

Consultants Draft Only – Not for Distribution  
**ANNOTATED RESPONSE BY Environmental Stewardship**  
**See footnotes with "ES"**

## **DESIRED FUTURE CONDITION EXPLANATORY REPORT FOR GROUNDWATER MANAGEMENT AREA 12 (DRAFT)<sup>1</sup>**

**Consultants Draft Only – Not for distribution**

**Environmental Stewardship provided initial comments to GMA-12 at the April 27, 2017, meeting by way of Phil Cook speaking on behalf of Steve Box. See Attachment A.**

This report was considered and approved by the member districts of Groundwater Management Area 12 on April 19, 2017.

Member Districts:

1. Brazos Valley Groundwater Conservation District
2. Fayette County Conservation District
3. Lost Pines Groundwater Conservation District
4. Mid-East Texas Groundwater Conservation District
5. Post Oak Savannah Groundwater Conservation District

**Prepared by:**

Daniel B. Stephens & Associates, Austin, TX

INTERA Incorporated, Austin, TX

LBG-Guyton Associates, Houston, TX

Martin Geologic Consulting, Austin, TX

April, 2017

---

<sup>1</sup> ES. Environmental Stewardship annotations are provided as footnotes to the original text provided by GMA-12 and GCDs for the April, 2017 meeting.



**ANNOTATED RESPONSE BY Environmental Stewardship**  
**See footnotes with "ES"**

**TABLE OF CONTENTS**

1.0	INTRODUCTION .....	1
1.1	GMA 12 .....	1
1.2	Joint Groundwater Planning Process .....	2
1.3	GMA 12 Joint Planning .....	3
2.0	GMA 12 DESIRED FUTURE CONDITIONS .....	12
2.1	Sparta, Queen City, Carrizo, Calvert Bluff, Simsboro, and Hooper Aquifers .....	12
2.2	Yegua-Jackson Aquifer .....	12
2.3	Brazos Alluvium Aquifer .....	13
2.4	Non-relevant Areas of Aquifers.....	13
3.0	POLICY JUSTIFICATION.....	14
4.0	TECHNICAL JUSTIFICATION .....	16
4.1	Central Queen City-Sparta Groundwater Availability Model .....	16
4.2	Potential Pumping Scenarios Using Queen City-Sparta GAM .....	16
4.3	Yegua-Jackson GAM .....	18
4.4	Potential Pumping Scenario Using Yegua-Jackson GAM .....	18
4.5	Use of Groundwater Availability Models .....	18
4.6	Potential Pumping of Brazos River Alluvium .....	19
5.0	FACTORS CONSIDERED FOR THE DESIRED FUTURE CONDITIONS.....	24
5.1	Aquifer Uses and Conditions .....	24
5.1.1	Carrizo-Wilcox Aquifer .....	26
5.1.2	Queen City Aquifer .....	29
5.1.3	Sparta Aquifer.....	30
5.1.4	Yegua-Jackson Aquifer .....	31
5.1.5	Brazos River Alluvium Aquifer .....	31
5.1.6	Trinity Aquifer .....	31
5.2	Water Supply Needs and Water Management Strategies .....	43
5.3	Hydrological Conditions .....	47
5.3.1	Geology and Hydrogeology.....	47
5.3.2	Total Estimated Recoverable Storage (TERS).....	50
5.3.3	Average Annual Recharge, Inflows, and Discharge.....	52
5.4	Environmental Factors .....	53
5.5	Subsidence .....	55
5.6	Socioeconomics.....	56
5.6.1	Regional Planning Assessment of Socioeconomic Impact .....	56
5.6.2	Other Considerations of Socioeconomic Impacts.....	57
5.6.3	Socioeconomic Considerations in GMA-12.....	57
5.6.4	Impacts of Major and Minor Aquifer DFCs on Socioeconomic Impacts Reasonably Expected to Occur .....	58
5.7	Private Property Rights .....	59
5.8	Feasibility of Achieving the Proposed Desired Future Condition .....	61
5.9	Any Other Relevant Information .....	62
6.0	OTHER DESIRED FUTURE CONDITIONS CONSIDERED .....	64

