Wintergarden Groundwater Conservation District

Management

Plan

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The Wintergarden Groundwater Conservation District Office is located at:

2881 Hwy. 277 West
P. O. Box 1433
Carrizo Springs, TX 78834

Telephone: (830) 876-3801
Fax: (830) 876-3782
E-mail wgcd.swtrea@sbcglobal.net

Office Hours: 8:00 a.m.-12:00 noon, 1:00 p.m. - 5:00 p.m.

Table of Contents

	Page
Purpose and Intent	**3**
Background	**3**
Policy	**3**
Management of Groundwater Supplies	**4**
Technical Research and Studies	**5**
Water Conservation	**5**
Action, Procedures, Performance and Avoidance	**5**
Groundwater Recharge	**6**
Groundwater Availability	**11**
Total Demand for Water	**11**
Water Supply Needs	**13**
Projected Surface Water Supply	**14**
Water Management Strategies	**16**
Historical Water Use Summary	**17**
Public Information	**23**
Methodology the District Will Use	**23**
Goals and Objectives	**23**
Regulation	**25**
Permits and Enforcement	**26**
Equity and Discretion	**26**
Cooperation and Coordination	**27**
Regulatory Action Plan	**27**
Transportation of Water from the District	**27**
Groundwater Protection	**28**
Fees	**28**
Definitions	**29**
Addendum A - TWDB GAM Run 10-024	**30**
Addendum B - TWDB GAM Run 10-041 MAG	**39**
Addendum C - TWDB GAM Run 10-012 MAG version 2	**49**
Addendum D - WGCD Resolution 2011-1	**70**

Purpose and Intent

It is the purpose and intent of this plan to establish policy in the area of water conservation, public information, regulations, permits and enforcement, equity and discretion, and cooperation and coordination, and will be in effect from adoption by notice and hearing until 2016. The goal of this plan is to establish a Regulatory Action Plan that will conserve, preserve, protect and prevent the waste of the underground water within the District. Due to the present potential mining of groundwater in the Carrizo aquifer in some areas of the District, the Regulatory Action Plan will also address reducing the mining of groundwater. The regulations and policies in this plan have been established so that the goals, needs and obligations of the District may be accomplished as set forth by the 75th Legislature, Regular Session 1997, House Bill 3602, and Chapter 36 of the Texas Water Code.

Background

The Wintergarden Groundwater Conservation District was created in 1997 by HB 3602 75th Leg. in accordance with Section 59, Article 16 of the Constitution of the State of Texas, and in accordance with the Texas Water Code Title 2 Water Administration Subtitle E Groundwater Management (ch. 35 & 36). The Wintergarden Groundwater Conservation District was confirmed by election in January 1998. The election was successful and a tax rate of $0.04 per $100.00 valuation was set. Over the years, the rate has been lowered and is currently at $0.028.

The District encompasses all of Dimmit, LaSalle, & Zavala Counties. This includes approximately 2,685,148 acres, or 4,195 square miles. The District economy is heavily dependent on agriculture and agriculture related business. Rainfall of 20.0 inches annually usually peaks in the late spring, with a secondary peak in the early fall. Due to this trend and high summer temperatures, irrigation is required for consistent crop production and yield. Approximately 90.7% of the total groundwater pumpage in the District is used in agriculture.

Last 5 year historical use (2004, 2006-2008*)* per county of acre-foot used for agriculture is as follows which represents a 17.6% reduction from the previous 5 years. Data used is referenced in the Historical Water Use Summary by Groundwater and Surface Water.

Dimmit	6,660 AF	12%
LaSalle	6,139 AF	11.1%
Zavala	42,499 AF	76.9%

Policy

It is the Policy of the District to promote water conservation, provide public information, maintain and sustain regulation, permits, enforcement, equity and discretion, cooperation and coordination. These policies are designed to support the regulation of groundwater withdrawals to reduce the mining of groundwater resources within the District and to

protect groundwater within the District as a sustainable resource for the benefit of those who rely upon it both inside and outside the District. The implementation of this plan can only be achieved through a concerted effort by all parties that use groundwater within the District and the Carrizo Aquifer. The Wintergarden Groundwater Conservation District Policy also provides that it will encourage any groundwater conservation district overlying the Carrizo Aquifer from approving the mining or export of groundwater from the aquifer boundaries that would result in the degradation of groundwater (levels or quality) within the Wintergarden Groundwater Conservation District boundaries. In the event groundwater is mined or exported for use outside the aquifer boundaries by a groundwater district other the Wintergarden Groundwater Conservation District ("the mining/or exporting district") and such use would result in the degradation of groundwater (levels or quality) within the Wintergarden Groundwater Conservation District boundaries, the Wintergarden Groundwater Conservation District shall demand that the mining/or exporting district shall, at no cost to the Wintergarden Groundwater Conservation District, implement a recharge plan to the satisfaction of the Wintergarden Groundwater Conservation District and within the Wintergarden Groundwater Conservation District that will maintain the safe yield and current level of the aquifer at the level currently in existence prior to the mining/or exporting action. The District shall maintain an office with regular office hours.

Management of Groundwater Supplies

The District will manage the supply of groundwater within the District in order to conserve the resource while seeking to maintain the economic viability of all resource user groups, public and private. In consideration of the economic and cultural activities occurring within the District, the District will identify and engage in such activities and practices, that if implemented, would result in a reduction of groundwater use. An observation network shall be established and maintained by the District in order to monitor changing storage conditions of groundwater supplies within the District. The District will make a regular assessment of water supply and groundwater storage conditions and will report those conditions to the Board and to the public. The District will undertake, as necessary, and cooperate with investigations of the groundwater resources within the District and will make the results of the investigations available to the public upon adoption by the Board.

The draft Managed Available Groundwater (MAG) values based on the DFC's adopted by Groundwater Management Area 13 (GMA 13) is referenced in Addendum B and Addendum C of this Plan. Official estimates of the Modeled Available Groundwater have not yet been issued to the district by the TWDB.

The District will adopt rules to regulate groundwater withdrawals by means of spacing and production limits. In making a determination, the District may deny a well construction permit or limit groundwater withdrawals in accordance with the guidelines stated in the rules of the District.

Technical Research and Studies

The District, in cooperation with other entities including the Texas Water Development Board and the Texas Commission on Environmental Quality, will work to determine methods to conserve and protect groundwater through more efficient irrigation practices, education, and well head protection. The District will be collecting well data from seven (7) continuous water level data recorders placed in Carrizo Aquifer wells in order to determine the current level in the aquifer and the effects of the current usage.

Water Conservation

Water conservation has become a strong initiative throughout the State of Texas. New buildings are required to use certain water conserving plumbing fixtures as a result of legislation passed by the Texas Legislature in 1991, SB1273. It has been recognized that fresh water is a vital commodity that can only last through preservation. The District may require a conservation plan for permitted wells in order to be sure that the groundwater produced is put to a beneficial use, not wasted. The District will work with water utilities, industry, and agriculture users to promote the most efficient use of water so that we may preserve one of our most valuable natural resources. The District will explore other conservation methods and options and will adopt new requirements as they become necessary.

Actions, Procedures, Performance and Avoidance for Plan Implementation

The District will implement the provisions of this plan and will utilize the provisions of this plan as a guidepost for determining the direction or priority for all District activities. All operations of the District, all agreements entered into by the District and any additional planning efforts in which the District may participate will be consistent with the provisions of this plan.

The District will adopt rules relating to the permitting of wells and the production of groundwater. The rules adopted by the District shall be pursuant to TWC Chapter 36 and the provisions of this plan. All 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 citizens with equality. Citizens may apply to the District for discretion in enforcement of the rules on grounds of adverse economic effect or unique local conditions. In exercising enforcement, 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 or binding on the Board for that matter or any subsequent matter. The Board shall make such decisions on a case-by-case basis and such decisions shall not establish precedent for any other action that may arise.

The District will seek the cooperation in the implementation of this plan and the management of groundwater supplies within the District. All activities of the District

will be undertaken in cooperation and coordinated with the appropriate state, regional or local water management entity.

Groundwater Recharge

This groundwater budget summarizes how the GAM model estimates water entering and leaving the aquifer. The groundwater budget is shown in Table 1 by aquifer. Lateral flow in and out represents groundwater flowing into and out of the aquifer(s) across county boundaries. Upward leakage to younger layers in Table 1 represents the exchange of groundwater between aquifer formations. Total recharge represents contributions to the aquifer from precipitation entering the system where the geologic unit containing the aquifer is exposed at the land surface. Net stream leakage reflects the interaction of the aquifer with surface water bodies.

The total recharge (rainfall/distributed) for Dimmit, La Salle, and Zavala counties from the GAM Run 10-024 is 22,847 acre-feet per year. Total estimated flow into the District aquifers other than distributed recharge is 29,961 acre feet for a total of 52,808 acre feet per year.

Table 1: Carrizo-Wilcox Aquifer's summarized information required for the Wintergarden Groundwater Conservation District's groundwater management plan. All values are reported in acre-feet per year. All numbers are rounded to the nearest 1 acre-foot. Reported flow estimates include both fresh and brackish waters present in the aquifers.

Management Plan requirement	Aquifer or confining unit	Results
Estimated annual amount of recharge from precipitation to the district	Carrizo-Wilcox Aquifer	15,229
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Carrizo-Wilcox Aquifer	326
Estimated annual volume of flow into the district within each aquifer in the district	Carrizo-Wilcox Aquifer	25,485
Estimated annual volume of flow out of the district within each aquifer in the district	Carrizo-Wilcox Aquifer	22,227
Estimated net annual volume of flow between each aquifer in the district	Reklaw Confining Unit and other overlying unit into Carrizo-Wilcox Aquifer	28,227

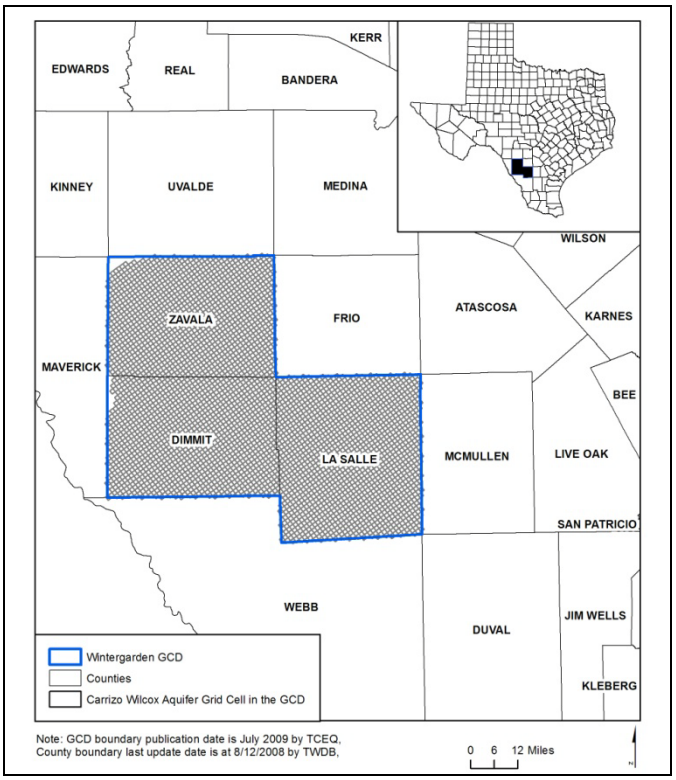

Figure 1: Area of the groundwater availability model for the Carrizo-Wilcox Aquifer from which the information in Table 1 was extracted (the aquifer extent within the Wintergarden Groundwater Conservation District boundary).

Table 2: Sparta Aquifer's summarized information required for the Wintergarden Groundwater Conservation District's groundwater management plan. All values are reported in acre-feet per year. All numbers are rounded to the nearest 1 acre-foot. Reported flow estimates include both fresh and brackish waters present in the aquifers.

Management Plan requirement	Aquifer	Results
Estimated annual amount of recharge from precipitation to the district	Sparta Aquifer	0
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Sparta Aquifer	0
Estimated annual volume of flow into the district within each aquifer in the district	Sparta Aquifer	778
Estimated annual volume of flow out of the district within each aquifer in the district	Sparta Aquifer	592
Estimated net annual volume of flow between each aquifer in the district	Weches Confining Unit into Sparta Aquifer	24
	Upper lying younger unit to Sparta	69

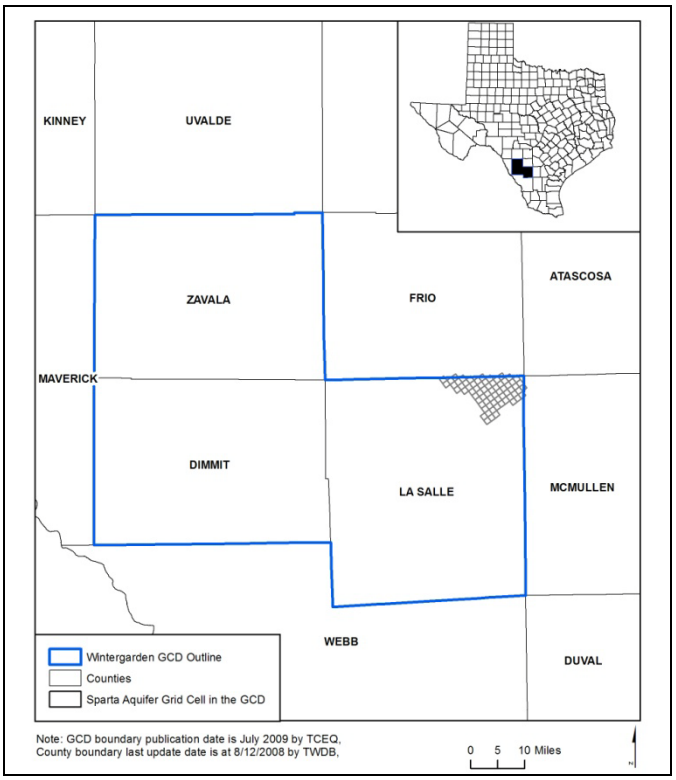

Figure 2: Area of the groundwater availability model for the Sparta Aquifer from which the information in Table 2 was extracted (the aquifer extent within the Wintergarden Groundwater Conservation District boundary).

Table 3: Queen City Aquifer's summarized information required for the Wintergarden Groundwater Conservation District's groundwater management plan. All values are reported in acre-feet per year. All numbers are rounded to the nearest 1 acre-foot. Reported flow estimates include both fresh and brackish waters present in the aquifers.

Management Plan requirement	Aquifer	Results
Estimated annual amount of recharge from precipitation to the district	Queen City Aquifer	0
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Queen City Aquifer	0
Estimated annual volume of flow into the district within each aquifer in the district	Queen City Aquifer	981
Estimated annual volume of flow out of the district within each aquifer in the district	Queen City Aquifer	309
Estimated net annual volume of flow between each aquifer in the district	Queen City Aquifer To Weches Confining Unit	386
	Queen City Aquifer into the Reklaw Confining Unit	438

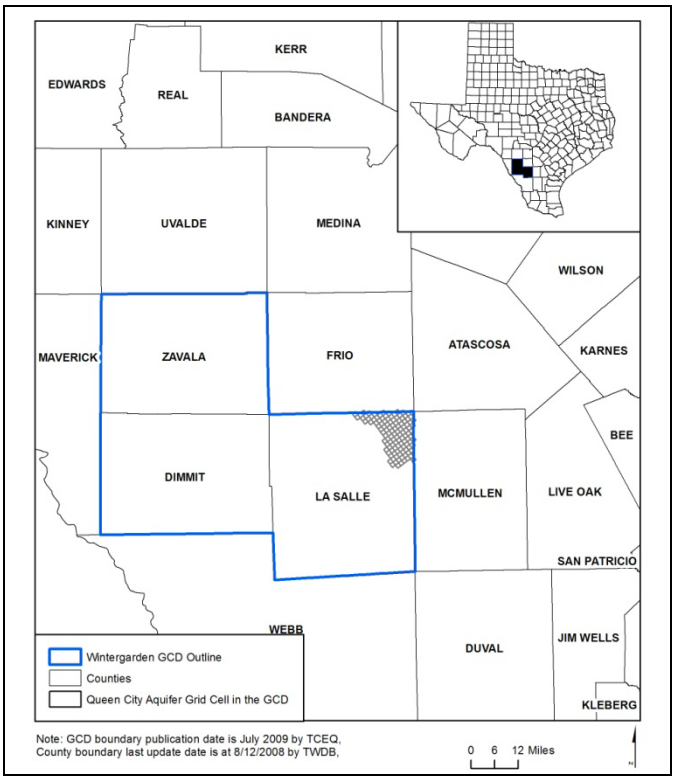

Figure 3: Area of the groundwater availability model for the Queen City Aquifer from which the information in Table 3 was extracted (the aquifer extent within the Wintergarden Groundwater Conservation District boundary).

Table 4: Yegua-Jackson Aquifer's summarized information required for the Wintergarden Groundwater Conservation District's groundwater management plan. All values are reported in acre-feet per year. All numbers are rounded to the nearest 1 acre-foot. Reported flow estimates include both fresh and brackish waters present in the aquifers.

