BRAZOS G
WATER PLANNING GROUP

Brazos
River Authority

2021 Brazos G Regional Water Plan

Volume I
Appendices

October 2020

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FREESE AND NICHOLS
SUSAN ROTH water and wastewater consulting

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Appendices

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Appendix A
Historical/Supplemental Data

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Appendix A: Description of Tables

Table A-1. Historical Population. Table A-1 provides detailed historical population totals for each county in the BGRWPA for each decade from 1900 through 2010. Historical data provided was obtained from the U.S. Census Bureau. Table A-1 also provides region totals for each year listed, percent change in population from decade to decade, the State's total population, and its corresponding percent change from decade to decade.

Table A-2. Historical Population by Subregion. Table A-2 categorizes the data listed in Table A-1 by the subregions identified in the BGRWPA, including the Rolling Plains, IH-35 Corridor and Lower Basin. Population totals for each subregion are provided as the summation of the populations of the counties within that subregion.

Table A-3. Historical Use by Source. Table A-3 provides a listing of water use in the BGRWPA by source, either groundwater or surface water for 1980, 1990, 2000, 2010, 2016, and 2017. These data were obtained from the TWDB. The total water use for the region is also listed.

Table A-4. Historical Groundwater Pumpage by Aquifer. Table A-4 provides a detailed listing of groundwater use by aquifer for 1980, 1990, 2000, 2010, 2016, and 2017. These data are a summary of data obtained from the TWDB for groundwater use in the BGRWPA.

Table A-5. BGRWPA Reservoirs. Table A-5 provides a complete listing of the reservoirs in the BGRWPA with a permitted capacity of at least 2,500 acre-feet. This table is provided to supplement Table 1-5 in the report.

Table A-6. Permitted Surface Water Diversions. Table A-6 lists the permitted diversions by county obtained from the TCEQ water-rights database. Table A-6 provides supplemental information to Table 1-6 in the report.

Table A-7. Historical Use by County. Table A-7 provides detailed water-use data by county for the BGRWPA for 1980, 1990, 2000, 2010, 2016, and 2017. Region totals are also provided. The data were obtained from the TWDB.

Table A-8. Historical Water Use by Type. Table A-8 lists water use as municipal, manufacturing, power generation, mining, irrigation or livestock watering for 1980, 1990, 2000, 2010, 2016, and 2017. Region totals are included for each year. All data were obtained from the TWDB.

Table A-9. Historical Water Use by County, Source and Type. Table A-9 provides 2017 water use by source and type for each county in the BGRWPA. The percentage of use by source for each county is also included. The data were obtained from the TWDB.

Table A-1 BGRWPA Historical Population

	Historical Population[1]											
County	**1900**	**1910**	**1920**	**1930**	**1940**	**1950**	**1960**	**1970**	**1980**	**1990**	**2000**	**2010**
Bell	45,535	49,186	46,412	50,030	44,863	73,824	94,097	124,483	157,889	191,088	237,974	310,235
Bosque	17,390	19,013	18,032	15,750	15,761	11,836	10,809	10,966	13,401	15,125	17,204	18,212
Brazos	18,859	18,919	21,975	21,835	26,977	38,390	44,895	57,978	93,588	121,862	152,415	194,851
Burleson	18,367	18,687	16,855	19,848	18,334	13,000	11,177	9,999	12,313	13,625	16,470	17,187
Callahan	8,768	12,973	11,844	12,785	11,568	9,087	7,929	8,205	10,992	11,859	12,905	13,544
Comanche	23,009	27,186	25,748	18,430	19,245	15,516	11,865	11,898	12,617	13,381	14,026	13,974
Coryell	21,308	21,703	20,601	19,999	20,226	16,284	23,961	35,311	56,767	64,213	74,978	75,388
Eastland	17,971	23,421	58,505	34,156	30,345	23,942	19,526	18,092	19,480	18,488	18,297	18,583
Erath	29,966	32,095	28,385	20,804	20,760	18,434	16,236	18,141	22,560	27,991	33,001	37,890
Falls	33,342	35,649	36,217	38,771	35,984	26,724	21,263	17,300	17,946	17,712	18,576	17,866
Fisher	2,708	12,596	11,009	13,563	12,932	11,023	7,865	6,344	5,891	4,842	4,344	3,974
Grimes	26,106	21,205	23,101	22,642	21,960	15,135	12,709	11,855	13,580	18,828	23,552	26,604
Hamilton	13,520	15,315	14,676	13,523	13,303	10,660	8,488	7,198	8,297	7,733	8,229	8,517
Haskell	2,637	16,249	14,193	16,669	14,905	13,736	11,174	8,512	7,725	6,820	6,093	5,899
Hill	41,355	46,760	43,332	43,036	38,355	31,282	23,650	22,596	25,024	27,146	32,321	35,089
Hood	9,146	10,008	8,759	6,779	6,674	5,287	5,443	6,368	17,714	28,981	41,100	51,182
Johnson	33,819	24,460	37,286	33,317	30,384	31,390	34,720	45,769	67,649	97,165	126,811	150,934
Jones	7,053	24,299	22,323	24,233	23,378	22,147	19,299	16,106	17,268	16,490	20,785	20,202
Kent	899	2,655	3,335	3,851	3,413	2,249	1,727	1,434	1,145	1,010	859	808
Knox	2,322	9,625	9,240	11,368	10,090	10,082	7,857	5,972	5,329	4,837	4,253	3,719
Lampasas	8,625	9,532	8,800	8,677	9,167	9,929	9,418	9,323	12,005	13,521	17,762	19,677
Lee	14,595	13,132	14,014	13,390	12,751	10,144	8,949	8,048	10,952	12,854	15,657	16,612
Limestone	32,573	34,621	33,283	39,497	33,781	25,251	20,413	18,100	20,224	20,946	22,051	23,384
McLennan	59,772	73,250	82,921	98,682	101,898	130,194	150,091	147,553	170,755	189,123	213,517	234,906
Milam	39,666	36,780	38,104	37,915	33,120	23,585	22,263	20,028	22,732	22,946	24,238	24,757
Nolan	2,611	11,999	10,868	19,323	17,309	19,808	18,963	16,220	17,359	16,594	15,802	15,216
Palo Pinto	12,291	19,506	23,431	17,576	18,456	17,154	20,516	28,962	24,062	25,055	27,026	28,111
Robertson	31,480	27,454	27,933	27,240	25,710	19,908	16,157	14,389	14,653	15,511	16,000	16,622
Shackelford	2,461	4,201	4,960	6,695	6,211	5,001	3,990	3,323	3,915	3,316	3,302	3,378
Somervell	3,498	3,931	3,563	3,016	3,071	2,542	2,577	2,793	4,154	5,360	6,809	8,490
Stephens	6,466	7,980	15,403	16,560	12,356	10,597	8,885	8,414	9,926	9,010	9,674	9,630
Stonewall	2,183	5,320	4,086	5,667	5,589	3,679	3,017	2,397	2,406	2,013	1,693	1,490

Table A-1 Concluded BGRWPA Historical Population

	Historical Population[1]											
County	**1900**	**1910**	**1920**	**1930**	**1940**	**1950**	**1960**	**1970**	**1980**	**1990**	**2000**	**2010**
Taylor	10,499	26,293	24,081	41,023	44,147	63,370	101,078	97,853	110,932	119,655	126,551	131,506
Throckmorton	1,750	4,563	3,589	5,253	4,275	3,618	2,767	2,205	2,053	1,880	1,850	1,641
Washington	32,931	25,561	26,624	25,394	25,387	20,542	19,145	18,842	21,998	26,154	30,373	33,718
Williamson	38,072	42,228	42,934	44,146	41,698	38,853	35,044	37,305	76,521	139,551	211,474	367,234
Young	6,540	13,657	13,379	20,128	19,004	16,810	17,254	15,400	19,001	18,126	13,989	14,804
Region G Total	**680,093**	**802,012**	**849,801**	**871,571**	**833,387**	**821,013**	**855,217**	**895,682**	**1,130,823**	**1,350,811**	**1,621,961**	**1,975,834**
% Change		17.9%	6.0%	2.6%	-4.4%	-1.5%	4.2%	4.7%	26.3%	19.5%	20.1%	21.8%
Annual Growth Rate		1.70%	0.60%	0.30%	-0.40%	-0.10%	0.40%	0.50%	2.40%	1.80%	1.80%	1.99%
State Total	3,048,710	3,896,542	4,663,228	5,824,715	6,414,824	7,711,194	9,579,677	11,196,730	14,229,191	16,986,510	20,851,820	24,915,388
% Change		27.8%	19.7%	24.9%	10.1%	20.2%	24.2%	16.9%	27.1%	19.4%	22.8%	19.5%
Annual Growth Rate		2.50%	1.80%	2.20%	1.00%	1.90%	2.20%	1.60%	2.40%	1.80%	2.10%	

[1]Historical population data from U.S. Census Bureau

Table A-2 BGRWPA Historical Population by Subregion

Sub-Region/	Historical Population[1]											
County	**1900**	**1910**	**1920**	**1930**	**1940**	**1950**	**1960**	**1970**	**1980**	**1990**	**2000**	**2010**
Rolling Plains												
Bosque	17,390	19,013	18,032	15,750	15,761	11,836	10,809	10,966	13,401	15,125	17,204	18,212
Callahan	8,768	12,973	11,844	12,785	11,568	9,087	7,929	8,205	10,992	11,859	12,905	13,544
Comanche	23,009	27,186	25,748	18,430	19,245	15,516	11,865	11,898	12,617	13,381	14,026	13,974
Coryell	21,308	21,703	20,601	19,999	20,226	16,284	23,961	35,311	56,767	64,213	74,978	75,388
Eastland	17,971	23,421	58,505	34,156	30,345	23,942	19,526	18,092	19,480	18,488	18,297	18,583
Erath	29,966	32,095	28,385	20,804	20,760	18,434	16,236	18,141	22,560	27,991	33,001	37,890
Fisher	2,708	12,596	11,009	13,563	12,932	11,023	7,865	6,344	5,891	4,842	4,344	3,974
Hamilton	13,520	15,315	14,676	13,523	13,303	10,660	8,488	7,198	8,297	7,733	8,229	8,517
Haskell	2,637	16,249	14,193	16,669	14,905	13,736	11,174	8,512	7,725	6,820	6,093	5,899
Hood	9,146	10,008	8,759	6,779	6,674	5,287	5,443	6,368	17,714	28,981	41,100	51,182
Jones	7,053	24,299	22,323	24,233	23,378	22,147	19,299	16,106	17,268	16,490	20,785	20,202
Kent	899	2,655	3,335	3,851	3,413	2,249	1,727	1,434	1,145	1,010	859	808
Knox	2,322	9,625	9,240	11,368	10,090	10,082	7,857	5,972	5,329	4,837	4,253	3,719
Lampasas	8,625	9,532	8,800	8,677	9,167	9,929	9,418	9,323	12,005	13,521	17,762	19,677
Nolan	2,611	11,999	10,868	19,323	17,309	19,808	18,963	16,220	17,359	16,594	15,802	15,216
Palo Pinto	12,291	19,506	23,431	17,576	18,456	17,154	20,516	28,962	24,062	25,055	27,026	28,111
Shackelford	2,461	4,201	4,960	6,695	6,211	5,001	3,990	3,323	3,915	3,316	3,302	3,378
Somervell	3,498	3,931	3,563	3,016	3,071	2,542	2,577	2,793	4,154	5,360	6,809	8,490
Stephens	6,466	7,980	15,403	16,560	12,356	10,597	8,885	8,414	9,926	9,010	9,674	9630
Stonewall	2,183	5,320	4,086	5,667	5,589	3,679	3,017	2,397	2,406	2,013	1,693	1,490
Taylor	10,499	26,293	24,081	41,023	44,147	63,370	101,078	97,853	110,932	119,655	126,551	131,506
Throckmorton	1,750	4,563	3,589	5,253	4,275	3,618	2,767	2,205	2,053	1,880	1,850	1,641
Young	6,540	13,657	13,379	20,128	19,004	16,810	17,254	15,400	19,001	18,126	13,989	14,804
Totals	**213,621**	**334,120**	**358,810**	**355,828**	**342,185**	**322,791**	**340,644**	**341,437**	**404,999**	**436,300**	**480,532**	**505,835**

Table A-2 Concluded BGRWPA Historical Population by Subregion

Sub-Region/	**Historical Population[1]**											
County	**1900**	**1910**	**1920**	**1930**	**1940**	**1950**	**1960**	**1970**	**1980**	**1990**	**2000**	**2010**
IH-35 Corridor												
Bell	45,535	49,186	46,412	50,030	44,863	73,824	94,097	124,483	157,889	191,088	237,974	310,235
Hill	41,355	46,760	43,332	43,036	38,355	31,282	23,650	22,596	25,024	27,146	32,321	35,089
Johnson	33,819	24,460	37,286	33,317	30,384	31,390	34,720	45,769	67,649	97,165	126,811	150,934
McLennan	59,772	73,250	82,921	98,682	101,898	130,194	150,091	147,553	170,755	189,123	213,517	234,906
Williamson	38,072	42,228	42,934	44,146	41,698	38,853	35,044	37,305	76,521	139,551	211,474	367,234
Totals	**218,553**	**235,884**	**252,885**	**269,211**	**257,198**	**305,543**	**337,602**	**377,706**	**497,838**	**644,073**	**822,097**	**1,098,398**
Lower Basin												
Brazos	18,859	18,919	21,975	21,835	26,977	38,390	44,895	57,978	93,588	121,862	152,415	194,851
Burleson	18,367	18,687	16,855	19,848	18,334	13,000	11,177	9,999	12,313	13,625	16,470	17,187
Falls	33,342	35,649	36,217	38,771	35,984	26,724	21,263	17,300	17,946	17,712	18,576	17,866
Grimes	26,106	21,205	23,101	22,642	21,960	15,135	12,709	11,855	13,580	18,828	23,552	26,604
Lee	14,595	13,132	14,014	13,390	12,751	10,144	8,949	8,048	10,952	12,854	15,657	16,612
Limestone	32,573	34,621	33,283	39,497	33,781	25,251	20,413	18,100	20,224	20,946	22,051	23,384
Milam	39,666	36,780	38,104	37,915	33,120	23,585	22,263	20,028	22,732	22,946	24,238	24,757
Robertson	31,480	27,454	27,933	27,240	25,710	19,908	16,157	14,389	14,653	15,511	16,000	16,622
Washington	32,931	25,561	26,624	25,394	25,387	20,542	19,145	18,842	21,998	26,154	30,373	33,718
Totals	**247,919**	**232,008**	**238,106**	**246,532**	**234,004**	**192,679**	**176,971**	**176,539**	**227,986**	**270,438**	**319,332**	**371,601**
Region G Total	**680,093**	**802,012**	**849,801**	**871,571**	**833,387**	**821,013**	**855,217**	**895,682**	**1,130,823**	**1,350,811**	**1,621,961**	**1,975,834**

[1]Historical population data from U.S. Census Bureau

Table A-3 Historical Use by Source

Water Source	Year					
	1980	1990	2000	2010	2016	2017
Groundwater	270,270	280,840	356,557	436,860	393,398	432,527
Surface Water	274,999	300,680	406,990	416,309	421,867	445,650
Region Total	**545,269**	**581,520**	**763,547**	**853,169**	**815,265**	**878,177**

Table A-4 Historical Groundwater Pumping by Aquifer

Aquifer	Year					
	1980	1990	2000	2010	2016	2017
Brazos Alluvium	29,426	36,528	23,070	129,064	110,859	133,065
Carrizo-Wilcox	32,111	55,759	96,156	40,055	40,611	40,089
Dockum	2,067	2,071	4,884	8,440	12,140	14,326
Edwards-BFZ	9,428	12,314	34,372	18,744	15,589	13,696
Edwards-TP	1,607	1,486	303	2,545	1,730	2,166
Gulf Coast	3,326	4,870	7,251	4,162	2,907	2,708
Queen City	1,556	1,707	2,132	2,813	2,356	2,676
Seymour	94,996	60,795	101,710	62,601	66,934	76,405
Sparta	1,042	1,423	1,595	4,445	4,948	4,529
Trinity	80,601	92,655	90,180	61,816	70,511	72,121
Woodbine	1,635	1,024	1,363	912	476	405
Yegua-Jackson				3,600	3,021	3,079
Blaine				406	279	335
Ellenburger-San Saba				28	17	18
Marble Falls				20	23	23
Ogallala				7	1	1
Other-Undiff	13,472	9,757	6,999	84,948	61,638	66,817
Region Total	**271,267**	**280,389**	**370,015**	**424,606**	**394,040**	**432,459**

Table A-5 BGRWPA Reservoirs (Permit Capacity Greater than 2,500 acft)

Reservoir	Stream	County	Permitted Storage (acft)	Permitted Diversion (Acft/yr)					Owner	Water Right Holders (Greater Than 1,000 acft)[1]
				Municipal[4]	Industrial	Irrigation	Other	Total		
Abilene	Elm Creek	Taylor	11,868	1,675	0	0	0	1,675	City of Abilene	City of Abilene
Alcoa Lake	Sandy Creek	Milam	15,650	0	14,000	0	0	14,000	Aluminum Co. of America	Aluminum Co. of America
Alvarado	Turkey Creek	Johnson	4,781	500	300	0	0	800	City of Alvarado	
Anson North	Thompson Creek	Jones	2,500	542	0	0	0	542	City of Anson	
Aquilla	Aquilla Creek	Hill	52,400	13,896	0	0	0	13,896	U.S. Army Corps of Engineers	Brazos River Authority
Belton	Leon River	Bell	469,600	130,257	0	0	0	130,257	U.S. Army Corps of Engineers	U.S. Army Corps of Engineers, Brazos River Authority
Brusy Creek[3]	Brazos River	Falls	6,560	0	0	0	0	0	City of Marlin	
Camp Creek	Camp Creek	Robertson	8,400	0	0	0	0	0	Camp Creek Water Co.	
Cisco	Sandy Creek	Eastland	45,000	1,971	56	0	0	2,027	City of Cisco	City of Cisco
Cleburne	Nolan River	Johnson	25,600	5,760	0	240	0	6,000	City of Cleburne	City of Cleburne
Clyde	North Prong Pecan Creek	Callahan	5,748	1,000	0	0	0	1,000	City of Clyde	City of Clyde
Squaw Creek Reservoir[2]	Squaw Creek	Somervell	151,500	0	23,180	0	0	23,180	TXU Electric Co.	TXU Electric Co.
Daniel	Gonzales Creek	Stephens	11,400	2,100	0	0	0	2,100	City of Breckenridge	City of Breckenridge
Dansby Power Plant[2]	Thompsons Creek	Brazos	15,227	0	850	0	0	850	City of Bryan	City of Bryan
Davis/Catherine	Dutchmen Creek	Knox	7,479	0	0	2,031	0	2,031	League Ranch	League Ranch
Fort Parker	Navasota River	Limestone	3,100	0	0	6	0	6	Texas Parks and Wildlife Dept.	
Fort Phantom Hill	Elm Creek	Jones	73,960	25,690	6,500	1,000		33,190	City of Abilene	City of Abilene, AEP Texas
Georgetown	North Fork San Gabriel River	Williamson	37,100	13,610	0	0	0	13,610	U.S. Army Corps of Engineers	Brazos River Authority
Gibbons Creek	Gibbons Creek	Grimes	32,084	0	9,740	0	0	9,740	Texas Municipal Power Agency	Texas Municipal Power Agency
Graham/Eddleman	Flint Creek	Young	52,386	11,000	8,400	100	500	20,000	City of Graham	City of Graham
Granbury	Brazos River	Hood	155,000	64,712	0	0	0	64,712	Brazos River Authority	Brazos River Authority
Granger	San Gabriel River	Williamson	65,500	19,840	0	0	0	19,840	U.S. Army Corps of Engineers	Brazos River Authority
Hubbard Creek	Hubbard Creek	Stephens	317,750	56,000	0	0	0	56,000	West Central Texas MWD	West Central Texas MWD
Kirby	Cedar Creek	Taylor	8,500	3,880	0	0	0	3,880	City of Abilene	City of Abilene
Lake Creek	Brazos River	McLennan	8,500	0	10,000	0	0	10,000	Luminant Generation Co.	Luminant Generation Co.
Leon	Leon River	Eastland	28,000	5,450	350	500	0	6,300	Eastland Co. WSD	Eastland Co. WSD
Limestone	Navasota River	Robertson	225,400	65,074	0	0	0	65,074	Brazos River Authority	Brazos River Authority
McCarty	Salt Prong	Shackelford	2,600	600	0	0	0	600	City of Albany	
Mexia	Navasota River	Limestone	9,600	2,887	65	0	0	2,952	Bistone MWSD	Bistone MWSD
Millers Creek Lake	Millers Creek	Baylor	30,696	3,500	1,000	0	500	5,000	North Central Texas MWD	North Central Texas MWD

Table A-5 Concluded BGRWPA Reservoirs (Permit Capacity Greater than 2,500 acft)

Reservoir	Stream	County	Permitted	Permitted Diversion (Acft/yr)					Owner	Water Right Holders
			Storage (acft)	Municipal[4]	Industrial	Irrigation	Other	Total		(Greater Than 1,000 acft)[1]
New Marlin[3]	Brazos River	Falls	3,135	6,000	2,000	0	0	8,000	City of Marlin	City of Marlin
Palo Pinto	Palo Pinto Creek	Palo Pinto	44,124	12,500	6,000	0	0	18,500	Palo Pinto MWD	Palo Pinto MWD
Possum Kingdom	Brazos River	Palo Pinto	724,739	230,750	0	0	0	230,750	Brazos River Authority	Brazos River Authority
Proctor	Leon River	Comanche	59,400	19,658	0	0	0	19,658	U.S. Army Corps of Engineers	Brazos River Authority
Robinson Off-Channel Reservoirs	Brazos River	McLennan	8,037	13,100	0	0	0	13,100	City of Robinson	City of Robinson
E-Area End Lake	Yegua Creek	Milam	7,173	0		0	0	0	Aluminum Co. of America	Aluminum Co. of America
Somerville	Yegua Creek	Washington	160,110	48,000	0	0	0	48,000	U.S. Army Corps of Engineers	Brazos River Authority
Stamford	Paint Creek	Haskell	60,000	10,000	0	0	0	10,000	City of Stamford	City of Stamford
Stillhouse Hollow	Lampasas River	Bell	235,700	67,768	0	0	0	67,768	U.S. Army Corps of Engineers	Brazos River Authority
Sweetwater	Cottonwood Creek	Nolan	10,000	2,730	960	50	0	3,740	City of Sweetwater	City of Sweetwater
Tradinghouse	Brazos River	McLennan	37,800	0	15,000	0	0	15,000	Tradinghouse Power Co. LLC	Tradinghouse Power Co. LLC
Trammel	Sweetwater Creek	Nolan	2,500	2,000	0	0	0	2,000	City of Sweetwater	City of Sweetwater
Truscott Brine[5]	Bluff Creek	Knox	107,000	0	0	0	0	0	Red River Authority of Texas	
Twin Oak[2]	Duck Creek	Robertson	30,319		13,200			13,200	TXU Electric Co.	TXU Electric Co.
Lake Brazos	Brazos River	McLennan	3,537	5,600	0	0	0	5,600	City of Waco	City of Waco
Waco	Bosque River	McLennan	192,062	78,969	16,802	900	0	96,671	City of Waco	City of Waco
Wheeler Branch	Wheeler Branch	Somervell	4,118	2,000	0	0	0	2,000	Somervell County Water Distri	Somervell County Water District
Whitney[6]	Brazos River	Hill	50,000	18,336	0	0	0	18,336	U.S. Army Corps of Engineers	Brazos River Authority

[1]Reservoir information obtained from water rights listing provided by the TCEQ. Permitted Diversions shown do not include diversions permitted under the BRA System Operations permit. [2]Only a portion of the permitted diversion is consumptive. Of the total 118,947 acft/yr permitted for these facilities, 44,570 acft/yr is consumptive. [3]This reservoir has not been constructed. Diversion authorization are associated with New Marlin Reservoir. [4]Multipurpose authorizations are reported in the highest category of use. [5]Only one of the two authorized reservoirs constructed. [6]Total storage of Lake Whitney is over 600,000 acft. BRA has the only priority water right in the conservation storage of the reservoir.

