Southwestern Travis County Groundwater Conservation District

GROUNDWATER MANAGEMENT PLAN

Adopted by Board of Directors on xxx xx, 2020

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GROUNDWATER MANAGEMENT PLAN

REVISION RECORD

Date Adopted	Effective Date	Affected Sections or General Comments..
xx/yy/20zz	xx/yy/20zz	Original Adoption

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Southwestern Travis County Groundwater Conservation District

GROUNDWATER MANAGEMENT PLAN

I. DISTRICT MISSION

The Southwestern Travis County Groundwater Conservation District (SWTCGCD, or District) was created by H.B. 4345 of the 85th Legislature (2017), which is called its "enabling legislation". The SWTCGCD is also subject to Chapter 36 of the Texas Water Code for the purpose of conserving, preserving, recharging, protecting and preventing waste of groundwater from the aquifers within southwestern Travis County. The District will conduct administrative and technical activities and programs to achieve these purposes. The District will use the authority granted by its enabling legislation, Chapter 36, and other state laws to: collect and manage water well and aquifer data; regulate water well drilling and production; promote the capping or plugging of abandoned wells; provide information and educational material to local property owners and the public; interact with other governmental or organizational entities; and incorporate other groundwater-related activities that may help meet the purposes of the District.

II. PURPOSE OF THIS GROUNDWATER MANAGEMENT PLAN

The purpose of the Groundwater Management Plan (Plan, or Management Plan) is to be a planning tool and guidance document for the District as it moves forward with its efforts to manage, conserve, and protect the groundwater resources of southwestern Travis County. The Plan contains and utilizes the hydrogeological and technical information provided by the Texas Water Development Board (TWDB) and other groundwater professionals regarding the groundwater resources of southwestern Travis County. This Plan not only provides guidance for District activities but, once approved by TWDB, it also serves as the authorization to undertake the actions referenced herein. These actions are intended to promote greater understanding of local aquifer conditions, development of groundwater management concepts and strategies, and the subsequent implementation of appropriate groundwater management strategies, policies, and Rules to address groundwater conditions, characteristics, and issues within the District. This Management Plan will enable the District to comply with the requirements of pertinent state laws and regulations, including its enabling legislation, Texas Water Code Chapter 36 and administrative Rules of the TWDB, which will guide the District's participation in regional water resources planning.

III. DISTRICT INFORMATION

A. Creation

The SWTCGCD was created by the passage of H.B. 4345, Article 2 of the 85th Texas Legislature (2017). On November 5, 2019, voters residing in the District confirmed the creation of the District. The District's statutory authority and duties are derived from H.B. 4345 (2017), as amended by S.B. 669 of the 86th Legislature (2019), and from Chapter 36 of the Texas Water Code that is applicable to groundwater conservation districts (GCDs). The enabling legislation as amended is codified in Special District Local Laws Code Chapter 8871, which may be accessed online at: https://statutes.capitol.texas.gov/Docs/SD/pdf/SD.8871.pdf.

B. Directors

The Board of Directors consists of seven members who are elected by the voters of the District using a hybrid of single-member precincts and at-large methods. The Directors are elected to staggered four-year terms. The Directors' geographic areas are designated by H.B. 4345 (2017) as follows:

- One Director resides in and is elected by voters in the City of Lakeway and Village of the Hills;
- One Director resides in and is elected by voters in the City of Bee Cave;
- One Director resides in and is elected by voters in the City of West Lake Hills; and
- Four Directors are elected at-large by voters residing in those areas within the District but outside the municipal limits of the cities named above. Each of these four Directors must also use groundwater for one or more beneficial uses at their respective residences.

In the confirmation election on November 5, 2019, voters in the District also elected six of the seven Directors authorized to govern the District. The initial vacancy associated with the seventh director position was filled on February 12, 2020, via appointment by the Board.

C. Authority

The District has the authority and duties authorized under H.B. 4345 (2017), and other authority and duties given to GCDs under Texas Water Code Chapter 36 (as long as they do not conflict with H.B. 4345 (2017); cooperatively administered by Texas Water Development Board under 31 Texas Administrative Code Section 356; and with statutory performance overseen by the Texas Commission on Environmental Quality (TCEQ).

D. Location and Extent

The boundaries of the District are described by its enabling legislation and shown on the map of the District's territory in Figure 1. This area is approximately 214 square miles (136,960 acres), which is 20.9 percent of Travis County's 1023 square miles (654,720 acres). The District has a population of 106,415, according to the 2017 estimate using US census block groups. The municipalities of the Village of the Hills, the City of Lakeway, the City of Bee Cave, and the City of West Lake Hills have a total population of approximately 27,000. The rest of the population, approximately 79,000, resides outside of the municipal limits, with a majority of that population in residential developments of various sizes throughout the District. A relatively small amount of the population resides in rural areas, scattered on farms and ranches especially in the western part of the District. The District is bounded on the west by Blanco and Burnet Counties; on the north and northeast by the Colorado River, separating it from other portions of Travis County; on the southeast by the Barton Spring/Edwards Aquifer Conservation District; and on the southwest by Hays County. The District is part of Groundwater Management Area 9[1] and of the Lower Colorado Regional Water Planning Group (Region K).

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[1] Some small parts of the District are also currently located in GMAs 8 and 10. TWDB will be making GMA boundary changes in the future that will remove that District territory that is in GMA 8 and 10. Until then, any groundwater in these affected areas that is not Trinity groundwater will be considered incidental and *de minimis* for current planning purposes.

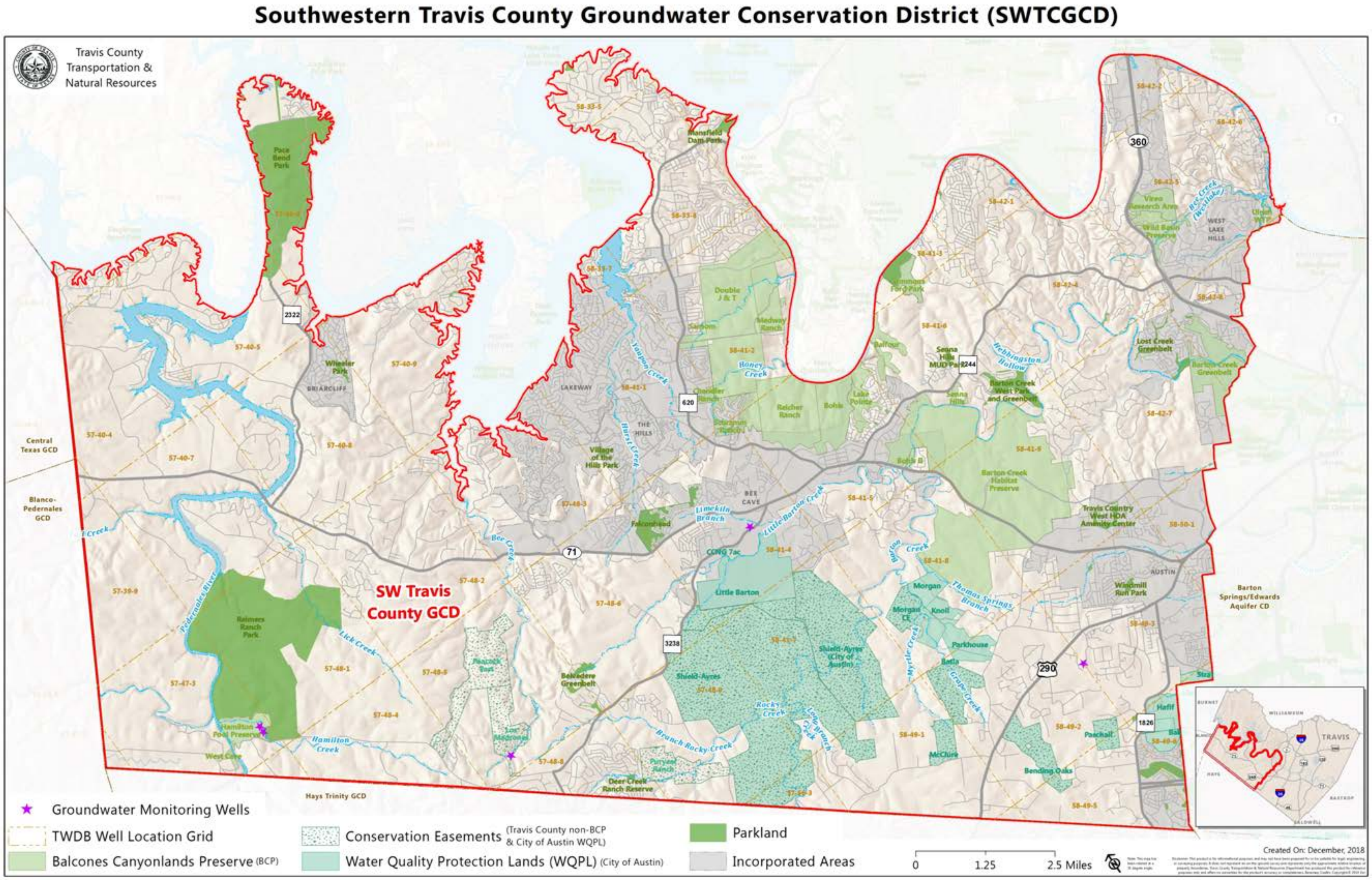


Figure 1. Map of Southwestern Travis County Groundwater Conservation District, Showing Incorporated Areas and Conservation Lands (Source: Sara Dilbert, GIS Analyst, Travis County, Texas)

E. Statement of Guiding Principles

The Board of Directors of SWTCGCD has established the following over-arching and enduring principles that will guide the management of groundwater in its jurisdiction under this initial Plan:

1. Groundwater planning and regulatory decision-making by the District will be consistent with "best available science" (Texas Water Code 36.0015) and relevant data then available.
2. The strategic goal of the District is to manage its groundwater resources in a fashion that tends to improve the sustainability of aquifers as a water supply for the community and to preserve springflows and base-flows of streams.
3. Collaboration with surface-water and groundwater providers and with surface-water and groundwater planning entities will be used to facilitate economically sustainable management of the groundwater resources.
4. The District will encourage voluntary compliance with its rules but will enforce its regulations in a legal, just, and impartial fashion that is equitable to the entire groundwater user community and that protects private property rights.
5. The District will be an educational and relevant data resource for the stakeholder community, other governmental entities, and the public as to aquifer characteristics, conditions and status; groundwater conservation; and drought status and response.
6. The District will strive to prevent waste of groundwater, including its pollution, by timely notifying other decision-makers of information relevant to the effects of waste and pollution on groundwater systems.
7. The District will operate in a highly transparent fashion, encouraging the timely involvement of stakeholders and the public in its activities, and regularly informing the public and stakeholders of the status of ongoing activities.

F. Groundwater Resources of Southwestern Travis County

The geology and hydrogeology of southwestern Travis County are described in this section of the Plan. These descriptions are based primarily on preliminary detailed information that is being developed by Travis County and the Barton Springs/Edwards Aquifer Conservation District (BSEACD). The recent report of this work, titled *Hydrogeologic Atlas of Southwest Travis County, Texas*, is described and electronically available in Appendix A of this Plan; it is referred to as the *Hydrogeologic Atlas* throughout this Plan. Other sources of information utilized in developing this section of the Management Plan include the Austin and Llano Sheets of the Geologic Atlas of Texas (reprinted 1986); *Hydrogeologic Atlas of the Hill Country Trinity Aquifer, Blanco, Hays, and Travis Counties, Texas* (2010); TWDB GAM Run 19-027, Southwestern Travis County (2019); TWDB Technical Report 339, *Evaluation of the Ground-water* [sic] *Resources of the Paleozoic and Cretaceous Aquifers in the Hill Country of Central Texas* (1992); and TWDB Technical Report LP 212, *Delineation Criteria for the Major and Minor Aquifer Maps of Texas* (1991).

1. Topography, Geology, and Drainage

Southwestern Travis County has two primary watersheds: the Pedernales River, which is a major tributary to the Colorado River, and the Colorado River itself. These rivers join within the District and provide surface water for Lake Travis and Lake Austin. Surface drainage within the District is generally from west to east and southwest to northeast.

The District lies in the eastern portion of the Edwards Plateau, an elevated topographic structure primarily comprised of Cretaceous-age limestone, dolomite and marl. The Edwards Plateau extends west into many Hill Country and West Texas counties and it more or less surrounds the much older rocks of the Llano Uplift (Figure 2). The eastern-most part of the Edwards Plateau is typified by complex faulting, most notably the Balcones Fault Zone (BFZ), the main portion of which overlaps the eastern-most part of the District and farther east. The eastern boundary of the District is essentially coincident with the largest fault in the BFZ, the Mount Bonnell Fault. These are a system of normal faults, are typically downthrown to the east or southeast, and have a general southwest to northeast alignment. The throw on individual faults varies from a few feet to several hundred feet.

Faulting and local geology have a direct impact on groundwater availability in the District, both in quantity and quality. In particular, one individual fault, the Bee Creek Fault, which is aligned on the land surface roughly with Bee Creek, is physically if not genetically distinct from the main BFZ and divides the District into two areas with considerably different hydrogeologic and groundwater characteristics west and east of the fault (Figure 3). The Bee Creek Fault may well have been an early part of the main BFZ faulting, with its location determined by sharp differences in the lithology and geologic structures of the underlying basement rocks east of the Llano Uplift.

Elevations within the District range from a low of approximately 500 feet above sea level at Lake Austin on the eastern side of the District to over 1,400 feet in the Shingle Hills area near the south-central boundary of the District.

2. Aquifers and Their Usage in Southwestern Travis County

In general, groundwater is available throughout the District. However, water quantity and quality vary greatly within its territory and are highly dependent on local hydrogeological conditions. Owing to rapid population growth within this area (refer to Table 1.1 and Figure 3.1 of the *Hydrogeologic Atlas*) , there are extensive parts of southwestern Travis County where increased groundwater demand has stressed those aquifers, or portions thereof, that have low production capability and/or low recharge rates, such that the aquifers are not able to meet the higher demand. In effect, the groundwater is not able to be recharged sufficiently to meet the current withdrawal rates, and it is already being mined in those parts of the District. This section of the Plan provides more detailed information on the District's aquifers and groundwater use that will inform future groundwater management. It is largely based on the recent studies reported in the *Hydrogeologic Atlas*.

Much of the population growth that has taken place and continues to occur in southwestern Travis County utilizes surface water as water supplies, provided by municipal systems, public utility authorities, water control and improvement districts, and other utilities. But some of these utilities use groundwater as a sole or supplemental source, as shown by public water supply well locations within or adjacent to their service areas (Figure 4). And substantial amounts of existing and new development in the District are located outside the service areas of these water-supply entities and rely upon groundwater from the Middle Trinity and especially the Lower Trinity Aquifers for water supply.

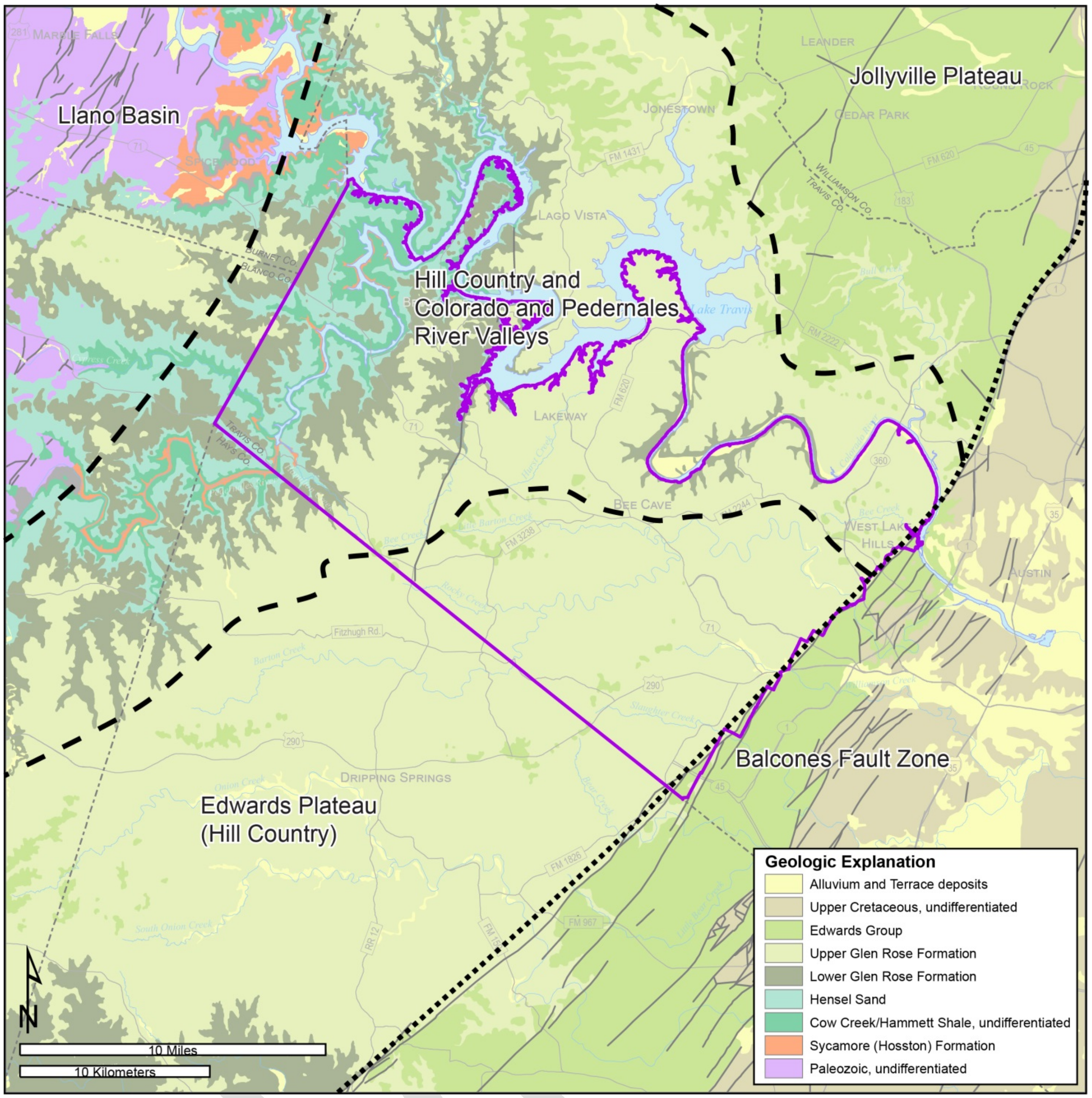


Figure 2. Regional geography of District, showing surface geology and major topographic features. District boundary is outlined in purple. (Source: Hydrogeologic Atlas)

Use of groundwater from both of these aquifers apparently has increased substantially over the past few decades. Both of these aquifers are known to be highly variable areally with regards to production quantity and yield, and in addition, some water quality concerns may be encountered involving salinity increases, excessive hardness, and odors.

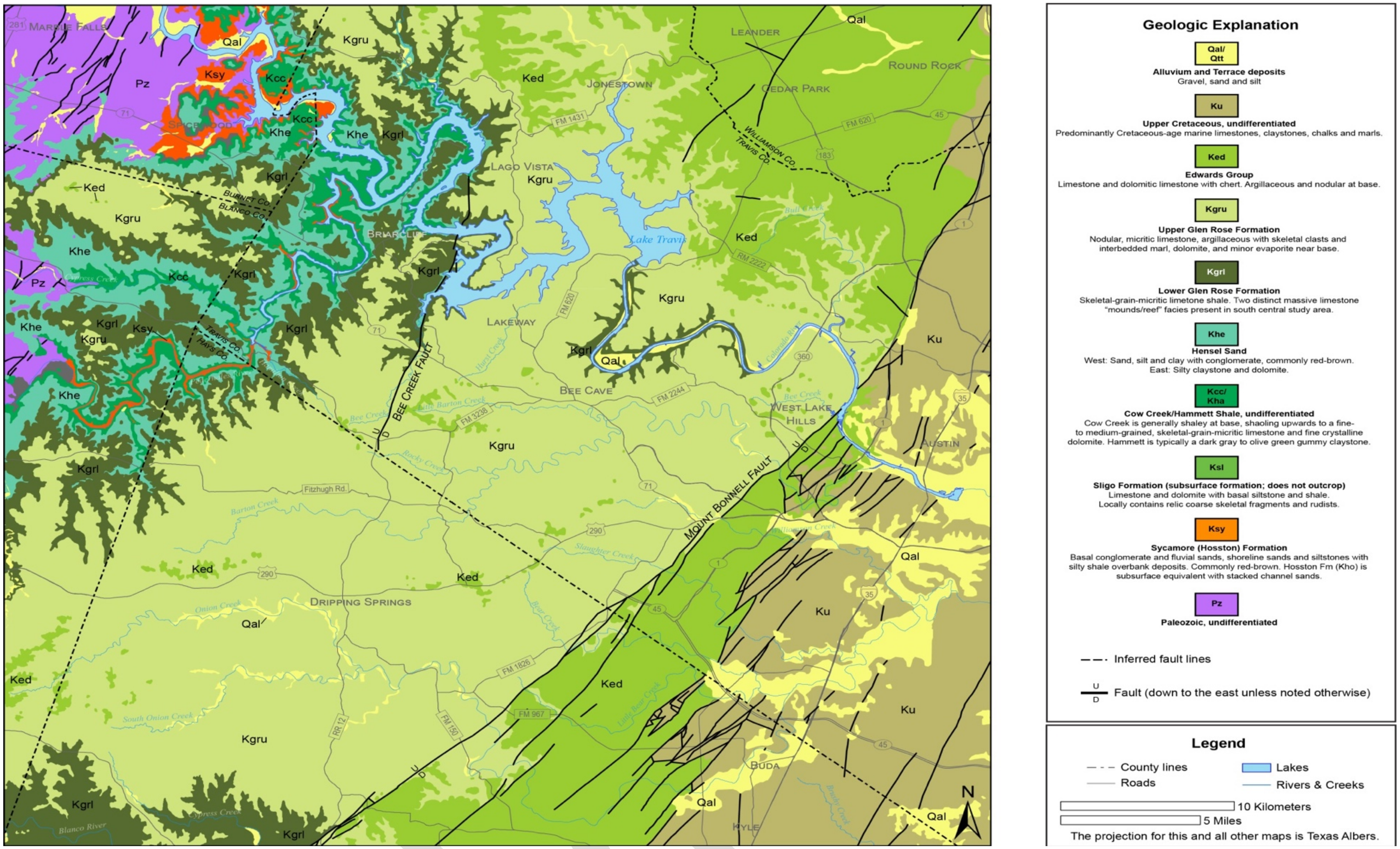


Figure 3. Geologic Basemap, describing geologic units present in District and fault locations. Bee Creek Fault essentially bisects the District. (Source: Hydrogeologic Atlas)

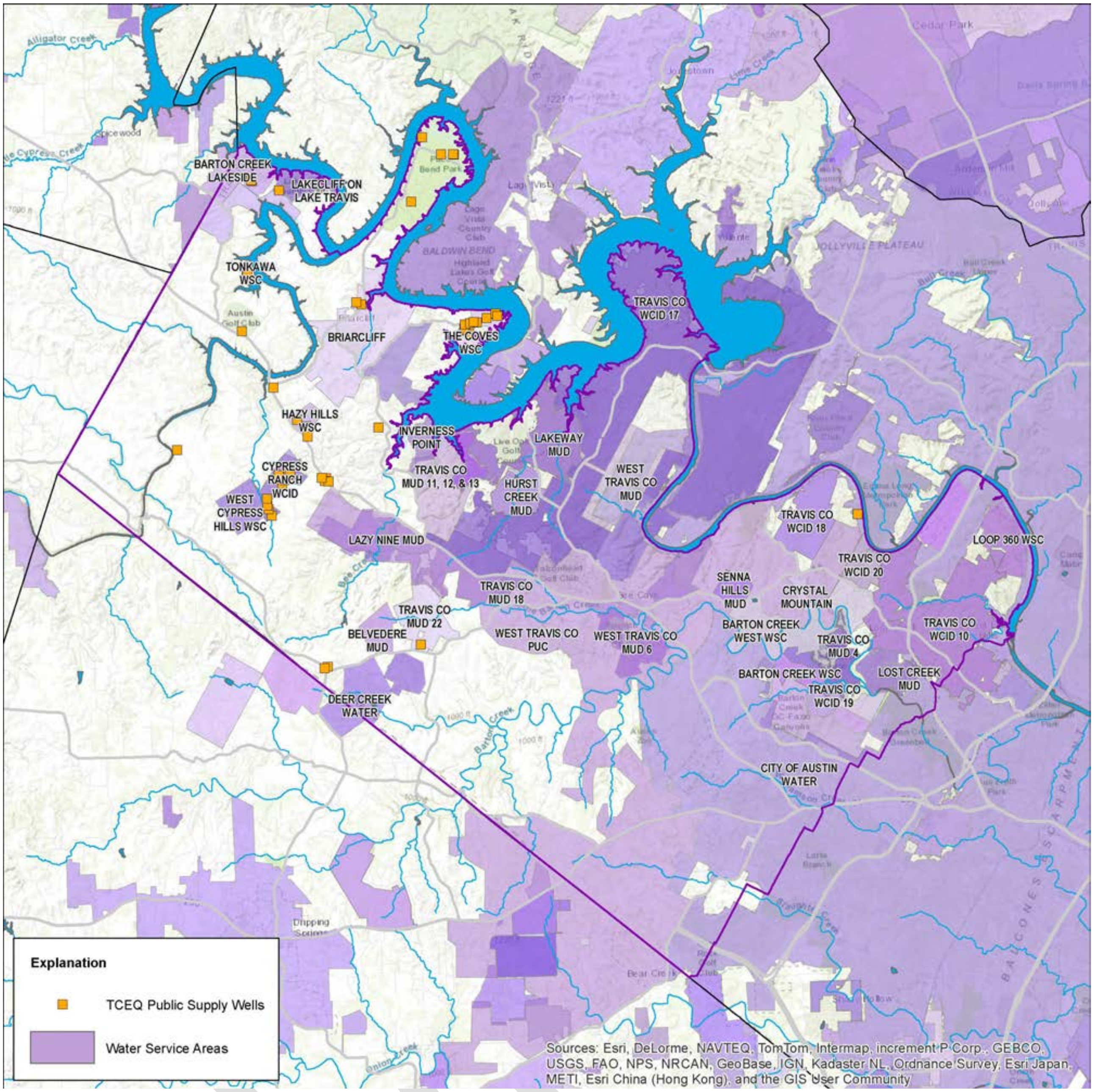


Figure 4. Water utility service areas in the District. Those utilities with water supply wells use groundwater for all or part of their supply, either all or part of the time. (Source: Hydrogeologic Atlas)

During the next 50 years, quantity and quality problems in the groundwater supply are considered to likely increase, and those problems would get worse if not managed. For this reason, the District's territory is part of the Hill Country Priority Groundwater Management Area (PGMA), which was established by TCEQ in 1990; the District is now a GCD member of Groundwater Management Area 9, which includes all but one of the GCDs that are within the Hill Country PGMA. However, both the hydrogeology and the stressed condition of the aquifers in the District are fundamentally different than those found in other GCDs in Groundwater Management Area 9 (including those in adjacent Hays County), in which the District participates for joint groundwater planning purposes and which approves the regional Desired Future Condition(s) (DFCs) for relevant aquifers.

Well depths range from shallow, hand-dug wells 20-30 feet deep to drilled wells more than 1000 feet deep in the District. 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 throughout the District. Water quality within a specific aquifer can often be defined or characterized in a general sense, but it can still be affected by local geology and hydrology, local withdrawal rates, as well as well construction methods.

There are five hydrogeologic subdivisions that the SWTCGCD is addressing in this Plan. These are shown schematically in the stratigraphic section of Figure 5. Each of the following aquifers are characterized and discussed in subsections below:

- Edwards
- Upper Trinity
- Middle Trinity
- Lower Trinity
- Hickory Aquifer and Other "Paleozoics" Aquifers

Of these, only the three subdivisions of the Trinity Aquifer are currently known to have groundwater production from wells in the District. Both the number of wells and their production are largest in the Lower Trinity Aquifer and those of the Upper Trinity are the smallest (refer to Figures 10.3 and 10.5 in the *Hydrogeologic Atlas*). The Trinity Aquifer extends across nearly all of southwestern Travis County, as shown in Figure 2 of GAM Run 19-027, reproduced in Appendix G.

a. Edwards Aquifer

To the east and west of the District, the Edwards group of limestones, dolomites, and marls forms major karst aquifer systems. The Edwards-Trinity (Plateau) Aquifer is a major aquifer over large parts of the Hill Country west and southwest of Travis County. The Edwards (Balcones Fault Zone) Aquifer is an important water supply immediately adjacent to the District to the east and southeast. However, within the District the Edwards rocks have been almost entirely removed by erosion and they only exist on some hilltops[2].

Relatively thin layers of limestone of the Fort Terrett formation of the Edwards Group that are a remnant of the Edwards Plateau to the west are locally present as a cap on the Shingle Hills and Destiny Hills, near Hamilton Pool Road in the south-central part of the District. In the eastern part of the District, another facies of the Edwards Group, the Walnut member of the Kainer formation, is present as a similar cap on certain hills there. Both of these Edwards occurrences form a thin, perched aquifer above the Upper Trinity Aquifer, which is very similar lithologically and hydraulically.

The District has not identified any wells that produce groundwater from these Edwards rocks; if any exist, they will most likely be old shallow, low-yielding wells for rural domestic and livestock use. Recharge will be solely from local precipitation occurring directly on the exceptionally small outcrop area, so within the District this aquifer may be extremely drought prone. This aquifer exists solely in an unconfined condition, so water not pumped from any wells will generally discharge from small seeps and springs at the base of the outcrop on the hillsides.

[2] In addition, several exceedingly small areas in SWTCGCD that are on certain portions of the boundary between SWTCGCD and BSEACD have the Edwards (Balcones Fault Zone) Aquifer mapped at the surface inside SWTCGCD. This circumstance arose from the imprecision in mapping the jurisdictional boundary as an approximation of the recharge zone boundary. SWTCGCD considers these areas as insignificant sources of Edwards (BFZ) groundwater and not germane for its groundwater management.

These may provide wet- weather flows to small, local streams within the county, which in turn might provide recharge to underlying aquifers from time to time.