**ANNOTATED RESPONSE BY Environmental Stewardship**

**See footnotes with "ES"**

7.0 RECOMMENDATIONS AND COMMENTS RECEIVED..... 65

7.1 Comments Received by Brazos Valley GCD..... 65

7.2 Comments Received by Fayette County GCD..... 65

7.3 Comments Received by Lost Pines GCD..... 65

7.4 Comments Received by Mid-East Texas GCD..... 65

7.5 Comments Received by Post Oak Savannah GCD ..... 65

8.0 SUMMARY ..... 67

8.1 Summary of DFCs ..... 67

8.2 Rationale and Justification for DFC Selection..... 70

9.0 REFERENCES..... 73

Appendix A: Agendas and Minutes for GMA 12 Joint Groundwater Planning Meetings from 2012 to 2016

Appendix B: GMA-12 Resolution for Proposed DFCs Dated April 15, 2016

Appendix C: Notices of and Minutes for GCD Public Hearings on Proposed GMA 12 DFCs

Appendix D: May 28, 2015 Presentation “GMA 12 Aquifer Uses and Conditions Consideration Discussion”

Appendix E: June 25, 2015 Presentation “GMA 12: Needs and Strategies”

Appendix F: TERS for GMA 12 (GAM Task 12-035)

Appendix G: GAM Run 13-002 for Fayette County GCD

Appendix H: GAM Run 10-014 for Lost Pines GCD

Appendix I: GAM Run 10-029 for Post Oak Savannah GCD

Appendix J: GAM Run 14-005 for Brazos Valley GCD

Appendix K: GAM Run 13-024 for Mid-East Texas GCD

Appendix L: May 28, 2015 Presentation “GMA 12: Hydrological Conditions Consideration Discussion”

Appendix M: August 13, 2015 Presentation “GMA-12: Environmental Impact Considerations”

Appendix N: August 13, 2015 Presentation “GMA 12 Socioeconomic impacts considerations”

Appendix O: June 25, 2015 Presentation “Groundwater Management Area 12: Consideration of the Impact on the Interests and Rights in Private Property in the Adoption of Desired Future Conditions of Aquifers”

Appendix P: August 13, 2015 Presentation “Presentation to GMA-12: Feasibility of a DFC”

Appendix Q: GMA 12’s Responses to Comments for Brazos Valley GCD

Appendix R: GMA 12’s Responses to Comments for Lost Pines GCD

Appendix S: GMA 12’s Responses to Comments for Post Oak Savannah GCD

**LIST OF FIGURES**

Figure 1-1 Groundwater Management Areas in Texas..... 8

Figure 1-2 Groundwater Conservation Districts in GMA 12 ..... 9

**ANNOTATED RESPONSE BY Environmental Stewardship**  
**See footnotes with "ES"**

Figure 1-3	Major Aquifers in GMA 12 .....	10
Figure 1-4	Minor Aquifers in GMA 12 .....	11
Figure 4-1	Conceptual Flow Model of the Sparta, Queen City, and Carrizo-Wilcox Aquifers (from Kelley and others, 2004, Figure 5.1) .....	21
Figure 4-2	Yegua-Jackson Aquifer System and Location (from Deeds and others, 2010, Figure 2.2.4) .....	22
Figure 4-3	Conceptual Flow Model of the Yegua-Jackson Aquifer (from Deeds and others, 2010, Figure 5.0.1) .....	23
Figure 5-1	Surface geology of GMA 12 .....	33
Figure 5-2	Extent of Carrizo-Wilcox Aquifer within GMA 12 .....	34
Figure 5-3	Extent of Carrizo Aquifer within GMA 12 .....	35
Figure 5-4	Extent of Calvert Bluff Aquifer within GMA 12 .....	36
Figure 5-5	Extent of Simsboro Aquifer within GMA 12 .....	37
Figure 5-6	Extent of Hooper Aquifer within GMA 12 .....	38
Figure 5-7	Extent of Queen City Aquifer within GMA 12 .....	39
Figure 5-8	Extent of Sparta Aquifer within GMA 12 .....	40
Figure 5-9	Extent of Yegua-Jackson Aquifer within GMA 12 .....	41
Figure 5-10	Extent of Brazos River Alluvium Aquifer within GMA 12 .....	42
Figure 5-11	Generic cross-section of the Carrizo-Wilcox Aquifer in GMA 12 (modified from Ashworth and Hopkins, 1995) .....	46
Figure 5-12	Socioeconomic Impacts Analysis – 2011 Brazos G Regional Water Plan Lost Income by Sector (\$millions) .....	63
Figure 5-13	Social Impacts of Water Shortages in Region G .....	63

