Cow Creek Groundwater Conservation District
GROUNDWATER MANAGEMENT PLAN

Revision, Adopted
January 9th, 2024

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GROUNDWATER MANAGEMENT PLAN
REVISION RECORD

Date Adopted	Effective Date	Affected Sections or General Comments
9/7/04	9/7/04	Original Adoption, CCGCD Board Resolution 090704-1
12/14/09	12/14/09	Revision, Re-adoption, CCGCD Board Resolution 2009-019
1/20/15	1/20/15	Revision, Re-adoption, CCGCD Board Resolution 2015-01
1/13/20	1/13/20	Revision, Re-adoption, CCGCD Board Resolution 2020-001
1/9/24	1/9/24	Revision, Re-adoption, CCGCD Board Resolution 2024-001

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TIME PERIOD FOR THIS PLAN

This plan becomes effective upon adoption by the Cow Creek 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 50 years. After five years, the plan will be reviewed for consistency with the applicable Regional Water Plans, the State Water Plan and Groundwater Management Area 9's Desired Future Conditions (DFC) 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, Desired Future Conditions in GMA 9, or District management strategies.

DISTRICT MISSION

The Cow Creek Groundwater Conservation District (CCGCD or District) was created for the purpose of conserving, preserving, recharging, protecting and preventing waste of groundwater from the aquifers within the District. The District will conduct administrative and technical activities and programs to achieve these purposes. The District will collect and archive water well and aquifer data, regulate water well drilling and production from permitted, non-exempt wells, 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 undertake other groundwater-related activities that may help meet the purposes of the District. The Texas Hill Country Area, which includes the Cow Creek GCD, was declared a Critical Groundwater Area by the then Texas Water Commission in 1990. This declaration, now known as the Hill Country Priority Groundwater Management Area (PGMA), gave notice to the residents of the area that water availability and quality will be at risk within the next 25 years.

STATEMENT OF GUIDING PRINCIPLES FOR AQUIFER MANAGEMENT

The CCGCD was created so that appropriate groundwater management techniques and strategies could be implemented at the local level to address groundwater issues or problems within the District. The District will continue to incorporate the best and most current site-specific data available in the development of this plan to ensure the sustainability of the aquifers and achievement of the DFC's. This plan serves as a guideline the District can follow to ensure greater understanding of local aquifer conditions, development of groundwater management concepts and strategies, and subsequent implementation of appropriate groundwater management policies.

COMMITMENT TO IMPLEMENT GROUNDWATER MANAGEMENT PLAN

To address potential groundwater quantity and quality issues, the District is committed to, and will actively pursue, the groundwater management strategies identified in this groundwater management plan. The management plan will be coordinated with District Rules, policies, and activities in order to effectively manage and regulate the drilling of wells, production of groundwater within the District, protection of recharge features, prevention of pollution and waste, the transfer of groundwater into and out of the District, and encouragement of conservation practices and efficient water use within the District. This includes the evaluation of the impact(s) of conjunctive use of surface and groundwater. A conjunctive water source is the combined use of groundwater and surface water sources to optimize the beneficial characteristics of each. The term "conjunctive use" means the combined use of groundwater and surface water sources that optimizes the beneficial characteristics of each source (Texas Water Code, Chapter 36).

Three basic terms form the basis of water planning. The key terms that need to be understood are available water, existing water supplies and drought. Note there is a critical distinction between available water and existing water supplies.

As the agency responsible for the State Water Plan, the Texas Water Development Board (TWDB) defines available water as "the maximum amount of water available during the drought of record, regardless of whether the supply is physically or legally available." The existing water supply is defined by the TWDB as the "maximum amount of water available from existing sources for use during drought of record conditions that is physically and legally available for use."

Texas water planning requires both must be managed under a worst-case scenario - the drought of record. By TWDB definition, this is "the period of time during recorded history when natural hydrological conditions provided the least amount of water supply. For Texas as a whole, the drought of record is generally considered to be from about 1950 to 1957."

The District will cooperate with and coordinate its management plan and regulatory policies with adjacent groundwater districts, Regional Water Planning Groups, and Groundwater Management Area 9 (GMA9).

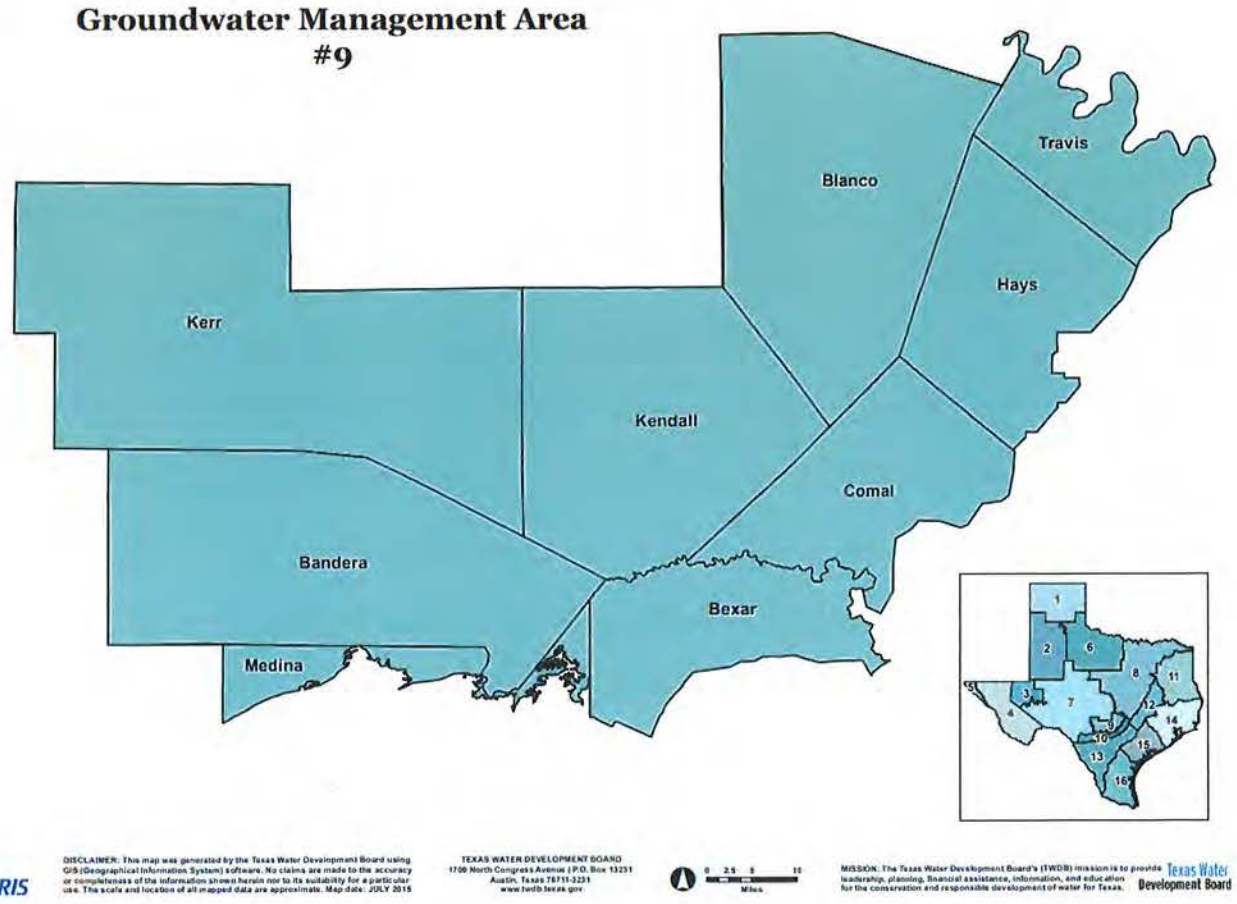
An electronic copy of the management plan is available online at www.ccgcd.org. A paper copy may be requested at the CCGCD office, located at 9 Toepperwein Road in Boerne, Texas 78006.

JOINT PLANNING IN MANAGEMENT AREA

Every five years, the districts in GMA 9 shall consider groundwater availability models and other data or information for the management area and shall establish desired future conditions for the relevant aquifers within the management area. In establishing the desired future conditions of the aquifers under this section, the districts shall consider uses or conditions of an aquifer within the management area that differ substantially from one geographic area to another.

The GMA may establish different desired future conditions for each aquifer, subdivision of an aquifer, or geologic strata located in whole or in part within the boundaries of the management area; or each geographic area overlying an aquifer in whole or in part or subdivision of an aquifer within the boundaries of the management area. The Texas Water Development Board will calculate the Modeled Available Groundwater (MAG) from the adopted Desired Future Conditions (DFC) of the management area.

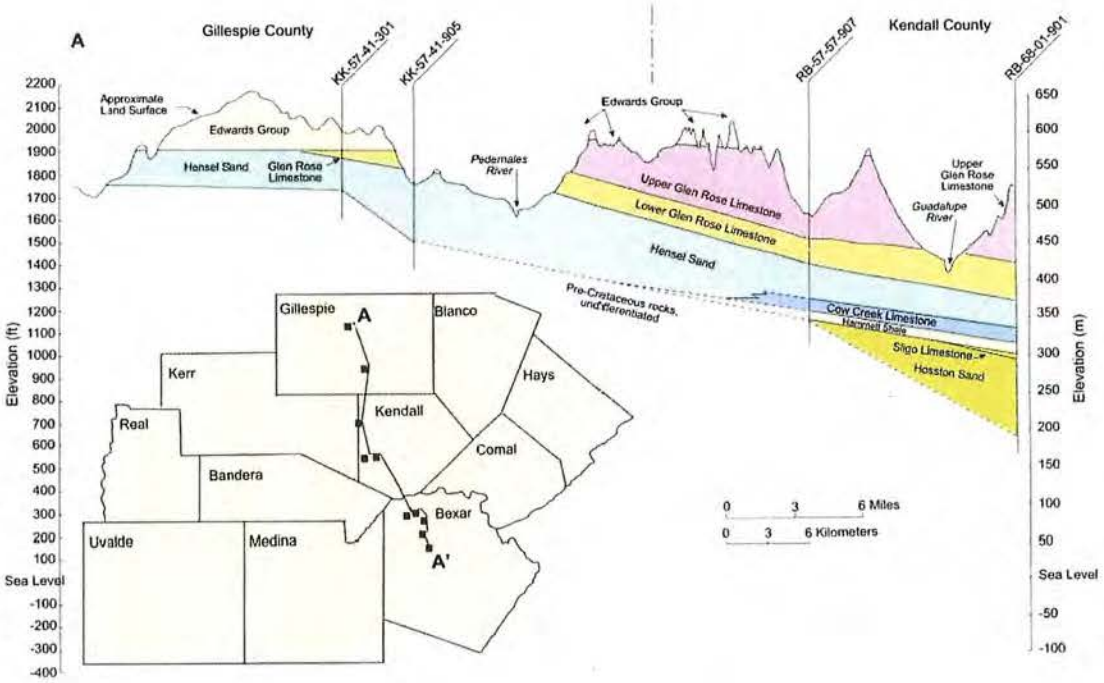
Map of Groundwater Management Area 9:

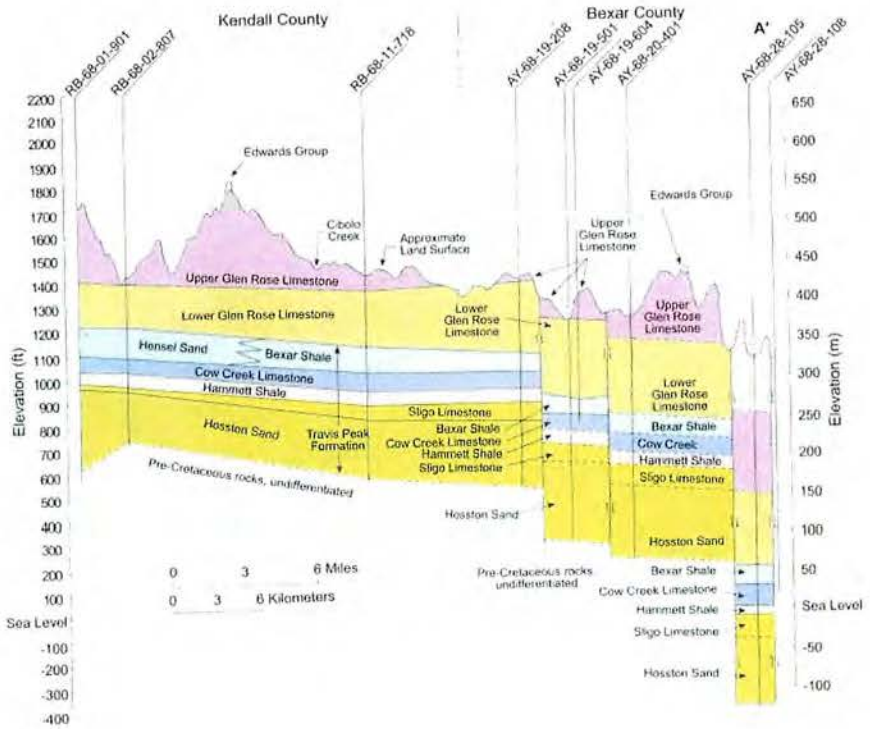


Source: TWDB GMA9 website:

http://www.twdb.texas.gov/mapping/doc/maps/gma/GMA_9_8x11.pdf?d=4205.130000016652

Stratigraphic cross-sections of the Hill Country Area:

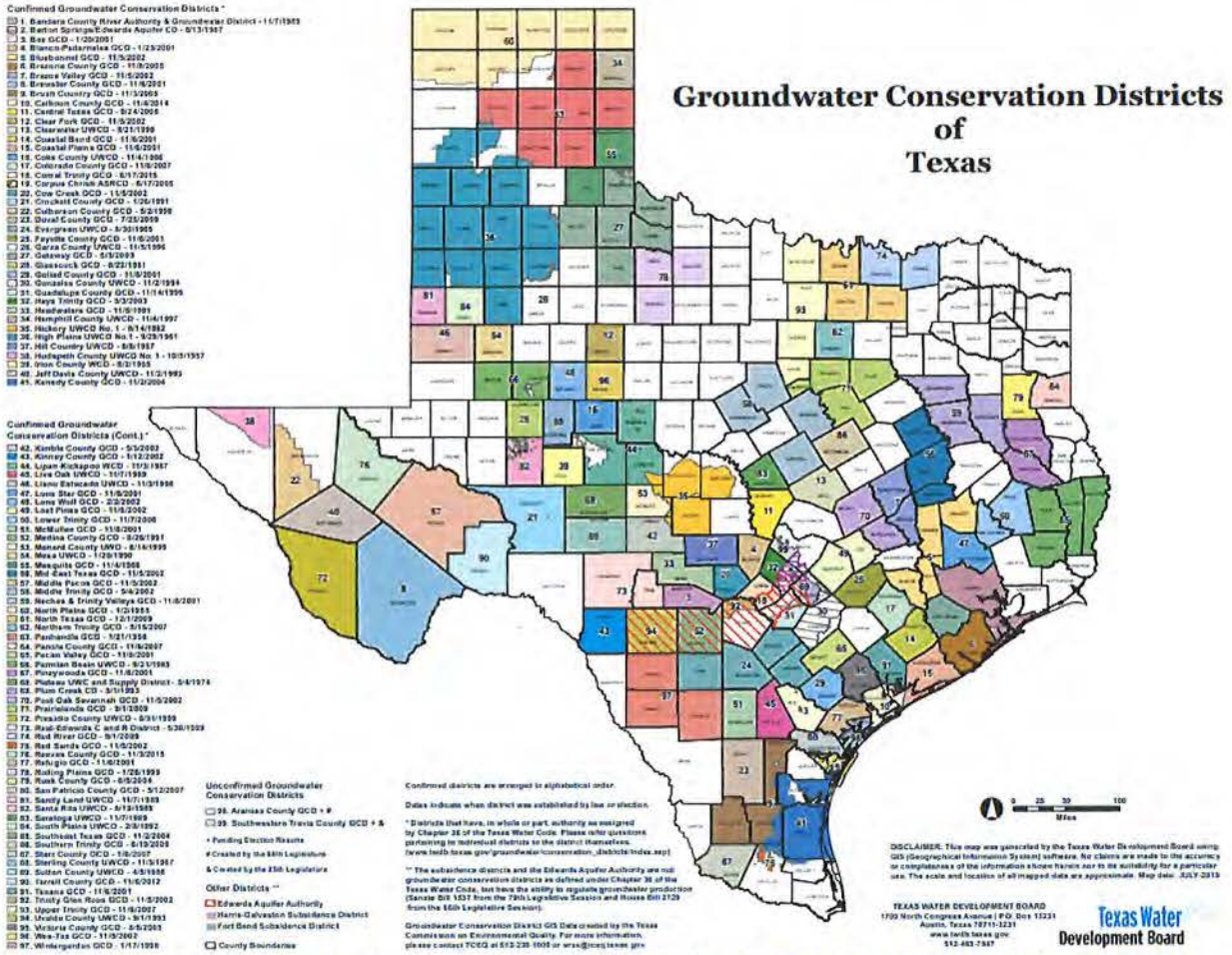




Source: modified from Ashworth, 1983; Mace and others, 2000

GENERAL DESCRIPTION OF THE DISTRICT

The Cow Creek Groundwater Conservation District includes all of Kendall County and encompasses roughly 663 square miles (424,320 acres), excluding the incorporated area of the City of Fair Oaks Ranch. The CCGCD was created in accordance with Chapter 36, HB 3544 and SB 2 of the 77th Legislature. On November 5, 2002, Kendall County voters approved the creation of the District and elected five Directors to govern the District. The District is currently funded through ad valorem property taxes and fees. The District's authority and duties are derived primarily from Chapter 36 of the Texas Water Code, Vernon's Texas Civil Statues.



Source: http://www.twdb.texas.gov/mapping/doc/maps/GCDs_8x11.pdf?d=3021.3100000983104

The current District Board of Directors is comprised of:

Board President Milan J. Michalec, Director District 2;
Vice President Bob Webster, Director District 1;
Treasurer Curt Campbell, Director District 4;
Secretary Alan Bloxsom, Director District 3;
Assistant Secretary/Treasurer, Benjamin Eldredge, Director At Large.

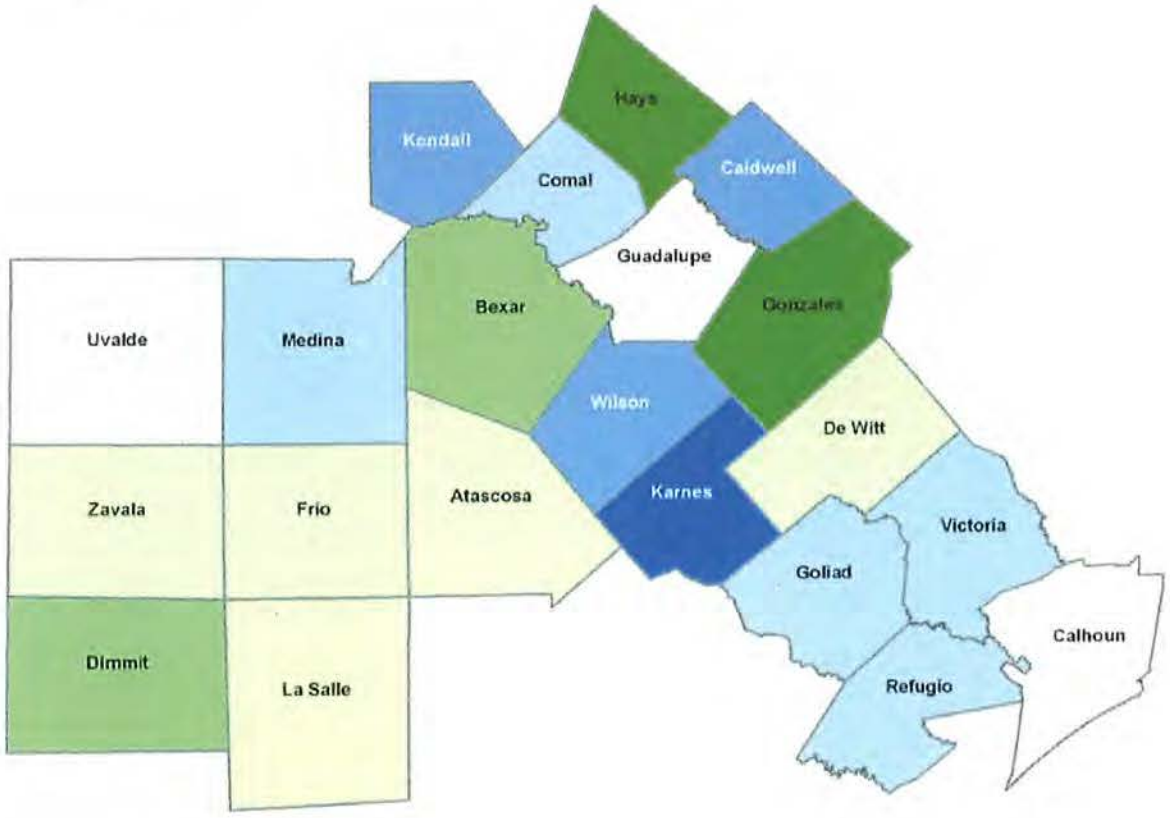
The District General Manager is Micah Voulgaris.
The District's current economy is best characterized as a service oriented, bedroom community tied closely to San Antonio, the Interstate 10 corridor, and to a lesser extent, U.S. 281 and Interstate 35 corridors. Originally considered an area relying primarily on an agricultural-based economy, the District still retains that same rural flavor, but may be even better known for its shopping, antique stores, restaurants, small industries, and tourist facilities. Wildlife hunting, some fishing, and other outdoor activities also contribute significantly to the local economy. Tourists visiting nearby State Parks and other attractions also contribute revenues to the local economy.

