Barton Springs
Edwards Aquifer
CONSERVATION DISTRICT

DISTRICT MANAGEMENT PLAN

ADOPTED BY BOARD RESOLUTION – September 27, 2012

APPROVED BY TWDB – January 7, 2013

This groundwater management plan has been prepared in accordance with Texas Water Code, Chapter 36, Section 1071, and Texas Water Development Board requirements under Texas Administrative Code, Chapter 356, Sections 5 and 6.

BARTON SPRINGS/EDWARDS AQUIFER CONSERVATION DISTRICT

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I. BACKGROUND INFORMATION

This introductory section of the Management Plan sets the context for groundwater management planning in the District and describes how the rest of the Management Plan is organized.

I.A. DESCRIPTION OF DISTRICT

The Barton Springs/Edwards Aquifer Conservation District (hereinafter the "District"), was created in 1987 by the 70th Texas Legislature under Senate Bill 988 (now codified at Special District Local Laws Code, Chapter 8802) and Chapter 52 (revised to Chapter 36) of the Texas Water Code (TWC). The District's mandate is to conserve, protect, and enhance not only the groundwater resources of the Barton Springs segment of the Edwards Aquifer but also all other relevant groundwater resources located within the District boundaries. The District has the authority to undertake various studies and implement structural facilities and non-structural programs to achieve its statutory mandate. The District has rule-making authority to implement its policies and procedures and to help ensure the management of the groundwater resources.

The District's jurisdictional area (Figure I-1) includes parts of three counties: northwestern Caldwell, northeastern Hays, and southeastern Travis Counties. (In 2011, that very small part of Bastrop County previously in the District was de-annexed and is now in Lost Pines GCD's sole jurisdiction.) It is bounded on the west by the western edge of the Edwards Aquifer outcrop and on the north by the impounded Colorado River. The eastern and southeastern boundary is generally formed by the easterly service area limits of the Creedmoor-Maha Water Supply Corporation and Goforth Special Utility District, as they existed when the District was formed. The District's southwestern boundary is generally along the "groundwater divide" that hydrologically separates the Barton Springs and the San Antonio segments of the Edwards Aquifer. Other groundwater conservation districts (GCDs), some of which currently overlap slightly with the District, and also several so-called unprotected areas that aren't covered by GCDs are adjacent to the District (Figure I-2). This area encompasses approximately 247 square miles and is estimated to be about 24 percent urban/suburban, 56 percent ranchland/farmland, 20 percent open space/conservation land/water, and 1 percent mining/landfill/other land use, on the basis of the 2006 National Land Cover Dataset, the most recent data available. The area has a long history of farming, ranching, and rural domestic use of groundwater, but it is increasingly and rapidly being converted to residential use owing to suburban and exurban development from Austin and San Marcos. Groundwater in the area is primarily utilized for domestic and public water supply purposes, with lesser amounts also being utilized for commercial, irrigation, and industrial use. See Figure I-3 for a breakdown of the types of wells in the District and percent of pumping of all wells by authorized use in 2011 for each classification category.

The Edwards Aquifer is a source of drinking water for approximately 70,000 people (the latest estimate, from 2010), residing both within and outside the District boundaries. Barton Springs provides significant recreational opportunities at Barton Springs Pool in Austin's Zilker Park, and receives one-half million visitors per year. The Springs complex provides habitat for the endangered Barton Springs salamander, *Eurycea sosorum*; and the Austin blind salamander, *Eurycea waterlooensis*, a candidate for imminent listing as endangered. Spring discharge from the Barton Springs segment contributes to Lady Bird Lake on the Colorado River System. Some

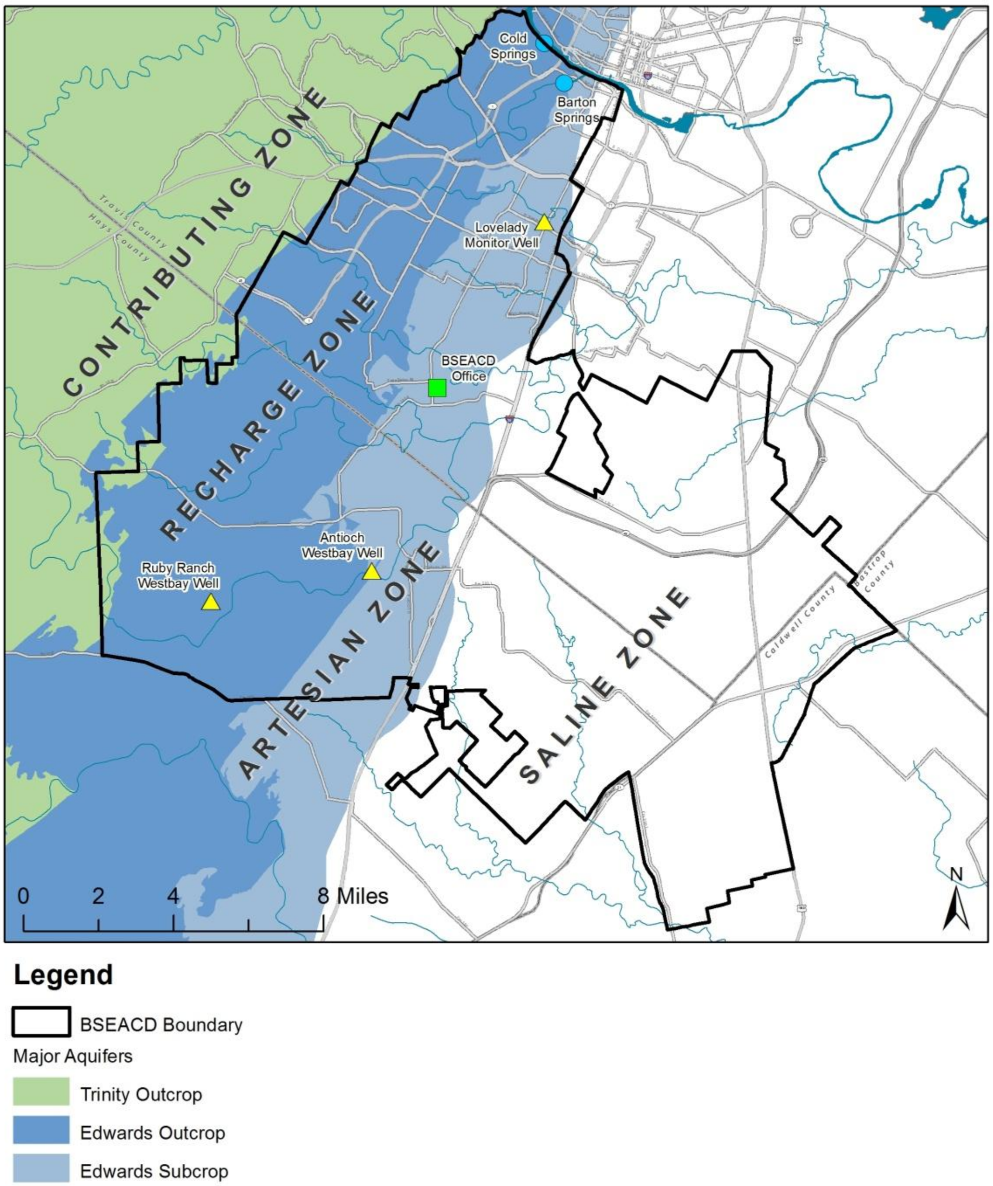

FIGURE I-1: LOCATION OF THE BARTON SPRINGS/EDWARDS AQUIFER CONSERVATION DISTRICT

This map displays the District's boundaries, major aquifers, hydrogeologic zones, key springs and monitoring wells.

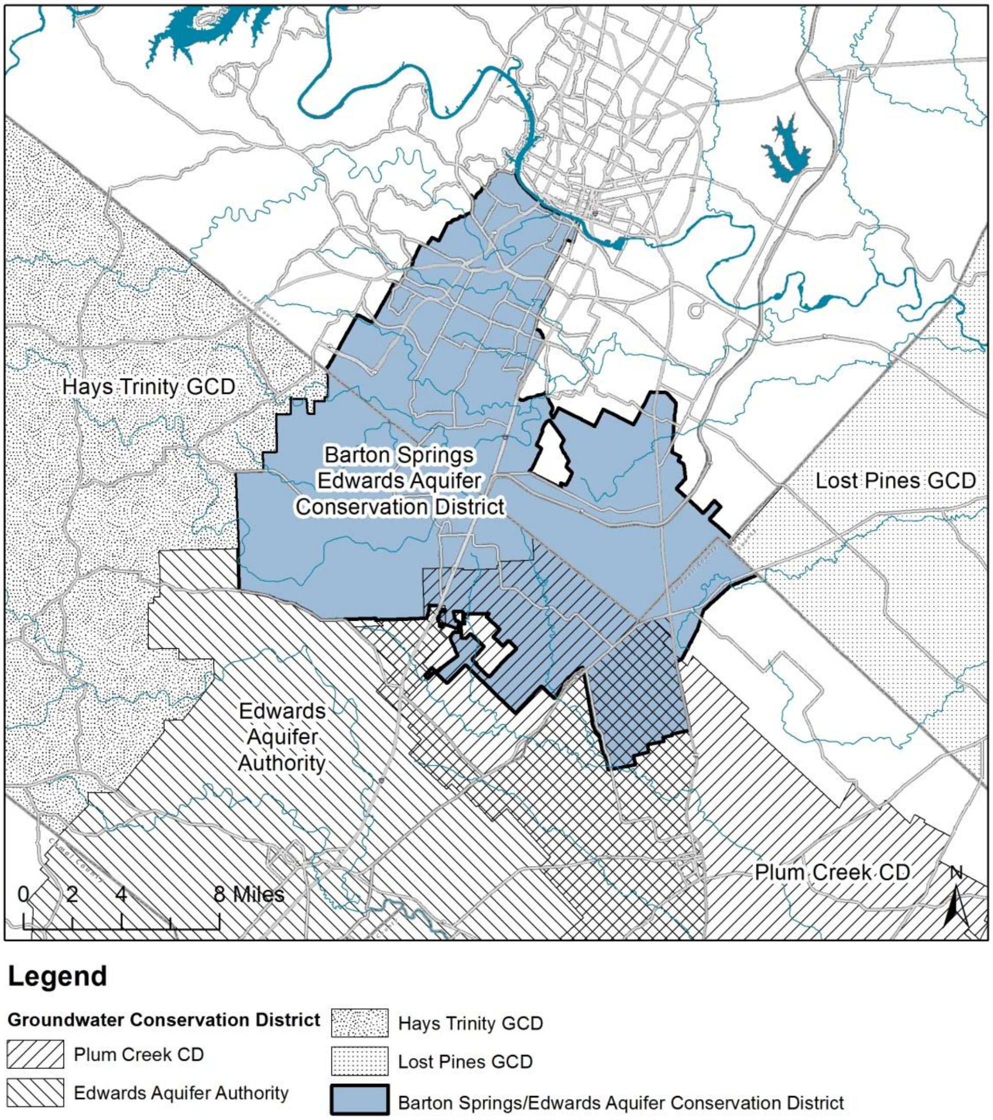

FIGURE I-2: OTHER GROUNDWATER CONSERVATION DISTRICTS ADJACENT TO THE DISTRICT

This map shows what other groundwater management entities exist in the areas just outside the District.

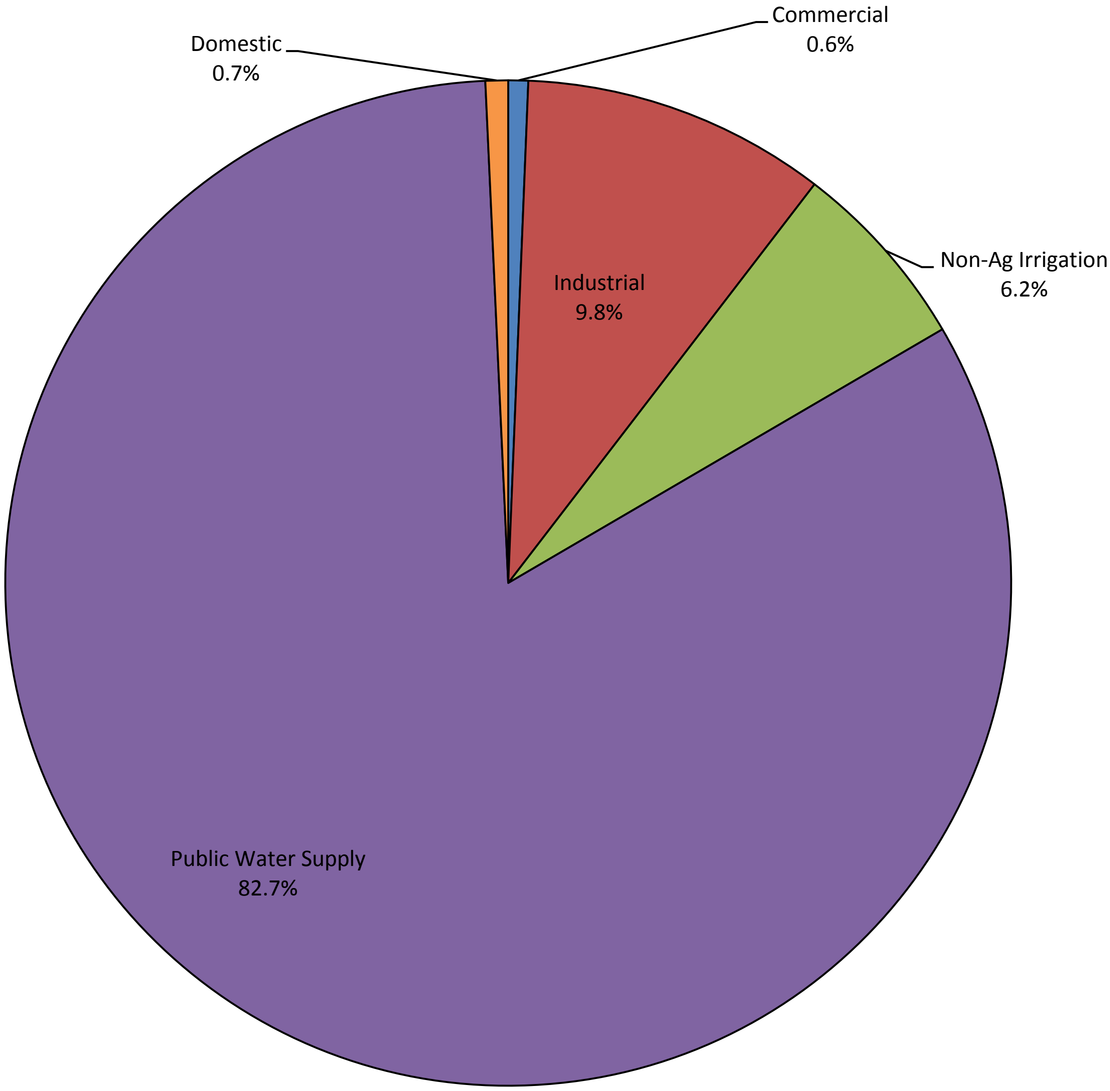

FIGURE I-3: TYPES OF GROUNDWATER USE AND THEIR PERCENT OF AUTHORIZED USE FOR PERMITTED WELLS IN THE DISTRICT

wells in the District also produce water from the Trinity Aquifer, and an incidental amount of groundwater is derived from the Taylor and Austin Groups and more geologically recent alluvial deposits.

While the area of the District is very small in comparison to other GCDs, its demographics have produced a rather complex set of legislative districts. Each of the State Senators and State Representatives that share constituencies with the District, as shown in Figures I-4 and I-5, represents a differing set of legislative priorities, yet each of them has expressed strong support for groundwater management, either on a general or a specific-issue basis. It is incumbent on the District to maintain accessible, constructive relationships with each of these legislators as a matter of course, as the future of both the District and of groundwater management in the state hang in that balance.

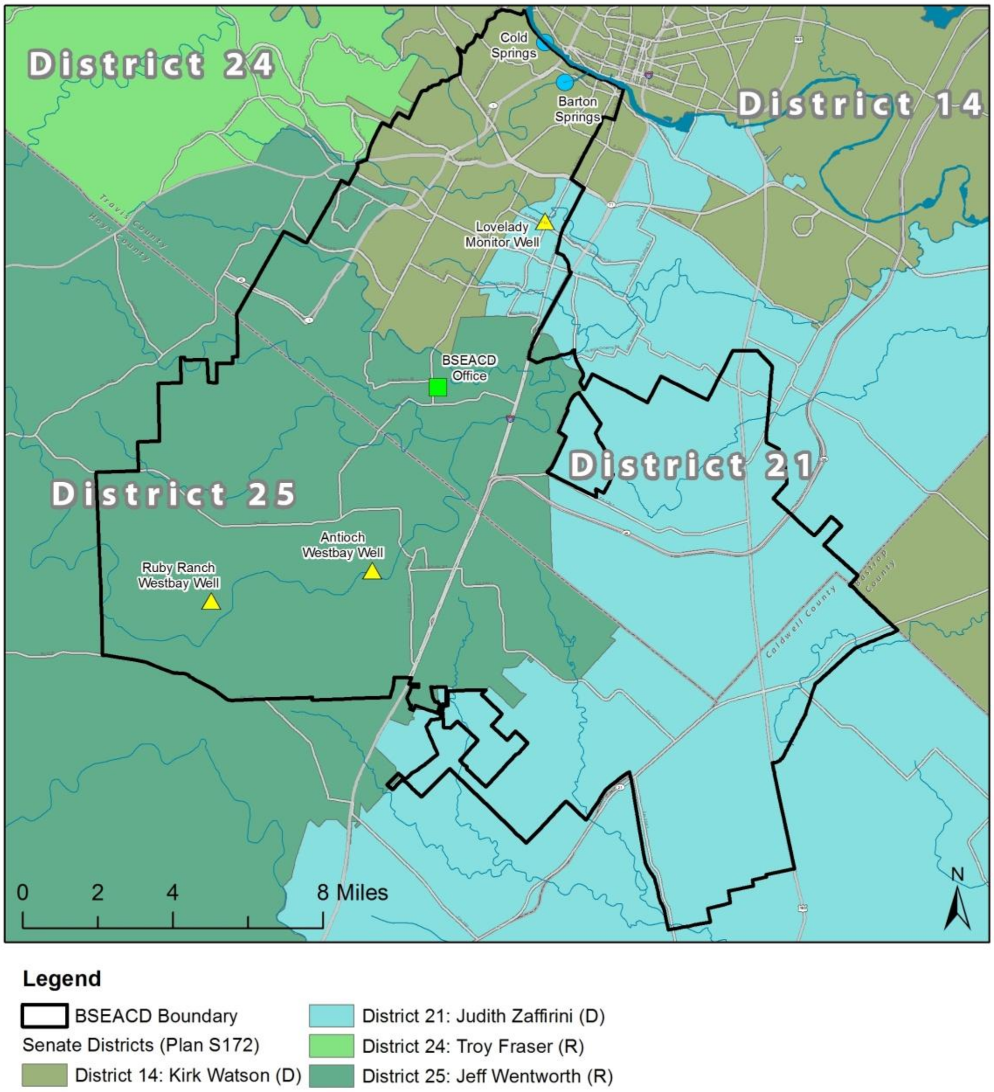

FIGURE I-4: SENATE DISTRICTS WITHIN OR ADJACENT TO THE DISTRICT'S BOUNDARY

This map displays the boundaries of local Senate Districts in relation to the District's boundary.

