Panola County

Groundwater
Conservation
District

District Management Plan

ADOPTED – JANUARY 20, 2009
READOPTED – February 19, 2013

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I. District Mission

The Panola County Groundwater Conservation District ("District") seeks to preserve and protect the groundwater resources of Panola County. The District will accomplish this mission by working to minimize the drawdown of the groundwater levels, prevent the waste of groundwater and reduce the degradation of the quality of the groundwater located in the Panola County area. The District will also use the authority granted by state law to protect and maintain the economic vitality of the communities within Panola County. The District believes the economy, environment, and quality of life in Panola County will be benefitted by the work of the District to accomplish its mission.

II. Purpose of the Management Plan

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

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

III. District Information

A. Creation

The District was created by the 80th Texas Legislature in 2007 with the enactment of House Bill 1498. (Appendix A) The creation of the District was confirmed by the citizens of Panola County at an election held on November 6, 2007. The District was provided with the rights and responsibilities specified in its enabling act, Chapter 36 of the Texas Water Code, the TWDB Rules, this Management Plan, and the District Rules.

B. Directors

The Board of Directors consists of nine members who are elected by the voters of Panola County. The District utilizes the same four precinct boundaries which are used for the Panola County Commissioners when filling eight of the District's director positions. One director position for the District is elected at-large from Panola County. Elections are held in November of even-numbered years. The directors for the District each are elected to a four-year term and a director may serve consecutive terms.

C. Authority

The District has the authority and duties given to GCDs by Texas Water Code Chapter 36, 31 Texas Administrative Code (TAC) Chapter 356, and the District's enabling act. The District exercises the authority it has been granted to preserve and protect the groundwater resources of Panola County through the adoption and implementation of rules for the District.

D. Location and Extent

The boundaries of the District are the same as Panola County. This area encompasses approximately 801 square miles (approximately 512,640 acres). The District is bounded by Harrison County to the north, Gregg and Rusk Counties to the west, Shelby County to the south, and the State of Louisiana to the east.

E. Groundwater Resources of Panola County

Panola County Groundwater Conservation District is located over the outcrop of the Carrizo-Wilcox Aquifer. The TWDB has identified the Carrizo-Wilcox Aquifer as the only major aquifer in the District. In general, this means that the aquifer is capable of providing relatively large amounts of water over a large area. A minor aquifer, by comparison, is defined as one capable of providing either a small amount of water over a large area or a large amount of water over a small area. The TWDB does not recognize any other major or minor aquifers in the District.

The Carrizo-Wilcox Aquifer, shown in Figure 1 and Figure 2, extends from the Texas-Mexico border along the Rio Grande River in South Texas to the Texas-Louisiana border in East Texas. Covering such a large area, its character can vary significantly depending on location. It is early Tertiary in age consisting primarily of unconsolidated sands and clays (George, 2009).

In many areas of the state, the Wilcox formation within the aquifer is divided into

upper, middle, and lower units. In central Texas these are known as the Hooper, Simsboro, and Calvert Bluff formations, respectively (Deeds and others, 2009). The Middle Wilcox is the primary unit exposed at land surface in the District, though some areas are overlain by the Upper Wilcox, Carrizo sand, and younger alluvial deposits along rivers and streams (George, 2009). The Lower Wilcox exists below the Middle Wilcox, but is limited in extent to the southern portion of the District (Kaiser, 1990). In the Carrizo-Wilcox, sediments in the District range in thickness from approximately 350 feet in the northeast to over 900 feet in the southwest (Oliver and Lupton, 2013). While most areas of the Carrizo-Wilcox dip to the southeast, this structure is due to Panola County's location in the Sabine Uplift – an area of East Texas and northwestern Louisiana where uplift occurred before and during deposition of the Wilcox (George, 2009).

Water quality samples from wells in the District indicate that water in the aquifer is generally fresh to slightly saline and of a sodium-bicarbonate composition. The water can be corrosive, however, with high iron content (Ashworth and Hopkins, 1995). Additionally, due to the presence of lignite in portions of the Wilcox in the District, dissolved gases such as methane also occur in some areas.

Well yields for the Carrizo-Wilcox Aquifer in Texas are commonly 500 gallons per minute or more, with some areas under artesian pressure supporting well yields up to 3,000 gallons per minute (Ashworth and Hopkins, 1995). This is not the case, however, for Panola County, which is located in an outcrop portion of the aquifer away from these more productive areas to the southwest. Of the over 1,900 wells in the TWDB Submitted Driller Reports Database in the District, the average well yield is 59 gallons per minute ranging between 1 and 225 gallons per minute. Over 99 percent of the wells reported in the database have well yields of 100 gallons per minute or less for the District.

Irrigation and municipal supply account for approximately 90 percent of the groundwater use of the Carrizo-Wilcox Aquifer in Texas (George and others, 2011). In Panola County, between 1980 and 2008 the TWDB estimates that pumping from the Carrizo-Wilcox Aquifer has varied between approximately 3,000 and 6,000 acre-feet per year, with approximately half of that attributable to municipal supply and the rest a combination of manufacturing, mining, livestock, and oil and gas activities.

Water level measurements by the District and available through TWDB indicate that groundwater generally flows toward the Sabine River, which runs through the eastern half of Panola County. Though the District has only been in existence since 2007, water level measurements are available for several wells back to 1980 and before. Water level trends are not consistent throughout the District. In the southwest portion of the District, water levels are generally steady or steadily declining. Near the Sabine River, most wells

show relatively steady water levels historically, which may be due to the influence of the Sabine River interacting with the aquifer. In the northeast and northwest areas of the county, water level measurements are considerably more variable, possibly due to the impact of nearby pumping.

FIGURE 1

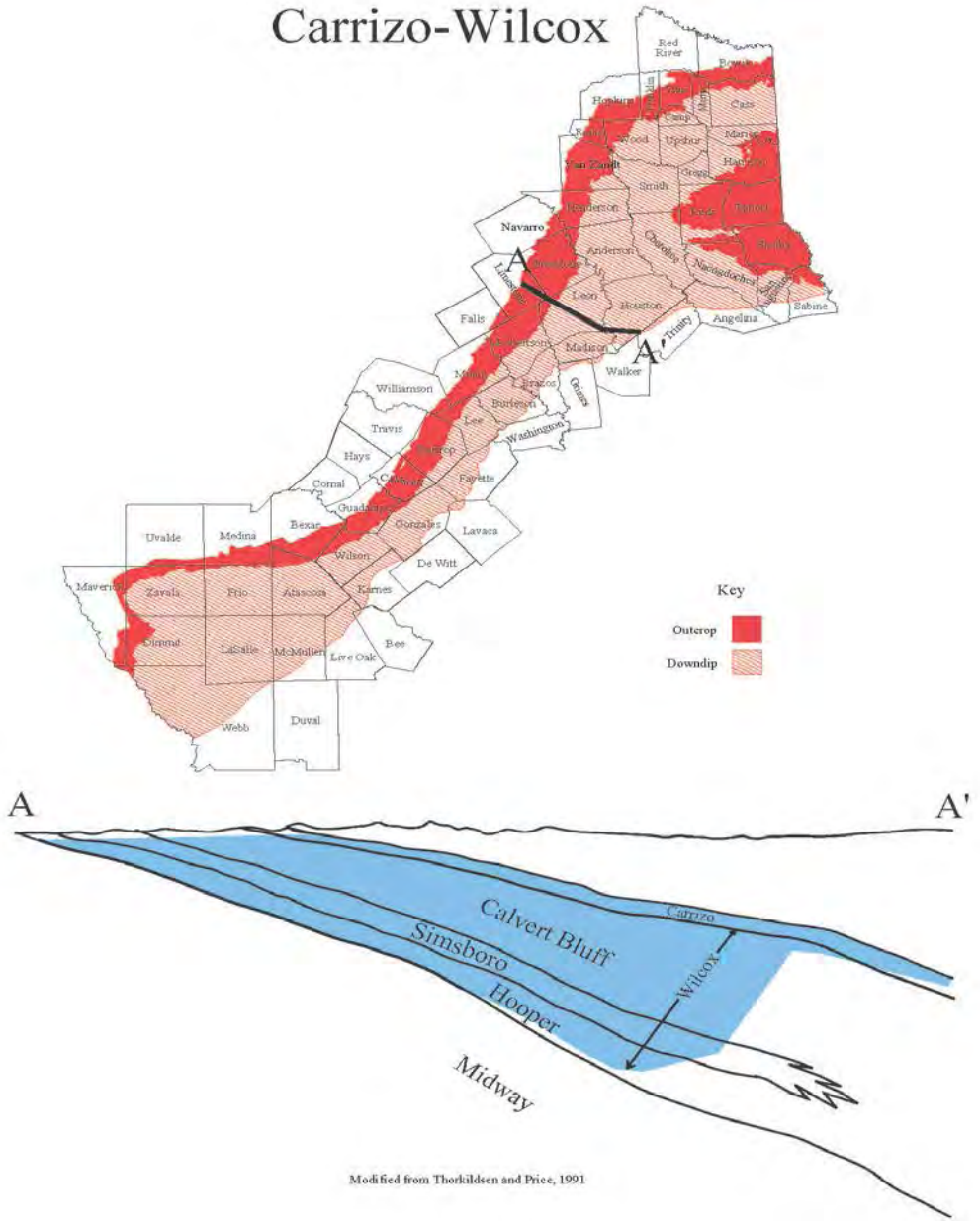
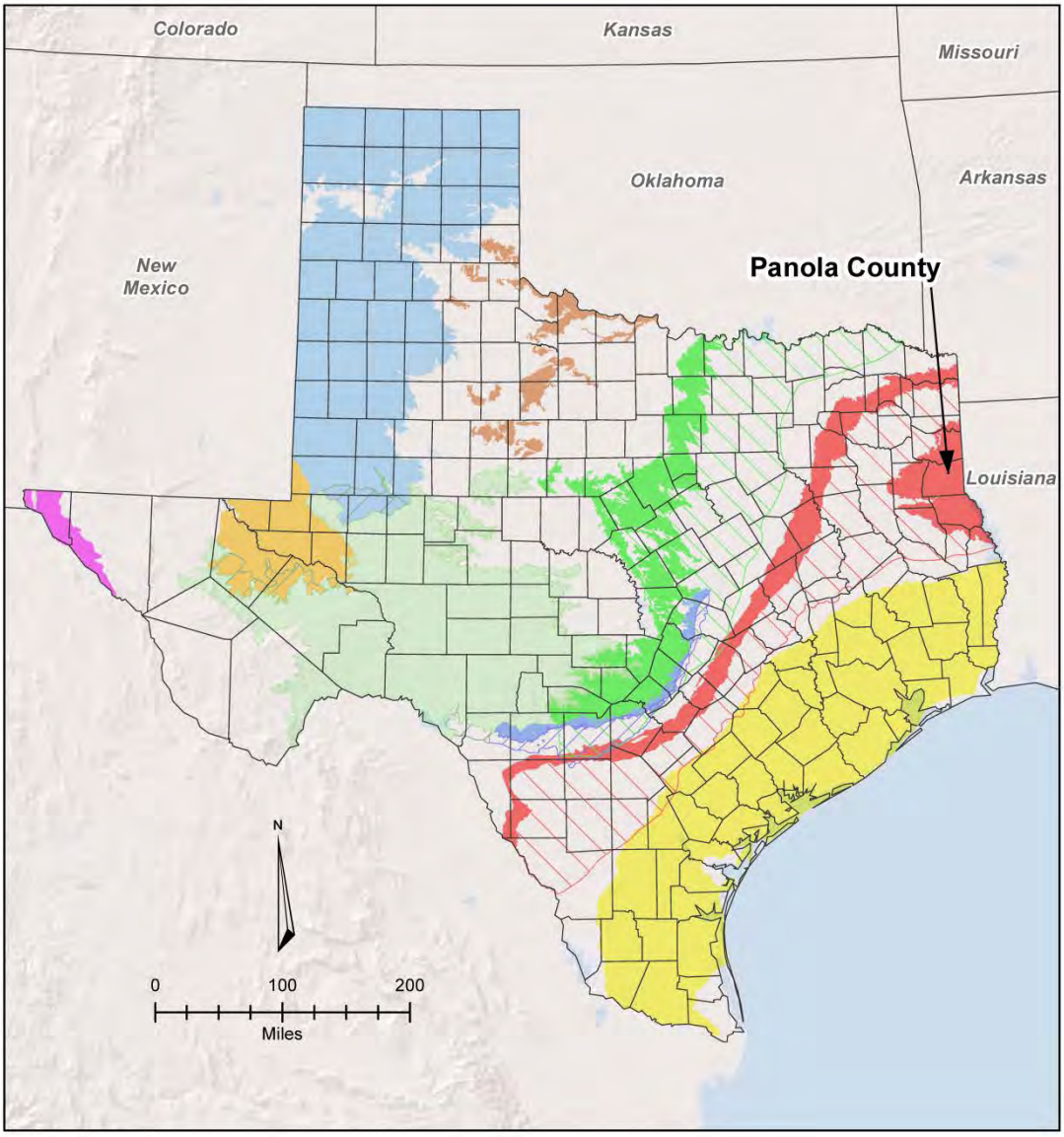


FIGURE 2



Major Aquifers of Texas
(Source: TWDB)

Prepared for Panola County Groundwater Conservation District

January 22, 2013

Legend

- Texas Counties/US States
- Pecos Valley
- Seymour
- Gulf Coast
- Carrizo - Wilcox (outcrop)
- Carrizo - Wilcox (subcrop)
- Hueco - Mesilla Bolson
- Ogallala
- Edwards - Trinity Plateau (outcrop)
- Edwards - Trinity Plateau (subcrop)
- Edwards BFZ (outcrop)
- Edwards BFZ (subcrop)
- Trinity (outcrop)
- Trinity (subcrop)

INTERA Geosciences & Engineering

IV. Criteria for Plan Approval

A. Planning Horizon

The Management Plan is adopted to be effective for a ten (10) year planning period. The planning period will begin on the date of approval by the TWDB. In accordance with Section 36.1072(e), the District will review and readopt the Management Plan, with or without amendments, in five years and resubmit the plan for TWDB approval. The Management Plan will be effective until the plan is replaced by a revised plan which has been approved by the TWDB.

B. Board Resolution

A certified copy of the Panola County Groundwater Conservation District Board of Directors resolution adopting the plan is located in Appendix B - District Resolution.

C. Plan Adoption

Public notices which demonstrate the Management Plan was adopted after the required public hearings and meetings were conducted are found in Appendix C – Notice of Hearings and Meetings.

D. Coordination with Surface Water Management Entities

Correspondence with the Sabine River Authority and the Panola County Fresh Water Supply District No. 1 which demonstrate the District provided the pertinent entities with a copy of the Management Plan are found in Appendix D – Correspondence with Surface Water Management Entities.

V. Estimates of Technical Information Required by TWC § 36.1071 / 31 TAC 356.52

A. Modeled Available Groundwater in the District Based on the Desired Future Condition Established under TWC 36.108— 31 TAC 356.52 (a)(5)(A) / TWC § 36.1071(e)(3)(A)

Modeled available groundwater is defined in Section 36.001 of the Texas Water Code as “the amount of water that the executive administrator [of TWDB] determines may be produced on an average annual basis to achieve a desired future condition established under Section 36.108.” The desired future condition of the aquifer may only be determined through joint planning with other GCDs in the same groundwater management area (GMA) as required by the 79th Legislature with the enactment of HB 1763. The District is part of GMA 11. The

GCDs of GMA 11 completed the first round of the joint planning process and adopted DFCs on April 13, 2010. The adopted DFCs are found in Appendix F.

The Modeled available groundwater numbers for the Carrizo-Wilcox Aquifer are found in Appendix G and are as follows (values are in acre-feet):

County	Region	Basin	2010	2020	2030	2040	2050	2060
Panola	I	Cypress	6	6	6	6	6	6
		Sabine	9,091	8,221	8,221	8,063	8,063	8,063

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

To estimate the annual amount of groundwater being used in the District, the District has looked to the TWDB Annual Water Use Survey Data. Because responses to the TWDB survey have been voluntary for years, the TWDB Water Use Survey Data is subject to variations in the completeness or accuracy of the data. The TWDB estimate of the amount of groundwater being used in the District on an annual basis is 6,337 acre-feet per year. The estimate is from the TWDB Annual Water Use Survey for the Year 2010 which is the most recent data available. TWDB data on estimated groundwater use is available from 1974 to 2010, excepting 1975 to 1979 and 1981 to 1983 when no data was collected. Between 2000 and 2010, estimates of groundwater use range from 2,633 to 6,337 acre-feet per year with an average of 4,166 acre-feet per year. Details of the estimate of the total amount of groundwater use are presented in Appendix H.

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

The estimate of the annual amount of recharge from precipitation to the aquifers within the District is based on Groundwater Availability Model ("GAM") Run 13-006 conducted by the TWDB. GAM Run 013-006 is the most recent GAM available to assess the amount of available groundwater in the aquifers within Panola County and is included as Appendix I.