Management Plan requirement	Aquifer	Results
Estimated annual amount of recharge from precipitation to the district	Yegua-Jackson Aquifer	7,618
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Yegua-Jackson Aquifer	8,190
Estimated annual volume of flow into the district within each aquifer in the district	Yegua-Jackson Aquifer	2,717
Estimated annual volume of flow out of the district within each aquifer in the district	Yegua-Jackson Aquifer	2,671
Estimated net annual volume of flow between each aquifer in the district	Not applicable	Not applicable

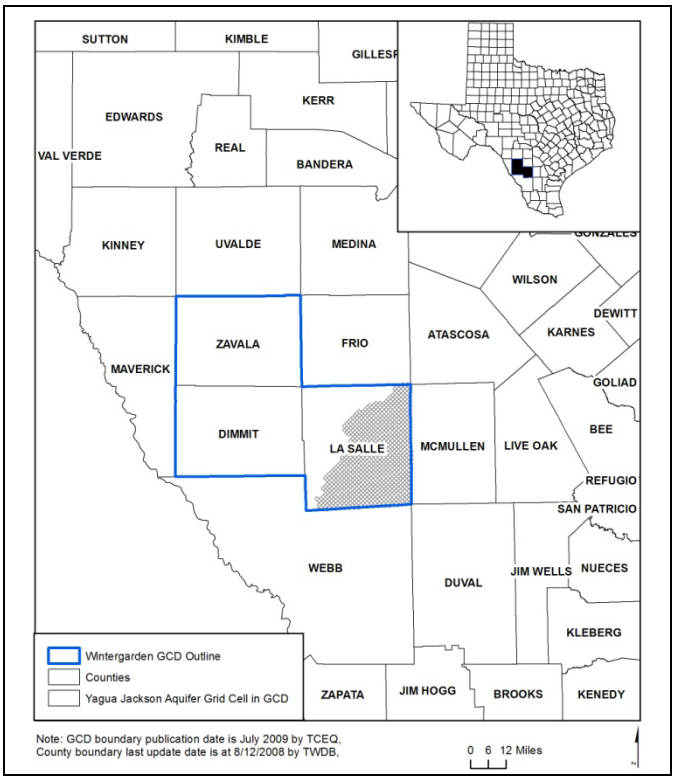

Figure 4: Area of the groundwater availability model for the Yegua-Jackson Aquifer from which the information in Table 4 was extracted (the aquifer extent within the Wintergarden Groundwater Conservation District boundary).

In addition to the above values, WGCD continues to support that recharge can be enhanced by a respectable amount with the implementation of a sound program to artificially recharge the aquifer as well as reduce pumpage. Since the spring of 1999 and continuing to date, WGCD along with Webb and Uvalde Counties have been actively engaged in an 8-month rain enhancement and hail suppression program which is planned to be reoccurring in future years. The rain enhancement and hail suppression may not only increase the agriculture economic base, but may also increase recharge. It has been reflected in various publications TCEQ, TWDB, and TDLR that cloud seeding may effectively increase rainfall by 12 – 20% thereby increasing recharge by a similar amount and reduce damage from hail-fall.

Groundwater Availability

All values aforementioned are a product of the Texas Water Development Board (TWDB) GAM run 10-024.

Projected Total Demand for Water

The WGCD is a three county District consisting of;
Dimmit: Asherton, Big Wells, Brundage, Catarina, and Carrizo Springs
LaSalle: Artesia Wells, Cotulla, Encinal, Fowlerton, Los Angeles, Millett, and Woodward.
Zavala: Batesville, Crystal City, La Pryor

Based on available data from the 2007 State Water Plan, annual water uses (acre feet/year) in the **District** have been projected to be

	2010	2020	2030	2040	2050	2060
Dimmit	14,727	14,611	14,584	14,157	13,677	13,157
La Salle	8,277	8,276	8,245	8,210	8,176	8,134
Zavala	76,832	74,250	71,752	69,283	66,906	64,634
District Total	**99,836**	**97,137**	**94,581**	**91,650**	**88,759**	**85,925**

2007 State Water Plan- Projected Water Demands

Total County Water Demands Data

Dimmit County

RWPG	Water User Group	County	River Basin	2010	2020	2030	2040	2050	2060
L	ASHERTON	DIMMIT	NUECES	286	299	306	301	293	279
L	BIG WELLS	DIMMIT	NUECES	149	156	159	157	153	145
L	CARRIZO SPRINGS	DIMMIT	NUECES	1,842	1,943	1,996	1,981	1,930	1,836
L	COUNTY-OTHER	DIMMIT	NUECES	282	292	293	284	274	261
L	COUNTY-OTHER	DIMMIT	RIO GRANDE	2	2	2	2	2	2
L	IRRIGATION	DIMMIT	NUECES	10,611	10,333	10,225	9,813	9,391	8,987
L	LIVESTOCK	DIMMIT	NUECES	447	447	447	447	447	447
L	LIVESTOCK	DIMMIT	RIO GRANDE	105	105	105	105	105	105
L	MINING	DIMMIT	NUECES	1,003	1,034	1,051	1,067	1,082	1,095
Total Projected Water Demands (acre-feet per year) =				**14,727**	**14,611**	**14,584**	**14,157**	**13,677**	**13,157**

La Salle County

RWPG	Water User Group	County	River Basin	2010	2020	2030	2040	2050	2060
L	COTULLA	LA SALLE	NUECES	1,407	1,516	1,566	1,615	1,677	1,743
L	COUNTY-OTHER	LA SALLE	NUECES	282	321	384	441	478	500
L	ENCINAL	LA SALLE	NUECES	110	109	108	106	107	107
L	IRRIGATION	LA SALLE	NUECES	4,791	4,643	4,500	4,361	4,227	4,097
L	LIVESTOCK	LA SALLE	NUECES	1,687	1,687	1,687	1,687	1,687	1,687
Total Projected Water Demands (acre-feet per year) =				**8,277**	**8,276**	**8,245**	**8,210**	**8,176**	**8,134**

Zavala County

RWPG	Water User Group	County	River Basin	2010	2020	2030	2040	2050	2060
L	COUNTY-OTHER	ZAVALA	NUECES	864	1,028	1,134	1,241	1,327	1,371
L	CRYSTAL CITY	ZAVALA	NUECES	2,247	2,272	2,343	2,337	2,349	2,370
L	IRRIGATION	ZAVALA	NUECES	71,800	68,963	66,238	63,621	61,107	58,692
L	LIVESTOCK	ZAVALA	NUECES	756	756	756	756	756	756
L	MANUFACTURING	ZAVALA	NUECES	1,043	1,106	1,154	1,200	1,238	1,315
L	MINING	ZAVALA	NUECES	122	125	127	128	129	130
Total Projected Water Demands (acre-feet per year) =				**76,832**	**74,250**	**71,752**	**69,283**	**66,906**	**64,634**

Source: Volume 3, 2007 State Water Planning Database
(http://www.twdb.state.tx.us/DATA/db07/defaultReadOnly.asp)

Water Supply Needs - Total County Water Needs Data (Dimmit, La Salle, and Zavala Counties) - (2007 State Water Plan)

2007 State Water Plan Projected Water Needs

Total County Water Needs Data

Positive values reflect a water surplus; negative values reflect a water need.

Dimmit County

RWPG	Water User Group	County	River Basin	2010	2020	2030	2040	2050	2060
L	ASHERTON	DIMMIT	NUECES	359	346	339	344	352	366
L	BIG WELLS	DIMMIT	NUECES	779	772	769	771	775	783
L	CARRIZO SPRINGS	DIMMIT	NUECES	485	384	331	346	397	491
L	COUNTY-OTHER	DIMMIT	NUECES	58	48	47	56	66	79
L	COUNTY-OTHER	DIMMIT	RIO GRANDE	1	1	1	1	1	1
L	IRRIGATION	DIMMIT	NUECES	175	278	318	470	626	776
L	LIVESTOCK	DIMMIT	NUECES	-	-	-	-	-	-
L	LIVESTOCK	DIMMIT	RIO GRANDE	-	-	-	-	-	-
L	MINING	DIMMIT	NUECES	1	1	1	1	1	1
Sum of Projected Water Needs (acre-feet per year) =				**0**	**0**	**0**	**0**	**0**	**0**

La Salle County

RWPG	Water User Group	County	River Basin	2010	2020	2030	2040	2050	2060
L	COTULLA	LA SALLE	NUECES	1,080	971	921	872	810	744
L	COUNTY-OTHER	LA SALLE	NUECES	218	179	116	59	22	-
L	ENCINAL	LA SALLE	NUECES	172	173	174	176	175	175
L	IRRIGATION	LA SALLE	NUECES	3,287	3,287	3,287	3,287	3,287	3,287
L	LIVESTOCK	LA SALLE	NUECES	-	-	-	-	-	-
Sum of Projected Water Needs (acre-feet per year) =				**0**	**0**	**0**	**0**	**0**	**0**

Zavala County

RWPG	Water User Group	County	River Basin	2010	2020	2030	2040	2050	2060
L	COUNTY-OTHER	ZAVALA	NUECES	504	343	237	130	44	-
L	CRYSTAL CITY	ZAVALA	NUECES	1,410	1,392	1,321	1,327	1,315	1,294
L	IRRIGATION	ZAVALA	NUECES	-48,165	-45,344	-42,621	-40,005	-37,492	-35,078
L	LIVESTOCK	ZAVALA	NUECES	-	-	-	-	-	-
L	MANUFACTURING	ZAVALA	NUECES	273	212	164	118	80	3
L	MINING	ZAVALA	NUECES	-	-	-	-	-	-
Sum of Projected Water Needs (acre-feet per year) =				**-48,165**	**-45,344**	**-42,621**	**-40,005**	**-37,492**	**-35,078**

Source: Volume 3, 2007 State Water Planning Database
(http://www.twdb.state.tx.us/DATA/db07/defaultReadOnly.asp)

Projected Surface Water Supply (Dimmit, La Salle, and Zavala Counties) – Table B (2007 State Water Plan - Total County Surface Water Supplies)

2007 State Water Plan - Projected Surface Water Supplies

Total County Surface Water Supplies

Dimmit County

RWPG	Water User Group	County	River Basin	Source Name	2010	2020	2030	2040	2050	2060
L	IRRIGATION	DIMMIT	NUECES	NUECES RIVER COMBINED RUN-OF-RIVER IRRIGATION	4,101	4,101	4,101	4,101	4,101	4,101
L	LIVESTOCK	DIMMIT	NUECES	LIVESTOCK LOCAL SUPPLY	224	224	224	224	224	224
L	LIVESTOCK	DIMMIT	RIO GRANDE	LIVESTOCK LOCAL SUPPLY	53	53	53	53	53	53
L	MINING	DIMMIT	NUECES	NUECES RIVER COMBINED RUN-OF-RIVER MINING	1	1	1	1	1	1
Total Projected Surface Water Supplies (acre-feet per year) =					**4,379**	**4,379**	**4,379**	**4,379**	**4,379**	**4,379**

La Salle County

RWPG	Water User Group	County	River Basin	Source Name	2010	2020	2030	2040	2050	2060
L	IRRIGATION	LA SALLE	NUECES	NUECES RIVER COMBINED RUN-OF-RIVER IRRIGATION	3,287	3,287	3,287	3,287	3,287	3,287
L	LIVESTOCK	LA SALLE	NUECES	LIVESTOCK LOCAL SUPPLY	844	844	844	844	844	844
Total Projected Surface Water Supplies (acre-feet per year) =					**4,131**	**4,131**	**4,131**	**4,131**	**4,131**	**4,131**

Zavala County

RWPG	Water User Group	County	River Basin	Source Name	2010	2020	2030	2040	2050	2060
L	LIVESTOCK	ZAVALA	NUECES	LIVESTOCK LOCAL SUPPLY	380	379	379	379	379	379
Total Projected Surface Water Supplies (acre-feet per year) =					**380**	**379**	**379**	**379**	**379**	**379**

Source: Volume 3, 2007 State Water Planning Database

(http://www.twdb.state.tx.us/DATA/db07/defaultReadOnly.asp)

Water Management Strategies

The following table identifies from 2007 State Water Plan various strategies for Dimmit, La Salle, and Zavala Counties. The WGCD has considered the following management strategies and will periodically review them as the State Water Plan is updated.

Projected Water Management Strategies - Total County Water Strategies Data (Dimmit, La Salle, and Zavala Counties) - (2007 State Water Plan)

Dimmit County

RWPG	WUG	WUG County	River Basin	Water Management Strategy	Source Name	Source County	2010	2020	2030	2040	2050	2060
L	ASHERTON	DIMMIT	NUECES	MUNICIPAL WATER CONSERVATION	CONSERVATION	DIMMIT	20	43	58	59	62	64
L	BIG WELLS	DIMMIT	NUECES	MUNICIPAL WATER CONSERVATION	CONSERVATION	DIMMIT	11	23	30	30	32	33
L	IRRIGATION	DIMMIT	NUECES	IRRIGATION WATER CONSERVATION	CONSERVATION	ZAVALA	6,948	6,948	6,948	6,948	6,948	6,948
Total Projected Water Management Strategies (acre-feet per year) =							**6,979**	**7,014**	**7,036**	**7,037**	**7,042**	**7,045**

La Salle County

RWPG	WUG	WUG County	River Basin	Water Management Strategy	Source Name	Source County	2010	2020	2030	2040	2050	2060
L	CARRIZO SPRINGS	LA SALLE	NUECES	MUNICIPAL WATER CONSERVATION	CONSERVATION	DIMMIT	152	312	464	590	700	777
L	COTULLA	LA SALLE	NUECES	MUNICIPAL WATER CONSERVATION	CONSERVATION	LA SALLE	118	248	369	488	615	745
L	COUNTY-OTHER	LA SALLE	NUECES	MUNICIPAL WATER CONSERVATION	CONSERVATION	LA SALLE	3	4	11	17	29	42
Total Projected Water Management Strategies (acre-feet per year) =							**273**	**564**	**844**	**1,095**	**1,344**	**1,564**

Zavala County

RWPG	WUG	WUG County	River Basin	Water Management Strategy	Source Name	Source County	2010	2020	2030	2040	2050	2060
L	ENCINAL	ZAVALA	NUECES	MUNICIPAL WATER CONSERVATION	CONSERVATION	LA SALLE	9	9	10	10	11	14
L	COUNTY-OTHER	ZAVALA	NUECES	MUNICIPAL WATER CONSERVATION	CONSERVATION	ZAVALA	42	54	71	89	115	149
L	CRYSTAL CITY	ZAVALA	NUECES	MUNICIPAL WATER CONSERVATION	CONSERVATION	ZAVALA	192	364	543	695	850	1,002
Total Projected Water Management Strategies (acre-feet per year) =							**243**	**427**	**624**	**794**	**976**	**1,165**

Source: Volume 3, 2007 State Water Planning Database
(http://www.twdb.state.tx.us/DATA/db07/defaultReadOnly.asp)

Historical Water Use Summary by Groundwater (GW) and Surface Water (SW)
Unit: Acre Feet
(acre-feet) - TWDB Water Use Survey Database)

Historical Water Use Summary by

Groundwater (GW) and Surface Water (SW)

Unit: Acre Feet (acre-feet)

DIMMIT COUNTY

Year	Source	Municipal	Manufacturing	Steam Electric	Irrigation	Mining	Livestock	Total
1974	GW	1,577	52	0	26,672	14	1,202	**29,517**
1974	SW	0	0	0	6,852	0	114	**6,966**
	Total	**1,577**	**52**	**0**	**33,524**	**14**	**1,316**	**36,483**
1980	GW	2,779	27	0	19,051	732	674	**23,263**
1980	SW	0	0	0	4,305	0	125	**4,430**
	Total	**2,779**	**27**	**0**	**23,356**	**732**	**799**	**27,693**
1984	GW	2,301	16	0	17,679	432	757	**21,185**
1984	SW	0	0	0	1,313	0	188	**1,501**
	Total	**2,301**	**16**	**0**	**18,992**	**432**	**945**	**22,686**
1985	GW	2,212	4	0	20,821	582	633	**24,252**
1985	SW	0	0	0	1,462	0	157	**1,619**
	Total	**2,212**	**4**	**0**	**22,283**	**582**	**790**	**25,871**
1986	GW	2,339	12	0	11,529	0	596	**14,476**
1986	SW	0	0	0	7,523	0	149	**7,672**
	Total	**2,339**	**12**	**0**	**19,052**	**0**	**745**	**22,148**
1987	GW	2,112	11	0	6,225	587	841	**9,776**
1987	SW	0	0	0	5,434	0	210	**5,644**
	Total	**2,112**	**11**	**0**	**11,659**	**587**	**1,051**	**15,420**
1988	GW	2,567	8	0	10,497	498	795	**14,365**
1988	SW	0	0	0	13,151	0	198	**13,349**
	Total	**2,567**	**8**	**0**	**23,648**	**498**	**993**	**27,714**
1989	GW	2,684	4	0	7,382	506	783	**11,359**
1989	SW	0	0	0	5,580	0	195	**5,775**
	Total	**2,684**	**4**	**0**	**12,962**	**506**	**978**	**17,134**
1990	GW	2,208	3	0	6,085	506	790	**9,592**
1990	SW	0	0	0	5,100	0	197	**5,297**
	Total	**2,208**	**3**	**0**	**11,185**	**506**	**987**	**14,889**
1991	GW	2,378	9	0	3,579	920	807	**7,693**
1991	SW	0	0	0	3,820	0	201	**4,021**
	Total	**2,378**	**9**	**0**	**7,399**	**920**	**1,008**	**11,714**
1992	GW	2,373	3	0	3,652	920	617	**7,565**
1992	SW	0	0	0	3,899	0	154	**4,053**
	Total	**2,373**	**3**	**0**	**7,551**	**920**	**771**	**11,618**
1993	GW	2,617	3	0	5,886	920	590	**10,016**
1993	SW	0	0	0	6,540	0	148	**6,688**
	Total	**2,617**	**3**	**0**	**12,426**	**920**	**738**	**16,704**