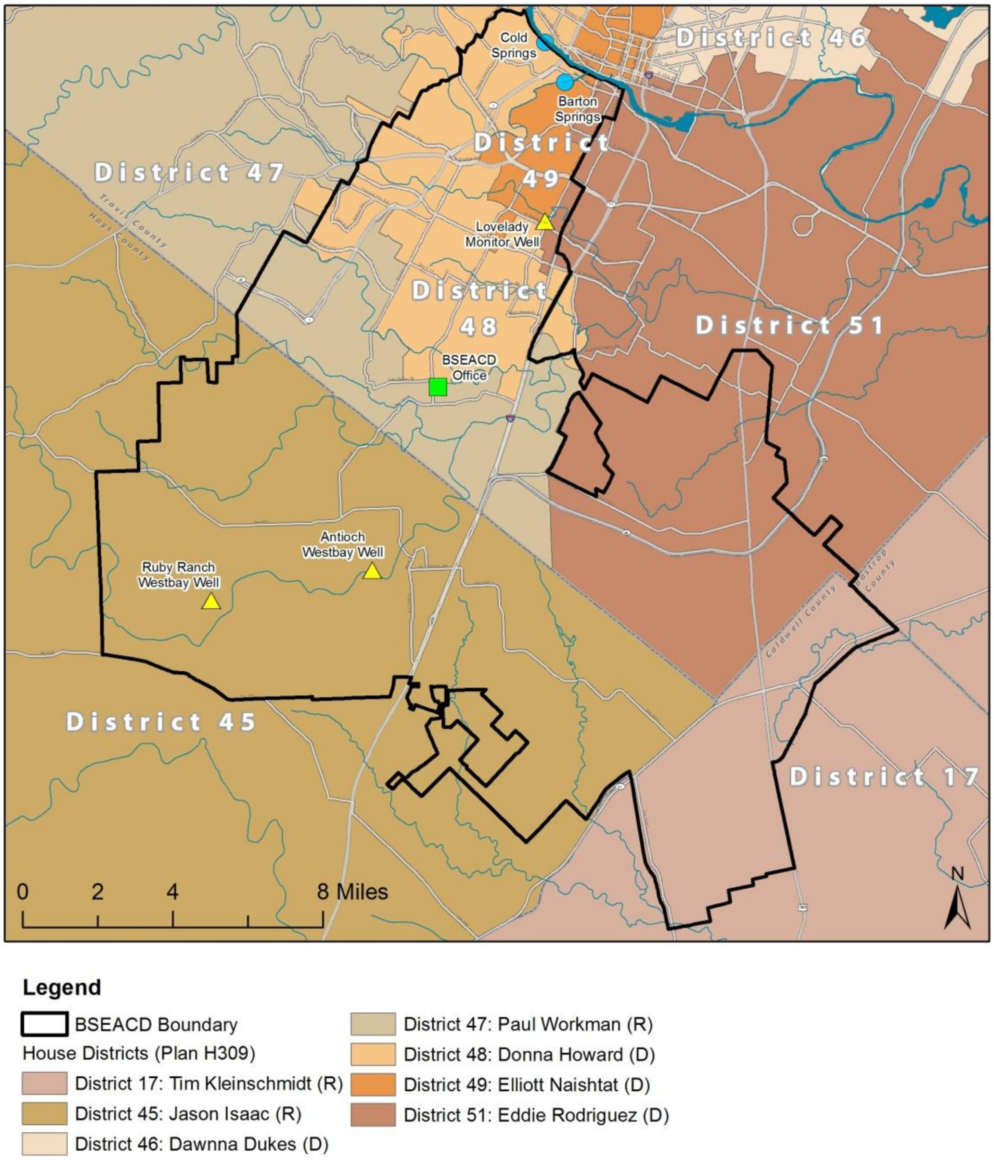

FIGURE I-5: HOUSE DISTRICTS WITHIN THE DISTRICT'S BOUNDARY

This map displays the boundaries of local House Districts in relation to the District's boundary.

I.B. MISSION, VISION, AND STRATEGIC PURPOSE OF THE DISTRICT

Strategic planning by the staff and directors of the District has established the following strategic elements that serve as a backdrop and guide for planning and performance:

Mission: *"As the responsible authority, the Barton Springs/Edwards Aquifer Conservation District is committed to conserving, protecting, enhancing recharge, and preventing waste of groundwater and to preserving all aquifers within the District."*

Vision: *"The Barton Springs/Edwards Aquifer Conservation District will excel in its operations and administration so that it is considered the model and standard for other groundwater districts."*

Overarching Strategic Purpose: *"We will manage the District aquifers to optimize the sustainable uses of groundwater in satisfying community interests."*

I.C. CORE VALUES AND STAFF GUIDELINES

The Board has established the following tenets as the core values of the District that guide all of our internal and external interactions and operations:

- We operate on the basis of the highest integrity.
- We are committed to protection of the aquifers and to prudent stewardship of the groundwater resources of the District.
- We provide exceptional service that is consistently and equitably applied and is responsive to the needs of the public, interest groups, and other governmental agencies.
- We recognize that we are a public trust and operate on a sound legal basis and under a financially responsible philosophy.
- We encourage our employees to succeed by doing what they do best, both individually and as a team, in a supportive working environment.
- We value and work to ensure transparency of our operations and openness in our dealings with various stakeholder groups.
- We strive to communicate useful information on groundwater management when and where needed by the public.

These values have been translated into the following operational guidelines for all District staff:

Integrity - We maintain and exhibit the highest integrity in all of our dealings, both internally and externally.
Quality - We offer high-quality services that meet or exceed our Board's expectations in providing support to their decision-making.
Continuous Improvement - We continuously look for innovative approaches and processes that improve the services we provide.
Teamwork - We build trust in our fellow workers and their roles, cultivate a harmonious and productive relationship among co-workers, and utilize the diversity of knowledge and perspective that reside in all of us to develop workable responses as shared solutions.
Problem-solving - We solve problems at the most immediate level first, while ensuring that problems are pursued to solution and that unresolved issues are elevated to successively higher levels.

Decision-making - In all decisions, we consider impacts on protection of the aquifer, on all users and other stewards of its resources, on District employees and Board members, and on other public and private entities.
Working Environment - We promote a safe, healthy work environment and foster a sense of care about our fellow workers' physical, mental, and emotional well-being.
Staff Development - We take advantage of those opportunities in which employees can grow professionally and/or personally, while allowing the District to apply new knowledge, skills, and expertise in accomplishing its mission.
Relationship-building - We build and maintain effective, bilateral relationships and communication with the regulated community, the scientific community, the public at-large and its special interest groups, and other state, federal, and local regulators.
Community Outreach - We communicate regularly and effectively with stakeholders and the public, to educate and disseminate information about groundwater use, conservation, protection, and resource value.
Value Proposition - As individual staff members, we provide the District with an honest day's work each working day and receive in return a competitive, fair compensation and benefits package and valued, challenging work assignments.

I.D. CRITICAL SUCCESS FACTORS

Through its continuing strategic and management planning process, the District Board has established the following as overall Critical Success Factors **(**CSFs**)** for the District that underpin the District's management objectives in this *Plan*:

- **Scientific CSF -** Providing sound science to support policy and tactical decisions made by the District that affect water supply users and endangered species habitat;
- **Business Administrative CSF -** Being highly efficient, accurate, and fair in administering transactional activities related to all District programs;
- **Regulatory CSF -** Developing and instituting an equitable and consistently administered regulatory program that is required to serve our mission;
- **Political CSF -** Being a respected, effective part of the state and local political landscape for water resource management and its stakeholder communities;
- **Educational CSF -** Serving our permittees, stakeholders, and the public at large as a readily accessible 'source of first resort' for reliable information about local water, groundwater, aquifer science, water use and conservation; and
- **Sustaining CSF -** Providing the programmatic and resource basis for innovative, cost-effective solutions to maintain and augment the sustainable quantity of water in the District and to protect the quality of District waters required for various existing uses.

These CSFs are expressed more quantitatively in the metrics, activities, and performance standards associated with the management objectives identified in Section III.C of this *Plan.*

I.E. RATIONALE AND TIME FRAME OF THIS PLAN

As required by TWC §36.1071 and §36.1072, a groundwater conservation district must submit to the Texas Water Development Board (TWDB) Executive Administrator a district management plan that meets the requirements of 31 Texas Administrative Code (TAC) §356.5 and §356.6. The TWDB Executive Administrator must review, comment for purposes of revision, and ultimately approve the management plans submitted by districts. Districts may review and revise their plans annually, and must re-adopt their plan with or without revisions at least once every five years.

This groundwater management plan incorporates relevant regional water management strategies outlined in the current (2011) Regional Water Plans developed by the Lower Colorado Regional Planning Group and the South Central Texas Regional Planning Group, and included in the 2012 State Water Plan. Population and water demand projections cover the 50-year period from 2010 to 2060 and are consistent with those used by the TWDB for this area in statewide water planning. A 10-year planning period is required by 31 TAC §356.5(a) for groundwater management plans. This *District Management Plan* (*Plan)* covers the period from 2012-2022.

The Board of Directors of the District adopted this *Plan* by Board Resolution (in Appendix I) on September 27, 2012. Upon its approval by the TWDB, this *Plan* will remain in effect until a revised *Plan* is submitted and approved, or for five years from the approval date, whichever is earlier. Additional or revised Desired Future Conditions adopted by the Groundwater Management Areas 9 and 10, if any, *may* subsequently require revision of the current *Plan* upon determination of applicable Modeled Available Groundwater estimates by TWDB and assessment of the need for revised objectives, activities, and authorities by the District.

I.F. ORGANIZATION OF THIS PLAN DOCUMENT

This initial introductory section has provided the statutory basis and some of the current output of the strategic planning that is a continuing initiative by the staff and Board, as a framework for the groundwater management plan that follows. The remainder of this plan is structured to provide information and data specifically requested in TWC 36.1071 and 1072 and in TAC 356.5 in a systematic, comprehensible fashion.

The next major section immediately below provides 1) hydrogeologic information as estimated on the basis of known geologic and hydrologic characteristics of various aquifers in and being managed by the District, and also 2) information on water supply and demand from the 2012 Texas Water Plan, as provided by the TWDB.

The third major section provides details of the program planning that comprise the primary basis for the District's *Rules and Bylaws (Rules)* and for day-to-day operations of the District. There are thirteen specific planning elements required to be addressed in the plan, and objectives, performance standards, and tracking methods are required to be established for eight "management goals." The applicable management goals articulated in TWC 36.1071 are addressed in aggregate by a set of specific management objectives, and each of these in turn are characterized by appropriate performance standards, activities, and metrics.

The fourth and final section of this *Plan* provides additional information required by TWDB concerning the coordination between the District and other water resource management entities.

For convenience of plan reviewers, Table I-1 cross-references the various planning elements specified by the TWDB in 31 TAC §356 with their location(s) in this *Plan*.

Table I-1. Cross-reference table showing TWDB plan requirements as of September 1, 2011, and their location in this *Plan* document

TAC REFERENCE	PLAN REQUIREMENTS	SECTION OF PLAN DOCUMENT
31 TAC §356.6(a)(1)	**A.** Is a hard copy of the Management Plan available?	This paper copy of entire document once furnished to TWDB
31 TAC §356.6(a)(1)	**B.** Is an electronic copy of the Management Plan available?	CD in envelope in document cover, once furnished to TWDB; also: http://www.bseacd.org/about-us/governing-documents/
31 TAC §356.5(a)(5)(A)	**1.** Is an estimate of the managed (modeled) available groundwater in the District based on the desired future condition of the aquifer(s) included (if available from the TWDB)?	II.A.1; IV.B
31 TAC §356.5(a)(5)(B); §356.2(2)	**2.** Is an estimate of the amount of groundwater being used within the District on an annual basis for at least the most recent five years, included?	II.A.2
31 TAC §356.5(a)(5)(C)	**3.** Is an estimate of the annual amount of recharge, from precipitation, to the groundwater resources within the District included?	II.A.3
31 TAC §356.5(a)(5)(D)	**4.** For each aquifer in the district, is an estimate of the annual volume of water that discharges from the aquifer to springs and any surface water bodies, including lakes, streams and rivers, included?	II.A.4
31 TAC §356.5(a)(5)(E)	**5.** Is an estimate of the annual volume of flow: **a)** into the District within each aquifer, **b)** out of the District within each aquifer, **c)** and between aquifers in the District, if a groundwater availability model is available, included?	II.A.5; Appendix II
31 TAC §356.5(a)(5)(F)	**6.** Is an estimate of the projected surface water supply within the District according to the most recently adopted state water plan included?	II.B.1
31 TAC §356.5(a)(5)(G)	**7.** Is an estimate of the projected total demand for water within the District according to the most recently adopted state water plan included?	II.B.2
31 TAC §356.5(a)(7)	**8.** Did the District consider the water supply needs that are included in the adopted state water plan?	II.B.3

31 TAC §356.5(a)(7)	**9.** Did the District consider the water management strategies that are included in the adopted state water plan?	II.B.3; II.B.4
31 TAC §356.5(a)(4); §356.6(a)(3)	**10.** Are the actions, procedures, performance, and avoidance necessary to effectuate the management plan, including specifications and proposed rules, all specified in as much detail as possible, included in the plan?	I.B; I.C III.A; III.B; III.C
31 TAC §356.6(a)(2)	**11.**Was a certified copy of the District's resolution adopting the plan included?	To Be Furnished Upon Board Approval of the Management Plan by its Resolution, in Appendix I
31 TAC §356.6(a)(5)	**12.**Was evidence that the plan was adopted, after notice and hearing, included?	To Be Furnished Upon Board Approval of the Management Plan, to be included in the Resolution, in Appendix I
31 TAC §356.6(a)(4)	**13**.Was evidence that, following notice and hearing, the District coordinated in the development of its management plan with all surface water management entities, included?	IV.A; Appendix I
31 TAC §356.5(b)	**14.** Has any available site-specific information been provided by the district to the executive administrator for review and comment before being used in the management plan when developing the estimates required in subsection 31 TAC §§356.5(a)(5)(C), (D), and (E)?	II.A.1; Drought-calibrated GAM Model and Sustainable Yield Study, in Appendix II
31 TAC §356.5(a)(2)&(3);	**C.** Are stipulated management goals, management objectives, and performance standards for effecting the plan identified? Do they specifically include the goals of:	III.C.1 through III.C.6, collectively and individually; Use Correlation Table III-2 in III.C.
31 TAC §356.5(a)(1)(A)	1. Providing the most efficient use of groundwater?	Use Correlation Table III-2 in III.C.
31 TAC §356.5(a)(1)(B)	2. Controlling and preventing waste of groundwater?	Use Correlation Table III-2 in III.C.
31 TAC §356.5(a)(1)(C)	3. Controlling and preventing subsidence?	Not Applicable in the District
31 TAC §356.5(a)(1)(D)	4. Addressing conjunctive surface water management issues?	Use Correlation Table III-2 in III.C.
31 TAC §356.5(a)(1)(E)	5. Addressing natural resource management issues that impact the use of groundwater and are impacted by the use of groundwater?	Use Correlation Table III-2 in III.C.
31 TAC §356.5(a)(1)(F)	6. Addressing drought conditions?	Use Correlation Table III-2 in III.C.

31 TAC §356.5(a)(1)(G)	7. Addressing, where appropriate and cost-effective:	
	a. conservation?	Use Correlation Table III-2 in III.C.
	b. recharge enhancement?	Use Correlation Table III-2 in III.C.
	c. rainwater harvesting?	Use Correlation Table III-2 in III.C.
	d. precipitation enhancement?	Not appropriate or cost-effective in the District
	e. brush control?	Not appropriate or cost-effective in the District
31 TAC §356.5(a)(1)(H)	8. Addressing in a quantitative manner the desired future conditions of the groundwater resources in the District (if available from the districts in the groundwater management area)?	II.A.1; Use Correlation Table III-2 in III.C; IV.B

II. PLANNING DATA AND REQUIRED INFORMATION

This section of the plan document summarizes the data and information that form the basis for the Management Plan, and compiles specific information required by the Texas Water Development Board (TWDB) to be included in the plan.

II.A. HYDROLOGICAL ESTIMATES

1. Modeled Available Groundwater, per TWDB

This Management Plan has been prepared and submitted to TWDB after the various Desired Future Conditions (DFCs) for the District's aquifers (coincident with the northern subdivision of GMA 10) were established by the joint planning process required by TWC 36.108. The DFCs for the northern subdivision of GMA 10 are as follows:

- Edwards Balcones Fault Zone (Freshwater) DFC dated August 24, 2010
    - Springflow of Barton Springs during average recharge conditions shall be no less than 49.7 cubic feet per second (cfs) averaged of an 84-month (seven-year) period; and
    - During extreme drought conditions, including those as severe as a recurrence of the 1950s drought of record, springflow of Barton Springs shall be no less than 6.5 cubic feet per second (cfs), averaged on a monthly basis.

- Saline Edwards Aquifer DFC adopted August 4, 2010
    - Well drawdown at the saline-freshwater interface (the so called Edwards "bad water line") in the northern subdivision of GMA 10 that averages no more than 5 feet and does not exceed a maximum of 25 feet at any one point on the interface.

- Trinity Aquifer DFC adopted August 23, 2010 (for the entire GMA 10)
    - 1) Except as otherwise provided herein: regional average well drawdown during average recharge conditions that does not exceed 25 feet (including exempt and non-exempt well use); 2) within the jurisdiction of the Hays-Trinity GCD: regional average well drawdown during average recharge conditions of zero (0) feet (including exempt and non-exempt well use); 3) in the Uvalde County part of GMA 10: regional average well drawdown during average recharge conditions of no more than twenty (20) feet (including exempt and non-exempt well use); 4) declare the Trinity Aquifer in part of GMA 10 that is in the Trinity-Glen Rose GCD as a non-relevant aquifer.

The TWDB has determined the amount of Modeled Available Groundwater (MAG) that is available from the aquifers being managed by the District and that preserve the DFCs. The MAGs for the northern subdivision of GMA 10 are shown in Table II-1.

Table II-1: Summary of MAGs

AQUIFER	MAG (acre-ft/yr)	MAG (cfs)	TWDB GAM Report Citation
Edwards (Freshwater) Average Conditions Drought Conditions	 11,528 3,756	 16 5.2	 Hutchison and Oliver, December 7, 2011
Edwards (Saline)	523	0.72	Bradley, 2011
Trinity Aquifer	1,288	1.78	Thorkildsen and Backhouse, 2011

Prior to the MAG determination by TWDB for extreme drought conditions in the freshwater Edwards, the District relied on a modeling and water balance approach described in a study of the sustainable yield of the Barton Springs aquifer completed in 2004, and accepted by TWDB (Smith and Hunt, 2004). The results of that study and other numerical modeling efforts support an approximate one-to-one relationship between springflow and pumping under low-flow conditions (Hunt et al., 2011). These studies have informed the determination of the Drought MAG. The lowest measured daily value of springflow is 9.6 cfs, during the drought of record (DOR); the lowest monthly value is 11 cfs. Withdrawals of 10 cfs would produce a springflow of 1 cfs, and so forth. Any withdrawals more than 11 cfs would further increase impacts to wells as the aquifer is de-watered, and would increase the duration of no-flow conditions at Barton Springs. These levels of withdrawals have been determined by the District Board to lead to unsustainable conditions.