Aquifer or confining Unit	Results (in acre-feet)
Carrizo-Wilcox Aquifer	38,085

D. For Each Aquifer, the Annual Volume of Water that Discharges from the Aquifer to Springs and any Surface Water Bodies, including Lakes, Streams, and Rivers—31 TAC 356.52 (a)(5)(D) / TWC §36.1071(e)(3)(D)

The estimate of the annual amount of water discharged to surface water systems by the groundwater resources of the District based on GAM Run 13-006 are as follows:

Aquifer or confining Unit	Results (in acre-feet)
Carrizo-Wilcox Aquifer	30,580

E. Annual Volume of Flow into and out of the District within each Aquifer and between Aquifers in the District, if a Groundwater Availability Model is Available — 31 TAC 356.52 (a)(5)(E) / TWC §36.1071(e)(3)(E)

1. Estimated annual volume of flow into the district within each aquifer in the district

The estimates of the amount of water flowing into the District within each aquifer in the District based on GAM Run 13-006 are as follows:

Aquifer or confining Unit	Results (in acre-feet)
Carrizo-Wilcox Aquifer	5,816

2. Estimated annual volume of flow out of the district within each aquifer in the district

The estimates of the amount of water flowing out of the District within each aquifer in the District based on GAM Run 13-006 are as follows:

Aquifer or confining Unit	Results (in acre-feet)
Carrizo-Wilcox Aquifer	3,122

3. Estimated net annual volume of flow between each aquifer in the district

The estimates of the net annual volume of flow between each aquifer in the District based on GAM Run 13-006 are as follows:

Aquifer or confining Unit	Results (in acre-feet)
From overlying confining units into the Carrizo-Wilcox Aquifer	16

F. Projected Surface Water Supply in the District, according to the most recently adopted state water plan — 31 TAC 356.52 (a)(5)(F) /TWC §36.1071(e)(3)(F)

The most recently adopted state water plan is the 2012 State Water Plan. This Plan indicates a projected surface water supply for Panola County of 10,452 acre-feet per year for year 2020 increasing to 11,177 acre-feet per year in 2060.

RWPG	Water User Group	County	River Basin	Source Name	2010	2020	2030	2040	2050	2060
I	Carthage	Panola	Sabine	Murvaul Lake/Reservoir	3,552	3,498	3,456	3,415	3,379	3,308
I	County-Other	Panola	Sabine	Murvaul Lake/Reservoir	1,331	1,328	1,323	1,319	1,315	1,310
I	Livestock	Panola	Cypress	Livestock Local Supply	30	30	30	30	30	30
I	Livestock	Panola	Sabine	Livestock Local Supply	1,828	1,828	1,828	1,828	1,828	1,828
I	Manufacturing	Panola	Sabine	Murvaul Lake/Reservoir	911	962	1,001	1,039	1,070	1,136
I	Manufacturing	Panola	Sabine	Sabine River Run-of-River Manufacturing	114	114	114	114	114	114
I	Manufacturing	Panola	Sabine	Sabine River Run-of-River Manufacturing	129	129	129	129	129	129
I	Mining	Panola	Sabine	Murvaul Lake/Reservoir	2,254	2,563	2,752	2,943	3,137	3,322
Total Projected Surface Water Supplies (acre-feet per year) =					**10,149**	**10,452**	**10,633**	**10,817**	**11,002**	**11,177**

Source: 2012 State Water Planning Database (Appendix H)

G. Projected Total Demand for Water in the District, according to the most recently adopted state water plan — 31 TAC 356.52 (a)(5)(G) / TWC §36.1071(e)(3)(G)

The most recently adopted state water plan is the 2012 State Water Plan. This Plan indicates a projected total water demand for Panola County of 13,039 acre-feet/year for the year 2020 increasing to 14,574 acre-feet per year in 2060.

2012 State Water Plan Projected Water Demands
Panola County

Region	Water User Group	County	River Basin	2010	2020	2030	2040	2050	2060
I	County-Other	Panola	Cypress	5	5	5	5	5	5
I	Livestock	Panola	Cypress	31	31	31	31	31	31
I	Beckville	Panola	Sabine	133	133	132	131	131	132
I	Carthage	Panola	Sabine	2,274	2,297	2,311	2,317	2,326	2,343
I	County-Other	Panola	Sabine	1,693	1,676	1,651	1,620	1,602	1,614
I	Manufacturing	Panola	Sabine	1,357	1,437	1,500	1,561	1,614	1,720
I	Mining	Panola	Sabine	3,756	4,271	4,587	4,905	5,228	5,536
I	Livestock	Panola	Sabine	3,065	3,065	3,065	3,065	3,065	3,065
I	Gill WSC	Panola	Sabine	94	96	97	99	100	100
I	Tatum	Panola	Sabine	29	28	28	28	27	28
Total Projected Water Demands (acre-feet per year) =				**12,437**	**13,039**	**13,407**	**13,762**	**14,129**	**14,574**

Source: 2012 State Water Planning Database (Appendix H)

VI. Consider the Water Supply Needs and Water Management Strategies included in the Adopted State Water Plan — TWC §36.1071(E)(4)

2012 State Water Plan Projected Water Needs
Panola County

Positive values represent a water surplus
Negative values represent a water need

Region	Water User Group	County	River Basin	2010	2020	2030	2040	2050	2060
I	Beckville	Panola	Sabine	448	448	449	450	450	449
I	Carthage	Panola	Sabine	1,682	1,599	1,538	1,487	1,438	1,341
I	County-Other	Panola	Cypress	0	0	0	0	0	0
I	County-Other	Panola	Sabine	989	1,006	1,031	1,062	1,080	1,068
I	Gill WSC	Panola	Sabine	19	17	16	14	13	13
I	Livestock	Panola	Cypress	0	0	0	0	0	0
I	Livestock	Panola	Sabine	282	282	282	282	282	282
I	Manufacturing	Panola	Sabine	-96	-116	-132	-147	-161	-187
I	Mining	Panola	Sabine	932	726	599	472	343	220
I	Tatum	Panola	Sabine	65	66	66	66	67	66
Total Projected Water Needs (acre-feet per year) =				**-96**	**-116**	**-132**	**-147**	**-161**	**-187**

Source: 2012 State Water Planning Database (Appendix H)

Projected Water Management Strategies
Panola County

RWPG	Water User Group	WUG County	River Basin	Water Management Strategy*	Source Name	2010	2020	2030	2040	2050	2060
I	Manufacturing	Panola	Sabine	Purchase Water from Provider	Murvaul Lake/Reservoir	96	116	132	147	161	187
Total Projected Water Management Strategies (acre-feet per year) =						**96**	**116**	**132**	**147**	**161**	**187**

Source: 2012 State Water Planning Database (Appendix H)

VII. Details on the District Management of Groundwater

The Texas Legislature has determined that GCDs, such as the Panola County Groundwater Conservation District, are the state's preferred method of groundwater management. The Texas Legislature codified its groundwater management policy decision in Section 36.0015 of the Texas Water Code, which provides that GCDs will manage groundwater resources through rules developed and implemented in accordance with Chapter 36 of the Texas Water Code. Chapter 36 establishes directives for GCDs and the statutory authority to carry out such directives to enable GCDs to have the proper tools to protect and preserve the groundwater resources with their boundaries. The District will give strong consideration to the economic and cultural activities which occur within the District and which rely upon the continued use of groundwater.

The District using the regulatory tools it has been given by Chapter 36 to properly address the groundwater issues within Panola County, such as groundwater quality and groundwater supply. The District believes that the prevention of contamination of its groundwater resources through abandoned and deteriorated water wells is important. Wells that have been abandoned or not properly maintained provide direct conduits or pathways that allow contamination from the surface to quickly reach the groundwater resources of the District. To address the threats to the water quality of its groundwater resources, the District requires, through its rules, that all abandoned, deteriorated, or replaced wells be plugged in compliance with the Water Well Drillers and Pump Installers Rules of the Texas Department of Licensing and Regulation. The District will also place a priority on the capping of water wells that the well owner plans to use at a later date in order to eliminate waste, prevent pollution, and stop future deterioration of the well casing.

The District has established a monitoring well network to monitor the changing storage conditions of the groundwater supplies within the District. The District will make a regular assessment of water supply and groundwater storage conditions and has reported and will continue to report those conditions to the District Board of Directors and to the public. The District has also worked and will continue to work with any local governmental entities or agencies of the State of Texas on any well monitoring efforts or well investigations which are conducted.

The District is using the regulatory tools granted to GCDs by Chapter 36 to preserve and protect the existing and historic users of groundwater within the District. The Texas Legislature empowered the District to protect existing users of groundwater, which are those individuals or entities currently invested in and using groundwater or the groundwater resources within the District for a beneficial purpose, and preserve historic use by historic users, which are those individuals or entities who used groundwater beneficially in the past. The District strives to protect and preserve such use to the extent practicable under the goals and objectives of this Management Plan.

One of the tools the District is using to protect existing and historic use of groundwater is the permitting process the District has created through the District's rules. Pursuant to legislative authority, such as Section 36.113(e) of the Texas Water Code, the District is protecting existing use by imposing more restrictive permit conditions on new permit applications and increased use by historic users. In protecting existing users, the District has established limitations that apply to all subsequent new permit applications and increased use by historic users, regardless of type or location of use, which bear a reasonable relationship to this Management Plan, and are reasonably necessary to protect existing use. In accordance with Section 36.116(b) of the Texas Water Code, the District isl also preserving historic use when implementing its rules to limit groundwater production to the maximum extent practicable consistent with this Management Plan.

In order to better manage the groundwater resources of Panola County, the District may establish management zones for and adopt different rules for each subdivision of an aquifer or geologic strata located in whole or in part within the boundaries of the District or each geographic area overlying a subdivision of an aquifer located in whole or in part within the boundaries of the District. The District has adopted rules to regulate groundwater withdrawals by means of spacing and/or production limits. The relevant factors to be considered in making a determination to grant or deny a permit or limit groundwater withdrawals shall include those set forth in the District's enabling act, Chapter 36 of the Texas Water Code, and the rules of the District.

VIII. Actions, Procedures, Performance, and Avoidance for Plan Implementation — 31 TAC 356.52 (A)(4); TWC §36.1071(E)(2)

The District will use the Management Plan to guide the District in its efforts to preserve and protect the groundwater resources of Panola County. The District will ensure that all of its rules development, regulatory activities, planning effects and daily operations are consistent with the Management Plan.

The rules for the District will be developed in coordination with the management goals and technical information provided in the Management Plan. The rules shall be consistent with the provision of the Management Plan and Chapter 36 of the Texas Water Code. The enforcement of the rules will be driven by the hydrogeological and technical information available to the District, including the information provided in the Management Plan.

The enabling act for the District requires the District to work and plan with other GCDs in its GMA – GMA 11. The District will use the Management Plan as part of its cooperation efforts with the neighboring GCDs.

IX. Methodology for Tracking Process to Achieve District's Management Goals — 31 TAC §356.52 (A)(6)

In order for the District to track its progress in achieving its management goals and objectives, the District will submit an annual report ("Annual Report") for review by its Board of Directors. The Annual Report will be submitted to the Board of Directors no later than 120 days following the end of the District's fiscal year, and will address the District's overall performance regarding each of its management goals and objectives for the previous fiscal year. Completion of the Annual Report will begin following the end of fiscal year 2009. The District will maintain a copy of the Annual Report for public review at the District office after formal adoption by the Board of Directors.

X. District Goals, Management Objectives, and Performance Standards — 31 TAC §356.52

The District's management goals, objectives and performance standards are addressed as follows:

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

A.1. Objective: The District will require the registration of all water wells, exempt and non-exempt, within the District's boundaries each year in accordance with the District Rules.

A.1. Performance Standard: The number of new and existing water wells registered with the District will be provided in the Annual Report submitted to the Board of Directors of the District each fiscal year.

A. 2. Objective: The District will require permits for all non-exempt groundwater use within District boundaries each year pursuant to the District Rules.

A.2. Performance Standard: The District will accept and process applications for permits for all non-exempt groundwater use pursuant to the permitting process described in the District Rules each year. The Annual Report for each fiscal year will contain a summary of the number of applications for the permitted use of groundwater and the number and type of permits issued.

A.3. Objective: The District will regulate the production of groundwater by maintaining a database of groundwater usage through production volume reports each year according to District rules.

A. 3. Performance Standard: The District will include a summary of the volume of water produced in the County each year in the annual report.

B. Controlling and Preventing Waste of Groundwater - 31TAC §356.52

(a)(1)(B); TWC §36.1071(a)(2)

B.1. Objective: The District will provide information on an annual basis to the public on the elimination, reduction, and prevention of the waste of groundwater and information focused on water quality protection each year. The District will use one of the following methods to provide information to the public at least once during each fiscal year:

a. distribute literature packets or brochures within Panola County and the surrounding areas;
b. provide public presentations on groundwater and water issues, including waste prevention;
c. sponsor an educational program/course;
d. provide information on the District's web site;
e. submit newspaper articles to local paper for publication;
f. present displays at local public events; or
g. become involved in the distribution of information, such as brochures, in schools in Panola County.

Performance Standard: The District's Annual Report will include a summary of the District's efforts during the fiscal year to provide educational information to the public on the elimination, reduction and prevention of the waste of groundwater.

B.2. Objective: The District will make an annual evaluation of its Rules to determine whether any amendments are necessary to facilitate prevention of waste of the groundwater within District boundaries.

B.2. Performance Standard: The District's Annual Report will include a summary of the evaluation of the District Rules and will provide a recommendation as to whether any amendments to the Rules are needed to facilitate prevention of waste.

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

C.1. Objective: The District will participate in the regional planning process by sending a representative to attend at least one meeting of the East Texas Regional Water Planning Group (Region I) each fiscal year.

C.1. Performance Standard: The attendance at any Region I meeting by a representative of the District will be included in the District's Annual Report and will indicate the dates of attendance.

D. Addressing Natural Resource Issues which Impact the Use and Availability of Groundwater, and which are Impacted by the Use of Groundwater - 31TAC §356.52 (a)(1)(E); TWC §36.1071(a)(5)

1. Objective: The District will monitor water-levels within District boundaries on an annual basis by measuring the water level of at least ten (10) water wells.

   Performance Standard: The District's Annual Report will include a description of the number of wells measured and the monitoring results of the measured well for each year.

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

E.1. Objective: The District will download at least one updated Palmer Drought Severity Index ("PDSI") map each month and will check for the regular updates to the Drought Preparedness Council Situation Report ("Situation Report") posted on the following website: http://www.txdps.state.tx.us/dem/sitrepindex.htm.

E.1. Performance Standard: The District will make an assessment of the status of drought in the District and prepare a quarterly briefing to the Board of Directors. The downloaded PDSI maps and Situation Reports will be included with copies of the quarterly briefings each year in the District Annual Report to the Board of Directors.

E.2. Objective: The District will create and adopt through the Board of Directors a Drought Contingency Plan and monitor drought conditions in the Carrizo-Wilcox aquifer as outlined in the Drought Contingency Plan. If necessary, the District will update its Drought Contingency Plan when changes are necessary.

E.2. Performance Standard: The District's Annual Report to the Board of Directors will provide a summary of any implementations of the Drought Contingency Plan for each year and include an update on any revisions made during that year.

F. Addressing Conservation, Recharge Enhancement, Rainwater Harvesting, Precipitation Enhancement, or Brush Control, Where Appropriate and Cost Effective - 31TAC §356.52 (a)(1)(G); TWC §36.1071(a)(7)

Conservation

F.1. Objective: The District will promote conservation at least once during

each fiscal year by one of the following methods:

a. distribute literature packets or brochures;
b. conduct public presentations;
c. sponsor an educational program/curriculum;
d. provide information on the District's web site;
e. submit newspaper articles to local newspaper for publication;
f. present displays at local public events;
g. annually conduct a local contest on water conservation; or
h. conduct classroom presentations on conservation.

F.1. Performance Standard: The District's Annual Report will provide a summary of the District efforts and a copy of any information provided by the District to the public during the previous fiscal year to promote conservation.

Rainwater Harvesting

F.2. Objective: The District will advocate rainwater harvesting each year by providing updated information about rainwater harvesting on the District web site at least once each fiscal year.

Performance Standard: The Annual Report for the District will include a copy of the information on rainwater harvesting which has been provided on the District web site within the previous fiscal year.

Recharge Enhancement

F.3. Objective: The District will provide information relating to recharge enhancement on the District web site at least one time each fiscal year.

F.3. Performance Standard: Each year, the District's Annual Report will include a copy of the information that has been provided on the District web site relating to recharge enhancement.

G. Addressing in a Quantitative Manner the Desired Future Conditions of the Groundwater Resources – 31 TAC §356.52(a)(1)(H); TWC §36.1071(a)(8)

G.1. Objective: The District will monitor water-levels within the District boundaries on an annual basis by measuring the water level of at least ten (10) wells.

G.1. Performance Standard: The District's Annual Report will include a description of the number of wells measured and the monitoring results of the measured well for each year.G.2. Objective: The District will consider a reasonable estimated amount of actual groundwater production under

existing permits through tracking production of all permitted water wells.

G.2. Performance Standard: The District's Annual Report will include the amount of production for each permitted water well within the boundaries of the District each year.

XII. Management Goals Determined Not Applicable to the District

A. **Controlling and Preventing Subsidence** - 31TAC §356.52(a)(1)(C); TWC §36.1071(a)(3)

This management goal is not applicable to the District because the District is unaware of any issues of subsidence which exist within the boundaries of the District.

B. Addressing Precipitation Enhancement – 31 TAC §·356.52(a)(1)(G); TWC §36.1071(a)(7)

Precipitation enhancement is not an appropriate or cost effective program for the District since there is not an operational precipitation enhancement program in nearby counties or groundwater conservation districts that the District could participate in and share expenses.

C. Addressing Brush Control – 31 TAC §·356.52(a)(1)(G); TWC §36.1071(a)(7)

Brush control is not an appropriate program for the District due to the geographic location, terrain, and hydrogeologic features of the territory within the District.