**LIST OF TABLES**

Table 1-1	A simplified stratigraphic column for GMA 12 .....	5
Table 1-2	Population projection from the 2017 State Water Plan .....	5
Table 1-3	GMA 12 meetings convened from 2012 to 2016 .....	6
Table 1-4	Public hearings conducted by the GCDs regarding the proposed DFCs. ....	7
Table 2-1	Adopted DFCs for the Sparta, Queen City, Carrizo, Calvert Bluff, Simsboro, and Hooper Aquifers .....	12
Table 2-2	Adopted DFCs for the Yegua and Jackson Aquifers .....	13
Table 2-3	Adopted DFCs for the Brazos River Alluvium Aquifer .....	13
Table 5-1	Estimated historic overall water use met with groundwater .....	25
Table 5-2	2012 metered/reported groundwater production in acre-feet .....	25
Table 5-3	Total estimated groundwater production from the Carrizo-Wilcox Aquifer in 2013 .....	26
Table 5-4	Total estimated groundwater production from the Queen City Aquifer in 2013 .....	29
Table 5-5	Total estimated groundwater production from the Sparta Aquifer in 2013 .....	30
Table 5-6	Total estimated groundwater production from the Yegua-Jackson Aquifer in 2013 in acre-feet .....	31
Table 5-7	Total estimated groundwater production from the Brazos River Alluvium Aquifer in 2013 in acre-feet .....	31

**ANNOTATED RESPONSE BY Environmental Stewardship**

**See footnotes with "ES"**

Table 5-8	2012 State Water Plan Amounts for Supplies, Demands and Strategies for the 14 Counties that Comprise GMA 12 .....	45
Table 5-9	2012 State Water Plan Amounts for Supplies, Demands and Strategies for the Five GCDs that a part of GMA 12.....	45
Table 5-10	Total estimated recoverable storage (TERS) in the Carrizo-Wilcox Aquifer in Fayette County .....	50
Table 5-11	Total amount of groundwater in storage (TERS) (in acre-feet) in GMA 12 .....	52
Table 7-1	Summary of all comments received by GMA 12 on the proposed DFCs .....	66
Table 8-1	Adopted DFCs for the Sparta, Queen City, Carrizo, Calvert Bluff, Simsboro, and Hooper Aquifers. ....	67
Table 8-2	Adopted DFCs for the Yegua-Jackson Aquifer. ....	69
Table 8-3	Adopted DFCs for the Brazos River Alluvium Aquifer.....	69

**ANNOTATED RESPONSE BY Environmental Stewardship**

**See footnotes with "ES"**

**ACROYNMS AND ABBREVIATIONS**

ac-ft/yr	acre-feet per year
DBSA	Daniel B. Stephens & Associates
DFCs	Desire Future Conditions
GAM	Groundwater Availability Model
GCD	Groundwater Conservation District
GMA	Groundwater Management Area
gpm	gallons per minute
HB	House Bill
INTERA	INTERA Incorporated
IO models	input/output models
LBG-Guyton	LBG-Guyton Associates
MAG	modeled available groundwater
mg/L	milligrams per liter
PS	potential scenarios
RWPG	regional water planning group
SAM	social accounting matrix
TDS	total dissolved solids
TERS	total estimated recoverable storage
TWDB	Texas Water Development Board
WSC	Water Supply Corporation

**ANNOTATED RESPONSE BY Environmental Stewardship**  
**See footnotes with "ES"**

## **1.0 INTRODUCTION**

### **1.1 GMA 12**

Groundwater Management Areas (GMAs) were created “in order to provide for the conservation, preservation, protection, recharging, and prevention of waste of the groundwater, and of groundwater reservoirs or their subdivisions, and to control subsidence caused by withdrawal of water from those groundwater reservoirs or their subdivisions, consistent with the objectives of Section 59, Article XVI, Texas Constitution...” (Texas Water Code §35.001). The responsibility for GMA delineation was delegated to the Texas Water Development Board (TWDB) (Section 35.004, Chapter 35, Title 2, Texas Water Code). The initial GMA delineations were adopted on December 15, 2002, and are modified as necessary according to agency rules. There are 16 GMAs in Texas. **Figure 1-1** shows the boundaries of these 16 GMAs, including GMA 12.

