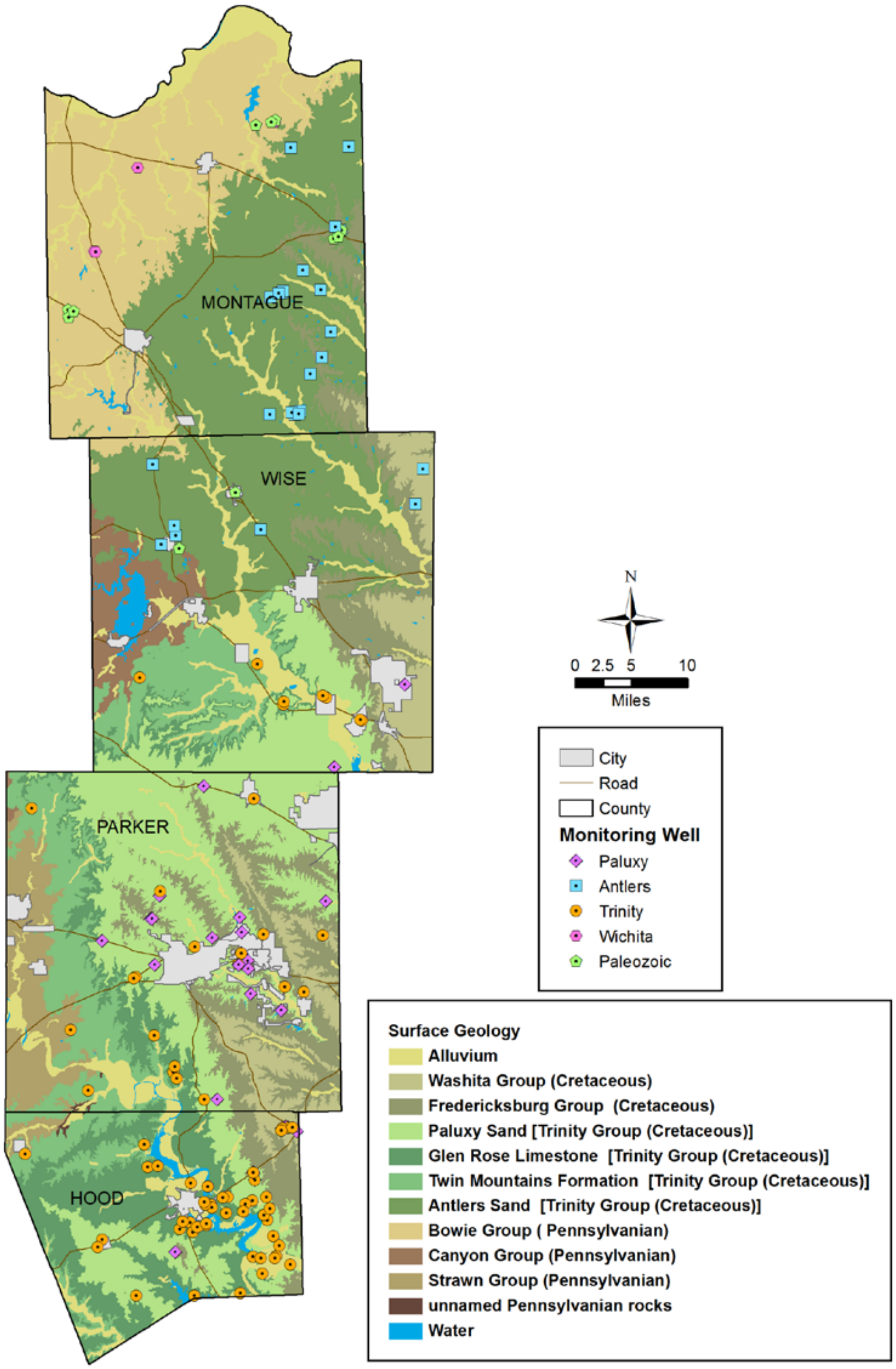

Figure 1. UTGCD Phase I Monitor Wells by Stratum and District Surface Geology.

This report is organized by chapters documenting each of the five tasks described above. This draft version of the report only documents efforts completed for Tasks 1 and 2. This document serves as the Task 1 and 2 milestone submittal. It has been delivered as an electronic file (pdf) and as a hard copy to promote comments from the Board and staff that can be used in the implementation of the remaining tasks.

2.0 Development of a Hydrogeologic Framework for Management

The objective of Task 1 is to develop an initial hydrogeologic framework for aquifer management within the District. Because the Paleozoics aquifer systems (Wichita, Bowie, Cisco and Canyon and Strawn Groups) are important in the District, this framework will include these aquifers as well as the Northern Trinity aquifer and associated formations as defined by the Texas Geologic Atlas Sherman and Dallas Sheets (McGowen et al., 1967; Barnes, 1972). The deliverable is a set of geologic cross-sections across the District. The geologic interpretations presented in this section are the product of Allan Standen (PG # 1227) in cooperation with INTERA personnel.

2.1 Overview of District Hydrogeology

Groundwater resources in the four counties making up the District include the Cretaceous-age Trinity Aquifer, several water-bearing units of Pennsylvanian- and Permian-age, referred to as the Paleozoic aquifers, and alluvial deposits (Figure 1). The Trinity Aquifer is recognized by the TWDB as a major aquifer in Texas. The Paleozoic aquifers are not recognized by the TWDB as either major or minor aquifers. No minor aquifers, as defined by the TWDB, are located in the District. The TWDB defines a major aquifer as one that supplies large quantities of water over large areas of the state and defines a minor aquifer as one that supplies relatively small quantities of water over large areas of the state or supplies large quantities of water over small areas of the state (Ashworth and Hopkins, 1995). A generalized stratigraphic section representative of the hydrogeology of the District is provided in **Table 1**. To properly design a monitoring network, one of the key components is an understanding of the hydrostratigraphic units which comprise the resource. This, in addition to an understanding of the groundwater use patterns by hydrostratigraphic unit (sub-aquifer), provides the data needed to make sure monitoring is occurring in the correct horizons. At this point, only the Trinity Aquifer has been considered in GMA-8 joint planning. However, the Paleozoic aquifer system which has not been included in the past must be for the next round of planning.

2.1.1 Geologic Setting

The oldest geologic units comprising aquifers in the District are the Paleozoic aquifers which are composed fluvial-deltaic and fluvial deposits originating from the Ouachita and Arbuckle mountains to the north and east of the District. These deposits were influenced by deep-seated structural features which influenced deposition through Cretaceous time. **Figure 2** shows the principal pre-Pennsylvanian structural features in the District and areas to the west. Important features for District aquifers are the Muenster Arch in Montague County which is an area of faulting and uplift and the Mineral Wells Fault Zone which is in south Wise County. These features have been shown to impact deposition through the Pennsylvanian and Permian and possibly into the Cretaceous (Trinity Aquifer).

The Paleozoic aquifers within the District were deposited on the eastern shelf of the Permian Basin. The Paleozoic aquifers are composed of a sequence of fluvial-deltaic deposits. The Paleozoic aquifers in the District are comprised from oldest to youngest of the Strawn, Canyon, Cisco, Bowie and Wichita Groups. The age of the Paleozoic aquifers at surface tends to get older as one moves north through the District to the south. The Strawn Group is primarily a fluvial-deltaic system comprised of several sandstone units inter-layered with shales.

Table 1. General Stratigraphy (Bené and others 2004; McGowen and others, 1967; 1972; Brown and others, 1972).

System	Hydrogeologic Characteristic	Group	Formation: North	Formation: South
	Water-Bearing		alluvial deposits	
Cretaceous	Confining Units (locally productive)	Washita	Weno	
			Denton	
			Fort Worth	
			Duck Creek	
			Kiamichi	
	Confining Units (locally productive)	Fredericksburg	Goodland	Edwards
				Comanche Peak
			Walnut Clay	Walnut Clay
	Aquifer	Trinity	Antlers	Paluxy
				Glen Rose
				Twin Mountains
Permian	Water-Bearing	Wichita	Nocona	
		Bowie	Archer City	
			Markley	
Pennsylvanian		Cisco	Thrifty and Graham, undivided	
	Water-Bearing	Canyon	Colony Creek Shale	
			Ranger	
			Ventioner	
			Jasper Creek	
			Chico Ridge Limestone	
			Willow Point	
	Water-Bearing	Strawn	Mineral Wells	
			Brazos River	
			Mingus	
			Buck Creek Sandstone	
			Grindstone Creek	
			Lazy Bend	

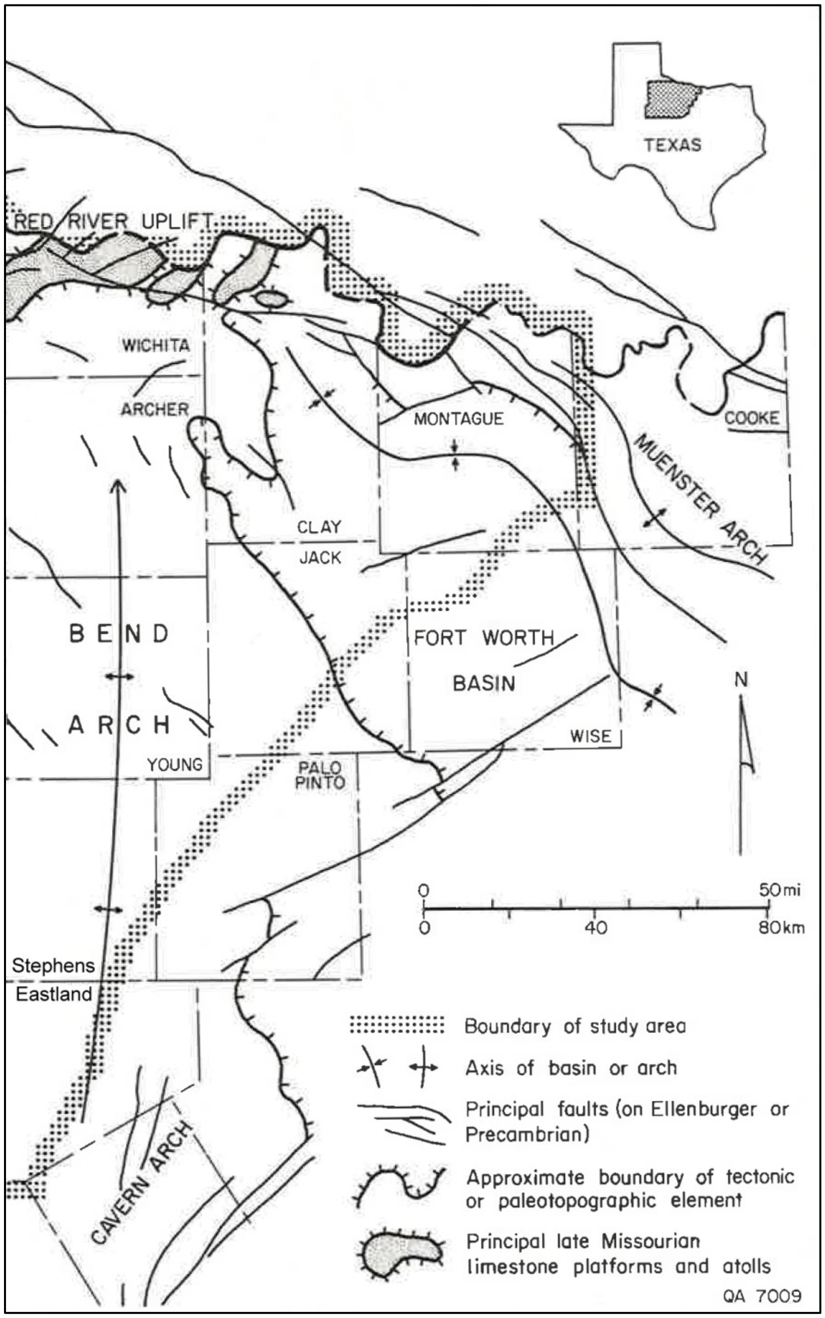

Figure 2. Principal Pre-Pennsylvanian structural features (after Brown et al. 1990)

The Canyon Group is a fluvial-deltaic system composed of sandstones and shales but which also has limestones reflecting a lower energy depositional environment. The Cisco Group is composed of fluvial-deltaic and marine deposits. The Cisco has many sandstone units that are poorly mapped because they are intermittent but has extensive limestone units (Brown et al., 1990). The Bowie Group represents a continental depositional facies and is typically composed of more coarse grained sediments than the underlying Cisco. The Wichita Group (Nocona Formation) is also a continental deposit and is composed of highly heterogeneous deposits of sand, gravel and shale. The Cretaceous Trinity Group unconformably overlies the Paleozoic aquifers system in the District, meaning that a period of erosion occurred after deposition of the Paleozoic aquifers and before the deposition of the Trinity aquifer. The Paleozoic aquifers generally dip in a westerly direction while the Cretaceous Trinity Group dips to the east-southeast. The Trinity Group was deposited from a sediment source feeding from the west and north into the East Texas Basin. Each of these aquifers will be discussed below.

2.1.1 Trinity Aquifer

The Trinity Aquifer, shown in Figure 1, is defined by the TWDB as a major aquifer composed of several individual aquifers contained within the Trinity Group. In the District, the Trinity Aquifer consists of the aquifers of the Paluxy Sand, the Glen Rose Formation, the Twin Mountains Formation, and the Antlers Formation. The Antlers Formation is the coalescence of the Paluxy and Twin Mountains formations north of the line where the Glen Rose Formation thins to extinction. This occurs approximately in central Wise County (Figure 1). The Cretaceous-age Fredericksburg and Washita Groups are generally considered confining units and they overlie the downdip portion of the Trinity Aquifer in the easternmost areas of the District.

The Paluxy Sand consists of sand, silt, and clay, with sand dominating. The sand and silts in the aquifer are primarily fine-grained, well sorted, and poorly cemented (Bené and others, 2004). Coarse-grained sand is found in the lower sections grading up to fine-grained sand with shale and clay in the upper section (Nordstrom, 1982). In general, natural groundwater flow in the Paluxy Sand is east to southeast (Langley, 1999). Wells completed into the Paluxy Sand typically yield small to moderate quantities of water that is fresh to slightly saline (Nordstrom, 1982). Where the Glen Rose Formation is absent, the Paluxy Sand is equivalent to the upper sands of the Antlers Formation (Baker and others, 1990).

The Glen Rose Formation consists primarily of limestone with some shale, sandy-shale, and anhydrite. In general, the aquifer yields small quantities of water in localized areas (Baker and others, 1990). Groundwater flow in the Glen Rose Formation is generally to the east and southeast.

The Twin Mountains Formation consists predominantly of medium- to coarse-grained sand, silty clay, and conglomerates. A massive sand is found in the lower portion of the formation while less sand is found in the upper portion of the aquifer due to increased interbedding of shale and clay (Nordstrom, 1982). In general, wells are primarily completed into the lower part of the aquifer. Where the Glen Rose Formation is absent, the Twin Mountains Formation is equivalent to the lower sands of the Antlers Formation (Baker and others, 1990). Typically, wells completed into the Twin Mountains Formation yield fresh and slightly saline water in moderate to large quantities (Nordstrom, 1982). Groundwater flow in this formation is generally to the east and southeast.

Typically, the Antlers Formation consists of a basal conglomerate and sand overlain by poorly consolidated sand interbedded with discontinuous clay layers (Nordstrom, 1982). Considerably more clay is found in the middle portion of the formation than in the upper and lower portions. Limestone is also found in the middle portion near the updip limit of the Glen Rose Formation. Generally, groundwater flow in the Antlers Formation is to the east and southeast. Well yield in the Antlers Formation is similar to that in the Twin Mountains Formation with downdip wells generally more productive than those in the outcrop areas.

2.1.2 Paleozoic Aquifers

Several Pennsylvanian- and Permian-age formations in the District are capable of producing usable quantities of groundwater. These formations are referred to collectively as the Paleozoic aquifers (see Figure 1). Literature regarding these formations is very limited and, therefore, information regarding their hydrologic characteristics is also limited. The Paleozoic aquifers are a significant source of groundwater in northern and western portions of Montague County, west-central Wise County, and western Parker County where the Trinity Aquifer is absent. Based on information in the TWDB groundwater database as of November 2009, the percentage of wells in the District completed into the Paleozoic aquifers is 78.2, 14.8, 5.4, and 0.0 percent for Montague, Wise, Parker, and Hood counties, respectively.

From youngest to oldest, the formations of the Wichita, Bowie, Cisco, Canyon, and Strawn groups make up the Paleozoic aquifers. The Wichita Group consists of the Nocona Formation (mudstone with sandstone and siltstone in thin lenticular beds throughout). The Bowie Group is composed of the Archer City Formation (predominantly mudstone with thin siltstone beds and sandstone) and the Markley Formation (mudstone with local thin beds of sandstone in upper portion and mudstone and shale with some coal and limestone below). The Cisco is comprised of the undivided Thrifty and Graham formations (predominantly mudstone and shale with thin sandstone beds and some sandstone sheets locally and two limestone members).

The underlying Canyon Group is comprised of the Colony Creek Shale (shale with some siltstone, local thin to medium beds of sandstone, and limestone lentils), the Ranger Limestone (predominantly limestone with local thin shale beds), the Ventioner Formation (shale and mudstone with numerous sandy and silty lenses and thin to medium beds), the Jasper Creek Formation (upper portion predominantly shale with thin siltstone beds throughout and isolated massive sandstone lenses and lower portion shale with thin limestone lentils and local thin and lenticular thick sandstone beds), the Chico Ridge Limestone (predominantly limestone with local shale beds), the Willow Point Formation (shale and claystone locally silty and sandy with local thin beds of sandstone and several limestone beds in lower portion and a single coal bed), and the Palo Pinto Formation (predominantly limestone and marl with some sandstone and shale and found west of the District). Sandstone lenses found in the Canyon Group are locally important to the occurrence of groundwater though are hard to map (Bayha, 1967).

The Strawn Group consists of the Mineral Wells Formation (shale containing local sandstone beds and a few limestone beds), the Brazos River Formation (sandstone with local lenses of conglomerate and mudstone), the Mingus Formation (sandy shale with one thin coal seam and some limestone beds), the Buck Creek Sandstone (sandstone), the Grindstone Creek Formation (shale, in part sandy, with local thin coal beds and sandstone lentils and limestone beds with some shale), and the Lazy Bend Formation (shale, in part sandy or silty, with local coal beds and limestone beds). While the Paleozoic aquifers are described as having many formations based upon outcrop, correlation of sandstone units in particular is very problematic in the subsurface.

The Paleozoic aquifers are the primary source of water in Montague County (Bayha, 1967) as indicated by the high percentage of wells completed into these aquifers in the county. Bayha (1967) indicates that groundwater is difficult to trace in these aquifers due to the complex depositional sequence.

2.1.2 Alluvial Deposits

Some alluvial deposits of Pleistocene to Recent age are capable of producing water in the District, especially along the Red River in Montague County and the Brazos River in Parker County. The majority of these sediments are stream deposits but some are of windblown origin. The alluvial deposits, consisting of sand, gravel, silt, and clay, yield small to large quantities of fresh water. Based on information in the TWDB groundwater database as of November 2009, the percentage of wells in the District completed into alluvial deposits is 10.0, 0.4, 3.0, and 0.1 percent for Montague, Wise, Parker, and Hood counties, respectively.

