

Blanco – Pedernales Groundwater Conservation District

GROUNDWATER MANAGEMENT PLAN

Originally Adopted
November 19, 2002

7th Revision, Adopted
October 25, 2018

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General Manager

Ronald G. Fieseler, PG
manager@blancogw.org

Blanco – Pedernales Groundwater Conservation District
601 W. Main
Post Office Box 1516
Johnson City, Texas 78636

(830) 868-9196
(830) 868-0376 FAX

www.blancogw.org

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GROUNDWATER MANAGEMENT PLAN

REVISION RECORD

<u>Date Adopted</u>	<u>Effective Date</u>	<u>Affected Sections or General Comments</u>
11/19/02	11/19/02	Original Adoption
02/18/03	02/18/03	Rev. 1: Revisions resulting from TWDB Approval Review
04/15/03	04/15/03	Rev. 2: Revise Table 1, Table 3, & associated text to address TWDB comments
06/05/08	06/05/08	Rev. 3: 5 year statutory review, general revisions, and new Chapter 36 requirements
09/18/08	09/18/08	Rev. 4: Revisions resulting from TWDB Approval Review comments
11/20/08	11/20/08	Rev. 5: Revisions resulting from TWDB Approval Review comments
11/21/13	11/21/13	Rev. 6: 5 year statutory review, and revisions due to new Chapter 36 requirements
10/25/18	10/25/18	Rev. 7: 5 year statutory review, and revisions due to new Chapter 36 requirements and new GMA 9 DFCs and MAGS

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(presented in a separate document file)

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I. DISTRICT MISSION

The Blanco-Pedernales Groundwater Conservation District (BPGCD or District) was created under Chapter 36 of the Texas Water Code for the purpose of conserving, preserving, recharging, protecting and preventing waste of groundwater from the aquifers within Blanco County. The District will conduct administrative and technical activities and programs to achieve these purposes. The District will use the authority granted by Chapter 36 and other state laws to collect and archive water well and aquifer data, regulate water well drilling and production, promote the capping or plugging of abandoned wells, provide information and educational material to local property owners, interact with other governmental or organizational entities, and incorporate other groundwater-related activities that may help meet the purposes of the District.

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, conserve, and protect the groundwater resources of Blanco County. The Management Plan contains the hydrogeological and technical information provided by the TWDB regarding the groundwater resources of Blanco County. This Management Plan serves as a guideline that will ensure greater understanding of local aquifer conditions, development of groundwater management concepts and strategies, and subsequent implementation of appropriate groundwater management strategies, policies, and Rules to address groundwater conditions, characteristics, and issues within the District. This Management Plan will enable the District to comply with the requirements of state law, including Texas Water Code Chapter 36, administrative Rules of the TWDB, and to guide the District's participation in cooperative regional water resources planning.

III. DISTRICT INFORMATION

A. Creation

The BPGCD was created in accordance with the Chapter 36 petition process. On January 23, 2001, Blanco County voters approved the creation of the District, its maximum tax rate, and elected five Directors to govern the District. The District's authority and duties are derived primarily from Chapter 36 of the Texas Water Code.

B. Directors

The Board of Directors consists of five members who are elected by the voters of Blanco County. The District utilizes the same four precinct boundaries which are used by the Blanco County Commissioners Court for County Commissioner elections. One Director is elected at-large from Blanco County as a whole. Elections are held during the May General Election in odd-numbered years. Directors 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 Groundwater Conservation Districts under Texas Water Code Chapter 36 (excluding power of eminent domain) and under 31 Texas Administrative Code Chapter 356. The District is part of Groundwater Management Area 9 and the Lower Colorado Regional Water Planning Group (Region K).

D. Location and Extent

The boundaries of the District are the same as Blanco County, whose area is approximately 715 square miles (457,825 acres). The County Seat is Johnson City, population approximately 2,000. The City of Blanco also has a population of approximately 2,000 and the rest of the population, approximately 7,000, resides in small rural communities or subdivisions, or on farms and ranches. Blanco County is bounded on the north by Llano and Burnet Counties, on the east by Travis and Hays Counties, on the south by Comal and Kendall Counties, and on the west by Gillespie County.

E. Groundwater Resources of Blanco County

1. Topography and Drainage

Blanco County has two primary watersheds: the Pedernales River, which is a tributary to the Colorado River, and the Blanco River, which is a tributary to the Guadalupe River. Surface drainage within the District is generally from west to east.

The District contains two major geologic features. The Llano Uplift extends into the northwestern portion of the District. This feature is characterized by complex faulting and is comprised of scattered granite exposures and a variety of subsequently deposited sedimentary Paleozoic rocks. The other major feature is the Edwards Plateau, an elevated structure primarily comprised of Cretaceous age limestone, dolomite and marl. The Edwards Plateau extends west into many West Texas counties. Blanco County lies near the southeastern edge of the Plateau.

Elevations within the District range from a low of approximately 730 feet above sea level where the Pedernales River leaves Blanco County to over 1,900 feet northwest of the city of Blanco, on the divide between the Pedernales and Blanco River basins.

For a graphic display of this information, please refer to Appendix A - Geological and Hydrogeological Information on Blanco County.

