CLEAR FORK GROUNDWATER CONSERVATION DISTRICT

DISTRICT MANAGEMENT PLAN
Approved February 2015
Amended: August 27, 2019

DISTRICT MISSION

The Clear Fork Groundwater Conservation District is committed to establish and protect the water rights of local landowners, and preserve this resource for generations to come.

TIME PERIOD FOR THIS PLAN

This plan becomes effective upon the adoption by the Board of Directors of the Clear Fork Groundwater Conservation District and certification by the Texas Water Development Board (TWDB). This is a ten-year plan and will remain in effect for the ten years, or until a revised plan is certified, whichever is earlier.

STATEMENT OF GUIDING PRINCIPLES

The citizens of Fisher County recognize the vital importance of the groundwater to the economy and longevity of the county. Being the primary water resource; the district recognizes the need to conserve and protect the quantity and the quality of groundwater through prudent and cost effective management. The goals of this plan can be best achieved through guidance from locally elected board members who have an understanding of local conditions as well as technical support from knowledgeable agencies. Management planning should be based upon an awareness of the hydrogeologic properties of the specific aquifers within the District as well as quantification of existing and future resource data. This management plan is intended only as a reference tool to provide guidance in the execution of district activities, but should allow flexibility in achieving its goals.

GENERAL DESCRIPTION

The District was created by the citizens of Fisher County through election in November, 2002. Directors are elected with Fisher County Commissioner's precincts, with a director from within each of the four precincts. Additionally, one director is elected as an at-large position from the entire county. The Clear Fork Groundwater Conservation District has the same real extent as that of Fisher County, Texas. The county has a diverse economy, with agriculture and industry all represented. Livestock operations include cattle, goats, and hogs. Crops include cotton, sorghum, wheat, hay, pecans, and some fruits and vegetables. One of the major industries is National Gypsum, which began operations in Fisher County in 1935. Oil and gas production have been a part of Fisher County for several decades. Communities in the county include Roby, Busby, Claytonville, Eskota, Hobbs, Longworth, McCaulley, Palava, Rotan, Royston, and Sylvester. The main tourist attraction is the diverse hunting opportunities in Fisher County.

LOCATION AND EXTENT

The Clear Fork Groundwater Conservation District shares a boundary with Fisher County. Fisher County is on U.S. Highway 180 west of Abilene in the Rolling Plains region of central West Texas. The county is bordered on the north by Kent and Stonewall counties, on the east by Jones County, on the south by Nolan County, and on the west by Scurry County. Its center point is 32°45' north latitude and 100°23' west longitude. Roby is the county seat; Rotan, the county's largest town, is 225 miles west of Dallas, 65 miles northwest of Abilene and 125 miles southeast of Lubbock. In addition to U.S. 180 the county's transportation needs are served by State highways 70 and 92.

Soils range from red to brown, with loamy surface layers and clayey or loamy subsoils. Between 51 percent and 60 percent of the land in the county is considered prime farmland. The vegetation, typical of the Rolling Prairies, features medium-height to tall grasses, mesquite, and cacti. Cedar, cottonwood, and pecan trees also grow along streams. Many species of wildflowers bloom in the spring and early summer, including daisies, buttercups, tallow weed, Indian blanket, baby's breath, prairie lace, wild verbena, belladonna, and hollyhock. Texas bluebells thrive in low places.

The climate is subtropical and sub-humid, with cool winters and hot summers. Temperatures range in January from an average low of 28° F to an average high of 56°, and in July from 70° to 96°. The average annual rainfall measures twenty-two inches, and the average relative humidity is 73 percent at 6 A.M. and 40 percent at 6 P.M. The average annual snowfall is five inches.

The growing season averages 222 days, with the last freeze in early April and the first freeze in early November. The agricultural economy centers around cattle, livestock products and hunting, but 60 percent of the annual agricultural income is from crops, especially cotton, wheat, sorghum, and hay. Petroleum, natural gas, gypsum, rock, and sand and gravel are also produced in the county. *

*Taken from "FISHER COUNTY." Handbook of Texas Online. <http:www.tshautexas.edu/handbook/online/view/NN/hcn4.html> [Accessed Mon Nov 22 9:35 US/Central 2004.] by Hooper Shelton

TOPOGRAPHY AND DRAINAGE

Fisher County covers 897 square miles of grassy, rolling prairies. The elevation ranges from 1,800 to 2,400 feet. The northern third of the county is drained by the Double Mountain Fork of the Brazos River, and the southern two-thirds is drained by the Clear Fork of the Brazos. *(Source: USDA Natural Resources Conservation Service, Abilene Field Office)*

*Taken from "FISHER COUNTY." Handbook of Texas Online. <http:www.tshautexas.edu/handbook/online/view/NN/hcn4.html> [Accessed Mon Nov 22 9:35 US/Central 2004.] by Hooper Shelton

SURFACE WATER RESOURCES OF CLEAR FORK G.C.D.

There is no reliable surface water within the district, with the exception of a few livestock tanks. Based on reported existing surface water rights holders within Fisher County, a total of 915 acre feet of water is permitted by the TCEQ mainly for irrigation use by landowners within the county.

GROUNDWATER RESOURCES

THE BLAINE AQUIFER

The Blaine Aquifer consists of water stored in cavities of gypsum and limestone rock. This aquifer is typically encountered from surface exposure to depths of 100 feet below the ground surface and has a saturated thickness less than 200 feet. Recharge occurs via open cavities and infiltration. The Blaine Aquifer water is high in total dissolved solids, typically about 3,000 mg/l, due to sulfates and chlorides. This salinity is too high for public water supply use without expensive treatment. However, it can and has been used to irrigate cotton. The high solids results from the natural dissolving of the gypsum and associated rock of the aquifer, therefore there are no feasible methods to reduce the dissolved solids levels.

DOCKUM GROUP AQUIFERS

The Dockum Group Aquifers are present in the southwest corner of the county.. The sediments are primarily sandstones, conglomerates and sandy shales. The formation also contains beds of gypsum, anhydrite, halite, and dolomite. In Fisher County the yields of wells range from less than 30 gal/min to as much as 200 gal/min, depending on saturated thickness, and average about 35 gal/min. Water quality is good to fair . The water is usually slightly saline with higher salinity in some locations. Irrigation wells completed in the Dockum Group formations have had yields as high as 700 GPM in the past. Current yields are generally lower.

SEYMOUR AQUIFER

The Seymour Formation is the only significant source of groundwater in Fisher County. The formation is present in the north one-third of Fisher County, stretching from east to west. The Seymour Aquifer contains discontinuous beds of poorly sorted gravel, conglomerate, sand and silty clay deposited during the Quaternary Period by eastward-flowing streams. Individual accumulations vary greatly in thickness, although most of the Seymour is less than 100 feet thick. Materials forming the Seymour aquifer are unconsolidated alluvial sediments of non-marine origin deposited on the erosional surface of Permian beds. In Fisher County the well yields range from less than 30 gal/min to as much as 200 gal/min, depending on saturated thickness, and average about 35 gal/min. The water quality is generally good.

STATUTORILY REQUIRED TABLES

MODELED AVAILABLE GROUNDWATER - Appendix A, GAM Run 16-031 - Modeled available groundwater estimates for the Blaine, Dockum, Ogallala, and Seymour aquifers in GMA 6.

AMOUNT OF GROUNDWATER BEING USED – Appendix B, Estimated Historical Water Use and 2012 State Water Plan Datasets, February 4, 2015, TWDB

RECHARGE FROM PRECIPITATION - Appendix C, GAM Run 14-007, July 25, 2014, Clear Fork Groundwater Conservation District Management Plan, TWDB.

DISCHARGE FROM THE AQUIFERS TO SPRINGS, LAKES & STREAMS – Appendix C, GAM Run 14-007, July 25, 2014, Clear Fork Groundwater Conservation District Management Plan, TWDB.

FLOW INTO THE DISTRICT AQUIFERS – Appendix C, GAM Run 14-007, July 25, 2014, Clear Fork Groundwater Conservation District Management Plan, TWDB.

FLOW OUT OF THE DISTRICTAQUIFERS – Appendix C, GAM Run 14-007, July 25, 2014, Clear Fork Groundwater Conservation District Management Plan, TWDB.

FLOW BETWEEN DISTRICT AQUIFERS – Appendix C, GAM Run 14-007, July 25, 2014, Clear Fork Groundwater Conservation District Management Plan, TWDB.

PROJECTED SURFACE WATER SUPPLIES – Appendix B, Estimated Historical Water Use and 2012 State Water Plan Datasets, February 4, 2015, TWDB

PROJECTED TOTAL WATER DEMAND – Appendix B, Estimated Historical Water Use and 2012 State Water Plan Datasets, July 7, 2015, TWDB

PROJECTED WATER SUPPLY NEEDS - Appendix B, Estimated Historical Water Use and 2012 State Water Plan Datasets, February 4, 2015, TWDB

WATER MANAGEMENT STRATEGIES – There are none. See Appendix B, Estimated Historical Water Use and 2012 State Water Plan Datasets, February 4, 2015, TWDB

MANAGEMENT OF GROUNDWATER SUPPLIES

Brush Management: The eradication of mesquite and salt cedar from areas of moderate to heavy brush canopy would yield additional groundwater supplies.

Potential Demand and Supply

Based on current calculations and projections it is obvious that issues will arise when demands exceed supplies. The District will use all regulatory statutes available to encourage the cities of Roby and Rotan, and the Water Supply Corporations in the District to develop conservation plans and additional surface water supplies. The District will also encourage additional water supplies through groundwater conservation education programs at the school and community levels.

The District will manage the supply of groundwater within the District in order to conserve the resource while seeking to maintain the economic viability of all resource user groups, public and private. In consideration of the economic and cultural activities occurring within the District, the District will continue to identify and engage in such activities and practices, that if implemented, would result in the conservation and protection of the groundwater. The observation and monitoring network will continue to be reviewed and maintained in order to monitor changing conditions of groundwater within the District. The District will undertake investigations of the groundwater resources within the District and will make the results of those investigations available to the public.

The District has adopted rules to regulate the groundwater withdrawals by means of spacing and production limits. The relevant factors to be considered in making the determination to grant a permit or limit groundwater withdrawal will include:

1. The purpose of the District and its rules;
2. The equitable conservation and preservation of the resource, and;
3. The economic hardship resulting from granting or denying a permit or the terms prescribed by the rules.

In pursuit of the District mission of conserving and protecting the resource, the District will enforce the terms and conditions of permits and rules of the District by enjoining the permit holder in a court of competent jurisdiction, as provided for in TWC §36.102, if necessary.

ACTIONS, PROCEDURES, PERFORMANCES AND AVOIDANCE FOR PLAN IMPLEMENTATION

The District will implement the provisions of the plan and will utilize the provisions of the plan as a guidepost for determining the direction or priority for all District Activities. All operations of the District, all agreements entered into by the District, and any additional planning efforts in which the District may participate will be consistent with the provisions of the plan.

The District has adopted rules relating to the implementation of this plan. The rules adopted by the District are pursuant to TWC §36 and the provisions of this plan. All rules will be adhered and enforced. The promulgation and enforcement of the rules will be based upon the best technical evidence available.

The District shall treat all citizens with equality. Citizens may apply to the District for discretion in enforcement of the rules on grounds of adverse economic effect or unique local characteristics. In granting discretion to any rule, the Board shall consider the potential for adverse effect on adjacent landowners and aquifer conditions. The exercise of said discretions by the Board shall not be construed as limiting the power of the board.

The methodology that the District will use to trace its progress on an annual basis in achieving its management goals will be as follows:

The District Manager will prepare and present an annual report to the Board of Directors on the District performance in regards to achieving management goals and objectives during the first monthly Board of Directors meeting each fiscal year. This report will include the number of instances each activity was engaged in during the year.

The annual report will be maintained on file at the District office.

DESIRED FUTURE CONDITIONS AND MODELED AVAILABLE GROUNDWATER

The District participated in Joint Planning in GMA 6 where DFC's were adopted in November 2016. For the Blaine Aquifer the Desired Future Condition for Fisher County, located within the Clear Fork Groundwater Conservation District, is that condition whereby the total decline in water levels will be no more than 4 feet during the period from 2020 – 2070. For the Dockum Aquifer the Desired Future Condition for Fisher County, located in the Clear Fork Groundwater Conservation District is that condition whereby the total decline in water levels will be no more than 27 feet during the period from 2020 – 2070. For the Seymour Aquifer the Desired Future Condition for that part of Pod 11 in Fisher County, located in Clear Fork Groundwater Conservation District is that condition whereby the total water level decline will be no more than 1 foot during the period from 2020 – 2070. The Modeled Available Groundwater calculated from these DFC's are in the chart below. The chart was obtained from https://www.twdb.texas.gov/groundwater/dfc/docs/summary/GMA6_MAG_2016a.pdf?d=18738.699999870732 and the GCD name for Fisher County Dockum is incorrect.

Groundwater Conservation District	County	Aquifer	Modeled Available Groundwater						TWDB Report
			2020	2030	2040	2050	2060	2070	
Clear Fork GCD	Fisher	Seymour (Pod 11)	6,718	6,132	6,149	6,472	6,490	6,131	GR 16-031 MAG
ClearFork GCD	Fisher	Blaine	12,855	12,820	12,855	12,820	12,855	12,820	GR 16-031 MAG
Gateway GCD	Fisher	Dockum	79	79	79	79	79	79	GR 16-031 MAG

GOALS, MANAGEMENT OBJECTIVES AND PERFORMANCE STANDARDS

GOAL 1.0 – Providing for the most efficient use of groundwater

1.1 Management Objective - Each year, on four (4) or more occasions, the District will disseminate educational information relating to conservation practices for the efficient use of water resources. These will include but are not limited to publications from the Texas Water Development Board, the Texas Commission on Environmental Quality, Texas Cooperative Extension Service, the Texas Water Resource Institute, and other resources.

1.1a Performance Standard - Number of occasions, annually, the District disseminated educational information related to conservation practices for the efficient use of groundwater.

1.1b Performance Standard – Number of educational literature packets that have been distributed will be reported to the board in the annual report.

1.2 Management Objective - The District will adopt and enforce rules regarding the spacing of all new wells drilled within the District to limit the areas of overlapping cones of depression.

1.2a Performance Standard - The number of wells drilled each year in compliance with the spacing rules will be reported to the Board annually.

1.3 Management Objective - The District will implant a district-wide voluntary monitoring network to evaluate groundwater availability. Wells will be monitored for static level at least annually.

1.3a Performance Standard – The number of wells involved in the project, and respective static levels, will be reported to the Board of Directors annually. Well will be placed on a well numbering grid map for reference.