Over the past few decades, Kendall County and other Hill Country counties in close proximity to the cities of Austin or San Antonio have seen rapid growth in population due to subdivision of large tracts of land into smaller acreage.

The City of Boerne and the townships of Comfort, Sisterdale, Waring, Bergheim, Kendalia, and Welfare are located in the District.

The District lies primarily within the Guadalupe River basin and for statewide water planning purposes is part of the 21 county South Central Texas Regional Water Planning Group (Region L).

Map of Region L:



Source: http://www.regionltexas.org/

Drainage and Topography

Source: http://www.twdb.texas.gov/surfacewater/rivers/river_basins/index.asp

The topography of the District is predominantly rough and hilly. The primary geologic feature in the area, the Edwards Plateau, is dominated by stream-dissected hills grading into rolling terrain and shallow valleys. This is an elevated structure made up of Cretaceous age limestone, dolomite and marl. The Edwards Plateau extends westward from the Balcones Fault Zone and covers many West Texas counties. The District lies near the southeastern edge of the Plateau. Elevation within the District ranges from a low of approximately 1,000 feet above sea level where Curry Creek leaves southeastern Kendall County to approximately 2,081 feet above sea level in the northwestern part of the District.

WATER RESOURCES WITHIN THE COW CREEK GROUNDWATER CONSERVATION DISTRICT

Groundwater Resources and Usage in the Cow Creek GCD

Estimated groundwater usage in Cow Creek GCD between 2013 and 2017 has been compiled by the TWDB.

The TWDB Estimated Historical Groundwater Use Values for Kendall County/CCGCD are included in the Appendix as Table A.

Within the CCGCD there are two primary aquifers, the Trinity and the Edwards Group of the Edwards-Trinity (Plateau) Aquifer, which provide groundwater to county residents. Well depths vary from shallow, hand-dug wells 20-30 feet deep to drilled wells that are up to 1,200 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 will consider new data as it becomes available and will amend this plan as appropriate.

Modeled Available Groundwater (Based on Desired Future Conditions)

Groundwater Management Area 9 has adopted Desired Future Conditions for the Aquifers located within the planning area. Current groundwater availability for the CCGCD has been estimated by the TWDB using GAM Run 21-014 MAG (**included in the appendix**). The time period over which the MAG would apply is for each decade from the year 2020 to 2080. The Modeled Available Groundwater (MAG) for the Trinity Aquifer is 10,622 acre-feet per year. The MAG for the Edwards Group of the Edwards-Trinity (Plateau) Aquifer is 200 acre-feet per year. The MAG for the Ellenburger-San Saba Aquifer is 62 acre-feet per year and the MAG for the Hickory is 140 acre-feet per year.

Aquifer Descriptions

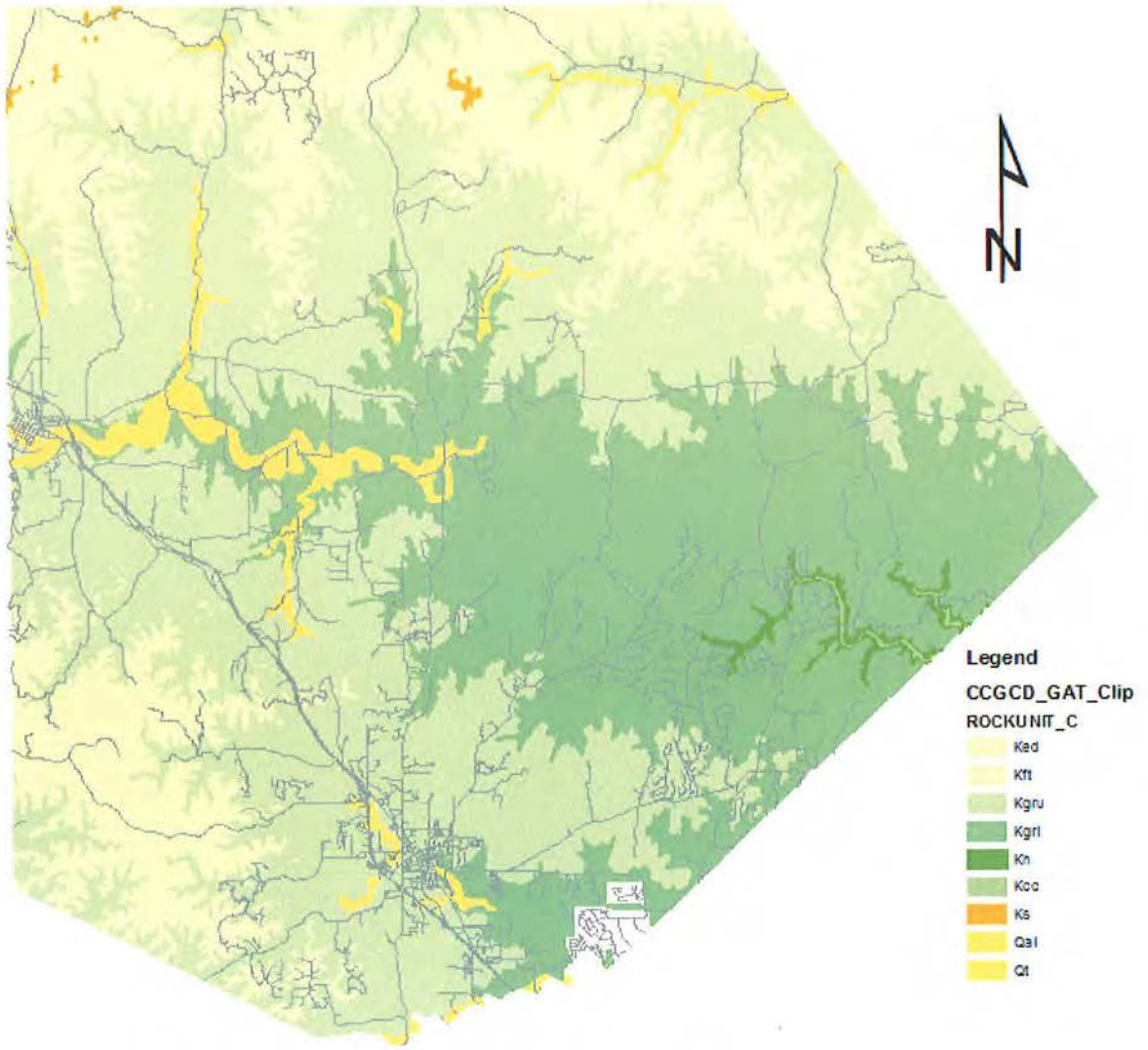
The Trinity Aquifer in the District is comprised primarily of the Upper Glen Rose (Upper Trinity), Lower Glen Rose Limestone, Hensell Sand, and the Cow Creek Limestone (Middle Trinity), and to a lesser extent, the Hoston and Sligo formations (Lower Trinity). It extends across the majority of the District. The Trinity Aquifer is recharged primarily from local precipitation on its outcrop and through fracturing and porosity in the overlying units where the Trinity is in the subsurface. Most recharge originates from outside of the District and flows down gradient into and through the District. Well yields vary greatly and are highly dependent on local subsurface hydro-geological characteristics. Yields are generally low, less than 20 gpm, but can

occasionally be higher, with yields of 200-275 gpm being reported. Production from Trinity wells is primarily used for municipal, rural domestic, and livestock demands. A small amount of irrigation occurs for golf courses, nurseries, vegetables, hay crops, peaches, pecans, grapes and grains.

The Edwards Group of the Edwards-Trinity (Plateau) Aquifer within the District is located at higher elevations along ridges in the northern and southwestern portions of the county. It is comprised of relatively thin layers of limestone and dolomite that is an extension of the Edwards Plateau into the District from the west. In general, yields from the aquifer are low (less than 20 gpm) and the water is used occasionally for rural domestic and livestock demands. The Edwards Group of the Edwards-Trinity (Plateau) Aquifer in the District 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 some base flow to small streams within the county.

Several minor aquifers occur in the District. These include alluvial aquifers, the Ellenburger, the Hickory, and the Marble Falls aquifers.

Geologic Map of the District:



Surface Water Resources and Usage in CCGCD

Groundwater supplies in the District are augmented by several other water sources. The City of Boerne has a firm supply of 645 acre feet per year of surface water from Boerne Lake and 3,611 acre feet per year of surface water from Canyon Lake (GBRA). Rural water systems (Kendall West Utility, Cordillera Ranch, and Miralomas MUD) supplies have a total of 2,488 acre feet per year of surface water from Canyon Lake (GBRA). Irrigation and livestock make up the additional surface water supplies (7,552 acre feet). Other adjudicated surface water withdrawals total approximately 3,417 acre feet per year (Guadalupe River, other surface water streams, and reservoirs).

In summary, annual surface water availability in the District totals approximately 7,522 acre feet per year in 2020 increasing to 7,907 acre feet per year in 2070. This is based on contracted amounts of

surface water from GBRA and Boerne Lake. Total County Supply in Table 3 does not include the adjudicated surface water withdrawals (approximately 3,417 acre feet per year).

Projected Total Water Supply in CCGCD

As shown in the Table 1 below, the projected total water supply in the Cow Creek GCD currently stands at about 18,174 acre feet per year and is expected to increase to 18,529 acre feet per year in 2060 due to the increase in GBRA surface water (which includes all sources except adjudicated surface water withdrawals). The District's projected estimates of surface water supplies are based on actual contracted amounts between the water providers and the GBRA. The most recently adopted state water plan projected surface water supply is included as Table B in the appendix.

TABLE 1
District's projected total supply in acre feet per year

	2020	2030	2040	2050	2060	2070
Available **Groundwater**	10,622	10,622	10,622	10,622	10,622	10,622
Projected Available **Surface Water**	7,552	7,657	7,742	7,807	7,862	7,907
Other adjudicated surface water rights	3,417	3,417	3,417	3,417	3,417	3,417
Total (excluding Run of the River)	18,174	18,279	18,364	18,429	18,484	18,529

Source: CCGCD

Based on the District's estimated projected supply from Table 1 and the estimated demands from Table 4, the District has compiled Table 2 to illustrate projected surpluses and shortages.

TABLE 2
Projected Supply, Demand, and Surplus/Shortage in acre feet per year

	2020	2030	2040	2050	2060	2070
Total County Supply (all sources)	18,174	18,279	18,364	18,429	18,484	18,529
Total Demand (all sources)	**7,520**	**9,080**	**10,748**	**12,404**	**14,176**	**15,923**
Surplus/Shortage	10,654	9,199	7,616	6,025	4,308	2,606

Source: CCGCD

The Texas Water Development Board (TWDB) defines available water as "the maximum amount of water available during the drought of record, regardless of whether the supply is physically or legally available."

The existing water supply is defined by the TWDB as the "maximum amount of water available from existing sources for use during drought of record conditions that is physically and legally available for use."

The District has reviewed the 2017 Texas State Water Plan Projected Water Supply Needs table (Table D in the appendix) and can see that a shortfall is anticipated to exist for Boerne of 650 acre-feet in 2050, 1,639 acre-feet in 2060, and 2,613 acre-feet in 2070.

The District has also reviewed the 2017 Texas State Water Plan Projected Water Management Strategies table (Table E in the appendix) and understands that municipal water conservation, Trinity Aquifer development, and Canyon Lake expansion are listed as potential strategies to meet future water needs.

Projected Population and Water Demands in CCGCD

Population projections for the District were derived from the Region L Plan.

TABLE 3
CCGCD Population Summary

KENDALL COUNTY COLORADO BASIN	2020	2030	2040	2050	2060	2070
COUNTY-OTHER	329	406	489	571	655	736
COLORADO BASIN TOTAL POPULATION	**329**	**406**	**489**	**571**	**655**	**736**
GUADALUPE BASIN						
KENDALL COUNTY WCID #1	3,190	3,750	4,341	4,927	5,525	6,112
COUNTY-OTHER	13,000	16,289	19,764	23,208	26,724	30,175
GUADALUPE BASIN TOTAL POPULATION	**16,190**	**20,039**	**24,105**	**28,135**	**32,249**	**36,287**
SAN ANTONIO BASIN						
BOERNE	14,367	18,820	23,524	28,187	32,947	37,619
FAIR OAKS RANCH	2,482	3,431	4,318	4,965	5,898	6,814
WATER SERVICES INC	280	346	417	487	558	628
COUNTY-OTHER	8,537	9,171	9,954	10,963	11,721	12,465
SAN ANTONIO BASIN TOTAL POPULATION	**25,666**	**31,768**	**38,213**	**44,602**	**51,124**	**57,526**
KENDALL COUNTY TOTAL POPULATION	**42,185**	**52,213**	**62,807**	**73,308**	**84,028**	**94,549**

Source: Region L 2016 Water Plan

Table 4 illustrates the estimated water demands through 2070. The most recently adopted state water plan projected total demand for water is included as Table C in the appendix.

TABLE 4

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.

KENDALL COUNTY *99.51% (multiplier)* All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
L	BOERNE	SAN ANTONIO	3,091	3,985	4,942	5,900	6,889	7,863
L	COUNTY-OTHER, KENDALL	COLORADO	41	48	57	66	75	85
L	COUNTY-OTHER, KENDALL	GUADALUPE	1,579	1,916	2,278	2,649	3,043	3,433
L	COUNTY-OTHER, KENDALL	SAN ANTONIO	1,037	1,079	1,147	1,251	1,334	1,417
L	FAIR OAKS RANCH	SAN ANTONIO	656	898	1,125	1,290	1,531	1,768
L	IRRIGATION, KENDALL	GUADALUPE	304	298	291	286	281	275
L	IRRIGATION, KENDALL	SAN ANTONIO	70	68	67	65	64	63
L	KENDALL COUNTY WCID #1	GUADALUPE	303	341	384	430	481	531
L	LIVESTOCK, KENDALL	COLORADO	13	13	13	13	13	13
L	LIVESTOCK, KENDALL	GUADALUPE	314	314	314	314	314	314
L	LIVESTOCK, KENDALL	SAN ANTONIO	66	66	66	66	66	66
L	WATER SERVICES INC	SAN ANTONIO	46	54	64	74	85	95
	Sum of Projected Water Demands (acre-feet)		**7,520**	**9,080**	**10,748**	**12,404**	**14,176**	**15,923**

Growth Patterns and Groundwater Impacts in CCGCD

Between 2020 and 2070, total District-wide water demand is estimated to increase from 7,520 acre feet per year in 2020 to 15,923 acre feet per year in 2060 (Table 4). The estimated amount of groundwater currently available within the District is approximately 10,622 acft/yr per year.

In the absence of new surface water sources, groundwater may have to be completely allocated to partially meet increased demands and water shortages that will occur in the District sometime between 2040 and 2060. As the demand increases, aquifers with areas of low production capability will probably experience a stressed condition sooner than anticipated and may not be able to meet higher demands. This may be particularly true in those areas where development is more intense. The most recently adopted state water plan water supply needs are included as Table E in the appendix. The State Water Plan also addresses Projected Water Management Strategies adopted by Region L. These strategies are included as Table F in the appendix.

Much of the growth now occurring in the District is focused on the southern end of the District. This area is served primarily by private water wells producing from various stratigraphic units of the Trinity Aquifer. This aquifer is known for low yield wells and water quality concerns involving hardness and other factors. TWDB Priority Groundwater Management Area studies

and the Trinity GAM indicate that with continued growth, this particular aquifer will be over extended to the point where quantity and quality problems are likely.

The Edwards Group of the Edwards-Trinity (Plateau) Aquifer is located in areas that are expected to slowly undergo development. The Edwards Group of the Edwards-Trinity (Plateau) Aquifer will be unlikely to provide enough water to support extensive growth. Therefore, any growth that does occur during the 50 year planning horizon will more than likely have to rely on some other water source such as the Trinity, and may have to take in consideration the associated water quantity or quality problems.

Recharge of Groundwater in CCGCD

The annual natural recharge occurring in the Cow Creek GCD is thought to be primarily through percolation of rainfall. More localized recharge, along with potentially higher rates of recharge, is probably occurring in the beds of rivers, creeks, and tributaries, particularly if associated with cave entrances or fracture zones. Recharge also occurs from flow through fracturing and porosity in the overlying units where the Trinity is in the subsurface. Most recharge originates from areas outside of the District and flows into and through the District. The District is aware of several significant recharge features in the area that are providing a major avenue for recharge.

Initial studies of the Trinity Aquifer calculated an annual recharge coefficient of approximately 4% of annual rainfall. This was documented in the September 2000 TWDB report on "Groundwater Availability of the Trinity Aquifer, Hill Country Area, and Texas: Numerical simulations through 2050" by Robert E. Mace, et. al. John Ashworth also developed a similar annual effective recharge coefficient (also 4% of average annual rainfall…about 30 inches) for the Trinity Aquifer in the Texas Department of Water Resources Report 273, Ground-Water Availability of the Lower Cretaceous Formations in the Hill Country of South-Central Texas, January 1983. A subsequent 2008 study, funded by the District, indicated more realistic recharge rates to range between 6% and 9% for the Guadalupe River Basin portion of the District. This was documented in Wet Rock Groundwater Services report "An Evaluation of the Trinity Aquifer Within Kendall County and Analysis of the Trinity (Hill Country) GAM", June 25, 2008, Kaveh Khorzad.

GAM RUN 19-011 (included in the appendix) provides a flow budget and recharge variables for the District based on version 2.01 of the GAM for the Hill Country portion of the Trinity Aquifer and the Edwards-Trinity (Plateau) Aquifer (TWDB 2011). Information for the Ellenburger-San Saba and Hickory aquifers is from version 1.01 of the groundwater availability model for the minor aquifers of the Llano Uplift region (TWDB 2016).

The groundwater availability model includes some portions of the Edwards Group outside the official boundary of the Edwards-Trinity (Plateau) Aquifer. Though flow for these areas is not explicitly reported, the interaction between the Edwards Group (outside the Edwards-Trinity Plateau Aquifer) and the underlying Trinity Aquifer is shown in the model.

These recharge potentials are not to be confused with "recoverable" groundwater. Not all groundwater is recoverable. Some contributes to spring flow and seeps, some is used by plant life while the water is still near the surface, while some is almost permanently retained within the rock itself. For instance, much of the Trinity is a rather "tight" formation, particularly in the vertical direction. The Trinity is known for its low porosity and permeability, limited fracturing and faulting, and a complicated stratigraphy that includes layers of rock that reduce transmissivity and retard downward-moving recharge water. As a result, individual well yields are often quite low and, though large quantities of water may be present in the subsurface in specific local sites and in certain wells, much of the groundwater in the Cow Creek GCD as a whole may be unrecoverable due to local hydrogeological conditions.

Whereas, significant recharge occurs within the District for the Edwards Trinity (Plateau) and the Upper and Lower Glen Rose, formations underlying these are predominantly recharged from outside the District's Boundary.

As previously mentioned, considerable amounts of water that could potentially recharge the Trinity Aquifer will be utilized through biological processes and a significant amount discharged at springs and seeps that provide relatively reliable base flow to local rivers and tributaries. Thus, much of the annual recharge may enter the ground, only to leave it again as base flow to surface streams. This is water that the aquifer rejects on an average annual basis and is potentially available and can theoretically be retrieved (at least on a short-term basis) without diminishing the average volume of groundwater being recharged to storage or, in other words, without creating a mining situation within the aquifer. However, if extensive pumping of this available water occurs, then base flow to area springs and streams will be greatly reduced and the effects of this reduction may be undesirable. Extensive pumping will also reduce the pressure head and may result in a significantly smaller quantity of recharge water actually percolating downward through the complex geology before providing deeper aquifer recharge that would be available for more reliable, long-term well production. Once pumping exceeds average annual recharge, then an aquifer mining condition will clearly exist and groundwater availability will decline.

Recharge Enhancement Potential

The District has yet to assess potential recharge projects in the area. The District may solicit ideas and information and may investigate any potential recharge enhancement opportunities, natural or artificial, that are brought to the District's attention. Such projects may include, but are not limited to: cleanup or site protection projects at any identified significant recharge feature, encouragement of prudent brush control/water enhancement projects, non-point source pollution mitigation projects, aquifer storage and recovery projects, development of recharge ponds or small reservoirs, and the encouragement of appropriate and practical erosion and sedimentation control at construction projects located near surface streams.

GROUNDWATER MANAGEMENT POLICIES
(Actions, Procedures, Performance and Avoidance for Plan Implementation)

The District will manage the supply of groundwater within the District based on the District's best available data and its assessment of water availability and groundwater storage conditions. The Groundwater Availability Model (including subsequent runs) and the Modeled Available Groundwater developed by the TWDB for the Trinity Aquifer will also aid in the decision making process of the District.

The District has adopted Rules that require the permitting of wells and groundwater production limits for non-exempt wells within the District consistent with this Groundwater Management Plan, the provisions of Chapter 36.113 and other pertinent sections of Chapter 36.

The District is in agreement with the commonly accepted groundwater management principle that opposes the mining of groundwater. Therefore, it shall be the policy of the District to limit withdrawal of groundwater from all current and future wells producing from the District's aquifers to no more than the current existing supply. Development or analysis of new or existing groundwater or aquifer data (MAG revisions) may result in changes to the groundwater availability volumes, with a corresponding change in production limits from the affected aquifers. It may also necessitate an increase in well spacing.

