SUTTON COUNTY UNDERGROUND WATER CONSERVATION DISTRICT

MANAGEMENT PLAN

2014 - 2019

Adopted:

November 12, 2013

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Sutton County Underground Water Conservation District

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MANAGEMENT PLAN

MISSION STATEMENT

The Sutton County Underground Water Conservation District (the District) was created by the 69th Texas Legislature (1985) under the authority of Section 59, Article XVI, of the Texas Constitution, and in accordance with Chapter 51 and 52 of the Texas Water Code. Note, in 1995, by Acts of the 74th Legislature, Chapter 52 of the Texas Water Code was repealed and replaced with Chapter 36 of the Texas Water Code effective September 1, 1995.

The District, a local government agency, provides for the conservation, preservation, protection, recharge and prevention of waste of the underground water reservoir, Edwards-Trinity (Plateau) Aquifer, located under the District; by consistently adhering to Chapter 36 of the Texas Water Code (TWC). The District conducts administrative and technical activities and programs to achieve these purposes by collecting, archiving water well and aquifer data, regulating water well drilling and production of permitted, non-exempt wells, promoting the capping or plugging of abandoned wells, providing information and educational material to local property owners, interacting with other governmental or organizational entities, and undertaking other groundwater-related activities that may help meet the purposes of the District. The District also strives to maintain groundwater ownership and rights of the landowners as provided in the TWC §36.002. Note: The District is drafting new rules, which are planned for implementation mid-2014.

TIME PERIOD FOR THIS PLAN

This plan becomes effective upon adoption by the Board of Directors and approval by the Texas Water Development Board executive administrator. This new plan remains in effect for a ten-year period or until a revised plan is approved, whichever is earlier.

STATEMENT OF GUIDING PRINCIPLES

Due to the negligible amount of surface water in Sutton County, the population depends primarily on groundwater resources. This vital water supply sustains the local economy and environment and therefore the protection and conservation of groundwater is of utmost importance to the District. The entire regional area is impacted by the local management of this resource, making its prudent management even more essential. The District places a high priority on the right of ownership of groundwater and believes cost-effective and judicious management of this precious commodity is best served by a locally-elected board. The

understanding of local conditions promotes the most responsible management of groundwater resources in the District.

REGIONAL COOPERATION AND COORDINATION

West Texas Regional Groundwater Alliance

The District is a member of the West Texas Regional Groundwater Alliance (WTRGA), a group of groundwater districts with common objectives regarding the management of groundwater in the Edwards-Trinity (Plateau) Aquifer. In 1988, four groundwater conservation districts, Coke County UWCD, Glasscock County UWCD, Irion County WCD and Sterling County UWCD signed the original Cooperative Agreement and as new districts were created, they too joined the Alliance. In the fall of 1996, the original Cooperative Agreement was redrafted and the West Texas Regional Groundwater Alliance was created. The WTRGA consists of seventeen locally-created and locally-funded groundwater conservation districts that encompass approximately 18.2 million acres or 28,368 miles of West Texas. Due to the diversity of the region, each member district provides its own unique programs to best serve its constituents. The current member districts are:

Coke County UWCD	Crockett County GCD
Glasscock GCD	Hickory UWCD#1
Hill Country UWCD	Irion County WCD
Kimble County GCD	Lipan-Kickapoo WCD
Lone Wolf GCD	Menard County UWD
Middle Pecos GCD	Permian Basin UWCD
Plateau UWC & SD	Santa Rita UWCD
Sterling County UWCD	Sutton County UWCD
Wes-Tex GCD	

This Alliance was created to implement the local districts' common objectives to facilitate the conservation, preservation and beneficial use of water and related resources. Local districts monitor water-related activities of the State's largest industries such as farming & ranching, oil and gas and municipalities. The Alliance provides coordination essential to the activities of these member districts as they strive to accomplish their objectives.

West Texas Weather Modification Association

In 1996, the West Texas Weather Modification Association (WTWMA) was formed for the purpose of providing weather modification for rainfall enhancement and aquifer recharge. The target area of WTWMA includes 6.4 million acres or 10,000 square miles. The District has participated in WTWMA since 1996. Currents members include:

City of San Angelo	Crockett County GCD
Glasscock GCD	Irion County WCD
Plateau UWC & SD	Santa Rita UWCD
Sterling County UWCD	Sutton County UWCD

MANAGEMENT OF GROUNDWATER SUPPLIES

The District monitors and evaluates groundwater conditions, regulates production and the transport of groundwater out of the District consistent with this plan, the District Rules and TWC Chapter 36. Production is regulated as needed to conserve groundwater, and protect groundwater users, while not unnecessarily or adversely limit production or impact the economic viability of the public, landowners and private groundwater users. In consideration of the importance of groundwater to the economy and culture of the District, the District identifies and engages in activities and practices that permit groundwater production and, as appropriate, protects the aquifer and groundwater in accordance with this Management Plan and the District's rules. A monitoring well network is maintained to monitor aquifer conditions within the District. The District makes a regular assessment of water supply and groundwater storage conditions and reports those conditions as appropriate in public meetings of the Board or public announcements. The District undertakes investigations, and co-operates with third-party investigations, of the groundwater resources within the District, and the results of the investigations are made available to the public when presented at a meeting of the Board.

The District adopts rules to regulate groundwater withdrawals by means of well spacing and production limits as appropriate to implement this Plan. In making a determination to grant a permit or limit groundwater withdrawals, the District considers the available evidence and, as appropriate and applicable, weigh the public benefit against the individual needs and hardship.

The factors that the District may consider in making a determination to grant a drilling, or operating permit, or limit groundwater withdrawals include:

1. The purpose of the rules of the District;
2. The equitable distribution of the resource;
3. The economic hardship resulting from grant or denial of a permit, or the terms prescribed by the permit;
4. This Management Plan and Desired Future Conditions of the District as adopted in Joint Planning under TWC § 36.108; and
5. The potential effect the permit may have on the aquifer, and groundwater users.

In pursuit of the District's mission of protecting the groundwater resources, the District may require adjustment of groundwater withdrawals in accordance with the Rules and Management Plan. To achieve this purpose, the District may, at the Board's discretion after notice and hearing, amend or revoke any permit for non-compliance, or reduce the production authorized by permit for the purpose of protecting the aquifer and groundwater availability. The determination to seek the amendment of a permit will be based on aquifer conditions observed by the District as stated in the District's rules. The determination to seek revocation of a permit will be based on compliance and non-compliance with the District's rules and regulations. The District will enforce the terms and conditions of permits and the rules of the District, as necessary, by fine and enjoining the permit holder in a court of competent jurisdiction as provided for in TWC § 36.102. The District adopted a drought contingency plan (DCP), see Appendix 4.0 for managing

groundwater resources when collected data indicates water levels are dropping. The DCP contains water level trigger points associated with a drought index well that is sited on the north end of the Sonora Golf Course. These trigger points invoke certain actions in the DCP as conditions worsen, and conversely as they improve.

The District uses reasonable and necessary technical resources at its disposal to evaluate the groundwater resources available within the District and determines the effectiveness of regulatory or conservation measures. A public or private user may appeal to the Board for discretion in enforcement of the provisions contained in the DCP on grounds of adverse economic hardship or unique local conditions. The exercise of discretion by the Board shall not be construed as limiting the power of the Board.

The District is expanding its research program to include aquifer dye testing to better understand the dynamics of the karst aquifer it's responsible for managing. As the District performs these tests it can better administer, protect, and maintain the quality of water in the aquifer. By knowing the characteristics of the aquifer regarding transmissivity, storage, and flow times the District can develop rules that ensure the safety and quality of the aquifer.

GENERAL DESCRIPTION OF THE DISTRICT

History

The Sutton County Underground Water Conservation District was created by the Acts of the Texas Legislature in 1985. The District was created to provide for the conservation, preservation, protection, recharge and prevention of waste of the underground water located under the District. The District encompasses all of Sutton County and is governed by a five-member locally-elected board of directors. The board includes four members from individual precincts and one at-large member; with elections being held every two years. Sutton County's economy is primarily based on agriculture, oil and gas, tourism, and recreational hunting.

The District lies within the Edwards Plateau and consists of approximately 929,920 acres in Sutton County, Texas. Sonora is the county seat and the only city in the county. The population of Sutton County was approximately 4,128 in 2010. Sutton County is bordered by Schleicher County to the north, Kimble County to the east, Edwards and Val Verde Counties to the south and Crockett County to the west.

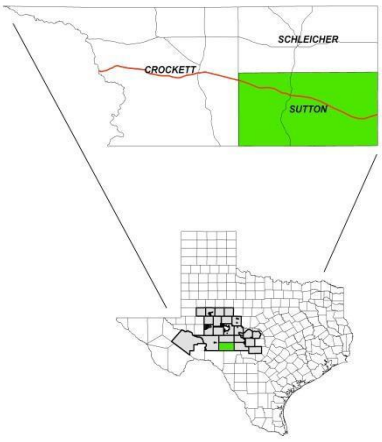


Figure 1 Location of Sutton County in Central West Texas

Topography and Drainage

The land is generally rolling to stony, flat topped hills with elevations from 1,900 to 2,500 feet. The District is included in two different river basins, the Colorado and the Rio Grande. The western half of the county slopes southwestward into the Devils River. The eastern half drains to the North Llano River and a small portion drains northeastward to the San Saba River.

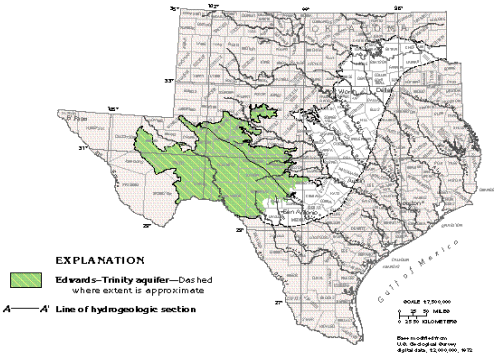
GROUNDWATER RESOURCES - Central Edwards Plateau (Plateau) Geology

The underlying Paleozoic rocks provide a relatively impermeable base for much of the Edwards-Trinity (Plateau) Aquifer (Barker and Ardis, 1992). In the north, the Edwards-Trinity (Plateau) Aquifer overlies Late Triassic age rocks of the Dockum Group (Figure 5-5). The Dockum Group consists of the Santa Rosa, Tecovas, Trujillo, and Cooper Canyon formations that form the Dockum Aquifer (Bradley and Kalaswad, 2003). Hydraulic communication between the Dockum Aquifer and the Trinity hydrostratigraphic unit of the Edwards-Trinity (Plateau) Aquifer is insignificant except where the Trinity Group lies directly over the Santa Rosa Formation (Walker, 1979).

The Trinity hydrostratigraphic unit is composed of the Trinity Group, which consists of the Basal Cretaceous Sand, the Glen Rose Limestone, the Antlers Sand, and the Maxon Sand. The Basal Cretaceous and Maxon sands are sometimes grouped together and are laterally equivalent to the Antlers Sand (sometimes also referred to as Trinity Sands) in the northern plateau area where the Glen Rose Limestone is absent.

The Fredericksburg Group consists of the Fort Terrett Formation and the lower part of the Fort Lancaster Formation, the Devils River Formation within the Devils River Reef Trend, and the West Nueces and McKnight formations within the Maverick Basin. The Lower Washita Group is composed of the Fort Lancaster Formation, the Devils River Formation within the Devils River Reef Trend, and the McKnight and Salmon Peak formations within the Maverick Basin. Locally, these units are combined and referred to as the Edwards Group Limestones (Rose, 1972) and form the Edwards hydrostratigraphic unit of the Edwards-Trinity (Plateau) Aquifer.

The Upper Cretaceous sediments include the uppermost section of the Washita Group sediments (Del Rio Clay and the Buda Limestone). The Boquillas Formation of the Eagle Ford Group and the Austin Chalk Formation of the Austin Group sediments are present only within Val Verde and Terrell counties. The Upper Cretaceous sediments are generally considered confining units to the underlying Edwards hydrostratigraphic unit of the Edwards-Trinity (Plateau) Aquifer.



Modified from Barker, R.A., Bush, P.W., and Baker, E.T., Jr., 1994, Geologic history and hydrogeologic setting of the Edwards–Trinity aquifer system, west-central Texas: U.S. Geological Survey Water-Resources Investigations Report 94–4039, 50 p.