GOAL 2.0 – Controlling and preventing waste of groundwater

2.1 Management Objective – Report to the Board on a monthly basis any and all reported wasteful practices and non-beneficial use of groundwater in the district. Investigate and determine how to handle each reported waste within five (5) working days.

2.1a Performance Standard – Monthly reports of wasteful practices will be summarized in the annual report to the Board of Directors. Summaries shall include all relevant dates, information, and any remedial action taken by the District (if applicable).

GOAL 3.0 – Addressing Drought Conditions

3.1 <u>Management Objective</u> – The District will monitor the Palmer Drought Severity Index (PDSI) by Texas Climatic Division. If PDSI indicates that the District will experience severe drought conditions, the District will notify all public water suppliers within the District

3.1a <u>Performance Standard</u> – The District staff will monitor the PDSI and report findings and actions to the District Board on a quarterly basis.

GOAL 4.0 – Addressing Conservation

4.1 <u>Management Objective</u> - The district will submit an article regarding water conservation for publication each year to at least one newspaper of general circulation in Fisher County.

4.1a <u>Performance Standard</u> – A copy of the article submitted by the District for publication will be included in the annual report given to the Board of Directors.

GOAL 5.0 – Addressing Recharge Enhancement

5.1 <u>Management Objective</u> - The district will encourage brush removal as a means of recharge enhancement by publishing an article each year and attending at least one Soil & Water Conservation district meeting each year.

5.1a <u>Performance Standard</u> – A copy of the article submitted by the District for publication will be included in the annual report given to the Board of Directors.

GOAL 6.0 – Addressing Rainwater harvesting

6.1 <u>Management Objective</u> - The district prepare a report investigating the possibility of a cooperative agreement with the Roby School District to construct a rainwater harvesting demonstration.

6.1a <u>Performance Standard</u> – The report will be submitted to the Board of Directors by 30 May 2017.

GOAL 7.0 – Addressing Precipitation Enhancement

7.1 Management Objective - The district will participate in an area precipitation enhancement program provided funds are available.

7.1a Performance Standard – The Board of directors will review the evaluation reports prepared by the precipitation enhancement program and summary results pertaining to Fisher County included in the annual report.

GOAL 8.0 – Addressing Brush control

8.1 Management Objective - The district will encourage brush control and Best Management Practices related to brush control where appropriate.

8.1a Performance Standard – The District will have an agenda item in at least one open meeting to discuss Brush control. A District official will meet annually with the Soil and Water Conservation District/Natural Resources Conservation Service Agencies to discuss and support the need for brush control in the Districts, The reports and information will be included in the District Annual report..

GOAL 9.0 – Monitoring Desired Future Conditions

9.1 Management Objective - The district will annually measure the water levels of at least two (2) monitoring wells within each aquifer within the District and will compare the status of the measurements to the Desired Future Condition.

9.1a Performance Standard – The status or the water levels measured and the tracking will be included in the Annual Report.

MANAGEMENT GOALS DETERMINED NOT-APPLICABLE

GOAL – Control and prevention of subsidence

The rigid geologic framework of the region precludes significant subsidence from occurring.

This goal is not applicable to the operations of the District.

GOAL – Conjunctive surface water management issues.

No surface water management entities exist within the District. There are no surface water impoundments within the District except for livestock consumption. The groundwater within the district is used primarily for livestock, domestic and irrigated agriculture.

This goal is not applicable to the operations of the District.

GOAL – Addressing natural resource issues which impact the use and availability of groundwater, and which are impacted by the use of groundwater.

The District has no documented occurrences of endangered or threatened species dependent upon groundwater resources.

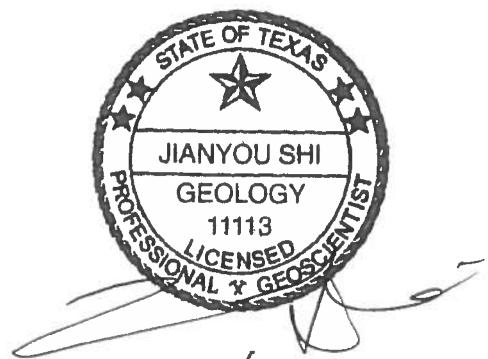
This goal is not applicable to the operations of the District.

Adopted this 31st Day of August 2015, at Roby, Texas.
Amended this 3rd Day of December 2018 at Roby, Texas.

APPENDIX A

GAM Run 16-031 MAG:
Modeled Available Groundwater for the Seymour, Blaine, Ogallala, and Dockum aquifers in Groundwater Management Area 6

Jerry Shi, Ph.D., P.G.
Texas Water Development Board
Groundwater Division
Groundwater Availability Modeling Department
(512) 463-5076
June 30, 2017



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GAM RUN 16-031 MAG: MODELED AVAILABLE GROUNDWATER FOR THE SEYMOUR, BLAINE, OGALLALA, AND DOCKUM AQUIFERS IN GROUNDWATER MANAGEMENT AREA 6

Jerry Shi, Ph.D., P.G.
Texas Water Development Board
Groundwater Division
Groundwater Availability Modeling Department
(512) 463-5076
June 30, 2017

EXECUTIVE SUMMARY:

The Texas Water Development Board (TWDB) estimated the modeled available groundwater values for the following relevant aquifers in Groundwater Management Area 6:

- Seymour Aquifer – The modeled available groundwater ranges from 181,589 acre-feet per year in 2020 to 173,102 acre-feet per year in 2070, and is summarized by groundwater conservation districts and counties in Table 1, and by river basins, regional planning areas, and counties in Table 5.
- Blaine Aquifer – The modeled available groundwater ranges from 74,182 acre-feet per year in 2020 to 70,874 acre-feet per year in 2070, and is summarized by groundwater conservation districts and counties in Table 2, and by river basins, regional planning areas, and counties in Table 6.
- Ogallala Aquifer – The modeled available groundwater remains at 409 acre-feet per year between 2020 and 2070, and is summarized by groundwater conservation districts and counties in Table 3, and by river basins, regional planning areas, and counties in Table 7.
- Dockum Aquifer – The modeled available groundwater ranges from 172 acre-feet per year in 2020 to 171 acre-feet per year in 2070, and is summarized by groundwater conservation districts and counties in Table 4, and by river basins, regional planning areas, and counties in Table 8.

The modeled available groundwater values for Groundwater Management Area 6 estimated for counties is slightly different from that estimated for groundwater conservation districts because of the process for rounding the values.

The modeled available groundwater estimates are based on the desired future conditions for the Seymour, Blaine, Ogallala, and Dockum aquifers adopted by groundwater conservation district representatives in Groundwater Management Area 6 on November 17, 2016. The district representatives declared the following aquifers to be non-relevant for purposes of joint planning: the Trinity Aquifer; the Ogallala Aquifer in Collingsworth and Dickens counties; the Blaine Aquifer in King and Stonewall counties; the Dockum Aquifer in Dickens and Kent counties; and the Seymour Aquifer in Wichita, Wilbarger, Archer, Clay, Stonewall, Throckmorton, Young, Kent, and Jones counties. The TWDB determined that the explanatory report and other materials submitted by the district representatives were administratively complete on May 5, 2017.

REQUESTOR:

Mr. Mike McGuire, General Manager of Rolling Plains Groundwater Conservation District and Groundwater Management Area 6 Coordinator.

DESCRIPTION OF REQUEST:

In a letter dated January 17, 2017, Mr. Mike McGuire provided the TWDB with the desired future conditions of the Seymour, Blaine, Ogallala, and Dockum aquifers. The desired future conditions were adopted on November 17, 2016 by the groundwater conservation district representatives in Groundwater Management Area 6. The desired future conditions are:

Dockum Aquifer (Resolution No. 2016-001)

"a. The Desired Future Condition for Fisher County, located in the Clear Fork Groundwater Conservation District is that condition whereby the total decline in water levels will be no more than 27 feet during the period from 2020 - 2070

b. The Desired Future Condition for Motley County, located in the Gateway Groundwater Conservation District is that condition whereby the total decline in water levels will be no more than 27 feet during the period from 2020 - 2070

c. The Dockum Aquifer in Dickens & Kent Counties, not located within a Groundwater Conservation District, has been determined to be non-relevant for joint planning purposes."

Trinity Aquifer (Resolution No. 2016-002)

"The Trinity Group Aquifers within Groundwater Management Area 6 have been determined to be non-relevant for joint planning purposes."

Ogallala Aquifer (Resolution No. 2016-003)

"a. The Desired Future Condition for Motley County, located in the Gateway Groundwater Conservation District, is that condition with average drawdown of between 23 and 27 feet, calculated from the end of 2012 conditions to the year 2070 as documented in GMA 2 Technical Memorandum 16-01.

b. The Ogallala Aquifer in Collingsworth County, located in the Mesquite Groundwater Conservation District, is insignificant or nonexistent, and is determined to be non-relevant for joint planning purposes

c. The Ogallala Aquifer in Dickens County, not located within a Groundwater Conservation District, is determined to be non-relevant for joint planning purposes."

Blaine Aquifer (Resolution No. 2016-004)

"a. The Desired Future Condition for that part of Childress County North of the Red River, located in the Mesquite Groundwater Conservation District, all of Collingsworth and Hall Counties, also located within the Mesquite Groundwater Conservation District; and that part of Childress County North of the Red River located in the Gateway Groundwater Conservation District is that condition whereby the total decline in water levels will be no more than 9 feet during the period from 2020 - 2070

b. The Desired Future Condition for that part of Childress County south of the Red River located in the Mesquite & Gateway Groundwater Conservation Districts; and all of Cottle, Foard, and Hardeman Counties, also located within the Gateway Groundwater Conservation District, is that condition whereby the total decline in water levels will be no more than 2 feet during the period from 2020 - 2070

c. The Desired Future Condition for Fisher County, located within the Clear Fork Groundwater Conservation District, is that condition whereby the total decline in water levels will be no more than 4 feet during the period from 2020 - 2070 *d. The Blaine Aquifer in Motley County, located within the Gateway Groundwater Conservation District, and in Knox County, located within the Rolling Plains Groundwater Conservation District, has been determined to be non-relevant for joint planning purposes.*

e. The Blaine Aquifer in Dickens, Kent, King, Jones, and Stonewall Counties, not located within a Groundwater Conservation District, has been determined to be non-relevant for joint planning purposes."

Seymour Aquifer (Resolution No. 2016-005)

"a. The Desired Future Condition for Pod 1 in Childress [and] Collingsworth Counties, located in the Mesquite and Gateway Groundwater Conservation Districts, is that condition whereby the total decline in water levels will be no more than 33 feet during the period from 2020 - 2070

b. The Desired Future Condition for Pod 2 in Hall County, located in Mesquite Groundwater Conservation District is that condition whereby the total decline in water levels will be no more than 15 feet during the period from 2020 - 2070

c. The Desired Future Condition for Pod 3 in Briscoe, Hall [and] Motley Counties, located in the Mesquite and Gateway Groundwater Conservation Districts, is that condition whereby the total decline in water levels will be no more than 15 feet during the period from 2020 - 2070

d. The Desired Future Condition for Pod 4 in Childress, Foard, and Hardeman counties, located in Gateway Groundwater Conservation District, is that condition whereby the total decline in water levels will be no more than 1 foot during the period from 2020 – 2070

e. The Desired Future Condition for Pod 6 in Knox County, located in Rolling Plains Groundwater Conservation District is that condition whereby the total decline in water levels will be no more than 18 feet during the period from 2020 –2070

f. The Desired Future Condition for that part of Pod 7 Baylor, Haskell, and Knox Counties, located in Rolling Plains Groundwater Conservation District is that condition whereby the total decline in water levels will be no more than 18 feet during the period from 2020 - 2070 *g. The Desired Future Condition for that part of Pod 8 in Baylor County, located in Rolling Plains Groundwater Conservation District is that condition whereby the total water level decline will be no more than 18 feet during the period from 2020 – 2070*

h. The Desired Future Condition for that part of Pod 11 in Fisher County, located in Clear Fork Groundwater Conservation District is that condition whereby the total water level decline will be no more than 1 foot during the period from 2020 - 2070

i. The Seymour Aquifer Pods 5, 9, 10, 12, 13, 14, 15, that part of 4 in Wichita and Wilbarger counties, that part of 7 in Stonewall County, that part of 8 in Throckmorton and Young counties, and that part of 11 in Jones and Stonewall counties have been determined to be non-relevant for joint planning purposes."

After review of the submittal, the TWDB sent a request for clarification email to Mr. Mike McGuire on February 28, 2017. On March 20, 2017, Mr. McGuire responded with additional information and clarifications as noted below.

a. Predictive model format - The six predictive model runs submitted for the Seymour and Blaine aquifers were in a format that the TWDB could not open. The TWDB asked for standard MODFLOW-2000 input and output files. Mr. McGuire sent the standard MODFLOW-2000 input packages to the TWDB on a flash drive.
b. Unclear baseline condition years and baseline water level conditions for the Blaine and Seymour aquifers – The explanatory report showed a baseline year of 2020, while the modeling technical report indicated 2010. Mr. McGuire confirmed in his response that the baseline year for calculating drawdown for these two aquifers was 2010. Because this baseline year is after the end of the calibration period for both groundwater availability models (Jigmond and others, 2014; Ewing and others, 2004), available water-level data between the end of the calibration period and the baseline year were evaluated. The result of the evaluation is included in Appendix A.
c. No pumping in the Blaine Aquifer in Fisher County - The groundwater availability model for the Seymour and Blaine aquifers (Ewing and others, 2004) does not contain pumping in the Blaine Aquifer in Fisher County between 1995 and 1999. This would not only result in a zero modeled available groundwater, but would also make it impossible to match the desired future condition for the Blaine Aquifer in Fisher County. Mr. McGuire then requested the TWDB to use an even pumping distribution within the Blaine Aquifer that meets the desired future condition in the county.

d. Desired future condition of the Blaine Aquifer in Foard County - A preliminary model run indicated that even the absence of pumping would cause a drawdown larger than the desired future condition (2 feet). Mr. McGuire clarified that a ten-foot drawdown for the Blaine Aquifer in Foard County is the desired future condition.

e. Unclear baseline condition years for the Dockum and Ogallala aquifers - The desired future conditions specify a timeline from 2020 to 2070. Mr. McGuire informed TWDB to use the year 2012 as Groundwater Management Area 2 did.

f. Desired future conditions of the Dockum and Ogallala aquifer in Fisher and Motley counties – Groundwater Management Area 6 intended to use the desired future conditions from Groundwater Management Area 2 for these two aquifers in Fisher and Motley counties. In his response, Mr. McGuire stated that Groundwater Management Area 6 intended to establish the desired future conditions for the Ogallala and Dockum aquifers in Fisher and Motley counties that reflected the pumping assumptions in those counties to achieve the average drawdown of 27 feet in Groundwater Management Area 2.

g. Aquifer boundaries – Mr. McGuire informed the TWDB that all desired future conditions and associated modeled available groundwater are based on model extent boundaries.

h. Unclear averaging method for recharge (Seymour Aquifer in Haskell, Knox, and Baylor counties) – Mr. McGuire confirmed with the TWDB that the recharge is the arithmetic mean from 2001 to 2005.

i. DFC statements of "no more than" – Mr. McGuire stated that the desired future conditions are based on the average decline within the individual geographical areas described in the Desired Future Conditions Table in Section 1 of the Explanatory Report. Decline is the difference between the baseline year and 2070.