2. Groundwater Resources and Usage in Blanco County

Within the BPGCD there are seven named aquifers which provide groundwater to county residents. These aquifers are:

- Edwards-Trinity (Plateau)
- Upper Trinity
- Middle Trinity
- Lower Trinity
- Ellenburger-San Saba
- Hickory
- Marble Falls

Well depths vary from shallow, hand-dug wells 20-30 feet deep to drilled wells 30-1800 feet deep. Depths are highly variable even within the same aquifer and depend entirely on site-specific topography and geology. Water quality and water quantity also vary greatly throughout the District. Water quality within a specific aquifer can often be defined or characterized in a general sense, but can still be affected by local geology and hydrology.

The District has not identified any wells producing significant groundwater quantities from the Edwards-Trinity (Plateau); the Upper Glen Rose (Upper Trinity), or the Marble Falls aquifers and has no current operating permits or pending applications for operating permits from those aquifers. Therefore, in order to provide for current and future demands from the few existing and anticipated domestic and livestock exempt wells that produce from these aquifers, and in order to help ensure continued flow from the seeps and springs that discharge from those aquifers and which subsequently provide base flow to local creeks and rivers, the current Rules of the District provide for the denial of any applications for drilling or permitting of any new non-exempt wells that propose to produce water from any of these aquifers.

a. Edwards-Trinity (Plateau) Aquifer

The Edwards-Trinity (Plateau) aquifer within Blanco County is scattered across the west central part of the county and is located at higher elevations along ridges. It is comprised of relatively thin layers of limestone that is an extension of the Edwards Plateau into Blanco County from the west. Yields from the aquifer are low (<20 gpm) and the water, if used at all, is used occasionally for rural domestic and livestock demands. The Edwards-Trinity aquifer in Blanco County exists in an unconfined condition. Recharge is solely from local precipitation occurring over the outcrop. Water not pumped from wells will generally discharge from small seeps and springs at the base of the Edwards outcrop and provides base flow to small streams within the county. No non-exempt wells producing from the Edwards-Trinity (Plateau) have been identified by the District..

Trinity Aquifer

The Trinity aquifer in Blanco County is comprised primarily of the Upper and Lower Glen Rose Limestone, Hensell Sand, the Cow Creek Limestone, and the Sycamore Sand/Hosston Sand. It extends across the majority of Blanco County, except in the northwestern corner of the county where Paleozoic rock predominates. The Trinity aquifer receives some recharge from local precipitation on its outcrop and through the overlying units where it is in the subsurface. More localized and potentially higher rates of recharge for the Hensell Sand probably occur in Hensell Sand outcrops in western Blanco County and eastern Gillespie County. Yields vary greatly and are highly dependent on local subsurface physical characteristics. The Trinity Aquifer is normally divided into three sections: Upper, Middle, and Lower Trinity.

b. Upper Trinity Aquifer

The Upper Trinity Aquifer consists of the Upper Glen Rose limestone and is located generally over the lower two-thirds of Blanco County. It is an unconfined aquifer comprised of alternating layers of limestone and calcareous clays. This forms an easily recognizable "stair-step" topography due to the differential weathering of the two layers. The Upper Glen Rose is also characterized by thin layers of gypsum/anhydrite beds which

appear to be the source of the sulfate often found in many wells in central Blanco County. Some wells have concentrations of sulfate so high that reverse osmosis or other treatment options must be incorporated prior to domestic use. It is not a significant source of groundwater production in Blanco County. Groundwater yields from the Upper Glen Rose are usually small and at times intermittent. For local groundwater management purposes only, the District chooses to consider the Upper Glen Rose (Upper Trinity) as a separate aquifer and not integrate it with the rest of the Trinity aquifer.

c. Middle Trinity Aquifer

The Middle Trinity Aquifer is an unconfined aquifer covering over two-thirds of Blanco County. It consists of the Lower Glen Rose Limestone, the Hensell Sandstone, and the Cow Creek Limestone. Groundwater may be produced from all three formations, but the Hensell and Cow Creek portions are generally the most productive and reliable. Yields from the Middle Trinity are generally low, usually between 10-50 gpm, but can occasionally be significantly higher, with yields of more than 500 gpm being reported from a few wells. Water quality varies, with many wells in central Blanco County having abnormally high levels of sulfate and other constituents, while wells in other areas often have very good quality. Production from Middle Trinity wells is primarily used for municipal, rural domestic, and livestock demands. Some demand for groundwater is attributed to irrigation of flower nurseries, vegetables, hay crops, peaches, pecans, grapes, and grains.

d. Lower Trinity Aquifer

Below the Cow Creek Limestone, lies the Hammett Shale, which acts as a confining unit between the Middle Trinity and the Lower Trinity. The Lower Trinity, in Blanco County, consists of the Sligo Formation, a sandy dolomitic limestone (absent for the most part, but perhaps thinly present in the southeastern edge of Blanco County) and the Sycamore (Hosston) Formation, a silty sandstone for the most part, but sometimes consisting of a gravel conglomerate. This last formation is known as the Sycamore where it is unconfined or outcrops, and as the Hosston when subsurface and confined. Groundwater production is generally limited to a few small-volume domestic and livestock wells. Water quality is generally good.