Figure 2 Location of the Edwards-Trinity (Plateau) Aquifer

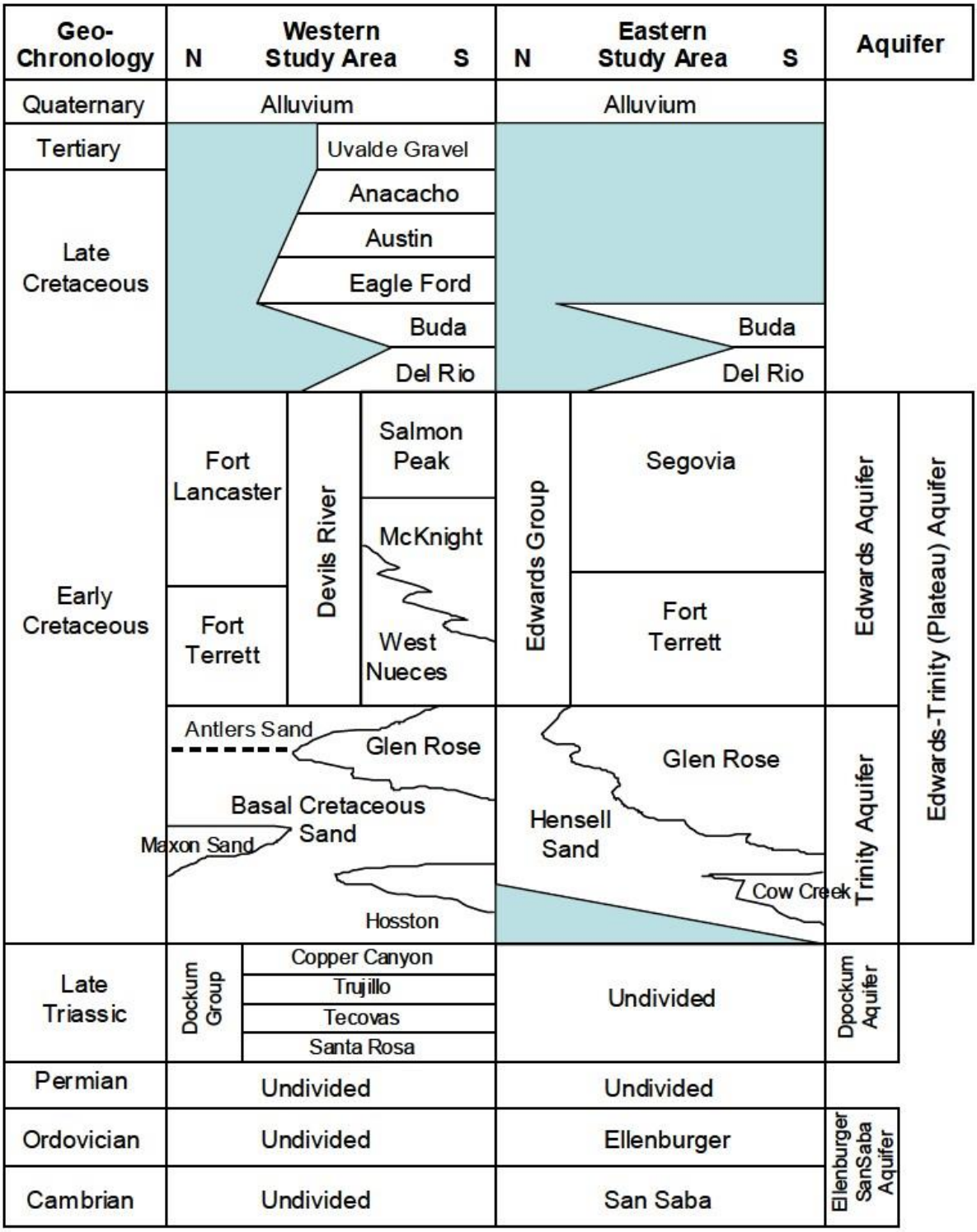


Figure 3 Stratigraphy of the Edwards-Trinity (Plateau) Aquifer around the Sutton County UWCD

ESTIMATED AVAILABLE GROUNDWATER

On September 1, 2005 House Bill (HB) 1763 passed by the 79th Legislature became effective and incorporated into Chapter 36 of the Texas Water Code. This Bill regionalizes decisions of groundwater availability, requires regional water planning groups to use groundwater availability numbers, "desired future conditions (DFC)," from ground water conservation districts, and defines a permitting target for groundwater production, "managed available groundwater (MAG)." Groundwater conservation districts, in accordance with HB-1763 must establish their respective DFCs of how their aquifer will be managed for 50 years, starting in 2010 through 2060. The DFC can include, but not limited to: 1.) Water levels do not decline more than 100' in 50 years; 2.) Water quality is not degraded below 1000 milligrams per liter of dissolved solids for 50 years; 3.) Spring flow is not allowed to fall below 10 cubic feet per second in times during drought of record for perpetuity; or 4.) 50 percent of the water in storage will be available in 50 years. The DFCs are presented by Districts to the members of their respective Groundwater Management Area (GMA) group for approval. Once approved the GMA sends them to the Texas Water Development Board for review, approval and integration into the MAG for each District and respective GMA. The MAG is a computer modeling program operated by the TWDB that integrates the DFCs into the model to be used by water planners for the next 50 years. As water districts collect new data the DFCs are updated at least on a five year basis, submitted to the TWDB to update the MAG.

DESIRED FUTURE CONDITIONS (DFC)

Technical District Information Required by Texas Administrative Code Estimate of Modeled Available Groundwater in District Based on Desired Future Conditions

TWC § 36.001 defines modeled available groundwater as "the amount of water that the executive administrator determines may be produced on an average annual basis to achieve a desired future condition established under Section 36.108".

The joint planning process set forth in TWC § 36.108 must be collectively conducted by all groundwater conservation districts within the same GMA. The District is a member of GMA 7, which along with the other districts in the GMA did establish a comprehensive DFC. Appendix 1.1 contains the GAM run [GAM Run: 10.043 MAG (Version 2)] used to establish the DFC of 7 feet of drawdown or 449,400 acre-feet per year from 2010 to 2060, the MAG for each county is listed in Table 7 of this report for GMA-7.

In Appendix 2.0 the District established its own DFC based on the report "Investigating the Water Resources of the Western Edwards-Trinity Aquifer;" prepared by Dr. Ronald T. Green and F. Paul Bertetti from Southwest Research Institute (SwRI). The District used information in this report and local economic factors to establish its MAG.

Table 1
Groundwater Availability in Sutton County[i]

River Basin	Aquifer	Annual Recharge During Drought* (acre-feet)	Supply From Storage (acre-feet)	Annual Availability (acre-feet)
Colorado	Edwards-Trinity	9,349	0	9,349
Rio Grande	Edwards-Trinity	11,426	0	11,426
Total		20,775		20,775

* Drought recharge equals one half of average annual recharge.

The District continues to gather data and perform research in order to obtain more accurate recharge and storage estimates.

ANNUAL AMOUNT OF RECHARGE FROM PRECIPITATION.[ii]

The estimated annual amount of recharge from precipitation to the District into the Edwards Group is 27,165 acre-feet.

ANNUAL VOLUME OF WATER THAT DISCHARGES FROM THE AQUIFER TO SPRINGS AND SURFACE WATER BODIES[iii]

The estimated annual volume of water that discharges from the Edwards Group to springs, streams and rivers is 26,288 acre-feet.

ANNUAL VOLUME OF FLOW INTO THE DISTRICT[iv]

The estimated annual volume of flow into the District within the Edwards Group is 25,022 acre-feet.

ANNUAL VOLUME OF FLOW OUT OF THE DISTRICT[v]

The estimated annual volume of flow out of the District within the Edwards Group is 26,205 acre feet.

ESTIMATED VOLUME OF FLOW BETWEEN AQUIFERS[vi]

Not applicable

SURFACE WATER RESOURCES

There are no surface water management entities in Sutton County and little surface water within the District with the exception of the North Llano River which heads a few miles from the eastern edge of Sutton County. Referring to the map below, for illustration, which compares the size of the watersheds for the North Llano (942 square miles) and the South Llano (939 square miles) as almost equal, yet exhibit very different hydrologic characteristics. The mean annual flow of the North Llano River is 66 cubic feet per second (cfs), while the mean annual flow of the South Llano River is 129 cfs. The median daily flow for the North Llano River is 20 cfs, while the median daily flow for the South Llano River is 80 cfs. The principle reason for such a difference results from greater springflow in the South Llano River watershed. Thus, surface water in the District is insignificant.

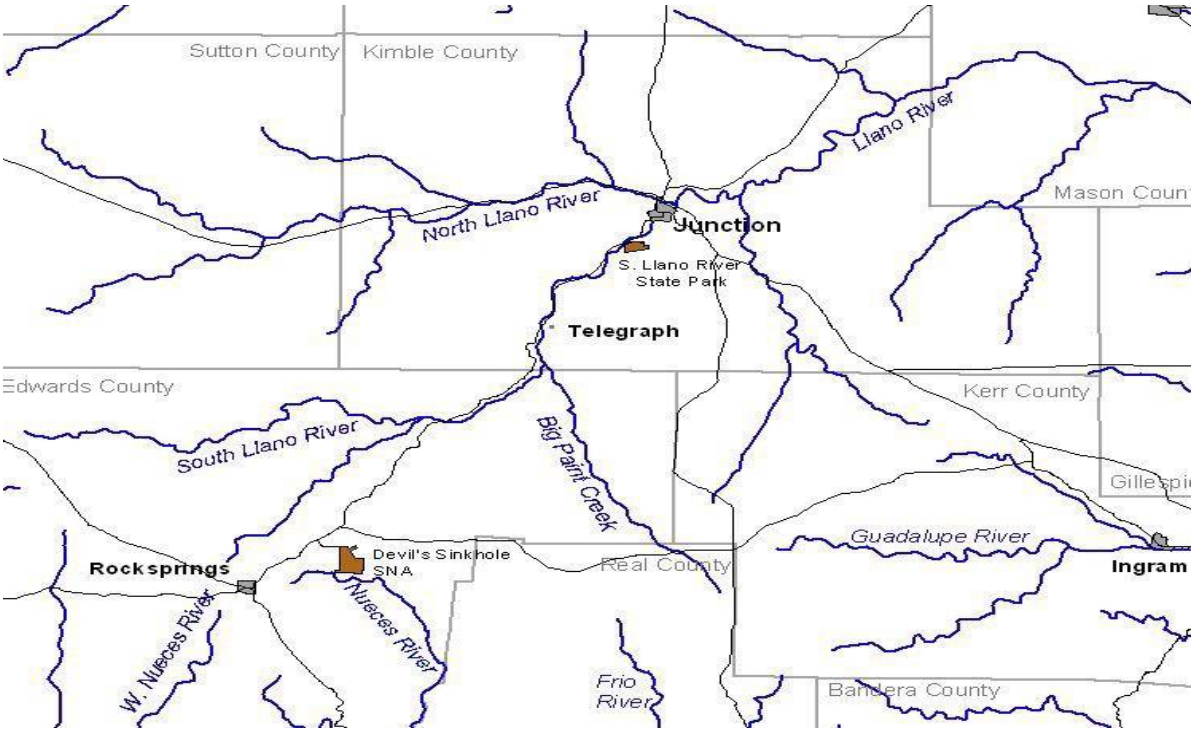


Figure 4 Map of the North and South Llano Rivers and surrounding areas

Table 2

Projected Surface Water Supplies
TWDB 2012 State Water Plan Data

SUTTON COUNTY *99.80 % (multiplier)* All values are in acre-feet/year

RWPG	WUG	WUG Basin	Source Name	2010	2020	2030	2040	2050	2060
F	IRRIGATION	COLORADO	N LLANO RIVER COMBINED RUN-OF-RIVER IRRIGATION	8	8	8	8	8	8
F	LIVESTOCK	COLORADO	LIVESTOCK LOCAL SUPPLY	46	46	46	46	46	46
F	LIVESTOCK	RIO GRANDE	LIVESTOCK LOCAL SUPPLY	57	57	57	57	57	57
	Sum of Projected Surface Water Supplies (acre-feet/year)			**111**	**111**	**111**	**111**	**111**	**111**

Table 3

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

Groundwater historical use estimates are currently unavailable for calendar years 2005, 2011 and 2012. TWDB staff anticipates the calculation and posting of these estimates at a later date.

SUTTON COUNTY *99.80 % (multiplier)* All values are in acre-feet/year

Year	Source	Municipal	Manufacturing	Steam Electric	Irrigation	Mining	Livestock	Total
1974	GW	993	0	0	1,506	168	1,138	3,805
1980	GW	1,697	0	0	1,347	11	737	3,792
1984	GW	1,569	0	0	792	78	455	2,894
1985	GW	1,393	0	0	1,272	78	501	3,244
1986	GW	1,288	0	0	1,018	32	446	2,784
1987	GW	1,049	0	0	1,018	62	559	2,688
1988	GW	1,139	0	0	1,018	69	596	2,822
1989	GW	1,322	0	0	795	38	591	2,746
1990	GW	1,173	0	0	769	38	589	2,569
1991	GW	1,200	0	0	769	73	622	2,664
1992	GW	1,162	0	0	769	77	459	2,467
1993	GW	1,184	0	0	1,250	77	479	2,990
1994	GW	1,154	0	0	1,304	75	499	3,032
1995	GW	1,283	0	0	1,226	75	501	3,085
1996	GW	1,413	0	0	1,782	75	379	3,649
1997	GW	1,414	0	0	1,782	75	415	3,686
1998	GW	1,260	0	0	269	75	391	1,995
1999	GW	1,401	0	0	1,782	75	428	3,686
2000	GW	1,382	0	0	1,470	75	439	3,366
2001	GW	1,279	0	0	1,323	39	208	2,849
2002	GW	1,244	0	0	1,323	50	188	2,805
2003	GW	1,252	0	0	347	55	150	1,804
2004	GW	1,059	0	0	347	55	141	1,602
2006	GW	1,108	0	0	1,674	0	362	3,144
2007	GW	914	0	0	1,834	0	394	3,142
2008	GW	1,139	0	0	407	0	468	2,014
2009	GW	889	0	0	676	157	457	2,179
2010	GW	927	0	0	1,141	151	476	2,695

PROJECTED TOTAL WATER DEMAND

Sutton County's population is projected to increase by approximately 5.2% between 2010 and 2060, according to the Region F Regional Water Plan[vii]. Based on estimated projections, water demands will increase proportionately into the year 2060, at which point the total demand for Sutton County will be approximately 4,015 acre-feet.