GMAs consist of all Groundwater Conservation Districts (GCDs) located within the GMA boundary. **Figure 1-2** shows the location of the five GCDs that are contained wholly or in part within the boundary of GMA 12: Brazos Valley GCD, Fayette County GCD, Lost Pines GCD, Mid-East Texas GCD and Post Oak Savannah GCD. The GMA area may also include counties that are not included in a GCD. GMA 12 includes portions of four counties that are not associated with GCDs: Falls, Limestone, Navarro and Williamson counties.

Portions of three major aquifers, as defined by TWDB, fall within GMA 12: the Gulf Coast Aquifer, the Carrizo-Wilcox Aquifer and the Trinity Aquifer. **Figure 1-3** shows the outlines of the major aquifers within GMA 12. The Carrizo-Wilcox Aquifer is, by far, the most extensive and important aquifer in the region, occurring in all five GCDs and providing significant quantities of groundwater across the GMA. The other two major aquifers that occur within GMA 12 only occur in a very limited area within the GMA: the Gulf Coast Aquifer only outcrops in a very small area in the southernmost portion of Brazos County, along the southeast boundary of GMA 12, and the Trinity Aquifer subcrop only exists in a small area along the northwest GMA 12 boundary in Bastrop, Lee and Williamson counties. In addition to these major aquifers, portions of four minor aquifers, as defined by TWDB, are also present within GMA 12: the Brazos River Alluvium Aquifer, the Queen City Aquifer, the Sparta Aquifer, and the Yegua-Jackson Aquifer. **Figure 1-4** shows the outlines of the minor aquifers within GMA 12. All minor aquifers are used as water supply sources within GMA 12. **Table 1-1** is a stratigraphic column showing the relative ages of the aquifers.

With the exception of the Brazos River Alluvium Aquifer, which is heavily pumped for irrigation purposes, most of the groundwater pumped in GMA 12 is from the Carrizo-Wilcox Aquifer. In this report, the Carrizo-Wilcox Aquifer will be subdivided into four major hydrogeologic units, from youngest to oldest: the Carrizo Aquifer, the Calvert Bluff Aquifer (Upper Wilcox Aquifer), the Simsboro Aquifer (Middle Wilcox Aquifer), and the Hooper Aquifer (Lower Wilcox Aquifer), as shown in Table 1-1.

GMA 12 includes all or part of 14 Texas counties: Bastrop, Brazos, Burleson, Falls, Fayette, Freestone, Lee, Leon, Limestone, Madison, Milam, Navarro, Robertson, and Williamson counties. Table 1-2 lists the fourteen counties and their area and population projections. As of the 2010 Census, these counties had a population of about 930,700 that is projected to grow to almost 3 million by 2070. Most of this growth

**ANNOTATED RESPONSE BY Environmental Stewardship**  
**See footnotes with "ES"**

will occur in Williamson County, of which only a small portion falls within the GMA 12 boundary. However, even excluding Williamson County, the population of GMA 12 is expected to more than double by 2070, and this growing population and the accompanying water demand could have significant implications for groundwater resources GMA 12. After Williamson County, the most populated and fastest growing counties are Bastrop County, whose population values include fast-growing suburbs of Austin, and Brazos County, which contains the fast-growing Bryan/College Station area.

## **1.2 Joint Groundwater Planning Process**

The joint groundwater planning process was first adopted by the Texas Legislature with the passage of House Bill (HB) 1763 in 2005. One of the requirements of HB 1763 is that, where two or more GCDs are located within the same boundaries of a GMA, the GCDs shall establish Desired Future Conditions (DFCs) for all relevant aquifers in the GMA by no later than September 1, 2010 and every five years thereafter.

DFCs are defined in Title 31, Part 10, §356.10 (6) of the Texas Administrative Code as “the desired, quantified condition of groundwater resources (such as water levels, spring flows, or volumes) within a management area at one or more specified future times as defined by participating groundwater conservation districts within a groundwater management area as part of the joint planning process.” Once DFCs are adopted, the Executive Administrator of the TWDB calculates the modeled available groundwater (MAG) for the aquifers, which is the estimated amount of pumping that will achieve the DFC. DFCs are essentially planning goals that could be reached, but should not be exceeded.

The joint groundwater planning horizon extends through at least the end of the current regional water planning period pursuant to §16.053, Texas Water Code, or in perpetuity, as defined by participating GCDs within a GMA as part of the joint groundwater planning process.