e. Ellenburger Aquifer

The Ellenburger Aquifer is unconfined, a massive, thickly-bedded, complexly fractured and faulted mix of limestone and dolomite present in the north central portions of the county. It lies generally west of Cypress Mill and north of US 290. From the outcrop areas, the aquifer dips predominately southeastward into the subsurface at angles up to 10 degrees in some areas. It is either absent or deeply subsurface in a broad area extending from the central portion of the county toward the southern and eastern parts of Blanco County. Well yields vary greatly depending on local geological conditions. Ellenburger wells usually have pumping rates between 3-45 gpm. In some areas though, significant localized development of subsurface solutional features has occurred in the Ellenburger resulting in groundwater production capabilities greater than 200 gpm. Water quality in the Ellenburger is almost always very good, with the only concern being the low to moderate hardness...a common issue with all Blanco County aquifers. The Ellenburger aquifer is utilized extensively by the City of Johnson City and many domestic and livestock users in northern and northwestern Blanco County. Recharge to the Ellenburger is mainly through outcrops and porous areas in the beds of rivers and tributaries, with some cross-formational flow contributions from overlying members of other aquifers.

f. Hickory Aquifer

The Hickory aquifer is comprised of sandstone and is found unconfined in northwestern Blanco County. Exposures are highly irregular in shape, due to both faulting and the overlap of Cretaceous age rocks. This aquifer dips predominantly southeastward from the outcrop areas at angles of about 10 degrees in some areas. Well depths are highly dependent on local geology, with well depths varying between 100 feet to over 1500 feet. The Hickory yields low to moderate quantities of water and water quality is almost always very good. Well drillers have reported some wells capability of producing up to 100 gpm or more. Recharge to the Hickory occurs from local precipitation on its outcrop and through fractures and faults in overlying units and/or cross-formational flow where the Hickory is in the subsurface.

g. Marble Falls Aquifer

The Marble Falls aquifer is an unconfined limestone aquifer located in the general vicinity of Pedernales Falls State Park and Cypress Mill. It is reported to be highly fractured with extensive development of subsurface solutional features. This rather isolated and minor aquifer yields low to moderate quantities of water. Some wells in Blanco County have produced water with high nitrate concentrations. Due to its small surface extent, groundwater usage is limited to local domestic and livestock needs. No non-exempt wells producing from the Marble Falls have been identified by the District as of August 2013.

IV. CRITERIA FOR PLAN APPROVAL

A. Planning Horizon

This Management Plan becomes effective upon adoption by the Blanco-Pedernales Groundwater Conservation District Board of Directors (District Board) and subsequent approval by the Texas Water Development Board (TWDB). This plan incorporates a planning period of ten years. The planning period will begin on the date of approval by the TWDB. After five years, in accordance with Section 36.1072(e), the plan will be reviewed for consistency with the applicable Regional Water Plans and the State Water Plan and shall be readopted with or without amendments. The plan may be revised at anytime in order to maintain such consistency or as necessary to address any new or revised data, Groundwater Availability Models, Groundwater Management Area 9 designated Desired Future Conditions and Modeled Available Groundwater quantities, or District management strategies. This Management Plan will remain in effect until the plan is replaced by a revised plan with has been approved by the TWDB.

B. Board Resolution

A certified copy of the Blanco-Pedernales Groundwater Conservation District Board of Directors Resolution #102518-01 adopting this Management Plan is located in Appendix B - District Resolution.

C. Plan Adoption

Public Notices and Posted Agendas which demonstrate this Management Plan was adopted after the required public hearings and meetings were conducted by the District are located in Appendix C - Notice of Hearings and Meetings.

D. Coordination with Surface Water Management Entities

Correspondence with surface water management entities which demonstrates the District provided the pertinent entities with a copy of this Management Plan will be provided in Appendix D - Correspondence with Surface Water Management Entities.

V. Estimates of Technical Information Required by TWC Section 36.1071 and 31 TAC 356.52

A. Modeled Available Groundwater in the District based on the Desired Future Conditions established under TWC 36.108 --- 31 TAC 356.52(a)(5)(A) and TWC 36.1071(e)(3)(A)

Modeled Available Groundwater (MAG) is defined in TWC Section 36.001 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 Section 36.108." The Desired Future Condition (DFC) of an aquifer may only be determined through joint planning with other Groundwater Conservation Districts (GCDs) in the same Groundwater Management Area (GMA) in accordance with TWC 36.108. The District is part of GMA 9. The current adopted DFCs approved by GMA 9 on April 18, 2016 are found in Appendix E.

The Modeled Available Groundwater numbers (in acre-feet per year) for Blanco County are found in TWDB MAG Reports and/or Aquifer Assessments in Appendix G and in the tables listed below.

Table 1. Modeled Available Groundwater for Blanco County

GMA 9 declared the Trinity Aquifer to be the only Relevant Aquifer in Blanco County for Regional Planning purposes.