Table 4

Projected Water Demands
TWDB 2012 State Water Plan Data

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

SUTTON COUNTY *99.80 % (multiplier)* All values are in acre-feet/year

RWPG	WUG	WUG Basin	2010	2020	2030	2040	2050	2060
F	COUNTY-OTHER	COLORADO	54	56	56	55	54	54
F	MINING	COLORADO	35	35	36	36	37	37
F	IRRIGATION	COLORADO	560	550	539	529	517	506
F	LIVESTOCK	COLORADO	357	357	357	357	357	357
F	SONORA	RIO GRANDE	1,195	1,252	1,252	1,236	1,235	1,222
F	COUNTY-OTHER	RIO GRANDE	223	232	231	226	225	223
F	MINING	RIO GRANDE	45	47	47	48	48	49
F	IRRIGATION	RIO GRANDE	1,248	1,224	1,200	1,176	1,153	1,130
F	LIVESTOCK	RIO GRANDE	437	437	437	437	437	437
	Sum of Projected Water Demands (acre-feet/year)		**4,154**	**4,190**	**4,155**	**4,100**	**4,063**	**4,015**

WATER SUPPLY NEEDS

Current estimates of supply and demand indicate a projected surplus for irrigation and for the City of Sonora, the only municipality in the District.

Table 5

Projected Water Supply Needs
TWDB 2012 State Water Plan Data

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

SUTTON COUNTY All values are in acre-feet/year

RWPG	WUG	WUG Basin	2010	2020	2030	2040	2050	2060
F	COUNTY-OTHER	COLORADO	0	0	0	0	0	0
F	COUNTY-OTHER	RIO GRANDE	0	0	0	0	0	0
F	IRRIGATION	COLORADO	1	11	22	32	44	55
F	IRRIGATION	RIO GRANDE	0	6	30	54	77	100
F	LIVESTOCK	COLORADO	0	0	0	0	0	0
F	LIVESTOCK	RIO GRANDE	0	0	0	0	0	0
F	MINING	COLORADO	0	0	0	0	0	0
F	MINING	RIO GRANDE	0	0	0	0	0	0
F	SONORA	RIO GRANDE	724	667	667	683	684	697
	Sum of Projected Water Supply Needs (acre-feet/year)		**0**	**0**	**0**	**0**	**0**	**0**

WATER MANAGEMENT STRATEGIES

Water management strategies as designed in the Region F Regional Water Plan, 2012 consist of conservation in relation to irrigation techniques.

Table 6

Projected Water Management Strategies

TWDB 2012 State Water Plan Data

SUTTON COUNTY

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

Water Management Strategy	Source Name [Origin]	2010	2020	2030	2040	2050	2060
IRRIGATION, COLORADO (F)							
IRRIGATION CONSERVATION	CONSERVATION [SUTTON]	0	44	88	88	88	88
IRRIGATION, RIO GRANDE (F)							
IRRIGATION CONSERVATION	CONSERVATION [SUTTON]	0	98	196	196	196	196
Sum of Projected Water Management Strategies (acre-feet/year)		**0**	**142**	**284**	**284**	**284**	**284**

Preservation and protection of groundwater quantity and quality has been the guiding principle of the District since its creation. The goals and objectives of this plan provide guidance in the performance of existing District activities and practices. District rules address groundwater withdrawals by means of spacing and/or production limits, waste, and well drilling completion as well as capping and plugging of unused or abandoned wells. These rules are meant to provide equitable conservation and preservation of groundwater resources, protect vested property rights and prevent confiscation of property.

ACTIONS, PROCEDURES, PERFORMANCE AND AVOIDANCE FOR PLAN IMPLEMENTATION

The District will implement and utilize the provisions of this plan as a guide for determining the direction and/or priority for District activities. Operations of the District and all agreements entered into by the District will be consistent with the provisions of this plan.

The District has adopted rules for the management of groundwater resources and will amend those rules as necessary pursuant to TWC Chapter 36 and the provisions of this plan. Rules will be adhered to and enforced. The promulgation and enforcement of the rules will be based on the

best technical evidence available.

The District shall treat all residents with equality. Residents may apply to the District for discretion in enforcement of the rules on grounds of adverse economic effect or unique local character. In granting discretion to any rule, the Board shall consider the potential for adverse effect on adjacent landowners. The exercise of said discretion by the Board shall not be construed as limiting the power of the Board. The District will seek cooperation in the implementation of this plan and the management of groundwater supplies within the District.

METHODOLOGY FOR TRACKING PROGRESS

The methodology that the District will use to trace the progress in achieving the management goals as prescribed by TWC 36.1071(a) will be as follows:

> The District General Manager will prepare and present an annual report to the Board of Directors on District performance regarding management plan goals and objectives for the preceding fiscal year during the first meeting of each fiscal year. The annual report will be maintained at the District office.

GOALS, MANAGEMENT OBJECTIVES AND PERFORMANCE STANDARDS

The District recognizes the importance of public education to encourage efficient use, implement conservation practices, prevent waste, and preserve the integrity of groundwater. Since the District was formed in 1985, it has provided residents with materials, programs, water analysis, and other information when requested, including requests from the TWDB for water level and analysis data.

Goal 1.0 – Provide for the Efficient Use of Groundwater (36.1071(a)(1))

Management Objective
1.2 - Provide programs to improve public awareness of efficient use, wasteful practices and conservation measures.

Performance Standard
1.1a - Annual report to the Board of Directors on the number of programs provided.

Management Objective
1.2 - Each year the District will publish one article or newsletter on water conservation.

Performance Standard
1.2a - Annual report to the Board of Directors on the number of newsletters or articles published.

Goal 2.0 - Control and Prevent Waste of Groundwater (36.1071(a)(2))

Management Objective

2.1 – The District provides educational leadership to citizens within the District concerning this subject. The activity is accomplished annually through at least one printed publication, such as a brochure, and public speaking at service organizations and public school.

Performance Standard

The number of publications and speaking appearances given by the District annually are archived by year.

Goal 3.0 - Natural Resource Issues (36.1071(a)(5))

Management Objective

3.1 – Measure, monthly, the wells in the water level monitoring network within the District with steel tape, E-line, and download data from electronic sensors.

Performance Standard

3.1a – Report, monthly, to the Board of Directors the measurement of water levels from 31 wells monitored in the District's water level monitoring network. Use Surfer 10® to illustrate changes in the potentiometric surface of the aquifer under the District.

Management Objective

3.2. – Maintain a district-wide rainfall event network using voluntary monitors and automatic digital rainfall collectors to help evaluate recharge.

Performance Standard

3.2a – Report, monthly; to the Board of Directors rainfall totals collected from 31 automated rain gauges and ten Stratus Professional raingauge (Model RG202) located throughout Sonora, TX in the rainfall monitoring network. Rainfall measurements from the automated raingauges are taken monthly, at end of each quarter transferred to Excel files for analyses and archival. Measurements from the RG202 are taken after each rain event, recorded and totaled at end of each month. See comments at end of Goal 6.0 for information about the aquifer dye testing the District is conducting.

3.2b – Annually report to the Board of Directors the annual rainfall within the District.

Management Objective

3.3 – Annually sample 33% of the 60 operating monitor wells in the District's water quality monitoring network. The District is an active participant in the TWDB water quality program providing TWDB with water quality information each year.

Performance Standard
3.3a – Annually report to the Board of Directors the water quality from the wells sampled in the District's water quality monitoring network.

Goal 4.0 - Drought Conditions (36.1071(a)(6))

Management Objective
4.1 – The District has an approved Drought Contingency Plan compliant with TCEQ standards, it also has a drought index well with trigger levels referenced in the plan, see Appendix 4.0.

Performance Standard
4.1a – Water levels of monitored wells and Drought Index Well are reported monthly. If there are changes that warrant actions to restrict water usage the appropriate trigger in the plan is activated.

Goal 5.0 - Conservation and Precipitation Enhancement (36.1071(a)(7))

Management Objective - Conservation
5.1 – Provide and distribute literature on water conservation by publishing at least one newsletter or newspaper article annually.

Performance Standard
5.1a – Annual report to the Board of Directors listing the number of times newsletters or newspaper articles were published.

Management Objective - Precipitation Enhancement
5.2 The District participates in the West Texas Weather Modification Association.

Performance Standard
5.2a – Report monthly to the Board of Directors on West Texas Weather Modification Association activities.

5.2b – Provide West Texas Weather Modification Association Annual Report to the Board of Directors.

5.2c – Annually provide to the Board of Directors the number of meetings attended by District personnel.

Goal 6.0 – Addressing in a Quantitative Manner the Desired Future Conditions (DFC) of the Groundwater Resources (36.1071(a)(8))

The District covers part of the Edwards-Trinity (Plateau) Aquifer and is within Groundwater Management Area (GMA) 7. The Edwards-Trinity (Plateau) Aquifer is the largest aquifer not subdivided into multiple GMAs. The District initiated a study with

SwRI and funded by seven counties surrounding Sutton County including the City of Del Rio for a water budget analyses of the Edwards-Trinity Aquifer. This formed the basis of the DFC for Sutton County along with the GAM Run 043MAG (Version 2); please see Appendices 1.0 and 2.0. The District has an ongoing program using its drought contingency well and monitoring network of water wells to assess groundwater resources; then analyzing changes in the potentiometric surface of the aquifer.

In addition to measuring water levels in its monitor wells and rainfall measurements the District is performing the first aquifer dye test in the district and for the Edwards-Trinity (Plateau) aquifer. The district is acquiring experience, lab equipment, and assistance from various organizations to correctly interpret the data collected. This information will answer questions about transmissivity, flow patterns, and better management of spills if one were to occur in this karst aquifer. The initial test was started on July 18, 2013 water samples and charcoal bugs are deployed and collected weekly, data is still being obtained using a fluorescence spectrometer, it is anticipated that final results will be available by June 2014.

Goal 7.0 - Rainwater Harvesting (36.1071(a)(7))
The District, with the permission of the county commissioners, modified the rain guttering system on the Civic Center, installed four 3,000 gallon water tanks for a demonstration rain harvest system. It is the centerpiece for educating people on the potential for rain harvesting in this area, please see Appendix 3.0. Already area ranchers are constructing their own systems and one of the churches in Sonora constructed a 30,000 gallon system.

MANAGEMENT GOALS DETERMINED NOT-APPLICABLE

Goal 8.0 - Controlling and Preventing Subsidence (36.1071(a)(3))
The rigid geologic framework of the region precludes significant subsidence from occurring. This management goal is not applicable to the operations of the District.

Goal 9.0 - Conjunctive Surface Water Management Issues (36.1071(a)(4))
There are no surface water management entities within the District. This management goal is not applicable to the operations of the District.

Goal 10.0 - Recharge Enhancement (36.1071(a)(7))
The diverse topography and limited knowledge of any specific recharge sites makes any type of recharge enhancement project economically unfeasible. This management goal is not applicable to the operation of the District.

Goal 11.0 - Brush Control (36.1071(a)(7))
The District recognizes the benefits of brush control through increased spring flows and the enhancement of native turf which limits runoff. However, most brush control projects within the District are carried out and funded through the NRCS and ample educational material and programs on brush control are provided by the Texas Agrilife

Extension Service. This management goal is not applicable to the operations of the District.

DEFINITIONS AND CONCEPTS

"Board" - the Board of Directors of the Sutton County Underground Water Conservation District.

"District" – the Sutton County Underground Water Conservation District.

"Groundwater" - water percolating below the surface of the earth.

"Integrity" - the preservation of groundwater quality.

"MAG" – a computer modeling program operated by the TWDB that integrates the desired future conditions (DFCs) into the model to be used by water planners for the next 50 years. As water districts collect new data the DFCs are updated at least on a five year basis, submitted to the TWDB to update the MAG.

"Ownership" - pursuant to TWC Chapter 36, §36.002, means the recognition of the rights of the owners of the land pertaining to groundwater.

"Recharge" - amount of water that infiltrates to the water table of an aquifer.

"Surface Water Entity" - TWC Chapter 15 Entities with authority to store, take divert, or supply surface water for use within the boundaries of a district.

"TCEQ" - Texas Commission on Environmental Quality.

"TWDB" - Texas Water Development Board.

"Waste" - pursuant to TWC Chapter 36, §36.001(8), means any one or more of the following:

(1) withdrawal of groundwater from a groundwater reservoir at a rate and in an amount that causes or threatens to cause intrusion into the reservoir of water unsuitable for agricultural, gardening, domestic, or stock raising purposes;

(2) the flowing or producing of wells from a groundwater reservoir if the water produced is not used for a beneficial purpose;

(3) escape of groundwater from a groundwater reservoir to any other reservoir or geologic strata that does not contain groundwater;

(4) pollution or harmful alteration of groundwater in a groundwater reservoir by saltwater or by other deleterious matter admitted from another stratum or from the surface of the ground;

(5) willfully or negligently causing, suffering, or allowing groundwater to escape into any river, creek, natural watercourse, depression, lake, reservoir, drain, sewer, street, highway, road, or road ditch, or onto any land other than that of the owner of the well unless such discharge is authorized by permit, rule, or order issued by the commission under Chapter 26;

(6) groundwater pumped for irrigation that escapes as irrigation tailwater onto land other than that of the owner of the well unless permission has been granted by the occupant of the land receiving the discharge; or

(7) for water produced from an artesian well, "waste" has the meaning assigned by Section 11.205.

"Well" - an artificial excavation that is dug or drilled for the purpose of producing groundwater.

LIST OF REFERENCES

[i] Region F Regional Water Plan, January 2011, Table 3.1-1, Groundwater Availability in Region F.