2.2 Approach for Development of the Hydrogeologic Sections

The construction of Paleozoic and Cretaceous formation cross-sections for the District required integration of subsurface information from numerous data sources and types. Available state agency published references (Texas Water Development Board (TWDB) and Bureau of Economic Geology (BEG)) were reviewed to identify and capture useful descriptions of stratigraphic marker beds and/or stratigraphic picks. The Sherman, Dallas and Abilene Geologic Atlas of Texas (GAT) sheets provided the geospatial distribution of the surface formation outcrops to connect with the top and base of subsurface picks.

The Paleozoic geologic surface outcrops are youngest in northern Montague County (Permian) and get progressively older (Pennsylvanian, Strawn) moving south into Parker County. Paleozoic rocks generally dip to the northwest-west at about 80 to 100 feet per mile. Over 1,000 scout tickets and cable tool driller's reports were screened to select wells with good location and Paleozoic (Permian and Pennsylvanian) formation top and base picks. A total of 40 locations with Paleozoic formation picks were selected for the created cross-sections. The number and geographic distribution of scout tickets and cable tool driller's reports decreased dramatically from Montague County south towards Hood County. Paleozoic formation top picks (Bowie Group, Gunsight Limestone, Canyon Group picks included the Home Creek, Ranger and Palo Pinto limestones and Strawn Group pick included the Caddo formation) were derived from the scout ticket and cable tool driller's reports which were compared with Paleozoic formation picks from BEG Report of Investigations 197, by Brown et. al., 1990. Formation picks from these two sources were compatible and in agreement.

The deeper Paleozoic picks for the Ranger, Palo Pinto and the Caddo formations are not illustrated in the constructed cross-sections because they were below the zone of interest for groundwater resources (upper 1,000 feet). However, these Paleozoic picks were used to construct subsurface formation surfaces. The geospatial subsurface thickness variations and extents of these Paleozoic formations are poorly known within the study area. Cross-section Paleozoic thicknesses in areas without data used outcrop thicknesses from the respective GAT sheets as a default.

Over 8,000 wells from the TWDB WIID website (groundwater database and submitted driller's reports) were screened by well depth (deepest) and the quality of the driller's reports lithologic description. A total of 102 driller's reports were selected to construct the cross-sections. Four Cretaceous formation top surfaces were mapped; the Paluxy Sand, Glen Rose Limestone, Twin Mountain Formation and the Antlers Sand. Cretaceous rocks generally dip to the east-southeast at about 40 to 60 feet per mile. A literature review of available older publications (Hendricks, 1957, Scott and Armstrong, 1932, Scott, 1930 and Stramel, 1951) as well as more recent publications (Baker, et. al., 1990, Duffin and Beynon, 1992, Harden, et al., 2004, Langley, 1999, McGowen et al, 1991 and Nordstrom, 1982) suggested that the Hensell and Hosston (aquifer units in the Travis Peak Formation) were not mappable geologic units within the study area. The older publications and the GAT sheet explanation provided detailed lithologic descriptions based on outcrops which were useful in the identification of formation tops and bases from the driller's report descriptions. The Hensell and Hosston were not positively identified within any of the 102 driller's reports which is consistent with the published geological reports in the area.

Brown, 1990 text and figures (1 and 6) provided general, structural subsurface guidance for the surface construction of the Paleozoic formations. A total of thirteen cross-sections (A - A' through M - M') were constructed for the District (see **Figure 3** for locations). The Paleozoic (Permian and Pennsylvanian Formations) interpretations in these cross-sections are based on very limited subsurface well data and should not be used or considered to replace or supersede more detailed regional structural studies. This study was intended to assist the District in understanding the stratigraphic framework and the designing of a water level monitoring system of their groundwater resources.

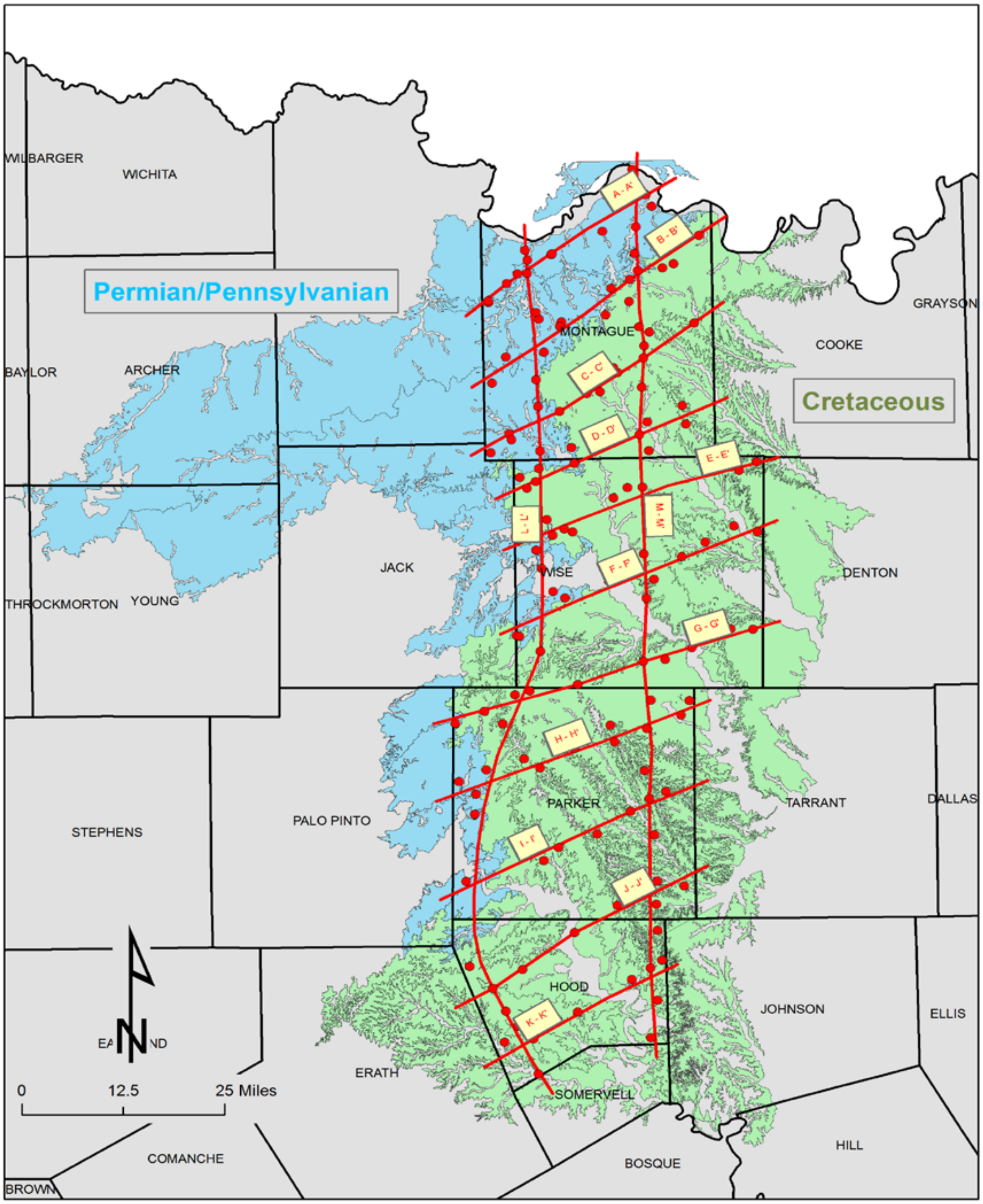

Figure 3. Cross-Section Base Map

2.3 Subsurface Data Sources and Reference Material Reviewed

Multiple subsurface data sources were investigated and used to construct the cross-sections for the UTGCD.

- The Bureau of Economic Geology (BEG) has a large collection of subsurface data including geophysical logs (1940's to present), scout tickets (1950's to 1990's) and cable tool driller's reports (1910 to 1960's).
- BEG publication, Brown et al, 1990, provided detailed information for the shallow Paleozoics in Montague County.
- UTGCD well data provided on CD.
- TWDB website (WIID) Texas Department of Licensing and Regulations (TDLR) submitted driller's reports (2001 to 2011) and groundwater well database driller's reports (1940s to present).
- University of Texas, Austin Thesis and Dissertations
- Texas Water Development Board (TWDB) publications

In addition to the subsurface data sources used to develop the correlations, many publications were reviewed for relevant information to help in the cross-section development and to understand the basic geology of the Trinity Aquifer and the Paleozoic Aquifers. The primary references reviewed include the following:

Baker, B., Duffin, G., Flores, R., and Lynch, T., 1990, Evaluation of Water Resources in Part of North-Central Texas, Report 318, Texas Water Development Board, 67 p

Bayha, D. C., 1967, Occurrence and Quality of Ground Water in Montague County Texas, Texas Water Development Board, Report 58, 102 p.

Barnes, V. E., 1988, Dallas Sheet, Geologic Atlas of Texas, 1:250,000, Bureau of Economic Geology

Brown, Jr., L. F., Goodson, J. L., Goodson, Harwood, P., and Barnes, V. E. Barnes, 2001, Abilene Sheet, Geologic Atlas of Texas, 1:250,000, Bureau of Economic Geology.

Brown, L. F., Solis-Iriarte, R. F. and Johns, D. A., 1990, Regional Depositional Systems Tracts, Paleogeography and Sequence Stratigraphy, Upper Pennsylvanian and Lower Permian Strata, North and West Central Texas, Report of Investigations No. 197, Texas Bureau of Economic Geology, 27 plates, 116 p.

Bullard, F. M. and Cuyler, R. H., 1930, A Preliminary Report on the Geology of Montague County, Texas, Bureau of Economic Geology, Part 1, pages 57 – 76.

Duffin, G. L. and Beynon, B. E., 1992, Evaluation of Water Resources in parts of the Rolling Prairies of North-Central Texas, Report 337, Texas Water Development Board, 93 p.

Harden, R. W. & Associates, Freese & Nichols Inc., HDR Engineering Inc., LBG-Guyton Associates, USGS, and Yelderman, J. Jr., 2004, Northern Trinity / Woodbine Aquifer Groundwater Availability Model, prepared for Texas Water Development Board, 391 p.

Hendricks, L., 1957, Geology of Parker County, Bureau of Economic Geology, Publication Number 5724, 67 p.

Langley, L., 1999, Updated Evaluation of Water Resources in Part of North-Central Texas, Report 349, Texas Water Development Board, 72 p.

McGowen, J. H., Hentz, T. F., Owen, D. E., Pieper, M. K., Shelby, C. A. and Barnes, V. E., 1991, Sherman Sheet, Geologic Atlas of Texas, 1:250,000, Bureau of Economic Geology

Nordstrom, P. L., 1982, Occurrence, Availability and Chemical Water Quality of Ground Water in the Cretaceous Aquifers of North Central Texas, Volumes 1 and 2, Report 269, Texas Water Development Board.

Scott, G. and Armstrong, J. M., 1932, The Geology of Wise County, The University of Texas, Bulletin 3224, pages 5 – 73.

2.4 Review of the Hydrogeologic Framework as Defined by Cross-Sections

Each of the thirteen cross-sections is depicted in Figures 4 through 16 and each will briefly be discussed below.

A – A' (Figure 4) - Cross-section has a southwestern to northeastern strike which parallels the outcrops of the Permian Archer City and Nocona formations. These Paleozoic formations possibly have been deformed by the Muenster Arch in the northeastern half of this cross-section.

B – B', (Figure 5) - Cross-section has a southwestern to northeastern strike which parallels the outcrops of the Permian Archer City and the Bowie Group Markley formations and includes the easterly dipping Cretaceous Trinity Aquifer, Antlers Formation. The Paleozoic formations possibly have been deformed by the Muenster Arch in the northeastern half of this cross-section.

C – C', (Figure 6) - Cross-section has a southwestern to northeastern strike which parallels the outcrops of the Bowie Group Markley Formation and includes the easterly dipping Cretaceous Trinity Aquifer, Antlers Formation.

D – D', (Figure 7) - Cross-section has a southwestern to northeastern strike which approximately parallels the outcrops of the Bowie Group Markley and Thrifty and Graham formation and includes the easterly dipping Cretaceous Trinity Aquifer, Antlers Formation.

E – E', (Figure 8) - Cross-section has a southwestern to northeastern strike which approximately parallels the outcrops of the Canyon Group undivided (Ventioner Formation) and includes the easterly dipping Cretaceous Trinity Aquifer, Antlers Formation.

F – F', (Figure 9) - Cross-section has a southwestern to northeastern strike which approximately parallels the outcrops of the Canyon Group undivided (Jasper Creek Formation) and includes the easterly dipping Cretaceous Trinity Aquifer, Antlers Formation transitioning into the Twin Mountain Formation. This cross-section is just north of the Mineral Wells – Newark East Fault system.

G – G', (Figure 10) - Cross-section has a southwestern to northeastern strike which approximately parallels the outcrops of the Strawn Group Mineral Wells Formation and includes the easterly dipping Cretaceous Trinity Aquifer, Twin Mountain Formation and overlying Paluxy Formation. This cross-section is in very close proximity and parallels the Mineral Wells – Newark East Fault system.

H – H', (Figure 11) - Cross-section has a southwestern to northeastern strike which approximately parallels the outcrops of the Strawn Group Mineral Wells and Brazos River formations and includes the easterly dipping Cretaceous Trinity Aquifer, Twin Mountain Formation and overlying Paluxy Formation.

I – I', (Figure 12) - Cross-section has a southwestern to northeastern strike which approximately parallels the outcrops of the Strawn Group Grindstone Creek and Lazy Bend formations and includes the easterly dipping Cretaceous Trinity Aquifer, Twin Mountain Formation and overlying Paluxy Formation.

J – J', (Figure 13) - Cross-section has a southwestern to northeastern strike and includes the easterly dipping Cretaceous Trinity Aquifer, Twin Mountain Formation and overlying Paluxy Formation

K – K', (Figure 14) - Cross-section has a southwestern to northeastern strike and includes the easterly dipping Cretaceous Trinity Aquifer, Twin Mountain Formation and overlying Paluxy Formation.

L – L', (Figure 15) - Cross-section has a north to south strike on the western side of the District. The Paleozoic formations (Permian and Pennsylvanian) seem to form a basin in this region of the District with the Paleozoic Formations becoming shallower to the south.

M – M', (Figure 16) - Cross-section has a north to south strike on the eastern side of the District. This section also shows a potential sub-basin in the Paleozoic formations (Permian and Pennsylvanian) with the formations becoming shallower to the south. General locations of the Muenster Arch and Mineral Wells – Newark East Fault system are noted in the cross-section.

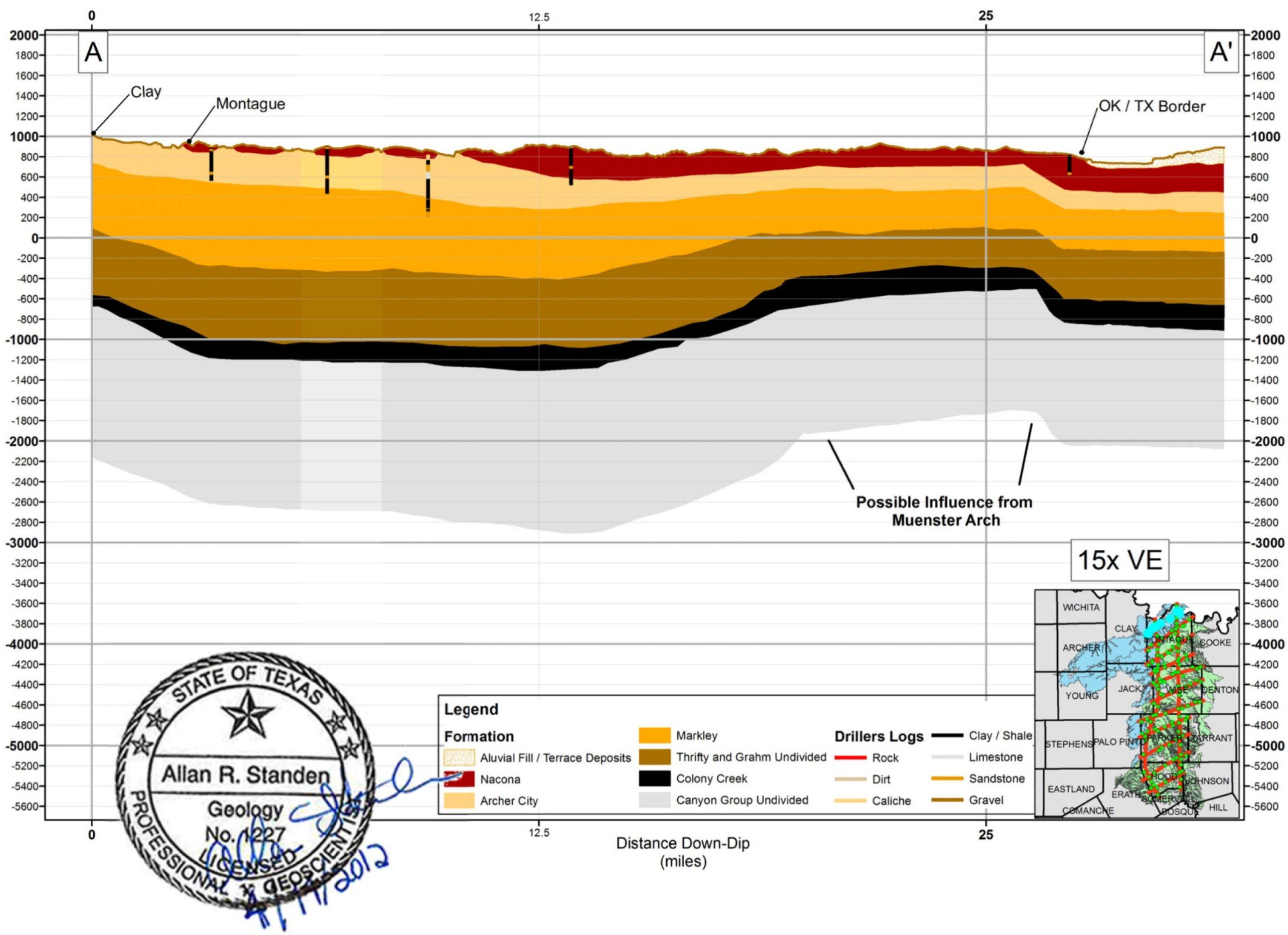

Figure 4. **Hydrogeologic Cross-Section A – A.**

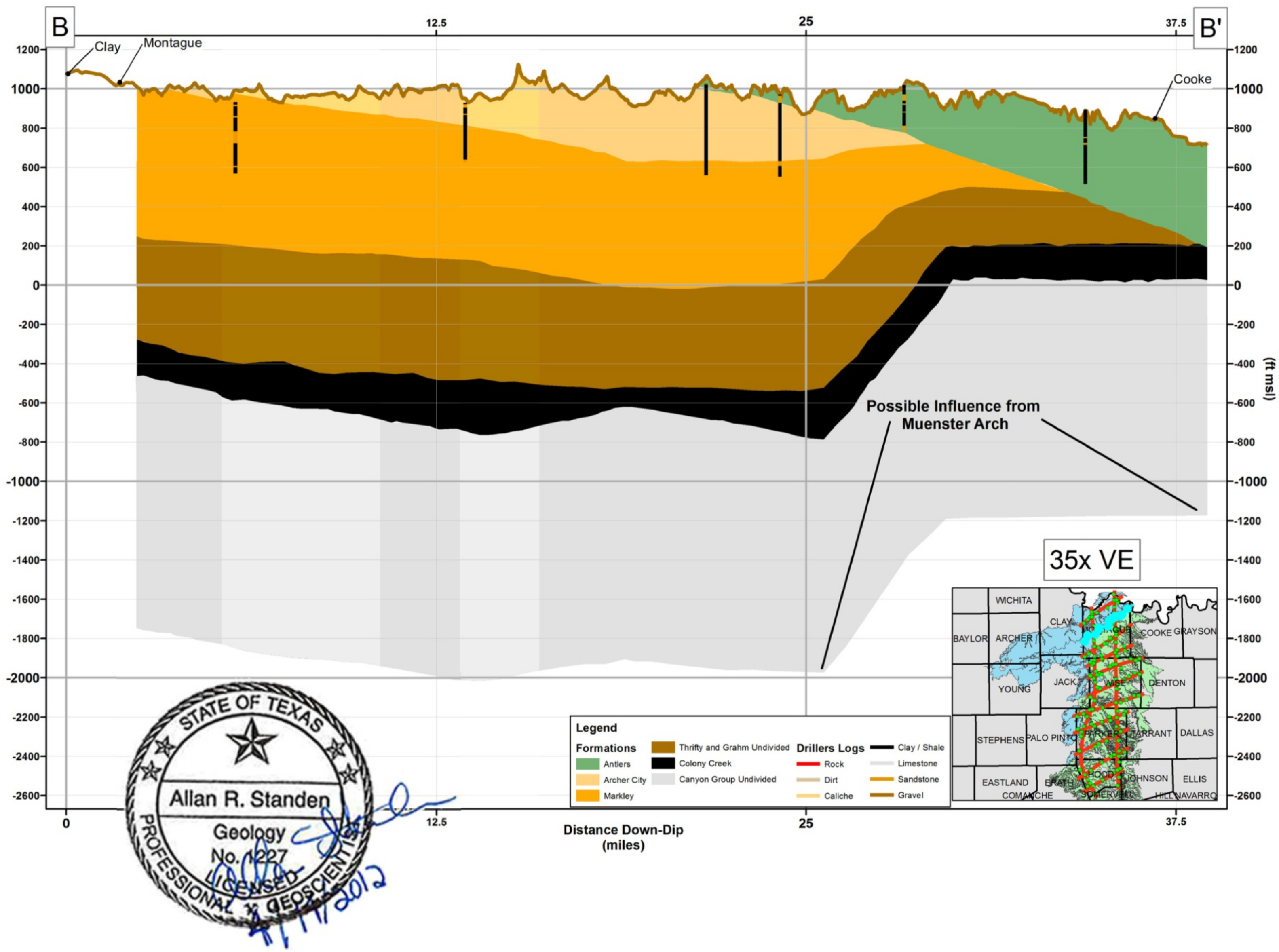

Figure 5. Hydrogeologic Cross-Section B – B.