This *Plan* also has been prepared before the conclusion and promulgation of the District's currently ongoing Habitat Conservation Plan (HCP). A draft of this plan (BSEACD 2007) is now available. The final HCP may modify the amount of water that can be withdrawn by wells in the District during a DOR in order to preserve endangered species populations at Barton Springs, the Edwards Aquifer's major natural outlet in the segment. The requirements of the HCP as currently perceived have been used to establish the Edwards (Freshwater) DFCs for this aquifer segment and in turn the MAG. The District employs a groundwater management regulatory program that is designed to limit groundwater withdrawals from the Edwards (Freshwater) to no more than about 5.2 cfs during a recurrence of the DOR to comply with the DFC expression. This limitation is the Edwards (Freshwater) drought MAG and is nearly equivalent to the District's Extreme Drought Withdrawal Limitation (EDWL) that was developed as a key output of the HCP. The EDWL maximizes, within current statutory authority and current rules, the amount of springflow during the worst part of a drought similar to the DOR. However, pumping under the EDWL needs to be reduced by a further 1.5 cfs to equal the drought MAG. Efforts are currently under way to meet that goal. Figure II-1 is a graphic that depicts the relationship of the DFC, MAGs, and the permitting structure for the Edwards (Freshwater) Aquifer.

Prehistoric climatic data indicate that there may be future droughts that will be worse than the 1950s' DOR. Climate change associated with increased levels of greenhouse gases in the atmosphere may cause future droughts to be more severe than droughts that have occurred during the historic period (IPCC 2007, Nielsen-Gammon, 2008). The District has already begun to

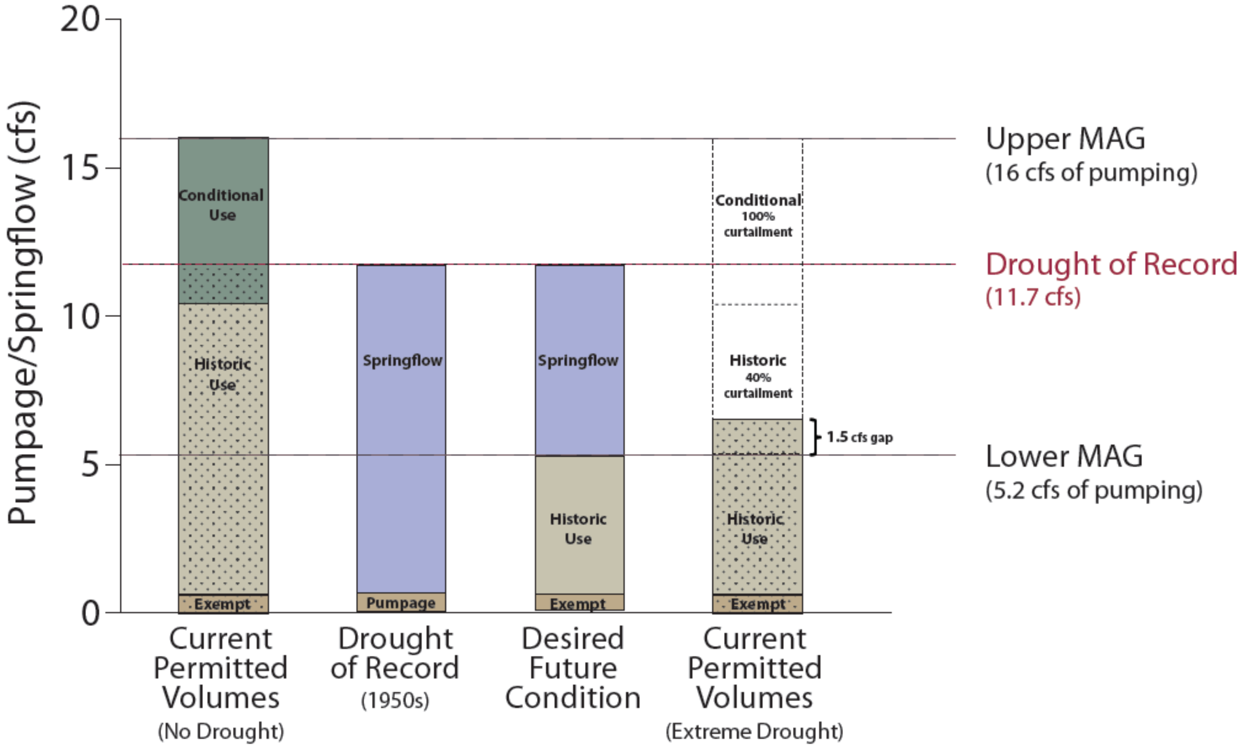

FIGURE II-1: CONCEPTUAL DIAGRAM OF THE DISTRICT'S MODELED AVAILABLE GROUNDWATER AND THE EQUIVALENT EXTREME DROUGHT WITHDRAWAL LIMITATION FORMULATION FOR THE EDWARDS (FRESHWATER) AQUIFER

This conceptual diagram shows the components and their restrictions associated with the Extreme Drought Withdrawal Limitation (EDWL) as incorporated in the District's drought management policy.

review data relating to such conditions and may consider policies in the future that would address the need and options for regulatory responses to more intense droughts.

No sustainable yield assessments for the Trinity Aquifer and Edwards (Saline) aquifers have been conducted prior to this *Plan*. Initial assessments and evaluations of the Trinity and Edwards (Saline) aquifer were conducted as part of the DFC and MAG process. As more information becomes available, revisions to the DFC expressions and new aquifer assessments are expected.

2. Actual Annual Groundwater Use

Groundwater use within the District is comprised primarily of pumpage and use from the freshwater Edwards Aquifers with a much smaller but increasing component of overall pumpage coming from the Trinity Aquifers. An incidental amount of groundwater is derived from the Taylor and Austin Groups and more geologically recent alluvial deposits. These withdrawals, however, are largely from exempt wells and are not permitted. Given the current management scheme of conditional permitting and the drought restrictions and curtailment requirements associated with new interruptible pumpage authorizations for the freshwater Edwards Aquifer, it is likely that future groundwater production will trend more towards pumpage from the Saline Edwards Aquifer and the Middle and Lower Trinity Aquifers.

The data presented below are a compilation of District monthly meter readings reported by District permittees and are therefore, a more accurate representation of actual in-District groundwater use than was provided by the TWDB in Appendix III. The following tables present the reported use data organized by Major Aquifer and Water Use Type (using the District’s water use type designations) in Table II-2(a) and by County and Management Zone in Table II-2 (b). These data include neither Exempt Use, which is primarily from the Edwards Aquifer and is estimated to be about 105,000,000 gallons (322 AF) annually, nor Non-exempt Domestic Use (NDU) under the District’s NDU general permit, which is also primarily from the Edwards Aquifer and is estimated to be about 20,600,000 gallons (63.2 AF) annually.

Table II-2: Actual Annual Pumpage for Last Five Years (in gallons and acre-feet)
(a) By Major Aquifer and Type of Use:

	PWS	Commercial	Irrigation	Industrial	Totals
Edwards Aquifer					
2007	1,237,098,520	9,157,492	90,327,219	145,977,492	1,482,560,723
	3,797	28	277	448	4,550
2008	1,635,001,051	8,129,101	95,486,300	223,125,231	1,961,741,683
	5,018	25	293	685	6,020
2009	1,334,838,604	6,858,106	81,294,200	174,509,965	1,597,500,875
	4,096	21	249	536	4,903
2010	1,398,211,160	8,565,229	91,338,590	240,230,719	1,738,345,698
	4,291	26	280	737	5,335
2011	1,647,368,453	8,791,848	104,405,640	261,507,704	2,022,073,645
	5,056	27	320	803	6,206
Trinity Aquifer					
2007	0	129,680	3,508,300	0	3,637,980
	0	0.40	11	0	11
2008	0	111,640	9,107,100	0	9,218,740
	0	0.34	28	0	28
2009	0	139,510	5,801,300	0	5,940,810
	0	0.43	18	0	18
2010	0	81,520	6,449,900	0	6,531,420
	0	0.25	20	0	20
2011	8,937,000	124,810	7,072,700	0	16,134,510
	27	0.38	22	0	50

(b) By County and District Management Zone

	Edwards Aquifer		Trinity Aquifers		Totals
	Freshwater Zones	Saline Zone	Middle Trinity	Lower Trinity	
Hays County					
2007	862,705,785	0	0	-	**862,705,785**
	2,648	0	0	-	**2,648**
2008	1,130,608,005	0	0	-	**1,130,608,005**
	3,470	0	0	-	**3,470**
2009	892,759,134	0	0	-	**892,759,134**
	2,740	0	0	-	**2,740**
2010	1,079,339,042	0	0	-	**1,079,339,042**
	3,312	0	0	-	**3,312**
2011	1,171,615,241	0	8,937,000	-	**1,180,552,241**
	3,596	0	27	-	**3,623**
Travis County					
2007	619,854,938	0	129,680	3,508,300	**623,492,918**
	1,902	0	0.4	11	**1,913**
2008	831,133,678	0	111,640	9,107,100	**840,352,418**
	2,551	0	0.3	28	**2,579**
2009	704,741,741	0	139,510	5,801,300	**710,682,551**
	2,163	0	0.4	18	**2,181**
2010	659,006,656	0	81,520	6,449,900	**665,538,076**
	2,022	0	0.3	20	**2,042**
2011	850,458,404	0	1,502,910	5,694,600	**857,655,914**
	2,610	0	5	17	**2,632**

3. Annual Recharge from Precipitation, by Aquifer

Edwards Aquifer

For the Barton Springs segment of the Edwards Aquifer, the long-term mean surface recharge should approximately equal the mean natural (i.e., with no well withdrawals) spring discharge, or about 53 cubic feet per second (cfs) at Barton Springs (Slade et al., 1986). The distribution and volume of this recharge have been modeled by many scientists. The report by Scanlon et al. (2001) documents the official TWDB Groundwater Availability Model (GAM) for the Barton Springs segment. A recent draft report by TWDB, GAM Run 08-37 (June 20, 2008), included as Appendix IV, summarizes the estimated amount of recharge from precipitation, the amount of spring discharge, and the amount of flow into and out of the District for steady-state conditions in 1989. Annual recharge from precipitation for the modeling was 42,858 acre-ft (59.2 cfs).

The majority (as much as 85 percent) of recharge to the aquifer is derived from streams originating on the contributing zone, located up gradient to the west of the recharge zone. Water flowing onto the recharge zone sinks into numerous caves, sinkholes, and fractures along its six major, ephemeral losing streams. The remaining recharge (15 percent) occurs in the upland areas of the recharge zone (Slade et al., 1986). Current studies indicate that upland recharge may constitute a larger fraction of recharge (Hauwert, 2009; Hauwert, 2011). Studies have shown that recharge is highly variable in space and time, and is focused within discrete features (Smith et al., 2001). For example, Onion Creek is the largest contributor of recharge (34 percent) with maximum recharge rates up to 160 cfs (Slade et al., 1986; Fieseler, 1998). Antioch Cave is located within Onion Creek and is the largest-capacity recharge feature with an average recharge of 46 cfs and a maximum of 95 cfs during one 100-day study (Fieseler, 1998). Recent work at Antioch Cave has also documented greater than 100 cfs of recharge entering the aquifer through the entrance to Antioch Cave (Smith et al., 2011). Dye tracing studies have shown that some of this water flows directly and very rapidly to Barton Springs with an unknown percentage contributing to storage.

Groundwater divides delineate the boundaries of aquifer systems and influence not only the local aquifer hydrodynamics, but also the groundwater budget (recharge). The groundwater divide separating the San Antonio and Barton Springs segments of the Edwards Aquifer has historically been drawn along topographic or surface water divides between the Blanco River and Onion Creek in the recharge zone, and along potentiometric highs in the confined zone between the cities of Kyle and Buda in Hays County. Recent studies reveal that during wet conditions the groundwater divide is located generally along Onion Creek in the recharge zone, extending easterly along a potentiometric ridge between the cities of Kyle and Buda toward the saline zone boundary (Hunt et al. 2006). During dry conditions the hydrologic divide moves south and is located along the Blanco River in the recharge zone, extending southeasterly to San Marcos Springs (Johnson et al., 2011). Thus, the groundwater divide is a hydrodynamic feature dependent upon the hydrologic conditions (wet versus dry) and the resulting hydraulic heads between Onion Creek and the Blanco River. Recent studies also reveal than under extreme drought conditions, some groundwater may bypass San Marcos Springs and flow toward Barton Springs (Land et al., 2011).

Trinity Aquifer

The Trinity Aquifer exposed in the Hill Country region (west of the District) receives recharge from rainfall on the outcrop, losing streams, and perhaps lakes during high levels (Mace et al., 2000). Mace et al. (2001) estimated recharge for the Upper and Middle Trinity Aquifers is equal to 4 to 6 percent of mean annual rainfall. Some of the Trinity units are recharged by vertical leakage from overlying strata (Ashworth, 1983). There are karst features, faults, and fractures throughout the Hill Country and such features may provide discrete recharge.

In the Balcones Fault Zone (BFZ), the amount of recharge to the Trinity Aquifer is generally unknown. The Trinity is composed of the Upper, Middle, and Lower Trinity aquifers. Potential sources of recharge include lateral flow from the Hill Country Trinity Aquifer, and vertical leakage from the Edwards Aquifer (stratigraphically above the Trinity). However, recent studies utilizing multiport monitoring wells (using Westbay® technologies) have provided a lot of information about the hydrologic communication between the Edwards and Upper and Middle Trinity aquifers. Results of those studies indicate that the top 100 ft of the Upper Trinity appear to be in direct hydrologic communication with the overlying Edwards. However, the remaining 350 feet of the Upper Trinity units behave as an aquitard and are a confining unit between the Edwards and the Middle Trinity. These studies indicate that the Middle Trinity is hydrologically separate from the overlying Edwards Aquifer. The source of recharge to the Middle Trinity is likely west of the Edwards Recharge Zone and occurs where the Middle Trinity units are exposed at the surface. Geochemical and head data suggest that the Edwards and Middle Trinity aquifer systems can be managed independently because of the behavior of the Upper Trinity as an aquitard (Smith and Hunt, 2010; Kromann et al., 2011).

4. Annual Discharges to Springs and Surface Water Bodies, by Aquifer

Edwards Aquifer

The largest natural discharge point of the Barton Springs aquifer is Barton Springs, the fourth largest spring in Texas, and consists of four major outlets: Main, Eliza, Old Mill, and Upper. Main Spring is the largest and discharges directly into Barton Springs Pool. Springflow at Barton Springs is determined and reported by the U.S. Geological Survey (USGS). Discharge reported for Barton Springs is based on a rating-curve correlation between water levels in the Barton Well (State Well Number 5842903) and physical flow measurements from Main, Eliza, and Old Mill. Flow from Upper Barton Springs, which is located about 400 feet upstream of the pool, is not included in the reported discharge, and bypasses the pool. Upper Barton Springs is characterized as an "overflow" spring and only flows when discharge at Barton Springs exceeds about 40 cfs (Hauwert et al., 2004).

Barton Springs has a long period of continuous discharge data, beginning in 1917. Monthly mean data are available from 1917 to 1978 (Slade et al., 1986), and daily mean discharge data are available thereafter. The long-term average springflow at Barton Springs is 53 cfs based on data from 1917 to 1995 and is a widely reported value (Slade et al., 1986; Scanlon et al., 2001; Hauwert et al., 2004). The maximum and minimum measured discharges are 166 and 9.6 cfs, respectively. The lowest measured spring discharge value occurred on March 26, 1956 during the 1950s drought (Slade et al., 1986). Low flow periods are defined as discharge below 35 cfs, moderate flow conditions occur between 35 to 70 cfs, and high flow conditions correspond to flows greater than 70 cfs (Hauwert et al., 2004). Mahler et al. (2006) define low flow as below 40 cfs. A peak in the daily average flow occurs in June, following the average peak rainfall in May.

Barton Springs flow is typical of a spring in a karst system with dynamic responses to recharge events and integrating a combined conduit, fracture, and matrix flow from the system. Springflow recessions and discharge rates are in large part determined by pre-existing conditions, the magnitude of recharge, and location of recharge. Massei et al. (2007) identify several source water types contributing to the conductivity measured in Barton Springs. Sources include matrix, surface water, saline-water zone, and other unidentified sources. Their relative contribution is dependent upon aquifer response to climatic and hydrologic conditions. Generally speaking; however, base springflow during periods of drought is sustained by the discharge of the matrix flow system into the conduit system (White, 1988; Mahler et al., 2006).

The Barton Springs aquifer contains other smaller springs. Cold Springs discharges directly into the Colorado River and is partially submerged by Lady Bird Lake. There are very few discharge data for Cold Springs, but it is estimated to be about 5 percent of Barton Springs discharge (Scanlon et al., 2001). A small spring named Rollingwood Spring, near Cold Springs, discharges into the Colorado River at a rate of about 0.02 to 0.06 cfs. Backdoor Spring is a small, perched spring located on Barton Creek and has discharge of about 0.02 cfs. Bee Springs is a small, perched spring and seep horizon discharging along Bee Creek and into Lake Austin and discharges about 0.2 to 0.6 cfs (Hauwert et al., 2004).

The report by TWDB on GAM Run 08-37 (Appendix IV) states that discharge from springs (Barton and Cold) was 39,723 acre-ft/year (54.9 cfs) under steady-state conditions in 1989. The amount of water withdrawn from wells was 3,135 acre-ft (4.3 cfs).

Trinity Aquifer

Most of the streams and rivers in the Central Texas Hill Country are characterized as net-gaining from the Trinity Aquifer (Ashworth, 1983). Recent modeling work suggests most discharge (57 percent of the Upper and Middle Trinity water budget) from the Trinity is to rivers and streams within the Hill Country (Mace et al., 2000). The discharge into the Hill Country streams and rivers is the source of baseflows in the streams and eventually a source of recharge to the Edwards Aquifer. Potentiometric maps in the Hill Country indicate lateral flow in the Upper and Middle Trinity Aquifers toward the Colorado River in northwestern Hays and western Travis Counties (Mace et al., 2000; Wierman et al., 2010). As described above, most of the lateral flow in the Middle Trinity aquifer stays within the Middle Trinity aquifer as it enters the Balcones Fault Zone and does not discharge as springflow or to surface water bodies in the District. Some of the flow within the upper-most portion of the Upper Trinity may flow laterally, and vertically, into the Edwards Aquifer, and ultimately contribute to wells and Barton Springs.

There are many small springs and seeps throughout the Hill Country that issue from the Upper and Middle Trinity Aquifers. One of the larger springs in the study area is Jacob’s Well, near Wimberley. According to the USGS, discharge at Jacob’s well since early 2005 ranges between near zero to 56 cfs, and averages 7 cfs. No major springs are known to issue from the Trinity Aquifer within the District, since only an incidental amount of the Trinity crops out in the District.

5. Annual Inflows, Outflows, and Inter-formational Flows

Edwards Aquifer

The amount of cross-formational inflow (sub-surface recharge) occurring through adjacent aquifers into the Barton Springs aquifer is unknown, although it is thought to be relatively small on the basis of water-budget analysis for surface recharge and discharge (Slade et al., 1985). Recent studies by the District and others have shown the potential for cross-formational flow both to and from the Barton Springs aquifer. Some sources of cross-formational flow are discussed below and include the saline-water zone, San Antonio segment, the Trinity Aquifer, and urban recharge.