1994	GW	2,521	2	0	4,507	920	789	**8,739**
1994	SW	0	0	0	6,211	0	197	**6,408**
	Total	**2,521**	**2**	**0**	**10,718**	**920**	**986**	**15,147**
1995	GW	2,704	2	0	5,489	919	788	**9,902**
1995	SW	0	0	0	6,099	0	197	**6,296**
	Total	**2,704**	**2**	**0**	**11,588**	**919**	**985**	**16,198**
1996	GW	2,815	4	0	5,185	919	682	**9,605**
1996	SW	0	0	0	5,761	0	170	**5,931**
	Total	**2,815**	**4**	**0**	**10,946**	**919**	**852**	**15,536**
1997	GW	2,408	0	0	1,706	919	655	**5,688**
1997	SW	0	0	0	7,583	0	164	**7,747**
	Total	**2,408**	**0**	**0**	**9,289**	**919**	**819**	**13,435**
1998	GW	2,488	0	0	1,786	919	401	**5,594**
1998	SW	0	0	0	7,940	0	101	**8,041**
	Total	**2,488**	**0**	**0**	**9,726**	**919**	**502**	**13,635**
1999	GW	2,543	0	0	1,792	919	442	**5,696**
1999	SW	0	0	0	7,966	0	111	**8,077**
	Total	**2,543**	**0**	**0**	**9,758**	**919**	**553**	**13,773**
2000	GW	3,132	0	0	3,793	919	442	**8,286**
2000	SW	0	0	0	2,957	0	111	**3,068**
	Total	**3,132**	**0**	**0**	**6,750**	**919**	**553**	**11,354**
2001	GW	2,375	0	0	5,230	917	405	**8,927**
2001	SW	0	0	0	3,874	0	333	**4,207**
	Total	**2,375**	**0**	**0**	**9,104**	**917**	**738**	**13,134**
2002	GW	2,115	0	0	7,015	917	327	**10,374**
2002	SW	0	0	0	4,677	0	269	**4,946**
	Total	**2,115**	**0**	**0**	**11,692**	**917**	**596**	**15,320**
2003	GW	2,202	0	0	1,643	917	300	**5,062**
2003	SW	0	0	0	2,125	0	247	**2,372**
	Total	**2,202**	**0**	**0**	**3,768**	**917**	**547**	**7,434**
2004	GW	355	0	0	4,055	917	300	**5,627**
2004	SW	0	0	0	1,370	0	247	**1,617**
	Total	**355**	**0**	**0**	**5,425**	**917**	**547**	**7,244**
2005	GW	*	*	*	*	*	*	*****
2005	SW	*	*	*	*	*	*	*****
	Total	*****	*****	*****	*****	*****	*****	*****
2006	GW	2,426	0	0	4,507	0	294	**7,227**
2006	SW	0	0	0	1,500	0	294	**1,794**
	Total	**2,426**	**0**	**0**	**6,007**	**0**	**588**	**9,021**
2007	GW	1,813	0	0	3,041	0	217	**5,071**
2007	SW	0	0	0	363	0	216	**579**
	Total	**1,813**	**0**	**0**	**3,404**	**0**	**433**	**5,650**
2008	GW	2,267	0	0	6,191	0	258	**8,716**
2008	SW	0	0	0	878	0	259	**1,137**
	Total	**2,267**	**0**	**0**	**7,069**	**0**	**517**	**9,853**

LA SALLE COUNTY

Year	Source	Municipal	Manufacturing	Steam Electric	Irrigation	Mining	Livestock	Total
1974	GW	990	0	0	11,900	5	1,047	**13,942**
1974	SW	0	0	0	985	0	115	**1,100**
	Total	**990**	**0**	**0**	**12,885**	**5**	**1,162**	**15,042**
1980	GW	998	0	0	10,759	0	181	**11,938**
1980	SW	0	0	0	2,604	0	719	**3,323**
	Total	**998**	**0**	**0**	**13,363**	**0**	**900**	**15,261**
1984	GW	1,150	0	0	9,242	0	128	**10,520**
1984	SW	0	0	0	1,817	0	1,157	**2,974**
	Total	**1,150**	**0**	**0**	**11,059**	**0**	**1,285**	**13,494**
1985	GW	966	0	0	3,003	0	104	**4,073**
1985	SW	0	0	0	583	0	943	**1,526**
	Total	**966**	**0**	**0**	**3,586**	**0**	**1,047**	**5,599**
1986	GW	953	0	0	2,666	0	105	**3,724**
1986	SW	0	0	0	667	0	951	**1,618**
	Total	**953**	**0**	**0**	**3,333**	**0**	**1,056**	**5,342**
1987	GW	1,030	0	0	2,467	0	101	**3,598**
1987	SW	0	0	0	617	0	911	**1,528**
	Total	**1,030**	**0**	**0**	**3,084**	**0**	**1,012**	**5,126**
1988	GW	1,162	0	0	2,426	0	100	**3,688**
1988	SW	0	0	0	607	0	903	**1,510**
	Total	**1,162**	**0**	**0**	**3,033**	**0**	**1,003**	**5,198**
1989	GW	1,303	0	0	6,051	0	99	**7,453**
1989	SW	0	0	0	350	0	891	**1,241**
	Total	**1,303**	**0**	**0**	**6,401**	**0**	**990**	**8,694**
1990	GW	1,233	0	0	6,198	0	98	**7,529**
1990	SW	0	0	0	1,094	0	890	**1,984**
	Total	**1,233**	**0**	**0**	**7,292**	**0**	**988**	**9,513**
1991	GW	1,335	0	0	6,278	0	101	**7,714**
1991	SW	0	0	0	2,322	0	909	**3,231**
	Total	**1,335**	**0**	**0**	**8,600**	**0**	**1,010**	**10,945**
1992	GW	1,298	0	0	7,974	0	108	**9,380**
1992	SW	0	0	0	1,994	0	969	**2,963**
	Total	**1,298**	**0**	**0**	**9,968**	**0**	**1,077**	**12,343**
1993	GW	1,327	0	0	6,750	0	100	**8,177**
1993	SW	0	0	0	68	0	902	**970**
	Total	**1,327**	**0**	**0**	**6,818**	**0**	**1,002**	**9,147**
1994	GW	1,266	0	0	5,524	0	77	**6,867**
1994	SW	0	0	0	16	0	695	**711**
	Total	**1,266**	**0**	**0**	**5,540**	**0**	**772**	**7,578**
1995	GW	1,309	0	0	4,895	0	75	**6,279**
1995	SW	0	0	0	49	0	676	**725**
	Total	**1,309**	**0**	**0**	**4,944**	**0**	**751**	**7,004**
1996	GW	1,386	0	0	7,137	0	57	**8,580**
1996	SW	0	0	0	72	0	517	**589**
	Total	**1,386**	**0**	**0**	**7,209**	**0**	**574**	**9,169**
1997	GW	1,183	0	0	4,721	0	61	**5,965**

1997	SW	0	0	0	0	0	547	**547**
	Total	**1,183**	**0**	**0**	**4,721**	**0**	**608**	**6,512**
1998	GW	1,435	0	0	3,618	0	61	**5,114**
1998	SW	0	0	0	0	0	550	**550**
	Total	**1,435**	**0**	**0**	**3,618**	**0**	**611**	**5,664**
1999	GW	1,537	0	0	3,293	0	69	**4,899**
1999	SW	0	0	0	0	0	622	**622**
	Total	**1,537**	**0**	**0**	**3,293**	**0**	**691**	**5,521**
2000	GW	1,625	0	0	4,003	0	70	**5,698**
2000	SW	0	0	0	0	0	634	**634**
	Total	**1,625**	**0**	**0**	**4,003**	**0**	**704**	**6,332**
2001	GW	1,518	0	0	3,134	0	87	**4,739**
2001	SW	0	0	0	0	0	785	**785**
	Total	**1,518**	**0**	**0**	**3,134**	**0**	**872**	**5,524**
2002	GW	1,700	0	0	5,286	0	69	**7,055**
2002	SW	0	0	0	0	0	619	**619**
	Total	**1,700**	**0**	**0**	**5,286**	**0**	**688**	**7,674**
2003	GW	1,666	0	0	4,518	0	60	**6,244**
2003	SW	0	0	0	2	0	543	**545**
	Total	**1,666**	**0**	**0**	**4,520**	**0**	**603**	**6,789**
2004	GW	1,091	0	0	4,334	0	64	**5,489**
2004	SW	0	0	0	0	0	573	**573**
	Total	**1,091**	**0**	**0**	**4,334**	**0**	**637**	**6,062**
2005	GW	*	*	*	*	*	*	*****
2005	SW	*	*	*	*	*	*	*****
	Total	*****	*****	*****	*****	*****	*****	*****
2006	GW	1,144	0	0	6,636	0	384	**8,164**
2006	SW	0	0	0	0	0	384	**384**
	Total	**1,144**	**0**	**0**	**6,636**	**0**	**768**	**8,548**
2007	GW	1,178	0	0	3,337	0	201	**4,716**
2007	SW	0	0	0	0	0	200	**200**
	Total	**1,178**	**0**	**0**	**3,337**	**0**	**401**	**4,916**
2008	GW	1,404	0	0	4,491	0	292	**6,187**
2008	SW	0	0	0	0	0	293	**293**
	Total	**1,404**	**0**	**0**	**4,491**	**0**	**585**	**6,480**

ZAVALA COUNTY

Year	Source	Municipal	Manufacturing	Steam Electric	Irrigation	Mining	Livestock	Total
1974	GW	1,298	948	0	116,530	12	1,059	**119,847**
1974	SW	0	0	0	29,785	0	105	**29,890**
	Total	**1,298**	**948**	**0**	**146,315**	**12**	**1,164**	**149,737**
1980	GW	2,068	1,053	0	81,800	68	397	**85,386**
1980	SW	0	0	0	25,070	0	793	**25,863**
	Total	**2,068**	**1,053**	**0**	**106,870**	**68**	**1,190**	**111,249**
1984	GW	2,594	1,088	0	90,673	135	129	**94,619**
1984	SW	0	0	0	4,917	0	1,165	**6,082**
	Total	**2,594**	**1,088**	**0**	**95,590**	**135**	**1,294**	**100,701**
1985	GW	2,154	951	0	94,200	143	113	**97,561**
1985	SW	0	0	0	5,454	0	1,018	**6,472**
	Total	**2,154**	**951**	**0**	**99,654**	**143**	**1,131**	**104,033**
1986	GW	2,370	922	0	39,865	0	92	**43,249**
1986	SW	0	0	0	19,733	0	835	**20,568**
	Total	**2,370**	**922**	**0**	**59,598**	**0**	**927**	**63,817**
1987	GW	2,399	858	0	34,968	127	83	**38,435**
1987	SW	0	0	0	15,869	0	755	**16,624**
	Total	**2,399**	**858**	**0**	**50,837**	**127**	**838**	**55,059**
1988	GW	2,670	908	0	74,621	124	69	**78,392**
1988	SW	0	0	0	33,866	0	624	**34,490**
	Total	**2,670**	**908**	**0**	**108,487**	**124**	**693**	**112,882**
1989	GW	2,592	1,233	0	92,370	116	68	**96,379**
1989	SW	0	0	0	3,312	0	614	**3,926**
	Total	**2,592**	**1,233**	**0**	**95,682**	**116**	**682**	**100,305**
1990	GW	2,349	1,306	0	76,296	116	71	**80,138**
1990	SW	0	0	0	34,626	0	643	**35,269**
	Total	**2,349**	**1,306**	**0**	**110,922**	**116**	**714**	**115,407**
1991	GW	2,484	1,091	0	70,894	114	73	**74,656**
1991	SW	0	0	0	32,173	0	659	**32,832**
	Total	**2,484**	**1,091**	**0**	**103,067**	**114**	**732**	**107,488**
1992	GW	2,303	1,271	0	58,125	114	88	**61,901**
1992	SW	0	0	0	26,379	0	793	**27,172**
	Total	**2,303**	**1,271**	**0**	**84,504**	**114**	**881**	**89,073**
1993	GW	2,511	1,046	0	51,085	114	89	**54,845**
1993	SW	0	0	0	17,924	0	798	**18,722**
	Total	**2,511**	**1,046**	**0**	**69,009**	**114**	**887**	**73,567**
1994	GW	2,576	729	0	54,095	114	96	**57,610**
1994	SW	0	0	0	21,729	0	863	**22,592**
	Total	**2,576**	**729**	**0**	**75,824**	**114**	**959**	**80,202**
1995	GW	2,570	697	0	55,914	114	92	**59,387**
1995	SW	0	0	0	18,558	0	829	**19,387**
	Total	**2,570**	**697**	**0**	**74,472**	**114**	**921**	**78,774**
1996	GW	2,690	721	0	56,062	114	81	**59,668**
1996	SW	0	0	0	18,607	0	728	**19,335**
	Total	**2,690**	**721**	**0**	**74,669**	**114**	**809**	**79,003**
1997	GW	2,467	691	0	49,288	114	86	**52,646**

1997	SW	0	0	0	16,359	0	774	**17,133**
	Total	**2,467**	**691**	**0**	**65,647**	**114**	**860**	**69,779**
1998	GW	2,791	712	0	68,653	114	69	**72,339**
1998	SW	0	0	0	22,786	0	618	**23,404**
	Total	**2,791**	**712**	**0**	**91,439**	**114**	**687**	**95,743**
1999	GW	2,538	1,100	0	51,353	114	91	**55,196**
1999	SW	0	0	0	16,093	0	821	**16,914**
	Total	**2,538**	**1,100**	**0**	**67,446**	**114**	**912**	**72,110**
2000	GW	2,920	922	0	35,140	114	76	**39,172**
2000	SW	0	0	0	11,135	0	681	**11,816**
	Total	**2,920**	**922**	**0**	**46,275**	**114**	**757**	**50,988**
2001	GW	2,886	758	0	40,617	114	52	**44,427**
2001	SW	0	0	0	14,251	0	469	**14,720**
	Total	**2,886**	**758**	**0**	**54,868**	**114**	**521**	**59,147**
2002	GW	2,854	1,412	0	111,873	114	77	**116,330**
2002	SW	0	0	0	35,328	0	695	**36,023**
	Total	**2,854**	**1,412**	**0**	**147,201**	**114**	**772**	**152,353**
2003	GW	2,950	3,681	0	41,692	114	101	**48,538**
2003	SW	0	0	0	6,375	0	905	**7,280**
	Total	**2,950**	**3,681**	**0**	**48,067**	**114**	**1,006**	**55,818**
2004	GW	2,490	981	0	50,481	114	87	**54,153**
2004	SW	0	0	0	4,110	0	783	**4,893**
	Total	**2,490**	**981**	**0**	**54,591**	**114**	**870**	**59,046**
2005	GW	*	*	*	*	*	*	*****
2005	SW	*	*	*	*	*	*	*****
	Total	*****	*****	*****	*****	*****	*****	*****
2006	GW	2,819	1,103	0	44,019	0	585	**48,526**
2006	SW	0	0	0	4,000	0	585	**4,585**
	Total	**2,819**	**1,103**	**0**	**48,019**	**0**	**1,170**	**53,111**
2007	GW	2,664	707	0	35,241	0	470	**39,082**
2007	SW	0	0	0	10,856	0	470	**11,326**
	Total	**2,664**	**707**	**0**	**46,097**	**0**	**940**	**50,408**
2008	GW	2,812	566	0	24,283	0	573	**28,234**
2008	SW	0	0	0	13,409	0	573	**13,982**
	Total	**2,812**	**566**	**0**	**37,692**	**0**	**1,146**	**42,216**

* there are no separate values available for groundwater and surface water

Source: TWDB Water Use Survey Database (http://www.twdb.state.tx.us/wushistorical/DesktopDefault.aspx?PageID=1)

Public Information

The District will take necessary steps to ensure the public is informed and will cooperate with the media and all interested parties. The dissemination of information to public is vital to create awareness and the public support that is needed to control and reduce the mining of the underground aquifer.

The District will also continue to pursue water conservation through a public information and education program. If used properly, voluntary conservation measures can significantly extend the life of the groundwater, thereby preventing the need for mandatory programs by this District or the State. Voluntary programs are entirely the function of providing the necessary education on conservation methods and habits along with the means to implement those methods. The District will continue to provide information to school districts and the public in an effort to create voluntary conservation.

Methodology the District Will Use to Track Progress on an Annual Basis in Achieving All Management Goals

The District Manager will prepare an annual report on District performances in achieving the management goals. The annual report will be presented to the Board of Directors during the first quarter of each calendar year. The report will include the number of instances each objective activity was engaged in during the year, referenced to the expenditure of staff time and budget so that the effectiveness and efficiency of each activity may be evaluated. The annual report will be maintained on file at the District Office and made available to the public upon adoption by the Board.

Goals and Objectives

Goal 1.0 Efficient Use of Ground Water.
Management Objectives: District will continue monitoring and recording data from the seven (7) Carrizo Aquifer continuous well water level recorders.
Performance Standards: The District will assimilate data from the continuous well water level recorders and present to the Board monthly.

Goal 2.0 Controlling and Preventing Waste of Groundwater.
Management Objectives: The District will at least on two (2) occasions each year provide public information on water conservation and waste prevention through public speaking appearances at public schools, and civic organizations or newspaper articles.

Performance Standards:
A. The number of speaking appearances made by the District each year.
B. The number of newspaper articles published by the District each year.

Goal 3.0 Control and Prevent Subsidence. This management goal is not applicable to the District due to the fact that subsidence is not a problem identified in the District or region.

Goal 4.0 Address Conjunctive Surface Water Management Issues.
Management Objectives: Each year the District will confer at least on one occasion with the Nueces River Authority on cooperative opportunities for conjunctive resource management.
Performance Standard: The number of conferences on conjunctive resource management opportunities held with Nueces River Authority each year.

Goal 5.0 Address Natural Resource Issues that Impact the Use and Availability of Groundwater.
Management Objectives: Each year the District will insure that all new wells permitted for construction within the District, comply with the District construction standards through monitoring of the State of Texas water well report required to be provided to the District by water well drillers.
Performance Standard: The number of newly permitted water wells within the District monitored for compliance will be reported to the Board annually.

Goal 6.0 Water Conservation.
Management Objectives: The District will promote water conservation by promoting water stewardship by raising public awareness of the necessity and importance of water conservation.
Performance Standard: Annual Report to the Board indicating the number of individuals or schools addressed.
Performance Standard: The number of newspaper articles published encouraging water conservation.

Goal 6.1 Recharge Enhancement.
Management Objectives: The District will monitor existing recharge structure and evaluate how natural or artificial recharge may be increased for the groundwater resources within the District via the existing structure and/or new sites.
Performance Standard: The number of recharge sites monitored will be at least one site annually.
Performance Standard: The number of acre feet of captured rainwater in the recharge pit will be documented and reported to the Board of Directors annually.

Goal 6.2 Precipitation Enhancement - The Board of Directors feel that Precipitation Enhancement is not cost effective and is not appropriate for our District at this time.

