Brazos Valley Groundwater Conservation District

Groundwater Management Plan

ADOPTED

APPROVED BY THE TEXAS WATER DEVELOPMENT BOARD ON

_____.

OBJECTIVES AMENDED BY ACTION OF THE BOARD ON

_____.

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1. MISSION STATEMENT:

The Brazos Valley Groundwater Conservation District (BVGCD) was authorized to be created by the Texas Legislature to protect and conserve the groundwater resources of Robertson and Brazos counties through local management in concert with Groundwater Management Area 12 (GMA-12). The District directs its efforts toward preventing waste of water, collecting data, promoting water conservation, protecting existing water rights, and preventing irreparable harm to the aquifers. The District's rules and management plan are based on the best available science, the laws and rules in effect, and the area's beneficial needs.

2. TIME PERIOD FOR THIS PLAN:

This plan becomes effective upon adoption by the BVGCD Board of Directors and subsequent approval by the Texas Water Development Board (TWDB). The Management Plan is based on a ten-year planning period; however, the plan may be revised at any time to insure that it is consistent with the applicable Regional Water plans, the State Water Plan, and additional science that may be developed. The District's Board of Directors shall re-adopt the management plan, with or without revisions, at least every five years.

3. STATEMENT OF GUIDING PRINCIPLES:

A vast majority of the residents of Brazos and Robertson counties rely solely on the local groundwater supplies to meet their drinking water needs and the majority of their industrial, agricultural, and livestock needs. Therefore, the local groundwater resources are vital to the Brazos Valley's growth, health, economy, and environment. The District believes this valuable resource can be managed in a reasonable manner through conservation, education, and regulation. The overall management goal will be to ensure a sustainable supply of water from the local groundwater resources while recognizing the need to balance protection of rights of private landowners with the responsibility of managing the area's groundwater resources for future generations. A basic understanding of the local aquifers and their hydrogeological properties, as well as quantification of available water supplies, is the foundation for development of prudent management strategies. The Carrizo-Wilcox Aquifer, as well as the minor aquifers in the area, must be conserved and preserved for future generations to the extent allowed by law and made possible through implementation of scientific data and information collected by the District. This Management Plan is intended as a tool for the District to provide continuity and consistency in decision making and to develop an understanding of local aquifer conditions for implementation of proper groundwater management policies.

The District has a responsibility to continually monitor aquifer conditions. As conditions warrant, this document may be modified to best serve the District in meeting its goals. At a minimum, the District Board will review and re-adopt this plan every five years.

4. DISTRICT INFORMATION

A. Creation

The BVGCD was originally created as a temporary District by the 76th Legislature in 1999 through Senate Bill 1911. The District then operated with all of the powers granted to groundwater conservation districts by Chapter 36 of the Texas Water Code (TWC), except the authority to adopt a management plan or levy an ad-valorem tax. The District was ratified by House Bill 1784 in the 77th Legislative Session in 2001 and was subsequently confirmed by the voters of both Brazos and Robertson counties in a general election held on November 5, 2002. The District was then granted full authorities afforded groundwater conservation districts by Chapter 36 of the TWC, limited only by provisions of the District's enabling legislation. The District's enabling act has been codified in Chapter 8835 of the Special Districts and Local Laws Code.

The District was created to implement proper management techniques at the local level to address groundwater needs that are vital to Brazos and Robertson counties. The District directs its efforts toward preventing waste of groundwater, collecting data, and providing education about water conservation, protecting existing water rights, and preventing irreparable harm to the aquifers. This plan provides a template for the District to follow, aiding in the development of an understanding of local aquifer conditions for implementation of proper groundwater management policies.

B. Location and Extent

The District encompasses Brazos and Robertson counties in Central Texas. The boundaries of the District are coterminous with the counties' boundaries. The District is bordered by Falls and Limestone counties to the North; Grimes and Washington counties to the South; Madison, Leon and Grimes counties to the East; and Milam and Burleson Counties to the West. The District comprises an area of approximately 1,456 square miles or 932,000 acres.

C. Background

The District's Board of Directors consists of eight (8) members appointed by their respective County Commissioners Courts. Four (4) members represent Robertson County and four (4) members represent Brazos County. The directors are appointed to represent the following interests:

Robertson County

1. One must represent municipal interests in the county.
2. One must be a bona fide agricultural producer who derives a substantial portion of his or her income from agriculture in the county.
3. One must be an employee or director of a rural water supply corporation in the county.
4. One must represent active industrial interests in the county.

Brazos County

1. One must be an employee or director of a rural water supply corporation in the county.
2. One must be a bona fide agricultural producer who derives a substantial portion of his or her income from agriculture in the county.
3. The governing body of the City of Bryan, with the approval of the Brazos County Commissioners Court, shall appoint one Director.
4. The governing body of the City of College Station, with the approval of the Brazos County Commissioners Court, shall appoint one Director.

D. Authority/Regulatory Framework

In the preparation of its management plan, the District followed all procedures and satisfied all requirements of Chapter 36 of the TWC and Chapter 356 of the TWDB rules contained in Title 30 of the Texas Administrative Code (TAC). The District exercises the powers it was granted and authorized to use by and through the special and general laws that govern it, including Chapter 1307, Acts of the 77th Legislature, Regular Session, 2001, and Chapter 36 of the TWC.

E. Groundwater Resources of the Brazos Valley Groundwater Conservation District

The five significant aquifers within the District's boundaries are the Carrizo-Wilcox, Queen City, Sparta, Yegua-Jackson, and Brazos River Alluvium. The Simsboro Sand is the most prolific water-yielding unit and is part of the Carrizo-Wilcox Aquifer. The Brazos River Alluvium, located near the Brazos River, is the next most prolific aquifer. The Queen City, Sparta, and Yegua-Jackson aquifers provide small to large pumping rates of useable groundwater to wells, as noted in Groundwater Resources of Brazos and Burleson Counties, Texas, Report 185 (Follett, 1974). A large pumping rate is defined as 200 gallons per minute or more. The vertical sequence of geologic units in descending order is listed in *Figure 1*. The Carrizo-Wilcox (Simsboro Sand) and Sparta aquifers provide water for large capacity public water supply and agricultural wells. Water from the Yegua-Jackson Aquifer is used for domestic, livestock, irrigation, industrial, and some minor retail public water supply use. Brazos River Alluvium wells are used mostly for agricultural irrigation purposes. The outcrop of the Gulf Coast aquifer occurs in the very southern part of the District providing a small amount of water for domestic and livestock wells.

The primary freshwater aquifers consist of sandy fluvial and deltaic sediments, while marine silts and clays act as aquitards separating the water-yielding zones. The Wilcox Group, from the shallowest to the deepest, consists of the Calvert Bluff, Simsboro Sand, and Hooper aquifers. No freshwater aquifers are located below the Midway, which is a thick impermeable clay located at the base of the Hooper Aquifer. The Calvert Bluff Aquifer is comprised of clay, sandy clay, shale, silt, and sand. The Simsboro Sand is generally composed of sand, while the Hooper Aquifer is made up of sand, silt, clay, and

shale. The Simsboro Sand is older than the Calvert Bluff, Carrizo, Queen City, Sparta, and Yegua-Jackson aquifers. The Carrizo Sand and Queen City Sand are separated by the Reklaw, which is a clay zone. The Cook Mountain Formation is composed of mostly clay separating the Sparta Sand and Yegua-Jackson aquifers. The Catahoula Sandstone or Catahoula Aquifer of the Gulf Coast Aquifer is composed of clay and sand in cross-bedded lenses. The Brazos River Alluvium can be found in a two to six mile wide zone of floodplain alluvial deposits along the Brazos River on the western boundary of the District. Sand, small gravel and clay compose the relatively thin Brazos River Alluvium. *Figure 2* illustrates a geologic cross section through Brazos and Robertson Counties and depicts the position, depth, thickness, and dip of the aquifers and confining units.

System	Series	Geologic Unit	Hydrogeologic Unit
Quaternary	Holocene	Flood-plain alluvium	Brazos River alluvium
	Pleistocene	Terrace deposits	
Tertiary	Miocene	Catahoula Sandstone	Gulf Coast aquifer
	Eocene	Jackson Group Whitsett Formation Manning Formation Wellborn Formation Caddell Formation	Yegua-Jackson aquifer
		Yegua Formation	
		Cook Mountain Formation	
		Sparta Sand	Sparta aquifer
		Weches Formation	
		Queen City Sand	Queen City aquifer
		Reklaw Formation	
		Carrizo Sand	Carrizo-Wilcox aquifer
		Wilcox Group Calvert Bluff Simsboro Hooper	