[ii] GAM Run 13-005 by Radu Boghici, Texas Water Development Board, Groundwater Availability Modeling Section, July 3, 2013.

[iii] Ibid.

[iv] Ibid.

[v] Ibid.

[vi] Ibid.

[vii] Region F Regional Water Plan, January 2011, Table 2A-1, Population Projections for Region F.

APPENDIX 1.0

GAM RUN 10-043 MAG (VERSION 2):
Modeled Available Groundwater for the
Edwards-Trinity (Plateau), Trinity, and
Pecos Valley Aquifers
Groundwater Management Area - 7

GAM RUN 10-043 MAG (VERSION 2): MODELED AVAILABLE GROUNDWATER FOR THE EDWARDS-TRINITY (PLATEAU), TRINITY, AND PECOS VALLEY AQUIFERS IN GROUNDWATER MANAGEMENT AREA 7

by Jerry Shi, Ph.D., P.G.
Texas Water Development Board
Groundwater Resources Division
Groundwater Availability Modeling Section
(512) 463-5076
November 12, 2012

EXECUTIVE SUMMARY:

The modeled available groundwater values for Groundwater Management Area 7 for the Edwards-Trinity (Plateau), Trinity, and Pecos Valley aquifers are summarized in Table 1. These values are also listed by county (Table 2), river basin (Table 3), and regional water planning area (Table 3). The modeled available groundwater values for the relevant aquifers in Groundwater Management Area 7 were initially based on Scenario 10 of GAM Run 09-035. In GAM Run 09-035, the Edwards-Trinity (Plateau), Trinity, and Pecos Valley aquifers were simulated and reported together. Though the desired future condition statement, specifying an average drawdown of 7 feet, only explicitly references the Edwards-Trinity (Plateau) Aquifer, it is the intent of the districts to also incorporate the Trinity and Pecos Valley aquifers. This was confirmed by Ms. Caroline Runge of Menard Underground Water District acting on behalf of Groundwater Management Area 7 in an e-mail to Ms. Sarah Backhouse at the Texas Water Development Board on June 6, 2012. The results here, therefore, contain information for each of these three aquifers. The modeled available groundwater from the Edwards-Trinity (Plateau), Trinity, and Pecos Valley aquifers in Groundwater Management Area 7 that achieves the requested desired future conditions is approximately 449,400 acre-feet per year from 2010 to 2060.

Earlier draft versions of this report showed modeled available groundwater for portions of the Edwards-Trinity (Plateau) Aquifer within the Lipan-Kickapoo Water Conservation District, the Lone Wolf Groundwater Conservation District, the Hickory Underground Water Conservation District No. 1, and the portion of the Trinity Aquifer within the Uvalde Underground Water Conservation District. However, Groundwater Management Area 7 declared those counties "not relevant" for joint planning purposes. Since modeled available groundwater only applies to areas with a specified desired future condition, we updated this report to depict modeled available groundwater only in counties with specified desired future conditions.

METHODS, PARAMETERS AND ASSUMPTIONS:

The desired future condition for Kinney County was evaluated in a new model run (Shi and others, 2012). The new model run is an update of Scenario 3 of Groundwater Availability Modeling (GAM) Task 10-027 (Hutchison, 2010a). Both model runs were based on the MODFLOW-2000 model developed by the TWDB to assist with the joint planning process regarding the Kinney County Groundwater Conservation District (Hutchison and others, 2011b). In both model runs, the total pumping in Kinney County, which lies within Groundwater Management Areas 7 and 10, was maintained at approximately 77,000 acre-feet per year to achieve the desired future conditions at Las Moras Springs. Details regarding this new model run are summarized in Shi and others (2012).

The desired future condition for the remaining areas in Groundwater Management Area 7 was based on Scenario 10 of GAM Run 09-035 using a MODFLOW-2000 model developed by the TWDB (Hutchison and others, 2011a). Details regarding this scenario can be found in Hutchison (2010b). In GAM Run 09-035, the Edwards-Trinity (Plateau), Trinity, Pecos Valley, and Trinity aquifers were simulated and reported together. The desired future condition statement specifying of an average drawdown of 7 feet, which is achieved in the above simulation, only explicitly references the Edwards-Trinity (Plateau) Aquifer. By stating that the above simulation is "incorporated in its entirety" into the resolution, it is the intent of the districts to also incorporate the Trinity and Pecos Valley aquifers. The results below, therefore, contain information on the Trinity and Pecos Valley aquifers in addition to the Edwards-Trinity (Plateau) Aquifer. This interpretation has been confirmed by Ms. Caroline Runge on behalf of Groundwater Management Area 7 to Ms. Sarah Backhouse at the Texas Water Development Board.

The locations of the Edwards-Trinity (Plateau), Trinity, and Pecos Valley aquifers are shown in Figure 1.

RESULTS:

The modeled available groundwater values from aquifers in Groundwater Management Area 7 that achieve the desired future conditions is approximately 445,000 acre-feet per year for the Edwards-Trinity (Plateau) aquifer, 2,500 acre-feet per year for the Trinity Aquifer, and 1,600 acre-feet per year for the Pecos Valley Aquifer (Tables 1, 2, and 3). These tables contain the modeled available groundwater for the aquifers subdivided by county, regional water planning area, and river basin for use in the regional water planning process. These areas are shown in Figure 2.

Tables 4, 5, and 6 show the modeled available groundwater for the Edwards-Trinity (Plateau), Trinity, and Pecos Valley aquifers summarized by county, regional water planning area, and river basin, respectively, within Groundwater Management Area 7.

The modeled available groundwater for the aquifers within and outside the groundwater conservation districts in Groundwater Management Area 7 where they were determined to be relevant for the purposes of joint planning are presented in Table 7. As shown in Table 7, the modeled available groundwater within the groundwater conservation districts in Groundwater Management Area 7 is approximately 370,000 acre-feet per year from 2010 to 2060.

LIMITATIONS:

The groundwater model used in developing estimates of modeled available groundwater is the best available scientific tool that can be used to estimate the pumping that will achieve the desired future conditions. Although the groundwater model used in this analysis is the best available scientific tool for this purpose, it, like all models, has limitations. In reviewing the use of models in environmental regulatory decision-making, the National Research Council (2007) noted:

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

A key aspect of using the groundwater model to develop estimates of modeled available groundwater is the need to make assumptions about the location in the aquifer where future pumping will occur. As actual pumping changes in the future, it will be necessary to evaluate the amount of that pumping as well as its location in the context of the assumptions associated with this analysis. Evaluating the amount and location of future pumping is as important as evaluating the changes in groundwater levels, spring flows, and other metrics that describe the condition of the groundwater resources in the area that relate to the adopted desired future condition.

Given these limitations, users of this information are cautioned that the modeled available groundwater numbers should not be considered a definitive, permanent description of the amount of groundwater that can be pumped to meet the adopted desired future condition. Because the application of the groundwater model was designed to address regional scale questions, the results are most effective on a regional scale. Texas Water Development Board makes no warranties or representations relating to the actual conditions of any aquifer at a particular location or at a particular time.

It is important for groundwater conservation districts to monitor future groundwater pumping as well as whether or not they are achieving their desired future conditions. Because of the limitations of the groundwater model and the assumptions in this analysis, it is important that the groundwater conservation districts work with Texas Water Development Board to refine these modeled available groundwater numbers given the reality of how the aquifer responds to the actual amount and location of pumping now and in the future.

REFERENCES:

Hutchison, William R., 2010a, GAM Task 10-027: Texas Water Development Board, GAM Task 10-027 Report, 7 p.

Hutchison, William R., 2010b, GAM Run 09-035 (version 2): Texas Water Development Board, GAM Run 09-035 Report, 10 p.

Hutchison, William R., Jones, Ian, and Anaya, Roberto, 2011a, Update of the Groundwater Availability Model for the Edwards-Trinity (Plateau) and Pecos Valley Aquifers of Texas, Texas Water Development Board, 59 p.

Hutchison, William R., Shi, Jerry, and Jigmond, Marius, 2011b, Groundwater Flow Model of the Kinney County Area, Texas Water Development Board, 138 p.

Shi, Jerry, Ridgeway, Cindy, and French, Larry, 2012, Draft GAM Task Report 12-002: Modeled Available Groundwater in Kinney County (April 11, 2012).

Shi, Jerry and Oliver, Wade, 2011, GAM Run 10-043 MAG (January 26, 2011).

Texas Water Development Board, 2007, Water for Texas - 2007—Volumes I-III; Texas Water Development Board Document No. GP-8-1, 392 p.

TABLE 1. MODELED AVAILABLE GROUNDWATER FOR THE EDWARDS-TRINITY (PLATEAU) AQUIFER IN GROUNDWATER MANAGEMENT AREA 7. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE DIVIDED BY COUNTY, REGIONAL WATER PLANNING AREA, AND RIVER BASIN.

County	Regional Water Planning Area	River Basin	Year					
			2010	2020	2030	2040	2050	2060
Coke	F	Colorado	998	998	998	998	998	998
Crockett	F	Colorado	19	19	19	19	19	19
		Rio Grande	5,407	5,407	5,407	5,407	5,407	5,407
Ector	F	Colorado	4,918	4,918	4,918	4,918	4,918	4,918
		Rio Grande	504	504	504	504	504	504
Edwards	J	Colorado	2,306	2,306	2,306	2,306	2,306	2,306
		Nueces	1,632	1,632	1,632	1,632	1,632	1,632
		Rio Grande	1,700	1,700	1,700	1,700	1,700	1,700
Gillespie	K	Colorado	2,378	2,378	2,378	2,378	2,378	2,378
		Guadalupe	136	136	136	136	136	136
Glasscock	F	Colorado	65,213	65,213	65,213	65,213	65,213	65,213
Irion	F	Colorado	2,293	2,293	2,293	2,293	2,293	2,293
Kimble	F	Colorado	1,283	1,283	1,283	1,283	1,283	1,283
Kinney	J	Nueces	12	12	12	12	12	12
		Rio Grande	70,326	70,326	70,326	70,326	70,326	70,326
McCulloch	F	Colorado	4	4	4	4	4	4
Menard	F	Colorado	2,194	2,194	2,194	2,194	2,194	2,194
Midland	F	Colorado	23,251	23,251	23,251	23,251	23,251	23,251
Nolan	G	Brazos	302	302	302	302	302	302
		Colorado	391	391	391	391	391	391
Pecos	F	Rio Grande	115,938	115,938	115,938	115,938	115,938	115,938
Reagan	F	Colorado	68,250	68,250	68,250	68,250	68,250	68,250
		Rio Grande	28	28	28	28	28	28
Real	J	Colorado	278	278	278	278	278	278
		Guadalupe	3	3	3	3	3	3
		Nueces	7,196	7,196	7,196	7,196	7,196	7,196
Schleicher	F	Colorado	6,410	6,410	6,410	6,410	6,410	6,410
		Rio Grande	1,640	1,640	1,640	1,640	1,640	1,640
Sterling	F	Colorado	2,497	2,497	2,497	2,497	2,497	2,497
Sutton	F	Colorado	386	386	386	386	386	386
		Rio Grande	6,052	6,052	6,052	6,052	6,052	6,052

TABLE 1. MODELED AVAILABLE GROUNDWATER FOR THE EDWARDS-TRINITY (PLATEAU) AQUIFER IN GROUNDWATER MANAGEMENT AREA 7. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE DIVIDED BY COUNTY, REGIONAL WATER PLANNING AREA, AND RIVER BASIN.

County	Regional Water Planning Area	River Basin	Year					
			2010	2020	2030	2040	2050	2060
Taylor	G	Brazos	331	331	331	331	331	331
		Colorado	158	158	158	158	158	158
Terrell	E	Rio Grande	1,421	1,421	1,421	1,421	1,421	1,421
Tom Green	F	Colorado	426	426	426	426	426	426
Upton	F	Colorado	21,257	21,257	21,257	21,257	21,257	21,257
		Rio Grande	1,122	1,122	1,122	1,122	1,122	1,122
Uvalde	L	Nueces	1,635	1,635	1,635	1,635	1,635	1,635
Val Verde	J	Rio Grande	24,988	24,988	24,988	24,988	24,988	24,988
Grand Total			**445,283**	**445,283**	**445,283**	**445,283**	**445,283**	**445,28**

TABLE 2. MODELED AVAILABLE GROUNDWATER FOR THE TRINITY AQUIFER IN GROUNDWATER MANAGEMENT AREA 7. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE DIVIDED BY COUNTY, REGIONAL WATER PLANNING AREA, AND RIVER BASIN.

County	Regional Water Planning Area	River Basin	Year					
			2010	2020	2030	2040	2050	2060
Gillespie	K	Colorado	2,482	2,482	2,482	2,482	2,482	2,482
Real	J	Nueces	52	52	52	52	52	52
Total			**2,534**	**2,534**	**2,534**	**2,534**	**2,534**	**2,534**

TABLE 3. MODELED AVAILABLE GROUNDWATER FOR THE PECOS VALLEY AQUIFER IN GROUNDWATER MANAGEMENT AREA 7. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE DIVIDED BY COUNTY, REGIONAL WATER PLANNING AREA, AND RIVER BASIN.