METHODS:

The desired future conditions for Groundwater Management Area 6 are based on water-level declines or drawdowns defined as the difference in well water levels between a baseline year and 2070. Depending on the aquifer, one of three groundwater availability models were used to construct predictive simulations to estimate drawdowns over the same time interval and to calculate modeled available groundwater. The aquifers and corresponding groundwater availability models were:

- Seymour Aquifer of Pod 7 in Baylor, Haskell, and Knox counties – "refined" groundwater availability model for the Seymour Aquifer (Jigmond and others, 2014)

- Seymour Aquifer (except Pod 7) and Blaine Aquifer – groundwater availability model for the Seymour and Blaine aquifers (Ewing and others, 2004)
- Ogallala and Dockum aquifers – groundwater availability model for the High Plains Aquifer System (Deeds and Jigmond, 2015)

Some of the predictive simulations employed for the modeled available groundwater calculations were part of the Groundwater Management Area 6 submittal (Nelson, 2017), while the others were developed by the TWDB (Appendix B).

One of the first steps for a predictive simulation is to verify if the model reflects real-world conditions for the selected baseline year. If the baseline year for a desired future condition falls within the model calibration period, the water levels and/or fluxes for the baseline year have been calibrated to observed data. If the baseline year is after the end of the calibration period, water levels and/or fluxes must be evaluated between the end of the calibration period and the baseline year to confirm if the model reflects real-world conditions. If water levels and/or fluxes have remained steady during this interim period, the end of the calibration period can be used for the baseline year. However, if water levels and/or fluxes have not remained steady, pumping (and sometimes recharge) is typically adjusted until water levels and/or fluxes reflect real-world conditions.

The simulated drawdown for an area (such as a county) is the average of simulated drawdowns in active model cells with centroids located within each designated area. For the Seymour, Ogallala, and Dockum aquifers, the active model cells or modeled extents are the same as, or similar to, the official aquifer boundaries. However, the modeled extent for the Blaine Aquifer is significantly larger than the official aquifer footprint in some counties, such as in Hall and Foard counties. Therefore, in Hall and Foard counties, the drawdown for the desired future condition contains the Blaine Aquifer and equivalent geologic units in the subcrop.

Another factor that affects the drawdown calculation is related to dry model cells. For this study, a model cell is considered dry when its water level falls below a cell bottom at the baseline year. A dry cell is excluded from the average drawdown calculation. This analysis is presented in Appendix C.

The following sections summarize the predictive simulations submitted by Groundwater Management Area 6 and the predictive simulations by the TWDB. The water level drawdowns calculated by these predictive model runs are presented in Appendix B, which can be compared with the desired future conditions.

Seymour Aquifer of Pod 7 in Baylor, Haskell, and Knox Counties

Three predictive simulations submitted by Nelson (2017) were developed from runs using the refined groundwater availability model for the Seymour Aquifer in Baylor, Haskell, and Knox counties (Jigmond and others, 2014). This refined groundwater availability model only covers Pod 7 of the Seymour Aquifer (Figure 1). The predictive simulations included the calibrated period (1949 through 2005) and a predictive period (2006 through 2070). The predictive period used annual time intervals with three different pumping scenarios: 100, 80, or 75 percent of the average pumping of the last five years (2001-2005) of the calibration period (Jigmond and others, 2014).

Because the baseline year for the desired future condition (2010) is after the end of the calibration period, the TWDB evaluated the water-level data at selected wells from winter months between 2005 and 2010. Figure A1 (in Appendix A) shows the average water-level change from 2005 to 2010 in the Seymour Aquifer in Baylor, Haskell, and Knox counties. The average water levels have been stable over the selected time interval. As a result, the TWDB determined that further refinement of pumping was not necessary for the period between 2005 and 2010, and determined that conditions at the end of the calibration period can be used as conditions for the baseline year.

Next, the TWDB checked the MODFLOW-2000 well packages for the predictive simulations and found no problem with the pumping scenario that used 100 percent of the average pumping of the last five years of the groundwater availability model (2001 through 2005). As a result, the TWDB ran this scenario to obtain the MODFLOW-2000 output files. The head output file was used to calculate the drawdowns between 2010 and 2070. The TWDB then compared the drawdowns with the desired future conditions for the Seymour Aquifer in Pod 7 in these three counties. The comparison indicates that the drawdowns do not exceed the desired future conditions (Table B1 in Appendix B).

Seymour and Blaine Aquifers (excluding Pod 7 of Seymour)

The other three predictive simulations by Nelson (2017) were based on the groundwater availability model for the Seymour and Blaine aquifers (Figure 2; Ewing and others, 2004). The predictive simulations were used to determine the desired future conditions for the Blaine Aquifer and all the Seymour Aquifer except Pod 7, which was covered by the refined model described earlier. The predictive simulations included the calibrated period (1975 through 1999) and a predictive period (2000 through 2070). The predictive period used annual time interval with three different pumping scenarios: 100, 75, or 50 percent of the average pumping of the last five years of the calibrated model, 1995 through 1999 (Ewing and others, 2004).

Because the baseline year (2010) is after the end of the calibration period (1999), TWDB evaluated the water-level data at selected wells from winter months between 1999 and 2010. Figure A2 (in Appendix A) illustrates the average water-level change from 1999 to 2010 in the Seymour Aquifer within Groundwater Management Area 6. For the Blaine Aquifer, only one well from Childress County (State Well Number 1231804) meets the selection criterion and its hydrograph is presented in Figure A3. Nevertheless, Figures A2 and A3 indicate that the water level has not significantly changed over the selected time interval. As a result, the TWDB determined that further model refinement of pumping was not necessary for the period between 1999 and 2010, and determined that conditions at the end of the calibration period can be used as conditions for the baseline year.

The TWDB also checked the MODFLOW-2000 well packages for the predictive simulations from Nelson (2017) and discovered a significant inconsistency between the well package from the submittal and that from the TWDB's calculation for the 100-percent pumping scenario based on the last five years of the calibrated groundwater availability model for the Seymour and Blaine aquifers. As a result, the TWDB developed a new predictive simulation for the Seymour and Blaine aquifers using the groundwater availability model by Ewing and others (2004). Because, as discussed above, the water levels did not change much from 1999 to 2010, this predictive simulation uses the water levels of the last stress period (1999) of the groundwater availability model as the initial head for the baseline year (2010). This new predictive simulation runs from 2011 through 2070 with an annual interval and the average recharge of 1995 through 1999 of the calibrated groundwater availability model as stated in the explanatory report and Mr. McGuire's response. The initial pumping is based on the average of the last five years of the calibrated model but was adjusted during the model run to meet the desired future conditions for the Seymour Aquifer (excluding Pod 7) (Table B1 in Appendix B) and Blaine Aquifer (Table B2 in Appendix B).

Ogallala and Dockum Aquifers

Per Mr. McGuire's request, the TWDB used the predictive simulation for the desired future conditions adopted by Groundwater Management Area 2 to reproduce the desired future conditions and to calculate the modeled available groundwater for Groundwater Management Area 6. This predictive simulation ran from 2013 through 2017, with a baseline year of 2012, the same year as the last stress period of the calibrated groundwater availability model by Deeds and Jigmond (2015). The predictive simulation used all boundary conditions from the last stress period of the groundwater availability model except the pumping package, which was modified and adjusted during the model run to meet the desired future conditions of Groundwater Management Area 2 (see GAM Run 16-

028 for details). The simulated drawdown or desired future conditions are presented in Tables B3 and B4 of Appendix B.

Modeled Available Groundwater

Once the predictive simulations met the desired future conditions, the modeled available groundwater values were extracted from the MODFLOW cell-by-cell budget files. Annual pumping rates were then divided by county, river basin, regional water planning area, and groundwater conservation district within Groundwater Management Area 6 (Figures 1 through 6 and Tables 1 through 6).

Modeled Available Groundwater and Permitting

As defined in Chapter 36 of the Texas Water Code, "modeled available groundwater" is the estimated average amount of water that may be produced annually to achieve a desired future condition. Groundwater conservation districts are required to consider modeled available groundwater, along with several other factors, when issuing permits in order to manage groundwater production to achieve the desired future condition(s). The other factors districts must consider include annual precipitation and production patterns, the estimated amount of pumping exempt from permitting, existing permits, and a reasonable estimate of actual groundwater production under existing permits.

PARAMETERS AND ASSUMPTIONS:

The parameters and assumptions for the groundwater availability simulations are described below:

Seymour Aquifer of Pod 7 in Baylor, Haskell, and Knox Counties

- The groundwater availability model for the Seymour Aquifer of Pod 7 by Jigmond and others (2014) was extended to include the predictive model simulation for this analysis (Nelson, 2017).

- The model has one layer, which represents the Seymour Aquifer.

- The model was run with MODFLOW-2000 (Harbaugh and others, 2000).

- During the predictive model run, some model cells went dry (Table C1 of Appendix C).

- Estimates of modeled drawdown and available groundwater from the model simulation were rounded to whole numbers.

Seymour and Blaine Aquifers

- Version 1.01 of the groundwater availability model for the Seymour and Blaine aquifers (Ewing and others, 2004) was updated to include the predictive model simulation for this analysis.

- The model has two layers that represent the Seymour Aquifer (Layer 1) and the Blaine Aquifer as well as other geologic units that underlie the Seymour Aquifer (Layer 2).

- The model was run with MODFLOW-2000 (Harbaugh and others, 2000).

- During the predictive model run, some model cells went dry (Table C2 of Appendix C).

- Estimates of modeled drawdown and available groundwater from the model simulation were rounded to whole numbers.

Ogallala and Dockum Aquifers

- Version 1.01 of the groundwater availability model for the High Plains Aquifer System by Deeds and Jigmond (2015) was used to develop the predictive model simulation used for this analysis (Hutchison, 2016d).

- The model has four layers which represent the Ogallala and Pecos Valley Alluvium aquifers (Layer 1); the Edwards-Trinity (High Plains), Rita Blanca, and Edwards-Trinity (Plateau) aquifers (Layer 2); the Upper Dockum Aquifer (Layer 3); and the Lower Dockum Aquifer (Layer 4). Pass-through cells exist in layers 2 and 3 where the Upper Dockum Aquifer was absent but the cells provided a pathway for flow between the Lower Dockum and the Ogallala or Edwards-Trinity (High Plains) aquifers vertically. These pass-through cells were excluded from the modeled available groundwater calculation.

- The model was run with MODFLOW-NWT (Niswonger and others, 2011). The model uses the Newton-Raphson formulation and the upstream weighting package, which automatically reduces pumping as heads drop in a particular cell as defined by the user. This feature may simulate the declining production of a well as saturated thickness decreases. Deeds and Jigmond (2015) modified the MODFLOW-NWT code to use a saturated thickness of 30 feet as the threshold (instead of percent of the saturated thickness) when pumping reductions occur during a simulation.

- During the predictive model run, no model cells within Groundwater Management Area 6 went dry.
- Estimates of modeled drawdown and available groundwater from the model simulation were rounded to whole numbers.

RESULTS:

The modeled available groundwater for the Seymour Aquifer that achieves the desired future condition adopted by Groundwater Management Area 6 slightly decreases from 181,589 to 173,102 acre-feet per year between 2020 and 2070. The modeled available groundwater is summarized by groundwater conservation district and county in Table 1. Table 5 summarizes the modeled available groundwater by county, river basin, and regional water planning area for use in the regional water planning process.

The modeled available groundwater for the Blaine Aquifer that achieves the desired future condition adopted by Groundwater Management Area 6 decreases slightly from 74,182 to 70,874 acre-feet per year between 2020 and 2070. The modeled available groundwater is summarized by groundwater conservation district and county in Table 2. Table 6 summarizes the modeled available groundwater by county, river basin, and regional water planning area for use in the regional water planning process.

The modeled available groundwater for the Ogallala Aquifer that achieves the desired future condition adopted by Groundwater Management Area 6 remains at 409 acre-feet per year between 2020 and 2070. The modeled available groundwater is summarized by groundwater conservation district and county in Table 3. Table 7 summarizes the modeled available groundwater by county, river basin, and regional water planning area for use in the regional water planning process.

The modeled available groundwater for the Dockum Aquifer that achieves the desired future condition adopted by Groundwater Management Area 6 remains at about 172 acre-feet per year between 2020 and 2070. The modeled available groundwater is summarized by groundwater conservation district and county in Table 4. Table 8 summarizes the modeled available groundwater by county, river basin, and regional water planning area for use in the regional water planning process.