Goal 6.3 Brush Control.
Management Objectives: Brush Control – Recharge Enhancement and Conservation Project in partnership with the Texas A & M Research Center, Uvalde, Texas, in La Salle and Zavala Counties
Performance Standard: La Salle County: Four (4) sites consisting of a control (no treatment – root plowed) freshly treated site – 5-year post treated, and 15-year post treated sites have been instrumented and data collected as to moisture depth and penetration and retention in relation to woody vegetation. Periodic updates received and filed. Report received at the end of this project; data published in a scientific, peer-reviewed journal. Zavala County: "The Effects of Brush Removal - Mesquite" project will continue to be conducted to determine and understand the effects of brush removal

on distributed recharge of the Carrizo-Wilcox aquifer. Conduct a manipulative study to examine the effects of the interactions between mechanical/chemical brush removal and post-fire treatment on distributed recharge over the outcrop of the Carrizo-Wilcox aquifer in Zavala, La Salle, and Dimmit counties as well as nearby counties outside the District, but relevant to the aquifer. Nine (9) sites (three replicates of three soil types) will be distributed across the aquifer recharge zone to compare the effects of mechanical, chemical, and prescribed fire management strategies on groundwater recharge processes. An annual brush control project status report will be presented to the Board of Directors which will include the following measurements and results: plot description, soil description, seasonal soil moisture, chloride and water isotope soil profiles, vegetation water isotopes following significant precipitation, vegetation description, fuels description, weather description, and fire behavior description.

Goal 6.4 Rainwater Harvesting.
Management Objectives: The District, in conjunction with, Texas AgriLife Research Center in Uvalde, Texas, have constructed a rainwater harvesting system at the research center.
Performance Standard: The District will acquire the volume of rainwater captured per year and include this information in the annual report to the Board of Directors.

Goal 7.0 Addressing Drought Conditions
Management Objectives: Each month the District will download the Palmer Drought Severity Index (PDSI) map by accessing the National Weather Service - Climate Prediction Center website http://www.cpc.ncep.noaa.gov/products/monitoring_and_data/drought.shtml; will check for updates to the Drought Preparedness Council Situation Report by accessing the Texas Department of Public Safety's website http://www.txdps.state.tx.us/dem/sitrepindex.htm; and will check for updates on the TWDB web page http://www.twdb.state.tx.us/DATA/drought/index.asp.
Performance Standard: The staff will assess the status of drought in the District and prepare a briefing with maps and situation reports for the Board of Directors. Monthly downloads will be filed for future use. Currently engaged with Southwest Research Institute to develop and prepare a drought contingency plan.

Goal 8.0 Addressing the Desired Future Conditions
Management Objectives: The District will annually compile well monitoring data from seven (7)) wells within the District, and will determine seven (7) year water well averages for the Carrizo/Wilcox Aquifer based on this data.
Performance Standard: The District's Annual Report will include a discussion of the newly permitted wells along with water level data as it relates to the 50-year Desired Future Conditions.

Regulation

The primary objective of this plan is to control groundwater withdrawals to reduce potential aquifer mining within the District. Groundwater withdrawals can be reduced through conservation of groundwater. In regulating groundwater withdrawals, the District shall take into account several factors, including:

1) economic impact of conservation measures;
2) the degree and effect of aquifer mining in the area; and
3) differing hydrological characteristics of the aquifer(s) within the District.

The District will utilize the data and information obtained to evaluate the effectiveness of its regulatory policies and determine what future action may be needed to achieve the mandate of the Act, the District Rules, and the objectives and requirements of this Plan.

Permits and Enforcement

The District may deny permits or limit groundwater withdrawals following the guidelines stated in the Act, Rules of the District, and this Plan, in determining whether to issue a permit or limit groundwater withdrawal, the District will weigh the public benefit against individual hardship after considering all appropriate testimony and all relevant factors that include:

1) the purpose of the District Rules;
2) the objectives and requirements of this Plan;
3) the economic impact on the applicant from grant or denial of the permit or terms prescribed by the permit; and
4) an equitable distribution of available groundwater.

In carrying out its purpose, the District is empowered to require the reduction of groundwater withdrawal to amounts that will reduce aquifer mining, and restore and maintain sufficient artesian pressure. To achieve this requirement, the District may, on its own initiative and based on information obtained through its monitoring procedures, amend or revoke any permits.

The District will enforce permit terms and conditions.

Equity and Discretion

The District recognizes that the burden of reducing the mining of an underground aquifer should be borne by all users of groundwater. Although a single entity's groundwater withdrawal may not be capable of causing severe problems, the total action by all users can cause significant mining of groundwater. Therefore, every entity must be regulated.

To achieve the objective, the District must use discretion in permitting groundwater withdrawals. Therefore, temporary exceptions to the general rule for a specific area may be necessary if an economic hardship will be created that is significantly greater for one person than for others in the District, or if required due to hydrological, physical, or geophysical characteristics.

The District Rules prescribe a production ratio of groundwater withdrawal based upon the number of acres of land owned by a property owner. Nothing in this Plan or the District Rules, however, should be interpreted to mean that a person is entitled to use groundwater in any amount merely because the District Rules prescribe a ratio for production. All uses of groundwater will be evaluated under the standards of beneficial

use as defined in the District Rules and Chapter 36, Texas Water Code. The number of acres of land that are not within the Certificate of Convenience and Necessity (CCN) of a public or private water utility may be taken into consideration to meet the production ratio. If the well will be used to serve the connections within the boundaries of a water utility's CCN, then the utility's number of connections within the CCN justifies the amount of water requested. Commercial uses of water will be based upon beneficial standards.

Cooperation and Coordination

The District will work with the public, the regulated community, and state and local governments to achieve the District goals. The District will work with all water suppliers, industrial, and agricultural users to help them to preserve groundwater. The Texas Commission on Environmental Quality is the agency charged with protecting the state's water resources, and the Texas Water Development Board is the agency responsible for water resources planning and promotion of water conservation practices. The District will continue to work with both of these agencies throughout the life of this Plan.

Regulatory Action Plan

This portion of the Plan translates the legislative mandate of the District, Chapter 36 of the Texas Water Code and the policy and purpose of the District Rules into specific objectives and requirements. The Regulatory Action Plan establishes the requirements necessary to receive a water well drilling and production permit. The requirements are written as general guidelines, and each permit will be evaluated based on the best scientific data available. The current demand on the aquifer and the trend of the water levels in the area may be determining factors in the evaluation of a permit application

Transportation of Water from the District

For conserving and protecting groundwater in the District, transportation of water from the District requires a permit as stated in the District Rules. In the review of applications for water transportation projects the District will take into account 1) the availability of water in the district and in the proposed receiving area during the period for which the water supply is requested; 2) the projected effect of the proposed transfer on aquifer conditions, depletion, subsidence, or effects on existing permit holders or other groundwater users within the district; and 3) the approved Regional Water Plan and this Plan. In addition to the forgoing, applications for permits to authorize the transportation of water from the District are subject to all other well permitting and operating provisions required for any other well in the District, including well spacing, production limits, and authorized use of water under standards of beneficial use. Transportation permits will also be subject to an export fee established in the District's Rules and consistent with Chapter 36, Texas Water Code. Transportation permits shall be reviewable, in accordance with the District Rules, upon the submission or discovery of data that demonstrates that the export of such water is causing or contributing to a depletion or mining of the aquifers within the District or otherwise contradicts the policies established in the District Plan.

Groundwater Protection

Section 26.401 of the Texas Water Code states that: "In order to safeguard present and future groundwater supplies, usable and potential usable groundwater must be protected and maintained."

A change in more than 10 % in the average groundwater level of the wells monitored by the District and/or by TWDB will necessitate a change in pumpage in that area and will trigger a review of well permits issued by the District in the area in which the change is occurring.

Groundwater contamination may result from many sources, including current and past oil and gas production, agriculture activities, industrial and manufacturing processes, commercial and business endeavors, domestic activities, and natural sources that may be influenced or may result from human activities.

The District shall take appropriate measures to discontinue activities that are either causing, or are a potential threat to cause groundwater contamination. Due to permeability of aquifer outcrops and recharge zones, there is a greater threat for groundwater contamination from surface pollution in recharge and outcrop regions, and the District will impose more stringent restrictions on those areas.

Fees

Copies of the District Rules and Management Plan are $5.00.

Water Well Drilling Permit Fee is $175.00 of which $75.00 is refundable to the applicant upon receipt of the drillers log and well registration to the District.

Water Well Production Permit Fee is $25.00

Well Registration Fee for exempt wells is $10.00.

Transportation Permit Application Fee is $200.00.

Photocopies of District Documents are $1.00 per page.

Sending or receiving Facsimiles is $2.00 for first page and $1.00 thereafter including coversheet.

Document research by a District Employee is $15.00 hr.

The cost of postage will be added when applicable.

Definitions

"Act" means the legislative Act that created the District that governs its operations. (Act of H.B. 3602, 75th Legislature.)

"Area" means a geographical area designated by the Board in which regulatory policy will be applied.

"Board" means the Board of Directors of the Wintergarden Groundwater Conservation District.

“Certificate of Convenience and Necessity (CNN)" means the designation of geographical boundaries of a service area of a water utility.

“District” means the Wintergarden Groundwater Conservation District.

"Groundwater" means water located beneath the earth's surface but does not include water produced with oil in the production of oil and gas.

"Mining of an Aquifer or Aquifer Mining" means to extract groundwater from an aquifer at an annual rate which exceeds the normal recharge to the aquifer.

"Outcrop" means an area which an underground stratum or geologic formation is found at the surface of the ground.

"Person" includes corporation, individual, organization, government or governmental subdivision or agency, business trust, estate trust, partnership, association, or any other legal entity.

"Plan" means this District Water Management Plan.

"Water Utility" means any corporation, company, entity, or governmental subdivision public or private that sells water to any person within its service area.

"Well" means any excavation, facility, device, or method that could be used to withdraw groundwater.

"Withdraw" means the act of extracting groundwater by any method.

GAM Run 10-024

By Mohammad Masud Hassan, P.E.
Texas Water Development Board
Groundwater Availability Modeling Section
(512) 463-3337
August 18, 2010

Mohammad Masud Hassan is a Hydrologist in the Groundwater Availability Modeling Section and is responsible for the work performed. The seal appearing on this document was authorized by Mohammad Masud Hassan, P.E.95699 on August 18, 2010.

EXECUTIVE SUMMARY:

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

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

The purpose of this model run is to provide information to Wintergarden Groundwater Conservation District for its groundwater management plan. The groundwater management plan for the Wintergarden Groundwater Conservation District was due for approval by the Executive Administrator of the Texas Water Development Board before January 25, 2011. This report supersedes GAM Run 05-28 (Wade, 2005) because the groundwater availability model for the Yegua-Jackson Aquifer has since been released and is required to be included. In addition, the methodology for extracting model information has changed since GAM Run 05-28 was released.

This report discusses the method, assumptions, and results from model runs using the groundwater availability models for the southern part of the Carrizo-Wilcox, Queen City, and Sparta aquifers, and the Yegua-Jackson Aquifer. Tables 1 through 4 summarizes the groundwater availability model data required by the statute, and figures 1 through 4 shows the area of each model from which the values in tables were extracted.

METHODS:

We ran the groundwater availability models for the southern part of the Carrizo-Wilcox, Queen City, and Sparta aquifers (1) extracted water budgets for each year of the 1980 through 1999 period and (2) averaged the annual water budget values for recharge, surface water outflow, inflow to the district, outflow from the district, net inter-aquifer flow (upper), and net inter-aquifer flow (lower). It should be noted that GAM Run 05-28 (Wade, 2005) used the model boundaries within the district; we are now using the official aquifer boundaries to extract information from the models. In addition, we are using average water budget information from the transient calibration instead of the steady-state model to include the affects of pumping on the aquifer system. Therefore the results from this report may differ slightly from GAM Run 05-28.

We ran the groundwater availability model for Yegua-Jackson Aquifer and (1) extracted water budgets for each year of the 1980 through 1997 period and (2) averaged the annual water budget values for recharge, surface water outflow, inflow to the district, outflow from the district for the portions of the Yegua-Jackson Aquifer located within the district.

PARAMETERS AND ASSUMPTIONS:

Carrizo-Wilcox, Sparta and Queen City aquifers

- We used Version 2.01 of the groundwater availability model for the southern part of the Carrizo-Wilcox, Queen City, and Sparta aquifers. See Dutton and others (2003) and Bené and others (2004) for assumptions and limitations of the groundwater availability model for the southern part of the Carrizo-Wilcox, Queen City, and Sparta aquifers.
- This groundwater availability model includes eight layers, representing (from top to bottom):

1. the Sparta Aquifer (Layer 1),
2. the Weches Confining Unit (Layer 2),
3. the Queen City Aquifer (Layer 3),
4. the Reklaw Confining Unit (Layer 4),
5. the Carrizo Aquifer (Layer 5),
6. the Upper Wilcox Aquifer (Layer 6),
7. the Middle Wilcox Aquifer (Layer 7), and
8. the Lower Wilcox Aquifer (Layer 8).

Information extracted and summarized for layer 5 to 8 represents the Carrizo-Wilcox Aquifer, layer 3 represents Queen City Aquifer, and layer 1 represent Sparta Aquifer.

- The root mean squared error (a measure of the difference between simulated and actual water levels during model calibration) in the groundwater availability model is 23 feet for the Sparta Aquifer, 18 feet for the Queen City Aquifer, and 33 feet for the Carrizo Aquifer for the calibration period (1980 to 1989) and 19, 22, and 48 feet for the same aquifers, respectively, in the verification period (1990 to 1999) (Kelley others, 2004). These root mean squared errors are between seven and ten percent of the range of measured water levels (Kelley others, 2004).
- Groundwater in the Carrizo-Wilcox, Queen City, and Sparta aquifers ranges from fresh to brackish in composition (Kelley and others, 2004). Groundwater with total dissolved solids of less than 1,000 milligrams per liter are considered fresh and total dissolved solids of 1,000 to 10,000 milligrams per liter are considered brackish.
- We used Groundwater Vistas Version 5 (Environmental Simulations, Inc. 2007) as the interface to process model output.

Yegua-Jackson Aquifer

- We used version 1.01 of the groundwater availability model for the western section of the Yegua-Jackson Aquifer. See Kelley and others (2010) for assumptions and limitations of the model.
- The Yegua-Jackson Aquifer model includes five layers representing:
    1. outcrop section for the Yegua-Jackson Aquifer and younger overlying units,
    2. the upper portion of the Jackson Group,
    3. the lower portion of the Jackson Group,
    4. the upper portion of the Yegua Group, and
    5. the lower portion of the Yegua Group.

  Information was extracted and summarized for portions of layer 1 that represent the Yegua-Jackson as well as layers 2 to 5.
- The mean absolute error (a measure of the difference between simulated and actual water levels during model calibration) for the four main aquifers in the model (Jackson Group, Upper Yagua and Lower Yagua) for the transient calibration period (1980 through 1997) ranged from approximately 31 to23 feet.

The root mean squared error was about ten percent (or less) of the maximum change in water levels across the model (Deeds and others, 2010).

- The recharge used for the model run represents average recharge as described in Deeds and others (2010).
- We used Groundwater Vistas Version 5 (Environmental Simulations, Inc. 2007) as the interface to process model output.
- The model results presented in this report were extracted from all areas of the model representing the units comprising the Yegua-Jackson Aquifer. For this reason, the reported values may reflect water of quality ranging from fresh to brackish and saline. This is especially true for the subcrop portions of the aquifer in the northeastern part of the District.

RESULTS:

A groundwater budget summarizes the amount of water entering and leaving the aquifer according to the groundwater availability model. Selected components were extracted from the groundwater budget for the aquifers located within the district and averaged over the duration of the calibration and verification portion of the model run (1980 through 1999 for the southern part of the Carrizo-Wilcox, Queen City, and Sparta aquifers, and 1980 through 1997 for the Yegua-Jackson Aquifer) in the district, as shown in tables 1 through 4. The components of the modified budgets shown in Tables include:

- Precipitation recharge—This is the aerially distributed recharge sourced from precipitation falling on the outcrop areas of the aquifers (where the aquifer is exposed at land surface) within the district.
- Surface water outflow—This is the total water exiting the aquifer (outflow) to surface water features such as streams, reservoirs, and drains (springs).
- Flow into and out of district—This component describes lateral flow within the aquifer between the district and adjacent counties.
- Flow between aquifers—This describes the vertical flow, or leakage, between aquifers or confining units. This flow is controlled by the relative water levels in each aquifer or confining unit and aquifer properties of each aquifer or confining unit that define the amount of leakage that occurs. “Inflow” to an aquifer from an overlying or underlying aquifer will always equal the “Outflow” from the other aquifer.

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

As depicted by Kalaswad and Arroyo (2006), groundwater in the southern Carrizo-Wilcox, Queen City, and Sparta aquifers ranges from fresh to saline. The reported values in this report for flow terms include fresh (less than 1,000 milligrams per liter total dissolved solids) and brackish (1,000 to 10,000 milligrams per liter total dissolved solids) groundwater.

Table 1: Carrizo-Wilcox Aquifer‘s summarized information required for the Wintergarden Groundwater Conservation District’s groundwater management plan. All values are reported in acre-feet per year. All numbers are rounded to the nearest 1 acre-foot. Reported flow estimates include both fresh and brackish waters present in the aquifers.