County	Regional Water Planning Area	River Basin	Year					
			2010	2020	2030	2040	2050	2060
Crockett	F	Rio Grande	31	31	31	31	31	31
Ector	F	Rio Grande	113	113	113	113	113	113
Pecos	F	Rio Grande	1,448	1,448	1,448	1,448	1,448	1,448
Upton	F	Rio Grande	2	2	2	2	2	2
Total			**1,594**	**1,594**	**1,594**	**1,594**	**1,594**	**1,594**

TABLE 4. MODELED AVAILABLE GROUNDWATER FOR THE EDWARDS-TRINITY (PLATEAU), TRINITY, AND PECOS VALLEY AQUIFERS IN GROUNDWATER MANAGEMENT AREA 7 BY COUNTY FOR EACH DECADE BETWEEN 2010 AND 2060. RESULTS ARE IN ACRE-FEET PER YEAR.

County	2010	2020	2030	2040	2050	2060
Coke	998	998	998	998	998	998
Crockett	5,457	5,457	5,457	5,457	5,457	5,457
Ector	5,535	5,535	5,535	5,535	5,535	5,535
Edwards	5,638	5,638	5,638	5,638	5,638	5,638
Gillespie	4,996	4,996	4,996	4,996	4,996	4,996
Glasscock	65,213	65,213	65,213	65,213	65,213	65,213
Irion	2,293	2,293	2,293	2,293	2,293	2,293
Kimble	1,283	1,283	1,283	1,283	1,283	1,283
Kinney	70,338	70,338	70,338	70,338	70,338	70,338
Mcculloch	4	4	4	4	4	4
Menard	2,194	2,194	2,194	2,194	2,194	2,194
Midland	23,251	23,251	23,251	23,251	23,251	23,251
Nolan	693	693	693	693	693	693
Pecos	117,386	117,386	117,386	117,386	117,386	117,386
Reagan	68,278	68,278	68,278	68,278	68,278	68,278
Real	7,529	7,529	7,529	7,529	7,529	7,529
Schleicher	8,050	8,050	8,050	8,050	8,050	8,050
Sterling	2,497	2,497	2,497	2,497	2,497	2,497
Sutton	6,438	6,438	6,438	6,438	6,438	6,438

TABLE 4. MODELED AVAILABLE GROUNDWATER FOR THE EDWARDS-TRINITY (PLATEAU), TRINITY, AND PECOS VALLEY AQUIFERS IN GROUNDWATER MANAGEMENT AREA 7 BY COUNTY FOR EACH DECADE BETWEEN 2010 AND 2060. RESULTS ARE IN ACRE-FEET PER YEAR.

County	2010	2020	2030	2040	2050	2060
Taylor	489	489	489	489	489	489
Terrell	1,421	1,421	1,421	1,421	1,421	1,421
Tom Green	426	426	426	426	426	426
Upton	22,381	22,381	22,381	22,381	22,381	22,381
Uvalde	1,635	1,635	1,635	1,635	1,635	1,635
Val Verde	24,988	24,988	24,988	24,988	24,988	24,988
Total	**449,411**	**449,411**	**449,411**	**449,411**	**449,411**	**449,411**

TABLE 5. MODELED AVAILABLE GROUNDWATER FOR THE EDWARDS-TRINITY (PLATEAU), TRINITY, AND PECOS VALLEY AQUIFERS IN GROUNDWATER MANAGEMENT AREA 7 BY REGIONAL WATER PLANNING AREA FOR EACH DECADE BETWEEN 2010 AND 2060. RESULTS ARE IN ACRE-FEET PER YEAR.

Regional Water Planning Area	Year					
	2010	2020	2030	2040	2050	2060
E	1,421	1,421	1,421	1,421	1,421	1,421
F	331,684	331,684	331,684	331,684	331,684	331,684
G	1,182	1,182	1,182	1,182	1,182	1,182
J	108,493	108,493	108,493	108,493	108,493	108,493
K	4,996	4,996	4,996	4,996	4,996	4,996
L	1,635	1,635	1,635	1,635	1,635	1,635
Total	**449,411**	**449,411**	**449,411**	**449,411**	**449,411**	**449,411**

TABLE 6. MODELED AVAILABLE GROUNDWATER FOR THE EDWARDS-TRINITY (PLATEAU), TRINITY, AND PECOS VALLEY AQUIFERS IN GROUNDWATER MANAGEMENT AREA 7 BY RIVER BASIN FOR EACH DECADE BETWEEN 2010 AND 2060. RESULTS ARE IN ACRE-FEET PER YEAR.

River Basin	Year					
	2010	2020	2030	2040	2050	2060
Brazos	633	633	633	633	633	633
Colorado	207,392	207,392	207,392	207,392	207,392	207,392
Guadalupe	139	139	139	139	139	139
Nueces	10,527	10,527	10,527	10,527	10,527	10,527
Rio Grande	230,720	230,720	230,720	230,720	230,720	230,720
Total	**449,411**	**449,411**	**449,411**	**449,411**	**449,411**	**449,411**

TABLE 7. MODELED AVAILABLE GROUNDWATER FOR THE EDWARDS-TRINITY (PLATEAU), TRINITY, AND PECOS VALLEY AQUIFERS IN GROUNDWATER MANAGEMENT AREA 7 BY GROUNDWATER CONSERVATION DISTRICT FOR EACH DECADE BETWEEN 2010 AND 2060. RESULTS ARE IN ACRE-FEET PER YEAR.

Groundwater Conservation District	Year					
	2010	2020	2030	2040	2050	2060
Coke County UWCD	998	998	998	998	998	998
Crockett County GCD	4,685	4,685	4,685	4,685	4,685	4,685
Glasscock GCD	106,075	106,075	106,075	106,075	106,075	106,075
Hill Country UWCD	4,996	4,996	4,996	4,996	4,996	4,996
Irion County WCD	2,435	2,435	2,435	2,435	2,435	2,435
Kimble County GCD	1,283	1,283	1,283	1,283	1,283	1,283
Kinney County GCD	70,338	70,338	70,338	70,338	70,338	70,338
Menard County UWD	2,194	2,194	2,194	2,194	2,194	2,194
Middle Pecos GCD	117,386	117,386	117,386	117,386	117,386	117,386
Plateau UWC and SD	8,050	8,050	8,050	8,050	8,050	8,050
Real-Edwards CRD	13,167	13,167	13,167	13,167	13,167	13,167
Santa Rita UWCD	27,416	27,416	27,416	27,416	27,416	27,416
Sterling County UWCD	2,497	2,497	2,497	2,497	2,497	2,497
Sutton County UWCD	6,438	6,438	6,438	6,438	6,438	6,438
Uvalde County UWCD (Edwards-Trinity Plateau)	1,635	1,635	1,635	1,635	1,635	1,635
Wes-Tex GCD	693	693	693	693	693	693

TABLE 7. MODELED AVAILABLE GROUNDWATER FOR THE EDWARDS-TRINITY (PLATEAU), TRINITY, AND PECOS VALLEY AQUIFERS IN GROUNDWATER MANAGEMENT AREA 7 BY GROUNDWATER CONSERVATION DISTRICT FOR EACH DECADE BETWEEN 2010 AND 2060. RESULTS ARE IN ACRE-FEET PER YEAR.

Groundwater Conservation District	Year					
	2010	2020	2030	2040	2050	2060
Total (areas in districts relevant for joint planning)	**370,286**	**370,286**	**370,286**	**370,286**	**370,286**	**370,286**
No District	79,125	79,125	79,125	79,125	79,125	79,125
Total (all areas)	**449,411**	**449,411**	**449,411**	**449,411**	**449,411**	**449,411**

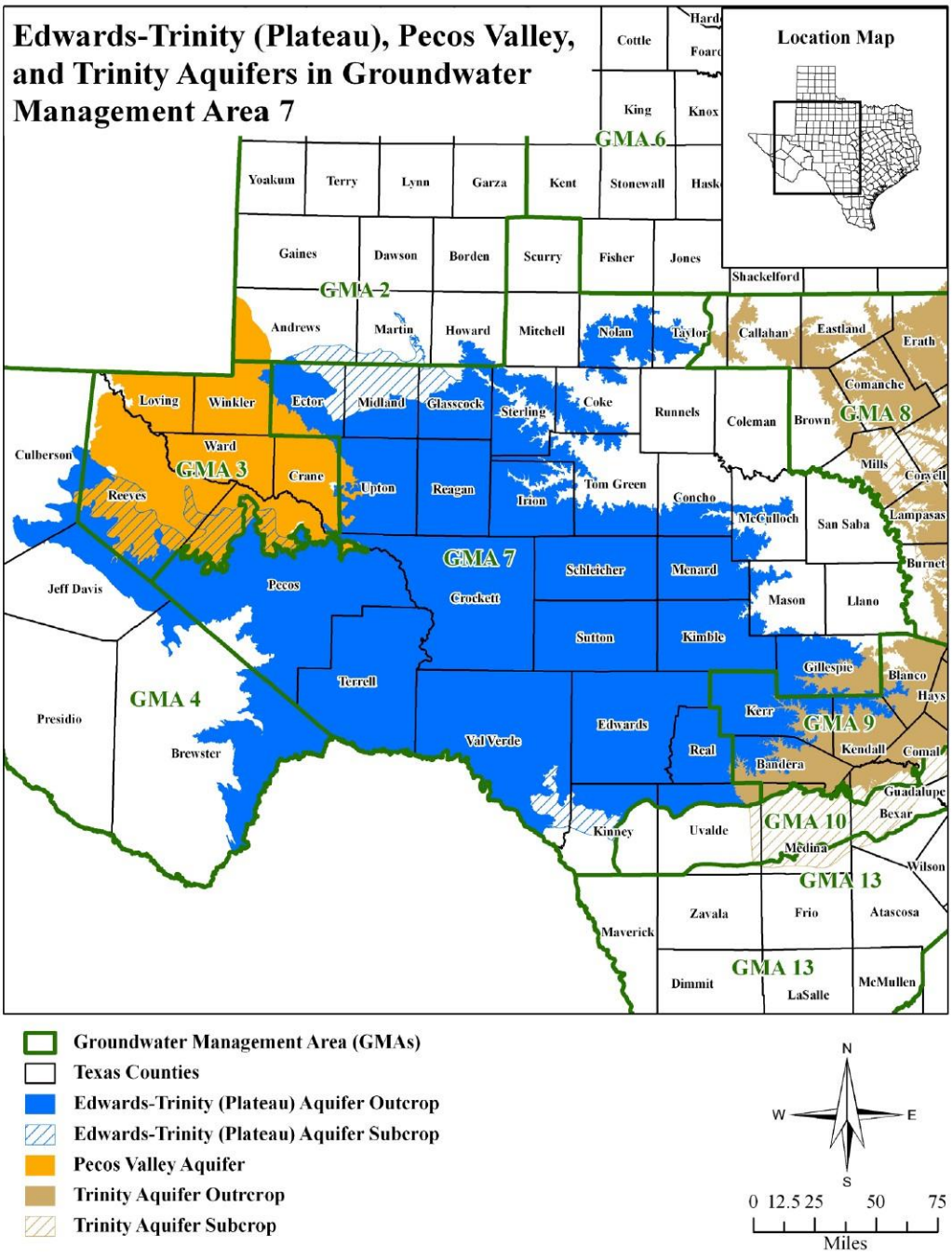


FIGURE 1. MAP SHOWING THE BOUNDARY OF THE EDWARDS-TRINITY (PLATEAU), PECOS VALLEY, AND TRINITY AQUIFERS ACCORDING TO THE 2007 STATE WATER PLAN (TWDB, 2007).

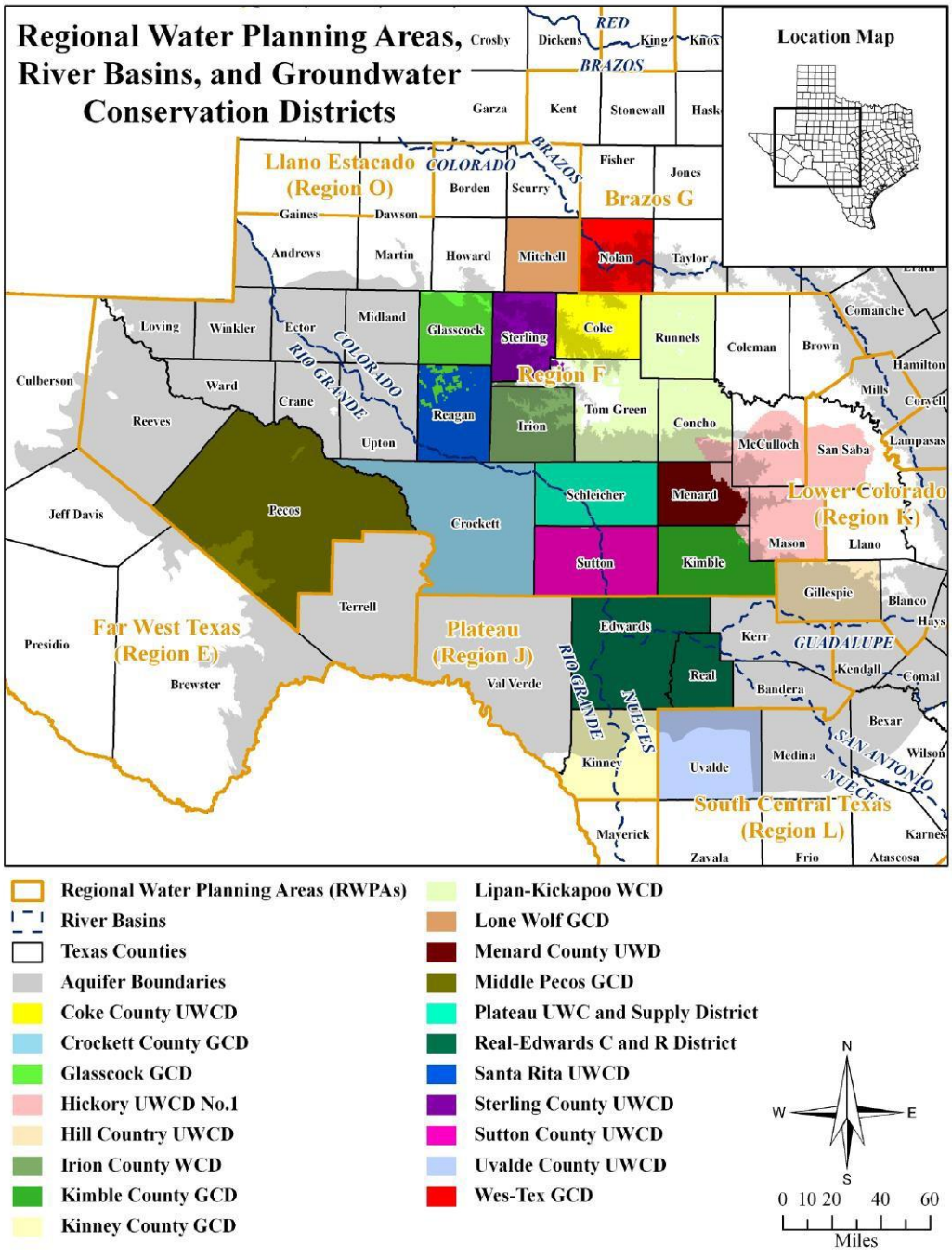


FIGURE 2. MAP SHOWING REGIONAL WATER PLANNING AREAS, GROUNDWATER CONSERVATION DISTRICTS, COUNTIES, AND RIVER BASINS IN AND NEIGHBORING GROUNDWATER MANAGEMENT AREA 7.