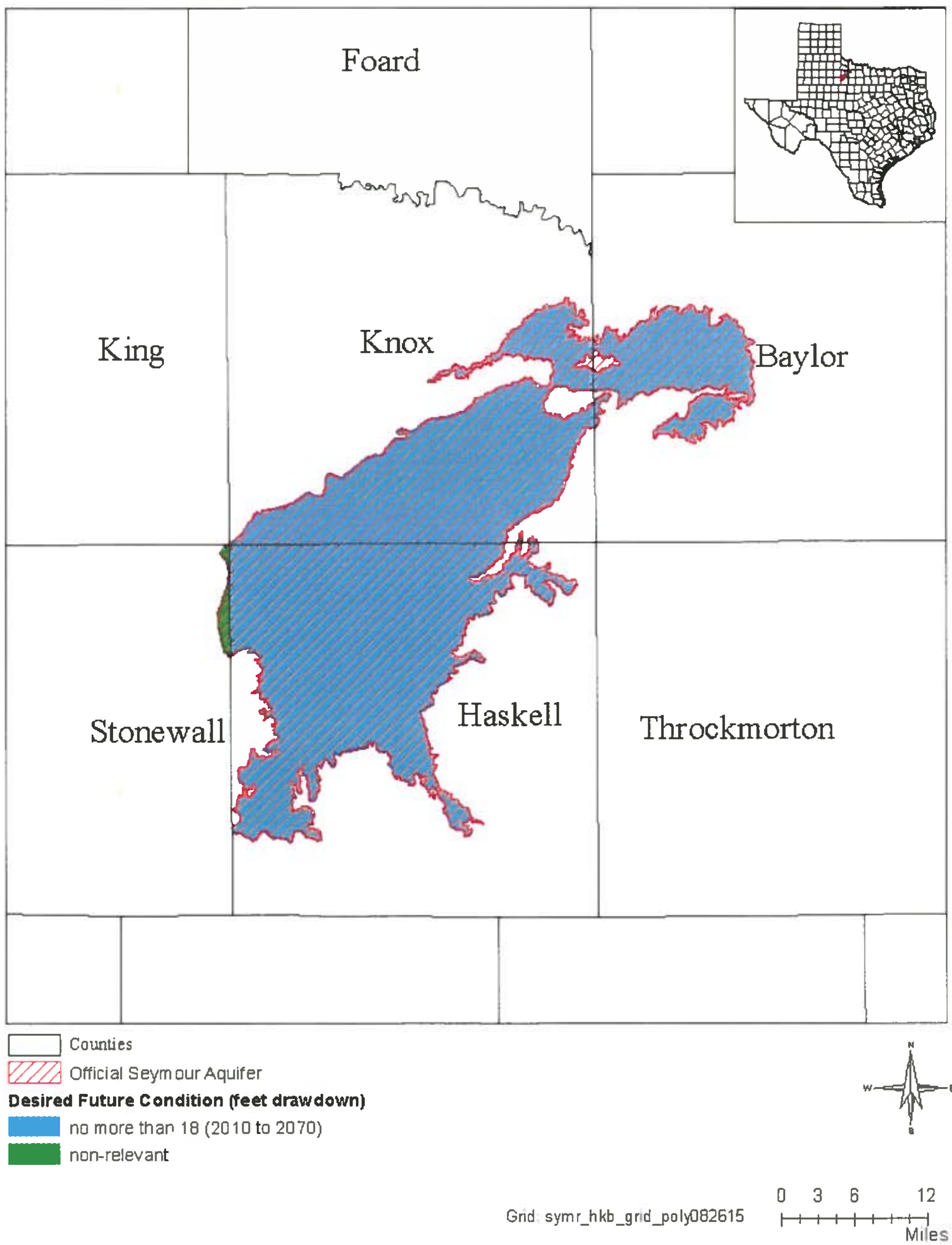

FIGURE 1. MAP SHOWING THE AREA COVERED BY THE REFINED GROUNDWATER AVAILABILITY MODEL FOR THE SEYMOUR AQUIFER POD 7, WHICH INCLUDES BAYLOR, HASKELL, AND KNOX COUNTIES WITHIN GROUNDWATER MANAGEMENT AREA 6.

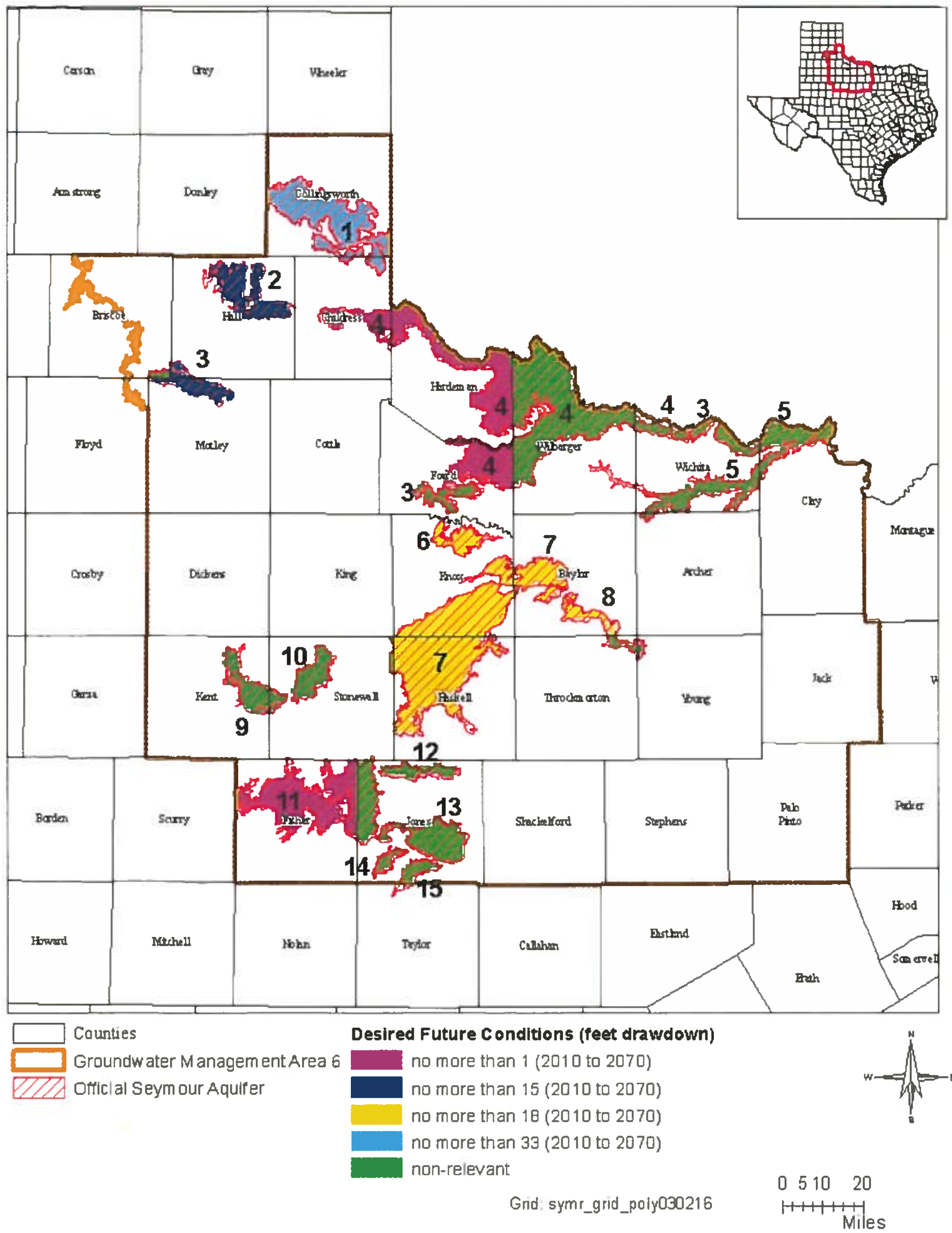

FIGURE 2. **MAP SHOWING THE AREA COVERED BY THE SEYMOUR AQUIFER IN THE GROUNDWATER AVAILABILITY MODEL FOR THE SEYMOUR AND BLAINE AQUIFERS WITHIN GROUNDWATER MANAGEMENT AREA 6. THE INTEGERS IN THE FIGURE ARE SEYMOUR AQUIFER POD NUMBERS.**

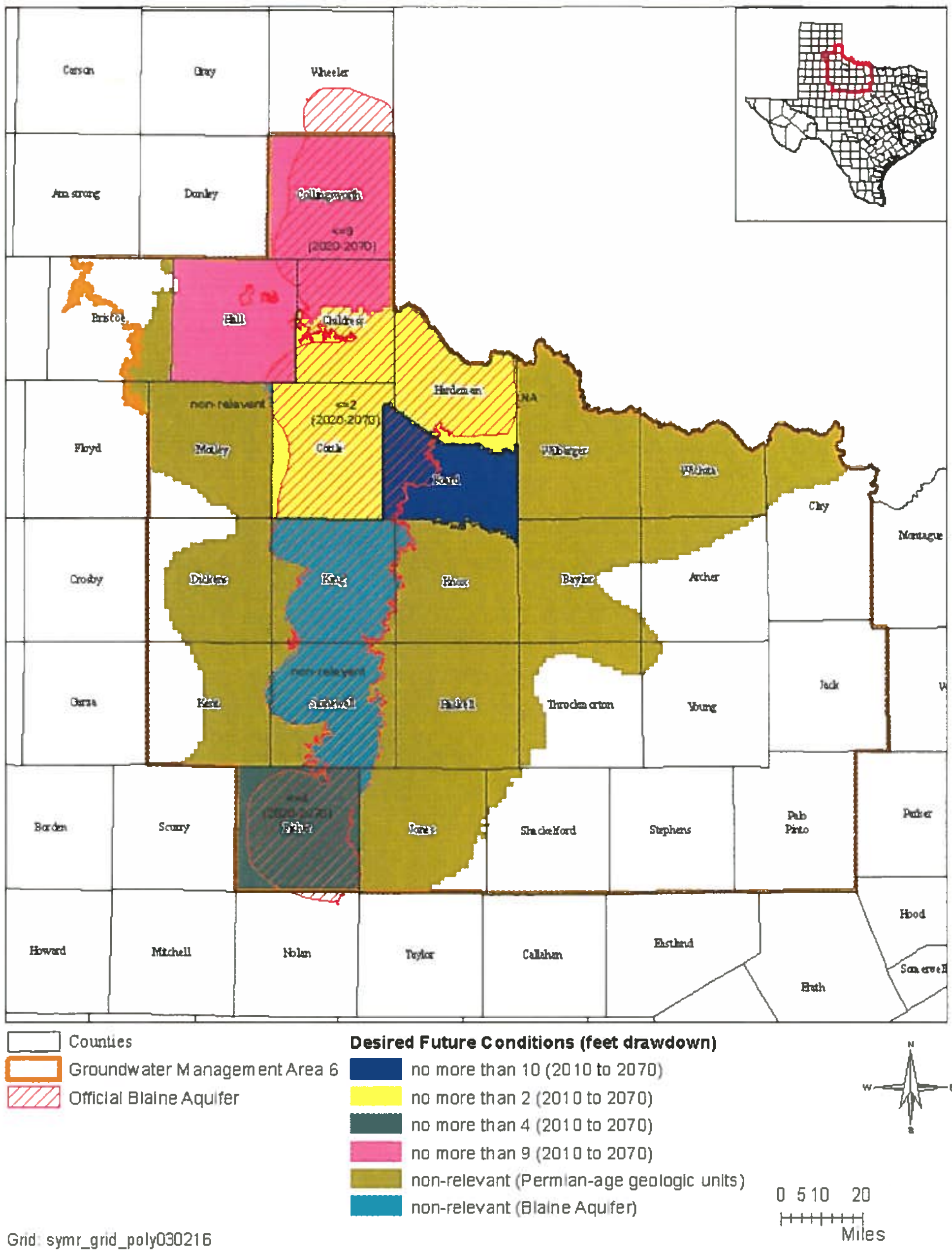

FIGURE 3. MAP SHOWING THE AREA COVERED BY THE BLAINE AQUIFER IN THE GROUNDWATER AVAILABILITY MODEL FOR THE SEYMOUR AND BLAINE AQUIFERS WITHIN GROUNDWATER MANAGEMENT AREA 6.

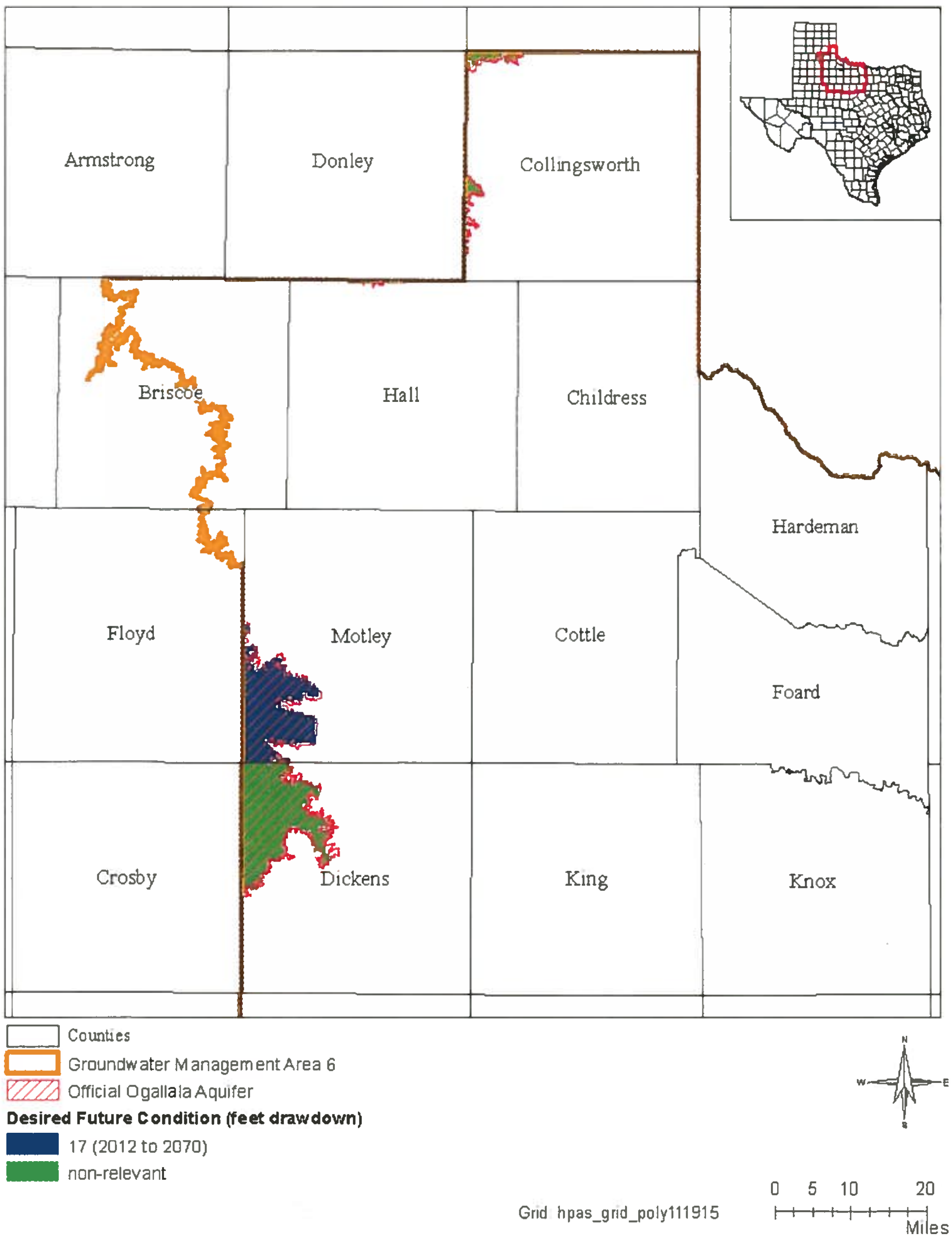

FIGURE 4. MAP SHOWING THE AREA COVERED BY THE OGALLALA AQUIFER IN THE GROUNDWATER AVAILABILITY MODEL FOR THE HIGH PLAINS AQUIFER SYSTEM WITHIN GROUNDWATER MANAGEMENT AREA 6.