The District has adopted Rules that regulate the spacing of wells and the production of groundwater consistent with the provisions Chapter 36.116. The District wishes to emphasize that in regulating or limiting groundwater production, it shall be the policy of the District to preserve historic use to the greatest extent practical and consistent with this plan. A copy of the District's Rules are available at: http://www.ccgcd.org/rules.

The District will implement and utilize the provisions of this groundwater management plan as a guidepost for determining the direction or priority for all District activities. All operations of the District, all agreements entered into by the District, and any additional planning efforts in which the District may participate will be consistent with the provisions of this plan. The District's current and future Rules will be promulgated pursuant to the provisions of Texas Water Code Chapter 36 shall be based on the best technical evidence available, and will address, implement, and be consistent with the provisions and policies of this plan.

The District shall 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 shall be in accordance with Chapter 36.1073.

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

The District will seek cooperation and coordination in the development and implementation of

this plan, management of groundwater resources, and appropriate District activities with the appropriate state, regional and 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. The promulgation and enforcement of the Rules will be based on the best technical evidence available.

METHODOLOGY FOR TRACKING PROGRESS IN ACHIEVING MANAGEMENT GOALS

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

The District General Manager, District Board President, or a Contracting Consultant will present an annual report to the District's Board of Directors on District performance and progress in achieving management goals and objectives at the November Regular Meeting.

GROUNDWATER MANAGEMENT GOALS

1.0 Provide for the most efficient use of groundwater.

1.1 Management Objective

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

Performance Standard(s)

Ongoing program of issuance or re-issuance of one or more well operating permits each year. The number of well operating permit applications and the number of permits issued will be included in the annual report to the District Board of Directors.

1.2 Management Objective

Ongoing program of collecting and maintaining actual meter readings from permitted non-exempt wells within the District.

Performance Standard(s)

Annual report submitted to the District Board outlining the previous year's water use from at least 25% of the District's permitted non-exempt wells.

1.3 Management Objective

Implement and maintain a program of issuing registrations for exempt domestic and livestock wells within the District.

Performance Standard(s)

Annual report submitted to the District Board outlining the previous year's registration program.

1.4 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 Kendall 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 Kendall County

subdivision regulations and the Water Well Drillers Rules.

2.0 Control and prevent waste of groundwater.

2.1 Management Objective

Each year the District will provide to local media articles describing groundwater waste prevention practices available for implementation by groundwater users.

Performance Standard(s)

Each year provide at least one article to the local media related to groundwater waste prevention practices.

2.2 Management Objective

Provide to the public water efficient literature handouts.

Performance Standard(s)

Each year provide water efficient literature handouts at a public event on at least one occasion. The District will also maintain a supply of water efficient literature at the office.

2.3 Management Objective

Have District personel available to speak at a local club or organization or a display booth at public events.

Performance Standard(s)

Each year the District will provide a speaker at a local club or organization or a display booth at public events a minimum of twice a year.

3.0 Control and prevent subsidence.

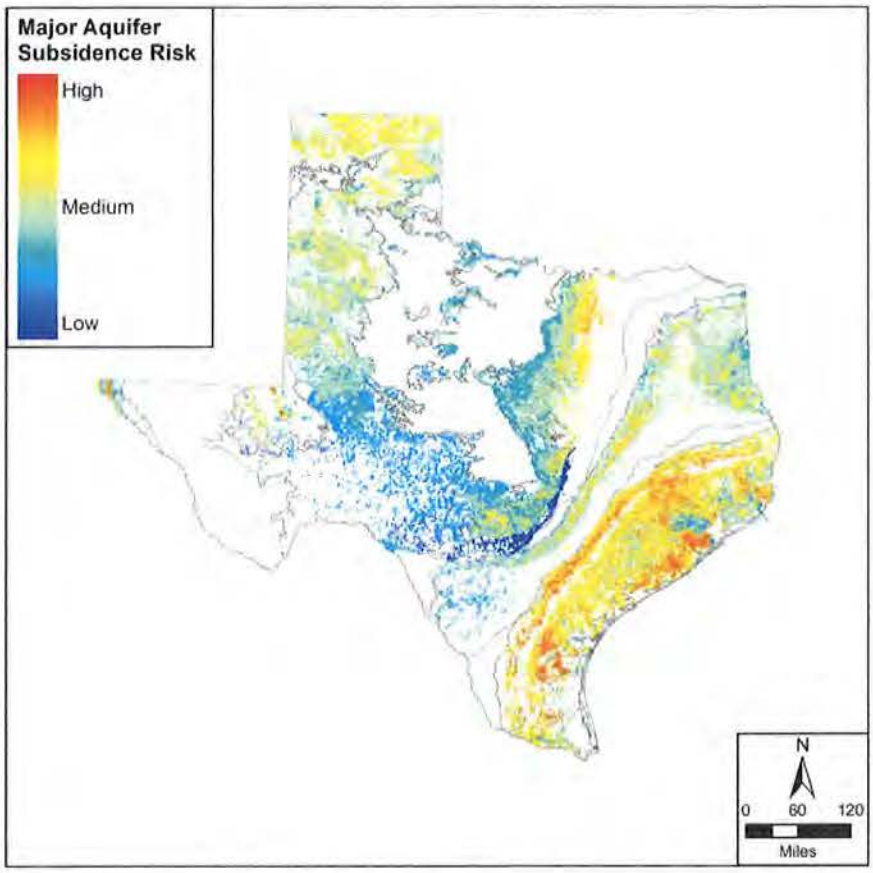
3.1 Management Objective

Controlling and preventing subsidence will be addressed during the review and processing of all new, renewed, and amended permit applications on a continual basis.

Performance Standard

If review results demonstrate potential subsidence, the District will implement actions ranging from reducing requested permitted pumping to including permit conditions imposing subsidence monitoring requirements and establishment of threshold limits that could result in reduced production based on monitoring results.

Figure 1 on page 1.7 of the subsidence report shows that the District has a medium level of major aquifer subsidence risk. Going forward the District will monitor for any evidence of subsidence in areas of heavy pumping of groundwater.



Source: *Identification of the Vulnerability of the Major and Minor Aquifers of Texas to Subsidence with Regard to Groundwater Pumping* – TWDB Contract Number 1648302062, by LRE Water:
http://www.twdb.texas.gov/groundwater/models/research/subsidence/subsidence.asp

4.0 Address conjunctive surface water management issues.

4.1 Management Objective

Meet with Kendall County, City of Boerne and Retail Water Utility Officials regarding water availability reports, City/County development requirements, and District Rules.

Performance Standard(s)

Meet with Kendall County, City of Boerne and Retail Water Utility Officials regarding water availability reports, City/County development requirements, and District Rules at least once a year and submit a comparative analysis of the Rules and requirements.

4.2 Management Objective

Maintain ongoing studies regarding correlations between spring flow, surface stream elevations/flows, rainfall, and groundwater levels.

Performance Standard(s)

An annual report submitted to the District Board will include a review of the ongoing studies and the number of "Aquifer Watch" reports submitted to local media.

4.3 Management Objective

Meet with the local entities responsible for surface water management.

Performance Standard(s)

Meet with the Guadalupe Blanco River Authority and appropriate local entities responsible for surface water management at least once a year.

5.0 Address natural resource issues which impact the use and availability of groundwater, or which are impacted by the use of groundwater.

5.1 Management Objective

Maintain an ongoing spring flow monitoring program in the District.

Performance Standard(s)

The District will take at least one annual flow rate measurement from a spring in the District and report the measurements to the Board in an annual report.

5.2 Management Objective

The District will maintain a database cataloging recharge features in the District.

Performance Standard(s)

A summary of the database will be included in the annual report to the District Board of Directors.

6.0 Address drought conditions.

6.1 Management Objective

Review the District's monitor well data, the Palmer Drought Severity Index, stream flow and rainfall data to determine status of drought condition and, if

necessary, report to District Board on need to implement drought contingency plan.

Performance Standards(s)

The District Board will conduct a review of the current drought stage status on a monthly basis. A copy of the review will be included in the annual report to the District Board of Directors.

6.2 Management Objective

Provide to the public drought-orientated literature handouts.

Performance Standards(s)

Each year provide drought-oriented literature handouts on at least one occasion. The District will also maintain a supply of drought-oriented literature at the office. https://www.waterdatafortexas.org/drought/

6.3 Management Objective

To evaluate groundwater availability the District will monitor water levels on selected wells representative of the Edwards Trinity (Plateau) and Trinity aquifers within the District in accordance with the water level monitoring schedule in Table 5. Of the 41 monitor wells the District currently checks, eleven of those are remotely monitored and reported digitally to the TWDB.

Table 5

Water Level Monitoring Schedule

Aquifer	# of Wells	Minimum Frequencies
Edwards Trinity	1	1 time per month
Upper Trinity	1	1 time per month
Middle Trinity	25	1 time per month
Lower Trinity	3	1 time per month

Performance Standard(s)

The District will take a minimum of 250 well readings annually and report the findings to the District Board.

7.0 Address:

Conservation

7.1 Management Objective

Each year the District will provide to local media articles identifying the importance of groundwater conservation and various groundwater conservation methods available for implementation by groundwater users.

Performance Standards(s)

Each year provide at least one article to the local media related to the importance of groundwater conservation and various groundwater conservation methods available for implementation by groundwater users.

7.2 Management Objective

Provide to the public water conservation literature handouts.

Performance Standards(s)

Each year provide water conservation literature handouts at a public event on at least one occasion and will maintain a supply which will be available at the District Office.

Recharge Enhancement

7.3 Management Objective

The District will investigate potential recharge enhancement sites either natural or artificial.

Performance Standard(s)

Annually, the General Manager will include a report to the District's Board on the District's findings related to recharge enhancement.

7.4 Management Objective

The District will investigate, identify, and catalog existing recharge features and adopt best management practices to protect these features.

Performance Standard(s)

Annually, the District will conduct a review of the policies related to the identification of and best management strategies for existing recharge features. A copy of the review will be included in the annual report to the District Board of Directors.

Rainwater Harvesting

7.5 Management Objective

The District will encourage rainwater harvesting and provide to the public literature related to rainwater harvesting and support demonstration sites within the District.

Performance Standard(s)

Annually, the District will provide rainwater harvesting literature at a public event on at least one occasion and the General Manager will include a report to the District's Board on the demonstration sites.

Precipitation Enhancement

7.6 Not applicable to include since this objective is not cost effective at this time.

Brush Control

7.7 Management Objective

The District will encourage brush control and Best Management Practices related to the same where appropriate.

Performance Standard(s)

Annually, the District will conduct a review of the policies adopted by the District Board related to brush control practices and/or the progression of brush control within the District. A copy of the review will be included in the annual report to the District Board of Directors. If it is found from review that no policies that relate to brush control practices were adopted by the District Board of Directors during the previous year, then a statement of such will be included in the annual report to the District Board of Directors.

8.0 Addressing Desired Future Conditions

8.1 Management Objective

The District will monitor the static water level in the Edwards Group of the Edwards-Trinity (Plateau) Aquifer to track the achievement of the adopted DFC.

Performance Standard(s)

The District will monitor the static water level in the Edwards Group of the Edwards-Trinity (Plateau) Aquifer on a bi-monthly basis. The data will be presented to the District Board of Directors in an annual report.

8.2 Management Objective

The District will monitor the static water level in the Trinity Aquifer to track the achievement of the adopted DFC.

Performance Standard(s)

The District will monitor the static water level in the Trinity Aquifer on a bi-monthly basis. The data will be presented to the District Board of Directors in an annual report.

8.3 Management Objective

Upon completion of any well in the Ellenburger-San Saba Aquifer the District will monitor the static water level in the Ellenburger-San Saba Aquifer to track the achievement of the adopted DFC.

Performance Standard(s)

Upon completion of a well in the Ellenburger-San Saba Aquifer the District will monitor the static water level in the Ellenburger-San Saba Aquifer on a bi-monthly basis. The data will be presented to the District Board of Directors in an annual report.

8.4 Management Objective

Upon completion of any well in the Hickory Aquifer the District will monitor the static water level in the Hickory Aquifer to track the achievement of the adopted DFC.

Performance Standard(s)

Upon completion of a well in the Ellenburger-San Saba Aquifer the District will monitor the static water level in the Ellenburger-San Saba Aquifer on a bi-monthly basis. The data will be presented to the District Board of Directors in an annual report.

Appendix

TABLE A

Historical Groundwater Use Values TWDB - Water Use Survey

KENDALL COUNTY *99.51% (multiplier)* All values are in acre-feet

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2016	GW	3,680	3	0	0	180	307	4,170
	SW	2,358	0	0	0	190	55	2,603
2015	GW	3,301	2	0	0	249	306	3,858
	SW	2,228	0	0	0	86	54	2,368
2014	GW	3,361	1	0	0	210	300	3,872
	SW	2,306	0	0	0	42	54	2,402
2013	GW	3,529	1	0	0	475	308	4,313
	SW	2,323	0	0	0	75	55	2,453
2012	GW	3,758	1	0	0	572	259	4,590
	SW	2,093	0	0	0	67	47	2,207
2011	GW	4,103	0	0	0	820	408	5,331
	SW	2,010	0	0	0	65	72	2,147
2010	GW	3,466	0	0	0	540	396	4,402
	SW	1,684	0	0	0	150	70	1,904
2009	GW	2,975	0	0	0	732	329	4,036
	SW	1,646	0	0	0	166	58	1,870
2008	GW	3,174	0	0	0	12	299	3,485
	SW	1,590	0	0	0	175	53	1,818
2007	GW	2,764	0	0	0	113	347	3,224
	SW	1,354	0	0	0	0	61	1,415
2006	GW	3,473	0	0	0	137	364	3,974
	SW	1,251	0	0	0	0	64	1,315
2005	GW	3,817	0	0	0	134	335	4,286
	SW	788	0	0	0	0	59	847
2004	GW	3,149	0	0	0	115	170	3,434
	SW	679	0	0	0	104	157	940
2003	GW	3,050	0	0	0	130	164	3,344
	SW	629	0	0	0	356	151	1,136
2002	GW	3,119	0	0	0	722	201	4,042
	SW	468	0	0	0	281	185	934
2001	GW	3,438	0	0	0	722	230	4,390
	SW	60	0	0	0	281	211	552

TABLE B

Projected Surface Water Supplies
TWDB 2017 State Water Plan Data

KENDALL COUNTY *99.51% (multiplier)* All values are in acre-feet

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
L	BOERNE	SAN ANTONIO	BOERNE LAKE/RESERVOIR	645	645	645	645	645	645
L	BOERNE	SAN ANTONIO	CANYON LAKE/RESERVOIR	3,611	3,611	3,611	3,611	3,611	3,611
L	COUNTY-OTHER, KENDALL	GUADALUPE	CANYON LAKE/RESERVOIR	2,488	2,488	2,488	2,488	2,488	2,488
L	FAIR OAKS RANCH	SAN ANTONIO	CANYON LAKE/RESERVOIR	585	690	775	840	895	940
L	IRRIGATION, KENDALL	GUADALUPE	GUADALUPE RUN-OF-RIVER	26	26	26	26	26	26
L	LIVESTOCK, KENDALL	COLORADO	COLORADO LIVESTOCK LOCAL SUPPLY	6	6	6	6	6	6
L	LIVESTOCK, KENDALL	GUADALUPE	GUADALUPE LIVESTOCK LOCAL SUPPLY	158	158	158	158	158	158
L	LIVESTOCK, KENDALL	SAN ANTONIO	SAN ANTONIO LIVESTOCK LOCAL SUPPLY	33	33	33	33	33	33
	Sum of Projected Surface Water Supplies (acre-feet)			**7,552**	**7,657**	**7,742**	**7,807**	**7,862**	**7,907**

TABLE C

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.

KENDALL COUNTY *99.51% (multiplier)* All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
L	BOERNE	SAN ANTONIO	3,091	3,985	4,942	5,900	6,889	7,863
L	COUNTY-OTHER, KENDALL	COLORADO	41	48	57	66	75	85
L	COUNTY-OTHER, KENDALL	GUADALUPE	1,579	1,916	2,278	2,649	3,043	3,433
L	COUNTY-OTHER, KENDALL	SAN ANTONIO	1,037	1,079	1,147	1,251	1,334	1,417
L	FAIR OAKS RANCH	SAN ANTONIO	656	898	1,125	1,290	1,531	1,768
L	IRRIGATION, KENDALL	GUADALUPE	304	298	291	286	281	275
L	IRRIGATION, KENDALL	SAN ANTONIO	70	68	67	65	64	63
L	KENDALL COUNTY WCID #1	GUADALUPE	303	341	384	430	481	531
L	LIVESTOCK, KENDALL	COLORADO	13	13	13	13	13	13
L	LIVESTOCK, KENDALL	GUADALUPE	314	314	314	314	314	314
L	LIVESTOCK, KENDALL	SAN ANTONIO	66	66	66	66	66	66
L	WATER SERVICES INC	SAN ANTONIO	46	54	64	74	85	95
	Sum of Projected Water Demands (acre-feet)		**7,520**	**9,080**	**10,748**	**12,404**	**14,176**	**15,923**

TABLE D

Projected Water Supply Needs
TWDB 2017 State Water Plan Data

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

KENDALL COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
L	BOERNE	SAN ANTONIO	2,159	1,265	308	-650	-1,639	-2,613
L	COUNTY-OTHER, KENDALL	COLORADO	47	40	31	22	13	3
L	COUNTY-OTHER, KENDALL	GUADALUPE	2,327	1,989	1,625	1,252	856	464
L	COUNTY-OTHER, KENDALL	SAN ANTONIO	383	341	272	168	84	1
L	FAIR OAKS RANCH	SAN ANTONIO	540	512	459	426	298	153
L	IRRIGATION, KENDALL	GUADALUPE	55	61	68	73	78	84
L	IRRIGATION, KENDALL	SAN ANTONIO	30	32	33	35	36	37
L	KENDALL COUNTY WCID #1	GUADALUPE	472	434	391	345	294	244
L	LIVESTOCK, KENDALL	COLORADO	0	0	0	0	0	0
L	LIVESTOCK, KENDALL	GUADALUPE	0	0	0	0	0	0
L	LIVESTOCK, KENDALL	SAN ANTONIO	0	0	0	0	0	0
L	WATER SERVICES INC	SAN ANTONIO	28	25	23	18	13	8
	Sum of Projected Water Supply Needs (acre-feet)		**0**	**0**	**0**	**-650**	**-1,639**	**-2,613**

TABLE E

Projected Water Management Strategies
TWDB 2017 State Water Plan Data

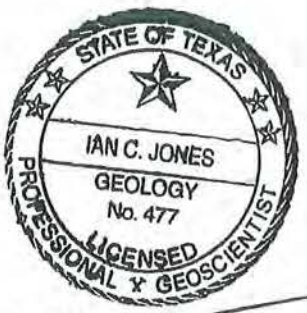
KENDALL COUNTY

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

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
BOERNE, SAN ANTONIO (L)							
LOCAL TRINITY AQUIFER DEVELOPMENT	TRINITY AQUIFER [KENDALL]	0	0	0	1,000	1,000	1,000
MUNICIPAL WATER CONSERVATION (RURAL)	DEMAND REDUCTION [KENDALL]	136	484	985	1,513	1,888	2,294
WESTERN CANYON EXPANSION	CANYON LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	639	1,613
		136	**484**	**985**	**2,513**	**3,527**	**4,907**
COUNTY-OTHER, KENDALL, COLORADO (L)							
MUNICIPAL WATER CONSERVATION (RURAL)	DEMAND REDUCTION [KENDALL]	0	0	0	0	0	0
		0	**0**	**0**	**0**	**0**	**0**
COUNTY-OTHER, KENDALL, GUADALUPE (L)							
MUNICIPAL WATER CONSERVATION (RURAL)	DEMAND REDUCTION [KENDALL]	0	0	0	0	0	9
		0	**0**	**0**	**0**	**0**	**9**
COUNTY-OTHER, KENDALL, SAN ANTONIO (L)							
MUNICIPAL WATER CONSERVATION (RURAL)	DEMAND REDUCTION [KENDALL]	0	0	0	0	0	4
		0	**0**	**0**	**0**	**0**	**4**
FAIR OAKS RANCH, SAN ANTONIO (L)							
MUNICIPAL WATER CONSERVATION (SUBURBAN)	DEMAND REDUCTION [KENDALL]	37	123	243	373	546	715
		37	**123**	**243**	**373**	**546**	**715**
WATER SERVICES INC, SAN ANTONIO (L)							
MUNICIPAL WATER CONSERVATION (RURAL)	DEMAND REDUCTION [KENDALL]	1	1	2	3	5	8
		1	**1**	**2**	**3**	**5**	**8**
Sum of Projected Water Management Strategies (acre-feet)		**174**	**608**	**1,230**	**2,889**	**4,078**	**5,643**

GAM Run 19-011: Cow Creek Groundwater Conservation District Groundwater Management Plan

Ian C. Jones, Ph.D., P.G.
Texas Water Development Board
Groundwater Division
Groundwater Availability Modeling Department
512-463-6641
March 5, 2019



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GAM Run 19-011: Cow Creek Groundwater Conservation District Groundwater Management Plan

Ian C. Jones, Ph.D., P.G.
Texas Water Development Board
Groundwater Division
Groundwater Availability Modeling Department
512-463-6641
March 5, 2019

EXECUTIVE SUMMARY:

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

The TWDB provides data and information to the Cow Creek Groundwater Conservation District in two parts. Part 1 is the Estimated Historical Water Use/State Water Plan dataset report, which will be provided to you separately by the TWDB Groundwater Technical Assistance Department. Please direct questions about the water data report to Mr. Stephen Allen at 512-463-7317 or stephen.allen@twdb.texas.gov. Part 2 is the required groundwater availability modeling information and this information includes:

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

The groundwater management plan for the Cow Creek Groundwater Conservation District should be adopted by the district on or before November 4, 2019 and submitted to the Executive Administrator of the TWDB on or before December 4, 2019. The current management plan for the Cow Creek Groundwater Conservation District expires on

February 2, 2020.