Management Plan requirement	Aquifer or confining unit	Results
Estimated annual amount of recharge from precipitation to the district	Carrizo-Wilcox Aquifer	15,229
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Carrizo-Wilcox Aquifer	326
Estimated annual volume of flow into the district within each aquifer in the district	Carrizo-Wilcox Aquifer	25,485
Estimated annual volume of flow out of the district within each aquifer in the district	Carrizo-Wilcox Aquifer	22,227
Estimated net annual volume of flow between each aquifer in the district	Reklaw Confining Unit and other overlying unit into Carrizo-Wilcox Aquifer	28,227

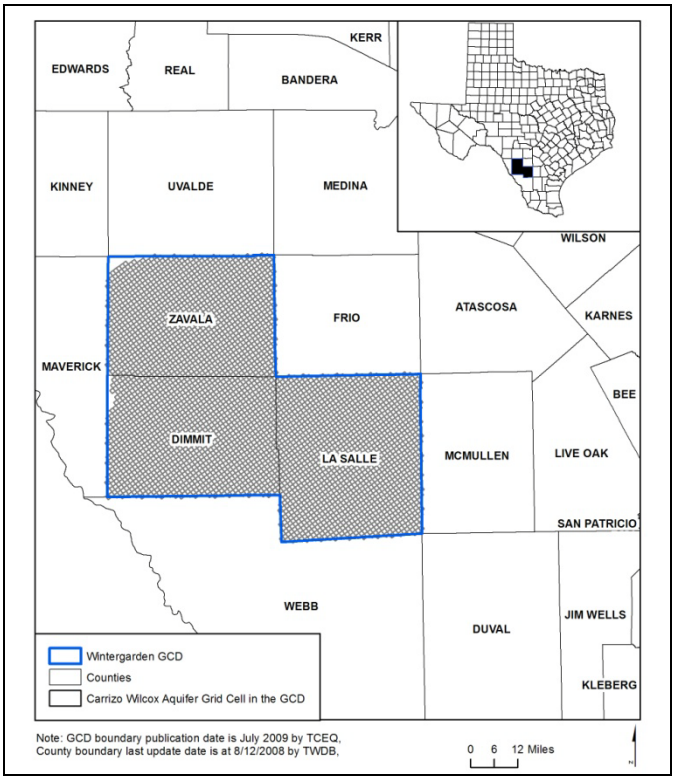

Figure 1: Area of the groundwater availability model for the Carrizo-Wilcox Aquifer from which the information in Table 1 was extracted (the aquifer extent within the Wintergarden Groundwater Conservation District boundary).

Table 2: Sparta Aquifer's summarized information required for the Wintergarden Groundwater Conservation District's groundwater management plan. All values are reported in acre-feet per year. All numbers are rounded to the nearest 1 acre-foot. Reported flow estimates include both fresh and brackish waters present in the aquifers.

Management Plan requirement	Aquifer	Results
Estimated annual amount of recharge from precipitation to the district	Sparta Aquifer	0
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Sparta Aquifer	0
Estimated annual volume of flow into the district within each aquifer in the district	Sparta Aquifer	778
Estimated annual volume of flow out of the district within each aquifer in the district	Sparta Aquifer	592
Estimated net annual volume of flow between each aquifer in the district	Weches Confining Unit into Sparta Aquifer	24
	Upper lying younger unit to Sparta	69

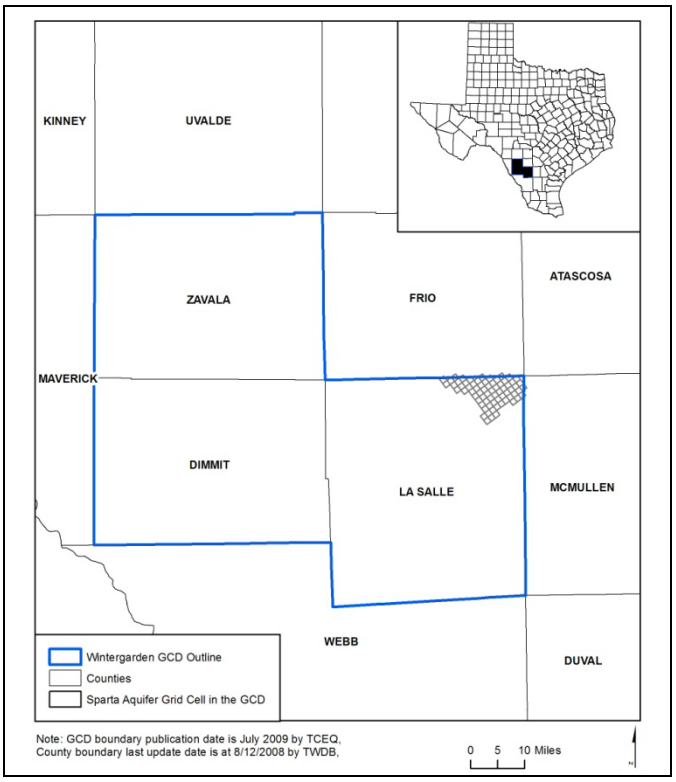

Figure 2: Area of the groundwater availability model for the Sparta Aquifer from which the information in Table 2 was extracted (the aquifer extent within the Wintergarden Groundwater Conservation District boundary).

Table 3: Queen City Aquifer's summarized information required for the Wintergarden Groundwater Conservation District's groundwater management plan. All values are reported in acre-feet per year. All numbers are rounded to the nearest 1 acre-foot. Reported flow estimates include both fresh and brackish waters present in the aquifers.

Management Plan requirement	Aquifer	Results
Estimated annual amount of recharge from precipitation to the district	Queen City Aquifer	0
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Queen City Aquifer	0
Estimated annual volume of flow into the district within each aquifer in the district	Queen City Aquifer	981
Estimated annual volume of flow out of the district within each aquifer in the district	Queen City Aquifer	309
Estimated net annual volume of flow between each aquifer in the district	Queen City Aquifer To Weches Confining Unit	386
	Queen City Aquifer into the Reklaw Confining Unit	438

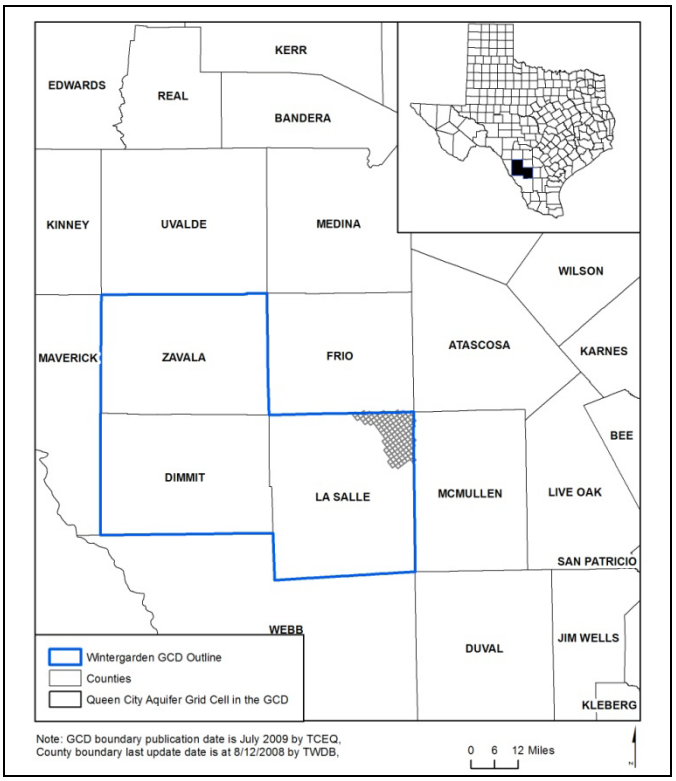

Figure 3: Area of the groundwater availability model for the Queen City Aquifer from which the information in Table 3 was extracted (the aquifer extent within the Wintergarden Groundwater Conservation District boundary).

Table 4: Yegua-Jackson Aquifer's summarized information required for the Wintergarden Groundwater Conservation District's groundwater management plan. All values are reported in acre-feet per year. All numbers are rounded to the nearest 1 acre-foot. Reported flow estimates include both fresh and brackish waters present in the aquifers.

Management Plan requirement	Aquifer	Results
Estimated annual amount of recharge from precipitation to the district	Yegua-Jackson Aquifer	7,618
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Yegua-Jackson Aquifer	8,190
Estimated annual volume of flow into the district within each aquifer in the district	Yegua-Jackson Aquifer	2,717
Estimated annual volume of flow out of the district within each aquifer in the district	Yegua-Jackson Aquifer	2,671
Estimated net annual volume of flow between each aquifer in the district	Not applicable	Not applicable

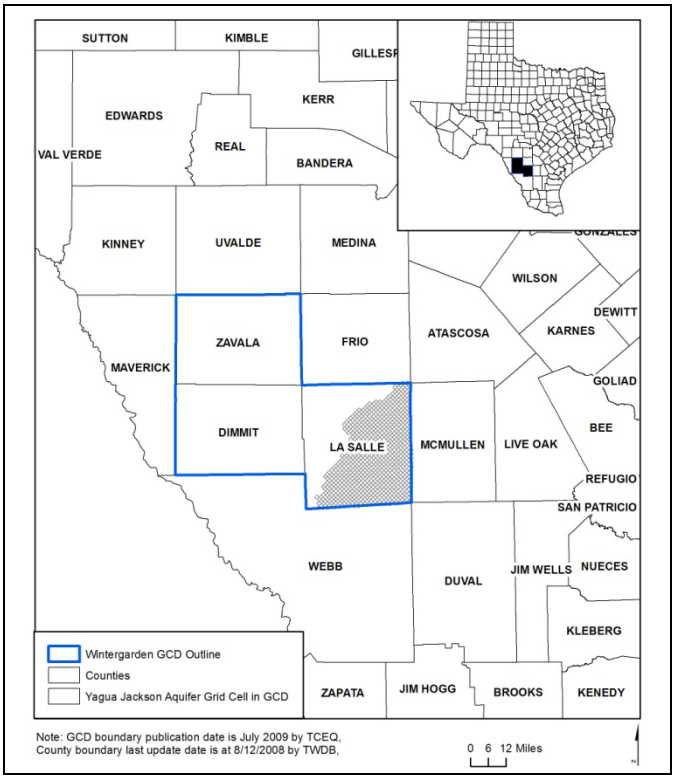

Figure 4: Area of the groundwater availability model for the Yegua-Jackson Aquifer from which the information in Table 4 was extracted (the aquifer extent within the Wintergarden Groundwater Conservation District boundary).

REFERENCES:

Wade, S., 2005, GAM Run 05-28, 2 p.

http://www.twdb.state.tx.us/gam/GAMruns/GR05-28.pdf

Chiang, W., and Kinzelbach, W., 2001, Groundwater Modeling with PMWIN, 346 p.

Deeds, N., Kelley, V.A., Fryar, D., Jones, T., Whallon, A.J., and Dean, K.E., 2003, Groundwater availability model for the Southern Carrizo-Wilcox Aquifer: Contract report to the Texas Water Development Board, 452 p., http://www.twdb.state.tx.us/gam/czwx_s/czwx_s.htm.

Environmental Simulations, Inc., 2007, Guide to Using Groundwater Vistas Version 5, 381 p.

Kelley, V.A., Deeds, N.E., Fryar, D.G., and Nicot, J.P., 2004, Groundwater availability models for the Queen City and Sparta aquifers: Contract report to the Texas Water Development Board, 867 p., http://www.twdb.state.tx.us/gam/qc_sp/qc_sp.htm.

Deeds, N.E., Yan, T., Singh, A., Jones, T.L., Kelley, V.A., Knox, P.R., Young, S.C., 2010, Groundwater availability model for the Yegua-Jackson Aquifer: Final report prepared for the Texas Water Development Board by INTERA, Inc., 582 p.,http://www.twdb.state.tx.us/gam/ygjk/ygjk.htm

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

GAM Run 10-041 MAG

by Mohammad Masud Hassan, P.E.

Texas Water Development Board
Groundwater Availability Modeling Section
(512) 463-3337
December 15, 2010

This work is released for the purpose of interim review under the authority of Mohammad Masud Hassan, P.E. 95699 on December 15, 2010.

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EXECUTIVE SUMMARY:

The estimated total pumping from the Yegua-Jackson Aquifer that achieves the desired future condition adopted by the members of Groundwater Management Area 13 is approximately 31,700 acre-feet per year. This is summarized by county, regional water planning area, and river basin as shown in Table 1. The estimated managed available groundwater, the amount available for permitting, from the Yegua-Jackson Aquifer for the groundwater conservation districts within Groundwater Management Area 13 is approximately 2,500 acre-feet per year as reported in Table 7. The pumping estimates were extracted from Groundwater Availability Modeling Task 10-012, Scenario 4, which Groundwater Management Area 13 used as the basis for developing their desired future condition for the Yegua-Jackson Aquifer.

REQUESTOR:

Mr. Mike Mahoney of Evergreen Underground Water Conservation District on behalf of Groundwater Management Area 13

DESCRIPTION OF REQUEST:

In a letter dated August 31, 2010 and received September 2, 2010, Mr. Mike Mahoney provided the Texas Water Development Board (TWDB) with the desired future condition of the Yegua-Jackson Aquifer adopted by the members of Groundwater Management Area 13. The desired future condition for the Yegua-Jackson Aquifer in Groundwater Management Area 13, as shown in Resolution No. R 2010-02, is as follows:

> *"In reference to* [Groundwater Availability Model] *Run T10-012, Table C-1, the committee has considered, the base scenario of an average drawdown of 0.0 feet, Scenario 2.5 an average drawdown of 1 foot, Scenario 3.0 an average drawdown of 1 foot, and Scenario 4.0 an average drawdown of 2 feet for the Yegua-Jackson Aquifer; and*
>
> [...] *the district members of the Groundwater Management Area 13, adopt Scenario 4.0, and an average drawdown of 2 feet for the Yegua-Jackson Aquifer."*

In response to receiving the adopted desired future condition, the Texas Water Development Board has estimated the managed available groundwater for each groundwater conservation district within Groundwater Management Area 13 for the Yegua-Jackson Aquifer.

METHODS:

The Texas Water Development Board previously completed several predictive groundwater availability model simulations of the Yegua-Jackson Aquifer to assist the members of Groundwater Management Area 13 in developing a desired future condition for this aquifer. The location of Groundwater Management Area 13, the Yegua-Jackson Aquifer, and the groundwater availability model cells that represent the aquifer are shown in Figure 1. As described in Resolution No. R 2010-02, the management area considered Scenario 4 of Groundwater Availability Modeling (GAM) Task 10-012 when developing a desired future condition for the Yegua-Jackson Aquifer (Oliver, 2010). Since the above desired future condition is met in Scenario 4 of GAM Task 10-012, the estimated pumping for Groundwater Management Area 13 presented here was taken directly from this simulation. This pumping was then divided by county, regional water planning area, river basin, and groundwater conservation district (Figure 2).

PARAMETERS AND ASSUMPTIONS:

The parameters and assumptions for the model run using the groundwater availability model for the Yegua-Jackson Aquifer are described below:

- The results presented in this report are taken from Scenario 4 in GAM Task 10-012 (Oliver, 2010). See GAM Task 10-012 for a full description of the methods, assumptions, and results for the groundwater availability model run.

- Version 1.01 of the groundwater availability model for the Yegua-Jackson Aquifer was used for this analysis. See Deeds and others (2010) for assumptions and limitations of the groundwater availability model.

- Cells were assigned to individual counties, river basins, regional water planning areas, and groundwater conservation districts as shown in the March 23, 2010 version of the file that associates the model grid to political and natural boundaries for the Yegua-Jackson Aquifer.

- The model results presented in this report were extracted from all areas of the model representing the units comprising the Yegua-Jackson Aquifer. This includes some areas outside the "official" boundary of the aquifer shown in the 2007 State Water Plan (TWDB, 2007).

Determining Managed Available Groundwater

As defined in Chapter 36 of the Texas Water Code, "managed available groundwater" is the amount of water that may be permitted. The pumping output from groundwater availability models, however, represents the total amount of pumping from the aquifer. The total pumping includes uses of water both subject to permitting and exempt from permitting. Examples of exempt uses include domestic, livestock, and oil and gas exploration. Each district may also exempt additional uses as defined by its rules or enabling legislation.

Since exempt uses are not available for permitting, it is necessary to account for them when determining managed available groundwater. To do this, the Texas Water Development Board developed a standardized method for estimating exempt use for domestic and livestock purposes based on projected changes in population and the distribution of domestic and livestock wells in the area. Because other exempt uses can vary significantly from district to district, and there is much higher uncertainty associated with estimating use due to oil and gas exploration, estimates of exempt pumping outside domestic and livestock uses have not been included. If the district believes it has a more appropriate estimate of exempt pumping, they may submit it, along with a description of how it was developed, to the Texas Water Development Board for consideration. Once established, the estimates of exempt pumping are subtracted from the total pumping output from the groundwater availability model to yield the estimated managed available groundwater for permitting purposes.

RESULTS:

The estimated total pumping from the Yegua-Jackson Aquifer in Groundwater Management Area 13 that achieves the above desired future condition is approximately 31,700 acre-feet per year. This pumping has been divided by county, regional water planning area, and river basin for each decade between 2010 and 2060 for use in the regional water planning process (Table 1). The total pumping estimates for the Yegua-Jackson Aquifer are also summarized by county, regional water planning area, river basin, and groundwater conservation district

as shown in tables 2 through 5. In Table 5, the total pumping both excluding and including areas outside of a groundwater conservation district is shown.

Table 6 contains the estimates of exempt pumping for the Yegua-Jackson Aquifer by groundwater conservation district due to domestic and livestock uses. The managed available groundwater for the groundwater conservation districts, the difference between the total pumping in the districts (Table 5, excluding areas outside of a district) and the estimated exempt use (Table 6) is shown in Table 7. The managed available groundwater, the amount available for permitting, for the Yegua-Jackson Aquifer for the groundwater conservation districts within Groundwater Management Area 13 is approximately 2,500 acre-feet per year.

REFERENCES:

Oliver, W., 2010, GAM Task 10-012 Model Run Report: Texas Water Development Board, GAM Task 10-012 Report, 48 p.

Deeds, N.E., Yan, T., Singh, A., Jones, T.L., Kelley, V.A., Knox, P.R., Young, S.C., 2010, Groundwater availability model for the Yegua-Jackson Aquifer: Final report prepared for the Texas Water Development Board by INTERA, Inc., 582 p.