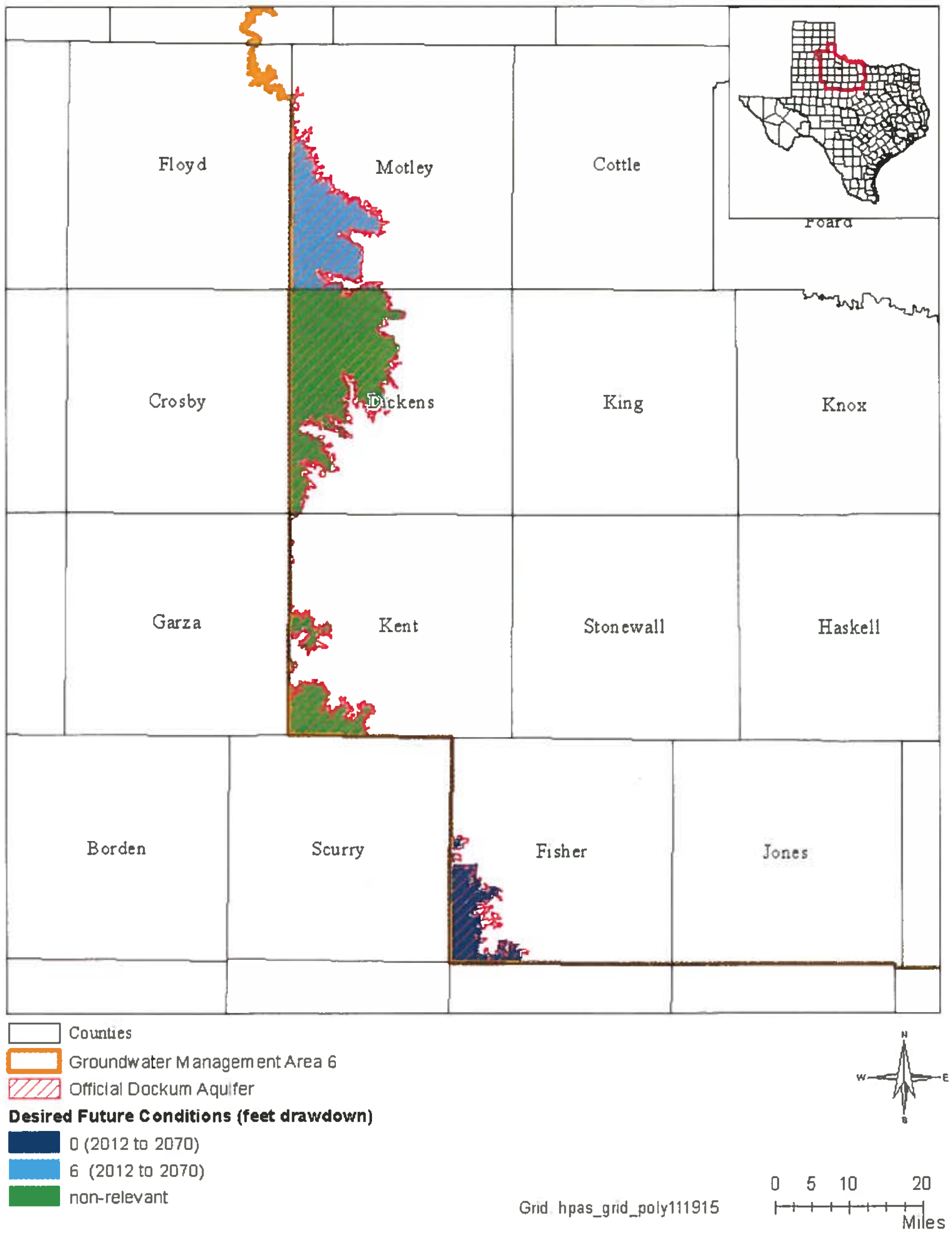

FIGURE 5. MAP SHOWING THE AREA COVERED BY THE DOCKUM AQUIFER IN THE GROUNDWATER AVAILABILITY MODEL FOR THE HIGH PLAINS AQUIFER SYSTEM WITHIN GROUNDWATER MANAGEMENT AREA 6.

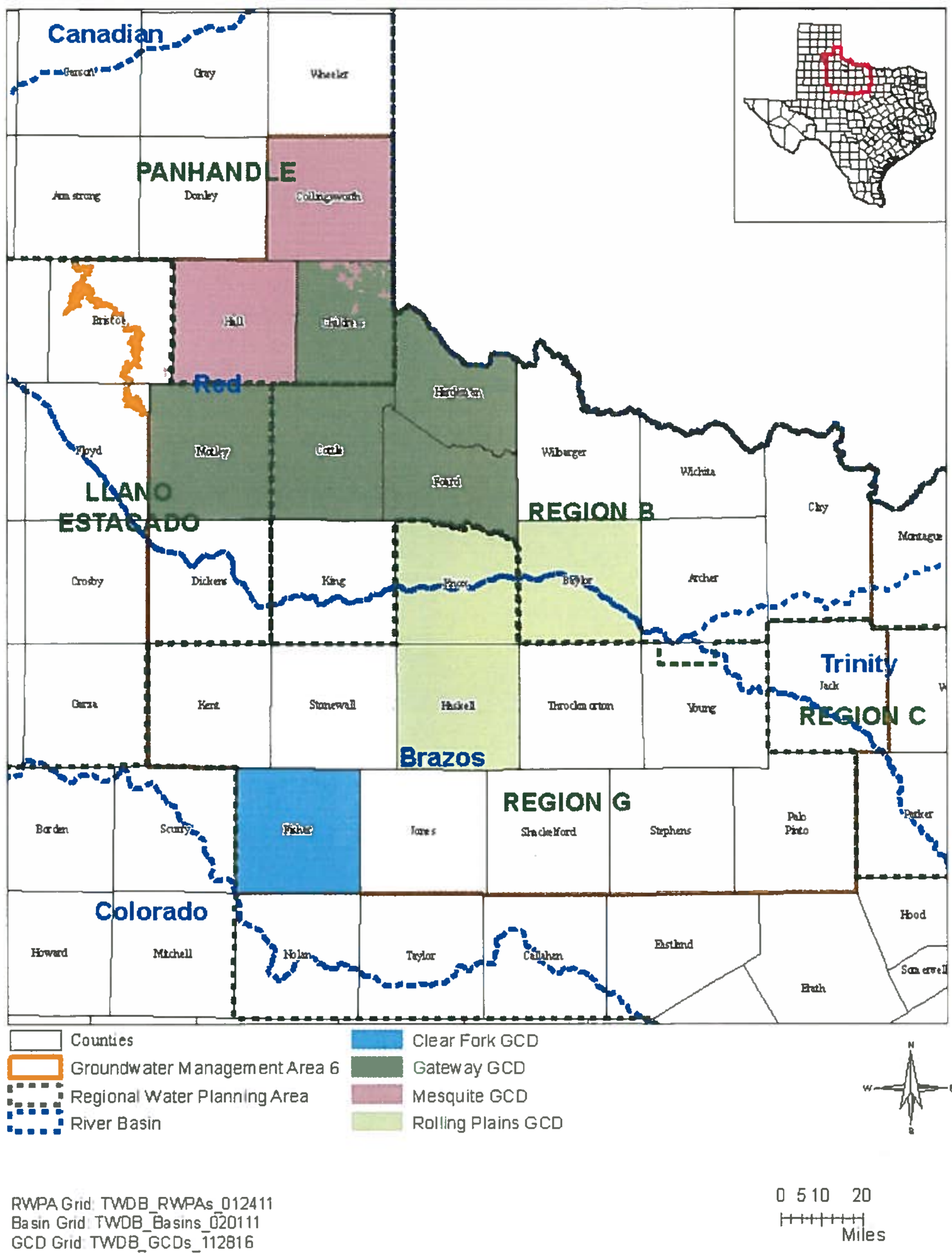

FIGURE 6. MAP SHOWING REGIONAL WATER PLANNING AREAS, GROUNDWATER CONSERVATION DISTRICTS (GCD), COUNTIES, AND RIVER BASINS IN GROUNDWATER MANAGEMENT AREA 6.

TABLE 1. MODELED AVAILABLE GROUNDWATER FOR THE SEYMOUR AQUIFER IN GROUNDWATER MANAGEMENT AREA 6 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2070. VALUES ARE IN ACRE-FEET PER YEAR.

Groundwater Conservation District	County	Seymour Aquifer Pod	2010	2020	2030	2040	2050	2060	2070
Clear Fork GCD	**Fisher**	**11**	**2,325**	**6,718**	**6,132**	**6,149**	**6,472**	**6,490**	**6,131**
Gateway GCD	Childress	4	40	2,875	3,230	3,301	3,292	3,301	3,282
Gateway GCD	Foard	4	4,278	11,897	4,945	5,389	8,066	7,815	3,943
Gateway GCD	Hardeman	4	531	20,378	13,040	18,885	17,520	20,002	32,868
Gateway GCD	Motley	3	2,098	4,843	6,679	4,843	4,830	3,972	3,961
Gateway GCD Total			**6,947**	**39,993**	**27,894**	**32,418**	**33,708**	**35,090**	**44,054**
Mesquite GCD	Childress	1	15	86	16	16	16	16	16
Mesquite GCD	Collingsworth	1	17,628	41,345	31,492	28,657	27,165	22,395	22,769
Mesquite GCD	Hall	2	6,837	15,446	16,751	19,666	22,861	25,861	24,595
Mesquite GCD Total			**24,480**	**56,877**	**48,259**	**48,339**	**50,042**	**48,272**	**47,380**
Rolling Plains GCD	Baylor	7	1,426	1,430	1,426	1,430	1,426	1,430	1,426
Rolling Plains GCD	Baylor	8	14	5,785	5,903	5,547	5,304	5,177	5,503
Rolling Plains GCD	Haskell	7	41,636	41,750	41,636	41,750	41,636	41,750	41,636
Rolling Plains GCD	Knox	7	25,641	25,712	25,641	25,712	25,641	25,712	25,641
Rolling Plains GCD	Knox	6	12	3,324	998	512	888	3,454	1,331
Rolling Plains GCD Total			**68,729**	**78,001**	**75,604**	**74,951**	**74,895**	**77,523**	**75,537**
Groundwater Management Area 6			**102,481**	**181,589**	**157,889**	**161,857**	**165,117**	**167,375**	**173,102**

TABLE 2. MODELED AVAILABLE GROUNDWATER FOR THE BLAINE AQUIFER IN GROUNDWATER MANAGEMENT AREA 6 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2070. VALUES ARE IN ACRE-FEET PER YEAR.

Groundwater Conservation District	County	2010	2020	2030	2040	2050	2060	2070
ClearFork GCD	**Fisher**	**0**	**12,855**	**12,820**	**12,855**	**12,820**	**12,855**	**12,820**
Gateway GCD	Childress	3,577	17,618	17,570	17,618	17,570	17,618	17,570
Gateway GCD	Cottle	2,688	14,766	11,621	11,653	11,621	11,653	11,621
Gateway GCD	Foard	26	6,582	6,564	6,582	6,564	6,582	6,564
Gateway GCD	Hardeman	4,233	8,488	8,465	8,488	8,465	8,488	8,465
Gateway GCD Total		**10,524**	**47,454**	**44,220**	**44,341**	**44,220**	**44,341**	**44,220**
Mesquite GCD	Childress	1,034	5,957	5,940	5,957	5,940	5,957	5,940
Mesquite GCD	Collingsworth	6,851	2,060	2,054	2,060	2,054	2,060	2,054
Mesquite GCD	Hall	10	5,856	5,840	5,856	5,840	5,856	5,840
Mesquite GCD Total		**7,895**	**13,873**	**13,834**	**13,873**	**13,834**	**13,873**	**13,834**
Groundwater Management Area 6		**18,419**	**74,182**	**70,874**	**71,069**	**70,874**	**71,069**	**70,874**

TABLE 3. MODELED AVAILABLE GROUNDWATER FOR THE OGALLALA AQUIFER IN GROUNDWATER MANAGEMENT AREA 6 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2012 AND 2070. VALUES ARE IN ACRE-FEET PER YEAR.

GCD	County	2012	2020	2030	2040	2050	2060	2070
Gateway GCD	Motley	409	409	409	409	409	409	409
Groundwater Management Area 6		**409**	**409**	**409**	**409**	**409**	**409**	**409**

TABLE 4. MODELED AVAILABLE GROUNDWATER FOR THE DOCKUM AQUIFER IN GROUNDWATER MANAGEMENT AREA 6 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2012 AND 2070. VALUES ARE IN ACRE-FEET PER YEAR.

GCD	County	2012	2020	2030	2040	2050	2060	2070
Gateway GCD	Motley	93	93	93	93	92	92	92
Clear Fork GCD	Fisher	79	79	79	79	79	79	79
Groundwater Management Area 6		**172**	**172**	**172**	**172**	**171**	**171**	**171**

TABLE 5. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE SEYMOUR AQUIFER IN GROUNDWATER MANAGEMENT AREA 6. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN.

County	RWPA	River Basin	Seymour Pod Number	2020	2030	2040	2050	2060	2070
Baylor	Region B	Brazos	7	1,136	1,133	1,136	1,133	1,136	1,133
Baylor	Region B	Red	7	294	294	294	294	294	294
Baylor	Region B	Brazos	8	5,785	5,903	5,547	5,304	5,177	5,503
Childress	Panhandle	Red	1 and 4	2,961	3,246	3,317	3,308	3,317	3,297
Collingsworth	Panhandle	Red	1	41,345	31,492	28,657	27,165	22,395	22,769
Fisher	Region G	Brazos	11	6,718	6,132	6,149	6,472	6,490	6,131
Foard	Region B	Red	4	11,897	4,945	5,389	8,066	7,815	3,943
Hall	Panhandle	Red	2 and 3	15,446	16,751	19,666	22,861	25,861	24,595
Hardeman	Region B	Red	4	20,378	13,040	18,885	17,520	20,002	32,868
Haskell	Region G	Brazos	7	41,750	41,636	41,750	41,636	41,750	41,636
Knox	Region G	Brazos	7	25,699	25,629	25,699	25,629	25,699	25,629
Knox	Region G	Red	7	13	13	13	13	13	13
Knox	Region G	Red	6	3,324	998	512	888	3,454	1,331
Motley	Llano Estacado	Red	3	4,843	6,679	4,843	4,830	3,972	3,961
Groundwater Management Area 6				**181,589**	**157,891**	**161,857**	**165,119**	**167,375**	**173,103**

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

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Childress	Panhandle	Red	23,575	23,510	23,575	23,510	23,575	23,510
Collingsworth	Panhandle	Red	2,060	2,054	2,060	2,054	2,060	2,054
Cottle	Region B	Red	14,766	11,621	11,653	11,621	11,653	11,621
Fisher	Region G	Brazos	12,855	12,820	12,855	12,820	12,855	12,820
Foard	Region B	Red	6,582	6,564	6,582	6,564	6,582	6,564
Hall	Panhandle	Red	5,856	5,840	5,856	5,840	5,856	5,840
Hardeman	Region B	Red	8,488	8,465	8,488	8,465	8,488	8,465
Groundwater Management Area 6			**74,182**	**70,874**	**71,069**	**70,874**	**71,069**	**70,874**

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

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Motley	Llano Estacado	Red	409	409	409	409	409	409
Groundwater Management Area 6			**409**	**409**	**409**	**409**	**409**	**409**

TABLE 8. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE DOCKUM AQUIFER IN GROUNDWATER MANAGEMENT AREA 6. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN.