We used two groundwater availability models to estimate the management plan information for the aquifers within the Cow Creek Groundwater Conservation District. Information for the Trinity and Edwards-Trinity (Plateau) aquifers is from version 2.01 of the groundwater availability model for the Hill Country portion of the Trinity Aquifer (Jones and others, 2011). Information for the Ellenburger-San Saba and Hickory aquifers is from version 1.01 of the groundwater availability model for the minor aquifers of the Llano Uplift region (Shi and others, 2016).

This report replaces the results of GAM Run 13-029 (Wade, 2013). GAM Run 19-011 includes results from the newly released groundwater availability model for the minor aquifers of the Llano Uplift Area (Shi and others, 2016). Tables 1 through 4 summarize the groundwater availability model data required by statute and Figures 1 through 4 show the area of the models from which the values in the tables were extracted. If, after review of the figures, the Cow Creek Groundwater Conservation District determines that the district boundaries used in the assessment do not reflect current conditions, please notify the TWDB at your earliest convenience.

METHODS:

In accordance with the provisions of the Texas State Water Code, Section 36.1071, Subsection (h), the two groundwater availability models mentioned above were used to estimate information for the Cow Creek Groundwater Conservation District management plan. Water budgets were extracted for the historical model periods for the Trinity and Edwards-Trinity (Plateau) aquifers (1981 through 1997), and the Ellenburger-San Saba and Hickory aquifers (1980 through 2010) using ZONEBUDGET Version 3.01 (Harbaugh, 2009) or ZONEBUDGET-USG (Panday and others, 2013), as applicable. The average annual water budget values for recharge, surface-water outflow, inflow to the district, and outflow from the district for the aquifers within the district are summarized in this report.

PARAMETERS AND ASSUMPTIONS:

Edwards-Trinity (Plateau) and Trinity Aquifers

- We used version 2.01 of the groundwater availability model for the Hill Country portion of the Trinity Aquifer System. See Jones and others (2011) for assumptions and limitations of the groundwater availability model.
- The groundwater availability model includes four layers, representing (from top to bottom):
    1. the Edwards Group of the Edwards-Trinity (Plateau) Aquifer,
    2. the Upper Trinity Aquifer,
    3. the Middle Trinity Aquifer, and
    4. the Lower Trinity Aquifer.
- Water budget information for the Edwards-Trinity (Plateau) and Trinity aquifers were extracted from active model cells within the respective aquifer footprints.
- The General-Head Boundary (GHB) package of MODFLOW was used to represent flow out of the study area between the Hill Country portion of the Trinity Aquifer and the Edwards (Balcones Fault Zone) Aquifer or the confined parts of the Trinity Aquifer underlying the Edwards (Balcones Fault Zone) Aquifer.
- The groundwater availability model includes some portions of the Edwards Group outside the official boundary of the Edwards-Trinity (Plateau) Aquifer. Though flow for these areas is not explicitly reported, the interaction between the Edwards Group (outside the Edwards-Trinity Plateau Aquifer) and the underlying Trinity Aquifer would be shown in the "flow between aquifers" segment of Table 1, if Layer 1 was present in the district.
- Only the outcrop area of the Hill County portion of the Trinity Aquifer was modeled, and the down-dip extent that underlies the Edwards (Balcones Fault Zone) Aquifer is not included.
- The model was run with MODFLOW-96 (Harbaugh and McDonald, 1996).

Marble Falls, Ellenburger-San Saba, and Hickory Aquifers

- We used version 1.01 of the groundwater availability model for the minor aquifers in the Llano Uplift area. See Shi and others (2016) for assumptions and limitations of the model.
- The groundwater availability model for the minor aquifers in Llano Uplift area contains eight layers: Layer 1 (the Trinity Aquifer, Edwards-Trinity (Plateau) Aquifer, and younger alluvium deposits), Layer 2 (confining units), Layer 3 (the Marble Falls Aquifer and equivalent unit), Layer 4 (confining units), Layer 5 (Ellenburger-San Saba Aquifer and equivalent unit), Layer 6 (confining units), Layer 7 (the Hickory Aquifer and equivalent unit), and Layer 8 (Precambrian units).
- Perennial rivers and reservoirs were simulated using MODFLOW-USG river package. Springs were simulated using MODFLOW-USG drain package. For this management plan, groundwater discharge to surface water includes groundwater leakage to the river and drain boundaries.
- The model was run with MODFLOW-USG beta version (Panday and others, 2013).

RESULTS:

A groundwater budget summarizes the amount of water entering and leaving the aquifers according to the groundwater availability model. Selected groundwater budget components listed below were extracted from the groundwater availability model results for the Trinity, Edwards-Trinity (Plateau), Ellenburger-San Saba, and Hickory aquifers, located within Cow Creek Groundwater Conservation District and averaged over the historical calibration periods, as shown in Tables 1 through 4.

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

each aquifer and aquifer properties of each aquifer or confining unit that define the amount of leakage that occurs.

The information needed for the district's management plan is summarized in Tables 1 through 4. It is important to note that sub-regional water budgets are not exact. This is due to the size of the model cells and the approach used to extract data from the model. To avoid double accounting, a model cell that straddles a political boundary, such as a district or county boundary, is assigned to one side of the boundary based on the location of the centroid of the model cell. For example, if a cell contains two counties, the cell is assigned to the county where the centroid of the cell is located.

TABLE 1. SUMMARIZED INFORMATION FOR THE EDWARDS-TRINITY (PLATEAU) AQUIFER FOR COW CREEK GROUNDWATER CONSERVATION DISTRICT'S GROUNDWATER MANAGEMENT PLAN. ALL VALUES ARE REPORTED IN ACRE-FEET PER YEAR AND ROUNDED TO THE NEAREST 1 ACRE-FOOT.

Management Plan requirement	Aquifer or confining unit	Results
Estimated annual amount of recharge from precipitation to the district	Edwards-Trinity (Plateau) Aquifer	6,046
Estimated annual volume of water that discharges from the aquifer to springs and any surface-water body including lakes, streams, and rivers	Edwards-Trinity (Plateau) Aquifer	3,061
Estimated annual volume of flow into the district within each aquifer in the district	Edwards-Trinity (Plateau) Aquifer	4,020
Estimated annual volume of flow out of the district within each aquifer in the district	Edwards-Trinity (Plateau) Aquifer	290
Estimated net annual volume of flow between each aquifer in the district	Flow from the Edwards-Trinity (Plateau) Aquifer into the Trinity Aquifer	6,429

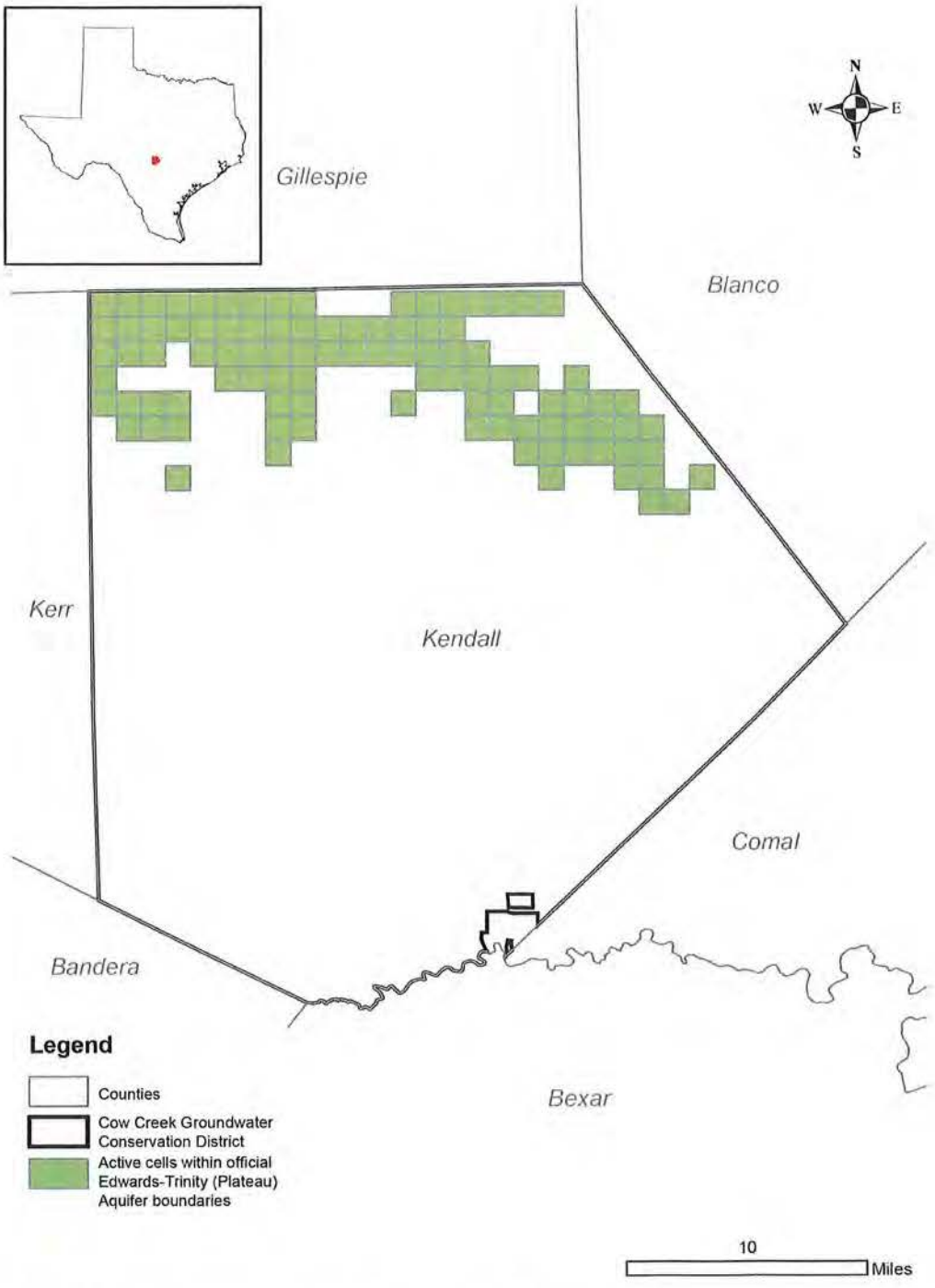

FIGURE 1. AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE EDWARDS-TRINITY (PLATEAU) AQUIFER FROM WHICH THE INFORMATION IN TABLE 1 WAS EXTRACTED (THE AQUIFER SYSTEM EXTENT WITHIN THE DISTRICT BOUNDARY).

TABLE 2. SUMMARIZED INFORMATION FOR THE TRINITY AQUIFER FOR COW CREEK GROUNDWATER CONSERVATION DISTRICT'S GROUNDWATER MANAGEMENT PLAN. ALL VALUES ARE REPORTED IN ACRE-FEET PER YEAR AND ROUNDED TO THE NEAREST 1 ACRE-FOOT.

Management Plan requirement	Aquifer or confining unit	Results
Estimated annual amount of recharge from precipitation to the district	Trinity Aquifer	50,110
Estimated annual volume of water that discharges from the aquifer to springs and any surface-water body including lakes, streams, and rivers	Trinity Aquifer	31,131
Estimated annual volume of flow into the district within each aquifer in the district	Trinity Aquifer	7,917
Estimated annual volume of flow out of the district within each aquifer in the district	Trinity Aquifer	30,915
Estimated net annual volume of flow between each aquifer in the district	Flow from the Edwards-Trinity (Plateau) Aquifer into the Trinity Aquifer	6,429
	Flow from the Edwards Group into the Trinity Aquifer	58

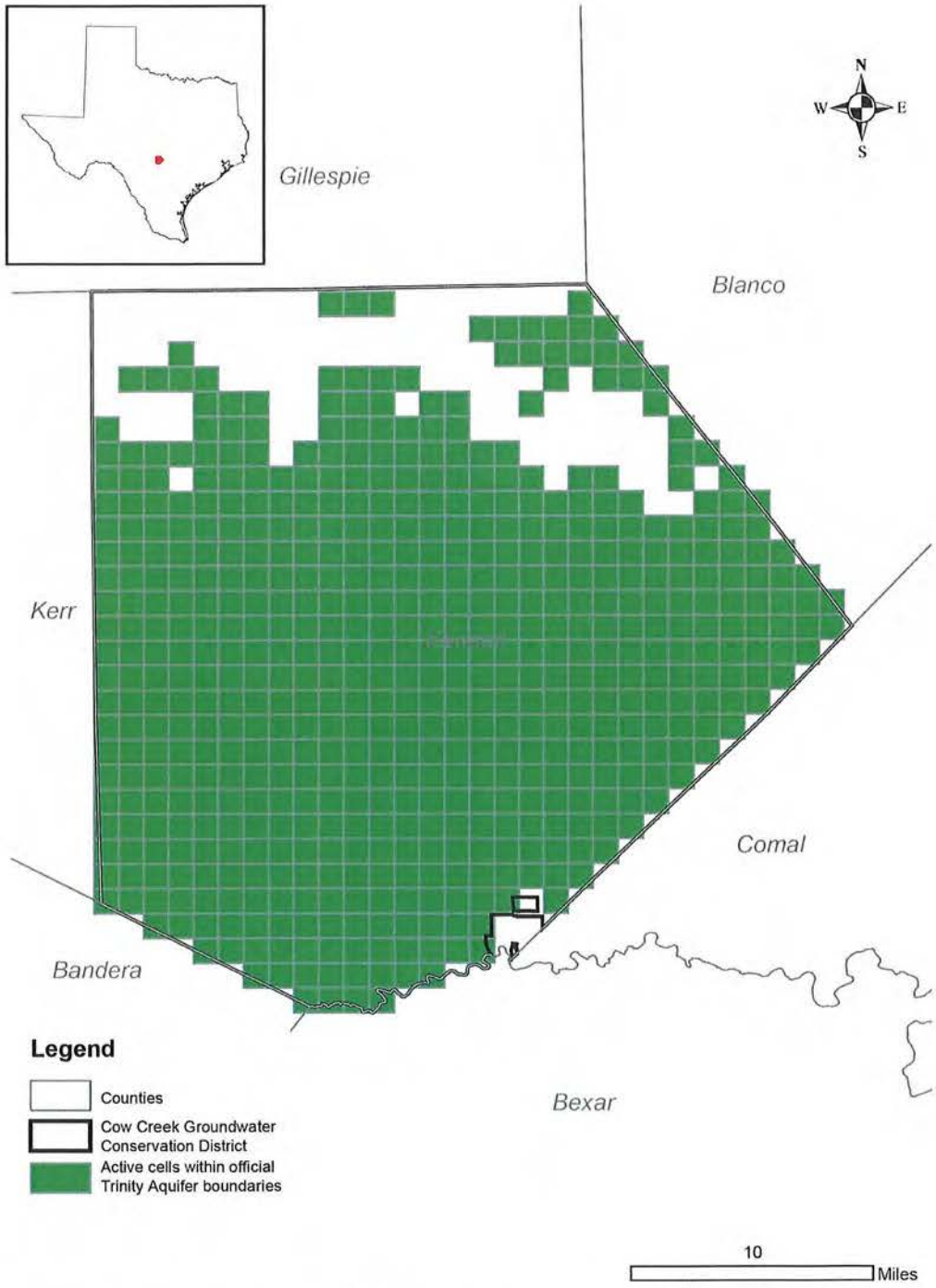

FIGURE 2. AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE TRINITY AQUIFER FROM WHICH THE INFORMATION IN TABLE 2 WAS EXTRACTED (THE AQUIFER SYSTEM EXTENT WITHIN THE DISTRICT BOUNDARY).

TABLE 3. SUMMARIZED INFORMATION FOR THE ELLENBURGER-SAN SABA AQUIFER FOR COW CREEK GROUNDWATER CONSERVATION DISTRICT'S GROUNDWATER MANAGEMENT PLAN. ALL VALUES ARE REPORTED IN ACRE-FEET PER YEAR AND ROUNDED TO THE NEAREST 1 ACRE-FOOT.

Management Plan requirement	Aquifer or confining unit	Results
Estimated annual amount of recharge from precipitation to the district	Ellenburger-San Saba Aquifer	0
Estimated annual volume of water that discharges from the aquifer to springs and any surface-water body including lakes, streams, and rivers	Ellenburger-San Saba Aquifer	0
Estimated annual volume of flow into the district within each aquifer in the district	Ellenburger-San Saba Aquifer	5,059
Estimated annual volume of flow out of the district within each aquifer in the district	Ellenburger-San Saba Aquifer	4,811
Estimated net annual volume of flow between each aquifer in the district	Flow into the Ellenburger-San Saba Aquifer from the Hickory Aquifer	1,626
	Flow from the Ellenburger-San Saba Aquifer to brackish units	3,948
	Flow into the Ellenburger-San Saba Aquifer from overlying confining unit	4,743
	Flow from the Ellenburger-San Saba Aquifer into underlying confining unit	2,746
	Flow into the Ellenburger-San Saba Aquifer from underlying Precambrian units	75

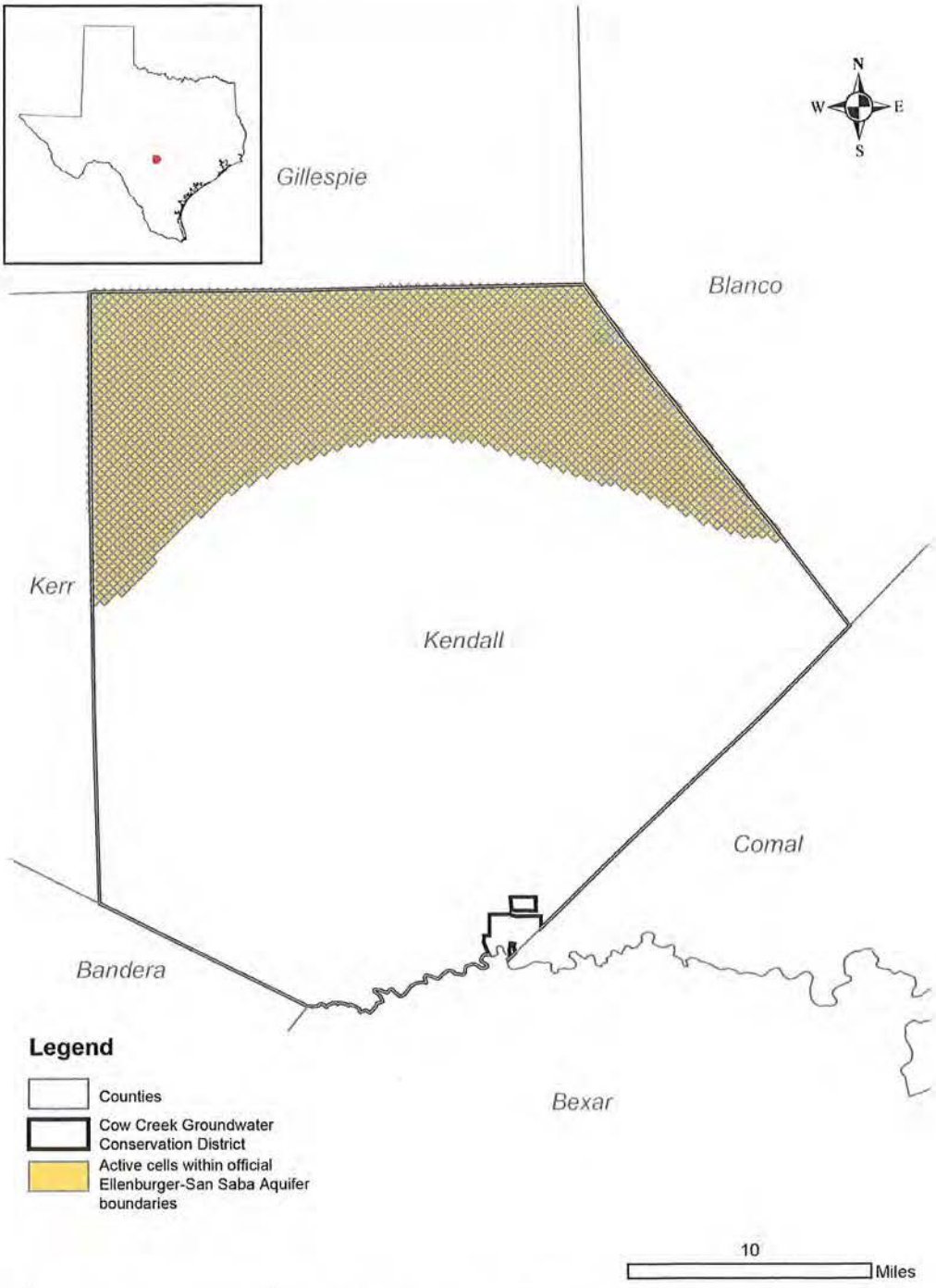

FIGURE 3. AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE ELLENBURGER-SAN SABA AQUIFER FROM WHICH THE INFORMATION IN TABLE 3 WAS EXTRACTED (THE AQUIFER SYSTEM EXTENT WITHIN THE DISTRICT BOUNDARY).