Table A-6 Permitted Surface Water Diversions

County	Permitted Diversions (acft/yr)					
	Municipal	Industrial	Irrigation	Mining	Other	Total
Bell	215,829	2	5,171	138	5	221,145
Bosque	3,940	5	9,099	0	0	13,044
Brazos	27,163	55,708	12,597	0	0	95,468
Burleson	0	420	8,040	0	1,000	9,460
Callahan	1,550	0	1,042	0	0	2,592
Comanche	19,858	11	12,258	0	0	32,127
Coryell	0	0	1,994	0	0	1,994
Eastland	8,871	556	2,315	1,607	0	13,349
Erath	80	0	4,763	30	25	4,898
Falls	6,339	2,000	6,537	0	0	14,876
Fisher	0	26	724	0	0	750
Grimes	0	16,050	2,193	200	0	18,443
Hamilton	614	3	3,331	0	0	3,947
Haskell	10,000	0	1,316	0	0	11,316
Hill	57,232	25,000	1,493	0	0	83,725
Hood	64,747	0	3,901	0	0	68,648
Johnson	6,980	300	903	125	0	8,308
Jones	59,532	4,007	7,420	383	0	71,342
Kent	0	0	554	5,900	0	6,454
Knox	34	0	2,233	235	0	2,502
Lampasas	4,642	48	2,370	0	0	7,060
Lee	0	0	182	0	0	182
Limestone	5,547	67	14	1,000	0	6,628
McLennan	98,224	53,876	7,350	0	0	159,450
Milam	2,792	33,512	7,884	0	0	44,188
Nolan	5,740	45	636	0	0	6,421
Palo Pinto	243,870	6,012	3,661	41	0	253,584
Robertson	65,074	13,200	9,730	685	480	89,169
Shackelford	774	50	138	0	0	962
Somervell	5,000	23,180	764	0	0	28,944
Stephens	58,100	97	1,078	218	0	59,493
Stonewall	0	0	8	235	0	243
Taylor	5,785	3,509	1,106	0	50	10,450
Throckmorton	660	0	9	0	0	669
Washington	97,500	50,020	50,002	500	0	198,022
Williamson	88,760	30,003	6,369	858	0	125,990
Young	11,250	8,509	1,304	600	0	21,663
Region Total	**1,176,487**	**326,216**	**180,488**	**12,755**	**1,560**	**1,697,506**

Table A-7 Historical Use (acft/yr) by County

	Year					
County	**1980**	**1990**	**2000**	**2010**	**2016**	**2017**
Bell	31,507	35,866	49,886	57,523	59,028	60,352
Bosque	4,893	5,403	7,808	10,210	7,945	8,620
Brazos	29,300	41,264	39,097	71,551	74,249	79,363
Burleson	9,508	9,956	22,165	32,085	20,551	30,629
Callahan	3,608	3,396	3,378	3,066	2,083	2,234
Comanche	31,034	54,850	42,113	30,602	28,506	33,182
Coryell	11,898	11,202	18,044	16,185	14,024	13,976
Eastland	19,781	16,491	20,512	9,182	6,157	6,772
Erath	21,190	19,902	24,991	18,486	16,095	18,309
Falls	10,103	10,966	7,585	12,986	10,544	12,425
Fisher	5,075	4,630	4,358	6,231	4,141	4,646
Grimes	3,534	15,969	10,195	20,362	14,489	13,412
Hamilton	4,090	4,476	3,818	4,059	3,304	4,186
Haskell	43,140	24,172	52,851	37,570	42,051	46,366
Hill	5,648	5,286	6,553	10,095	8,136	8,116
Hood	8,513	15,605	12,864	19,315	16,272	17,815
Johnson	12,672	15,182	26,025	28,517	24,334	24,867
Jones	14,803	9,703	10,540	5,587	5,491	5,201
Kent	1,607	1,916	1,649	1,344	1,098	1,151
Knox	51,309	33,774	44,926	30,338	29,736	36,119
Lampasas	3,983	3,350	5,557	3,853	4,672	4,620
Lee	3,957	4,677	5,876	7,429	4,364	5,073
Limestone	4,800	9,766	27,494	32,474	21,366	21,279
McLennan	70,528	58,934	74,850	56,616	66,864	68,621
Milam	19,935	32,134	59,275	42,897	32,465	30,337
Nolan	9,719	7,389	10,170	10,847	14,773	16,614
Palo Pinto	8,749	7,067	8,302	13,035	7,558	9,265
Robertson	24,856	25,504	25,394	122,268	105,778	123,708
Shackelford	1,963	2,072	2,413	1,585	1,335	1,203
Somervell	1,578	11,424	20,101	24,879	67,795	68,495
Stephens	9,094	3,597	10,231	3,230	1,920	1,964
Stonewall	1,461	1,719	1,129	910	614	695
Taylor	32,040	31,573	43,122	23,999	24,756	25,550
Throckmorton	838	1,475	1,145	805	665	946
Washington	5,444	6,397	8,815	7,505	6,291	6,789
Williamson	16,471	27,458	44,125	71,868	84,636	88,785
Young	6,640	6,975	6,190	3,676	4,751	4,426
Region Total	**545,269**	**581,520**	**763,547**	**853,170**	**838,837**	**906,111**

Table A-8 Historical Water Use (acft/yr) by Type

	Year					
Use Type	**1980**	**1990**	**2000**	**2010**	**2016**	**2017**
Municipal	215,744	236,955	319,141	326,414	346,937	362,506
Manufacturing	21,124	32,240	56,993	46,131	9,804	10,821
Power	28,686	57,657	86,963	76,545	154,706	153,229
Mining	11,413	6,944	15,008	53,383	8,666	13,730
Irrigation	229,387	200,954	232,991	298,754	267,635	315,648
Livestock	38,915	46,770	52,451	51,943	43,860	44,035
Region Total	**545,269**	**581,520**	**763,547**	**853,170**	**831,608**	**899,969**

Table A-9 Historical Water Use by County, Source and Type

County	Water Source	Use Type						County Total	Percent of Total
		Municipal	Manufacturing	Mining	Power	Irrigation	Livestock		
Bell	G	2,663	13	11	0	817	218	3,722	6.5%
	S	49,988	604	0	0	2,653	509	53,754	93.5%
	Total	52,651	617	11	0	3,470	727	57,476	100%
Bosque	G	2,568	2	0	1	2,281	285	5,137	60%
	S	173	13	0	2,294	338	665	3,483	40%
	Total	2,741	15	0	2,295	2,619	950	8,620	100%
Brazos	G	36,810	1,418	345	63	35,261	406	74,303	96%
	S	367	0	38	301	1,609	754	3,069	4%
	Total	37,177	1,418	383	364	36,870	1,160	77,372	100%
Burleson	G	2,650	35	3,927	0	20,860	308	27,780	94%
	S	0	0	436	0	604	718	1,758	6%
	Total	2,650	35	4,363	0	21,464	1,026	29,538	100%
Callahan	G	317	0	0	0	239	216	772	35%
	S	809	0	0	0	5	648	1,462	65%
	Total	1,126	0	0	0	244	864	2,234	100%
Comanche	G	185	2	0	0	18,251	958	19,396	58%
	S	1,529	8	0	0	9,375	2,874	13,786	42%
	Total	1,714	10	0	0	27,626	3,832	33,182	100%
Coryell	G	629	0	0	0	364	148	1,141	8%
	S	11,823	2	0	0	0	840	12,665	92%
	Total	12,452	2	0	0	364	988	13,806	100%
Eastland	G	187	0	0	0	3,418	40	3,645	54%
	S	1,677	38	284	0	310	756	3,065	46%
	Total	1,864	38	284	0	3,728	796	6,710	100%

Table A-9 Historical Water Use by County, Source and Type (Continued)

County	Water Source	Use Type						County Total	Percent of Total
		Municipal	Manufacturing	Mining	Power	Irrigation	Livestock		
Erath	G	3,881	63	0	0	7,050	2,050	13,044	71%
	S	400	0	0	0	82	4,783	5,265	29%
	Total	4,281	63	0	0	7,132	6,833	18,309	100%
Falls	G	1,310	0	0	0	6,661	303	8,274	67%
	S	2,023	0	0	0	412	1,716	4,151	33%
	Total	3,333	0	0	0	7,073	2,019	12,425	100%
Fisher	G	348	166	0	0	3,543	137	4,194	90%
	S	247	0	0	0	0	205	452	10%
	Total	595	166	0	0	3,543	342	4,646	100%
Grimes	G	2,982	230	0	1	399	319	3,931	29%
	S	0	0	0	8,651	0	746	9,397	71%
	Total	2,982	230	0	8,652	399	1,065	13,328	100%
Hamilton	G	441	0	0	0	1,288	260	1,989	48%
	S	722	0	0	0	0	1,475	2,197	52%
	Total	1,163	0	0	0	1,288	1,735	4,186	100%
Haskell	G	110	0	0	0	45,057	138	45,305	98%
	S	737	2	0	0	0	322	1,061	2%
	Total	847	2	0	0	45,057	460	46,366	100%
Hill	G	3,605	0	2	0	333	63	4,003	49%
	S	2,204	0	0	0	720	1,189	4,113	51%
	Total	5,809	0	2	0	1,053	1,252	8,116	100%
Hood	G	5,995	13	0	14	2,991	190	9,203	16%
	S	1,450	393	142	1,828	46,008	231	50,052	84%
	Total	7,445	406	142	1,842	48,999	421	59,255	100%

Table A-9 Historical Water Use by County, Source and Type (Continued)

County	Water Source	Use Type						County Total	Percent of Total
		Municipal	Manufacturing	Mining	Power	Irrigation	Livestock		
Johnson	G	5,775	1,038	32	0	86	421	7,352	30%
	S	14,421	878	106	186	526	982	17,099	70%
	Total	20,196	1,916	138	186	612	1,403	24,451	100%
Jones	G	944	0	0	0	1,937	142	3,023	59%
	S	1,587	0	0	0	294	263	2,144	41%
	Total	2,531	0	0	0	2,231	405	5,167	100%
Kent	G	103	0	0	0	756	263	1,122	97%
	S	0	0	0	0	0	29	29	3%
	Total	103	0	0	0	756	292	1,151	100%
Knox	G	211	0	0	0	34,970	91	35,272	98%
	S	479	0	0	0	0	368	847	2%
	Total	690	0	0	0	34,970	459	36,119	100%
Lampasas	G	114	0	0	0	112	189	415	9%
	S	3,685	36	46	0	83	353	4,203	91%
	Total	3,799	36	46	0	195	542	4,618	100%
Lee	G	2,266	8	699	0	692	398	4,063	81%
	S	0	0	24	0	0	927	951	19%
	Total	2,266	8	723	0	692	1,325	5,014	100%
Limestone	G	1,759	16	149	628	0	14	2,566	13%
	S	659	7	405	15,141	0	1,392	17,604	87%
	Total	2,418	23	554	15,769	0	1,406	20,170	100%
McLennan	G	12,350	1,340	0	0	1,747	269	15,706	27%
	S	35,647	1,901	1	0	3,287	1,527	42,363	73%
	Total	47,997	3,241	1	0	5,034	1,796	58,069	100%

Table A-9 Historical Water Use by County, Source and Type (Continued)

County	Water Source	Use Type						County Total	Percent of Total
		Municipal	Manufacturing	Mining	Power	Irrigation	Livestock		
Milam	G	4,664	0	103	841	5,208	480	11,296	37%
	S	4,390	0	11	13,183	308	1,120	19,012	63%
	Total	9,054	0	114	14,024	5,516	1,600	30,308	100%
Nolan	G	1,501	297	0	0	14,046	148	15,992	97%
	S	269	136	0	0	30	98	533	3%
	Total	1,770	433	0	0	14,076	246	16,525	100%
Palo Pinto	G	121	0	0	0	564	78	763	8%
	S	4,681	0	0	296	2,041	1,423	8,441	92%
	Total	4,802	0	0	296	2,605	1,501	9,204	100%
Robertson	G	2,208	35	3,011	5,232	74,946	620	86,052	70%
	S	0	0	2	34,901	1,302	1,446	37,651	30%
	Total	2,208	35	3,013	40,133	76,248	2,066	123,703	100%
Shackelford	G	3	0	0	0	117	5	125	10%
	S	574	0	2	0	0	502	1,078	90%
	Total	577	0	2	0	117	507	1,203	100%
Somervell	G	510	3	232	1	117	41	904	1%
	S	859	0	51	66,253	333	95	67,591	99%
	Total	1,369	3	283	66,254	450	136	68,495	100%
Stephens	G	22	0	1	0	45	40	108	5%
	S	1,376	7	2	0	111	360	1,856	95%
	Total	1,398	7	3	0	156	400	1,964	100%

Table A-9 Historical Water Use by County, Source and Type (Concluded)

County	Water Source	Use Type						County Total	Percent of Total
		Municipal	Manufacturing	Mining	Power	Irrigation	Livestock		
Stonewall	G	107	0	1	0	89	335	532	77%
	S	79	0	0	0	0	84	163	23%
	Total	186	0	1	0	89	419	695	100%
Taylor	G	750	3	0	0	860	109	1,722	7%
	S	21,206	488	0	0	15	616	22,325	93%
	Total	21,956	491	0	0	875	725	24,047	100%
Throckmorton	G	4	0	47	0	50	0	101	11%
	S	124	0	12	0	0	704	840	89%
	Total	128	0	59	0	50	704	941	100%
Washington	G	1,517	194	294	0	200	168	2,373	35%
	S	2,707	81	33	0	0	1,506	4,327	65%
	Total	4,224	275	327	0	200	1,674	6,700	100%
Williamson	G	14,109	42	1,038	0	272	420	15,881	18%
	S	70,163	450	8	0	291	980	71,892	82%
	Total	84,272	492	1,046	0	563	1,400	87,773	100%
Young	G	183	0	0	0	46	135	364	8%
	S	2,584	50	1	274	614	539	4,062	92%
	Total	2,767	50	1	274	660	674	4,426	100%

Appendix B
Aquifer Descriptions and Groundwater Availability

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Method of Determination for Groundwater Availability

When available, the amount of groundwater available for development is based on the TWDB's determination of modeled available groundwater (MAG), which is based on desired future conditions (DFC), as established by members of Groundwater Conservation Districts within a Groundwater Management Area (GMA). If a groundwater availability model (GAM) is available for an aquifer, it is to be used by the TWDB in making the MAG determination.

For aquifers without an adopted MAG, the TWDB provided "total availability" estimates that are based on results from groundwater modeling during the development of the MAGs for other aquifers. For other aquifers, Brazos G utilized the groundwater availability estimate carried forward from the 2016 Brazos G Regional Water Plan; these were determined based on a variety of sources, predominately information from historical TWDB groundwater reports and the TWDB groundwater database. The Brazos G technical consultant requested specific groundwater availability estimates based on the above information, and coordinated closely with the TWDB staff to finalize the non-MAG groundwater availability estimates for aquifers in counties and river basins for which an official MAG has not been adopted.

The MAG determination is based upon drought-of-record conditions which would occur simultaneously with increased, dry-year demands. For groundwater systems sensitive to annual hydrologic variability, this this is a ration approach. However, supplies from some aquifer systems, such as the Carrizo-Wilcox Aquifer, are not sensitive to annual or short-term fluctuations in hydrology. For these systems, simply applying the MAG has been found to be an overly conservative estimate of availability. With the realization that demands in many years will be substantially less than the dry-year demands, the Brazos G Regional Water Planning Group has adopted a MAG Peak Factor to increase planning supplies, which is based on developing an annual pumping pattern that reflects annual variation in pumping from an aquifer over a period while not exceeding the cumulative volume that would be pumped by the MAG in that same period. Any adjustments to the MAG, such as the MAG Peak Factor, must still honor the established DFCs for a given aquifer. A MAG Peak Factor is incorporated for the Carrizo-Wilcox Aquifer in Brazos County for this planning cycle. This peak factor is a composite factor representing the cumulative availability for the Carrizo-Wilcox Aquifer system from both the Carrizo and Simsboro Formations and represents an annual available groundwater supply which is 15 percent to 20 percent greater across the planning horizon than the MAG. The development of this MAG Peak Factor is presented in Appendix N-1 of the Brazos G technical memorandum for this plan.

Blaine Aquifer

Location

The Blaine Aquifer, a minor aquifer, occurs in the extreme western part of Brazos G and east of the High Plains of Texas (Figure B-1).

Geohydrology

The Blaine Formation of the Pease River Group of Permian Age consists of beds of gypsum, anhydrite, halite, dolomite, sandstone, and shale. Not all beds are found throughout the formation, however the individual beds of gypsum and dolomite are laterally continuous. Recharge primarily occurs from precipitation on the outcrop, which is along the eastern edge of the formation. Discharge is to the wells, seepage to streams, or leakage to other formations. Saturated thickness reaches 300 feet in the aquifer, but freshwater saturated thickness averages about 135 feet. Groundwater occurs primarily in solution channels and caverns within the beds of anhydrite and gypsum that contribute to the overall poor quality of the water. Although some wells contain slightly saline water, with total dissolved solids between 1,000 and 3,000 milligrams per liter, most contain moderately saline water, with total dissolved solids between 3,000 and 10,000 milligrams per liter, exceeding secondary drinking water standards for Texas. The aquifer is under water table conditions in the eastern part of the aquifer and under confined conditions to the west.

Development and Use

While the upper part of the Blaine provides irrigation supplies from solutioning of gypsum and dolomite beds in adjacent planning areas, Ogilbee (1962) reports that similar conditions are not present in Knox County. They probably do not exist in Fisher, Nolan and Stonewall Counties either. The TWDB data base shows only a few livestock and household wells in the Blaine Aquifer in the four counties. These data show inventoried Blaine wells be less than 200 ft deep. Water quality is highly variable. The TWDB estimated 2017 pumpage from Blaine Aquifer in Brazos G at 335 acft/yr, of which 6 acft/yr was for municipal use.

Availability

The Blaine Aquifer in Brazos G is in GMA-6. In a letter dated June 2017, the TWDB referenced a report titled GAM Run 16-031 MAG, which presents the MAG for the Blaine Aquifer in GMA-6. The MAG determination (Shi, 2017) utilized the Desired Future Conditions (DFC's provided by the GMA-6 representative) and groundwater model of the Seymour and Blaine aquifers (Ewing et. al, 2004) Using the approach outlined by the TWDB, aquifer MAG was calculated each county. The only county in Brazos G with an adopted MAG for the Blaine Aquifer is Fisher County. Availability of the Blaine Aquifer in Knox and Stonewall Counties is provided by the TWDB and is estimated based on modeling from GMA-6; availability in Nolan County is estimated based on previous Brazos G Regional Water Plans, historical TWDB groundwater reports, and data from the TWDB groundwater database.

Blaine Aquifer

Modeled Available Groundwater (acft/yr)						
COUNTY	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
FISHER	12,855	12,820	12,855	12,820	12,855	12,820
KNOX [A]	700	700	700	700	700	700
NOLAN [A]	100	100	100	100	100	100
STONEWALL [A]	8,700	8,700	8,700	8,700	8,700	8,700
TOTAL	22,355	22,320	22,355	22,320	22,355	22,320

[A] Non-GAM estimate

Well Yields and Water Quality

Any extensive development of this aquifer is unlikely because of the frequent occurrence of poor-quality water and low well yields.

Resource Considerations

Counties in groundwater districts include: Knox (Rolling Plains Groundwater Conservation District (GCD)), Fisher (Clear Fork GCD), and Nolan (Wes-Tex GCD).

References

Duffin, G.L., and Beynon, B.E., 1992, Evaluation of water resources in parts of the Rolling Prairies region of North-Central Texas: TWDB Report 337.

Muller, Daniel A., and Price, Robert D., 1979, Ground-water availability in Texas: TDWR Report 238.

Ogilbee, William and Osborne, F.L., 1962, Ground-water resources of Haskell and Knox Counties, Texas: TWC Bulletin 6209.

Ewing, J.D., Jones, T.L., Pickens, J.F. and others, 2004, Groundwater Availability for the Seymour Aquifer: Texas Water Development Board Contract Report. http://www.twdb.state.tx.us/gam/symr/symr.htm

Shi, J., 2017, Gam Run 16-031 MAG: Modeled Available Groundwater for the Seymour, Blaine, Ogallala, and Dockum Aquifers in Groundwater Management Area 6, Texas Water Development Board Groundwater Division.

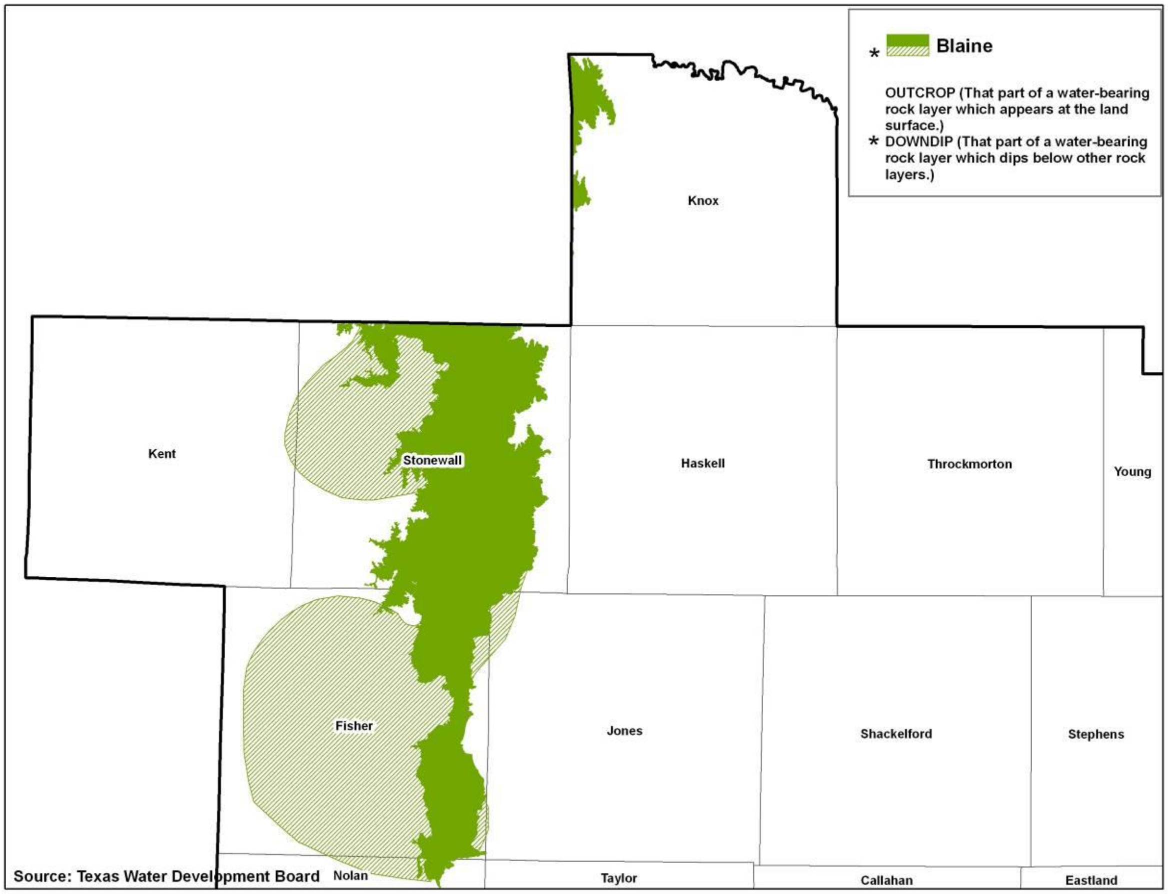

Figure B-1. Location of Blaine Aquifer in Brazos G

Brazos River Alluvium Aquifer

Location

The Brazos River Alluvium Aquifer is a minor aquifer and occurs along the floodplain and terrace deposits of the Brazos River downstream of Hill and Bosque Counties. The width of the aquifer ranges from less than one to almost seven miles. The Brazos River Alluvium Aquifer in Brazos G occurs in parts of Hill, Bosque, McLennan, Falls, Milam, Robertson, Burleson, Brazos, Washington and Grimes Counties. It is limited to the valley area along the Brazos River (Figure B-2).

Geohydrology

The river alluvium forms a floodplain and a series of terraces. The floodplain is of primary significance as a source of groundwater locally, however, groundwater also may occur in the terrace deposits that are outside the floodplain. The alluvium consists of layers of clay, silt, sand and various mixtures. The coarsest and best water-bearing zones are in the lower part of the aquifer. Water in the floodplain alluvium usually exists under water table conditions, although leaky artesian conditions may occur locally where there are extensive lenses of clay. The maximum saturated thickness of the alluvium is about 85 feet. The primary source of recharge is precipitation on the floodplain. Lesser amounts of recharge are losses of runoff in streams crossing the floodplain, groundwater discharge from adjacent aquifers and return flow from irrigation water. Discharge is mostly by seepage to the Brazos River, evapotranspiration, and wells.

Development and Use

The year 2017 Brazos G groundwater use for the Brazos River Alluvium Aquifer was estimated to be 133,065 acft with approximately 99 percent used for irrigation.

Availability

The Brazos River Alluvium Aquifer in Brazos G is in GMA-12. In a letter dated December 2017, the TWDB referenced a report titled GAM Run 17-030 MAG (Wade and Ballew, 2017), which presents the MAG for aquifers in the management area. The MAG volume for the Brazos River Alluvium Aquifer was determined using the groundwater availability model for the Brazos River Alluvium, version 1.01 (Ewing and Jigmond, 2016), which was developed to meet the Desired Future Conditions adopted by groundwater conservation district representatives of GMA-12. An adopted MAG is only available for Brazos, Burleson, Milam, and Robertson Counties. Non-MAG availability in Bosque, Falls, Hill, McLennan, and Washington Counties were provided by the TWDB and are estimated based average modeling for GMA-12. Non-MAG availability estimates for Grimes County are similarly based on modeling for GMA-14.

Brazos River Alluvium Aquifer

Modeled Available Groundwater (acft/yr)						
COUNTY	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
BOSQUE [A]	830	830	830	830	830	830
BRAZOS	81,581	80,311	80,081	79,976	79,913	79,872
BURLESON	28,472	28,418	28,414	28,414	28,414	28,413
FALLS [A]	16,684	16,684	16,684	16,684	16,684	16,684
GRIMES [A]	5,112	5,112	5,112	5,112	5,112	5,112
HILL [A]	632	632	632	632	632	632
MCLENNAN [A]	15,023	15,023	15,023	15,023	15,023	15,023
MILAM	47,818	47,785	47,779	47,775	47,773	47,771
ROBERTSON	61,161	57,959	57,633	57,544	57,503	57,480
WASHINGTON [A]	5,770	5,770	5,770	5,770	5,770	5,770
TOTAL	263,083	258,524	257,958	257,760	257,654	257,587

[A] Non-GAM estimate

Well Yields

Yields from large supply wells are typically between 250 and 500 gallons per minute (gpm). Well yields are considerably less at the edges of the alluvium, and where there is minimal sand thickness or a considerable amount of silt and/or clay is present.

Water Quality

Water quality from the Brazos River Alluvium Aquifer varies widely, even within short distances. Concentrations of dissolved solids exceed 1,000 milligrams per liter (mg/L) in many areas; but, water is sufficiently fresh to meet drinking water standards in some areas. Data show the aquifer generally having 500 to 3,000 mg/L dissolved solids content. Areas with dissolved solids concentrations less than 500 mg/L or greater than 3,000 mg/L are of limited extent. Local groundwater contamination from agriculture chemicals is like1ly in intensively irrigated areas.

Resource Considerations

Any extensive development of this aquifer is likely to cause some reductions of streamflow in the Brazos and Little Brazos Rivers.

Counties with groundwater conservation districts in the Brazos G include: Bosque (Middle Trinity GCD, Grimes (Bluebonnet GCD), Hill (Prairielands GCD), Robertson and Brazos (Brazos Valley GCD), McLennan (McLennan County GCD) and Milam and Burleson (Post Oak Savannah GCD).

References

Cronin, J.G., and Wilson, C.A., 1967, Groundwater in the flood-plain alluvium of the Brazos River, Whitney Dam to vicinity of Richmond, Texas: TWDB Report 41.

Ewing, J.E., and Jigmond, M., 2016, Final Numerical Model Report for the Brazos River Alluvium Aquifer Groundwater Availability Model: Contract report to the Texas Water Development Board.