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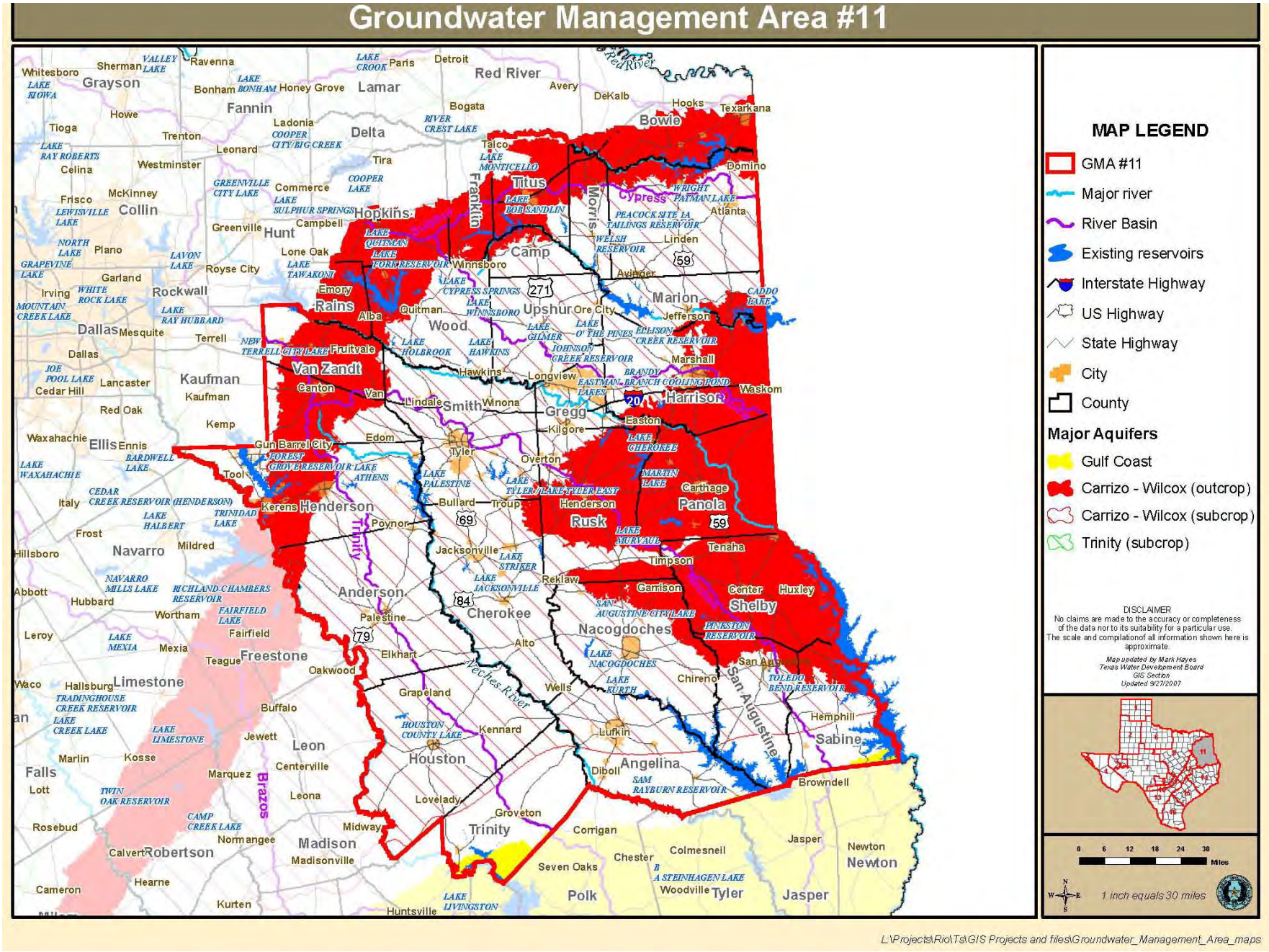
Groundwater Management Area #11
MAP LEGEND
GMA #11
Major river
River Basin
Existing reservoirs
Interstate Highway
US Highway
State Highway
City
County
Major Aquifers
Gulf Coast
Carrizo - Wilcox (outcrop)
Carrizo - Wilcox (subcrop)
Trinity (subcrop)
DISCLAIMER
No claims are made to the accuracy or completeness of the data nor to its suitability for a particular use. The scale and compilationof all information shown here is approximate.
Map updated by Mark Hayes
Texas Water Development Board
GIS Section
Updated 9/27/2007
0 6 12 18 24 30
Miles
1 inch equals 30 miles
L:\Projects\Rio\Ts\GIS Projects and files\Groundwater_Management_Area_maps

APPENDIX LIST

A - Enabling Act for Panola County Groundwater Conservation District

B - Resolution Adopting Management Plan

C - Notices of Public Hearings and Meetings of Panola County GCD

D - Entities to Notify and Evidence of Coordination with Surface Water Management Entities

E - Groundwater Management Areas in Texas

F - Desired Future Conditions Adopted by Groundwater Management Area 11

G - Modeled Available Groundwater Estimates for Groundwater Management Area 11 – GAM Run 10-015 version 2

H - Historical Water Use Summary By Groundwater and Surface Water

I - Estimates for historical groundwater flows – GAM Run 13-006

APPENDIX A

ENABLING ACT FOR PANOLA COUNTY GCD

H.B. No. 1498

AN ACT

relating to the creation of the Panola County Groundwater Conservation District; providing authority to impose a tax and issue bonds.

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

SECTION 1. Subtitle H, Title 6, Special District Local Laws Code, is amended by adding Chapter 8819 to read as follows:

CHAPTER 8819. PANOLA COUNTY GROUNDWATER

CONSERVATION DISTRICT

SUBCHAPTER A. GENERAL PROVISIONS

Sec. 8819.001. DEFINITIONS. In this chapter:

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

(2) "Director" means a member of the board.

(3) "District" means the Panola County Groundwater Conservation District.

Sec. 8819.002. NATURE OF DISTRICT. The district is a groundwater conservation district in Panola County created under and essential to accomplish the purposes of Section 59, Article XVI, Texas Constitution.

Sec. 8819.003. CONFIRMATION ELECTION REQUIRED. If the creation of the district is not confirmed at a confirmation election held on or before December 31, 2008, the district is dissolved on that date, except that:

(1) any debts incurred shall be paid;

(2) any assets that remain after the payment of debts shall be transferred to Panola County; and

(3) the organization of the district shall be maintained until all debts are paid and remaining assets are transferred.

Sec. 8819.004. INITIAL DISTRICT TERRITORY. The initial boundaries of the district are coextensive with the boundaries of Panola County, Texas.

Sec. 8819.005. APPLICABILITY OF OTHER GROUNDWATER CONSERVATION DISTRICT LAW. Except as otherwise provided by this chapter, Chapter 36, Water Code, applies to the district.

[Sections 8819.006-8819.020 reserved for expansion]

SUBCHAPTER A-1. TEMPORARY PROVISIONS

Sec. 8819.021. APPOINTMENT OF TEMPORARY DIRECTORS. (a) Not later than the 45th day after the effective date of this chapter, nine temporary directors shall be appointed as follows:

(1) the Panola County Commissioners Court shall appoint eight temporary directors, with two of the temporary directors appointed from each of the four commissioners precincts in the county to represent the precincts in which the temporary directors reside; and

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

(b) Of the temporary directors, at least one director must represent rural water suppliers in the district, one must represent agricultural interests in the district, and one must represent industrial interests in the district.

I If there is a vacancy on the temporary board of directors of the district, the Panola County Commissioners Court shall appoint a person to fill the vacancy in a manner that meets the representational requirements of this section.

(d) Temporary directors serve until the earlier of:

(1) the election of initial directors under Section 8819.023; or

(2) the date this subchapter expires under Section 8819.026.

Sec. 8819.022. ORGANIZATIONAL MEETING OF TEMPORARY DIRECTORS. As soon as practicable after all the temporary directors have qualified under Section 36.055, Water Code, a majority of the temporary directors shall convene the organizational meeting of the district at a location within the district agreeable to a majority of the directors. If an agreement on location cannot be reached, the organizational meeting shall be at the Panola County Courthouse.

Sec. 8819.023. CONFIRMATION AND INITIAL DIRECTORS' ELECTION. (a) The temporary directors shall hold an election to confirm the creation of the district and to elect the initial directors of the district.

(b) The temporary directors shall have placed on the ballot the names of all candidates for an initial director's position who have filed an application for a place on the ballot as provided by Section 52.003, Election Code.

I The ballot must be printed to provide for voting for or against the proposition: "The creation of the Panola County Groundwater Conservation District."

(d) If the district levies a maintenance tax for payment of expenses, the ballot must be printed to provide for voting for or against the proposition: "The levy of a maintenance tax at a rate not to exceed ____ cents for each $100 of assessed valuation."

(e) Section 41.001(a), Election Code, does not apply to an election held under this section.

(f) Except as provided by this section, an election under this section must be conducted as provided by Sections 36.017(b)-(i), Water Code, and the Election Code. The provision of Section 36.017(d), Water Code, relating to the election of permanent directors does not apply to an election under this section.

Sec. 8819.024. INITIAL DIRECTORS. (a) If creation of the district is confirmed at an election held under Section 8819.023, the initial directors of the district serve on the board of directors until permanent directors are elected under Section 8819.025 or 8819.053.

(b) The two initial directors representing each of the four commissioners precincts shall draw lots to determine which of the two directors shall serve a term expiring June 1 following the first regularly scheduled election of directors under Section 8819.025, and which of the two directors shall serve a term expiring June 1 following the second regularly scheduled election of directors. The at-large director shall serve a term expiring June 1 following the second regularly scheduled election of directors.

Sec. 8819.025. INITIAL ELECTION OF PERMANENT DIRECTORS. On the uniform election date prescribed by Section 41.001, Election Code, in May of the first even-numbered year after the year in which the district is authorized to be created at a confirmation election, an election shall be held in the district for the election of four directors to replace the initial directors who, under Section 8819.024(b), serve a term expiring June 1 following that election.

Sec. 8819.026. EXPIRATION OF SUBCHAPTER. This subchapter expires September 1, 2012.

[Sections 8819.027-8819.050 reserved for expansion]

SUBCHAPTER B. BOARD OF DIRECTORS

Sec. 8819.051. DIRECTORS; TERMS. (a) The district is governed by a board of nine directors.

(b) Directors serve staggered four-year terms, with four or five directors' terms expiring June 1 of each even-numbered year.

I A director may serve consecutive terms.

Sec. 8819.052. METHOD OF ELECTING DIRECTORS: COMMISSIONERS PRECINCTS. (a) The directors of the district shall be elected according to the commissioners precinct method as provided by this section.

(b) One director shall be elected by the voters of the entire district, and two directors shall be elected from each county commissioners precinct by the voters of that precinct.

I Except as provided by Subsection (e), to be eligible to be a candidate for or to serve as director at large, a person must be a registered voter in the district. To be a candidate for or to serve as director from a county commissioners precinct, a person must be a registered voter of that precinct.

(d) A person shall indicate on the application for a place on the ballot:

(1) the precinct that the person seeks to represent; or

(2) that the person seeks to represent the district at large.

(e) When the boundaries of the county commissioners precincts are redrawn after each federal decennial census to reflect population changes, a director in office on the effective date of the change, or a director elected or appointed before the effective date of the change whose term of office begins on or after the effective date of the change, shall serve in the precinct to which elected or appointed even though the change in boundaries places the person's residence outside the precinct for which the person was elected or appointed.

Sec. 8819.053. ELECTION DATE. The district shall hold an election to elect the appropriate number of directors on the uniform election date prescribed by Section 41.001, Election Code, in May of each even-numbered year.

Sec. 8819.054. COMPENSATION. (a) Sections 36.060(a), (b), and (d), Water Code, do not apply to the district.

(b) A director is entitled to receive compensation of not more than $50 a day for each day the director actually spends performing the duties of a director. The compensation may not exceed $3,000 a year.

I The board may authorize a director to receive reimbursement for the director's reasonable expenses incurred while engaging in activities on behalf of the board.

Sec. 8819.055. BOARD ACTION. A majority vote of a quorum is required for board action. If there is a tie vote, the proposed action fails.

[Sections 8819.056-8819.100 reserved for expansion]

SUBCHAPTER C. POWERS AND DUTIES

Sec. 8819.101. GENERAL POWERS. Except as otherwise provided by this chapter, the district has all of the rights, powers, privileges, functions, and duties provided by the general law of this state applicable to groundwater conservation districts created under Section 59, Article XVI, Texas Constitution.

Sec. 8819.102. GROUNDWATER WELLS UNDER RAILROAD COMMISSION JURISDICTION. (a) Except as provided by this section, a groundwater well drilled or operated within the district under a permit issued by the Railroad Commission of Texas is under the jurisdiction of the railroad commission, and, in respect to such a well, the district has only the authority provided by Chapter 36, Water Code.

(b) Groundwater produced in an amount authorized by a railroad commission permit may be used within or exported from the district without a permit from the district.

I To the extent groundwater is produced in excess of railroad commission authorization, the holder of the railroad commission permit:

(1) shall apply to the district for the appropriate permit for the excess production; and

(2) is subject to the applicable regulatory fees.

Sec. 8819.103. PROHIBITION ON DISTRICT PURCHASE, SALE, TRANSPORT, OR DISTRIBUTION OF WATER. The district may not purchase, sell, transport, or distribute surface water or groundwater for any purpose.

Sec. 8819.104. PROHIBITION ON DISTRICT USE OF EMINENT DOMAIN POWERS. The district may not exercise the power of eminent domain.

Sec. 8819.105. REGIONAL COOPERATION. (a) In this section, "designated groundwater management area" means an area designated as a groundwater management area under Section 35.004, Water Code.

(b) To provide for regional continuity, the district shall comply with the requirements of Section 36.108, Water Code, and:

(1) participate as needed in coordination meetings with other groundwater conservation districts in its designated groundwater management area;

(2) coordinate the collection of data with other groundwater conservation districts in its designated groundwater management area in such a way as to achieve relative uniformity of data type and quality;

(3) coordinate efforts to monitor water quality with other groundwater conservation districts in its designated groundwater management area, local governments, and state agencies;

(4) provide groundwater level data to other groundwater conservation districts in its designated groundwater management area;

(5) investigate any groundwater or aquifer pollution with the intention of locating its source;

(6) notify other groundwater conservation districts in its designated groundwater management area and all appropriate agencies of any groundwater pollution detected;

(7) annually provide to other groundwater conservation districts in its designated groundwater management area an inventory of water wells and an estimate of groundwater production in the district; and

(8) include other groundwater conservation districts in its designated groundwater management area on the mailing lists for district newsletters, seminars, public education events, news articles, and field days.

[Sections 8819.106-8819.150 reserved for expansion]

SUBCHAPTER D. GENERAL FINANCIAL PROVISIONS

Sec. 8819.151. LIMITATION ON TAXES. The district may not impose ad valorem taxes at a rate that exceeds 1.5 cents on each $100 valuation of taxable property in the district.

Sec. 8819.152. FEES. (a) The board by rule may impose reasonable fees on each well:

(1) for which a permit is issued by the district; and

(2) that is not exempt from district regulation.

(b) A production fee may be based on:

(1) the size of column pipe used by the well; or

(2) the amount of water actually withdrawn from the well, or the amount authorized or anticipated to be withdrawn.

I The board shall base the initial production fee on the criteria listed in Subsection (b)(2). The initial production fee:

(1) may not exceed:

(A) 25 cents per acre-foot for water used for agricultural irrigation; or

(B) 6.75 cents per thousand gallons for water used for any other purpose; and

(2) may be increased at a cumulative rate not to exceed three percent per year.

(d) In addition to the production fee authorized under this section, the district may assess an export fee on groundwater from a well that is produced for transport outside the district.

(e) Fees authorized by this section may be:

(1) assessed annually;

(2) used to pay the cost of district operations; and

(3) used for any other purpose allowed under Chapter 36, Water Code.

Sec. 8819.153. LIMITATION ON INDEBTEDNESS. The district may issue bonds and notes under Subchapter F, Chapter 36, Water Code, except that the total indebtedness created by that issuance may not exceed $500,000 at any time.

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

(b) The governor has submitted the notice and Act to the Texas Commission on Environmental Quality.

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

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

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

_____ _____

President of the Senate Speaker of the House

I certify that H.B. No. 1498 was passed by the House on May 2, 2007, by the following vote: Yeas 147, Nays 0, 2 present, not voting; that the House refused to concur in Senate amendments to H.B. No. 1498 on May 24, 2007, and requested the appointment of a conference committee to consider the differences between the two houses; and that the House adopted the conference committee report on H.B. No. 1498 on May 26, 2007, by the following vote: Yeas 140, Nays 0, 2 present, not voting.

_____
Chief Clerk of the House

I certify that H.B. No. 1498 was passed by the Senate, with amendments, on May 21, 2007, by the following vote: Yeas 31, Nays 0; at the request of the House, the Senate appointed a conference committee to consider the differences between the two houses; and that the Senate adopted the conference committee report on H.B. No. 1498 on May 26, 2007, by the following vote: Yeas 30, Nays 0.