TABLE 4. SUMMARIZED INFORMATION FOR THE HICKORY AQUIFER FOR COW CREEK GROUNDWATER CONSERVATION DISTRICT'S GROUNDWATER MANAGEMENT PLAN. ALL VALUES ARE REPORTED IN ACRE-FEET PER YEAR AND ROUNDED TO THE NEAREST 1 ACRE-FOOT.

Management Plan requirement	Aquifer or confining unit	Results
Estimated annual amount of recharge from precipitation to the district	Hickory Aquifer	0
Estimated annual volume of water that discharges from the aquifer to springs and any surface-water body including lakes, streams, and rivers	Hickory Aquifer	0
Estimated annual volume of flow into the district within each aquifer in the district	Hickory Aquifer	2,696
Estimated annual volume of flow out of the district within each aquifer in the district	Hickory Aquifer	2,065
Estimated net annual volume of flow between each aquifer in the district	Flow from the Hickory Aquifer into the Ellenburger-San Saba Aquifer	1,623
	Flow into the Hickory Aquifer from overlying confining units	2,753
	Flow from the Hickory Aquifer into underlying confining units	200
	Flow into the Hickory Aquifer from brackish Ellenburger-San Saba	1,288
	Flow from the Hickory Aquifer into the brackish Hickory Formation	280

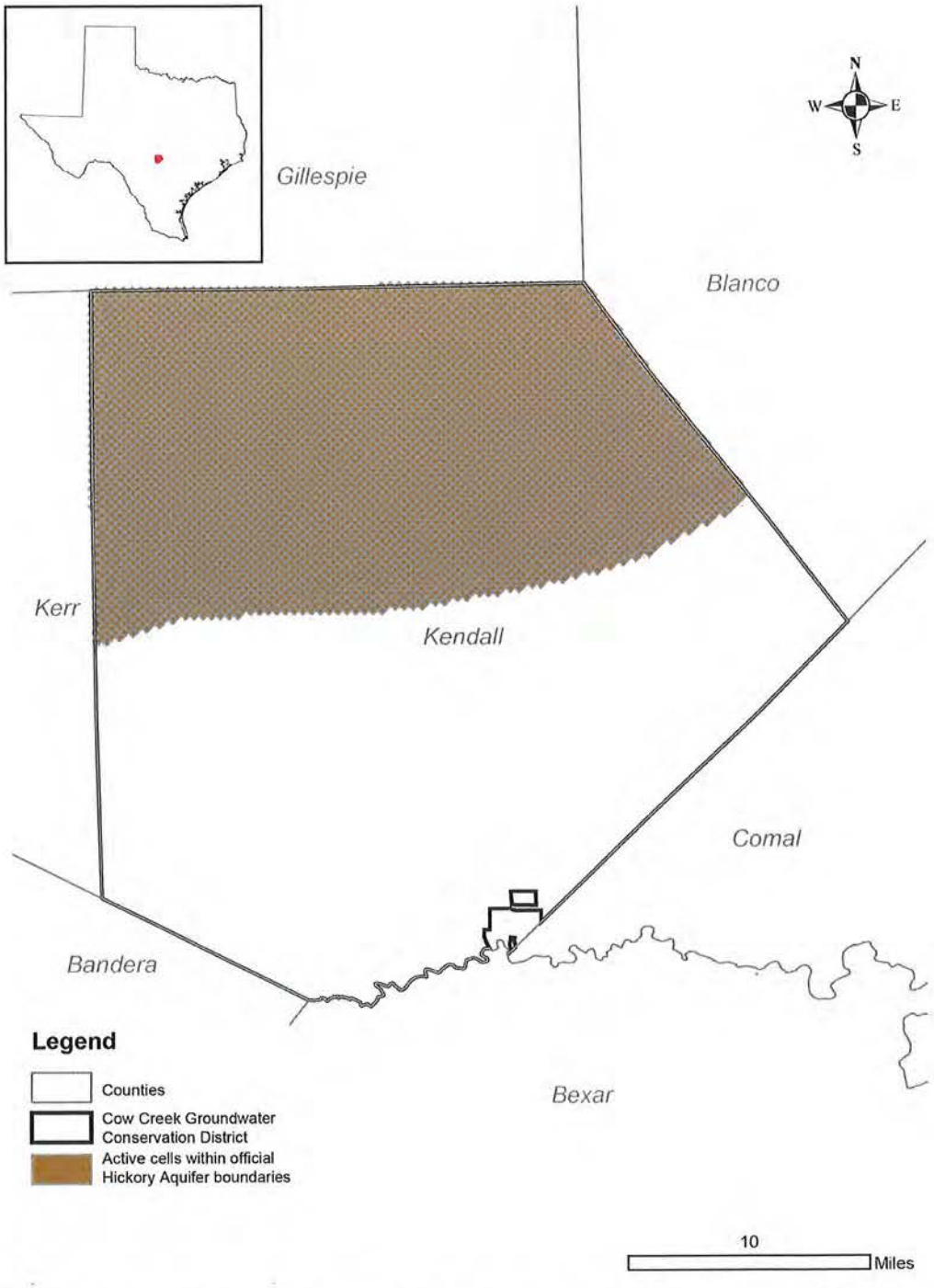

FIGURE 4. AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE HICKORY AQUIFER FROM WHICH THE INFORMATION IN TABLE 4 WAS EXTRACTED (THE AQUIFER SYSTEM EXTENT WITHIN THE DISTRICT BOUNDARY).

LIMITATIONS:

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

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

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

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

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

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Wade, S. C., 2013, GAM Run 13-029: Cow Creek Groundwater Conservation District Management Plan, 22 p., http://www.twdb.texas.gov/groundwater/docs/GAMruns/GR13-029.pdf

GAM Run 21-014 MAG: Modeled Available Groundwater for the Aquifers in Groundwater Management Area 9

Grayson Dowlearn, P.G.
Texas Water Development Board
Groundwater Division
Groundwater Modeling Department
512-475-1552
December 8, 2022

12/8/2022

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GAM Run 21-014 MAG: Modeled Available Groundwater for the Aquifers in Groundwater Management Area 9

Grayson Dowlearn, P.G.
Texas Water Development Board
Groundwater Division
Groundwater Modeling Section
512-475-1552
December 8, 2022

EXECUTIVE SUMMARY:

Groundwater Management Area (GMA) 9 adopted the desired future conditions for the Hickory and Ellenburger-San Saba aquifers, for the combined Trinity Aquifer and Trinity Group of the Edwards-Trinity (Plateau) Aquifer, and for the Edwards Group of the Edwards-Trinity (Plateau) Aquifer on November 15, 2021. Groundwater Management Area 9 submitted a Desired Future Conditions Explanatory Report (GMA 9 and others, 2021) and other supporting documents to the Texas Water Development Board (TWDB) on December 9, 2021. The TWDB determined that the explanatory report and other materials submitted by the district representatives were administratively complete on November 8, 2022.

Modeled available groundwater estimates are approximately 140 acre-feet per year for the Hickory Aquifer and approximately 60 acre-feet per year for the Ellenburger-San Saba Aquifer for the period between 2020 and 2080. Modeled available groundwater estimates range between a maximum of 90,264 acre-feet per year in 2020 and a minimum of 89,491 acre-feet per year in 2060 for the combination of Trinity Aquifer and Trinity group of the Edwards-Trinity (Plateau) Aquifer within Groundwater Management Area 9. Modeled available groundwater estimates are approximately 2,210 acre-feet per year for the Edwards Group of the Edwards-Trinity (Plateau) Aquifer for the period between 2020 and 2080. Modeled available groundwater estimates are provided in Tables 2 through 10.

Figure 1 provides the groundwater conservation district and county boundaries within Groundwater Management Area 9. Figure 2 provides the county, regional water planning area, and river basin boundaries within Groundwater Management Area 9.

REQUESTOR:

Mr. Ronald Fieseler, General Manager of Blanco Pedernales Groundwater Conservation District and Administrator of Groundwater Management Area 9.

DESCRIPTION OF REQUEST:

Mr. Ronald Fieseler provided the TWDB with the desired future conditions of the aquifers within Groundwater Management Area 9 on behalf of Groundwater Management Area (GMA) 9 in a letter dated December 9, 2021. Groundwater conservation district representatives in Groundwater Management Area 9 adopted desired future conditions for the aquifers within Groundwater Management Area 9 on November 15, 2021, as described in Resolution No. 111521-01 (Appendix D in GMA 9 and others, 2021). Desired future conditions are listed in Table 1 and represent average water level drawdowns across the specified area until the specified ending year.

TABLE 1. DESIRED FUTURE CONDITIONS FOR GROUNDWATER MANAGEMENT AREA 9 EXPRESSED AS AVERAGE DRAWDOWN (ADAPTED FROM SUBMITTED RESOLUTION).

Major or minor aquifer	Desired future condition
Trinity Aquifer and Trinity Group of the Edwards-Trinity (Plateau) Aquifer	Allow for an increase in average drawdown of approximately 30 feet through 2060 (throughout GMA 9) consistent with "Scenario 6" in TWDB GAM Task 10-005
Edwards Group of Edwards-Trinity (Plateau)	Allow for no net increase in average drawdown in Bandera and Kendall counties through 2080
Ellenburger-San Saba	Allow for an increase in average drawdown of no more than 7 feet in Kendall County through 2080
Hickory	Allow for an increase in average drawdown of no more than 7 feet in Kendall County through 2080

Additionally, Groundwater Management Area 9 voted to declare certain aquifers and/or portions of aquifers to be non-relevant for the purposes of joint planning, as shown in Table 2.

TABLE 2. AQUIFERS AND PORTIONS OF AQUIFERS WHICH WERE DECLARED NON-RELEVANT FOR THE PURPOSES OF JOINT PLANNING WITHIN GROUNDWATER MANAGEMENT AREA 9.

Major or minor aquifer	Non-relevant area
Edwards (Balcones Fault Zone) Aquifer	Entire aquifer (Bexar, Comal, Hays, and Travis counties)
Edwards Group of Edwards-Trinity (Plateau) Aquifer	Portion in Blanco and Kerr counties
Ellenburger-San Saba Aquifer	Portion in Blanco and Kerr counties
Hickory Aquifer	Portion in Blanco, Hays, Kerr, and Travis counties
Marble Falls Aquifer	Entire aquifer (Blanco County)

After reviewing the submitted documents, TWDB staff requested clarifications regarding the methodology and assumptions used in the definitions of desired future conditions. Appendix A includes the responses to these clarifications that Groundwater Management Area 9 provided to the TWDB on October 17, 2022.

METHODS:

Hickory and Ellenburger-San Saba Aquifers

The groundwater availability model for the minor aquifers of the Llano Uplift Region of Texas (Version 1.01; Shi and others, 2016a, 2016b) was used to calculate the drawdown and modeled available groundwater for the Hickory and Ellenburger-San Saba aquifers (Llano Uplift aquifers) within Groundwater Management Area 9. The predictive model files used in the evaluation were originally developed by the TWDB in the previous joint planning cycle for GAM Run 16-023 (Jones, 2017). The evaluation in GAM Run 16-023 only went to 2070, so the TWDB extended the model files to 2080 for this evaluation.

Pumping was distributed evenly across the Kendall County portion of the Llano Uplift aquifers and then varied until the desired future condition was achieved within the accepted tolerance defined by Groundwater Management Area 9. Modeled water levels were extracted for December 2010 (initial water levels equivalent to the final stress period of the historically calibrated model) and December 2080 (stress period 70). Drawdown was calculated as the difference in water levels between those two endpoints. Drawdown averages were calculated by aquifer for each area specified in the desired future conditions. The modeled available groundwater values were determined by extracting pumping rates by decade from the model results using ZONEBUDGET USG Version 1.00 (Panday and others, 2013).

Trinity Aquifer and Trinity Group of the Edwards-Trinity (Plateau) Aquifer

The groundwater availability model for the Hill Country Portion of the Trinity Aquifer (Version 2.01; Jones and others, 2011) was used to calculate the drawdown and modeled available groundwater values for the combination of Trinity Aquifer and Trinity Group of the Edwards-Trinity (Plateau) Aquifer within Groundwater Management Area 9. Predictive model files from TWDB GAM Task 10-005 (Hutchison, 2010) were used, as specified by Resolution No. 111521-01 (Appendix D in GMA 9 and others, 2021). GAM Task 10-005 (Hutchison, 2010) ran a predictive pumping scenario ("Scenario 6") under 387 different recharge conditions. For every model run, modeled water levels were extracted for December 2008 (initial water levels) and December 2060 (stress period 50), and drawdown was calculated as the difference in water level between those two endpoints. The drawdown average across Groundwater Management Area 9 was calculated as the average of the 387 scenarios. The TWDB confirmed that the desired future conditions adopted by Groundwater Management Area 9 are achievable using this methodology. The modeled available groundwater values were determined by extracting pumping rates by decade from each model run's results and then averaging the modeled pumping rates from the 387 scenarios using custom Fortran scripts developed by the TWDB for Task 10-005 (Hutchison, 2010).

Edwards Group of the Edwards-Trinity (Plateau) Aquifer

The groundwater availability model for the Hill Country Portion of the Trinity Aquifer (Version 2.01; Jones and others, 2011) was also used to calculate the drawdown and modeled available

groundwater for the Edwards Group of the Edwards-Trinity (Plateau) Aquifer within Groundwater Management Area 9. The predictive model files used in the evaluation were originally developed by the TWDB in the previous joint planning cycle for GAM Run 16-023 (Jones, 2017). The evaluation in GAM Run 16-023 only went to 2070, so the TWDB extended these model files to 2080 for this evaluation.

The TWDB created a predictive pumping scenario by copying "Scenario 6" from TWDB Task 10-005 and then varying Edwards Group pumping by a constant multiplier across Bandera and Kendall counties until the desired future condition was achieved within the accepted tolerance defined by Groundwater Management Area 9. The TWDB used these predictive model files to extract modeled water levels from December 1997 (initial water levels equivalent to the final stress period of the historically calibrated model) and December 2080 (stress period 83) and drawdown was calculated as the difference in water level between those two endpoints. The modeled available groundwater values were determined by extracting pumping rates by decade from the model results using ZONEBUDGET Version 3.01 (Harbaugh, 2009).

Modeled Available Groundwater and Permitting

As defined in Chapter 36 of the Texas Water Code (2011), "modeled available groundwater" is the estimated average amount of water that may be produced annually to achieve a desired future condition. Groundwater conservation districts are required to consider modeled available groundwater, along with several other factors, when issuing permits in order to manage groundwater production to achieve the desired future condition(s). The other factors districts must consider include annual precipitation and production patterns, the estimated amount of pumping exempt from permitting, existing permits, and a reasonable estimate of actual groundwater production under existing permits.

PARAMETERS AND ASSUMPTIONS:

Hickory and Ellenburger-San Saba aquifers

- Version 1.01 of the groundwater availability model for the minor aquifers of the Llano Uplift Region of Texas was the base model for this analysis. See Shi and others (2016a, 2016b) for assumptions and limitations of the historical calibrated model.
- In the previous joint planning cycle, the TWDB created predictive model files to extend the base model to 2070 for planning purposes. For the current analysis, these model files were extended an additional ten years to 2080 using the same assumptions used in the previous cycle. See GAM Run 16-023 (Jones, 2017) for assumptions and limitations of this predictive model simulation.
- The model has eight layers, which represent the Cretaceous age and younger water-bearing units (Layer 1), Permian and Pennsylvanian age confining units (Layer 2), the Marble Falls Aquifer and equivalent (Layer 3), Mississippian age confining units (Layer 4), the Ellenburger-San Saba Aquifer and equivalent (Layer 5), Cambrian age confining units (Layer 6), the Hickory Aquifer and equivalent (Layer 7), and Precambrian age confining units (Layer 8).
- To be consistent with assumptions made by Groundwater Management Area 9 (see GMA 9 and others, 2021), the TWDB assumed a tolerance of five percent of the drawdown when comparing desired future conditions to modeled drawdown results.

- The model was run with MODFLOW-USG (Panday and others, 2013).
- Drawdown averages and modeled available groundwater volumes were calculated based on the extent of the official TWDB aquifer boundary (Figures 3 and 4). The most recent TWDB model grid file dated August 23, 2022 (*lnup_grid_poly082322.csv*) was used to determine model cell entity assignment (county, groundwater management area, groundwater conservation district, river basin, regional water planning area).
- Drawdowns for cells that became dry during the simulation were excluded from the drawdown averages. Pumping in dry cells was excluded from the modeled available groundwater calculations.
- Estimates of modeled available groundwater from the model simulation were rounded to the nearest whole number.

Trinity Aquifer and Edwards-Trinity (Plateau) Aquifer

- Version 2.01 of the groundwater availability model for the Hill Country Portion of the Trinity Aquifer was the base model for this analysis. See Jones and others (2011) for assumptions and limitations of the historical calibrated model.
- The model has four layers which represent the Edwards Group of the Edwards-Trinity (Plateau) Aquifer (Layer 1), the Upper Trinity hydrostratigraphic unit (Layer 2), the Middle Trinity hydrostratigraphic unit (Layer 3), and the Lower Trinity hydrostratigraphic unit (Layer 4).
- The evaluation of the Trinity Aquifer and the Trinity Group of the Edwards-Trinity (Plateau) Aquifer used predictive model files created by the TWDB that extended the base model to 2060 for planning purposes and represented 387 different potential recharge scenarios. See GAM Task 10-005 (Hutchison, 2010) for the assumptions and limitations of these predictive model simulations.
- The evaluation of the Edwards Group of the Edwards-Trinity (Plateau) Aquifer used predictive model files created by the TWDB during the previous joint planning cycle that extended the base model to 2070 for planning purposes. For the current analysis, the TWDB extended these model files an additional ten years to 2080 using the same assumptions used in the previous cycle. See GAM Run 16-023 (Jones, 2017) for assumptions and limitations of this predictive model simulation.
- Although the base model (Jones and others, 2011) was only calibrated to 1997, the TWDB developed a subsequent steady-state version of the model representing observed conditions in the Trinity Aquifer as of 2008 (Chowdhury, 2010). Since that model provided the initial water levels for the GAM Task 10-005 (Hutchison, 2010) predictive model files, the reference year of 2008 can be used for drawdown calculations for the Trinity Aquifer and the Trinity Group of Edwards-Trinity (Plateau) Aquifer. Since this verification did not apply to the Edwards Group of the Edwards-Trinity (Plateau) Aquifer, the original reference year of 1997 from the base model was used for drawdown calculations in that unit.
- Drawdowns for cells that became dry during the simulation were excluded from the drawdown averages. Pumping volumes are reduced to zero if a cell becomes dry during the predictive model run. The modeled available groundwater values do not include dry cells for decades after the cell becomes dry.

- Drawdown averages and modeled available groundwater volumes were calculated based on the extent of active model cells, not the official TWDB aquifer boundary (Figures 5 and 6). The most recent TWDB model grid file dated August 15, 2022 (*trnt_h_grid_poly081522.csv*) was used to determine model cell entity assignment (county, groundwater management area, groundwater conservation district, river basin, regional water planning area).
- To be consistent with Groundwater Management Area 9's assumptions (see GMA 9 and others, 2021), a tolerance of five percent of the desired future condition drawdown was assumed when comparing desired future conditions to modeled drawdown results.
- The model was run with MODFLOW-96 (Harbaugh and McDonald, 1996)
- Estimates of modeled available groundwater from the model simulation were rounded to the nearest whole number.

RESULTS:

The modeled available groundwater estimates that achieve the desired future conditions adopted by Groundwater Management Area 9 are as follows:

- Hickory Aquifer: 140 acre-feet per year (summarized by county and groundwater conservation district in Table 3 and by county, regional water planning area, and river basin in Table 4).
- Ellenburger-San Saba Aquifer: Approximately 60 acre-feet per year for the that (summarized by county and groundwater conservation district in Table 5 and by county, regional water planning area, and river basin in Table 6).
- Combined Trinity Aquifer and Trinity Group of the Edwards-Trinity (Plateau) Aquifer: Ranges from a maximum of 90,264 acre-feet per year in 2020 and a minimum of 89,491 acre-feet per year in 2060 (summarized by county and groundwater conservation district in Table 7 and by county, regional water planning area, and river basin in Table 8).
- Edwards Group of the Edwards-Trinity (Plateau) Aquifer: 2,210 acre-feet per year (summarized by county and groundwater conservation district in Table 9 and by county, regional water planning area, and river basin in Table 10).