For resource planning and regulatory purposes, the District considers these hilltop Edwards occurrences as the *de facto* uppermost part of the Upper Trinity Aquifer. The District will propose to GMA 9 that these perched aquifers also are to be non-relevant for joint planning purposes. The “non-relevant” designation means that it is unlikely to be significant for regional water planning strategies, not necessarily that it is unimportant as a water supply to the local users in the District.

b. Upper Trinity Aquifer

The Upper Trinity Aquifer consists of the Upper Glen Rose limestone and is located generally over the majority of southwestern Travis County. It is an unconfined aquifer comprised of alternating layers of limestone and calcareous clays. This forms an easily recognizable "stair-step" topography due to the differential weathering of the various layers. The Upper Glen Rose is also characterized by one or more thin layers of gypsum/anhydrite beds which are widely attributed to be the source of the sulfate and "rotten egg smell" often found in some wells. The Upper Glen Rose Aquifer is not a major source of groundwater production in southwestern Travis County primarily because of its low yields, with most of its wells used for domestic and other residential (including lawn irrigation) purposes (per *Hydrogeologic Atlas*). Groundwater yields from wells in the Upper Glen Rose are spatially variable, depending on local subsurface physical characteristics, but typically are small and at times intermittent. This is a usual characteristic of perched aquifers. This Aquifer also discharges naturally over most of the District as seeps and springs, which subsequently provide base flow to local creeks and rivers.

For local groundwater management purposes, the District chooses to consider the Upper Trinity as a separate aquifer from the underlying Middle Trinity and Lower Trinity Aquifers. The zones of poor water quality in the Upper Trinity Aquifer indicate that it may need to be isolated from the better aquifers below it to avoid commingling and to protect their water quality. Section VII.B of this Plan describes steps that would have the benefits of not only protecting the groundwater supply used by the relatively few wells in the Upper Trinity, but also improving the base flow of streams in the large outcrop areas of the Upper Trinity in the District.

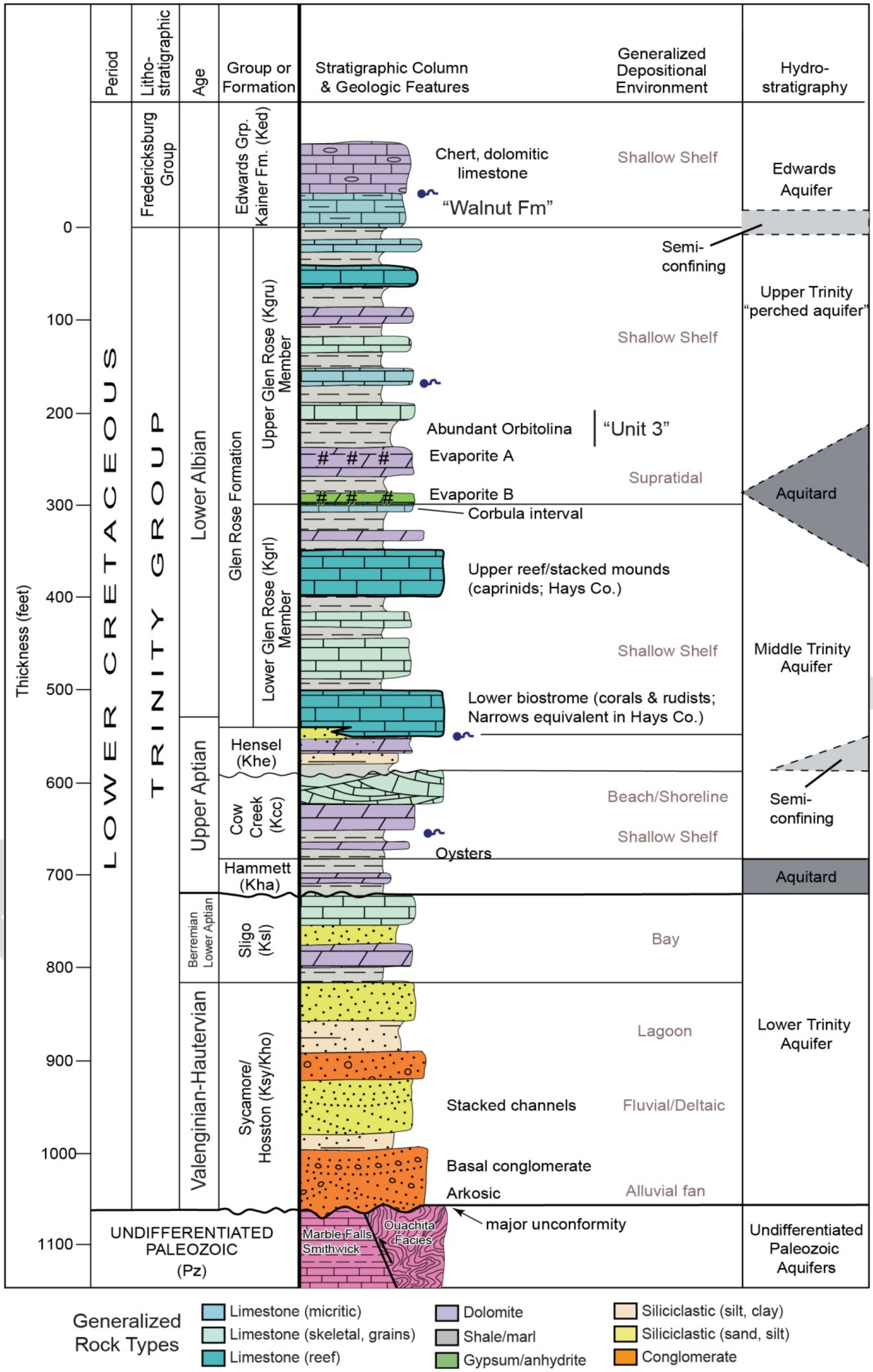


Figure 5. Stratigraphic column showing lithologic and hydrostratigraphic characteristics of the District's aquifers. (Source: Hydrogeologic Atlas)

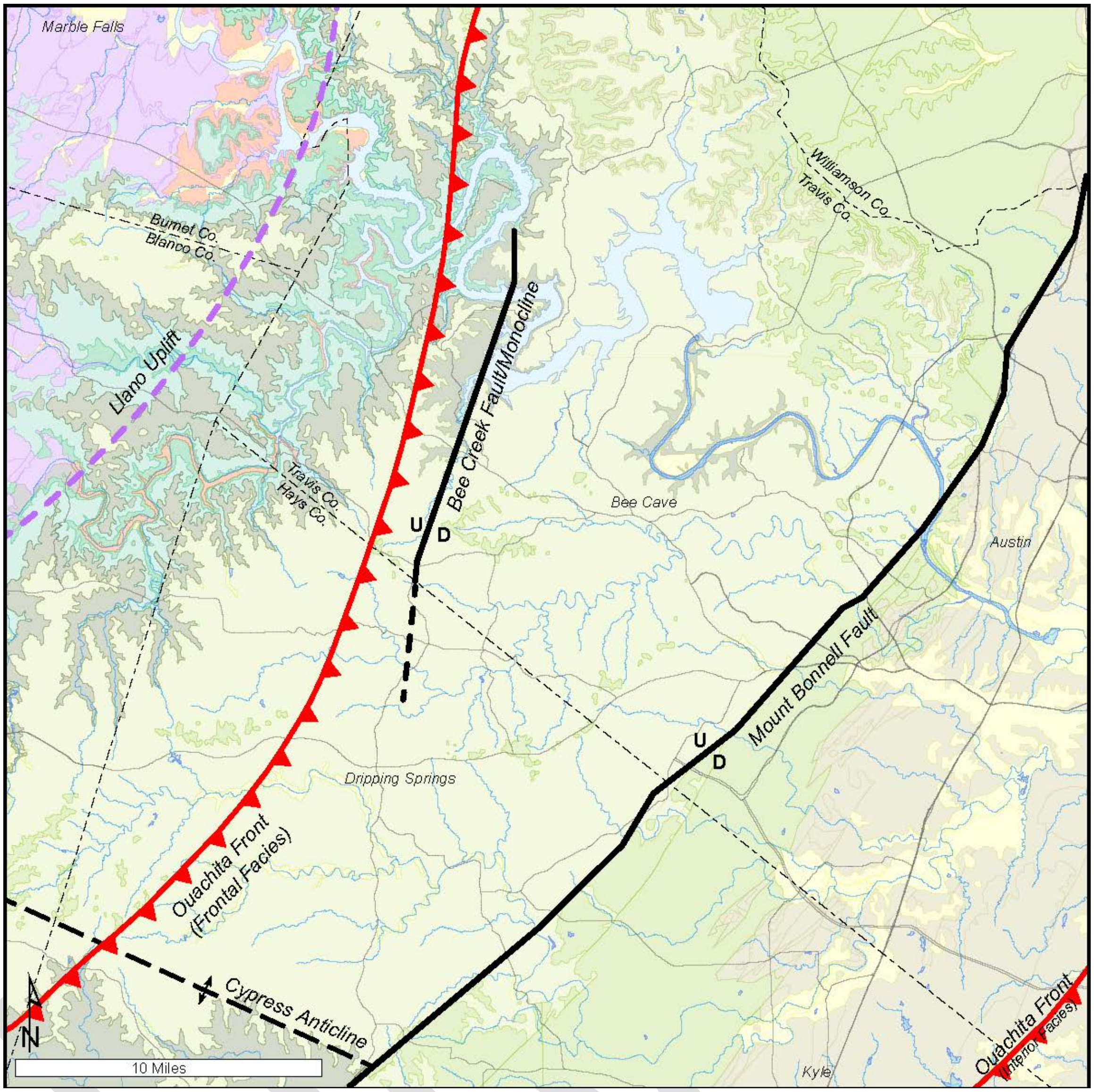


Figure 6. Map of key structural elements that affect the aquifers in the District. Characteristics of the Trinity Aquifer east and west of the Bee Creek Fault are hydrologically different. (Source: Hydrogeologic Atlas)

c. Middle Trinity Aquifer

The Middle Trinity Aquifer is an unconfined to semi-confined aquifer covering almost all of southwestern Travis County. It crops out only in the canyon areas adjacent to the Pedernales and Colorado Rivers, and elsewhere is overlain by the Upper Trinity Aquifer. It consists of the Lower Glen Rose limestone, the Hensel sandstone, and the Cow Creek limestone. As noted above and shown in Figure 6, from the *Hydrogeologic Atlas*, the Bee Creek Fault, located in the center of the District and trending roughly north – south from the Colorado River to about the Travis- Hays county line appears to play a significant role in the hydrogeological characteristics and the hydrologic behavior of both the Middle and Lower Trinity Aquifers in the District.

West of the Bee Creek Fault, the Middle Trinity units are partially exposed at the surface and constitute the recharge zone of the Middle Trinity. In some areas, the Middle Trinity may also be hydrologically connected to the river-and-lake systems, where the larger local streams tend to be gaining streams. East of the Bee Creek Fault, some localized recharge of the Middle Trinity from adjacent formations and possibly from Lake Travis may occur. In the southeastern-most part of the District, there appears to be higher hydraulic heads near the Balcones Fault Zone. The cause for these areas of higher groundwater pressure is currently unknown but could be from inter-formational flows from the Upper Trinity above, the influence of faulting, or a lack of historical pumping in this area. Groundwater may be produced from all three geologic formations of the Middle Trinity, but the Cow Creek formation at the aquifer's base is generally the most productive and reliable. In some locations, especially to the east, the Hensel serves as a semi-confining to confining layer as it becomes more calcareous and less of a sandstone. Yields from the Middle Trinity are generally low and reflect the dominant primary (matrix) porosity, typically between 10-50 gpm, but can be significantly higher, again depending on subsurface physical characteristics (Figure 7). The Middle Trinity yields in southwest Travis County are considerably smaller than yields in adjacent Hays County, where secondary porosity from dissolution along fractures and faults contributes to higher groundwater production rates. This is a significant difference in the hydrogeology between these two adjacent areas that are otherwise quite similar. It is the primary reason that the Middle Trinity is the main aquifer used in Hays County but not in southwest Travis County.

It is noteworthy that in the area east of the Bee Creek Fault, the water levels in both the Middle and Lower Trinity have declined at least since 1978 because of pumping, suggesting groundwater withdrawals exceed recharge. Water levels in the Middle Trinity in large parts of this area are much lower than elsewhere (Figure 8) and are now approaching the base of the aquifer, so little additional production from this aquifer is possible.

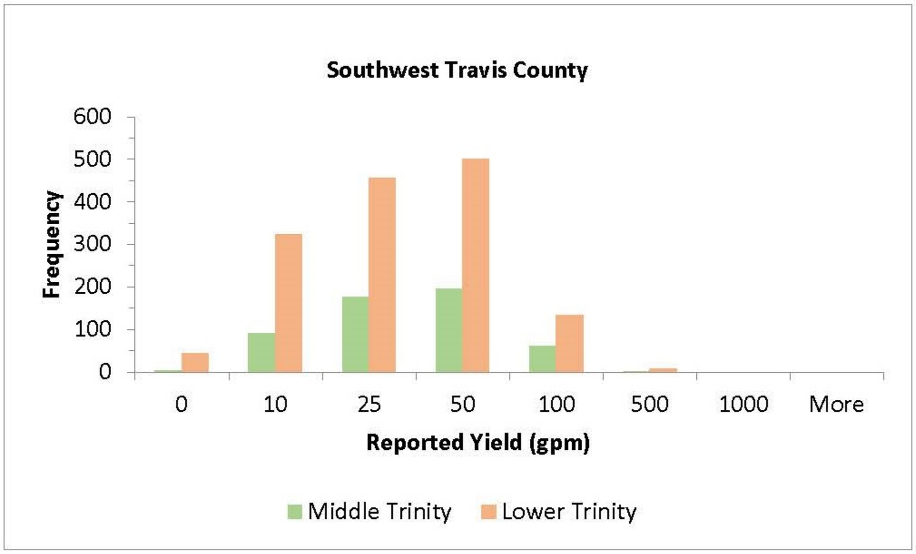
Water quality of the Middle Trinity varies, with some wells reporting abnormally high levels of sulfate and other constituents. But wells in some areas, especially those west of the Bee Creek Fault, typically have very good quality. Production from Middle Trinity wells is primarily used for community/public water systems, rural domestic, and irrigation demands. Some irrigation demand may be attributed to agricultural crops and livestock, but most is believed to be golf course and residential irrigation.

For local groundwater management purposes, the District chooses to differentiate the Middle Trinity as a separate aquifer from the rest of the Trinity aquifer, primarily to provide special, differentiated attention in its rulemaking for the areas of the Middle Trinity that are east and west of the Bee Creek Fault. Following the investigation results and conclusions described in the *Hydrogeologic Atlas*, accessible in Appendix A, the District intends to differentiate the areas west and east of the Bee Creek Fault as Areas 1 and 2, respectively, for management of the Middle Trinity Aquifer.

d. Lower Trinity Aquifer

Below the Cow Creek limestone lies the Hammett shale, which acts as a regional confining unit between the Middle Trinity and the Lower Trinity throughout the District, thickening somewhat toward the east. Below the Hammett, the Lower Trinity in southwestern Travis County consists of the Sligo formation (where present), a sandy dolomitic limestone, and the underlying Sycamore (Hosston) formation, a silty sandstone, but in some areas consisting of a gravel conglomerate. This lower formation is known as the Sycamore where it crops out and is

Yield Summary Tables



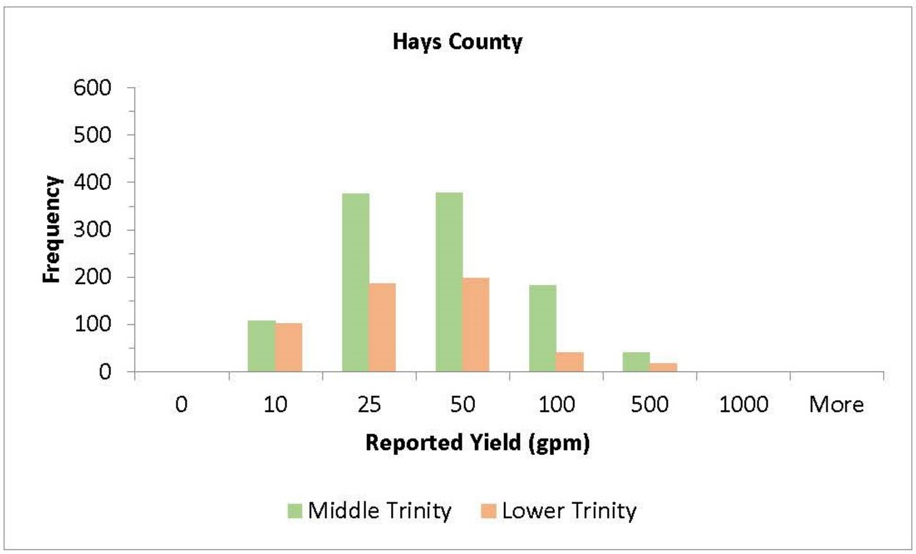


Figure 7. Comparison of Well Yields between Middle and Lower Trinity Aquifers and between southwestern Travis and northern Hays Counties. (Source: Hydrogeologic Atlas)

unconfined, and as the Hosston where in the subsurface and confined. The Lower Trinity is exposed at the surface only in the deeper gorges of the Pedernales River and the Colorado River, where it presumably sometimes recharges and at other times may discharge, depending on relative groundwater and surface-water elevations; the surface water-groundwater interaction of this unit is poorly understood.

Groundwater production from the Lower Trinity will require deeper wells, but yields are generally low, again due to the dominant primary (matrix) porosity. Most current production in the area west of the Bee Creek Fault is from the Lower Trinity (especially higher-capacity public water supply wells). There is pronounced drawdown since 1978 from production east of the Bee Creek Fault (Figure 9), where irrigation (including residential irrigation) is the dominant use.

Water quality in the Lower Trinity is generally good west of the Bee Creek Fault but tends to be slightly saline to the east of the fault (per *Hydrogeologic Atlas*). The mix of uses for the Lower Trinity is similar to the Middle Trinity.

For local groundwater management purposes, the District chooses to differentiate the Lower Trinity as a separate aquifer from the rest of the Trinity Aquifer, primarily to provide special, differentiated attention in its rulemaking to the areas of the Lower Trinity east and west of the Bee Creek Fault. Following the investigation results and conclusions described in the *Hydrogeologic Atlas*, accessible in Appendix A, the District also intends to differentiate the areas west and east of the Bee Creek Fault as Areas 1 and 2, respectively, for management of the Lower Trinity Aquifer.

e. Hickory Aquifer and Other "Paleozoics" Aquifers

The Lower Trinity Aquifer within the District lies unconformably on much older Paleozoic rocks. Paleozoic rocks are divided into two general groups by the Ouachita Thrust Front: [3]

- In the western part of SWTCGCD, and west of the Ouachita Front, the Paleozoic rocks are part of the "Foreland" group of rocks and may provide water to wells and therefore be considered aquifers. Known Paleozoic aquifers include the minor aquifers of the Marble Falls Limestone, Ellenberger-San Saba, and Hickory Aquifers. These rocks are faulted and fractured.

- East of the Ouachita Front, the Paleozoic rocks are more deformed and metamorphosed in a complex group of rocks called the "Ouachita Facies", which have very low water-bearing properties.

These aquifers are collectively termed the "Paleozoics" in this plan. West of Travis County, where these aquifers are much more accessible and locally used for water supplies, they are called the Llano Uplift Aquifers.

It is not known whether any Paleozoic units can be designated as an aquifer anywhere in southwestern Travis County and, if so, what its reservoir characteristics are, other than being at great depth. For example, the elevation of the top of the Hickory Aquifer is estimated in the Llano Uplift Aquifers Conceptual Model report to TWDB (Shi et al., 2016) to range from 742 feet below msl at the western Travis County line to 2,393 feet below msl at the Ouachita Thrust Front near Bee Creek. The District is not aware of any water wells completed or planned in the Hickory or other Paleozoics Aquifers in southwestern Travis County, which is unsurprising because the depths of up to several thousand feet are beyond the capabilities of typical water well drilling equipment in this region. However, on the basis of regional structural information and inference, the TWDB has included data for the Hickory in GAM Run 19-027, Southwestern Travis County (Appendix G), and the District is obligated to acknowledge it as a possible local aquifer, potentially perhaps an alternative water supply in the future if it is a groundwater reservoir.

In this Plan the District considers the Paleozoics to currently be an insignificant if not non-existent water supply. This conclusion is buttressed by the fact that GMA 9 has previously declared these aquifers to be non-relevant for joint groundwater planning purposes in areas similarly situated to the District relative to the Llano Uplift (Jones, 2017; Appendix E).

[3] The Ouachita Front is the boundary between the Paleozoic Forelands to the west and the Ouachita Facies to the east, indirectly affecting the younger, Cretaceous-aged rocks that comprise the Trinity Aquifer in the District. The Front reflects local structural differences in the underlying rocks, which may have influenced the location of the Bee Creek Fault.

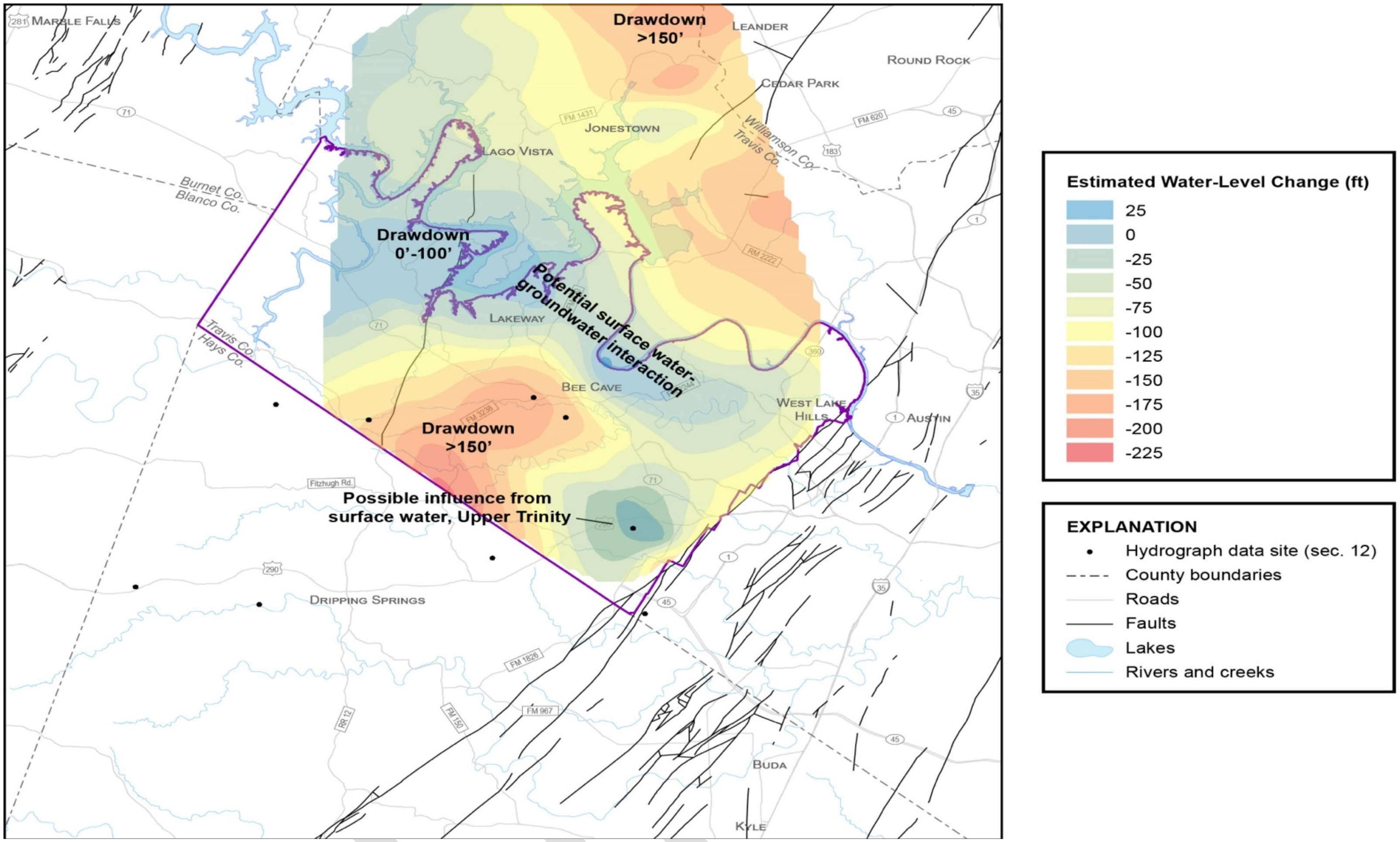


Figure 8. Generalized well drawdown observed and inferred in Middle Trinity Aquifer, 1978-2018. District is outlined in purple. (Source: Hydrogeologic Atlas)

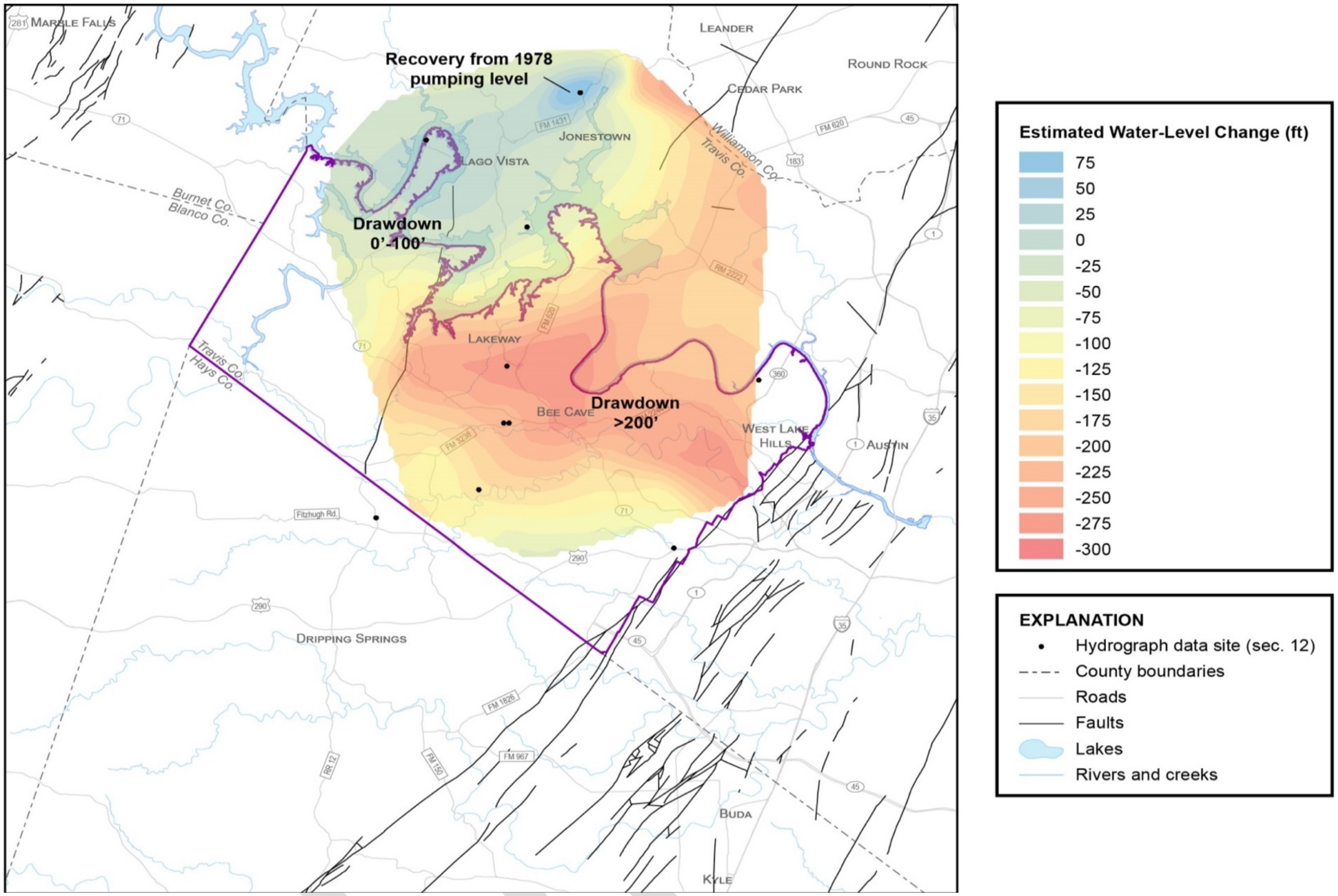


Figure 9. Generalized well drawdown observed and inferred in Lower Trinity Aquifer. District is outlined in purple. (Source: *Hydrogeologic Atlas*)

IV. CRITERIA AND INFORMATION FOR PLAN APPROVAL *(31 TAC 356.53)*

A. Planning Horizon

This Plan is the initial Plan prepared by the Southwestern Travis County Groundwater Conservation District (SWTCGCD) and will become effective upon adoption by the SWTCGCD Board of Directors (District Board) followed by its subsequent approval by the Texas Water Development Board (TWDB). This plan has an effective planning period of five years. The planning period will begin on the date of approval by the TWDB. No later than every five years, in accordance with TWC Section 36.1072(e), the plan must be reviewed for consistency with the applicable Regional Water Plans and the State Water Plan and shall be readopted with or without amendments.

The plan *may* be revised at any time in order to maintain such consistency or as necessary to address any new or revised data, new or revised Groundwater Availability Models, GMA 9 designated DFCs and Modeled Available Groundwater (MAG) quantities, or evolving District management strategies. For those reasons, it is currently anticipated that this initial Plan will be revised multiple times in the course of the first ten years of District operation. This Plan will remain in effect until the plan is replaced by a revised plan that has been approved by the TWDB.

B. Board Resolution

A certified copy of the Southwestern Travis County Groundwater Conservation District Board of Directors Resolution #XXXXXXXX adopting this Plan is located in Appendix B - District Resolution.

C. Notifications Before Plan Adoption

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

D. Coordination with Surface Water Management Entities

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

V. ESTIMATES OF TECHNICAL INFORMATION (Required by TWC Section 36.1071 and 31 TAC 356.52)

The data and information presented in this section of the Plan and in the relevant appendices are provided by the TWDB and are the best information on these topics available at the time this initial Plan was prepared and submitted for approval. For readers' convenience, certain information from some appendices is transcribed and reproduced in this section, but in the event of any differences between what is shown in the text and what is included in the TWDB reports in various appendices, the TWDB reports prevail.