Trinity Aquifer (GAM 10-050 MAG Version 2)

County	RWPG	River Basin	2010	2020	2030	2040	2050	2060
Blanco	K	Colorado	1,322	1,322	1,322	1,322	1,322	1,322
Blanco	K	Blanco	1,251	1,251	1,251	1,251	1,251	1,251

The following Aquifers were declared "Non-Relevant" with respect to GMA 9 Regional Planning in Blanco County. The water availability quantities shown are for informational purposes and are taken from previous Aquifer Assessments.

Ellenburger-San Saba Aquifer (GTA Aquifer Assessment 10-01 MAG)

County	RWPG	River Basin	2010	2020	2030	2040	2050	2060
Blanco	K	Colorado	2,661	2,661	2,661	2,661	2,661	2,661

Hickory Aquifer (GTA Aquifer Assessment 10-02 MAG)

County	RWPG	River Basin	2010	2020	2030	2040	2050	2060
Blanco	K	Colorado	1,163	1,163	1,163	1,163	1,163	1,163

Marble Falls Aquifer (GTA Aquifer Assessment 10-14 MAG)

County	RWPG	River Basin	2010	2020	2030	2040	2050	2060
Blanco	K	Colorado	261	261	261	261	261	261

B. Amount of Groundwater being used within the District on an annual basis --- 31TAC 356.52(a)(5)(B) / TWC Section 36.1071(e)(3)(B)

To estimate the annual amount of groundwater being used within Blanco County, the District has looked to the TWDB Annual Water Use Survey Data. The data set includes data from 2001-2016. The annual groundwater use varied from 1,329-3,538 acre-feet of groundwater per year.

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

Groundwater and surface water historical use estimates are currently unavailable for calendar year 2017. TWDB staff anticipates the calculation and posting of these estimates at a later date.

BLANCO COUNTY

All values are in acre-feet

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2016	GW	905	0	0	0	1,398	209	2,512
	SW	356	0	0	0	0	90	446
2015	GW	886	0	0	0	1,339	207	2,432
	SW	354	0	0	0	0	88	442
2014	GW	1,003	0	0	0	1,908	202	3,113
	SW	376	0	0	0	24	87	487
2013	GW	1,041	0	0	0	1,825	195	3,061
	SW	342	0	0	0	0	83	425
2012	GW	1,166	0	0	0	2,150	222	3,538
	SW	332	0	0	0	0	95	427
2011	GW	1,274	0	0	0	357	270	1,901
	SW	350	0	0	0	0	116	466
2010	GW	1,105	0	0	0	369	270	1,744
	SW	285	0	0	0	0	116	401
2009	GW	1,037	0	0	0	405	545	1,987
	SW	281	0	0	0	0	234	515
2008	GW	948	0	1	0	68	469	1,486
	SW	327	0	0	0	0	201	528
2007	GW	819	0	1	0	190	363	1,373
	SW	265	1	0	0	0	155	421
2006	GW	1,018	0	1	0	35	293	1,347
	SW	269	1	0	0	250	125	645
2005	GW	979	0	1	0	44	305	1,329
	SW	256	1	0	0	250	131	638
2004	GW	898	0	1	0	59	198	1,156
	SW	255	1	0	0	254	188	698
2003	GW	930	0	1	0	52	192	1,175
	SW	263	1	0	0	254	182	700
2002	GW	934	0	1	0	68	261	1,264
	SW	264	1	0	0	94	248	607
2001	GW	988	0	1	0	68	236	1,293
	SW	307	1	0	0	94	225	627

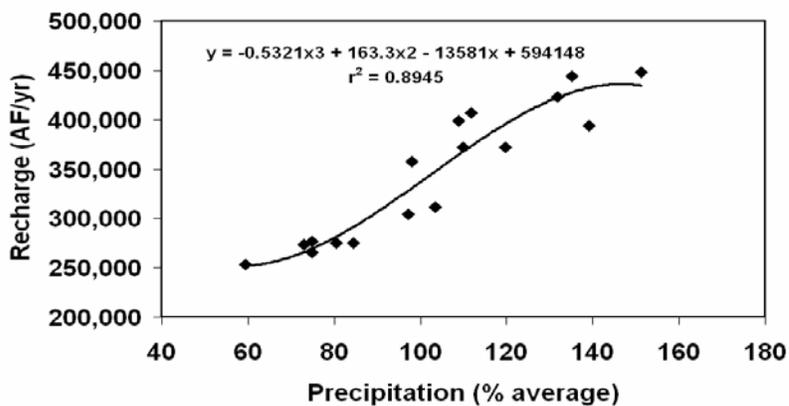
C. Annual Amount of Recharge from Precipitation to the Groundwater Resources with the District --- 31TAC 356.52(a)(5)(C) / TWC Section 36.1071(e)(3)(C)

The estimate of the annual amount of recharge from precipitation to the aquifers within the District is based on GAM Run 18-003 or aquifer assessments based on water-budget analyses conducted by the TWDB. These GAM runs and aquifer assessments from the TWDB are included in Appendix G.