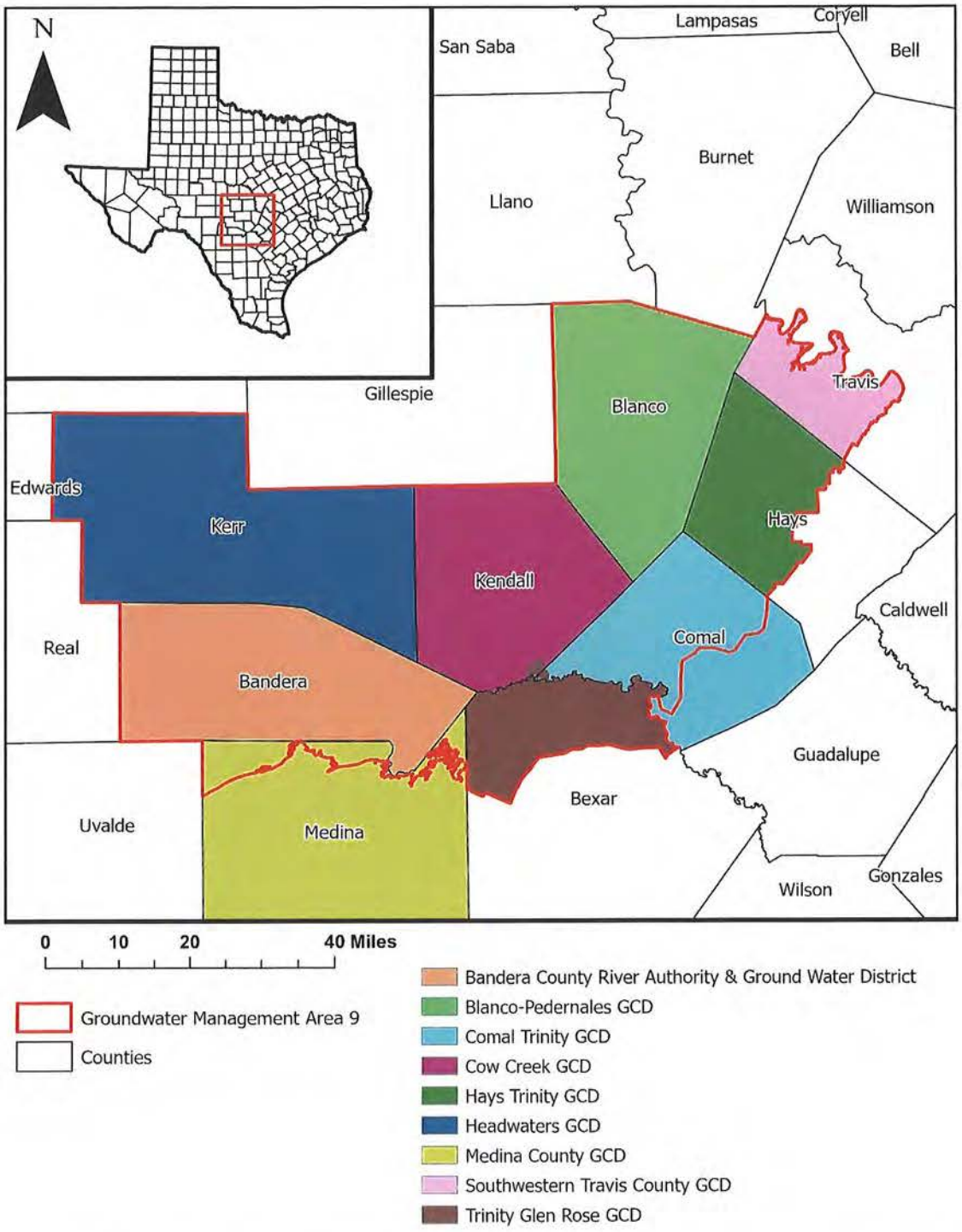

FIGURE 1. MAP SHOWING GROUNDWATER MANAGEMENT AREA 9, GROUNDWATER CONSERVATION DISTRICTS (GCD), AND COUNTY BOUNDARIES.

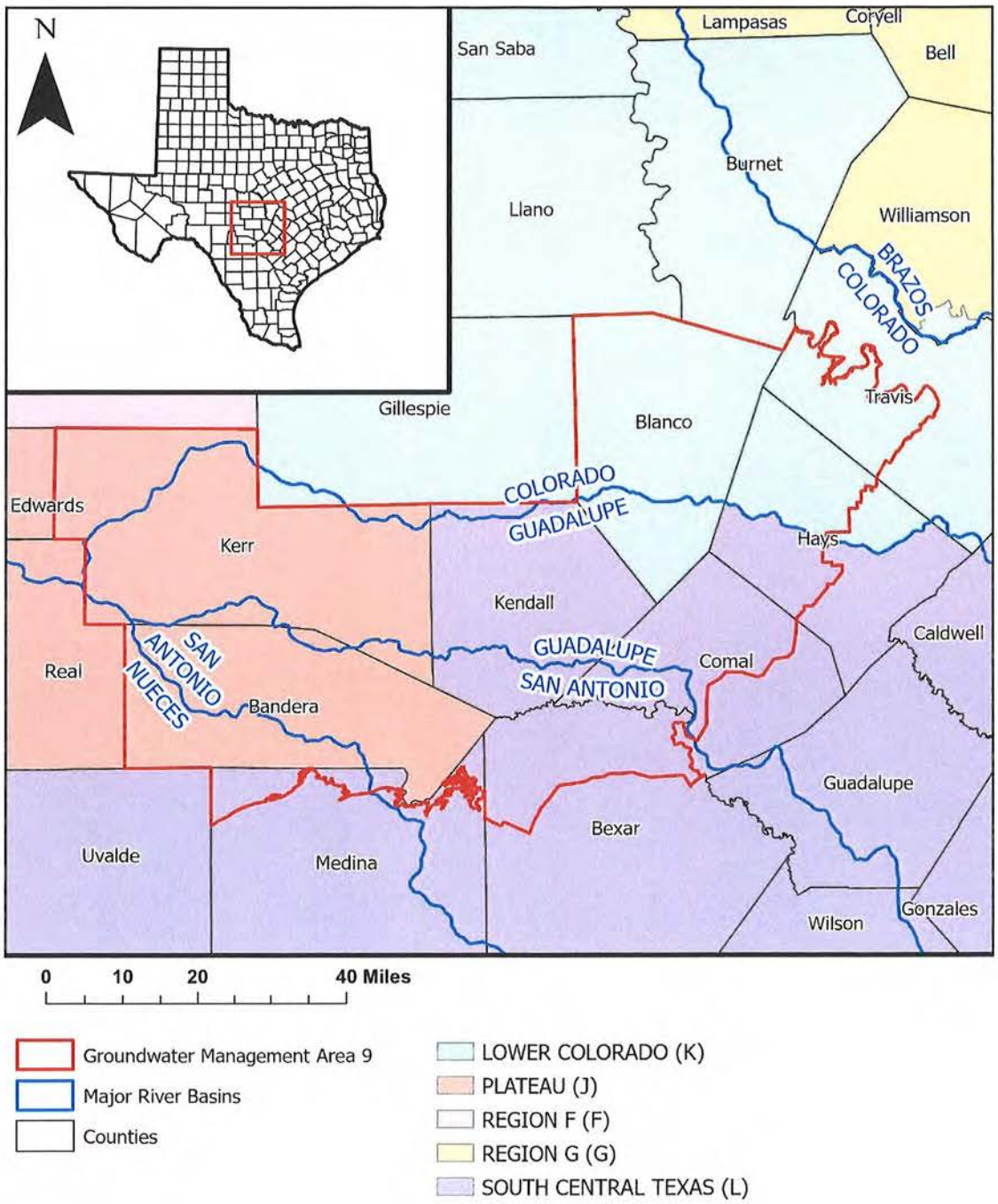

FIGURE 2. MAP SHOWING GROUNDWATER MANAGEMENT AREA 9, REGIONAL WATER PLANNING AREAS, RIVER BASINS, AND COUNTY BOUNDARIES.

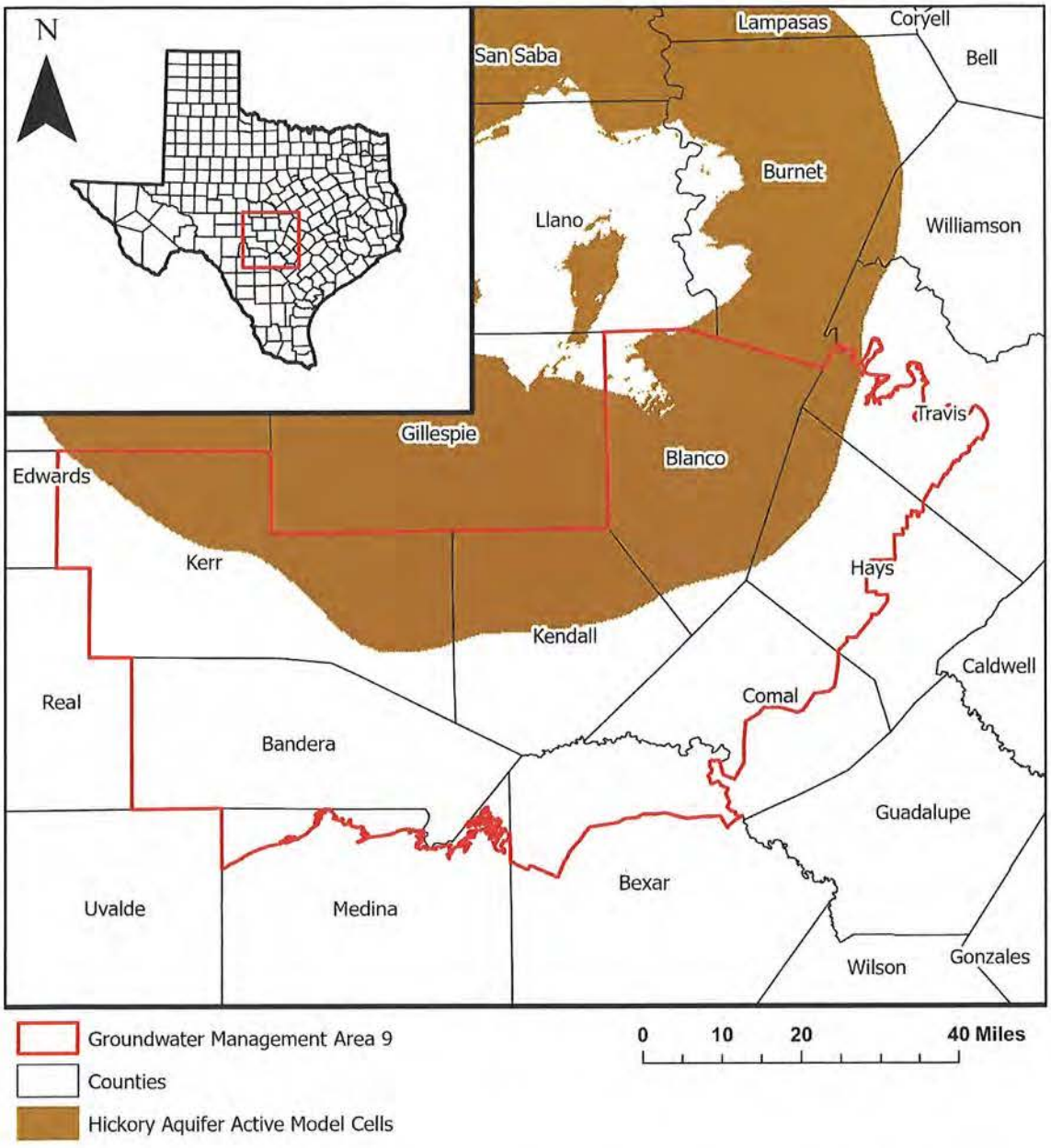

FIGURE 3. MAP SHOWING THE ACTIVE MODEL CELLS REPRESENTING THE HICKORY AQUIFER (LAYER 7) IN THE MINOR AQUIFERS OF THE LLANO UPLIFT REGION OF TEXAS GROUNDWATER AVAILABILITY MODEL IN RELATION TO GROUNDWATER MANAGEMENT AREA 9.

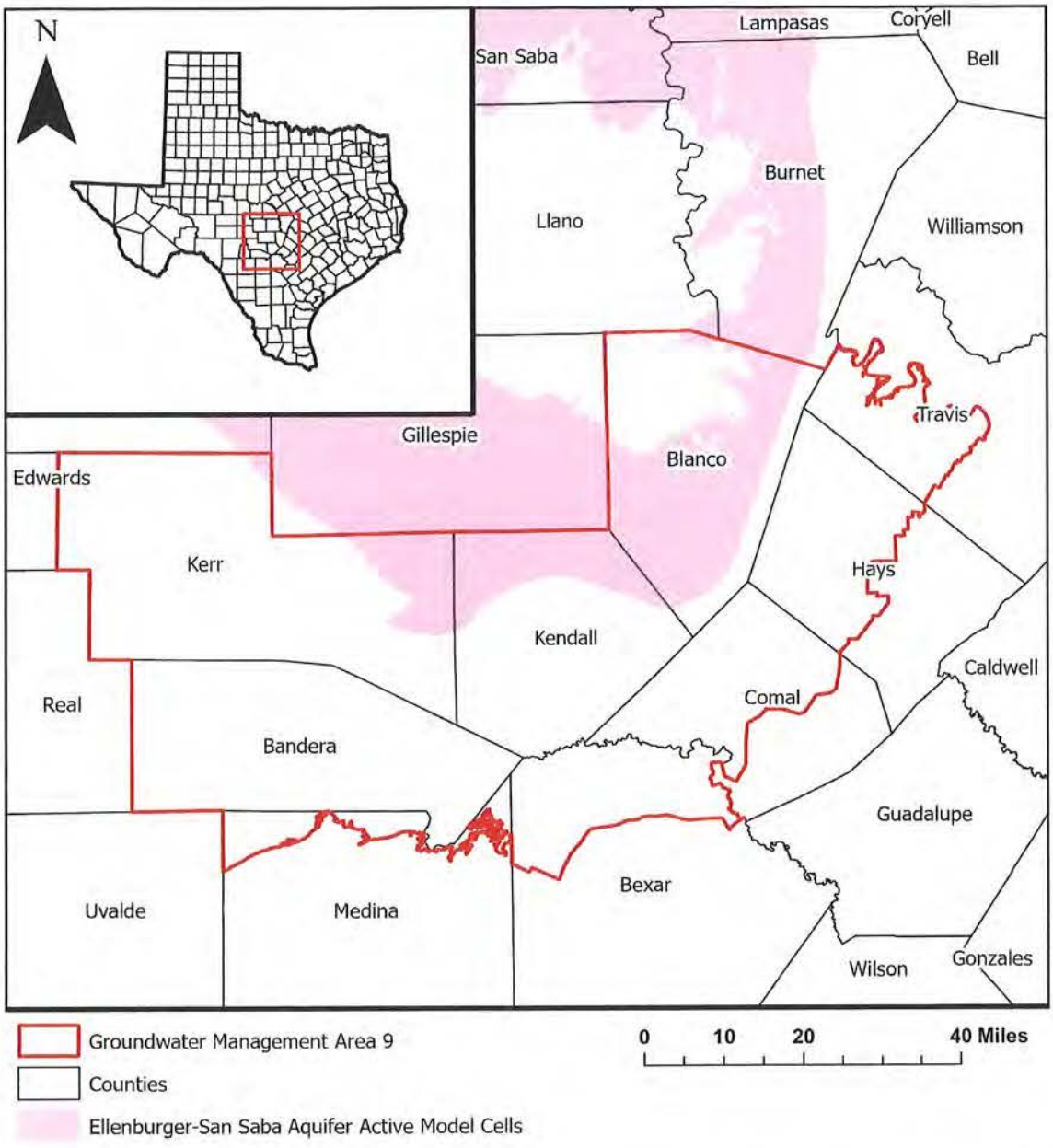

FIGURE 4. MAP SHOWING THE ACTIVE MODEL CELLS REPRESENTING THE ELLENBURGER-SAN SABA AQUIFER (LAYER 5) IN THE MINOR AQUIFERS OF THE LLANO UPLIFT REGION OF TEXAS GROUNDWATER AVAILABILITY MODEL IN RELATION TO GROUNDWATER MANAGEMENT AREA 9.

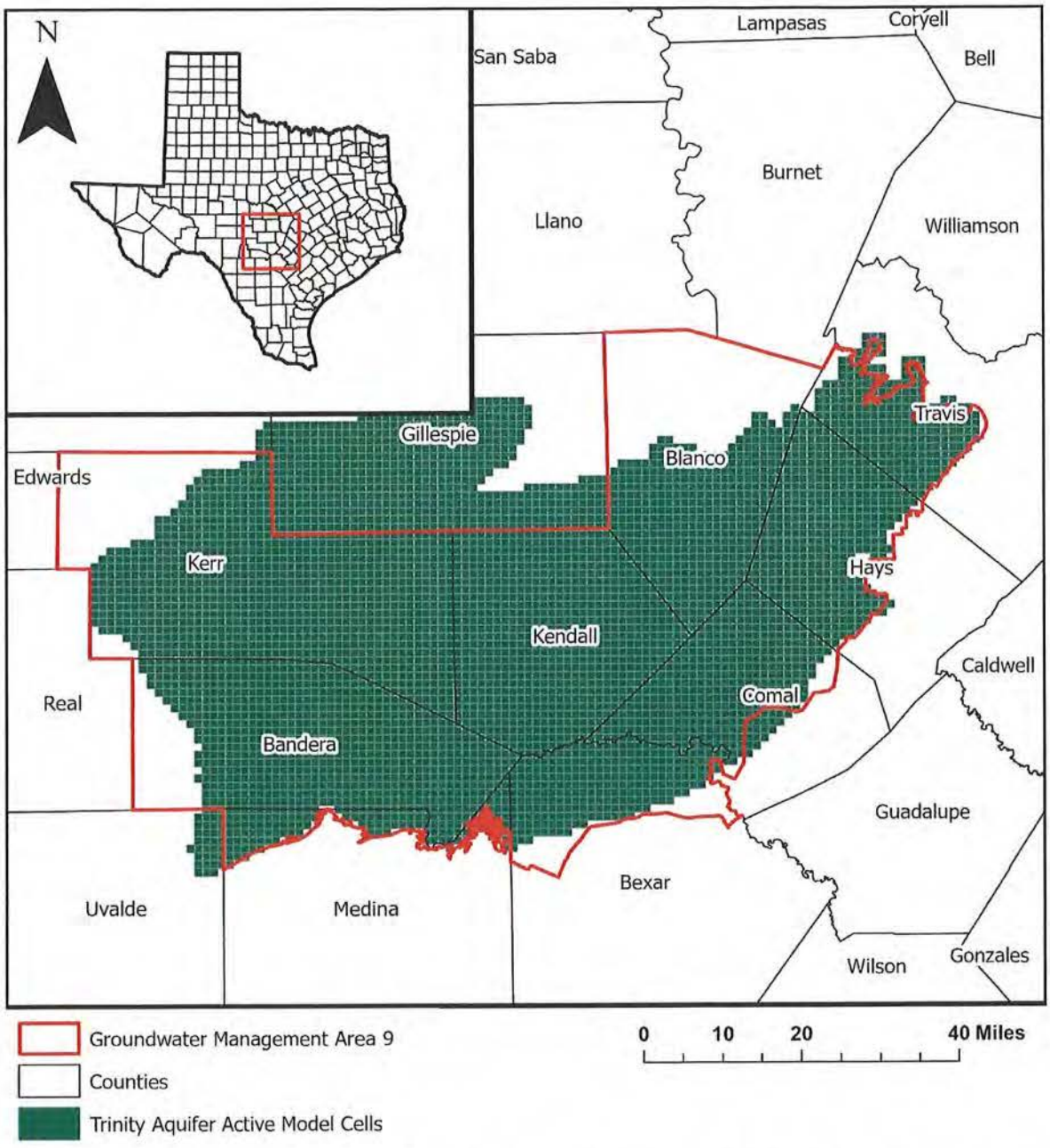

FIGURE 5. MAP SHOWING THE ACTIVE MODEL CELLS REPRESENTING THE TRINITY AQUIFER AND TRINITY GROUP OF THE EDWARDS-TRINITY (PLATEAU) AQUIFER (LAYERS 2, 3, AND 4) IN THE HILL COUNTRY PORTION OF THE TRINITY AQUIFER GROUNDWATER AVAILABILITY MODEL IN RELATION TO GROUNDWATER MANAGEMENT AREA 9.