Wade, S.C., and Ballew, N., 2017, GAM Run 17-030 MAG: Modeled Available Groundwater for the Carrizo-Wilcox, Queen City, Sparta, Yegua-Jackson, and Brazos River Alluvium Aquifers in Groundwater Management Area 12, Texas Water Development Board Groundwater Division.

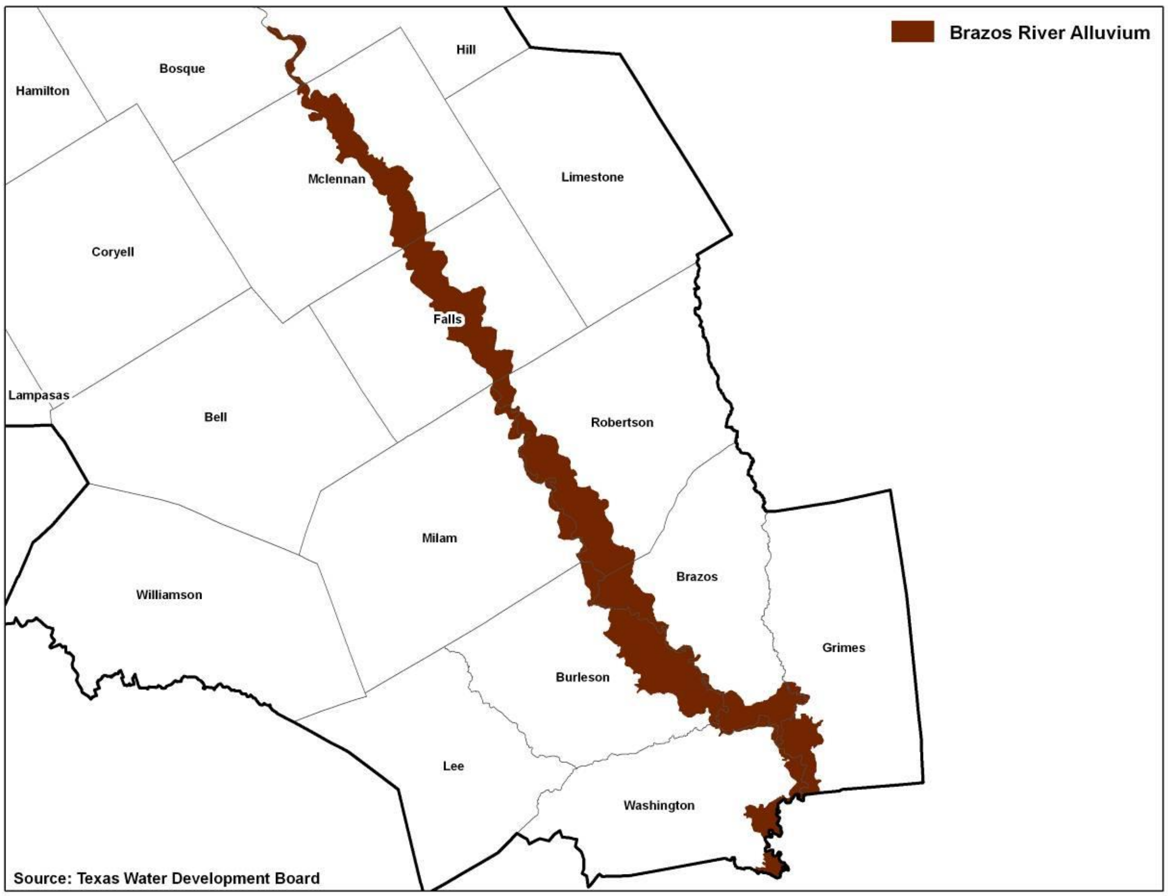

Figure B-2. Location of Brazos River Alluvium Aquifer in Brazos G

Carrizo-Wilcox Aquifer

Location

The Carrizo-Wilcox, a major aquifer within the Brazos G, is of major significance in water planning due to a relatively large supply of undeveloped water. It traverses a southeastern part of the Brazos G in a northeast-southwest-trending band and extends into adjoining planning areas (Figure B-3). It occurs within the Brazos G primarily in parts of Brazos, Burleson, Lee, Limestone, Milam, and Robertson Counties.

Geohydrology

The Carrizo Formation and the underlying Wilcox Group, which is divided into the Calvert Bluff, Simsboro, and Hooper units, form the Carrizo-Wilcox Aquifer. The Simsboro is a major water-bearing unit across the Brazos G and also in neighboring planning areas. Between the Colorado and Trinity Rivers, the Simsboro sands are uniquely productive and are largely separated from overlying and underlying geologic units by clays of low permeability. The sands in the Simsboro and Carrizo are overwhelmingly the two most significant water-bearing zones in the Carrizo-Wilcox. The Calvert Bluff and Hooper are generally tapped only by shallow wells.

The Carrizo-Wilcox consists of a thick sequence of ancient river and delta deposits, consisting mostly of sand, silt, and clay. Total thickness is typically between 2,000 and 3,000 feet, and net sand thickness can exceed 50 percent of the total thickness. Some important coal (lignite) deposits occur primarily within the Calvert Bluff. From surface outcrops (recharge areas) the members of the Carrizo-Wilcox dip coastward beneath younger strata. Water table conditions occur in recharge areas, and artesian conditions occur in downdip areas. Precipitation is the main source of recharge. A substantial, but unknown, amount of potential recharge is lost through evapotranspiration in areas of the outcrop. Freshwater sands occur up to 30 miles south of recharge areas and to depths up to about 3,000 feet in the most permeable sands. Slightly saline water occurs just to the southeast (coastward) of the fresh water. Faulting within the Mexia-Talco Fault Zone occurs in an approximately 5-mile wide belt across parts of Lee, Burleson, Milam, and Robertson Counties. The faults affect position, continuity, and possibly water quality within the Carrizo-Wilcox zones in variable and mostly unknown ways.

Development and Use

The year 2017 Brazos G groundwater use for the Brazos River Alluvium Aquifer was estimated to be 40,089 acft with approximately 57 percent used for municipal purposes. Relatively large amounts of municipal water use is by Bryan, College Station, Texas A&M, Hearne and Rockdale. Most of the irrigation use occurs in Milam and Robertson Counties.

Availability

The Carrizo-Wilcox in Brazos G primarily lies within the boundary of GMA-12; however, a portion does extend across the northern part of Grimes County in GMA-14. In a letter dated December 2017 to GMA-12, the TWDB referenced a report titled GAM Run 17-030 MAG (Wade and Ballew, 2017) which presents the MAG within the management area. The MAG was determined using the groundwater availability model for the central part of the Carrizo-Wilcox, Queen City, and Sparta aquifers, version 2.02 (Kelley and others, 2004), which was developed to meet the Desired Future Conditions adopted by groundwater conservation district representatives of GMA-12. No MAG has been adopted for the Carrizo-Wilcox within GMA-14; the groundwater availability values for Grimes County, as provided by the TWDB, are estimated based on from groundwater modeling from GMA-14. The results are presented in the following table.

Carrizo-Wilcox Aquifer

Modeled Available Groundwater (acft/yr)						
COUNTY	**2020**	**2030**	**2040**	**2050**	**2060**	**2070** [A]
BRAZOS	44,832	47,844	49,418	53,969	57,167	57,167
BRAZOS (MAG PEAK FACTOR)	53,350	55,977	59,302	63,683	65,742	65,742
BURLESON	23,242	28,039	32,511	36,485	38,694	38,694
FALLS	867	875	884	895	895	895
GRIMES [B]	8,274	8,274	8,274	8,274	8,274	8,274
LEE	21,142	20,516	20,558	21,466	19,069	19,069
LIMESTONE	11,353	11,483	11,664	11,966	11,966	11,966
MILAM	23,928	20,211	19,119	21,366	22,327	22,327
ROBERTSON	46,590	47,400	47,881	48,281	48,282	48,282
WILLIAMSON	9	9	9	10	9	9
TOTAL [C]	188,755	192,784	200,202	212,426	215,258	215,258

[A] – Adopted MAG does not include a MAG determination for 2070; 2070 value extrapolated based on 2060 volume.
[B] - Non-GAM Estimate
[C] – Values calculated using MAG Peak Factor for the Carrizo-Wilcox Aquifer in Brazos County.

Well Yields

Wide variations occur in individual well yields for the four Carrizo-Wilcox hydrogeologic units, mostly depending on well depth and local sand thickness. Estimated ranges for maximum individual well yields are from 500 to 2,000 gpm for the Carrizo, from 100 to 300 gpm for the Calvert Bluff, from 500 to 3,000 gpm for the Simsboro, and from 100 to 300 gpm for the Hooper.

Water Quality

Water generally meets drinking water standards, but local exceptions occur. Excessive iron concentrations are the most common water quality problem, and some water supplies must be treated. Hydrogen sulfide and methane occurrences are occasionally reported. Water obtained near the outcrops of the water-bearing zones generally is higher in hardness and lower in total dissolved solids content. In downdip areas the water is commonly a sodium-bicarbonate-type water, with total dissolved solids content ranging from about 300 to 800 mg/L and averaging 400 to 500 mg/L. The dissolved solid concentrations tend to be greater at the downdip limit of the aquifer.

Resource Considerations

Few development problems have occurred to date, and water-level declines have been relatively small or restricted to pumping centers near larger developments. No important pollution problems are evident. One potential impact of significant drawdown is dewatering existing wells due to the wells being too shallow or have casing diameters which restrict setting pumps at lower depths.

There are four groundwater conservation districts that oversee the development and management of the Carrizo-Wilcox Aquifer within the Brazos G. The counties with a groundwater conservation district include: Lee (Lost Pines GCD), Robertson and Brazos (Brazos Valley GCD), Milam and Burleson (Post Oak Savannah GCD), and Grimes (Bluebonnet GCD).

References

Dutton, A.R., 1999, Assessment of groundwater availability in the Carrizo-Wilcox Aquifer in Central Texas--Results of numerical simulations of six groundwater-withdrawal projections (2000-2050), The University of Texas at Austin, Bureau of Economic Geology.

Dutton, A.R., Harden, B., Nicot, J.P., and O’Rourke, D., 2003. Groundwater availability model for the central part of the Carrizo-Wilcox Aquifer in Texas. TWDB Contract Report.

Follett, C.R., 1970, Ground-water resources of Bastrop County, Texas: TWDB Report 109.

Follett, C.R., 1974, Ground-water resources of Brazos and Burleson Counties, Texas: TWDB Report 185.

Harden, R.W. & Associates, Inc., 1986, The most suitable areas for management of the Carrizo/Wilcox aquifer in Central Texas.

Kelley, V.A., Deeds, N.E., Fryar, D.G., and Nicot, J.P., 2004, Groundwater availability models for the Queen City and Sparta Aquifers: TWDB Contract Report, http://www.twdb.state.tx.us/gam/czwx_c/czwx_c.htm

Rettman, P.L., 1987, Ground-water resources of Limestone County, Texas: TWDB Report 299.

Thompson, G.L., 1966, Ground-water resources of Lee County, Texas: TWDB Report 20.

Thorkildsen, D., and Price, R.D., 1991, Ground-water resources of the Carrizo-Wilcox aquifer in the Central Texas region: TWDB Report 332.

Wade, S.C., and Ballew, N., 2017, GAM Run 17-030 MAG: Modeled Available Groundwater for the Carrizo-Wilcox, Queen City, Sparta, Yegua-Jackson, and Brazos River Alluvium Aquifers in Groundwater Management Area 12, Texas Water Development Board Groundwater Division.

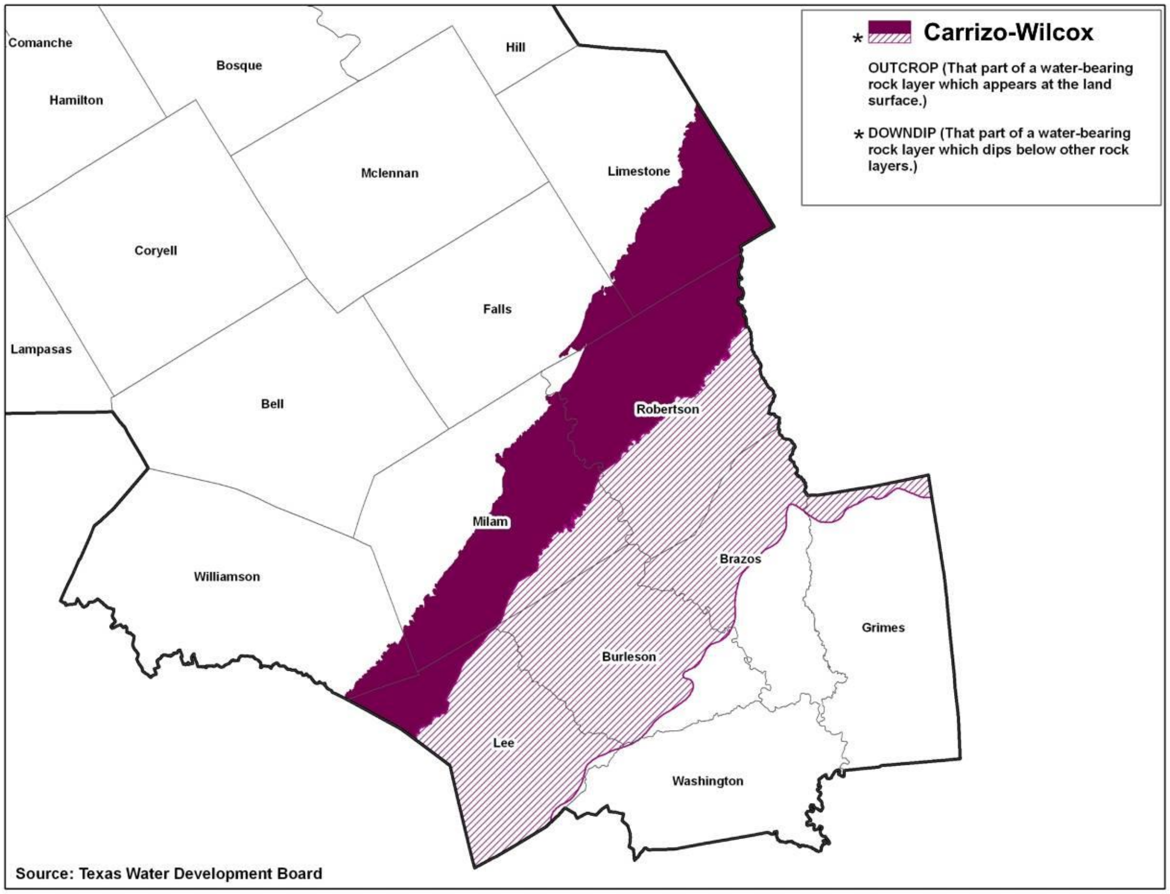

Figure B-3. Location of Carrizo-Wilcox Aquifer in Brazos G

Cross-Timbers Aquifer

Location

The Cross Timbers Aquifer was newly-designated as a minor aquifer in December 2017. The aquifer occurs in a band ranging in thickness from approximately 75 to 90 miles wide extending from the Red River at the Oklahoma-Texas border to the Colorado River in central Texas. With the exception of the westernmost counties, the Cross Timbers Aquifer is shown to underlay the counties of the Brazos G Upper Basin as well as portions of Hood and Lampasas County in the Brazos G Middle Basin (Figure B-16).

Geohydrology

Four separate formation groups comprise the Cross Timbers Aquifer: the Strawn, Canyon, Cisco-Bowie, and Wichita-Albany Groups. In general, the formation groups of the Cross Timbers Aquifer consist of limestone, shale, and sandstone which occur in layers or lenses indicating riverine and deltaic depositional environments (Ballew and French, 2019). The Strawn Group consists of shale, limestone, and sandstone with conglomerate and thin beds of coal. The Canyon Group overlays the Strawn Group and is comprised of massive too thin-bedded limestone, interbedded with shale, thin sandstone, and conglomerate. The Cisco Group, overlaying the Canyon Group, consists of shale, siltstone, sandstone, limestone, conglomerate, and some coal. The youngest of the formations, those in the Wichita Group, consists primarily of thin beds of limestone and fine grained sandstone; however, massive saturated limestone beds have been located near the top of the group (Ballew and French, 2019). Total aquifer thickness within the Brazos G is anticipated to be one the order of 3,000 to 5,000 ft thick based on generalized cross sections (Nicot and others, 2013).

Development and Use

Development is mostly limited to local use for household and livestock purposes. Approximately 75 percent of the well completed in the Cross Timbers formation are domestic wells and approximately 20 percent are stock wells (Ballew and French, 2019). Pumpage estimates for the Cross Timbers Aquifer was not included specifically in the TWDB's 2017 estimates; however, review of literature indicates that pumpage from 'Other Aquifers' identified by the TWDB within the same area as the Cross Timber Aquifer extent is likely from the Cross Timbers Aquifer (Ballew and French, 2019). The TWDB reports a usage from Other Aquifers in the region of the Cross Timbers Aquifer extent within Brazos G of 5,521 acft/yr with approximately 53 percent used for irrigation and 33 percent for municipal use.

Availability

The Cross Timbers Aquifer lies within the boundaries of GMA-6. The most recent round of planning and selection of Desired Future Conditions by each groundwater management area did not include an adopted MAG for the Cross Timbers Aquifer. This is a newly designated aquifer by the TWDB; groundwater availability estimates in Shackelford and Stephens Counties are based on the availability provided for Other Aquifers in the 2016 Brazos G Regional Water Plan.

Cross-Timbers Aquifer

Modeled Available Groundwater (acft/yr)						
COUNTY	**2020**	**2030**	**2030**	**2050**	**2060**	**2070**
SHACKELFORD [A]	712	712	712	712	712	712
STEPHENS [A]	620	620	620	620	620	620
TOTAL	1,332	1,332	1,332	1,332	1,332	1,332

[A] – Non-MAG estimate.

Well Yields

The geometry and aquifer properties vary widely within the Cross Timbers Aquifer and contribute to variability in well yields. Reported yield range as high as 57 to 189 gpm among the four formation groups with the Strawn Group being the most prolific; however, the majority of reported yields range are less than 30 to 45 gpm (Ballew and French, 2019).

Water Quality

Groundwater produced from the Cross Timbers Aquifer ranges from fresh to brackish with high variability of water quality within and between individual formations. The majority of wells sampled are completed in the Cisco Group and were found to have total dissolved solids concentrations less than 3,000 milligrams per liter with a median concentration of 839 milligrams per liter (Ballew and French, 2019). Samples analyses from all formations in the Cross Timbers Aquifer indicate the native groundwater is mostly fresh to slightly saline. Evaluations concerning chloride concentrations (Nicot and others, 2013) indicate an average chloride concentration in the Cross Timbers Aquifer approximately twice as much as that in the adjacent Trinity Aquifer, likely influenced by surface contamination of halite dissolution.

Resource Considerations

Counties with groundwater conservation districts include: Lampasas (Saratoga UWCD), Erath and Comanche (Middle Trinity GCD), Hood (Upper Trinity GCD), and Haskell (Rolling Plains GCD).

References

Ballew, N., and French, L.N., 2019, Groundwater Conditions in the Cross Timbers Aquifer, Texas Water Development Board Groundwater Management Report 19-01.

Nicot, J.P., Huang, Y., Wolaver, B.D., and Costley, R.A., 2013, Flow and Salinity Patters in Low-Transmissivity Upper Paleozoic Aquifer of North-Central Texas: Gulf Coast Association of Geological Societies Journal, V. 2.

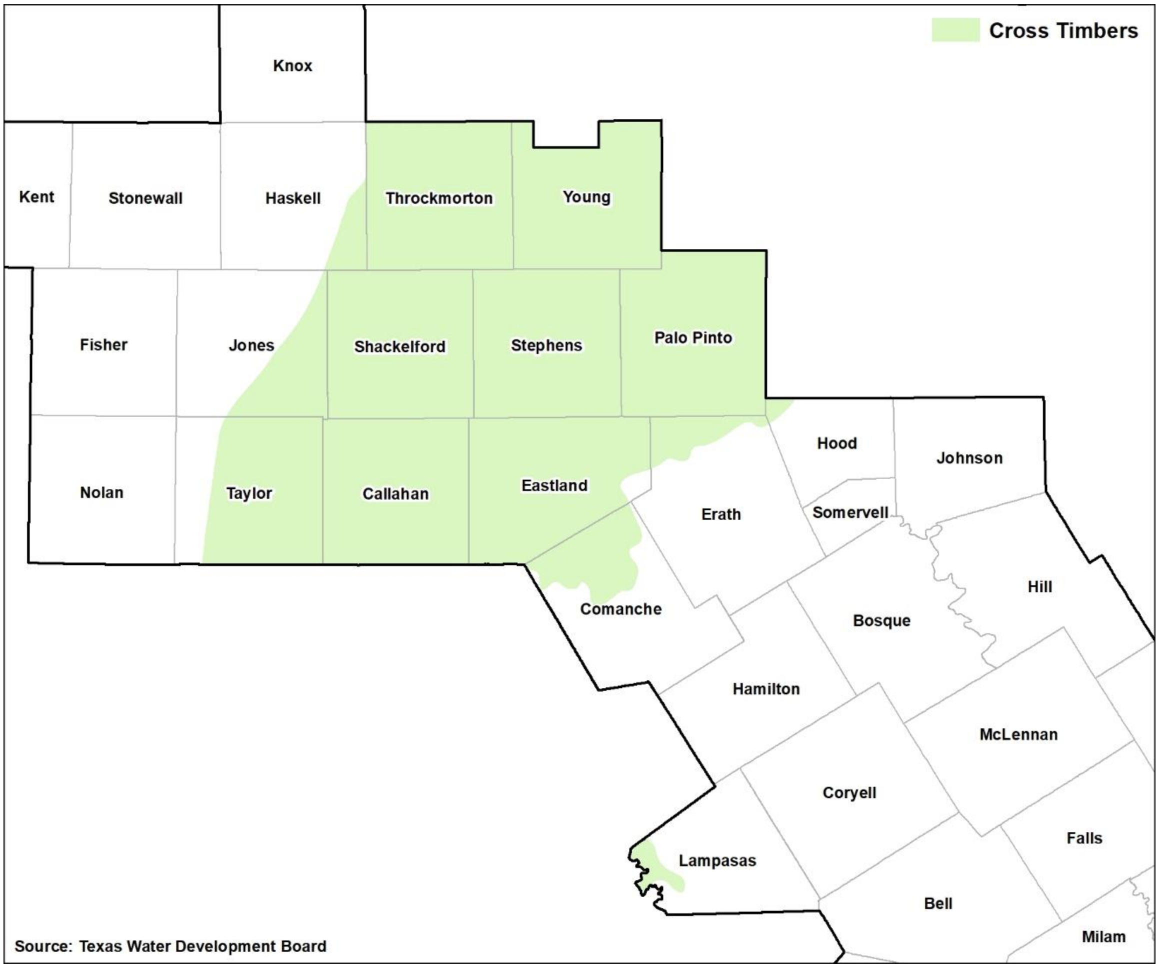

Figure B-4. Location of Cross-Timbers Aquifer in Brazos G

Dockum Aquifer

Location

The Dockum, a minor aquifer, occurs only along in the western parts of Nolan, Fisher, and Kent Counties within the Brazos G (Figure B-4). It's important to note that there is a discrepancy in the occurrence of the Dockum as shown in Figure B-4 and in the Shamburger, 1967 report. The Shamburger report shows the Dockum extending into the mid-part of Nolan County, while the TWDB delineation is limited to the extreme western edge of the county.

Geohydrology

Water is derived largely from sands and gravels in the Santa Rosa Formation of Permian age or from the Santa Rosa and the overlying Trinity Sands in a western Nolan County. Water table conditions mostly prevail.

Development and Use

The year 2017 groundwater use within the Brazos G totaled 14,326 acft. Over 97 percent of the water produced from the Dockum Aquifer is for irrigation in Nolan County.

Availability

The Dockum in Brazos G is divided between GMA-6 and GMA-7. In letter dated December June 2017 to GMA-6, the TWDB referenced a report titled GAM Run 16-031 MAG (Shi, 2017) which presents the modeled available groundwater for Kent and Fisher Counties. In letter dated September 2018 to GMA-7, the TWDB referenced a report titled GAM Run 16-026 MAG Version 2 (Jones, 2018) which presents the MAG for Nolan County. The MAG within both groundwater management areas was determined using the groundwater availability model for the High Plains Aquifer System (Deeds and Jigmond, 2015) and the specified Desired Future Conditions provided by the GMA-6 and GMA-7 representatives. Of the three counties in which the Dockum Aquifer is present, a MAG volume was only adopted for Fisher County. Availability of the Dockum Aquifer in Kent County, as provided by the TWDB, was estimated based on modeling from GMA-1; availability in Nolan County was estimated based on previous Brazos G Regional Water Plans, historical TWDB groundwater reports, and data from the TWDB groundwater database.

Dockum Aquifer

Modeled Available Groundwater (acft/yr)						
COUNTY	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
FISHER	79	79	79	79	79	79
KENT [A]	6,250	6,250	6,250	6,250	6,250	6,250
NOLAN [A]	5,750	5,750	5,750	5,750	5,750	5,750
TOTAL	12,079	12,079	12,079	12,079	12,079	12,079

[A] – Non-MAG estimate

Well Yields and Water Quality

Well yields vary widely, ranging from less than 10 gpm to 400 gpm and averaging 200 gpm.

Water from the aquifer typically meets drinking water standards and contains 500 to 600 mg/L dissolved solids content. However, in heavily irrigated areas, elevated concentrations of nitrates have been reported.

Resource Considerations

There are three groundwater conservation districts in Brazos G counties where the Dockum Aquifer is present. Groundwater management in Nolan County is by Wes-Tex GCD. There is little pumpage from the Dockum in the Kent County (Salt Fork UWCD) and Fisher County (Clear Fork GCD).

References

Duffin, G.L., and Beynon, B.E., 1992, Evaluation of water resources in parts of the Rolling Prairies region of North-Central Texas: TWDB Report 337.

Deeds, N.E., and Jigmond, M., 2015. Numerical Model Report for the High Plains Aquifer System Groundwater Availability Model, Prepared by INTERA.

Ewing, J.E. and others, 2008, Groundwater Availability for the Dockum Aquifer, TWDB Contract Report, http://www.twdb.state.tx.us/gam/dckm/dckm.htm

HDR Engineering, Inc., March 2009, Study 2: Groundwater availability model of the Edwards-Trinity (Plateau) and Dockum Aquifers in Western Nolan and Eastern Mitchell Counties, Texas: Prepared for Brazos G Regional Water Planning Group.