Figure 1: Geologic Units

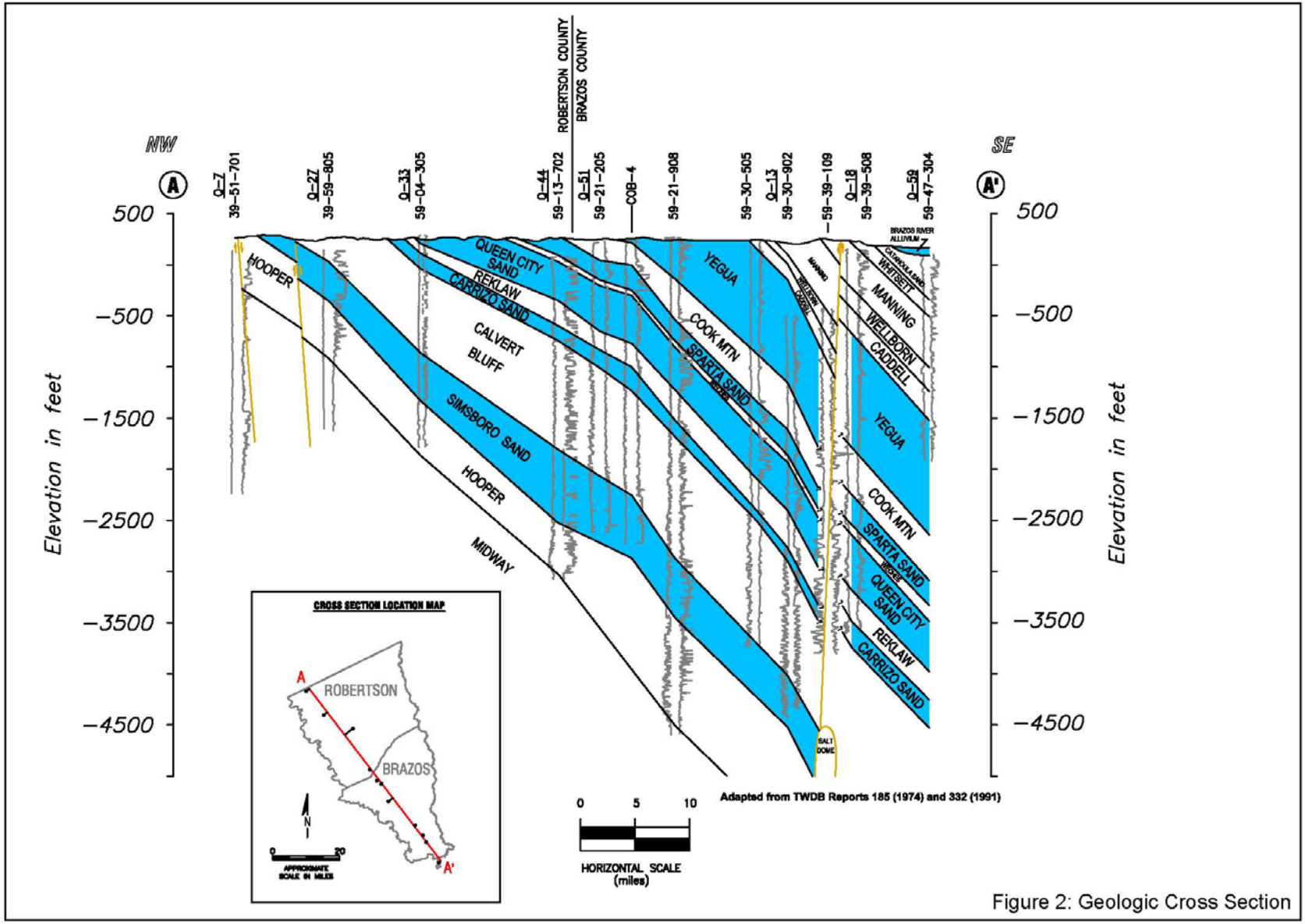
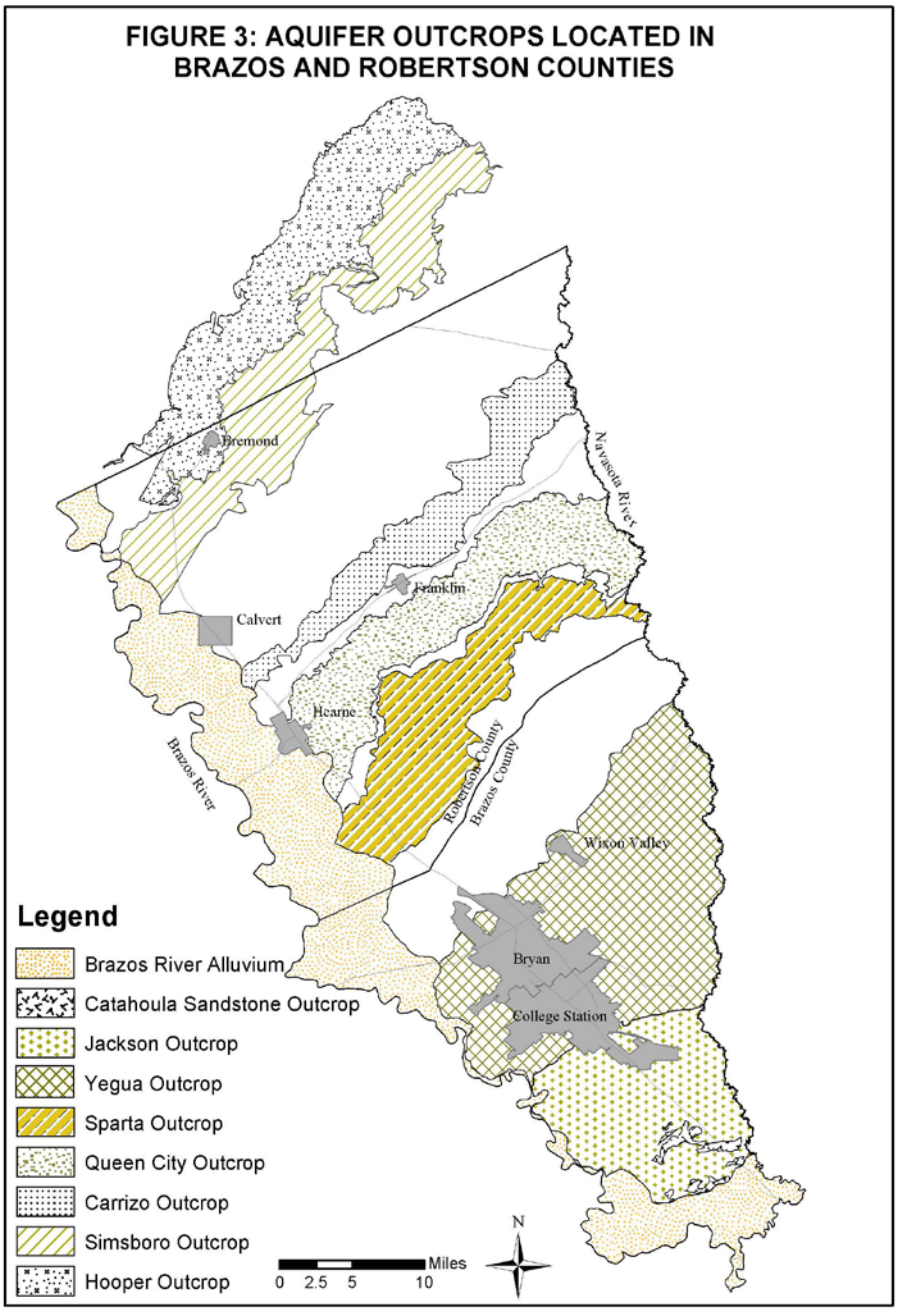


Figure 2: Geologic Cross Section



The Carrizo-Wilcox, Queen City, Sparta, and Yegua-Jackson aquifers outcrop within the District's boundaries in northeast to southwest trending belts paralleling the Gulf coastline. An aquifer outcrop map is included for Brazos and Robertson counties in *Figure 3*. The aquifer outcrops extend outside of the District into adjacent counties as shown on the map above.

Younger aquifers outcrop closest to the coast. Older aquifers outcrop progressively further inland with increased age of the aquifer. The Catahoula Sandstone, which is the basal sand of the Gulf Coast Aquifer, occurs in a very limited area in the southern tip of Brazos County.

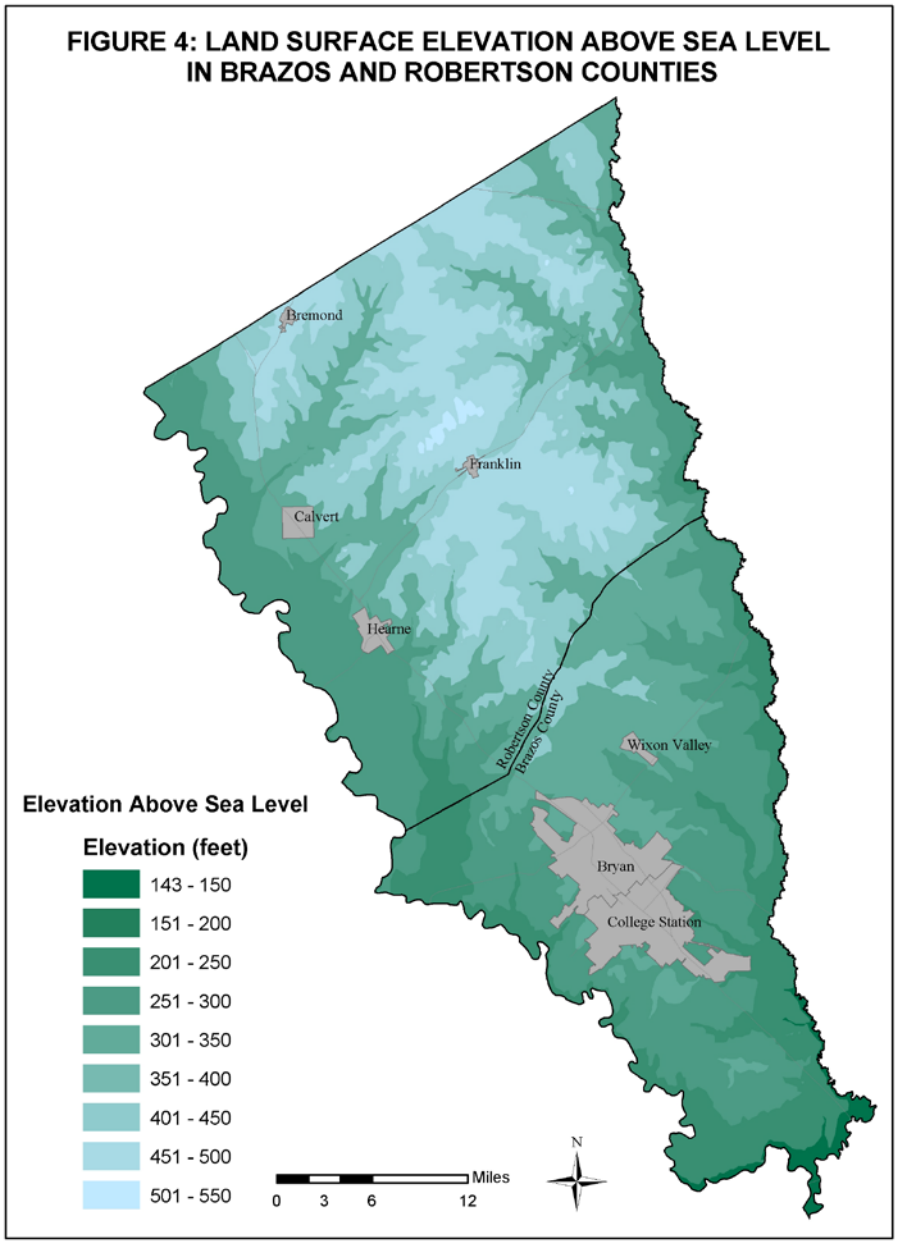
The general trend of the aquifers, with the exception of the Brazos River Alluvium, is to dip underground southeastward towards the Gulf Coast from their surface exposure. The aquifers dip at a maximum rate of about 110 feet per mile. Each aquifer underlies younger aquifers that have a similar dip toward the coast. A salt dome occurs in the southern part of Brazos County. The top of the salt dome has an elevation of about 4,600 feet relative to sea level. The thickness and position of the Simsboro Sand is influenced by the salt dome, but the dome occurs significantly down dip of the area where the Simsboro Sand contains potable quality groundwater.