APPENDIX 2.0
DESIRED FUTURE CONDITIONS
SUTTON COUNTY UWCD

Desired Future Conditions
For
Sutton County Underground Water Conservation District

Executive Summary

In compliance with House Bill (HB) 1763 Sutton County has established their "Desired Future Conditions (DFC)" for integration into the Texas Water Development Board (TWDB) model for "Managed Available Groundwater (MAG)." Because the Edwards-Trinity Aquifer is a karst aquifer it is a complex geological structure and difficult to model its hydrology. The Texas Water Development Board (TWDB) has made numerous attempts at modeling it for a Groundwater Availability Model (GAM) without success. Eight counties/water districts adjacent to one another recognized these facts and cooperated in a joint study, a water budget analyses, by hiring Dr. Ron Green, Ph.D., P.G. and Mr. F. Paul Bertetti, P.G. from Southwest Research Institute (SwRI) to work on this project. The information contained in this report entitled "Investigating the Water Resources of the Western Edwards- Trinity Aquifer," June 2010[1](a.k.a. SwRI Report); is an integral part of the calculation of the DFC for these water districts. The interpretation of this data is the basis for determining the amount of water available for the next 50 years. The basis for determining the DFC for Sutton County are derived from information contained in this water budget analyses, actual pumpage, and estimates of the various uses within the county. Thus Sutton County's usage rate (DFC) is 3,350 Acre-Feet (Ac-Ft) and its MAG at 50 years is 6,450 Ac-Ft.

Introduction

On September 1, 2005 House Bill (HB) 1763 passed by the 79th Legislature became effective and incorporated into Chapter 36 of the Texas Water Code. This Bill regionalizes decisions of groundwater availability, requires regional water planning groups to use groundwater availability numbers, "desired future conditions (DFC)," from ground water conservation districts, and defines a permitting target for groundwater production, "managed available groundwater (MAG)." Groundwater conservation districts, in accordance with HB-1763 must establish their respective DFCs of how their aquifer will be managed for 50 years, starting in 2010 through 2060. The DFC can include, but not limited to: 1. Water levels do not decline more than 100' in 50 years; 2. Water quality is not degraded below 1000 milligrams per liter of dissolved solids for 50 years; 3. Spring flow is not allowed to fall below 10 cubic feet per second in times during drought of record for perpetuity; or 4. 50 percent of the water in storage will be available in 50 years. The DFCs are presented by Districts to the members of their respective Groundwater Management Area (GMA) group for approval. Once approved the GMA sends them to the Texas Water Development Board for review, approval and integration into the MAG for each District and respective GMA. The MAG is a computer modeling program operated by the TWDB that integrates the DFCs into the model to be used by water planners for the next 50 years. As water districts collect new data the DFCs are updated at least on a five year basis, submitted to the TWDB to update the MAG.

Description

Sutton County covers approximately 1453 square miles or 929,920 acres over the Edwards-Trinity Aquifer in West Central Texas. The aquifer system underlies west-central Texas nearly flat-lying Lower Cretaceous and Upper Cretaceous strata, thin northwestward atop generally massive pre-Cretaceous rocks that are comparatively impermeable and structurally complex. The soil in this area supports oak, juniper, mesquite, prickly pear, range grasses of the type that survive in dry regions. The area contains a variety of wildlife: white-tailed deer, Rio Grande turkey, and small population of quail, dove, and a number of migratory birds that traverse the area at different times of the year. Ranching is a major economic activity where sheep, goats, and cattle are stocked on the ranches in this area.

The water district maintains a water well database that currently contains 1642 wells divided into several categories, please see Table 1.0. There are probably water wells scattered throughout the county that are not in the database, it would take a great deal of time to physically locate them.

Table 1.0 List of Well Types in Sutton County

Well Type	Number of Wells
Domestic	560
Livestock	885
Permitted	65
Public Water Supply	9
Irrigation	30
Industrial	50
Miscellaneous	43

Domestic Usage

The domestic use of water in Sutton County is based on a household of four people using the American Water Works Association estimate for indoor use is 96 gallons per day per person. This is a more reasonable estimate than calculating consumption based on each well producing 25,000 gallons per day. With 560 domestic wells in the database the amount of water used is 241 Ac-Ft.

Livestock Usage

The livestock population as of February 2010 includes a stable population of cattle, sheep, and goats. There is a small number of horses that ranchers have to work their stock, there are no horse farms or a large population, and are not counted.

Table 2.0 List of Livestock in Sutton County

Type of Livestock	Number of head	Water Consumed	Gallons/Year	Acre-Feet
Cows (Dry)	1197	18gal/day	7,864,290	24.13
Cows (w/ calf)	6133	35gal/day	78,349,075	240.44
Bulls	650	35gal/day	8,303750	25.48
Calves	6384	5 gal/day	11,650,800	36
Sheep	22,900	3 gal/day	25,075,500	77
Goats	74,250	3 gal/day	81,303,750	250

Source: Sutton County Ag Extension Office and the NRCS Office. Consumption numbers from the USDA Publication No. AS-954 in cooperation with North Dakota State Univ.

Irrigation

The number of acres in irrigation is: 550 acres of fields and 95 acres of pasture land for a total of 677Ac-Ft of water used on this land (Source Sutton County NRCS Office and telephone conversations with local landowners/irrigators).

Wildlife

There is one perennial source of water is Sutton County, the North Llano River that flows diagonally, north to south, through the eastern part of the county. This is notable because wildlife has basic water needs too. Because there is very little surface water available wildlife depends on groundwater resources at the various ranches across the county. In order to account for this population and its impact the Texas Parks & Wildlife biologist was asked to provide an estimate of the number of various species and their water requirements within the county. It is

recognized the numbers of different species may be low, but this is the best estimate that could be supported. Please see Table 3.0 for these estimates.

Table 3.0 Estimated Population of Wildlife in Sutton County

Species	estimated # animals	water use gals./animal/year	total annual use by species
White-tailed Deer	95,112	452.25	43,014,402 gals.
Axis Deer	4,000	452.25	1,809,000
Sika Deer	300	452.25	135,675
Fallow Deer	200	452.25	90,450
Elk	150	2,400	360,000
Aoudad	200	300	60,000
Blackbuck Antelope	400	300	120,000
Rio Grande turkey	40,000	73	2,920,000
Raccoon	100,000	80	8,000,000
Bobcat	1,400	90	126,000
Jackrabbit	290,000	29	8,410,000
Feral Hogs	5,000	1,460	7,300,000

Oil/Gas Usage

The amount of water used in 2008/2009 by the oil/gas companies, referred to as "Mining" is 480 Ac-Ft (Source various landowner reports on pumpage for this activity). Currently oil/gas activity is low due to the downturn in the economy, but when this activity picks up again water consumption could jump 30% so the estimate is 625 Ac-ft.

White-tailed Deer Farms

There are four landowners in Sutton County that raise white-tailed deer. The total water consumption for these operations is 1.12 acre-feet of water. This amount is added into the livestock numbers.

Water Consumption Sonora, Texas

The population of Sutton County is 4270 as of the 2008 population census estimate. Of that number for 2008, city census, there were 3020 people living in Sonora, TX, 1,050 households, and 815 families residing in the city. City water consumption is 264,447,000 gallons or 812 Ac-Ft for the year ending 2009 (Source: City of Sonora Utility Department)

Background Information

Numerous attempts at establishing the Groundwater Availability Model (GAM) for the Edwards-Trinity aquifer for Sutton County and its adjacent counties: Menard, Schleicher, Crockett, Edwards, Real, Kimble and Val Verde have been made over the past several years. These GAMs have included data obtained from the state water plan, (2007) and other sources. These data have appeared in various reports over the years; there are inconsistencies among the various publications presenting this data. The negative qualities of the data make it difficult to accept it on a hydrogeological basis. With this in mind the above named counties/water districts decided to join in on a project with Southwest Research Institute (SwRI) and Dr. Ron Green PH.D., P.G. and Mr. F. Paul Bertetti, P.G. to establish a water budget for this area of the Edwards-Trinity aquifer. This water budget, in turn, would be utilized by these districts to establish their DFCs.

The reports and documentation published on the Edwards-Trinity aquifer contains quantitative data collected over many years of painstaking research. The numbers presented in these publications are derived from actual measurements, the methods and techniques proven to be hydrologically valid can be repeated and verified. Anyone can read these publications and appreciate the work reported. However, it takes a person with the training and knowledge in hydrology to correctly interpret and explain the results, identify the pitfalls, and connect the dots for proper use of this data when establishing the DFC. Highlights from this report note:

- Groundwater catchments in the study area extend farther north compared with their overlying surface watersheds.
- Counties with the greatest uncertainty in the water budget assessments are Crockett, Val Verde, and Menard.
- River discharge measurements provide an opportunity to calculate recharge for the area that contributes to baseflow in the river.
- Long-term average annual river discharge values corrected to baseflow were converted to estimates for recharge for each contributing area analyzed.
- Recharge values were correlated with precipitation in the study area.

- Knowing the correlation between precipitation and recharge allowed prediction of how recharge in the study area will vary during periods when precipitation is less than the long-term average precipitation for extended periods.
- Recharge for each county in the study area was calculated for average precipitation conditions and predicted for periods when precipitation was reduced by 10, 20, and 30 percent.
- Within the study area, specifically, Sutton County is less vulnerable to drought because they receive greater amounts of precipitation, on average, and their groundwater catchment areas extend beyond the extents of their surface watersheds.

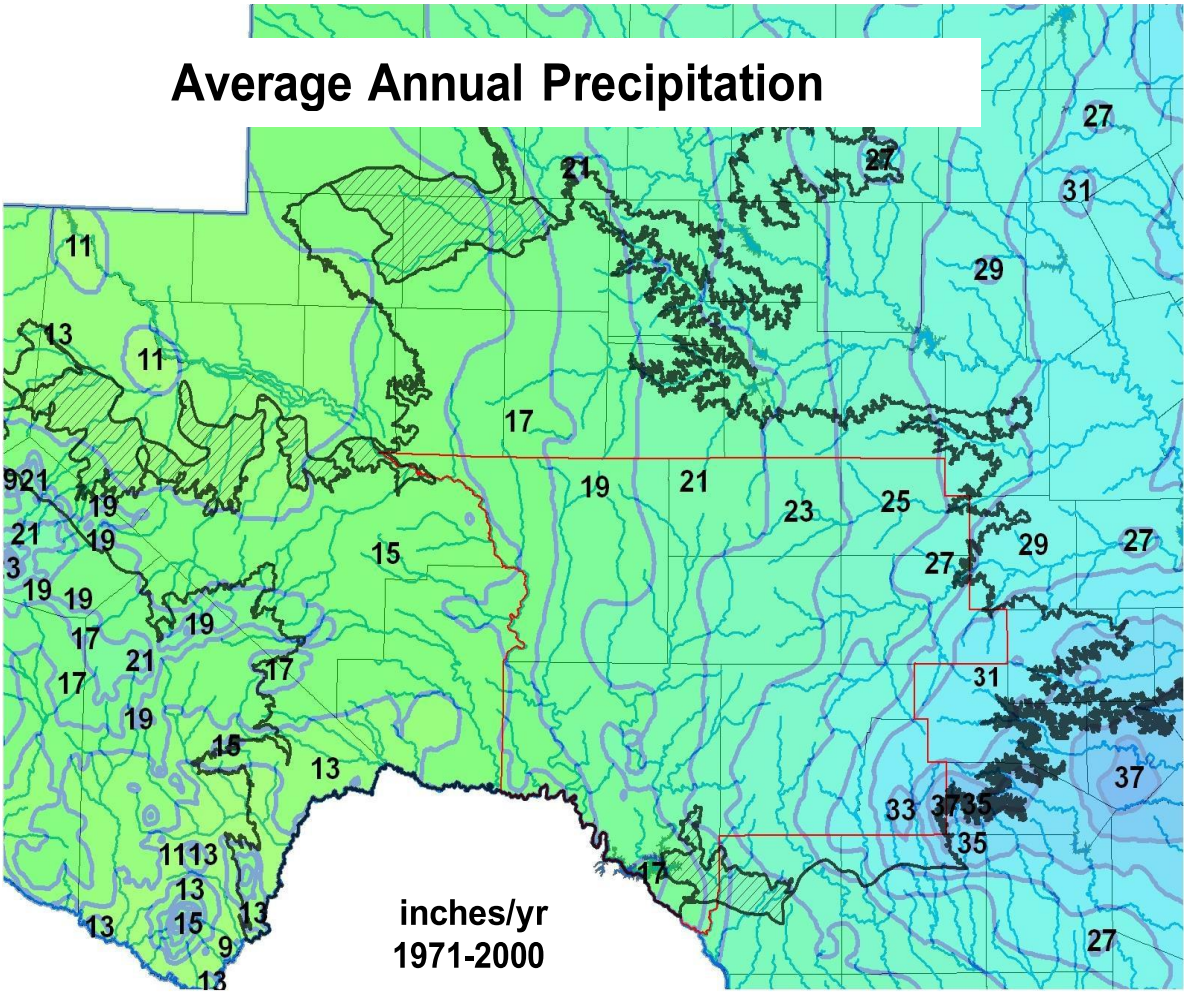


Figure 1.0 Average Annual Precipitation

Establishment of the Desired Future Conditions for the Sutton County Underground Water Conservation District