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Fisher	Region G	Brazos	79	79	79	79	79	79
Motley	Llano Estacado	Red	93	93	93	92	92	92
Groundwater Management Area 6			**172**	**172**	**172**	**171**	**171**	**171**

LIMITATIONS:

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

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

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

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

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

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Appendix A

Water Level Hydrograph

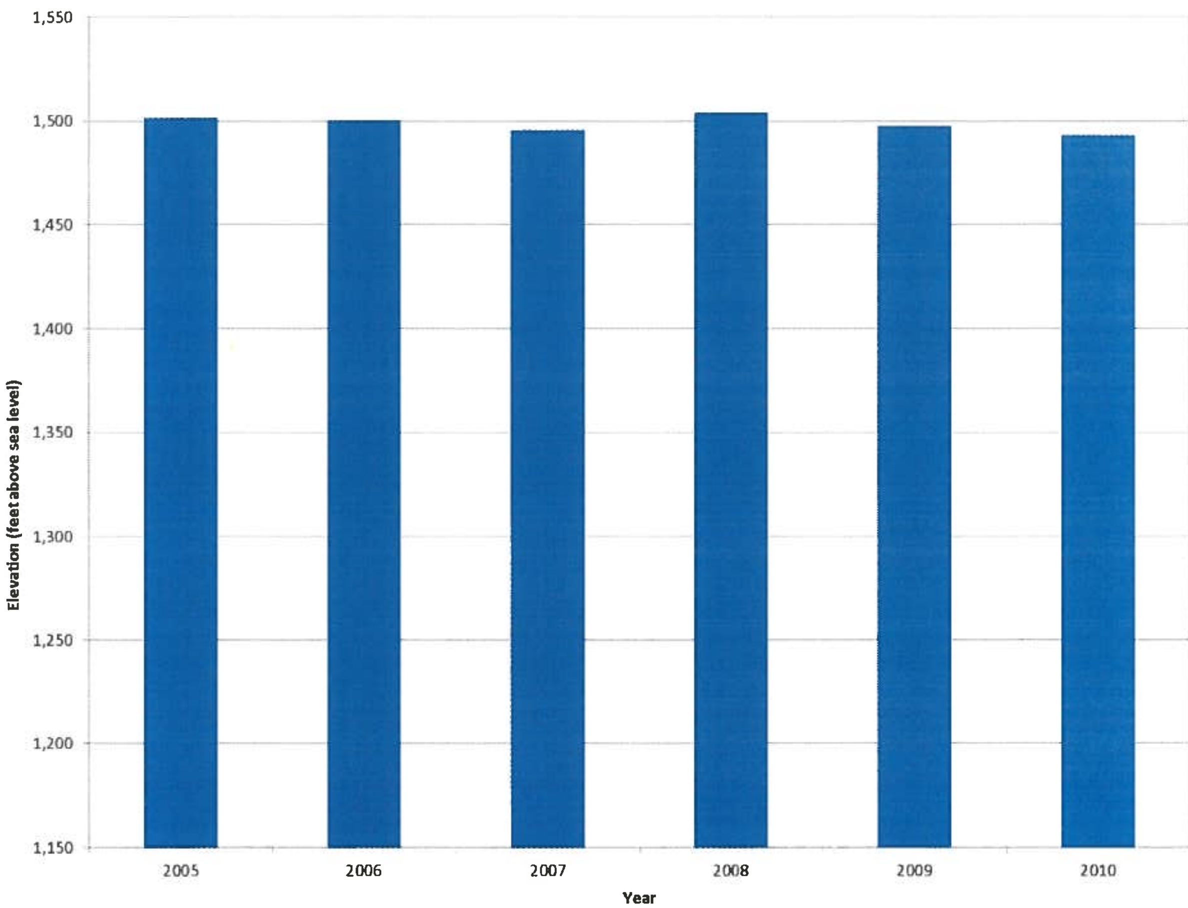

FIGURE A1. AVERAGE WATER-LEVEL HYDROGRAPH OF SEYMOUR AQUIFER IN BAYLOR, HASKELL, AND KNOX COUNTIES BETWEEN 2005 AND 2010.

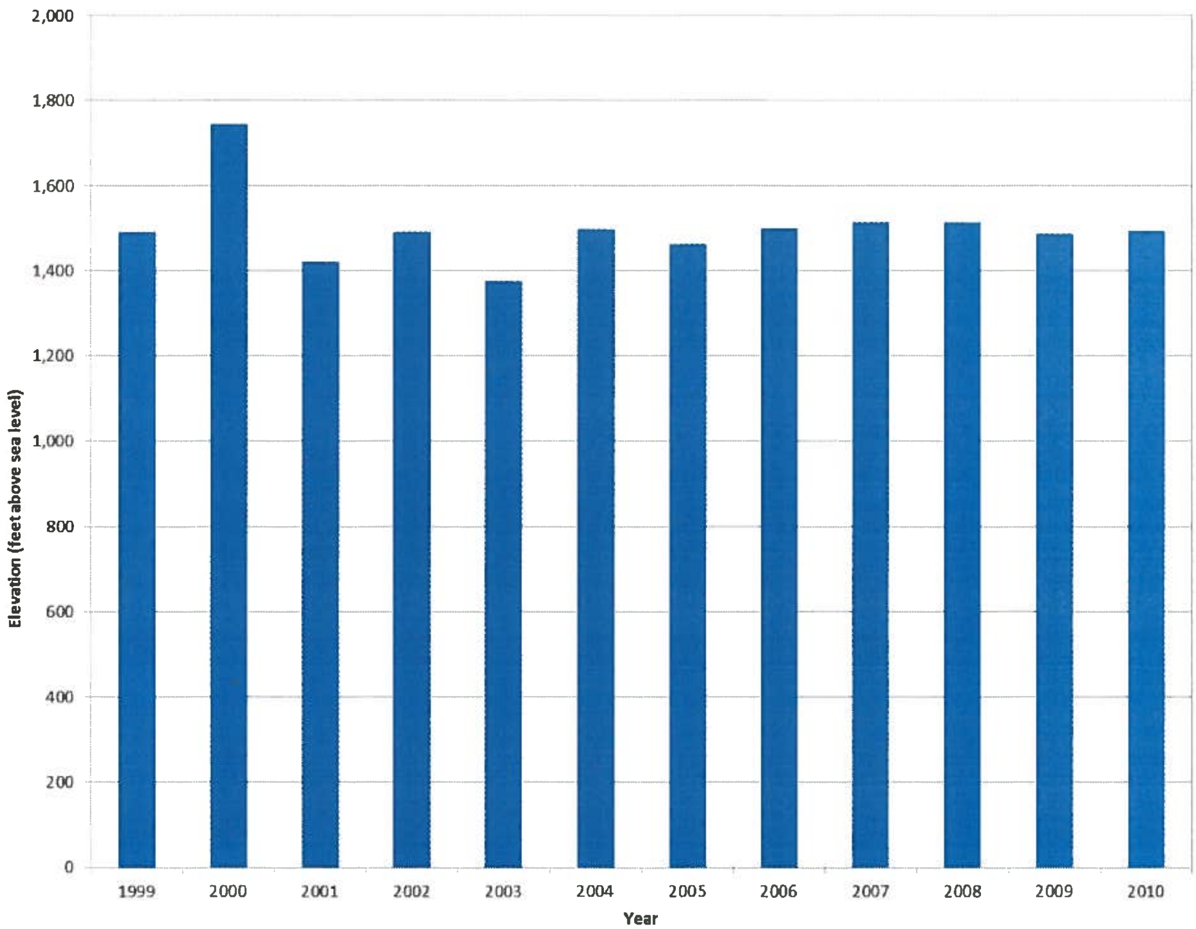

FIGURE A2. AVERAGE WATER-LEVEL HYDROGRAPH OF SEYMOUR AQUIFER IN BAYLOR, HASKELL, AND KNOX COUNTIES BETWEEN 1999 AND 2010.

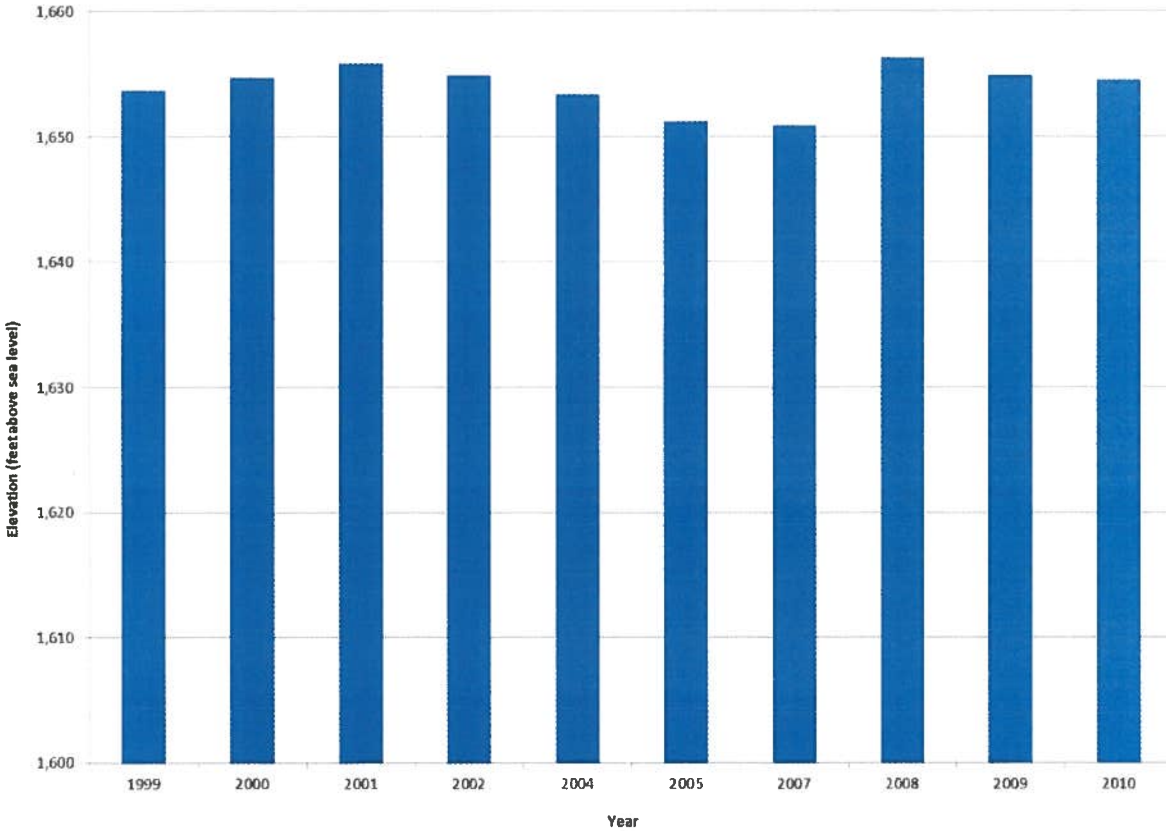

FIGURE A3. WATER-LEVEL HYDROGRAPH OF BLAINE AQUIFER IN CHILDRESS COUNTY (STATE WELL NUMBER 1231804) BETWEEN 1999 AND 2010.

Appendix B

Desired Future Conditions and Simulated Drawdowns

TABLE B1. MODELED DRAWDOWN IN SEYMOUR AQUIFER IN GROUNDWATER MANAGEMENT AREA (GMA) 6. MODELED DRAWDOWN WAS CALCULATED BY TWDB BASED ON MODFLOW HEAD FILE FROM GMA 6 SUBMITTAL, WHICH USED AVERAGE PUMPING OF LAST FIVE YEARS OF THE CALIBRATED MODEL. PUMPING WAS SLIGHTLY MODIFIED, AS NEEDED.

Seymour Aquifer Pod	County	Groundwater Conservation District	Modeled Drawdown (feet 2010 to 2070)	Desired Future Condition (feet drawdown)	Groundwater Availability Model
1	Childress, Collingsworth	Mesquite, Gateway	22.41	no more than 33	Ewing and others (2004)
2	Hall	Mesquite	9.91	no more than 15	Ewing and others (2004)
3	Briscoe, Hall, and Motley	Mesquite, Gateway	13.23	no more than 15	Ewing and others (2004)
4	Childress, Foard, and Hardeman	Gateway	0.97	no more than 1.0	Ewing and others (2004)
6	Knox	Rolling Plains	12.46	no more than 18	Ewing and others (2004)
7	Baylor, Haskell, and Knox	Rolling Plains	7.30	no more than 18	Jigmond and others (2014)
8	Baylor	Rolling Plains	14.80	no more than 18	Ewing and others (2004)
11	Fisher	Clear Fork	0.86	no more than 1.0	Ewing and others (2004)

TABLE B2. MODELED DRAWDOWN IN BLAINE AQUIFER IN GROUNDWATER MANAGEMENT AREA 6. MODELED DRAWDOWN WAS CALCULATED BASED ON A PREDICTIVE SIMULATION BY TWDB.

County	Groundwater Conservation District	Modeled Drawdown (feet 2010 to 2070)	Desired Future Condition (feet drawdown)	Groundwater Availability Model
Childress North of Red River	Mesquite, Gateway	5.94	no more than 9	Ewing and others (2004)
Childress South of Red River	Gateway	1.93	no more than 2	Ewing and others (2004)
Collingsworth	Mesquite	8.43	no more than 9	Ewing and others (2004)
Cottle	Gateway	1.68	no more than 2	Ewing and others (2004)
Fisher	Clear Fork	2.41	no more than 4	Ewing and others (2004)
Foard	Gateway	6.48	no more than 10	Ewing and others (2004)
Hall	Mesquite	4.79	no more than 9	Ewing and others (2004)
Hardeman	Gateway	1.15	no more than 2	Ewing and others (2004)

TABLE B3. MODELED DRAWDOWN IN OGALLALA AQUIFER IN GROUNDWATER MANAGEMENT AREA (GMA) 6. MODELED DRAWDOWN WAS BASED ON GMA 2 DESIRED FUTURE CONDITIONS GROUNDWATER PREDICTIVE MODEL.