Topography and Drainage

Natural topography in Brazos and Robertson counties range from gently hilly terrain in the center of the counties to relatively flat terrain along the Brazos and Navasota river corridors. The western border of the counties is the Brazos River and the eastern is the Navasota River. The land surface elevation above sea level for Brazos and Robertson counties is shown on *Figure 4*. Altitudes in the District range from about 140 feet to 550 feet above mean sea level, with higher elevations in the center of the counties.

Numerous creeks drain runoff into the Brazos River, west of the surface water drainage divide and into the Navasota River to the east of the divide. At the southernmost tip of Brazos County, the Navasota River merges with the Brazos River. Drainages include Carters Creek, Cedar Creek, Duck Creek, Mud Creek, Peach Creek, Pin Oak Creek, Spring Creek, Thompson Creek, Walnut Creek, Wickson Creek, and the Little Brazos River. The Little Brazos River drains Walnut Creek, Mud Creek, Pin Oak Creek, and Spring Creek into the Brazos River.

Carters Creek has a stream gradient of about 10 feet per mile towards the Navasota River from its origin in central Brazos County. Cedar Creek drains from central Robertson County through Brazos County to the Navasota River and has a stream gradient of about 9 feet per mile. Duck Creek has a stream gradient of about 7 feet per mile and drains northeast Robertson County into the Navasota River. Mud Creek drains central Robertson County into the Little Brazos River and has a stream gradient of about 10 feet per mile. Peach Creek has a stream gradient of about 12 feet per mile and drains southern Brazos County into the Navasota River. Pin Oak Creek drains southern Robertson County into the Little Brazos River and has a stream gradient of about 22 feet per mile. Spring Creek has a stream gradient of about 17 feet per mile and drains southern Robertson County into the Little Brazos River. Thompson Creek drains northwest Brazos County into the Brazos River and has a stream gradient of about 11 feet per mile. Walnut Creek has a stream gradient of about 7 feet per mile and drains northwestern Robertson County into the Little Brazos River. Wickson Creek drains central Brazos County into the Navasota River and has a stream gradient of about 8 feet per mile.



F. Surface Water Supplies of Brazos and Robertson Counties

Brazos and Robertson counties are within the Region G Regional Water Planning Group commonly designated as Brazos G. Each regional water group supplies their specific assessments to TWDB for incorporation into the State water plan.

Projected surface water supplies are the maximum amount of surface water available from existing sources for use during drought of record conditions that is physically and legally available for use. These

are the existing surface water supply volumes that, without implementing any recommended water management strategies, could be used during a drought by water user groups located within the specified geographic area.

Surface water sources include any water resources where water is obtained directly from a surface water body. This would include rivers, streams, creeks, lakes, ponds, and tanks. In the State of Texas, all waters contained in a watercourse (rivers, natural streams and lakes, and storm water, flood water, and rainwater of every river, natural stream, canyon, ravine, depression, and watershed) are waters of the State and thus belong to the State. The State grants individuals, municipalities, water suppliers, and industries the right to divert and use this water through water rights permits. Water rights are considered property rights and can be bought, sold, or transferred with state approval. These permits are issued based on the concept of prior appropriation, or "first-in-time, first-in-right." Water rights issued by the State generally fall into two major categories: run-of-river rights and stored water rights.

In addition to the water rights permits issued by the State, individual landowners may use State waters without a specific permit for certain types of uses. The most common of these uses is domestic and livestock use. These types of water sources are generally referred to as "Local Supply Sources". Many individuals with land along a river or stream that still have an old riparian right can also divert a reasonable amount of water for domestic and livestock uses without a permit.

5. REQUIRED ESTIMATES: 31 TAC 356.5(a)(5)(A)-(G)

A. Modeled Available Groundwater

Section 36.001 of the TWC defines modeled available groundwater (MAG) as "the amount of water that the Executive Administrator [of the TWDB] determines may be produced on an average annual basis to achieve a desired future condition established under §36.108." Desired future condition (DFC) is defined in §36.001 of the TWC as "a quantitative description, adopted in accordance with §36.108 of the Texas Water Code, of the desired condition of the groundwater resources in a management area at one or more specified future times." The District participates in the joint planning process in GMA-12, as defined per TWC §36.108, and established DFCs for aquifers within the District, excluding the Brazos River Alluvium Aquifer.

DFCs Adopted by GMA 12.

The District's current DFCs for the area covered by GMA-12 are the average drawdowns listed in *Table 1*. The average drawdowns in *Table 1* are for a 60-year period beginning January, 2000 and ending December, 2059. For each of the aquifers, the DFC average drawdowns are for the area covered by each aquifer in Brazos and Robertson counties as defined by the stratigraphy used in the TWDB Groundwater Availability Model for the Central Queen City and Sparta Aquifers (Kelley and others, 2004).

Table 1. Adopted Aquifer DFCs based on the Average Threshold that occurs between January, 2000 and December, 2059. Yegua-Jackson (2000-2060)	**Average Drawdowns (ft)**
Sparta	15
Queen City	12
Carrizo	47
Upper Wilcox (Calvert Bluff Formation)	106
Middle Wilcox (Simsboro Formation)	270
Lower Wilcox (Hooper Formation)	170
Yegua-Jackson	Yegua – 70 Jackson – 110

A. Resolution to Adopt Desired Future Conditions, August 12, 2010, letter from Gary Westbrook, General Manager, Post Oak Savannah GCD to Kevin Ward, Executive Administrator, Texas Water Development Board (Sparta, Queen City, Carrizo, Upper Wilcox, Middle Wilcox, Lower Wilcox).

B. Resolution to Adopt Desired Future Conditions, July 26, 2011, letter from Gary Westbrook, General Manager, Post Oak Savannah GCD, to Melanie Calhoun, Executive Administrator, Texas Water Development Board (Yegua-Jackson).

The District Board declared the Brazos River Alluvium Aquifer relevant for the 2016 DFC planning cycle. In doing so, a DFC will be set for the aquifer based upon saturated thickness of the water bearing layer.

The TWDB's **MAG Estimates** based on GMA-12 adopted DFCs:

Carrizo

Modeled Available Groundwater for the Carrizo Aquifer summarized by county in GMA-12 for each decade between 2010 and 2060. Results are in ac-ft/yr. MAG attached as *Appendix B1*.

County	2010	2020	2030	2040	2050	2060
Brazos	3,253	3,721	3,728	3,741	3,764	3,766
Robertson	1,732	1,707	1,697	1,712	1,729	1,730

http://www.twdb.texas.gov/groundwater/docs/GAMruns/GR10-044_MAG.pdf

Calvert Bluff

Modeled Available Groundwater for the Calvert Bluff Aquifer summarized by county in GMA-12 for each decade between 2010 and 2060. Results are in ac-ft/yr. MAG attached as *Appendix B1*.

County	2010	2020	2030	2040	2050	2060
Brazos	0	0	0	0	0	0
Robertson	1,777	1,762	1,756	1,756	1,755	1,755

http://www.twdb.texas.gov/groundwater/docs/GAMruns/GR10-044_MAG.pdf

Simsboro

Modeled Available Groundwater for the Simsboro Aquifer summarized by county in GMA-12 for each decade between 2010 and 2060. Results are in ac-ft/yr. MAG attached as *Appendix B1*.

County	2010	2020	2030	2040	2050	2060
Brazos	30,672	35,114	41,119	45,680	50,206	53,403
Robertson	41,053	41,647	42,044	42,453	42,782	42,782

http://www.twdb.texas.gov/groundwater/docs/GAMruns/GR10-044_MAG.pdf

Hooper

Modeled Available Groundwater for the Hooper Aquifer summarized by county in GMA-12 for each decade between 2010 and 2060. Results are in ac-ft/yr. MAG attached as *Appendix B1*.

County	2010	2020	2030	2040	2050	2060
Brazos	0	0	0	0	0	0
Robertson	324	319	317	317	316	316

http://www.twdb.texas.gov/groundwater/docs/GAMruns/GR10-044_MAG.pdf

Queen City

Modeled Available Groundwater for the Queen City Aquifer summarized by county in GMA-12 for each decade between 2010 and 2060. Results are in ac-ft/yr. MAG attached as *Appendix B2.*

County	2010	2020	2030	2040	2050	2060
Brazos	512	604	634	587	533	529
Robertson	0	0	0	0	0	0

http://www.twdb.texas.gov/groundwater/docs/GAMruns/GR10-045_MAG.pdf

Sparta

Modeled Available Groundwater for the Sparta Aquifer summarized by county in GMA-12 for each decade between 2010 and 2060. Results are in ac-ft/yr. MAG attached as *Appendix B3.*

County	2010	2020	2030	2040	2050	2060
Brazos	4295	5941	7308	7305	7307	7307
Robertson	200	300	400	500	616	616

http://www.twdb.texas.gov/groundwater/docs/GAMruns/GR10-046_MAG.pdf

Yegua-Jackson

Modeled Available Groundwater for the Yegua-Jackson Aquifer summarized by county in GMA-12 for each decade between 2010 and 2060. Results are in ac-ft/yr. MAG attached as *Appendix B4.*

County	2010	2020	2030	2040	2050	2060
Brazos	7,071	7,071	7,071	7,071	7,071	7,071
Robertson	--	--	--	--	--	--

http://www.twdb.texas.gov/groundwater/docs/GAMruns/GR10-060_MAG.pdf

Brazos River Alluvium - Not Relevant in 2010 DFCs.