Leakage from the saline-water zone into the freshwater zone is probably minimal, although leakage appears to influence water quality at Barton Springs during low-flow conditions (Senger and Kreitler, 1984; Slade et al., 1986). Recent studies indicate that the fresh-saline zone interface may be relatively stable over time (Lambert et al., 2010). On the basis of a geochemical evaluation, Hauwert et al. (2004) state that the saline-water zone contribution could be as high as 3% for Old Mill Springs and 0.5% for Main and Eliza Springs under low-flow conditions of 17cfs Barton Springs flow. These estimates were independently recalculated and corroborated by Johns (2006) and are similar to the results of Garner and Mahler (2005). Under normal flow conditions contribution from the saline-water zone would be smaller. Massei et al. (2007) noted that specific conductance of Barton Springs increased 20% under the 2000 drought condition, probably from saline-water zone contribution.

Subsurface flow into the Barton Springs aquifer from the adjacent San Antonio segment located to the south is limited when compared with surface recharge (Slade et al., 1985). Hauwert et al. (2004) indicated that flow across the southern boundary is probably insignificant under normal conditions. As discussed in Section II.A.3, recent studies have documented that the southern boundary of the Barton Springs Aquifer is hydrodynamic in nature and fluctuates between Onion Creek and the Blanco River. Accordingly, groundwater from the recharge zone of the San Antonio segment is flowing into the Barton Springs aquifer during drought conditions (Johnson et al., 2011). Results of recent dye-trace studies indicate that under certain high-flow conditions water recharging along Onion Creek flows from the Barton Springs aquifer to San Marcos Springs (Hunt et al., 2006b).Under moderate drought conditions, water recharged along the Blanco River can flow to both San Marcos and Barton Springs. Under extreme drought conditions, it has been estimated that up to 5 cfs of groundwater flow bypasses (underflows) San Marcos Springs and flows toward Barton Springs (Land et al., 2011).

Changes in land use influence the inflows of aquifers systems. Recent studies have shown that urbanization may increase recharge to the Edwards Aquifer (Sharp, 2010; Sharp et al., 2009). Sources of the increase in recharge include leaking infrastructure such as pressurized potable water lines, wastewater from both collector lines and septic tank drainfields, and stormwater in infiltration basins. Recharge is increased from the return flows of irrigation practices (e.g. lawn watering), and the increase in pervious cover decreases evapotranspiration (Sharp, 2010; Sharp et al., 2009).

Trinity Aquifer

Flow (or leakage) from the Trinity Aquifer into the Barton Springs aquifer is thought to be relatively insignificant when compared with surface recharge (Slade et al., 1985). However, leakage from the Trinity Aquifer may nevertheless locally impact water quality and influence water levels (Senger and Kreitler, 1984; Slade et al., 1986). Estimates by Hauwert et al., 2004, based on water chemistry at Barton Springs, suggest that a small contribution of flow to the springs is from the Trinity Aquifer. As discussed in Section II.A.3., recent studies utilizing multiport monitoring wells have provided a lot of information about hydrologic communication between the Edwards and Upper and Middle Trinity aquifers. Results of those studies indicate that the top 100 ft of the Upper Trinity appear to be in direct hydrologic communication with the overlying Edwards. However, the remaining 350 feet of the Upper Trinity units behave effectively as an aquitard and represent a confining unit between the Edwards and the Middle

Trinity. These studies indicate that the Middle Trinity is hydrologically separate from the overlying Edwards Aquifer (Smith and Hunt, 2010; Kromann et al., 2011).

Previously it was presumed that the flow was from the Trinity into the Edwards Aquifer. A groundwater model of the (Hill Country) Trinity Aquifer includes lateral groundwater leakage into the Balcones Fault Zone in order for the model to simulate observed hydrogeologic conditions in the Hill Country Trinity. Steady-state modeling indicates that as much as 8,000 acre-feet/year discharge into the Edwards (BFZ) in Travis and Hays Counties (Mace et al., 2000). However, recent data suggest that the flow within the Middle Trinity units is laterally continuous (e.g. stays within the Middle Trinity) from the Hill Country into the Balcones Fault Zone (Smith and Hunt, 2010).

Very little information is available on the Lower Trinity Aquifer and the hydrologic relationship with the overlying Middle Trinity Aquifer in the District. The Hammett Shale is a very good aquitard, perhaps even an aquiclude in the District, and may inhibit flows into, or out of, the lower Trinity (Wierman et al., 2010).

II.B. STATE WATER PLAN PROJECTIONS

As shown in Figure II-2, most of the District (including almost all of the freshwater groundwater production area) lies within the Lower Colorado Water Planning Region (Region K); a smaller part of the District, generally in the uppermost reaches of the Plum Creek watershed in the Guadalupe River basin, is within the South Central Texas Water Planning Region (Region L). The prevailing water strategies applicable to the area of the District in the two regions are similar.

This section of the Plan utilizes information provided by the Texas Water Development Board in the report entitled *Estimated Historical Water Use and 2012 State Water Plan Datasets: BSEACD*. The report provides county-level data that are applicable to the District and is included in this *Plan* as Appendix III.

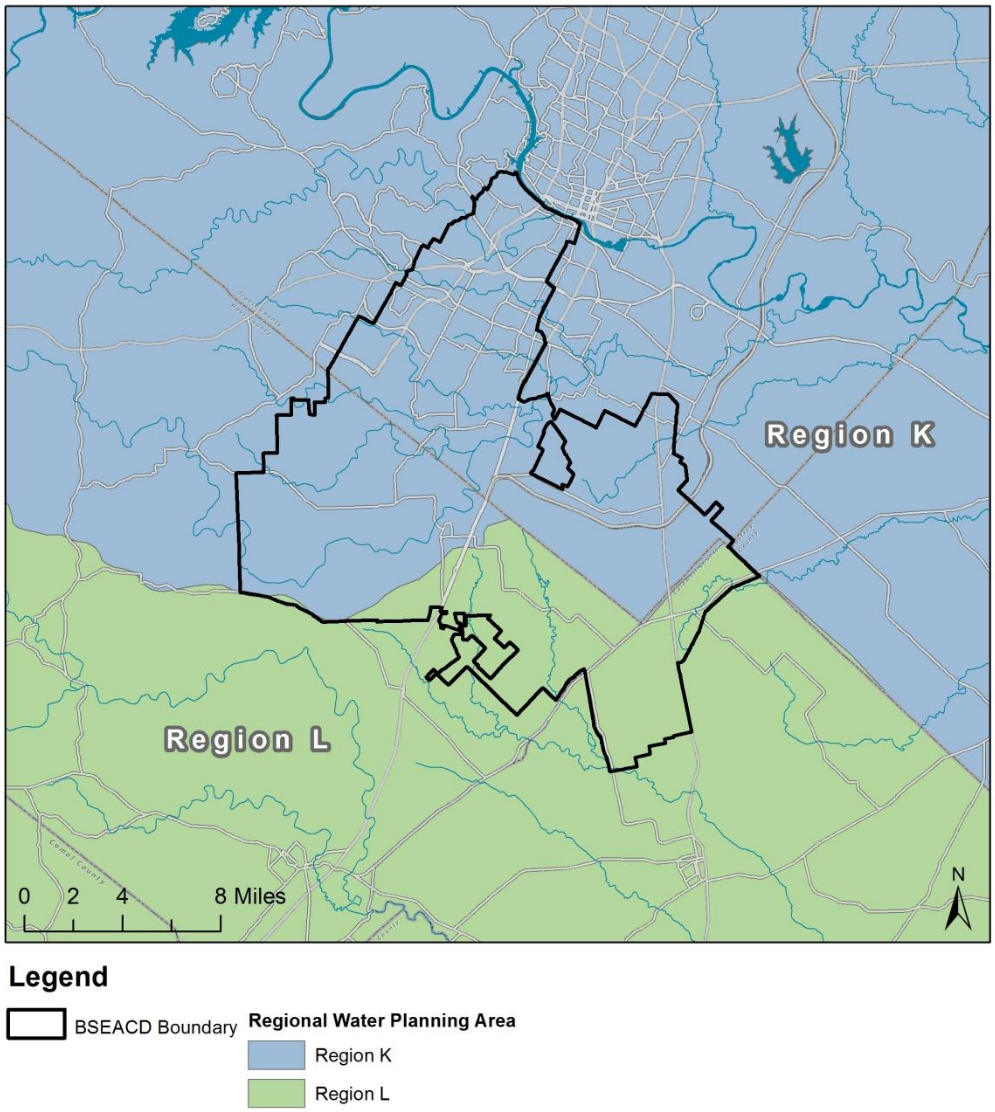

FIGURE II-2: REGIONAL WATER PLANNING AREAS WITHIN THE DISTRICT'S BOUNDARY
This map displays the District's boundaries in relation to the Region L and Region K boundaries.

1. Projected Surface Water Supply in District

The surface water supply in the District is provided primarily by run-of-river diversions and especially by reservoirs in the Colorado River basin. The southeastern-most part of the District in Hays County and Caldwell County is supplied by the Guadalupe-Blanco River system, especially water from main-stem reservoirs like Canyon Lake. Most of this Guadalupe-Blanco water is conveyed to some users in the District by the Hays County Pipeline.

Projected water supply data have been extracted from the 2012 State Water Plan (SWP) database and provided by the TWDB at the county level (Appendix III). The projections are estimated using an apportioning multiplier derived from the ratio of the land area of District in the county relative to the entire county area. The apportioning multiplier was used for all water user groups (WUGs) except for public water supplies (i.e. municipalities, water supply corporations, and utility districts). The derivation of these apportioning multipliers is shown in Table II-3.

Table II-3: Areal Distribution of District by County.

Most of the District is in Travis and Hays Counties, in sub-equal amounts; the District comprises only a small part of any one county.

For County:	Total Acres in County	Acres in District	Percent in Co.	Apportioning Multiplier
Travis	656,348	75,377	48%	11.5%
Hays	433,248	66,748	42%	15.4%
Caldwell	350,498	15,823	10%	4.5%
Totals	**1,440,094**	**157,948**	**100%**	**100%**

The total annual projected surface water supply in the counties of the District is estimated to be **293,027**acre-feet in 2020 (2020 is the closest decadal estimate to 2022, the final year of this *Plan*). These supplies refer to the firm-yield supplies from surface water sources during a recurrence of the drought of record. For comparison purposes, the projected surface water supplies from the three primary counties comprising the District (Bastrop was excluded because its area has been de-annexed since the previous management plan was approved) are provided in the following table by decade in acre-feet (Appendix III, page 6):

	2010	**2020**	**2030**	**2040**	**2050**	**2060**
Travis	287,687	286,132	277,118	263,891	254,337	244,503
Hays	4,120	4,680	4,680	4,680	4,680	4,680
Caldwell	195	195	195	195	195	195
Total	**294,012**	**293,027**	**284,023**	**270,806**	**261,262**	**251,438**

2. Projected Total Demand for Water in District

For estimating total water demand, the District has used data extracted from the SWP and provided by the TWDB (Appendix III). As with projected surface water supply data, county-level water demand data have been apportioned for certain WUGs using the apportioning multipliers described in Table II-3. The TWDB provides demand estimates by decade as well as by county. The decadal estimates for 2020 are used to approximate demand for the year 2022, the final year of this *Plan*. On these bases, the total annual demand by county for water arising from the District is shown below:

From Travis County in the District: 188,746 acre-feet
From Hays County in the District: 6,659acre-feet
From Caldwell County in the District: 846acre-feet

TOTAL DEMAND IN DISTRICT: 198,271acre-feet in 2022

The water demands arising from the County by decade in the prevailing SWP are provided in the following table by decade in acre-feet (Appendix III, page 11):

	2010	**2020**	**2030**	**2040**	**2050**	**2060**
Travis	158,162	188,746	222,698	253,180	284,819	307,727
Hays	4,978	6,659	8,181	9,837	11,808	13,442
Caldwell	655	846	1,014	1,185	1,359	1,536
Totals	**165,805**	**198,271**	**233,923**	**266,242**	**300,036**	**324,765**

3. Projected Water Supply Needs

For estimating projected water supply needs, the District has used data extracted from the SWP and provided by the TWDB (Appendix III). The TWDB provides water supply needs estimates by decade as well as by county. The decadal estimates for 2020 are used to approximate demand for the year 2022, the final year of this *Plan*. A summary of the projected water supply needs is provided in the following table by decade in acre-feet (Appendix III, page 15):

	2010	**2020**	**2030**	**2040**	**2050**	**2060**
Travis	-3,538	-11,053	-14,067	-18,134	-55,470	-92,045
Hays	-1,674	-5,738	-11,146	-18,871	-28,549	-36,273
Caldwell	-210	-892	-1,910	-3,054	-4,300	-5,694
Totals	**-5,422**	**-17,683**	**-27,123**	**-40,059**	**-88,319**	**-134,012**

The above projections show that for the SWP planning period (2010-2060), there is a progressively increasing water supply deficit, increasing from 5,422 acre/feet in 2020 up to 134,012 acre/feet in 2060. These water-supply needs in the District arise primarily from and are dominated by the burgeoning growth on the southern fringe of the Austin metropolitan area (Figure II-3), and also in the gradual diminution of the surface water supplies, as reservoir capacity decreases with time. As in prior plans, some of the water-demand deficits in the District area in the out-years (the later years in the planning period) include numerous contractual shortages. These contractual shortages will be addressed on an *ad-hoc* basis, through the renewal and expansion of contracts with wholesale water suppliers and the contractual reallocation of existing supplies in order to address the projected water demands for these and other area WUGs. But even so, it is projected that there will be unmet needs in the District, especially under DOR conditions and in the out-years.

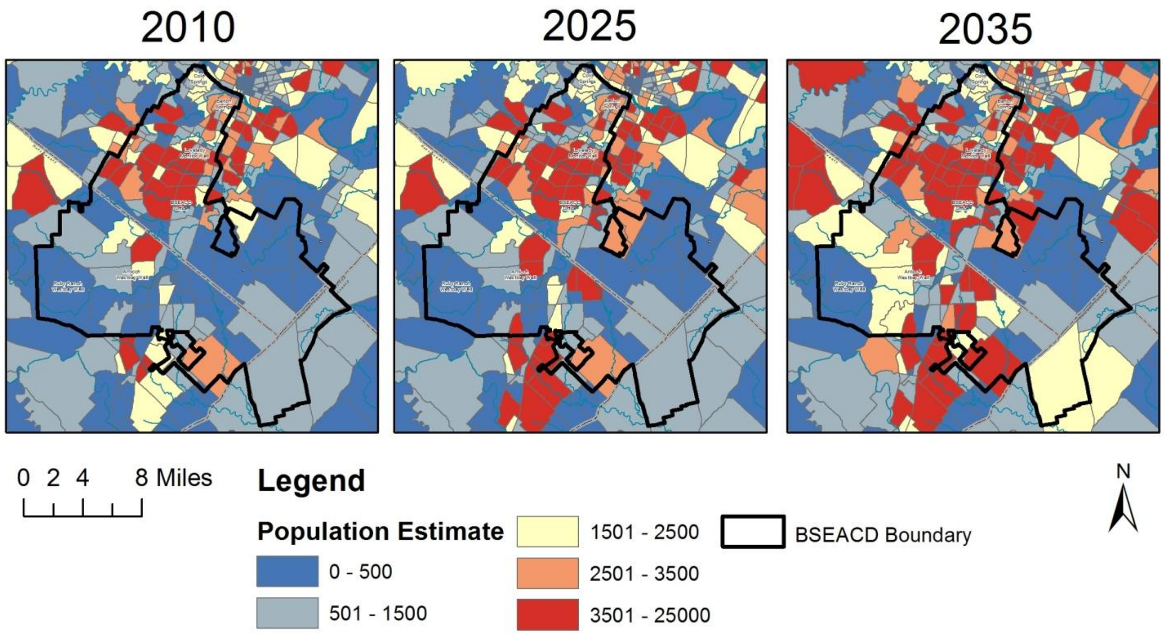

FIGURE II-3: POPULATION GROWTH PREDICTIONS 2010-2035
Population density mapping based on population estimates from the Capitol Area Metropolitan Planning Organization.

4. Water Management Strategies

The strategies to address the supply needs described above are identified in Appendix III (page 19). These data -- organized by decade, county, and WUG -- are extracted from the 2012 SWP and have been provided to the District by the TWDB. Key management strategies relevant to WUGs in the District and adjoining areas include:

- (Municipal Water) Conservation
- Drought Management
- Use of/Transfer from Available or Re-allocated Surface Water Supplies
- Purchase of Surface Water from Wholesale Water Providers (WWP)
- Purchase of Carrizo-Wilcox Aquifer Water, via Hays-Caldwell Public Utility Agency
- Development of Saline Zone of Edwards-BFZ Aquifer
- Development of Trinity Aquifer

In contrast to the previous regional planning, and perhaps telling to the supply crunch that now exists in this area of burgeoning growth, only one of the WUGs in the District has allocation or transfer as a continuing key water management strategy in the future. (An allocation strategy involves WUGs that have surplus water during the planning period and WUGs in the same county that have unavoidable deficiencies in water supplies; a transfer strategy applies to an individual WUG with an anticipated shortage that is located in multiple basins and/or counties.) That WUG is Creedmoor-Maha WSC, which will receive an allocation from LCRA's re-allocation of its run-of-river supply to meet shortfalls beginning in 2020 and increasing each decade through the planning period. Any other inter-basin transfers and/or allocations that might be made in the District would likely be ones of opportunity rather than as planned elements of the overall strategy. It should also be noted that none of the WUGs in the District have a strategy in the current SWP that involves increased use of the freshwater Edwards-BFZ Aquifer, but that aquifer is a key existing supply for many WUGs.

All of the strategies listed above will be beneficial to the District in reducing demand and providing more, and more equitable distribution of water supplies. But the regional strategies addressing groundwater supplies and affecting groundwater use are of specific importance to this *Plan*. Those strategies are briefly characterized below.

<u>Regional Strategies – Water Conservation, Municipal</u>

The recurring droughts of the past five years have defined a "new normal" for the population centers in the District, especially those that depend on the drought-prone karst groundwater for all or a substantial part of their supply. Virtually every one of the municipalities and larger water supply providers in the District have instituted new conservation measures, including water use and conservation education, provision of low-use devices at reduced cost to their retail end-users, substitution of less water-demanding landscaping elements for water-thirsty ones, and more aggressive enforcement of wasteful water use during non-drought as well as drought periods. These measures are intended to be deployed on a full-time basis to develop a water conservation ethos and mind-set in the citizenry, so that water shortages can be as infrequent and as brief as possible.

<u>Regional Strategies – Drought Management</u>

Water providers in the District understand that "water conservation" measures alone will not be protective of their water supply during the more severe and prolonged droughts, and that special drought management measures are needed to ensure additional curtailment of water use during those periods, up to and including a recurrence of the 1950s' drought of record. In addition to the development, implementation, and enforcement of drought contingency plans that set forth specific, temporary measures to reduce end-user water demand, both retail and wholesale water providers are attempting to diversify their water supply portfolios, so that they can rely on the less constrained, even if more expensive water resources during drought and on the more constrained resources when not in drought. These alternative supplies can be either surface water sources or other groundwater sources.

<u>Regional Strategies – Purchase of Carrizo-Wilcox Aquifer Water, via Hays-Caldwell Public Utility Agency</u>

While none are currently able to employ such a source, as it is not yet available in this area, a number of the larger WUGs in the eastern part of the District, notably City of Kyle, City of Buda, Goforth SUD, and Creedmoor-Maha WSC, and Mountain City WUG are intending to access imported Carrizo-Wilcox Aquifer water to meet future water demands, beginning in 2020. These are new groundwater supplies for the area of the District that are planned to be supplied by a new special district, the Hays-Caldwell Public Utility Agency. At a minimum, this new water supply will relieve pressures for over-drafting of the aquifers in the District.