County	Groundwater Conservation District	Modeled Drawdown (feet 2010 to 2070)	Desired Future Condition (feet drawdown)	Groundwater Availability Model
Motley	Gateway	17	17	Deeds and Jigmond (2015)

TABLE B4. MODELED DRAWDOWN IN DOCKUM AQUIFER IN GROUNDWATER MANAGEMENT AREA (GMA) 6. MODELED DRAWDOWN WAS BASED ON GMA 2 DESIRED FUTURE CONDITIONS GROUNDWATER PREDICTIVE MODEL.

County	Groundwater Conservation District	Modeled Drawdown (feet 2010 to 2070)	Desired Future Condition (feet drawdown)	Groundwater Availability Model
Fisher	Clear Fork	0	0	Deeds and Jigmond (2015)
Motley	Gateway	6	6	Deeds and Jigmond (2015)

Appendix C

Summary of Model Dry Cells

TABLE C1. MODEL DRY CELLS FROM PREDICTIVE SIMULATION OF SEYMOUR AQUIFER OF POD 7 IN BAYLOR, HASKELL, AND KNOX COUNTIES.

County	Stress Periods	Active Cells	Dry Cells	Wet Cells	Percent of Dry Cells
Baylor	1 to 408 (1980 to 2070)	5,753	401	5,352	7
Haskell	1 to 408 (1980 to 2070)	23,697	596	23,101	3
Knox	1 to 408 (1980 to 2070)	15,927	3,117	12,810	20

TABLE C2. MODEL DRY CELLS FROM PREDICTIVE SIMULATION OF SEYMOUR AND BLAINE AQUIFERS.

Desired Future Condition Zone	Stress Period	Active Cells	Dry Cells	Wet Cells	Percent of Dry Cells
Seymour (Pod 1)	1 to 60 (2011 to 2070)	296	109	187	37
Seymour (Pod 2)	1 to 60 (2011 to 2070)	133	48	85	36
Seymour (Pod 3)	1 to 60 (2011 to 2070)	66	30	36	45
Seymour (Pod 4)	1 to 60 (2011 to 2070)	453	85	368	19
Seymour (Pod 6)	1 to 60 (2011 to 2070)	58	33	25	57
Seymour (Pod 8)	1 to 60 (2011 to 2070)	45	11	34	24
Seymour (Pod 11)	1 to 60 (2011 to 2070)	280	94	186	34
Blaine (North of Red River of Childress)	1 to 60 (2011 to 2070)	309	0	309	0
Blaine (South of Red River of Childress)	1 to 60 (2011 to 2070)	408	0	408	0
Blaine (Collingsworth)	1 to 60 (2011 to 2070)	930	0	930	0
Blaine (Cottle)	1 to 60 (2011 to 2070)	907	0	907	0
Blaine (Fisher)	1 to 60 (2011 to 2070)	900	0	900	0
Blaine (Foard)	1 to 60 (2011 to 2070)	706	0	706	0
Blaine (Hall)	1 to 60 (2011 to 2070)	900	0	900	0
Blaine (Hardeman)	1 to 60 (2011 to 2070)	708	0	708	0

APPENDIX B

Estimated Historical Water Use And 2012 State Water Plan Datasets:

Clear Fork Groundwater Conservation District

by Stephen Allen
Texas Water Development Board
Groundwater Resources Division
Groundwater Technical Assistance Section
stephen.allen@twdb.texas.gov
(512) 463-7317
February 4, 2015

GROUNDWATER MANAGEMENT PLAN DATA:

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

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

The five reports included in part 1 are:

1. Estimated Historical Water Use (checklist Item 2)
   from the TWDB Historical Water Use Survey (WUS)
2. Projected Surface Water Supplies (checklist Item 6)
3. Projected Water Demands (checklist Item 7)
4. Projected Water Supply Needs (checklist Item 8)
5. Projected Water Management Strategies (checklist Item 9)
   reports 2-5 are from the 2012 Texas State Water Plan (SWP)

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

DISCLAIMER:

The data presented in this report represents the most up-to-date WUS and 2012 SWP data available as of 2/4/2015. Although it does not happen frequently, neither of these datasets are static so they are subject to change pending the availability of more accurate WUS data or an amendment to the 2012 SWP. District personnel must review these datasets and correct any discrepancies in order to ensure approval of their groundwater management plan.

The WUS dataset can be verified at this web address:

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

The 2012 SWP dataset can be verified by contacting Sabrina Anderson (sabrina.anderson@twdb.texas.gov or 512-936-0886).

For additional questions regarding this data, please contact Stephen Allen (stephen.allen@twdb.texas.gov or 512-463-7317) or Rima Petrossian (rima.petrossian@twdb.texas.gov or 512-936-2420).

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

Groundwater and surface water historical use estimates are currently unavailable for calendar year 2013. TWDB staff anticipates the calculation and posting of these estimates at a later date.

FISHER COUNTY

All values are in acre-fee/year

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2012	GW	631	147	14	0	5,290	228	6,310
	SW	327	2	2	0	0	342	673
2011	GW	577	126	216	0	5,462	361	6,742
	SW	297	2	52	0	0	542	893
2010	GW	546	104	88	0	4,393	337	5,468
	SW	235	1	21	0	0	506	763
2009	GW	318	131	114	0	5,348	264	6,175
	SW	326	1	27	0	0	396	750
2008	GW	400	162	139	0	5,274	284	6,259
	SW	328	1	34	0	0	425	788
2007	GW	686	146	0	0	4,057	222	5,111
	SW	365	2	0	0	0	332	699
2006	GW	332	152	0	0	4,990	257	5,731
	SW	129	8	0	0	0	386	523
2005	GW	410	159	0	0	3,470	242	4,281
	SW	136	1	0	0	0	363	500
2004	GW	605	159	0	0	2,844	57	3,665
	SW	528	4	0	0	0	511	1,043
2003	GW	602	159	0	0	2,664	56	3,481
	SW	528	1	0	0	0	501	1,030
2002	GW	202	159	0	0	3,139	58	3,558
	SW	212	1	0	0	32	519	764
2001	GW	100	159	0	0	2,707	59	3,025
	SW	567	14	0	0	27	530	1,138
2000	GW	217	158	0	0	2,446	58	2,879
	SW	578	9	0	0	13	526	1,126

Projected Surface Water Supplies
TWDB 2012 State Water Plan Data

FISHER COUNTY

All values are in acre-feet/year

RWPG	WUG	WUG Basin	Source Name	2010	2020	2030	2040	2050	2060
G	IRRIGATION	BRAZOS	BRAZOS RIVER COMBINED RUN-OF-RIVER IRRIGATION	757	757	757	757	758	758
G	LIVESTOCK	BRAZOS	LIVESTOCK LOCAL SUPPLY	585	585	585	585	585	585
G	ROTAN	BRAZOS	COLORADO RIVER MWD LAKE/RESERVOIR SYSTEM	278	271	249	231	222	203
	Sum of Projected Surface Water Supplies (acre-feet/year)			**1,620**	**1,613**	**1,591**	**1,573**	**1,565**	**1,546**

Projected Water Demands
TWDB 2012 State Water Plan Data

Please note that the demand numbers presented here include the plumbing code savings found in the Regional and State Water Plans.

FISHER COUNTY

All values are in acre-feet/year

RWPG	WUG	WUG Basin	2010	2020	2030	2040	2050	2060
G	MANUFACTURING	BRAZOS	192	225	255	284	310	336
G	MINING	BRAZOS	375	359	354	349	344	337
G	COUNTY-OTHER	BRAZOS	185	181	155	134	124	97
G	ROTAN	BRAZOS	278	271	249	231	222	203
G	ROBY	BRAZOS	76	75	75	74	74	76
G	IRRIGATION	BRAZOS	2,386	2,314	2,245	2,178	2,113	2,049
G	LIVESTOCK	BRAZOS	585	585	585	585	585	585
G	BITTER CREEK WSC	BRAZOS	117	114	113	111	110	113
	Sum of Projected Water Demands (acre-feet/year)		**4,194**	**4,124**	**4,031**	**3,946**	**3,882**	**3,796**

Projected Water Supply Needs
TWDB 2012 State Water Plan Data

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

FISHER COUNTY

All values are in acre-feet/year

RWPG	WUG	WUG Basin	2010	2020	2030	2040	2050	2060
G	BITTER CREEK WSC	BRAZOS	136	139	140	142	143	140
G	COUNTY-OTHER	BRAZOS	64	68	94	115	125	152
G	IRRIGATION	BRAZOS	2,295	2,367	2,436	2,503	2,569	2,633
G	LIVESTOCK	BRAZOS	0	0	0	0	0	0
G	MANUFACTURING	BRAZOS	148	115	85	56	30	4
G	MINING	BRAZOS	208	224	229	234	239	246
G	ROBY	BRAZOS	255	256	256	257	257	255
G	ROTAN	BRAZOS	0	0	0	0	0	0
	Sum of Projected Water Supply Needs (acre-feet/year)		**0**	**0**	**0**	**0**	**0**	**0**

Projected Water Management Strategies
TWDB 2012 State Water Plan Data

APPENDIX C

GAM Run 14-007: Clear Fork Groundwater Conservation District Management Plan

by Shirley C. Wade, Ph.D., P.G.
Texas Water Development Board
Groundwater Resources Division
Groundwater Availability Modeling Section
(512) 936-0883
July 25, 2014

STATE OF TEXAS
SHIRLEY C. WADE
GEOLOGY
No. 525
LICENSED
PROFESSIONAL GEOSCIENTIST

Shirley C. Wade
7/25/14

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GAM RUN 14-007: CLEAR FORK GROUNDWATER CONSERVATION DISTRICT MANAGEMENT PLAN

by Shirley C. Wade, Ph.D., P.G.
Texas Water Development Board
Groundwater Resources Division
Groundwater Availability Modeling Section
(512) 936-0883
July 25, 2014

EXECUTIVE SUMMARY:

Texas State Water Code, Section 36.1071, Subsection (h) (Texas Water Code, 2011), states that, in developing its groundwater management plan, a groundwater conservation district shall use groundwater availability modeling information provided by the executive administrator of the Texas Water Development Board (TWDB) in conjunction with any available site-specific information provided by the district for review and comment to the executive administrator. Information derived from groundwater availability models that shall be included in the groundwater management plan includes:

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

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

The groundwater management plan for the Clear Fork Groundwater Conservation District should be adopted by the district on or before July 27, 2015 and submitted to the executive administrator of the TWDB on or before August 26, 2015. The current management plan for the Clear Fork Groundwater Conservation District expires on October 25, 2015.

This report discusses the methods, assumptions, and results from model runs using the groundwater availability models for the Dockum Aquifer and the Seymour and Blaine aquifers. This model run replaces the results of GAM Run 09-017 (Oliver, 2009). GAM Run 14-007 meets current standards set after the release of GAM Run 09-017. Tables 1 and 2 summarize the groundwater availability model data required by statute, and Figures 1 and 2 show the area of the models from which the values in the table were extracted. If after review of the figures, the Clear Fork Groundwater Conservation District determines that the district boundaries used in the assessment do not reflect current conditions, please notify the TWDB immediately.

The Blaine Aquifer has been designated as a minor aquifer within Clear Fork Groundwater Conservation District; however, at the time the groundwater availability model for the Seymour and Blaine aquifers was developed in 2004 the Permian units within the district were not considered part of the Blaine Aquifer. Consequently the model does not represent the portion of the Blaine Aquifer within the district. If the district would like information for the Blaine Aquifer, they may request it from the Groundwater Technical Assistance Section of the Texas Water Development Board.

METHODS:

In accordance with the provisions of the Texas State Water Code, Section 36.1071, Subsection (h), the groundwater availability models for the Dockum Aquifer (Ewing and others, 2008) and the Seymour and Blaine aquifers (Ewing and others, 2004) were run for this analysis. Clear Fork Groundwater Conservation District water budgets were extracted for the historical model period (1980 through 1999) using ZONEBUDGET Version 3.01 (Harbaugh, 2009). The average annual water budget values for recharge, surface water outflow, inflow to the district, outflow from the district, net inter-aquifer flow (upper), and net inter-aquifer flow (lower) for the portion of the aquifer located within the district is summarized in this report.

PARAMETERS AND ASSUMPTIONS:

Dockum Aquifer

- We used version 1.01 of the groundwater availability model for the Dockum Aquifer. See Ewing and others (2008) for assumptions and limitations of the groundwater availability model for the Dockum Aquifer.

- This groundwater availability model includes three layers which generally represent the Ogallala, Edwards-Trinity (High Plains), Edwards-Trinity (Plateau), Pecos Valley, and Rita Blanca aquifers (Layer 1), the upper portion of the Dockum Aquifer (Layer 2), and the lower portion of the Dockum Aquifer (Layer 3).

- The geologic units represented in Layer 1 of the groundwater availability model are only included in the model for the purpose of more accurately representing flow between these units and the Dockum Aquifer. This model is not intended to explicitly simulate flow in these overlying units (Ewing and others, 2008).

- The MODFLOW Drain package was used to simulate both evapotranspiration and springs. Only drain flow from model grid cells representing springs within the district were incorporated into the surface water outflow values shown in Table 1.

- Groundwater in the Dockum Aquifer ranges from fresh to brine in composition (Ewing and others, 2008). Groundwater with total dissolved solids of less than 1,000 milligrams per liter is considered fresh, total dissolved solids of 1,000 to 10,000 milligrams per liter is considered brackish, and total dissolved solids greater than 35,000 milligrams per liter is considered brine.

- The model was run with MODFLOW-2000 (Harbaugh and others, 2000).

Seymour and Blaine Aquifers

- We used version 1.01 of the groundwater availability model for the Seymour and Blaine aquifers. See Ewing and others (2004) for assumptions and limitations of the groundwater availability model.

- This groundwater availability model includes two layers, representing the Seymour (layer 1) and Blaine (layer 2) aquifers. In areas where the Blaine

Aquifer was not designated as an aquifer in 2004 layer 2 of the model roughly represents the various Permian units located in the study area. After the groundwater availability model was released the boundary of the Blaine Aquifer was extended and now includes the Clear Fork Groundwater Conservation District. However, the groundwater availability model for the Seymour and Blaine aquifers does not represent the Blaine Aquifer within the district at this time.

- The model was run with MODFLOW-2000 (Harbaugh and McDonald, 2000).