The joint groundwater planning process was expanded significantly by the passage of Senate Bill 660 in 2011. The more substantive elements of the expanded process include: (1) new requirements that an Explanatory Report be developed and submitted as part of the joint groundwater planning process to document that required factors have been considered; (2) a change from requirements involving estimates of managed available groundwater to modeled available groundwater (MAG) (including the process for addressing exempt use); (3) new requirements for individual GCDs to provide for a 90-day public comment period, during which the individual GCD is to hold a public hearing on the proposed DFCs before final adoption by at least two thirds of the GCD representatives in the GMA; and (4) as soon as possible after final adoption of the DFCs by GCD representatives in the GMA, individual GCDs are to adopt the DFCs. The deadline for adopting proposed DFCs for the second round of joint groundwater planning was extended to May 1, 2016, by the passage of Senate Bill 1282 by the Texas Legislature in 2013.

If a GMA includes more than one GCD, those districts must engage in a joint groundwater planning process, including at least an annual meeting. The districts must jointly determine the DFCs for the management area and, in doing so, are required to consider the nine following factors:

1. Aquifer uses or conditions within the management area, including conditions that differ substantially from one geographic area to another;
2. The water supply needs and water management strategies included in the state water plan;

**ANNOTATED RESPONSE BY Environmental Stewardship  
See footnotes with "ES"**

3. Hydrological conditions, including for each aquifer in the management area the total estimated recoverable storage as provided by the executive administrator, and the average annual recharge, inflows, and discharge;
4. Other environmental impacts, including impacts on spring flow and other interactions between groundwater and surface water;
5. The impact on subsidence;
6. Socioeconomic impacts reasonably expected to occur;
7. The impact on the interests and rights in private property, including ownership and the rights of management area landowners and their lessees;
8. The feasibility of achieving the DFC; and
9. Any other information relevant to the specific DFCs.

After the DFCs are adopted by a GMA, the TWDB determines a MAG value based on the adopted DFCs. A MAG is defined in Title 31, Part 10, §356.10 (13) of the Texas Administrative Code as “the amount of water that the executive administrator determines may be produced on an average annual basis to achieve a desired future condition.”

### 1.3 GMA 12 Joint Planning

The joint groundwater planning process established by HB 1763 in 2005 and amended by Senate Bill 660 in 2011 is a public, transparent process, where all planning decisions are made in open, publicly noticed meetings in accordance with provisions contained in Texas Water Code Chapter 36. From 2012 to 2016, GMA 12 convened 19 times at the dates listed in **Table 1-3**. All of the meetings were open to the public and were held at the Milano Civic Center in Milano, Texas. All meeting notices were posted at least 72 hours in advance of the meeting and included an invitation to submit comments, questions and requests for additional information to the Post Oak Savannah GCD.

**Table 1-3 lists the dates and the major discussion topics of the GMA 12 joint planning meetings from 2012 to 2015<sup>2</sup>. Appendix A contains the agenda and the minutes for all of the GMA 12 meetings.** The GCDs that are members of GMA 12 retain hydrogeologic consultants for GCD-level management and modeling. INTERA Incorporated (INTERA) serves as the consultant for Post Oak Savannah GCD, Daniel B. Stephens & Associates (DBSA) serves as the consultant for Lost Pines GCD and Fayette County GCD, LBG-Guyton Associates (LBG-Guyton) serves as the consultant for Brazos Valley GCD and Martin Geologic

---

<sup>2</sup> ES, as a landowner in GMA-12, attended and commented at 15 of the 21 meetings listed in Table 1-3. ES attended and commented at the meetings highlighted in Table 1-3 and documented in Appendix A. Phil Cook provided comments regarding this Explanatory Report on behalf of Environmental Stewardship at the April 27, 2017 meeting (See Attachment A). ES provided written comments on the meetings and presentation to the GMA-12 members and districts on the following dates:

July 25, 2013	June 18, 2015	February 4, 2016
December 19, 2013	August 6, 2015	March 22, 2016
June 27, 2014	September 21, 2015	March 24, 2016
March 27, 2015	October 6, 2015	
May 15, 2015	January 27, 2016	

Copies of the comments presented to GMA-12 are posted on ES' website page "ES Comments on GMA-12 Proposed DFCs" at <http://environmental-stewardship.org/es-comments-gma-12-proposed-dfcs/>.

**ANNOTATED RESPONSE BY Environmental Stewardship**  
**See footnotes with "ES"**

serves as the consultant for Mid-East Texas GCD. This Explanatory Report is a joint effort of these four consulting firms.