Regional Strategies – Development of Saline Zone of Edwards-BFZ Aquifer

The saline zone of the Edwards-BFZ Aquifer, which exists under much of the eastern portion of the District, is a potential new water supply for the area. While it is known that there is a relatively large volume of brackish to saline groundwater in this area, and in adjacent areas along the down-dip Edwards trend, it is not yet known how much water can be produced in the long-run as a reliable supply, what the effects of such withdrawals might be on the adjacent freshwater zone just updip of the saline zone, what the turn-key costs are of desalinating that water and disposing of any concentrate, and how well that aquifer might also serve as a host of an aquifer storage and recovery facility. To a considerable degree, development of this resource is not a matter of if, but when – when will it become economically feasible relative to the cost of providing supplies from other sources. The developmental uncertainties, which are identified above, need to be removed, and this task seems ripe for a public-private partnership response. Nevertheless, a number of WUGs in the District have such a supply as a strategy, including the City of Buda, Cimarron Park Water Company, and Hays County-Other WUGs; Hays County-Other would access such a supply by 2020 in its water management strategy.

Regional Strategies – Development of the Trinity Aquifer

The Trinity underlies the Edwards throughout the District, and since the more accessible Edwards is fully subscribed as a firm-yield water supply, the Trinity is increasingly being accessed as an alternative groundwater supply, especially in the western part of the District where it is shallower. The Trinity is much more variable in quality and quantity, and the hydrogeologic controls on this aquifer's characteristics are only just now beginning to be understood; it deserves continued study but also serious consideration as a new water supply in many parts of the District. However, at this time, only one WUG in the District, Hays County-Manufacturing, is identified in the SWP using this resource, and not until 2030. The Trinity appears to represent an under-appreciated resource, and a not insignificant number of others are using it advantageously already, even for public water supply purposes. It also could serve as a host for an aquifer storage and recovery facility.

5. Synthesis of Regional Water Supply and Demand for District Planning

The strategies for addressing water supply and demand identified by the regional water planning groups in the District's jurisdiction, summarized in the preceding sections, demonstrate the importance of local factors in determining what is available and feasible in any one area. It is under these conditions that local management of the water resources, such as is provided by local groundwater conservation districts, is of paramount importance in being a vehicle for making those things happen. Effective communication among local jurisdictions and among local, regional, and state levels of government will be required to meet the water challenges in the future.

In the District, first and foremost, the SWP strategies hinge on the protection of its aquifers, notably the freshwater Edwards Aquifer that is already at its sustainable yield and MAG-level usage, so that it may continue to serve as a reliable, high-quality water supply for its existing users. In the District, aggressive drought management must complement the full-time water conservation efforts of the end users of the water system. To facilitate groundwater management during extreme drought stages, the District must foster the provision of alternative water supplies, including a) other available freshwater aquifers, such as the Trinity and the Carrizo-Wilcox; b) substitution of reclaimed water and rainwater-harvesting in lieu of higher-quality freshwater; and c) the development of new firm-yield supplies through technologies such as desalination and aquifer storage and recovery.

The contribution of groundwater within the District to the regional and state water planning process is discussed quantitatively in Section IV of this *Plan.*

III. PROGRAM PLANNING FOR DISTRICT

This major section of the plan document contains details of the implementation plan for the District, specifying the management objectives, performance standards, activities, and metrics.

III.A. RELATIONSHIP OF THIS PLAN TO OTHER DISTRICT DOCUMENTS

The *District Management Plan* (*Plan*) is considered the "master guidance document" for the District and, once approved by the Texas Water Development Board (TWDB), establishes the entire scope of the District's activities and, in concert with legal statutes, its authorities. The District *Rules and Bylaws (Rules),* which direct and control the day-to-day activities of the District, flow from and must be consistent with the prevailing *Plan*. The District's *Rules,* which are complementary with the policies approved by the District's Board of Directors and the District staff's implementation activities, is always located on the District webpage at: http://www.bseacd.org/about-us/governing-documents/; the current version of the District's *Rules* is linked on that page and available for download at:
http://www.bseacd.org/uploads/Rules_and_Bylaws_Board_approved_9_17_11%281%29.pdf.

From time to time during the term of this *Plan,* the District may make changes in its *Rules* to accommodate new and changing requirements, but all such changes in the *Rules* must maintain consistency with the TWDB-approved *Plan.* Similarly, program-specific plans associated with external parties, such as the Habitat Conservation Plan (HCP) with US Fish and Wildlife Service (USFWS), are not considered completely promulgated unless and until those plan provisions and measures are generally reflected in an approved *Plan*. Ongoing internal planning activities, such as the continuing strategic planning initiatives, may be used to consider the need and efficacy of certain changes to the *Plan*, but they do not have effect unless and until the changes are made in the *Plan* and the revised *Plan* is approved by TWDB.

By statute, while this is a ten-year *Plan*, it must be reviewed and re-adopted at least every five years to ensure its currency, and it may be amended or revised at any time, after appropriate public input and with Board approval. It is currently anticipated that the issuance of the final HCP *may* require a further revision of this *Plan* before the plan period is complete. However, the already defined outputs of the HCP process and the likely requirements to achieve and/or maintain compliance with the applicable Desired Future Conditions of the District's aquifers in large part underpin the current objectives and strategies of this *Plan*, and therefore large substantive differences between this and the subsequent *Plans* are not anticipated.

III.B. GENERAL APPROACH USED IN PROGRAMMING

The activities of the District are intrinsically multi-disciplined and multi-lateral; virtually every one of the management goals and objectives identified in this *Plan* are best served by a combination of skill sets. The District staff is structured in a matrix approach where all staff members report to the General Manager but all work is undertaken through various standing, internal teams or external project teams. Currently, the internal teams, each with a staff member who serves as Team Leader, include: Aquifer Science, Regulatory Compliance, Education and

Outreach, General Services, and General Management. These teams can be reconfigured over time to meet evolving internal and external needs. Every staff member works on multiple teams. The Board of Directors of the District provides policy-level direction for District initiatives and various, *Rules*-specified approvals for implementation through the General Manager.

The District has multiple aquifers that it is currently managing, or could be in the future. These are described in more detail in Appendix II. The primary aquifer is the District's namesake, the freshwater portion of the Barton Springs segment of the Edwards Aquifer, called the Barton Springs aquifer. However, several other aquifers are used in the District. Increasingly, the Trinity Aquifer, and more specifically the Middle Trinity Aquifer, is being used in parts of the District where the Edwards is unreliable and/or completely committed. In the future, both the Lower Trinity and the saline-water zone of the Edwards may be more important groundwater supplies in the District than at present. In addition, small amounts of shallow groundwater are found in alluvium and terraces along downstream parts of the larger watercourses and are locally used from time to time. This *Plan* considers each of the following as a different "management zone:"

- Western Freshwater Edwards and Upper Trinity Aquifer: Western side of recharge zone where saturated thickness of Edwards is relatively thin (nominally, 100 feet or less in thickness). Saturated thickness of the Edwards is based in part on fault blocks, pumping, and drought conditions;
- Eastern Freshwater Edwards and Upper Trinity Aquifer: Eastern side of recharge zone and confined zone;
- Saline-Water Zone Edwards Aquifer: East of the line where concentration of total dissolved solids in Edwards groundwater equals 1,000 milligrams per liter;
- Middle Trinity Aquifer: Lower Glen Rose, Hensell Sand, Cow Creek Formation; and
- Lower Trinity Aquifer: Sligo and Hosston Formations.

These management zones within the District's boundaries are depicted schematically in Figure III-1. In addition, the Outcropping Trinity Aquifer (Undifferentiated), which exists in a very small area in the extreme western District and is not currently used as a significant water supply, is another possible management zone in the future. The District manages the other aquifers in the District (for example, the very minor alluvial aquifers, and the Austin Chalk aquifer) by convention as part of the Western Freshwater Edwards/Upper Trinity Aquifer management zone. Each of these management zones is promulgated through normal rule-making and delineated by geospatial boundaries for the geographically defined management zones and by the stratigraphic formation for the hydrogeologic management zones.

For each of the aquifers listed above, the *Plan* anticipates that certain rules may apply to one, but not to others, of these management zones; other rules will apply to all aquifers/management zones in the District. Accordingly, some of the performance standards and activities in the following section are or will be management zone-specific.

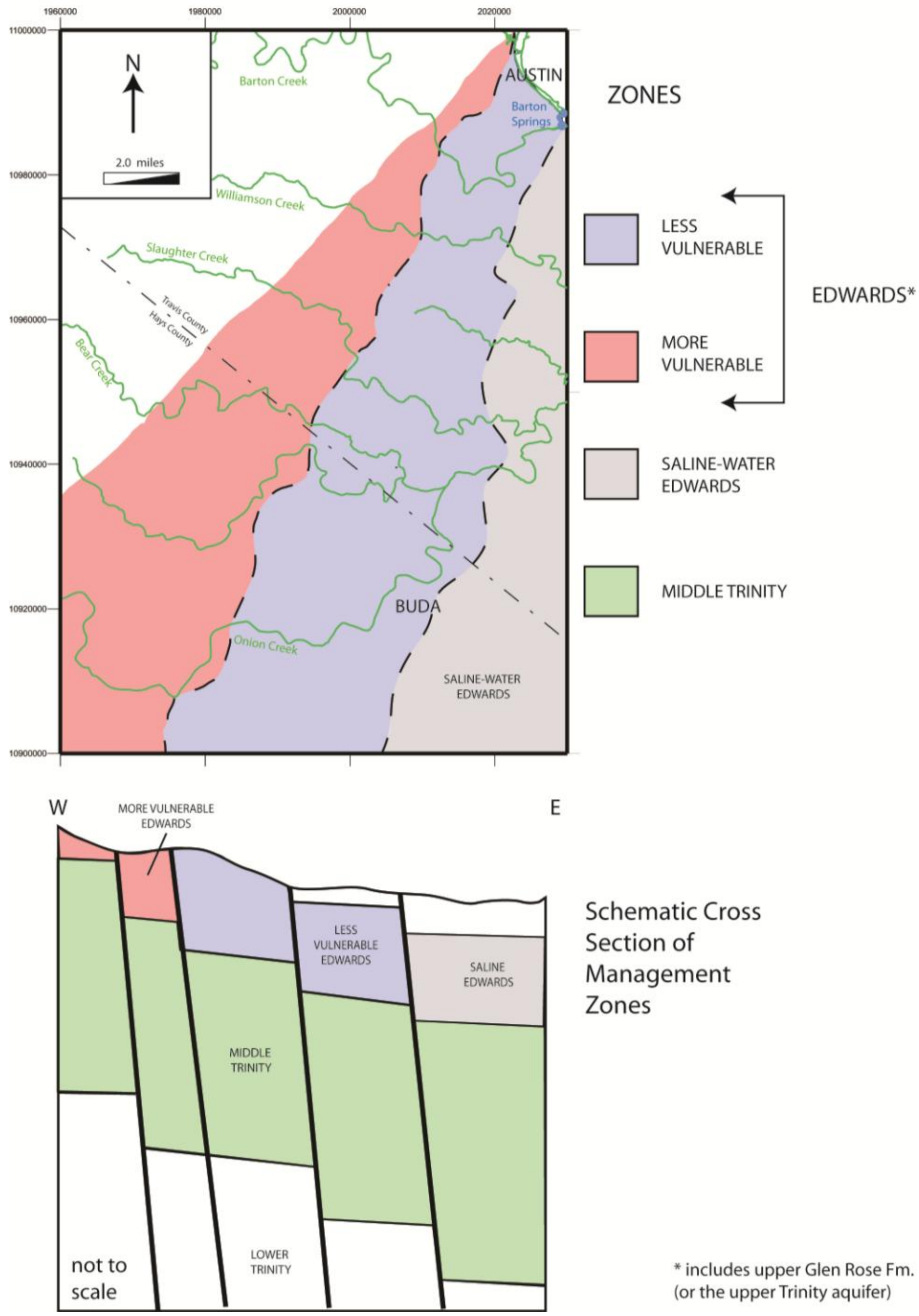

FIGURE III-1: CONCEPTUAL MANAGEMENT ZONES AND CROSS-SECTION
Portions of the aquifer where the saturated Edwards is thin are considered to be more vulnerable to having wells go dry during periods of extreme drought.

III.C. MANAGEMENT GOALS, OBJECTIVES, AND STRATEGIES

The Texas Water Development Board (TWDB) has specified nine overarching management goals to be addressed in the groundwater management planning performed by all groundwater conservation districts (GCDs) in Texas; these goals are rooted in the statutory authority of Texas Water Code (TWC), Chapter 36. One of these goals, related to controlling and preventing subsidence, is not applicable to the District as there are no geologic strata in the District that are structurally affected by groundwater withdrawals from them. The TWDB has indicated that these overarching general goals provide the basis for district-specific objectives and strategies (performance standards and activities) that individual GCDs should use as the framework for their management plans.

In this section, each of the District's current management objectives is identified and characterized by its relevant strategies, which include both performance standards and their activities. Each objective has two or more performance standards that are principally associated with it; these are designated herein as "Primary Performance Standards (Primary PS)" and each Primary PS "belongs" to one objective, under which it is further elaborated as to its suite of activities. A recap of the current *Plan*'s objectives and their corresponding primary performance standards and metrics is shown in Table III-1.

Much of what the District does is multi-dimensional and the activities under a particular performance standard might contribute to the accomplishment of more than one objective. So, in addition to its Primary PS, an objective generally will also have other performance standards with activities that contribute to that objective from time to time or in a supplemental fashion; these are designated "Supporting Performance Standards (Supporting PS)." A performance standard is the Primary PS for one, and only one, objective, but it may be a Supporting PS for one or more other objectives.

Certain performance standards and especially activities are further designated as aquifer-specific or management zone-specific; where not so designated, they apply to all relevant aquifers and management zones in the District. Some performance standards and activities have metrics associated with specifically stated time frames (e.g., intensity, frequency); if not, the context provides the time frame (e.g., each year, or within the plan period.) Using the identified metrics and their collective judgment, as appropriate, the District's directors will evaluate all performance standards and assess the adequacy of progress toward the management objectives each year, in the program review that is part of the District's *Annual Report* submitted to TCEQ.

Table III-2 below shows the correspondence between the TWDB's groundwater management goals and the District's objectives and performance standards that are characterized in this section of the *Management Plan*. This table is intended as an overall, at-a-glance indication of how the goals are being addressed in this plan in a multi-dimensional fashion. Further details are found under the respective subsections for a particular objective and performance standard. Note that essentially everything that the District does relates in some way to the three goals of providing efficient use of groundwater, of addressing natural resource management issues, and of addressing the Desired Future Conditions (DFCs) of District aquifers.

TABLE III-1. Summary of Plan Objectives and Their Performance Standards and Metrics

Objective 1 – Assure the long-term sustainability of the District to carry out its mission as a GCD with excellence.	
Primary Performance Standards	**Metrics**
1-1: Hire, equip, train, evaluate, and motivate appropriate staff to achieve the District's mission within budgetary constraints.	Overall score of GM's annual performance review for fiscal year; Number of instances of unresolved personnel issues referred to the Board; Staff turnover rate net of reductions-in-force.
1-2: Align District plans, policies and programs with the District's mission and vision, and regularly review and revise them, as warranted, to respond to changing circumstances that affect their need, effectiveness or implementation.	Satisfactory progress toward or timely completion of revisions to the District's Management Plan that are approved by TWDB; Establish a Contingency and Risk Management Plan and update it within one year of each Management Plan's approval, and at least once every two years thereafter; Timely budgeting and amendments.
1-3: Ensure the District has the near-term and long-term financial basis and contractual wherewithal to support its mission.	A clean financial audit report each year; absence of vendor problems and contractual disputes; amount of activity concerning grant proposals and projects; and biannual receipt of official PFIA certificate for completing required training.

1-4: Provide efficient administrative support and infrastructure, such that District operations are executed reliably and accurately, meet staff and local stakeholder needs, and conform to District policies and with federal and state requirements.	Absence of claims of OMA and PIA violations by external parties; lack of staff complaints about continuing problems with support services and infrastructure.
1-5: Provide mechanisms to align District Rules, policies, and programs with the will of its collective and precinct-level constituencies, within the constraints of statutes governing the District.	Maintaining a full Board; effective participation in Board activities and representation of constituents by each of the five Board members; properly conducted director elections.
1-6: Provide leadership in promoting legislation and regulations that benefit the protection of the District's groundwater resources and opposing legislation and regulations that harm those resources.	Preparation of a Legislative Agenda report before the end of each even- numbered fiscal year that reflects the consensus of the Board concerning the next session; Preparation of a Legislative Session De-briefing report before the end of each odd- numbered fiscal year that assesses specific legislation that affects the District, both individually and as a GCD political subdivision, that passed and did not pass, and generally why that occurred; Collective judgment of the Board as to appropriateness of what was pursued legislatively, what actions were taken, and what outcomes were achieved; Collective judgment of the Board as to appropriateness of what litigation or contested-cases were pursued, what actions were taken, and what outcomes were achieved.

Objective 2. Promulgate a fair and efficient regulatory program.	
Primary Performance Standards	**Metrics**
2-1: Review and modify the Rules as warranted to provide and maintain a sound statutory basis for continued District operations and to ensure consistency with both District authority and programmatic needs.	Rule making process is initiated and conducted in accordance with all statutory requirements and required timeframes; rules are in alignment with District policies and objectives as determined by the Board with PAC input in even-numbered years.
2-2: Process and review all well registrations, permit renewals, and applications for permits, permit amendments, and authorizations in accordance with the Rules, Well Construction Standards, and other District guidelines in accordance within specified procedural timeframes.	Requests for Permits and authorizations are processed in accordance with all statutory requirements and required timeframes.
2-3: Monitor existing District wells for compliance with the Rules, and Well Construction Standards.	Specified minimum number of permittee inspections completed or exceeded each year; the majority of all documented violations are brought into compliance or are addressed by a Board Order within six months of the staff-established compliance deadlines; during drought, all required meter readings are submitted or collected each month.
2-4: Efficiently process permittee meter readings, water use fee invoices and payments, conservation credits, permit renewals and related communications.	Timely processing of permit renewals, conservation credits, and meter readings within timeframes specified in Rules or policies.

Objective 3. Develop and implement an effective drought management program that achieves the adopted Desired Future Conditions (DFCs) of each relevant aquifer in the District.

Primary Performance Standards	Metrics
3-1: Assist permittees in developing drought and conservation planning strategies, permit conversion strategies, and pricing strategies, and enforce compliance with drought management rules during District-declared drought to achieve DFCs during extreme drought.	Achieve overall monthly pumpage reductions within 10% of the aggregate pumpage reduction (volumetric) goal of the prevailing drought stage.
3-2: Monitor and declare drought stages on the basis of the analysis of data from the District's defined drought triggers and in accordance with the adopted drought trigger methodology.	Acceptable-to-Board proportion of timely updates of all drought related information during drought.
3-3: Inform and educate permittees and the public about declared drought stages and the severity of drought, and encourage practices and behaviors to reduce water use.	Timeliness and adequacy of response to requests for information. Absence of complaints received concerning water utility permittees' unwarranted actions.

Objective 4. Demonstrate leadership in external communication, collaboration, coordination and joint planning with respect to groundwater and related resources.