RESULTS:

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

- Precipitation recharge—The areally distributed recharge sourced from precipitation falling on the outcrop areas of the aquifers (where the aquifer is exposed at land surface) within the district.
- Surface water outflow—The total water discharging from the aquifer (outflow) to surface water features such as streams, reservoirs, and springs.
- Flow into and out of district—The lateral flow within the aquifer between the district and adjacent counties.
- Flow between aquifers—The net vertical flow between the aquifer and adjacent aquifers or confining units. This flow is controlled by the relative water levels in each aquifer or confining unit and aquifer properties of each aquifer or confining unit that define the amount of leakage that occurs. "Inflow" to an aquifer from an overlying or underlying aquifer will always equal the "Outflow" from the other aquifer.

It is important to note that sub-regional water budgets are not exact. This is due to the size of the model cells and the approach used to extract data from the model. To avoid double accounting, a model cell that straddles a political boundary, such as a district or county boundary, is assigned to one side of the boundary based on the location of the centroid of the model cell. For example, if a cell contains two counties, the cell is assigned to the county where the centroid of the cell is located.

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

Management Plan requirement	*Aquifer or confining unit*	*Results*
Estimated annual amount of recharge from precipitation to the district	Dockum Aquifer	2,095
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Dockum Aquifer	319
Estimated annual volume of flow into the district within each aquifer in the district	Dockum Aquifer	65
Estimated annual volume of flow out of the district within each aquifer in the district	Dockum Aquifer	98
Estimated net annual volume of flow between each aquifer in the district	Not Applicable[1]	Not Applicable

[1] The Dockum Aquifer Groundwater Availability Model assumes a no-flow boundary condition at the base.

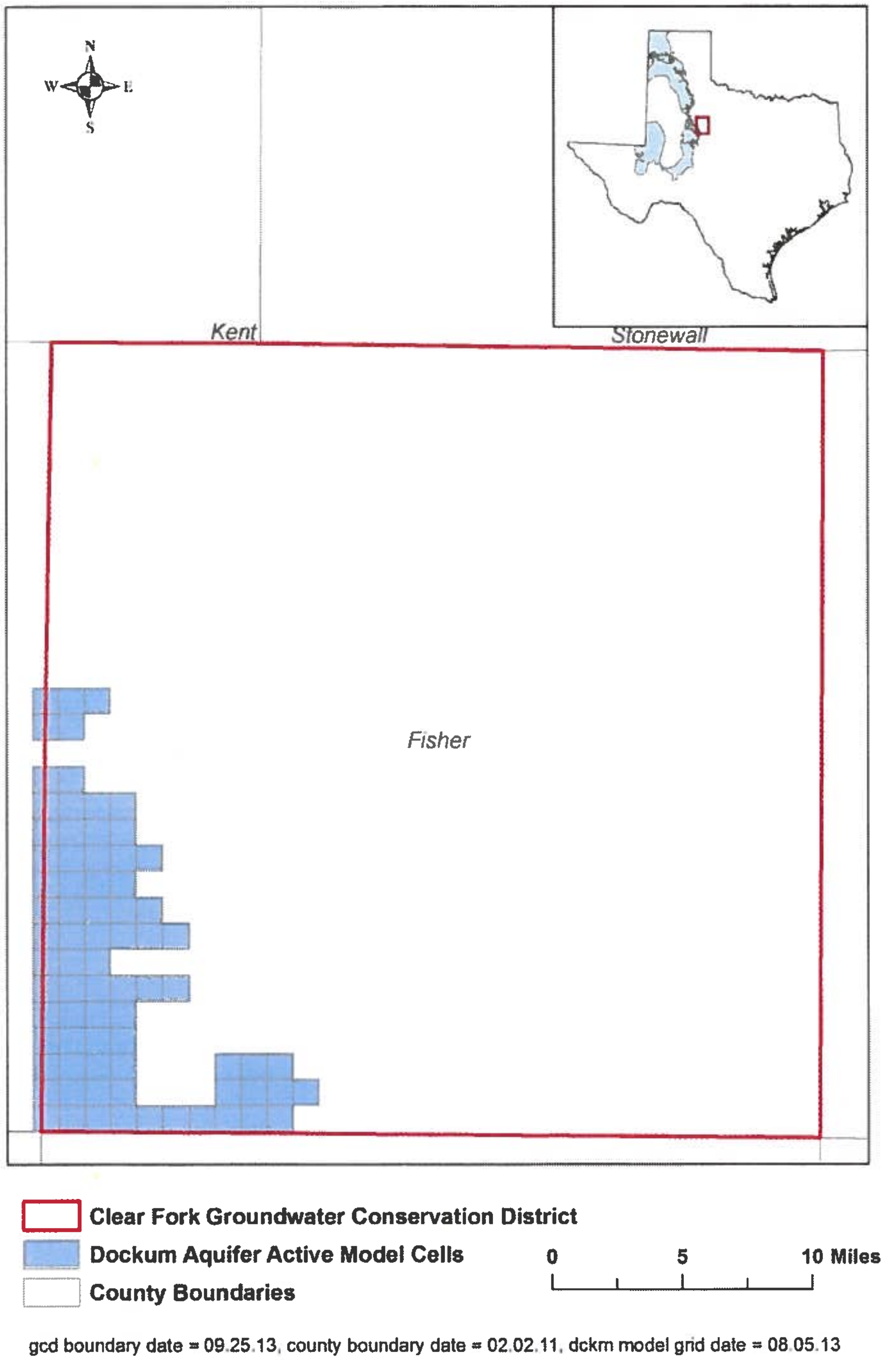

FIGURE 1: AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE DOCKUM AQUIFER FROM WHICH THE INFORMATION IN TABLE 1 WAS EXTRACTED (THE DOCKUM AQUIFER EXTENT WITHIN THE DISTRICT BOUNDARY).

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

Management Plan requirement	*Aquifer or confining unit*	*Results*
Estimated annual amount of recharge from precipitation to the district	Seymour Aquifer	12,261
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Seymour Aquifer	3,011
Estimated annual volume of flow into the district within each aquifer in the district	Seymour Aquifer	0
Estimated annual volume of flow out of the district within each aquifer in the district	Seymour Aquifer	459
Estimated net annual volume of flow between each aquifer in the district	From underlying Permian units to the Seymour Aquifer	436

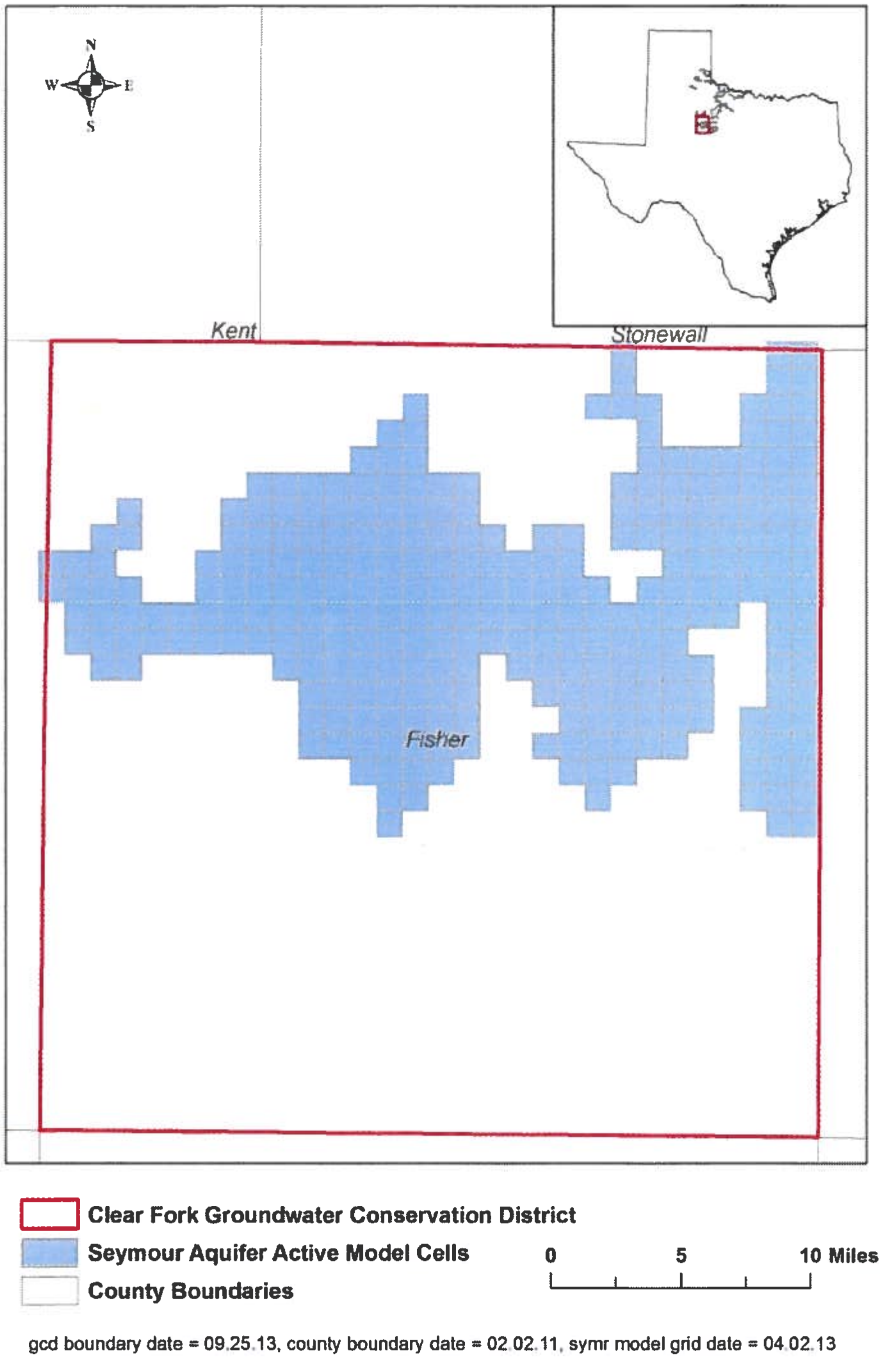

FIGURE 2: AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE SEYMOUR AQUIFER FROM WHICH THE INFORMATION IN TABLE 2 WAS EXTRACTED (THE SEYMOUR AQUIFER EXTENT WITHIN THE DISTRICT BOUNDARY).

LIMITATIONS:

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

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

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

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

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

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NOTICE OF BOARD MEETING OF THE
CLEAR FORK GROUNDWATER CONSERVATION DISTRICT

Tuesday August 27, 2019

7:00 AM

at the

USDA Service Center Conference Room, 105 N Lyon, Roby, Texas

AGENDA

1. Call to order
2. Public Comments
3. Review and approve minutes of the June Board meeting
4. Mangers Report –
5. RMBJ Geo. Report –

Business Items as Listed for Discussion / Action

a) Discuss Budget for 2020
b) Discuss Tax Rate for 2019
c) Set Tax Rate Hearing date and time
d) Amended Management Plan
e) Financial Report and pay bills
f) Other Items of Business for next board meeting
g) Set next Meeting
h) Adjournment

1.Members of the public may address the Board for limited time concerning any subject whether or not it is on the agenda. The Board is not allowed to take action on any subject presented that is not on the agenda, nor is the Board required to provide a response.
2.During the meeting, the Board may go into executive session for any of the proposes authorized under the Texas Open Meetings Act, Chapter 551 of the Texas Government Code, for any item on the above agenda or as otherwise authorized by law.
3. The District is committed to comply with the Americans with Disabilities Act. Responsible accommodations and equal opportunity for effective communications will be provided upon request. Please contact the District's General Manager at 325-776-2730 at least 48 hours in advance of the meeting if accommodation is needed.

I certify that this notice was posted before 72 hours in accordance with the Texas Open Meeting Act ;
dated: 9:45 AM August 22, 2019

Belynda Rains

Belynda Rains, District Manager

RECEIVED
AUG 22 2019

CLEAR FORK GROUNDWATER CONSERVATION DISTRICT
BOARD MEETING
Tuesday August 27, 2019 7:00 AM
USDA Service Center
105 N Lyon St
Roby, Texas

Minutes: Recorded by Belynda Rains

In Attendance: Directors; Ted Posey
Jack Brown
Greg Pruitt
Amy Bush - RMBJ, GEO Inc.
General Manager: Belynda Rains

Board Meeting

1. Call To Order –7:05 AM with a prayer lead by Chairman Ted Posey
2. Public Comments – None
3. Approval of Minutes of the June 28, 2019 Board Meeting - stand approved as recorded
4. Mangers Report – no report was given – directors needed to act on business and get to other duties.
5. Report from RMBJ Geo – Amy was present – reported they had worked on and attended the GMA 6 meeting in Quanah, all was current till the next round of DFC's due May of 2020. She and Ray had attended the Groundwater Summit in San Antonio. Amy was assisting Belynda in getting all the Appendix's attached to the Management Plan and ready for submission after board's approval.

Business Items:

a) Budget for 2020 – General Manager Belynda had worked on the budget and presented a draft for review. The board reviewed with some discussion, no action was taken at this time.

b) Tax Rate for 2019 - Belynda presented to the board the tax rate calculation from the Appraisal officer. She had visited with Kellen Walker, chief appraiser and there were new tax laws going into effect in 2020 and with this information it had been suggested that the board consider the "rollback" rate of .014545/$100 valuation. This would increase the tax value by about 7% but would still be under the Districts set rate of $.015/$100 valuation. Greg moved to propose the tax rate of $.01454/$100 valuation, motion was seconded by Jack, motion passed.

c) Tax Rate Hearing Date and Time - Jack moved to set the meeting for September 10, 2019 at 7a.m. in the Conference Room of the USDA Service Center, seconded by Greg, motion carried.

d) Consider and Approve Amended Management Plan – Since the Amended Management Plan had been reviewed in prior meetings and copy had been presented to the board members there was no questions or discussion. Motion by Jack Brown to approve the Amended Management Plan as written, motion was seconded by Greg Pruitt. Motion passed.

e) Financial Report and Pay Bills – Due to other obligations by board members and there were no bills to be presented for approval, Chairman Posey asked that the report be given with the next meetings report.

f) Other items of Business for next board meeting – Budget and tax rate.

g) Set next Meeting – September 10, 2019 @ 7:00 Belynda will send notices.

h) Adjournment – Greg moved meeting adjourn at 7:49 AM; seconded by Jack. Motion carried

THE ABOVE MINUTES OF THE MEETING OF THE BOARD OF DIRECTORS OF THE CLEAR FORK GROUNDWATER CONSERVATION DISTRICT HELD ON August 27, 2019 WERE APPROVED AND ADOPTED BY THAT BOARD ON Sept. 10, 2019

Ted Posey
Ted Posey, Chairman

ATTEST Belynda Rains
Belynda Rains, General Manager