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

MAG is defined in TWC Section 36.001as "the amount of water that the Executive Administrator of the TWDB determines may be produced on an average annual basis to achieve a DFC established under Section 36.108." The DFC of an aquifer may only be determined through joint planning with other GCDs in the same GMA in accordance with TWC 36.108. The District is part of GMA 9. The current adopted DFCs approved by GMA 9 on April 18, 2016 are found in Appendix E.

However, the District was not involved in the development or approval of the GMA 9 DFCs, because it had not yet been created. Consequently, the District has not adopted these DFCs and the current DFCs are not applicable to SWTCGCD. The District is participating in the ongoing round of DFC planning, which includes discussion and possible action to subdivide GMA 9 for joint planning purposes, and the District will adopt one or more, as applicable, DFCs and their corresponding MAG estimates once those new DFCs are established by GMA 9 and approved by TWDB, scheduled for mid-2021.

The MAG numbers (in acre-feet per year) previously allocated to the Southwestern Travis County GCD territory are found in TWDB MAG Report in Appendix E, which is the source of the information in Table 1 below. GMA 9 declared the Trinity Aquifer to be the only relevant aquifer in Southwestern Travis County for regional planning purposes.

Table 1. Modeled Available Groundwater for Southwestern Travis County

Trinity Aquifer

County	RWPG	River Basin	2010	2020	2030	2040	2050	2060
Travis	K	Colorado	8,920	8,672	8,655	8,643	8,627	8,598

A small part of the District currently is mapped as part of GMA 10, and the Trinity is a relevant aquifer in this area. Accordingly, in addition to the MAG estimates related to GMA 9 in Table 1, the Trinity MAG also includes an estimated 329 acre-feet per year for the decades 2010 through 2060 within the GMA (TWDB, GR 16-033 MAG).

The following aquifers were declared by GMA 9 to be "non-relevant" in Southwestern Travis County for joint planning and therefore do not have associated MAGs: Hickory Aquifer and Edwards (BFZ) Aquifer.

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

To estimate the annual amount of groundwater being used within Southwestern Travis County, the District has looked to the TWDB Annual Historical Water Use Survey Data (included in Appendix F and reproduced in Table 2 below). The data set includes data from 2001-2017, which was aggregated at the county level and then apportioned to the District by TWDB on an areal basis. An apportionment multiplier of 0.209 was applied, calculated by dividing the District's area by the total Travis County area on an areal basis. The table shows that estimated annual groundwater use in the District has varied from 2,582 (in 2007) to 4,917 (in 2011) acre-feet of groundwater per year.

Table 2. Estimated Historical Water Use in the District

Estimated Historical Water Use

TWDB Historical Water Use Survey (WUS) Data

TRAVIS COUNTY *20.9% (multiplier)* All values are in acre-feet

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2017	GW	4,158	145	0	17	389	16	4,725
	SW	33,406	2,527	0	327	52	63	36,375
2016	GW	3,873	145	0	17	369	17	4,421
	SW	32,385	2,099	0	154	86	68	34,792
2015	GW	3,335	153	0	0	156	17	3,661
	SW	31,170	2,011	0	198	2,211	68	35,658
2014	GW	3,404	162	0	0	217	17	3,800
	SW	31,003	1,762	0	564	1,753	66	35,148
2013	GW	3,979	160	0	0	354	20	4,513
	SW	32,366	1,885	0	677	897	80	35,905
2012	GW	3,901	126	0	0	246	21	4,294
	SW	34,882	1,836	23	769	700	83	38,293
2011	GW	4,917	90	0	0	602	26	5,635
	SW	38,676	1,642	23	1,856	627	106	42,930
2010	GW	3,888	168	259	0	152	26	4,493
	SW	33,582	1,416	373	627	627	104	36,729
2009	GW	3,305	158	246	0	59	28	3,796
	SW	34,977	1,661	566	1,058	866	110	39,238
2008	GW	2,724	191	234	0	263	25	3,437
	SW	36,828	2,337	581	1,557	834	99	42,236
2007	GW	2,582	169	0	0	158	24	2,933
	SW	31,499	2,220	198	1,601	713	97	36,328
2006	GW	2,761	208	0	0	427	23	3,419
	SW	37,910	2,246	337	1,304	627	94	42,518
2005	GW	3,122	198	0	0	311	27	3,658
	SW	33,571	2,356	659	889	660	109	38,244
2004	GW	2,793	265	0	0	165	54	3,277
	SW	30,349	2,319	404	2,073	974	64	36,183
2003	GW	2,921	250	0	0	178	59	3,408
	SW	32,086	2,794	342	800	912	69	37,003
2002	GW	2,660	207	0	0	285	98	3,250
	SW	32,494	2,966	421	498	6	115	36,500

These use amounts seem reasonably consistent with other estimates for groundwater use in southwestern Travis County, especially after considering the growth that has occurred in this area. Previous estimates of annual pumping in this area from 1975 indicated about 1,540 acre-ft/yr (501 M gal/yr) from the undifferentiated Trinity Aquifer (Brune and Duffin, 1983). In 2011 another estimate of annual pumping in southwestern Travis County was made for modeling evaluations in GMA 9. Those estimates indicated about 3,950 ac-ft/yr (1.3 B gal/yr) from the undifferentiated Trinity Aquifer (Hunt, 2011). A more recent (2020) estimate of total Trinity pumping in this area is about 4,400 ac-ft/yr (*Hydrogeologic Atlas*).

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

The estimate of the annual amount of recharge from precipitation to the aquifers within the District is based on GAM Run 19-027, aquifer assessment based on water-budget analyses conducted by the TWDB. These GAM runs and aquifer assessments from the TWDB are included in Appendix G and are summarized in Table 3.

Table 3. Recharge from Precipitation in the District

Aquifer	Recharge From Precipitation (Acre-feet per year)	Comment
Edwards (BFZ)	79	Non-relevant
Trinity	12,167	Relevant
Hickory	0	Non-relevant

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

The estimate of the annual volume of water discharged to surface water systems by the groundwater resources of the District are based on TWDB GAM Run 19-027. The GAM run and analysis from the TWDB are included in Appendix G and summarized in Table 4.

Table 4. Discharge to Surface Water Bodies

Aquifer	Discharge to Surface Water Bodies (Acre-feet per year)	Comment
Edwards (BFZ)	0	Non-relevant
Trinity	12,654	Relevant
Hickory	0	Non-relevant

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

The estimates of these amounts of water flowing within each aquifer in the District are based on TWDB GAM Run 19-027. This GAM Run and analysis from the TWDB are included in Appendix G and summarized in Table 5.

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

The estimates of these amounts of water flowing within each aquifer in the District are included in Appendix G and summarized in Table 5.

Table 5. Flow Into, Out of, and Between Aquifers in District

Aquifer	Acre-Feet in:	Acre-Feet out	Acre-Feet between Aquifers	Comment
Edwards (BFZ)	306	615	2,332*	Non-relevant; From the Hill Country Trinity to the Edwards (BFZ) and the downdip Trinity, per the GAM for the Hill Country Trinity
Trinity	10,024	9,205	2,333	Relevant; From the Hill Country Trinity to the Edwards (BFZ) and the downdip Trinity
Hickory	3,121	1,114	Into overlying (younger) units: 2,153; From underlying (Precambrian) units: 145	Non-relevant

*From the Groundwater Availability Model for the Hill Country portion of the Trinity Aquifer.

F. Projected Surface Water Supply in the District, According to Most Recently Adopted State Water Plan --- 31TAC 356.52(a)(5)(F) / TWC Section 36.1071(e)(3)(F)

The most recently adopted State Water Plan is the 2017 State Water Plan. This Plan incorporated the 2016 Region K Water Plan, which provided projected surface water supplies in the District and Travis County.

Within the District, there are two large surface water impoundments, Lake Travis and Lake Austin, which are operated and managed by the Lower Colorado River Authority. These two impoundments are the primary water source for many of the residents and businesses located within the District, including a part of the City of Austin and the City of West Lake Hills and all of the Village of the Hills, the City of Lakeway, and the City of Bee Cave, as well as multiple surface-water management entities such as the West Travis County Public Utility Agency. Local usage of surface water (usually for livestock watering or limited irrigation from small ponds or small-scale riparian diversions from the Pedernales River and its smaller tributaries) is termed "local supply" in the State and Region K Plans.

The Projected Surface Water Supply Survey dataset from the TWDB for Travis County is included in Appendix F. The dataset has been aggregated by TWDB for Travis County, and then those data for county-level Water Use Groups (WUGs), including manufacturing, steam electric power, irrigation, mining, county-other, and livestock, were apportioned to the District by TWDB. An apportionment multiplier of 0.209, calculated on an areal basis, was applied by TWDB to these WUGs. By convention the values for WUGs that are municipalities, water supply corporations, and utility districts are not apportioned; instead, their full values are retained. The District has further adjusted the dataset in Appendix F to include in the annual totals only those supplies that are wholly or partially within, or very close to, the geographic area of the District. This revised dataset is presented in Table 6 below.

This analysis indicates that the surface-water supplies potentially available to users in the District will decrease from 303,976 acre-feet in 2020 to 233,440 acre-feet in 2070, a 23.2% decrease. Moreover, a large portion of these projected water supplies is derived from the City of Austin Water Utility, which has not been apportioned to the District's geographic area, even though the District is only a relatively small part of the utility's total service area.

Table 6. Projected Surface Water Supplies in District

Projected Surface Water Supplies

TWDB 2017 State Water Plan Data

TRAVIS COUNTY			*20.9% (multiplier)*			All values are in acre-feet			
RWPG	**WUG**	**WUG Basin**	**Source Name**	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
K	AUSTIN	COLORADO	COLORADO RUN-OF-RIVER	137,829	129,682	112,223	100,459	88,585	75,600
K	AUSTIN	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	123,626	123,626	123,626	123,626	123,613	123,046
K	BARTON CREEK WEST WSC	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	760	760	760	760	760	760
K	BEE CAVE	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	1,552	1,552	1,552	1,552	1,552	1,552
K	BRIARCLIFF	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	400	400	400	400	400	400
K	CEDAR PARK	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	0	0	0	0	0	0
K	COUNTY-OTHER, TRAVIS	COLORADO	COLORADO RUN-OF-RIVER	945	859	782	656	480	325
K	COUNTY-OTHER, TRAVIS	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	3,023	3,023	3,023	3,023	3,023	3,023
K	CREEDMOOR-MAHA WSC	COLORADO	COLORADO RUN-OF-RIVER	0	0	0	0	0	0

K	IRRIGATION, TRAVIS	COLORADO	COLORADO RUN-OF-RIVER	0	0	0	0	0	0
K	IRRIGATION, TRAVIS	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	543	543	543	543	543	543
K	JONESTOWN	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	0	0	0	0	0	0
K	LAGO VISTA	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	0	0	0	0	0	0
K	LAKEWAY	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	4,249	4,249	4,249	4,249	4,249	4,249
K	LEANDER	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	1,202	1,684	1,738	1,269	1,079	941
K	LIVESTOCK, TRAVIS	COLORADO	COLORADO LIVESTOCK LOCAL SUPPLY	142	142	142	142	142	142
K	LIVESTOCK, TRAVIS	GUADALUPE	GUADALUPE LIVESTOCK LOCAL SUPPLY	0	0	0	0	0	0
K	LOOP 360 WSC	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	1,250	1,250	1,250	1,250	1,250	1,250
K	LOST CREEK MUD	COLORADO	COLORADO RUN-OF-RIVER	1,092	1,072	1,057	1,056	1,054	1,054
K	MANOR	COLORADO	COLORADO RUN-OF-RIVER	0	0	0	0	0	0
K	MANOR	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	0	0	0	0	0	0
K	MANUFACTURING, TRAVIS	COLORADO	COLORADO RUN-OF-RIVER	0	0	0	0	0	0
K	MANUFACTURING, TRAVIS	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	59	59	59	59	59	59
K	MANVILLE WSC	COLORADO	COLORADO RUN-OF-RIVER	0	0	0	0	0	0
K	MANVILLE WSC	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	0	0	0	0	0	0
K	MINING, TRAVIS	COLORADO	COLORADO OTHER LOCAL SUPPLY	448	573	709	835	974	1,134
K	MINING, TRAVIS	GUADALUPE	COLORADO OTHER LOCAL SUPPLY	0	0	0	0	0	0
K	NORTH AUSTIN MUD #1	COLORADO	COLORADO RUN-OF-RIVER	0	0	0	0	0	0
K	NORTHTOWN MUD	COLORADO	COLORADO RUN-OF-RIVER	0	0	0	0	0	0
K	NORTHTOWN MUD	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	0	0	0	0	0	0
K	PFLUGERVILLE	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	0	0	0	0	0	0
K	POINT VENTURE	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	0	0	0	0	0	0

K	ROLLINGWOOD	COLORADO	COLORADO RUN-OF-RIVER	384	0	0	0	0	0
K	ROUND ROCK	COLORADO	BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	0	0	0	0	0	0
K	ROUND ROCK	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	0	0	0	0	0	0
K	SHADY HOLLOW MUD	COLORADO	COLORADO RUN-OF-RIVER	0	0	0	0	0	0
K	STEAM ELECTRIC POWER, TRAVIS	COLORADO	COLORADO RUN-OF-RIVER	0	0	0	0	0	0
K	STEAM ELECTRIC POWER, TRAVIS	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	3,377	3,377	3,377	2,505	1,147	0
K	SUNSET VALLEY	COLORADO	COLORADO RUN-OF-RIVER	0	0	0	0	0	0
K	THE HILLS	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	1,533	1,533	1,533	1,533	1,533	1,533
K	TRAVIS COUNTY MUD #4	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	3,818	3,820	3,822	3,823	3,823	3,823
K	TRAVIS COUNTY WCID #10	COLORADO	COLORADO RUN-OF-RIVER	2,128	0	0	0	0	0
K	TRAVIS COUNTY WCID #17	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	8,027	8,027	8,027	8,027	8,027	8,027
K	TRAVIS COUNTY WCID #18	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	1,736	1,736	1,736	1,736	1,736	1,736
K	TRAVIS COUNTY WCID #19	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	498	496	494	493	493	493
K	TRAVIS COUNTY WCID #20	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	1,135	1,135	1,135	1,135	1,135	1,135
K	WELLS BRANCH MUD	COLORADO	COLORADO RUN-OF-RIVER	0	0	0	0	0	0
K	WEST LAKE HILLS	COLORADO	COLORADO RUN-OF-RIVER	1,605	0	0	0	0	0
K	WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	2,615	2,615	2,615	2,615	2,615	2,615
K	WILLIAMSON-TRAVIS COUNTY MUD #1	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	0	0	0	0	0	0
Sum of Projected Surface Water Supplies (acre-feet)				337,386	324,791	310,736	299,843	288,251	275,501
			Supplies within SWTCGCD	**303,976**	**292,213**	**274,852**	**261,746**	**248,272**	**233,440**

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

The most recently adopted State Water Plan is the 2017 State Water Plan. This Plan incorporated the 2016 Region K Water Plan, which provided projected Total Demand for Water in the District and Travis County.

These data on water demand are included in Appendix F. Similarly to the treatment of the data on surface-water supplies described in the preceding subsection, this dataset has been aggregated by TWDB at the county level and then the demands by the county-level WUGs have been apportioned to the District by TWDB on an areal basis. An apportionment multiplier of 0.209 was used in these calculations. As with the supply data, the demand values for WUGs that are municipalities, water supply corporations, and utility districts are not apportioned; instead, their full values are retained. The District has further adjusted the dataset in Appendix F to include in the annual totals only those demands that arise wholly or partially within, or very close to, the geographic area of the District. This revised dataset is presented in Table 7 below.

This analysis indicates that the annual water demands by users in the District will increase from 205,188 acre-feet in 2020 to 339,695 acre-feet in 2070, a 65.6% increase. As with the supply data, a large portion of the projected demand is derived from the City of Austin Water Utility, which has not been apportioned to the District's geographic area, even though the District is only a relatively small part of the utility's total service area.

Table 7. Projected Total Water Demand within the District

Projected Water Demands

TWDB 2017 State Water Plan Data

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

TRAVIS COUNTY *20.9% (multiplier)* All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
K	AQUA WSC	COLORADO	0	0	0	0	0	0
K	AUSTIN	COLORADO	157,445	182,933	209,973	229,887	246,590	266,411
K	BARTON CREEK WEST WSC	COLORADO	432	427	424	423	422	422
K	BEE CAVE	COLORADO	1,777	2,043	2,297	2,582	2,834	3,070
K	BRIARCLIFF	COLORADO	260	295	328	368	403	436
K	CEDAR PARK	COLORADO	0	0	0	0	0	0
K	COUNTY-OTHER, TRAVIS	COLORADO	1,749	1,590	1,447	1,214	890	602
K	COUNTY-OTHER, TRAVIS	GUADALUPE	0	0	0	0	0	0
K	CREEDMOOR-MAHA WSC	COLORADO	0	0	0	0	0	0
K	CREEDMOOR-MAHA WSC	GUADALUPE	0	0	0	0	0	0
K	ELGIN	COLORADO	0	0	0	0	0	0
K	GOFORTH SUD	GUADALUPE	0	0	0	0	0	0

K	IRRIGATION, TRAVIS	COLORADO	903	831	764	703	647	603
K	JONESTOWN	COLORADO	0	0	0	0	0	0
K	LAGO VISTA	COLORADO	0	0	0	0	0	0
K	LAKEWAY	COLORADO	6,977	9,115	9,093	9,081	9,076	9,075
K	LEANDER	COLORADO	0	0	0	0	0	0
K	LIVESTOCK, TRAVIS	COLORADO	142	142	142	142	142	142
K	LIVESTOCK, TRAVIS	GUADALUPE	0	0	0	0	0	0
K	LOOP 360 WSC	COLORADO	1174	1,220	1,264	1,316	1,363	1,407
K	LOST CREEK MUD	COLORADO	1092	1,072	1,057	1,056	1,054	1,054
K	MANOR	COLORADO	0	0	0	0	0	0
K	MANUFACTURING, TRAVIS	COLORADO	7480	10,180	13,346	15,255	17,092	19,151
K	MANVILLE WSC	COLORADO	0	0	0	0	0	0
K	MINING, TRAVIS	COLORADO	725	850	985	1,112	1,251	1,411
K	MINING, TRAVIS	GUADALUPE	0	0	0	0	0	0
K	MUSTANG RIDGE	COLORADO	0	0	0	0	0	0
K	MUSTANG RIDGE	GUADALUPE	0	0	0	0	0	0
K	NORTH AUSTIN MUD #1	COLORADO	0	0	0	0	0	0
K	NORTHTOWN MUD	COLORADO	0	0	0	0	0	0
K	PFLUGERVILLE	COLORADO	0	0	0	0	0	0
K	POINT VENTURE	COLORADO	0	0	0	0	0	0
K	ROLLINGWOOD	COLORADO	384	379	376	375	376	378
K	ROUND ROCK	COLORADO	0	0	0	0	0	0
K	SHADY HOLLOW MUD	COLORADO	0	0	0	0	0	0
K	STEAM ELECTRIC POWER, TRAVIS	COLORADO	3,867	4,703	4,703	4,912	5,121	5,539
K	SUNSET VALLEY	COLORADO	0	0	0	0	0	0
K	THE HILLS	COLORADO	1,449	1,444	1,441	1,439	1,438	1,438
K	TRAVIS COUNTY MUD #4	COLORADO	2611	3,010	3,387	3,810	4,184	4,533
K	TRAVIS COUNTY WCID #10	COLORADO	2128	2,428	2,715	3,044	3,341	3,619
K	TRAVIS COUNTY WCID #17	COLORADO	8451	10,053	11,017	11,187	11,479	11,842
K	TRAVIS COUNTY WCID #18	COLORADO	1123	1,267	1,407	1,573	1,725	1,867
K	TRAVIS COUNTY WCID #19	COLORADO	498	496	494	493	493	493
K	TRAVIS COUNTY WCID #20	COLORADO	590	587	584	583	582	582
K	VOLENTE	COLORADO	0	0	0	0	0	0
K	WELLS BRANCH MUD	COLORADO	0	0	0	0	0	0
K	WEST LAKE HILLS	COLORADO	1564	1,550	1,539	1,533	1,532	1,532
K	WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY	COLORADO	2367	2,720	3,057	3,438	3,774	4,088
K	WILLIAMSON-TRAVIS COUNTY MUD #1	COLORADO	0	0	0	0	0	0

Sum of Projected Water Demands (acre-feet)	234,367	276,746	317,606	348,567	375,181	405,048
Demand within SWTCGCD	**205,188**	**239,3355**	**271,8400**	**295,5266**	**315,8099**	**339,695**

VI. CONSIDER THE WATER SUPPLY NEEDS AND WATER MANAGEMENT STRATEGIES INCLUDED IN THE ADOPTED STATE WATER PLAN *(Required by TWC Section 36.1071(e)(4))*

The most recently adopted State Water Plan is the 2017 State Water Plan. This Plan incorporated the 2016 Region K Water Plan, which provided the estimated water supply needs in Travis County and the water management strategies planned to meet those needs. This information appears in Appendix F and is tabulated in subsections below. TWDB does not attempt to apportion the needs and strategies from the county level to the District, as the GCD is required only to consider the county-level needs and strategies in its Plan.

A. Water Supply Needs

Table 8 below provides a listing of individual WUGs with identified water supply needs (negative numbers in the table indicate a water supply shortage) and the aggregated needs for water. Overall, Travis County's need for additional water supplies to meet projected demand will grow from its current shortfall in supply of about 3,200 acre-feet annually to a shortfall of more than 134,000 acre-feet annually in 2070.

Table 8. Projected Water Supply Needs Relevant to the District

Projected Water Supply Needs

TWDB 2017 State Water Plan Data

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

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
K	AQUA WSC	COLORADO	721	584	447	286	138	0
K	AUSTIN	COLORADO	108,581	74,946	30,447	-1,231	-29,821	-63,194
K	BARTON CREEK WEST WSC	COLORADO	328	333	336	337	338	338
K	BEE CAVE	COLORADO	-225	-491	-745	-1,030	-1,282	-1,518
K	BRIARCLIFF	COLORADO	140	105	72	32	-3	-36
K	CEDAR PARK	COLORADO	-505	-941	-1,121	-987	-1,084	-1,194
K	COUNTY-OTHER, TRAVIS	COLORADO	10,613	10,963	11,278	11,790	12,505	13,139
K	COUNTY-OTHER, TRAVIS	GUADALUPE	94	86	78	75	74	70
K	CREEDMOOR-MAHA WSC	COLORADO	160	59	-43	-171	-309	-445
K	CREEDMOOR-MAHA WSC	GUADALUPE	0	0	0	0	0	0
K	ELGIN	COLORADO	0	-101	-196	-305	-402	-493
K	GOFORTH SUD	GUADALUPE	0	0	0	0	0	0
K	IRRIGATION, TRAVIS	COLORADO	809	1,156	1,474	1,767	2,034	2,246
K	JONESTOWN	COLORADO	-93	-113	-133	-158	-182	-206
K	LAGO VISTA	COLORADO	2,157	1,840	1,537	1,193	885	597

K	LAKEWAY	COLORADO	-1,469	-3,607	-3,585	-3,573	-3,568	-3,567
K	LEANDER	COLORADO	68	-1,224	-3,282	-4,153	-4,544	-4,937
K	LIVESTOCK, TRAVIS	COLORADO	3	3	3	3	3	3
K	LIVESTOCK, TRAVIS	GUADALUPE	0	0	0	0	0	0
K	LOOP 360 WSC	COLORADO	76	30	-14	-66	-113	-157
K	LOST CREEK MUD	COLORADO	0	0	0	0	0	0
K	MANOR	COLORADO	2,316	757	357	-94	-494	-867
K	MANUFACTURING, TRAVIS	COLORADO	0	0	0	0	0	0
K	MANVILLE WSC	COLORADO	3,765	873	182	-568	-1,286	-2,346
K	MINING, TRAVIS	COLORADO	0	0	0	0	0	0
K	MINING, TRAVIS	GUADALUPE	0	0	0	0	0	0
K	MUSTANG RIDGE	COLORADO	0	0	0	0	0	0
K	MUSTANG RIDGE	GUADALUPE	0	0	0	0	0	0
K	NORTH AUSTIN MUD #1	COLORADO	0	0	0	0	0	0
K	NORTHTOWN MUD	COLORADO	339	339	339	339	339	339
K	PFLUGERVILLE	COLORADO	-605	-4,935	-9,073	-13,727	-17,872	-21,741
K	POINT VENTURE	COLORADO	13	-83	-174	-278	-369	-455
K	ROLLINGWOOD	COLORADO	0	-379	-376	-375	-376	-378
K	ROUND ROCK	COLORADO	3	-60	-126	-202	-265	-323
K	SHADY HOLLOW MUD	COLORADO	0	0	0	0	0	0
K	STEAM ELECTRIC POWER, TRAVIS	COLORADO	2,626	-1,374	-1,374	-6,543	-14,043	-21,530
K	SUNSET VALLEY	COLORADO	27	27	27	27	27	27
K	THE HILLS	COLORADO	84	89	92	94	95	95
K	TRAVIS COUNTY MUD #4	COLORADO	1,207	810	435	13	-361	-710
K	TRAVIS COUNTY WCID #10	COLORADO	0	-2,428	-2,715	-3,044	-3,341	-3,619
K	TRAVIS COUNTY WCID #17	COLORADO	-302	-1,904	-2,868	-3,038	-3,330	-3,693
K	TRAVIS COUNTY WCID #18	COLORADO	613	469	329	163	11	-131
K	TRAVIS COUNTY WCID #19	COLORADO	0	0	0	0	0	0
K	TRAVIS COUNTY WCID #20	COLORADO	545	548	551	552	553	553
K	VOLENTE	COLORADO	0	-13	-25	-40	-54	-66
K	WELLS BRANCH MUD	COLORADO	0	0	0	0	0	0
K	WEST LAKE HILLS	COLORADO	41	-1,550	-1,539	-1,533	-1,532	-1,532
K	WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY	COLORADO	421	68	-269	-650	-986	-1,300
K	WILLIAMSON-TRAVIS COUNTY MUD #1	COLORADO	48	52	54	55	55	56
	Sum of Projected Water Supply Needs (acre-feet)		**-3,199**	**-19,203**	**-27,658**	**-41,766**	**-85,617**	**-134,438**

B. Water Management Strategies

Table 9 below presents how each of the WUGs in Travis County is projected to respond to its water needs, which generally will be by planning for additional supplies or by demand reduction. These water management strategies are included in the 2016 Region K Water Plan and the 2017

State Water Plan, as presented in the final table in Appendix F. Only one groundwater-related strategy is currently planned for use by a WUG that is in the District's territory, viz., the City of Lakeway plans to expand its supply by increased use of the Trinity Aquifer. In addition, several other WUGs are projected to operate an aquifer storage and recovery system in the Trinity Aquifer or utilize the Trinity as a new groundwater resource, but these projects are not in or near the District. Nevertheless, the District will closely monitor such developments for opportunities to facilitate them, as feasible, as well as learn from them.

During the course of this planning period, other WUGs within the District may choose to employ additional groundwater-related strategies that will be reflected in subsequent Region K and State Water Plans. Such strategies may include additional drought curtailments, groundwater conservation education, recharge enhancement through injection wells and other managed recharge approaches, aquifer storage and recovery (with or without conjunctive surface-water or effluent wastewater use), and development of alternative groundwater supplies (such as the Hickory or other Paleozoic Aquifers). The District will consider such new strategies as they arise and, as feasible, support those that relate to groundwater and to increasing the amount of water supplies and/or decreasing the demand for those supplies.