Primary Performance Standards	**Metrics**
4-1: Cultivate and communicate effectively and routinely with stakeholders of all types that affect and are affected by the District's programs and policies.	Collective judgment of the Board once each quarter as to whether communications between the District and its stakeholder community, including constituents and other public officials, are providing an effective basis for District decision-making and for identifying any needed remedial actions.
4-2: Collaborate with joint Groundwater Management Area (GMA) and regional water planning efforts on policies, regulations, and activities affecting water quality or desired future conditions of the aquifers managed by the District.	Percent of GMA meetings attended; timely provision of responsive comments on MPs of other GCDs in GMA 9 and 10; participation in public hearings on DFCs and MPs; timely discussion and voting on GMA items.
4-3: Provide technical assistance as warranted to federal, state and local entities; organizations; and individuals on the geology, hydrogeology, and karst features impacted by groundwater-utilizing land use activities.	Trends in number of requests for repeat/return participation in events.
4-4: Through education and public outreach, inform groundwater users and the general public of the connectivity of recharge and discharge, importance of water quality protection, and the relationship between surface water and groundwater.	Number of workshops/seminars with acknowledged District participation; number of District-sponsored outreach meetings and info distribution events; trends in number of page views and amount of "click-throughs" for District website; number of new subscriptions to the Friends of the Aquifers email contact list.

4-5: Prepare, submit, and maintain a draft and final Habitat Conservation Plan (HCP) and provide support of related National Environmental Policy Act documentation and processes for obtaining an Incidental Take Permit from the US Fish & Wildlife Service (FWS) for the endangered species at Barton Springs.	Satisfactory progress toward completion of the HCP that is acceptable to FWS, as judged by the Board and with the use of an annual HCP Status Report prepared by District Staff near the end of each fiscal year; Upon its receipt, success in maintaining a Section 10(a) Incidental Take Permit; Establishment and convening meetings at least annually of an HCP Management Advisory Committee; Promulgation of a regulatory program that achieves the Extreme Drought Withdrawal Limitation that is based on the MAG for the prevailing drought DFC for the Freshwater Edwards Aquifer.

Objective 5. Extend current groundwater supplies by encouraging supply-side and demand-side improvements.

Primary Performance Standards	Metrics
5-1: On at least a bi-annual basis, assess the availability and feasibility of regional alternative water supplies and encourage District permittees to diversify their water supplies by fostering arrangements with available water suppliers.	A report completed in odd-numbered years summarizing the above activities, grant activities, and active alternative supply projects in the District, and making recommendations.
5-2: Conduct investigations and, as warranted and feasible, physically alter discrete recharge features that will lead to an increase in recharge to the Edwards Aquifer.	Grant opportunities that have been researched and considered; excavation conducted in at least one cave, sinkhole, or recharge feature annually.
5-3: Conduct investigations, as warranted and feasible, to evaluate the potential for the saline zone of the Edwards Aquifer to provide water for a desalination facility, and to evaluate the potential for the Edwards saline zone and the Trinity aquifers beneath the freshwater Edwards as reservoirs for an Aquifer Storage and Recovery (ASR) system.	Completion of or significant progress on above activities; coordination accomplished with other partners, including outcome of funding requests and development of partnership agreements, as warranted; development of a budget/business and work plan.

5-4: Maintain and develop programs that inform and educate District groundwater users and area residents of all ages about water conservation practices and resources and use of alternate water sources including gray water / condensate reuse and rainwater harvesting.	Preparation and dissemination of material shared with District groundwater users and area residents that will inform them about water conservation and alternate water sources.

Objective 6. Increase understanding of all District aquifers so that appropriate policy and regulatory decisions are made.

Primary Performance Standards	Metrics
6-1: Assess aquifer conditions by sampling and collecting groundwater data from selected wells.	Information collected on wells within the District entered into District database.
6-2: Conduct scientific studies to better determine groundwater availability, to understand and prevent threats to water quality, to minimize impacts to water-supply wells and springs, and to provide sound science on which to base District policy.	Sufficient scientific studies are conducted and communicated each year so that the Board considers itself to be well advised of scientific basis and implications of Board policies.

TABLE III-2. Goals, Objectives, and Performance Standards

	Goal 1 Providing the Most Efficient Use of Groundwater	**Goal 2** Controlling and Preventing Waste of Groundwater	**Goal 3** Addressing Conjunctive Surface Water Management Issues	**Goal 4** Addressing Natural Resource Management Issues	**Goal 5** Addressing Drought Conditions	**Goal 6** Addressing Demand Reduction Through Conservation	**Goal 7** Addressing Supply Increase Through Structural Enhancement	**Goal 8** Addressing Quantitatively the Desired Future Conditions
Objective 1								
PS 1-1	●			●				●
PS 1-2	●	●	●	●	●	●	●	●
PS 1-3	●			●				●
PS 1-4	●			●				●
PS 1-5	●	●	●	●	●	●	●	●
PS 1-6	●	●	●	●	●	●	●	●
Objective 2								
PS 2-1	●	●	●	●	●	●		●
PS 2-2	●	●	●	●	●	●		●
PS 2-3	●	●	●	●	●	●		●
PS 2-4	●	●		●	●	●		●
Objective 3								
PS 3-1	●	●		●	●	●		●
PS 3-2	●	●		●	●	●		●
PS 3-3	●	●		●	●	●		●
Objective 4								
PS 4-1	●	●	●	●	●	●	●	●
PS 4-2	●		●	●		●	●	●
PS 4-3	●		●	●			●	●
PS 4-4	●	●	●	●			●	●
Objective 5								
PS 5-1	●		●	●	●	●	●	●
PS 5-2	●		●	●			●	●
PS 5-3	●		●	●			●	●
PS 5-4	●	●		●	●	●		●
Objective 6								
PS 6-1	●		●	●				●
PS 6-2	●	●	●	●	●	●	●	●

III.C.1. Objective 1 – Assure the long-term sustainability of the District to carry out its mission as a GCD with excellence.

Primary Performance Standards:

<u>Performance Standard 1-1</u>: Hire, equip, train, evaluate, and motivate appropriate staff to achieve the District's mission within budgetary constraints.

Board-level Activities:

a. Hire, evaluate, and fairly compensate an effective General Manager.
b. Address appropriately unresolved personnel issues between the General Manager and staff members, or upon request by the General Manager.
c. Budget sufficient funds for salaries, wages, and benefits that will attract and maintain a staff that is sufficient to carry out the District's mission according to the prevailing *Management Plan*.
d. Communicate perceived concerns about staff performance issues and other personnel matters to the General Manager.

Staff-level Activities:

a. Assign and supervise staff in roles that utilize their strengths and promote teamwork.
b. Evaluate staff performance regularly and constructively.
c. Develop and administer a staff compensation program that equitably rewards individual and team performance that advances the mission of the District.
d. Provide opportunities for staff training and professional development.
e. Maintain and improve staff morale and commitment to their job and the District.

Lead Team Responsible: General Management
Other Objectives Supported: All

Metrics: Overall score of General Manager's annual performance review for fiscal year; number of instances of unresolved issues referred to the Board; staff turnover rate net of reductions-in-force.

<u>Performance Standard 1-2</u>: Align District plans, policies and programs with the District's mission and vision, and regularly review and revise them, as warranted, to respond to changing circumstances that affect their need, effectiveness or implementation.

Board-level Activities:

a. Develop and be guided by a "Director Job Description" that sets forth the roles, responsibilities, and expectations of a District Director.
b. Participate in development and updating of District strategic planning initiatives between approved revisions of management plans, including risk management and contingency planning.

c. Participate in developing and updating and then approve District *Management Plan,* and *Rules & Bylaws*.
d. Provide liaison to staff concerning policy-level guidance and requests of individual staff through the General Manager.
e. Establish and effectively utilize standing and *ad hoc* public advisory groups.

Staff-level Activities:

a. Participate in development and updating of District strategic planning initiatives between approved revisions of management plans, at Board's discretion and direction.
b. Participate in developing recommendations as to approaches and content of the District's *Management Plan* and *Rules & Bylaws*, and their revisions and amendments.
c. Provide liaison between Board policy-level guidance/requests and staff direction.
d. Help identify and recruit members of standing and *ad hoc* public advisory groups and administer their use.
e. Provide quality assurance of District work product and deliverables.
f. Establish and maintain a continuous improvement ethos and program.

Lead Team Responsible:	General Management
Other Objectives Supported:	Objectives 2 and 4

Metrics: Satisfactory progress toward or timely completion of revisions to the District's *Management Plan* that are approved by TWDB; establish a Contingency and Risk Management Plan and update it within one year of each *Management Plan*'s approval, and at least once every two years thereafter; timely budgeting and amendments.

<u>Performance Standard 1-3</u>: Ensure the District has the near-term and long-term financial basis and contractual wherewithal to support its mission.

Board-level Activities:

a. Proactively develop and support legislative and other initiatives that attach a more realistic value to the groundwater resources within the District, especially in comparison to the costs of other local water resources.
b. Participate in developing and then approve fiscal-year budgets, including use of reserve funds and approval of budget amendments.
c. Specify various financial-impact scenarios that should be included in contingency planning.
d. Authorize and receive results of annual financial audits, and institute accepted recommendations on financial controls or procedures.
e. Help identify and approve appropriate use of grant funding and resource commitments that will substantially enable progress toward District objectives.
f. Establish purchasing policy and review and approve all contracts in accordance with the policy and upon legal review and approval as to form.

Staff-level Activities:

a. Maintain finances in a manner that maximizes liquidity while maintaining the greatest return on District fund balances by investing in securities or investment pools that operate in low risk investments and are backed by the state and/or federal government.
b. Provide effective and efficient accounting and financial records management and necessary investment training, in accordance with federal and state law, the *Rules*, and Board direction.
c. Develop recommended elements and budgetary estimates for fiscal-year budgets and amendments.
d. Contract for and participate in conducting an independent financial audit annually, including provision of financial records and preparation of management discussion and analysis, and submit year end reports to TCEQ and the Texas State Pension Review Board as required by law.
e. Help identify appropriate grant funding and resource commitments and utilize grant resources to leverage existing resources substantially with minimum opportunity costs.
f. Publish budgets, current-period, year-to-date summary financial information and transaction-level information on the District website as part of the Open Government initiative.
g. Acquire and manage projects in accordance with good project accounting and management practice and in conformance with sponsoring agency requirements.
h. Obtain contracts for services in accordance with established District standards, and coordinate acquisition activities ensuring cost-effectiveness and quality by utilizing purchasing procedures that meet both District policy, state law, and the *Rules.*

Lead Team Responsible: General Services
Other Objectives Supported: All

Metrics: A clean financial audit report each year; absence of vendor problems and contractual disputes; amount of activity concerning grant proposals and projects; and biannual receipt of official Public Funds Investment Act (PFIA) certificate for completing required training.

Performance Standard 1-4: Provide efficient administrative support and infrastructure, such that District operations are executed reliably and accurately, meet staff and local stakeholder needs, and conform to District policies and with federal and state requirements.

Board-level Activities:

a. Receive training on and comply with Open Meetings Act (OMA) and Public Information Act (PIA) requirements.
b. Provide budget allocation for the required administrative activities on continuing basis.

Staff-level Activities:

a. Ensure that directors and appropriate staff receive training in and stay current with OMA and PIA requirements, and that daily District operations comply with those standards.
b. As administrative liaison to Board, develop, post, and distribute District Board agendas, meeting materials, and backup documentation in a timely and required manner; post select documents on the District website, and maintain official records, files, and minutes of Board meetings appropriately.

c. As Records Management Officer, maintain, retain, and control all District records in accordance with the Texas State Library and Archives Commission-approved District Records Retention Schedule to allow for safekeeping and efficient retrieval of any and all records, and annually audit records for effective management of use, maintenance, retention, preservation and disposal of the records' life cycle as required by the Local Government Code.
d. As needed, update retention schedule in accordance with the Texas Administrative Code requirements, and file any amended retention schedule with the Texas State Library.
e. Maintain the office building and grounds, office equipment, and supplies to provide an efficient work environment that meets the needs of the staff and stakeholder community.
f. Perform cost-benefit analyses on all District insurance and employee-benefit policies before renewal, and acquire or renew all District policies in a timely fashion.
g. Maintain District vehicles in good operational condition.
h. Maintain and evaluate needed enhancements to the District computer system and network to facilitate District productivity and to support District programs and projects.

Lead Team Responsible: General Services
Other Objectives Supported: All

Metrics: Absence of claims of OMA and PIA violations by external parties; lack of staff complaints about continuing problems with support services and infrastructure.

<u>Performance Standard 1-5</u>: Provide mechanisms to align District *Rules*, policies, and programs with the will of its collective and precinct-level constituencies, within the constraints of statutes governing the District.

Board-level Activities:

a. Regularly visit with a spectrum of stakeholder interests in the single-member precincts and with the legislative community being represented by the directors as to their needs and concerns.
b. Solicit candidate(s) to campaign every four (4) years for each director precinct place on Board, authorize or cancel an election, and canvass election results, as warranted.
c. Authorize and participate in decennial and other re-districting, ensuring Department of Justice (DOJ) pre-clearances and conformance with statutory requirements.
d. Utilize advisory groups to calibrate stakeholder inputs and possible responses, as needed.

Staff-level Activities:

a. Support District's general counsel in re-districting director precincts the year after each decennial census, including timely submission of all DOJ-required data and documents for successful pre-clearance, as necessary.
b. Make internal preparations for and conduct elections for the two or three directorships up for election biennially in even-numbered years in concert with county election offices, and in accordance with state and federal election laws, and as required by TWC Chapter 36.
c. Prepare all election contracts with associated entities including election services contracts and joint election agreements, and all necessary orders and notices to conduct or to cancel an election.

Lead Team Responsible: General Services
Other Objective Supported: Objective 4

Metrics: Maintaining a full Board; effective participation in Board activities and representation of constituents by each of the five (5) Board members; properly conducted director elections.

<u>Performance Standard 1-6</u>: Provide leadership in promoting legislation and regulations that benefit the protection of the District's groundwater resources and opposing legislation and regulations that harm those resources.

Board-level Activities:

a. Propose and support legislation and regulatory initiatives that control and prevent point/nonpoint-sources of pollution and cross-formational contamination of the aquifers managed by the District.
b. Oppose legislation or regulatory initiatives that don't ensure protection of groundwater quantity and quality, including non-compliance with DFCs.
c. Meet with local legislators and relevant committee members to foster an effective working relationship.
d. Seek legal remedies as warranted and feasible to minimize or avoid impacts on groundwater quantity and quality of aquifers in the District.

Staff-level Activities:

a. Work with District legislative liaison, as available, and other GCDs to effect needed legislation, at Board's direction and discretion.
b. Support District's counsel in contested-cases and litigation, at Board's direction and discretion.
c. Keep Board informed of status and progress concerning legislative and litigation matters.

Lead Team Responsible: General Management
Other Objective Supported: Objective 2

Metrics: Preparation of a *Legislative Agenda* report before the end of each even-numbered fiscal year that reflects the consensus of the Board concerning the next session; preparation of a *Legislative Session De-briefing* report before the end of each odd-numbered fiscal year that assesses specific legislation that affects the District, both individually and as a GCD political subdivision, that passed and did not pass, and generally why that occurred; collective judgment of the Board as to appropriateness of what was pursued legislatively, what actions were taken, and what outcomes were achieved; collective judgment of the Board as to appropriateness of what litigation or contested-cases were pursued, what actions were taken, and what outcomes were achieved.

Supporting Performance Standards:

Performance Standard	Brief Description
2-1	Review and modify the *Rules* as warranted to provide and maintain a sound statutory basis for continued District operations and to ensure consistency with both District authority and programmatic needs.
2-5	Efficiently process permittee meter readings, water use fee invoices and payments, conservation credits, permit renewals and related communications.
4-1	Cultivate and communicate effectively and routinely with stakeholders of all types that affect and are affected by the District's programs and policies.
4-2	Collaborate with joint Groundwater Management Area (GMA) and regional water planning efforts on policies, regulations, and activities affecting water quality or desired future conditions of the aquifers managed by the District.

III.C.2. Objective 2. Promulgate a fair and efficient regulatory program.

Primary Performance Standards:

Performance Standard 2-1: Review and modify the *Rules* as warranted to provide and maintain a sound statutory basis for continued District operations and to ensure consistency with both District authority and programmatic needs.

Board-level Activities:

a. Provide direction and input to staff to guide the development of proposed rule concepts and draft rules.
b. Appoint and convene *ad hoc* policy advisory committees to review and comment on District policies and proposed rules revisions as warranted.
c. Conduct public hearings for proposed rule changes.
d. Adopt necessary rule updates and revisions as warranted.

Staff-level Activities:

a. Periodically review and provide proposed rule concepts to the Board to address necessary updates and revisions.
b. Consider rule updates and revisions needed to address specific needs of separate management zones for the different areas and aquifers within the District.
c. Upon direction by the Board, prepare draft rules based on vetted rule concepts and Board input.
d. Schedule and provide required notification of public hearings for proposed *Rule* changes.
e. Make the adopted revised *Rules* available to the public after adoption by the Board.

Lead Team Responsible: Regulatory Compliance
Other Objective Supported: Objective 1

Metrics: Rulemaking process is initiated and conducted in accordance with all statutory requirements and required timeframes; rules are in alignment with District policies and objectives as determined by the Board with PAC input in even-numbered years.

Performance Standard 2-2: Process and review all well registrations, permit renewals, and applications for permits, permit amendments, and authorizations in accordance with the *Rules*, *Well Construction Standards*, and other District guidelines in accordance within specified procedural timeframes.

Board-level Activities:

a. Conduct public hearings for certain permits and authorizations.

b. Take appropriate action on certain requested permits and authorizations presented to the Board considering application information, staff recommendations, and the District *Rules and Bylaws*.

Staff-level Activities:

a. Register all new wells.
b. Review and process well registration forms, plugging authorizations, and permit-by-rule authorizations.
c. For all other applications, review and make determinations of administrative completeness.
d. Require and receive results of aquifer tests for certain production permits and amendments.
e. Assist applicants with planning and execution of all aquifer tests in accordance with the District's Aquifer Test Guidelines.
f. Evaluate complete production and transport permit applications on the basis of: beneficial use, non-speculative needs, reasonable demand, the ability to comply with drought management requirements, and the ability to conform to management zone requirements.
g. Evaluate all complete permit and authorization requests on the basis of potential for impact to sustainable groundwater quantity and quality, public health and welfare, contribution to waste, unreasonable well interference.
h. Provide recommendation formed on the basis of staff evaluation for Board or General Manager consideration of certain permits and authorizations.
i. Schedule and provide required notification of public hearings for certain requested permits and authorizations.
j. Perform well site inspections before and after the drilling of each new well.
k. Prior to permit renewal, review all permits for compliance with District *Rules and Bylaws.*

Lead Team Responsible: Regulatory Compliance
Other Objective Supported: Objectives 1 and 6

Metrics: Requests for permits and authorizations are processed in accordance with all statutory requirements and required timeframes.

Performance Standard 2-3: Monitor existing District wells for compliance with the *Rules*, and *Well Construction Standards*.

Board-level Activities:

a. Provide direction to staff for enforcement of unresolved violations of the *Rules* as warranted.

Staff-level Activities:

a. Register all newly identified unregistered wells.
b. Conduct inspections of at least ten selected permittee systems (not including NDUs) each fiscal year for compliance with the *Rules*.
c. Identify and notify individual permittees of any rule violations and take appropriate steps to ensure compliance.
d. Notify abandoned well owners and monitor to ensure wells are properly plugged or brought into compliance.
e. Perform well site inspections before each well plugging.

f. Obtain meters readings by site inspections from individual permittees who fail to submit after late submittal notification has been provided.
g. Monitor usage of individually permitted wells monthly and NDUs at least annually.
h. Provide compliance updates and enforcement recommendations to the Board as warranted in accordance with the adopted enforcement plan.