During the GMA 12 meeting on April 15, 2016, GMA 12 proposed the DFCs for adoption. As required by Texas Water Code Section 36.108 (d-2), the proposed DFCs were subsequently distributed to the individual GCDs in GMA 12. **A copy of the resolution for proposed DFCs is included as Appendix B<sup>3</sup>.** A period of not less than 90 days was provided by each GCD to allow for public comments on the proposed DFCs. During this comment period, each GCD held a public hearing on the proposed DFCs. **Table 1-4** lists the date on which each GCD conducted a public hearing on the proposed DFCs. Minutes for these public hearings are included in **Appendix C**.

---

<sup>3</sup> ES protested the wording of the resolution in its comments to GMA-12 on March 22, 2017, as follows:

**ES asserts that the following paragraph in the resolution adopting the proposed desired future condition (DFCs) on April 15, 2016 is erroneous and misleading.**

**WHEREAS**, the proposed desired future conditions provide a balance between the highest practicable level of groundwater production and the conservation, preservation, protection, recharging, and prevention of waster of groundwater in the management area;

We would propose amending this paragraph in the resolution adopting the final DFCs to recognize the following finding (see ES March 22, 2017 comments for details).

As such, ES proposes that the following paragraph in the resolution be amended as follows:

**"WHEREAS** there are recognized shortcomings in the GAM and yet there remains a need to do an evaluation of what conservation standards are needed to fully protect the aquifers so that a balance can be struck between conservation and the highest practicable level of groundwater production (development), and **WHEREAS** re-adopting the previously adopted DFCs, extended to 2070, strikes the best balance currently available; and".

**ANNOTATED RESPONSE BY Environmental Stewardship**  
**See footnotes with "ES"**

Table 1-1 A simplified stratigraphic column for GMA 12

System	Series	Geologic Unit	Hydrogeologic Unit
Quaternary		Brazos River Alluvium	Brazos River Alluvium Aquifer
Tertiary	Upper Eocene	Jackson Group	Yegua-Jackson Aquifer
		Yegua Formation	
	Middle Eocene	Cook Mountain Formation	confining unit
		Sparta Sand	Sparta Aquifer
		Weches Formation	confining unit
		Queen City Sand	Queen City Aquifer
		Reklaw Formation	confining unit
		Carrizo Sand	Carrizo- Wilcox Aquifer
	Lower Eocene	Calvert Bluff Fm. ( <i>Upper Wilcox</i> )	
		Simsboro Fm. ( <i>Middle Wilcox</i> )	
Upper Paleocene	Hooper Fm. ( <i>Lower Wilcox</i> )		

Table 1-2 Population projection from the 2017 State Water Plan

Name	Area <sup>1</sup> (square miles)	Population 2010 <sup>2</sup>	Population 2020	Population 2030	Population 2040	Population 2050	Population 2060	Population 2070
Bastrop	896	74,171	95,487	125,559	164,648	217,608	289,140	384,244
Brazos	590	194,851	227,654	264,665	302,997	349,894	400,135	455,529
Burleson	678	17,187	18,539	19,946	20,838	21,735	22,442	23,022
Falls	774	17,866	19,413	20,397	20,610	20,126	20,736	21,364
Fayette	959	24,554	28,373	32,384	35,108	37,351	39,119	40,476
Freestone	892	19,816	20,437	21,077	22,947	31,142	44,475	73,287
Lee	634	16,612	19,131	21,511	22,877	23,375	23,709	23,889
Leon	1,081	16,801	18,211	19,536	20,603	22,071	23,340	24,582
Limestone	933	23,384	25,136	26,615	27,817	29,134	30,206	31,152
Madison	472	13,664	14,753	15,817	16,786	17,872	18,886	19,877
Milam	1,022	24,757	26,234	27,793	28,896	30,300	31,501	32,629
Navarro	1,086	47,735	52,544	57,032	61,667	71,452	86,952	107,814
Robertson	865	16,622	18,358	20,150	21,801	23,525	25,174	26,771
Williamson	1,137	422,679	632,433	794,478	987,495	1,195,374	1,431,101	1,675,901
<b>TOTAL</b>		<b>930,699</b>	<b>1,216,703</b>	<b>1,466,960</b>	<b>1,755,090</b>	<b>2,090,959</b>	<b>2,486,916</b>	<b>2,940,537</b>