Table 9. Water Management Strategies Relevant to the District

Projected Water Management Strategies

TWDB 2017 State Water Plan Data

TRAVIS COUNTY

WUG, Basin (RWPG)

All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
AQUA WSC, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	163	184	204	229	251	272
MUNICIPAL CONSERVATION - AQUA WSC	DEMAND REDUCTION [TRAVIS]	74	94	87	87	96	103
		237	**278**	**291**	**316**	**347**	**375**
AUSTIN, COLORADO (K)							
CITY OF AUSTIN - AQUIFER STORAGE AND RECOVERY	TRINITY AQUIFER ASR [TRAVIS]	10,000	25,000	25,000	50,000	50,000	50,000
CITY OF AUSTIN - CAPTURE LOCAL INFLOWS TO LADY BIRD LAKE	COLORADO RUN-OF-RIVER [TRAVIS]	1,000	1,000	1,000	1,000	1,000	1,000
CITY OF AUSTIN - CONSERVATION	DEMAND REDUCTION [TRAVIS]	22,969	24,559	28,317	31,220	33,822	36,899
CITY OF AUSTIN - DIRECT REUSE	DIRECT REUSE [TRAVIS]	5,429	10,429	20,429	22,929	25,429	27,929
CITY OF AUSTIN - INDIRECT POTABLE REUSE THROUGH LADY BIRD LAKE	INDIRECT REUSE [TRAVIS]	20,000	20,000	20,000	20,000	20,000	20,000
CITY OF AUSTIN - LAKE AUSTIN OPERATIONS	COLORADO RUN-OF-RIVER [TRAVIS]	2,500	2,500	2,500	2,500	2,500	2,500
CITY OF AUSTIN - LAKE LONG ENHANCED STORAGE	LAKE LONG/RESERVOIR [RESERVOIR]	20,000	20,000	20,000	20,000	20,000	20,000

CITY OF AUSTIN - LONGHORN DAM OPERATION IMPROVEMENTS	COLORADO RUN-OF-RIVER [TRAVIS]	3,000	3,000	3,000	3,000	3,000	3,000
CITY OF AUSTIN - OTHER REUSE	DIRECT REUSE [TRAVIS]	1,000	1,000	1,500	2,000	2,500	3,000
CITY OF AUSTIN - RAINWATER HARVESTING	RAINWATER HARVESTING [TRAVIS]	83	828	4,141	8,282	12,423	16,564
CITY OF AUSTIN RETURN FLOWS	INDIRECT REUSE [TRAVIS]	19,258	17,749	22,990	22,874	26,759	30,312
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	15,745	18,293	20,997	22,989	24,659	26,641
		120,984	**144,358**	**169,874**	**206,794**	**222,092**	**237,845**
BARTON CREEK WEST WSC, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	65	64	64	63	63	63
MUNICIPAL CONSERVATION - BARTON CREEK WEST WSC	DEMAND REDUCTION [TRAVIS]	42	77	108	122	137	152
		107	**141**	**172**	**185**	**200**	**215**
BEE CAVE, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	355	409	459	516	567	614
LCRA - LANE CITY RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIRS (2020 DECADE) [RESERVOIR]	300	300	600	600	800	800
MUNICIPAL CONSERVATION - BEE CAVE VILLAGE	DEMAND REDUCTION [TRAVIS]	175	374	608	863	1,136	1,323
		830	**1,083**	**1,667**	**1,979**	**2,503**	**2,737**
BRIARCLIFF, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	26	30	33	37	40	44
		26	**30**	**33**	**37**	**40**	**44**
CEDAR PARK, COLORADO (K)							
BRUSHY CREEK RUA-EXISTING CONTRACTS	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM [RESERVOIR]	170	175	15	0	0	0
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	486	516	553	553	552	552
MUNICIPAL CONSERVATION - CEDAR PARK	DEMAND REDUCTION [TRAVIS]	246	479	614	724	822	921
MUNICIPAL WATER CONSERVATION (SUBURBAN) - CEDAR PARK	DEMAND REDUCTION [TRAVIS]	89	287	492	542	540	539
		991	**1,457**	**1,674**	**1,819**	**1,914**	**2,012**
COUNTY-OTHER, TRAVIS, COLORADO (K)							
BRUSH CONTROL	COLORADO RUN-OF-RIVER [TRAVIS]	425	425	425	425	425	425
		425	**425**	**425**	**425**	**425**	**425**
CREEDMOOR-MAHA WSC, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	28	31	34	38	41	45
LCRA - MID BASIN RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIRS (2020 DECADE)	0	400	400	400	400	400

	[RESERVOIR]						
SALINE EDWARDS ASR	EDWARDS AQUIFER ASR [TRAVIS]	0	101	101	101	101	101
SALINE EDWARDS ASR (SALINE)	EDWARDS-BFZ AQUIFER [TRAVIS]	0	199	199	199	199	199
URGENT WATER LOSS REDUCTION PROJECT - CMWSC	DEMAND REDUCTION [TRAVIS]	19	20	22	25	27	30
		47	**751**	**756**	**763**	**768**	**775**
CREEDMOOR-MAHA WSC, GUADALUPE (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	1	2	2	2	2	2
URGENT WATER LOSS REDUCTION PROJECT - CMWSC	DEMAND REDUCTION [TRAVIS]	1	1	1	1	1	1
		2	**3**	**3**	**3**	**3**	**3**
ELGIN, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	38	53	67	83	98	112
LCRA - LANE CITY RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIRS (2020 DECADE) [RESERVOIR]	0	48	129	222	304	381
		38	**101**	**196**	**305**	**402**	**493**
GOFORTH SUD, GUADALUPE (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	2	3	3	3	3	4
MUNICIPAL WATER CONSERVATION (RURAL)	DEMAND REDUCTION [TRAVIS]	0	0	0	0	0	0
		2	**3**	**3**	**3**	**3**	**4**
JONESTOWN, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	82	86	90	95	99	104
MUNICIPAL CONSERVATION - JONESTOWN	DEMAND REDUCTION [TRAVIS]	20	36	51	73	96	122
		102	**122**	**141**	**168**	**195**	**226**
LAGO VISTA, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	374	437	498	566	628	686
MUNICIPAL CONSERVATION - LAGO VISTA	DEMAND REDUCTION [TRAVIS]	187	301	426	604	773	972
		561	**738**	**924**	**1,170**	**1,401**	**1,658**
LAKEWAY, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	1,395	1,823	1,819	1,816	1,815	1,815
EXPANSION OF CURRENT GROUNDWATER SUPPLIES - TRINITY AQUIFER	TRINITY AQUIFER [TRAVIS]	500	500	500	500	500	500
LCRA - LANE CITY RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIRS (2020 DECADE) [RESERVOIR]	1,000	1,000	1,000	1,000	1,000	1,000
MUNICIPAL CONSERVATION - LAKEWAY	DEMAND REDUCTION [TRAVIS]	702	1,652	2,408	3,052	3,640	3,921
		3,597	**4,975**	**5,727**	**6,368**	**6,955**	**7,236**

LEANDER, COLORADO (K)

BRUSHY CREEK RUA-EXISTING CONTRACTS	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM [RESERVOIR]	2,967	4,136	4,588	2,891	2,368	1,988
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	170	436	753	813	843	882
LCRA - LANE CITY RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIRS (2020 DECADE) [RESERVOIR]	0	0	0	662	1,576	2,349
		3,137	**4,572**	**5,341**	**4,366**	**4,787**	**5,219**

LOOP 360 WSC, COLORADO (K)

DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	176	183	190	197	204	211
MUNICIPAL CONSERVATION - LOOP 360 WSC	DEMAND REDUCTION [TRAVIS]	116	224	333	441	546	648
		292	**407**	**523**	**638**	**750**	**859**

LOST CREEK MUD, COLORADO (K)

DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	218	214	211	211	211	211
MUNICIPAL CONSERVATION - LOST CREEK MUD	DEMAND REDUCTION [TRAVIS]	108	137	171	215	254	294
		326	**351**	**382**	**426**	**465**	**505**

MANOR, COLORADO (K)

DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	171	234	294	362	422	477
EXPANSION OF CURRENT GROUNDWATER SUPPLIES - TRINITY AQUIFER	TRINITY AQUIFER [TRAVIS]	0	600	600	600	600	600
		171	**834**	**894**	**962**	**1,022**	**1,077**

MANVILLE WSC, COLORADO (K)

DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	448	541	630	733	825	911
EXPANSION OF CURRENT GROUNDWATER SUPPLIES - TRINITY AQUIFER	TRINITY AQUIFER [TRAVIS]	0	0	0	1,000	1,000	1,000
LCRA - MID BASIN RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIRS (2020 DECADE) [RESERVOIR]	0	0	0	500	2,000	2,000
		448	**541**	**630**	**2,233**	**3,825**	**3,911**

MUSTANG RIDGE, COLORADO (K)

MUNICIPAL WATER CONSERVATION (RURAL)	DEMAND REDUCTION [TRAVIS]	0	0	0	0	0	0
		0	**0**	**0**	**0**	**0**	**0**

MUSTANG RIDGE, GUADALUPE (K)

MUNICIPAL WATER CONSERVATION (RURAL)	DEMAND REDUCTION [TRAVIS]	0	0	0	0	0	0
		0	**0**	**0**	**0**	**0**	**0**

NORTH AUSTIN MUD #1, COLORADO (K)

DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	12	12	12	11	11	11
		12	**12**	**12**	**11**	**11**	**11**

NORTHTOWN MUD, COLORADO (K)

DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	104	120	135	152	167	180
		104	**120**	**135**	**152**	**167**	**180**

PFLUGERVILLE, COLORADO (K)

DIRECT REUSE - PFLUGERVILLE	DIRECT REUSE [TRAVIS]	500	1,000	2,000	2,000	4,000	4,000
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	3,194	4,276	5,311	6,474	7,503	8,463
EXPANSION OF CURRENT GROUNDWATER SUPPLIES - EDWARDS-BFZ AQUIFER	EDWARDS-BFZ AQUIFER [TRAVIS]	0	0	1,000	1,000	1,000	1,000
LCRA - LANE CITY RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIRS (2020 DECADE) [RESERVOIR]	0	0	0	3,000	3,000	4,000
LCRA - MID BASIN RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIRS (2020 DECADE) [RESERVOIR]	0	0	0	0	0	2,000
MUNICIPAL CONSERVATION - PFLUGERVILLE	DEMAND REDUCTION [TRAVIS]	604	2,105	2,625	3,029	3,514	3,966
		4,298	**7,381**	**10,936**	**15,503**	**19,017**	**23,429**

POINT VENTURE, COLORADO (K)

DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	52	66	80	96	109	122
LCRA - LANE CITY RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIRS (2020 DECADE) [RESERVOIR]	0	100	100	300	300	300
MUNICIPAL CONSERVATION - POINT VENTURE	DEMAND REDUCTION [TRAVIS]	34	82	139	191	241	301
		86	**248**	**319**	**587**	**650**	**723**

ROLLINGWOOD, COLORADO (K)

DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	58	57	56	56	56	57
LCRA - MID BASIN RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIRS (2020 DECADE) [RESERVOIR]	0	400	400	400	400	400
MUNICIPAL CONSERVATION - ROLLINGWOOD	DEMAND REDUCTION [TRAVIS]	38	67	79	91	104	118
		96	**524**	**535**	**547**	**560**	**575**

ROUND ROCK, COLORADO (K)

ADDITIONAL ADVANCED CONSERVATION - ROUND ROCK	DEMAND REDUCTION [TRAVIS]	0	0	10	24	40	59
BRA SYSTEM OPERATIONS-LITTLE RIVER	BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	1	3	14	15	17
BRUSHY CREEK RUA-EXISTING CONTRACTS	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM [RESERVOIR]	265	244	219	203	186	170
DROUGHT MANAGEMENT	DEMAND REDUCTION	19	21	24	26	29	31

	[TRAVIS]						
LITTLE RIVER OCR	LITTLE RIVER OFF-CHANNEL LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	25	76
MUNICIPAL CONSERVATION - ROUND ROCK	DEMAND REDUCTION [TRAVIS]	13	11	10	8	9	10
MUNICIPAL WATER CONSERVATION (SUBURBAN) - ROUND ROCK	DEMAND REDUCTION [TRAVIS]	6	1	0	0	0	0
		303	**278**	**266**	**275**	**304**	**363**
SHADY HOLLOW MUD, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	117	114	111	110	110	110
MUNICIPAL CONSERVATION - SHADY HOLLOW MUD	DEMAND REDUCTION [TRAVIS]	38	16	0	0	0	0
		155	**130**	**111**	**110**	**110**	**110**
STEAM ELECTRIC POWER, TRAVIS, COLORADO (K)							
CITY OF AUSTIN - DIRECT REUSE	DIRECT REUSE [TRAVIS]	3,500	7,500	7,500	8,500	9,500	10,500
LCRA - MID BASIN RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIRS (2020 DECADE) [RESERVOIR]	0	0	0	0	4,543	11,030
		3,500	**7,500**	**7,500**	**8,500**	**14,043**	**21,530**
SUNSET VALLEY, COLORADO (K)							
DEVELOPMENT OF NEW GROUNDWATER SUPPLIES - TRINITY AQUIFER	TRINITY AQUIFER [TRAVIS]	0	0	200	200	200	200
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	116	150	182	218	250	280
EDWARDS / MIDDLE TRINITY ASR	TRINITY AQUIFER ASR [HAYS]	0	200	200	200	200	200
LCRA - MID BASIN RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIRS (2020 DECADE) [RESERVOIR]	0	715	715	715	715	715
MUNICIPAL CONSERVATION - SUNSET VALLEY	DEMAND REDUCTION [TRAVIS]	38	90	158	241	305	366
		154	**1,155**	**1,455**	**1,574**	**1,670**	**1,761**
THE HILLS, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	217	217	216	216	216	216
MUNICIPAL CONSERVATION - THE HILLS	DEMAND REDUCTION [TRAVIS]	144	272	386	487	581	665
		361	**489**	**602**	**703**	**797**	**881**
TRAVIS COUNTY MUD #4, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	522	602	677	762	837	907
MUNICIPAL CONSERVATION - TRAVIS COUNTY MUD #4	DEMAND REDUCTION [TRAVIS]	262	564	912	1,302	1,705	2,114
		784	**1,166**	**1,589**	**2,064**	**2,542**	**3,021**
TRAVIS COUNTY WCID #10, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION	532	607	679	761	835	905

	[TRAVIS]						
LCRA - LANE CITY RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIRS (2020 DECADE) [RESERVOIR]	0	3,000	3,000	3,000	3,000	3,000
MUNICIPAL CONSERVATION - TRAVIS COUNTY WCID #10	DEMAND REDUCTION [TRAVIS]	213	445	707	996	1,316	1,533
		745	**4,052**	**4,386**	**4,757**	**5,151**	**5,438**
TRAVIS COUNTY WCID #17, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	1,268	1,508	1,653	1,678	1,722	1,776
LCRA - LANE CITY RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIRS (2020 DECADE) [RESERVOIR]	1,000	2,000	2,000	2,000	2,000	2,000
MUNICIPAL CONSERVATION - TRAVIS COUNTY WCID #17	DEMAND REDUCTION [TRAVIS]	853	1,825	2,399	2,889	3,325	4,645
		3,121	**5,333**	**6,052**	**6,567**	**7,047**	**8,421**
TRAVIS COUNTY WCID #18, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	168	190	211	236	259	280
MUNICIPAL CONSERVATION - TRAVIS COUNTY WCID #18	DEMAND REDUCTION [TRAVIS]	60	95	87	87	96	104
		228	**285**	**298**	**323**	**355**	**384**
TRAVIS COUNTY WCID #19, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	100	99	99	99	99	99
MUNICIPAL CONSERVATION - TRAVIS COUNTY WCID #19	DEMAND REDUCTION [TRAVIS]	50	92	131	166	199	229
		150	**191**	**230**	**265**	**298**	**328**
TRAVIS COUNTY WCID #20, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	118	117	117	117	116	116
MUNICIPAL CONSERVATION - TRAVIS COUNTY WCID #20	DEMAND REDUCTION [TRAVIS]	59	110	153	197	234	268
		177	**227**	**270**	**314**	**350**	**384**
VOLENTE, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	4	4	5	6	7	7
LCRA - LANE CITY RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIRS (2020 DECADE) [RESERVOIR]	142	142	142	142	142	142
		146	**146**	**147**	**148**	**149**	**149**
WELLS BRANCH MUD, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	82	80	79	78	78	78
		82	**80**	**79**	**78**	**78**	**78**
WEST LAKE HILLS, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	313	310	308	307	306	306
LCRA - MID BASIN RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIRS	0	1,300	1,300	1,300	1,300	1,300

	(2020 DECADE) [RESERVOIR]						
MUNICIPAL CONSERVATION - WEST LAKE HILLS	DEMAND REDUCTION [TRAVIS]	157	286	398	505	609	700
		470	**1,896**	**2,006**	**2,112**	**2,215**	**2,306**
WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	473	544	611	688	755	818
LCRA - LANE CITY RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIRS (2020 DECADE) [RESERVOIR]	0	200	200	400	400	400
MUNICIPAL CONSERVATION - WEST TRAVIS COUNTY PUA	DEMAND REDUCTION [TRAVIS]	234	505	809	1,164	1,526	1,900
		707	**1,249**	**1,620**	**2,252**	**2,681**	**3,118**
WILLIAMSON-TRAVIS COUNTY MUD #1, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	23	22	22	22	22	22
		23	**22**	**22**	**22**	**22**	**22**
Sum of Projected Water Management Strategies (acre-feet)		**148,025**	**193,654**	**228,226**	**275,824**	**306,314**	**338,831**

VII. DETAILS ON HOW THE DISTRICT WILL MANAGE GROUNDWATER *(Required by 31 TAC 356.52(a)(4))*

A. District Authority and Groundwater Management Rules and Policies

The Texas Legislature has determined that GCDs such as the Southwestern Travis County Groundwater Conservation District are the state's preferred method of groundwater management in their jurisdictional areas. The Southwestern Travis County Groundwater Conservation District was created in 2017 by H.B. 4345 (85th Legislature). This enabling statute provides for specific authorities and duties that are unique to the District and take precedence over certain portions of Chapter 36 of the Texas Water Code.

The Texas Legislature codified its groundwater management policy decision in Section 36.0015 of the Texas Water Code, which provides that GCDs will manage groundwater resources through rules developed and implemented in accordance with Chapter 36 of the Texas Water Code. Chapter 36 establishes directives for GCDs and the statutory authority to carry out such directives to enable GCDs to have the proper tools to protect and preserve the groundwater resources with their boundaries. Unless superseded by H.B. 4345 (2017), the District is required to and will incorporate applicable provisions of Chapter 36 in the District's Plan and Rules. In doing so, the District will give strong consideration to the economic and cultural activities which occur within the District and which rely upon the continued use of groundwater.

The District will use the Plan to guide the District in its efforts to preserve and protect the groundwater resources of southwestern Travis County. The District intends that its rules development, regulatory activities, planning effects and daily operations are consistent with the approved Plan and will be formulated in coordination with the management goals and technical information required for the approved Plan. The rules will be consistent with the provisions of the Plan the District’s enabling statute, and Chapter 36 of the Texas Water Code. The enforcement of the rules will be driven by the hydrogeological and technical information available to the District, including the information provided in the Plan.

At the time this initial Plan was submitted to the TWDB for approval, the District Rules were not yet able to be promulgated, as the Rules must be consistent with an approved Plan. The Rules will elaborate the specifics of how the Plan will be implemented. Once promulgated, the Rules will be accessible on a page of the District's website, at https://swtcgcd.com/rules. As noted above, the District will encourage cooperative and voluntary Rule compliance, but if Rule enforcement becomes necessary, the enforcement will be legal, fair, and impartial.

The District is committed to work with other GCDs in GMA 9 for joint groundwater planning in the GMA. The District will use the Plan as part of its cooperative efforts with the neighboring GCDs. The District will manage the supply of groundwater within the District on the basis of: 1) applicable DFCs and, to the extent feasible, MAG quantities resulting from the GMA 9 joint planning process; 2) differentiated exempt and non-exempt wells and groundwater demands; and 3) the best science and relevant data available to the District.

The District will review and re-adopt this plan, with or without revisions, at least once every five years in accordance with Chapter 36.1072(e). Any amendment to this plan will be pursued in accordance with Chapter 36.1073.

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

B. Specification of Actions, Procedures, Performance and Avoidance for Plan Implementation (Required by 31 TAC 356.52(a)(4); TWC Section 36.1071(E)(2*)*

The District will use the regulatory authorities and tools it has been granted by its enabling statute (H.B. 4345, 2017) and Chapter 36 to properly and appropriately address the groundwater issues within the District, to include both groundwater quality and groundwater supply. A required part of achieving this goal is the establishment of a fair and equitable permitting program for non-exempt users, including rulemaking for defining exempt and non-exempt wells in the District, the use of metering and self-reporting of actual groundwater use by non-exempts (only), a production fee assessment and collection process applicable to non-exempts (only), and a regulatory enforcement program.

In addition to the permitting program, the District also intends to regulate groundwater withdrawals and minimize well interference by adopting rules that prescribe minimum well spacing for each of the aquifers and/or management zones.

In its joint planning with GMA 9, the District will strive to have DFCs for the Trinity and its subdivisions that are adopted by the GMA to take into account the substantial differences between its aquifers and those in other GCDs and to provide an adequate basis for protecting the District's groundwater uses and users. More specifically, the District will advocate for GMA subdivisions and GCD management zones as necessary to accomplish this goal.

The District will support, undertake, and continue to promote scientific studies of the Trinity Aquifer and its use in order to develop rational groundwater production limits and to improve estimates of the MAG.

The District will make maximum use of existing information on drought conditions, including that on the TWDB's drought web-page: https://www.waterdatafortexas.org/drought. Considering the limited availability of groundwater in the aquifers in the District, the SWTCGCD will implement an appropriate drought-management program that includes defined groundwater drought severity stages, mandatory stage-wise curtailments for non-exempt well users that are defined in their permits, and aspirational curtailments for exempt well users.

Through its rulemaking and permitting program, the District will promulgate mandatory well construction standards and methods, including, as needed for new wells in certain aquifers, those that are beyond the measures required of all groundwater wells by Texas Department of Licensing and Regulation (TDLR), and also proper ongoing well maintenance procedures that protect zones of higher quality water from zones of poorer quality water. Inadequate well construction and maintenance may provide direct conduits or pathways that allow contamination from the surface or adjacent formations to affect the groundwater resources of the District.

The District also believes the prevention of contamination of its groundwater resources through abandoned and deteriorated water wells is important. Wells that have been abandoned may also provide direct conduits or pathways that allow contamination from the surface to quickly reach the groundwater resources of the District. To address the threats to the water quality of its groundwater resources, the District will require, through its rules, that those abandoned, deteriorated, or replaced wells that are demonstrably problematic in this regard will be either rehabilitated to obviate commingling problems and/or to be part of a monitoring well network, or plugged in compliance with the Water Well Drillers and Pump Installers Rules of the TDLR.

The District will establish and use a monitoring well network to assess changes in the groundwater storage conditions of aquifers or aquifer subdivisions on a continuing basis. The District will make a regular assessment of water supply and groundwater storage conditions and will report those conditions to the District Board of Directors and to the public. The District also will work with relevant local governmental entities or agencies of the State of Texas on well monitoring efforts and well investigations that are conducted in the District, including specifically those related to evaluating compliance with applicable DFCs.

The District plans to use the regulatory tools granted by its enabling legislation and Chapter 36 to preserve existing uses of groundwater within the District and to protect existing users by minimizing adverse effects on water-level or potentiometric surfaces of existing wells and on water quality supporting such use. The Texas Legislature empowered the District to protect existing users of groundwater, which are those individuals or entities currently invested in and using groundwater or the groundwater resources within the District for a beneficial purpose, and to preserve such uses as feasible. The District strives to protect and preserve such use to the extent practicable under the goals and objectives of this Plan. The District is not required, nor does it currently intend, to implement a "grandfathering" program or "historic use" designation as part of protecting existing use. In accordance with Section 36.116 of the Texas Water Code, the District will also protect existing use though District Rules on spacing of wells and production limits on groundwater from larger, non-exempt wells to the extent practicable and consistent with this Plan.

The District will undertake rulemaking that defines and avoids "speculative demand" and "unreasonable impacts" on the aquifers and uses. It will utilize its authority to limit egregious use of groundwater, including but not limited to wells solely or mainly used for lawn and landscape irrigation, to the extent allowed by statute.

In order to better manage the groundwater resources of southwestern Travis County during times of high demand or within areas of high demand, the District may establish management zones, e.g., Critical

Groundwater Depletion Areas, and adopt separate Rules for those areas. The District may also adopt different Rules for each subdivision of an aquifer or geologic strata located in whole or in part within the boundaries of the District or each geographic area overlying a subdivision of an aquifer located in whole or in part within the boundaries of the District. For example, in order to 1) protect current and future demands by the few existing and anticipated domestic and livestock exempt wells that produce from the Upper Trinity Aquifer, and 2) promote continued flow within creeks and rivers, the District will need to carefully consider the effects of drilling any new larger wells that seek to produce water from the Upper Glen Rose (Upper Trinity) Aquifer under a new permit. Such special considerations may need to be taken into account for the Middle Trinity and Lower Trinity Aquifers as well.

The District will define at least annually those specific authorized revenue sources and amounts that are necessary to financially support planned and budgeted District activities to implement this Plan, and it will establish by Board resolution what fees and fee rate schedule should be employed for any particular revenue source, while ensuring equitable fee generation among the sources.

In accomplishing the activities described above and pursuing other initiatives that may be needed in managing the groundwater resources in its territory, the District will strive to develop and exhibit the characteristics of a well-managed organization. The District will utilize effective staffing and staff utilization, efficient management systems, requisite internal and external communications, and appropriate governance and reporting practices to promote efficient and sustainable operations, as allowed by available financial resources.

C. Methodology for Tracking Progress in Achieving Management Goals *(Required by 31 TAC 356.52(a)(6))*

To track the District's progress toward achieving its management goals pursuant to this initial Plan, the District will prepare an annual report on District performance and progress toward achieving each management goal and its objective(s) in each fiscal year. The annual report will be presented in an open meeting to the Board of Directors for its acknowledgment of current status and discussion of whether satisfactory progress is being made and what future actions may be required for continued progress. The first annual report will cover FY 2020, and its and subsequent reports will be presented no later than the second regular District Board meeting of the following *calendar* year. The annual report will be posted on the District website for public review following Board approval.

The Board's consideration of the annual report each year will explicitly include:

- A review of the groundwater management activities undertaken in the fiscal year in terms of the relevant Management Goals, Management Objectives, and Performance Standards, which are identified in the next section of this Plan;
- An assessment of whether the District's progress toward achieving each of the Management Goals is consistent with the Plan and, if not, what changes may be indicated to achieve the Goals; and
- An evaluation of whether operating experience and new information indicate that the Plan should be revised and submitted to TWDB for approval to guide groundwater management activities in the future.

VIII. DISTRICT GOALS, MANAGEMENT OBJECTIVES, AND PERFORMANCE STANDARDS (Required by 31 TAC 356.52(a)(1-3))

The District's Management Goals coincide with the relevant goals established by the Texas Legislature for all GCDs, as set forth in TWC Chapter 36.1071. These are described in the subsections below as to their related Management Objectives and Performance Standards as required by the designated statute.

To achieve certain Objectives and Performance Standards, the District has defined and will use what it is calling "tactical milestones", which provide a roadmap of intended activities associated with the initial operation of this new GCD. They are designed to serve as interim guideposts in accomplishing the applicable objective and standard in a timely, rational fashion. Unlike Management Objectives and Performance Standards that are statutorily mandated and require TWDB approval, the tactical milestones are intended to be discretionary internal guidance, able to be revised solely by Board action, provided the applicable Performance Standard(s) are achieved.

It is anticipated that these objectives and/or performance standards will evolve and be revised in subsequent revisions to this initial Plan for this new GCD, as knowledge of the GCD's and the aquifers' characteristics and as experience gained in operating the GCD increase with time, and as tactical milestones are passed.

A. Providing the Most Efficient Use of Groundwater.

The "most efficient use of groundwater" is defined (31 TAC 356.10(14)) as "practices, techniques, and technologies that a district determines will provide the least consumption of groundwater for each type of use balanced with the benefits of using groundwater".

A.1 Management Objective - Regulate and account for groundwater withdrawals in southwestern Travis County.

Performance Standards

a. The District will make concerted attempts to register wells known to exist in the District as soon as possible during the initial 5-year period for this Plan, and then keep a well inventory current thereafter.
b. The District will develop and implement an effective groundwater production permitting program for non-exempt wells, including meter-based reporting of actual groundwater withdrawals, in the first complete fiscal year following Plan approval.

A.2 Management Objective – Evaluate current well-spacing practices in the District and promulgate additional spacing requirements through District rulemaking if and as needed to help reduce or prevent interference and unreasonable impacts between nearby wells.

Performance Standard

a. The District will develop an Annual Report that is submitted to and approved by the District Board regarding issues concerning existing well spacing problems, suitability of current (and/or currently being considered) District well spacing rules, and their compatibility with the Water Well Drillers Rules.

A.3 Management Objective - Evaluate groundwater availability on a continuing and recurrent basis by monitoring, reporting, and publicizing water levels on selected wells representative of conditions in the two primary aquifers and their subdivisions within the District.

Performance Standards

a. Water levels will be monitored in accordance with the following monitoring schedule, beginning as soon as possible and completed no later than the end of the first five years following operations under the approved Plan:

Water Level Monitoring Schedule

Aquifer	Minimum # of Wells	Minimum Frequency[4]
Middle Trinity	1	1 times per year
Lower Trinity	1	1 times per year

Existing groundwater wells will be utilized for this monitoring to the extent practicable.

b. Number of water level monitoring wells in use, the recorded measurements, and their compliance with the schedule above will be reported in the Annual Report beginning in the second fiscal year of District operations.

B. Controlling and Preventing Waste of Groundwater.

“Waste” of groundwater is considered in this Plan to include 1) egregious use of water in amounts beyond that reasonably needed to achieve the intended beneficial purpose, and 2) the degradation of aquifer water quality caused by accessing and using groundwater without reasonably available safeguards.

B.1 Management Objective – Require new wells, including both exempt and non-exempt wells, to be constructed such that groundwater in zones of poorer quality water cannot intermingle with groundwater in zones of usable high-quality water.

Performance Standard

a. The District will, by rulemaking in the second year of operation under the approved Plan, restrict new wells from being completed in the Upper Trinity Aquifer.
b. The District will, by rulemaking in the first year of operation under the approved Plan, promulgate well construction standards that case off zones containing poorer-quality water that otherwise would be in hydrologic connection with usable high-quality water.

B.2 Management Objective - Provide District-specific information on the importance of controlling and preventing waste of groundwater to District groundwater users on an ongoing basis.

Performance Standards

[4] If and as available and feasible, one or more of the monitoring wells may be deployed with continuous, semi-continuous, and/or on-demand telemetry to some central station accessible by the District for reporting purposes. The statistics derived from telemetered monitoring would replace the specified frequency requirement for such wells.

a. The Annual Report to Board will contain an analysis of the database of registered wells as to their intended beneficial use(s), nominal production capacity, and imputed reasonable use, beginning with the third fiscal year report
b. Each year provide information to groundwater users on controlling and preventing waste of groundwater on at least one occasion by one or more of the following methods:
    - article to local newspapers
    - distribution of conservation literature handouts
    - public presentation by District Staff or Directors
    - information on District website
    - District exhibit/display booth at a public event

C. Controlling and Preventing Subsidence.

The District has considered the vulnerability of the District to subsidence associated with groundwater withdrawals from aquifers in the District, including a review of TWDB's subsidence risk assessment report (LRE Water and others 2017). Essentially, the rather rigid geologic framework of the region has a low to moderate risk, and there has been no evidence of subsidence in the District occurring as a result of past groundwater withdrawals. Therefore, this goal is not applicable to the district.

D. Addressing Conjunctive Surface Water Management Issues.

The term "conjunctive use" is defined (31 TAC 356.10(5)) as "the combined use of groundwater and surface water sources that optimizes the beneficial characteristics of each source, such as water banking, aquifer storage and recovery, enhanced recharge, and joint management". The term "conjunctive surface water management issues" is defined (31 TAC 356.10(6)) as "issues related to conjunctive use such as groundwater- or surface water-quality degradation and impacts of shifting between surface water and groundwater during shortages".

D.1 <u>Management Objective</u> – Assess opportunities for substitution of surface water or new alternative water supplies, from surface water, reclaimed water, and/or groundwater sources, for District groundwater.

<u>Performance Standard</u>

a. Participate in the Regional Water Planning process by sending a District representative to participate in at least one meeting annually of the Lower Colorado Regional Water Planning Group (Region K), with the dates and locations of Region K meeting(s) attended and any opportunities or issues associated with alternative water supplies to be reported to the Board of Directors annually.

E. Addressing Natural Resource Issues Which Impact the Use and Availability of Groundwater, or Which Are Impacted by the Use of Groundwater.

The term "natural resource issues" is defined (31 TAC 356.10(15)) as "issues related to environmental and other concerns that may be affected by a district's Plan and rules, such as impacts on endangered species, soils, oil and gas production, mining, air and water quality degradation, agriculture, and plant and animal life". In the District, springs and seeps flowing from outcrop areas of the Upper Trinity Aquifer (including the Ft. Terrett, Walnut, and the Upper Glen Rose outcrops) provide water for local habitat and contribute to base flow to nearby creeks and rivers throughout the GCD. These aquifers are known for low productivity and intermittent availability. They also have zones of poorer quality water that should be isolated from aquifers and zones of significantly better-quality groundwater.