Lead Team Responsible: Regulatory Compliance
Other Objectives Supported: Objectives 1 and 6

Metrics: Specified minimum number of permittee inspections completed or exceeded each year; the majority of all documented violations are brought into compliance or are addressed by a Board Order within six (6) months of the staff-established compliance deadlines; during drought, all required meter readings are submitted or collected each month.

Performance Standard 2-4: Efficiently process permittee meter readings, water use fee invoices and payments, conservation credits, permit renewals and related communications.

Board-level Activities:

a. Issue conservation credits annually based on the annual conservation credit audit and staff recommendations.

Staff-level Activities:

a. Require timely-submitted monthly readings from individually permitted wells, enter all meter readings into the database, and file all monthly meter reading forms.
b. Maintain permittee mailings lists and contact information in database.
c. Annually renew compliant production and transport permits by September 1 of each year.
d. Perform annual underpumpage analysis as warranted and provide recommendations for Board consideration.
e. Perform annual conservation credit audit.

Lead Team Responsible: General Services
Other Objective Supported: Objectives 1 and 6

Metrics: Timely processing of permit renewals, conservation credits, and meter readings within timeframes specified in *Rules* or policies.

Supporting Performance Standards:

Performance Standard	Brief Description
1-2	Align District plans, policies and programs with the District's mission and vision, and regularly review and revise them, as warranted, to respond to changing circumstances that affect their need, effectiveness or implementation.
3-1	Assist permittees in developing drought and conservation planning strategies, permit conversion strategies, and pricing strategies, and enforce compliance with drought management rules during District-declared drought to achieve DFCs during extreme drought.
3-2	Monitor and declare drought stages on the basis of the analysis of data from the District's defined drought triggers and in accordance with the adopted drought trigger methodology.
3-4	Inform and educate permittees and the public about declared drought stages and the severity of drought, and encourage practices and behaviors to reduce water use.

III.C.3. Objective 3. Develop and implement an effective drought management program that achieves the adopted Desired Future Conditions (DFCs) of each relevant aquifer in the District.

Primary Performance Standards:

Performance Standard 3-1: Assist permittees in developing drought and conservation planning strategies, permit conversion strategies, pricing strategies, and enforce compliance with drought management rules during District-declared drought to achieve DFCs during extreme drought.

Board-level Activities:

a. Provide direction to staff for enforcement and fee assessment for permittee violations of the *Rules* and applicable provisions of permittee's User Drought Contingency Plans (UDCPs).

Staff-level Activities:

a. Assist and support permittees with the development, implementation, and interpretation of User Conservation Plans (UCPs) and UDCPs in accordance with the *Rules* and as warranted.
b. Review and approve submitted UCPs and UDCPs in accordance with the *Rules.*
c. Require that all outdated UCPs and UDCPs are updated prior to annual permit renewal in accordance with the *Rules.*
d. Upon declaration of drought, send notification to all permittees of requirement to implement and comply with all applicable provisions of their prevailing UDCP.
e. Perform monthly evaluation of individual permittee compliance with monthly pumpage limits in accordance with the adopted enforcement plan.
f. Send notices of overpumpage to all noncompliant permittees each month.
g. Evaluate, stipulate, and enforce conservation-tier pricing for water-provider permittees to reduce demand by end-users.
h. Identify occurrences of noncompliance that warrant possible enforcement action and are subject to assessment of drought management fees.
i. Provide compliance updates and enforcement recommendations to the Board in accordance with the adopted enforcement plan.

Lead Team Responsible: Regulatory Compliance
Other Objectives Supported: Objectives 1, 2, and 5

Metrics: Achieve overall monthly pumpage reductions within 10% of the aggregate pumpage reduction (volumetric) goal of the prevailing drought stage.

Performance Standard 3-2: Monitor and declare drought stages on the basis of the analysis of data from the District's defined drought triggers and in accordance with the adopted drought trigger methodology.

Board-level Activities:

a. Make drought declarations considering the current aquifer conditions relative to defined drought triggers, the adopted drought trigger methodology, and staff recommendations.

Staff-level Activities:

a. Review relevant aquifer data on a monthly basis when not in drought.
b. Periodically provide updates to the Board on current aquifer conditions and provide recommendations of drought declarations as warranted.
c. Confirm drought flows from Barton Springs that are indicated by monitoring well data with in-stream discharge (e.g., flow-meter) measurements sufficient to produce or verify a reliable stage-discharge relationship.
d. When any drought trigger drops below average levels, monitoring will be done biweekly, and estimates will be made as to when either indicator will reach drought levels.
e. Produce and update charts showing the status of the defined triggers on a biweekly basis during a District-declared drought.
f. Produce and update charts showing the status of the defined triggers on a weekly basis during an Emergency Response Period.
g. Collect and evaluate data for the assessment of the Middle and Lower Trinity Aquifers and how they might be impacted and regulated by drought.

Lead Team Responsible: Aquifer Science
Other Objective Supported: Objective 6

Metrics: Acceptable-to-Board proportion of timely updates of all drought related information during drought.

Performance Standard 3-3: Inform and educate permittees and the public about declared drought stages and the severity of drought, and encourage practices and behaviors to reduce water use.

Board-level Activities:

a. Authorize and participate in efforts to disseminate information related to aquifer conditions during drought and practices that could facilitate demand reduction.

Staff-level Activities:

a. Provide public awareness of declared drought stages and drought severity by at least monthly communications which may include written and electronic correspondence, newspaper articles and advertisements, press releases, the District website, District newsletter, and special permittee newsletters.
b. Support permittees' efforts to inform their end users of drought stages and water conservation measures with by creating general drought stage information and informational materials on water conservation.

Lead Team Responsible: Education and Outreach
Other Objectives Supported: Objectives 2, 4, and 5

Metrics: Timeliness and adequacy of response to requests for information. Absence of complaints received concerning water utility permittees' unwarranted actions.

Supporting Performance Standard:

Performance Standard	Brief Description
5-4	Maintain and develop programs that inform and educate District groundwater users and area residents of all ages about water conservation practices and resources and use of alternate water sources including gray water / condensate reuse and rainwater harvesting**.**

III.C.4. Objective 4. Demonstrate leadership in external communication, collaboration, coordination and joint planning with respect to groundwater and related resources.

Primary Performance Standards:

Performance Standard 4-1: Cultivate and communicate effectively and routinely with stakeholders of all types that affect and are affected by the District's programs and policies.

Board-level Activities:

a. Cultivate balanced relationships with and among stakeholders, precinct residents, and policy makers to promote the District's mission.
b. Represent the District with legislative community, other political subdivisions, and related groups.

Staff-level Activities:

a. Cultivate balanced relationships between District staff and stakeholders.
b. Represent the District with legislative community, other political subdivisions, and related groups.
c. Represent the District in alliances and other organizations with common interests.

Lead Team Responsible:	General Management
Other Objectives Supported:	Objectives 1 and 6

Metrics: Collective judgment of the Board once each quarter as to whether communications between the District and its stakeholder community, including constituents and other public officials, are providing an effective basis for District decision-making and for identifying any needed remedial actions.

Performance Standard 4-2: Collaborate with joint Groundwater Management Area (GMA) and regional water planning efforts on policies, regulations, and activities affecting water quality or desired future conditions of the aquifers managed by the District.

Board-level Activities:

a. Utilize the data, results, and staff recommendations associated with water quality and/or desired future conditions to direct staff and develop policy in accordance with the District's mission.
b. Designate a District representative to participate in and serve as a voting member of GMA 9 and GMA 10.
c. Review and comment on management plans of other GMA member districts for consistency with DFCs of shared or hydrologically connected aquifers.

Staff-level Activities:

a. Provide information and input to current and proposed rules, standards, and planning efforts related to regional development and water/wastewater management.

b. Apply standards specified in the Regional Water Quality Protection Plan (2005) where applicable.
c. Provide recommendations to the Board on management plans of other GMA member districts for consistency with DFCs of shared or hydrologically connected aquifers.
d. Develop and implement a cost-effective method for evaluating and demonstrating compliance with the DFCs of the relevant aquifers in the District, in collaboration with other GCDs in the GMAs.
e. Support by attendance and in-kind consultation services in meetings of GMAs 9 and 10, as appropriate.
f. Seek public inputs on concerns that help articulate DFCs.
g. Vote on applicable items requiring GMA joint planning approvals.

Lead Team Responsible:	Regulatory Compliance
Other Objectives Supported:	Objectives 1 and 6

Metrics: Percent of GMA meetings attended; timely provision of responsive comments on management plans of other GCDs in GMA 9 and 10; participation in public hearings on DFCs and management plans; timely discussion and voting on GMA items.

Performance Standard 4-3: Provide technical assistance as warranted to federal, state and local entities; organizations; and individuals on the geology, hydrogeology, and karst features impacted by groundwater-utilizing land use activities.

Board-level Activities:

a. Establish standards and criteria specified in the Regional Water Quality Protection Plan to be used by District staff in evaluating deleterious impacts to recharge water quality.

Staff-level Activities:

a. Provide information to developers, roadway contractors, the regulated community, and local and state agency personnel about the locations and sources of vulnerability of the District's groundwater resources, and the steps they can take to mitigate the threats of contamination.
b. Apply standards and criteria specified in the Regional Water Quality Protection Plan (2005), as applicable and warranted, for the evaluation of various land uses requiring or affecting groundwater supplies and the associated potential for recharge water quality degradation or waste.
c. Review and provide comments, where applicable, for Water Pollution Abatement Plans or other environmental site assessments associated with any permits or authorizations submitted to the TCEQ, COA, small cities, counties, or other political jurisdictions in order to mitigate potential degradation of the District's groundwater resources.

Lead Team Responsible:	Aquifer Science
Other Objective Supported:	Objective 6

Metrics: Qualitative judgment by the Board as to how well the District's directors are promoting groundwater protection with other entities.

<u>Performance Standard 4-4</u>: Through education and public outreach, inform groundwater users and the general public of the connectivity of recharge and discharge, importance of water quality protection, and the relationship between surface water and groundwater.

Board-level Activities:

a. Communicate with constituents of their respective single-member precincts to ensure fair representation.
b. Facilitate dissemination of education and public outreach information within respective single-member precincts.
c. Help promote and/or participate in District-sponsored events.

Staff-level Activities:

a. Offer and/or recommend workshop(s) and/or presentations that educate local residents on the District, its management, District aquifers, Texas groundwater and surface resources, and indoor/outdoor water conservation practices.
b. Use electronic and printed media and in-person visits to deliver accurate and timely information to community groups that are interested in and/or affect the groundwater resource and its use, both upon request and on a proactive basis.
c. Organize and conduct events that allow the District to work cooperatively with area residents, including youth, in demonstrating the important relationships between surface and groundwater quality.
d. Maintain up-to-date District and aquifer information and literature that are available to the public via the website, print materials, and an electronic newsletter.

Lead Team Responsible: Education and Outreach
Other Objectives Supported: Objectives 1, 5, and 6

Metrics: Number of workshops/seminars with acknowledged District participation; number of District-sponsored outreach meetings and info distribution events; trends in number of page views and amount of "click-throughs" for District website; number of new subscriptions to the Friends of the Aquifers email contact list.

<u>Performance Standard 4-5</u>: Prepare, submit, and maintain a draft and final Habitat Conservation Plan (HCP) and provide support of related National Environmental Policy Act documentation and processes for obtaining an Incidental Take Permit from the US Fish & Wildlife Service (FWS) for the endangered species at Barton Springs.

Board-level Activities:

a. Assess and authorize needed measures within the District's authority, on a continuing basis, to minimize take and prevent jeopardy of the endangered species that are specified in the HCP.
b. Fund on a continuing basis the primary and adaptive management measures to minimize take and prevent jeopardy of the endangered species in the HCP.

Staff-level Activities:

a. Prepare a draft HCP, respond to public comments, and prepare and submit a final HCP that are acceptable to FWS.
b. Establish, periodically convene, and utilize an HCP Management Advisory Committee to assess independently the effectiveness of the HCP measures and recommend changes necessary to improve effectiveness, if warranted.
c. Employ an adaptive management strategy to respond effectively to unforeseen and/or changed circumstances.

Lead Team Responsible: General Management
Other Objectives Supported: All

Metrics: Satisfactory progress toward completion of the HCP that is acceptable to FWS, as judged by the Board and with the use of an annual HCP Status Report prepared by District Staff near the end of each fiscal year; upon its receipt, success in maintaining a Section 10(a) Incidental Take Permit; establishment and convening meetings at least annually of an HCP Management Advisory Committee; promulgation of a regulatory program that achieves the Extreme Drought Withdrawal Limitation that is based on the MAG for the prevailing drought DFC for the Freshwater Edwards Aquifer.

Supporting Performance Standards:

Performance Standard	Brief Description
3-3	Inform and educate permittees and the public about declared drought stages and the severity of drought, and encourage practices and behaviors to reduce water use.
5-4	Maintain and develop programs that inform and educate District groundwater users and area residents of all ages about water conservation practices and resources and use of alternate water sources including gray water / condensate reuse and rainwater harvesting.

III.C.5. Objective 5. Extend current groundwater supplies by encouraging supply-side and demand-side improvements. Note: This scope includes water conservation, recharge enhancement, and alternative supplies such as desalination, Aquifer Storage and Recovery (ASR), use of reclaimed water, and substituted other groundwater.

Primary Performance Standards:

<u>Performance Standard 5-1</u>: On at least a bi-annual basis, assess the availability and feasibility of regional alternative water supplies and encourage District permittees to diversify their water supplies by fostering arrangements with available water suppliers.

Board-level Activities:

a. Provide input to District staff about policy considerations of alternative water supplies.
b. Provide active leadership in promoting and pursuing alternative water supplies, including but not limited to participating in speakers' bureaus, working with water providers, legislative community and agencies such as TWDB and TCEQ, and assessing political and economic efficacy and paths.

Staff-level Activities:

a. Identify available alternative water resources and supplies (e.g., saline Edwards desalination, ASR, reuse, rainwater, etc.).
b. Evaluate viability of alternative water sources by considering:
    - available/proposed infrastructure
    - financial factors
    - logistical/engineering factors
    - potential secondary impacts (development density/intensity or recharge water quality).
c. Develop relationships/agreements with area surface water providers and encourage service to District permittees during extreme drought where appropriate.
d. Explore possible incentives to District permittees to implement the use of alternative water supplies through pricing, permit terms, and other mechanisms where appropriate.
e. Remove/reduce institutional barriers to use of alternative sources as feasible.
f. Produce a bi-annual report for the Board to serve as a summary of regional alternative supplies and activities conducted in accordance with this objective.

Lead Team Responsible:	Regulatory Compliance
Other Objectives Supported:	None

Metrics: A report completed in odd-numbered years summarizing the above activities, grant activities, and active alternative supply projects in the District, and making recommendations.

<u>Performance Standard 5-2</u>: Conduct investigations and, as warranted and feasible, physically alter discrete recharge features that will lead to an increase in recharge to the Edwards Aquifer.

Board-level Activities:

a. Participate in discussions about activities related to recharge enhancement.
b. Establish policies concerning recharge enhancement projects.
c. Fund approved projects, including seeking external funding partners.

Staff-level Activities:

a. Determine locations, cost-effective methods, and efficacy of potential recharge maintenance and enhancement for at least one additional recharge feature during the five-year term of this *Plan*.
b. Seek both internal and external funding to study and construct BMPs that are capable of diverting surface waters into the District aquifers.
c. Excavate sediment and other material from at least one recharge feature, such as caves, sinkholes, and BMPs, each year so that the capacity of the feature to recharge the aquifer will be at least maintained if not increased.
d. Identify and pursue grant funding, as appropriate, Board-authorized and available pertaining to recharge enhancement and nonpoint source pollution, and manage grant projects in accordance with grant requirements and good project management practice to meet milestones on budget and schedule.

Lead Team Responsible: Aquifer Science
Other Objectives Supported: None

Metrics: Annual oral presentation in even-numbered years on progress in these activities, to enable the Board to assess the progress; inclusion of these activities in the biennial Alternative Water Supplies Report in odd-numbered years; Number of excavations conducted in caves, sinkholes, or recharge features annually (with at least one being satisfactory).

<u>Performance Standard 5-3</u>: Conduct investigations, as warranted and feasible, to evaluate the potential for the saline zone of the Edwards Aquifer to provide water for a desalination facility, and to evaluate the potential for the Edwards saline zone and the Trinity aquifers beneath the freshwater Edwards as reservoirs for an Aquifer Storage and Recovery (ASR) system.

Board-level Activities:

a. Provide input of the extent of investigations of the saline zone and the level of interest of the Board on desalination and ASR.
b. Assist in developing and approve a business plan if and as necessary for co-funded investigations.
c. Authorize funding for a portion or all of investigations on the Edwards saline zone.

Staff-level Activities:

a. Install monitor well in saline zone for sampling and aquifer parameter testing.

b. Cooperate with other organizations for installing a test well in the saline zone and for evaluating the feasibility of desalination and/or ASR in the saline zone.
c. Conduct aquifer tests of Trinity aquifers to determine if they could serve as reservoirs for an ASR system.

Lead Team Responsible: Aquifer Science
Other Objectives Supported: None

Metrics: Annual oral presentation in even-numbered years on progress in these activities to enable the Board to assess the progress; inclusion of these activities in the biennial Alternative Water Supplies Report in odd-numbered years.

Performance Standard 5-4: Maintain and develop programs that inform and educate District groundwater users and area residents of all ages about water conservation practices and resources and use of alternate water sources including gray water/condensate reuse and rainwater harvesting**.**

Board-level Activities:

a. Provide direction and input to staff on messages that the Board would like to convey to the public about water conservation and alternate water sources.

Staff-level Activities:

a. Support and publicize other local-area water conservation initiatives using print and presentation opportunities.
b. Maintain up-to-date water conservation and alternate water source information and literature that is available to the public via the website and print materials.
c. Provide District groundwater permittees and end-users with water conservation and alternate water source presentations upon request where possible.
d. Offer and/or recommend educational events annually that address topics such as leak detection, water audits, irrigation audits, indoor water conservation, water use behavior, native landscaping, or rainwater harvesting.
e. Engage and solicit participation of permittees and other stakeholders on the District's conservation credit policy.

Lead Team Responsible: Education and Outreach
Other Objectives Supported: Objectives 1, 3, 4, and 6

Metrics: Preparation and dissemination of material shared with District groundwater users and area residents that will inform them about water conservation and alternate water sources.

Supporting Performance Standards:

Performance Standard	Brief Description
3-1	Assist permittees in developing drought and conservation planning strategies, permit conversion strategies, and pricing strategies, and complying with District drought rules to achieve DFCs during extreme drought.
3-2	Enforce compliance with drought management rules during District-declared drought.
3-4	Inform and educate permittees and the public about declared drought stages and the severity of drought, and encourage practices and behaviors to reduce water use.
4-4	Through education and public outreach, inform groundwater users and the general public of the connectivity of recharge and discharge, importance of water quality protection, and the relationship between surface water and groundwater.

III.C.6. Objective 6. Increase understanding of all District aquifers so that appropriate policy and regulatory decisions are made.

Primary Performance Standards:

Performance Standard 6-1: Assess aquifer conditions by sampling and collecting groundwater data from selected wells.

Board-level Activities:

a. Provide direction and input to staff about how the Board would like to have data collected, maintained, and reported.