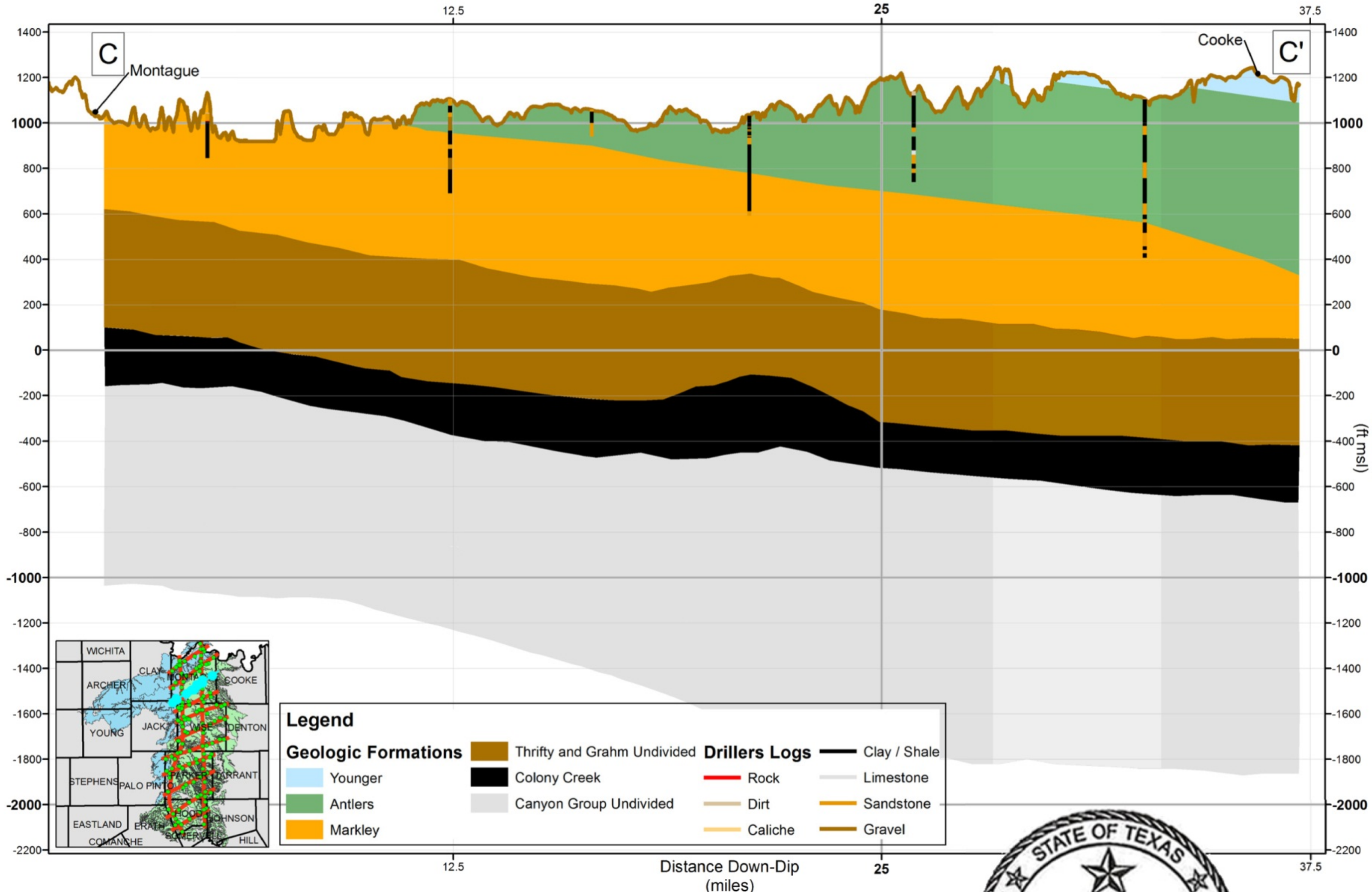

Figure 6. Hydrogeologic Cross-Section C – C.

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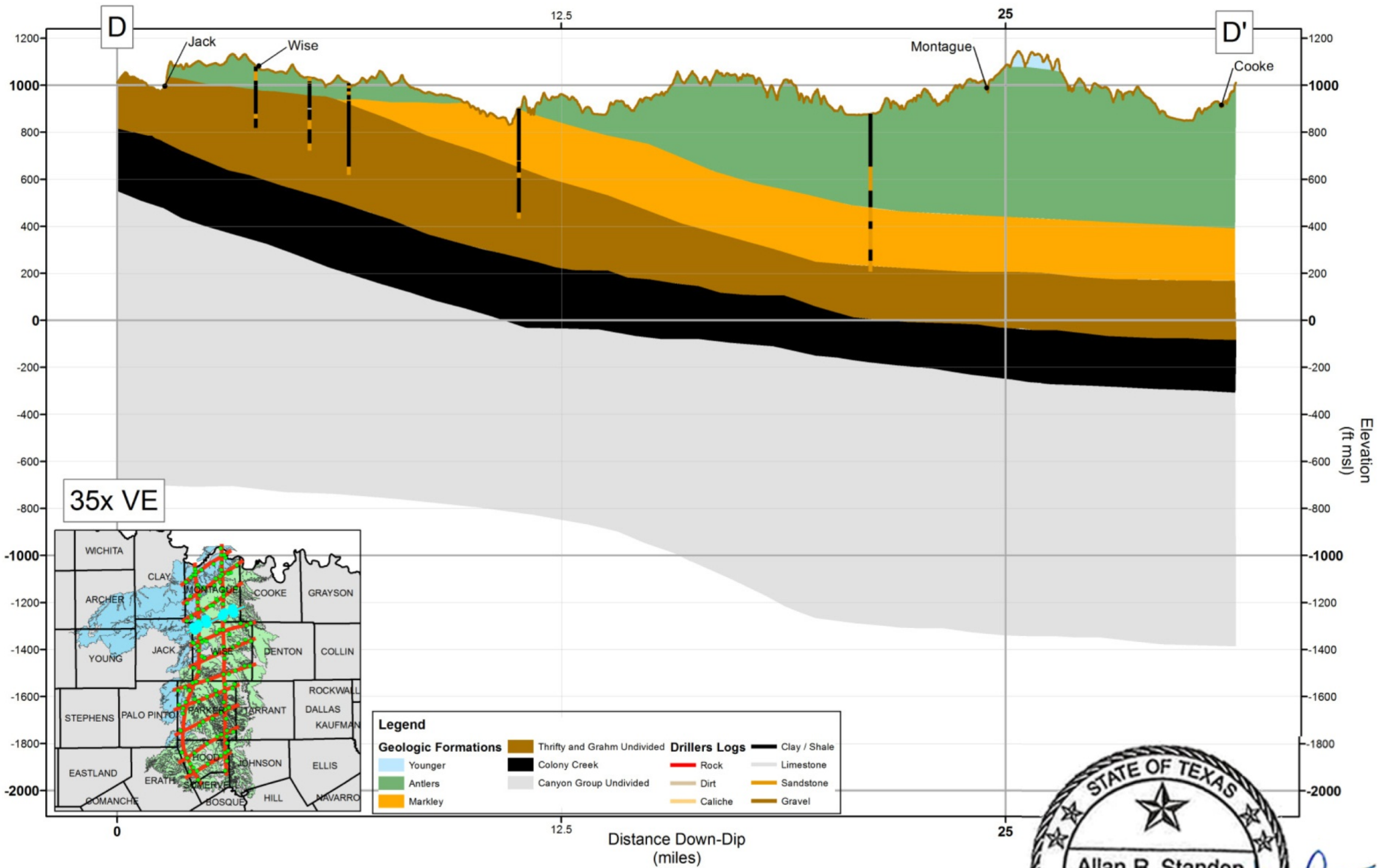

Figure 7. **Hydrogeologic Cross-Section D – D.**

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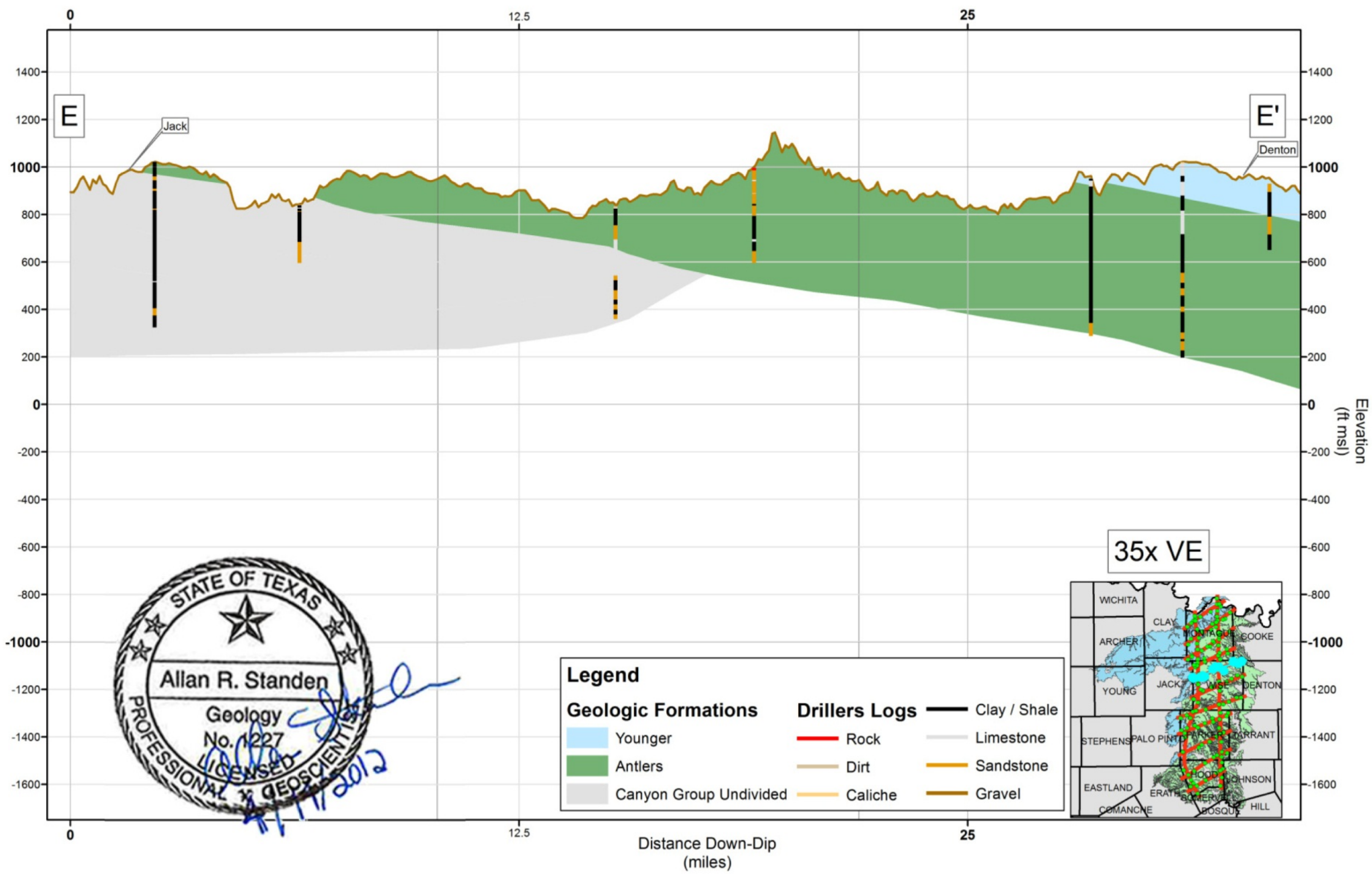


Figure 8. Hydrogeologic Cross-Section E – E.

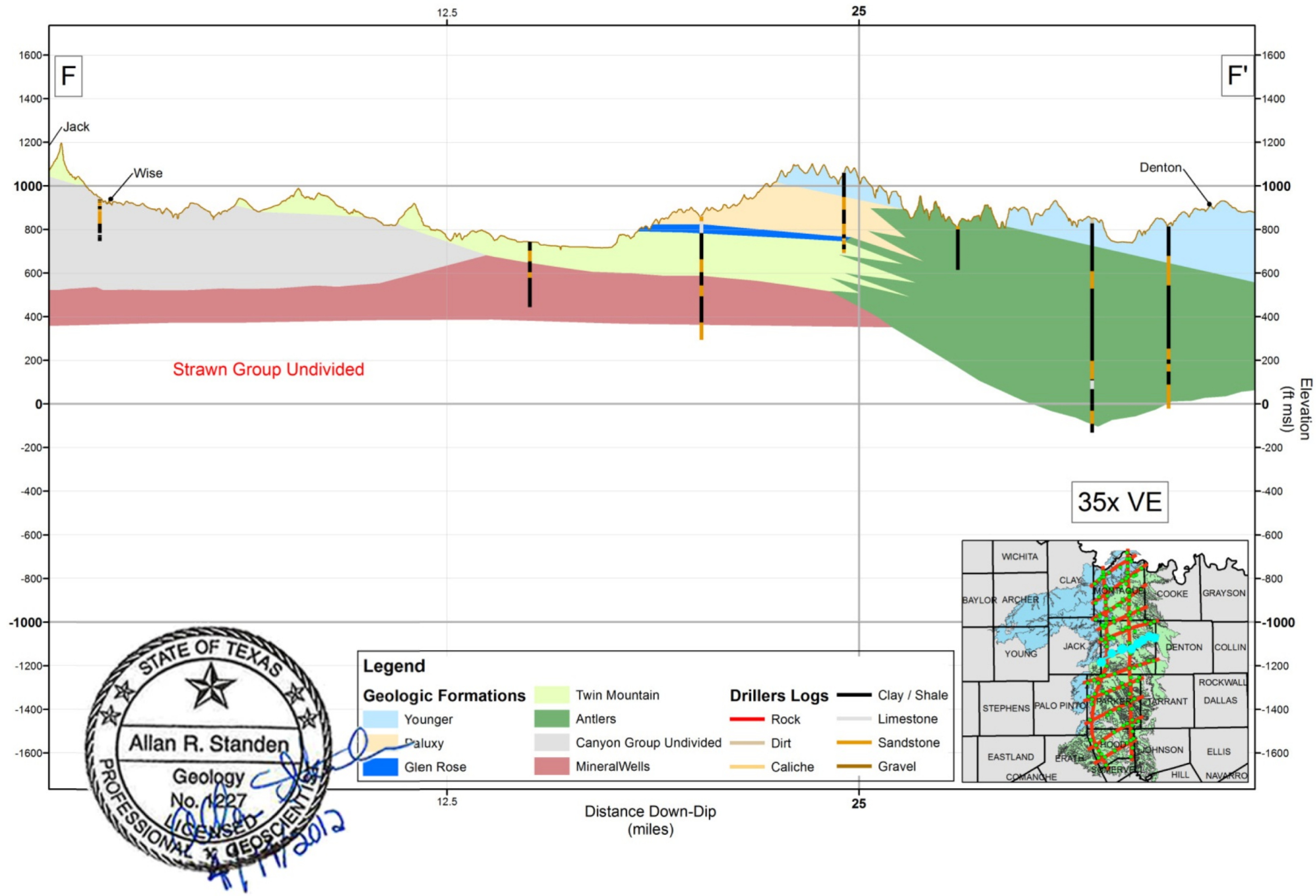


Figure 9. Hydrogeologic Cross-Section F – F.