B. Historical Water Use Data

Data from the TWDB Historical Water Use Survey, included in *Appendix C1*, provides annual historical water use projections from 2000 to 2012, the most recent years of record availability. The table includes groundwater and surface water accounting for municipal, manufacturing, steam electric, irrigation, mining, and livestock usage. Data presented in *Table 2* reflects groundwater use within the District from metered wells required to report water production to the District.

The data is for the 2009-2013 period and delineated by aquifer. Exempt well use (domestic, livestock, wells used for oil and gas rig supply) are not included. Brazos River Alluvium wells have no requirement to be metered and are not a part of *Table 2*.

Table 2. Metered Groundwater Use by Aquifer (ac-ft/yr)

Aquifer	2009	2010	2011	2012	2013
Hooper	611	914	911	956	794
Simsboro	68,586	63,977	67,519	53,817	64,110
Calvert Bluff	13	58	20	70	80
Carrizo	730	746	1,227	810	799
Queen City	32	0	558	36	64
Sparta	3,432	3,279	4,334	3,083	3,403
Yegua-Jackson	1,599	1,396	1,659	1,408	1,298
Totals	75,003	70,370	76,228	60,180	70,548

C. Annual Recharge from Precipitation

Scope: This is the recharge to aquifers from precipitation falling on outcrop areas of the aquifers within the District. Additional recharge to aquifers occurs in areas outside the District.

Methodology: Using data from the TWDB GAM Run 14-005, attached as *Appendix D*, the annual estimated recharge is given in acre-feet per year (ac-ft/yr) in *Table 3*.

Table 3. GAM Recharge and Discharge Estimates

Management Plan Requirements	Aquifer or Confining Unit	Results ac-ft/yr
Estimated annual amount of recharge from precipitation to the District	Gulf Coast Aquifer System	40
	Yegua-Jackson Aquifer	26,512
	Sparta Aquifer	9,970
	Queen City Aquifer	6,091
	Carrizo-Wilcox Aquifer	26,906
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Gulf Coast Aquifer System	255
	Yegua-Jackson Aquifer	39,287
	Sparta Aquifer	1,861
	Queen City Aquifer	11,902
	Carrizo-Wilcox Aquifer	16,869

Source: TWDB GAM Run 14-005

D. Annual Volume of Water Discharging to Surface Water

Scope: This includes groundwater discharging from each aquifer within the District to springs and surface water bodies including lakes, streams, and rivers.

Methodology: Using data from the TWDB GAM Run 14-005, attached as *Appendix D*, *Table 3* summarizes the flow from each aquifer to surface water springs, lakes, streams, and rivers.

E. Annual Flow Into/Out and Between Aquifers

Scope: Flow into and out of the District is described as lateral flow within the aquifers between the District and adjacent counties. Flow between aquifers describes the vertical flow, or leakage, between aquifers. Flow into the District from each aquifer is provided in the *Table 4*.

Methodology: Using data from the TWDB GAM Run 14-005, attached as *Appendix D*, annual flow into/out and between aquifers was calculated. Groundwater flow results are provided in *Table 4*.

Table 4. GAM Flow Estimates

Management Plan Requirements	Aquifer or Confining Unit	Results ac-ft/yr
Estimated annual volume of flow into the District within each aquifer in the District	Gulf Coast Aquifer System	332
	Yegua-Jackson Aquifer	12,029
	Sparta Aquifer	617
	Queen City Aquifer	1,865
	Carrizo-Wilcox Aquifer	17,840
Estimated annual volume of flow out of the District within each aquifer in the District	Gulf Coast Aquifer System	48
	Yegua-Jackson Aquifer	9,921
	Sparta Aquifer	496
	Queen City Aquifer	815
	Carrizo-Wilcox Aquifer	10,051
Estimated net annual volume of flow between each aquifer in the District	To the Gulf Coast Aquifer System from the confined portion of the Yegua and Jackson groups[1]	423
	To the Yegua-Jackson Aquifer from the confined portion of the Yegua and Jackson groups	178
	To the Sparta Aquifer from overlying stratigraphic units	714
	From the Sparta Aquifer to the Weches Formation confining unit	599
	From the Sparta Aquifer to the down-dip portion of the Sparta Formation	76
	Weches Formation confining unit into the Queen City Aquifer	209
	Reklaw Formation confining unit into the Queen City Aquifer	148
	From the Queen City Aquifer to the down-dip portion of the Queen City Formation	83
	To the Carrizo-Wilcox Aquifer from the Reklaw Formation confining Unit	62
	To the Carrizo-Wilcox Aquifer from the down-dip portions of the equivalent formations	10,962

Source: TWDB GAM Run 14-005

[1] Calculated using the groundwater availability model for the Yegua-Jackson Aquifer

F. Projected Surface Water Supply

Surface water is currently allocated by the Texas Commission on Environmental Quality (TCEQ) for the use and benefit of all people of the State. Anyone seeking a new water right must submit an application to the TCEQ. The TCEQ then determines whether or not the permit will be issued and the permit conditions. The water right grants a certain quantity of water to be diverted and/or stored, a priority date, and other conditions, which may include a maximum diversion rate and in stream flow restrictions to protect existing water rights and environmental flows.

The Brazos River Authority (BRA) is the largest surface water right holder within the District, holding most of the rights to the water within the Brazos River Basin, including the water in Lake Limestone in northeast Robertson County. There are several water rights within the District consisting primarily of irrigation rights along the rivers, steam electric, and water for public supply rights for surface water. The BRA contracts raw water to various entities for long and short-term supplies for municipal, industrial, and agricultural irrigation uses.

Wellborn Special Utility District (Wellborn) is currently the only retail water supply within the District utilizing surface water in addition to groundwater, holding a permit for 4,000 ac-ft/yr.

Projected surface water supplies are described in the 2012 State Water Plan and are referenced in a table provided by the TWDB in *Appendix C2*.

G. Projected Water Demands

The Brazos G Regional Water Planning Group (BGRWPG) and local water use data indicate that total water demands for the District will be 128,906 acre-feet, by the year 2060. This number includes use from all available groundwater and surface water sources within the District.

Current and projected water demands by user group within each county in the District through the year 2060 are described in *Appendix C3*. These estimates are in the current 2012 State Water Plan. However, the District has concerns that these numbers, particularly for agricultural irrigation and public water supply, are low and do not appropriately reflect actual growth or current usage within the District. It is expected that actual demands will be considerably higher than shown and projected water demands may be adjusted significantly in the 2016 Region G Plan and 2017 State Water Plan. The District will continue to work to collect accurate data about current production as well as projected demands. This information will be provided to the TWDB for inclusion in future Regional and State water plans. As indicated in the regional water plan, these projections take into account population growth, rainfall, and conservation measures to be taken by each user group.

H. Projected Water Supply Needs

Projected water supply needs, based on projections in the 2012 State Water Plan, are included in *Appendix C4*. Negative values (listed in red) indicate a projected water supply need, and additional water will be required to meet the demand. The District expects that the water supply needs may be adjusted significantly in the 2016 Region G Plan and the 2017 State Water Plan.

I. Projected Water Management Strategies to Meet Future Supply Needs

Demand and supply data developed as part of the Region G planning process in 2011, District records, and GMA-12 planning efforts indicate that groundwater and surface water supplies should be adequate to meet projected future demands. There will be a need for infrastructure improvements to provide water at higher rates as water demands increase. However, if current conditions and projected needs from the State Water Plan are low, these shortages will be satisfied by further development of groundwater and surface water resources. The District expects the 2016 Region G Plan and the 2017 State Water Plan may include such additional strategies. While there seems to be sufficient water resources today to meet the 50-year planning horizon, large scale water development projects, both within the District and in neighboring districts, could alter available water supplies. Hydrogeological studies indicate that as groundwater

production approaches the estimates of water demands being developed as part of the GMA-12 process, some older production wells in the Simsboro Sand may need to be replaced due to declining water levels and limited available drawdown. As part of its long-range management strategy, the District will review changes in aquifer utilization and well water level changes to help estimate appropriate future well construction and possible need for a change in the water management strategy. Some water management strategies, as given in the 2012 State Water Plan, are included in *Appendix C5*. If projected demand within the District from the 2012 State Water Plan are low (as suggested above), then projected water needs are also understated.

J. Natural or Artificial Recharge of Groundwater Resources

1. Estimate of Average Recharge to the Groundwater Resources within the District.

Aquifers within the District receive recharge from infiltration of precipitation and water from streams that cross aquifer outcrops. Estimated locations of aquifer outcrops within the District are shown on *Figure 3*. Recharge to aquifers within the District can occur outside District boundaries as an aquifer outcrop extends to the north into an adjoining county or to the east and west of the District.

Estimates of recharge for the Carrizo-Wilcox Aquifer have been in the range of 3 to 5 inches per year based on groundwater flow modeling work. TWDB GAM Run 14-005, found in *Appendix D*, provides estimates of recharge for the aquifer systems. Based on areas of the aquifer outcrops within Robertson County, the resulting estimate of recharge to the Carrizo-Wilcox Aquifer is about 26,906 ac-ft/yr. Additional recharge occurs outside the District that contributes to the total recharge to the aquifer system.