_____
Secretary of the Senate

APPROVED: _____

Date

_____

Governor

APPENDIX B

RESOLUTION ADOPTING MANAGEMENT PLAN

APPENDIX C

NOTICES OF PUBLIC HEARINGS AND MEETINGS OF THE PANOLA COUNTY GCD

APPENDIX D

ENTITIES TO NOTIFY AND EVIDENCE OF COORDINATION WITH SURFACE WATER MANAGEMENT ENTITIES

Cities in Panola County:

Brenda Samford, City Manager
812 W. Panola St.
Carthage, Texas 75633

City of Beckville
P.O. Box 97
Beckville, Texas 75631

City of Gary
P. O. Drawer 160
Gary, Texas 75643

City of Tatum
P. O. Box 1105
Tatum, Texas 75691

Groundwater Management Area 11-Groundwater Conservation Districts:

Anderson County Underground Water Conservation District
Tommy Wardell
450 Anderson County Road #409
Palestine, Texas 75803

Neches & Trinity Valleys Groundwater Conservation District
Roy J. Rodgers, Manager
P. O. Box 1387
Jacksonville, Texas 75766

Pineywoods Groundwater Conservation District
David Alford, General Manager
202 E. Pilar, Room 213
Nacogdoches, Texas 75961

Rusk County Groundwater Conservation District
Len Luscomb, General Manager
P. O. Box 97
Henderson, Texas 75653

Surface Water Management Entities:
Sabine River Authority
Jerry Clark, General Manager
P.O. Box 579
Orange, Texas 77631-0579

Panola County Fresh Water Supply District No. 1
Harry Smith, General Manager
Route 4, Box 331
Carthage, Texas 75633-0331

APPENDIX E


Groundwater Management Areas In Texas
1
2
6
5
8
7
4
11
12
14
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15
13
16

APPENDIX F

DESIRES FUTURE CONDITIONS ADOPTED BY GROUNDATER MANAGEMENT AREA 11

MONIQUE NORMAN
ATTORNEY AT LAW

P.O. BOX 50245
AUSTIN, TEXAS 78763

512.459.9428
FAX 512.459.8671
NORMAN.LAW@EARTHLINK.NET

May 4, 2010

RECEIVED
MAY 06 2010
TWDB

Kevin Ward
Executive Administrator
Texas Water Development Board
P.O. Box 13231
Austin, TX 78711-3231

Re: Submittal of Desired Future Conditions by Groundwater Management Area 11

Dear Mr. Ward:

I am submitting the enclosed Desired Future Conditions ("DFCs") of the groundwater resources in Groundwater Management Area 11 ("GMA 11"), pursuant to Section 36.108 of the Texas Water Code. Groundwater Management Area 11 ("GMA 11") is comprised of six groundwater conservation districts in East Texas: Anderson County Underground Water Conservation District, Harrison County Groundwater Conservation District; Neches and Trinity Valleys Groundwater Conservation District, Panola County Groundwater Conservation District, Pineywoods Groundwater Conservation District, and Rusk County Groundwater Conservation District. The member districts of GMA 11 have worked together over the past few years, in coordination with the Texas Water Development Board, to unanimously adopt initial DFCs that will protect and conserve the groundwater resources for East Texas, while allowing for anticipated growth in the area.

The GMA 11 DFCs are based on the Texas Water Plan and the Texas Water Development Board's applicable Groundwater Availability Models runs for all relevant aquifers within the boundaries of Groundwater Management Area 11: the Yegua Jackson, Sparta, Weches, Queen City, Reklaw, and Carrizo-Wilcox aquifers. The Desired Future Condition is defined as allowing up to an average draw down of 17 feet that applies throughout GMA 11. The GMA recognized that the Trinity, Nacatoch, and Gulf Coast Aquifers are not relevant to GMA 11 and are not included in its DFCs (see attached meeting minutes for the February 9, 2010 GMA 11 meeting).

The Desired Future Condition of 17 feet average drawdown is based on 178 individual drawdowns by aquifer and county (see document attached to the GMA 11 DFC Resolution, listing individual drawdowns).

The enclosed documents are:

1. Groundwater Management Area 11 Desired Future Conditions Resolution No. 1, which includes the voting record;

2. Groundwater Management Area 11 member district's meeting notices for the April 13, 2010 meeting in which it adopted its DFCs Resolution;

3. Groundwater Management Area 11 member district's meeting minutes for the April 13, 2010 meeting, which were adopted on April 27, 2010; and

4. Groundwater Management Area 11 member district's meeting minutes for the February 9, 2010 meeting, which were adopted on April 13, 2010:

Len Luscomb, the General Manager of Rusk County Groundwater Conservation District, is the contact for GMA 11 regarding this submission: (903) 657-1900; rcgcd@suddenlinkmail.com). Please contact Mr. Luscomb if you have any comments or questions. Thank you for your time and consideration.

Sincerely,

Monique Norman

Monique Norman

Len Luscomb

GROUNDWATER MANAGEMENT AREA 11
DESIRED FUTURE CONDITIONS RESOLUTION NO. 1

WHEREAS, Groundwater Management Area 11 ("GMA 11") is comprised of six groundwater conservation districts: Anderson County Underground Water Conservation District, Harrison County Groundwater Conservation District; Neches and Trinity Valleys Groundwater Conservation District, Panola County Groundwater Conservation District, Pineywoods Groundwater Conservation District, and Rusk County Groundwater Conservation District;

WHEREAS, pursuant to TEXAS WATER CODE § 36.108, the presiding officer, or his designee, from each of the six Districts in GMA 11 are obligated to engage in ongoing joint planning to, among other things, establish the Desired Future Conditions ("DFCs") of the aquifers within GMA 11;

WHEREAS, such joint planning has been undertaken, and is ongoing, by the six presiding officers or designees of the Districts and GMA 11 has met as required by Section 36.108 of the Texas Water Code for joint planning to set the initial DFCs for the aquifers within its boundaries;

NOW, THEREFORE, BE IT RESOLVED BY GROUNDWATER MANAGEMENT AREA 11 THAT:

1. The Desired Future Condition is hereby adopted for all relevant aquifers within the boundaries of Groundwater Management Area 11: the Yegua Jackson, Sparta, Weches, Queen City, Reklaw, and Carrizo-Wilcox aquifers. The Desired Future Condition is defined as allowing up to an average draw down of 17 feet that applies throughout GMA 11.

2. The Desired Future Condition of 17 feet average drawdown is based on 178 individual drawdowns by aquifer and county (see attached document listing individual drawdowns, which is incorporated into this DFC resolution).

3. The Desired Future Condition is based on the Texas Water Plan and Groundwater Availability Model data, in coordination with the Texas Water Development Board.

4. The Desired Future Condition shall become effective immediately and shall remain in effect for five years, unless modified or repealed sooner by the GMA 11 in accordance with applicable law.

PASSED AND APPROVED BY A VOTE OF FIVE (UNANIMOUS) OF THE VOTING MEMBERS OF THE GROUNDWATER MANAGEMENT AREA 11 PRESENT, THIS 13TH DAY OF APRIL, 2010.

Table 1
Drawdown Details for Adopted Desired Future Conditions in 2060
Groundwater Management Area 11

County	Model Layer Defining Aquifer or Confining Unit (CU)									Overall (except Yegua-Jackson)
	Yegua-Jackson	Sparta	Weches (CU)	Queen City	Reklaw (CU)	Carrizo	Upper Wilcox	Middle Wilcox	Lower Wilcox	
ANDERSON (ACUWCD)				1	12	35	26	12	5	15
ANDERSON (NTVGCD)		-2	1	7	15	36	26	11	4	16
ANGELINA	32	10	11	16	22	42	5	-18	-3	11
BOWIE							21			1
CAMP				12		18	17	39		19
CASS				8	6	10	7	7		8
CHEROKEE		7	14	11	11	32	32	15	10	18
FRANKLIN					-16	-3	7	19		11
GREGG				7	11	42	49	56	79	35
HARRISON					2	24	13	5	4	9
HENDERSON				4	15	41	32	27	15	23
HOPKINS					-22	-12	-15	-28		-26
HOUSTON	3	2	1	2	15	35	12	2	-2	8
MARION				17	11	21	15	15		16
MORRIS				13	10	29	25	23		21
NACOGDOCHES	8	3	3	11	10	14	11	-10	-6	4
PANOLA				-11	-19	11	2	1	4	2
RAINS							7	-10	-5	-8
RUSK			-46	-15	-2	6	6	23	21	12
SABINE	15	5	5	7	15	24	13	6	5	10
SAN AUGUSTINE	13	-4	-4	-3	11	20	9	-3	-2	3
SHELBY				-18	-19	23	-3	3	1	1
SMITH		-5	-5	11	34	103	118	92	76	68
TITUS				-1	-3	31	14	5		9
TRINITY	11	5	4	4	12	33	-3	-7	-1	6
UPSHUR		-5	-5	5	17	56	66	66	97	44
VAN ZANDT				7	11	31	13	17	11	14
WOOD		-5	-7	-2	36	110	83	55	114	59
Overall	17	3	4	7	15	38	26	15	11	17

Note: negative drawdown means groundwater level increase. blank spaces means absence of aquifer in that county

NOT PRESENT

BEN PINSON
ANDERSON COUNTY UNDERGROUND
WATER CONSERVATION DISTRICT

SOMER PAGE
PANOLA COUNTY
GROUNDWATER CONSERVATION DISTRICT

JIM MCNATT
HARRISON COUNTY
GROUNDWATER CONSERVATION DISTRICT

DAVID ALFORD
PINEYWOODS GROUNDWATER
CONSERVATION DISTRICT

ROY RODGERS
NECHES AND TRINITY VALLEYS
GROUNDWATER CONSERVATION DISTRICT

LEN LUSCOMB
RUSK COUNTY
GROUNDWATER CONSERVATION DISTRICT

NOTICE OF MEETING GROUNDWATER MANAGEMENT AREA 11

Notice is hereby given that the groundwater conservation districts (GCD) located wholly or partially within **Groundwater Management Area 11** (GMA-11) as designated by the Texas Water Development Board (TWDB) consisting of:

Anderson County Underground Water Conservation District (ACUWCD),
Harrison County Groundwater Conservation District (HCGCD),
Neches and Trinity Valleys Groundwater Conservation District (NTVGCD),
Panola County Groundwater Conservation District (PCGCD),
Pineywoods Groundwater Conservation District (PGCD), and
Rusk County Groundwater Conservation District (RCGCD);

will hold a **Joint Planning Meeting at 10:00 a.m. on Tuesday, April 13, 2010** in room 119 (Commissioners Room) in Nacogdoches City Hall at 202 E. Pilar, Nacogdoches, TX, for the following purposes:[i]

1. Call meeting to order and establish a quorum
2. Welcome and introductions
3. Public comments[ii]
4. Consent items: approve minutes of February 9, 2010 meeting.
5. Committee member district update and comments.
6. Hear presentation and remarks from TWDB representatives(s).
7. Discuss and take action to repeal the DFC resolution for the Carrizo-Wilcox aquifers adopted by GMA-11 on October 20, 2009.
8. Discuss and take possible action to set initial aquifer wide Desired Future Conditions for all aquifers in GMA-11 except for the Yegua Jackson Aquifer if GAM data not available.
9. Discuss agenda items and set date, time, and place for next meeting.

Dated and posted this 7th day of April, 2010

For David Alford, Chairman, GMA-11

By: Roy J Rodgers, Secretary GMA-11

GMA-11 is committed to compliance with the Americans with Disabilities Act reasonable accommodations and equal opportunity for effective communications will be provided upon request. Please contact David Alvord at (936) 568-9292 at least 24 hours in advance if accommodation is needed.

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2010 APR -8 AM 8:33

NOTICE OF MEETING GROUNDWATER MANAGEMENT AREA 11

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Pineywoods Groundwater Conservation District (PGCD), and
Rusk County Groundwater Conservation District (RCGCD);

will hold a **Joint Planning Meeting at 10:00 a.m. on Tuesday, April 13, 2010** in room 119 (Commissioners Room) in Nacogdoches City Hall at 202 E. Pilar, Nacogdoches, TX, for the following purposes:[i]

1. Call meeting to order and establish a quorum
2. Welcome and introductions
3. Public comments[ii]
4. Consent items: approve minutes of February 9, 2010 meeting.
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Pam Stevens
Deputy Clerk

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Dated and posted this 7th day of April, 2010

For David Alford, Chairman, GMA-11

[signature]

By: Roy J Rodgers, Secretary GMA-11

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#6712

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9. Discuss agenda items and set date, time, and place for next meeting.

Dated and posted this 7th day of April, 2010

For David Alford, Chairman, GMA-11

By: Roy J Rodgers, Secretary GMA-11

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FOR RECORD
2010 APR -7 PM 3:38
LAYLA [illegible]
CHEROKEE COUNTY, TEXAS
BY
DEPUTY

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MINUTES OF CALLED MEETING OF THE GROUNDWATER MANAGEMENT AREA 11 (GMA 11) HELD ON THE 13th DAY OF APRIL 2010

On the 13th day of April 2010 at 10:00 a.m. in the City Commissioners Chambers Room, 119 in Nacogdoches City Hall at 202 E. Pilar Street, Nacogdoches, Texas, the Board of Directors and/or designated representative of the Groundwater Conservation Districts within the TWDB designated Groundwater Management Area 11 (GMA-11) of the State of Texas convened in a regular meeting at which time the following items were discussed and action possibly taken with the following:

Members present:

David Alford	Representative, Pineywoods GCD
Len Luscomb	Representative, Rusk County GCD
Roy Rodgers	Representative, Neches & Trinity Valleys GCD
Somer Page	Representative Panola County GWD
Jim McNatt	Representative, Harrision County GCD

Members Absent:

Anderson County Underground Water Conservation District

Others present included:

Bill Hutchinson	TWDB
Sarah Backhouse	TWDB
Monique Norman	RCGCD Counsel
Dustin kinder	Andrew & Foster Drilling
Mike Harbardt	Region I
Jason Ferrell	RCGCD

1 & 2. Call to Order:

The meeting was called to order at 10:00 a.m. by the Chairman. The Secretary declared a quorum present with five members attending. Len Luscomb delivered the invocation.

3. Public Comments

There were no comments at this time. The item was tabled to follow all other agenda items.

4. Approval of Minutes:

Upon review, the February 9, 2010 minutes were approved (motion was made by Len Luscomb, 2nd by Jim McNutt, approved unanimously).

5. Committee member district update and comments.

Page Somer of PCGCD commented that PCGCD rules were now ready to finalize. The District is looking to hire a field representative.

Jim McNatt of HCGCD reported that they now have organized opposition to the tax part of the election scheduled for May 8th.

Len Luscomb reported that the District now had a new "science wagon" for gathering well data and it was available for viewing following the meeting. RCGCD is also being audited by the state. The District now has 100 water wells for quarterly monitoring.

NTVGCD and PWGCD had no comments.

6. Hear presentation and remarks from TWDB representatives(s).

Dr. William (Bill) Hutchinson, Director, Groundwater Resources, TWDB, made a comprehensive presentation of data from Draft Model Run report T10-012 for the Yegua-Jackson Aquifer and the data with revised pumping amounts submitted by the PGCD. Dr. Hutchinson reported that his data showed that, if pumping levels were equal approximately to the amount in the 2007 State Water Plan, with minor changes from GMA-11 districts, the average drawdown for all aquifers including the Yegua Jackson GMA wide would be about 17 feet.

7. Discuss and take action to repeal the DFC resolution for the Carrizo-Wilcox aquifers adopted by GMA-11 on October 20, 2009.

A motion was made by Len Luscomb, RCGCD, to repeal the DFC resolution for the Carrizo-Wilcox aquifers adopted by GMA-11 on October 20, 2009. Second by Jim McNutt, passed unanimously

8. Discuss and take possible action to set initial aquifer wide Desired Future Conditions for all aquifers in GMA-11 except for the Yegua Jackson Aquifer if GAM data not available.

Under item 6, Dr. Bill Hutchison, the Director of Groundwater Resources Division of the Texas Water Development Board made a presentation at the Groundwater Management Area 11 (GMA 11) that discussed an overall average drawdown of 17 feet and 20 feet for GMA 11, and the applicable resulting Desired Future Conditions (DFC) for each aquifer in each county comprising GMA 11. Dr. Hutchison's presentation of GMA 11 average drawdown DFCs and associated Managed Available Groundwater (MAG) estimates were based on model runs of the Texas Water Development Board's groundwater availability models for the Yegua Jackson, Sparta, Weches, Queen City, Reklaw, and Carrizo-Wilcox aquifers.

Groundwater Management Area 11 discussed the proposed Desire Future Condition of an average drawdown for each aquifer and county in GMA 11, specifically for the Yegua Jackson, Sparta, Weches, Queen City, Reklaw, and Carrizo-Wilcox aquifers.

Groundwater Management Area 11 members present voted unanimously to adopt Groundwater Management Area 11 Desired Future Conditions Resolution No. 1, which adopted a DFC for all relevant aquifers within the boundaries of Groundwater Management Area 11: the Yegua Jackson, Sparta, Weches, Queen City, Reklaw, and Carrizo-Wilcox aquifers. The Desired Future Condition is defined as allowing up to an average draw down of 17 feet that applies throughout GMA 11. The Desired Future Condition of 17 feet average drawdown is based on 178 individual drawdowns by aquifer and county and incorporates the 17 foot average drawdown table document presented by the Texas Water Development Board. The DFC is based on the Texas Water Plan and Groundwater Availability Model data, in coordination with the Texas Water Development Board. The DFC shall become effective immediately and shall remain in effect for five years, unless modified or repealed sooner by the GMA 11 in accordance with applicable law. The motion was made by Len Luscomb, 2nd by Jim McNutt, passed unanimously.