Existing information on aquifer structure, recharge, and hydrology are analyzed to calculate the water budget for the western Edwards-Trinity aquifer and in particular Sutton County. The rate of precipitation for these calculations is taken from Figure 12 of the SwRI Report; see Figure 1.0

in this report, which shows 23" for the Eastern half of Sutton County and 21" for the Western half. In Sutton County recharge is assumed to be 1.00 inch/year determined by averaging the 1.30 inch/year recharge calculated for the eastern portion of the county and recharge of 0.63 inch/year in the Pecos River catchment area for a total of 77,493 Ac-Ft. The recharge rate is significantly higher than the recharge rates (1.65% of annual precipitation, 0.37inch/year or a recharge of 28,900 Ac-Ft) cited in the 2004 TWDB (Texas Water Development Board) 04-17 GAM report. The primary justification for the larger recharge rate is implied by the river discharge measurements that indicate groundwater piracy is taking place which, contributes additional recharge from north of the surface water divide. Groundwater flow through karst aquifers can occur as porous media flow through the aquifer matrix and preferential flow through conduits or other solution cavities enhance flow pathways facilitating groundwater piracy.

The recharge rates calculated for each water district in the study area came from data and analyses contained in the SwRI report. The methodology equated recharge to the baseflow discharge calculations that are averaged over the perceived groundwater catchment area. Also, there is an approximate linear relationship between recharge and precipitation where recharge decreases linearly as precipitation decreases from 31 inch/year in the southeastern corner of the study area to a low of about 17 inch/year in the northwest corner of the study area. Recharge approaches zero when precipitation decreases below about 17 inch/year. A mathematical relation describing the correlation of recharge to precipitation can be written as:

$$R = 0.15(P - 16.5) \text{ for } P > 16.5,\ R = 0 \text{ for } P \leq 16.5 \quad \text{(Eq. 1)}$$

Where R is recharge (inch/year) and P is precipitation (inch/year). This expression provides a basis to predict hypothetical recharge based on anticipated precipitation for the study area.

Table 4.0 below compares calculated recharge, recharge predicted at 10, 20, and 30 percent reduction in precipitation, recharge values assigned to the 2004 Edwards-Trinity Aquifer GAM, groundwater availability documented in the 2007 Texas State Water Plan for Sutton County.

Table 4.0 Calculate Recharge Based on Percentage of Precipitation in Sutton County

Recharge Parameter	Sutton County
Calculated Recharge	75,556
Predicted recharge @ 90% precipitation	48,821
Predicted recharge @ 80% precipitation	22,086
Predicted recharge @ 70% precipitation	0
2004 GAM recharge	28,900
2007 Texas State Water Plan	20,775

However, based on weather predictions by climatologists the region will become dryer due to a reduction in rainfall which, in turn, will reduce aquifer recharge. It is necessary, then, to

consider recharge within the framework of usage (pumpage) for the next 50 years. Making predictions is not an easy task, future generations will adapt to the circumstances; in the meantime, we have to make sure we do not squander resources at their expense. It is with this premise that we must establish the means necessary to secure our water resources by establishing a Desired Future Condition for Sutton County. Reiterating for clarification water in Sutton County is used for domestic, agricultural, municipal, and industrial purposes. Further, several more reasons bring into focus present and future uses.

- Climate and precipitation are the corner stones of existence in west central Texas considering Sutton County is on the northern edge of the Chihuahuan desert where drought is a way of life. Referencing the SwRI Report if precipitation is less than or equal to 70% there is no recharge of the aquifer.

- In addition to climate and precipitation there are two important economic factors that must be included in the equation.

    1. Sonora, TX is the only city on the "Ports to Plains" highway route making it crucial to plan for enough available water to support future economic growth.

    2. Even though oil/gas activity is currently low it is important to have ample sources of water available to support resurgence in this economic activity.

- Sutton County is also interdependent with its neighboring counties, over use of the resource could adversely affect Menard, Kimble, Edwards, Real counties. Conversely, over use by Pecos, Crockett, and Schleicher counties would adversely affect Sutton County.

- Management of water resources in this environment for present sustainability and future growth is a balancing act of needs versus fulfillment of all economic desires. A moderate conservative approach to the establishment of the DFC for Sutton County was used.

Therefore, the parameter for predicted recharge at 90% precipitation, 48,821 acre feet/year with an estimated 20% pumpage rate we have available 9,764 acre-feet/year; or, 9,800 Ac-Ft. The usages by the various entities within the county, Table 5.0 are subtracted from the available pumpage to arrive at the DFC or starting point of the 50 years of usage for Sutton County. In order to compensate for under reporting of the amounts in this report the acre-feet of water usage is increased by 10%; except for oil/gas which is already increased by 30%.

Table 5.0 User Group Water Consumption in Sutton County

User Group	Acre-Feet of Water
Municipal	895
Manufacturing	0
Domestic	265
Irrigation	745
Mining (Oil/Gas)	625
Livestock	653
Wildlife	245
Total	**3428**

Then using 9,800 Ac-Ft – 3,428 usage rate we have a MAG (at 50 years) of 6,372 Ac-Ft/year.

1) "Investigating the Water Resources of the Western Edwards-Trinity Aquifer," Final report, Prepared by: Ronald T. Green, Ph.D., P.G. and F. Paul Bertetti, P.G., June 2010.

APPENDIX 3.0

RAIN HARVEST DEMONSTRATION PROJECT

COLLECTION TANKS (3K GALLON) CONNECTED TO PLENUM

SIX INCH TRANSFER PIPE CONNECTING CIVIC CENTER WITH COLLECTION TANKS

RAIN GUTTER TO ROOF COLLECTION PLENUM (4” PIPE) CONNECTED TO 6” TRANSFER PIPE

This demonstration system has been used for community awareness seminars on saving water not only for large projects, but also for individuals who can only set up small projects. There is a 2500 gallon system and a single barrel water catchment demonstration setup. The 2500 gallon system is connected to drip lines that supply water to a number of oak trees and the surrounding lawn. The 12,000 gallon system is connected to an electric pump which pushes the water through a series of sprinklers that water grass and pecan trees.

One of the churches in Sonora emulated this system by constructing a 30, 000 gallon system for watering the landscape and lawns. A rancher installed a multibuilding system that provides water for trees, lawns, fire protection, and livestock. The idea of using rain harvesting is slowly catching on.

APPENDIX 4.0

SUTTON COUNTY UWCD
DROUGHT CONTINGENCY PLAN

Water uses regulated or prohibited under this Rule are considered to be non-essential, and continuation of such uses during times of water restrictions, as defined herein, are deemed to constitute a waste of water.

A. Introduction

The goal of this Drought Contingency and Emergency Water Demand Management Plan (hereinafter, "the Plan") is to cause a reduction in water use in response to drought or emergency conditions so that water availability can be preserved. Since emergency conditions can occur rapidly, responses must also be enacted quickly. This Plan has been prepared in advance considering conditions that will initiate and terminate the actions set forth herein.

The Sutton County Underground Water Conservation District (hereinafter, "the District") Board of Directors (hereinafter, "the Board") will monitor water usage patterns; inform the public of drought conditions through the media, District website, and notices placed at various locations, make decisions on the degree of restrictions that apply to the City of Sonora (hereinafter, "the City") and the County of Sutton (hereinafter, "the County"); and consider appropriate changes to this Plan. The Board will develop public awareness notices, information sheets, and other material that will serve as a constant reminder that water should be conserved at all times, not just during a drought or emergency conditions. The Board will also review and evaluate any needed amendments or changes to this Plan due to changes in the aquifer or other relevant circumstances. This review and evaluation will be done every year for the first three (3) years of implementation and every other year subsequently unless conditions necessitate more frequent amendments.

The Plan will be implemented according to the categories of rationing as imposed by the Board. Section C describes these categories and conditions.

B. Background

The County (an area of 929,920 Acres) is over the Edwards-Trinity Aquifer (hereinafter, "the Aquifer") in the region where it historically receives an average annual rainfall of 23" in the eastern half of the county and 21" in the western half of the County. The calculated recharge versus annual precipitation for the County is approximately 1.0" per year. An evaluation of the local hydrogeology determined that the county must receive an average of at least 17" of rain before recharge can occur (*Green and Bertetti,* 2010). Because the County does not have surface water that is useable to any great extent, it is totally dependent on groundwater resources for its water supply. The groundwater used in the District comes from the Aquifer.

The Aquifer is karst, which means it is composed of limestone that is fractured, channeled, and in some areas cavernous. There are two areas that have sufficiently large quantities of water capable of allowing wells to yield 100 or more gallons per minute (gpm). One area of large water quantity is along Granger Draw in the northwest corner of

the District. The other area of large water quantity is in the Dry Devils River floodplain in the central region of the District. Together, the two areas are capable of producing up to 3,200 to 6,400 acre-feet per year (ac-ft/yr). An acre foot of water is equivalent to 325,851 gallons or covers an acre of land one foot deep. The Aquifer in the remainder of the District can typically only support wells with a lower rate of flow. The geological diversity of the Aquifer in the County makes it necessary to monitor the potentiometric surface of the aquifer in both the prolific (*i.e.*, in large floodplains) and less prolific (*i.e.*, away from large floodplains) areas to effectively determine the effects of drought on the water levels and the status of groundwater resources.

The District drilled and developed a drought index well (hereinafter, "DIW") in the floodplain of the Dry Devils River at the north end of the Sonora Golf Course. Elevation from the top of the well is 2,148' mean sea level (msl) and its total depth is 217' (1,931' msl). The DIW is equipped with an electronic water level sensor at 200' (1,948 msl). The water level sensor in the DIW is an In-Situ Model 500 Level Troll sensor (hereinafter, the "Sensor") that is vented to atmosphere for more accurate measurements of aquifer activity. The information from the Sensor will be used to form a set of drought triggers that will indicate different stages of drought severity. By monitoring the water levels in the aquifer at the DIW, the District will be able to more accurately administer the level of restrictions for the City appropriate for the severity of drought.

In conjunction with the DIW, each month the District measures the static water level of thirty-one (31) wells strategically located over the area of the District. Fifteen (15) of these wells are equipped with automated water level sensors. The water levels in fourteen (14) wells are measured with a steel tape, and two (2) wells are measured with an E-line (electric-line). In addition, there are thirty-one (31) automated rain gauges distributed throughout the District and ten (10) graduated rain gauges located around the City for a total of forty-one (41) rain gauges. Each quarter-year the corresponding measured water levels and measured precipitation from all measured sources are graphed. The quarter-annual water levels are used to prepare a map of the potentiometric surface of the aquifer. This surface describes the groundwater surface of the aquifer for that period of time. Over time, the changes in the potentiometric surface will be used to show the increases and decreases in the water level of the aquifer. Linking the potentiometric surface information with the DIW levels will allow the District to determine whether the DIW accurately represents the status of groundwater resources for the entire District.

C. Public Involvement

Opportunity for the public to provide input into the preparation of the Plan was provided by the Board. The Board scheduled and posted a notice at the District Office, the Sutton County Annex, the District's website, and in the local newspaper of a public meeting to accept input on the Plan. In the adoption of this Plan, the Board considered all comments from landowners.

D. Public Education

Within three (3) months of the Plan's enactment, the District will send a mailer summarizing the details of the Plan to each individual and entity in the District's jurisdiction affected by the Plan. The District will periodically provide the public with information about the Plan, including information about the conditions under which each drought stage of the Plan is to be initiated or terminated and the drought response measures to be implemented in each stage. This information will be provided by means of articles and/or news releases in the local newspaper and on the District website.

E. Coordination with Regional Water Planning Group

The service area of the District is located within the Regional Water Planning Group F. Regional Water Planning Group F has been provided a copy of this Plan. The City has also been provided a copy of this Plan.