<sup>1</sup> calculated from the Stratmap county shapefile from TNRIS

<sup>2</sup> from the 2010 Census

**ANNOTATED RESPONSE BY Environmental Stewardship**  
**See footnotes with "ES"**

Table 1-3 GMA 12 meetings convened from 2012 to 2016

Meeting Date	Quorum Present	Major Discussion Topic
October 18, 2012	Yes	Appointed representatives to regional water planning groups, discussed TWDB MAG runs and proposed improvements to Queen City-Sparta (Central Carrizo) GAM, GCD reports on status of Management Plans
July 25, 2013	Yes	GCD updates on joint planning and anticipated changes to DFCs, discussion of new DFC adoption process (Water Code Chapter 36.108), discussed proposed improvements to Queen City-Sparta (Central Carrizo) GAM
December 19, 2013	Yes	Discussed joint planning requirements and GCD consultants' roles, GCD updates on Management Plans and monitoring, began process to update Queen City-Sparta (Central Carrizo) GAM
June 6, 2014	Yes	Discussed pumping and projected groundwater demand used in GAMs, discussion of costs and strategy for extending the calibration period for the Queen City-Sparta (Central Carrizo) GAM
June 27, 2014	Yes	Accepted a standardized form for written comments, discussion of process and schedule for proposing DFCs, discussed shallow management zone DFCs and drawdown-based DFCs, received public comments concerning groundwater/surface water interactions and private property rights.
December 4, 2014	Yes	Presentations on preliminary modeling results, updated pumping files for the Queen City-Sparta (Central Carrizo) GAM, shallow zone management strategies, and Total Estimated Recoverable Storage in GMA 12.
February 26, 2015	Yes	Discussed DFCs for shallow management zones, presentation of GAM results up to predictive scenario 4 (PS4), PS4 submitted for public comment
March 27, 2015	Yes	Received comments on PS4 & DFC options
April 30, 2015	Yes	Discussed GAM results up to predictive scenario 4 (PS4) and comments received on PS4, accepted a standardized form for GCDs to submit proposed DFCs.
May 28, 2015	Yes	Presentations on Hydrologic Conditions* and Aquifer Uses and Conditions*
June 25, 2015	Yes	Presentations on Private Property Rights* and Water Supply Needs and Water Management Strategies*
August 13, 2015	Yes	Presentations on 1) Environmental Impacts*, 2) Socioeconomic Impacts* and 3) DFC Feasibility*
September 24, 2015	Yes	Presentation on Subsidence* and discussion of the previous presentations on 1) Aquifer Uses and Conditions*, 2) Water Supply Needs and Water Management Strategies*, 3) Private Property Rights*, including comments received on these topics
October 22, 2015	Yes	Presentation on Feasibility of DFCs*, discussion of previous presentations on 1) Socioeconomic Impacts*, 2) Environmental Impacts*, and 3) Hydrological Conditions including comments received on these topics.
December 17, 2015	Yes	Presentation on GAM results for Predictive Scenario 5 (PS5), TWDB presentation on role of GAMs in joint planning, discussion of previous presentation on Feasibility of DFCs* as well as comments received on that topic.

**ANNOTATED RESPONSE BY Environmental Stewardship**  
**See footnotes with "ES"**

Meeting Date	Quorum Present	Major Discussion Topic
February 4, 2016	Yes	Updated pumping files used for groundwater modeling, presentation on Brazos River alluvium DFCs, receive public comments on impact of DFCs on GW/SW interaction
March 24, 2016	Yes	Presentation of GAM results for a modified Predictive Scenario 5 (PS5)
April 15, 2016	Yes	Proposed GMA 12 DFCs approved and released for public comment
October 11, 2016	Yes	Presentation on GAM results for Predictive Scenario 10 (PS10), discussion of comments received on GMA 12 DFCs.
December 1, 2016	Yes	Discussed and accepted submission of Predictive Scenario 10 (PS10) in lieu of Predictive Scenario 6 (PS6) for purposes of evaluation of proposed DFCs.
April 27, 2017		

\* Denotes the nine factors required during considerations for DFCs under Texas Water Code Section 36.108

Table 1-4 Public hearings conducted by the GCDs regarding the proposed DFCs.

GCD	Public Hearing Date
Brazos Valley GCD	May 12 & June 9, 2016
Fayette County GCD	July 11, 2016
Lost Pines GCD	July 20, 2016
Mid-East Texas GCD	June 28, 2016
Post Oak Savannah GCD	July 12, 2016