Table 2. Recharge from Precipitation

Aquifer	Recharge From Precipitation	Groundwater Availability Model Run
Edwards-Trinity (Plateau)	571	GAM Run 18-003
Trinity	44,470	GAM Run 18-003
Ellenburger-San Saba	16,552	GAM Run 18-003
Hickory	2,089	GAM Run 18-003
Marble Falls	199	GAM Run 18-003

In addition, TWDB GAM Run Task 10-005 utilized the Hill County Trinity GAM in the creation of the graphic below which shows precipitation versus recharge in the Trinity Aquifer from 1981-1987 which provides another basis for estimating the annual amount of Trinity Aquifer recharge for Blanco County.



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 --- 31TAC 356.52(a)(5)(D) / TWC Section 36.1071(e)(3)(D)

The estimate of the annual volume of water discharged to surface water systems by the groundwater resources of the District are based on TWDB GAM Run 18-003. The GAM run and analysis from the TWDB is included in Appendix G.

Table 3. Discharge to Surface Water Bodies

Aquifer	Discharge to Surface Water Bodies	Groundwater Availability Model Run
Edwards-Trinity (Plateau)	0	GAM Run 18-003
Trinity	25,448	GAM Run 18-003
Ellenburger-San Saba	24,179	GAM Run 18-003
Hickory	15,772	GAM Run 18-003
Marble Falls	7,746	GAM Run 18-003

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

- (1) **Estimated annual volume of flow into the District.**
- (2) **Estimated annual volume of flow out of the District.**
- (3) **Estimated annual volume of flow between each aquifer in the District.**

The estimates of these amounts of water flowing within each aquifer in the District are included in Appendix G and summarized as follows:

Table 4. Flow into, out of, and between Aquifers

Aquifer	Acre-Feet in:	Acre-Feet out	Acre-Feet between Aquifers	Groundwater Availability Model Run
Edwards-Trinity (Plateau)	0	206	188	GAM Run 18-003
Trinity	4,468	19,490	1,336	GAM Run 18-003
Ellenburger-San Saba	6,902	12,439	17,190	GAM Run 18-003
Hickory	7,572	7,270	12,336	GAM Run 18-003
Marble Falls	0	0	7,550	GAM Run 18-003

F. Projected Surface Water Supply in the District, according to most recently adopted State Water Plan --- 31TAC 356.52(a)(5)(F) / TWC Section 36.1071(e)(3)(F)

The most recently adopted State Water Plan is the 2017 State Water Plan. This Plan incorporated the 2016 Region K Water Plan, which provided projected surface water supplies in the District and Blanco County. The Projected Surface Water Supply Survey Data from the TWDB are included in Appendix F and are summarized and included below.

Within the District, all surface water impoundments consist of relatively small ponds and a few small dams on the Pedernales River, Blanco River, and their tributaries. The City of Blanco uses surface water sources as the primary source of city municipal water. This include water from the Blanco River and water from Canyon Lake purchased from Canyon Lake Water Service Company. Johnson City maintains some surface water rights on the Pedernales River. However, Johnson City is currently relying on groundwater from a series of Ellenburger aquifer wells and is not withdrawing from the Pedernales River at this time. Local usage of surface water (usually for livestock watering or limited irrigation from small ponds or small scale diversions from surface streams) is termed “local supply” in the State and Region K Plans.

Table 5 Projected Surface Water Supplies

Projected Surface Water Supplies
TWDB 2017 State Water Plan Data

BLANCO COUNTY				All values are in acre-feet					
RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
K	BLANCO	GUADALUPE	BLANCO LAKE/RESERVOIR	596	596	596	596	596	596
K	BLANCO	GUADALUPE	CANYON LAKE/RESERVOIR	600	600	600	600	600	600
K	CANYON LAKE WATER SERVICE COMPANY	GUADALUPE	CANYON LAKE/RESERVOIR	128	150	163	169	174	177
K	COUNTY-OTHER, BLANCO	COLORADO	COLORADO OTHER LOCAL SUPPLY	49	55	57	56	56	56
K	COUNTY-OTHER, BLANCO	GUADALUPE	CANYON LAKE/RESERVOIR	60	60	60	60	60	60
K	IRRIGATION, BLANCO	GUADALUPE	GUADALUPE RUN-OF-RIVER	9	9	9	9	9	9
K	LIVESTOCK, BLANCO	COLORADO	COLORADO LIVESTOCK LOCAL SUPPLY	101	101	101	101	101	101
K	LIVESTOCK, BLANCO	GUADALUPE	GUADALUPE LIVESTOCK LOCAL SUPPLY	101	101	101	101	101	101
Sum of Projected Surface Water Supplies (acre-feet)				1,644	1,672	1,687	1,692	1,697	1,700

G. Projected Total Demand for Water in the District, according to most recently adopted State Water Plan --- 31TAC 356.52(a)(5)(G) / TWC Section 36.1071(e)(3)(G)

The most recently adopted State Water Plan is the 2017 State Water Plan. This Plan incorporated the 2016 Region K Water Plan, which provided projected Total Demand for Water in the District and Blanco County. This data appears in Appendix F and is summarized and included below.

Table 6 Projected Total Demand for Water within District

Projected Water Demands
TWDB 2017 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.