3. Public Comments Reopened

There were no comments requiring action by the GMA-11 representatives.

9. Discuss agenda items and set date, time, and place for next meeting.

The next meeting was set for April 27, 2010 at 10:00 a.m. in Nacogdoches. A second meeting will be scheduled for the same date and place to immediately follow the 10:00 a.m. meeting to cover any items that may be necessary to complete the DFC package for submission to TWDB. A motion was made and approved to adjourn at 11:03. a.m. (motion by Len Luscomb, 2nd by Jim McNutt, passed unanimously).

Date 4-27-10

David Alford, Chairman

Attested to by:

Roy Rodgers, Secretary

MINUTES OF CALLED MEETING OF THE GROUNDWATER MANAGEMENT AREA 11 (GMA 11) HELD ON THE 9th DAY OF FEBRUARY 2010

On the 9th day of February 2010 at 10:00 a.m. in the City Commissioners Chambers Room, 119 in Nacogdoches City Hall at 202 E. Pilar Street, Nacogdoches, Texas, the Board of Directors and/or designated representative of the Groundwater Conservation Districts within the TWDB designated Groundwater Management Area 11 (GMA-11) of the State of Texas convened in a regular meeting at which time the following items were discussed and action possibly taken with the following:

Members present:

David Alford	Representative, Pineywoods GCD
Len Luscomb	Representative, Rusk County GCD
Roy Rodgers	Representative, Neches & Trinity Valleys GCD
Larry Dorman	Representative Panola County GWD
Jim McNatt	Representative, Harrision County GCD

Others present included:

Bill Hutchinson	TWDB
Robert Bradley	TWDB
Monique Norman	RCGCD Counsel
Lynn R Wallace	City of Henderson
Randy Boyd	City of Henderson
Robert Crain	NWNA

1 & 2. Call to Order:

The meeting was called to order at 10:00 a.m. by the Chairman. The Secretary declared a quorum present with five members attending. Roy Rodgers delivered the invocation.

3. Public Comments

There were no comments at this time. The item was tabled to follow all other agenda items.

4. Approval of Minutes:

Upon review, the November 24, 2009 minutes were approved with two typo corrections (motion was made by Len Luscomb, 2nd by Larry Dorman, approved unanimously).

5. Committee member district update and comments.

Larry Dorman of PCGCD commented that PCGCD was working on rules and well registration

Jim McNatt of HCGCD reported that they were working on an election scheduled for May 8th.

Len Luscomb had Monique Norman report on the Carrizo-Wilcox study meeting held in Austin.

NTVGCD and PWGCD had no comments.

6. Hear presentation and remarks from TWDB representatives(s).

Dr. William (Bill) Hutchinson, Director, Groundwater Resources, TWDB, made a comprehensive presentation of new analyses of data from GAM 08-23 which included a new data run with revised pumping amounts to be submitted by the GMA-11 representatives. This data run was to change pumping amounts from the various aquifers. Dr. Hutchinson reported that his data showed that, if pumping levels were increased to the amount in the 2007 State Water Plan and using the aquifer pumping amounts submitted by GMA-11, the average drawdown for all aquifers (not including the Yegua Jackson) GMA wide would be about 40 feet, a change from the 20 foot average using state water plan pumping amounts.

Following many comments from the representatives concerning pumping from each aquifer, Dr. Hutchinson agreed to make another data run using pumping data from PGCD obtained from their consultant study and return at a future meeting to discuss the data, including county-by-county data.

7. **Hear report on Carrizo Wilcox study and survey requirements for GMA-11.**

Monique Norman and Len Luscomb made comments concerning this item under Item 5 above.

8. **Discuss and take possible action on proposal by Rusk County Groundwater Conservation District to set initial aquifer wide Desired Future Conditions for all aquifers in GMA-11.**

See Item 9.

9. **Discuss setting DFCs for aquifers within GMA-11 and consideration of TWDB recommendations and take possible action on procedures for adopting DFC for GMA-11 including setting public hearing dates and locations.**

A motion was made by Len Luscomb, seconded by Jim McNutt that GMA-11 approve in principal a DFC with an average drawdown of 20 feet based on the state water plan numbers with approximately 183 (by county by aquifer) MAG numbers and drawdown numbers plus including the Yegua-Jackson Aquifer when the GAM is final with a final vote on April 13, 2010. Motion passed unanimously.

A motion was made by Len Luscomb, seconded by Larry Dorman, that we vote on the initial DFC at the April 13, 2010 GMA-11 meeting. Motion passed unanimously.

Motion by Roy Rodgers, seconded by Len Luscomb that the Trinity, Nacatoch, and Gulf Coast Aquifers are not relevant to GMA-11 and are not included in the DFC. Motion passed unanimously.

3. **Public Comments Reopened**

There were no comments requiring action by the GMA-11 representatives.

10. **Discuss agenda items and set date, time, and place for next meeting.**

The next meeting was set for April 13, 2010 at 10:00 a.m. in Nacogdoches. A motion was made and approved to adjourn at 11:28. a.m. (motion by Len Luscomb, 2nd by Larry Dorman, passed unanimously).

Date 4-13-10

David Alford, Chairman

Attested to by:

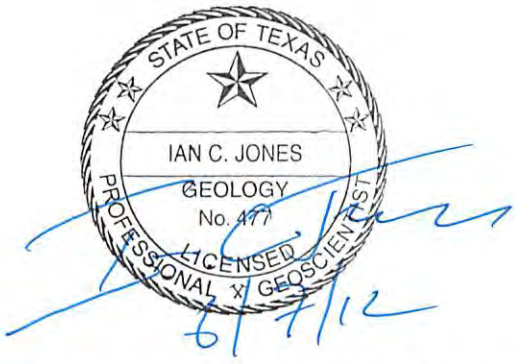
Roy Rodgers, Secretary

APPENDIX G

MODELED AVAILABLE GROUNDWATER ESTIMATES
GAM RUN 10-016 VERSION 2

GAM Run 10-016 MAG (Version 2): Model Run for the Yegua-Jackson, Sparta, Queen City, and Carrizo-Wilcox Aquifers in Groundwater Management Area 11

by Ian C. Jones, Ph.D., P.G., Jerry Shi, Ph.D., P.G., and Oliver Wade, P.G.
Texas Water Development Board
Groundwater Resources Division
Groundwater Availability Modeling Section
(512) 463-6641
June 7, 2012



The seal appearing on this document was authorized by Ian C. Jones, P.G. 477, on June 7, 2012.

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GAM RUN 10-016 MAG (VERSION 2): MODEL RUN FOR THE YEGUA-JACKSON, SPARTA, QUEEN CITY, AND CARRIZO-WILCOX AQUIFERS IN GROUNDWATER MANAGEMENT AREA 11

by Ian C. Jones, Ph.D., P.G., Jerry Shi, Ph.D., P.G., and Wade Oliver, P.G.
Texas Water Development Board
Groundwater Resources Division
Groundwater Availability Modeling Section
(512) 463-6641
June 7, 2012

EXECUTIVE SUMMARY:

The modeled available groundwater for Groundwater Management Area 11 is summarized for the Carrizo-Wilcox (Table 1), Queen City (Table 2), Sparta (Table 3), and Yegua-Jackson (Table 4) aquifers. Modeled available groundwater values for these aquifers are also summarized by county (Table 5), regional planning area (Table 6), river basin (Table 7), and groundwater conservation district (Table 8). The pumping estimates are based on Groundwater Availability Modeling Task 10-009. This previously completed model simulation meets the desired future condition adopted by the members of Groundwater Management Area 11 of an overall average drawdown of 17 feet.

The modeled available groundwater within the groundwater conservation districts that reflects the desired future conditions adopted by Groundwater Management Area 11 declines from approximately 195,000 acre-feet per year in 2010 to 189,000 acre-feet per year in 2060 (Table 8). When areas outside of groundwater conservation districts are considered, the modeled available groundwater is approximately 559,000 acre-feet per year in 2010 and declines to 543,000 acre-feet per year in 2060.

The total modeled available groundwater for each aquifer in Groundwater Management Area 11, including areas outside a groundwater conservation district, is also summarized by groundwater conservation district for each decade between 2010 and 2060 (Tables 9 through 15).

REQUESTOR:

Ms. Monique Norman, General Counsel, and Mr. Len Luscomb, General Manager, of Rusk County Groundwater Conservation District on behalf of Groundwater Management Area 11.

DESCRIPTION OF REQUEST:

In a letter dated May 4th, 2010 and received by the Texas Water Development Board (TWDB) on May 6th, 2010, Ms. Norman and Mr. Luscomb provided the Texas Water Development Board (TWDB) with the desired future condition (DFC) of the Carrizo-Wilcox, Queen City, Sparta, and Yegua-Jackson aquifers within Groundwater Management Area 11. The desired future condition for the aquifers, as described in Resolution No. 1 and adopted April 13, 2010 by the groundwater conservation districts (GCDs) within Groundwater Management Area 11, is described below:

> *The Desired Future Condition is defined as allowing up to an average draw down of 17 feet that applies throughout [Groundwater Management Area] 11. … The Desired Future Condition of 17 feet average drawdown is based on 178 individual drawdowns by aquifer and county.*

METHODS:

The aquifers referred to above are covered by two groundwater availability models: one for the northern portion of the Carrizo-Wilcox, Queen City, and Sparta aquifers (Fryar and others, 2003; Kelley and others, 2004) and one for the Yegua-Jackson Aquifer (Deeds and others, 2010). The aquifers covered by each of the groundwater availability models are shown in Figures 1 and 2.

In the previously completed Groundwater Availability Modeling Task 10-009, both of these models were run and achieved the above desired future condition (Oliver, 2010). The pumping results for Groundwater Management Area 11 presented here, taken directly from the simulations documented in Oliver (2010), have been divided by county, regional water planning area, river basin, and groundwater conservation district. These areas are shown in Figure 3. See Oliver (2010) for a full description of the methods, assumptions, and results for the groundwater availability model run.

The model results presented in this report were extracted from all areas of the model representing the units of the Carrizo-Wilcox, Queen City, Sparta, and Yegua-Jackson aquifers. This includes some areas outside the "official" boundaries of the aquifers shown in the 2007 State Water Plan (TWDB, 2007). For this reason, the area over which the average drawdown that meets the desired future condition was calculated may reflect water of quality ranging from fresh to brackish and saline.

PARAMETERS AND ASSUMPTIONS:

Northern Portion of the Carrizo-Wilcox, Queen City, and Sparta Aquifers

The parameters and assumptions for the groundwater availability model run for the northern portion of the Carrizo-Wilcox, Queen City, and Sparta Aquifers are described below:

- Version 2.01 of the groundwater availability model for the northern portion of the Carrizo-Wilcox, Queen City, and Sparta Aquifers was used for this analysis. See Fryar and others (2003) and Kelley and others (2004) for assumptions and limitations of the groundwater availability model for the northern part of the Carrizo-Wilcox, Queen City, and Sparta Aquifers.
- The model includes eight layers, representing:
    1. Sparta Aquifer (Layer 1)
    2. Weches confining unit (Layer 2)
    3. Queen City Aquifer (Layer 3)
    4. Reklaw confining unit (Layer 4)
    5. Carrizo Aquifer (Layer 5)
    6. Upper Wilcox Aquifer (Layer 6)
    7. Middle Wilcox Aquifer (Layer 7)
    8. Lower Wilcox Aquifer (Layer 8)
- In the Sabine Uplift area, a portion of Layer 8, though active in the model, is outside the extent of the Lower Wilcox unit of the Carrizo-Wilcox Aquifer as described in Kelley and others (2004). Because of this, results for Layer 8 in

this area were not included when determining the average drawdown over Groundwater Management Area 11.

- Cells were assigned to individual counties and groundwater conservation districts as shown in the September 14, 2009 version of the cell assignment model grid for the northern portion of the Carrizo-Wilcox, Queen City, and Sparta aquifers.
- Recharge rates are based on average (1961 to 1990) precipitation (Kelley and others, 2004).

Yegua-Jackson Aquifer

The parameters and assumptions for the model run using the groundwater availability model for the Yegua-Jackson Aquifer are described below:

- Version 1.01 of the groundwater availability model for the Yegua-Jackson Aquifer was used for this analysis. See Deeds and others (2010) for assumptions and limitations of the groundwater availability model.
- The model includes five layers representing the Yegua-Jackson Aquifer and the overlying Catahoula unit.
- Cells were assigned to individual counties and groundwater conservation districts as shown in the March 23, 2010 version of the cell assignment model grid for the Yegua-Jackson Aquifer.
- The recharge used for the model run represents average recharge as described in Deeds and others (2010).

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. This is distinct from "managed available groundwater", which was a permitting value and accounted for the estimated use of the aquifer exempt from permitting. This change was made to reflect changes in statute by the 82nd Texas Legislature, effective September 1, 2011.

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. The estimated amount of pumping exempt from permitting, which the TWDB is now required to develop after soliciting input from applicable groundwater conservation districts, will be provided in a separate report.

RESULTS:

The modeled available groundwater in Groundwater Management Area 11 from the Carrizo-Wilcox, Queen City, Sparta, and Yegua-Jackson aquifers that achieves the desired future condition declines from approximately 559,000 acre-feet per year in 2010 to 543,000 acre-feet per year in 2060. Tables 1 through 4 contain the estimates of total pumping for the Carrizo-Wilcox, Queen City, Sparta, and Yegua-Jackson aquifers, respectively. In these tables, results have been subdivided by county, regional water planning area, and river basin for use in the regional water planning process.

Tables 5 through 7 show the modeled available groundwater for all aquifers summarized by county, regional water planning area, and river basin, respectively, within Groundwater Management Area 11. The modeled available groundwater for all aquifers within and outside the groundwater conservation districts in Groundwater Management Area 11 are presented in Table 8. Tables 9 through 15 show the modeled available groundwater for each model layer—Lower Wilcox Formation, Middle Wilcox Formation, Upper Wilcox Formation, Carrizo Formation, Queen City Aquifer, Sparta Aquifer, and Yegua-Jackson Aquifer— within and outside the groundwater conservation districts in Groundwater Management Area 11.

LIMITATIONS:

The groundwater model 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 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 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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TABLE 1. MODELED AVAILABLE GROUNDWATER FOR THE CARRIZO-WILCOX AQUIFER IN GROUNDWATER MANAGEMENT AREA 11. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE DIVIDED BY COUNTY, REGIONAL WATER PLANNING AREA, AND RIVER BASIN.

County	Region	Basin	Year					
			2010	2020	2030	2040	2050	2060
Anderson	I	Neches	4,393	4,393	4,393	4,393	4,393	4,393
		Trinity	5,684	5,684	5,684	5,684	5,684	5,684
Angelina	I	Neches	26,414	26,414	26,414	26,414	26,414	26,414
Bowie	D	Sulphur	11,126	8,216	7,976	7,533	7,533	7,083
Camp	D	Cypress	4,041	4,041	4,041	4,041	4,041	4,041
Cass	D	Cypress	2,955	2,955	2,955	2,955	2,955	2,955
		Sulphur	578	578	578	578	578	578
Cherokee	I	Neches	11,222	11,222	11,222	11,222	11,222	11,222
Franklin	D	Cypress	7,794	7,736	7,736	7,736	7,736	7,736
		Sulphur	1,952	1,748	1,748	1,748	1,748	1,748
Gregg	D	Cypress	820	820	820	820	820	820
		Sabine	6,829	6,829	6,829	6,829	6,829	6,829
Harrison	D	Cypress	4,892	4,873	4,839	4,787	4,772	4,728
		Sabine	4,019	3,964	3,947	3,911	3,911	3,911
Henderson	C	Trinity	5,254	5,187	5,187	5,187	5,187	5,187
	I	Neches	3,999	3,999	3,999	3,999	3,999	3,999
Hopkins	D	Cypress	253	253	253	253	253	253
		Sabine	2,043	2,001	2,001	2,001	2,001	2,001
		Sulphur	1,137	1,137	1,137	1,137	1,137	1,137
Houston	I	Neches	1,924	1,924	1,924	1,924	1,924	1,924
		Trinity	3,432	3,432	3,432	3,432	3,432	3,432
Marion	D	Cypress	2,077	2,077	2,077	2,077	2,077	2,077
Morris	D	Cypress	2,196	2,196	2,174	2,174	2,174	2,174
		Sulphur	420	420	384	384	384	384
Nacogdoches	I	Neches	21,385	21,385	21,385	21,385	21,385	21,385
Panola	I	Cypress	6	6	6	6	6	6
		Sabine	9,091	8,221	8,221	8,063	8,063	8,063
Rains	D	Sabine	1,703	1,703	1,620	1,620	1,620	1,583
Red River	D	Sulphur	0	0	0	0	0	0
Rusk	I	Neches	11,776	11,776	11,766	11,766	11,766	11,747
		Sabine	9,067	9,067	9,067	9,067	9,067	9,067
Sabine	I	Neches	1,254	1,254	1,254	1,254	1,254	1,254
		Sabine	5,612	5,604	5,604	5,604	5,604	5,604
San Augustine	I	Neches	1,490	1,490	1,490	1,490	1,490	1,490
		Sabine	291	291	291	291	291	291
Shelby	I	Neches	2,900	2,736	2,578	2,288	2,152	2,019
		Sabine	9,144	8,481	8,323	8,159	8,159	7,710
Smith	D	Sabine	12,245	12,245	12,245	12,235	12,221	12,221
	I	Neches	21,004	21,004	21,004	21,004	21,004	21,004

TABLE 1. CONTINUED.