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: Estimated total annual pumping for the Yegua-Jackson Aquifer in Groundwater Management Area 13. 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
Atascosa	L	Nueces	855	855	855	855	855	855
Frio	L	Nueces	0	0	0	0	0	0
Gonzales	L	Guadalupe	980	980	980	980	980	980
		Lavaca	3	3	3	3	3	3
Karnes	L	Guadalupe	112	112	112	112	112	112
		Nueces	34	34	34	34	34	34
		San Antonio	628	628	628	628	628	628
La Salle	L	Nueces	91	91	91	91	91	91
McMullen	N	Nueces	179	179	179	179	179	179
Webb	M	Nueces	11,969	11,969	11,969	11,969	11,969	11,969
		Rio Grande	8,030	8,030	8,030	8,030	8,030	8,030
Wilson	L	Guadalupe	48	48	48	48	48	48
		Nueces	184	184	184	184	184	184
		San Antonio	606	606	606	606	606	606
Zapata	M	Rio Grande	7,999	7,999	7,999	7,999	7,999	7,999
Total			**31,718**	**31,718**	**31,718**	**31,718**	**31,718**	**31,718**

Table 2: Estimated total annual pumping for the Yegua-Jackson Aquifer summarized by county in Groundwater Management Area 13 for each decade between 2010 and 2060. Results are in acre-feet per year.

County	Year					
	2010	2020	2030	2040	2050	2060
Atascosa	855	855	855	855	855	855
Frio	0	0	0	0	0	0
Gonzales	983	983	983	983	983	983
Karnes	774	774	774	774	774	774
La Salle	91	91	91	91	91	91
McMullen	179	179	179	179	179	179
Webb	19,999	19,999	19,999	19,999	19,999	19,999
Wilson	838	838	838	838	838	838
Zapata	7,999	7,999	7,999	7,999	7,999	7,999
Total	**31,718**	**31,718**	**31,718**	**31,718**	**31,718**	**31,718**

Table 3: Estimated total annual pumping for the Yegua-Jackson Aquifer summarized by regional water planning area in Groundwater Management Area 13 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
L	3,541	3,541	3,541	3,541	3,541	3,541
M	27,998	27,998	27,998	27,998	27,998	27,998
N	179	179	179	179	179	179
Total	**31,718**	**31,718**	**31,718**	**31,718**	**31,718**	**31,718**

Table 4: Estimated total annual pumping for the Yegua-Jackson Aquifer summarized by river basin in Groundwater Management Area 13 for each decade between 2010 and 2060. Results are in acre-feet per year.

River Basin	Year					
	2010	2020	2030	2040	2050	2060
Guadalupe	1,140	1,140	1,140	1,140	1,140	1,140
Lavaca	3	3	3	3	3	3
Nueces	13,312	13,312	13,312	13,312	13,312	13,312
Rio Grande	16,029	16,029	16,029	16,029	16,029	16,029
San Antonio	1,234	1,234	1,234	1,234	1,234	1,234
Total	**31,718**	**31,718**	**31,718**	**31,718**	**31,718**	**31,718**

Table 5: Estimated total annual pumping for the Yegua-Jackson Aquifer summarized by groundwater conservation district (GCD) in Groundwater Management Area 13 for each decade between 2010 and 2060. Results are in acre-feet per year. UWCD refers to Underground Water Conservation District.

Groundwater Conservation District	Year					
	2010	2020	2030	2040	2050	2060
Evergreen UWCD	2,467	2,467	2,467	2,467	2,467	2,467
Gonzales County UWCD	865	865	865	865	865	865
McMullen GCD	179	179	179	179	179	179
Wintergarden GCD	91	91	91	91	91	91
Total (excluding non-district areas)	**3,602**	**3,602**	**3,602**	**3,602**	**3,602**	**3,602**
No District	28,116	28,116	28,116	28,116	28,116	28,116
Total (including non-district areas)	**31,718**	**31,718**	**31,718**	**31,718**	**31,718**	**31,718**

Table 6: Estimates of exempt use for the Yegua-Jackson Aquifer in Groundwater Management Area 13 by groundwater conservation district (GCD) for each decade between 2010 and 2060. Results are in acre-feet per year. UWCD refers to Underground Water Conservation District.

Groundwater Conservation District	Source	Year					
		2010	2020	2030	2040	2050	2060
Evergreen UWCD	T	335	392	462	529	583	637
Gonzales County UWCD	T	576	478	404	350	335	340
McMullen GCD	T	37	39	37	35	34	32
Wintergarden GCD	T	65	74	81	86	89	92
Total		**1,013**	**983**	**984**	**1,000**	**1,041**	**1,101**

Note: T = Estimated exempt use calculated by TWDB

Table 7: Estimates of managed available groundwater for the Yegua-Jackson Aquifer in Groundwater Management Area 13 by groundwater conservation district (GCD) for each decade between 2010 and 2060. Results are in acre-feet per year.

Groundwater Conservation District	Year					
	2010	2020	2030	2040	2050	2060
Evergreen UWCD	2,132	2,075	2,005	1,938	1,884	1,830
Gonzales County UWCD	289	387	461	515	530	525
McMullen GCD	142	140	142	144	145	147
Wintergarden GCD	26	17	10	5	2	0[1]
Total (excluding non-district areas)	**2,589**	**2,619**	**2,618**	**2,602**	**2,561**	**2,502**

[1] Since the exempt use amount is 92 acre-feet per year compared to the estimated available pumping amount of 91 acre-feet per year, the managed available groundwater would be negative. Because the difference between the estimated total pumping and the estimated exempt use for 2060 is negligible, the managed available groundwater is reported as zero.

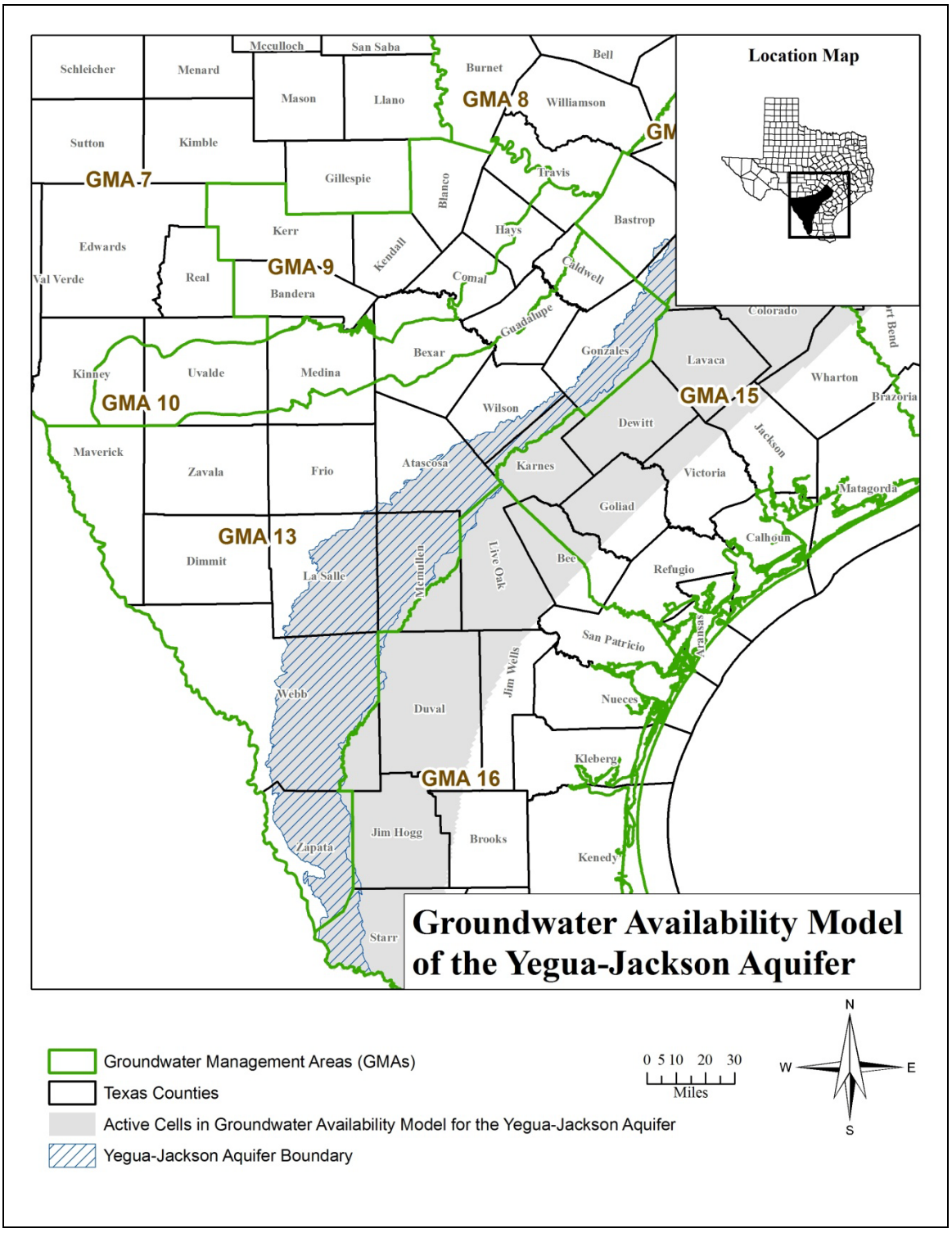

Figure 1: Map showing the areas covered by the groundwater availability model for the Yegua-Jackson Aquifer.

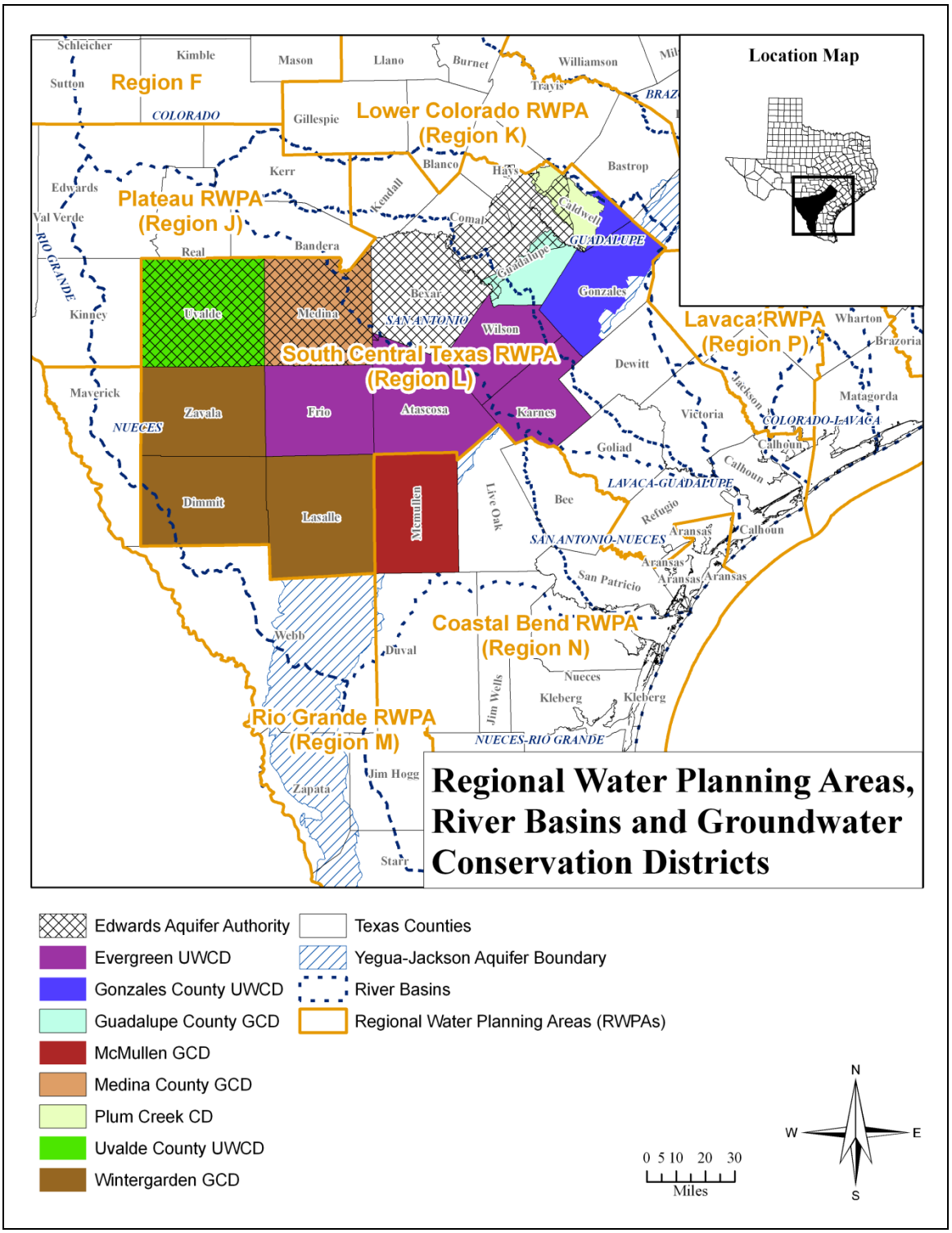

Figure 2: Map showing regional water planning areas (RWPAs), groundwater conservation districts (GCDs), counties, and river basins in Groundwater Management Area 13.

GAM Run 10-012 MAG version 2

by Shirley Wade, Ph.D., P.G.

Texas Water Development Board
Groundwater Availability Modeling Section
(512) 936-0883
December 15, 2010

This document is released for the purpose of interim review under the authority of Shirley Wade, P.G. 525, on December 15, 2010.

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EXECUTIVE SUMMARY:

The estimated total pumping for Groundwater Management Area 13 by decade for the Queen City, Sparta, and Carrizo-Wilcox aquifers summarized by county, river basin, and regional water planning group is listed in Tables 1, 2, and 3 respectively. The managed available groundwater estimates for the Queen City, Sparta, and Carrizo-Wilcox aquifers range from 360,770 acre-feet per year in 2010 to 385,613 acre-feet per year in 2060 (Table 9)[1]. The pumping estimates were extracted from results of Groundwater Availability Model Run 09-034, scenario 4, which was selected by Groundwater Management Area 13 as a basis for developing desired future conditions and estimating total pumping. The managed available groundwater estimates were calculated by subtracting estimates of exempt use from the total pumping estimates (Table 8).

REQUESTOR:

Mr. Mike Mahoney of the Evergreen Underground Water Conservation District acting on behalf of Groundwater Management Area 13

DESCRIPTION OF REQUEST:

In a letter dated April 13, 2010 and received by the Texas Water Development Board (TWDB) on April 15, 2010, Mr. Mike Mahoney provided the TWDB with the desired future conditions of the Carrizo-Wilcox, Queen City, and Sparta aquifers adopted by the groundwater conservation districts in Groundwater Management Area 13. The desired future conditions for the Carrizo-Wilcox, Queen City, and Sparta aquifers, as described in Resolution R 2010-01 and adopted April 9, 2010 by the groundwater conservation districts within Groundwater Management Area 13, are described below:

- "In reference to GAM Run 09-034, the committee has considered, the base scenario of an average drawdown of 22 feet, scenario 2 an average drawdown of 22 feet, scenario 3 an average drawdown of 23 feet and scenario 4 an average drawdown of 23 feet;"
- "The district members of Groundwater Management Area 13, adopt scenario 4, and an average drawdown of 23 feet for the Sparta, Weches, Queen City, Reklaw, Carrizo, and the Wilcox Aquifers"

In response to receiving the adopted desired future conditions, TWDB has estimated the managed available groundwater for each of the groundwater conservation districts within Groundwater Management Area 13.

METHODS:

Groundwater Management Area 13, located in south central Texas, includes the southern part of the Queen City, Sparta, and Carrizo-Wilcox aquifers (Figure 1). For the previously completed Groundwater Availability Model Run 09-034 (Wade and Jigmond, 2010) average recharge and evapotranspiration rates and initial streamflows based on the historical calibration-verification runs, representing 1981 to 1999 were summarized. These averages were then used for each year of the 61-year predictive simulations along with pumping specified by Groundwater Management Area 13 members in four scenarios. The results of the pumping scenarios were

[1] In the process of preparing managed available groundwater and exempt use values for individual model layers in Appendix A, the total exempt use values have been updated to reflect more accurate estimates. The exempt use has been modified by no more than 25 acre-feet per year for individual groundwater conservation districts compared with the draft version 1 of this report dated November 8, 2010.

reviewed by members of Groundwater Management Area 13 to develop their desired future conditions. Model scenario 4 resulted in an overall average drawdown of 23 feet for the Queen City, Sparta, and Carrizo-Wilcox aquifers and for the Weches and Reklaw confining units. The pumping for scenario 4 was extracted from the model results and divided by county, river basin, regional water planning area and groundwater conservation district within Groundwater Management Area 13 (Figure 2).

PARAMETERS AND ASSUMPTIONS:

The parameters and assumptions for the groundwater availability model for the southern part of the Queen City, Sparta, and Carrizo-Wilcox aquifers are described below:

- Version 2.01 of the groundwater availability model for the southern part of the Queen City, Sparta, and Carrizo-Wilcox aquifers was used for this analysis

- Groundwater Vistas Version 5 (Environmental Simulations, Inc. 2007) was used as the interface to process model output results.

- See Deeds and others (2003) and Kelley and others (2004) for assumptions and limitations of the groundwater availability model for the southern part of the Queen City, Sparta, and Carrizo-Wilcox aquifers.

- The model includes eight layers representing:

    1. the Sparta Aquifer (layer 1),
    2. the Weches Formation (layer 2),
    3. the Queen City Aquifer (layer 3),
    4. the Reklaw Formation (layer 4),
    5. the Carrizo Aquifer (layer 5),
    6. the upper and where the upper is missing, the middle Wilcox Aquifer (layer 6),
    7. the middle Wilcox Aquifer (layer 7), and
    8. the lower Wilcox Aquifer (layer 8).

- Groundwater in the groundwater availability model for the southern portion of the Queen City, Sparta, and Carrizo-Wilcox aquifers ranges from fresh to saline (Kelley and others, 2004).
- The root mean square error (a measure of the difference between simulated and measured water levels during model calibration) in the entire model for 1999 is 23 feet for the Sparta Aquifer, 18 feet for the Queen City aquifer, and 33 feet for the Carrizo aquifer (Kelley and others, 2004).