BLANCO COUNTY			All values are in acre-feet						
RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070	
K	BLANCO	GUADALUPE	365	423	456	473	486	494	
K	CANYON LAKE WATER SERVICE COMPANY	GUADALUPE	128	150	163	169	174	177	
K	COUNTY-OTHER, BLANCO	COLORADO	576	663	712	737	755	768	
K	COUNTY-OTHER, BLANCO	GUADALUPE	388	447	479	496	510	518	
K	IRRIGATION, BLANCO	COLORADO	179	168	157	152	149	143	
K	IRRIGATION, BLANCO	GUADALUPE	77	72	68	65	64	61	
K	JOHNSON CITY	COLORADO	354	411	444	461	473	481	
K	LIVESTOCK, BLANCO	COLORADO	435	435	435	435	435	435	
K	LIVESTOCK, BLANCO	GUADALUPE	129	129	129	129	129	129	
K	MANUFACTURING, BLANCO	COLORADO	15	15	15	15	15	15	
K	MANUFACTURING, BLANCO	GUADALUPE	5	5	5	5	5	5	
K	MINING, BLANCO	COLORADO	5	5	5	5	5	5	
Sum of Projected Water Demands (acre-feet)			2,656	2,923	3,068	3,142	3,200	3,231	

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

The most recently adopted State Water Plan is the 2017 State Water Plan. This Plan incorporated the 2016 Region K Water Plan, which provided the estimated water supply needs in the District and Blanco County. This data appears in Appendix F and is summarized and included below. The table provides a listing of individual WUGs with identified water supply needs (negative numbers in the table indicate a water supply shortage).

Table 7 Projected Water Supply Needs

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**Projected Water Supply Needs
TWDB 2017 State Water Plan Data**

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

BLANCO COUNTY			All values are in acre-feet						
RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070	
K	BLANCO	GUADALUPE	831	773	740	723	710	702	
K	CANYON LAKE WATER SERVICE COMPANY	GUADALUPE	0	0	0	0	0	0	
K	COUNTY-OTHER, BLANCO	COLORADO	130	49	2	-24	-42	-55	
K	COUNTY-OTHER, BLANCO	GUADALUPE	545	486	454	437	423	415	
K	IRRIGATION, BLANCO	COLORADO	29	40	51	56	59	65	
K	IRRIGATION, BLANCO	GUADALUPE	39	44	48	51	52	55	
K	JOHNSON CITY	COLORADO	-48	-105	-138	-155	-167	-175	
K	LIVESTOCK, BLANCO	COLORADO	3	3	3	3	3	3	
K	LIVESTOCK, BLANCO	GUADALUPE	34	34	34	34	34	34	
K	MANUFACTURING, BLANCO	COLORADO	0	0	0	0	0	0	
K	MANUFACTURING, BLANCO	GUADALUPE	0	0	0	0	0	0	
K	MINING, BLANCO	COLORADO	0	0	0	0	0	0	
Sum of Projected Water Supply Needs (acre-feet)			-48	-105	-138	-179	-209	-230	

The Water Management Strategy included in the 2017 State Water Plan and the 2016 Region K Water Plan is developing a new well field to pump water from the Ellenburger-San Saba aquifer. This data appears in Appendix F and is summarized and included below. Additional groundwater was only allocated to meet each WUG's individual shortage.

Table 8 Water Management Strategies
Projected Water Management Strategies
TWDB 2017 State Water Plan Data

BLANCO COUNTY

WUG, Basin (RWPG)		All values are in acre-feet					
Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
BLANCO, GUADALUPE (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [BLANCO]	55	63	68	71	73	74
MUNICIPAL CONSERVATION - BLANCO	DEMAND REDUCTION [BLANCO]	19	32	28	26	27	27
		74	95	96	97	100	101
CANYON LAKE WATER SERVICE COMPANY, GUADALUPE (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [BLANCO]	19	23	24	25	26	27
MUNICIPAL WATER CONSERVATION (RURAL)	DEMAND REDUCTION [BLANCO]	0	0	0	1	5	9
		19	23	24	26	31	36
COUNTY-OTHER, BLANCO, COLORADO (K)							
BRUSH CONTROL	COLORADO RUN-OF-RIVER [BLANCO]	425	425	425	425	425	425
DROUGHT MANAGEMENT	DEMAND REDUCTION [BLANCO]	86	99	107	111	113	115
EXPANSION OF CURRENT GROUNDWATER SUPPLIES - ELLENBURGER-SAN SABA AQUIFER	ELLENBURGER-SAN SABA AQUIFER [BLANCO]	0	0	0	55	55	55
EXPANSION OF CURRENT GROUNDWATER SUPPLIES - HICKORY AQUIFER	HICKORY AQUIFER [BLANCO]	0	0	0	55	55	55
		511	524	532	646	648	650
COUNTY-OTHER, BLANCO, GUADALUPE (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [BLANCO]	58	67	72	74	77	78
		58	67	72	74	77	78
JOHNSON CITY, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [BLANCO]	71	82	89	92	95	96
EXPANSION OF CURRENT GROUNDWATER SUPPLIES - ELLENBURGER-SAN SABA AQUIFER	ELLENBURGER-SAN SABA AQUIFER [BLANCO]	175	175	175	175	175	175
MUNICIPAL CONSERVATION - JOHNSON CITY	DEMAND REDUCTION [BLANCO]	18	30	30	28	26	26
		264	287	294	295	296	297
Sum of Projected Water Management Strategies (acre-feet)		926	996	1,018	1,138	1,152	1,162