Staff-level Activities:

a. Collect water-quality and groundwater-level information annually from:
   - All individually permitted wells (except for public supply wells) scheduled for routine compliance inspections
   - All newly drilled wells
   - Abandoned wells where sample collection is possible prior to District-authorized plugging
   - Five (5) other selected wells of interest.

b. Record data in District databases and use to assess groundwater quality and quantity.

   Lead Team Responsible: Regulatory Compliance
   Other Objectives Supported: None

Metrics: Information collected on wells within the District entered into District database.

Performance Standard 6-2: Conduct scientific studies to better determine groundwater availability, to understand and prevent threats to water quality, to minimize impacts to water-supply wells and springs, and to provide sound science on which to base District policy.

Publish District scientific and data-collection studies through various means ranging from local to international outlets.

Board-level Activities:

a. Provide guidance on policy issues that involve scientific evaluation.
b. Authorize funding for a portion or all of investigations related to aquifer science.

Staff-level Activities:

a. Collect, maintain, and interpret relevant data such as water levels, water quality, stream flow, rainfall, and aquifer properties, including water-level information from at least ten (10) monitor wells and stream or spring flow measurements at least three (3) times annually.

b. Periodically and regularly measure and evaluate the accuracy and precision of the discharges at the Barton Springs complex, and promote improvements in the reliability of such measurements.
c. Identify and pursue grant funding, as appropriate and available to conduct aquifer studies, and manage grant projects in accordance with grant requirements and good project management practice to meet milestones on budget and schedule.
d. Assess effects of "urban leakage" and its consequences for groundwater model calibration and outputs.
e. Collaborate on aquifer studies with other agencies and institutions by participating in at least five meetings each year with other groundwater scientists and engineers to discuss topics of current and direct interest to the District staff.
f. Evaluate the various groundwater models to determine which ones best suit the needs of the District for groundwater availability analyses, or consider other model software that has not yet been applied to District studies.
g. Prepare presentations, abstracts, and papers to present at scientific meetings and conferences or for publication by the District or other scientific organizations.
h. Appoint and convene when appropriate an *ad hoc* technical advisory committee to review and comment on District investigations and analyses.

Lead Team Responsible: Aquifer Science
Other Objectives Supported: Objectives 1 and 7

Metrics: An annual report of publications produced by the District that affects or will affect current or future Board decision-making; qualitative judgment by Board as to adequacy of the type of scientific information provided to them.

Supporting Performance Standards:

Performance Standard	Brief Description
2-4	Monitor existing District wells for compliance with the *Rules*, and Well Construction Standards.
4-3	Provide leadership and technical assistance to federal, state and local entities; organizations; and individuals on the geology, hydrogeology, and karst features impacted by groundwater-utilizing land use activities.
4-4	Through education and public outreach, inform groundwater users and the general public of the connectivity of recharge and discharge, importance of water quality protection, and the relationship between surface water and groundwater.
5-4	Maintain and develop programs that inform and educate District groundwater users and area residents of all ages about water conservation practices and resources and use of alternate water sources including gray water/condensate reuse and rainwater harvesting.

IV. COORDINATION WITH OTHER WATER MANAGEMENT ENTITIES

This final major section of this Management Plan (Plan) contains additional Texas Water Development Board (TWDB)-required information that details how planning by other water resource agencies will be incorporated and coordinated.

IV.A. COORDINATION WITH REGIONAL SURFACE WATER MANAGEMENT ENTITIES

Over the years, the District has contributed to and participated in the development of the Lower Colorado Regional Water Plan (Region K). Because significant population growth has occurred in the southeastern part of the District, the District has become similarly engaged in the development of the South Central Texas Regional Water Plan (Region L). Letters evidencing this coordination are in Appendix I of this *Plan*. Table IV-1 summarizes the contribution of District groundwater resources that would be available during a recurrence of the drought of record, by county and water planning region. This information in aggregate comports with the Modeled Available Groundwater (MAG) estimates provided by TWDB and has been provided to the regional water planning groups. Because the MAGs to achieve the adopted DFCs are substantially smaller than the production estimates in the prior plan, less groundwater (but more surface water) is being supplied by the District's aquifers; in terms of the overall water supply, the differences between the prior plan and this plan are very small. Both on its own and through its two Groundwater Management Areas, the District will continue to participate actively in the water planning activities of both Regions K and L during the term of this *Plan.*

Region K

The available groundwater supplies from the Barton Springs aquifer during drought-of-record (DOR) conditions, and the resulting springflows from Barton Springs that augment the surface water supplies in Region K, have been included in the 2011 Regional Water Plan and, in turn, the 2012 State Water Plan (SWP). The District's regulatory program incorporates production limitations required to meet the DFCs of the relevant aquifers during extreme drought conditions that are now reflected in the current water plans. The District's aquifers are projected to provide Region K about 3,458 acre-feet annually of freshwater Edwards groundwater and about 634 acre-feet of Trinity groundwater to satisfy the water demand in Region K during a DOR recurrence. The District also projects providing about 523 acre-feet from desalination of groundwater from the Saline Edwards Aquifer in the final years of this *Plan.* This amount of saline production is considered extremely conservative and the projection is expected to be revised upwards as new information becomes available, new DFCs are adopted, and this *Plan* is subsequently amended. But for now, the future needs from this source in the 2012 SWP are considerably in excess of this current supply.

The District's regulatory program is predicated on the fact that no "new" fresh Edwards Aquifer groundwater is available during extreme drought conditions. The authorized groundwater withdrawals from the Barton Springs aquifer are already at its sustainable yield. The groundwater supplies provided by the Edwards Aquifer are available to new demand sources, including amendments by existing permittees, only on an interruptible supply basis, up to and including complete curtailment, during extreme drought. The District's regulatory program

Table IV-1. Groundwater Available in 2012-2022 from BSEACD During Drought of Record Conditions

			Edwards		Trinity		Saline Edwards		Total GW Available	
			cfs	AF/Yr	cfs	AF/Yr	cfs	AF/Yr	cfs	AF/Yr
Region K										
	Travis Co.									
		Non-exempt	1.499	1085	0.05	34	0.72	523	**2.27**	**1642**
		Exempt	0.111	81		0		0	**0.11**	**81**
	Hays Co.									
		Non-exempt	2.899	2099	0.83	600			**3.73**	**2699**
		Exempt	0.267	193		0		0	**0.27**	**193**
Region L										
	Hays Co.									
		Non-exempt	0.357	259	0.90	654			**1.26**	**913**
		Exempt	0.067	48		0		0	**0.07**	**48**
	Caldwell Co.									
		Non-exempt	0	0	0.00	0			**0.00**	**0**
		Exempt	0	0	0.00	0		0	**0.00**	**0**
										0
	TOTALS		**5.20**	**3765**	**1.78**	**1288**	**0.72**	**523**	**7.70**	**5576**

Re-cap by Well Type, Water Planning Regions, and Source Counties

	cfs	AF/Yr
Non-exempt	7.258	5254
Exempt	0.445	322

	cfs	AF/Yr
Region K	6.38	4615
Region L	1.33	961

	cfs	AF/Yr
Travis Co.	2.38	1723
Hays Co.	5.32	3853
Caldwell Co.	0	0

requires that the permittee demonstrate an assured, feasible, and demonstrably available alternative water supply during drought in order to be permitted for additional groundwater use from the Barton Springs aquifer during non-drought. To the extent that less groundwater is made available during extreme drought by additional regulatory actions, authorized groundwater use and supplies will decrease, but springflow and therefore downstream surface water flows in the Colorado River system will be increased by an equivalent amount.

The Lower Colorado River Authority (LCRA), the City of Austin (COA), and the Guadalupe-Blanco River Authority (GBRA) provide surface water to parts of the District. The District is coordinating with these entities to serve as alternative water suppliers to existing groundwater permittees, especially during extreme drought, by encouraging the establishment of contractual service extensions and emergency interconnects during such groundwater droughts. The District has a goal of preserving any groundwater demand reductions accomplished through such means, such that additional environmental flows and a minimum flow of 6.5 cfs (the drought DFC) are available at Barton Springs during a DOR recurrence, and consequently additional surface water would be available in the Colorado River at Austin to offset the substituted surface water.

The District is partnering and cooperating with the LCRA and the COA in various water conservation educational programs and events (e.g., the Water IQ program).

Region L

A small geographic part of the District, viz., the uppermost part of the Plum Creek watershed in the Guadalupe River basin, lies in State Water Planning Region L (South Central Texas Region), rather than in the Colorado River basin and Region K. However, some of the District's larger permittees provide water supplies to this part of the District, which has been undergoing tremendous growth, as depicted in the preceding Figure II-3. In addition, another large permittee, the City of Kyle, which also is a burgeoning growth area, imports Barton Springs aquifer water to satisfy part of its demand, which is located entirely in Region L. However, the water supply for the service areas of these permittees has been allocated between Region K and Region L by TWDB on the basis of the location of the source wells and land area, not the population served. For planning purposes, TWDB has projected that the District will provide only about 307 acre-feet annually of Edwards groundwater, plus about 654 acre-feet of Trinity groundwater (although this latter figure is more uncertain because of its depth and likely higher salinity), to satisfy the water demand in Region L during a DOR recurrence. These groundwater volumes supplied by the District to Region L are much smaller than in the prior plan, and in fact much smaller than the demand already being served. However, again, in terms of planning to meet overall regional demand, the difference in supplies from one plan to the next is very small.

Interestingly, water demand located in the District in Region L that is satisfied by Edwards Aquifer groundwater affects the surface water supplies of Region K by modifying the discharges at Barton Springs, tributary to the Colorado River. So, to the extent that GBRA water substitutes for Edwards groundwater during extreme drought, as described above, that substitution comprises a *de facto* inter-basin transfer of water from Region L to Region K. Currently, the volume of such transfers, which are just now being established institutionally and would only occur during extreme drought (including the DOR), would be negligibly small; but over time, such transfers could increase to an indeterminate degree.

Other Resource Management Agencies

While not strictly a water management entity, the US Fish and Wildlife Service (USFWS) will likely be issuing a federal Endangered Species Act Section 10(a) permit to the District during the term of this *Plan*. This permit authorizes the specific groundwater management planning and associated measures used by the District to protect the endangered species that use the natural outflows of the Edwards Aquifer at Barton Springs as key habitat. Changes in the groundwater management measures used by the District must not only be consistent with the prevailing *Plan* but also potentially must be authorized by USFWS via a change to the Section 10(a) permit.

IV.B. COORDINATION WITH REGIONAL GROUNDWATER MANAGEMENT ENTITIES

1. Joint Regional Groundwater Planning

The District participates in and contributes to the joint regional planning being conducted by Groundwater Management Areas (GMAs) 9 and 10, as authorized and required by Texas Water Code §36.108. Figure IV-1 is a map that shows the spatial relationship of the District with these two GMAs. The purpose of this recurring joint planning is to develop and revise, as necessary, feasible Desired Future Conditions (DFCs) for all aquifers being managed by the groundwater conservation districts (GCDs) in the GMA; these represent consensus views of what characteristics are intended that the aquifers should have during and/or at the end of the 50-year planning term. TWDB in turn then converts those DFCs to estimates of the Modeled Available Groundwater (MAG), which comprise the approved volumetric basis for regional water planning, and constitute one of the important considerations in groundwater permitting and related regulatory programs for the GCDs.

GMA 9 focuses on the Trinity Aquifer, especially in the Hill Country Priority Groundwater Management Area (PGMA), but includes other minor aquifers in the GMA. GMA 10 focuses on the Edwards Aquifer, but includes other major and minor aquifers within its geographic boundaries. For the District, the Trinity Aquifers in both GMAs and the Edwards Aquifers, both its freshwater and saline-water zones, in GMA 10 are of regulatory interest and are therefore included in the joint planning.

The joint planning process has now produced the initial set of DFCs that are applicable to and relevant for the District, and the TWDB has estimated the corresponding MAGs for the District that now form key considerations in its permitting programs. The current DFCs and MAGs applicable to the District and the initial planned approach to monitoring the DFCs to demonstrate compliance are shown in Table IV-2. This *Plan* has regulatory, educational, and scientific programs that are consistent with achieving and/or maintaining these DFCs during the term of the *Plan*.

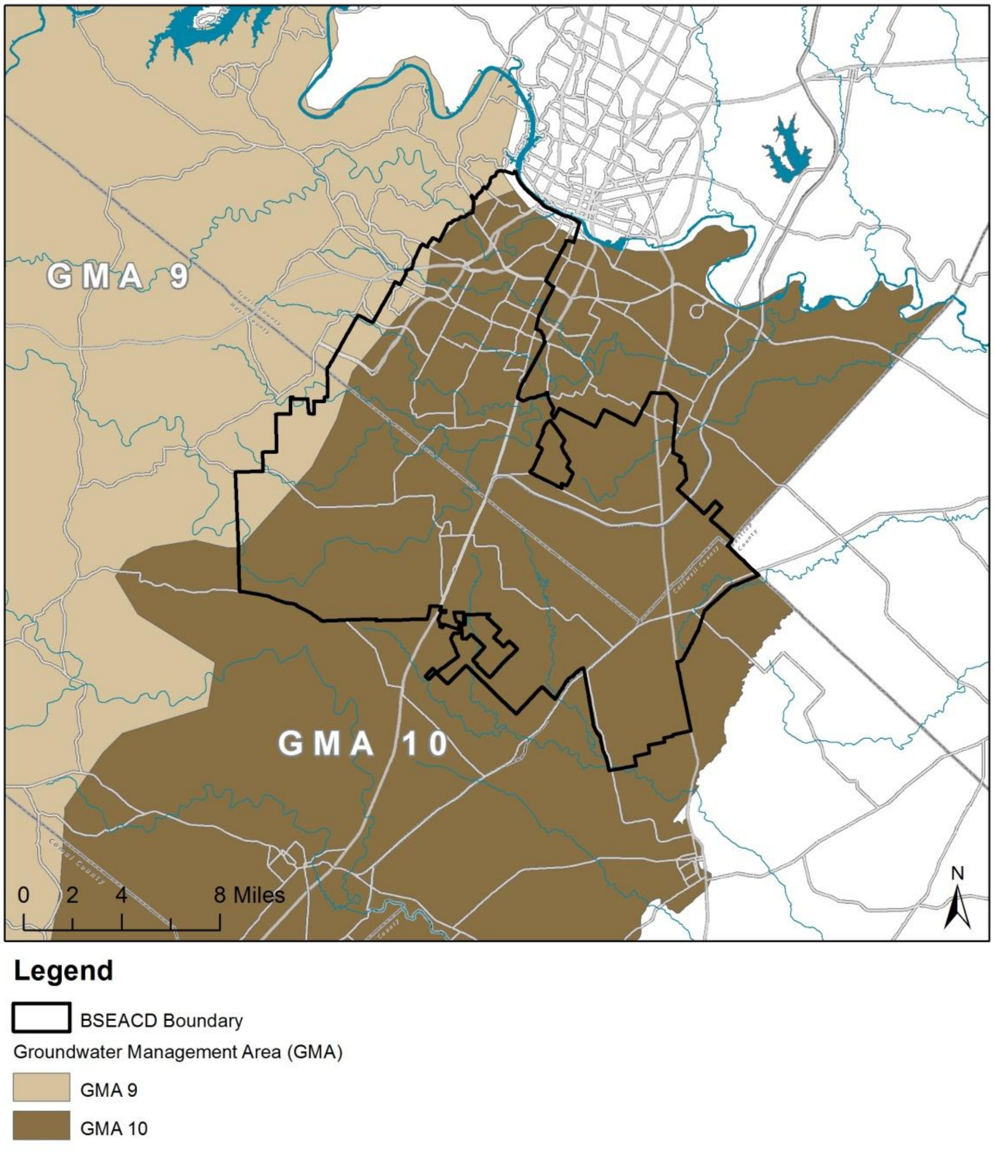

FIGURE IV-1: GROUNDWATER MANAGEMENT AREAS
The District participates in Edwards Aquifer joint planning efforts with other groundwater planning efforts in GMA 9 and GMA 10.

Table IV-2. DFCs and MAGs Applicable to BSEACD in 2012

GMA	Aquifer	Adopted DFC Applicable to BSEACD	MAG in BSEACD	Initial Approach to Monitoring	Comments
GMA 10 (Northern Subdivision)	Freshwater Edwards	The seven-year average springflow of Barton Springs shall not be less than 49.7 cfs during average recharge conditions.	16.0 cfs (monthly average)	Annual computation of 84-month rolling average of gaged springflow.	"Upper DFC" prevents unacceptably high acceleration into drought.
GMA 10 (Northern Subdivision)	Freshwater Edwards	During… a recurrence of the 1950s' drought of record, monthly average springflow at Barton Springs shall not be less than 6.5 cfs.	5.2 cfs (monthly average)	Monthly average of gaged daily springflow during extreme drought; at other times, average springflow not less than 5.2 cfs.	Extreme Drought DFC protects endangered species and well users in western part of district.
GMA 10 (Northern Subdivision)	Saline Edwards	Saline production shall produce no more than 5 feet of drawdown at any one point on the fresh-saline interface, and no more than an average 25 feet of drawdown along the interface.	523 acre-feet annually	Drawdown measured in multi-port well near TDS in comparison to modeled drawdown at that point and that produces five feet of drawdown at the interface.	Initial DFC is believed to be extraordinarily conservative.
GMA 10	Trinity (Undifferentiated)	Regional average well drawdown during average recharge conditions does not exceed 25 feet.	1,288 acre-feet annually	Computation of average areal difference in potentiometric surfaces with and without actual pumping in the District.	Initial DFC is believed to be very conservative.

GMA 9	Trinity (Undifferentiated)	Allow for increase in GMA-average drawdown of 30 feet through 2060, consistent with Scenario 6 of TWDB GAM Task 10-005.	Not estimated; equal to exempt use	Confirm location of new non-exempt wells as not being in GMA 9.	GMA 9 part of District is very small.

2. Coordination with Adjacent GCDs

The District enjoys "special" working relationships with adjoining GCDs, viz., the Edwards Aquifer Authority (EAA), Plum Creek CD, and Hays Trinity GCD, as shown earlier in Figure I-2. With EAA, District staff members regularly share information and cooperate with their EAA counterparts on hydrogeological and other technical matters, including serving as members of various advisory groups; in addition, the District and EAA coordinate on supporting or opposing legislative initiatives that would have shared outcomes for both entities. Plum Creek CD and the District have some substantial areas of overlapping jurisdictions, arising from differences in how the two GCDs were originally defined; the District is discussing with PCCD some joint special projects to benefit shared constituents in that area. The District also from time to time provides technical, administrative, and programmatic support to Hays Trinity GCD, which is severely resource-constrained by its enabling legislation; much of the jurisdiction of the Hays Trinity GCD is in the contributing zone of the Barton Springs aquifer and the recharge zone of the District's Trinity aquifers.

3. Coordination with Other Regional and Statewide GCDs

The District is a member and takes a leadership role in the Texas Alliance of Groundwater Districts (TAGD), a state-wide association that promotes and supports sound management of groundwater resources in the state on the basis of local conditions and good science. It is an educational and a shared-experience vehicle that helps GCDs be efficient in local operations, knowledgeable of new technical information and changing statutory and regulatory imperatives, informative to the public and key institutions, and perceptive of bigger-picture issues and challenges beyond their local jurisdictional areas.

The District is also a member and active participant in several other local, regional, and statewide associations, including the Austin Geological Society, Texas Water Conservation Association, Texas Rural Water Association, and the Texas Groundwater Districts Association.

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