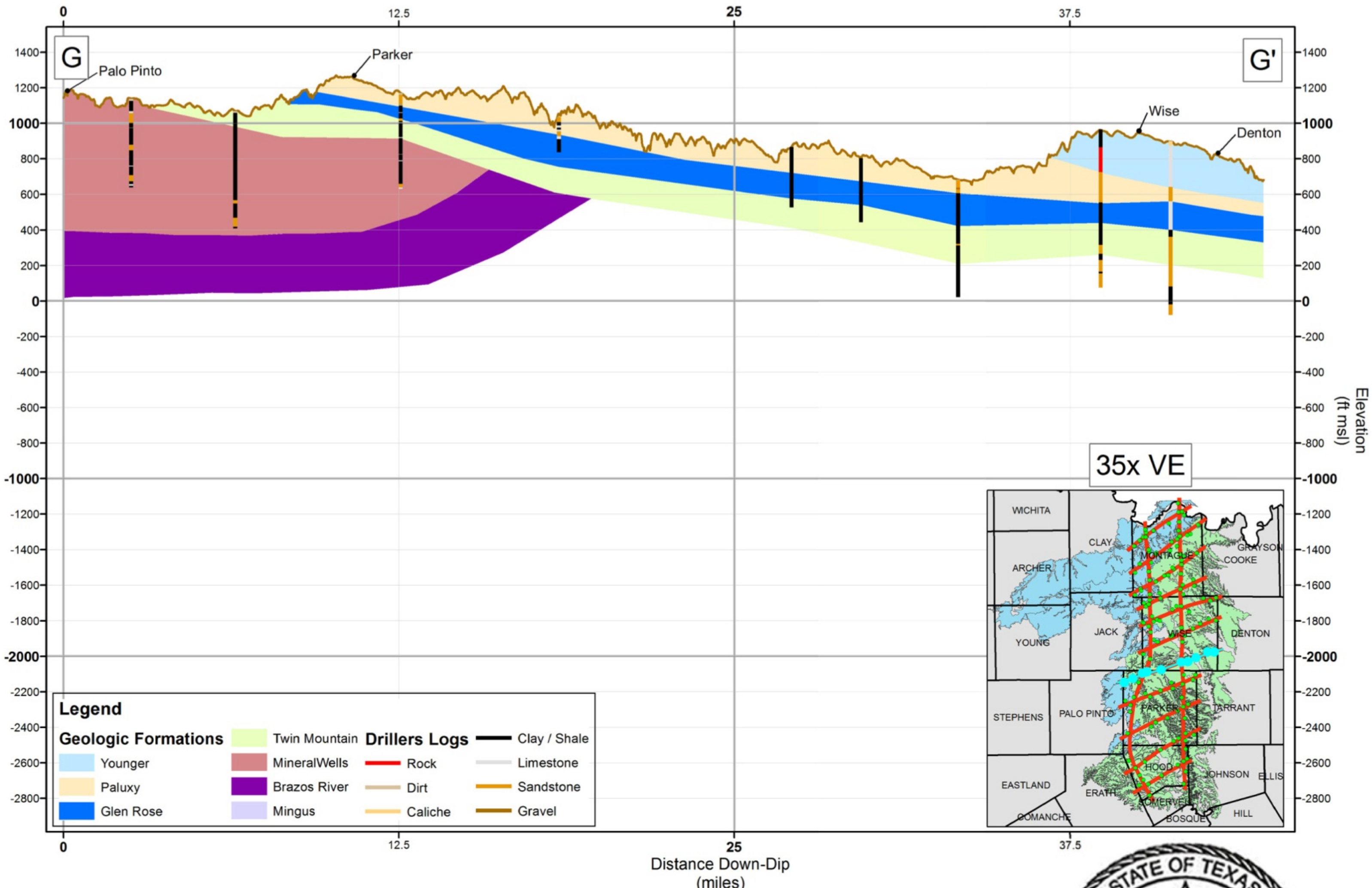
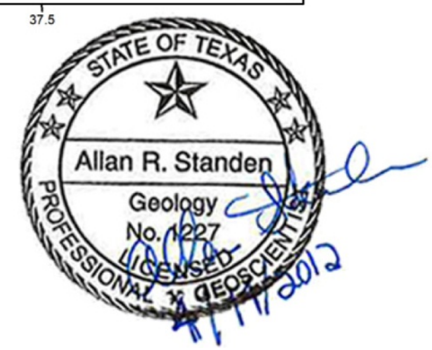


Figure 10. **Hydrogeologic Cross-Section G – G.**



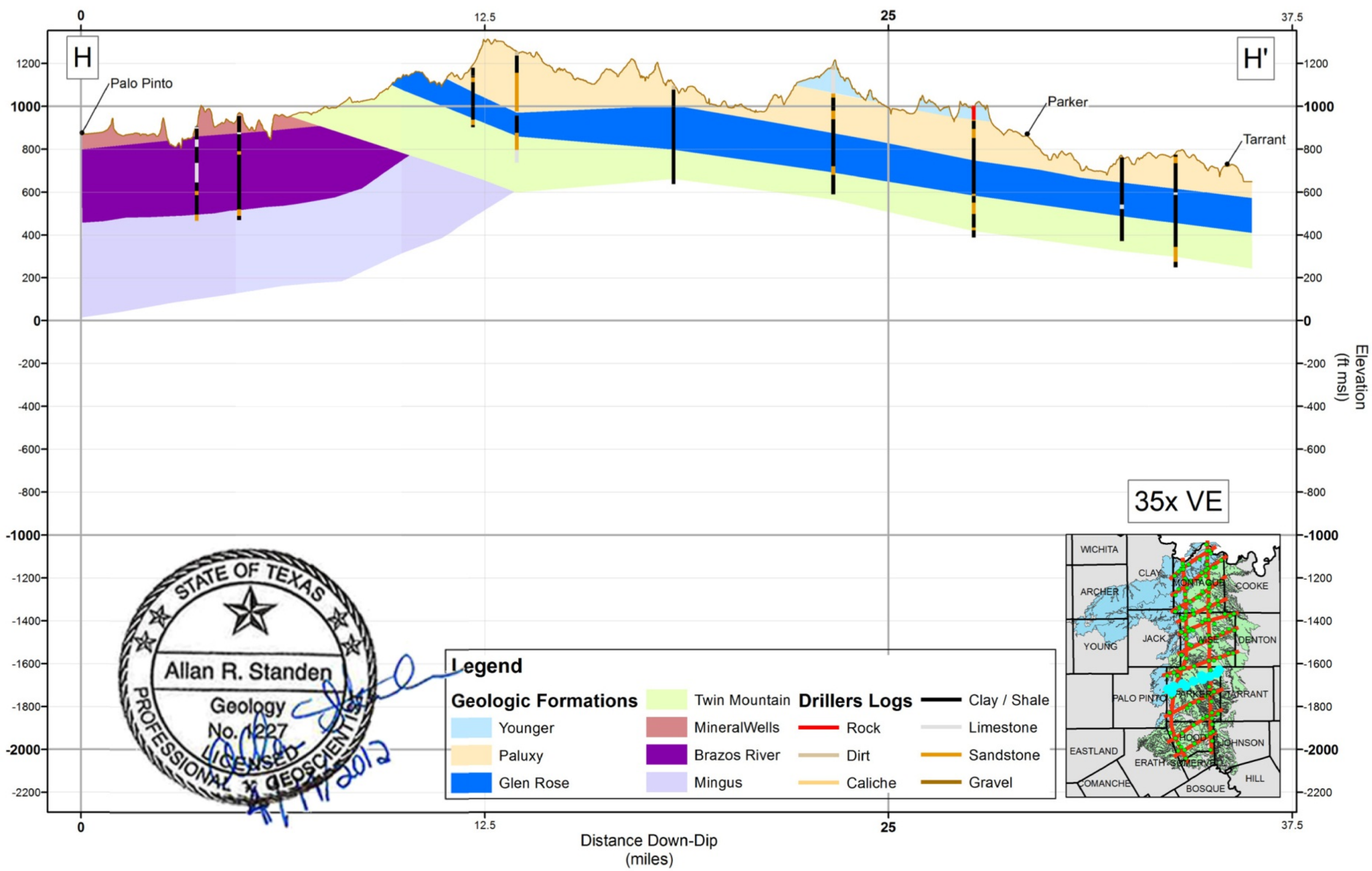


Figure 11. Hydrogeologic Cross-Section H – H.

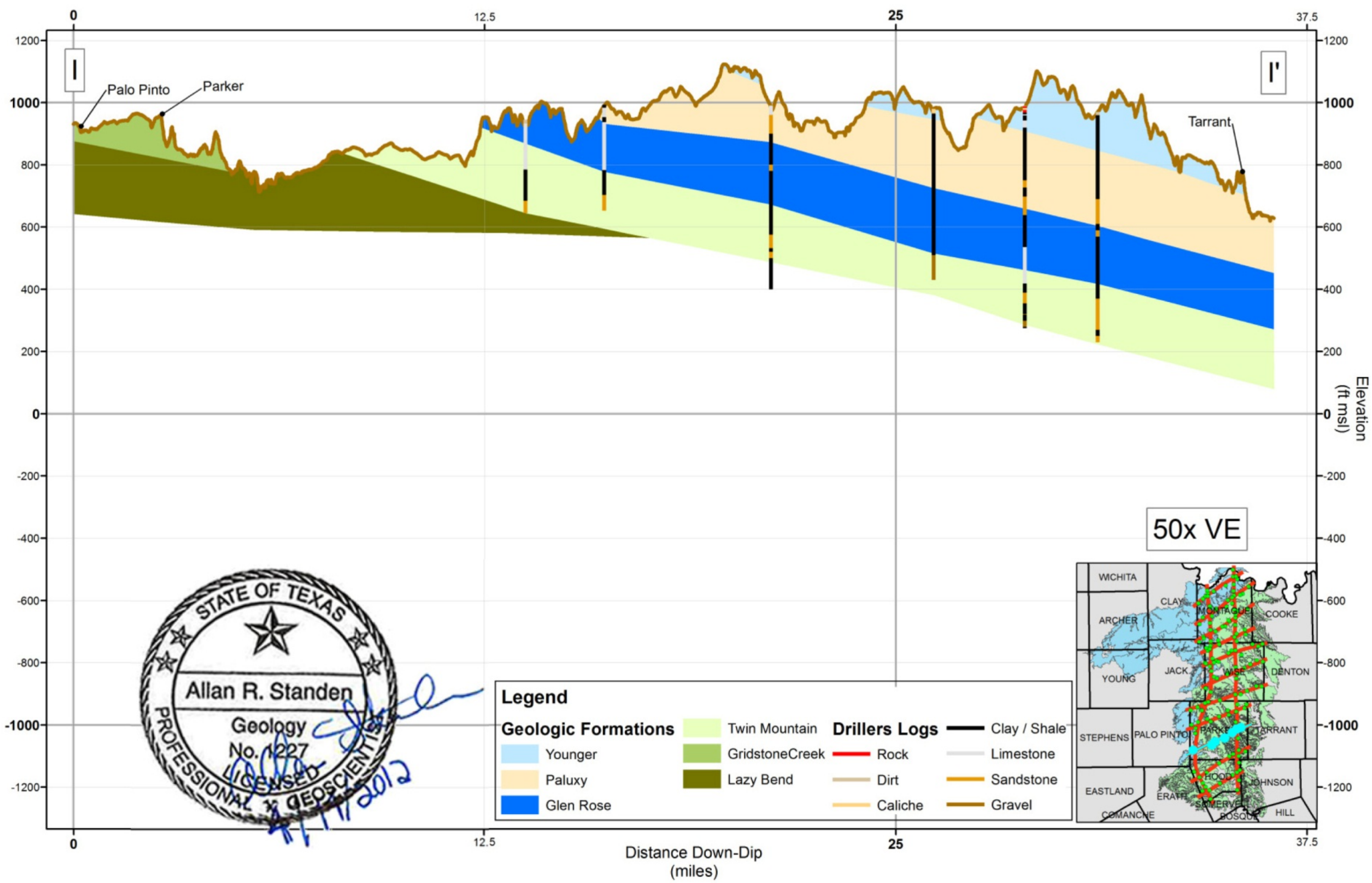


Figure 12. Hydrogeologic Cross-Section I – I.

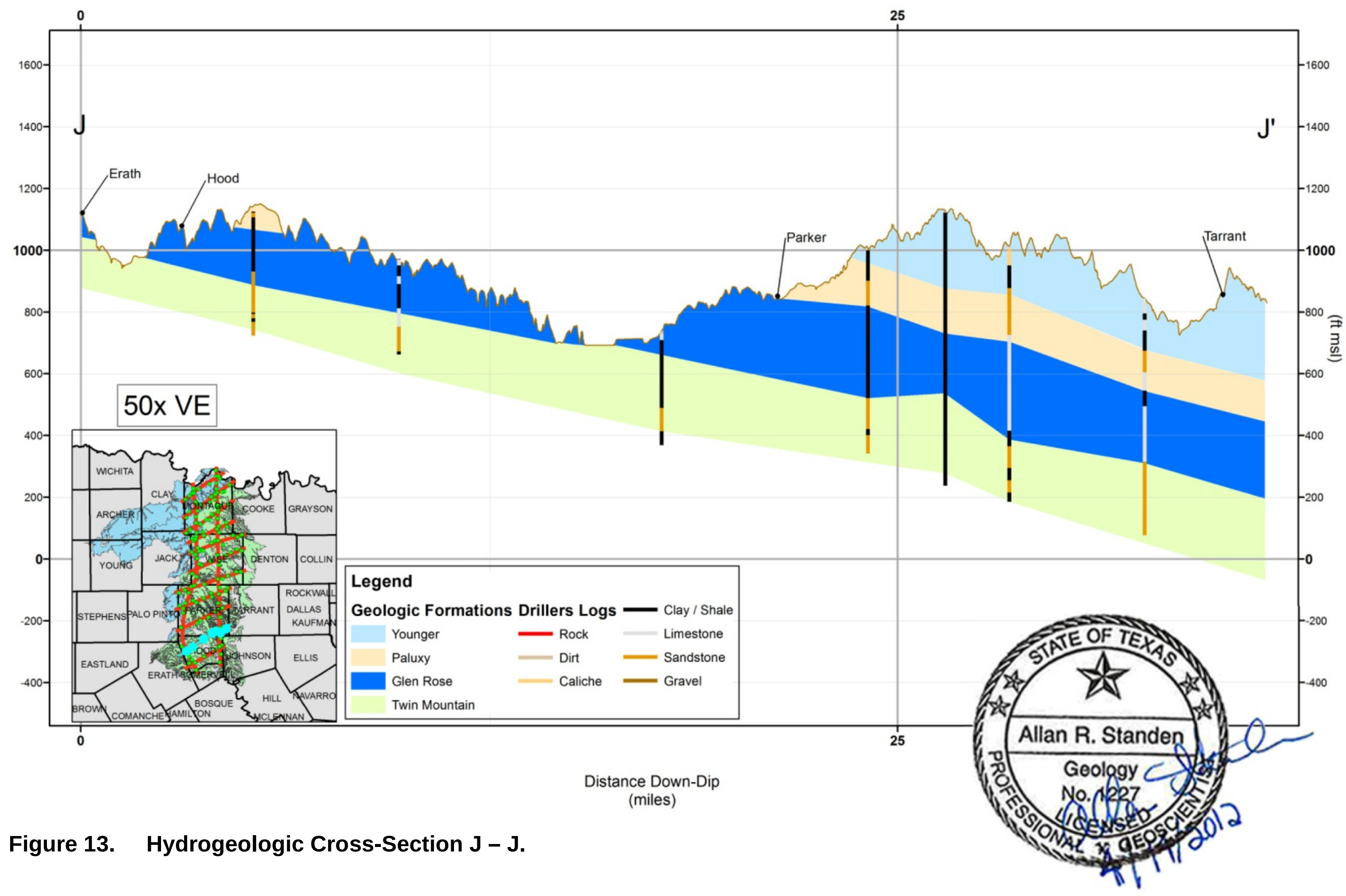


Figure 13. **Hydrogeologic Cross-Section J – J.**

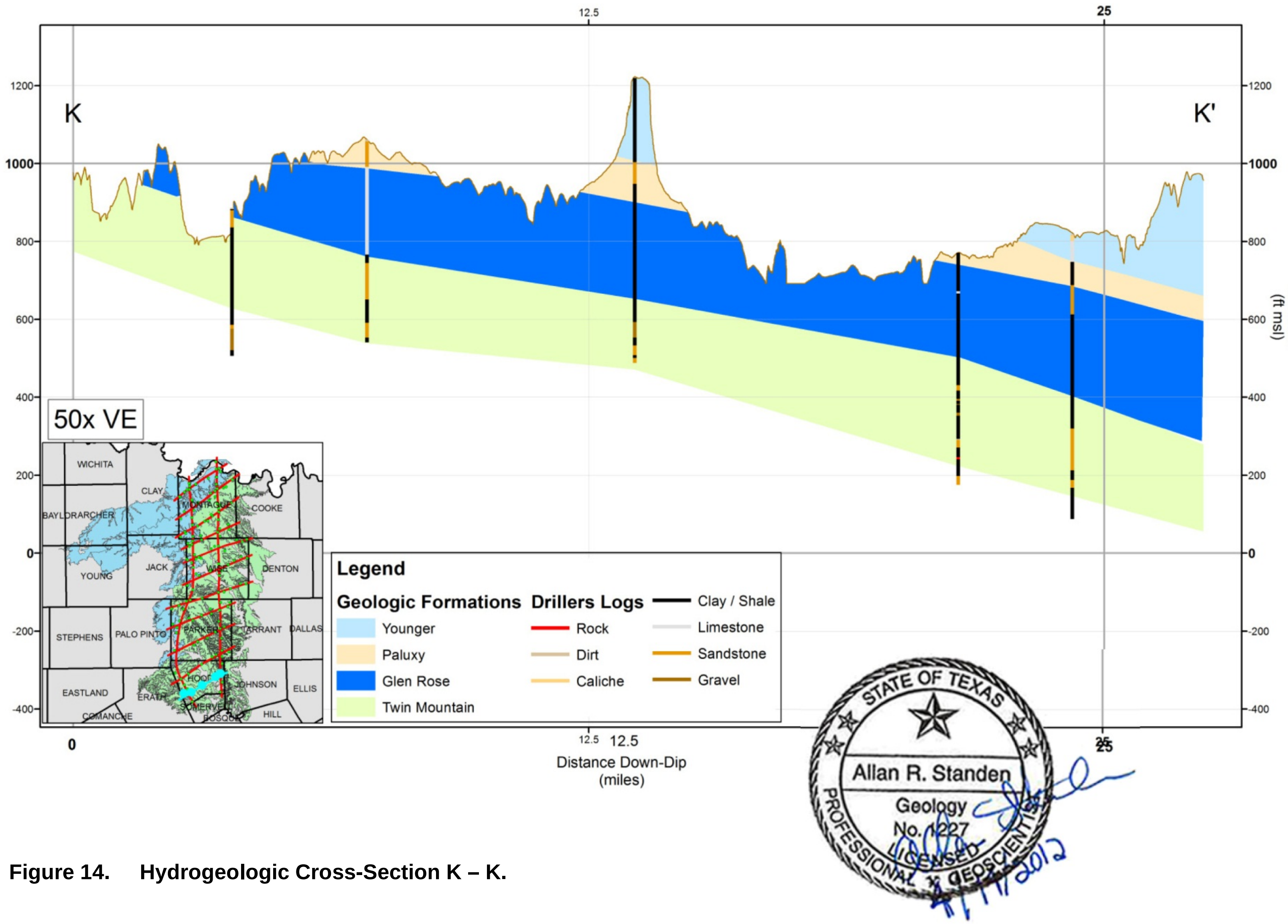


Figure 14. Hydrogeologic Cross-Section K – K.