E.1 Management Objective - To help extend the period of spring and seep flow during times of drought or limited rainfall, evaluate the effectiveness of District Rules to discourage utilization of the Upper Trinity Aquifer and prevent leakage from that aquifer into other aquifers, and consider how the District may increase the current effectiveness.

Performance Standard

a. The Annual Report will include a summary regarding effectiveness of District Rules in protecting springs and seeps and the base flow of streams in the District.

F. Addressing Drought Conditions.

F.1 Management Objective - Review applicable local data and information on the TWDB drought webpage at https://www.waterdatafortexas.org/drought to determine status of groundwater drought conditions and, as warranted, report to the District Board on the need to implement the District Drought Plan.

Performance Standard

a. The District will prepare: 1) a quarterly staff report that is submitted to the District Board on aquifer conditions in the District and outlook during non-drought; and 2) a monthly staff report on status of drought stages that is submitted to the Board during District-declared drought.
b. The District Board will promulgate rules no later than the second year of District operations under the approved Plan that 1) require declaration of groundwater drought in the District per applicable District groundwater drought indices and threshold trigger levels, and 2) implement mandatory specified drought curtailments by non-exempt well owners under terms of their permits issued by the District at the time of drought declaration.

F.2 Management Objective - Provide stakeholders and, upon request, the public with drought-oriented literature handouts and references to other related information sources.

Performance Standards

a. Compile available information on temporary water demand reducing practices and measures and, during declared drought, post that info on the District website.
b. Once each year, staff will provide the Board with a qualitative report on drought-webpage unique visits and explicit requests for drought-oriented literature and information as part of the Annual Report.

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

G.1 Groundwater Conservation

Management Objective - Identify regularly the importance of water conservation and various water conservation methods available for implementation by groundwater end-users.

Performance Standards

a. Develop and promulgate the District's required Water Conservation Plan no later than the end of the second year of District operations under the approved Plan, and link to it on the District website
b. Provide groundwater conservation information on at least one occasion each quarter by at least one of the following methods:
    - article to local newspapers
    - distribution of conservation literature handouts
    - public presentation by District Staff or Directors
    - information on District website
    - District exhibit/display booth at a public event

G.2 Recharge Enhancement

The term "recharge enhancement" is defined (31 TAC 356.10(19)) as "increased recharge accomplished by the modification of the land surface, streams, or lakes to increase seepage or infiltration rates or by the direct injection of water into the subsurface through wells".

Management Objective - Investigate and evaluate potential opportunities for recharge enhancement projects, by natural or artificial means and including aquifer storage and recovery (ASR), on an ongoing basis after the first year of operation under the initial Plan.

Performance Standard

a. Beginning at the end of the third year of operating under the Plan, the Annual Report will include the number and type of potential recharge enhancement opportunities identified and pursued each year, and their efficacy, if any.

G.3 Rainwater Harvesting

Management Objective - The District will promote and encourage the use of rainwater harvesting among its constituents and provide advice, information, and literature regarding the benefits of rainwater harvesting.

Performance Standards

a. At least annually, provide rainwater harvesting information to stakeholders and the public on at least one occasion using one of the following methods:
    - article to local newspapers
    - distribution of rainwater-harvesting literature handouts

- public presentation by District Staff or Directors
- information on District website
- District exhibit/display booth at a public event

G.4 Precipitation Enhancement

This strategy is not only too costly for consideration by the District at this time, but the District's extremely small geographic area and the imprecision in the delivery location of enhanced precipitation also combine to make such a water management strategy impractical. Therefore, this goal is not applicable to the operations of this District at this time.

G.5 Brush Control

This strategy is not within the District's financial or managerial ability to implement or to be cost-effective. Further, brush is not expected to be a significant factor for groundwater availability in the District's primary, confined aquifers. Therefore, this goal is not considered applicable to the operations of this District at this time.

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

There is no currently applicable DFC for the Edwards-Trinity (Plateau) Aquifer, the Edwards (BFZ) Aquifer, or the Paleozoics Aquifers in this part of GMA 9. On the basis of currently available information, no DFCs are deemed needed for these aquifers in SWTCGCD.

The current DFC for the Trinity Aquifer in GMA 9 was established and adopted by the other GCDs in the GMA before the District was confirmed and therefore without voting participation by the SWTCGCD. The development of the regional Trinity Aquifer DFC by GMA 9 also did not have the benefit of being informed by the recent scientific study, *The Hydrogeologic Atlas of the Trinity Aquifer in Southwest Travis County* (Appendix A).

In the course of developing this initial Plan, it has become clear that the Trinity Aquifer's hydrogeology and the aquifer condition in the District are substantially and significantly different than those in other parts of GMA 9. Achieving the Trinity's DFC, as currently expressed and measured, along with its allocated MAGs is and will be most assuredly problematic in the District. For example, current annual groundwater withdrawals in the GCD are estimated to be about one-half of the MAG allocated to southwestern Travis County in the current GAM. But the actual drawdown in groundwater levels associated with that level of aquifer use is already 6-8 times the change in drawdown described in the current DFC. And if use were eventually doubled to that described by the MAG, the associated drawdown would be an order of magnitude larger than the DFC and would completely de-water a large portion of the Trinity Aquifer in SWTCGCD. That is considered an unacceptable outcome of District groundwater management.

For these reasons, the District is proposing to address the Trinity DFC over the term of this initial Plan using a time-phased, conditional approach. Each time period has a different Management Objective in this plan, and each has specific Performance Standards that will apply in ways that depend on outcomes of future decision-making at the GMA 9 level during that period.

H.1 Management Objective – This objective relates to District actions in the approximately two-year time period from approval of this initial Plan by the Board of Directors (subject to subsequent TWDB administrative approval) to approval of the DFCs in the ongoing joint-planning round by TWDB, when the new DFCs may be adopted by the individual GCDs in GMA

9. During this time period, the SWTCGCD would continue its interim course and not adopt the current DFC, owing to the problems associated with that DFC and allocated MAG as described above, and permitting by the District would not consider specifically the DFC or MAG. While no DFC would be considered applicable to the District during this time, the Management Objective would be to assess whether and how the District programs and actions could meet an alternative applicable DFC, including in particular what sort of GMA subdivision(s) would produce a rational new DFC to be established by GMA 9 and that was applicable to SWTCGCD.

Performance Standards

a. During this initial two-year time period, the District will participate in GMA 9 activities by attending the majority of GMA 9 meetings each year and by advocating strategies for improving the applicability of the DFCs being developed during the then-ongoing round of joint planning. Progress and related issues that arise will be included in summary fashion in each year's Annual Report.

b. To assist in the monitoring of the Trinity across the GMA, the District will measure water levels in at least one District-designated DFC monitoring well one or more times annually, to enable comparisons of water levels and allowable drawdown. This comparison and its data will be included in the Annual Report to the District Board, and each year pertinent parts will also be provided annually to the GMA 9 Committee as required under Texas Water Code Section 36.108.

c. As soon as feasible but no later than the completion of the Explanatory Report in the ongoing DFC round, the District will develop and support a recommendation as to GMA-9 subdivision, DFC expression, and DFC monitoring that is responsive to the District's groundwater characteristics (and possibly those of parts of other GCDs with similar circumstances), and then advocate for GMA 9 subdivision along similar lines as soon thereafter as possible, so that the District would have an applicable DFC and the Trinity would be a relevant aquifer for joint planning in the District. The rationale and technical support for this recommendation, and GMA 9's response to the recommendation, will be included in the GCD's Annual Report for the time period in which the recommendation is presented for action to GMA 9.

   For example, the District may propose that GMA 9 subdivides the Trinity, during the ongoing round of DFC planning, on the basis of its distinctly different hydrogeology to have a new DFC expression applicable only to the new subdivision, comprising the jurisdictional area of SWTCGCD. The DFC expression would likely be fundamentally different than the current DFC expression, for example, it could be a managed-depletion specification, in consideration of the groundwater mining that is accompanying even current amounts of groundwater use.

H.2 Management Objective – This objective relates to District actions in the time period after TWDB approval of the new DFCs resulting from the ongoing round of joint planning, and further provided that no subdivision of GMA 9 has then occurred and/or that no substantive change in the Trinity DFC has been made by GMA 9. In this circumstance and time period, the Management Objective would be for the District to support and seek a "Non-relevant Aquifer in SWTCGCD" determination by GMA, because no realistic SWTCGCD Plan can be shown to achieve that expression of a Trinity DFC, as is required by TWC Chapter 36.1073 for *relevant* aquifers.

Performance Standard

a. The District will manage the Trinity using its prospective regulatory program under this initial Plan without the benefit of an applicable DFC or MAG, at least for the then-current round of joint planning.

b. During this time period, the District will fully participate in GMA 9 joint planning, including addressing the next round of DFCs, compliance monitoring, and continued advocacy for and support of GMA subdivision that would result in an applicable and achievable DFC in the District.

H.3 Management Objective – This objective relates to District actions in the time period after TWDB approval of the new DFCs resulting from the ongoing round of joint planning, and further provided GMA 9 has been subdivided or the DFC expression has otherwise been revised such that an achievable Trinity DFC would be applicable to the District. In this circumstance and time period, the Management Objective would be that following the District's adoption of the DFC for the Trinity as a *relevant* aquifer, subdivision, or management zone, it would strive to manage existing and prospective demand for groundwater from that subdivision to comply with the then-applicable DFC(s) and support the allocated MAG(s) in accordance with the Plan and Rules.

Performance Standards

a. The District will attend the majority of the GMA 9 meetings each year and participate in GMA 9 joint planning activities, including proposing new DFCs, monitoring DFC compliance, and assessing alternative GMA subdivision proposals, as warranted.
b. The District will issue operating permits to non-exempt users only up to the point that the aggregate volume of exempt and non-exempt production, including the requested permitted volume, then does not exceed the TWDB-allocated amount of MAG for the applicable DFC. A summary of these permitting actions and the rationale for any restrictions will be included in the Annual Report each year, as warranted.
c. No later than the end of the second year of the District's operating with an applicable DFC and MAG allocation, develop and promulgate a regulatory approach to ensure the applicable, apportioned MAG is accommodated as additional exempt and non-exempt demand for groundwater of that aquifer subdivision is requested in the future. This approach would consider conditional permitting and/or phased permitting that accommodates uncertainties in aquifer response and demands. A summary of the selected regulatory approach and its rationale will be included in the Annual Report each year, as warranted.

An Electronic Copy of this Groundwater Management Plan May Be Accessed at:

https://swtcgcd.com/mp

Contact for Management Plan Comments:

Ms. Kodi Sawin, General Manager: GeneralManager@swtcgcd.org

Physical Address:

Southwestern Travis County Groundwater Conservation District
8656 Highway 71 West
Building A, Suite 224
Austin, TX 78735

Mailing Address:

Southwestern Travis County Groundwater Conservation District
P.O. Box 340595
Austin, TX 78734

Primary Telephone Number: 512-276-2875

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Appendices

APPENDIX A GEOLOGICAL AND HYDROGEOLOGICAL INFORMATION ON SOUTHWEST TRAVIS COUNTY

APPENDIX B DISTRICT RESOLUTION #XXXXXXX: ADOPTION OF GROUNDWATER MANAGEMENT PLAN BY BOARD OF DIRECTORS

APPENDIX C NOTICES OF HEARINGS AND OPEN MEETINGS ADDRESSING ADOPTION OF GROUNDWATER MANAGEMENT PLAN

APPENDIX D COORDINATION WITH SURFACE-WATER MANAGEMENT ENTITIES

APPENDIX E TWDB GAM RUN 16-023 MAG: MODELED AVAILABLE GROUNDWATER FOR DESIRED FUTURE CONDITIONS ADOPTED BY GROUNDWATER MANAGEMENT AREA 9 FOR ITS DECLARED RELEVANT AQUIFERS

APPENDIX F TWDB ESTIMATED HISTORICAL WATER USE & 2017 STATE WATER PLAN DATASETS

APPENDIX G TWDB GAM RUN 19-027: DATASET FOR SOUTHWESTERN TRAVIS COUNTY GCD GROUNDWATER MANAGEMENT PLAN

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Appendix A

Geological and Hydrogeological Information on Southwest Travis County

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Geological and Hydrogeological Information on Southwest Travis County

Southwest Travis County was identified as part of the Hill Country Priority Groundwater Management Area in 1990. This designation signified that problems with groundwater quantity and/or quality either already existed or were expected to develop in the next 25 years. At the same time, the burgeoning growth of the area as part of suburban Austin was placing ever-increasing pressure on this particular area's water resources. Nevertheless, the area's hydrogeology was poorly characterized, with pumping and aquifer conditions largely unmonitored. Responding to this issue required, among other things, additional geoscientific information on the groundwater resources so that they could be effectively managed.

A key element in finally developing this information was an inter-local agreement between Travis County and the Barton Springs/Edwards Aquifer Conservation District, which adjoins the area, to develop what has been called the *Hydrogeologic Atlas of Southwest Travis County.* Quoting from this *Hydrogeologic Atlas*'s introduction:

> "This atlas represents a collaborative groundwater study in cooperation with Travis County Transportation and Natural Resources Division and the Barton Springs/Edwards Aquifer Conservation District. The study represents a compilation of existing and new hydrogeologic date to develop a better understanding of groundwater resources in Southwest Travis County. The scope of the work also included the collection of new data through over 100 site visits and geologic investigations. All of the data generated as part of the study are available as digital spatial datasets.
>
> The goal of this study is to provide a foundation of hydrogeologic data for scientists, residents, and ultimately policy makers. The data and evaluations presented provide a baseline of information for the newly created Southwestern Travis County Groundwater Conservation District…"

Rarely does a new GCD in Texas have the benefit of such an excellent scientific information resource. It underpins this Management Plan and ultimately the rulemaking of the GCD. The *Hydrogeologic Atlas of Southwest Travis County* is a large-format document that has numerous photographs, maps, figures, and tables and therefore a copy of it is not able to be physically included in this appendix. Those seeking more information on this area's hydrogeology should go to this link:

https://bseacd.org/scientific-reports/

The scientific citation for the Atlas is:

Hunt, B.B., Cockrell, L.P., Gary, R.H., Vay, J.M., Kennedy, V., Smith, B.A., and Camp, J.P., 2020, Hydrogeologic Atlas of Southwest Travis County, Central Texas: Prepared by the Barton Springs/Edwards Aquifer Conservation District and Travis County, March 2020, 79 pg. + digital datasets.

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Appendix B

District Resolution # xxxxxxxx: Adoption of Groundwater Management Plan by Board of Directors

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Appendix C

Notices of Hearings and Meetings Addressing Adoption of Management Plan

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[Reserved for copies of official notices of public hearing, Board meeting, and posted agenda for Board adoption of Management Plan, when available]

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Appendix D

Coordination with Surface-Water Management Entities

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Appendix E

TWDB GAM Run 16-023 MAG: Modeled Available Groundwater for Desired Future Conditions Adopted By Groundwater Management Area 9 for Its Declared Relevant Aquifers

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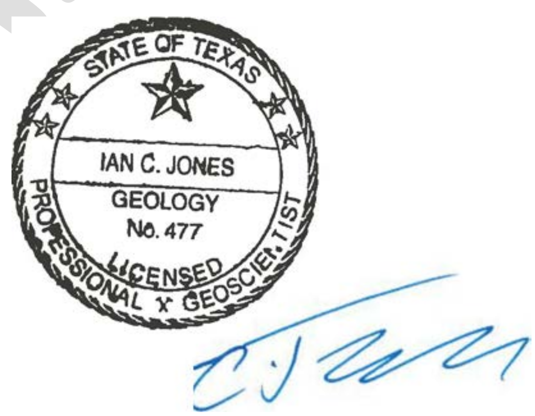
GAM RUN 16-023 MAG: MODELED AVAILABLE GROUNDWATER FOR THE AQUIFERS IN GROUNDWATER MANAGEMENT AREA 9

Ian C. Jones, Ph.D., P.G. Texas Water Development Board
Groundwater Division Groundwater Availability Modeling Section
(512) 463-6641
February 28, 2017



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GAM RUN 16-023 MAG: MODELED AVAILABLE GROUNDWATER FOR THE AQUIFERS IN GROUNDWATER MANAGEMENT AREA 9

Ian C. Jones, Ph.D., P.G. Texas Water Development Board
Groundwater Division Groundwater Availability Modeling Section
(512) 463-6641
February 28, 2017

EXECUTIVE SUMMARY:

We have prepared estimates of the modeled available groundwater for the relevant aquifers of Groundwater Management Area (GMA) 9—the Trinity, Edwards Group of the Edwards- Trinity (Plateau), Ellenburger-San Saba, and Hickory aquifers. The estimates are based on the desired future conditions for these aquifers adopted by the groundwater conservation districts (GCDs) in GMA 9 on April 28, 2016. The explanatory report and other materials submitted to the Texas Water Development Board (TWDB) were determined to be administratively complete on November 23, 2016.

The modeled available groundwater values are summarized by decade for the GCDs (Tables 1, 3, 5, and 7) and for use in the regional water planning process (Tables 2, 4, 6, and 8). The modeled available groundwater estimates are 2,208 acre-feet per year in the Edwards Group of the Edwards-Trinity (Plateau) Aquifer, up to 75 acre-feet per year in the Ellenburger-San Saba Aquifer, 140 acre-feet per year in the Hickory Aquifer, and range from approximately 93,000 acre-feet per year in 2010 to about 90,500 acre-feet per year in 2060 in the Trinity Aquifer. Please note that the Trinity Aquifer includes both the Trinity Aquifer as defined by the TWDB and the Trinity Group of the Edwards-Trinity (Plateau) Aquifer. The modeled available groundwater estimates were extracted from results of model runs using the groundwater availability models for the Hill Country portion of the Trinity Aquifer version 2.01 (Jones and others, 2011), and the minor aquifers of the Llano Uplift Area (Shi and others, 2016).

REQUESTOR:

Mr. Ronald Fieseler, chair of Groundwater Management Area 9 districts.

DESCRIPTION OF REQUEST:

In a letter dated April 25, 2016, Mr. Ronald Fieseler provided the TWDB with the desired future conditions of the Trinity, Edwards Group of the Edwards-Trinity (Plateau), Ellenburger-San Saba, and Hickory aquifers in Groundwater Management Area 9. Mr.

Fieseler provided additional clarifications for baseline years for each desired future condition, areas not covered by the models, assumed climatic conditions, and spatial pumping distributions through emails to the TWDB on June 8, 2016, August 15, 2016 and September 9, 2016. Mr. Fieseler also clarified the water level drawdown for the Ellenburger-San Saba Aquifer in Kendall County in a letter dated October 19, 2016.

The final adopted desired future conditions for the aquifers in Groundwater Management Area 9 are:

- Trinity Aquifer *[Upper, Middle, and Lower undifferentiated]* - 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) *[Aquifer]* in Kendall and Bandera counties - Allow for no net increase in average drawdown in Bandera and Kendall counties through 2070.
- Ellenburger-San Saba Aquifer in Kendall County - Allow for an increase in average drawdown of no less than 7 feet in Kendall County through 2070.
- Hickory Aquifer in Kendall County - Allow for an increase in average drawdown of no more than 7 Feet in Kendall County through 2070.

The Trinity Aquifer includes both the Trinity Aquifer as defined by the TWDB and the Trinity Group of the Edwards-Trinity (Plateau) Aquifer.

Additionally, districts in Groundwater Management Area 9 voted to declare that the following aquifers or parts of aquifers be classified as non-relevant for the purposes of joint planning:

- Edwards Group of the Edwards-Trinity (Plateau) Aquifer in Kerr and Blanco counties.
- Ellenburger-San Saba Aquifer in Blanco and Kerr counties.
- Hickory Aquifer in Blanco, Hays, Kerr, and Travis counties.
- Marble Falls Aquifer in Blanco County.
- Edwards (Balcones Fault Zone) Aquifer in Bexar, Comal, Hays, and Travis counties.

METHODS:

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

The desired future condition for the Trinity Aquifer is identical to the one adopted in 2010 and the associated modeled available groundwater is based on a specific model run and scenario—Scenario 6 in GAM Task 10-005 (Hutchison, 2010) and GAM Task 10-050 (Hassan, 2012). Trinity Aquifer water-level drawdown is based on 2008 water levels.

For other relevant aquifers—the Edwards Group of the Edwards-Trinity (Plateau), Ellenburger-San Saba, and Hickory aquifers—the groundwater availability models for the Hill Country portion of the Trinity Aquifer version 2.01 (Jones and others, 2011), and the minor aquifers of the Llano Uplift Area (Shi and others, 2016) were used to simulate the desired future conditions outlined in the explanatory report (GMA 9 and others, 2016) and further clarified as noted in the previous section. Water level drawdown calculations were based on the water levels simulated in final years of the historical versions of the respective models. These final years are 1997 in the groundwater availability model for the Hill Country portion of the Trinity Aquifer and 2010 in the groundwater availability model for the minor aquifers of the Llano Uplift Area. The predictive model runs retain pumping rates from the historic period—1980 through 1997—except in the aquifer or area of interest. In those areas, pumping rates are varied such that they produce the desired future average water level drawdown conditions. Pumping rates were reported on 10-year intervals from 2010 through 2060 (for the Trinity Aquifer) and 2010 through 2070 (for all other relevant aquifers). The groundwater availability estimates for 2070 for the Trinity Aquifer will be determined by the regional water planning groups.

Water level drawdown averages were calculated for the relevant portions of each aquifer. Drawdown for model cells which became dry during the simulation (water level dropped below the base of the cell) were excluded from the averaging. Estimates of modeled available groundwater therefore decrease over time as continued simulated pumping predicts the development of dry model cells in areas of Hays, Kerr, and Travis counties. The calculated water-level drawdown averages were compared with the desired future conditions to verify that the pumping scenario achieved the desired future conditions.

Modeled available groundwater values for the Trinity Aquifer and the Edwards Group of the Edwards-Trinity (Plateau) Aquifer were determined by extracting pumping rates by decade from the model results using ZONEBUDGET Version 3.01 (Harbaugh, 2009). For the Ellenburger-San Saba and Hickory aquifers, modeled available groundwater values were determined by extracting pumping rates by decade from the model results using ZONBUDUSG Version 1.01 (Panday and others, 2013).

PARAMETERS AND ASSUMPTIONS:

Trinity and Edwards-Trinity (Plateau) Aquifers

We used the groundwater availability model (version 2.01) for the Hill Country portion of the Trinity Aquifer developed by Jones and others (2009) to determine modeled available groundwater in the Trinity Aquifer and the Edwards Group of the Edwards-Trinity (Plateau) Aquifer. See Jones and others (2009) for details on model construction, recharge, discharge, assumptions, and limitations. The parameters and assumptions for the groundwater availability model for the Hill Country portion of the Trinity Aquifer are described below:

- The model has four layers:
    - Layer 1 represents mostly the Edwards Group of the Edwards-Trinity (Plateau) Aquifer and larger portions of the Edwards Group not classified as an aquifer,
    - Layer 2 represents the Upper Trinity Aquifer,
    - Layer 3 represents the Middle Trinity Aquifer, and
    - Layer 4 represents the Lower Trinity Aquifer.
- The model was run with MODFLOW-96 (Harbaugh and McDonald, 1996).
- Parts of Bandera, Blanco, and Kerr counties are not included in the model and consequently are not included in the modeled available groundwater calculations.
- Drawdown for cells with water levels below the base elevation of the cell ("dry" cells) were excluded from calculation of average drawdown and the modeled available groundwater values.
- In separate model runs, modeled available groundwater was calculated for the Trinity Aquifer and the Edwards Group of the Edwards-Trinity (Plateau) Aquifer. The Trinity Aquifer is defined as the Trinity Group occurring within Groundwater Management Area 9, irrespective of whether it forms part of the Trinity Aquifer or Edwards-Trinity (Plateau) Aquifer.
- The results for the Trinity Aquifer presented in this report are based on Scenario 6 of GAM Task 10-005 (Hutchison, 2010). See Hutchison (2010) for a full description of the methods, assumptions, and results of the model simulations. Each scenario in GAM Task 10-005 consisted of a series of 387 separate 50-year

model simulations, each with a different recharge configuration. Though the pumping input to the model was the same for each of the 387 simulations, the pumping output differed depending on the occurrence of inactive (or dry) cells. Because the analysis was statistical any baseline year may be assumed, therefore average drawdown is based on 2008 conditions as noted in the Groundwater Management Area 9 explanatory report.

- The results for the Edwards Group of the Edwards-Trinity (Plateau) Aquifer are based on a single model run using historic pumping rates in all parts of the model area except the Edwards Group of Kendall and Bandera counties and average recharge from GAM Task 10-005. Recharge used in this model run represents the average recharge taken from the 387 simulations (Run 169) used in Trinity Aquifer model runs. Average drawdown was calculated based on the last historic stress period (1997).

Minor aquifers of the Llano Uplift Area

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 parameters and assumptions for the groundwater availability model for the minor aquifers of the Llano Uplift Area are described below:

- The model 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 units),
  - Layer 4 (confining units),
  - Layer 5 (Ellenburger-San Saba Aquifer and equivalent units),
  - Layer 6 (confining units),
  - Layer 7 (the Hickory Aquifer and equivalent units), and
  - Layer 8 (Precambrian units).
- The model was run with MODFLOW-USG beta (development) version (Panday and others, 2013).

- Perennial rivers and reservoirs were simulated using the MODFLOW-USG river package. Springs were simulated using the MODFLOW-USG drain package.

- There is no historic pumping information available for the Ellenburger-San Saba and Hickory aquifers of Kendall County. Consequently, we used uniformly distributed pumping to simulate the desired future condition and determine the modeled available groundwater.

RESULTS:

The modeled available groundwater for the Trinity Aquifer that achieves the desired future conditions adopted by districts in Groundwater Management Area 9 decreases from 93,052 to 90,503 acre-feet per year between 2010 and 2060 (Tables 1 and 2). This decline is attributable to the occurrence of increasing numbers of dry model cells over time in parts of Hays, Kerr, and Travis counties. The modeled available groundwater for the Edwards Group of the Edwards-Trinity (Plateau), Ellenburger-San Saba, and Hickory aquifers are 2,208, 75, and 140 acre-feet per year, respectively (Tables 3 through 8). The modeled available groundwater for the respective aquifers has been summarized by aquifer, county, and groundwater conservation district (Tables 1, 3, 5, and 7). The modeled available groundwater is also summarized by county, regional water planning area, river basin, and aquifer for use in the regional water planning process (Tables 2, 4, 6, and 8).

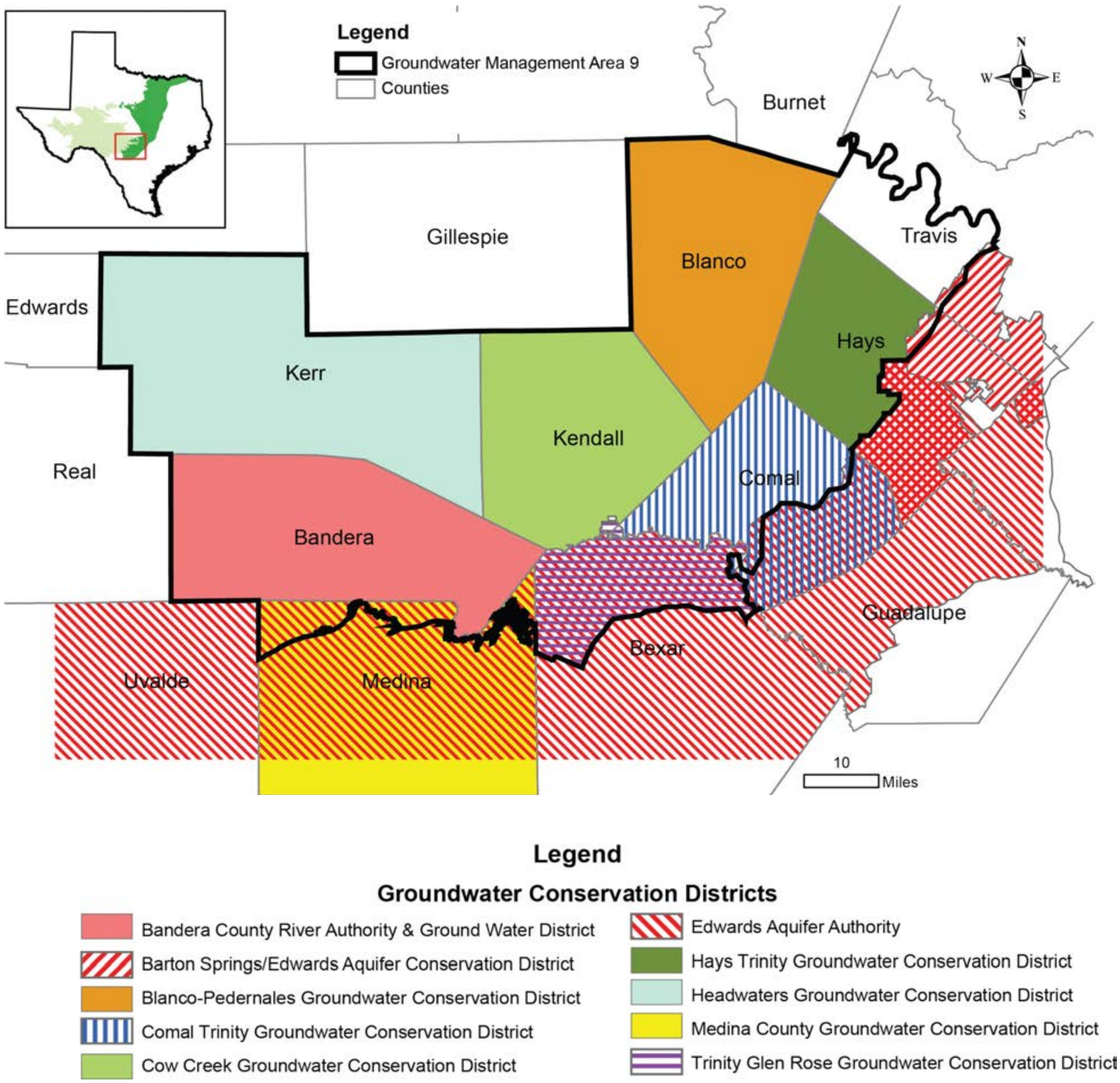

FIGURE 1. MAP SHOWING THE GROUNDWATER CONSERVATION DISTRICTS IN GROUNDWATER MANAGEMENT AREA 9. NOTE: THE BOUNDARIES OF THE EDWARDS AQUIFER AUTHORITY OVERLAP WITH THE MEDINA COUNTY, TRINITY GLEN ROSE, AND COMAL TRINITY GROUNDWATER CONSERVATION DISTRICTS AND THE BARTON SPRINGS/EDWARDS AQUIFER CONSERVATION DISTRICT.