VII. Details on the District Management of Groundwater

A. District Authority and Management Rules and Policies

The Texas Legislature has determined that GCDs, such as the Blanco-Pedernales 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 uses the regulatory tools it has been given by Chapter 36 to properly address the groundwater issues within Blanco-Pedernales, such as groundwater quality and groundwater supply. The District believes 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. In accordance with Section 36.116 of the Texas Water Code, the District is also protecting historic use through District Rules on spacing of wells and production limits on groundwater to the extent practicable consistent with this Management Plan.

In order to better manage the groundwater resources of Blanco County during times of high demand or within areas of high demand, the District may establish Critical Groundwater Depletion Areas and adopt different Rules for those areas. The District may also 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 Chapter 36 of the Texas Water Code, and the rules of the District.

B. Summary of Blanco County Water Resources 2010-2060

In general, groundwater is available throughout Blanco County. Water quantity and quality vary greatly and are highly dependent on local hydrogeological conditions. As growth occurs, there will probably be areas of Blanco County where increase in groundwater demand will be such that some aquifers, or portions thereof, with low production capability will be found in a stressed condition and may not be able to meet higher demand.

Much of the growth now occurring in Blanco County is currently focused in the southern end of the county. This area is served primarily by private water wells producing from the Middle Trinity Aquifer. This aquifer is well known for locally variable well yields...10-50 gpm seems to be the average, but some high volume wells are capable of producing 100-500 gpm.

The Middle Trinity Aquifer is also known for some water quality concerns involving hardness and odors. It is conceivable that with continued growth, this particular aquifer could be overextended during the next 50 years to the point where quantity and quality problems may increase.

The Ellenburger Aquifer, producing primarily in the northern third of Blanco County, should be able to meet future demands placed on it through the year 2060. However the District believes that the areas adjacent to Johnson City may experience seasonal shortfalls from the Ellenburger if development of small acreage lots increases. Many of these developments will be solely dependent upon the Ellenburger since the underlying Paleozoic rocks are very deep and have unpredictable groundwater availability. Consequently, the Ellenburger adjacent to Johnson City will need to be carefully monitored in order to determine how long it will be able to meet future demands of local users.

The Edwards-Trinity (Plateau), Hickory, and Marble Falls aquifers are located in areas that are not expected to undergo extensive development and are not likely to experience water quantity or quality problems during the 50 year planning horizon.

VIII. Action, Procedures, Performance And Avoidance For Plan Implementation - 31 TAC 356.52(A)(4); TWC Section 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 Blanco 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 will be consistent with the provisions 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 District Rules can be found at the following website:

<http://www.blancogw.org>

Click on the Rules button and follow the link to the current Rules

The District is committed to work and plan with other GCDs in Groundwater Management Area 9. The District will use the Management Plan as part of its cooperative efforts with the neighboring GCDs. The District will manage the supply of groundwater within the District based on Desired Future Conditions and Modeled Available Groundwater quantities resulting from the Groundwater Management Area 9 cooperative planning process, exempt and non-exempt wells and groundwater demands, and the District's best available data.

The District will review and re-adopt this plan, with or without revisions, at least once every five years in accordance with Chapter 36.1072(e).

Any amendment to this plan will be in accordance with Chapter 36.1073.

The District will seek cooperation and coordination in the development and implementation of this plan with the appropriate state, regional or local water management or planning entities.

The District will encourage cooperative and voluntary Rule compliance, but if Rule enforcement becomes necessary, the enforcement will be legal, fair, and impartial.

IX. Methodology For Tracking Progress In Achieving Management Goals - 31 TAC 356.52(A)(6)

The District will use the following methodology to track its progress toward achieving its management goals:

The District General Manager will present an annual report to the Board of Directors on District performance and progress in achieving management goals and objectives at a regular District Board meeting of the following calendar year beginning in Fiscal Year 2003.

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

A. Providing The Most Efficient Use Of Groundwater.

A.1 Management Objective

Implement and maintain a program of issuing well operating permits for non-exempt wells within Blanco County.

Performance Standards

Annual issuance or re-issuance of one or more well operating permits each year.

A.2 Management Objective

The District will evaluate the effectiveness of current well spacing requirements in District Rules to help reduce or prevent interference between nearby wells. Spacing requirements will be coordinated to the greatest extent possible with Blanco County subdivision regulations and the Water Well Drillers Rules (16 Texas Administrative Code Chapter 76).

Performance Standards

Annual report submitted to the District Board regarding suitability of current District well spacing rules and their compatibility with Blanco County subdivision regulations and the Water Well Drillers Rules.

B. Controlling and Preventing Waste of Groundwater.

B.1 Management Objective

Each year the District will provide information on the importance of controlling and preventing waste of groundwater to groundwater users.