Jones, I.C., 2018. GAM Run 16-026 MAG Version 2: Modeled Available Groundwater for the Aquifers in Groundwater Management Area 7. Texas Water Development Board Groundwater Division.

Muller, Daniel A., and Price, Robert D., 1979, Ground-water availability in Texas: TDWR Report 238.

Oliver, W. and Hutchinson, W.R., 2010 Modification and recalibration of the Groundwater Availability Model of the Dockum Aquifer: Texas Water Development Board, 114 p.

Shamburger, Victor M., Jr., 1967, Ground-water resources of Mitchell and Western Nolan Counties, Texas: TWDB Report 50.

Shi, J., 2017, GAM Run 16-031 MAG: Modeled Available Groundwater for the Seymour, Blaine, Ogallala, and Dockum Aquifers in Groundwater Management Area 6, Texas Water Development Board Groundwater Division.

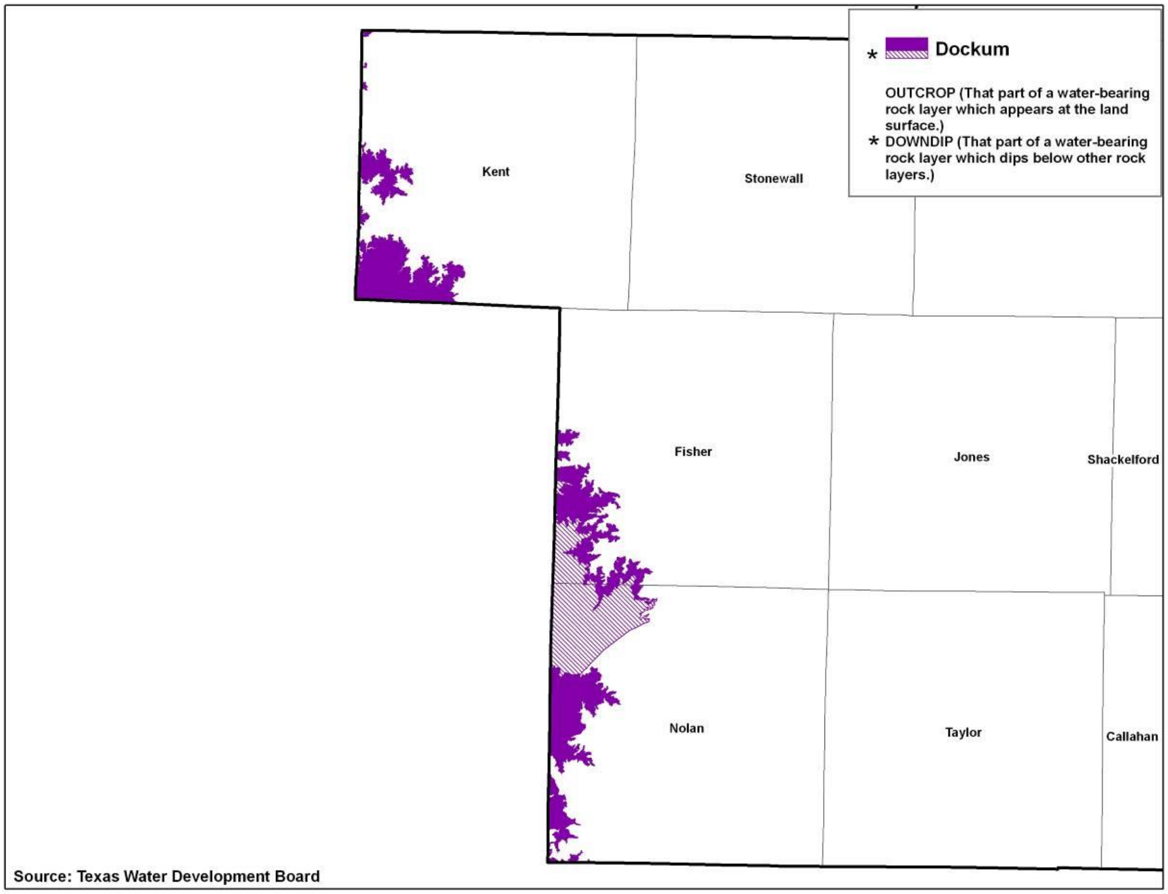

Figure B-5. Location of Dockum Aquifer in Brazos G

Edwards (Balcones Fault Zone) Aquifer

Location

The northern segment of the Edwards (Balcones Fault Zone (BFZ)) Aquifer is a major aquifer and occurs in the southern part of the central Brazos G region. This segment of the aquifer also extends into the adjacent Region K planning area to the south, but only to the Colorado River. The northern segment of the Edwards (BFZ) is hydraulically separate from the Edwards (BFZ) occurring south of the Colorado River, referred to as the Barton Springs segment, and the San Antonio segment of the Edwards (BFZ) even further south. The northern segment of the Edwards (BFZ) appears to be overdeveloped except during average and wet times, and some supplies are subject to shortages in larger droughts.

The Edwards (BFZ) in the Brazos G occurs in a narrow north-south-trending belt across parts of Williamson and Bell Counties (Figure B-5), essentially extending from Round Rock to Salado.

Geohydrology

The Edwards (BFZ) Aquifer consists of the Edwards and associated limestone, including the Comanche Peak, Kiamichi and Georgetown. However, significant water-bearing zones are normally restricted to the Edwards (BFZ), with associated limestone commonly yielding little to no water according to test drilling records (Harden, 1999). The source of the water is infiltration of rainfall and seepage from streams. The water moves primarily in honeycombed, solution-enlarged voids and other enlarged secondary porosity zones along joints and faults. The formation dips to the east beneath younger strata. Water table conditions occur in recharge areas (mostly west of IH-35), and artesian conditions occur further east. At the eastern boundary of the aquifer the water quality becomes more mineralized and eventually unusable for most purposes. The water moves from recharge areas to natural spring discharge points and to wells. The three largest springs (and their approximate high and low flows) include San Gabriel Springs at Georgetown (zero to 25 cubic feet per second (cfs)), Berry Springs north of Georgetown (zero to 48 cfs) and Salado Springs at Salado (5 to 59 cfs). The Edwards (BFZ) responds more quickly than most other aquifers to drought and wet cycles. With adequate rainfall, the aquifer is able to supply substantial water to current users and sustain substantial springflow at the three main locations. In times of below-average rainfall or drought, discharge exceeds recharge with the result being most springflow decreases greatly or dries up and some wells begin to fail. Over the years more and more wells have been drilled and increasingly diminished springflow has occurred. Introduction of surface water supplies has slowed the trend, but competition for Edwards (BFZ) water in the area is continuing.

Development and Use

The year 2017 groundwater use within the Brazos G totaled 13,696 acft. Approximately 86 percent of the water is used for municipal supply, of which about 72 percent occurs in Williamson County.

Availability

The Northern Edwards (BFZ) Aquifer in Brazos G is within GMA-8. In letter dated January 2018 to GMA-8, the TWDB referenced a report titled GAM Run 17-029 MAG (Shi, 2018) which presents the MAG for the aquifers in the groundwater management area. The MAG volumes were determined using the groundwater availability model for the northern segment of the Edwards (BFZ) Aquifer, version 1.01 (Jones, 2003) and previous GAM run results (Anaya, 2008) based on the specified Desired Future Conditions provided by the GMA-8 representative. The results are presented in the following table.

Edwards (BFZ) Aquifer

Modeled Available Groundwater (acft/yr)						
COUNTY	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
BELL	6,469	6,469	6,469	6,469	6,469	6,469
WILLIAMSON	3,452	3,452	3,452	3,452	3,452	3,452
TOTAL	9,921	9,921	9,921	9,921	9,921	9,921

Well Yields

Wide variations occur in individual well yields obtainable from the Edwards (BFZ). Well yields depend upon boreholes encountering secondary, solution-enlarged openings in the limestone. Wells used for public supply range from 200 to about 2,000 gpm.

Water Quality

Water, although hard, meets drinking water standards with dissolved solids content mostly less than 500 mg/L in developed areas. Further east, the water becomes more mineralized. The fluoride content is high in some of the downdip eastern areas.

Resource Considerations

Groundwater resources appear to be overdeveloped during record drought conditions. Existing local plans of the larger users have long included conjunctive use plans with surface waters from Lakes Georgetown, Travis, and/or Stillhouse Hollow. Significant groundwater pumpage can reduce springflow, and the aquifer is locally subject to pollution from surface sources. The higher withdrawals by wells can directly affect springflow and downstream surface water supplies. A groundwater district exists in Bell County (Clearwater UWCD).

References

Anaya, R., 2008, GAM Run 08-010 MAG: Managed available groundwater for the Edwards (Balcones Fault Zone) Aquifer in Bell, Travis, and Williamson Counties. Texas Water Development Board Groundwater Division.

Duffin, G.L., and Musick, S.P., 1991, Evaluation of water resources in Bell, Burnet, Travis, Williamson, and parts of adjacent counties, Texas: TWDB Report 326.

Harden, R. W., 1999, personal communication.

Jones, I.C., 2003, Groundwater Availability Model: Northern Segment of the Edwards Aquifer, Texas: TWDB Report 358.

Kreitler, C.W., Senger, R.K., and Collins, E.W., 1987, Geology and hydrology of the northern segment of the Edwards aquifer with an emphasis on the recharge zone in the Georgetown, Texas, area: Prepared for the Texas Water Development Board, IAC (86-67)-1046; Univ. of Texas, Bureau of Economic Geology.

Shi, J., 2018, GAM Run 17-029 MAG: Modeled Available Groundwater for the Trinity, Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory Aquifers in Groundwater Management Area 8. Texas Water Development Board Groundwater Division.

William F. Guyton Associates, Inc., 1987, Ground-water availability update: consulting report to City of Georgetown.

Yelderman, Joe C., 1987, Hydrogeology of the Edwards Aquifer, Northern Balcones and Washita Prairie Segments: Austin Geological Society Guidebook 11.

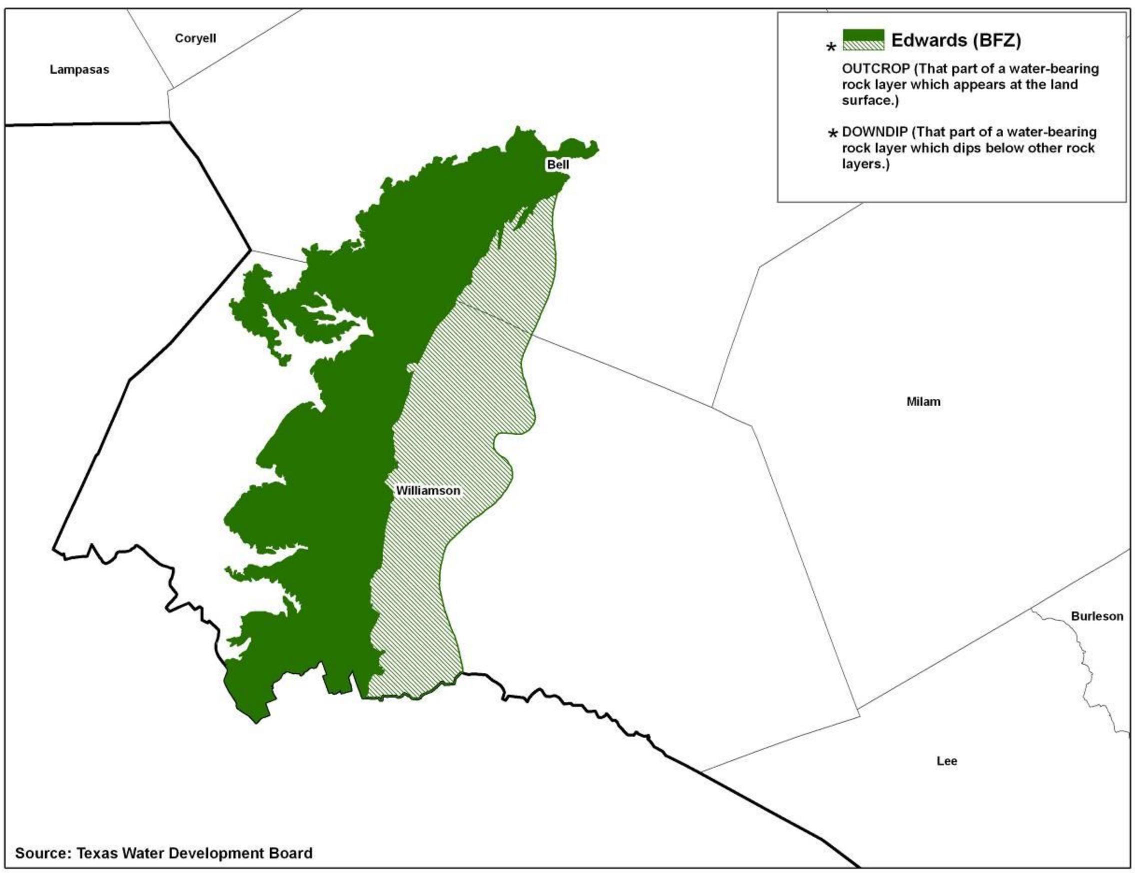

Figure B-7. Location of Edwards (BFZ) Aquifer (northern segment) in Brazos G

Edwards-Trinity (Plateau) Aquifer

Location

The Edwards-Trinity (Plateau) Aquifer is a major aquifer in Texas due to its expansive coverage and available water supplies. In the Brazos G, this aquifer is found only in parts of Nolan and Taylor Counties (Figure B-6). It provides only a very small water supply to the planning region.

Geohydrology

Water from the Edwards-Trinity (Plateau) is derived largely from Cretaceous sands (Trinity) in Nolan County in combination with the underlying Dockum, where present. Water-table conditions are typical. Maximum well yields typically are less than 50 gallons per minute. In western Nolan County, much of the water production is associated with the Edwards-Trinity (Plateau) because of the surface geology, but the major water-bearing zone of higher capacity wells is the underlying Dockum.

Development and Use

The year 2017 groundwater use within the Brazos G totaled 2,166 acft. Approximately 87 percent of the water is used for municipal supply, of which about 82 percent occurs in Nolan County.

Availability

The Edwards-Trinity (Plateau) Aquifer in Brazos G is divided between GMA-7 and GMA-8. In a letter dated September 2018 to GMA-7, the TWDB referenced a report titled GAM Run 16-026 MAG Version 2 (Jones, 2018) which presents the MAG for the aquifers in the management area. Similarly, a letter dated January 2018 to GMA-8 from the TWDB referenced a report titled GAM Run 17-029 MAG (Shi, 2018) which provides the MAG volumes for this management area. The MAG volume for Edwards-Trinity (Plateau) Aquifer in GMA-7 was developed using the single-layer alternative groundwater flow model for the Edwards-Trinity (Plateau) and Pecos Valley aquifers (Hutchinson an Others, 2011) which is an update to the previously developed groundwater availability model (Anaya and Jones, 2009). No MAG has been adopted for the Edwards-Trinity (Plateau) Aquifer in GMA-8. In lieu of this, groundwater availability in Nolan County is estimated based on previous Brazos G Regional Water Plans, historical TWDB groundwater reports, and data from the TWDB groundwater database. Groundwater availability in Taylor County was estimated based on the availability utilized in the 2016 Brazos G Regional Water Plan.

Edwards-Trinity (Plateau) Aquifer

Modeled Available Groundwater (acft/yr)						
COUNTY	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
NOLAN [A]	693	693	693	693	693	693
TAYLOR [A]	489	489	489	489	489	489
TOTAL	1,182	1,182	1,182	1,182	1,182	1,182

[A] – Non-MAG estimate

Well Yields and Water Quality

Potential well yields are generally less than 100 gpm. Typical waters meet drinking water standards and contain 400 to 500 mg/L dissolved solids content.

Resource Consideration

In 2012, the TWDB estimated the total pumpage from the aquifer to be 2,631 acft. Most of the usage was for municipal purposes in Nolan County. Few undeveloped supplies appear available. Existing supplies appear to be susceptible to droughts.

Groundwater in Nolan County is regulated by Wes-Tex GCD.

References

Anaya, R. and Jones, I., 2004, Groundwater availability model of the Edwards-Trinity (Plateau) and Cenozoic Pecos Alluvium Aquifer systems, Texas: Texas Water Development Board.

Anaya, R., and Jones, I.C., 2009, Groundwater Availability Model for the Edwards-Trinity (Plateau) and Pecos Valley Aquifers of Texas. Texas Water Development Board Report 373.

Hutchinson, W.R., Jones, I.C., Anaya, R., 2011, Update of the Groundwater Availability Model for the Edwards-Trinity (Plateau) and Pecos Valley Aquifers of Texas.

HDR Engineering, Inc., March 2009, Study 2: Groundwater availability model of the Edwards-Trinity (Plateau) and Dockum Aquifers in Western Nolan and Eastern Mitchell Counties, Texas: Prepared for Brazos G Regional Water Planning Group.

Jones, I.C., 2018, GAM Run 16-026 MAG Version 2: Modeled Available Groundwater for the Aquifers in Groundwater Management Area 7, Texas Water Development Board Groundwater Division.

Muller, Daniel A., and Price, Robert D., 1979, Ground-water availability in Texas: TDWR Report 238.

Taylor, Howard D., 1978, Occurrence, Quantity, and Quality of Ground Water in Taylor County, Texas: TWDB Report 224.

Shamburger, Victor M., Jr., 1967, Ground-Water Resources of Mitchell and Western Nolan Counties, Texas: TWDB Report 50.

Shi, J., 2018, GAM Run 17-029 MAG: Modeled Available Groundwater for the Trinity, Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory Aquifers in Groundwater Management Area 8, Texas Water Development Board Groundwater Division.

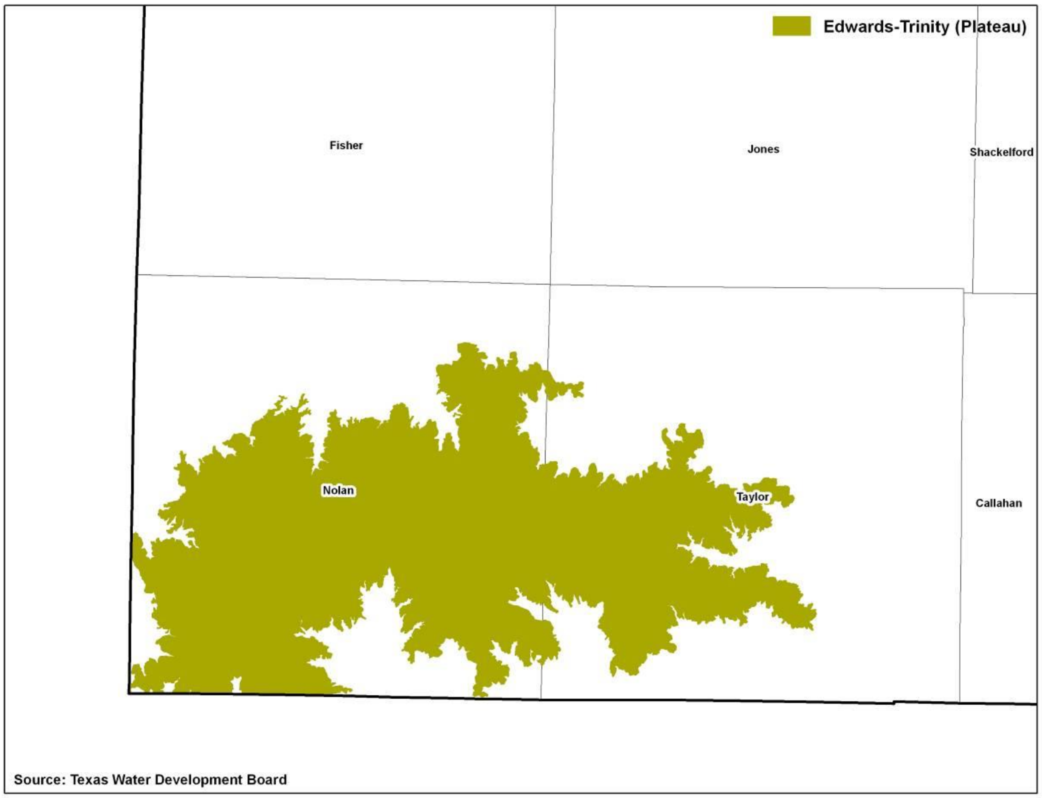

Figure B-8. Location of Edwards-Trinity (Plateau) Aquifer in Brazos G

Ellenburger-San Saba Aquifer

Location

The Ellenburger-San Saba Aquifer, a minor aquifer, occurs in the Brazos G, but only in the southwestern part of Lampasas County (Figure B-7). It primarily occurs in adjacent planning area to the south and west.

Geohydrology

The aquifer consists of limestone and dolomites with secondary solutioning along fractures and faults. The aquifer extends from outcrops and dips to depths of perhaps 2,000 feet. Little is known about conditions in the deeper parts of the aquifer. In some areas the aquifer is believed to be connected to the Marble Falls Aquifer. Faults are believed to function as an important part in controlling groundwater flow and water levels. The aquifer supports numerous springs, is lightly used, and usually has less than 1,000 mg/L dissolved solids.

Development and Use

In 2017, the TWDB estimated pumpage in Brazos G to be about 18 acft with approximately 61 percent of the use being for livestock and the remaining 39 percent for municipal use.

Availability

In a letter dated January 2018 to GMA-8, the TWDB referenced a report titled GAM Run 17-029 MAG (Shi, 2018) which provides the MAG volumes for the aquifers in GMA-8. The MAG for the Ellenburger-San Saba Aquifer was developed using the groundwater availability model for the minor aquifers in the Llano Uplift region of Texas (Shi and Others, 2016) and Desired Future Conditions provided by GMA-8 representative. The results are presented in the following table.

Ellenburger-San Saba

Modeled Available Groundwater (acft/yr)						
COUNTY	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
LAMPASAS	2,601	2,593	2,601	2,593	2,601	2,593
TOTAL	2,601	2,593	2,601	2,593	2,601	2,593

Resource Considerations

Groundwater resources are large in relation to current use and future local demand. The Saratoga Underground Water Conservation District has jurisdiction in Lampasas County.

References

Bluntzer, R.L., 1992, Evaluation of the ground-water resources of the Paleozoic and Cretaceous aquifers in the Hill Country of Central Texas: TWDB Report 339.

Preston, R.D., Pavlicek, D.J., Bluntzer, R.L., Derton, J., 1996, The Paleozoic and related aquifers of Central Texas: TWDB Report 346.

Williams, C.R., 2008. Adopted desired future conditions of the Ellenburger-San Saba, Hickory, and Marble Falls Aquifers: Memorandum dated June 9, 2008 and directed to Cheryl Maxwell, Administrative Agent for Groundwater Management Area 8.

Shi, J., Boghici, R., Kohlrenken, W., and Hutchinson, W.R., 20216, Numerical Model Report: Minor Aquifers of the Llano Uplift Region of Texas (Marble Falls, Ellenburger-San Saba, and Hickory).

Shi, J., 2018, GAM Run 17-029 MAG: Modeled Available Groundwater for the Trinity, Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory Aquifers in Groundwater Management Area 8, Texas Water Development Board Groundwater Division.

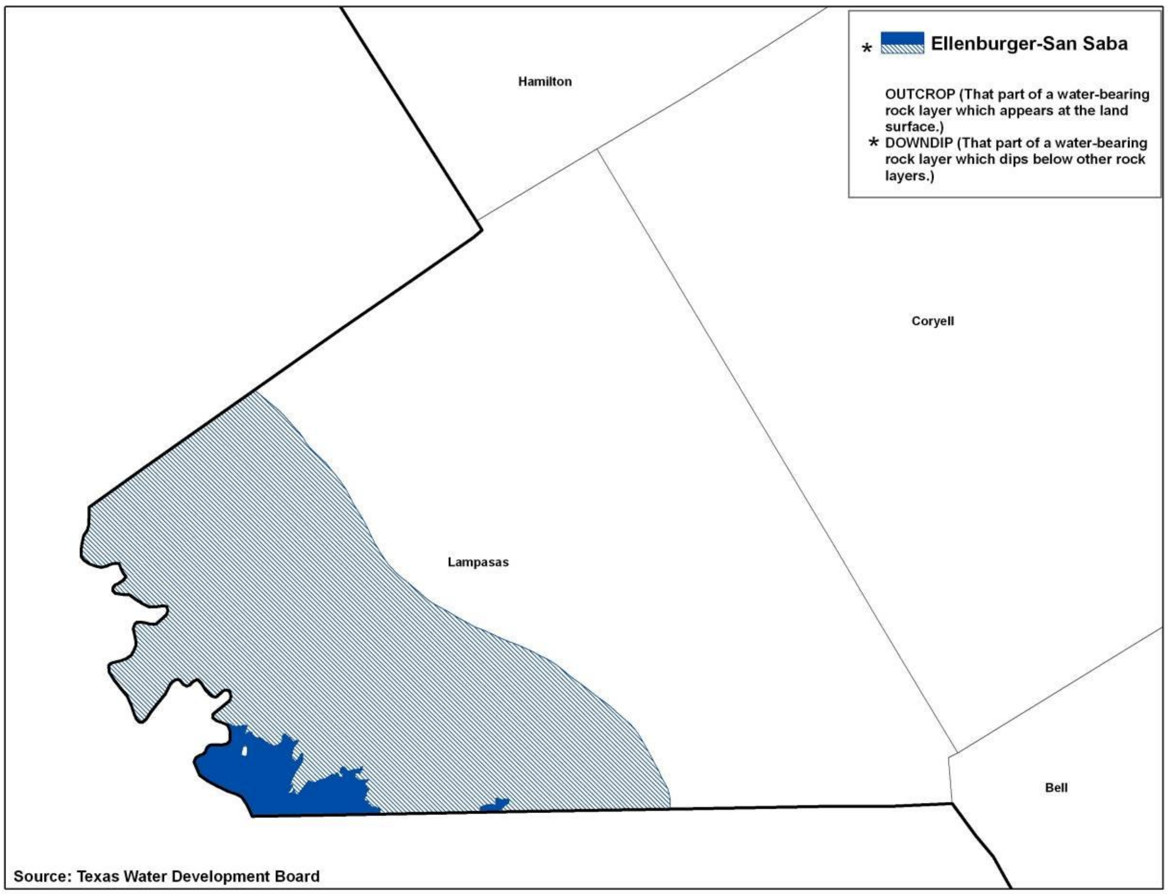

Figure B-8. Location of Ellenburger-San Saba Aquifer in Brazos G

Gulf Coast Aquifer

Location

The Gulf Coast Aquifer, a major aquifer, occurs in a limited area in the southeastern part of the Brazos G. It occurs in a northeast-southwest-trending band and extends into adjoining planning areas (Figure B-8). In the Brazos G the aquifer is present primarily in Washington and in the southern two-thirds of Grimes Counties. A small part of the aquifer exists in the extreme southernmost part of Brazos County, but is not considered to be sufficiently productive for regional planning purposes.