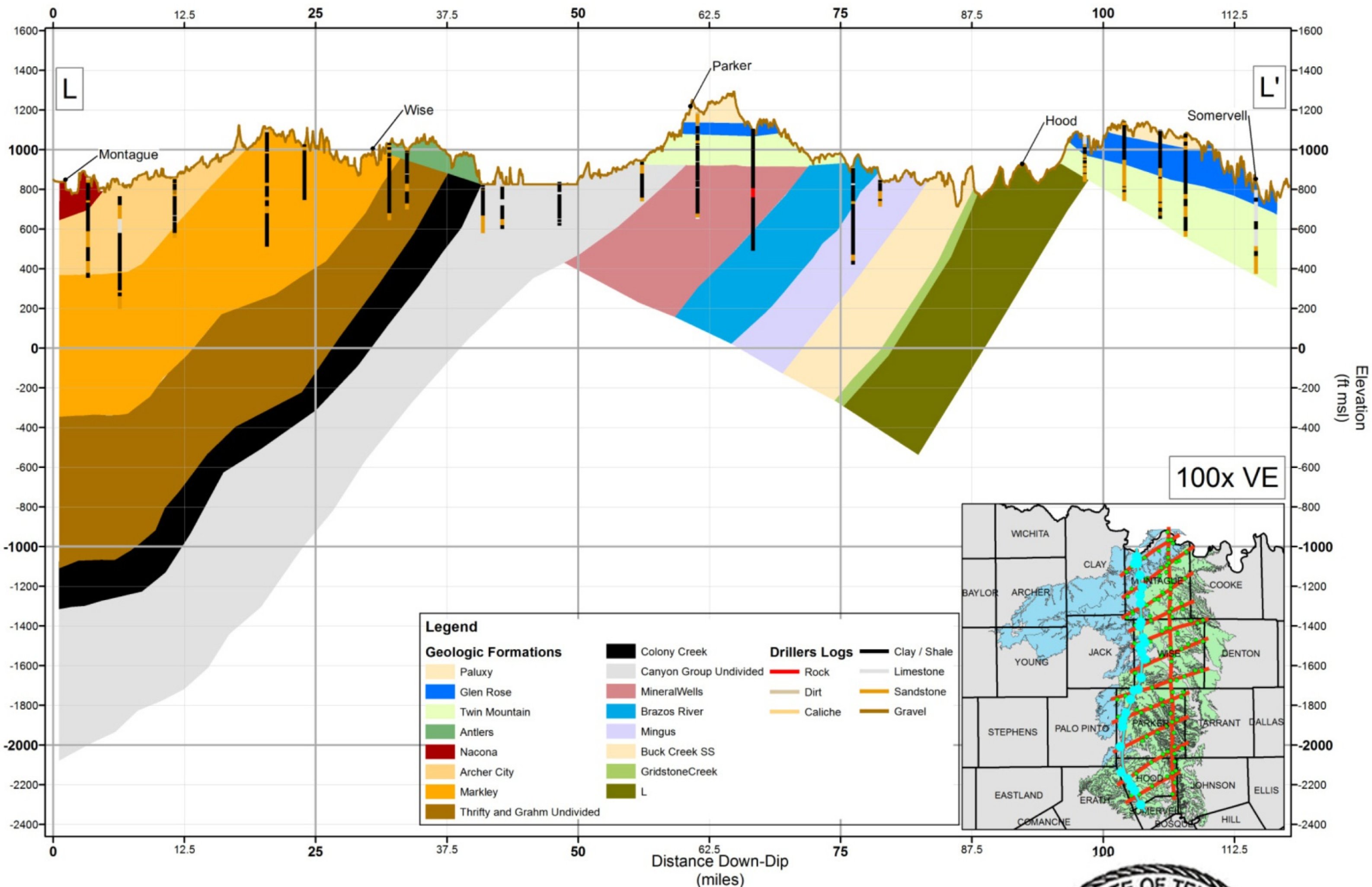


Figure 15. Hydrogeologic Cross-Section L – L.

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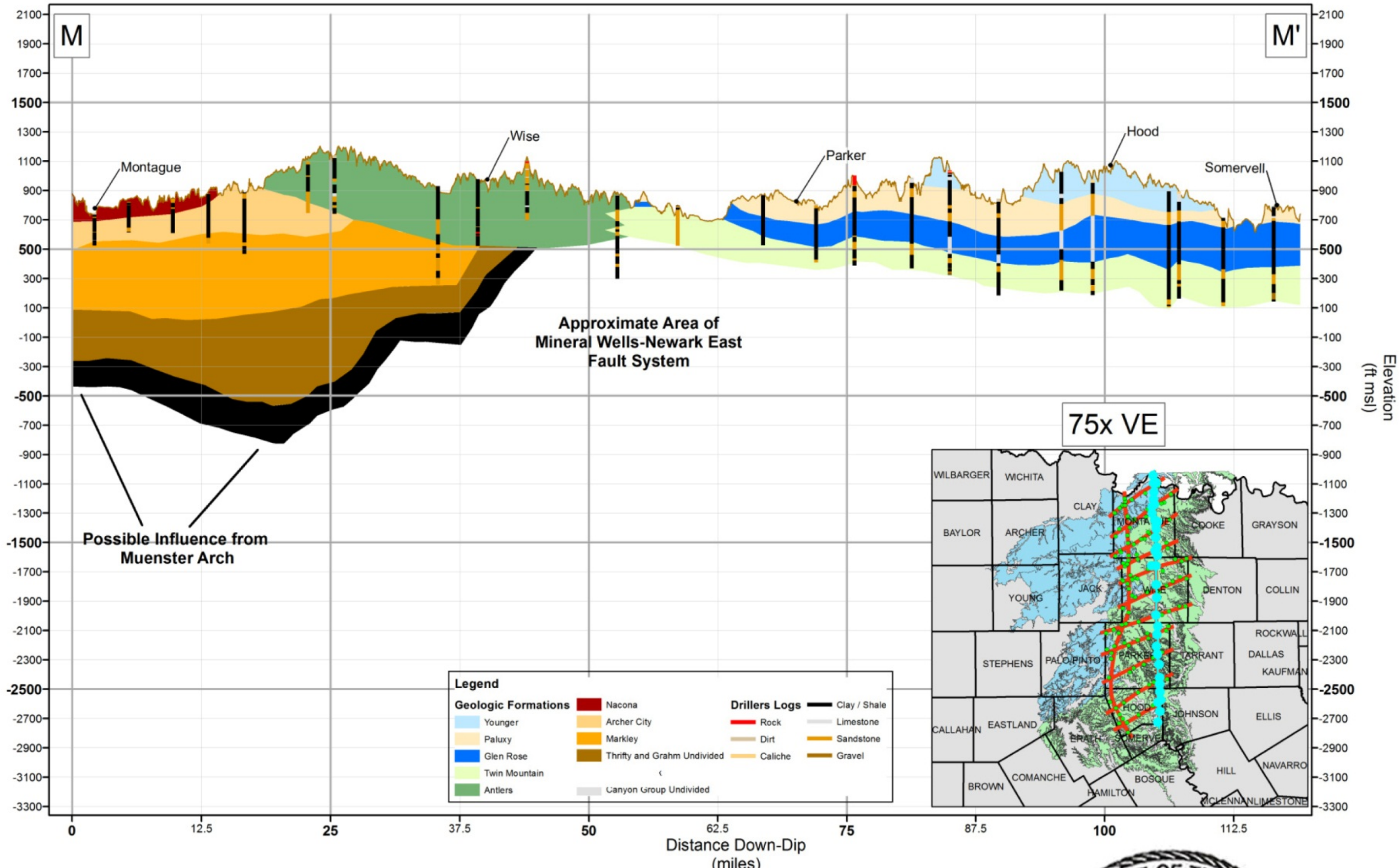

Figure 16. Hydrogeologic Cross-Section M – M.

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3.0 Development of the UTGCD Monitoring Strategy

The purpose of Task 2 is to document a monitoring strategy for the District that defines the objectives and goals of the monitoring network, provides a context for evaluating Phase I monitor wells, and helps guide the expansion of the monitoring network in Phase II. The process of developing the monitoring strategy has been divided into three primary activities:

- Refine monitoring plan objectives and goals;
- Define monitoring constraints, if they exist; and
- Develop the strategy for expansion of the monitor well network and program

These activities are documented in this section.

3.1 Monitoring Plan Objectives and Goals

There are many objectives that can be defined for a monitoring program, derived from several separate but overlapping requirements of a District. In our review of the potential monitoring requirements, it was determined that monitoring objectives could be derived from several sources including:

- Chapter 36 (The Water Code) of the Texas Administrative Code;
- Current and future District rules;
- Groundwater Management Plan; and
- Fundamental hydrogeologic characterization of aquifer conditions.

A review of the requirements that precipitate monitoring will be followed by a list of potential monitoring objectives.

3.1.1 Chapter 36 of the Texas Administrative Code

At a fundamental level, all monitoring requirements are derived from the statute defining the Groundwater Conservation Districts (TAC 36).

TAC 36.101 – Rulemaking Authority - Under TAC 36.101 the District has the authority to develop rules. The District is still in the early stages of its development of a comprehensive system to manage the groundwater resources located within its boundaries. The District is acutely aware that the path it ultimately pursues for the permitting and regulation of water wells may have a significant impact on the manner in which water is provided to support human, animal, and plant life, land development, public water supplies, commercial and industrial operations, agriculture, and other economic growth in the District. The District Board takes its responsibilities very seriously with regard to these decisions and the impacts they may have on the property rights of the citizens of the District, and desires to undertake its approach to the development of a permitting and regulatory system in a careful, measured, and deliberate manner. In that regard, the District is determined to accumulate as much data and information as is practicable on the groundwater resources located within its boundaries before developing permanent rules and regulations that would impose permitting or groundwater production regulations on water wells.

The District began its initial studies and analysis of the aquifers and groundwater use patterns in early 2008 in an attempt to both catch up with then-ongoing discussions regarding the development of desired future conditions of the aquifers by the existing groundwater conservation districts in GMA-8, and to develop some baseline information on which decisions could be made for the development of temporary rules governing water wells. In August 2008, the District adopted its first set of temporary rules, which pioneer the District's information-gathering initiative. The District recognizes that the collection of District-scale hydrogeologic information such as groundwater levels, stratigraphy and hydraulic properties is critical to making sound policy and rules. As a result, both the Phase I and Phase II Monitoring Programs are being developed to support these fundamental requirements of the District.

TAC.36.1071 – Management Plan - The 75th Texas Legislature established a comprehensive regional and statewide water planning process in 1997. A critical component of that far-reaching overhaul of the Texas' water planning process included a requirement that each groundwater conservation district develop a management plan that defines the water needs and supply within each district and defines the goals the district will use to manage the groundwater in order to meet the stated needs or demonstrate that the needs exceed available groundwater supplies. Information from each district's management plan is incorporated into the regional and state water plans. The management plan is also used as the basis for the development of the district's permitting and groundwater management rules. A key component of the management plan is the establishment of a set of performance standards and management objectives which the District will use to demonstrate that they are achieving management goals set forth in the plan.

TAC.36.108 – Joint Planning in Management Area - This statute requires joint planning among districts located within the same Groundwater Management Area ("GMA"). Among other activities conducted pursuant to this joint planning process, the districts within each GMA must establish desired future conditions for all relevant aquifers located in whole or in part within the GMA. The desired future conditions established through this process are then submitted to the Texas Water Development Board ("TWDB"), which is required to provide each district with estimates concerning the amount of groundwater that can be produced from each relevant aquifer annually within each county located in the GMA in order to achieve the desired future conditions established for each aquifer. This quantified annual water budget for each aquifer is known as the "Modeled Available Groundwater" or "MAG" amount. Chapter 36 requires that technical information, such as the desired future conditions of the relevant aquifers within a district's jurisdiction and the amount of managed available groundwater from such aquifers, be included in the district's management plan. In addition, it is a requirement of the District to be able to demonstrate that they are achieving the DFC which can only be done through a monitoring program.

Other key aspects of this statute that are relevant to monitoring include the ability for a District to consider aquifer conditions and how they may vary geographically across a District. Statute TAC.36.108.D-1(1) states that districts can set DFCs differently in each aquifer, subdivision of an aquifer or geologic strata. This allows the District to adopt dissimilar regulatory approaches for wells completed in separate aquifers or in different geographic regions of the District, in order to address critical areas or to otherwise tailor regulations that are more suitable for a particular aquifer or area. For example, groundwater management strategies employed for the outcrop of the aquifer may differ from those utilized in subcrop areas. This regulatory flexibility may be appropriate to a District but requires hydrogeologic data including monitoring data to define these portions of the aquifer that may warrant such treatment.

3.1.2 Current or Future District Rules

In August 2008, the District adopted its first set of temporary rules, which pioneer the District's information-gathering initiative. Among other things, the rules require most large wells to be registered with the District, have meters installed to record the amount of groundwater produced, and submit records of the amounts produced to the District. Large well owners are also required to submit fee payments to the District based upon the amount of groundwater produced.

In addition, all new wells are required to be registered with the District and comply with the minimum well spacing requirements of the District. The minimum well spacing requirements were developed by the District to try to limit the off-property impacts of new wells to existing registered wells and adjoining landowners. They include minimum tract size requirements, spacing requirements from the property line on the tract where the well is drilled, and spacing requirements from registered wells in existence at the time the new well is proposed. The spacing distances were developed through hydrogeologic modeling of the varying sizes of the cones of depression of various well capacities, and such distances naturally increase with increases in well capacities. The District's spacing requirements should go a long way toward limiting well interference problems between new wells and between new and existing wells.

The District's monitoring network can be assimilated with groundwater production and use reports and estimates, well location and completion data, information on aquifer recharge rates and other hydrogeologic properties, and other information, in a database that the District is developing to enable it to better understand and manage the groundwater resources of the area. Information gleaned from these efforts will be used by the District in the future in the establishment of desired future conditions for the aquifers, in the monitoring of actual conditions of the aquifers and calibration of modeled conditions, in making planning decisions, and in the development of permanent District rules. These rules may include a permitting system for water wells and the potential for managing the District aquifers in a series of management zones recognizing the potential variability within the aquifers and their use.

3.1.3 Groundwater Management Plan

The Groundwater Management Plan provides several policy statements or management goals and performance standards that relate to the District Monitoring Plan. Specifically, the District's Mission statement states that the District will manage groundwater in a fair and equitable manner such that availability and accessibility of groundwater will remain for future generations. In addition the statement explicitly provides a desire to protect the quality of the groundwater in the recharge zone of the aquifer. This mission statement implies an understanding of the conditions of the aquifer (both water levels and water quality) that can only be accomplished through a deliberate monitoring program.

In the goals, management objective and performance standards section of the Management Plan the District sets specific goals and objectives specific to monitoring to comply with 31TAC(a)(1)(H) ((Implementing TWC §36.1071(a)(8)). These are reproduced below.

F.1 Objective - Within 3 years of Groundwater Management Plan adoption develop a Groundwater Monitoring Program within the District.

F.1 Performance Standard - Upon development, attachment of the District Groundwater Monitoring Program to the District's Annual Report to be given to the District's Board of Directors.

F.2 Objective - Upon approval of the District Monitoring Program – conduct water level measurements at least annually on groundwater resources within the District.

F.2 Performance Standard - Annual evaluation of water-level trends and the adequacy of the monitoring network to monitor aquifer conditions within the District and comply with the aquifer resources desired future conditions. The evaluation will be included in the District's Annual Report to be given to the District's Board of Directors. (See Table 5, in the main document)

F.3 Objective - Monitor non-exempt pumping within the District for use in evaluating District compliance with aquifer desired future conditions.

F.3 Performance Standard - Annual reporting of groundwater used by non-exempt wells will be included in the Annual Report provided to the District's Board of Directors. (See Table 2in the main document)

3.1.4 Fundamental Hydrogeologic Characterization of Aquifer Conditions

In addition to the requirements of monitoring described above, the management of groundwater implies groundwater monitoring and the collection of hydrogeologic data to characterize groundwater conditions. These generally support all of the implied or explicit objectives or requirements for monitoring and basic data collection defined in the preceding three sections. The objectives which may be classified as supporting hydrogeologic characterization include:

- Characterize current baseline groundwater levels in aquifers within the District;
- Characterize trends in aquifer levels in the District;
- Characterize hydraulic gradients within the District, i.e.:
    - Horizontal within aquifers
    - Vertical between aquifers
- Identify aquifers or aquifer zones that may respond distinctively to development and thus may be candidates for different management rules, e.g.:
    - Shallow versus deep (unconfined versus confined)
- Characterize aquifer response to pumping;
- Quantify available groundwater in the District;
- Identify areas susceptible to drought or significant drawdown from increased pumping during drought;
- Monitor aquifer water quality and trends in water quality, e.g.:
    - Isotopic fingerprinting of methane and other higher hydrocarbons (C_2-C_6) in areas of intense fracing operations
    - Characterization of brackish resources in the District
- Identify zones prone to surface contamination;
- Estimate recharge;
- Estimate groundwater and surface water interaction.

3.1.5 Summary of Monitoring Goals and Objectives

From the review of potential monitoring objectives and requirements provided in the sections above, one can conclude that there are many reasons for monitoring, many of which overlap. All of these monitoring objectives are worthy of consideration and relevant to the management of groundwater resources. While all identified objectives may be considered given the general mission statement for the District, it makes sense to prioritize the most important objectives above those that are not required through rule, statute or Management Plan requirements.

We consider the following monitoring objectives to be most important because they are either implicitly or explicitly required based upon the Districts rules or Management Plan.

- Establish current baseline groundwater levels in aquifers within the district;
- Establish trends in aquifer levels in the District;
- Define unique aquifer areas that could be established as separate groundwater management areas and therefore be handled differently in future rules, e.g.:
    - Shallow versus deep
    - Aquitards versus Aquifers
    - Paleozoic aquifer system versus the Trinity aquifer
- Provide adequate information to define future DFCs both in the Trinity and the Paleozoic Aquifers;

  - Better inform what is sustainable pumping
  - To be used to develop a better groundwater availability model
- Provide a means for definition of Desired Future Conditions within the district and a method for compliance demonstration.

There are several other monitoring requirements that are likely important to the District but may be of lower priority. These could include:

- Establish water quality within the District and trends in water quality;
- Determine areas prone to water quality degradation;
- Determine areas prone to drought to perhaps assist in drought planning;
- Provide a basis for drought management planning and drought impacts on groundwater conditions; and
- Define the base of freshwater in the District as well as the extent of brackish resources;
- Monitor the base of useable water as defined by the Railroad Commission, especially in areas of high density oil and gas exploration and production;
- Develop some isotope signature data in the deep aquifers in areas of high density oil and gas exploration and production;
- Monitor recharge in the shallow unconfined aquifer systems;
- Monitor aquifer levels at the borders of the District to define potential impacts from pumping outside of the District.

3.2 Monitoring Constraints

There are several constraints that one may consider applicable to the expansion of an existing monitoring network. These may include:

- Staff resources available to monitor network (number of wells);
- Costs associated with monitoring (number of wells);
- Current DFC and inherent assumptions and
- New versus existing wells.

Each of the more important constraints to our analysis will be described in the following sections.

3.2.1 Number of Wells

There exists a physical limit as to the number of wells that District staff can visit in a quarter and measure water level while still performing their other duties. This constraint has been brought up with the Board and the General Manager and at this time it is the District's opinion that they could double the number of wells in the current network. For purposes of this analysis, we are assuming that another 80 wells could be brought into the network in addition to those currently in the network. This number could change as we go through the analysis phase of this study. It is also assumed that the resources required to manage the larger network are available to current District staff.

3.2.2 Cost Constraints

It will be assumed that costs associated with the addition of 80 monitor wells will be acceptable from a District perspective. In addition, we will assume that each existing well will require an equal resource commitment for sampling.