Performance Standards

Each year provide information to groundwater users on controlling and preventing waste of groundwater on at least one occasion by one of the following methods:

- article to local newspapers
- distribution of conservation literature handouts
- public presentation by District Staff or Directors
- information on District website
- District exhibit/display booth at a public event

C. Controlling and Preventing Subsidence.

The rigid geologic framework of the region precludes significant subsidence from occurring. Therefore, this goal is not applicable to the operations of this District.

D. Addressing Conjunctive Surface Water Management Issues.

D.1 Management Objective

Assist Blanco County Commissioners Court in the evaluation of water availability reports submitted in accordance with County subdivision requirements.

Performance Standard

Annual report submitted to District Board evaluating the status of the MOU and a brief report on any water availability reports reviewed in accordance with the MOU.

D.2 Management Objective

Participate in the Regional Water Planning process by sending a representative to attend at least one meeting of the Lower Colorado Regional Water Planning Group (Region K).

Performance Standard

The dates and locations of meetings attended will be reported to the Board of Directors either monthly or annually.

E. Addressing Natural Resource Issues Which Impact The Use And Availability Of Groundwater, Or Which Are Impacted By The Use Of Groundwater.

E.1 Management Objective

Springs and seeps flowing from outcrop areas of the Edwards-Trinity (Plateau) and the Upper Glen Rose (Upper Trinity) aquifers provide water to local habitat and often provide base flow to nearby creeks and rivers. Both aquifers are known for low productivity and intermittent availability. The District intends to help extend the period of spring and seep flow during times of drought or limited rainfall by evaluating the effectiveness of current Rules to discourage utilization of those aquifers and prevent leakage from those aquifers into other aquifers.

Performance Standard

Annual report submitted to the District Board will include a summary regarding suitability of current District Rules prohibiting the drilling of new non-exempt wells in those aquifers; and, for those wells that penetrate those aquifers to produce groundwater from lower aquifers, the suitability of current Rules requiring the sealing off of those aquifers during the cementing/grouting process.

F. Addressing Drought Conditions.

F.1 Management Objective

At least quarterly, District Staff will review applicable data to determine status of drought conditions and, if necessary, report to District Board on need to implement the District Drought Rules.

Performance Standards

A monthly or quarterly report submitted to District Board on drought conditions in the District.

F.2 Management Objective

Provide to the public, upon request, drought-orientated literature handouts.

Performance Standards

Each year provide drought-orientated literature handouts on at least one occasion.

F.3 Management Objective

To evaluate groundwater availability each year the District will monitor water levels on selected wells representative of the two primary aquifers within the District in accordance with the water level monitoring schedule shown below.

Water Level Monitoring Schedule

<u>Aquifer</u>	<u># of Wells</u>	<u>Minimum Frequencies</u>
Trinity	3	4 times per year
Ellenburger	2	3 times per year

Performance Standard

Number of water level records measured annually.

G. Addressing Groundwater Conservation, Recharge Enhancement, Rainwater Harvesting, Precipitation Enhancement, or Brush Control where Appropriate and Cost Effective.

G.1 Groundwater Conservation

Management Objective

Each year the District will identify the importance of water conservation and various water conservation methods available for implementation by groundwater users.

Performance Standards

Each year provide groundwater conservation information on at least one occasion by one of the following methods:

- article to local newspapers
- distribution of conservation literature handouts
- public presentation by District Staff or Directors

- information on District website
- District exhibit/display booth at a public event

G.2 Recharge Enhancement

Management Objective

Investigate potential opportunities for recharge enhancement projects, either natural or artificial.

Performance Standard

Annual report submitted to the District Board on investigation of the number of potential recharge enhancement opportunities, if any.

G.3 Rainwater Harvesting

Management Objective

The District will promote rainwater harvesting and provide advice, information, and literature regarding the benefits of rainwater harvesting.

Performance Standards

Each year provide rainwater harvesting information on at least one occasion by one of the following methods:

- article to local newspapers
- distribution of conservation literature handouts
- public presentation by District Staff or Directors
- information on District website
- District exhibit/display booth at a public event

G.4 Precipitation Enhancement

This strategy is too costly for consideration by the District at this time. Therefore, this goal is not applicable to the operations of this District at this time.

G.5 Brush Control

This strategy is being implemented in Blanco County by the Pedernales Soil and Water Conservation District and other agencies. Therefore, this goal is not applicable to the operations of this District at this time.

H. Addressing in a Quantitative Manner the Desired Future Conditions of the Groundwater Resources.

H.1 Management Objective

For any aquifer within the District that has an approved DFC, assess whether the current District programs and actions toward meeting the DFC are sufficient or require further attention.

Performance Standards

For any aquifer with an approved DFC, measure water levels in at least one District-designated monitor wells one or more times annually and compare with the average drawdown and the allowable drawdown resulting from the DFC process. This comparison will be included in the General Manager's annual report to the District Board and will also be reviewed by the District at least once every five years and provided to the GMA 9 Committee as required under Texas Water Code Section 36.108.

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Blanco-Pedernales Groundwater Conservation District

601 West Main, P.O. Box 1516, Johnson City, Texas 78636 (830) 868-9196 FAX (830) 868-0376

www.blancogw.org

manager@blancogw.org