Geohydrology

The Gulf Coast Aquifer consists primarily of four water-bearing zones, the deepest being the Catahoula. The Catahoula is overlain by the Jasper Aquifer (mostly within the Oakville Sandstone). The Burkeville confining layer separates the Jasper from the overlying Evangeline Aquifer, which is contained within the Fleming and Goliad Sands. The Chicot Aquifer overlies the Evangeline and is the uppermost component of the Gulf Coast Aquifer. The Chicot consists of the Lissie, Willis and younger formations.

The water-bearing zones present consist of a complex sequence of ancient river and delta deposits, consisting mostly of interbedded and interfingering sands, silts and clays which thicken coastward. The strata form a leaky artesian aquifer system of large extent along the Texas Coastal Plain. Total thickness in the Brazos G is up to 1,200 feet, and net sand thickness is about 20 percent of the total thickness. From surface outcrops (recharge areas) the sand zones dip coastward beneath younger strata. Water table conditions occur in recharge areas, and artesian conditions occur in downdip areas. Precipitation is the main source of recharge, and large amounts of recharge are rejected by evapotranspiration in the outcrop. Mostly only freshwater sands occur in the Brazos G, and they extend to depths as great as 1,200 feet. However, some slightly saline water sands occur in the deeper extents of the Catahoula.

Development and Use

The year 2017 groundwater use within the Brazos G totaled 2,708 acft. Approximately 75 percent of the water was used for municipal and manufacturing supply.

Availability

The Gulf Coast Aquifer in Brazos G is primarily within GMA-14, though a small portion of the aquifer extends into southern most part of Brazos County in GMA-12. In letter dated December 2016 to GMA-14, the TWDB referenced a report titled GAM Run 16-024 MAG (Wade, 2016) which presents the MAG for the aquifers in GMA-14. The MAG for the Gulf Coast Aquifer in GMA-14 was determined using the groundwater availability model for the northern part of the Gulf Coast Aquifer System, Version 3.01 (Kasmarek, 2013) Desired Future Conditions provided by the GMA-14 representative.

A letter from the TWDB to GMA-12, dated December 2017, referenced a report titled GAM Run 17-030 MAG (Wade and Ballew, 2017) which provides the MAG volumes for the aquifers in GMA-12. No MAG has been adopted for the Gulf Coast Aquifer in GMA-12. In lieu of an adopted MAG, the Gulf Coast Aquifer MAG estimates are as provided by the TWDB and are based on modeling from GMA-14.

Gulf Coast Aquifer

Modeled Available Groundwater (acft/yr)						
COUNTY	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
BRAZOS [A]	1,189	1,189	1,189	1,189	1,189	1,189
GRIMES	13,996	13,996	13,996	13,996	13,996	13,996
WASHINGTON	13,031	13,031	13,031	13,031	13,031	13,031
TOTAL	28,216	28,216	28,216	28,216	28,216	28,216

[A] – Non-MAG estimate

Well Yields

Wide variations occur in individual well yields obtainable from the primary water-bearing sands, depending on area, depth, and local sand thickness. Estimated ranges for maximum individual well yields are 300 to 800 gpm.

Water Quality

Water generally meets drinking water standards, but local exceptions occur. Iron content is occasionally a problem. Waters obtained near the outcrops of the water-bearing zones are generally higher in hardness and lower in total dissolved solids content. In downdip areas the water is commonly a calcium-bicarbonate-type water, with total dissolved solids content ranging up to 1,000 mg/L.

Resource Considerations

Groundwater resources are largely undeveloped, few development problems have occurred to date and water-level declines are minimal to none. Few and limited water pollution problems are apparent. Counties with groundwater conservation districts include: Grimes (Bluebonnet GCD) and Robertson and Brazos (Brazos Valley GCD).

References

Baker, E.T., Jr., Follett, C.D., McAdoo, G.D., and Bonnet, C.W., 1974, Ground-water resources of Grimes County, Texas: TWDB Report 186.

Baker, E.T., Jr., 1979, Stratigraphic and hydrogeologic framework of part of the Coastal Plain of Texas: TDWR Report 236.

Kasmarek, M.C.., 2013, Hydrogeology and Simulation of Groundwater Flow and Land-Surface Subsidence in the Northern Part of the Gulf Coast Aquifer System, Texas: USGS Scientific Report 2012-5154.

Muller, Daniel A., and Price, Robert D., 1979, Ground-water availability in Texas: TDWR Report 238.

Sandeen, W.M., 1972, Ground-water resources of Washington County, Texas: TWDB Report 162.

Wade, S.C., and Ballew, N., 2017, GAM Run 17-030 MAG: Modeled Available Groundwater for the Carrizo-Wilcox, Queen City, Sparta, Yegua-Jackson, and Brazos River Alluvium Aquifers in Groundwater Management Area 12, Texas Water Development Board Groundwater Division.

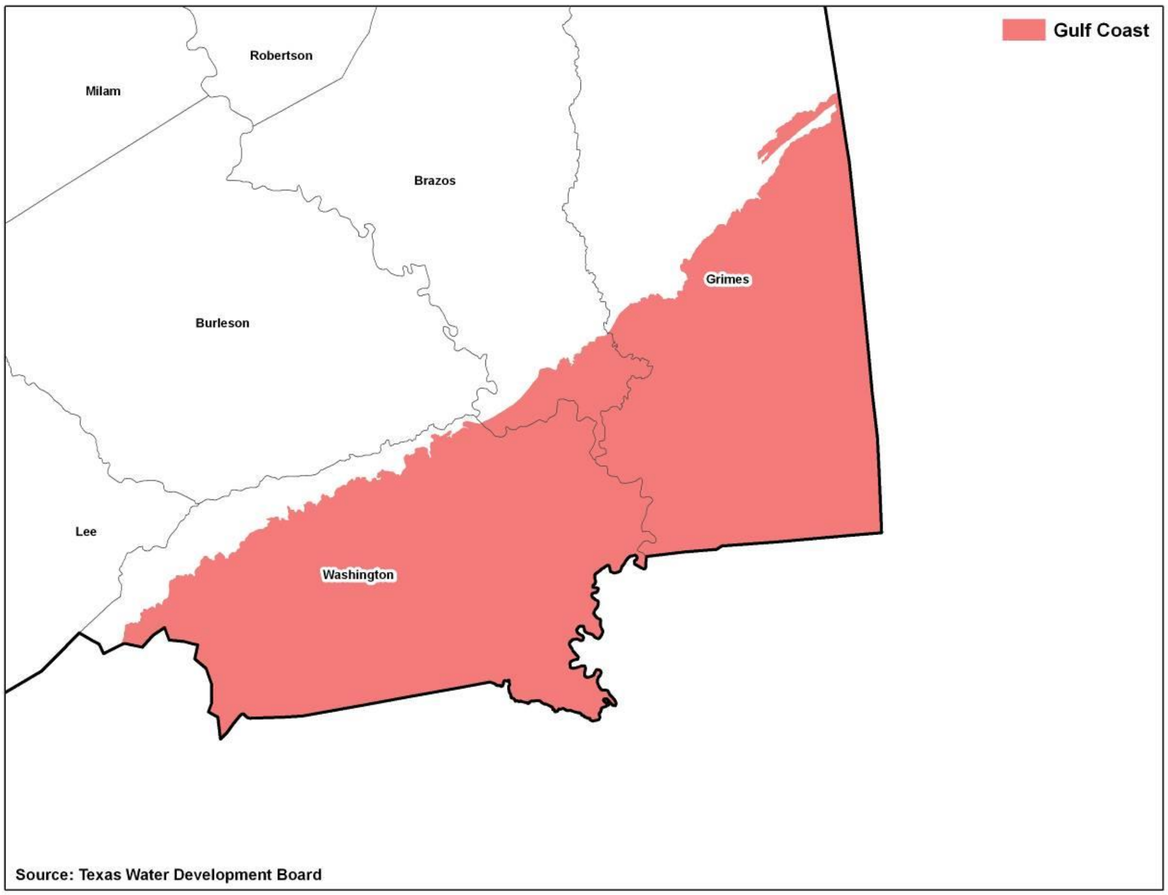

Figure B-9. Location of Gulf Coast Aquifer in Brazos G

Hickory Aquifer

Location

The Hickory Aquifer, a minor aquifer, occurs in the southwest half of Lampasas County and the western tip of Williamson County in the Brazos G. The aquifer primarily occurs in an adjacent planning area to the south and west of Brazos G.

Geohydrology

The aquifer consists of sandstones which dip northeast away from the Llano Uplift. No pumpage is listed in Brazos G in TWDB data files for year 2017, and no Hickory wells are known to exist within the Brazos G. Geophysical log data suggest that the aquifer is deeper than 3,500 feet.

Development and Use

Water-bearing properties are unknown, and water quality with excessive radiological parameters is likely. For these reasons, it is not considered in planning for the Brazos G.

Availability

The Saratoga Underground Water Conservation District encompasses Lampasas County.

In a letter dated January 2018 to GMA-8, the TWDB referenced a report titled GAM Run 17-029 MAG (Shi, 2018) which provides the MAG volumes for the aquifers in GMA-8. The MAG for the Hickory Aquifer was developed using the groundwater availability model for the minor aquifers in the Llano Uplift region of Texas (Shi and Others, 2016) and Desired Future Conditions provided by GMA-8 representative. The results are presented in the following table.

Hickory Aquifer

Modeled Available Groundwater (acft/yr)						
COUNTY	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
LAMPASAS	114	113	114	113	114	113
WILLIAMSON	0	0	0	0	0	0
TOTAL	114	113	114	113	114	113

References

Bluntzer, R.L., 1992, Evaluation of the ground-water resources of the Paleozoic and Cretaceous aquifers in the Hill Country of Central Texas: TWDB Report 339.

Preston, R.D., Pavlicek, D.J., Bluntzer, R.L., Derton, J., 1996, The Paleozoic and related aquifers of Central Texas: TWDB Report 346.

Shi, J., Boghici, R., Kohlrenken, W., and Hutchinson, W.R., 20216, Numerical Model Report: Minor Aquifers of the Llano Uplift Region of Texas (Marble Falls, Ellenburger-San Saba, and Hickory).

Shi, J., 2018, GAM Run 17-029 MAG: Modeled Available Groundwater for the Trinity, Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory Aquifers in Groundwater Management Area 8, Texas Water Development Board Groundwater Division.

Williams, C.R., 2008. Adopted desired future conditions of the Ellenburger-San Saba, Hickory, and Marble Falls Aquifers: Memorandum dated June 9, 2008 and directed to Cheryl Maxwell, Administrative Agent for Groundwater Management Area 8.

Marble Falls Aquifer

Location

The Marble Falls Aquifer, a minor aquifer, occurs in the Brazos G only in Lampasas County (Figure B-9). It primarily occurs in an adjacent planning area to the south and west.

Geohydrology

The Marble Falls Aquifer occurs in discontinuous outcrops in the southwestern part of Lampasas County. Water occurs in secondary solution fractures, cavities and channels in the Marble Falls Limestone. The aquifer is connected to the Ellenburger-San Saba Aquifer where intervening beds are thin or absent and via faults. The aquifer supports numerous springs. The larger ones include the springs at Lampasas, which average about 9 cfs.

Development and Use

The TWDB estimates pumpage within Brazos G for year 2017 at 23 acft, of which 11 acft was for municipal use.

Availability

In a letter dated January 2018 to GMA-8, the TWDB referenced a report titled GAM Run 17-029 MAG (Shi, 2018) which provides the MAG volumes for the aquifers in GMA-8. The MAG for the Marble Falls Aquifer was developed using the groundwater availability model for the minor aquifers in the Llano Uplift region of Texas (Shi and Others, 2016) and Desired Future Conditions provided by GMA-8 representative. The results are presented in the following table.

Marble Falls Aquifer

Modeled Available Groundwater (acft/yr)						
COUNTY	**2020**	**2030**	**2030**	**2050**	**2060**	**2070**
LAMPASAS	2,845	2,837	2,845	2,837	2,845	2,837
TOTAL	2,845	2,837	2,845	2,837	2,845	2,837

Well Yields and Water Quality

Aquifer use is limited to shallow, small wells. Water quality is suitable for most purposes near the outcrop area.

Resource Considerations

Groundwater resources are large in relation to current use and future local demand. Regulation is provided by the Saratoga Underground Water Conservation District for Lampasas County.

References

Bluntzer, R.L., 1992, Evaluation of the ground-water resources of the Paleozoic and Cretaceous aquifers in the Hill Country of Central Texas: TWDB Report 339.

Muller, Daniel A., and Price, Robert D., 1979, Ground-water availability in Texas: TDWR Report 238.

Preston, R.D., Pavlicek, D.J., Bluntzer, R.L., Derton, J., 1996, The Paleozoic and related aquifers of Central Texas: TWDB Report 346.

Shi, J., Boghici, R., Kohlrenken, W., and Hutchinson, W.R., 20216, Numerical Model Report: Minor Aquifers of the Llano Uplift Region of Texas (Marble Falls, Ellenburger-San Saba, and Hickory).

Shi, J., 2018, GAM Run 17-029 MAG: Modeled Available Groundwater for the Trinity, Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory Aquifers in Groundwater Management Area 8, Texas Water Development Board Groundwater Division.

Williams, C.R., 2008. Adopted desired future conditions of the Ellenburger-San Saba, Hickory, and Marble Falls Aquifers: Memorandum dated June 9, 2008 and directed to Cheryl Maxwell, Administrative Agent for Groundwater Management Area 8.

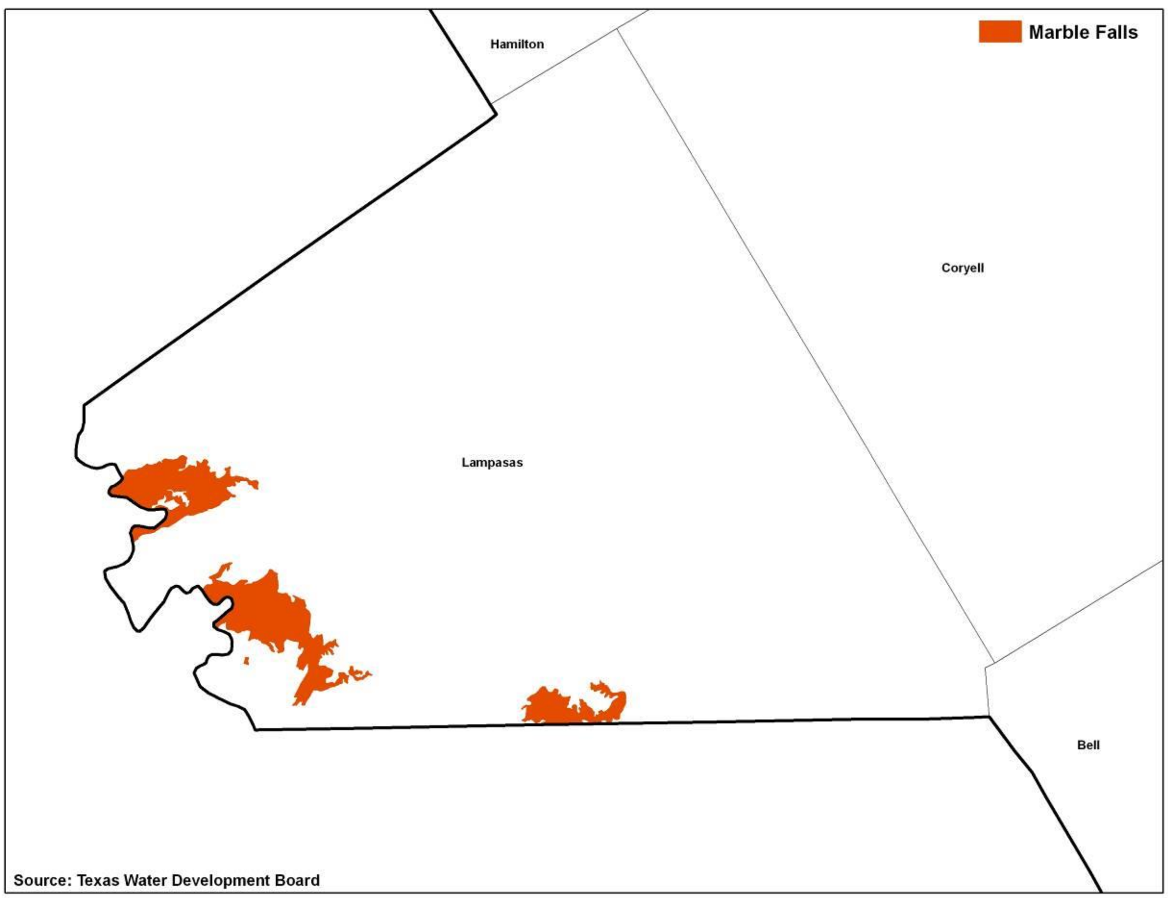

Figure B-10. Location of Marble Falls Aquifer in Brazos G

Queen City Aquifer

Location

The Queen City Aquifer, a minor aquifer, occurs in the southeastern part of the Brazos G and in adjoining planning areas. It forms a northeast-southwest-trending band primarily across parts of Robertson, Brazos, Grimes, Milam, Burleson and Lee Counties (Figure B-10).

Geohydrology

The water-bearing zones consist of sands interbedded with silts and clays. Total sand thickness ranges up to 300 feet. From their surface outcrop (recharge area) the sands dip coastward beneath younger strata. Freshwater occurs to depths up to 2,000 feet or more. Water table conditions occur in recharge areas, and artesian conditions exist in downdip areas. Precipitation and vertical leakage are the main sources of recharge. A large amount of recharge is rejected by evapotranspiration in the outcrop.

Development and Use

The year 2017 groundwater use within the Brazos G totaled 2,676 acft. About 29 percent of that use occurred in Milam County followed by 24 percent, 23 percent, and 21 percent in Lee, Milam, and Robertson Counties, respectively. Total use was about 60 percent for irrigation and 26 percent for municipal use. The relatively small use is partly due to the presence and development of the Sparta Aquifer at shallower depths over most of the area where the Queen City is present.

Availability

The Queen City Aquifer in Brazos G is primarily in GMA-12, though a portion of the aquifer extends into the northern parts of Grimes and Washington Counties in GMA-14. In a letter dated December 2017 to GMA-12, the TWDB referenced a report titled GAM Run 17-030 MAG (Wade and Ballew, 2017) which presents the MAG within the management area. The MAG for the Queen City Aquifer was determined using the groundwater availability model for the central part of the Carrizo-Wilcox, Queen City, and Sparta aquifers, version 2.02 (Kelley and others, 2004), which was developed to meet the Desired Future Conditions adopted by groundwater conservation district representatives of GMA-12. No MAG has been adopted for the Queen City within GMA-14; the non-MAG groundwater availability for Grimes County, as provided by the TWDB, are based on modeling from GMA-14.

Queen City Aquifer

Modeled Available Groundwater (acft/yr)						
COUNTY	**2020**	**2030**	**2040**	**2050**	**2060**	**2070** [A]
BRAZOS	836	883	887	891	891	891
BURLESON	416	447	447	447	447	447
GRIMES [B]	637	637	637	637	637	637
LEE	757	774	791	810	829	829
MILAM	53	56	56	56	56	56
ROBERTSON	368	309	309	309	309	309
TOTAL	3,067	3,106	3,127	3,150	3,169	3,169

[A] – Adopted MAG does not include a MAG determination for 2070; 2070 value extrapolated based on 2060 volume.

[B] – Non-MAG estimate

Well Yields

Estimated ranges for maximum individual well yields are 200 to 500 gpm. Wide variations can occur in individual well yields obtainable from the Queen City sands, depending on area, depth and local sand thickness.

Water Quality

Water typically meets drinking water standards, except for iron. High iron content is a common, but treatable, problem. Hydrogen sulfide or methane gas is reported occasionally. Waters obtained near the outcrops of the water-bearing zones generally are higher in hardness and lower in total dissolved solids content. In downdip areas the water is commonly a calcium/sodium- or sodium-bicarbonate-type water with total dissolved solids content ranging from 300 mg/L up to 1,000 mg/L or more.

Resource Considerations

Groundwater resources are partly undeveloped, and few development problems have occurred to date. Water level declines are minimal to none. Few and limited water pollution problems are apparent.

Counties with groundwater districts include: Grimes (Bluebonnet GCD), Robertson and Brazos (Brazos Valley GCD), Lee (Lost Pines GCD), and Milam and Burleson (Post Oak Savannah GCD).

References

Baker, E.T., Jr., Follett, C.D., McAdoo, G.D., and Bonnet, C.W., 1974, Ground-water resources of Grimes County, Texas: TWDB Report 186.

Brown, Eric, 1997, Water quality in the Queen City aquifer, TWDB Hydrologic Atlas No. 6.

Dutton, A.R., Harden, B., Nicot, J.P., and O'Rourke, D., 2003. Groundwater availability model for the central part of the Carrizo-Wilcox Aquifer in Texas. TWDB Contract Report.

Follett, C.R., 1974, Ground-water resources of Brazos and Burleson Counties, Texas: TWDB Report 185.

Dutton, A.R., Harden, B., Nicot, J.P., and O'Rourke, D., 2003. Groundwater availability model for the central part of the Carrizo-Wilcox Aquifer in Texas. TWDB Contract Report.

Kelley, V.A., Deeds, N.E., Fryar, D.G., and Nicot, J.P., 2004, Groundwater availability models for the Queen City and Sparta Aquifers: TWDB Contract Report, http://www.twdb.state.tx.us/gam/czwx_c/czwx_c.htm

Muller, Daniel A., and Price, Robert D., 1979, Ground-water availability in Texas: TDWR Report 238

Thompson, G.L., 1966, Ground-water resources of Lee County, Texas: TWDB Report 20.

Wade, S.C., and Ballew, N., 2017, GAM Run 17-030 MAG: Modeled Available Groundwater for the Carrizo-Wilcox, Queen City, Sparta, Yegua-Jackson, and Brazos River Alluvium Aquifers in Groundwater Management Area 12, Texas Water Development Board Groundwater Division.

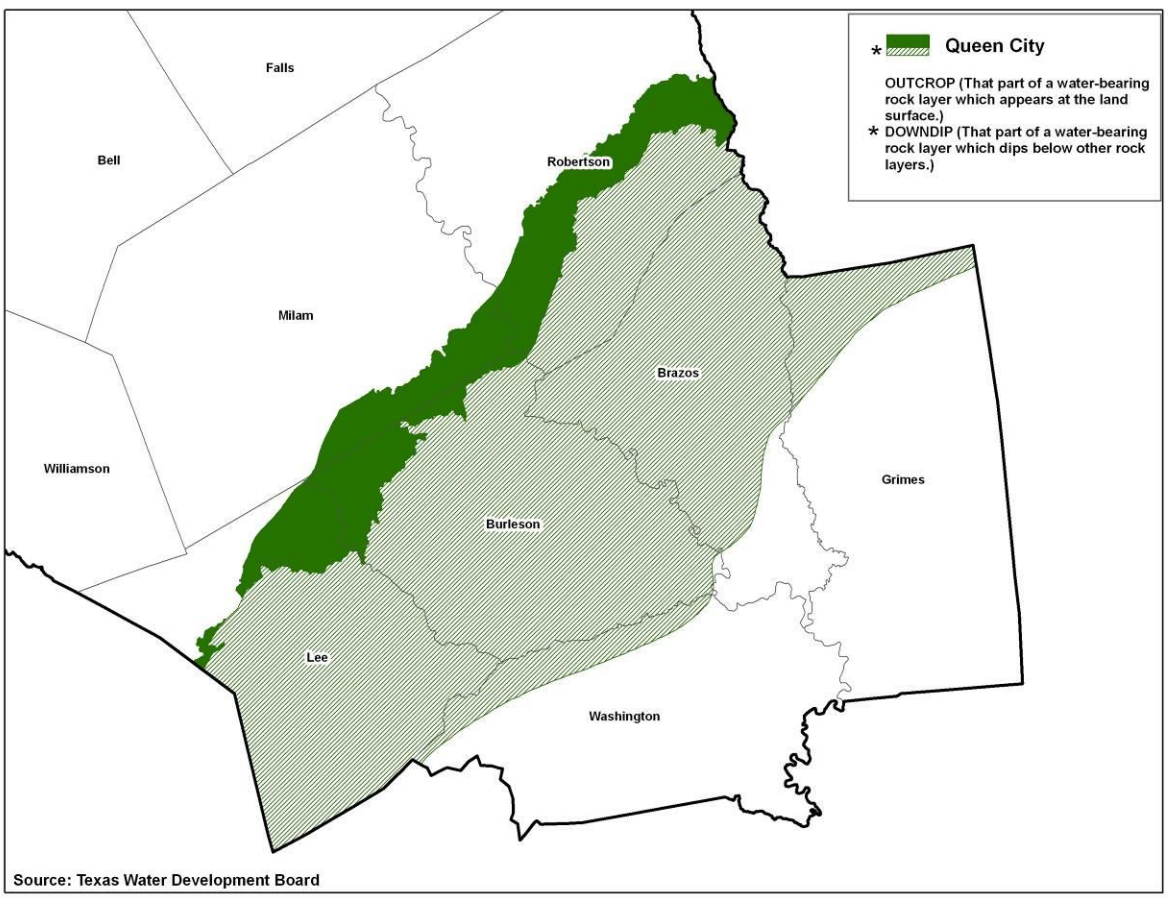

Figure B-11. Location of Queen City Aquifer in Brazos G

Seymour Aquifer

Location

The Seymour Aquifer is classified as a major aquifer in Texas and occurs in scattered, isolated areas in the western part of the Brazos G and in three other planning areas to the north. The Seymour is a shallow, alluvial aquifer used almost exclusively for irrigation.