F. Authorization

The general manager of the District is hereby authorized and directed to implement the applicable provisions of the Plan upon determination that such implementation is necessary to protect public health, safety, and welfare. The general manager shall have the authority to initiate or terminate drought stages or other water supply emergency response measures as described in this Plan.

G. Application

The provisions of the Plan shall apply to all homeowners and property owners utilizing water within the boundaries of this District. The terms "person" and "property owners" as used in the Plan include individuals, corporations, partnerships, associations, and all other legal entities.

H. Trigger Conditions For Initiating and Terminating Drought Stages

The Board is responsible for monitoring water supply and demand conditions on a quarter-annual basis (or more frequently as conditions warrant) and shall determine when conditions warrant initiation or termination of each drought stage of the Plan. The Board will monitor drawdown reports, water supply in storage, and rainfall to determine when drought conditions are attained. The drought stage triggering conditions described in Table 1.0 below takes into consideration the vulnerability of the water source under drought of record conditions, the production and distribution capacities of the aquifer, and projected water usage based upon historical patterns. As improved technology and data is made available to the Board, the Board may adjust the table so long as the adjustments are related to such improved technology and data.

The DIW in the main channel of the Dry Devil's River on the north end of the Sonora Golf Course allows for measurement of fluctuations in the aquifer. These measurements are used to formulate drought stage triggers for the City's water supply. The Board will report

the measurements to the City on a daily basis by email, fax, or other means agreed to by the City and the Board. Within one year after the authorization of this plan, a wireless node will be installed at the well that reports real time data measurements to both the City and the Board. The table below shows the drought trigger designations, drought stages, and associated aquifer levels in terms of groundwater elevation, mean sea level, (msl) at the DIW.

Table 1.0 – Drought Trigger/Stage Levels

Drought Trigger	Drought Stage	Aquifer Level
0	Normal Base	1986.0 msl
D0	Abnormally Dry	1984.5 msl
D1	Moderate Drought	1983.0 msl
D2	Severe Drought	1981.5 msl
D3	Extreme Drought	1980.0 msl
D4	Exceptional Drought	1978.5 msl

I. Stage Levels of Water Allocations

The stage levels of water restrictions are to be placed in effect by the drought stage triggers identified in Section H, above. The District may institute monitoring and enforce penalties for violations of the Plan for each of the stages listed below. The City is recognized by the District as the responsible entity that manages the water system use of its citizens and administers the water resources of its citizens. Therefore, the City will be held responsible for adherence to the various stages of drought severity during drought conditions. The District is responsible for ensuring land owners outside the extraterritorial jurisdiction of the City adhere to the various stages of drought severity during drought conditions.

The water restriction measures are summarized below.

a. Stage I - Abnormally Dry (D0)

1. Alternate day, time of day, or duration restriction for outside water usage allowed. (District will notify public water utilities and landowners which restrictions are in effect).
2. The public water utilities will reduce flushing operations to the extent allowed by applicable law (operations a city does to clear water lines of dirt, sand, and gravel after a water-line repair).
3. Reduction of water use will be encouraged through local media (radio, newspaper, and District website).

b. Stage II - Moderate Drought (D1)

Goal: Achieve a 10% reduction in total daily water use until such time as conditions change in accordance with Section J.

1. All requirements of Stage I shall remain in effect during Stage II

2. Water users are requested to voluntarily limit irrigation of landscaped areas twice per week: even numbered residences may irrigate on Wednesday and Saturday, and odd numbered residences may irrigate on Thursday and Sunday.

3. Golf courses and athletic fields are allowed to use water on Monday, Wednesday, and Friday in the hours from 10:00 pm to 8:00 am. These areas shall be watered for that period of time it takes to attain 1" of accumulated water; as described in I (c) (2) below.

4. Public service announcements will be made as conditions change via local media (radio, newspaper, and District website).

c. **Stage III - Severe Drought (D2)**

Goal: Achieve a 20% reduction in total daily water use until such time as conditions change in accordance with Section J.

1. All requirements of Stage II shall remain in effect during Stage III.

2. Irrigation of landscaped areas shall be limited to one day per week: Mondays for households and Wednesdays for commercial, golf course and athletic fields. Automated sprinkler systems are permitted, but may only run for the period of time it takes to accumulate one (1") inch of equivalent rainfall. Landowners can measure the amount of equivalent rainfall with a small 1" gauge by setting the gauge in the center of the yard, turning on the sprinkler system, and recording the time it takes the sprinkler system to fill the gauge to the 1" mark. The recorded time can then be used to operate the system for the specified 1" rain equivalent on the day irrigation of landscaped areas is permitted.

3. Washing of automobiles, trucks, trailers, boats, and other types of mobile equipment must be done over pervious cover or at car wash facilities.

4. Water troughs or any water receptacles with mechanical float controls shall be routinely inspected by the District and properly maintained to prevent leaks and water waste.

5. Use of water to fill, refill, or add to any indoor or outdoor swimming pools, wading pools, or Jacuzzi-type pools is prohibited except on designated watering days during the designated watering hours (10:00 pm to 8:00 am). When such facilities are not in use, some form of surface cover shall be used to limit the evaporation of water.

6. Operation of any ornamental fountain or pond for aesthetic or scenic purposes is prohibited except where necessary to support aquatic life (freshwater game fish) or where such fountains or ponds are equipped with a recirculation system.

7. Irrigation of a golf course fairway is limited to once per week, Wednesday. Automated sprinkler systems are permitted, but may only run for the period of time it takes to accumulate one (1") inch of equivalent rainfall. The golf course can measure the amount of equivalent rainfall with a small 1" gauge by setting the gauge in the center of the yard, turning on the sprinkler system, and recording the time it takes the sprinkler system to fill the gauge to the 1" mark. The recorded time can then be used to operate the system for the specified 1" rain equivalent on the day irrigation of landscaped areas is permitted.

8. Irrigation of athletic fields is limited to one day per week on Monday (10:00 pm to 8:00 am).

9. All restaurants shall serve water to their customers only upon request.

10. The use of water for construction purposes from designated fire hydrants under special permit is to be discontinued.

d. **Stage IV - Extreme Drought (D3)**

Goal: Achieve mandatory 30% reduction in daily groundwater use until such time as conditions change in accordance with Section J.

1. All requirements of Stage III shall remain in effect during Stage IV.

2. Irrigation of lawns and landscaped areas shall be limited to once a week: Wednesday from the hours of 10:00 pm to 8:00 am and shall be by means of hand-held hoses or hand-held buckets only. No hose end sprinklers or automatic sprinklers are allowed at any time.

3. The watering of golf courses is prohibited. These requirements also apply to the irrigation of parks, public properties, and athletic fields.

4. Sales of groundwater for commercial or industrial use from within the District are prohibited.

5. Use of water by governmental or commercial entities from hydrants shall be limited to firefighting, firefighting related activities, or other activities necessary to maintain public health, safety, and welfare.

6. Irrigation of any crops not intended for human and/or animal consumption is prohibited.

7. Leak-proof troughs shall be used to provide water for livestock.

8. Use of groundwater for construction activities is prohibited.

9. Hydraulic fracturing activity and/or exportation of water outside the District shall be prohibited.

10. The issuance of new well drilling permits may be suspended except to replace an existing well.

e. **Stage V – Exceptional Drought (D4)**

Goal: Achieve mandatory 40% reduction in daily groundwater use until such time as conditions change in accordance with Section J.

1. All requirements of Stage IV shall remain in effect during Stage V.

2. Irrigation of lawn and landscaped areas is prohibited at all times.

3. Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane, or any other mobile vehicle is prohibited at all times.

4. The filling, refillling, or adding of potable water to swimming pools, wading pools, or Jacuzzi-type pools for any reason is prohibited.

5. No additional, expanded, or increase-in-size water service connections, meters, service lines, pipeline extensions, mains, or water service facilities of any kind shall be allowed or approved.

6. In the event of system failure, the water supply will be managed by such measures necessary to maintain public health and safety.

7. Irrigation of any crops, including those designated for human and/or animal consumption, is prohibited.

8. No new well drilling or operating permits shall be issued except to replace an existing well on an emergency basis.

J. INITIATION AND TERMINATION PROCEDURES

Once a drought trigger condition occurs, the District, or its designated responsible representative, shall, based on recommendations from the Board, decide upon the appropriate stage of restriction to be initiated. Once the District decides upon the appropriate stage of restriction to be initiated, it shall provide the public with a notice

describing the stage of restrictions.

The notice shall contain the following information:

a. the date water restrictions shall begin;
b. the fact that the District will monitor the duration of the stage of restriction using the data obtained from the DIW and potentiometric surface maps; and
c. the stage (level) of water restrictions to be employed, the penalty for violations of the water conservation program, and the affected area or areas.

When a drought trigger condition improves, the District may ease the water restrictions provided that such an action is based on measured data. Conversely, if conditions continue to worsen, the District may invoke the next trigger in accordance with measured data. Water restrictions will remain in effect until it is evident that aquifer levels have sufficiently recovered enough to allow pumping to resume at a level commensurate with an associated drought trigger. Because there is a lead/lag relationship between precipitation and aquifer recovery, it is not possible to predict beforehand the length of time restrictions must remain active. When the Board begins easing restrictions as a result of measured data indicating such easing of restrictions is appropriate, the Board shall give District landowners information pertaining to the easing of the restrictions via local media (TV, radio, newspapers, and the District website).

K. PENALTIES FOR VIOLATIONS

a. **First Violation**- The Violator will be notified by written notice of the Violator's specific violation and the Violator's need to comply with District rules. The notice will show the amount of penalty to be assessed for continued violations.

    1. Failure to comply with Stage 1 restrictions results in a fine of $250.00 per violation per day.
    2. Failure to comply with Stage 2 requirements results in a fine of $500.00 per violation per day.
    3. Failure to comply with Stage 3 requirements results in a fine of $1,600.00 per violation per day.

b. If the Violator does not comply by Stage 4 or 5, the District may assess a penalty of up to $2,500.00 per day.

c. **Subsequent Violations**- The District may assess a penalty of up to $10,000.00 per violation for continuing violations. Each day a violation exists shall be considered a separate, subsequent violation. The District may also install a flow restricting device in the Violator's well to limit the amount of water that will pass through the well in a twenty-four (24) hour period. The costs associated with the purchase of a flow restriction device and its installation in accordance with this procedure shall be paid by the Violator in addition to any penalty assessed.

These penalty provisions apply to all landowners and/or potable water supply operators (hereinafter, "Water Suppliers") within the District. Municipal Water Suppliers are responsible for ensuring their customers comply with these provisions. Municipal Water Supplies shall be deemed to be the violator if a customer or user of the Water Supplier violates this Plan.

L. EXEMPTIONS OR WAIVERS

The Board may, in writing, grant temporary variance for existing water uses otherwise prohibited under the Plan if it determines that failure to grant such variance would cause an emergency condition adversely affecting the health or sanitation of the public or the person requesting such variance and if one or more of the following conditions are met:

a. Compliance with this Plan cannot be technically accomplished during the duration of the water supply shortage or other condition for which the Plan is in effect.
b. Alternative methods can be implemented which will achieve the same level of reduction in water use.

Persons requesting an exemption from the provisions of this Plan shall file a petition for variance with the Board within five (5) business days after the Plan or particular drought response stage has been invoked or after a condition justifying the variance first occurs. "Business day" shall be defined as any day, Monday through Friday, excluding Saturday, Sunday, and national holidays. If any date set forth in this Plan or computed pursuant to this Plan falls on a Saturday, Sunday or national holiday, such date shall be deemed automatically amended to be the first business day following such weekend day or holiday. All petitions for variances shall be reviewed by the Board and shall include the following:

a. Name and address of the petitioner(s).
b. Purpose of water use.
c. Specific provision(s) of the Plan from which the petitioner is requesting relief.
d. Detailed statement as to how the specific provision of the Plan adversely affects the petitioner or what damage or harm will occur to the petitioner or others if petitioner complies with the Plan.
e. Description of the relief requested.
f. Period of time for which the variance is sought.
g. Alternative water use restrictions or other measures the petitioner is taking or proposes to take to meet the intent of this Plan and the compliance date.
h. Other pertinent information, as requested by the Board.

Variances granted by the Board shall be subject to the following conditions, unless specifically waived or modified by the Board:

a. Variances granted shall include a timetable for compliance.
b. Variances granted shall expire when the water restrictions in effect at the time of the granting of the variance are no longer in effect, unless the petitioner has failed to meet specified requirements. No variances allowed for a condition requiring water restrictions will continue beyond the termination of water restrictions under Section H. Any variances for subsequent water restrictions must go through a separate petition process. The fact that a variance has been granted in response to a petition will have no relevance to the Board's decision on any subsequent petition.

No variance shall be retroactive or otherwise justify any violation of this Plan occurring prior to the issuance of the variance.

M. SEVERABILITY

If any one or more of the provisions contained in this Plan are for any reason held to be invalid, illegal, or unenforceable in any respect, the invalidity, illegality, or unenforceability may not affect any other rules or provisions of these rules, and these rules must be construed as if such invalid, illegal or unenforceable rules or provision had never been contained in these rules.

N. IMPLEMENTATION

The Board established the DROUGHT CONTINGENCY AND EMERGENCY WATER DEMAND MANAGEMENT PLAN by Resolution. This Board will review the procedures in this Plan every year for the first three (3) years of implementation and subsequently every other year unless conditions necessitate more frequent review. Modifications may be required to accommodate system growth, changes in water use demand, available water supply, and/or other circumstances.

This Plan was adopted by the Sutton County Underground Water Conservation District Board at the properly noticed public meeting held on March 12, 2013.