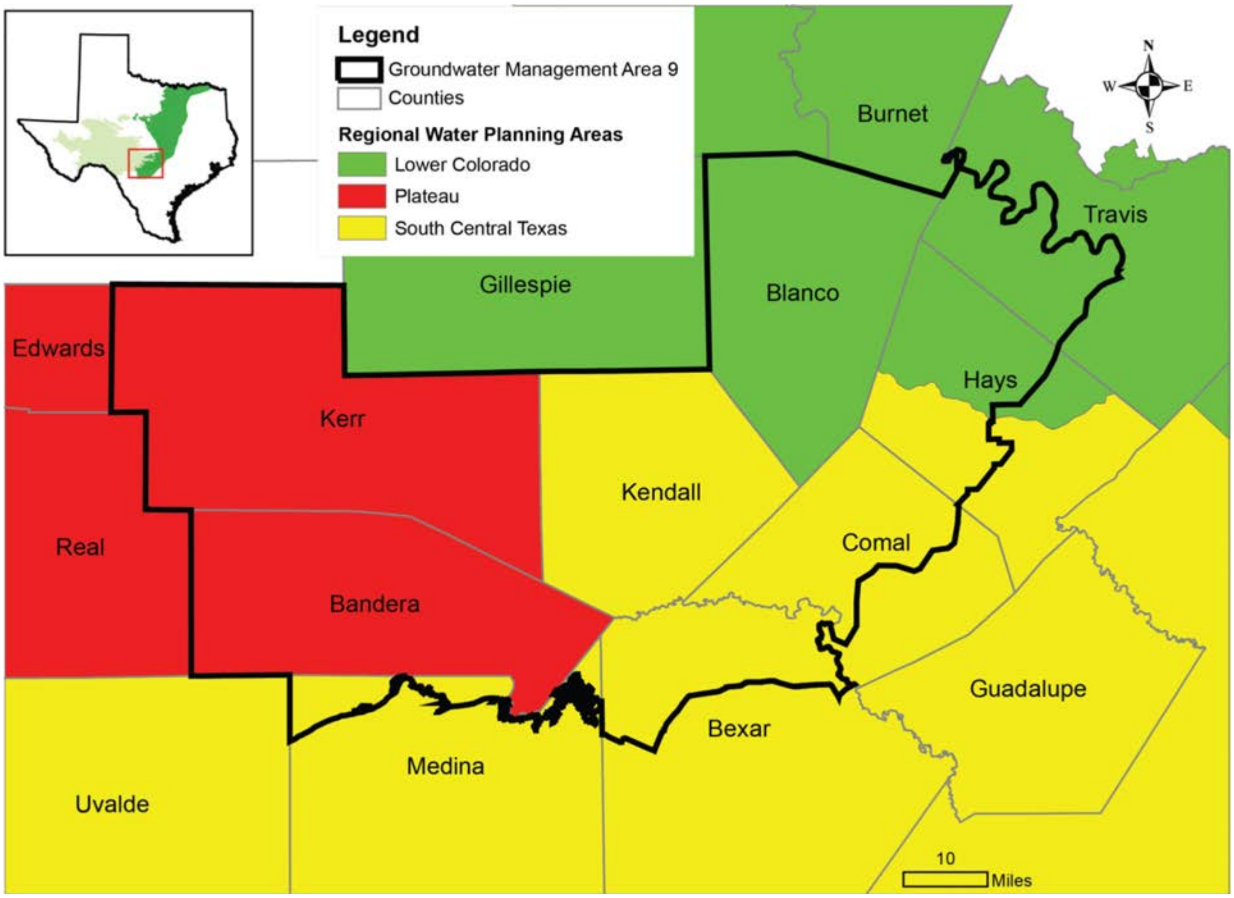

FIGURE 2. MAP SHOWING REGIONAL WATER PLANNING AREAS IN GROUNDWATER MANAGEMENT AREA 9.

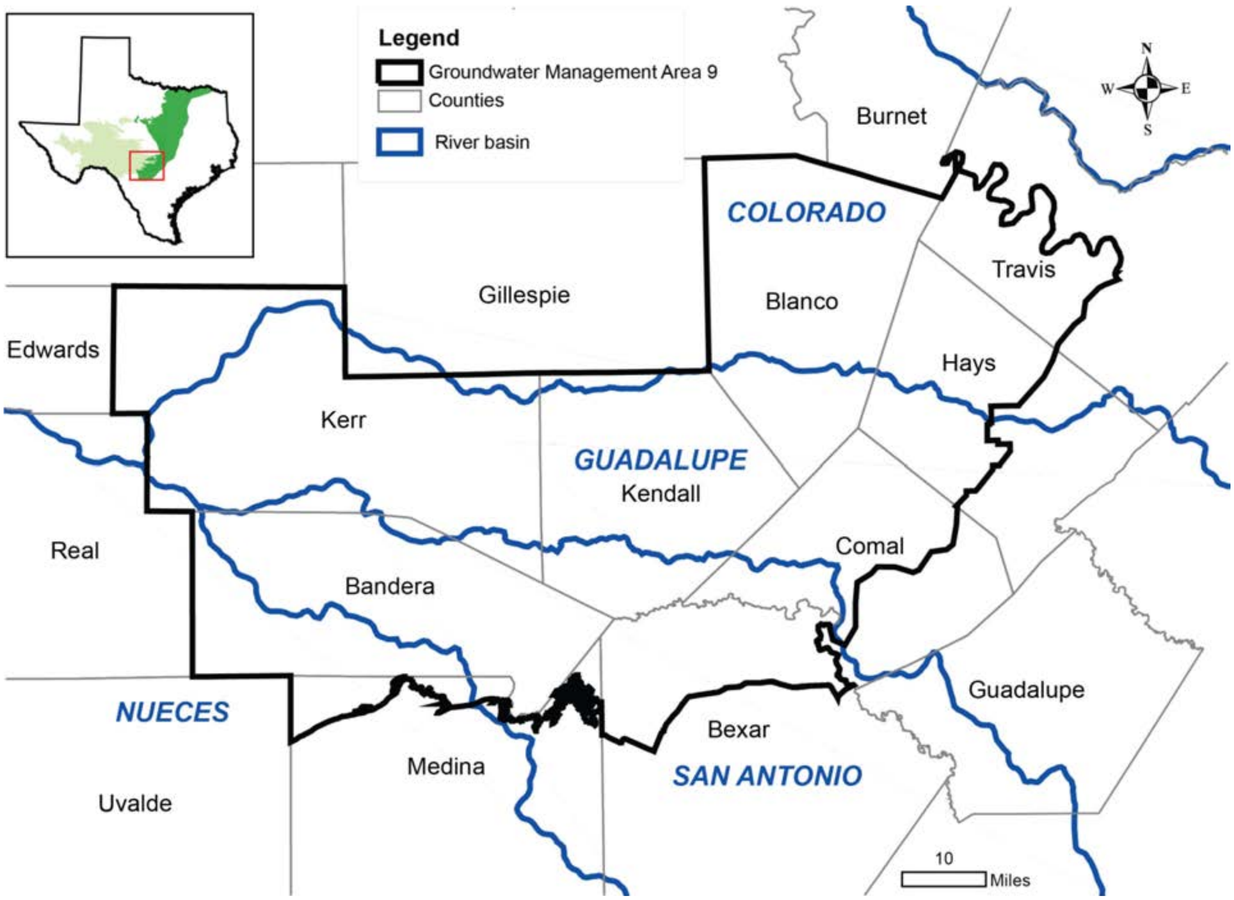

FIGURE 3. MAP SHOWING RIVER BASINS IN GROUNDWATER MANAGEMENT AREA 9. THESE INCLUDE PARTS OF THE COLORADO, GUADALUPE, SAN ANTONIO, AND NUECES RIVER BASINS.

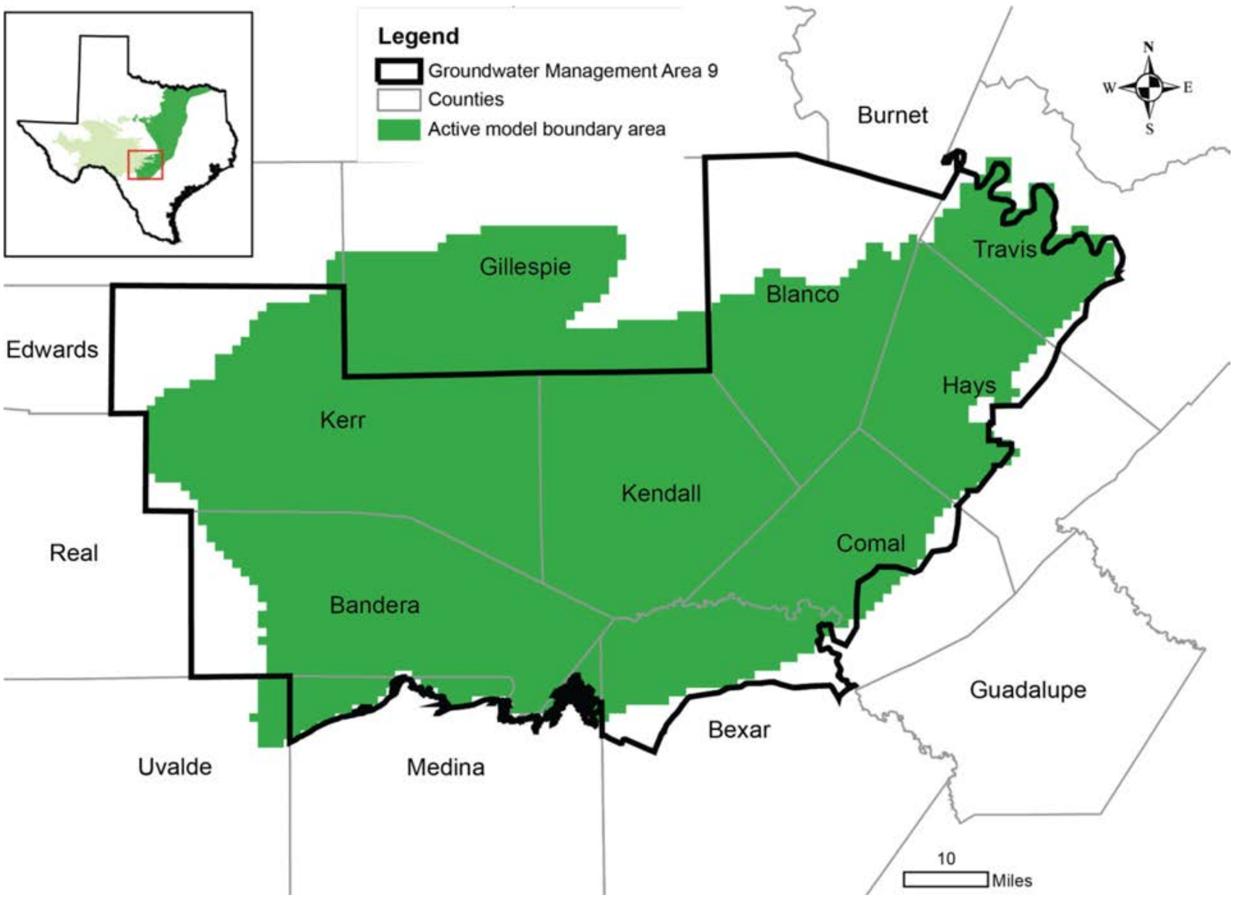

FIGURE 4. MAP SHOWING THE AREAS COVERED BY THE TRINITY AQUIFER IN THE GROUNDWATER AVAILABILITY MODEL FOR THE HILL COUNTRY PORTION OF THE TRINITY AQUIFER IN GROUNDWATER MANAGEMENT AREA 9.

TABLE 1. MODELED AVAILABLE GROUNDWATER FOR THE TRINITY AQUIFER IN GROUNDWATER MANAGEMENT AREA 9 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2060. RESULTS ARE IN ACRE-FEET PER YEAR.

District	County	Year					
		2010	2020	2030	2040	2050	2060
Bandera County River Authority & Groundwater District Total	Bandera	7,284	7,284	7,284	7,284	7,284	7,284
Barton Springs/Edwards Aquifer Conservation District Total	Hays	22	22	22	22	22	22
Blanco-Pedernales Groundwater Conservation District Total	Blanco	2,573	2,573	2,573	2,573	2,573	2,573
Comal Trinity Groundwater Conservation District Total	Comal	10,076	10,076	10,076	10,076	10,076	10,076
Cow Creek Groundwater Conservation District Total	Kendall	10,622	10,622	10,622	10,622	10,622	10,622
Hays Trinity Groundwater Conservation District Total	Hays	9,109	9,098	9,095	9,094	9,094	9,094
Headwaters Groundwater Conservation District Total	Kerr	16,435	14,918	14,845	14,556	14,239	14,223
Medina County Groundwater Conservation District Total	Medina	2,500	2,500	2,500	2,500	2,500	2,500

TABLE 1. CONTINUED.

District	County	Year					
		2010	2020	2030	2040	2050	2060
Trinity Glen Rose Groundwater Conservation District	Bexar	24,856	24,856	24,856	24,856	24,856	24,856
Trinity Glen Rose Groundwater Conservation District	Comal	138	138	138	138	138	138
Trinity Glen Rose Groundwater Conservation District	Kendall	517	517	517	517	517	517
Trinity Glen Rose Groundwater Conservation District Total		**25,511**	**25,511**	**25,511**	**25,511**	**25,511**	**25,511**
No district Total	**Travis**	**8,920**	**8,672**	**8,655**	**8,643**	**8,627**	**8,598**
GMA 9	**Total**	**93,052**	**91,276**	**91,183**	**90,881**	**90,548**	**90,503**

TABLE 2. MODELED AVAILABLE GROUNDWATER FOR THE TRINITY AQUIFER IN GROUNDWATER MANAGEMENT AREA 9 SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN FOR EACH DECADE BETWEEN 2010 AND 2060. RESULTS ARE IN ACRE-FEET PER YEAR.

County	RWPA	River Basin	Year					
			2010	2020	2030	2040	2050	2060
Bandera	J	Guadalupe	76	76	76	76	76	76
		Nueces	903	903	903	903	903	903
		San Antonio	6,305	6,305	6,305	6,305	6,305	6,305
		Total	**7,284**	**7,284**	**7,284**	**7,284**	**7,284**	**7,284**
Bexar	L	San Antonio	24,856	24,856	24,856	24,856	24,856	24,856
		Total	**24,856**	**24,856**	**24,856**	**24,856**	**24,856**	**24,856**
Blanco	K	Colorado	1,322	1,322	1,322	1,322	1,322	1,322
		Guadalupe	1,251	1,251	1,251	1,251	1,251	1,251
		Total	**2,573**	**2,573**	**2,573**	**2,573**	**2,573**	**2,573**
Comal	L	Guadalupe	6,906	6,906	6,906	6,906	6,906	6,906
		San Antonio	3,308	3,308	3,308	3,308	3,308	3,308
		Total	**10,214**	**10,214**	**10,214**	**10,214**	**10,214**	**10,214**

TABLE 2. CONTINUED.

County	RWPA	River Basin	Year					
			2010	**2020**	**2030**	**2040**	**2050**	**2060**
Hays	K	Colorado	4,721	4,710	4,707	4,706	4,706	4,706
	L	Guadalupe	4,410	4,410	4,410	4,410	4,410	4,410
		Total	**9,131**	**9,120**	**9,117**	**9,116**	**9,116**	**9,116**
Kendall	L	Colorado	135	135	135	135	135	135
		Guadalupe	6,028	6,028	6,028	6,028	6,028	6,028
		San Antonio	4,976	4,976	4,976	4,976	4,976	4,976
		Total	**11,139**	**11,139**	**11,139**	**11,139**	**11,139**	**11,139**
Kerr	J	Colorado	318	318	318	318	318	318
		Guadalupe	15,646	14,129	14,056	13,767	13,450	13,434
		San Antonio	471	471	471	471	471	471
		Total	**16,435**	**14,918**	**14,845**	**14,556**	**14,239**	**14,223**
Medina	L	Nueces	1,575	1,575	1,575	1,575	1,575	1,575
		San Antonio	925	925	925	925	925	925
		Total	**2,500**	**2,500**	**2,500**	**2,500**	**2,500**	**2,500**

TABLE 2. CONTINUED.

County	RWPA	River Basin	Year					
			2010	2020	2030	2040	2050	2060
Travis	K	**Colorado (Total)**	**8,920**	**8,672**	**8,655**	**8,643**	**8,627**	**8,598**
GMA 9			**93,052**	**91,276**	**91,183**	**90,881**	**90,548**	**90,503**

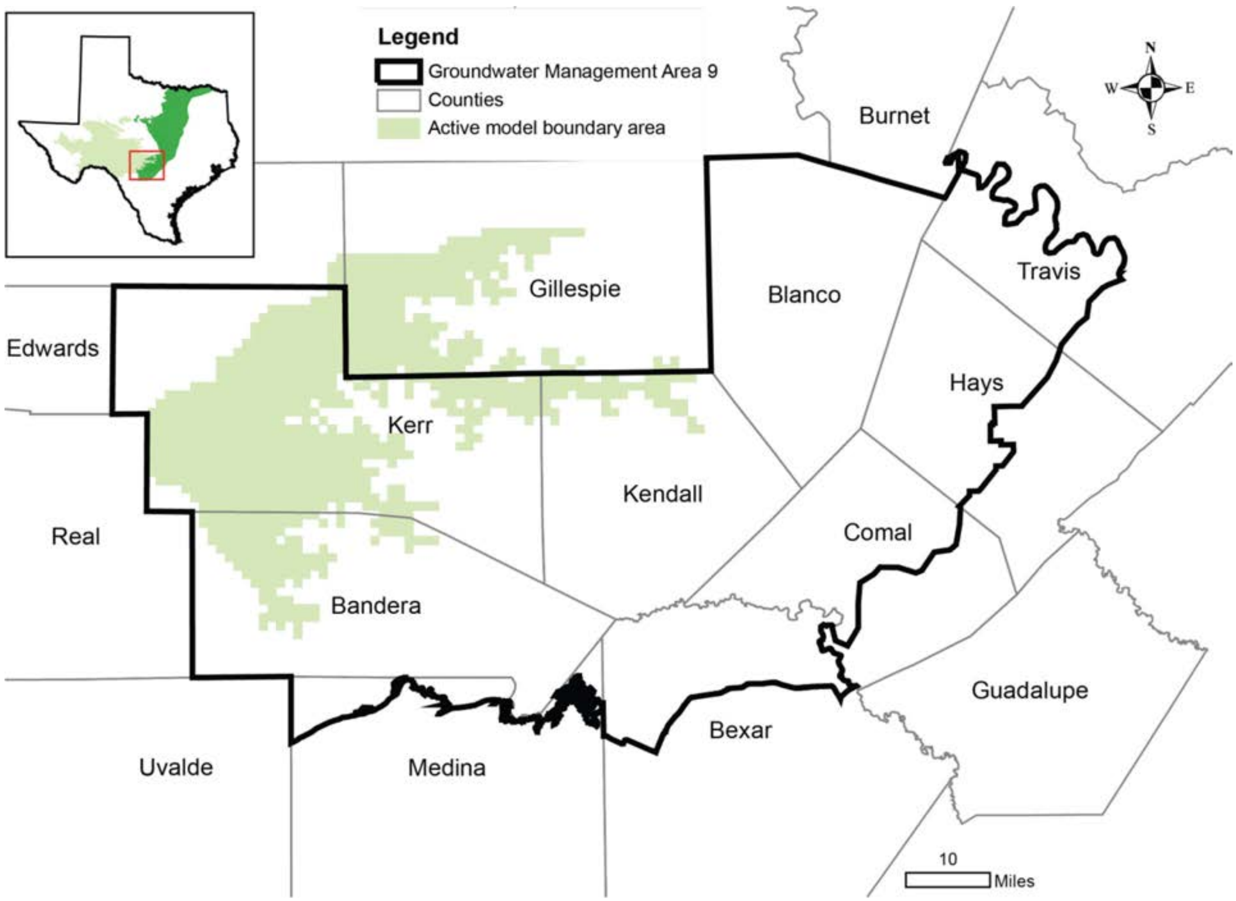

FIGURE 5. MAP SHOWING THE AREAS COVERED BY THE EDWARDS GROUP OF THE EDWARDS-TRINITY (PLATEAU) AQUIFER IN THE GROUNDWATER AVAILABILITY MODEL FOR THE HILL COUNTRY PORTION OF THE TRINITY AQUIFER IN GROUNDWATER MANAGEMENT AREA 9.

TABLE 3. MODELED AVAILABLE GROUNDWATER FOR THE EDWARDS GROUP OF THE EDWARDS-TRINITY (PLATEAU) AQUIFER IN GROUNDWATER MANAGEMENT AREA 9 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT AND COUNTY, FOR EACH DECADE BETWEEN 2010 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR.

District	County	Year						
		2010	2020	2030	2040	2050	2060	2070
Bandera County River Authority & Groundwater District Total	Bandera	2,009	2,009	2,009	2,009	2,009	2,009	2,009
Cow Creek Groundwater Conservation District Total	Kendall	199	199	199	199	199	199	199
Grand Total		2,208	2,208	2,208	2,208	2,208	2,208	2,208

TABLE 4. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE EDWARDS GROUP OF THE EDWARDS- TRINITY (PLATEAU) AQUIFER IN GROUNDWATER MANAGEMENT AREA 9 SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN FOR EACH DECADE BETWEEN 2010 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR.

County	RWPA	River Basin	Year						
			2010	2020	2030	2040	2050	2060	2070
Bandera	Plateau (J)	Guadalupe	81	81	81	81	81	81	81
		Nueces	38	38	38	38	38	38	38
		San Antonio	1,890	1,890	1,890	1,890	1,890	1,890	1,890
		Total	**2,009**	**2,009**	**2,009**	**2,009**	**2,009**	**2,009**	**2,009**
Kendall	South Central Texas (L)	Colorado	69	69	69	69	69	69	69
		Guadalupe	130	130	130	130	130	130	130
		Total	**199**	**199**	**199**	**199**	**199**	**199**	**199**
Grand Total			**2,208**	**2,208**	**2,208**	**2,208**	**2,208**	**2,208**	**2,208**

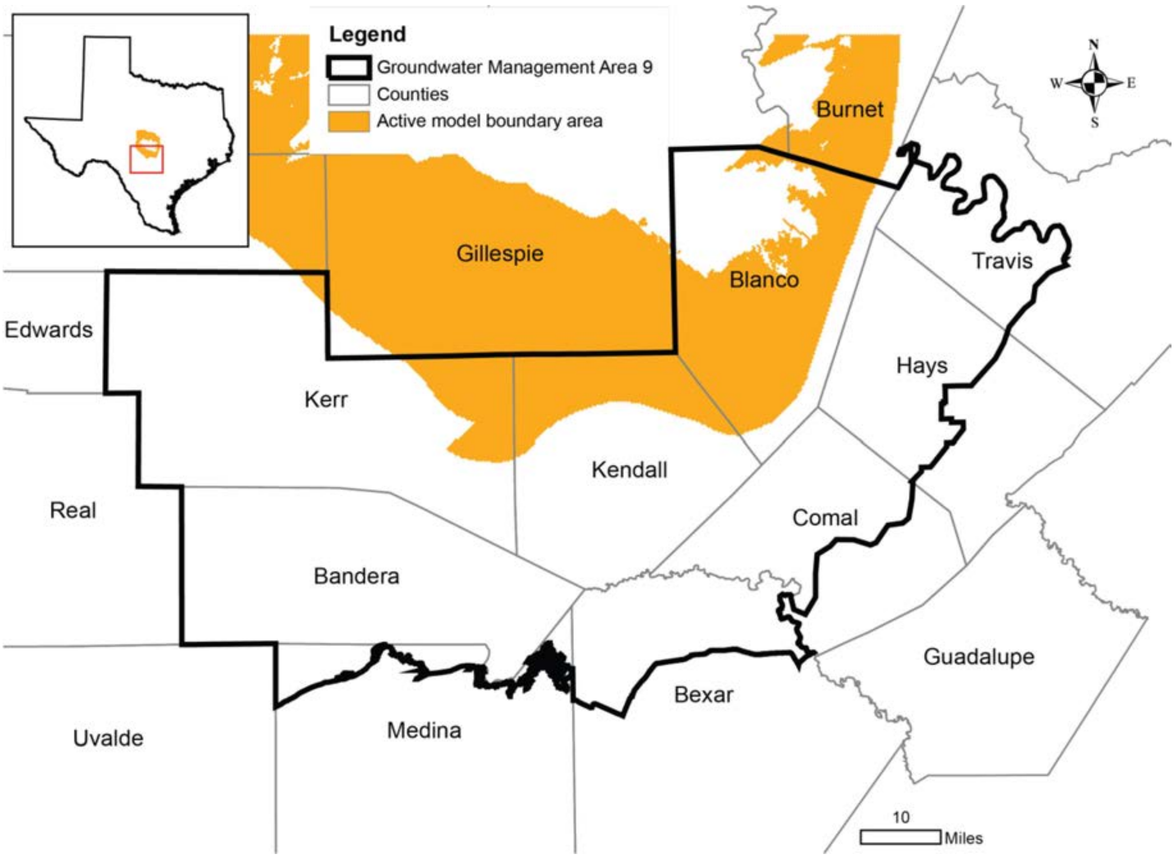

FIGURE 6. MAP SHOWING THE AREAS COVERED BY THE ELLENBURGER-SAN SABA AQUIFER IN THE GROUNDWATER AVAILABILITY MODEL FOR THE MINOR AQUIFERS OF THE LLANO UPLIFT AREA IN GROUNDWATER MANAGEMENT AREA 9.

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 2010 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR.

District	County	Year						
		2010	2020	2030	2040	2050	2060	2070
Cow Creek Groundwater Conservation District Total	**Kendall**	**75**	**75**	**75**	**75**	**75**	**75**	**75**

TABLE 6. MODELED AVAILABLE GROUNDWATER FOR THE ELLENBURGER-SAN SABA AQUIFER IN GROUNDWATER MANAGEMENT AREA 9 SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN FOR EACH DECADE BETWEEN 2010 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR.

County	RWPA	River Basin	Year						
			2010	2020	2030	2040	2050	2060	2070
Kendall	South Central Texas (L)	Colorado	10	10	10	10	10	10	10
		Guadalupe	64	64	64	64	64	64	64
		Total	**75**	**75**	**75**	**75**	**75**	**75**	**75**

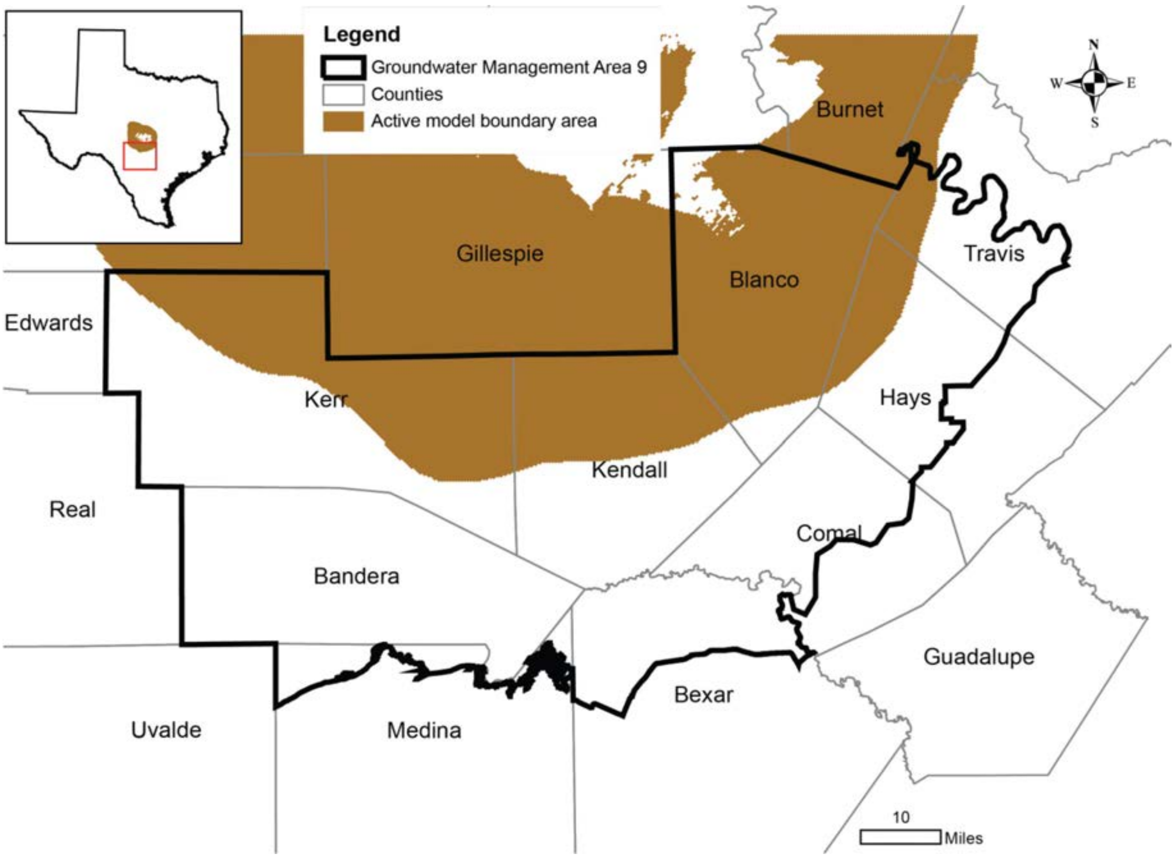

FIGURE 7. MAP SHOWING AREAS COVERED BY THE HICKORY AQUIFER IN THE GROUNDWATER AVAILABILITY MODEL FOR THE MINOR AQUIFERS OF THE LLANO UPLIFT AREA IN GROUNDWATER MANAGEMENT AREA 9.