The largest area of the Seymour Aquifer is in Haskell and Knox Counties where nearly 90 percent of the Seymour pumpage in Brazos G occurs. Other scattered areas of the aquifer extend over parts of Jones, Fisher, Kent, Stonewall, and Throckmorton Counties (Figure B-11). While the Seymour has a large surficial extent in these four counties, the aquifer generally has a relatively thin saturated thickness, is less productive and does not support widespread irrigation as it does in Knox and Haskell Counties.

Geohydrology

The Seymour consists of isolated areas of alluvium and is composed of gravel, sand and silty clay. The gravels, deposited by eastward flowing streams in geologic times, are mostly in the lower part of the Seymour. Total formation thickness is generally less than 100 feet. Water table conditions predominate. Direct infiltration of precipitation is the main source of recharge and is reasonably high. The historical pumpage in Knox and Haskell Counties is equivalent to capturing about 2.0 inches, or over 8 percent, of the annual precipitation. Recharge amounting of over 20 percent of precipitation has been observed for some seasons near Rochester in Haskell County. Water levels have fluctuated mostly in response to variations in rainfall and irrigation pumpage. Continuing water level declines have not occurred in most areas in Haskell and Knox Counties, and some rises have been noted. In all the other counties most water levels show a level or declining trend; and, few rises have been noted.

Development and Use

Within the Brazos G, the TWDB estimates total groundwater pumpage in 2017 to be 76,405 acft. About 98 percent was used for irrigation. However, this aquifer is an important resource for several municipal water users in the northern part of the region. In Kent County, groundwater from the Seymour accounts for nearly all of the municipal supplies. Haskell and Knox Counties accounted for about 96 percent of the total withdrawals in year 2017.

Availability

The Seymour Aquifer in Brazos G is in GMA-6. In a letter dated June 2017, the TWDB referenced a report titled GAM Run 16-031 MAG (Shi, 2017) which presents the MAG for the aquifers in GMA-6. The GAM run report notes that the MAG for the Seymour Aquifer in Knox and Haskell Counties was determined using a refined groundwater availability model for the Seymour Aquifer (Jigmund and others, 2014); the Seymour MAG for Fisher County was determined using the groundwater availability model for the Seymour and Blaine Aquifers (Ewing and others, 2004). Both determinations incorporated Desired Future Conditions provided by the GMA-6 representative.

The 16-031 GAM results did not include a MAG determination for Jones, Kent, Stonewall, Throckmorton, and Young Counties. In lieu of an adopted MAG, the Seymour Aquifer MAG in these counties are estimates, as provided by the TWDB, based on modeling from GMA-6.

Seymour Aquifer

Modeled Available Groundwater (acft/yr)						
COUNTY	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
FISHER	6,718	6,132	6,149	6,472	6,490	6,131
HASKELL	41,750	41,636	41,750	41,636	41,750	41,636
JONES [A]	2,918	2,918	2,918	2,918	2,918	2,918
KENT [A]	1,181	1,180	1,180	1,179	1,179	1,179
KNOX	29,036	26,640	26,224	26,530	29,166	26,973
STONEWALL [A]	233	230	224	215	214	214
THROCKMORTON [A]	115	115	115	115	115	115
YOUNG [A]	309	258	258	258	258	258
TOTAL	82,260	79,109	78,818	79,323	82,090	79,424

[A] – Non-MAG estimate

Well Yields

Well yields average 270 gpm and are as high as 1,300 gpm. Wide variations occur in individual well yields obtainable from the Seymour, depending on area, depth and local character and thickness of gravels.

Water Quality

Water quality is variable for many reasons. The dissolved solids content of natural water ranges from 300 to 3,000 mg/L with most values between 400 and 1,000 mg/L. Most water meets drinking water standards, except for nitrate content which typically ranges from 30 to 90 mg/L and commonly exceeds the limit of 45 mg/L for public supplies. Past oil field practices have impacted water quality locally. Many detailed maps of individual water quality parameters for Haskell and Knox Counties are in included in the TDWR Report 226 (Harden, 1978).

Resource Considerations

Groundwater resources, while significant, are essentially fully developed, although some added supplies could be developed in some areas of water level rises or in other areas in average to wet times. Counties with groundwater conservation districts include: Kent (Salt Fork UWCD) and Haskell and Knox (Rolling Plains GCD). There may be additional opportunities for conjunctive use or for recharge and conservation projects in the region, depending on surface water availability and cost effectiveness.

References

Bradley, R. G. and Petrini, H., 1998, Priority groundwater management area update on Area 16, Rolling Prairies Region of North Central Texas, TWDB Open File Report 98-03.

Cronin, J. G., 1972, Ground water in Dickens and Kent Counties, Texas: TWDB Report 158.

Duffin, G.L., and Beynon, B.E., 1992, Evaluation of water resources in parts of the Rolling Prairies region of North-Central Texas: TWDB Report 337.

Ewing, J.D., Jones, T.L., Pickens, J.F. and others, 2004, Groundwater Availability for the Seymour Aquifer: Texas Water Development Board Contract Report. http://www.twdb.state.tx.us/gam/symr/symr.htm

Harden, R. W., and Associates, 1978, The Seymour aquifer, ground-water quality and availability in Haskell in Knox Counties, Texas: TDWR Report 226.

Jigmond, M., Hutchinson, M., and Shi, J., 2014, Final Report: Groundwater Availability Model of the Seymour Aquifer in Haskell, Knox, and Baylor Counties.

Muller, Daniel A., and Price, Robert D., 1979, Ground-water availability in Texas: TDWR Report 238.

Preston, R. D., 1978, Occurrence and availability of ground water in Baylor County, Texas: TDWR Report 218.

Price, R.D., 1978, Occurrence, quality, and availability of ground water in Jones County, Texas: TDWR Report 215.

Shi, J., 2017, GAM Run 16-031 MAG: Modeled Available Groundwater for the Seymour, Blaine, Ogallala, and Dockum Aquifers in Groundwater Management Area 6. Texas Water Development Board Groundwater Division.

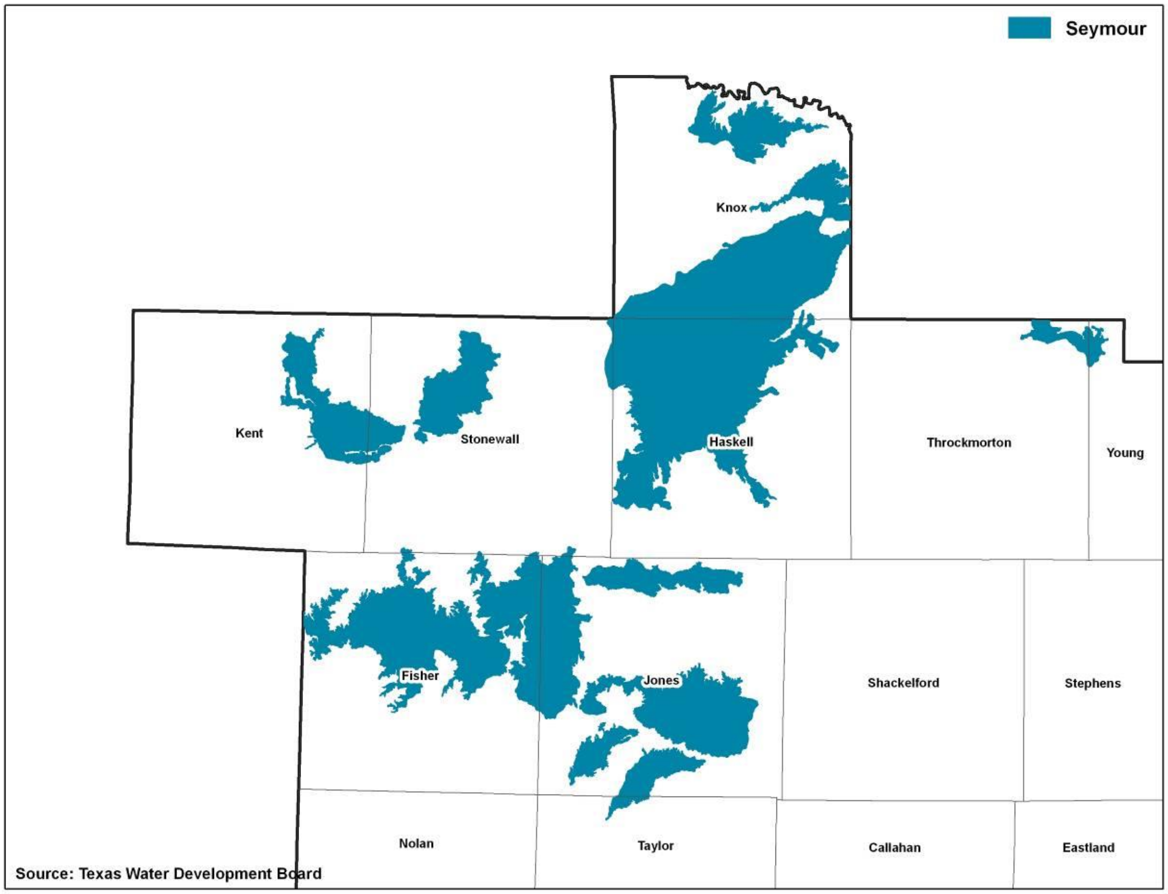

Figure B-12. Location of Seymour Aquifer in Brazos G

Sparta Aquifer

Location

The Sparta Aquifer, a minor aquifer, occurs in the southeastern part of the Brazos G and in adjoining planning areas. It occurs in a northeast-southwest-trending band primarily across parts of Brazos, Burleson, Grimes, Lee, Milam and Robertson Counties (Figure B-12). Its location is a short distance southeast of the Queen City Aquifer. Some users have wells screened across both zones.

Geohydrology

The water-bearing zones consist of sands interbedded with silts and clays. Total sand thickness ranges from about 100 to 200 feet. From their surface outcrop (recharge area) the sands dip coastward beneath younger strata. Freshwater occurs to depths up to 2,000 feet or more. Water table conditions occur in recharge areas, and artesian conditions occur in downdip areas. Precipitation and vertical leakage are the main sources of recharge. A large amount of recharge is rejected by evapotranspiration in the outcrop.

Development and Use

The year 2017 groundwater use within the Brazos G totaled 4,529 acft. About 60 percent that use was for municipal purposes, the majority of which occurred in Brazos County.

Availability

The Sparta Aquifer in Brazos G is primarily within GMA-12, though a portion of the aquifer extends into the northern parts of Grimes and Washington Counties in GMA-14. In a letter dated December 2017 to GMA-12, the TWDB referenced a report titled GAM Run 17-030 MAG (Wade and Ballew, 2017) which presents the MAG within the management area. The MAG for the Sparta Aquifer was determined using the groundwater availability model for the central part of the Carrizo-Wilcox, Queen City, and Sparta aquifers, version 2.02 (Kelley and others, 2004) and Desired Future Conditions provided by the GMA-12 representative.

No MAG has been adopted for the Sparta Aquifer in GMA-14; the groundwater availability for Grimes County are estimates, as provided by the TWDB, based on modeling from GMA-14. The resulting MAG volumes for the Sparta Aquifer in Brazos G are presented in the table below.

Sparta Aquifer

Modeled Available Groundwater (acft/yr)						
COUNTY	**2020**	**2030**	**2040**	**2050**	**2060**	**2070 [A]**
BRAZOS	5,404	6,505	7,507	8,509	8,509	8,509
BURLESON	2,246	4,042	5,613	6,735	6,735	6,735
GRIMES [B]	2,571	2,571	2,571	2,571	2,571	2,571
LEE	1,483	1,487	1,490	1,493	1,494	1,494
ROBERTSON	510	510	510	510	510	510
TOTAL	12,214	15,115	17,691	19,818	19,819	19,819

[A] - Adopted MAG does not include a MAG determination for 2070; 2070 value extrapolated based on 2060 volume.

[B] – Non-MAG estimate.

Well Yields

Estimated ranges for maximum individual well yields are 200 to 600 gpm. Wide variations can occur in individual well yields obtainable from the Sparta, depending on area, depth and local sand thickness.

Water Quality

Water typically meets drinking water standards, except for iron. High iron content is a common problem, and hydrogen sulfide gas is reported occasionally. Waters obtained near the outcrops of the water-bearing zones generally are higher in hardness and lower in total dissolved solids content. In downdip areas the water is commonly a calcium/sodium- or sodium-bicarbonate-type water with total dissolved solids content ranging from about 300 up to 1,000 mg/L or more.

Well Yields

Estimated ranges for maximum individual well yields are 200 to 600 gpm. Wide variations can occur in individual well yields obtainable from the Sparta, depending on area, depth and local sand thickness.

Water Quality

Water typically meets drinking water standards, except for iron. High iron content is a common problem, and hydrogen sulfide gas is reported occasionally. Waters obtained near the outcrops of the water-bearing zones generally are higher in hardness and lower in total dissolved solids content. In downdip areas the water is commonly a calcium/sodium- or sodium-bicarbonate-type water with total dissolved solids content ranging from about 300 up to 1,000 mg/L or more.

Resource Considerations

Groundwater resources are largely undeveloped, except in the vicinity of College Station and Texas A&M well fields. Few development problems have occurred to date, and water level declines have been limited except near these well fields and the former Bryan well fields. Few and limited water pollution problems are apparent. Counties with groundwater conservation districts include: Lee (Lost Pines GCD), Robertson and Brazos (Brazos Valley GCD) and Milam and Burleson (Post Oak Savannah GCD).

References

Baker, E.T., Jr., Follett, C.D., McAdoo, G.D., and Bonnet, C.W., 1974, Ground-water resources of Grimes County, Texas: TWDB Report 186.

Dutton, A.R., Harden, B., Nicot, J.P., and O'Rourke, D., 2003. Groundwater availability model for the central part of the Carrizo-Wilcox Aquifer in Texas. TWDB Contract Report.

Follett, C.R., 1974, Ground-water resources of Brazos and Burleson Counties, Texas: TWDB Report 185.

Kelley, V.A., Deeds, N.E., Fryar, D.G., and Nicot, J.P., 2004, Groundwater availability models for the Queen City and Sparta Aquifers: TWDB Contract Report, http://www.twdb.state.tx.us/gam/czwx_c/czwx_c.htm

Merrick, Biri, 1997, Water quality in the Sparta aquifer, TWDB Hydrologic Atlas No. 5.

Muller, Daniel A., and Price, Robert D., 1979, Ground-water availability in Texas: TDWR Report 238.

Thompson, G.L., 1966, Ground-water resources of Lee County, Texas: TWDB Report 20.

Wade, S.C., and Ballew, N., 2017, GAM Run 17-030 MAG: Modeled Available Groundwater for the Carrizo-Wilcox, Queen City, Sparta, Yegua-Jackson, and Brazos River Alluvium Aquifers in Groundwater Management Area 12, Texas Water Development Board Groundwater Division.

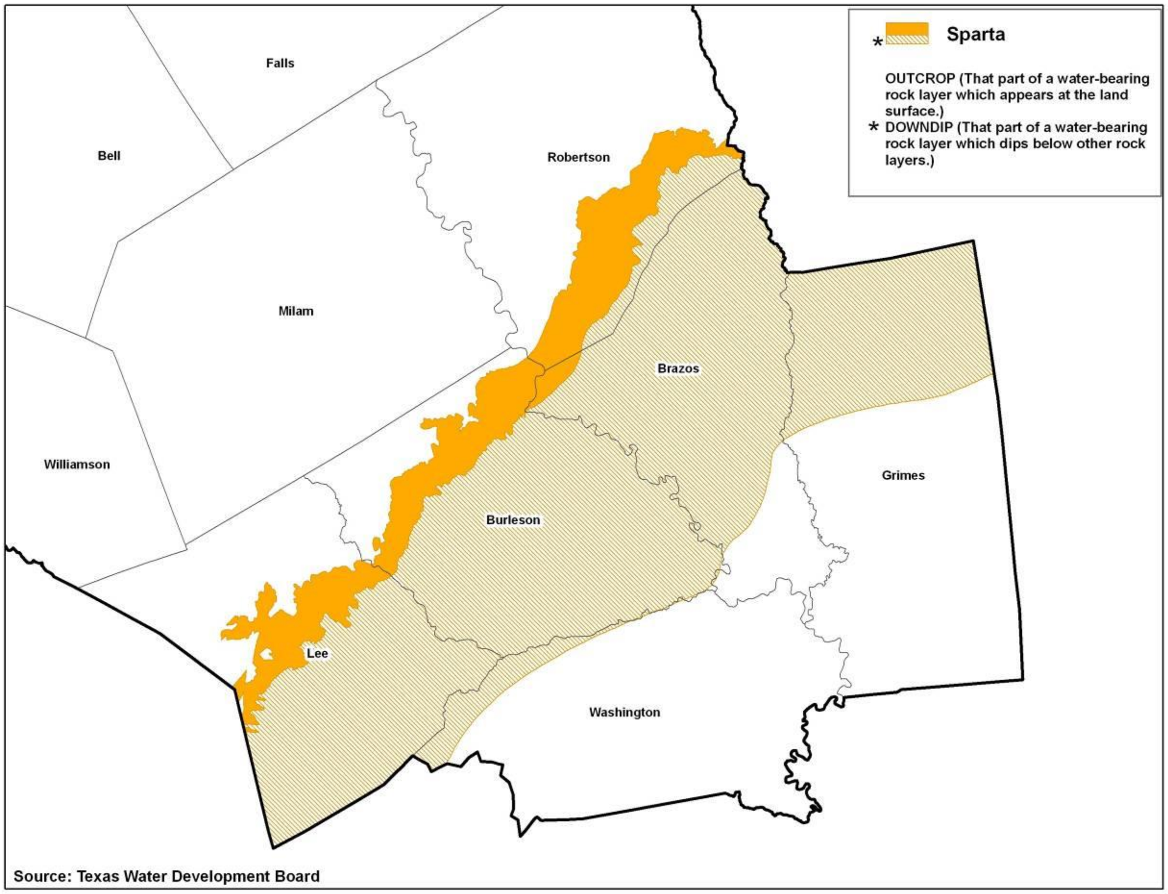

Figure B-13. Location of Sparta Aquifer in Brazos G

Trinity Aquifer

Location

The Trinity Aquifer, a major aquifer, occurs in a north-south-trending band that extends in Brazos G from Williamson County in the south to Hood and Johnson Counties in the north. The aquifer supplies drinking water to numerous communities, homes and farms in Central Texas and irrigation water to many farms, especially in Comanche and Erath Counties. Considering the trends in water level declines as a reference, the aquifer appears to be overdeveloped in a large part of the confined area.

The outcrop of the Trinity Aquifer in Brazos G occurs mostly in Callahan, Eastland, Erath, Hood, Somervell, Comanche, Hamilton, Coryell and Lampasas Counties. The confined area is mostly in Johnson, Hill, Bosque, McLennan, Coryell, Bell and Williamson Counties (Figure B-13).

Geohydrology

The aquifer is composed of the Paluxy, Glen Rose and Travis Peak Formations. The Travis Peak Formation is subdivided into the Hensell, Pearsall/CowCreek/Hamett, and Hosston/Sligo members. Updip where the Glen Rose thins or is missing, the Paluxy and Travis Peak Formations coalesce to form the Antlers Formation. The uppermost water-bearing zone is the Paluxy Formation. The lower water-bearing zone consists of Travis Peak Formation and is divided into the Hensell and Hosston Members in much of the eastern part of Brazos G. Groundwater is much more abundant in the lower zones than the upper zone.

The water-bearing zones consist of a sand and limestone and are often interbedded with clay and shale. The aquifer outcrops in the western part of the north-south-trending band and is confined in the eastern part. The rocks dip east-southeast at a rate of about 15 feet per mile in the northwest part of Brazos G, gradually increase in dip to 40 feet per mile in the central part, and then rapidly increase in dip to 80 to 100 feet per mile east of the Luling-Mexia-Talco Fault Zone. Water table conditions occur in outcrop (recharge) areas, and confined (artesian) conditions occur in downdip areas. The aquifer is naturally recharged by precipitation in the outcrop area where soils have layers of sand and sandy loam. In the downdip area, some recharge to the heavily pumped water-bearing zones probably includes a very modest amount of leakage from over- and underlying formations. Discharge is mostly to wells, springs, seeps and evapotranspiration in the outcrop area, and to wells in the confined zone.

Development and Use

The year 2017 Brazos G groundwater use totaled 71,284 acft, of which 42 percent was municipal use and 49 percent irrigation. Comanche, Erath, and McLennan Counties account for the highest percentage of total pumpage at 26 percent, 18 percent, and 15 percent, respectively.

Availability

The Trinity Aquifer in Brazos G is primarily located within GMA-8, though a small portion extends into Palo Pinto County in GMA-6. In letter dated January 2018 to GMA-8, the TWDB referenced a report titled GAM Run 17-029 MAG (Shi, 2018), which presents the MAG for the aquifers in the management area. The Trinity Aquifer MAG volume in GMA-8 was determined using the groundwater availability model for the northern portion of the Trinity and Woodbine aquifers (Kelley and others, 2014) and Desired Future Conditions provided by the GMA-8 representative. No MAG has been adopted for the Trinity Aquifer in GMA-6; the groundwater availability estimate used for Palo Pinto County was taken from previous Brazos G Regional Water Plans and is based on historical TWDB reports and data included in the TWDB groundwater database.

In addition, some municipal or county authorities in the North - Central Texas Trinity and Woodbine Aquifers and Central Texas -Trinity Aquifer in Priority Groundwater Management Areas (PGMAs) may require groundwater availability certification at a subdivision level. If these authorities choose to require a certification, the developer of a new subdivision plat is to follow TCEQ Chapter 230 - Groundwater Availability Certification for Platting rules. It is unknown how many, if any, of the authorities in these PGMAs require certifications.

Well Yields

Well yields have a wide variation in the Trinity Aquifer. In general, yields for large supply wells in the western part of the aquifer where the outcrop occurs are between 50 and 250 gpm. In the confined part, large wells usually produce between 200 and 700 gpm. Well yields are mostly related to the cumulative thickness of sand layers and water level in the water-bearing zone at the well. Potential well yields have declined substantially in areas with large declines in water levels from a combination of increased lift and the inability to create a cone of depression around the well.

Water Quality

Water quality from the Trinity Aquifer is acceptable for most municipal and industrial purposes; however, excess concentrations of certain constituents in some areas exceed drinking water standards. One concern is relatively high concentrations of bacteria and nutrients that have been found in some wells in Callahan, Eastland, Erath and Comanche Counties. Another concern is contamination from brines associated with oil and gas operations. Finally, limited areas are impacted by leakage of poor-quality water from overlying formations.

Resource Considerations

Groundwater resources are considered to be within or less than development limits in the outcrop area and generally overdeveloped in the confined areas. The Trinity Aquifer in Brazos G is overseen by seven groundwater conservation districts, but these districts do not cover the entire aquifer area within the Brazos G. Counties with groundwater conservation districts include: Lampasas (Saratoga UWCD), Bell (Clearwater UWCD), Bosque, Comanche and Erath (Middle Trinity GCD), McLennan (McLennan County GCD), and Coryell (Tablerock GCD), Somerville, Johnson and Hill (Prairielands GCD) and Hood (Upper Trinity GCD).

Trinity Aquifer

Modeled Available Groundwater (acft/yr)						
COUNTY	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
BELL	9,267	9,241	9,267	9,241	9,267	9,241
BOSQUE	8,788	8,762	8,788	8,762	8,788	8,762
CALLAHAN	1,729	1,725	1,729	1,725	1,729	1,725
COMANCHE	12,072	12,039	12,072	12,039	12,072	12,039
CORYELL	4,503	4,491	4,503	4,491	4,503	4,491
EASTLAND	5,747	5,732	5,747	5,732	5,747	5,732
ERATH	20,658	20,599	20,658	20,599	20,658	20,599
FALLS	1,438	1,434	1,438	1,434	1,438	1,434
HAMILTON	2,431	2,425	2,431	2,425	2,431	2,425
HILL	4,029	4,017	4,029	4,017	4,029	4,017
HOOD	12,458	12,424	12,458	12,424	12,458	12,424
JOHNSON	9,422	9,396	9,422	9,396	9,422	9,396
LAMPASAS	1,672	1,666	1,672	1,666	1,672	1,666
LEE	0	0	0	0	0	0
LIMESTONE	0	0	0	0	0	0
MCLENNAN	20,691	20,635	20,691	20,635	20,691	20,635
MILAM	0	0	0	0	0	0
PALO PINTO [A]	12	12	12	12	12	12
SOMERVELL	3,188	3,181	3,188	3,181	3,188	3,181
TAYLOR	14	14	14	14	14	14
WILLIAMSON	3,513	3,503	3,513	3,503	3,513	3,503
TOTAL	121,632	121,296	121,632	121,296	121,632	121,296

[A] – Non-MAG estimate

References

Baker, B., Duffin, G., Flores, R., and Lynch, T., 1990, Evaluation of water resources in part of Central Texas: TWDB Report 319.

Baker, B., Duffin, G., Flores, R., and Lynch, T., 1990, Evaluation of water resources in part of North-Central Texas: TWDB Report 318.

Bene', J. and Harden, B. and others, 2004, Northern Trinity/Woodbine Aquifer Groundwater Availability Model: TWDB Contract Report, http://www.twdb.state.tx.us/gam/trnt_n/trnt_n.htm

Duffin, G., and Musick, S.P., 1991, Evaluation of water resources in Bell, Burnet, Travis, Williamson, and parts of adjacent counties, Texas: TWDB Report 326.

Kelley, V.A., Ewing, J., T.L., Jones, Young, S.C., Deeds, N., and Hamlin, S., 2014. Updated Groundwater Availability Model of the Northern Trinity and Woodbine Aquifers – Draft Final Model Report.

Klemt, W.B., Perkins, R.D., and Alvarez, H.J., 17975, Ground-water resources in part of Central Texas, with emphasis on the Antlers and Travis Peak Formations: TWDB Report 195.

Nordstrom, P.L., 1982, Occurrence, availability, and chemical quality of ground-water in the Cretaceous aquifers of North-Central Texas: TDWR Report 269.

Nordstrom, P.L., 1987, Ground-water resources of the Antlers and Travis Peak Formations in the outcrop area of North-Central Texas: TWDB Report 298.

Sandeen, W.M., 1972, Ground-water resources of Washington County, Texas: TWDB Rept. 162.