- Recharge rates, evapotranspiration rates, and initial streamflows are averages of historic estimates from 1981 to 1999.

Determining Managed Available Groundwater

As defined in Chapter 36 of the Texas Water Code, "managed available groundwater" is the amount of water that may be permitted. The pumping output from groundwater availability models, however, represents the total amount of pumping from the aquifer. The total pumping includes uses of water both subject to permitting and exempt from permitting. Examples of exempt uses include domestic, livestock, and oil and gas exploration. Each district may also exempt additional uses as defined by its rules or enabling legislation.

Since exempt uses are not available for permitting, it is necessary to account for them when calculating managed available groundwater. The TWDB developed a standardized method for estimating exempt use for domestic and livestock purposes based on projected changes in population and the distribution of domestic and livestock wells in the area. Because other exempt uses can vary significantly from district to district and there is much higher uncertainty associated with estimating use due to oil and gas exploration, estimates of exempt pumping outside domestic and livestock uses have not been included. If the district believes it has a more appropriate estimate of exempt pumping, they may submit it, along with a description of how it was developed, to the Texas Water Development Board for consideration. Once established, the estimates of exempt pumping are subtracted from the total pumping output from the groundwater availability model to yield the estimated managed available groundwater for permitting purposes.

RESULTS:

The estimated total pumping in the hydrogeologic units comprising the Carrizo-Wilcox Aquifer that achieves the desired future conditions adopted by Groundwater Management Area 13 increases from 375,654 to 403,998 acre-feet per year between 2010 and 2060 (Table 1). The estimated total pumping in the Queen City Aquifer in Groundwater Management Area 13 declines from 16,312 to 14,539 acre-feet per year over the same time period (Table 2). The estimated total pumping in the Sparta Aquifer in Groundwater Management Area 13 declines from 6,800 to 6,364 acre-feet per year (Table 3). The total pumping estimates in tables 1, 2, and 3 are reported by county, river basin, and regional water planning area for use in the regional water planning process.

Total pumping estimates are also summarized by county (Table 4), river basin (Table 5), regional water planning area (Table 6), and groundwater conservation district (Table 7). In Table 7, the total pumping among all districts has been calculated both excluding and including areas outside the jurisdiction of a groundwater conservation district. Estimates for exempt use for the Carrizo-Wilcox, Queen City, and Sparta aquifers by groundwater conservation district are shown in Table 8 and estimates of managed available groundwater are listed in Table 9. In order to determine the managed available groundwater for each groundwater conservation district, the exempt use estimates for each district in Table 8 were subtracted from the estimated total pumping for each district (excluding non-district areas) in Table 7. Additional information on pumping amounts and exempt use for individual aquifer layers of the model is provided in Appendix A. Tables are provided for each groundwater conservation district listing the total pumping and estimated exempt use for each aquifer layer.

REFERENCES AND ASSOCIATED MODEL RUNS:

Deeds, N., Kelley, V., Fryar, D., Jones, T., Whallon, A. J., and Dean, K. E., 2003, Groundwater Availability Model for the Southern Carrizo-Wilcox Aquifer: contract report to the Texas Water Development Board, 452 p.

Donnelly, A.C.A., 2007a, GAM Run 06-29, Texas Water Development Board GAM Run Report, 59 p.

Donnelly, A.C.A., 2007b, GAM Run 07-16, Texas Water Development Board GAM Run Report, 63 p.

Donnelly, A.C.A., 2007c, GAM Run 07-17, Texas Water Development Board GAM Run Report, 38 p.

Environmental Simulations, Inc., 2007, Guide to using Groundwater Vistas Version 5, 381 p.

Kelley, V. A., Deeds, N. E., Fryar, D. G., and Nicot, J. P., 2004, Groundwater availability models for the Queen City and Sparta aquifers: contract report to the Texas Water Development Board, 867 p.

Wade S.C., 2008a, GAM Run 08-41, Texas Water Development Board GAM Run Report, 56 p.

Wade S.C., 2008b, GAM Run 08-42, Texas Water Development Board GAM Run Report, 56 p.

Wade S.C., 2008c, GAM Run 08-43, Texas Water Development Board GAM Run Report, 58 p.

Wade S.C. and Jigmond, M., 2010, GAM Run 09-034, Texas Water Development Board GAM Run Report, 146 p.

Table 1. Estimated total annual pumping by decade for the Carrizo-Wilcox Aquifer in Groundwater Management Area 13. Results are in acre-feet per year and are divided by county, river basin, and regional water planning area.

County	Regional Water Planning Area	Basin	Year					
			2010	2020	2030	2040	2050	2060
Atascosa	L	Nueces	67,828	68,655	70,248	71,826	73,665	75,687
		San Antonio	120	120	120	120	120	120
Bexar	L	Nueces	14,198	14,198	14,198	14,198	14,198	14,198
		San Antonio	12,081	12,081	12,081	12,081	12,081	11,909
Caldwell	L	Colorado	593	593	593	593	593	593
		Guadalupe	43,952	43,952	43,544	43,544	42,967	42,967
Dimmit	L	Nueces	3,252	3,252	3,252	3,252	3,252	3,252
		Rio Grande	107	107	107	107	107	107
Frio	L	Nueces	81,551	79,089	76,734	74,439	72,222	70,030
Gonzales	L	Guadalupe	52,268	62,101	70,102	75,575	75,754	75,754
		Lavaca	215	215	215	215	215	215
Guadalupe	L	Guadalupe	8,869	9,460	9,910	11,648	12,168	12,668
		San Antonio	1,373	1,373	1,373	1,373	1,373	1,373
Karnes	L	Guadalupe	185	195	207	215	220	224
		Nueces	87	92	97	101	103	105
		San Antonio	787	830	878	915	936	951
La Salle	L	Nueces	6,454	6,454	6,454	6,454	6,454	6,454
Maverick	M	Nueces	776	776	776	472	472	472
		Rio Grande	1,265	1,265	1,246	1,204	1,097	1,059
McMullen	N	Nueces	1,819	1,819	1,819	1,819	1,819	1,819
Medina	L	Nueces	2,542	2,519	2,507	2,507	2,507	2,507
		San Antonio	26	26	26	26	26	26
Uvalde	L	Nueces	2,971	1,230	828	828	828	828
Webb	M	Nueces	92	92	92	92	92	92
		Rio Grande	824	824	824	824	824	824
Wilson	L	Guadalupe	624	672	731	791	861	938
		Nueces	7,151	7,311	7,505	7,703	7,932	8,185
		San Antonio	27,786	29,003	30,481	31,992	33,738	35,672
Zavala	L	Nueces	35,859	35,859	35,520	35,387	35,288	34,968
Total			**375,654**	**384,162**	**392,467**	**400,302**	**401,914**	**403,998**

Table 2. Estimated total annual pumping by decade for the Queen City Aquifer in Groundwater Management Area 13. Results are in acre-feet per year and are divided by county, river basin, and regional water planning area.

County	Regional Water Planning Area	Basin	Year					
			2010	2020	2030	2040	2050	2060
Atascosa	L	Nueces	4,546	4,546	4,513	4,405	4,300	4,202
Caldwell	L	Guadalupe	307	307	307	307	307	307
Dimmit	L	Nueces	0	0	0	0	0	0
		Rio Grande	0	0	0	0	0	0
Frio	L	Nueces	4,748	4,582	4,422	4,270	4,124	3,983
Gonzales	L	Guadalupe	5,030	5,030	5,030	5,030	5,030	5,030
		Lavaca	35	35	35	35	35	35
Guadalupe	L	Guadalupe	0	0	0	0	0	0
Karnes	L	Guadalupe	0	0	0	0	0	0
		Nueces	0	0	0	0	0	0
		San Antonio	0	0	0	0	0	0
La Salle	L	Nueces	1	1	1	1	1	1
McMullen	N	Nueces	136	136	136	136	136	136
Webb	M	Nueces	0	0	0	0	0	0
		Rio Grande	0	0	0	0	0	0
Wilson	L	Guadalupe	128	114	101	90	80	72
		Nueces	148	132	117	104	93	83
		San Antonio	1,233	1,094	973	866	772	690
Zavala	L	Nueces	0	0	0	0	0	0
Total			**16,312**	**15,976**	**15,635**	**15,244**	**14,878**	**14,539**

Table 3. Estimated total annual pumping by decade for the Sparta Aquifer in Groundwater Management Area 13. Results are in acre-feet per year and are divided by county, river basin, and regional water planning area.

County	Regional Water Planning Area	Basin	Year					
			2010	2020	2030	2040	2050	2060
Atascosa	L	Nueces	1,191	1,130	1,082	1,042	1,013	994
Dimmit	L	Nueces	0	0	0	0	0	0
Frio	L	Nueces	729	698	674	650	624	601
Gonzales	L	Guadalupe	3,529	3,529	3,529	3,529	3,529	3,529
		Lavaca	23	23	23	23	23	23
Karnes	L	Guadalupe	0	0	0	0	0	0
		Nueces	0	0	0	0	0	0
		San Antonio	0	0	0	0	0	0
La Salle	L	Nueces	987	987	987	987	987	987
McMullen	N	Nueces	90	90	90	90	90	90
Webb	M	Nueces	0	0	0	0	0	0
		Rio Grande	0	0	0	0	0	0
Wilson	L	Guadalupe	23	20	18	16	14	13
		Nueces	55	49	44	39	34	31
		San Antonio	173	154	137	121	108	97
Zavala	L	Nueces	0	0	0	0	0	0
Total			**6,800**	**6,680**	**6,583**	**6,498**	**6,422**	**6,364**

Table 4. Estimated total annual pumping for the Carrizo-Wilcox, Queen City, and Sparta aquifers summarized by county in Groundwater Management Area 13 for each decade between 2010 and 2060. Results are in acre-feet per year.

County	Year					
	2010	2020	2030	2040	2050	2060
Atascosa	73,685	74,451	75,964	77,394	79,099	81,003
Bexar	26,279	26,279	26,279	26,279	26,279	26,107
Caldwell	44,852	44,852	44,444	44,444	43,867	43,867
Dimmit	3,359	3,359	3,359	3,359	3,359	3,359
Frio	87,027	84,369	81,829	79,359	76,969	74,614
Gonzales	61,099	70,932	78,933	84,407	84,586	84,586
Guadalupe	10,241	10,833	11,283	13,021	13,541	14,041
Karnes	1,059	1,117	1,181	1,231	1,260	1,280
La Salle	7,442	7,442	7,442	7,442	7,442	7,442
Maverick	2,041	2,041	2,022	1,676	1,569	1,531
McMullen	2,045	2,045	2,045	2,045	2,045	2,045
Medina	2,568	2,545	2,534	2,534	2,534	2,534
Uvalde	2,971	1,230	828	828	828	828
Webb	916	916	916	916	916	916
Wilson	37,320	38,548	40,106	41,722	43,632	45,780
Zavala	35,859	35,859	35,520	35,387	35,288	34,968
Total	**398,765**	**406,819**	**414,685**	**422,044**	**423,214**	**424,900**

Table 5. Estimated total pumping for the Carrizo-Wilcox, Queen City, and Sparta aquifers summarized by river basin in Groundwater Management Area 13 for each decade between 2010 and 2060. Results are in acre-feet per year.

Basin	Year					
	2010	2020	2030	2040	2050	2060
Colorado	593	593	593	593	593	593
Guadalupe	114,914	125,380	133,478	140,746	140,931	141,502
Lavaca	273	273	273	273	273	273
Nueces	237,211	233,696	232,096	230,802	230,234	229,705
Rio Grande	2,196	2,196	2,177	2,135	2,028	1,990
San Antonio	43,579	44,681	46,069	47,494	49,154	50,838
Total	**398,765**	**406,819**	**414,685**	**422,044**	**423,214**	**424,900**

Table 6. Estimated total pumping for the Carrizo-Wilcox, Queen City, and Sparta aquifers summarized by regional water planning area in Groundwater Management Area 13 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
L	393,763	401,816	409,702	417,407	418,684	420,408
M	2,957	2,957	2,938	2,592	2,485	2,447
N	2,045	2,045	2,045	2,045	2,045	2,045
Total	**398,765**	**406,819**	**414,685**	**422,044**	**423,214**	**424,900**

Table 7. Estimated total pumping for the Carrizo-Wilcox, Queen City, and Sparta aquifers summarized by groundwater conservation district (GCD) in Groundwater Management Area 13 for each decade between 2010 and 2060. Results are in acre-feet per year. UWCD refers to Underground Water Conservation District.

Groundwater Conservation District	Year					
	2010	2020	2030	2040	2050	2060
Evergreen UWCD	199,092	198,485	199,080	199,706	200,960	202,676
Gonzales County UWCD	84,767	94,600	102,601	108,075	108,254	108,254
Guadalupe County GCD	10,241	10,833	11,283	13,021	13,541	14,041
McMullen GCD	2,045	2,045	2,045	2,045	2,045	2,045
Medina County GCD	2,568	2,545	2,534	2,534	2,534	2,534
Plum Creek CD	14,284	14,284	13,876	13,876	13,299	13,299
Plum Creek CD and Gonzales County UWCD overlap	5,920	5,920	5,920	5,920	5,920	5,920
Uvalde County UWCD	2,971	1,230	828	828	828	828
Wintergarden GCD	46,660	46,660	46,321	46,188	46,089	45,769
Total (excluding non-district areas)	**368,549**	**376,602**	**384,488**	**392,192**	**393,469**	**395,366**
No District	30,217	30,217	30,197	29,851	29,744	29,534
Total (including non-district areas)	**398,765**	**406,819**	**414,685**	**422,044**	**423,214**	**424,900**

Table 8. Estimates of exempt use for the Carrizo-Wilcox, Queen City, and Sparta aquifers in Groundwater Management Area 13 by groundwater conservation district (GCD) for each decade between 2010 and 2060[2]. Results are in acre-feet per year. UWCD refers to Underground Water Conservation District.

Groundwater Conservation District	Source	Year					
		2010	2020	2030	2040	2050	2060
Evergreen UWCD	T	2,921	3,277	3,724	4,183	4,669	5,169
Gonzales County UWCD	T	2,414	2,014	1,704	1,481	1,413	1,429
Guadalupe County GCD	T	326	264	198	127	73	17
McMullen GCD	T	23	24	23	22	21	20
Medina County GCD	T	443	549	648	734	817	892
Plum Creek CD	T	110	105	95	87	79	72
Plum Creek CD and Gonzales County UWCD overlap	T	8	8	7	6	6	6
Uvalde County UWCD	T	35	43	49	54	58	60
Wintergarden GCD	T	1,499	1,720	1,869	1,991	2,069	2,088
Total		**7,779**	**8,004**	**8,317**	**8,685**	**9,205**	**9,753**

Table 9. Estimates of managed available groundwater for the Carrizo-Wilcox, Queen City, and Sparta aquifers in Groundwater Management Area 13 by groundwater conservation district (GCD) for each decade between 2010 and 2060. Results are in acre-feet per year. UWCD refers to Underground Water Conservation District.

Groundwater Conservation District	Year					
	2010	2020	2030	2040	2050	2060
Evergreen UWCD	196,171	195,208	195,356	195,523	196,291	197,507
Gonzales County UWCD	82,353	92,586	100,897	106,594	106,841	106,825
Guadalupe County GCD	9,915	10,569	11,085	12,894	13,468	14,024
McMullen GCD	2,022	2,021	2,022	2,023	2,024	2,025
Medina County GCD	2,125	1,996	1,886	1,800	1,717	1,642
Plum Creek CD	14,174	14,179	13,781	13,789	13,220	13,227
Plum Creek CD and Gonzales County UWCD overlap	5,912	5,912	5,913	5,914	5,914	5,914
Uvalde County UWCD	2,936	1,187	779	774	770	768
Wintergarden GCD	45,161	44,940	44,452	44,197	44,020	43,681
Total	**360,770**	**368,598**	**376,171**	**383,507**	**384,264**	**385,613**

[2] The exempt use values have been updated to reflect more accurate estimates than what is shown in version 1 of this draft report dated November 8, 2010. The exempt use estimates for each groundwater conservation district have been revised by no more than 25 acre-feet per year.