The Queen City Aquifer is composed of fine-grained sands with interbedded clay. The outcrop area also can contain alternating areas of sands and other areas of lower permeability silt or clay. The TWDB GAM Run 14-005, found in *Appendix D*, estimates the recharge to the Queen City Aquifer within the District is about 6,091 ac-ft/yr. The Queen City Aquifer outcrop occurs over about 105 square miles in Robertson County.

The Sparta Aquifer is composed of quartz sand with a small amount of interbedded clay within the aquifer thickness. Recharge to the aquifer via infiltrated precipitation and stream flow is estimated at about 9,970 ac-ft/yr in the TWDB GAM Run 14-005, found in *Appendix D*. The estimated outcrop of the aquifer encompasses about 100 square miles within the District.

The Yegua-Jackson Aquifer is composed of sandstone, clay, and lignite beds in some areas. The outcrop area is extensive in Brazos County as shown on Figure 3. Estimated recharge to the Yegua-Jackson aquifer is about 26,512 ac-ft/yr, based on the TWDB GAM Run 14-005 (*Appendix D*). The aquifer or overlying fluviatile terrace deposits outcrop over about 350 square miles in Brazos County.

The outcrop for the Catahoula sandstone of the Gulf Coast Aquifer System occurs in the very southern part of the District. In part of the outcrop area, either the Navasota River or Brazos River Alluvium has covered or washed away the surface sediments of the Catahoula sandstone. Most likely, some recharge to the buried sediments of the Gulf Coast Aquifer System occurs via leakage

from the Navasota River or Brazos River Alluvium. It is estimated, based on the TWDB GAM Run 14-005 (*Appendix D*) that recharge to the Gulf Coast Aquifer System is about 40 ac-ft/yr.

The Brazos River Alluvium, located in the area of the Brazos River floodplain encompasses about 140 square miles within Brazos and Robertson counties. Recharge to the Brazos River Alluvium is estimated to occur via infiltration of precipitation and stream flow. Recharge to the Brazos River Alluvium is estimated to be at least 26,500 ac-ft/yr based on information from past Region G planning. A three-dimensional groundwater flow model is being developed for the Brazos River Alluvium by the TWDB. Results from the modeling project will be used to refine the estimate of recharge to the Brazos River Alluvium.

2. How Natural or Artificial Recharge of Groundwater Within The District Might Be Increased.

Recharge enhancement may increase the amount of groundwater available from the aquifers within the District. Increasing recharge can be difficult in geologic environments that occur within the District because a large percentage of the potential recharge is rejected due to shallow water levels in the sediments of the aquifer outcrops or to the low permeability of sediments in some of the aquifer outcrops. Recharge might be enhanced by the construction of rainfall runoff retention structures on ephemeral streams. Further study of the surface geology and soil characteristics in the District may result in the identification of areas with porous soils that could provide sites for enhanced recharge or test sites for recharge investigations.

The District encourages and supports the use of Aquifer Storage and Recovery projects as a means of water conservation. This most likely would occur in the form of reuse of effluent produced by municipalities or industry.

6. MANAGEMENT OF GROUNDWATER SUPPLIES – 31 TAC 356.5(A)(6)

Groundwater conservation districts have statutorily been designated as Texas' preferred method of groundwater management through the rules developed, adopted, and promulgated by individual groundwater districts, as authorized by Chapter 36 of the TWC and the individual district's enabling act (TWC §36.0015). The BVGCD may manage groundwater supplies, in part, by regulating the spacing and production of wells, to minimize drawdown of the water table or reduction of artesian pressure, to control subsidence, to prevent interference between wells, to prevent degradation of water quality, or to prevent waste (TWC §36.116). The method of groundwater production regulation must be based on hydrogeological conditions of aquifers in the District. However, the District may preserve historic use (TWC §36.116(b)).

The BVGCD, as authorized by law, has adopted the following groundwater management strategy:

A. Availability Goal

The water availability goals of the District are expressed through the Desired Future Conditions adopted by the GMA-12 pursuant to §36.108 of the TWC.

B. Historic Use

The District shall preserve historic or existing groundwater use in the District before the effective date of the District's rules, to the maximum extent practicable. Historic use permits were issued

for wells in operation prior to January 1, 2007.

C. Pumping Rate Limit

The District will regulate groundwater withdrawal through permitting efforts and by setting a maximum pumping rate limit of 3,300 gpm/well. Wells producing water from all District aquifers, excluding the Brazos River Alluvium, will be required to have land legally assigned to the well in an amount to be determined in relationship to the average annual production rate of the well.

D. Beneficial Use

The District will regulate groundwater withdrawal by setting production limits on wells based on evidence of beneficial use; and the District will continue to study various management methods including regulating groundwater production based on surface acreage which may become appropriate for effective management of groundwater withdrawal

E. Well Spacing

The District will require well spacing on new water wells as follows:

1. A new well may not be drilled within 50 feet from the property line of any adjoining landowners;
2. Spacing of new wells completed in the Simsboro formation shall be spaced one foot per one gallon per minute of average annual production capacity from existing wells; and
3. Spacing of new wells completed in other formations (other than the Brazos River Alluvium) shall be spaced two feet per one gallon per minute of average annual production capacity from existing wells.

The District will incorporate these management strategies into its rules and will permit wells accordingly.

7. METHODOLOGY TO TRACK DISTRICT PROGRESS IN ACHIEVING MANAGEMENT GOALS 31 TAC 356.5 (a)(6)

An annual report will be developed by the General Manager and District staff and provided to the District's Board of Directors. The Annual Report will cover activities of the District including information on the District's performance regarding achieving the District's management goals and objectives. The Annual Report will be delivered to the District Board within 60 days following the completion of the District's fiscal year, beginning with the fiscal year that starts on January 1, 2015. A copy of the Annual Report will be kept on file and available for public inspection at the District's offices upon adoption.

8. ACTIONS, PROCEDURES, PERFORMANCE, AND AVOIDANCE FOR DISTRICT IMPLEMENTATION OF MANAGEMENT PLAN 31 TAC 356.5 (a)(4)

The District will act on goals and directives established in this District Management Plan. The District will use the objectives and provisions of the Management Plan as a guideline in its policy implementation and decision-making. In both its daily operations and long-term planning efforts, the District will continuously strive to comply with the initiatives and standards created by the Management Plan.

The District will amend rules in accordance with Chapter 36 of the TWC and rules will be followed and enforced. The District may amend the District rules as necessary to comply with changes to Chapter 36 of the TWC and to insure the best management of the groundwater within the District. Development and enforcement of the rules of the District will be based on the best scientific and technical evidence available to the District.

The District will encourage public cooperation and coordination in implementation of the District Management Plan. All operations and activities of the District will be performed in a manner that best encourages cooperation with appropriate state, regional, and local water entities, as well as landowners and the general public. Meetings of the District's Board of Directors will be noticed and conducted in accordance with the Texas Open Meetings Act. The District will also make available for public inspection all official documents, reports, records, and minutes of the District pursuant with the Texas Public Information Act.

For information concerning rules of the District, visit the District's website at http://brazosvalleygcd.org/rules-and-regulations/.

9. MANAGEMENT GOALS AND OBJECTIVES 31 TAC 356.5(A)(1)

Unless indicated otherwise, performance on goals will be measured annually. The Management Plan will be subject to review at least every five years and modification will be made as appropriate. Information describing programs, policies, and actions taken by the District to meet goals and objectives established by the District will be included in the Annual Report prepared by the General Manager and presented to the District's Board of Directors. Following District Board approval, the report will be made available to the County Commissioners Courts and general public.

A. Management Goals:

1. Implement Strategies Providing For the Most Efficient Use of Groundwater:

1a. **Objective –** Require all existing and new non-exempt wells constructed within the boundaries of the District to be permitted by the District and operated in accordance with District Rules. In addition, the District will encourage all exempt wells constructed within the District boundaries to be registered with the District.

- **Performance Standard** – The number of exempt and permitted wells registered within the District will be reported annually in the District's Annual Report submitted to the District Board of Directors.

1b. **Objective –** Regulate the production of groundwater by permitting wells within the District's boundaries based on beneficial use and in accordance with District Rules. Each year the District will accept and process applications for permitted use of groundwater in the District, in accordance with the permitting process established by District rules. The District will regulate production of groundwater from permitted wells by verification of pumpage volumes using meters.

- **Performance Standard –** Number and type of applications made for permitted use of groundwater in the District, number and type of permits issued by the District, and

amount of groundwater permitted will be included in the Annual Report given to the District Board of Directors.

- **Performance Standard –** Actual annual pumpage from each metered well within the District will be reported annually and compared to the amount permitted for that well. This information will be included in the District's Annual Report submitted to the District Board of Directors.

1c. Objective – Conduct ongoing monitoring of aquifers underlying the District and current groundwater production within the District, and then assess the available groundwater that can be produced from each aquifer within the District after sufficient data are collected and evaluated. Using this data and information developed for GMA-12, the District will re-evaluate availability goals as necessary and will permit wells in accordance with appropriate production goals.

- **Performance Standard –** The District will conduct appropriate studies to identify issues and criteria needed to address groundwater management needs within the District's boundaries. Groundwater availability goals will take into consideration GMA-12 planning and research of hydrogeological and geologic characteristics of the aquifers, which may include, but not necessarily be limited to, amount of water use, water quality, and water level declines.

- **Performance Standard –** A progress report on the work of the District regarding groundwater availability will be written annually, as substantial additional data are developed. The progress report will be included in the Annual Report to the District Board of Directors.

2. <u>Implement Strategies to Control and Prevent Waste of Groundwater</u>:

2a. Objective – Apply a water use fee to the permitted use of groundwater in the District to encourage conservation-oriented use of groundwater resources to eliminate or reduce waste.

- **Performance Standard –** Each year the District will apply a water use fee to the non-exempt permitted use of groundwater produced within the District pursuant to District rules. The amount of fees generated and amount of water produced for each type of permitted use will be a part of the Annual Report presented to the District Board of Directors.