Shi, J., 2018, GAM Run 17-029 MAG: Modeled Available Groundwater for the Trinity, Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory Aquifers in Groundwater Management Area 8. Texas Water Development Board Groundwater Division.

Williams, C.R., 2008, Desired Future Conditions of N. Trinity Aquifer: Memorandum dated December 15, 2008 to Cheryl Maxwell, Administrative Agent for Groundwater Management Area 8.

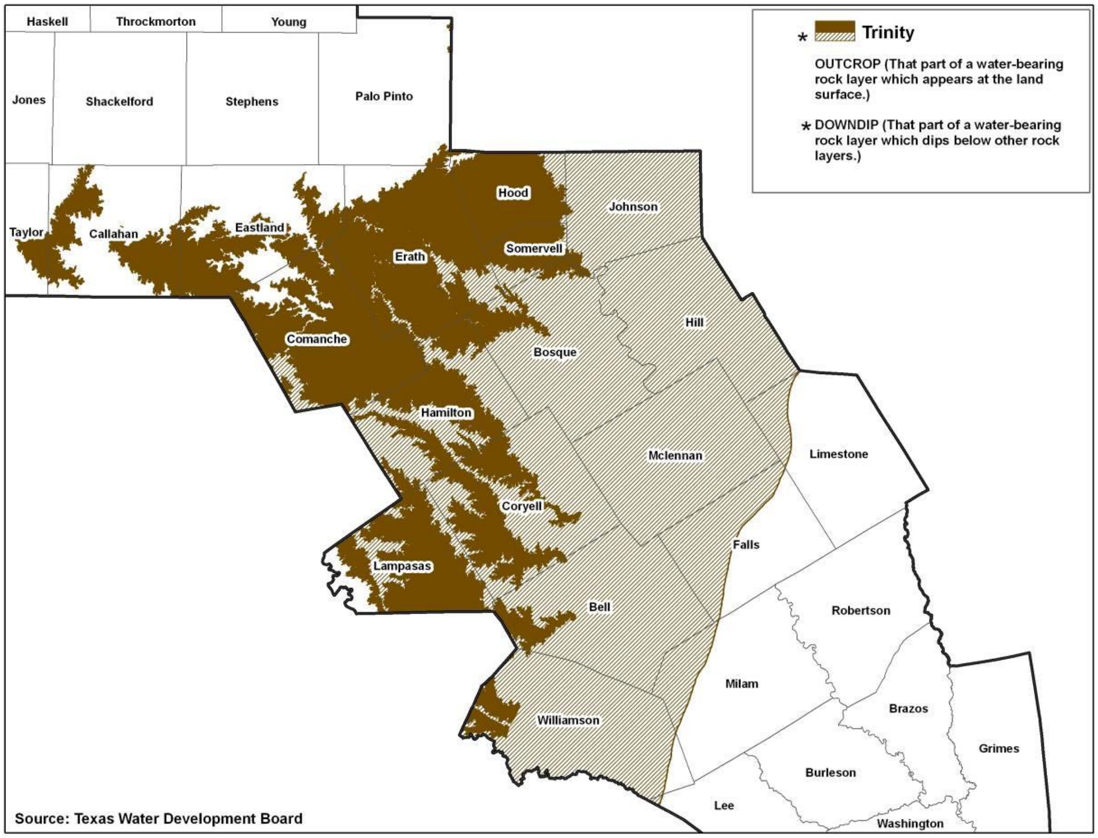

Figure B-14. Location of Trinity Aquifer in Brazos G

Woodbine Aquifer

Location

The Woodbine Aquifer, a minor aquifer, is in the north-central part of the Brazos G and in adjacent planning areas to the north. It occurs in a north-south-trending belt primarily across parts of Johnson and Hill Counties (Figure B-14).

Geohydrology

The Woodbine consists of water-bearing sandstone interbedded with shale. The sandstone tends to be thicker in the lower part of the formation. The upper part of the Woodbine has distinctly poorer water quality. Total formation thickness ranges up to slightly over 200 feet and sand thickness up to 100 feet. From their surface outcrop (recharge area) the water-bearing sands dip eastward beneath younger strata. Water table conditions occur in recharge areas, and artesian conditions occur in downdip areas. Precipitation is the main source of recharge. Maximum estimated transmissivities for the best yielding zones in the lower Woodbine are about 250 to 500 square ft per day.

Development and Use

Development is mostly limited to local use for household and livestock purposes. The TWDB estimates the total pumpage to be 405 acft in 2017. About 58 percent of the pumpage was for municipal purposes.

Availability

The Woodbine Aquifer in Brazos G is located in GMA-8. In a letter dated January 2018 to GMA-8, the TWDB referenced a report titled GAM Run 17-029 MAG (Shi, 2018) which provides the MAG volumes for the aquifers in GMA-8. The MAG for the Woodbine Aquifer in GMA-8 was determined using the groundwater availability model for the northern portion of the Trinity and Woodbine aquifers (Kelley and others, 2014) and Desired Future Conditions provided by the GMA-8 representative. The MAG volume for the Woodbine Aquifer in Brazos G is presented in the following table.

In addition, some municipal or county authorities in the North - Central Texas Trinity and Woodbine Aquifers in Priority Groundwater Management Areas (PGMAs) may require groundwater availability certification at a subdivision level. If these authorities choose to require a certification, the developer of a new subdivision plat is to follow TCEQ Chapter 230 - Groundwater Availability Certification for Platting rules. It is unknown how many, if any, of the authorities in these PGMAs require subdivision certifications.

Woodbine Aquifer

Modeled Available Groundwater (acft/yr)						
COUNTY	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
HILL	588	586	588	586	588	586
JOHNSON	1,985	1,980	1,985	1,980	1,985	1,980
MCLENNAN	0	0	0	0	0	0
TOTAL	2,573	2,566	2,573	2,566	2,573	2,566

Well Yields

Estimated ranges for maximum individual well yields are 50 to 150 gpm. Wide variations occur in individual well yields obtainable from Woodbine sands, depending on area, depth, and local sand thickness.

Water Quality

Water typically meets drinking water standards. Waters obtained near the outcrop of the water-bearing zones generally are higher in hardness and lower in total dissolved solids content. In confined areas the water is commonly a sodium-bicarbonate-type water with total dissolved solids content ranging from 500 to over 1,000 mg/L. The higher mineralized waters contain appreciably higher sulfate content. High iron concentrations are common in the outcrop areas.

Resource Considerations

The Woodbine is a relatively weak aquifer, supports little development and has minimal potential within the Brazos G. Few development problems have occurred to date, but large water level declines can be expected from any significant added development. Care must be taken in well construction to seal off the higher mineralized water in the upper part of the formation and to screen the best water-bearing zones in the lower part. No existing local plans are known. The groundwater conservation districts regulating the Woodbine in the Brazos G are McLennan County GCD and Prairielands GCD (Hill, Johnson Counties).

References

Hopkins, Janie, 1996, Water quality in the Woodbine Aquifer, TWDB Hydrologic Atlas No. 4.

Bene', J. and Harden, B. and others, 2004, Northern Trinity/Woodbine Aquifer Groundwater Availability Model: TWDB Contract Report, http://www.twdb.state.tx.us/gam/trnt_n/trnt_n.htm

Kelley, V.A., Ewing, J., T.L., Jones, Young, S.C., Deeds, N., and Hamlin, S., 2014. Updated Groundwater Availability Model of the Northern Trinity and Woodbine Aquifers – Draft Final Model Report.

Klemt, W.B., Perkins, R.D., and Alvarez, H.J., 1975, Ground-water resources of part of Central Texas, with emphasis on the Antlers and Travis Peak Formations: TWDB Report 195.

Muller, Daniel A., and Price, Robert D., 1979, Ground-water availability in Texas: TDWR Report 238.

Nordstrom, P.L., 1982, Occurrence, availability, and chemical quality of ground water in the Cretaceous aquifers of North-Central Texas: TDWR Report 269.

Shi, J., 2018, GAM Run 17-029 MAG: Modeled Available Groundwater for the Trinity, Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory Aquifers in Groundwater Management Area 8, Texas Water Development Board Groundwater Division.

Thompson, Gerald L., 1969, Ground water resources of Johnson County, Texas: TWDB Report 94.

Williams, C.R., 2008, Desired Future Conditions of N. Trinity Aquifer: Memorandum dated December 15, 2008 to Cheryl Maxwell, Administrative Agent for Groundwater Management Area 8.

Ward, J.K., Managed available groundwater estimates for the Woodbine Aquifer in Groundwater Management Area 8: TWDB letter dated Nov 10, 2008 with *GAM Run 08-14mag* attachment.

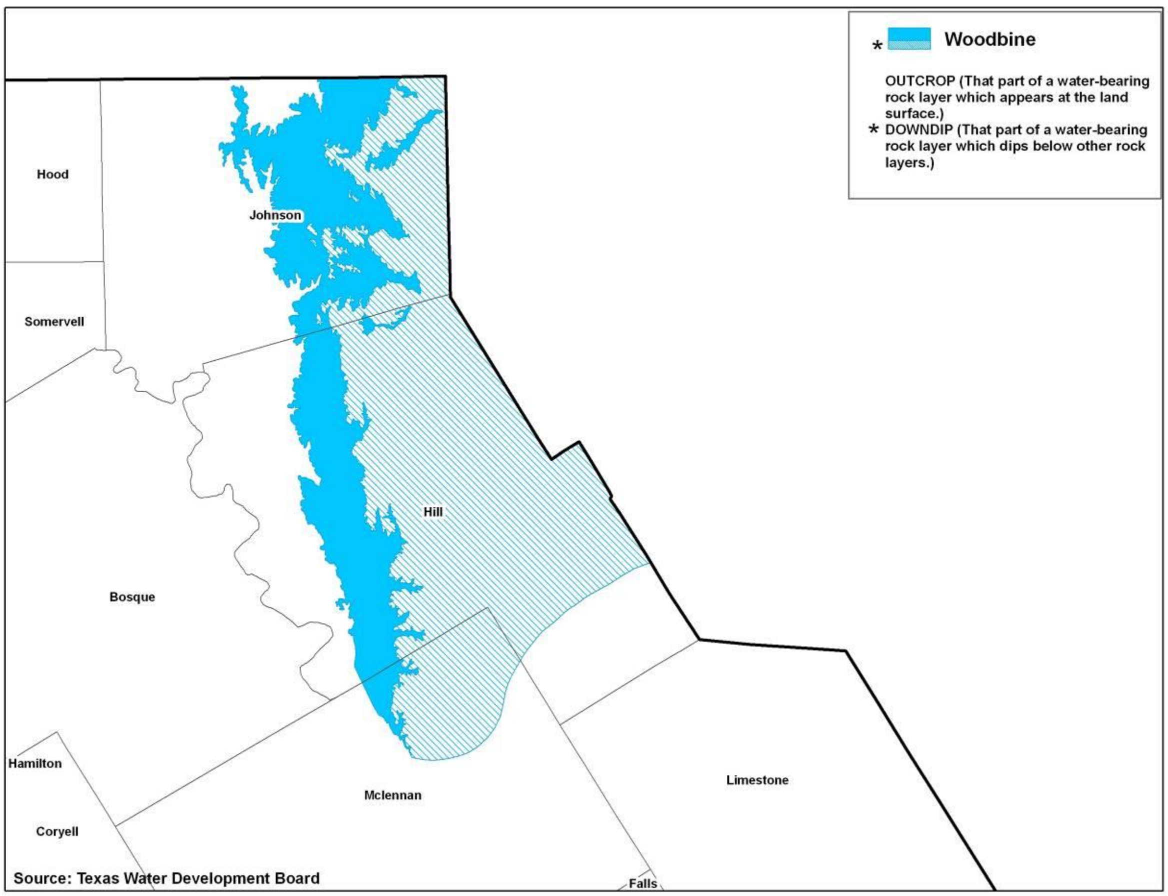

Figure B-15. Location of Woodbine Aquifer in Brazos G

Yegua-Jackson Aquifer

Location

The Yegua-Jackson Aquifer occurs in the southeastern part of the Brazos G and in adjoining planning areas. It occurs in a northeast-southwest-trending band that is 15-20 miles wide and primarily cuts across parts of Brazos, Burleson, Grimes, Lee, and Washington Counties (Figure B-15). Its location is a short distance downdip of the Sparta Aquifer and is covered by younger sediments in much of the area.

Geohydrology

The Yegua Formation consists of fine to medium sand that is interbedded with indurated fine-grained sandstone and clay. It has a maximum thickness in Grimes County of nearly 1,200 ft. The Jackson Group consists of fine to medium sand, clay, and siltstone. Its maximum thickness is about 1,600 ft. From their surface outcrop (recharge area) the sands dip coastward beneath younger strata. Water table conditions occur in recharge areas, and artesian conditions occur in downdip areas. Precipitation is the main source of recharge. A large amount of recharge is rejected by evapotranspiration in the outcrop.

Development and Use

Development is mostly limited to local use for household and livestock purposes. The TWDB estimates the total pumpage to be 3, 079 acft in 2017. Over two-thirds of the pumpage occurred in Brazos County, the majority of which was for irrigation purposes.

Availability

The Yegua-Jackson Aquifer in Brazos G is in GMA-12 and 14. In a letter dated December 2017, the TWDB referenced a report titled GAM Run 17-030 MAG (Wade and Ballew, 2017) which provides the MAG volumes for the aquifers in GMA-12. The MAG for the Yegua-Jackson in GMA-12 was determined using version 1.01 of the groundwater availability model for the Yegua-Jackson Aquifer (Deeds and others, 2010) and Desired Future Conditions provided by the GMA-12 representative.

The Yegua-Jackson Aquifer was not included in the most recent modeling and Desired Future Condition evaluation for GMA-14. Correspondingly, no MAG has been adopted for the Yegua-Jackson in Grimes and Washington Counties. In lieu of a published MAG by the GMA, the groundwater availability in Grimes, Lee, and Washington Counties are estimates, as provided by the TWDB, based on modeling from GMAs -14, 13, and -12, respectively.

Well Yields

Estimated maximum individual well yields are about 500 gpm. Wide variations can occur in individual well yields, depending on area, depth and local sand thickness.

Water Quality

Relatively shallow wells yield water that typically meets drinking water standards.. Waters obtained near the outcrops of the water-bearing zones generally are higher in hardness and lower in total dissolved solids content. In downdip areas, water with total dissolved solids content ranges from about 300 up to 1,000 mg/L or more.

Resource Considerations

Counties with groundwater conservation districts include: Lee (Lost Pines GCD), Robertson and Brazos (Brazos Valley GCD), and Grimes (Bluebonnet GCD).

Yegua-Jackson Aquifer

Modeled Available Groundwater (acft/yr)						
COUNTY	**2020**	**2030**	**2040**	**2050**	**2060**	**2070***
BRAZOS	6,856	6,854	6,854	6,854	6,854	6,854
BURLESON	14,544	12,576	12,564	12,478	12,326	12326
GRIMES [A]	3,278	3,278	3,278	3,278	3,278	3,278
LEE [A]	635	635	635	635	635	635
WASHINGTON [A]	291	291	291	291	291	291
TOTAL	25,604	23,634	23,622	23,536	23,384	23,384

[A] – Non-MAG estimate

References

Baker, E.T., Jr., Follett, C.D., McAdoo, G.D., and Bonnet, C.W., 1974, Ground-water resources of Grimes County, Texas: TWDB Report 186.

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

Follett, C.R., 1974, Ground-water resources of Brazos and Burleson Counties, Texas: TWDB Report 185.

Thompson, G.L., 1966, Ground-water resources of Lee County, Texas: TWDB Report 20.

Wade, S.C., and Ballew, N., 2017, GAM Run 17-030 MAG: Modeled Available Groundwater for the Carrizo-Wilcox, Queen City, Sparta, Yegua-Jackson, and Brazos River Alluvium Aquifers in Groundwater Management Area 12, Texas Water Development Board Groundwater Division.

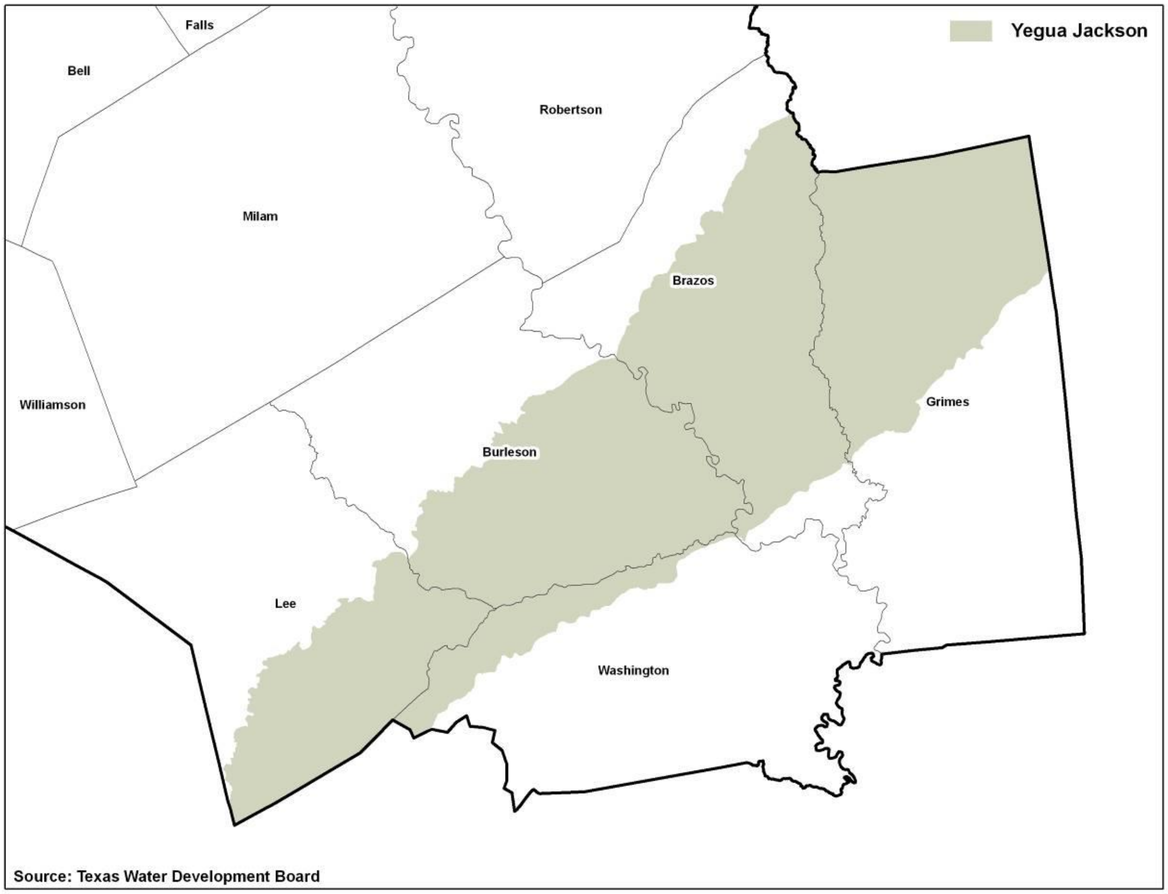

Figure B-16. Location of Yegua-Jackson Aquifer in Brazos G

Appendix C

Water Rights – Permitted and Reported Water Use

Table C-1: Water Rights- Permitted and Actual Use

Basin	Water Right No.	County	Water Right Holder	Water Source	Permitted Amount	Use	Reported Use 2011	Reported Use 2012	Reported Use 2013
Colorado	001660	Callahan	City of Clyde	Lake Clyde	1,000	MUN	123	48	166
Brazos	002315	McLennan	City of Waco	Lake Waco	58,200	MUN	38,006	35,099	35,882
					16,802	IND	0	0	0
					900	IRR	704	666	538
Brazos	002936	Bell	US Department of the Army	Lake Belton	12,000	MUN	6,914	5,925	5,201
Brazos	002938	Bell	City Of Temple	Leon River	35,804	MUN	17,680	13,921	14,701
						IND	0	577	633
Brazos	002971	Lampasas	City of Lampasas	Sulphur Creek	3,760	MUN	0	0	90
Brazos	003440	Knox	League Ranch	Lake Davis, Lake Catherine	2,031	IRR	0	0	0
						OTH	0	0	0
Brazos	003458	Young	City of Graham	Lake Eddleman/Graham	11,000	MUN	5,358	2,274	3,273
					8,400	IND	0	0	0
					100	IRR	0	0	0
					500	MIN	0	0	0
Brazos	003468	Eastland	Eastland Industrial Foundation, EBBA Iron Inc.	Lake Olden	1,607	MIN	0	0	265
Brazos	003470	Eastland	Eastland County WSD	Lake Leon	5,450	MUN	0	0	0
					350	IND	0	0	0
					500	IRR	0	0	0
Brazos	003718	Kent	Occidental Permian Ltd	Double Mountain Fork Brazos River	5,900	MIN	22	23	0
Brazos	003724	Haskell	Frances Davis	Double Mountain Fork Brazos River	1,016	IRR	0	0	0
Brazos	003758	Milam	Aluminum Company of America	Lake Alcoa	18,000	IND	6,677	10,660	9,383
Brazos	003761	Milam	City Of Cameron	Little River	2,792	MUN	1,384	1,154	972
Brazos	003773	Milam	Arledge & Shanahan Lp	Little River	1,300	IRR	1,080	0	150
Brazos	003775	Milam	Leifeste, Jesse Robertson	Little River	1,767	IRR	128	176	66
Brazos	004013	Palo Pinto	Rocking Wranch LP, Dalton Bend Ranch LTD	Brazos River	1,329	IRR	304	288	329
Brazos	004031	Palo Pinto	Palo Pinto County MWD 1	Lake Palo Pinto	12,500	MUN	4,497	4,189	3,948
					6,000	IND	0	0	0
Brazos	004087	Comanche	Don Frazier Clark, et. al., Leland A Hodges Et Al	Copperas Creek	1,060	IRR	0	0	0
Brazos	004097	Somervell	TXU Electric Company	Squaw Creek	23,180	IND	19,548	22,280	20,514
Brazos	004104	Bosque	Chisholm Trail Ventures Lp	Brazos River	3,811	IRR	1,370	370	320
Brazos	004106	Johnson	City of Cleburne	Lake Pat Clebburne	5,760	MUN	5,526	4,458	2,113
					240	IRR	126	212	164
						IND	0	0	0
Brazos	004128	Nolan	City of Sweetwater	Lake Trammel	2,000	MUN	0	0	0
Brazos	004130	Nolan	City of Sweetwater	Lake Sweetwater	2,730	MUN	0	0	0
					960	IND	0	0	0
					50	IRR	82	242	248
Brazos	004142	Taylor	City of Abilene	Lake Abilene	1,675	MUN	0	0	0
Brazos	004150	Taylor	City of Abilene	Lake Kirby	3,880	MUN	0	0	0
						IND	0	0	0
						IRR	1,422	113	37
Brazos	004151	Taylor	AEP Texas North Company	Upper Lytle Lake	2,500	IND	0	0	0
Brazos	004161	Jones	City of Abilene	Fort Phantom Hill Reservoir	25,690	MUN	8,993	4,739	3,273
					4,000	IND	14	42	48
					1,000	IRR	8	4	3
Brazos	004165	Jones	City of Abilene	Deadman Creek	3,000	MUN	0	0	0
Brazos	004179	Haskell	City of Stamford	Lake Stamford	10,000	MUN	888	801	748
						IND	0	0	0
				College Lake		OTH	0	0	0
Brazos	004211	Eastland	City of Cisco	Lake Cisco	1,971	MUN	854	776	676
					56	IND	0	0	0
Brazos	004212	Eastland	City of Cisco	Battle Creek	1,000	MUN	12	167	10
Brazos	004213	Stephens	West Central Texas MWD	Hubbard Creek Lake	56,000	MUN	18,762	22,075	20,883
						IND	0	0	0
						IRR	0	0	0
						MIN	52	45	74
						D&L	0	0	817
Brazos	004214	Stephens	City of Breckenridge	Lake Daniel	2,100	MUN	6	119	0
Brazos	004235	McLennan	Holy Land and Cattle, Glen Marecek et al	Brazos River	2,600	IRR	62	606	1,717
Brazos	004270	Falls	Walsh Ranch LTD Partnership	Brazos River	1,851	IRR	0	0	0
Brazos	004276	Falls	Robert L. Macha, et. al.	Brazos River	1,200	IRR	0	0	0