County	Region	Basin	Year					
			2010	2020	2030	2040	2050	2060
Titus	D	Cypress	8,051	7,516	7,214	7,063	6,833	6,833
		Sulphur	2,805	2,805	2,805	2,805	2,805	2,805
Trinity	H	Trinity	1,101	1,101	1,101	1,101	1,101	1,101
	I	Neches	1,114	1,114	1,114	1,114	1,114	1,114
Upshur	D	Cypress	5,426	5,426	5,426	5,426	5,426	5,426
		Sabine	1,689	1,689	1,689	1,689	1,689	1,689
Van Zandt	D	Neches	4,288	4,288	4,288	4,288	4,288	4,288
		Sabine	4,942	4,611	4,611	4,611	4,611	4,379
		Trinity	1,384	1,384	1,384	1,384	1,384	1,384
Wood	D	Cypress	2,053	2,053	2,053	2,053	2,053	2,053
		Sabine	19,663	19,486	19,398	19,355	19,280	19,258
Total			**274,938**	**268,835**	**267,687**	**266,340**	**265,870**	**264,484**

TABLE 2. MODELED AVAILABLE GROUNDWATER FOR THE QUEEN CITY AQUIFER IN GROUNDWATER MANAGEMENT AREA 11. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE DIVIDED BY COUNTY, REGIONAL WATER PLANNING AREA, AND RIVER BASIN.

County	Region	Basin	Year					
			2010	2020	2030	2040	2050	2060
Anderson	I	Neches	9,762	9,762	9,762	9,762	9,762	9,762
		Trinity	9,039	9,039	9,039	9,039	9,039	9,039
Angelina	I	Neches	1,093	1,093	1,093	1,093	1,093	1,093
Camp	D	Cypress	3,705	3,542	3,542	3,542	3,542	3,542
Cass	D	Cypress	35,970	35,970	35,970	35,970	35,970	35,970
		Sulphur	3,223	3,223	3,223	3,223	3,223	3,223
Cherokee	I	Neches	22,396	22,396	22,396	22,396	22,396	22,396
Gregg	D	Cypress	1,359	1,359	1,359	1,359	1,359	1,359
		Sabine	6,214	6,214	6,214	6,214	6,214	6,214
Harrison	D	Cypress	7,890	7,890	7,890	7,890	7,890	7,890
		Sabine	2,483	2,483	2,483	2,483	2,483	2,483
Henderson	C	Trinity	3,533	3,533	3,533	3,533	3,533	3,533
	I	Neches	12,316	12,316	12,316	12,316	12,316	12,316
Houston	I	Neches	131	131	131	131	131	131
		Trinity	279	279	279	279	279	279
Marion	D	Cypress	15,549	15,549	15,549	15,549	15,549	15,549
Morris	D	Cypress	9,652	9,652	9,652	9,652	9,537	9,537
Nacogdoches	I	Neches	5,002	5,002	5,002	5,002	5,002	5,002
Panola	I	Sabine	0	0	0	0	0	0
Rusk	I	Neches	40	40	40	40	40	40
		Sabine	18	18	18	18	18	18
Sabine	I	Neches	0	0	0	0	0	0
		Sabine	0	0	0	0	0	0
San Augustine	I	Neches	7	7	7	7	7	7
		Sabine	0	0	0	0	0	0
Shelby	I	Sabine	0	0	0	0	0	0
Smith	D	Sabine	25,994	25,994	25,994	25,994	25,994	25,994
	I	Neches	28,259	28,259	28,259	28,259	28,259	28,259
Titus	D	Cypress	138	138	138	138	138	138
Trinity	H	Trinity	0	0	0	0	0	0
	I	Neches	0	0	0	0	0	0
Upshur	D	Cypress	18,324	18,324	18,324	18,324	18,143	18,143
		Sabine	7,246	7,246	7,246	7,246	7,246	7,246
Van Zandt	D	Neches	3,814	3,814	3,814	3,814	3,814	3,814
Wood	D	Cypress	1,009	1,009	1,009	1,009	1,009	1,009
		Sabine	9,103	9,103	9,103	9,103	9,103	9,103
Total			**243,548**	**243,385**	**243,385**	**243,385**	**243,089**	**243,089**

TABLE 3. MODELED AVAILABLE GROUNDWATER FOR THE SPARTA AQUIFER IN GROUNDWATER MANAGEMENT AREA 11. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE DIVIDED BY COUNTY, REGIONAL WATER PLANNING AREA, AND RIVER BASIN.

County	Region	Basin	Year					
			2010	2020	2030	2040	2050	2060
Anderson	I	Neches	344	344	344	344	344	344
		Trinity	272	272	272	272	272	272
Angelina	I	Neches	689	689	689	689	689	689
Cherokee	I	Neches	359	359	359	359	359	359
Houston	I	Neches	302	302	302	302	302	302
		Trinity	594	594	594	594	594	594
Nacogdoches	I	Neches	409	409	409	409	409	409
Rusk	I	Neches	4,362	0	0	0	0	0
Sabine	I	Neches	61	61	61	61	61	61
		Sabine	235	235	235	235	235	235
San Augustine	I	Neches	202	202	202	202	202	202
		Sabine	3	3	3	3	3	3
Smith	I	Neches	0	0	0	0	0	0
	D	Sabine	0	0	0	0	0	0
Trinity	I	Neches	313	313	313	313	313	313
	H	Trinity	302	302	302	302	302	302
Upshur	D	Sabine	0	0	0	0	0	0
Wood	D	Sabine	0	0	0	0	0	0
Total			**8,447**	**4,085**	**4,085**	**4,085**	**4,085**	**4,085**

TABLE 4. MODELED AVAILABLE GROUNDWATER FOR THE YEGUA-JACKSON AQUIFER IN GROUNDWATER MANAGEMENT AREA 11. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE DIVIDED BY COUNTY, REGIONAL WATER PLANNING AREA, AND RIVER BASIN.

County	Region	Basin	Year					
			2010	2020	2030	2040	2050	2060
Angelina	I	Neches	16,890	16,890	16,890	16,890	16,890	16,507
Houston	I	Neches	1,324	1,324	1,324	1,324	1,324	1,324
		Trinity	4,061	4,061	4,061	4,061	4,061	4,061
Nacogdoches	I	Neches	235	235	235	235	235	235
Sabine	I	Neches	3,724	3,724	3,724	3,724	3,724	3,724
		Sabine	575	575	575	575	575	575
San Augustine	I	Neches	2,102	2,102	2,102	2,102	2,102	2,102
		Sabine	9	9	9	9	9	9
Trinity	H	Trinity	2,191	2,191	2,191	2,191	2,191	2,191
	I	Neches	700	700	700	700	700	700
Total			**31,811**	**31,811**	**31,811**	**31,811**	**31,811**	**31,428**

TABLE 5. MODELED AVAILABLE GROUNDWATER FOR THE CARRIZO-WILCOX, QUEEN CITY, SPARTA, AND YEGUA-JACKSON AQUIFERS BY COUNTY FOR EACH DECADE BETWEEN 2010 AND 2060. RESULTS ARE IN ACRE-FEET PER YEAR.

County	Year					
	2010	2020	2030	2040	2050	2060
Anderson	29,494	29,494	29,494	29,494	29,494	29,494
Angelina	45,086	45,086	45,086	45,086	45,086	44,703
Bowie	11,126	8,216	7,976	7,533	7,533	7,083
Camp	7,746	7,583	7,583	7,583	7,583	7,583
Cass	42,726	42,726	42,726	42,726	42,726	42,726
Cherokee	33,977	33,977	33,977	33,977	33,977	33,977
Franklin	9,746	9,484	9,484	9,484	9,484	9,484
Gregg	15,222	15,222	15,222	15,222	15,222	15,222
Harrison	19,284	19,210	19,159	19,071	19,056	19,012
Henderson	25,102	25,035	25,035	25,035	25,035	25,035
Hopkins	3,433	3,391	3,391	3,391	3,391	3,391
Houston	12,047	12,047	12,047	12,047	12,047	12,047
Marion	17,626	17,626	17,626	17,626	17,626	17,626
Morris	12,268	12,268	12,210	12,210	12,095	12,095
Nacogdoches	27,031	27,031	27,031	27,031	27,031	27,031
Panola	9,097	8,227	8,227	8,069	8,069	8,069
Rains	1,703	1,703	1,620	1,620	1,620	1,583
Red River	0	0	0	0	0	0
Rusk	25,263	20,901	20,891	20,891	20,891	20,872
Sabine	11,461	11,453	11,453	11,453	11,453	11,453
San Augustine	4,104	4,104	4,104	4,104	4,104	4,104
Shelby	12,044	11,217	10,901	10,447	10,311	9,729
Smith	87,502	87,502	87,502	87,492	87,478	87,478
Titus	10,994	10,459	10,157	10,006	9,776	9,776
Trinity	5,721	5,721	5,721	5,721	5,721	5,721
Upshur	32,685	32,685	32,685	32,685	32,504	32,504
Van Zandt	14,428	14,097	14,097	14,097	14,097	13,865
Wood	31,828	31,651	31,563	31,520	31,445	31,423
Total	**558,744**	**548,116**	**546,968**	**545,621**	**544,855**	**543,086**

TABLE 6. MODELED AVAILABLE GROUNDWATER FOR THE CARRIZO-WILCOX, QUEEN CITY, SPARTA, AND YEGUA-JACKSON AQUIFERS BY REGIONAL WATER PLANNING AREA FOR EACH DECADE BETWEEN 2010 AND 2060. RESULTS ARE IN ACRE-FEET PER YEAR.

Region	Year					
	2010	2020	2030	2040	2050	2060
C	8,787	8,720	8,720	8,720	8,720	8,720
D	269,054	264,560	263,738	263,003	262,373	261,588
H	3,594	3,594	3,594	3,594	3,594	3,594
I	277,309	271,242	270,916	270,304	270,168	269,184
Total	**558,744**	**548,116**	**546,968**	**545,621**	**544,855**	**543,086**

TABLE 7. MODELED AVAILABLE GROUNDWATER FOR THE CARRIZO-WILCOX, QUEEN CITY, SPARTA, AND YEGUA-JACKSON AQUIFERS BY RIVER BASIN FOR EACH DECADE BETWEEN 2010 AND 2060. RESULTS ARE IN ACRE-FEET PER YEAR.

Basin	Year					
	2010	2020	2030	2040	2050	2060
Cypress	134,160	133,385	133,027	132,824	132,283	132,239
Neches	227,999	223,473	223,305	223,015	222,879	222,344
Sabine	138,218	136,072	135,726	135,315	135,226	134,486
Sulphur	21,241	18,127	17,851	17,408	17,408	16,958
Trinity	37,126	37,059	37,059	37,059	37,059	37,059
Total	**558,744**	**548,116**	**546,968**	**545,621**	**544,855**	**543,086**

TABLE 8. MODELED AVAILABLE GROUNDWATER FOR THE CARRIZO-WILCOX, QUEEN CITY, SPARTA, AND YEGUA-JACKSON AQUIFERS BY GROUNDWATER CONSERVATION DISTRICT (GCD) FOR EACH DECADE BETWEEN 2010 AND 2060. RESULTS ARE IN ACRE-FEET PER YEAR. UWCD REFERS TO UNDERGROUND WATER CONSERVATION DISTRICT.

District	Year					
	2010	2020	2030	2040	2050	2060
Anderson County UWCD	1,361	1,361	1,361	1,361	1,361	1,361
Neches & Trinity Valleys GCD	87,212	87,145	87,145	87,145	87,145	87,145
Panola GCD	9,097	8,227	8,227	8,069	8,069	8,069
Pineywoods GCD	72,117	72,117	72,117	72,117	72,117	71,734
Rusk County GCD	25,263	20,901	20,891	20,891	20,891	20,872
Total (excluding non-district areas)	**195,050**	**189,751**	**189,741**	**189,583**	**189,583**	**189,181**
No District	363,694	358,365	357,227	356,038	355,272	353,905
Total (including non-district areas)	**558,744**	**548,116**	**546,968**	**545,621**	**544,855**	**543,086**

TABLE 9. MODELED AVAILABLE GROUNDWATER FOR THE LOWER WILCOX FORMATION BY GROUNDWATER CONSERVATION DISTRICT (GCD) FOR EACH DECADE BETWEEN 2010 AND 2060. RESULTS ARE IN ACRE-FEET PER YEAR. UWCD REFERS TO UNDERGROUND WATER CONSERVATION DISTRICT.

District	Year					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**
Anderson County UWCD	7	7	7	7	7	7
Neches & Trinity Valleys GCD	1,886	1,886	1,886	1,886	1,886	1,886
Panola GCD	725	725	725	725	725	725
Pineywoods GCD	0	0	0	0	0	0
Rusk County GCD	0	0	0	0	0	0
Total (excluding non-district areas)	**2,618**	**2,618**	**2,618**	**2,618**	**2,618**	**2,618**
No District	2,717	2,717	2,717	2,717	2,717	2,717
Total (including non-district areas)	**5,335**	**5,335**	**5,335**	**5,335**	**5,335**	**5,335**

TABLE 10. MODELED AVAILABLE GROUNDWATER FOR THE MIDDLE WILCOX FORMATION BY GROUNDWATER CONSERVATION DISTRICT (GCD) FOR EACH DECADE BETWEEN 2010 AND 2060. RESULTS ARE IN ACRE-FEET PER YEAR. UWCD REFERS TO UNDERGROUND WATER CONSERVATION DISTRICT.

District	Year					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**
Anderson County UWCD	15	15	15	15	15	15
Neches & Trinity Valleys GCD	1,719	1,719	1,719	1,719	1,719	1,719
Panola GCD	5,764	5,764	5,764	5,764	5,764	5,764
Pineywoods GCD	678	678	678	678	678	678
Rusk County GCD	8,731	8,731	8,731	8,731	8,731	8,731
Total (excluding non-district areas)	**16,907**	**16,907**	**16,907**	**16,907**	**16,907**	**16,907**
No District	44,427	44,223	44,194	44,179	44,179	44,165
Total (including non-district areas)	**61,334**	**61,130**	**61,101**	**61,086**	**61,086**	**61,072**

TABLE 11. MODELED AVAILABLE GROUNDWATER FOR THE UPPER WILCOX FORMATION BY GROUNDWATER CONSERVATION DISTRICT (GCD) FOR EACH DECADE BETWEEN 2010 AND 2060. RESULTS ARE IN ACRE-FEET PER YEAR. UWCD REFERS TO UNDERGROUND WATER CONSERVATION DISTRICT.

District	Year					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**
Anderson County UWCD	107	107	107	107	107	107
Neches & Trinity Valleys GCD	9,652	9,652	9,652	9,652	9,652	9,652
Panola GCD	770	770	770	770	770	770
Pineywoods GCD	12,581	12,581	12,581	12,581	12,581	12,581
Rusk County GCD	5,156	5,156	5,156	5,156	5,156	5,156
Total (excluding non-district areas)	**28,266**	**28,266**	**28,266**	**28,266**	**28,266**	**28,266**
No District	45,600	42,690	42,396	41,968	41,968	41,495
Total (including non-district areas)	**73,866**	**70,956**	**70,662**	**70,234**	**70,234**	**69,761**

TABLE 12. MODELED AVAILABLE GROUNDWATER FOR THE CARRIZO FORMATION BY GROUNDWATER CONSERVATION DISTRICT (GCD) FOR EACH DECADE BETWEEN 2010 AND 2060. RESULTS ARE IN ACRE-FEET PER YEAR. UWCD REFERS TO UNDERGROUND WATER CONSERVATION DISTRICT.

District	Year					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**
Anderson County UWCD	281	281	281	281	281	281
Neches & Trinity Valleys GCD	16,885	16,818	16,818	16,818	16,818	16,818
Panola GCD	1,838	968	968	810	810	810
Pineywoods GCD	34,540	34,540	34,540	34,540	34,540	34,540
Rusk County GCD	6,956	6,956	6,946	6,946	6,946	6,927
Total (excluding non-district areas)	**60,500**	**59,563**	**59,553**	**59,395**	**59,395**	**59,376**
No District	73,903	71,851	71,036	70,290	69,820	68,940
Total (including non-district areas)	**134,403**	**131,414**	**130,589**	**129,685**	**129,215**	**128,316**

TABLE 13. MODELED AVAILABLE GROUNDWATER FOR THE QUEEN CITY AQUIFER BY GROUNDWATER CONSERVATION DISTRICT (GCD) FOR EACH DECADE BETWEEN 2010 AND 2060. RESULTS ARE IN ACRE-FEET PER YEAR. UWCD REFERS TO UNDERGROUND WATER CONSERVATION DISTRICT.

District	Year					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**
Anderson County UWCD	951	951	951	951	951	951
Neches & Trinity Valleys GCD	56,095	56,095	56,095	56,095	56,095	56,095
Panola GCD	0	0	0	0	0	0
Pineywoods GCD	6,095	6,095	6,095	6,095	6,095	6,095
Rusk County GCD	58	58	58	58	58	58
Total (excluding non-district areas)	**63,199**	**63,199**	**63,199**	**63,199**	**63,199**	**63,199**
No District	180,349	180,186	180,186	180,186	179,890	179,890
Total (including non-district areas)	**243,548**	**243,385**	**243,385**	**243,385**	**243,089**	**243,089**

TABLE 14. MODELED AVAILABLE GROUNDWATER FOR THE SPARTA AQUIFER BY GROUNDWATER CONSERVATION DISTRICT (GCD) FOR EACH DECADE BETWEEN 2010 AND 2060. RESULTS ARE IN ACRE-FEET PER YEAR. UWCD REFERS TO UNDERGROUND WATER CONSERVATION DISTRICT.