2b. Objective – Evaluate District rules annually to determine whether any amendments are necessary to decrease the amount of waste within the District.

- **Performance Standard –** The District will include a discussion of the annual evaluation of District rules, and determination of whether any amendments to the rules are necessary to prevent waste of groundwater. The evaluation will be included in the Annual Report provided to the District Board of Directors.

2c. **Objective** – Provide information to the general public and schools within the District on wise use of water to eliminate and reduce wasteful practices.

- **Performance Standard** – The District will include a page on the District's web-site devoted to wise use of water and providing tips to help eliminate and reduce wasteful use of groundwater. The District will provide information to local school districts including providing Texas Education Agency approved water curriculum and in-school presentations to encourage wise use of water and understanding of the significance of aquifers to District residents.

3. **Implement Strategies to Address Conjunctive Surface Water Management Issues:**

3a. **Objective** – Encourage the use of surface water supplies where available, to meet the needs of specific user groups within the District.

- **Performance Standard** – The District will participate in the Region G Regional Water Planning process by attending at least one BGRWPG meeting annually and will encourage the development of surface water supplies where appropriate. This activity will be noted in the Annual Report presented to the District Board of Directors.

4. **Implement Strategies to Address Natural Resource Issues which Impact the Use and Availability of groundwater, and which are Impacted by the Use of Groundwater**

4a. **Objective** – Determine if there are any natural spring flows within the District that may be impacted by increased groundwater pumping.

- **Performance Standard –** Annually monitor water levels in at least two (2) wells near natural spring flows, if found, for potential impact from groundwater production. Prepare an annual assessment statement and include in the Annual Report to the District Board of Directors.

5. **Implement Strategies to Address Drought Conditions:**

5a. **Objective** – A District staff member will download at least one Palmer Drought Severity Index (PDSI) map monthly. The Palmer Drought Severity Index map will be used to monitor drought conditions and will be used by the Board to determine trigger conditions provided by the District's Drought Contingency Plan.

- **Performance Standard** –District staff will make an assessment of drought conditions in the District and will brief the District Board at each regularly scheduled board meeting.

5b. **Objective** – Require 100 percent of entities that are mandated by the State of Texas to have drought contingency plans, to submit those plans to the District or follow the District's plan when applying for a permit from the District for water production.

- **Performance Standard** – Review 100 percent of the drought contingency plans submitted as a result of permitting, whenever permit applications for water production

are received. The number of drought contingency plans required to be submitted by permitted entities to the District as part of the well permitting process and the number of drought contingency plans actually submitted to the District will be described in the Annual Report to the District Board.

➢

5c. **Objective** – The District drought contingency plan will be reviewed for effectiveness and needed updates once annually.

➢ **Performance Standard –** A report summarizing findings of the annual review of the District drought contingency plan will be included in the Annual Report to the District Board of Directors. Additional drought information sources are available at http://www.twdb.state.tx.us/data/drought/.

6. **<u>Implement Strategies to Promote Water Conservation:</u>**

6a. **Objective -** Require 100 percent of water applicants requesting a permit for water production within the District to submit a water conservation plan, unless one is already on file with the District at the time of the permit application, or agree to comply with the District's adopted Water Conservation Plan.

➢ **Performance Standard** – Review 100 percent of the water conservation plans submitted as a result of permit requirements to ensure compliance with permit conditions. Number of water conservation plans required to be submitted by water permittees to the District that year as part of the well permitting process and number of water conservation plans actually submitted to the District will be reported in the Annual Report to the District Board of Directors. If the water permittee chooses to agree to follow the District's adopted Water Conservation Plan in lieu of submitting a water conservation plan, then that number will be indicated in the Annual Report to the District Board.

6b. **Objective** – Develop a system for measurement and evaluation of groundwater supplies.

➢ **Performance Standard** – Water level monitoring wells will be identified for Brazos River Alluvium, Yegua-Jackson, Sparta, Queen City, Carrizo, Calvert Bluff, Simsboro, and Hooper aquifers. At least two (2) wells per aquifer will be monitored on an annual basis to track changes in static water levels.

6c. **Objective** – Assist in funding and obtaining grant funds for the implementation of water conservation methods. Work with the appropriate state and federal agencies to facilitate bringing grant funds to various groups within the District boundaries to develop and implement water conservation methods. Work with local entities to help develop plans for obtaining grant funding from the District. The District will meet with at least one state or federal agency annually to discuss bringing water conservation methods grant funds into the District.

- **Performance Standard** – Number of meetings held annually with at least one state or federal agency and the number of grants for water conservation methods applied for and obtained will be included in the Annual Report to the District Board of Directors.

- **Performance Standard** – Once annually, the District will conduct a meeting to address potential District grant funding for water conservation projects. Following proposal submission, applications will be reviewed for possible District Board approval. The number of water conservation projects submitted and the number of projects approved for grant funding by the District will be reported in the Annual Report to the District Board.

7. <u>Implement Strategies to Protect Water Quality:</u>

7a. Objective - Develop baseline water quality data and a system for continued evaluation of groundwater quality.

- **Performance Standard** – Develop general understanding of water quality within aquifers in the District based on TCEQ, TWDB, and other data. Coordinate with TCEQ on water quality issues.

7b. Objective – Require all water permittees that are required by the TCEQ to have well vulnerability studies prior to constructing a well, to provide evidence of the study to the District prior to construction of a well within the District.

- **Performance Standard** – Review all vulnerability studies submitted as a result of permit requirements to help ensure water quality protection.

7c. Objective – Provide information to the general public and schools within the District on the importance of protecting water quality.

- **Performance Standard** – The District will include a page on the District's web-site devoted to water quality issues and will provide information to permittees on wellhead protection. The District will provide in-school presentations addressing aquifer contamination and aquifer protection.

8. <u>Implement Strategies to Assess Adopted Desired Future Conditions</u>

8a. Objective - At least once every three years, the District will evaluate well water level monitoring data and determine whether the change in water levels is in general conformance with the DFCs adopted by the District. The District will estimate total annual groundwater production for each aquifer based on the water use reports, estimated exempted use, and other relevant information, and compare these production estimates to the MAGs.

- **Performance Standard** – At least once every three years, the General Manager will report to the District Board the water level data obtained from the monitoring wells in each aquifer, the average artesian head change for each aquifer calculated from the

water levels of the monitoring wells in each aquifer, a comparison of the average artesian head change for each aquifer with the DFCs for each aquifer, and the District progress in conforming with the DFCs.

- **Performance Standard** – At least once every year, the General Manager will report to the District Board the total permitted groundwater production and the estimated total annual groundwater production for each aquifer and compare these amounts to the MAGs.

B. <u>Management Goals Determined Not to be Applicable to the Brazos Valley Groundwater Conservation District</u>

1. Controlling and Preventing Subsidence:

The geologic formation of the aquifers within the District precludes significant subsidence from occurring due to groundwater pumping.

2. Rainwater Harvesting:

With average annual precipitation in the District about 39 inches, a goal of rainwater harvesting is not applicable at this time.

3. Recharge Enhancement:

With an average annual precipitation of about 39 inches and outcrop areas of the Carrizo-Wilcox limited to the northern part of Robertson County, this goal in not applicable at this time. The exception would be the utilization of Aquifer Storage and Recovery projects.

4. Precipitation Enhancement:

With the high amount of annual rainfall in the District, precipitation enhancement does not appear to be needed. This goal is therefore not applicable at this time.

5. Brush Control:

A significant amount of the District's area is heavily forested with other areas in improved pasture or cultivated land. Brush control, as a goal, in not applicable at this time.

APPENDIX A

DEFINITIONS, ACRONYMS and ABBREVIATIONS

Definitions

Desired Future Condition – "a quantitative description, adopted in accordance with §36.108 of the Texas Water Code, of the desired future condition of the groundwater resources in a management area at one or more specified future times" as defined in §36.001 of the Texas Water Code.

Modeled Available Groundwater – "the amount of water that the Executive Administrator (of the TWDB) determines may be produced on an annual average basis to achieve a desired future condition established under §36.108".

Data Definitions*

Projected Water Demands*

From the 2012 State Water Plan Glossary: "**WATER DEMAND – "**Quantity of water projected to meet the overall necessities of a water user group in a specific future year." (See 2012 State Water Plan Chapter 3 for more detail.)
Additional explanation: These are water demand volumes as projected for specific Water User Groups in the 2011 Regional Water Plans. This is NOT groundwater pumpage or demand based on any existing water source. This demand is how much water each Water User Group is projected to require in each decade over the planning horizon.

Projected Surface Water Supplies*

From the 2012 State Water Plan Glossary: "**EXISTING *[surface]* WATER SUPPLY -** Maximum amount of *[surface]* water available from existing sources for use during drought of record conditions that is physically and legally available for use." (See 2012 State Water Plan Chapter 5 for more detail.)
Additional explanation: These are the existing surface water supply volumes that, without implementing any recommended WMSs, could be used during a drought (in each planning decade) by Water User Groups located within the specified geographic area.

Projected Water Supply Needs*

From the 2012 State Water Plan Glossary: "**NEEDS -**Projected water demands in excess of existing water supplies for a water user group or a wholesale water provider." (See 2012 State Water Plan Chapter 6 for more detail.)
Additional explanation: These are the volumes of water that result from comparing each Water User Group's projected existing water supplies to its projected water demands. If the volume listed is a negative number, then the Water User Group shows a projected need during a drought if they do not implement any water management strategies. If the volume listed is a positive number, then the Water User Group shows a projected surplus. Note that if a Water User Group shows a need in any decade, then they are considered to have a potential need during the planning horizon, even if they show a surplus elsewhere.