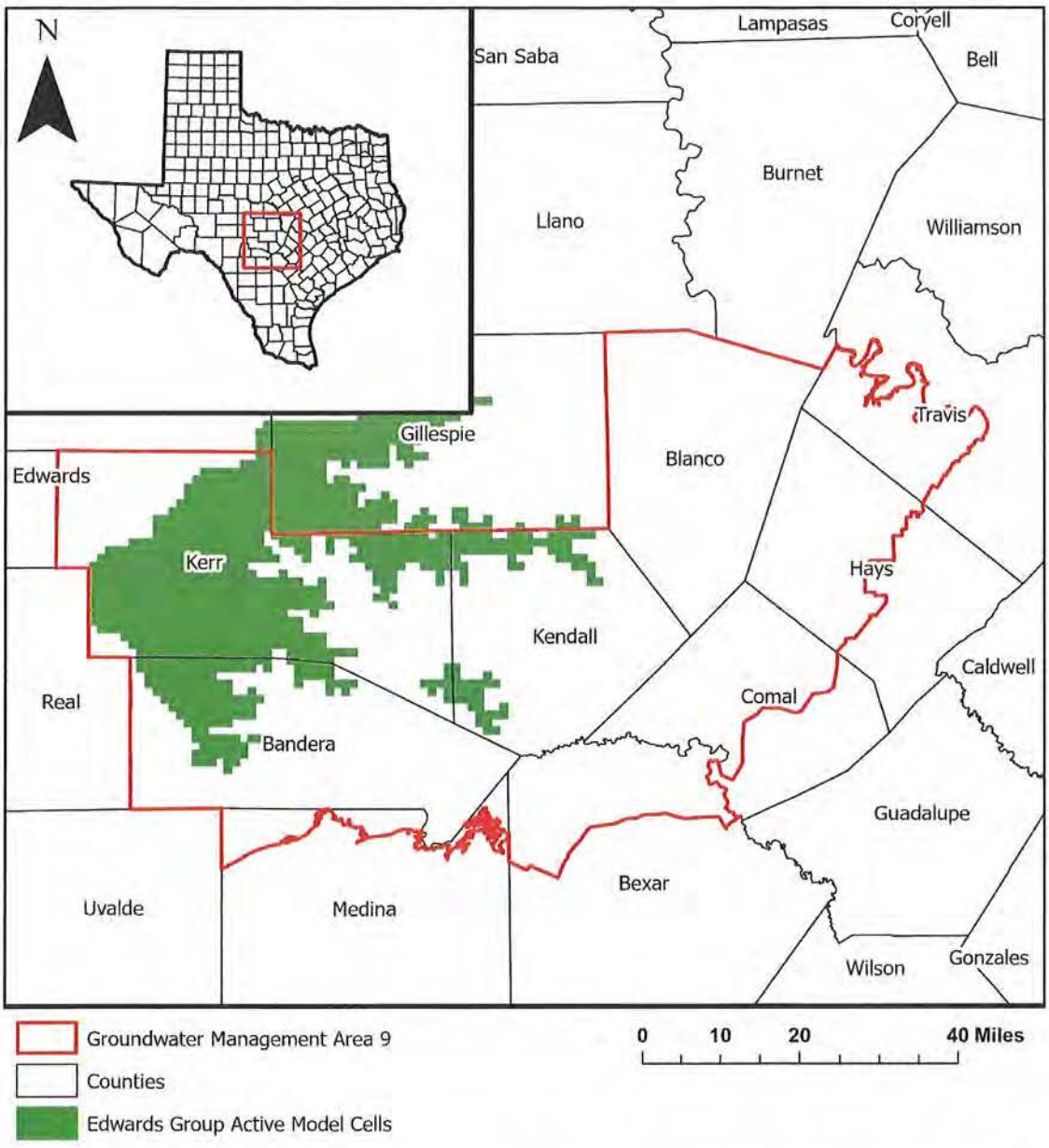

FIGURE 6. MAP SHOWING THE ACTIVE MODEL CELLS REPRESENTING THE EDWARDS GROUP OF THE EDWARDS-TRINITY (PLATEAU) AQUIFER (LAYER 1) IN THE HILL COUNTRY PORTION OF THE TRINITY AQUIFER GROUNDWATER AVAILABILITY MODEL IN RELATION TO GROUNDWATER MANAGEMENT AREA 9.

TABLE 3. MODELED AVAILABLE GROUNDWATER FOR THE HICKORY AQUIFER IN GROUNDWATER MANAGEMENT AREA 9 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.

Groundwater Conservation District (GCD)	County	Aquifer	2020	2030	2040	2050	2060	2070	2080
Cow Creek GCD	Kendall	Hickory	141	140	141	140	141	140	141

TABLE 4. MODELED AVAILABLE GROUNDWATER FOR THE HICKORY AQUIFER IN GROUNDWATER MANAGEMENT AREA 9. RESULTS ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN FOR EACH DECADE FROM 2030 TO 2080. VALUES ARE IN ACRE-FEET PER YEAR.

County	RWPA	Basin	Aquifer	2030	2040	2050	2060	2070	2080
Kendall	L	Colorado	Hickory	12	12	12	12	12	12
Kendall	L	Guadalupe	Hickory	128	128	128	128	128	128
Groundwater Management Area 9 Total			**Hickory**	**140**	**140**	**140**	**140**	**140**	**140**

TABLE 5. MODELED AVAILABLE GROUNDWATER FOR THE ELLENBURGER-SAN SABA AQUIFER IN GROUNDWATER MANAGEMENT AREA 9 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.

Groundwater Conservation District (GCD)	County	Aquifer	2020	2030	2040	2050	2060	2070	2080
Cow Creek GCD	Kendall	Ellenberger-San Saba	62	62	62	62	62	62	62

TABLE 6. MODELED AVAILABLE GROUNDWATER FOR THE ELLENBURGER-SAN SABA AQUIFER IN GROUNDWATER MANAGEMENT AREA 9. RESULTS ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN FOR EACH DECADE FROM 2030 TO 2080. VALUES ARE IN ACRE-FEET PER YEAR.

County	RWPA	Basin	Aquifer	2030	2040	2050	2060	2070	2080
Kendall	L	Colorado	Ellenberger-San Saba	9	9	9	9	9	9
Kendall	L	Guadalupe	Ellenberger-San Saba	53	54	53	54	53	54
Groundwater Management Area 9 Total			**Ellenberger-San Saba**	**62**	**63**	**62**	**63**	**62**	**63**

TABLE 7. MODELED AVAILABLE GROUNDWATER FOR THE TRINITY AQUIFER AND TRINITY GROUP OF THE EDWARDS-TRINITY (PLATEAU) AQUIFER IN GROUNDWATER MANAGEMENT AREA 9 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2060. VALUES ARE IN ACRE-FEET PER YEAR.

Groundwater Conservation District	County	Aquifer	2020	2030	2040	2050	2060
Bandera County River Authority & Ground Water District	Bandera	Trinity	7,284	7,284	7,284	7,284	7,284
Blanco-Pedernales GCD	Blanco	Trinity	2,573	2,573	2,573	2,573	2,573
Comal Trinity GCD	Comal	Trinity	9,383	9,383	9,383	9,383	9,383
Cow Creek GCD	Kendall	Trinity	10,622	10,622	10,622	10,622	10,622
Hays Trinity GCD	Hays	Trinity	9,074	9,071	9,070	9,070	9,070
Headwaters GCD	Kerr	Trinity	14,918	14,845	14,556	14,239	14,223
Medina County GCD	Medina	Trinity	2,340	2,340	2,340	2,340	2,340
Southwestern Travis County GCD	Travis	Trinity	8,559	8,542	8,530	8,515	8,485
Trinity Glen Rose GCD	Bexar	Trinity	24,856	24,856	24,856	24,856	24,856
	Comal	Trinity	138	138	138	138	138
	Kendall	Trinity	517	517	517	517	517
Trinity Glen Rose GCD Total		**Trinity**	**25,511**	**25,511**	**25,511**	**25,511**	**25,511**
Groundwater Management Area 9 Total		**Trinity**	**90,264**	**90,171**	**89,869**	**89,537**	**89,491**

TABLE 8 MODELED AVAILABLE GROUNDWATER FOR THE TRINTY AQUIFER AND TRINITY GROUP OF THE EDWARDS-TRINITY (PLATEAU) AQUIFER IN GROUNDWATER MANAGEMENT AREA 9. RESULTS ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN FOR EACH DECADE FROM 2030 TO 2060. VALUES ARE IN ACRE-FEET PER YEAR.

County	RWPA	Basin	Aquifer	2030	2040	2050	2060
Bandera	J	Guadalupe	Trinity	76	76	76	76
Bandera	J	Nueces	Trinity	903	903	903	903
Bandera	J	San Antonio	Trinity	6,305	6,305	6,305	6,305
Bexar	L	San Antonio	Trinity	24,856	24,856	24,856	24,856
Blanco	K	Colorado	Trinity	1,322	1,322	1,322	1,322
Blanco	K	Guadalupe	Trinity	1,251	1,251	1,251	1,251
Comal	L	Guadalupe	Trinity	6,252	6,252	6,252	6,252
Comal	L	San Antonio	Trinity	3,269	3,269	3,269	3,269
Hays	K	Colorado	Trinity	4,707	4,706	4,706	4,706
Hays	L	Guadalupe	Trinity	4,364	4,364	4,364	4,364
Kendall	L	Colorado	Trinity	135	135	135	135
Kendall	L	Guadalupe	Trinity	6,028	6,028	6,028	6,028
Kendall	L	San Antonio	Trinity	4,976	4,976	4,976	4,976
Kerr	J	Colorado	Trinity	318	318	318	318
Kerr	J	Guadalupe	Trinity	14,056	13,767	13,450	13,434
Kerr	J	Nueces	Trinity	0	0	0	0
Kerr	J	San Antonio	Trinity	471	471	471	471
Medina	L	Nueces	Trinity	1,575	1,575	1,575	1,575
Medina	L	San Antonio	Trinity	765	765	765	765
Travis	K	Colorado	Trinity	8,542	8,530	8,515	8,485
Groundwater Management Area 9 Total			**Trinity**	**90,171**	**89,869**	**89,537**	**89,491**

TABLE 9 MODELED AVAILABLE GROUNDWATER FOR THE EDWARDS GROUP OF THE EDWARDS-TRINITY (PLATEAU) AQUIFER IN GROUNDWATER MANAGEMENT AREA 9 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.

GCD	County	Aquifer	2020	2030	2040	2050	2060	2070	2080
Bandera County River Authority & Ground Water District	Bandera	Edwards	2,009	2,009	2,009	2,009	2,009	2,009	2,009
Cow Creek GCD	Kendall	Edwards	200	200	200	200	200	200	200
Groundwater Management Area 9 Total		**Edwards**	**2,209**	**2,209**	**2,209**	**2,209**	**2,209**	**2,209**	**2,209**

TABLE 10 MODELED AVAILABLE GROUNDWATER FOR THE EDWARDS GROUP OF THE EDWARDS-TRINITY (PLATEAU) AQUIFER IN GROUNDWATER MANAGEMENT AREA 9. RESULTS ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN FOR EACH DECADE FROM 2030 TO 2080. VALUES ARE IN ACRE-FEET PER YEAR.

County	RWPA	Basin	Aquifer	2030	2040	2050	2060	2070	2080
Bandera	J	Guadalupe	Edwards	81	81	81	81	81	81
Bandera	J	Nueces	Edwards	38	38	38	38	38	38
Bandera	J	San Antonio	Edwards	1,890	1,890	1,890	1,890	1,890	1,890
Kendall	L	Colorado	Edwards	69	69	69	69	69	69
Kendall	L	Guadalupe	Edwards	130	130	130	130	130	130
Groundwater Management Area 9 Total			**Edwards**	**2,208**	**2,208**	**2,208**	**2,208**	**2,208**	**2,208**

LIMITATIONS:

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

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

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

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

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

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Shi, J., Boghici, R., Kohlrenken, W., and Hutchison, W.R., 2016a, Conceptual Model Report: Minor Aquifers of the Llano Uplift Region of Texas. Texas Water Development Board Report, 306 p., http://www.twdb.texas.gov/groundwater/models/gam/llano/Llano_Uplift_Conceptual_Model_Report_Final.pdf.

Shi, J., Boghici, R., Kohlrenken, W., and Hutchison, W.R., 2016b, Numerical Model Report: Minor Aquifers of the Llano Uplift Region of Texas (Marble Falls, Ellenburger-San Saba, and Hickory). Texas Water Development Board Report, 435 p., http://www.twdb.texas.gov/groundwater/models/gam/llano/Llano_Uplift_Numerical_Model_Report_Final.pdf.

APPENDIX A: CLARIFICATIONS

Groundwater Management Area 9 Joint Planning Committee

Bandera County River Authority and Groundwater District
Blanco-Pedernales Groundwater Conservation District
Comal Trinity Groundwater Conservation District
Cow Creek Groundwater Conservation District
Hays-Trinity Groundwater Conservation District
Headwaters Groundwater Conservation District
Medina County Groundwater Conservation District
Trinity Glen Rose Groundwater Conservation District
Southwestern Travis County Groundwater Conservation District

Mr. Micah Voulgaris, GMA 9 Planning Committee Chairman P.O. Box 1567 Boerne, Texas 78006

October 17, 2022

Stephen Allen, P.G., Geoscientist
Groundwater Technical Assistance Team
Groundwater Resources
Texas Water Development Board
P. O. Box 13231
1700 North Congress Avenue
Austin, Texas 78711-3231

Re: Acknowledgement of clarifications needed for the Texas Water Development Board to declare the Groundwater Management Area 9 Desired Future Conditions submittal administratively complete

Mr. Allen,

This letter is in response to your email sent to me on Tuesday, October the 11th.

It was the intent of the Groundwater Management Area 9 Joint Planning Committee to adopt Desired Future Conditions that produced drawdown values consistent with the previous two planning cycles.

GMA 9 acknowledges and accepts all ten of the "other clarifications" and the two "optional clarifications" as outlined in the attached document sent by the TWDB.

Please let us know if you need additional information or if further action is required.

Thank you,
Groundwater Management Area 9

Micah Voulgaris
GMA 9 Chairman

Enclosure: *GMA09_Clarifications_v1*

FIGURE A1: PAGE 1 OF CORRESPONDENCE BETWEEN GROUNDWATER MANAGEMENT AREA 9 AND THE TWDB RELATED TO CLARIFIACTIONS (LETTER FROM GROUNDWATER MANAGEMENT AREA 9 ACKNOWLEDGING AND ACCEPTING CLARIFICATIONS)

Critical Clarifications *(need additional files or an update to Legal DFC Resolution)*:

- None, unless the GMA disagrees with clarifications and assumptions below.

Other Clarifications (*TWDB will only need acknowledgement for administratively complete*):

Trinity Aquifer:

1. Please confirm that the phrase *"average drawdown of approximately 30 feet through 2060 consistent with Scenario 6 in TWDB GAM Task 10-005"* in the DFC Resolution means *"no more than 30 feet of average water level decline in 2060, as compared to 2008 water levels, averaged over all TWDB GAM Task 10-005 Scenario 6 model iterations."*[1] This method produces drawdown values consistent with the DFC values provided in the Explanatory Report and is consistent with the methodology used in the previous planning cycle.
2. Please confirm that the GMA accepts the following assumptions for calculating modeled drawdown: 1) exclude all cells that become dry and 2) use all active model cells even if they do not fall within the official TWDB aquifer boundary. This method produces drawdown values consistent with the DFC values provided in the Explanatory Report and is consistent with the methodology used in the previous planning cycle.
3. As in the previous planning cycle, we will only provide MAG values calculated within the extent of the TWDB Trinity (Hill Country) Aquifer GAM. Since this model does not extend across the entire GMA, these MAG values will not include any pumping that might occur outside the model extent. Please confirm that this methodology is acceptable to the GMA. Otherwise, please contact TWDB to request additional MAG value calculations.

Edwards Group of the Edwards-Trinity (Plateau) Aquifer:

4. Please confirm that the phrase *"no net increase in average drawdown through 2080"* in the DFC Resolution means *"no average water level decline in 2080, as compared to 1997 water levels."*[2] This method produces drawdown values consistent with the DFC values provided in the Explanatory Report and is consistent with the methodology used in the previous planning cycle.
5. Since the GMA did not provide predictive model files, TWDB used the predictive model files *[based on Trinity (Hill Country) Aquifer GAM]* developed by TWDB during the previous planning cycle (see GAM Run 16-023) and extended them to 2080 by assuming the same recharge rates and the same percentage increase in pumping rates as was used in the previous planning cycle. Please confirm that this methodology is acceptable to the GMA.
6. Please confirm that the GMA accepts the following assumptions for calculating modeled drawdown: 1) exclude all cells that become dry and 2) include all active model cells even if they do not fall within the official TWDB aquifer boundary. This method produces drawdown values consistent with the DFC values provided in the Explanatory Report and is consistent with the methodology used in the previous planning cycle.
7. As in the previous planning cycle, we will only provide MAG values calculated within the extent of the TWDB Trinity (Hill Country) Aquifer GAM. Since this model does not extend across the entire GMA, these MAG values will not include any pumping that might occur outside the model extent.

[1] 2008 is the last calibrated water level available from the TWDB GAM Task 10-005 model
[2] 1997 is the last calibrated water level available from the TWDB Trinity (Hill Country) Aquifer GAM

FIGURE A2: PAGE 2 OF CORRESPONDENCE BETWEEN GROUNDWATER MANAGEMENT AREA 9 AND THE TWDB RELATED TO CLARIFIACTIONS (OTHER CLARIFICATIONS NUMBERS 1 TO 7)

Please confirm that this methodology is acceptable to the GMA. Otherwise, please contact TWDB to request additional MAG value calculations.

Ellenburger-San Saba & Hickory Aquifers:

8. Please confirm that the phrase *"average drawdown of no more than 7 feet in Kendall County through 2080"* in the DFC Resolution means *"average water level decline of no more than 7 feet in 2080, as compared to 2010 water levels."*[3] This method produces drawdown values consistent with the DFC values provided in the Explanatory Report and is consistent with the methodology used in the previous planning cycle.
9. Since the GMA did not provide predictive model files, TWDB used the predictive model files *[based on Llano Uplift GAM]* developed by TWDB during the previous planning cycle (see GAM Run 16-023) and extended them to 2080 by assuming the same recharge rates and the same pumping rates and distribution as was used in the previous planning cycle. Please confirm that this methodology is acceptable to the GMA.
10. Please confirm that the GMA accepts the following assumptions for calculating modeled drawdown: 1) only include active model cells within the official TWDB aquifer boundary. This method produces drawdown values consistent with the DFC values provided in the Explanatory Report and is consistent with the methodology used in the previous planning cycle.

Optional Clarifications *(Clerical corrections to Explanatory Report)*[4]

Edwards Group of the Edwards-Trinity (Plateau) Aquifer:

– baseline year for DFC incorrectly listed as 2008 rather than 1997 *(see Clarification #4)*

Ellenburger-San Saba & Hickory Aquifers:

– baseline year for DFC incorrectly listed as 2008 rather than 2010 *(see Clarification #8)*

[3] 2010 is the last calibrated water level available from the TWDB Llano Uplift GAM.

[4] Since TWDB considers the legal DFC Resolution documents, rather than the Explanatory Report, as the official definition of DFCs, TWDB does not officially require corrections to the Explanatory Report. However, because the Explanatory Report is often used as a simplified, more-readable summary of the legal DFC Resolution documents, we recommend correcting the Explanatory Report to match the DFC Resolutions to avoid confusion.

FIGURE A3: PAGE 3 OF CORRESPONDENCE BETWEEN GROUNDWATER MANAGEMENT AREA 9 AND THE TWDB RELATED TO CLARIFIACTIONS (OTHER CLARIFICATIONS NUMBERS 8 TO 10 AND OPTIONAL CLARIFICATIONS)

Estimated Historical Groundwater Use And 2017 State Water Plan Datasets:

Cow Creek Groundwater Conservation District

by Stephen Allen
Texas Water Development Board
Groundwater Division
Groundwater Technical Assistance Section
stephen.allen@twdb.texas.gov
(512) 463-7317
August 15, 2019

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 this part are:

1. Estimated Historical Groundwater 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)

   from the 2017 Texas State Water Plan (SWP)

Part 2 of the 2-part package is the groundwater availability model (GAM) report for the District (checklist items 3 through 5). 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 2017 SWP data available as of 8/15/2019. Although it does not happen frequently, either of these datasets are subject to change pending the availability of more accurate WUS data or an amendment to the 2017 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 2017 SWP dataset can be verified by contacting Sabrina Anderson (sabrina.anderson@twdb.texas.gov or 512-936-0886).

The values presented in the data tables of this report are county-based. In cases where groundwater conservation districts cover only a portion of one or more counties the data values are modified with an apportioning multiplier to create new values that more accurately represent conditions within district boundaries. The multiplier used in the following formula is a land area ratio: (data value * (land area of district in county / land area of county)). For two of the four SWP tables (Projected Surface Water Supplies and Projected Water Demands) only the county-wide water user group (WUG) data values (county other, manufacturing, steam electric power, irrigation, mining and livestock) are modified using the multiplier. WUG values for municipalities, water supply corporations, and utility districts are not apportioned; instead, their full values are retained when they are located within the district, and eliminated when they are located outside (we ask each district to identify these entity locations).

The remaining SWP tables (Projected Water Supply Needs and Projected Water Management Strategies) are not modified because district-specific values are not statutorily required. Each district needs only "consider" the county values in these tables.

In the WUS table every category of water use (including municipal) is apportioned. Staff determined that breaking down the annual municipal values into individual WUGs was too complex.

TWDB recognizes that the apportioning formula used is not perfect but it is the best available process with respect to time and staffing constraints. If a district believes it has data that is more accurate it can add those data to the plan with an explanation of how the data were derived. Apportioning percentages that the TWDB used are listed above each applicable table.

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

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.

KENDALL COUNTY *99.51% (multiplier)* All values are in acre-feet

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2017	GW	3,731	3	0	0	220	292	4,246
	SW	2,617	0	0	0	48	52	2,717
2016	GW	3,680	3	0	0	180	307	4,170
	SW	2,358	0	0	0	190	55	2,603
2015	GW	3,301	2	0	0	249	306	3,858
	SW	2,228	0	0	0	86	54	2,368
2014	GW	3,361	1	0	0	210	300	3,872
	SW	2,306	0	0	0	42	54	2,402
2013	GW	3,529	1	0	0	475	308	4,313
	SW	2,323	0	0	0	75	55	2,453
2012	GW	3,758	1	0	0	572	259	4,590
	SW	2,093	0	0	0	67	47	2,207
2011	GW	4,103	0	0	0	820	408	5,331
	SW	2,010	0	0	0	65	72	2,147
2010	GW	3,466	0	0	0	540	396	4,402
	SW	1,684	0	0	0	150	70	1,904
2009	GW	2,975	0	0	0	732	329	4,036
	SW	1,646	0	0	0	166	58	1,870
2008	GW	3,174	0	0	0	12	299	3,485
	SW	1,590	0	0	0	175	53	1,818
2007	GW	2,764	0	0	0	113	347	3,224
	SW	1,354	0	0	0	0	61	1,415
2006	GW	3,473	0	0	0	137	364	3,974
	SW	1,251	0	0	0	0	64	1,315
2005	GW	3,817	0	0	0	134	335	4,286
	SW	788	0	0	0	0	59	847
2004	GW	3,149	0	0	0	115	170	3,434
	SW	679	0	0	0	104	157	940
2003	GW	3,050	0	0	0	130	164	3,344
	SW	629	0	0	0	356	151	1,136

Projected Surface Water Supplies
TWDB 2017 State Water Plan Data

KENDALL COUNTY *99.51% (multiplier)* All values are in acre-feet

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
L	BOERNE	SAN ANTONIO	BOERNE LAKE/RESERVOIR	645	645	645	645	645	645
L	BOERNE	SAN ANTONIO	CANYON LAKE/RESERVOIR	3,611	3,611	3,611	3,611	3,611	3,611
L	COUNTY-OTHER, KENDALL	GUADALUPE	CANYON LAKE/RESERVOIR	2,488	2,488	2,488	2,488	2,488	2,488
L	FAIR OAKS RANCH	SAN ANTONIO	CANYON LAKE/RESERVOIR	585	690	775	840	895	940
L	IRRIGATION, KENDALL	GUADALUPE	GUADALUPE RUN-OF-RIVER	26	26	26	26	26	26
L	LIVESTOCK, KENDALL	COLORADO	COLORADO LIVESTOCK LOCAL SUPPLY	6	6	6	6	6	6
L	LIVESTOCK, KENDALL	GUADALUPE	GUADALUPE LIVESTOCK LOCAL SUPPLY	158	158	158	158	158	158
L	LIVESTOCK, KENDALL	SAN ANTONIO	SAN ANTONIO LIVESTOCK LOCAL SUPPLY	33	33	33	33	33	33
	Sum of Projected Surface Water Supplies (acre-feet)			**7,552**	**7,657**	**7,742**	**7,807**	**7,862**	**7,907**

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.