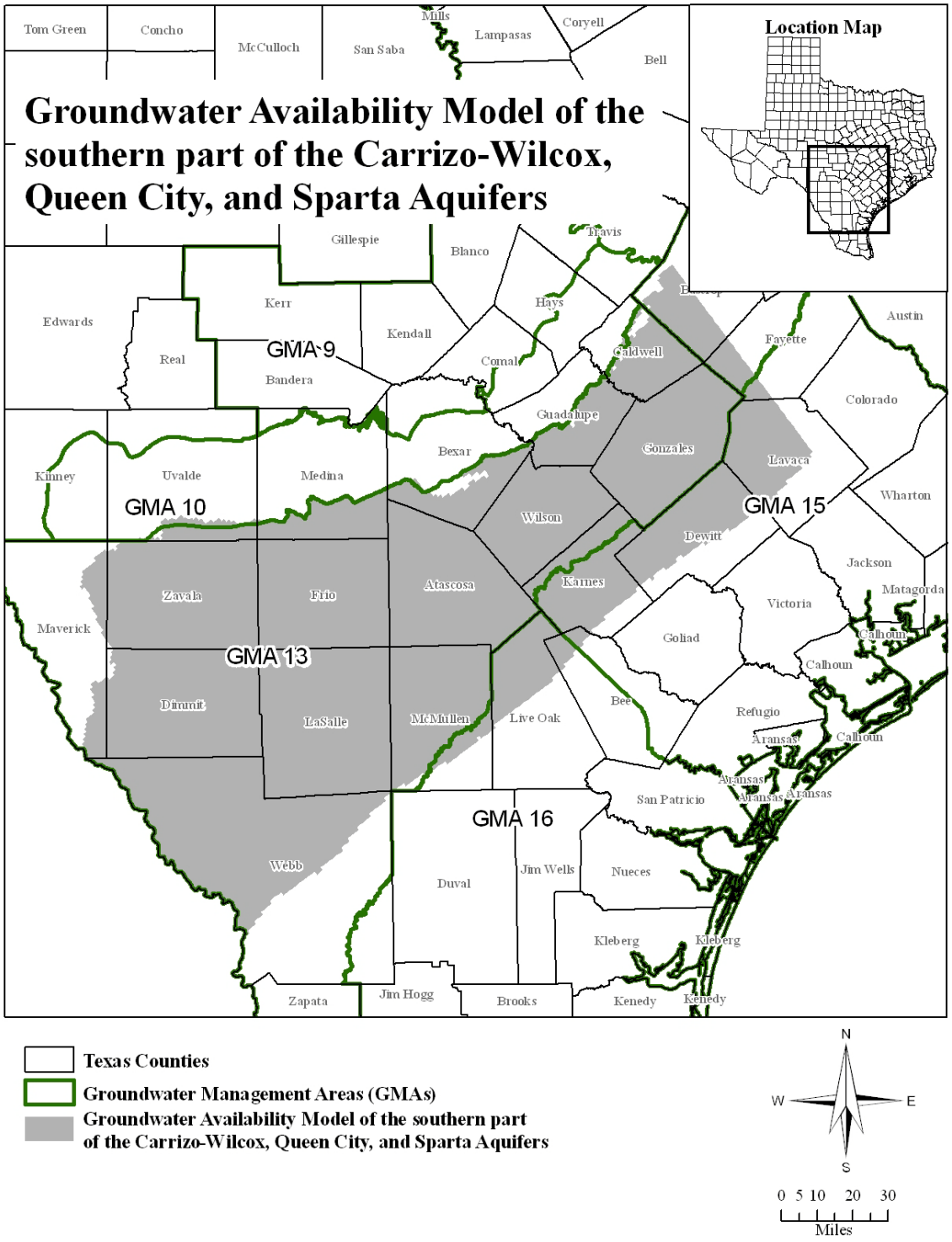

Figure 1. Map showing the areas covered by the groundwater availability model for the southern part of the Carrizo-Wilcox, Queen City, and Sparta Aquifers.

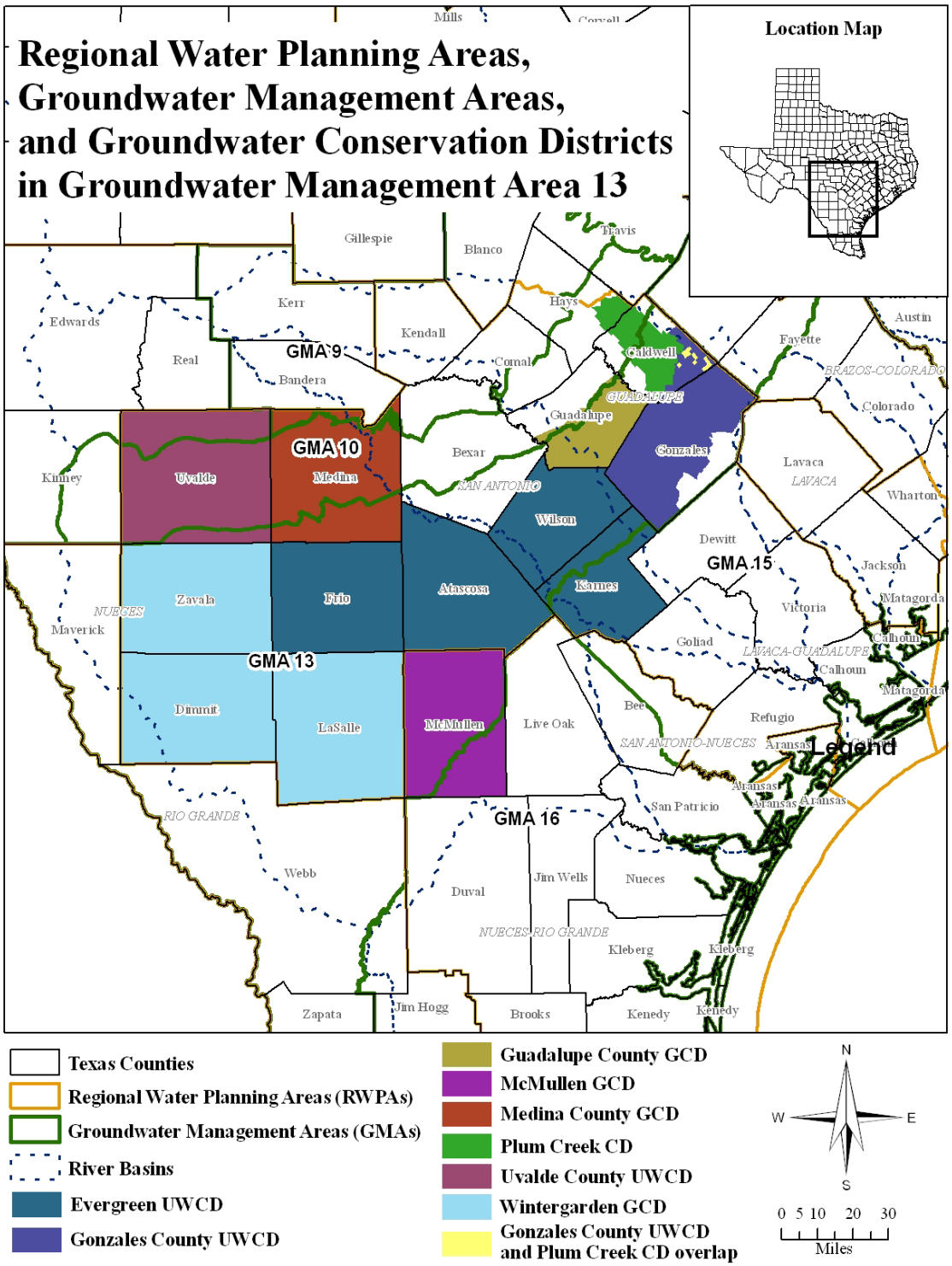

Figure 2. Map showing regional water planning areas, groundwater management areas, groundwater conservation districts (GCDs), counties, and river basins in and neighboring Groundwater Management Area 13. UWCD refers to Underground Water Conservation District.

Appendix

Estimates of total pumping and total pumping minus exempt use by aquifer layer for each groundwater conservation district

Table A-1. Estimates of total annual pumping, exempt use, and the difference between the two for Evergreen Underground Water Conservation District by aquifer unit or model layer. Results are in acre-feet per year.

Evergreen Underground Water Conservation District		**Year**					
	Unit or Layer	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Pumping	Sparta	2,170	2,051	1,954	1,869	1,793	1,735
	Queen City	10,803	10,467	10,126	9,735	9,369	9,030
	Carrizo	151,372	151,221	152,254	153,356	155,052	157,166
	Wilcox (Layer 6)	375	375	375	375	375	375
	Wilcox (Layer 7)	371	371	371	371	371	371
	Wilcox (Layer 8)	34,000	34,000	34,000	34,000	34,000	34,000
	Total	**199,092**	**198,485**	**199,080**	**199,706**	**200,960**	**202,676**
Exempt Use	Sparta	344	415	497	579	666	756
	Queen City	669	785	922	1,056	1,197	1,339
	Carrizo	1,805	1,947	2,142	2,353	2,576	2,807
	Wilcox (Layer 6)	34.3	43.3	54.3	65.0	76.7	89.0
	Wilcox (Layer 7)	34.3	43.3	54.3	65.0	76.7	89.0
	Wilcox (Layer 8)	34.3	43.3	54.3	65.0	76.7	89.0
	Total	**2,921**	**3,277**	**3,724**	**4,183**	**4,669**	**5,169**
Pumping minus exempt by unit	Sparta	1,826	1,636	1,457	1,290	1,127	979
	Queen City	10,134	9,682	9,204	8,679	8,172	7,691
	Carrizo	149,567	149,274	150,112	151,003	152,476	154,359
	Wilcox (Layer 6)	341	332	321	310	298	286
	Wilcox (Layer 7)	337	328	317	306	295	282
	Wilcox (Layer 8)	33,965	33,956	33,945	33,935	33,923	33,911
	Total	**196,171**	**195,208**	**195,356**	**195,523**	**196,291**	**197,507**

Table A-2. Estimates of total annual pumping, exempt use, and the difference between the two for Gonzales County Underground Water Conservation District by aquifer unit or model layer. Results are in acre-feet per year.

Gonzales County Underground Water Conservation District		Year					
	Unit or Layer	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Pumping	Sparta	3,552	3,552	3,552	3,552	3,552	3,552
	Queen City	5,315	5,315	5,315	5,315	5,315	5,315
	Carrizo	44,276	54,109	62,110	67,584	67,763	67,763
	Wilcox (Layer 6)	0	0	0	0	0	0
	Wilcox (Layer 7)	11,986	11,986	11,986	11,986	11,986	11,986
	Wilcox (Layer 8)	19,638	19,638	19,638	19,638	19,638	19,638
	Total	**84,767**	**94,600**	**102,601**	**108,075**	**108,254**	**108,254**
Exempt Use	Sparta	311	258	218	189	181	184
	Queen City	584	486	411	357	341	345
	Carrizo	1,394	1,161	982	853	814	824
	Wilcox (Layer 6)	0	0	0	0	0	0
	Wilcox (Layer 7)	62.5	54.5	46.5	41.0	38.5	38.0
	Wilcox (Layer 8)	62.5	54.5	46.5	41.0	38.5	38.0
	Total	**2,414**	**2,014**	**1,704**	**1,481**	**1,413**	**1,429**
Pumping minus exempt by unit	Sparta	3,241	3,294	3,334	3,363	3,371	3,368
	Queen City	4,731	4,829	4,904	4,958	4,974	4,970
	Carrizo	42,882	52,948	61,128	66,731	66,949	66,939
	Wilcox (Layer 6)	0	0	0	0	0	0
	Wilcox (Layer 7)	11,924	11,932	11,940	11,945	11,948	11,948
	Wilcox (Layer 8)	19,575	19,583	19,591	19,597	19,599	19,600
	Total	**82,353**	**92,586**	**100,897**	**106,594**	**106,841**	**106,825**

Table A-3. Estimates of total annual pumping, exempt use, and the difference between the two for Guadalupe County Groundwater Conservation District by aquifer unit or model layer. Results are in acre-feet per year.

Guadalupe County Groundwater Conservation District		Year					
	Unit or Layer	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Pumping	Carrizo	5,500	6,239	6,689	8,427	9,000	9,500
	Wilcox (Layer 6)	0	0	0	0	0	0
	Wilcox (Layer 7)	3,194	3,047	3,047	3,047	2,994	2,994
	Wilcox (Layer 8)	1,547	1,547	1,547	1,547	1,547	1,547
	Total	**10,241**	**10,833**	**11,283**	**13,021**	**13,541**	**14,041**
Exempt Use	Carrizo	56	45	34	22	12	3
	Wilcox (Layer 6)	0	0	0	0	0	0
	Wilcox (Layer 7)	135.0	109.5	82.0	52.5	30.5	7.0
	Wilcox (Layer 8)	135.0	109.5	82.0	52.5	30.5	7.0
	Total	**326**	**264**	**198**	**127**	**73**	**17**
Pumping minus exempt by unit	Carrizo	5,444	6,194	6,655	8,405	8,988	9,497
	Wilcox (Layer 6)	0	0	0	0	0	0
	Wilcox (Layer 7)	3,059	2,937	2,965	2,994	2,963	2,987
	Wilcox (Layer 8)	1,412	1,438	1,465	1,495	1,517	1,540
	Total	**9,915**	**10,569**	**11,085**	**12,894**	**13,468**	**14,024**

Table A-4. Estimates of total annual pumping, exempt use, and the difference between the two for McMullen Groundwater Conservation District by aquifer unit or model layer. Results are in acre-feet per year.

McMullen Groundwater Conservation District		Year					
	Unit or Layer	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Pumping	Sparta	90	90	90	90	90	90
	Queen City	136	136	136	136	136	136
	Carrizo	1,819	1,819	1,819	1,819	1,819	1,819
	Total	**2,045**	**2,045**	**2,045**	**2,045**	**2,045**	**2,045**
Exempt Use	Sparta	0	0	0	0	0	0
	Queen City	5	6	5	5	5	5
	Carrizo	18.0	18.0	18.0	17.0	16.0	15.0
	Total	**23**	**24**	**23**	**22**	**21**	**20**
Pumping minus exempt by unit	Sparta	90	90	90	90	90	90
	Queen City	131	130	131	131	131	131
	Carrizo	1,801	1,801	1,801	1,802	1,803	1,804
	Total	**2,022**	**2,021**	**2,022**	**2,023**	**2,024**	**2,025**

Table A-5. Estimates of total annual pumping, exempt use, and the difference between the two for Medina County Groundwater Conservation District by aquifer unit or model layer. Results are in acre-feet per year.

Medina County Groundwater Conservation District		Year					
	Unit or Layer	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Pumping	Carrizo	400	400	400	400	400	400
	Wilcox (Layer 6)	0	0	0	0	0	0
	Wilcox (Layer 7)	1,248	1,248	1,248	1,248	1,248	1,248
	Wilcox (Layer 8)	921	897	886	886	886	886
	Total	**2,568**	**2,545**	**2,534**	**2,534**	**2,534**	**2,534**
Exempt Use	Carrizo	132	164	193	219	244	266
	Wilcox (Layer 6)	0	0	0	0	0	0
	Wilcox (Layer 7)	155.5	192.5	227.5	257.5	286.5	313.0
	Wilcox (Layer 8)	155.5	192.5	227.5	257.5	286.5	313.0
	Total	**443**	**549**	**648**	**734**	**817**	**892**
Pumping minus exempt by unit	Carrizo	268	236	207	181	156	134
	Wilcox (Layer 6)	0	0	0	0	0	0
	Wilcox (Layer 7)	1,092	1,055	1,020	990	961	935
	Wilcox (Layer 8)	765	705	658	628	599	573
	Total	**2,125**	**1,996**	**1,886**	**1,800**	**1,717**	**1,642**

Table A-6. Estimates of total annual pumping, exempt use, and the difference between the two for Plum Creek Conservation District by aquifer unit or model layer. Results are in acre-feet per year.

Plum Creek Conservation District		Year					
	Unit or Layer	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Pumping	Wilcox (Layer 7)	4,734	4,734	4,734	4,734	4,158	4,158
	Wilcox (Layer 8)	9,550	9,550	9,141	9,141	9,141	9,141
	Total	**14,284**	**14,284**	**13,876**	**13,876**	**13,299**	**13,299**
Exempt Use	Wilcox (Layer 7)	55.0	52.5	47.5	43.5	39.5	36.0
	Wilcox (Layer 8)	55.0	52.5	47.5	43.5	39.5	36.0
	Total	**110**	**105**	**95**	**87**	**79**	**72**
Pumping minus exempt by units	Wilcox (Layer 7)	4,679	4,682	4,687	4,691	4,118	4,122
	Wilcox (Layer 8)	9,495	9,497	9,094	9,098	9,102	9,105
	Total	**14,174**	**14,179**	**13,781**	**13,789**	**13,220**	**13,227**

Table A-7. Estimates of total annual pumping, exempt use, and the difference between the two for the overlap area between Plum Creek Conservation District and Gonzales Underground Water Conservation District (UWCD) by aquifer unit or model layer. Results are in acre-feet per year.

Plum Creek Conservation District/Gonzales UWCD		**Year**					
	Unit or Layer	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Pumping	Queen City	57	57	57	57	57	57
	Carrizo	5,107	5,107	5,107	5,107	5,107	5,107
	Wilcox (Layer 6)	0	0	0	0	0	0
	Wilcox (Layer 7)	308	308	308	308	308	308
	Wilcox (Layer 8)	448	448	448	448	448	448
	Total	**5,920**	**5,920**	**5,920**	**5,920**	**5,920**	**5,920**
Exempt Use	Queen City	4	4	4	3	3	3
	Carrizo	3	3	2	2	2	2
	Wilcox (Layer 6)	0	0	0	0	0	0
	Wilcox (Layer 7)	0.5	0.5	0.5	0.5	0.5	0.5
	Wilcox (Layer 8)	0.5	0.5	0.5	0.5	0.5	0.5
	Total	**8**	**8**	**7**	**6**	**6**	**6**
Pumping minus exempt by unit	Queen City	53	53	53	54	54	54
	Carrizo	5,104	5,104	5,105	5,105	5,105	5,105
	Wilcox (Layer 6)	0	0	0	0	0	0
	Wilcox (Layer 7)	307	307	307	307	307	307
	Wilcox (Layer 8)	447	447	447	447	447	447
	Total	**5,912**	**5,912**	**5,913**	**5,914**	**5,914**	**5,914**

Table A-8. Estimates of total annual pumping, exempt use, and the difference between the two for Uvalde County Underground Water Conservation District by aquifer unit or model layer. Results are in acre-feet per year.

Uvalde County Underground Water Conservation District		**Year**					
	Unit or Layer	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Pumping	Carrizo	828	828	828	828	828	828
	Wilcox (Layer 6)	2,143	402	0	0	0	0
	Total	**2,971**	**1,230**	**828**	**828**	**828**	**828**
Exempt Use	Carrizo	23.0	29.0	33.0	36.0	39.0	40.0
	Wilcox (Layer 6)	12.0	14.0	16.0	18.0	19.0	20.0
	Total	**35**	**43**	**49**	**54**	**58**	**60**
Pumping minus exempt by units	Carrizo	805	799	795	792	789	788
	Wilcox (Layer 6)	2,131	388	-16	-18	-19	-20
	Total	**2,936**	**1,187**	**779**	**774**	**770**	**768**

Note: Dry cells in the later decades of the model run lead to zero pumping which results in negative values of managed available groundwater in the outcrop of the Wilcox (layer 6).

Table A-9. Estimates of total annual pumping, exempt use, and the difference between the two for Wintergarden Groundwater Conservation District by aquifer unit or model layer. Results are in acre-feet per year.