Projected Water Management Strategies*

From the 2012 State Water Plan Glossary: "**RECOMMENDED WATER MANAGEMENT STRATEGY -** Specific project or action to increase water supply or maximize existing supply to meet a specific need." (See 2012 State Water Plan Chapter 7 for more detail.)
Additional explanation: These are the specific water management strategies (with associated water volumes) that were recommended in the 2011 Regional Water Plans.
**Terminology used by TWDB staff in providing data for 'Estimated Historical Water Use And 2012 State Water Plan Datasets' reports issued by TWDB.*

Acronyms

BGRWPG – Brazos G Regional Water Planning Group

BRA – Brazos River Authority

BVGCD – Brazos Valley Groundwater Conservation District

DFC(s) – Desired Future Condition(s)

MAG – Modeled Available Groundwater

GAM – Groundwater Availability Model

GCD – Groundwater Conservation District

GMA-12 – Groundwater Management Area 12

TAC – Texas Administrative Code

TWC – Texas Water Code

TWDB – Texas Water Development Board

Abbreviations

ac-ft/yr – acre feet per year

gpm – gallons per minute

APPENDIX B1

GAM Run 10-044 MAG

APPENDIX B2

GAM Run 10-045 MAG

APPENDIX B3

GAM Run 10-046 MAG

APPENDIX B4

GAM Run 10-060 MAG

APPENDIX C1

Estimated Historical Water Use

Estimated Historical Water Use And 2012 State Water Plan Datasets:

Brazos Valley 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
November 20, 2014

GROUNDWATER MANAGEMENT PLAN DATA:

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

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

The five reports included in part 1 are:

1. Estimated Historical Water Use (checklist Item 2)

   from the TWDB Historical Water Use Survey (WUS)
2. Projected Surface Water Supplies (checklist Item 6)
3. Projected Water Demands (checklist Item 7)
4. Projected Water Supply Needs (checklist Item 8)
5. Projected Water Management Strategies (checklist Item 9)

   reports 2-5 are from the 2012 Texas State Water Plan (SWP)

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

DISCLAIMER:

The data presented in this report represents the most up-to-date WUS and 2012 SWP data available as of 11/20/2014. Although it does not happen frequently, neither of these datasets are static so they are subject to change pending the availability of more accurate WUS data or an amendment to the 2012 SWP. District personnel must review these datasets and correct any discrepancies in order to ensure approval of their groundwater management plan.

The WUS dataset can be verified at this web address:

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

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

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

Estimated Historical Water Use

TWDB Historical Water Use Survey (WUS) Data

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

BRAZOS COUNTY

All values are in acre-feet/year

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2012	GW	33,826	1,422	52	114	34,442	307	70,163
	SW	943	0	4	307	2,873	569	4,696
2011	GW	38,521	1,770	134	114	38,700	407	79,646
	SW	974	0	349	307	3,702	756	6,088
2010	GW	32,667	1,666	82	123	31,834	402	66,774
	SW	0	0	211	112	3,707	747	4,777
2009	GW	33,324	1,947	75	101	28,181	414	64,042
	SW	0	0	192	104	1,434	770	2,500
2008	GW	32,573	2,066	67	126	24,019	368	59,219
	SW	0	0	173	214	1,615	683	2,685
2007	GW	28,689	2,184	1	149	25,638	502	57,163
	SW	0	0	0	472	260	932	1,664
2006	GW	31,592	2,100	1	249	25,168	550	59,660
	SW	0	0	0	426	1,043	1,022	2,491
2005	GW	42,095	2,118	1	347	28,498	480	73,539
	SW	0	0	0	441	981	891	2,313
2004	GW	27,041	2,144	1	381	18,854	494	48,915
	SW	0	0	0	0	626	740	1,366
2003	GW	25,624	2,084	1	145	9,706	497	38,057
	SW	0	0	0	434	1,361	745	2,540
2002	GW	37,539	2,001	1	52	5,555	404	45,552
	SW	13	0	0	75	1,138	606	1,832
2001	GW	28,813	94	10	248	5,394	413	34,972
	SW	47	0	0	260	1,105	619	2,031
2000	GW	30,264	137	78	844	5,660	413	37,396
	SW	221	0	0	341	1,258	619	2,439

ROBERTSON COUNTY

All values are in acre-feet/year

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2012	GW	2,387	39	213	3,952	62,023	498	69,112
	SW	0	0	77	29,327	2,051	1,163	32,618
2011	GW	2,632	44	415	5,206	93,264	793	102,354
	SW	0	0	6	40,660	4,586	1,851	47,103
2010	GW	2,375	51	15,185	342	76,833	759	95,545
	SW	0	4,725	114	17,334	2,780	1,771	26,724
2009	GW	2,709	88	14,821	190	62,036	484	80,328
	SW	0	4,735	113	1,483	7,750	1,130	15,211
2008	GW	2,847	3,882	15,691	14	62,627	508	85,569
	SW	0	85	113	154	0	1,185	1,537
2007	GW	2,663	4,619	7,734	2	56,934	396	72,348
	SW	0	136	0	0	1,691	925	2,752
2006	GW	2,948	4,613	7,676	1	58,391	487	74,116
	SW	0	136	0	0	1,163	1,137	2,436
2005	GW	3,007	3,660	7,676	0	60,246	542	75,131
	SW	0	107	0	0	9,353	1,265	10,725
2004	GW	2,702	4,151	7,475	0	40,411	750	55,489
	SW	0	305	0	0	9,266	1,126	10,697
2003	GW	2,809	4,769	7,584	0	18,425	721	34,308
	SW	0	0	0	0	9,332	1,083	10,415
2002	GW	2,910	4,802	7,554	1	23,624	613	39,504
	SW	0	0	0	0	3,222	921	4,143
2001	GW	2,845	4,692	8,291	0	20,541	590	36,959
	SW	0	174	0	0	2,801	885	3,860
2000	GW	3,060	4,480	1	0	14,535	603	22,679
	SW	0	0	0	0	2,037	905	2,942

APPENDIX C2

Projected Surface Water Supplies

Projected Surface Water Supplies

TWDB 2012 State Water Plan Data

BRAZOS COUNTY

All values are in acre-feet/year

RWPG	WUG	WUG Basin	Source Name	2010	2020	2030	2040	2050	2060
G	IRRIGATION	BRAZOS	BRAZOS RIVER COMBINED RUN-OF-RIVER IRRIGATION	4,379	4,399	4,420	4,440	4,460	4,480
G	LIVESTOCK	BRAZOS	LIVESTOCK LOCAL SUPPLY	1,032	1,032	1,032	1,032	1,032	1,032
G	MANUFACTURING	BRAZOS	BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM	14,720	14,720	14,720	14,720	14,720	14,720
G	STEAM ELECTRIC POWER	BRAZOS	DANSBY POWER PLANT/BRYAN UTILITIES LAKE/RESERVOIR	85	85	85	85	85	85
G	WELLBORN SUD	BRAZOS	BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM	4,000	4,000	4,000	4,000	4,000	4,000
	Sum of Projected Surface Water Supplies (acre-feet/year)			**24,216**	**24,236**	**24,257**	**24,277**	**24,297**	**24,317**

ROBERTSON COUNTY

All values are in acre-feet/year

RWPG	WUG	WUG Basin	Source Name	2010	2020	2030	2040	2050	2060
G	IRRIGATION	BRAZOS	BRAZOS RIVER COMBINED RUN-OF-RIVER IRRIGATION	9,103	9,124	9,146	9,168	9,190	9,212
G	LIVESTOCK	BRAZOS	LIVESTOCK LOCAL SUPPLY	1,508	1,508	1,508	1,508	1,508	1,508
G	MINING	BRAZOS	BRAZOS RIVER COMBINED RUN-OF-RIVER MINING	9	9	9	9	9	9
G	STEAM ELECTRIC POWER	BRAZOS	BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM	25,150	25,165	25,181	25,196	25,211	25,226
G	STEAM ELECTRIC POWER	BRAZOS	BRAZOS RIVER COMBINED RUN-OF-RIVER STEAM ELECTRIC POWER	1	1	1	1	1	1
G	STEAM ELECTRIC POWER	BRAZOS	TWIN OAK LAKE/RESERVOIR	2,741	2,718	2,694	2,671	2,647	2,624
	Sum of Projected Surface Water Supplies (acre-feet/year)			**38,512**	**38,525**	**38,539**	**38,553**	**38,566**	**38,580**

APPENDIX C3

Projected Water Demands

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.

BRAZOS COUNTY

All values are in acre-feet/year

RWPG	WUG	WUG Basin	2010	2020	2030	2040	2050	2060
G	COUNTY-OTHER	BRAZOS	808	695	593	510	422	395
G	BRYAN	BRAZOS	11,957	13,179	14,221	15,022	16,096	16,493
G	COLLEGE STATION	BRAZOS	20,032	22,977	25,779	27,844	30,432	31,342
G	STEAM ELECTRIC POWER	BRAZOS	526	488	394	446	303	393
G	MANUFACTURING	BRAZOS	316	365	413	462	506	549
G	MINING	BRAZOS	27	28	29	30	31	31
G	IRRIGATION	BRAZOS	6,584	6,267	5,964	5,676	5,403	5,142
G	LIVESTOCK	BRAZOS	1,032	1,032	1,032	1,032	1,032	1,032
G	WICKSON CREEK SUD	BRAZOS	1,126	1,451	1,701	1,924	2,206	2,301
G	WELLBORN SUD	BRAZOS	1,069	1,285	1,482	1,637	1,820	1,886
	Sum of Projected Water Demands (acre-feet/year)		**43,477**	**47,767**	**51,608**	**54,583**	**58,251**	**59,564**