District	Year					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**
Anderson County UWCD	0	0	0	0	0	0
Neches & Trinity Valleys GCD	975	975	975	975	975	975
Panola GCD	0	0	0	0	0	0
Pineywoods GCD	1,098	1,098	1,098	1,098	1,098	1,098
Rusk County GCD	4,362	0	0	0	0	0
Total (excluding non-district areas)	**6,435**	**2,073**	**2,073**	**2,073**	**2,073**	**2,073**
No District	2,012	2,012	2,012	2,012	2,012	2,012
Total (including non-district areas)	**8,447**	**4,085**	**4,085**	**4,085**	**4,085**	**4,085**

TABLE 15. MODELED AVAILABLE GROUNDWATER FOR THE YEGUA-JACKSON AQUIFER BY GROUNDWATER CONSERVATION DISTRICT (GCD) FOR EACH DECADE BETWEEN 2010 AND 2060. RESULTS ARE IN ACRE-FEET PER YEAR. UWCD REFERS TO UNDERGROUND WATER CONSERVATION DISTRICT.

District	Year					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**
Anderson County UWCD	0	0	0	0	0	0
Neches & Trinity Valleys GCD	0	0	0	0	0	0
Panola GCD	0	0	0	0	0	0
Pineywoods GCD	17,125	17,125	17,125	17,125	17,125	16,742
Rusk County GCD	0	0	0	0	0	0
Total (excluding non-district areas)	**17,125**	**17,125**	**17,125**	**17,125**	**17,125**	**16,742**
No District	14,686	14,686	14,686	14,686	14,686	14,686
Total (including non-district areas)	**31,811**	**31,811**	**31,811**	**31,811**	**31,811**	**31,428**

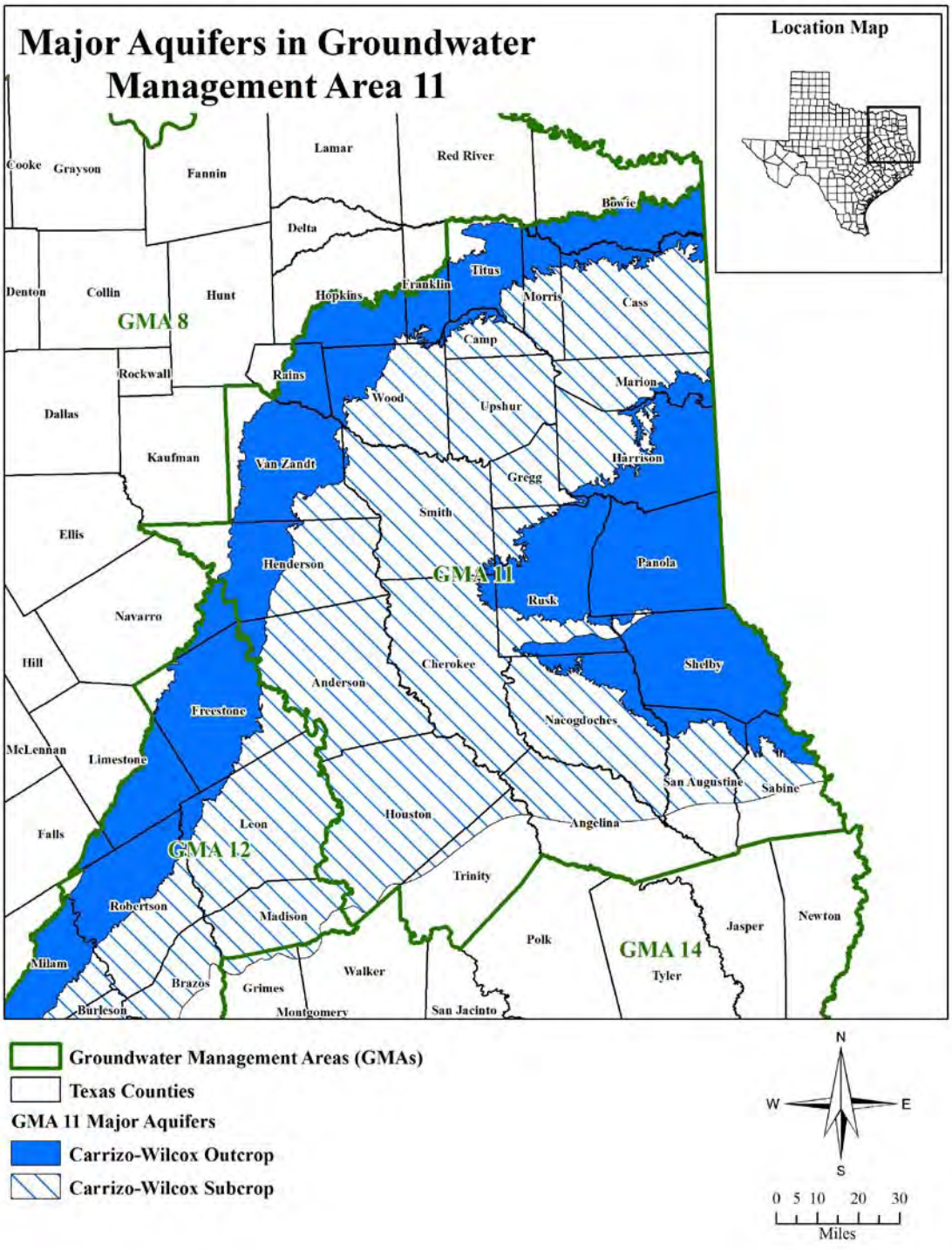


FIGURE 1. MAP SHOWING THE BOUNDARY OF THE CARRIZO-WILCOX AQUIFER ACCORDING TO THE 2007 STATE WATER PLAN (TWDB, 2007).

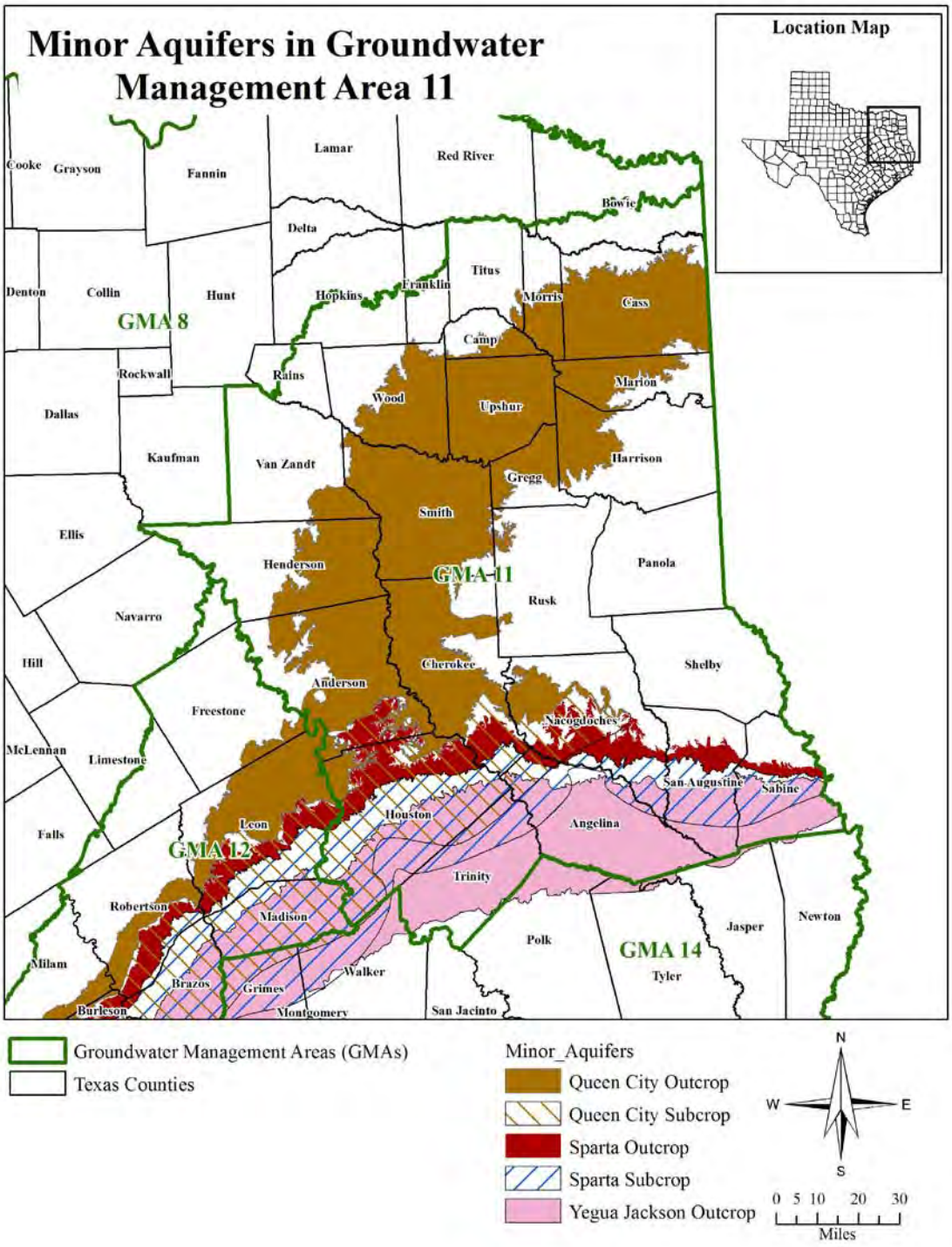


FIGURE 2. MAP SHOWING THE BOUNDARIES OF THE QUEEN CITY, SPARTA, AND YEGUA-JACKSON AQUIFERS ACCORDING TO THE 2007 STATE WATER PLAN (TWDB, 2007).

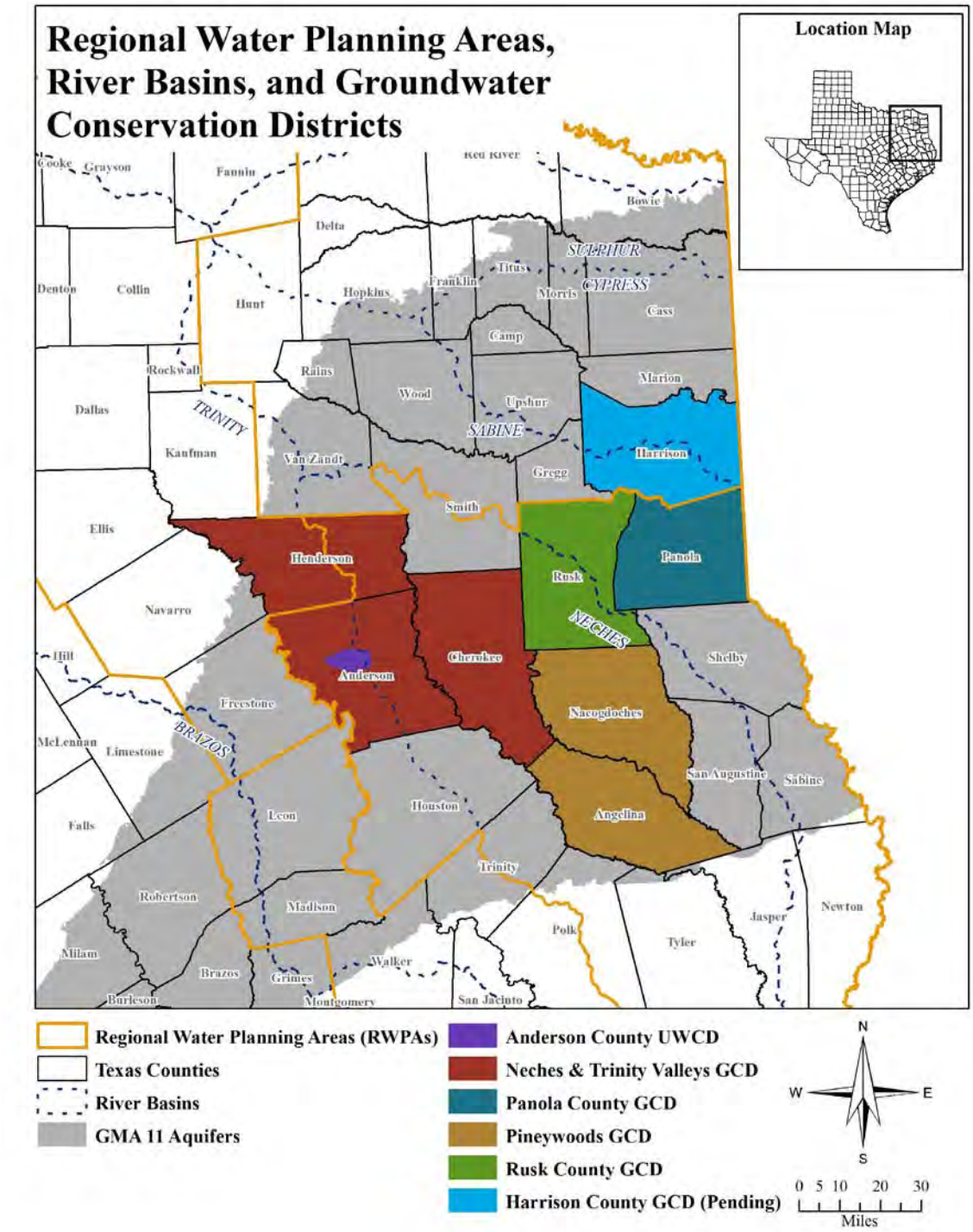


FIGURE 3. MAP SHOWING REGIONAL WATER PLANNING AREAS, GROUNDWATER CONSERVATION DISTRICTS, COUNTIES, AND RIVER BASINS IN AND NEIGHBORING OF GROUNDWATER MANAGEMENT AREA 11.

Appendix

TABLE A1. AVERAGE DRAWDOWN OVER THE 51-YEAR PREDICTIVE GROUNDWATER AVAILABILITY MODEL RUN IN GROUNDWATER MANAGEMENT AREA 11 FOR THE CARRIZO-WILCOX, QUEEN CITY, AND SPARTA AQUIFERS AND WECHES AND REKLAW CONFINING UNITS. ALL VALUES ARE IN FEET. "ANDERSON (ACUWCD)" REFERS TO THE ANDERSON COUNTY UNDERGROUND WATER CONSERVATION DISTRICT WITHIN ANDERSON COUNTY. "ANDERSON (NTVGCD)" REFERS TO THE PORTION OF NECHES AND TRINITY VALLEYS GROUNDWATER CONSERVATION DISTRICT IN ANDERSON COUNTY. NEGATIVE VALUES INDICATE A RISE IN WATER LEVELS.

County	Sparta	Weches (CU)	Queen City	Reklaw (CU)	Carrizo	Upper Wilcox	Middle Wilcox	Lower Wilcox	Overall
Anderson (ACUWCD)			1	12	35	26	12	5	15
Anderson (NTVGCD)	-2	1	7	15	36	26	11	4	16
Angelina	10	11	16	22	42	5	-18	-3	11
Bowie						21	0	0	1
Camp			12	0	18	17	39	0	19
Cass			8	6	10	7	7	0	8
Cherokee	7	14	11	11	32	32	15	10	18
Franklin				-16	-3	7	19	0	11
Gregg			7	11	42	49	56	79	35
Harrison			0	2	24	13	5	4	9
Henderson			4	15	41	32	27	15	23
Hopkins				-22	-12	-15	-28	0	-26
Houston	2	1	2	15	35	12	2	-2	8
Marion			17	11	21	15	15	0	16
Morris			13	10	29	25	23	0	21
Nacogdoches	3	3	11	10	14	11	-10	-6	4
Panola			-11	-19	11	2	1	4	2
Rains						7	-10	-5	-8
Rusk	0	-46	-15	-2	6	6	23	21	12
Sabine	5	5	7	15	24	13	6	5	10
San Augustine	-4	-4	-3	11	20	9	-3	-2	3
Shelby			-18	-19	23	-3	3	1	1
Smith	-5	-5	11	34	103	118	92	76	68
Titus			-1	-3	31	14	5	0	9
Trinity	5	4	4	12	33	-3	-7	-1	6
Upshur	-5	-5	5	17	56	66	66	97	44
Van Zandt			7	11	31	13	17	11	14
Wood	-5	-7	-2	36	110	83	55	114	59
Total	**3**	**4**	**7**	**15**	**38**	**26**	**15**	**11**	**17**

APPENDIX H

HISTORICAL WATER USE SUMMARY BY GROUNDWATER AND SURFACE WATER

Estimated Historical Water Use And 2012 State Water Plan Datasets:

Panola County 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
January 30, 2013

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/GMPchecklist0911.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 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 updated Historical Water Use and 2012 State Water Planning data available as of 1/30/2013. Although it does not happen frequently, neither of these datasets are static and are subject to change pending the availability of more accurate data (Historical Water Use data) or an amendment to the 2012 State Water Plan (2012 State Water Planning data). District personnel must review these datasets and correct any discrepancies in order to ensure approval of their groundwater management plan.

The Historical Water Use dataset can be verified at this web address:

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

The 2012 State Water Planning dataset can be verified by contacting Wendy Barron (wendy.barron@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 years 2005, 2011 and 2012. TWDB staff anticipates the calculation and posting of these estimates at a later date.