3.2.3 Desired Future Condition and Basis

The current Northern Trinity Aquifer DFC is based upon the Northern Trinity GAM (Bené and others, 2004). In the GAM, the Trinity Aquifer is divided into four model layers generally representing the dominant hydrostratigraphy of the Trinity Aquifer in Central and North-Central

Texas; the Upper Trinity (Paluxy and Glen Rose aquifers), the Middle Trinity (Hensell aquifer) and the Lower Trinity (Hosston aquifer). The GAM models the Paluxy aquifer as model layer 3, the Glen Rose aquifer as model layer 4, the Hensell aquifer as model layer 5, and the Hosston aquifer as model layer 7. Model layer 6 represents the Pearsall/Cow Creek/Hammett members of the Travis Peak Formation, which are conceptualized as a confining unit. The relationship between these model layers and the hydrostratigraphy in the District is illustrated in **Table 2**. Table 2 shows that the GAM layering is inconsistent with the District hydrostratigraphy and this discrepancy becomes worse as one moves into the Antlers Formation in the Northern parts of the District. The Hensell and Hosston aquifers are generally not defined in the District but are combined as the Travis Peak Formation. As one moves north of the middle of Wise County, the Glen Rose (model layer 4) also becomes unidentifiable as a distinct unit and is generally lumped with the Antlers Formation. In regions of the District north of Decatur, the entire Trinity Aquifer sequence is generally mapped as the Antlers Formation.

Because the GAM was used as a means of defining desired future conditions as well as estimating the modeled available groundwater, the following discussion of the DFC uses terms of hydrostratigraphic nomenclature and model layers consistent with the GAM.

Table 2. Relationship Between District Trinity Aquifer Hydrostratigraphy and the Current Northern Trinity Aquifer GAM.

<table>
<tr><th colspan="2">District Geology</th><th colspan="2">GAM Model</th></tr>
<tr><th>Montague and northern Wise counties</th><th>Hood, Parker, southern Wise counties</th><th>Model Stratigraphy</th><th>Model Layer</th></tr>
<tr><td rowspan="5">Antlers Formation</td><td>Paluxy Sand</td><td>Paluxy aquifer</td><td>3</td></tr>
<tr><td>Glen Rose Formation</td><td>Glen Rose aquifer</td><td>4</td></tr>
<tr><td rowspan="3">Twin Mountains Formation</td><td>Hensell aquifer</td><td>5</td></tr>
<tr><td>Pearsall/Cow Creek/Hammett/ Sligo confining unit</td><td>6</td></tr>
<tr><td>Hosston aquifer</td><td>7</td></tr>
</table>

The desired future conditions were specified based upon average drawdown from the year 2000 through the year 2050 on a county and aquifer (model layer) basis. **Table 3** defines the desired future conditions for the four counties comprising the District for the Northern Trinity Aquifer. For example, for the Hosston aquifer in Hood County, the specified management goal (desired future condition) is defined “from estimated year 2000 conditions, the average drawdown of the Hosston Aquifer should not exceed approximately 56 feet after 50 years” (Wade, 2009). All of the desired future conditions are specified in Wade (2009) in a similar format. These are summarized in **Table 3**.

Table 3. Desired Future Conditions and Managed Available Groundwater for the Northern Trinity Aquifer in the District.

County	Trinity Sub-Aquifer	Desired Future Condition(1)	Managed Available Groundwater (2) (AFY)
Hood	Paluxy	1	942
	Glen Rose	2	4
	Hensell	16	3,595
	Hosston	56	6,604
Hood County Total		NA	11,145
Parker	Paluxy	5	9,800
	Glen Rose	6	192
	Hensell	16	1,441
	Hosston	40	3,815
Parker County Total		NA	15,248
Wise	Paluxy	4	2,559
	Glen Rose	14	5
	Hensell	23	1,480
	Hosston	53	5,238
Wise County Total		NA	9,282
Montague	Paluxy	0	505
	Glen Rose	1	-
	Hensell	3	362
	Hosston	12	1,807
Montague County		NA	2,674
District Total		**NA**	**38,349**

OUTDATED

(1) Average drawdown in feet after 50 years from the year 2000
(2) from GAM Run 08-84mag (Wade, 2009)

From a monitoring network perspective, any aquifer DFC is very important in that it defines a constraint on how the monitoring network should be configured. The District Management Plan has explicit performance standards for evaluating the District monitoring program with respect to its adequacy to comply with the DFC. As a result, the monitoring network must be evaluated against the DFC. The current Trinity Aquifer DFC and MAG are couched in terms of GAM model layers that do not necessarily correlate to the District hydrogeology. However, the model layering must be used as a basis for evaluating and further developing the District monitoring network. We will also review the monitoring network using the hydrogeologic framework defined in Section 2.0.

GMA-8 did not propose a DFC for the Paleozoic aquifers systems in the District during Round 1 of the Joint-Planning Process. As a result, there is no equivalent DFC to be used to constrain the monitoring network. For the Paleozoic aquifers we will use the hydrogeologic framework defined in Section 2.0.

Finally, it has been documented by the District that the current Northern Trinity GAM has limitations to its use. As a result, four Districts within GMA-8 agreed to make revisions to the GAM over the course of the last 2 years. GAMs provide useful tools for supporting monitor well network development activities. The current Northern Trinity GAM is not ideal for these purposes for the UTGCD. However, we will try to use the GAM to the degree possible to understand the development of a monitor well network that can defensibly be used to evaluate aquifer conditions as they relate to the DFC.

3.2.4 New Versus Existing Wells

We are assuming that due to cost considerations, the Phase II wells will overwhelmingly consist of existing wells. It may be that once the analysis of the current network and the availability of existing wells are known, drilling a new well may be recommended to the District. However, new wells will only be recommended after the analysis has determined the need.

3.3 Monitoring Strategy

The monitoring strategy is meant to define the strategic concepts or framework that will guide the evaluation and augmentation of the Phase I monitoring network. While the summary in Section 3.1.5 shows that the individual objectives of a monitoring program can be numerous and varied, they all fall within a fundamental requirement: to be able to monitor the aquifer resources within the District at a scale commensurate with the management objectives or the future management objectives.

The current most important management objective stated for the District is the DFC Statement adopted by GMA-8 and instituted into the District Management Plan (Section 3.2.3 above). We will develop a strategy that keeps the DFC in center focus while also looking at other important aspects of District hydrogeology such as trends in water levels, current pumping distribution, shallow versus deep well screens and the hydrogeologic framework defined in Section 2.0.

The Paleozoic Aquifers do not currently have a DFC developed. The strategy that is developed for the Paleozoic aquifers will be informed by the development of the Trinity Aquifer monitoring strategy, with variation for the unique hydrogeology of the Paleozoic aquifers.

3.3.1 Trinity Aquifer Monitoring Strategy

Our strategy for the assessment of the current Phase I Trinity Aquifer monitoring network will also be used to guide the augmentation of the network in Phase II. The process will be sequential, as outlined in the following.

Step 1 – Establish Full Set of Potential Monitor Wells:

The first step will require two data sets. One is the existing Phase I monitor well network and data. The second will be a database with the available completion (screen location) information for all other potential wells. A potential well must have adequate location, elevation and completion information available, that any water level measurement can be accurately referenced to a common vertical datum, and definitely assigned to a particular aquifer or section of aquifer. It will also be important that the monitor well has a history of water level measurements. Because the DFC is based upon drawdown since the year 2000, it would be best if the time series starts by the year 2000, or can be reliably extrapolated back to that time.

In addition to these attributes, there are other practical considerations that can only be assessed once site visits have begun.

Step 2 – Develop DFC Zones:

The second step will be to divide the Trinity Aquifer within the District into 20 zones based upon the current DFC (termed DFC Zones). These zones are defined by the combination of Northern Trinity Aquifer GAM layer (based on the model grid discretization) and county. An initial assessment of the Phase I wells will be performed to determine whether a monitor well currently exists in each DFC Zone. If this is not the case, we try to find a candidate well for those “empty” zones.

Step 3 – Investigation of Monitor Well Location Based Upon DFC Methods:

Step 3 is an empirical study of the required or optimal number of monitor wells that may be required in a given DFC Zone to reproduce the DFC as calculated from the GAM. The TWDB calculated the DFC using the GAM by averaging drawdown calculated at each GAM model cell for a given model layer and county (DFC Zone) from the year 2000 to 2050. The GAM model grid is a one square mile grid. The District cannot support a monitoring program that would monitor every square mile of the District (3,208 square miles times four model layers equals 12,832 monitor wells). Therefore, the question that has to be addressed is how many monitor wells are required to provide good agreement with the model average methods used by GMA-8.

To test the number of required wells, we will simulate the performance of a hypothetical monitoring network using the existing DFC run. We will start by ensuring that each DFC Zone has at least one monitor well, from the Phase I wells and potential new monitor wells. At these well locations, we will extract the simulated head from the DFC run. These point “measurements” of head represent the simulated monitoring network. We will then estimate average drawdown in each DFC Zone based on these heads. The average will be calculated by interpolating the point “measurements” onto a one square mile grid, then taking the arithmetic mean of the grid values for each DFC Zone.

The DFC Zone drawdown averages estimated from the simulated monitoring network will be compared to the actual DFC run drawdown averages by DFC Zone. We expect there will be a difference between the two values, since the monitoring network has a limited head coverage compared to the GAM.

In a next iteration, we increase the number of monitor wells in those zones with the greatest difference between the estimate from the hypothetical monitoring network and the GAM. The new wells will be located based on an equal area, space filling approach or potentially by adding monitor points at locations where we have identified potential monitor wells. We will consider both options. This increase in well coverage will improve the performance of the monitor well network in those zones. Thus with each iteration, the hypothetical monitoring network will provide an average drawdown estimate that is closer to the DFC.

By this analysis, we hope to gain insight into the number (and potentially the strategy for location) of monitor wells that will adequately track the DFC. The best case we can expect out of this analysis approach is an optimal number of monitor wells in each DFC Zone.

An enhancement to the above analysis would be to look at the improvement (i.e., decrease in monitoring points) that may occur if we account for pumping in our monitor well selection process, instead of the initial space-filling approach. This would require calculation of a pumping density function (acre-feet per year per square-mile) that will be used to guide the location of additional monitor wells. Theoretically, this approach should improve our ability to reproduce the DFC with a smaller number of monitor points.

At the end of Step 3, we hope to have insight into the number of monitor wells it takes to satisfactorily reproduce the DFC average drawdown for each DFC Zone. We will also gain insight into the proposed approach for locating new wells based on pumping density.

Step 4 – Consideration of Water Level Trends:

In Step 4 we will use an analysis of water level trends to provide additional information for locating monitor wells. A monitor well program should be able to track large scale water level declines as a result of large pumping centers as well as regions of the aquifer that appear stable. Our objective is to characterize the trends in water levels at a scale much smaller than a county but not directly affected by pumping (i.e. not in a pumping well or directly adjacent to one).

We will use the data from the Phase I monitor wells in addition to any other available time series data to develop trends. We will focus our analysis on the time period from 2000 to present as this is the drawdown baseline used in the GMA-8 DFC calculations. We will look at two alternatives for this analysis. First, we will see if we have adequate time series data to investigate trends in each DFC Zone. Second, we will look at the dataset more globally and see if the data is defining areas of stable versus decreasing water level trends.

Step 5 - Initial Monitor Well Location Based Previous Analyses:

By this point in the analysis we will have developed some insight into:

- the number of wells needed to satisfactorily reproduce the DFC calculations;
- the influence of pumping on developing a better monitoring network; and
- trends in water levels across the District.

Based on this knowledge, we are ready to evaluate the Phase I wells and start identifying potential Phase II wells.

The first requirement will be the development of a District pumping dataset based upon the District's metered data and the District's best estimate of groundwater use. We will attempt to locate pumping as closely as possible to point locations. Once this is developed, we will use the actual District pumping data to develop a pumping density function for the District. We will then use the DFC Zones, the pumping data and the water level trend data to evaluate Phase I wells and to identify potential Phase II monitor wells.

Step 6 –Screen Monitor Well Locations Based on Updated Hydrogeology:

Because much of the focus at this point has been on the GAM model layering which is based on hydrostratigraphy that is not well matched to District conditions, the next step in the strategy is to compare the draft monitoring network to the hydrogeology developed as part of this scope of work (see Section 2). We will intersect all monitor well screens with the new hydrogeologic framework and make sure that these intervals are being adequately monitored.

Step 7 –Screen Monitor Well Locations Considering Shallow versus Deep:

Finally, we will review the draft monitoring network in terms of how well it does at monitoring aquifer conditions across the District in both shallow (unconfined to semi-confined) and deep (confined) portions of the aquifer system. We will also develop a registered well density coverage and assess whether the overall monitoring network does a good job of mimicking the density of groundwater use as it can be defined from registered wells.

3.3.2 Paleozoic Aquifer Monitoring Strategy

Our strategy for the Paleozoic Aquifers will be similar to that proposed for the Northern Trinity Aquifer with the exception that we will not be defining DFC Zones. Below each step will be discussed in terms of the Paleozoic Aquifers. We will develop similar zones based upon the hydrogeologic framework for assessment of the current Phase I Trinity Aquifer monitoring network. These zones will also be used to guide the augmentation of the network in Phase II. The process will be sequential.

Step 1 – Establish Universe of Potential Monitor Wells:

The same strategy and process used for the Trinity aquifer will be used for the Paleozoic aquifers (see Section 3.3.1, Step 1).

Step 2 – Develop Hydrostratigraphic-County Zones:

The second step will be to divide the Paleozoic aquifers into unique Hydrostratigraphic-County zones. Initially we will define five unique hydrostratigraphic units (Wichita, Bowie, Cisco, Canyon and Strawn) and four counties making 20 maximum combinations. In reality, there are fewer because each hydrostratigraphic unit does not reside in every county. An initial assessment of the Phase I wells will determine whether a monitor well is located in each of the Hydrostratigraphic-County zones. If this is not the case, we try to identify a potential well in each.

Step 3 – Investigation of Monitor Well Location Based Upon DFC Methods:

Step 3 cannot be performed for the Paleozoic aquifers because they have neither a DFC nor a GAM.

Step 4 – Consideration of Water Level Trends:

In Step 4 we will use an analysis of water level trends to provide additional information for locating monitor wells. In a monitor well program you want to be able to monitor large scale water level declines as a result of large pumping centers as well as monitor regions of the aquifer that appear stable. Our objective is to characterize the trends in water levels at a scale much smaller than a county but not directly affected by pumping (ie., not in a pumping well or directly adjacent to one).

We will use the data from the Phase I monitor wells in addition to any other available time series data to develop trends. We will look at two alternatives for this analysis. First, we will see if we have adequate time series data to investigate trends in each Hydrostratigrahic-County zone. Secondly, we will look at the dataset more globally and see how the data is defining areas of stable versus decreasing water level trends.

Step 5 - Initial Monitor Well Location Based Previous Analyses:

We will use the insight gained from Step 3 in the Trinity aquifer analysis along with the trend analysis data to evaluate the Phase I wells and to start identifying potential Phase II wells.

The first step of this analysis will be the development of a District pumping dataset based upon the District's metered data and the District's best estimate of groundwater use. We will attempt to locate pumping as closely as possible to point locations. Once this is developed, we will use the actual District pumping data to develop a pumping density function for the District. Once we have that we will use the Hydrotsratigraphic-County zones, the pumping data and the water level trend data to identify Phase I redundant wells and to identify potential Phase II monitor wells. In addition to the District database, we currently have the last 10 years of driller's reports for wells identified as being drilled for oil and gas exploration. We can also get the last 10 years of oil and gas well locations from the Railroad Commission for approximately $200. This data can help us see where oil and gas water use is most likely.

Step 6 –Screen Monitor Well Locations Based on Updated Hydrogeology:

Because we are using the hydrostratigrahic framework to develop the network, this step is unnecessary.

Step 7 –Screen Monitor Well Locations Based Upon Shallow versus Deep Screens:

Finally, we will review the draft monitoring network in terms of how well it does at monitoring aquifer conditions across the District in both shallow (unconfined to semi confined) and deep (confined) portions of the aquifer system. We will also develop a registered-well density coverage to assess whether the overall monitoring network does a good job of mimicking the density of groundwater use as it can be defined from registered wells.

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Upper Trinity Groundwater Conservation District

ANNUAL FINANCIAL REPORT

FOR THE YEAR ENDED DECEMBER 31, 2018

UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT
Annual Financial Report
For the Year Ended December 31, 2018

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Report on the Financial Statements

We have audited the accompanying financial statements of the governmental activities and the major fund information of the Upper Trinity Groundwater Conservation District (the District) as of and for the year ended December 31, 2018, and the related notes to the financial statements, which collectively comprise the District's basic financial statements as listed in the table of contents.

Management's Responsibility for the Financial Statements

Management is responsible for the preparation and fair presentation of these financial statements in accordance with accounting principles generally accepted in the United States of America; this includes the design, implementation, and maintenance of internal control relevant to the preparation and fair presentation of financial statements that are free from material misstatement, whether due to fraud or error.

Auditor's Responsibility

Our responsibility is to express opinions on these financial statements based on our audit. We conducted our audit in accordance with auditing standards generally accepted in the United States of America. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the entity's preparation and fair presentation of the financial statement in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. Accordingly, we express no such opinion. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinions.

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Opinions

In our opinion, the financial statements referred to above present fairly, in all material respects, the respective financial position of the governmental activities and the major fund of Upper Trinity Groundwater Conservation District as of December 31, 2018, and the respective changes in financial position for the year then ended in accordance with accounting principles generally accepted in the United States of America.

Other Matters

Required Supplementary Information

Accounting principles generally accepted in the United States of America require that the management's discussion and analysis, budgetary comparison information, schedule of change in Net Pension Liability and Related Ratios, Schedule of Contributions, and Notes to Required Supplementary Information on pages 4 through 8, page 30, and pages 31 through 33, respectively, be presented to supplement the basic financial statements. Such information, although not a part of the basic financial statements, is required by the Governmental Accounting Standards Board, who considers it to be an essential part of the financial reporting for placing the basic financial statements in an appropriate operational, economic, or historical context. We have applied certain limited procedures to the required supplementary information in accordance with auditing standards generally accepted in the United States of America, which consisted of inquiries of management about the methods of preparing the information and comparing the information for consistency with management's responses to our inquiries, the basic financial statements, and other knowledge we obtained during our audit of the basic financial statements. We do not express an opinion or provide any assurance on the information because the limited procedures do not provide us with sufficient evidence to express an opinion or provide any assurance.

Boucher, Morgan & Young

Stephenville, Texas
July 25, 2019

MANAGEMENT’S DISCUSSION AND ANALYSIS

UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT
MANAGEMENT'S DISCUSSION AND ANALYSIS

As management of the Upper Trinity Groundwater Conservation District, we offer readers of the District's financial statement this narrative overview and analysis of the financial activities of the District for the fiscal year ended December 31, 2018. The District has implemented Governmental Accounting Standards Board Statement 34 –Basic Financial Statements and Management's Discussion and Analysis for State and Local Governments.

Financial Highlights:

> The assets and deferred outflows of the Upper Trinity Groundwater Conservation District exceeded its liabilities and deferred inflows at the close of the most recent fiscal year by $5,091,340.
>
> The District's total net position increased by $463,499 during the fiscal year.

Overview of Financial Statements:

This discussion and analysis is intended to serve as an introduction to the District's basic financial statements. The District's basic financial statements are comprised of three components: 1) government-wide financial statements, 2) fund financial statements, and 3) notes to the financial statements. This report also contains other supplementary information in addition to the basic financial statements themselves.

Government-wide financial statements – The government-wide financial statements are designed to provide readers with a broad overview of the District's finances, in a manner similar to a private-sector business.

The Statement of Net Position presents information on all of the District's assets and liabilities, with the difference between two reported as net position. Over time, increases or decreases in net position may serve as a useful indicator of whether the financial position of the District is improving or deteriorating.