ROBERTSON COUNTY

All values are in acre-feet/year

RWPG	WUG	WUG Basin	2010	2020	2030	2040	2050	2060
G	TRI-COUNTY SUD	BRAZOS	77	82	83	84	83	83
G	ROBERTSON COUNTY WSC	BRAZOS	258	315	348	370	368	365
G	STEAM ELECTRIC POWER	BRAZOS	15,789	17,882	31,113	36,369	48,118	50,319
G	MANUFACTURING	BRAZOS	85	101	117	134	150	163
G	LIVESTOCK	BRAZOS	1,508	1,508	1,508	1,508	1,508	1,508
G	IRRIGATION	BRAZOS	16,175	16,019	15,561	15,115	14,682	14,261
G	MINING	BRAZOS	10,300	10,300	10,300	78	77	76
G	COUNTY-OTHER	BRAZOS	567	594	609	616	613	611
G	HEARNE	BRAZOS	1,124	1,108	1,093	1,077	1,066	1,066
G	FRANKLIN	BRAZOS	344	373	389	397	396	395
G	BREMOND	BRAZOS	157	154	151	148	146	146
G	CALVERT	BRAZOS	327	323	318	313	310	310
G	WICKSON CREEK SUD	BRAZOS	20	30	35	39	39	39
	Sum of Projected Water Demands (acre-feet/year)		**46,731**	**48,789**	**61,625**	**56,248**	**67,556**	**69,342**

APPENDIX C4

Projected Water Supply Needs

Projected Water Supply Needs

TWDB 2012 State Water Plan Data

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

BRAZOS COUNTY

All values are in acre-feet/year

RWPG	WUG	WUG Basin	2010	2020	2030	2040	2050	2060
G	BRYAN	BRAZOS	5,227	4,005	2,963	2,162	1,088	691
G	COLLEGE STATION	BRAZOS	5,679	2,734	-68	-2,133	-4,721	-5,631
G	COUNTY-OTHER	BRAZOS	735	848	950	1,033	1,121	1,148
G	IRRIGATION	BRAZOS	9,928	10,265	10,589	10,897	11,190	11,471
G	LIVESTOCK	BRAZOS	0	0	0	0	0	0
G	MANUFACTURING	BRAZOS	16,879	16,830	16,782	16,733	16,689	16,646
G	MINING	BRAZOS	5	4	3	2	1	1
G	STEAM ELECTRIC POWER	BRAZOS	19	57	151	99	242	152
G	WELLBORN SUD	BRAZOS	4,626	4,410	4,213	4,058	3,875	3,809
G	WICKSON CREEK SUD	BRAZOS	384	59	-191	-414	-696	-791
	Sum of Projected Water Supply Needs (acre-feet/year)		**0**	**0**	**-259**	**-2,547**	**-5,417**	**-6,422**

ROBERTSON COUNTY

All values are in acre-feet/year

RWPG	WUG	WUG Basin	2010	2020	2030	2040	2050	2060
G	BREMOND	BRAZOS	234	237	240	243	245	245
G	CALVERT	BRAZOS	186	190	195	200	203	203
G	COUNTY-OTHER	BRAZOS	118	91	76	69	72	74
G	FRANKLIN	BRAZOS	284	255	239	231	232	233
G	HEARNE	BRAZOS	1,807	1,823	1,838	1,854	1,865	1,865
G	IRRIGATION	BRAZOS	5,357	5,534	6,014	6,482	6,937	7,380
G	LIVESTOCK	BRAZOS	0	0	0	0	0	0
G	MANUFACTURING	BRAZOS	80	64	48	31	15	2
G	MINING	BRAZOS	9	9	9	9	9	9
G	ROBERTSON COUNTY WSC	BRAZOS	159	102	69	47	49	52
G	STEAM ELECTRIC POWER	BRAZOS	18,086	15,985	2,746	-2,518	-14,276	-16,485
G	TRI-COUNTY SUD	BRAZOS	18	13	12	11	12	12
G	WICKSON CREEK SUD	BRAZOS	0	0	0	0	0	0
	Sum of Projected Water Supply Needs (acre-feet/year)		**0**	**0**	**0**	**-2,518**	**-14,276**	**-16,485**

APPENDIX C5

Projected Water Management Strategies

Projected Water Management Strategies
TWDB 2012 State Water Plan Data

BRAZOS COUNTY

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

Water Management Strategy	Source Name [Origin]	2010	2020	2030	2040	2050	2060
BRYAN, BRAZOS (G)							
MUNICIPAL WATER CONSERVATION	CONSERVATION [BRAZOS]	0	0	0	0	122	248
WASTEWATER REUSE	DIRECT REUSE [BRAZOS]	0	0	0	0	605	605
COLLEGE STATION, BRAZOS (G)							
ADDITIONAL CARRIZO AQUIFER DEVELOPMENT (INCLUDES	CARRIZO-WILCOX AQUIFER [BRAZOS]	0	0	0	3,000	3,000	3,000
BRA SYSTEM OPERATIONS PERMIT	BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM	0	0	0	2,500	2,500	2,500
MUNICIPAL WATER CONSERVATION	CONSERVATION [BRAZOS]	545	1,378	1,320	1,177	1,149	1,184
WASTEWATER REUSE	DIRECT REUSE [BRAZOS]	0	0	0	312	312	312
WICKSON CREEK SUD, BRAZOS (G)							
PURCHASE WATER FROM CITY OF BRYAN	CARRIZO-WILCOX AQUIFER [BRAZOS]	900	900	900	900	900	900
Sum of Projected Water Management Strategies (acre-feet/year)		**1,445**	**2,278**	**2,220**	**7,889**	**8,588**	**8,749**

ROBERTSON COUNTY

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

Water Management Strategy	Source Name [Origin]	2010	2020	2030	2040	2050	2060
STEAM-ELECTRIC CONSERVATION	CONSERVATION [ROBERTSON]	474	894	2,178	2,546	3,368	3,522
WASTEWATER REUSE	DIRECT REUSE [ROBERTSON]	0	0	0	1,791	13,314	15,479
Sum of Projected Water Management Strategies (acre-feet/year)		**474**	**894**	**2,178**	**4,337**	**16,682**	**19,001**
STEAM ELECTRIC POWER, BRAZOS (G)							

APPENDIX D

TWDB GAM Run 14-005

APPENDIX E

Public Notices Regarding Hearing

Related to Plan Adoption

Public Hearing

BRAZOS VALLEY GROUNDWATER CONSERVATION DISTRICT
112 West Third Street
Hearne, Texas

July 17, 2014 at 3:00 p.m.

Public Hearing on the Brazos Valley Groundwater Conservation District's proposed groundwater Management Plan update, as required by chapter 36.1071 of the Texas Water Code.

Copies of the District Management Plan may be obtained at the District office.

Signed this 14th, day of July, 2014

Alan M. Day
General Manager

The Board of Directors may meet in closed session, pursuant to the Texas Open Meetings Act, Texas Government Code §§ 551.071-551.076, to:

(1) consult with attorney ;
(2) deliberate regarding the purchase, exchange, lease, or value of real property if deliberation in an open meeting would have a detrimental effect on the position of the District in negotiations with a third person;
(3) deliberate a negotiated contract for a prospective gift or donation to the District if deliberation in an open meeting would have a detrimental effect on the position of the District in negotiations with a third person;
(4) to deliberate the appointment, employment, evaluation, reassignment, duties, discipline or dismissal of a Board member or District employee;
(5) to receive information from employees or question employees, but not deliberate public business or agency policy that affects public business; and
(6) to deliberate the deployment or specific occasions for implementation of security personnel or devices.

The Board may also meet in open session on these matters as required by the Texas Open Meetings Act, Texas Government Code § 551.102.

** **Agenda items may be taken out of order at the discretion of the Board Chairman**

APPENDIX F

Letters Coordinating with Regional

Surface Water Management

BRAZOS VALLEY GROUNDWATER CONSERVATION DISTRICT
P.O. BOX 528 · HEARNE, TX 77859 · (979)279-9350 · FAX: (979)279-0035
WWW.BRAZOSVALLEYGCD.ORG

October 13, 2014

Trey Buzbee
Brazos River Authority
P.O. Box 7555
Waco, TX 76714

Dear Trey,

The Brazos Valley Groundwater Conservation District is currently updating its Management Plan as required by Chapter 36 of the Texas Water Code. One of the specific objectives contained in the plan addresses conjunctive use of surface and groundwater assets.

Enclosed is a copy of the body of the plan. Please review and make any suggestions or comments to the District office by November 1, 2014. The adoption of the draft will be an action item on the November 13, 2014 Regular Board Meeting.

If you have any questions concerning the plan, please feel free to contact me at your convenience.

Best regards,

Alan M. Day
General Manager
979-279-9350 (office)
817-774-6412 (cell)
aday@brazosvalleygcd.org

BRAZOS VALLEY GROUNDWATER CONSERVATION DISTRICT
P.O. BOX 528 · HEARNE, TX 77859 · (979)279-9350 · FAX: (979)279-0035
WWW.BRAZOSVALLEYGCD.ORG

October 13, 2014

Stephen Cast, General Manager
Wellborn Special Utility District
P. O. Box 250
Wellborn, Texas 77881

Dear Stephen,

The Brazos Valley Groundwater Conservation District is currently updating its Management Plan as required by Chapter 36 of the Texas Water Code. One of the specific objectives contained in the plan addresses conjunctive use of surface and groundwater assets.

Enclosed is a copy of the body of the plan. Please review and make any suggestions or comments to the District office by November 1, 2014. The adoption of the draft will be an action item on the November 13, 2014 Regular Board Meeting.

If you have any questions concerning the plan, please feel free to contact me at your convenience.

Best regards,

Alan M. Day
General Manager
979-279-9350 (office)
817-774-6412 (cell)
aday@brazosvalleygcd.org

APPENDIX G

Brazos Valley GCD Board of Directors Resolution

Adopting Revised Management Plan

APPENDIX H

Minutes of Brazos Valley GCD Board of Directors Meetings Related to Public Hearings for and Adoption of the Management Plan

APPENDIX I

Brazos Valley GCD Contact Information

BRAZOS VALLEY GROUNDWATER CONSERVATION DISTRICT

District Staff

Alan M. Day, General Manager
Cynthia Lopez, Office Manager
Carlos Rodriguez, Field Technician

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http://brazosvalleygcd.org/