TABLE 7. MODELED AVAILABLE GROUNDWATER FOR THE HICKORY AQUIFER IN GROUNDWATER MANAGEMENT AREA 9 SUMMARIZED BY DISTRICT AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR.

District	County	Year						
		2010	2020	2030	2040	2050	2060	2070
Cow Creek Groundwater Conservation District Total	**Kendall**	**140**	**140**	**140**	**140**	**140**	**140**	**140**

TABLE 8. MODELED AVAILABLE GROUNDWATER FOR THE HICKORY AQUIFER IN GROUNDWATER MANAGEMENT AREA 9 SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN FOR EACH DECADE BETWEEN 2010 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR.

County	RPWA	River Basin	Year						
			2010	2020	2030	2040	2050	2060	2070
Kendall	South Central Texas (L)	Colorado	12	12	12	12	12	12	12
		Guadalupe	128	128	128	128	128	128	128
		Total	**140**	**140**	**140**	**140**	**140**	**140**	**140**

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.

Model "Dry" Cells

The predictive model run for this analysis results in water levels in some model cells dropping below the base elevation of the cell during the simulation. In terms of water level, the cells have gone dry. However, as noted in the model assumptions the transmissivity of the cell remains constant and will produce water.

A total of 18 cells out of 23,805 active cells simulating the Trinity Aquifer cells go "dry" during the predictive period through 2060. These dry cells are located in western Travis County, central Hays County and Kerr County. These dry cells are associated either with areas of high pumping or thin parts of the Trinity Aquifer.

REFERENCES:

Groundwater Management Area 9 (GMA 9) Joint Planning Committee, Blanton and Associates, Inc., and LBG-Guyton Associates, 2016, Groundwater Management Area 9 explanatory report for desired future conditions: major and minor aquifers, April 2016, 189 p.

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National Research Council, 2007, Models in Environmental Regulatory Decision Making Committee on Models in the Regulatory Decision Process, National Academies Press, Washington D.C., 287 p., http://www.nap.edu/catalog.php?record_id=11972.

Panday, S., Langevin, C. D., Niswonger, R. G., Ibaraki, M., and Hughes, J. D., 2013, MODFLOW–USG version 1: An unstructured grid version of MODFLOW for simulating groundwater flow and tightly coupled processes using a control volume finite-difference formulation: U.S. Geological Survey Techniques and Methods, book 6, chap. A45, 66 p.

Shi, J., Boghici, R., Kohlrenken, W., and Hutchison, W., 2016, Numerical model report: minor aquifers of the Llano Uplift Region of Texas (Marble Falls, Ellenburger-San Saba, and Hickory): Texas Water Development Board published report, 400 p.

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Appendix F

TWDB Estimated Historical Water Use & 2017 State Water Plan Datasets

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Estimated Historical Groundwater Use And 2017 State Water Plan Datasets:

Southwestern Travis County Groundwater Conservation District

by Stephen Allen
Texas Water Development Board
Groundwater Division
Groundwater Technical Assistance Section
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(512) 463-7317
March 27, 2020

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 3/27/2020. 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 2018. TWDB staff anticipates the calculation and posting of these estimates at a later date.

TRAVIS COUNTY *20.9% (multiplier)* All values are in acre-feet

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2017	GW	4,158	145	0	17	389	16	4,725
	SW	33,406	2,527	0	327	52	63	36,375
2016	GW	3,873	145	0	17	369	17	4,421
	SW	32,385	2,099	0	154	86	68	34,792
2015	GW	3,335	153	0	0	156	17	3,661
	SW	31,170	2,011	0	198	2,211	68	35,658
2014	GW	3,404	162	0	0	217	17	3,800
	SW	31,003	1,762	0	564	1,753	66	35,148
2013	GW	3,979	160	0	0	354	20	4,513
	SW	32,366	1,885	0	677	897	80	35,905
2012	GW	3,901	126	0	0	246	21	4,294
	SW	34,882	1,836	23	769	700	83	38,293
2011	GW	4,917	90	0	0	602	26	5,635
	SW	38,676	1,642	23	1,856	627	106	42,930
2010	GW	3,888	168	259	0	152	26	4,493
	SW	33,582	1,416	373	627	627	104	36,729
2009	GW	3,305	158	246	0	59	28	3,796
	SW	34,977	1,661	566	1,058	866	110	39,238
2008	GW	2,724	191	234	0	263	25	3,437
	SW	36,828	2,337	581	1,557	834	99	42,236
2007	GW	2,582	169	0	0	158	24	2,933
	SW	31,499	2,220	198	1,601	713	97	36,328
2006	GW	2,761	208	0	0	427	23	3,419
	SW	37,910	2,246	337	1,304	627	94	42,518
2005	GW	3,122	198	0	0	311	27	3,658
	SW	33,571	2,356	659	889	660	109	38,244
2004	GW	2,793	265	0	0	165	54	3,277
	SW	30,349	2,319	404	2,073	974	64	36,183
2003	GW	2,921	250	0	0	178	59	3,408
	SW	32,086	2,794	342	800	912	69	37,003
2002	GW	2,660	207	0	0	285	98	3,250
	SW	32,494	2,966	421	498	6	115	36,500

Projected Surface Water Supplies

TWDB 2017 State Water Plan Data

TRAVIS COUNTY *20.9% (multiplier)* All values are in acre-feet

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
K	AUSTIN	COLORADO	COLORADO RUN-OF-RIVER	137,829	129,682	112,223	100,459	88,585	75,600
K	AUSTIN	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	123,626	123,626	123,626	123,626	123,613	123,046
K	BARTON CREEK WEST WSC	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	760	760	760	760	760	760
K	BEE CAVE	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	1,552	1,552	1,552	1,552	1,552	1,552
K	BRIARCLIFF	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	400	400	400	400	400	400
K	CEDAR PARK	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	1,927	1,638	1,646	1,776	1,677	1,566
K	COUNTY-OTHER, TRAVIS	COLORADO	COLORADO RUN-OF-RIVER	945	859	782	656	480	325
K	COUNTY-OTHER, TRAVIS	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	3,023	3,023	3,023	3,023	3,023	3,023
K	CREEDMOOR-MAHA WSC	COLORADO	COLORADO RUN-OF-RIVER	241	241	241	241	241	241
K	IRRIGATION, TRAVIS	COLORADO	COLORADO RUN-OF-RIVER	158	158	158	158	158	158
K	IRRIGATION, TRAVIS	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	543	543	543	543	543	543
K	JONESTOWN	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	315	315	315	315	315	315
K	LAGO VISTA	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	3,451	3,451	3,451	3,451	3,451	3,451
K	LAKEWAY	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	4,249	4,249	4,249	4,249	4,249	4,249
K	LEANDER	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	1,202	1,684	1,738	1,269	1,079	941
K	LIVESTOCK, TRAVIS	COLORADO	COLORADO LIVESTOCK LOCAL SUPPLY	142	142	142	142	142	142
K	LIVESTOCK, TRAVIS	GUADALUPE	GUADALUPE LIVESTOCK LOCAL SUPPLY	5	5	5	5	5	5

K	LOOP 360 WSC	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	1,250	1,250	1,250	1,250	1,250	1,250
K	LOST CREEK MUD	COLORADO	COLORADO RUN-OF-RIVER	1,092	1,072	1,057	1,056	1,054	1,054
K	MANOR	COLORADO	COLORADO RUN-OF-RIVER	1,141	0	0	0	0	0
K	MANOR	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	159	159	159	159	159	159
K	MANUFACTURING, TRAVIS	COLORADO	COLORADO RUN-OF-RIVER	7,405	10,105	13,271	15,180	17,017	19,075
K	MANUFACTURING, TRAVIS	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	59	59	59	59	59	59
K	MANVILLE WSC	COLORADO	COLORADO RUN-OF-RIVER	2,240	0	0	0	0	0
K	MANVILLE WSC	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	307	305	299	295	288	281
K	MINING, TRAVIS	COLORADO	COLORADO OTHER LOCAL SUPPLY	448	573	709	835	974	1,134
K	MINING, TRAVIS	GUADALUPE	COLORADO OTHER LOCAL SUPPLY	7	9	10	11	13	14
K	NORTH AUSTIN MUD #1	COLORADO	COLORADO RUN-OF-RIVER	82	79	77	75	75	75
K	NORTHTOWN MUD	COLORADO	COLORADO RUN-OF-RIVER	691	798	898	1,011	1,111	1,203
K	NORTHTOWN MUD	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	339	339	339	339	339	339
K	PFLUGERVILLE	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	10,314	10,314	10,314	10,313	10,284	10,254
K	POINT VENTURE	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	360	360	360	360	360	360
K	ROLLINGWOOD	COLORADO	COLORADO RUN-OF-RIVER	384	0	0	0	0	0
K	ROUND ROCK	COLORADO	BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	225	203	177	146	123	102
K	ROUND ROCK	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	0	0	0	0	0	0
K	SHADY HOLLOW MUD	COLORADO	COLORADO RUN-OF-RIVER	779	758	741	731	730	730
K	STEAM ELECTRIC POWER, TRAVIS	COLORADO	COLORADO RUN-OF-RIVER	1,039	1,039	1,039	1,039	1,039	1,039
K	STEAM ELECTRIC POWER, TRAVIS	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	3,377	3,377	3,377	2,505	1,147	0
K	SUNSET VALLEY	COLORADO	COLORADO RUN-OF-RIVER	386	499	606	727	834	934
K	THE HILLS	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	1,533	1,533	1,533	1,533	1,533	1,533

K	TRAVIS COUNTY MUD #4	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	3,818	3,820	3,822	3,823	3,823	3,823
K	TRAVIS COUNTY WCID #10	COLORADO	COLORADO RUN-OF-RIVER	2,128	0	0	0	0	0
K	TRAVIS COUNTY WCID #17	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	8,027	8,027	8,027	8,027	8,027	8,027
K	TRAVIS COUNTY WCID #18	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	1,736	1,736	1,736	1,736	1,736	1,736
K	TRAVIS COUNTY WCID #19	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	498	496	494	493	493	493
K	TRAVIS COUNTY WCID #20	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	1,135	1,135	1,135	1,135	1,135	1,135
K	WELLS BRANCH MUD	COLORADO	COLORADO RUN-OF-RIVER	1,638	1,602	1,577	1,563	1,559	1,558
K	WEST LAKE HILLS	COLORADO	COLORADO RUN-OF-RIVER	1,605	0	0	0	0	0
K	WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	2,615	2,615	2,615	2,615	2,615	2,615
K	WILLIAMSON-TRAVIS COUNTY MUD #1	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	201	201	201	202	201	202
	Sum of Projected Surface Water Supplies (acre-feet)			**337,386**	**324,791**	**310,736**	**299,843**	**288,251**	**275,501**

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.

TRAVIS COUNTY *20.9% (multiplier)* All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
K	AQUA WSC	COLORADO	1,089	1,226	1,363	1,524	1,672	1,810
K	AUSTIN	COLORADO	157,445	182,933	209,973	229,887	246,590	266,411
K	BARTON CREEK WEST WSC	COLORADO	432	427	424	423	422	422
K	BEE CAVE	COLORADO	1,777	2,043	2,297	2,582	2,834	3,070
K	BRIARCLIFF	COLORADO	260	295	328	368	403	436
K	CEDAR PARK	COLORADO	2,432	2,579	2,767	2,763	2,761	2,760
K	COUNTY-OTHER, TRAVIS	COLORADO	1,749	1,590	1,447	1,214	890	602
K	COUNTY-OTHER, TRAVIS	GUADALUPE	5	7	9	9	9	10
K	CREEDMOOR-MAHA WSC	COLORADO	565	623	681	756	828	896
K	CREEDMOOR-MAHA WSC	GUADALUPE	27	30	33	36	40	43
K	ELGIN	COLORADO	251	352	447	556	653	744
K	GOFORTH SUD	GUADALUPE	9	10	11	12	13	14
K	IRRIGATION, TRAVIS	COLORADO	903	831	764	703	647	603
K	JONESTOWN	COLORADO	408	428	448	473	497	521
K	LAGO VISTA	COLORADO	1,868	2,185	2,488	2,832	3,140	3,428
K	LAKEWAY	COLORADO	6,977	9,115	9,093	9,081	9,076	9,075
K	LEANDER	COLORADO	1,134	2,908	5,020	5,422	5,623	5,878
K	LIVESTOCK, TRAVIS	COLORADO	142	142	142	142	142	142
K	LIVESTOCK, TRAVIS	GUADALUPE	5	5	5	5	5	5
K	LOOP 360 WSC	COLORADO	1,174	1,220	1,264	1,316	1,363	1,407
K	LOST CREEK MUD	COLORADO	1,092	1,072	1,057	1,056	1,054	1,054
K	MANOR	COLORADO	1,141	1,559	1,959	2,410	2,810	3,183
K	MANUFACTURING, TRAVIS	COLORADO	7,480	10,180	13,346	15,255	17,092	19,151
K	MANVILLE WSC	COLORADO	2,984	3,604	4,201	4,885	5,499	6,074
K	MINING, TRAVIS	COLORADO	725	850	985	1,112	1,251	1,411
K	MINING, TRAVIS	GUADALUPE	7	9	10	11	13	14
K	MUSTANG RIDGE	COLORADO	45	46	47	48	50	51
K	MUSTANG RIDGE	GUADALUPE	17	17	17	18	19	20
K	NORTH AUSTIN MUD #1	COLORADO	82	79	77	75	75	75
K	NORTHTOWN MUD	COLORADO	691	798	898	1,011	1,111	1,203
K	PFLUGERVILLE	COLORADO	12,775	17,105	21,243	25,896	30,012	33,851
K	POINT VENTURE	COLORADO	347	443	534	638	729	815

K	ROLLINGWOOD	COLORADO	384	379	376	375	376	378
K	ROUND ROCK	COLORADO	265	301	336	377	414	448
K	SHADY HOLLOW MUD	COLORADO	779	758	741	731	730	730
K	STEAM ELECTRIC POWER, TRAVIS	COLORADO	3,867	4,703	4,703	4,912	5,121	5,539
K	SUNSET VALLEY	COLORADO	386	499	606	727	834	934
K	THE HILLS	COLORADO	1,449	1,444	1,441	1,439	1,438	1,438
K	TRAVIS COUNTY MUD #4	COLORADO	2,611	3,010	3,387	3,810	4,184	4,533
K	TRAVIS COUNTY WCID #10	COLORADO	2,128	2,428	2,715	3,044	3,341	3,619
K	TRAVIS COUNTY WCID #17	COLORADO	8,451	10,053	11,017	11,187	11,479	11,842
K	TRAVIS COUNTY WCID #18	COLORADO	1,123	1,267	1,407	1,573	1,725	1,867
K	TRAVIS COUNTY WCID #19	COLORADO	498	496	494	493	493	493
K	TRAVIS COUNTY WCID #20	COLORADO	590	587	584	583	582	582
K	VOLENTE	COLORADO	76	89	101	116	130	142
K	WELLS BRANCH MUD	COLORADO	1,638	1,602	1,577	1,563	1,559	1,558
K	WEST LAKE HILLS	COLORADO	1,564	1,550	1,539	1,533	1,532	1,532
K	WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY	COLORADO	2,367	2,720	3,057	3,438	3,774	4,088
K	WILLIAMSON-TRAVIS COUNTY MUD #1	COLORADO	153	149	147	147	146	146
		Sum of Projected Water Demands (acre-feet)	**234,367**	**276,746**	**317,606**	**348,567**	**375,181**	**405,048**

Projected Water Supply Needs

TWDB 2017 State Water Plan Data

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

TRAVIS COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
K	AQUA WSC	COLORADO	721	584	447	286	138	0
K	AUSTIN	COLORADO	108,581	74,946	30,447	-1,231	-29,821	-63,194
K	BARTON CREEK WEST WSC	COLORADO	328	333	336	337	338	338
K	BEE CAVE	COLORADO	-225	-491	-745	-1,030	-1,282	-1,518
K	BRIARCLIFF	COLORADO	140	105	72	32	-3	-36
K	CEDAR PARK	COLORADO	-505	-941	-1,121	-987	-1,084	-1,194
K	COUNTY-OTHER, TRAVIS	COLORADO	10,613	10,963	11,278	11,790	12,505	13,139
K	COUNTY-OTHER, TRAVIS	GUADALUPE	94	86	78	75	74	70
K	CREEDMOOR-MAHA WSC	COLORADO	160	59	-43	-171	-309	-445
K	CREEDMOOR-MAHA WSC	GUADALUPE	0	0	0	0	0	0
K	ELGIN	COLORADO	0	-101	-196	-305	-402	-493
K	GOFORTH SUD	GUADALUPE	0	0	0	0	0	0
K	IRRIGATION, TRAVIS	COLORADO	809	1,156	1,474	1,767	2,034	2,246
K	JONESTOWN	COLORADO	-93	-113	-133	-158	-182	-206
K	LAGO VISTA	COLORADO	2,157	1,840	1,537	1,193	885	597
K	LAKEWAY	COLORADO	-1,469	-3,607	-3,585	-3,573	-3,568	-3,567
K	LEANDER	COLORADO	68	-1,224	-3,282	-4,153	-4,544	-4,937
K	LIVESTOCK, TRAVIS	COLORADO	3	3	3	3	3	3
K	LIVESTOCK, TRAVIS	GUADALUPE	0	0	0	0	0	0
K	LOOP 360 WSC	COLORADO	76	30	-14	-66	-113	-157
K	LOST CREEK MUD	COLORADO	0	0	0	0	0	0
K	MANOR	COLORADO	2,316	757	357	-94	-494	-867
K	MANUFACTURING, TRAVIS	COLORADO	0	0	0	0	0	0
K	MANVILLE WSC	COLORADO	3,765	873	182	-568	-1,286	-2,346
K	MINING, TRAVIS	COLORADO	0	0	0	0	0	0
K	MINING, TRAVIS	GUADALUPE	0	0	0	0	0	0
K	MUSTANG RIDGE	COLORADO	0	0	0	0	0	0
K	MUSTANG RIDGE	GUADALUPE	0	0	0	0	0	0
K	NORTH AUSTIN MUD #1	COLORADO	0	0	0	0	0	0
K	NORTHTOWN MUD	COLORADO	339	339	339	339	339	339
K	PFLUGERVILLE	COLORADO	-605	-4,935	-9,073	-13,727	-17,872	-21,741
K	POINT VENTURE	COLORADO	13	-83	-174	-278	-369	-455

K	ROLLINGWOOD	COLORADO	0	-379	-376	-375	-376	-378
K	ROUND ROCK	COLORADO	3	-60	-126	-202	-265	-323
K	SHADY HOLLOW MUD	COLORADO	0	0	0	0	0	0
K	STEAM ELECTRIC POWER, TRAVIS	COLORADO	2,626	-1,374	-1,374	-6,543	-14,043	-21,530
K	SUNSET VALLEY	COLORADO	27	27	27	27	27	27
K	THE HILLS	COLORADO	84	89	92	94	95	95
K	TRAVIS COUNTY MUD #4	COLORADO	1,207	810	435	13	-361	-710
K	TRAVIS COUNTY WCID #10	COLORADO	0	-2,428	-2,715	-3,044	-3,341	-3,619
K	TRAVIS COUNTY WCID #17	COLORADO	-302	-1,904	-2,868	-3,038	-3,330	-3,693
K	TRAVIS COUNTY WCID #18	COLORADO	613	469	329	163	11	-131
K	TRAVIS COUNTY WCID #19	COLORADO	0	0	0	0	0	0
K	TRAVIS COUNTY WCID #20	COLORADO	545	548	551	552	553	553
K	VOLENTE	COLORADO	0	-13	-25	-40	-54	-66
K	WELLS BRANCH MUD	COLORADO	0	0	0	0	0	0
K	WEST LAKE HILLS	COLORADO	41	-1,550	-1,539	-1,533	-1,532	-1,532
K	WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY	COLORADO	421	68	-269	-650	-986	-1,300
K	WILLIAMSON-TRAVIS COUNTY MUD #1	COLORADO	48	52	54	55	55	56
	Sum of Projected Water Supply Needs (acre-feet)		**-3,199**	**-19,203**	**-27,658**	**-41,766**	**-85,617**	**-134,438**

Projected Water Management Strategies

TWDB 2017 State Water Plan Data

TRAVIS COUNTY

WUG, Basin (RWPG)

All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
AQUA WSC, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	163	184	204	229	251	272
MUNICIPAL CONSERVATION - AQUA WSC	DEMAND REDUCTION [TRAVIS]	74	94	87	87	96	103
		237	**278**	**291**	**316**	**347**	**375**
AUSTIN, COLORADO (K)							
CITY OF AUSTIN - AQUIFER STORAGE AND RECOVERY	TRINITY AQUIFER ASR [TRAVIS]	10,000	25,000	25,000	50,000	50,000	50,000
CITY OF AUSTIN - CAPTURE LOCAL INFLOWS TO LADY BIRD LAKE	COLORADO RUN-OF-RIVER [TRAVIS]	1,000	1,000	1,000	1,000	1,000	1,000
CITY OF AUSTIN - CONSERVATION	DEMAND REDUCTION [TRAVIS]	22,969	24,559	28,317	31,220	33,822	36,899
CITY OF AUSTIN - DIRECT REUSE	DIRECT REUSE [TRAVIS]	5,429	10,429	20,429	22,929	25,429	27,929
CITY OF AUSTIN - INDIRECT POTABLE REUSE THROUGH LADY BIRD LAKE	INDIRECT REUSE [TRAVIS]	20,000	20,000	20,000	20,000	20,000	20,000
CITY OF AUSTIN - LAKE AUSTIN OPERATIONS	COLORADO RUN-OF-RIVER [TRAVIS]	2,500	2,500	2,500	2,500	2,500	2,500
CITY OF AUSTIN - LAKE LONG ENHANCED STORAGE	LAKE LONG/RESERVOIR [RESERVOIR]	20,000	20,000	20,000	20,000	20,000	20,000
CITY OF AUSTIN - LONGHORN DAM OPERATION IMPROVEMENTS	COLORADO RUN-OF-RIVER [TRAVIS]	3,000	3,000	3,000	3,000	3,000	3,000
CITY OF AUSTIN - OTHER REUSE	DIRECT REUSE [TRAVIS]	1,000	1,000	1,500	2,000	2,500	3,000
CITY OF AUSTIN - RAINWATER HARVESTING	RAINWATER HARVESTING [TRAVIS]	83	828	4,141	8,282	12,423	16,564
CITY OF AUSTIN RETURN FLOWS	INDIRECT REUSE [TRAVIS]	19,258	17,749	22,990	22,874	26,759	30,312
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	15,745	18,293	20,997	22,989	24,659	26,641
		120,984	**144,358**	**169,874**	**206,794**	**222,092**	**237,845**
BARTON CREEK WEST WSC, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	65	64	64	63	63	63
MUNICIPAL CONSERVATION - BARTON CREEK WEST WSC	DEMAND REDUCTION [TRAVIS]	42	77	108	122	137	152
		107	**141**	**172**	**185**	**200**	**215**
BEE CAVE, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION	355	409	459	516	567	614

	[TRAVIS]						
LCRA - LANE CITY RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIRS (2020 DECADE) [RESERVOIR]	300	300	600	600	800	800
MUNICIPAL CONSERVATION - BEE CAVE VILLAGE	DEMAND REDUCTION [TRAVIS]	175	374	608	863	1,136	1,323
		830	**1,083**	**1,667**	**1,979**	**2,503**	**2,737**
BRIARCLIFF, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	26	30	33	37	40	44
		26	**30**	**33**	**37**	**40**	**44**
CEDAR PARK, COLORADO (K)							
BRUSHY CREEK RUA-EXISTING CONTRACTS	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM [RESERVOIR]	170	175	15	0	0	0
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	486	516	553	553	552	552
MUNICIPAL CONSERVATION - CEDAR PARK	DEMAND REDUCTION [TRAVIS]	246	479	614	724	822	921
MUNICIPAL WATER CONSERVATION (SUBURBAN) - CEDAR PARK	DEMAND REDUCTION [TRAVIS]	89	287	492	542	540	539
		991	**1,457**	**1,674**	**1,819**	**1,914**	**2,012**
COUNTY-OTHER, TRAVIS, COLORADO (K)							
BRUSH CONTROL	COLORADO RUN-OF-RIVER [TRAVIS]	425	425	425	425	425	425
		425	**425**	**425**	**425**	**425**	**425**
CREEDMOOR-MAHA WSC, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	28	31	34	38	41	45
LCRA - MID BASIN RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIRS (2020 DECADE) [RESERVOIR]	0	400	400	400	400	400
SALINE EDWARDS ASR	EDWARDS AQUIFER ASR [TRAVIS]	0	101	101	101	101	101
SALINE EDWARDS ASR (SALINE)	EDWARDS-BFZ AQUIFER [TRAVIS]	0	199	199	199	199	199
URGENT WATER LOSS REDUCTION PROJECT - CMWSC	DEMAND REDUCTION [TRAVIS]	19	20	22	25	27	30
		47	**751**	**756**	**763**	**768**	**775**
CREEDMOOR-MAHA WSC, GUADALUPE (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	1	2	2	2	2	2
URGENT WATER LOSS REDUCTION PROJECT - CMWSC	DEMAND REDUCTION [TRAVIS]	1	1	1	1	1	1
		2	**3**	**3**	**3**	**3**	**3**
ELGIN, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	38	53	67	83	98	112
LCRA - LANE CITY RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIRS (2020 DECADE) [RESERVOIR]	0	48	129	222	304	381

		38	**101**	**196**	**305**	**402**	**493**
GOFORTH SUD, GUADALUPE (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	2	3	3	3	3	4
MUNICIPAL WATER CONSERVATION (RURAL)	DEMAND REDUCTION [TRAVIS]	0	0	0	0	0	0
		2	**3**	**3**	**3**	**3**	**4**
JONESTOWN, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	82	86	90	95	99	104
MUNICIPAL CONSERVATION - JONESTOWN	DEMAND REDUCTION [TRAVIS]	20	36	51	73	96	122
		102	**122**	**141**	**168**	**195**	**226**
LAGO VISTA, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	374	437	498	566	628	686
MUNICIPAL CONSERVATION - LAGO VISTA	DEMAND REDUCTION [TRAVIS]	187	301	426	604	773	972
		561	**738**	**924**	**1,170**	**1,401**	**1,658**
LAKEWAY, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	1,395	1,823	1,819	1,816	1,815	1,815
EXPANSION OF CURRENT GROUNDWATER SUPPLIES - TRINITY AQUIFER	TRINITY AQUIFER [TRAVIS]	500	500	500	500	500	500
LCRA - LANE CITY RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIRS (2020 DECADE) [RESERVOIR]	1,000	1,000	1,000	1,000	1,000	1,000
MUNICIPAL CONSERVATION - LAKEWAY	DEMAND REDUCTION [TRAVIS]	702	1,652	2,408	3,052	3,640	3,921
		3,597	**4,975**	**5,727**	**6,368**	**6,955**	**7,236**
LEANDER, COLORADO (K)							
BRUSHY CREEK RUA-EXISTING CONTRACTS	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM [RESERVOIR]	2,967	4,136	4,588	2,891	2,368	1,988
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	170	436	753	813	843	882
LCRA - LANE CITY RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIRS (2020 DECADE) [RESERVOIR]	0	0	0	662	1,576	2,349
		3,137	**4,572**	**5,341**	**4,366**	**4,787**	**5,219**
LOOP 360 WSC, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	176	183	190	197	204	211
MUNICIPAL CONSERVATION - LOOP 360 WSC	DEMAND REDUCTION [TRAVIS]	116	224	333	441	546	648
		292	**407**	**523**	**638**	**750**	**859**
LOST CREEK MUD, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	218	214	211	211	211	211
MUNICIPAL CONSERVATION - LOST	DEMAND REDUCTION	108	137	171	215	254	294

CREEK MUD	[TRAVIS]						
		326	**351**	**382**	**426**	**465**	**505**
MANOR, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	171	234	294	362	422	477
EXPANSION OF CURRENT GROUNDWATER SUPPLIES - TRINITY AQUIFER	TRINITY AQUIFER [TRAVIS]	0	600	600	600	600	600
		171	**834**	**894**	**962**	**1,022**	**1,077**
MANVILLE WSC, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	448	541	630	733	825	911
EXPANSION OF CURRENT GROUNDWATER SUPPLIES - TRINITY AQUIFER	TRINITY AQUIFER [TRAVIS]	0	0	0	1,000	1,000	1,000
LCRA - MID BASIN RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIRS (2020 DECADE) [RESERVOIR]	0	0	0	500	2,000	2,000
		448	**541**	**630**	**2,233**	**3,825**	**3,911**
MUSTANG RIDGE, COLORADO (K)							
MUNICIPAL WATER CONSERVATION (RURAL)	DEMAND REDUCTION [TRAVIS]	0	0	0	0	0	0
		0	**0**	**0**	**0**	**0**	**0**
MUSTANG RIDGE, GUADALUPE (K)							
MUNICIPAL WATER CONSERVATION (RURAL)	DEMAND REDUCTION [TRAVIS]	0	0	0	0	0	0
		0	**0**	**0**	**0**	**0**	**0**
NORTH AUSTIN MUD #1, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	12	12	12	11	11	11
		12	**12**	**12**	**11**	**11**	**11**
NORTHTOWN MUD, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	104	120	135	152	167	180
		104	**120**	**135**	**152**	**167**	**180**
PFLUGERVILLE, COLORADO (K)							
DIRECT REUSE - PFLUGERVILLE	DIRECT REUSE [TRAVIS]	500	1,000	2,000	2,000	4,000	4,000
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	3,194	4,276	5,311	6,474	7,503	8,463
EXPANSION OF CURRENT GROUNDWATER SUPPLIES - EDWARDS-BFZ AQUIFER	EDWARDS-BFZ AQUIFER [TRAVIS]	0	0	1,000	1,000	1,000	1,000
LCRA - LANE CITY RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIRS (2020 DECADE) [RESERVOIR]	0	0	0	3,000	3,000	4,000
LCRA - MID BASIN RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIRS (2020 DECADE) [RESERVOIR]	0	0	0	0	0	2,000
MUNICIPAL CONSERVATION - PFLUGERVILLE	DEMAND REDUCTION [TRAVIS]	604	2,105	2,625	3,029	3,514	3,966
		4,298	**7,381**	**10,936**	**15,503**	**19,017**	**23,429**

POINT VENTURE, COLORADO (K)

DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	52	66	80	96	109	122
LCRA - LANE CITY RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIRS (2020 DECADE) [RESERVOIR]	0	100	100	300	300	300
MUNICIPAL CONSERVATION - POINT VENTURE	DEMAND REDUCTION [TRAVIS]	34	82	139	191	241	301
		86	**248**	**319**	**587**	**650**	**723**

ROLLINGWOOD, COLORADO (K)

DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	58	57	56	56	56	57
LCRA - MID BASIN RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIRS (2020 DECADE) [RESERVOIR]	0	400	400	400	400	400
MUNICIPAL CONSERVATION - ROLLINGWOOD	DEMAND REDUCTION [TRAVIS]	38	67	79	91	104	118
		96	**524**	**535**	**547**	**560**	**575**

ROUND ROCK, COLORADO (K)

ADDITIONAL ADVANCED CONSERVATION - ROUND ROCK	DEMAND REDUCTION [TRAVIS]	0	0	10	24	40	59
BRA SYSTEM OPERATIONS-LITTLE RIVER	BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	1	3	14	15	17
BRUSHY CREEK RUA-EXISTING CONTRACTS	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM [RESERVOIR]	265	244	219	203	186	170
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	19	21	24	26	29	31
LITTLE RIVER OCR	LITTLE RIVER OFF-CHANNEL LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	25	76
MUNICIPAL CONSERVATION - ROUND ROCK	DEMAND REDUCTION [TRAVIS]	13	11	10	8	9	10
MUNICIPAL WATER CONSERVATION (SUBURBAN) - ROUND ROCK	DEMAND REDUCTION [TRAVIS]	6	1	0	0	0	0
		303	**278**	**266**	**275**	**304**	**363**

SHADY HOLLOW MUD, COLORADO (K)

DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	117	114	111	110	110	110
MUNICIPAL CONSERVATION - SHADY HOLLOW MUD	DEMAND REDUCTION [TRAVIS]	38	16	0	0	0	0
		155	**130**	**111**	**110**	**110**	**110**

STEAM ELECTRIC POWER, TRAVIS, COLORADO (K)

CITY OF AUSTIN - DIRECT REUSE	DIRECT REUSE [TRAVIS]	3,500	7,500	7,500	8,500	9,500	10,500
LCRA - MID BASIN RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIRS (2020 DECADE) [RESERVOIR]	0	0	0	0	4,543	11,030
		3,500	**7,500**	**7,500**	**8,500**	**14,043**	**21,530**

SUNSET VALLEY, COLORADO (K)

DEVELOPMENT OF NEW GROUNDWATER SUPPLIES - TRINITY AQUIFER	TRINITY AQUIFER [TRAVIS]	0	0	200	200	200	200
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	116	150	182	218	250	280
EDWARDS / MIDDLE TRINITY ASR	TRINITY AQUIFER ASR [HAYS]	0	200	200	200	200	200
LCRA - MID BASIN RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIRS (2020 DECADE) [RESERVOIR]	0	715	715	715	715	715
MUNICIPAL CONSERVATION - SUNSET VALLEY	DEMAND REDUCTION [TRAVIS]	38	90	158	241	305	366
		154	**1,155**	**1,455**	**1,574**	**1,670**	**1,761**
THE HILLS, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	217	217	216	216	216	216
MUNICIPAL CONSERVATION - THE HILLS	DEMAND REDUCTION [TRAVIS]	144	272	386	487	581	665
		361	**489**	**602**	**703**	**797**	**881**
TRAVIS COUNTY MUD #4, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	522	602	677	762	837	907
MUNICIPAL CONSERVATION - TRAVIS COUNTY MUD #4	DEMAND REDUCTION [TRAVIS]	262	564	912	1,302	1,705	2,114
		784	**1,166**	**1,589**	**2,064**	**2,542**	**3,021**
TRAVIS COUNTY WCID #10, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	532	607	679	761	835	905
LCRA - LANE CITY RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIRS (2020 DECADE) [RESERVOIR]	0	3,000	3,000	3,000	3,000	3,000
MUNICIPAL CONSERVATION - TRAVIS COUNTY WCID #10	DEMAND REDUCTION [TRAVIS]	213	445	707	996	1,316	1,533
		745	**4,052**	**4,386**	**4,757**	**5,151**	**5,438**
TRAVIS COUNTY WCID #17, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	1,268	1,508	1,653	1,678	1,722	1,776
LCRA - LANE CITY RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIRS (2020 DECADE) [RESERVOIR]	1,000	2,000	2,000	2,000	2,000	2,000
MUNICIPAL CONSERVATION - TRAVIS COUNTY WCID #17	DEMAND REDUCTION [TRAVIS]	853	1,825	2,399	2,889	3,325	4,645
		3,121	**5,333**	**6,052**	**6,567**	**7,047**	**8,421**
TRAVIS COUNTY WCID #18, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	168	190	211	236	259	280
MUNICIPAL CONSERVATION - TRAVIS COUNTY WCID #18	DEMAND REDUCTION [TRAVIS]	60	95	87	87	96	104
		228	**285**	**298**	**323**	**355**	**384**
TRAVIS COUNTY WCID #19, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	100	99	99	99	99	99

MUNICIPAL CONSERVATION - TRAVIS COUNTY WCID #19	DEMAND REDUCTION [TRAVIS]	50	92	131	166	199	229
		150	**191**	**230**	**265**	**298**	**328**
TRAVIS COUNTY WCID #20, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	118	117	117	117	116	116
MUNICIPAL CONSERVATION - TRAVIS COUNTY WCID #20	DEMAND REDUCTION [TRAVIS]	59	110	153	197	234	268
		177	**227**	**270**	**314**	**350**	**384**
VOLENTE, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	4	4	5	6	7	7
LCRA - LANE CITY RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIRS (2020 DECADE) [RESERVOIR]	142	142	142	142	142	142
		146	**146**	**147**	**148**	**149**	**149**
WELLS BRANCH MUD, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	82	80	79	78	78	78
		82	**80**	**79**	**78**	**78**	**78**
WEST LAKE HILLS, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	313	310	308	307	306	306
LCRA - MID BASIN RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIRS (2020 DECADE) [RESERVOIR]	0	1,300	1,300	1,300	1,300	1,300
MUNICIPAL CONSERVATION - WEST LAKE HILLS	DEMAND REDUCTION [TRAVIS]	157	286	398	505	609	700
		470	**1,896**	**2,006**	**2,112**	**2,215**	**2,306**
WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	473	544	611	688	755	818
LCRA - LANE CITY RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIRS (2020 DECADE) [RESERVOIR]	0	200	200	400	400	400
MUNICIPAL CONSERVATION - WEST TRAVIS COUNTY PUA	DEMAND REDUCTION [TRAVIS]	234	505	809	1,164	1,526	1,900
		707	**1,249**	**1,620**	**2,252**	**2,681**	**3,118**
WILLIAMSON-TRAVIS COUNTY MUD #1, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	23	22	22	22	22	22
		23	**22**	**22**	**22**	**22**	**22**
Sum of Projected Water Management Strategies (acre-feet)		**148,025**	**193,654**	**228,226**	**275,824**	**306,314**	**338,831**

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[may not be required, depending on number of pages in preceding appendix]

Appendix G

TWDB GAM Run 19-027: Dataset for Southwestern Travis County GCD Management Plan

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Texas Water

Development Board

P.O. Box 13231, 1700 N. Congress Ave. Austin, TX 78711-3231, www.twdb.texas.gov Phone (512) 463-7847, Fax (512) 475-2053

December 13, 2019

Mr. Richard A. Scadden
President
Southwestern Travis County Groundwater Conservation District 13333-A
Highway 71 West
Bee Cave, TX 78738 Dear Mr.

Scadden:

This letter transmits information to you in partial fulfilment of Texas Water Code, Section 36.1071, Subsections (e) and (h), which require that the Executive Administrator of the Texas Water Development Board (TWDB) provide groundwater availability modeling information to a groundwater conservation district for use in developing its groundwater management plan.

The TWDB provides this information to the Southwestern Travis County Groundwater Conservation District in two parts. Part 1 is the Estimated Historical Water Us e / State Water Plan datasets report, which will be provided to you separately from the TWDB Groundwater Technical Assistance Section. The Pa rt 1 water data report includes estimates of historical water use, project e d surface water supplies, projected water demands, projected water supply needs, and projected water management strategies for the groundwater conservation district. Please direct questions about the water data report to Mr. Stephen Allen at (512) 463-7317 or Ste phe n.Allen@ twdb.texas.gov. Part 2 is the required groundwater availability modeling information and is provided with this letter. This in formation includes:

1. the annual amount of recharge from precipitation, if any, to each aquife r within the district;
2. for each aquifer within the district, the annual volume of water that discharges from the aquifer to springs and any sur face-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 Southwestern Travis County Groundwater Conservation District is due by November 5, 2022. If you have any further questions or concerns about the model run, please feel free to contact Shirley Wade of our Groundwater staff at (512) 936-0883 or Shir ley.Wade@twd b.texas.gov, or Cindy Ridgeway of our Groundwater staff at

(512) 936-2386 or Cind y.Ridgeway@twdb.texas.gov. For your convenience, an electronic version of the GAM Run 19-027 report is available to download at http://www.twdb.texas.gov/groundwater/docs/GAM runs/GRl9-027.pdf.

Sincerely,

Jeff Walker
Executive Administrator

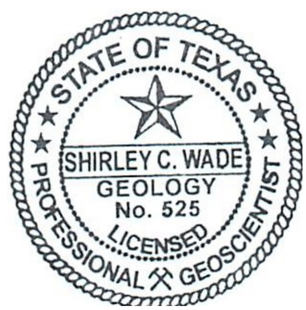
Enclosures

cw /o enc.:

Cindy Ridgeway, P.G., Groundwater Stephen Allen, P.G., Groundwater
Shirley C. Wade, Ph.D., P.G., Groundwater

GAM RUN 19-027: SOUTHWESTERN TRAVIS COUNTY GROUNDWATER CONSERVATION DISTRICT GROUNDWATER MANAGEMENT PLAN

Shirley C. Wade, Ph.D., P.G. Texas Water Development Board
Groundwater Division Groundwater Availability Modeling Department
512-936-0883
December 13, 2019



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GAM RUN 19-027: SOUTHWESTERN TRAVIS COUNTY GROUNDWATER CONSERVATION DISTRICT GROUNDWATER MANAGEMENT PLAN

Shirley C. Wade, Ph.D., P.G. Texas Water Development Board
Groundwater Division Groundwater Availability Modeling Department
512-936-0883
December 13, 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 Southwestern Travis County 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 in formation 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 sur face-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 Southwestern Travis County Groundwater Conservation District is due by November 5, 2022.

We used three groundwater availability models to estimate the management plan information for the aquifers within the Southwestern Travis County Groundwater Conservation District. Information for the Hickory Aquifer is from version 1.01 of the groundwater availability model for the minor aquifers in the Llano Uplift Region (Shi and others, 2016a and b). The model does not cover the entire Hickory Aquifer within the district. Please contact Mr. Stephen Allen with the TWDB at (512) 463-7317 or stephen.allen@twdb.texas.gov for additional information on the aquifer in areas not covered by the groundwater availability model. Information for the Trinity Aquifer is from the groundwater availability model for the Hill Country portion of the Trinity Aquifer System (Jones and others, 2011). Information for the Edwards (Balcones Fault Zone) Aquifer is from the groundwater availability model for the Barton Springs Segment of the Edwards (Balcones Fault Zone) Aquifer (Scanlon and others, 2001).

METHODS:

In accordance with the provisions of the Texas State Water Code, Section 36.1071, Subsection (h), the groundwater availability models mentioned above were used to estimate information for the Southwestern Travis Groundwater Conservation District management plan. Water budgets were extracted for the historical model periods for the Trinity Aquifer (1981 through 1997) and Edwards (Balcones Fault Zone) Aquifer (1989 through 1998) using ZONEBUDGET Version 3.01 (Harbaugh, 2009). Water budgets were extracted for the historical model period for the Hickory Aquifer (1981 through 2010) using ZONE BUDGET USG Version 1.00 (Panday and others, 2013). The average annual water budget values for recharge, surface-water outflow, inflow to the district, outflow from the district, and net inter-aquifer flow (lower) for the portion of the aquifer located within the district are summarized in this report.

PARAMETERS AND ASSUMPTIONS:

Hickory Aquifer

- We used version 1.01 of the groundwater availability model for the minor aquifers in the Llano Uplift Region to analyze the Hickory Aquifer. See Shi and others (2016a and b) for assumptions and limitations of the model.

- The groundwater availability model for the minor aquifers in the Llano Uplift Region contains eight active layers (from top to bottom):

- Layer 1 - the Trinity Aquifer, Edwards-Trinity (Plateau) Aquifer, and younger alluvium deposits,
- Layer 2 - Permian and Pennsylvanian age confining units,
- Layer 3 - the Marble Falls Aquifer and equivalent,
- Layer 4- Mississippian age confining units,
- Layer 5 - the Ellenburger-San Saba Aquifer and equivalent,
- Layer 6 - Cambrian age confining units,
- Layer 7 - the Hickory Aquifer and equivalent, and
- Layer 8 - Precambrian age confining units.

- The Hickory Aquifer is the only aquifer from the Llano Uplift Aquifer System present in southwestern Travis County.
- The groundwater availability model does not include the entire Hickory Aquifer within the district boundaries. The area east of the Ouachita Thrust Fault is not active in the model because research suggests the fault wall may likely act as a flow barrier.
- Perennial rivers and reservoirs were simulated using the MODFLOW-USG river package. Springs were simulated using the MODFLOW-USG drain package. However, for this analysis, surface water discharge does not occur from the Hickory Aquifer within the groundwater district boundaries.
- The model was run with MODFLOW-USG (Panday and others, 2013).

Hill Country portion of the Trinity Aquifer System

- 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):
  - Layer 1 - the Edwards Group of the Edwards-Trinity(Plateau) Aquifer,
  - Layer 2 - the Upper Trinity Aquifer,

- Layer 3 - the Middle Trinity Aquifer, and
- Layer 4 - the Lower TrinityAquifer.

- Layer 1 is not present in the district. An individual water budget for the district was determined for the remaining layers of the Hill Country portion of the Trinity Aquifer System (Layer 2 to Layer 4, collectively).
- The General-Head Boundary (GHB) package of MOD FLOW 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 model was run with MODFLOW-96 (Harbaugh and McDonald,1996).

Barton Springs Segment of the Edwards (Balcones Fault Zone) Aquifer

- We used version 1.01 of the groundwater availability model for the Barton Springs segment of the Edwards (Balcones Fault Zone) Aquifer. See Scanlon and others (2001) for assumptions and limitations of the groundwater availability model.
- The transient model has monthly stress periods and covers the time period of 1989 through 1998.
- The groundwater availability model is a one-layer model and assumes no interaction with the underlying Trinity Aquifer. The cells are 1,000 feet long parallel to the strike of the faults and 500 feet wide.
- The model was run with MODFLOW-96 (Harbaugh and McDonald,1996).

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 Hickory Aquifer, the Hill Country potion of the Trinity Aquifer System, and the Edwards (Balcones Fault Zone) Aquifer located within the Southwestern Travis County Groundwater Conservation District and averaged over the historical calibration periods, as shown in Table 1.

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.

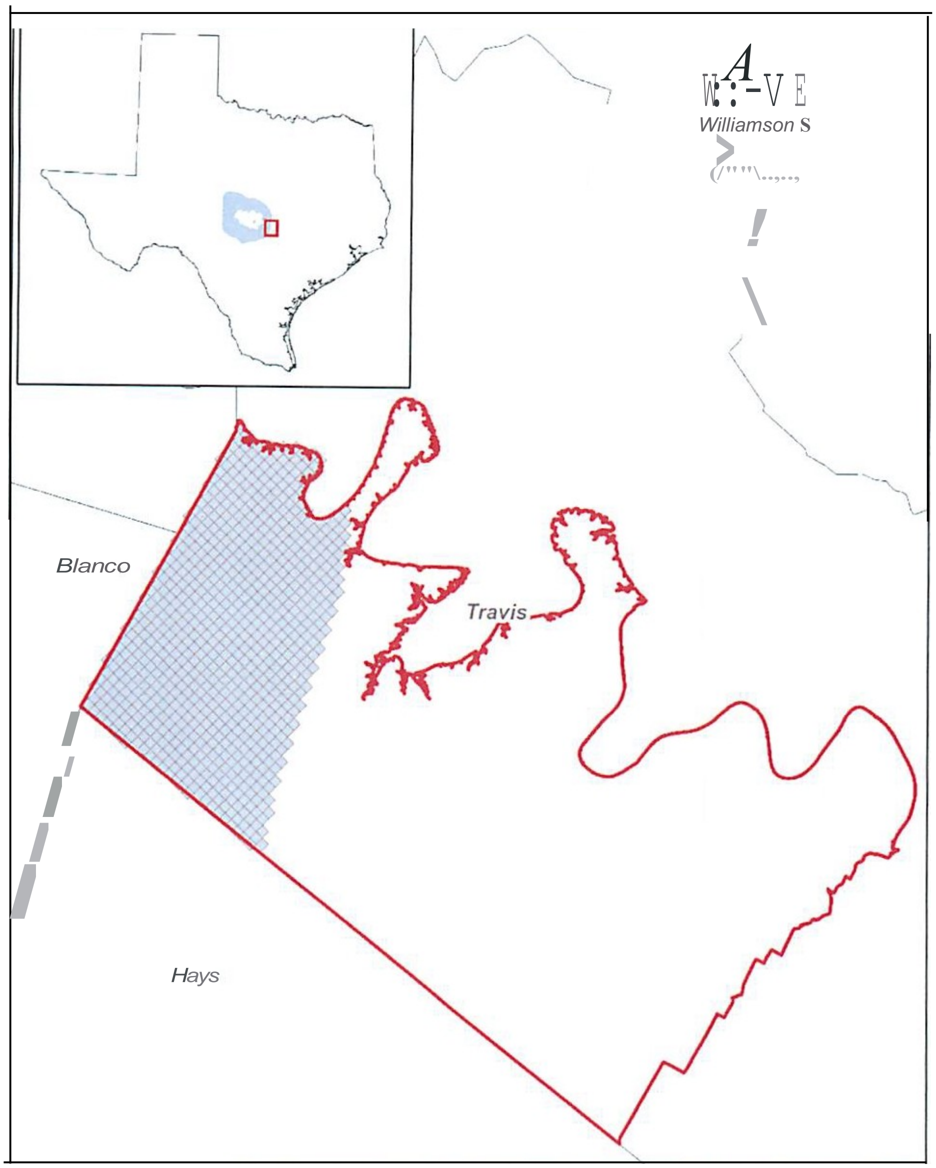
3. Flow into and out of district-the lateral flow within the aquifer between the district and adjacent counties.

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.

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 HICKORY AQUIFER FOR SOUTHWESTERN TRAVIS COUNTY GROUNDWATER CONSERVATION DISTRICT'S GROUNDWATER MANAGEMENT PLAN. ALL VALUES ARE REPORTED IN ACRE-FEET PER YEAR AND ROUNDED TO THE NEAREST 1 ACRE-FOOT.

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	3,121
Estimated annual volume of flow out of the district within each aquifer in the district	Hickory Aquifer	1,114
Estimated net annual volume of flow between each aquifer in the district	From the Hickory Aquifer into overlying Younger units.	2,153
	To the Hickory Aquifer from underlying Precambrian Formations	145



0 2.5 5 10 Miles

c:J Southwestern Travis County Groundwater Conservation District Hickory Aquifer Active Model Cells

[County Boundaries

gcd boundaries date = 01.22.18, county boundaries date= 02.02.11, lnup model grid date = 11.12.19

FIGURE 1 AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE MINOR AQUIFERS IN THE LLANO UPLIFT REGION FROM WHICH THE INFORMATION IN TABLE 1 WAS EXTRACTED (THE HICKORY AQUIFER EXTENT WITHIN THE DISTRICT BOUNDARY).

TABLE 2. SUMMARIZED INFORMATION FOR THE HILL COUNTRY PORTION OF THE TRINITY AQUIFER SYSTEM FOR SOUTHWESTERN TRAVIS COUNTY GROUNDWATER CONSERVATION DISTRICT'S GROUNDWATER MANAGEMENT PLAN. ALL VALUES ARE REPORTED IN ACRE- FEET PER YEAR AND ROUNDED TO THE NEAREST 1 ACRE-FOOT.

Management Plan requirement	Aquifer or confining unit	Result s
Estimated annual a mount of recharge from precipitation to the district	Trinity Aquifer	12,167
Estimated annual volume of water that discharges from the aquifer to springs and any surface -water body including lakes, streams, and rivers	Trinity Aquifer	12,654
Estimated annual volume of flow in to the district with in each aquifer in the district	Trinity Aquifer	10,024
Estimated annual volume of flow out of the district within each aquifer in the district	Trinity Aquifer	9,205
Estimated net annual volume of flow between each aquifer in the district	From the Hill Country portion of the Trinity Aquifer to the Edwards (Balcones Fault Zo ne) Aquifer and the Trinity Aquifer underlying the Edwards (Balcones Fault Zone) Aquifer.	2,333

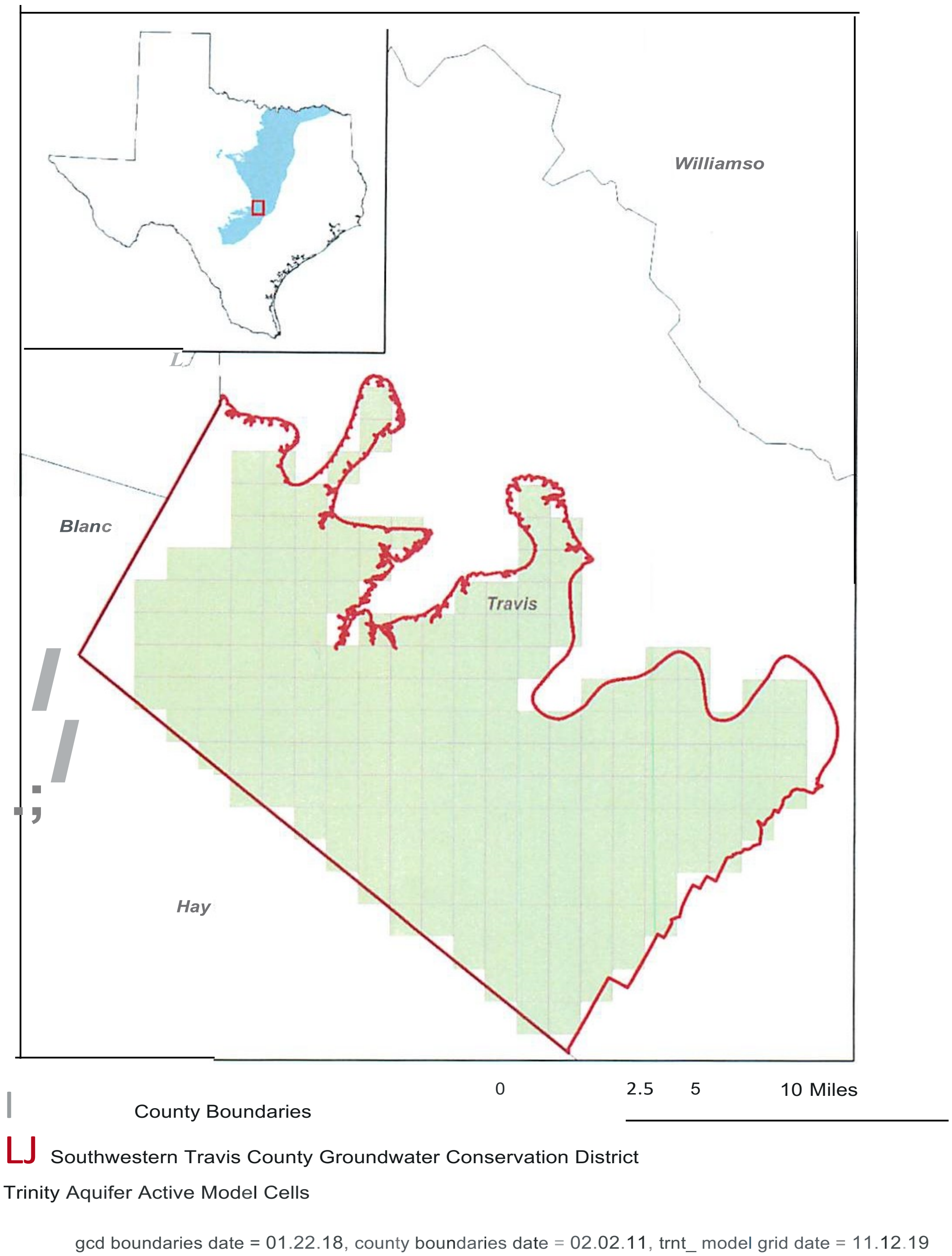
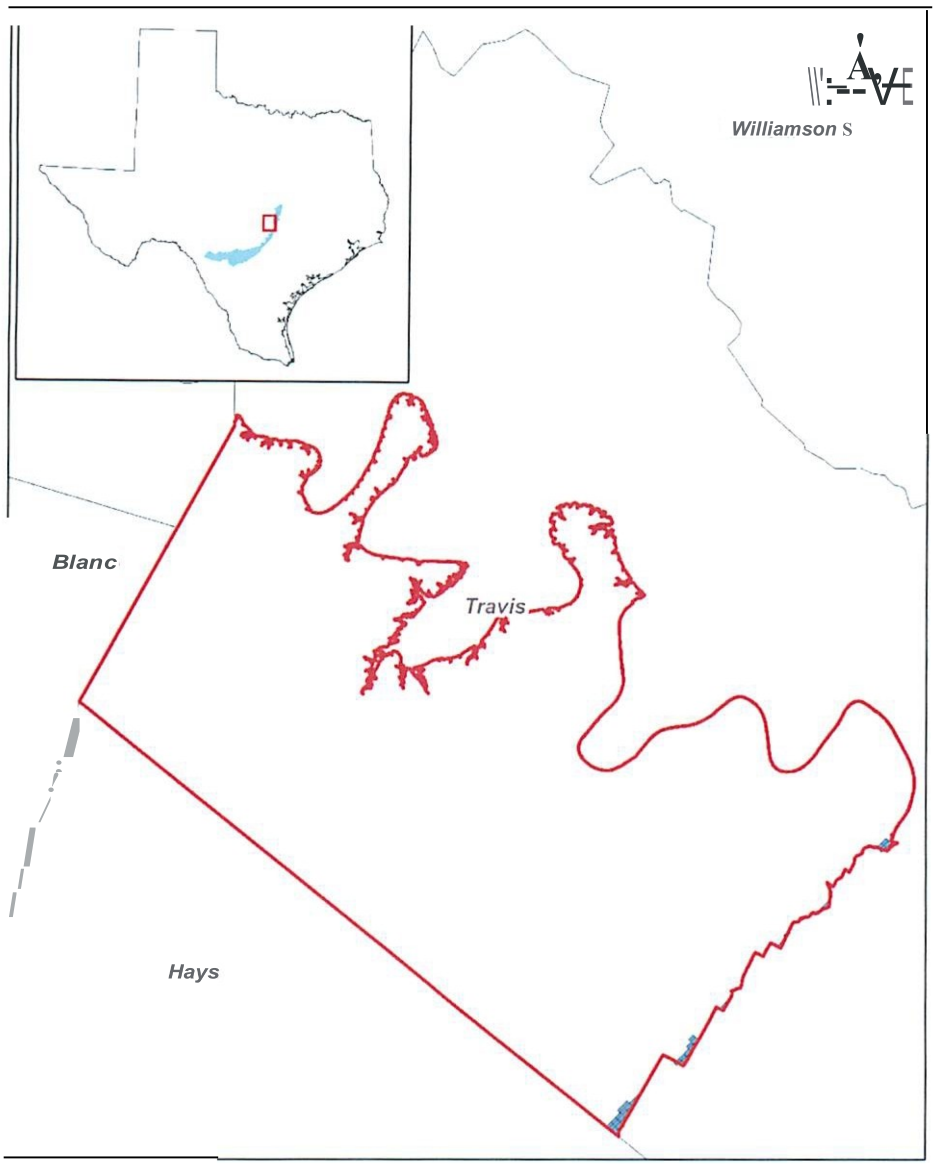


FIGURE 2 AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE HILL COUNTRY PORTION OF THE TRINITY AQUIFER SYSTEM FROM WHICH THE INFORMATION IN TABLE 2 WAS EXTRACTED (THE TRINITY AQUIFER EXTENT WITHIN THE DISTRICT BOUNDARY).

TABLE 3. SUMMARIZED INFORMATION FOR THE BARTON SPRINGS SEGMENT OF THE EDWARDS (BALCONES FAULT ZONE) AQUIFER FOR SOUTHWESTERN TRAVIS COUNTY GROUNDWATER CONSERVATION DISTRICT'S GROUNDWATER MANAG EME NT PLAN. ALL VALUES ARE REPORTED IN ACRE-FEET PER YEAR ANO 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 (Balcones Fault Zone) Aquifer	79
Estimated annual volume of water that discharges from the aquifer to springs and any surface-water body including lakes, streams, and rivers	Edwards (Balcones Fault Zone) Aquifer	0
Estimated annual volume of flow into the district within each aquifer in the district	Edwards (Balcones Fault Zone) Aquifer	306
Estimated annual volume of flow out of the district within each aquifer in the district	Edwards (Balcones Fault Zone) Aquifer	615
Estimated net annual volume of flow between each aquifer in the district	From the Hill Country portion of the Trinity Aquifer to the Edwards (Balcones Fault Zone) Aquifer and the Trinity Aquifer underlying the Edwards (Balcones Fault Zone 1 Aquifer.	2,333 [1]

[1] From the Groundwater Availability Model for the Hill Country portion of the Trinity Aquifer



0 2.5 5 10 Miles

D Southwestern Travis County Groundwater Conservation District

Edwards (Balcones Fault Zone) Aquifer Active Model Cells

County Boundaries

gcd boundaries date = 01.22.18, county boundaries date = 02.02.11. ebfz_b model grid date= 11.12.19

FIGURE 3 AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE BARTON SPRINGS SEGMENT OF THE EDWARDS (BALCONES FAULT ZONE) AQUIFER FROM WHICH THE INFORMATION IN TABLE 3 WAS EXTRACTED (AQUIFER 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 ofa regulatory model more complex than sole/ya 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 TWD B 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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Texas Water Code, 2011, htt p:// www.statute s.le g is .s ta te . tx . us / docs / WA/ pdf/ WA.3 6. pdf

This is the final page of the SWTCGCD Management Plan.