The Statement of Activities presents information showing how the District's net position changed during the fiscal year. All changes in net position are reported when the underlying event giving rise to change occurs, regardless of the timing of related cash flow. Thus, revenues and expenses are reported in this statement for some items that will only result in cash flows in the future fiscal periods.

Both of the government-wide financial statements distinguish functions of the District that are principally supported by charges and fees. The governmental activity of the District is to develop and enforce rules to provide protection to existing wells, to prevent waste and promote groundwater conservation.

Fund financial statements – A fund is a grouping of related accounts that is used to maintain control over resources that have been segregated for specific activities or objectives. The District, like other state and local governments, uses fund accounting to ensure and demonstrate compliance with finance-related legal requirements. The funds of the District consist solely of the one governmental fund.

Governmental Funds – Governmental funds are used to account for essentially the same functions reported as governmental activities in the government-wide financial statements. However, unlike the government-wide financial statements, governmental fund financial statements focus on near-term inflows and outflows of spendable resources, as well as on balances of spendable resources available at the end of the fiscal year. Such information may be useful in evaluating a government's near-term financing requirements.

Because the focus of governmental funds is narrower than that of the government-wide financial statements, it is useful to compare the information presented for governmental funds with similar information presented for governmental activities in the government-wide financial statements. By doing so, readers may better understand the long-term impact of a government's near-term financing decisions. Both the governmental fund balance sheet and the governmental fund statement of revenues, expenditures and changes in fund balance provide a reconciliation to facilitate this comparison between governmental funds and governmental activities.

> At the close of the current fiscal year, the District's governmental fund reported ending fund balance of $3,327,403 compared to the $3,277,079 in the prior year.

Notes to the Financial Statements – The notes provide additional information that is essential to a full understanding of the data provided in the government-wide and fund financial statements. The notes to the financial statements can be found on pages 17-28 of this report.

Governmental-Wide Financial Analysis

As noted earlier, net position may serve, over time, as a useful indicator of a government's financial position. In the case of Upper Trinity Groundwater Conservation District, assets and deferred outflows exceeded liabilities and deferred inflows by $5,091,340 as of December 31, 2018.

The largest portion of the District's net position is Unrestricted, while the remaining balance reflects its investment in capital assets.

Upper Trinity Groundwater Conservation District's Net position:

		Governmental Activities 2017		Governmental Activities 2018
Current assets	$	3,546,159	$	3,441,006
Capital assets		1,293,337		1,702,643
Total assets		4,839,496		5,143,649
Deferred outflows		37,416		39,942
Total assets and deferred outflows		4,876,912		5,183,591
Current liabilities		269,080		113,603
Non-current liabilities (assets)		(20,009)		(23,339)
Total liabilities		249,071		90,264
Deferred inflows		-		1,987
Total deferred inflows		-		1,987
Net position:				
Net investment in capital assets		1,293,337		1,702,643
Unrestricted		3,334,504		3,388,697
Total Net Position	$	4,627,841	$	5,091,340

As of December 31, 2018, the District is able to report positive balances in both categories of net position.

Analysis of the District's Operations – The following table provides a summary of the District's operations for the year ended December 31, 2018. Governmental-type activities increased the District's net position by $463,499.

Upper Trinity Groundwater Conservation District's Changes in Net position

	Governmental Activities 2017	Governmental Activities 2018
Revenues:		
Program Revenues:		
Water usage fees	$ 850,341	$ 907,049
New well registration fees	194,600	703,375
Other program revenue	38,347	28,494
Total program revenues	1,083,288	1,638,918
General Revenues:		
Miscellaneous revenue	4,427	5,790
Net Investment earnings	36,991	30,017
Total revenues	1,124,706	1,674,725
Expenses:		
Groundwater conservation	962,385	1,215,095
Total expenses	962,385	1,215,095
Change in net position	169,852	463,499
Net position - beginning of year, as previously reported	4,457,989	4,627,841
Net position - end of year	$ 4,627,841	$ 5,091,340

Financial Analysis of the Government's Funds

The net position increased in 2018 by $463,499 compared to a $169,852 increase in 2017. Increased water use by non-exempt well owners, such as Public Water Supply, along with an increase in well registration fee from $175 to $600 per well caused an increase in program revenue of approximately $555,630. Expenditures increased from the previous year by $252,710.

Capital Assets

The Upper Trinity Groundwater Conservation District's investment in capital assets as of December 31, 2018, amounts to $1,702,643 (net of accumulated depreciation). This investment in capital assets includes land, construction in progress, vehicles, furniture, equipment, and software.

Capital Assets at Year-End Net of Accumulated Depreciation

	Governmental - Type Activities 2017	Governmental - Type Activities 2018
Land	$ 267,834	$ 267,834
Construction in progress	729,240	97,391
Building	-	1,057,880
Automobiles	64,996	36,789
Furniture and equipment	95,403	96,798
Software	135,864	145,951
Total	$ 1,293,337	$ 1,702,643

Depreciation expenses on all assets amounted to $78,816 for the year.

Economic Factors for Next Year

The original budget for the 2019 fiscal year shows projected revenues of $1,591,700 and expenditures of $1,569,250.

On November 19, 2018 the Board of Directors of UTGCD passed and adopted Resolution 18-010 Allocation of Funds for the District. They designated “Committed Funds” for Operating Reserve Fund and Legal Reserve Fund. They also designated “Assigned Funds” for Monitoring Well Drilling Fund, Desired Future Conditions Preparation Fund, Facilities/Building Fund, and Technology Development Fund.

The Board believes it is very prudent to recognize the litigious nature of the process of DFC adoptions and related issues with the adoption of permanent rules, especially if those rules contain permit limitations on non-exempt water wells. In addition, the revenues from water usage could decline if certain situations occur. Therefore, the Board deems it wise to accumulate sufficient funds to cover operations and unexpected expenses should they lose any major fee payers.

The District’s immediate and long-term financial goals are to fund necessary water conservation and monitoring programs with program revenues and to safeguard the cash on hand for future needs.

Political issues affecting the District include potential groundwater ownership legislative issues, definition of “brackish” water, and discussions of the authority of groundwater conservation districts.

There could be a continued decrease in groundwater used for oil and gas exploration or production if companies continue to move out of the Barnett Shale or if they increase their use of alternative water sources. Also, production of groundwater by public water systems could decrease if they increase conservation efforts or increase their supply of surface water.

Request for Information

This financial report is designed to provide our citizens, customers, investors and creditors with a general overview of the District’s finances. If you have questions about this report or need any additional information, contact Upper Trinity Groundwater Conservation District in care of Doug Shaw, General Manager, 1859 W Hwy 199, P.O. Box 1749, Springtown, Texas 76082.

BASIC FINANCIAL STATEMENTS

UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT
STATEMENT OF NET POSITION
DECEMBER 31, 2018

	Governmental Activities
ASSETS	
Current assets:	
Cash and cash equivalents	$ 369,147
Certificates of deposit	2,609,557
Receivables, net of allowance	447,079
Deposits	1,610
Undeposited funds	13,613
Total current assets	3,441,006
Capital assets:	
Depreciable, net	1,702,643
Total assets	5,143,649
DEFERRED OUTFLOWS:	
Deferred retirement contributions	29,431
Deferred investment experience	8,949
Deferred assumption/input changes	1,562
Total deferred outflows	39,942
Total assets and deferred outflows	$ 5,183,591
LIABILITIES	
Current liabilities:	
Accounts and credit card payables	45,131
Payroll liabilities	19,232
Driller deposits	49,240
Total current liabilities	113,603
Non-current liabilities:	
Net pension liability (asset)	(23,339)
Total liabilities	90,264
DEFERRED INFLOWS:	
Deferred actual vs. assumption	1,987
Total deferred inflows	1,987
NET POSITION	
Net investment in capital assets	1,702,643
Unrestricted	3,388,697
Total net position	$ 5,091,340

The accompanying notes are an integral part of the financial statements.

UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT
STATEMENT OF ACTIVITIES
FOR THE YEAR ENDED DECEMBER 31, 2018

		Program Revenues	Net (Expense) Revenue and Changes in Net Position
			Primary Government
	Expenses	Charges for Services	Governmental Activities
Primary Government			
Governmental Activities			
General government	$ 1,211,226	$ 1,638,918	$ 427,692
Total governmental	1,211,226	1,638,918	427,692
General revenues			
Miscellaneous revenue			5,790
Investment earnings			30,017
Total general revenues			35,807
Change in net position			463,499
Net position - beginning			4,627,841
Net position - ending			$ 5,091,340

The accompanying notes are an integral part of the financial statements.

UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT
BALANCE SHEET - GOVERNMENTAL FUND
DECEMBER 31, 2018

		General Fund
ASSETS		
Cash and cash equivalents	$	369,147
Certificates of deposit		2,609,557
Accounts receivable, net of allowance		447,079
Security deposits		1,610
Undeposited funds		13,613
Total assets	$	3,441,006
LIABILITIES		
Accounts and credit cards payable	$	45,131
Payroll liabilities		19,232
Driller deposits		49,240
Total liabilities		113,603
FUND BALANCE		
Committed		750,000
Assigned		1,050,000
Unassigned		1,527,403
Total fund balance		3,327,403
Total liabilities and fund balance	$	3,441,006

The accompanying notes are an integral part of the financial statements.

UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT
RECONCILIATION OF THE GOVERNMENTAL FUND BALANCE SHEET
TO THE STATEMENT OF NET POSITION
DECEMBER 31, 2018

Total Fund Balance - Governmental Fund		$ 3,327,403
Capital assets used in governmental activities are not financial resources and therefore are not reported in governmental funds balance sheet.		1,702,643
The statement of net position includes the District's proportionate share of the TCDRS net pension liability (asset) as well as certain pension related transactions accounted for as Deferred Inflows and Outflows of resources.		
Net pension asset (liability)	23,339	
Deferred retirement contributions	29,431	
Deferred investment experience	8,949	
Deferred actual vs. assumption	(1,987)	
Deferred assumption/input changes	1,562	61,294
Net Position of Governmental Activities		$ 5,091,340

The accompanying notes are an integral part of the financial statements.

UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT
STATEMENT OF REVENUES, EXPENDITURES, AND CHANGES IN FUND BALANCE
GOVERNMENTAL FUND
FOR THE YEAR ENDED DECEMBER 31, 2018

	General Fund
Revenues:	
Exception fees	$ 9,395
Export fees	695
Penalties assessed	11,404
Forfeited deposits	7,000
New well registration fees	703,375
Semi-annual program income	907,049
Total program revenue	1,638,918
Investment earnings	30,017
Other sources	5,790
Total revenues	1,674,725
Expenditures:	
General government	1,136,279
Capital outlay	488,122
Total expenditures	1,624,401
Net change in fund balance	50,324
Fund balance - beginning of year	3,277,079
Fund balance - end of year	$ 3,327,403

The accompanying notes are an integral part of the financial statements.

UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT
RECONCILIATION OF THE GOVERNMENTAL FUNDS STATEMENT OF REVENUES, EXPENDITURES AND CHANGES IN FUND BALANCE TO THE STATEMENT OF ACTIVITIES
DECEMBER 31, 2018

Total Net Change in Fund Balance - Governmental Fund	$	50,324
Current year capital outlays are expenditures in the fund financial statements, but they should be shown as increases in capital assets in the government-wide financial statements. The net effect of removing the 2018 capital outlays is to increase net position.		488,122
Depreciation is not recognized as an expense in governmental funds since it does not require the use of current financial resources. The net effect of the current year's depreciation is to decrease net position.		(78,816)
Net pension liabilities as well as the related deferred inflows and outflows of resources generated from those assets are not payable from current resources and therefore, are not reported in the govenrmental funds. These balances increased (decreased) by this amount.		3,869
Change in Net Position of Governmental Activities	$	463,499

The accompanying notes are an integral part of the financial statements.

NOTES TO FINANCIAL STATEMENTS

1. Organization

The Upper Trinity Groundwater Conservation District (the "District") is a political subdivision of the State of Texas created under the authority of Article XVI, Section 59, Texas Constitution, and operating pursuant to the provisions of the Texas Water Code, Chapter 36, and Senate Bill 1983, Acts of the 80th Legislature, Regular Session, 2007. The creation of the District was confirmed in an election by the citizens of Montague, Wise, Parker and Hood counties, Texas, on November 6, 2007.

The mission of the Upper Trinity Groundwater Conservation District is to develop rules to provide protection to existing wells, prevent waste, promote conservation, provide a framework that will allow availability and accessibility of groundwater for future generations, protect the quality of the groundwater in the recharge zone of the aquifer, ensure that the residents of Montague, Wise, Parker, and Hood counties maintain local control over their groundwater, respect and protect the property rights of landowners in groundwater, and operate the District in a fair and equitable manner for all residents of the District.

2. Summary of Significant Accounting Policies

Generally Accepted Accounting Principles – Upper Trinity Groundwater Conservation District prepares its financial statements in accordance with accounting principles generally accepted in the United States of America, in conformity with authoritative pronouncements of the Governmental Accounting Standards Board (GASB).

A. Basis of Presentation – Government – Wide Statements

The government-wide financial statements (the statement of net position and the statement of changes in net position) report information on all the activities of the District. There are no governmental activities, which normally are supported by taxes and governmental revenues, and are reported separately from business-type activities, which rely to a significant extent on fees and charges for support.

The statement of activities demonstrates the degree to which the direct expenses of a given program are offset by program revenues. Direct expenses are those that are clearly identifiable with a specific program. Program revenues include charges to customers or applicants who purchase, use, or directly benefit from goods, services, meeting the operational or capital requirements of a particular program. Taxes and other items not properly included among program revenues are reported instead as general revenues.

B. Measurement focus, Basis of Accounting and Basis of Presentation

The government-wide statements are reported using the economic resources measurement focus and the accrual basis of accounting. Revenues are recorded when earned and expenses are recorded when a liability is incurred, regardless of the timing of related cash flow.

Governmental fund financial statements are reported using the current financial resources measurement focus and the modified accrual basis of accounting. Under the modified accrual basis of accounting, revenues are recognized as soon as they are measurable and available. Revenues are considered to be available when they are collectible within the current period or

2. Summary of Significant Accounting Policies (continued)

soon enough thereafter to pay the liabilities of the current period. Water usage fees for each six month period are due and payable one month after the period ends. The District recognizes all fees pertaining to the calendar year as revenues for that year.

Expenditures are generally recorded when the related fund liability is incurred.

The accounts of the Upper Trinity Groundwater Conservation District are organized and operated on the basis of funds. A fund is an independent fiscal and accounting entity with self-balancing set accounts. Fund accounting segregates funds according to their purpose and is used to aid management in demonstrating compliance with finance-related legal and contractual provisions. The minimum number of funds is maintained consistent with legal and managerial requirements.

The District reports the following major governmental fund: The *general fund* is the government's primary operating fund. It accounts for all financial resources of the general government, except those required to be accounted for in another fund.

There are no proprietary funds of the District generating significant operating revenues, such as charges for services, resulting from exchange transactions associated with the principal activity of the fund.

C. Cash and Cash Equivalents

For purposes of the statements of cash flows, the District considers highly liquid investments with a maturity of three months or less to be cash equivalent.

D. Capital Assets, Depreciation, and Amortization

The District's property, plant, and equipment with useful lives of more than one year stated as historical cost and comprehensively reported in the government-wide financial statements. The District generally capitalizes individual assets with an initial cost of $1,500 or more, or a grouping of like-kind assets with a total cost of $5,000 or more. Capital assets are depreciated using the straight-line method. When capital assets are disposed, the cost and applicable accumulated depreciation are removed from the respective accounts, and the resulting gain or loss is recorded in operations.

Estimated useful lives, in years, for depreciable assets are as follows:

Vehicles	5-7 years
Furniture and equipment	5 years
Software	5 years
Building	30 years

Maintenance and repairs which do not materially improve or extend the lives of the respective assets are charged to expense as incurred.

2. Summary of Significant Accounting Policies (continued)

E. Pensions

For purposes of measuring the net pension liability (asset), deferred outflows of resources and deferred inflows of resources related to pensions, and pension expense, information about the Fiduciary Net Position of the Texas County and District Retirement System (TCDRS) and additions to/deductions from TCDRS' Fiduciary Net Position have been determined on the same basis as they are reported by TCDRS. For this purpose, plan contributions are recognized in the period that compensation is reported for the employee, which is when contributions are legally due. Benefit payments and refunds are recognized when due and payable in accordance with the benefit terms. Investments are reported at fair value.

F. Budget

The District is legally required to adopt a budget and has done so in order to better manage its resources.

1. The budget is adopted on a basis consistent with accounting principles generally accepted in the United States of America (GAAP). Annual appropriated budgets are adopted for the general fund. All annual appropriations lapse at fiscal year end. The final amended expenditures budget for the general fund for the year ended December 31, 2018 totaled $1,779,200. The general fund revenues budgeted for the year were $1,524,200 which is less than the budgeted expenditures, resulting in a deficit budget for the year. The deficit is due to the District constructing an office building. It is being covered by an existing fund balance (see Note 8 for further details on fund balance assignments and commitments).

2. The Board of Directors may approve budget amendments during the year. The Board approved budget amendments through the year as required.

3. Formal budgetary integration is employed as a management control device during the year for the general fund.

G. Net Position and Fund Equity

Net position represents the difference between assets and liabilities. The net investment in capital assets component of net position consists of capital assets, net of accumulated depreciation, reduced by the outstanding balances of any borrowing used for the acquisition, construction or improvement of those assets, and adding back unspent proceeds. Net position is reported as restricted when there are limitations imposed on its use either through the enabling legislation adopted by the District or through external restrictions imposed by creditors, grantors, or laws and/or regulations of other governments.

2. Summary of Significant Accounting Policies (continued)

Fund Balance Classification - The governmental fund financial statements present fund balances based on classifications that comprise a hierarchy that is based primarily on the extent to which the District is bound to honor constraints on the specific purpose for which amounts in the respective governmental funds can be spent. The classifications used in the governmental fund financial statements are as follows:

Nonspendable - Resources which cannot be spent because they are either a) not in spendable form or; b) legally or contractually required to be maintained intact.

Restricted – Resources with constraints placed on the use of resources are either a) externally imposed by creditors (such as through debt covenants), grantors, contributors, or laws or regulations of other governments; or b) imposed by law through constitutional provisions or enabling legislation.

Committed – Resources which are subject to limitations the government imposes upon itself at its highest level of decision making (resolution), and that remain binding unless removed in the same manner.

Assigned - Resources neither restricted nor committed for which a government has a stated intended use as established by the Board of Directors, or an official to which to the Board of Directors has delegated the authority to assign amounts for specific purposes.

Unassigned – Resources which cannot be properly classified in one of the other four categories. The General fund is the only fund that reports a positive unassigned fund.

H. Estimates

The preparation of financial statements in conformity with accounting principles generally accept in the United States of America required management to make estimates and assumptions that affect the amounts reported in the financial statements. Actual results may differ from those estimates.

I. Receivables

Gross accounts receivable of $468,362 are presented in the Balance Sheet and Statement of Net Position net of an allowance for doubtful accounts in the amount of $21,283.

3. Deposits and Investments with Financial Institutions

At year end, the book balance of the District's checking account and certificates of deposit was $2,978,704 which was all unrestricted. The bank balance of $2,989,553 was fully covered by federal depository insurance or pledged securities, with the total cash and certificates split among area banks.