PANOLA COUNTY

All values are in acre-feet/year

Year	Source	Municipal	Manufacturing	Steam Electric	Irrigation	Mining	Livestock	Total
1974	GW	1,372	337	0	3	166	356	2,234
	SW	454	271	0	0	0	1,205	1,930
1980	GW	1,862	108	0	0	139	708	2,817
	SW	817	630	0	0	252	542	2,241
1984	GW	1,989	352	0	0	286	654	3,281
	SW	777	409	0	64	0	981	2,231
1985	GW	2,020	362	0	0	200	640	3,222
	SW	780	420	0	100	0	960	2,260
1986	GW	1,768	243	0	0	3,305	670	5,986
	SW	713	453	0	100	0	1,007	2,273
1987	GW	1,856	196	0	0	989	695	3,736
	SW	1,202	477	0	100	2,133	1,043	4,955
1988	GW	1,959	189	0	0	1,047	705	3,900
	SW	1,450	504	0	100	2,108	1,059	5,221
1989	GW	1,865	196	0	0	1,078	747	3,886
	SW	1,226	477	0	0	2,130	1,121	4,954
1990	GW	1,898	212	0	0	1,078	858	4,046
	SW	1,117	429	0	0	2,130	1,288	4,964
1991	GW	1,901	359	0	0	1,044	869	4,173
	SW	1,230	258	0	0	2,047	1,303	4,838
1992	GW	2,036	205	0	0	1,051	812	4,104
	SW	1,284	389	0	0	2,065	1,217	4,955
1993	GW	1,965	196	0	0	1,064	815	4,040
	SW	1,445	444	0	0	2,100	1,222	5,211
1994	GW	1,944	210	0	0	1,064	1,090	4,308
	SW	1,290	420	0	0	2,100	1,635	5,445
1995	GW	2,004	265	0	0	1,045	1,059	4,373
	SW	1,558	641	0	0	2,090	1,589	5,878
1996	GW	1,918	247	0	0	1,944	1,126	5,235
	SW	1,508	665	0	0	2,090	1,690	5,953
1997	GW	1,894	252	0	0	1,947	1,128	5,221

Estimated Historical Water Use

TWDB Historical Water Use Survey (WUS) Data

Groundwater and surface water historical use estimates are currently unavailable for calendar years 2005, 2011 and 2012. TWDB staff anticipates the calculation and posting of these estimates at a later date.

Year	Source	Municipal	Manufacturing	Steam Electric	Irrigation	Mining	Livestock	Total
1997	SW	1,511	744	0	0	2,095	1,693	6,043
1998	GW	1,959	119	0	0	1,947	1,118	5,143
	SW	1,876	907	0	0	1,881	1,677	6,341
1999	GW	1,989	118	0	0	1,947	1,216	5,270
	SW	1,871	156	0	0	1,881	1,825	5,733
2000	GW	2,074	269	0	0	1,016	1,238	4,597
	SW	2,018	915	0	0	1,881	1,858	6,672
2001	GW	1,993	326	0	0	1,196	1,264	4,779
	SW	1,615	964	0	0	1,286	1,903	5,768
2002	GW	1,906	263	0	0	434	1,254	3,857
	SW	1,544	778	0	0	467	1,888	4,677
2003	GW	1,861	746	0	0	832	1,249	4,688
	SW	1,508	2,203	0	0	896	1,880	6,487
2004	GW	1,703	177	0	0	842	1,270	3,992
	SW	1,380	521	0	0	907	1,913	4,721
2006	GW	2,243	191	0	18	241	333	3,026
	SW	1,555	573	0	0	9	2,996	5,133
2007	GW	1,860	406	0	31	9	327	2,633
	SW	1,589	616	0	0	41	2,942	5,188
2008	GW	2,325	260	0	64	5	304	2,958
	SW	1,640	603	0	0	32	2,739	5,014
2009	GW	2,718	408	0	31	1,322	314	4,793
	SW	890	1,263	0	0	870	2,827	5,850
2010	GW	4,031	0	0	346	1,824	136	6,337
	SW	385	717	0	50	1,373	1,226	3,751

Projected Surface Water Supplies
TWDB 2012 State Water Plan Data

PANOLA COUNTY

All values are in acre-feet/year

RWPG	WUG	WUG Basin	Source Name	2010	2020	2030	2040	2050	2060
I	CARTHAGE	SABINE	MURVAUL LAKE/RESERVOIR	3,552	3,498	3,456	3,415	3,379	3,308
I	COUNTY-OTHER	SABINE	MURVAUL LAKE/RESERVOIR	1,331	1,328	1,323	1,319	1,315	1,310
I	LIVESTOCK	CYPRESS	LIVESTOCK LOCAL SUPPLY	30	30	30	30	30	30
I	LIVESTOCK	SABINE	LIVESTOCK LOCAL SUPPLY	1,828	1,828	1,828	1,828	1,828	1,828
I	MANUFACTURING	SABINE	MURVAUL LAKE/RESERVOIR	911	962	1,001	1,039	1,070	1,136
I	MANUFACTURING	SABINE	SABINE RIVER RUN-OF-RIVER MANUFACTURING	114	114	114	114	114	114
I	MANUFACTURING	SABINE	SABINE RIVER RUN-OF-RIVER MANUFACTURING	129	129	129	129	129	129
I	MINING	SABINE	MURVAUL LAKE/RESERVOIR	2,254	2,563	2,752	2,943	3,137	3,322
	Sum of Projected Surface Water Supplies (acre-feet/year)			10,149	10,452	10,633	10,817	11,002	11,177

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.

PANOLA COUNTY

All values are in acre-feet/year

RWPG	WUG	WUG Basin	2010	2020	2030	2040	2050	2060
I	COUNTY-OTHER	CYPRESS	5	5	5	5	5	5
I	LIVESTOCK	CYPRESS	31	31	31	31	31	31
I	BECKVILLE	SABINE	133	133	132	131	131	132
I	CARTHAGE	SABINE	2,274	2,297	2,311	2,317	2,326	2,343
I	COUNTY-OTHER	SABINE	1,693	1,676	1,651	1,620	1,602	1,614
I	MANUFACTURING	SABINE	1,357	1,437	1,500	1,561	1,614	1,720
I	MINING	SABINE	3,756	4,271	4,587	4,905	5,228	5,536
I	LIVESTOCK	SABINE	3,065	3,065	3,065	3,065	3,065	3,065
I	GILL WSC	SABINE	94	96	97	99	100	100
I	TATUM	SABINE	29	28	28	28	27	28
	Sum of Projected Water Demands (acre-feet/year)		12,437	13,039	13,407	13,762	14,129	14,574

Projected Water Supply Needs
TWDB 2012 State Water Plan Data

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

PANOLA COUNTY

All values are in acre-feet/year

RWPG	WUG	WUG Basin	2010	2020	2030	2040	2050	2060
I	BECKVILLE	SABINE	448	448	449	450	450	449
I	CARTHAGE	SABINE	1,682	1,599	1,538	1,487	1,438	1,341
I	COUNTY-OTHER	CYPRESS	0	0	0	0	0	0
I	COUNTY-OTHER	SABINE	989	1,006	1,031	1,062	1,080	1,068
I	GILL WSC	SABINE	19	17	16	14	13	13
I	LIVESTOCK	CYPRESS	0	0	0	0	0	0
I	LIVESTOCK	SABINE	282	282	282	282	282	282
I	MANUFACTURING	SABINE	-96	-116	-132	-147	-161	-187
I	MINING	SABINE	932	726	599	472	343	220
I	TATUM	SABINE	65	66	66	66	67	66
	Sum of Projected Water Supply Needs (acre-feet/year)		-96	-116	-132	-147	-161	-187

Projected Water Management Strategies
TWDB 2012 State Water Plan Data

PANOLA COUNTY

WUG, Basin (RWPG)

All values are in acre-feet/year

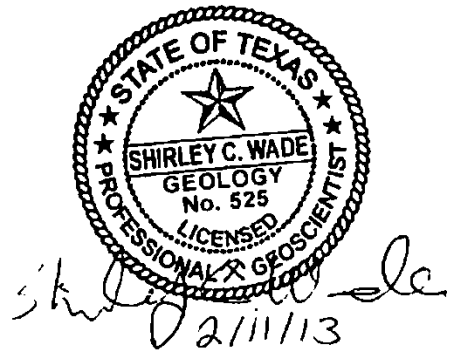
Water Management Strategy	Source Name [Origin]	2010	2020	2030	2040	2050	2060
MANUFACTURING, SABINE (I)							
PURCHASE WATER FROM PROVIDER (1)	MURVAUL LAKE/RESERVOIR [RESERVOIR]	96	116	132	147	161	187
Sum of Projected Water Management Strategies (acre-feet/year)		96	116	132	147	161	187

APPENDIX I

ESTIMATES OF HISTORICAL GROUNDWATER FLOWS
GAM RUN 13-006

GAM Run 13-006: Panola County Groundwater Conservation District Management Plan

by Shirley Wade, Ph.D., P.G.
Texas Water Development Board
Groundwater Resources Division
Groundwater Availability Modeling Section
(512) 936-0883
February 11, 2013



The seal appearing on this document was authorized by Shirley Wade, P.G. 525 on February 11, 2013.

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GAM RUN 13-006: PANOLA COUNTY GROUNDWATER CONSERVATION DISTRICT MANAGEMENT PLAN

by Shirley Wade, Ph.D., P.G.
Texas Water Development Board
Groundwater Resources Division
Groundwater Availability Modeling Section
(512) 936-0883
February 11, 2013

EXECUTIVE SUMMARY:

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

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

The purpose of this report is to provide Part 2 of a two-part package of information from the TWDB to Panola County Groundwater Conservation District management plan to fulfill the requirements noted above. The groundwater management plan for the Panola County Groundwater Conservation District should be adopted by the district on or before December 9, 2013 and submitted to the executive administrator of the TWDB on or before January 8, 2014. The current management plan for the Panola County Groundwater Conservation District expires on March 9, 2014.

This report discusses the methods, assumptions, and results from a model run using the groundwater availability model for the northern part of the Carrizo-Wilcox, Queen City, and Sparta aquifers. Table 1 summarizes the groundwater availability model data required by the statute, and Figure 1 shows the area of the model from which the values in the table were extracted. This model run replaces the results of GAM Run 08-50. GAM Run 13-006 meets current standards set after the release of GAM Run 08-50. If after review of the figures, Panola County Groundwater Conservation District determines that the district boundaries used in the assessment do not reflect current conditions, please notify the Texas Water Development Board immediately.

METHODS:

In accordance with the provisions of the Texas State Water Code, Section 36.1071, Subsection (h), the groundwater availability model for the northern part of the Carrizo-Wilcox, Queen City, and Sparta aquifers was run for this analysis. Panola County Groundwater Conservation District Water budgets for 1980 through 1999 were extracted 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 portions of the aquifers located within the district are summarized in this report.

PARAMETERS AND ASSUMPTIONS:

- We used Version 2.01 of the groundwater availability model for the northern part of the Carrizo-Wilcox, Queen City, and Sparta aquifers. See Fryar and others (2003) and Kelley and others (2004) for assumptions and limitations of the groundwater availability model for the northern part of the Carrizo-Wilcox, Queen City, and Sparta aquifers.
- The groundwater availability model includes eight layers, that roughly correspond to:
    - the Sparta Aquifer (Layer 1),
    - the Weches Confining Unit (Layer 2),
    - the Queen City Aquifer (Layer 3),
    - the Reklaw Confining Unit (Layer 4),
    - the Carrizo Aquifer (Layer 5),

- the Upper Wilcox Aquifer (Layer 6),
- the Middle Wilcox Aquifer (Layer 7), and
- the Lower Wilcox Aquifer (Layer 8).

- The Sparta and Queen City aquifers and associated confining units (layers 1 to 4) are not substantively present in the district. The reported water budget values for these layers, therefore, are very small or zero. Accordingly, these values are not presented in Table 1.
- In the Sabine Uplift area, the Simsboro Formation (Middle Wilcox Aquifer) is not distinguishable and the Wilcox Group is informally divided into the Upper Wilcox and the Lower Wilcox aquifers (Fryar and others, 2003). In the current version of the groundwater availability model, layers 6 and 7 represent the Upper Wilcox and Lower Wilcox aquifers in this area. Layer 8 is included in the model in this area, but it is of nominal thickness and is not intended to represent the Lower Wilcox aquifer.
- The model was run with MODFLOW-96 (Harbaugh and McDonald, 1996).

RESULTS:

A groundwater budget summarizes the amount of water entering and leaving the aquifer according to the groundwater availability model. Selected groundwater budget components listed below were extracted from the 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 Table 1.

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

define the amount of leakage that occurs. “Inflow” to an aquifer from an overlying or underlying aquifer will always equal the “Outflow” from the other aquifer.

The information needed for the District’s management plan is summarized in Table 1. 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 (Figure 1).

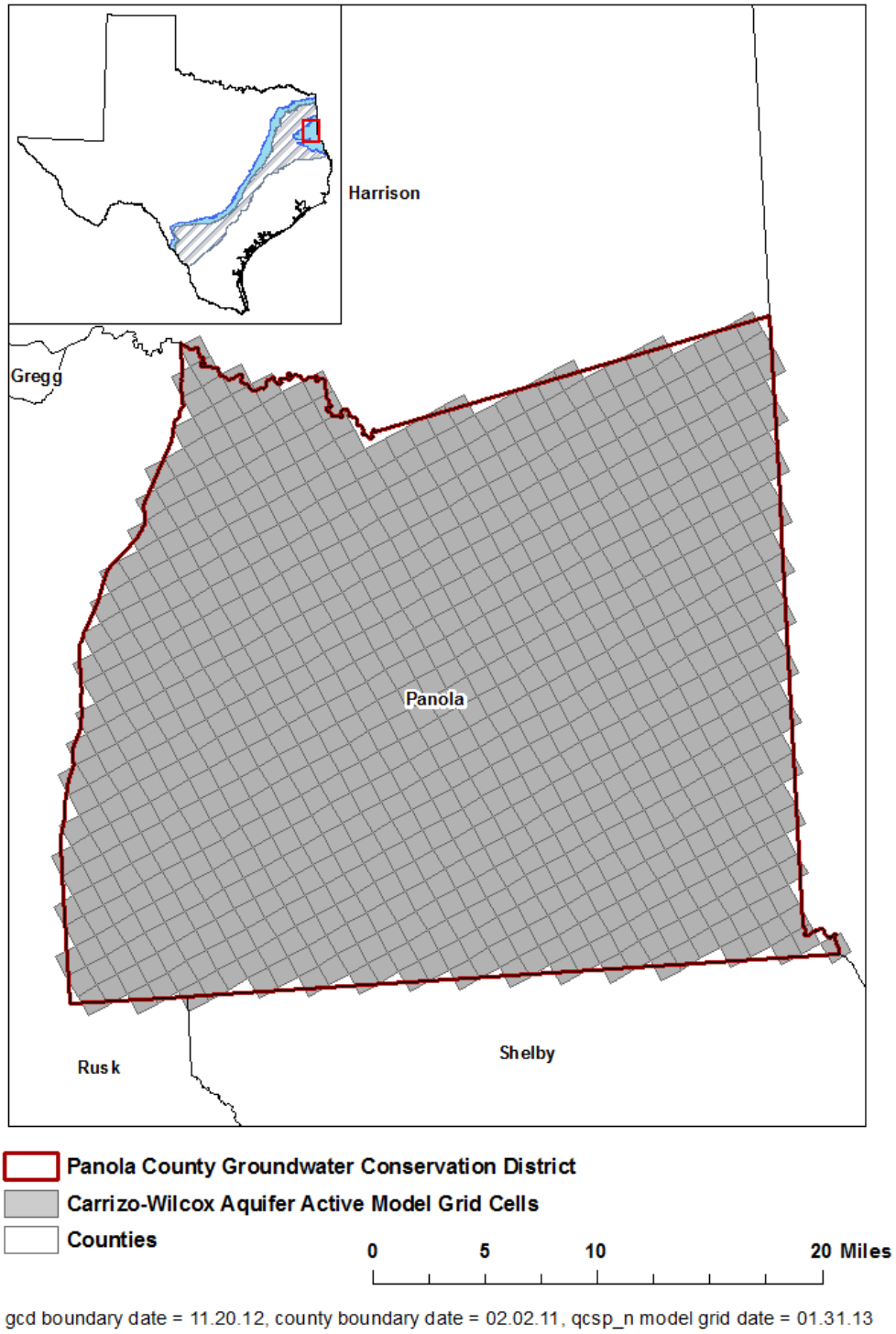

FIGURE 1: AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE CARRIZO-WILCOX, QUEEN CITY, AND SPARTA AQUIFERS FROM WHICH THE INFORMATION IN TABLE 1 WAS EXTRACTED (THE CARRIZO-WILCOX AQUIFER EXTENT WITHIN THE DISTRICT BOUNDARY).

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

Management Plan requirement	*Aquifer or confining unit*	*Results*
Estimated annual amount of recharge from precipitation to the district	Carrizo-Wilcox Aquifer	38,085
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Carrizo-Wilcox Aquifer	30,580
Estimated annual volume of flow into the district within each aquifer in the district	Carrizo-Wilcox Aquifer	5,816
Estimated annual volume of flow out of the district within each aquifer in the district	Carrizo-Wilcox Aquifer	3,122
Estimated net annual volume of flow between each aquifer in the district	From overlying confining units into the Carrizo-Wilcox Aquifer	16

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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