KENDALL COUNTY

99.51% (multiplier)

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
L	BOERNE	SAN ANTONIO	3,091	3,985	4,942	5,900	6,889	7,863
L	COUNTY-OTHER, KENDALL	COLORADO	41	48	57	66	75	85
L	COUNTY-OTHER, KENDALL	GUADALUPE	1,579	1,916	2,278	2,649	3,043	3,433
L	COUNTY-OTHER, KENDALL	SAN ANTONIO	1,037	1,079	1,147	1,251	1,334	1,417
L	FAIR OAKS RANCH	SAN ANTONIO	656	898	1,125	1,290	1,531	1,768
L	IRRIGATION, KENDALL	GUADALUPE	304	298	291	286	281	275
L	IRRIGATION, KENDALL	SAN ANTONIO	70	68	67	65	64	63
L	KENDALL COUNTY WCID #1	GUADALUPE	303	341	384	430	481	531
L	LIVESTOCK, KENDALL	COLORADO	13	13	13	13	13	13
L	LIVESTOCK, KENDALL	GUADALUPE	314	314	314	314	314	314
L	LIVESTOCK, KENDALL	SAN ANTONIO	66	66	66	66	66	66
L	WATER SERVICES INC	SAN ANTONIO	46	54	64	74	85	95
	Sum of Projected Water Demands (acre-feet)		**7,520**	**9,080**	**10,748**	**12,404**	**14,176**	**15,923**

Projected Water Supply Needs
TWDB 2017 State Water Plan Data

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

KENDALL COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
L	BOERNE	SAN ANTONIO	2,159	1,265	308	-650	-1,639	-2,613
L	COUNTY-OTHER, KENDALL	COLORADO	47	40	31	22	13	3
L	COUNTY-OTHER, KENDALL	GUADALUPE	2,327	1,989	1,625	1,252	856	464
L	COUNTY-OTHER, KENDALL	SAN ANTONIO	383	341	272	168	84	1
L	FAIR OAKS RANCH	SAN ANTONIO	540	512	459	426	298	153
L	IRRIGATION, KENDALL	GUADALUPE	55	61	68	73	78	84
L	IRRIGATION, KENDALL	SAN ANTONIO	30	32	33	35	36	37
L	KENDALL COUNTY WCID #1	GUADALUPE	472	434	391	345	294	244
L	LIVESTOCK, KENDALL	COLORADO	0	0	0	0	0	0
L	LIVESTOCK, KENDALL	GUADALUPE	0	0	0	0	0	0
L	LIVESTOCK, KENDALL	SAN ANTONIO	0	0	0	0	0	0
L	WATER SERVICES INC	SAN ANTONIO	28	25	23	18	13	8
	Sum of Projected Water Supply Needs (acre-feet)		**0**	**0**	**0**	**-650**	**-1,639**	**-2,613**

Projected Water Management Strategies
TWDB 2017 State Water Plan Data

KENDALL COUNTY

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

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
BOERNE, SAN ANTONIO (L)							
LOCAL TRINITY AQUIFER DEVELOPMENT	TRINITY AQUIFER [KENDALL]	0	0	0	1,000	1,000	1,000
MUNICIPAL WATER CONSERVATION (RURAL)	DEMAND REDUCTION [KENDALL]	136	484	985	1,513	1,888	2,294
WESTERN CANYON EXPANSION	CANYON LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	639	1,613
		136	**484**	**985**	**2,513**	**3,527**	**4,907**
COUNTY-OTHER, KENDALL, COLORADO (L)							
MUNICIPAL WATER CONSERVATION (RURAL)	DEMAND REDUCTION [KENDALL]	0	0	0	0	0	0
		0	**0**	**0**	**0**	**0**	**0**
COUNTY-OTHER, KENDALL, GUADALUPE (L)							
MUNICIPAL WATER CONSERVATION (RURAL)	DEMAND REDUCTION [KENDALL]	0	0	0	0	0	9
		0	**0**	**0**	**0**	**0**	**9**
COUNTY-OTHER, KENDALL, SAN ANTONIO (L)							
MUNICIPAL WATER CONSERVATION (RURAL)	DEMAND REDUCTION [KENDALL]	0	0	0	0	0	4
		0	**0**	**0**	**0**	**0**	**4**
FAIR OAKS RANCH, SAN ANTONIO (L)							
MUNICIPAL WATER CONSERVATION (SUBURBAN)	DEMAND REDUCTION [KENDALL]	37	123	243	373	546	715
		37	**123**	**243**	**373**	**546**	**715**
WATER SERVICES INC, SAN ANTONIO (L)							
MUNICIPAL WATER CONSERVATION (RURAL)	DEMAND REDUCTION [KENDALL]	1	1	2	3	5	8
		1	**1**	**2**	**3**	**5**	**8**
Sum of Projected Water Management Strategies (acre-feet)		**174**	**608**	**1,230**	**2,889**	**4,078**	**5,643**

THE BOERNE STAR CLASSIFIEDS

Wednesday online edition, 11 a.m. on Monday;
Weekend issue, 11 a.m. on Thursday.
Call 830-249-2441 and ask for Sonya.

WWW.BOERNESTAR.COM

FULL TIME

Caregivers Needed! Please call 830-331-8496 or apply online at 155.axiscare.com

RENTALS/ COMMERCIAL

OFFICE WAREHOUSE FOR RENT. We have 2 units available with small office in front and connected warehouse in the back. Great for small business, plumbers, electricians, and others needing an office space with warehouse space. Total space is 1,250 sq. ft., includes AC, warehouse & private restroom. Call 830-816-7867 or email us Atticpantry@outlook.com

RENTALS

3/2 w/garage, fireplace, fenced yard, washer/ dryer connections. Available 12-1, $1600, 512-784-8412

☆☆☆☆☆
☆☆☆☆☆

FOR SALE

Burial Plot in North Old Section Boerne Cemetery, $3200, 210-842-2155

FOR SALE: 55 gallon ink drums $10, wood pallets $5 and end rolls $10. Call Granite Printing, 512-352-3687, or come by 2675 CR 374, Circleville, TX.

BUSINESS OPPORTUNITY

Please carefully consider the value or benefits before you purchase a product or service. Publication of products or services does not indicate endorsement by the Boerne Star. If you feel you have been the victim of fraud, please contact the Attorney General's Office and/or the Better Business Bureau.

MUSICAL INSTRUMENTS

ATTENTION FORMER BAND STUDENTS AND PARENTS! Did you know that you can donate used band instruments to SAM'S Kids and count it as a tax deduction? SAM'S Kids needs used band instruments for BISD students. For more information, please contact Janet D'Spain at BISD, 830-357-2006

SERVICES

All real estate advertised herein is subject to the Federal Fair Housing Act, which makes it illegal to advertise any preference, limitation, or discrimination because of race, color, religion, sex, handicap, familial status, or national origin, or intention to make any such preference, limitation or discrimination.

We will not knowingly accept any advertising for real estate which is in violation of the law. All persons are hereby informed that all dwellings advertised are available on an equal opportunity basis.

HELP WANTED

CITY OF Boerne

NOW HIRING

The City of Boerne is looking for the best employees to join our team. With strong values of service, excellence, integrity, respect and collaboration we offer competitive pay, excellent benefits and flexible schedules.

LEGALS

Notice to Unsecured Creditors
Cause No. 23-193-PR, County Court, Kendall County, Texas
Estate of Lisa Marie Mathews, Deceased

Notice is hereby given that original Letters of Administration were issued to the Estate of Lisa Marie Mathews on December 5, 2023 to Michael J. Leonides.

You must present your claim before the 121st day after the date of the receipt of this notice or the claim is barred, if the claim is not barred by the general statutes of limitation.

The claim may be effectively presented by only one of the following methods:

1. A written instrument that is hand-delivered with proof of receipt, or mailed by certified mail, return receipt requested with proof of receipt, to the person below.

2. A pleading filed in a lawsuit with respect to the claim.

3. A written instrument or pleading filed in the court in which the administration of the estate is pending.

The claim should be addressed in care of the representative's attorney:

Reed Greene
26254 IH 10 West, Suite 135
Boerne, TX 78006

NOTICE TO CREDITORS

NOTICE OF APPOINTMENT OF Andrew George Sherwood as Independent Executor of the Estate of George Edwin Sherwood, Deceased

Pending in the County Court, Sitting in Matters Probate, Kendall County, Texas, No. 23-210-PR

TO ALL PERSONS INTERESTED IN THE ABOVE ESTATE:

WHEREAS, on the 13th day of December, 2023, in the County Court, Kendall County, Texas, the undersigned duly qualified as the Independent Executor of the Estate of George Edwin Sherwood, Deceased.

Notice is hereby given that original Letters Testamentary on the estate were granted and this is to notify all persons having claims against said estate to present the same to the undersigned within the time and in the manner prescribed by law. Any person indebted to said estate is hereby notified to pay same to the undersigned.

ANDREW GEORGE SHERWOOD, Independent Executor of the Estate of George Edwin Sherwood, Deceased

Address: Werner & Augsburger, Robert J. Augsburger, 11010 Coachlight, Suite 100 San Antonio, Texas 78216.

Dated at Boerne, Texas, December 17, 2023

NOTICE TO PERSONS HAVING CLAIMS AGAINST ESTATE OF MELVIN RAY SWEATMAN, DECEASED

Notice is hereby given that original Letters Testamentary were issued to TERESA K. SWEATMAN and MICHAEL A. SHEPPARD on the Estate of MELVIN RAY SWEATMAN, Deceased, on December 5, 2023, in Cause No. 23-207-PR of the Probate Docket of Kendall County, Texas, which is still pending, and that such persons now hold such letters. All persons having claims against the estate are required to present the same within the time prescribed by law to such persons. Such claims shall be addressed in care of Michael A. Sheppard, CRAIN & SHEPPARD, at the address of P.O. Box 427, Cuero, Texas 77954.

Teresa K. Sweatman and Michael A. Sheppard, Independent Co-Executors of Estate of Melvin Ray Sweatman, Deceased

LEGALS

ORDINANCE NO. 2023-37

AN ORDINANCE OF THE CITY COUNCIL OF CITY OF BOERNE, TEXAS, AMENDING THE UNIFIED DEVELOPMENT CODE, CHAPTER 2. PROCEDURES, ADDING SECTION 2.13 EXTRATERRITORIAL JURISDICTION, TO PROVIDE A PROCESS FOR PETITIONS FOR RELEASE FROM THE CITY'S EXTRATERRITORIAL JURISDICTION; AND CHAPTER 8. ENVIRONMENTAL DESIGN, SECTION 8.1 FLOODPLAIN MANAGEMENT, AND APPENDICES, APPENDIX A. DEFINITIONS; PROVIDING A SAVINGS CLAUSE; PROVIDING THAT THIS ORDINANCE IS CUMULATIVE OF ALL ORDINANCES; REPEALING ALL ORDINANCES IN CONFLICT; PROVIDING A PENALTY FOR VIOLATION; AND PROVIDING A SEVERABILITY CLAUSE; PROVIDING FOR PUBLICATION; AND PROVIDING AN EFFECTIVE DATE

Passed, approved and adopted on December 12, 2023.

s/s Mayor Frank Ritchie
s/s Lori A. Carroll, City Secretary

LEGAL NOTICE

The Cow Creek Groundwater Conservation District (District), will receive public comment on the proposed amendments to its Management Plan at a public hearing at the District office, located at 9 Toepperwein Road, Boerne, Texas, 78006 at 6 p.m. on January 9th, 2024. The proposed amendments to the District's Management Plan reflect the adopted Desired Future Conditions for the aquifers in Kendall County and the associated Managed Available Groundwater. The District Board, at the conclusion of the public hearing, will discuss comments received and consider possible adoption of the proposed amendments. Written and oral public comments on the proposed amendments must be submitted to the District on or prior to the hearing date. A complete copy of the current Management Plan and proposed amendments are available at www.ccgcd.org and the District office, 9 Toepperwein Road, Boerne, TX 78006; (830) 816-2504

LEGALS

NOTICE OF PUBLIC HEARING

Notice is hereby given that the Historic Landmark Commission of the City of Boerne, Texas, will hold a Public Hearing on **Tuesday, January 02, 2024, at 5:30 PM**, in the City Council Chambers, located at the City Hall, 447 N. Main Street, Boerne, Texas, to discuss the following:

Public hearing:

A. Consider the demolition request for all structures located at 418 Graham Street (KAD 23512) (William and Alison Wood)

All interested parties are encouraged to attend.

NOTICE OF ASSISTANCE AT THE PUBLIC MEETINGS
Requests for special services must be received forty-eight (48) hours prior to the meeting time by calling the Planning Department At 830-248-1501.

NOTICE OF PUBLIC HEARING

Notice is hereby given that the Planning and Zoning Commission of the City of Boerne, Texas, will hold a Public Hearing on **Monday, January 8, 2024, at 6:00 PM**, in the City Council Chambers, located at the City Hall, 447 N. Main Street, Boerne, Texas, to discuss the following:

A. Consider a request for a variance to the Unified Development Code: Chapter 8, Section 8.2(a) Watershed Protection Zones, for 524 Alder Street (KAD No. 14229). Take necessary action.

All interested parties are encouraged to attend.

NOTICE OF ASSISTANCE AT THE PUBLIC MEETINGS
Requests for special services must be received forty-eight (48) hours prior to the meeting time by calling the Planning Department At 830-248-1501.

NOTICE OF PUBLIC HEARING

Notice is hereby given that the City Council of the City of Boerne, Texas will hold a Public Hearing on **January 9, 2024,** at 6:00 p.m., in the Ronald C. Bowman City Council Chambers, located at Boerne City Hall, 447 N Main Street, Boerne, Texas, to discuss the following:

A. Consider an appeal of a vested rights determination of the City Manager for the property at 678 Rosewood Avenue. *(One of one public hearing)*

B. Consider an amendment to the Unified Development Code, official zoning map for a proposed Special Use Permit for automobile sales to 10.47 acres located at 31905 Interstate Highway 10 West (A10097 – Survey 170 A Cruz, KAD Nos. 48805 and 12233) in a C3-EC, Community Commercial Entrance Corridor Overlay District and A C4-EC, Regional Commercial Entrance Corridor Overlay District. *(One of one public hearing. Bonito Soto and Scott Crabtree)*

All interested parties are encouraged to attend.

s/s Lori A. Carroll
City Secretary

NOTICE OF ASSISTANCE AT THE PUBLIC MEETINGS
The City Hall is wheelchair accessible. Access to the building and special parking are available at the north entrance of the building. Requests for special services must be received forty-eight (48) hours prior to the meeting time by calling the City Secretary at 830-249-9511.

NOTICE OF THE REGULAR MEETING
AND A PUBLIC HEARING
OF THE COW CREEK GROUNDWATER
CONSERVATION DISTRICT KENDALL COUNTY, TEXAS

NOTICE is hereby given that the regular meeting and a public hearing of the Cow Creek Groundwater Conservation District will be held on **Tuesday the 9th of January, 2024**. The meeting and Public Hearing will begin at **6:00 P.M.** and will occur in the District Meeting Room located at 9 Toepperwein Road, Boerne, Texas, at which time the following will be discussed, and appropriate action taken, pursuant to Chapter 36, Water Code; and pursuant to V.T.C.A. Government Code Section 551, Open Meetings, including all subchapters and sections:

Join Zoom Meeting
https://us06web.zoom.us/j/8476235409?pwd=noBo4JbcZyJJVBoz09GDoviTZUWU42.1&omn=89578783839
Meeting ID: 847 623 5409
Passcode: 202401

1. Call to Order

2. Pledge of Allegiance

3. Establishment of a Quorum

4. Public comment

5. Consent Agenda:
   a. Approval of minutes from the December 11th, 2023 Regular Meeting
   b. Payroll, employee benefits, operational expenses, and payment of such
   c. Monthly financial report(s)
   d. Monthly operations report

6. Public Hearing on the proposed amendments to the District Management Plan.

7. Discussion and possible action on the proposed amendments to the District Management Plan.

8. Variance requests:
   a. James Shaw, on behalf of Comfort Falls Ranch LLC/ClearWater Ranch is requesting relief from District Rule 3.2 and 3.3 at 118 FM 1621 in Comfort, TX. The reason for the request is because the platting process to subdivide the property into 20 residential lots was started in November of 2022 and a complete submittal approval was approved with Kendall County on July 15, 2023.

   b. Kyle Greco, on behalf of 448 Waring Welfare LLC/Windmill Ranch is requesting relief from District Rule 3.2 and 3.3 at 448 Waring-Welfare Road in Comfort, TX. The reason for the request is because the platting process to subdivide the property into 16 residential lots was started in July of 2022 and a complete submittal approval was approved with Kendall County on August 18, 2022.

9. Discussion and possible action related to the November 14th, 2023 Application for an Operating Permit for an Existing Well for the City of Fair Oaks Ranch and the December 13, 2023 Notice of Deficiencies for the same.

10. District activities & subcommittee updates:
    a. Monthly report
    b. Discussion and action on the current drought stage
    c. Status updates on:
        (1) Pending enforcement issues
        (2) Pending permit applications
        (3) GMA9 activities
        (4) Region L activities
        (5) District Monitor Well Expansion Project
        (6) Camp Bullis Sentinel Landscape Project

11. Correspondence

12. Future meeting dates and meeting topics

13. Adjournment

Micah Voulgaris
Cow Creek Groundwater Conservation District
General Manager

Please note:

1. *The District may take a brief recess during the course of the meeting, depending upon the length of the meeting.*
2. *The Cow Creek Groundwater Conservation District is committed to compliance with the American Disabilities Act (ADA). Reasonable accommodations and equal opportunity for effective communications will be provided upon request. Please contact the District office at 830-816-2504 at least 24 hours in advance if accommodation is needed.*
3. *Citizens who desire to address the Board on any matter may sign up to do so prior to the meeting. Public comments will be received during the Public Comment portion of the meeting. Please limit comments to 5 minutes.*
4. *At any time during the meeting and in compliance with the Texas Open Meetings Act, Chapter 551, Government Code, Vernon's Texas Codes, Annotated, the Cow Creek Groundwater Conservation District Board may meet in executive session for consultation concerning attorney-client matters (§551.071); deliberation regarding real property (§551.072); deliberation regarding prospective gift (§551.073); personnel matters (§551.074); and deliberation regarding security devices (§551.076).*

VG-272-2024-661

Kendall County
Denise Maxwell
Kendall County Clerk

Instrument Number: 661

Public Notice

Recorded On: January 04, 2024 09:18 AM

Number of Pages: 3

" Examined and Charged as Follows: "

Total Recording: $0.00

********** **THIS PAGE IS PART OF THE INSTRUMENT** **********
Any provision herein which restricts the Sale, Rental or use of the described REAL PROPERTY because of color or race is invalid and unenforceable under federal law.

File Information:

Document Number:	661
Receipt Number:	20240104000011
Recorded Date/Time:	January 04, 2024 09:18 AM
User:	Grace O
Station:	cclerk07

Record and Return To:

Cow Creek

STATE OF TEXAS
Kendall County
I hereby certify that this Instrument was filed in the File Number sequence on the date/time printed hereon, and was duly recorded in the Official Records of Kendall County, Texas

Denise Maxwell
Kendall County Clerk
Kendall County, TX

Denise Maxwell

From: Micah Voulgaris
To: Stephen Allen
Subject: FW: Cow Creek GCD Management Plan
Date: Monday, August 12, 2024 3:45:31 PM
Attachments: CCGCD Management Plan_adopted January 9, 2024.pdf

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From: Micah Voulgaris
Sent: Tuesday, January 16, 2024 11:02 AM
To: dnichols@gbra.org
Subject: Cow Creek GCD Management Plan

Good Morning Mr. Nichols,
Please find attached the Cow Creek GCD's most recently adopted Groundwater Management Plan. Please let me know if you have any questions.

Thanks,
CCGCD General Manager
Micah Voulgaris

P.O. Box 1557
Boerne, TX 78006
C: 830-446-9782
O: 830-816-2504

www.ccgcd.org