3. Deposits and Investments with Financial Institutions (continued)

At the end of the period the District had no deposits which were exposed to custodial credit risk. Custodial credit risk is the risk that in the event of a bank failure, the government's deposits may not be returned to it. The District's funds are required to be deposited and invested under the terms of the depository contract. All deposited funds are FDIC insured per the District's investment policy.

The State Public Funds Investments Act authorizes the government to invest in obligations of the U.S. Treasury, obligations of states, agencies, counties, cities and other political subdivisions, secured certificates of deposit, repurchase agreements, bankers' acceptances, commercial paper, mutual funds, guaranteed investment contracts and investment pools. During the year ended December 31, 2018, the District did not own any types of securities other than those permitted by statute.

4. Risk Management

The District is exposed to various risks of loss related to torts; theft of, damage to and destruction of assets; errors and omissions; injuries to employees; natural disasters; and the litigious nature of the political environment in which it operates. The District is covered through third-party insurance policies, and risk is also mitigated by the protections afforded it through the Texas Water Code, Chapter 36, Sections 36.066, 36.251 and 36.253.

5. Changes in Capital Assets

Capital assets consist of the following:

	Balance 12/31/2017	Additions	Retirements/ Adjustments	Balance 12/31/2018
Governmental activities:				
Non-depreciable assets:				
Land	$ 267,834	$ -	$ -	$ 267,834
Construction in progress	729,240	447,009	(1,078,858)	97,391
Total non-depreciable assets	997,074	447,009	(1,078,858)	365,225
Capital assets being depreciated:				
Building	-	-	1,078,858	1,078,858
Automobiles	214,554	-	-	214,554
Furniture and equipment	136,131	13,132	-	149,263
Software	185,560	27,981	-	213,541
Total capital assets being depreciated	536,245	41,113	1,078,858	1,656,216
Less accumulated depreciation:				
Building	-	(20,978)	-	(20,978)
Automobiles	(149,558)	(28,207)	-	(177,765)
Furniture and equipment	(40,728)	(11,737)	-	(52,465)
Software	(49,696)	(17,894)	-	(67,590)
Total accumulated depreciation	(239,982)	(78,816)	-	(318,798)
Total capital assets being depreciated, net	296,263	(37,703)	1,078,858	1,337,418
Governmental activities capital assets, net	$ 1,293,337	$ 409,306	$ -	$ 1,702,643

Depreciation expenses charged to the general government operations was $78,816.

6. Compensated Absences

It is the District's policy that employees will not receive payment for unused sick pay benefits upon separation from service. Therefore, no liability is reported for unpaid accumulated sick leave.

However, unused vacation and comp time earned is accrued as of December 31 and is payable upon separation from service. As of December 31, 2018, the District's liability for unpaid vacation and comp time was $11,872.

7. Estimates

The preparation of financial statements in conformity with generally accepted accounting principles requires management to make estimates and assumptions that affect certain reported amounts and disclosures. Accordingly, actual results could differ from those estimates.

8. Fund Balance Classifications

The Board passed a resolution during 2018 in order to commit a total of $750,000 for a legal reserve and litigation fund.

The Board has assigned the 2018 fund balance for the following purposes:

Monitoring well drilling fund	$500,000
Desired future conditions preparation fund	50,000
Facilities/building fund	50,000
Technology development fund	450,000

9. Retirement Plan

Plan Description

The District provides retirement benefits for all of its full-time and part-time employees through a nontraditional defined benefit plan in the state-wide Texas County and District Retirement System (TCDRS). The Board of Trustees of TCDRS is responsible for the administration of the state-wide agent multiple-employer public employee retirement. TCDRS in the aggregate issues a comprehensive annual financial report (CAFR) on a calendar year basis. The CAFR is available upon written request from the TCDRS Board of Trustees at P.O. Box 2034, Austin, TX 78768-2034.

Benefits Provided

The plan provisions are adopted by the governing body of the employer, within the options available in the Texas state statutes governing TCDRS (TCDRS Act). Members can retire at age 60 and above with 5 or more years of service, with 30 years of service regardless of age, or when the sum of their age and years of service equals 75 or more, when vested. Members are vested after 5 years of service but must leave their accumulated contributions in the plan to receive any employer-financed benefit. Members who withdraw their personal contributions in a lump sum are not entitled to any amounts contributed by their employer.

Benefit amounts are determined by the sum of the employee's contributions to the plan, with interest, and employer-financed monetary credits. The level of these monetary credits is adopted by the governing body of the employer within the actuarial constraints improved by the TCDRS Act so that the resulting benefits can expect to be adequately financed by the employer's commitment to contribute. At retirement, death or disability, the benefit is calculated by converting the sum of the employee's accumulated contributions and the employer-financed monetary credits to a monthly annuity using annuity purchase rates prescribed by the TCDRS Act. There are no automatic post-employment benefit changes, including automatic COLAs.

At the December 31, 2017 valuation and measurement date, the following employees were covered by the benefit terms:

Inactive employees of beneficiaries currently receiving benefits	1
Inactive employees entitled to but not yet receiving benefits	5
Active employees	8
	14

Contributions

The District has elected the annually determined contribution rate (Variable Rate) plan provision of the TCDRS Act. The plan is funded by monthly contributions from both employee members and the employer based on the covered payroll of employee members. Under the TCDRS Act, the contribution rate of the employer is actuarially determined annually.

The District contributed using the actuarially required contribution rate of 6.13% for the calendar year. The deposit rate payable by the employee members for calendar year 2018 is the rate of 5% as adopted by the governing body of the employer. The employee and employer deposit rates may be changed by the governing body of the District within the options available in the TCDRS Act.

9. Retirement Plan (continued)

Net Pension Liability

The District's Net Pension Liability (NPL) for the year ended December 31, 2018, was measured as of December 31, 2017, and the Total Pension Liability (TPL) used to calculate the Net Pension Liability was determined by an actuarial valuation as of that date.

Actuarial Assumptions:

The Total Pension Liability in the December 31, 2017 actuarial valuation was determined using the following actuarial assumptions:

Inflation	2.75% per year
Overall payroll growth	4.9% per year
Investment Rate of Return	8.0%, net of pension plan investment expense, including inflation

The annual salary increase rates assumed for individual members vary by length of service and by entry-age group. The annual rates consist of a general wage inflation component of 3.25% (made up of 2.75% inflation and .5% productivity increase assumptions) and a merit, promotion and longevity component that on average approximates 1.6% per year for a career employee.

Mortality rates for depositing members were based on 90% of the RP-2014 Active Employee Mortality Table for males and females as appropriate, projected with 110% of the MP-2014 Ultimate scale after 2014. Service retirees, beneficiaries and non-depositing members were based on 130% of the RP-2014 Healthy Annuitant Mortality Table for males and 110% of the RP-2014 Healthy Annuitant Mortality Table for females, both projected with 110% of the MP-2014 Ultimate scale after 2014. Disabled retirees were based on 130% of the RP-2014 Disabled Annuitant Mortality Table for males and 115% of the RP-2014 Disabled Annuitant Mortality Table for females, both projected with 110% of the MP-2014 Ultimate scale after 2014.

All actuarial assumptions that determined the total pension liability as of the December 31, 2017 valuation were based on the results of an actuarial experience study for the period January 1, 2013 – December 31, 2016, except where required to be different by GASB 68.

The long-term expected rate of return of 8% is determined by adding expected inflation to expected long-term real returns, and reflecting expected volatility and correlation. The capital market assumptions and information shown below are provided by TCDRS' investment consultant, Cliffwater LLC. The numbers shown are based on January 2018 information for a 10-10 year time horizon and are re-assessed at a minimum every four years, and it is set based on a 30-year time horizon, the most recent analysis was performed in 2017. See Milliman's TCDRS Investigation of Experience report for the period January 1, 2013 – December 31, 2016 for more details. Best estimates of geometric real rates of return (net of inflation, assumed at 1.95%) for each major asset class included in the target asset allocation (as adopted by the TCDRS board in April 2018) are summarized below:

9. **Retirement Plan (continued)**

Net Pension Liability (continued)

Asset Class	Benchmark	Target Allocation	Geometric Real Rate of Return (Expected minus inflation)
US Equities	Dow Jones U.S. Total Stock Market Index	11.5%	4.55%
Private Equity	Cambridge Associates Global Private Equity & Venture Capital Index	16.0%	7.55%
Global Equities	MSCI World (net) Index	1.5%	4.85%
Int'l Equities - Developed Markets	MSCI World Ex USA (net)	11.0%	4.55%
Int'l Equities - Emerging Markets	MSCI Emerging Markets (net) Index	8.0%	5.55%
Investment-Grade Bonds	Blomberg Barclays U.S. Aggregate Bond Index	3.0%	0.75%
Strategic Credit	FTSE High-Yield Cash-Pay Capped Index	8.0%	4.12%
Direct Lending	S&P/LSTA Leveraged Loan Index	10.0%	8.06%
Distressed Debt	Cambridge Associates Distressed Securities Index	2.0%	6.30%
REIT Equities	67% FTSE NAREIT Equity REITs Index + 33% S&P Global REIT (net) Index	2.0%	4.05%
Master Limited Partnerships (MLPs)	Alerian MLP Index	3.0%	6.00%
Private Real Estate Partnerships	Cambridge Associates Real Estate Index	6.0%	6.25%
Hedge Funds	Hedge Fund Research, Inc. (HFRI) Fund of Funds Composite Index	18.0%	4.10%
Total		100.0%	

Discount Rate

The discount rate used to measure the Total Pension Liability was 8.1%. Using the alternative method, the projected fiduciary net position is determined to be sufficient compared to projected benefit payments based on the funding requirements under the District's funding policy and the legal requirements under the TCDRS Act.

1. TCDRS has a funding policy where the unfunded actuarial accrued liability (UAAL) shall be amortized as a level percent of pay over 20-year closed layered periods.
2. Under the TCDRS Act, the District is legally required to make the contribution specified in the funding policy.
3. The District assets are projected to exceed its accrued liabilities in 20 years or less. When this point is reached, the District is still required to contribute at least the normal cost.
4. Any increased cost due to the adoption of a COLA is required to be funded over a period of 15 years.

Since the projected fiduciary net position is projected to be sufficient to pay projected benefit payments in all future years, the discount rate for purposes of calculating the total pension liability and the net pension liability of the District is equal to the long-term assumed rate of return on investments.

UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT
Notes to Financial Statements
December 31, 2018

9. **Retirement Plan (continued)**

Net Pension Liability (continued)

	Increase (Decrease)		
	Total Pension Liability (a)	Plan Fiduciary Net Position (b)	Net Pension Liability (a) - (b)
Balance at 12/31/2016	$ 132,039	$ 152,048	$ (20,009)
Changes for the year:			
Service cost	44,816	-	44,816
Interest on total pension liability	14,109	-	14,109
Effect of plan changes	-	-	-
Effect of economic/demographic gains or losses	8,751	-	8,751
Effect of assumptions changes or inputs	119	-	119
Refund of contributions	(3,245)	(3,245)	-
Benefit payments	(2,213)	(2,213)	-
Administrative expenses	-	(145)	145
Member contributions	-	21,088	(21,088)
Net investment income	-	22,875	(22,875)
Employer contributions		26,740	(26,740)
Other	-	567	(567)
Net changes	$ 62,337	$ 65,667	$ (3,330)
Balance at 12/31/2017	**$ 194,376**	**$ 217,715**	**$ (23,339)**

Sensitivity of the net pension liability to changes in the discount rate

The following presents the net pension liability of the District, calculated using the discount rate of 8.1%, as well as what the District's net pension liability would be if it were calculated using a discount rate that is 1-percentage-point lower (7.1%) or 1-percentage point higher (9.1%) than the current rate:

	1% Decrease in Discount Rate (7.1%)	Discount Rate (8.1%)	1% Increase in Discount Rate (9.1%)
Total pension liability	$ 233,523	$ 194,376	$ 163,201
Fiduciary net position	217,715	217,715	217,715
Net pension liabiltiy (asset)	$ 15,808	$ (23,339)	$ (54,514)

9. **<u>Retirement Plan (continued)</u>**

Net Pension Liability (continued)

Pension Plan Fiduciary Net Position

Detailed information about the pension plan's Fiduciary Net Position is available in a separately-issued TCDRS financial report. That report may be obtained on the internet at www.tcdrs.org.

Pension Expense and Deferred Outflows of Resources and Deferred Inflows of Resources Related to Pensions

For the year ended December 31, 2018, the District recognized pension expense of $21,161.

As of December 31, 2018, the District reported deferred outflows of resources and deferred inflows of resources related to pensions from the following sources:

	Deferred Inflows of Resources	Deferred Outflows of Resources
Differences between expected and actual experience	$ 21,830	$ 30,779
Changes of assumptions	-	1,561
Net difference between projected and actual earnings	1,987	-
Contributions subsequent to the measurement date	N/A	29,431
Total	$ 23,817	$ 61,771

$29,431 reported as deferred outflows of resources related to pensions resulting from contributions subsequent to the measurement date will be recognized as a reduction of the net pension liability for the year ending December 31, 2019. Other amounts reported as deferred outflows and inflows of resources related to pensions will be recognized in pension expense as follows:

Valuation year ended December 31:	
2018	$ 1,762
2019	1,457
2020	(323)
2021	(735)
2022	1,037
Thereafter	5,325

REQUIRED SUPPLEMENTARY INFORMATION

UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT
STATEMENT OF REVENUES, EXPENDITURES AND
CHANGES IN FUND BALANCE - BUDGET AND ACTUAL
GENERAL FUND
FOR THE YEAR ENDED DECEMBER 31, 2018

	GAAP Basis			Variance
	Budgeted Amounts			Positive
	Original	Final	Actual	(Negative)
Revenues:				
Exception fees	$ 10,000	$ 10,000	9,395	(605)
Export fees	1,000	1,000	695	(305)
Penalties assessed	10,000	10,000	11,404	1,404
Forfeited deposits	5,000	5,000	7,000	2,000
New well registration fees	600,000	600,000	703,375	103,375
Semi-annual program income	875,000	875,000	907,049	32,049
Total program revenue	1,501,000	1,501,000	1,638,918	137,918
Investment earnings	20,000	20,000	30,017	10,017
Other sources	3,200	3,200	5,790	2,590
Total revenues	1,524,200	1,524,200	1,674,725	12,607
Expenditures:				
General government	1,280,400	1,287,400	1,136,279	151,121
Capital outlay	243,800	491,800	488,122	3,678
Total Expenditures	1,524,200	1,779,200	1,624,401	154,799
Excess (Deficiency) of Revenues Over (Under) Expenditures	-	(255,000)	50,324	305,324
Fund balance - beginning of year	3,277,079	3,277,079	3,277,079	-
Fund balance - end of year	$ 3,277,079	$ 3,022,079	$ 3,327,403	$ 305,324

UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT
SCHEDULE OF CHANGE IN NET PENSION LIABILITY
AND RELATED RATIOS
Last 10 Years (will ultimately be displayed)

Total Pension Liability	**2017**	**2016**	**2015**	**2014**
Service Cost	$ 44,816	$ 42,402	$ 19,962	$ 21,024
Interest on total pension liability	14,109	10,705	6,204	4,158
Effect of plan changes	-	-	(3,620)	-
Effect of assumption changes or inputs	119	-	1,886	-
Effect of economic/demographic (gains) or losses	8,751	(25,799)	26,243	3,650
Benefit payments/refunds of contributions	(5,458)	(13,040)	(2,766)	-
Net Change in Total Pension Liability	62,337	14,268	47,909	28,832
Total Pension Liability, beginning	132,039	117,771	69,862	41,030
Total Pension Liability, ending (a)	$ 194,376	$ 132,039	$ 117,771	$ 69,862
Fiduciary Net Position				
Emloyer contributions	$ 26,740	$ 28,501	$ 13,860	$ 11,178
Member contributions	21,088	19,959	17,724	14,747
Investment income net of investment expenses	22,875	7,967	(1,459)	3,400
Benefit payments/refunds of contributions	(5,458)	(13,040)	(2,766)	-
Administrative expenses	(145)	(86)	(67)	(49)
Other	567	4,417	246	(3)
Net Change in Fiduciary Net Position	65,667	47,718	27,538	29,273
Fiduciary Net Position, beginning	152,048	104,330	76,792	47,519
Fiduciary Net Position, ending (b)	$ 217,715	$ 152,048	$ 104,330	$ 76,792
Net Pension Liability (Asset), ending = (a) - (b)	$ (23,339)	$ (20,009)	$ 13,441	$ (6,930)
Fiduciary net position as a % of total pension liability	112.01%	115.15%	88.59%	109.92%
Pensionable covered payroll	$ 421,761	$ 399,176	$ 354,472	$ 294,939
Net pension liability as a % of covered payroll	-5.53%	-5.01%	3.79%	-2.35%

Note: This schedule is presented to illustrate the requirement to show information for 10 years. However, recalculations of prior years are not required, and if prior years are not reported in accordance with the standards of GASB 67/68, they should not be shown here. Therefore, we have shown only years for which the new GASB statements have been implemented.

UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT
SCHEDULE OF EMPLOYER CONTRIBUTIONS
Last 10 Fiscal Years (will ultimately be displayed)

Year Ending December 31	Actuarially Determined Contribution	Actual Employer Contribution	Contribution Deficiency (Excess)	Pensionable Covered Payroll	Actual Contribution as a % of Covered Payoll
2012	10,266	10,266	-	252,239	4.1%
2013	10,948	10,948	-	269,002	4.1%
2014	11,178	11,178	-	294,939	3.8%
2015	13,860	13,860	-	354,472	3.9%
2016	28,501	28,501	-	399,176	7.1%
2017	26,740	26,740	-	421,761	6.3%

UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT
Notes to Required Supplementary Information
December 31, 2018

Budget

Annual operating budget is adopted on a basis consistent with generally accepted accounting principles for a governmental fund. The budget lapses at fiscal year end.

The Board of Directors follows these procedures in establishing budgetary data reflected in the financial statements:

a. Prior to the beginning of the fiscal year, a proposed budget is submitted by the Finance Committee to the Board for approval.
b. During the year, the Board may amend the budget.
c. Budgetary control is maintained at the line item level, subject to adjustments permitted as described above.

Retirement Schedules

Valuation Date

Actuarially determined contribution rates are calculated as of December 31, two years prior to the end of the fiscal year in which contributions are reported.

Methods and Assumptions Used to Determine Contribution Rates

Actuarial Cost Method	Entry Age
Amortization Method	Level percentage of payroll, closed
Remaining Amortization Period	0.0 years (based on contribution rate calculated in 12/31/2017valuation)
Asset Valuation Method	5-year smoothed market
Inflation	2.75%
Salary Increases	Varies by age and service. 4.9% average over career including inflation
Investment Rate of Return	8.00%, net of administrative and investment expenses, including inflation
Retirement Age	Members who are eligible for service retirement are assumed to commence receiving benefit payments based on age. The average age at service retirement for recent retirees is 61.
Mortality	130% of the RP-2014 Healthy Annuitant Mortality Table for males and 110% of the RP-2014 Healthy Annuitant Mortality Table for females, both projected with 110% of the MP-2014 Ultimate scale after 2014.
Changes in Assumptions and Methods Reflected in the Schdedule of Employer Contributions	2015: New inflation, mortality and other assumptions were reflected 2017: New mortality assumptions were reflected
Changes in Plan Provisions Reflected in the Schedule of Employer Contributions	2015: No changes in plan provisions were reflected in the Schedule. 2016: Employer contributions reflect that the current service matching rate was increased to 200%. 2017: New Annuity Purchase Rates were reflected for benefits earned after 2017.