							Reported Use		
Basin	Water Right No.	County	Water Right Holder	Water Source	Permitted Amount	Use	2011	2012	2013
Brazos	004283	Brazos	KR Sod-Brazos LP, Harvest Guard LP, Ted Higginbottom, et. al.	Brazos River	5,440	IRR	652	1,534	789
Brazos	004318	Bosque	CHS Farms LTD. McPherson et. al. Lakeview Recreation Association INC, Smith Bend Ranch Ltd	Brazos River	2,820	IRR	1,393	2,026	2,151
						IND	0	0	70
Brazos	004340	McLennan	City of Waco	Brazos River	5,600	MUN	5	0	0
Brazos	004342	McLennan	Tradinghouse Power Co Llc	Brazos River	27,000	IND	0	0	0
Brazos	004344	McLennan	Lola Robinson	Tehuacana Crk	1,060	IRR	1,060	1,060	1,060
Brazos	004345	McLennan	Luminant Generation Co Llc	Brazos River	10,000	IND	0	0	0
Brazos	004355	Falls	City of Marlin	New Marlin Lake	6,000	MUN	763	605	553
					2,000	IND	0	0	553
				Brushy Creek Reservoir		REC	0	0	0
Brazos	004363	Robertson	Joe Reistino Estate	Brazos River	1,500	IRR	500	1,500	0
Brazos	004364	Robertson	Cliff A. Skiles, Jr.	Little Brazos River	724	IRR	694	720	674
Brazos	004398	Robertson	Gathan Reistino	Brazos River	1,500	IRR	0	0	0
Brazos	004589	Jones	City of Abilene	Deadman Creek	4,330	IRR	381	169	55
Brazos	004591	Milam	Warrens Turf Nursery, INC.	Little River	52	IRR	0	0	0
			Hillard Ranches, Inc.		606	IRR	0	0	0
			James K. Wilson, et. al.		91	IRR	0	0	0
Brazos	005085	McLennan	City of Robinson	Brazos River	13,100	MUN	824	567	388
Brazos	005094	McLennan	City of Waco	Lake Waco	20,770	MUN	0	0	0
Brazos	005155	Palo Pinto	Brazos River Authority	Possum Kingdom	230,750	MUN	2,736	998	1,323
						IND	60,445	5,454	12,322
						IRR	16,554	3,459	4,113
						MIN	2,083	1,601	2,595
						OTH	241	45	107
Brazos	005156	Hood	Brazos River Authority	Lake Granbury	64,712	MUN	8,263	5,849	5,752
						IND	45,006	45,000	44,939
						IRR	5,949	4,483	3,493
						MIN	479	200	0
Brazos	005157	Hill	Brazos River Authority	Lake Whitney	18,336	MUN	3,497	779	1,617
						IND	24,514	19,232	24,921
Brazos	005158	Hill	Brazos River Authority	Lake Aquilla	13,896	MUN	6,743	5,451	7,288
						IND	0	0	0
						MIN	0	0	0
Brazos	005159	Comanche	Brazos River Authority	Lake Proctor	19,658	MUN	3,306	2,868	2,607
						IND	0	0	0
						IRR	4,908	7,858	5,582
						MIN	0	0	0
Brazos	5160	Bell	Brazos River Authority	Lake Belton	100,257	MUN	59,548	53,637	55,734
						IND	9,726	7,176	26,453
						IRR	6,273	247	1,741
						MIN	0	0	0
Brazos	005161	Bell	Brazos River Authority	Lake Stillhouse Hollow	67,768	MUN	65,194	28,182	26,241
						IND	8,107	0	2
						IRR	27,841	360	12
						MIN	0	0	0
Brazos	005162	Williamson	Brazos River Authority	Lake Georgetown	13,610	MUN	13,441	13,444	13,443
						IND	0	0	0
						IRR	0	0	0
						MIN	0	0	0
Brazos	005163	Williamson	Brazos River Authority	Lake Granger	19,840	MUN	4,262	3,453	3,548
						IND	602	0	3,351
						IRR	0	0	0
						MIN	0	0	0
Brazos	005164	Washington	Brazos River Authority	Lake Somerville	48,000	MUN	7,033	3,271	3,251
						IND	29,459	4,069	15,523
						IRR	5,015	0	17,607
						MIN	0	12	8
Brazos	005165	Robertson	Brazos River Authority	Lake Limestone	65,074	MUN	2,680	1,091	994
						IND	60,118	43,838	41,575
						IRR	1,052	362	393
						MIN	28	16	37
Brazos	005268	Brazos	City of Bryan	Thompsons Creek	850	IND	0	0	0

Basin	Water Right No.	County	Water Right Holder	Water Source	Permitted Amount	Use	Reported Use 2011	Reported Use 2012	Reported Use 2013
Brazos	005271	Burleson	Texas A&M University	Middle Bayou	1,200	IRR	290	213	281
					420	IND	0	0	0
Brazos	005272	Milam	Aluminum Company of America	Alcoa Lake	14,000	IND	0	0	0
Brazos	005287	Limestone	Bistone Municipal WSD	Lake Mexia	2,887	MUN	125	0	0
					65	IND	0	0	0
Brazos	005289	Limestone	City of Groesbeck	Navasota River	2,500	MUN	736	0	567
Brazos	005298	Robertson	TXU	Duck Creek	13,200	IND	12,346	10,933	11,603
Brazos	005307	Grimes	Texas Municipal Power Agency	Navasota River	6,000	IND	3,277	3,245	5,044
Brazos	005311	Grimes	Texas Municipal Power Agency	Gibbons Creek	9,740	IND	4,751	3,392	5,610
Brazos	005447	Palo Pinto	Palo Pinto County MWD 1	Brazos River	1,153	REC	0	0	0
Brazos	005470	Robertson	Clifford A Skiles Jr Et Ux	Brazos River	514	IRR	510	514	510
Brazos	005551	Bosque	City of Clifton	N Bosque River	2,004	MUN	567	483	209
Brazos	005744	Somervell	Somervell County Water District	Wheeler Branch	2,000	MUN	67.18	487.94	478.79
Brazos	005912	Brazos	City of Bryan	Burton, Still, Turkey, Carters, Navasota, Brazos	14,282	MUN	0	0	0
Brazos	005913	Brazos	City of College Station	Carters Crk, Lick Crk, Navasota River, Brazos Rive	12,881	MUN	0	0	0

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Appendix D

Detailed Description of Vegetative Regions and Biotic Provinces

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Vegetative Regions

Rolling Plains. The original prairie vegetation included tall and mid-grasses such as little bluestem (*Schizachyrium scoparium* var. *frequens*), big bluestem (*Andropogon gerardii*), sand bluestem (*Andropogon halli*), side-oats grama (*Bouteloua curtipendula*), Indian grass (*Sorghastrum nutans*), switchgrass (*Panicum virgatum*), hairy grama (*B. hirsuta*), blue grama (*B. gracilis*), Canada wildrye (*Elymus canadensis*) and western wheat (*Agropyron smithii*).

Mesquite (*Prosopis glandulosa*) is a common invader on all soils, while shinnery oak (*Quercus harvardii*) and sand sage (*Artemisia filifolia*) invade only sandy soils. Juniper (*Juniperus* spp.) clings to steep slopes along rivers.

Blackland Prairies. Studies have shown that the native vegetation of the Blackland Prairies should be classified as true prairie with little bluestem being a climax dominant.[1] Big bluestem, Indiangrass, switchgrass, hairy grama, sideoats grama, tall dropseed (*Sporobolus asper* var. *asper*), silver bluestem (*Bothriochloa saccharoides*) and Texas wintergrass (*Stipa leucotricha*) represent other important grasses in the vegetational region. With heavy grazing practices, invading or increasing species such as buffalograss (*Buchloe dactyloides*), Texas grama (*Bouteloua rigidiseta*) and smutgrass (*Sporobolus indicus*), along with other annuals, may become prevalent.[2] Improved pastures with the introduced grass species such as dallisgrass (*Paspalum dilatatum*) and bermudagrass (*Cynodon dactylon*) are common in the area. Asters (*Aster* spp.), prairie bluet (*Hedyotis nigricans* var. *nigricans*), prairie clover (*Dalea* spp.) and late coneflower (*Rudbeckia serotina*) are common forbs of these prairies.[3]

Wooded areas along riparian strips in the Blackland Prairies include such species as black willow (*Salix nigra*), oaks (*Quercus* spp.), pecan (*Carya illinoinensis*), osage orange (*Maclura pomifera*), elms (*Ulmus* spp.) and eastern cottonwood (*Populus deltoides*).[4] Woody invasive species that are commonly found in the vegetational area include post oak (*Quercus stellata*), blackjack oak (*Q. marilandica*) and cedar elm (*Ulmus crassifolia*) in the north, with honey mesquite (*Prosopis glandulosa*) being a common invader in the southern portion of the region.[5]

Post Oak Savannah. Typical native woody vegetation in this area includes post oak (*Quercus stellata*), blackjack oak (*Q. marilandica*), eastern juniper (*Juniperus virginiana*) and hackberries (*Celtis* spp.). Yaupon (*Ilex vomitoria*), American beautyberry (*Callicarpa americana*) and greenbriar (*Smilax bona-nox*) are common understory constituents of wooded areas. Common

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[1] Gould, 1975.
[2] Gould, 1975 and Correll, S.S. and Johnston, M.C., *Manual of the Vascular Plants of Texas*, University of Texas at Dallas, 1970.
[3] Hatch, S.L., Ghandi, K.N. and Brown, L.E., *Checklist of the Vascular Plants of Texas*, Texas Agricultural Experiment Station, Texas A&M University, College Station, Texas, 1990.
[4] Hatch, et. al., 1990.
[5] Gould, 1975.

native grasses in this region include little bluestem (*Schizachyrium scoparium*), Indiangrass (*Sorghastrum nutans*), switchgrass (*Panicum virgatum*) and Texas wintergrass (*Stipa leucotricha*). Forbs typical of the prairie portions include indigobush (*Amorpha fruiticosa* v. *angustifolia*), senna (*Cassia* sp.), tick-clover (*Desmodium* spp.), prairie-clover (*Petalostemon* spp.), western ragweed (*Ambrosia psilostachya*) and croton (*Croton* spp.).[6]

Cross Timbers and Prairies. Upland vegetation within this region may vary from open savannah consisting of such native grasses as little bluestem (*Schizachyrium scoparium*), big bluestem (*Andropogon gerardi*), Indian grass (*Sorghastrum nutans*), switchgrass (*Panicum virgatum*), Canada wild-rye (*Elymus canadensis*), side-oats grama (*Bouteloua curtipendula*), hairy grama (*B. hirsuta*), tall dropseed (*Sporobolus* sp.) and Texas wintergrass (*Stipa leucotricha*).

Much of this region has been utilized for agriculture, primarily in the form of ranchland. With the advent of overgrazing and land mismanagement, invading grasses such as hairy tridens (*Erioneuron pilosum*), Texas grama (*B. rigidiseta*) and red lovegrass (*Eragrostis secundiflora*) have become common, along with dense brush consisting of post oak (*Quercus stellata*), blackjack oak (*Q. marilandica*), mesquite (*Prosopis glandulosa*) and junipers (*Juniperus* sp.). Along streams, riparian vegetation is typically dominated by such hardwood tree species as cedar elm (*Ulmus crassifolia*) and pecan (*Carya illinoinensis*) and oaks, but mesquite is also a typical invader in these areas.[7]

Edwards Plateau. Grasses that are typical of the Edwards Plateau region include switchgrass (*Panicum virgatum*), Indian grass (*Sorghastrum nutans*), beardgrass (*Bothriochloa* spp.), little bluestem (*Schizachyrium scoparium*), sideoats grama (*Bouteloua curtipendula*), Canada wildrye (*Elymus canadensis*), curly mesquite (*Hilaria belangeri*) and buffalograss (*Buchloe dactyloides*). Other plants commonly found within this vegetational area include ashe juniper (*Juniperus ashei*), plateau live oak (*Quercus fusiformis*), Texas oak (*Q. texana*), Texas persimmon (*Diospyros texana*), elbowbush (*Forestiera pubescens*), Texas mountain laurel (*Sophora secundiflora*), prickly-pear cactus (*Opuntia* spp.) and pencil cactus (*O. leptocaulis*).[8]

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[6] Correll and Johnston, 1970 and Gould, 1975.
[7] Correll and Johnston, 1970 and Hatch, et. al., 1990.
[8] Hatch, et. al., 1990.

Biotic Provinces

Kansan. The mixed-grass plains region is dominated by little bluestem, big bluestem (*Andropogon gerardii*) and western wheatgrass. The mesquite-grass association is dominated by mesquite (*prosopis grandulosa*), with various species of grama (*Bouteloua* spp.), three-awn (*Aristida* spp.) and broomweed (*Gutierrezia texana*). The short-grass plains are dominated by buffalograss (*Buchloe dactyloides*) with various species of grama grasses.

Characteristic mammals of the Kansan province include: black-footed ferret (*Mustela nigripes*), striped skunk (*Mephitis mephitis*), coyote (*Canis latrans*), northern grasshopper mouse (*Onychomys leucogaster*), southern plains woodrat (*Neotoma micropus*) and Ord=s Kangaroo rat (*Dipodomys ordii*).

Austroriparian. Common Austroriparian province mammals within Texas include: Virginia opossum (*Didelphis virginaiana*), eastern mole (*Scalopus aquaticus*), eastern pipistrelle (*Pipistrellus subflavus*), eastern red bat (*Lasiurus borealis*), eastern gray squirrel (*Sciurus carolinesis*), eastern flying squirrel (*Glaucomys volans*), Baird's pocket gopher (*Geomys breviceps*), white-footed mouse (*Peromyscus leucopus*), hispid cotton rat (*Sigmodon hispidus*), eastern woodrat (*Neotoma floridana*), eastern cottontail (*Sylvilagus floridanus*) and swamp rabbit (*Sylvilagus aquaticus*).

Land turtles common to this province are ornate box turtle (*Terrapene ornata*) and eastern box turtle (*Terrapene carolina*). Common snake species found in this Texas region include: cottonmouth moccasin (*Agkistrodon piscivorus leucostoma*), copperhead (*Agkistrodon contortirx*), rough green snake (*Opheodrys aestivus*), rat snake (*Elaphe obsoleta*), coachwhip (*Masticophis flagellum*) and speckled kingsnake (*Lampropeltis geluta holbrooki*). Several Austroriparian species apparently reach their western limits in this Texas province, including the eastern harvest mouse (*Reithrodontomys humulis*), cotton mouse (*Peromyscus gossypinus*), spotted salamander (*Ambystoma maculatum*), marbled salamander (*Ambystoma opacum*), mole salamander (*Ambystoma talpoideum*), pig frog (*Rana grylio*) and pickerel frog (*Rana palustris*).

Balconian. Fifty-seven species of mammals are known from the Balconian province but no species is restricted to this province. The mammalian fauna of the Balconian contains a strong influence from the Chihuahuan species that range into the province from the west and the Austroriparian province from the east.

Some common mammals are the nine-banded armadillo (*Dasypus novimcinctus*), fox squirrel (*Sciurus niger*), white-footed mouse (*Peromyscus leucopus*), black rat (*Rattus rattus*), house mouse (*Mus musculus*), raccoon (*Procyon lotor*) and white-tailed deer (*Odocoileus virginiana*).

Approximately 400 avian species have been recorded as occurring in the Balconian Biotic Province. Common species include mourning dove (*Zenaida macroura*), yellow-billed cuckoo (*Coccyzus americanus*), chimney swift (*Chaetura pelagica*), black-chinned hummingbird

(*Archilochus alexandri*), red-bellied woodpecker (*Melanerpes carolinus*), purple *martin (Progne subis*), cliff swallow (*Hirundo pyrrhonota*), blue jay (*Cyanocitta cristata*), Carolina chickadee (*Parus carolinensis*), tufted titmouse (*Parus bicolor*), Carolina wren (*Thryothorus ludovicianus*), Bewick's wren (*Thryomanes bewickii*), northern mockingbird (*Mimus polyglottos*), white-eyed vireo (*Vireo griseus*), black-and-white warbler (*Mniotilta varia*), northern cardinal (*Cardinalis cardinalis*), rufous-crowned sparrow (*Aimophila ruficeps*), lark sparrow (*Chodestes grammacus*), great-tailed grackle (*Quiscalus mexicanus*) and house sparrow (*Passer domesticus*).

Texan. Mammals typical of this province include the Virginia opossum (*Didelphis virginiana*), eastern mole (*Scalopus aquaticus*), fox squirrel (*Sciurus niger*), Louisiana pocket gopher (*Geomys breviceps*), fulvous harvest mouse (*Reithrodontomys fulvescens*), white-footed mouse (*Peromyscus leucopus*), hispid cotton rat (*Sigmodon hispidus*), eastern cottontail (*Sylvilagus floridanus*) and swamp rabbit (*S. aquaticus*). Animals typical of grasslands of this province include the thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*), hispid pocket mouse (*Chaetodipus hispidus*), deer mouse (*Peromyscus maniculatus*) and black-tailed jackrabbit (*Lepus californicus*).

Typical anuran species to this province are the Hurter's spadefoot (*Scaphiopus holbrookii hurteri*), Gulf Coast toad (*Bufo valliceps*), Woodhouse's toad (*Bufo woodhousii*), gray treefrog (*Hyla versicolor*/*chrysoscelis*), green treefrog (*Hyla cinerea*), bullfrog (*Rana catesbeiana*), southern leopard frog (*Rana sphenocephala*) and eastern narrowmouth toad (*Microhylla carolinensis*).

Table D-1. Federal and State-Listed Threatened and Endangered Species of Potential Occurrence in the BGRWPA

Common Name	*Scientific Name*	*USFWS/State*	*County of Occurrence*
Amphibians			
Houston toad	*Anaxyrus houstonensis*	LE/E	Be, Br, Bu, Fa, Gr, Le, Li, Mi, Ro, Wa, Wi
Salado Springs salamander	*Eurycea chisholmensis*	LT/--	Be, Wi
Georgetown salamander	*Eurycea naufragia*	LT/--	Wi
Barton Springs salamander	*Eurycea sosorum*	LE/E	Wi
Jollyville Plateau salamander	*Eurycea tonkawae*	LT/--	Wi
Black-spotted newt	*Notophthalmus meridionalis*	--/T	Li
Arachnids			
Reddell harvestman	*Reddell harvestman*	LE/--	WI
Bone Cave harvestman	*Texella reyesi*	LE/--	Wi
Birds			
Zone-tailed hawk	*Buteo albonotatus*	--/T	Be, Ca, Co, Cr, Ea, Ha, La, Wi
Red knot	*Calidris canutus rufa*	LT/--	Be, Bo, Br, Bu, Fa, Gr, Hi, Jo, Le, Li, Mc, Mi, Ro, Wa, Wi
Piping plover	*Charadrius melodus*	LT/T	Be, Bo, Br, Bu, Fa, Gr, Hi, Ho, Jo, Le, Li, Mc, Mi, Ro, So, Wa, Wi
Reddish egret	*Egretta rufescens*	--/T	Wa
Swallow-tailed kite	*Elanoides forficatus*	--/T	Br, Bu, Fa, Gr, Le, Li, Mi, Ro, Wa, Wi
Whooping crane	*Grus americana*	LE/E	Be, Bo, Br, Bu, Ca, Co, Cr, Ea, Er, Fa, Gr, Ha, Hs, Hi, Ho, Jo, Jn, Kn, La, Le, Li, Mc, Mi, Pa, Ro, Sh, So, St, Th, Wa, Wi, Yo
Bald eagle	*Haliaeetus leucocephalus*	--/T	Be, Bo, Br, Bu, Ca, Co, Cr, Ea, Er, Fa, Fi, Gr, Ha, Hs, Hi, Ho, Jo, Jn, Ke, Kn, La, Le, Li, Mc, Mi, Nola, Pa, Ro, Sh, So, St, Sn, Ta, Th, Wa, Wi, Yo
Black rail	*Laterallus jamaicensis*	PT/--	Be, Bo, Br, Bu, Ca, Co, Cr, Ea, Er, Fa, Fi, Gr, Ha, Hs, Hi, Ho, Jo, Jn, Ke, Kn, La, Le, Li, Mc, Mi, Nola, Pa, Ro, Sh, So, St, Sn, Ta, Th, Wa, Wi, Yo
Wood stork	*Mycteria americana*	--/T	Be, Br, Bu, Fa, Gr, Le, Li, Mi, Ro, Wa, Wi
Eskimo curlew	*Numenius borealis*	LE/E	Wa

Common Name	***Scientific Name***	***USFWS/State***	***County of Occurrence***
Red-cockaded woodpecker	*Picoides borealis*	LE/E	Gr
White-faced ibis	*Plegadis chihi*	--/T	Be, Bo, Br, Bu, Ca, Co, Cr, Ea, Er, Fa, Fi, Gr, Ha, Hs, Hi, Ho, Jo, Jn, Ke, Kn, La, Le, Li, Mc, Mi, Nola, Pa, Ro, Sh, So, St, Sn, Ta, Th, Wa, Wi, Yo
Golden-cheeked warbler	*Setophaga chrysoparia*	LE/E	Be, Bo, Cr, Cr, Ea, Er, Ha, Hi, Ho, Jo, La, Mc, Pa, So, St, Wi, Yo
Interior least tern	*Sternula antillarum athalassos*	LE/E	Be, Bo, Br, Bu, Co, Cr, Ea, Er, Fa, Gr, Ha, Hi, Ho, Jo, La, Le, Li, Mc, Mi, Pa, Ro, Sh, So, St, Th, Wa, Wi, Yo
Black-capped vireo	*Vireo atricapilla*	--/E	Be, Bo, Ca, Co, Cr, Ea, Er, Ha, Hi, Ho, Jo, La, Mc, No, Pa, Sh, So, St, Ta, Wi, Yo
Fish			
Western creek chubsucker	*Erimyzon claviformis*	--/T	Br, Gr
Smalleye shiner	*Notropis buccula*	LE/--	Be, Bo, Br, Bu, Fa, Fi, Hs, Hi, Ke, Kn, Mc, Mi, Pa, Ro, Sn, Wa, Yo
Sharpnose shiner	*Notropis oxyrhynchus*	LE/--	Bo, Br, Bu, Fa, Fi, Hs, Hi, Ke, Kn, Li, Mc, Mi, Pa, Ro, Sn, Wa, Yo
Paddlefish	*Polyodon spathula*	--/T	Gr
Insects			
Coffin Cave mold beetle	*Batrisodes texanus*	LE/--	Wi
Tooth Cave ground beetle	*Rhandine peresphone*	LE/--	Wi
Kretschmarr Cave mold beetle	*Texamaurops reddelli*	LE/--	Be, Wi
Mammals			
Louisiana black bear	*Ursus americanus luteolus*	--/T	Gr
Rafinesque's big-eared bat	*Corynorhinus rafinesquii*	--/T	Gr
Texas kangaroo rat	*Dipodomys elator*	--/T	Kn
Mollusks			
False spike mussel	*Quadrula mitchelli*	--/T	Mi, Wi
Texas fatmucket	*Lampsilis bracteata*	C/T	No, Ta
Smooth pimpleback	*Quadrula houstonensis*	C/T	Be, Bo, Br, Bu, Co, Cr, Fa, Gr, Ha, Hi, La, Le, Li, Mc, Mi, Ro, Sh, Wa, Wi
Texas fawnsfoot	*Truncilla macrodon*	C/T	Be, Bo, Br, Bu, Cr, Er, Fa, Gr, Ha, Hs, Hi, Ho, Jo, Jn, La, Li, Mc, Mi, Pa, Ro, Sh, So, St, Th, Wa, Wi, Yo

Common Name	*Scientific Name*	*USFWS/State*	*County of Occurrence*
Texas pimpleback	*Quadrula petrina*	C/T	La
Plants			
Large-fruited sand-verbena	*Abronia macrocarpa*	LE/E	Ro
Navasota ladies'-tresses	*Sprianthes parksii*	LE/E	Br, Bu, Gr, Li, Mi, Ro, Wa
Reptiles			
Alligator snapping turtle	*Macroclemys temminckii*	--/T	Gr, Li
Brazos water snake	*Nerodia harteri*	--/T	Bo, Er, Hs, Ho, Jo, Jn, Kn, La, Pa, Sh, So, St, Th, Yo
Texas Horned Lizard	*Phrynosoma cornutum*	--/T	Be, Bo, Br, Bu, Ca, Co, Cr, Ea, Er, Fa, Fi, Gr, Ha, Hs, Hi, Ho, Jo, Jn, Ke, Kn, La, Le, Li, Mc, Mi, Nola, Pa, Ro, Sh, So, St, Sn, Ta, Th, Wa, Wi, Yo
Timber Rattlesnake	*Crotalus horridus*	--/T	Bo, Br, Bu, Cr, Ea, Fa, Gr, Hi, Le, Mc, Mi, Ro, Ta, Wa, Wi

United States Fish and Wildlife Service Listing Abbreviations (USFWS):
LE: Endangered (in danger of extinction throughout all or a significant portion of its range)
LT: Threatened (likely to become endangered within the foreseeable future)
PE, PT: Proposed endangered/threatened
LE/SA,LT S/A: Endangered/threatened by similarity of appearance
DL, PDL: Delisted, proposed delisted
C: Candidate for listing, with biological vulnerability and threats to support listing
LT w/CH: Threatened with Critical Habitat in Texas
--: Not Federally Listed

Texas Parks and Wildlife Department (TPWD) Listing Abbreviations:
E: Listed as Endangered by the State of Texas
T: Listed as Threatened by the State of Texas
--: Rare, but with no regulatory listing status

County Name Abbreviations

Be:	Bell	Kn:	Knox
Bo:	Bosque	La:	Lampasas
Br:	Brazos	Le:	Lee
Bu:	Burleson	Li:	Limestone
Ca:	Callahan	Mc:	McLennan
Co:	Comanche	Mi:	Milam
Cr:	Coryell	No:	Nolan
Ea:	Eastland	Pa:	Palo Pinto
Er:	Erath	Ro:	Robertson
Fa:	Falls	Sh:	Shackelford
Fi:	Fisher	So:	Somervell
Gr:	Grimes	St:	Stephens
Ha:	Hamilton	Sn:	Stonewall
Hs:	Haskell	Ta:	Taylor
Hi:	Hill	Th:	Throckmorton
Ho:	Hood	Wa:	Washington
Jo:	Johnson	Wi:	Williamson
Jn:	Jones	Yo:	Young
Ke:	Kent		

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Appendix E
Detailed Information for Agricultural Resources

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Irrigation

Surveys of the BGRWPA counties were completed in 1994 by the TWDB and in 1997, and every five years thereafter, by the US Department of Commerce (Census of Agriculture). The total irrigated acreage for the BGRWPA was 214,096 acres in the 1994 survey, 186,955 acres in the 2007 survey, and 171,052 acres in 2017.

Irrigated acreage has declined from 1994 to the present time in the Cross Timbers Region by 33,535 acres. Acreage in Comanche and Erath Counties comprise the majority of total rrigated acreage in the region at 39 and 32 percent, respectively.

For the Rolling Plains Regiion, irrigated acreage decreased by 35,498 during the same period. The region is continuing in its trend toward dry land crops such as small grains, hay and silage. Haskell and Knox Counties contain the largest portions of total irrigated acreage in the region at 32 and 24 percent, respectively.

In the Southeast and Central Region, total irrigated acreage decreased by 43,044 acres between 1994 and present day. This region contains the greatest quantity of irrigated acreage in the BGRWPA at approximately 34 percent of all irrigated acreage. Robertson and Brazos Counties contain the most irrigated acreage among the counties in the Brazos G area.

The Blackland Region is the only region for which irrigated acreage has increased between 1994 and now; the total increase across this period within the region is 10,857 acres. Nearly 2/3 of the total irrigated acreage in the Blackland Region is within Falls, Johson, Milam, Bell and McLennan Counties.

Livestock

The Cross Timbers region is a major dairy area of the state. Erath County is the leading county in the Cross Timbers region as well as the Brazos G RWPA as a whole in terms of the number of dairy cows; Comanche County ranks second followed by Hamilton County in the Blacklands region at a distant third. Over 80 percent of the total number of dairy cows in the Brazos G RWPA are located in Erath and Comanche Counties. Dairy water requirements vary widely, depending on the types of waste removal and cow washing systems. Surveys of 11 dairies in Erath County in the early 1990s showed a daily water use of about 100 gallons per milking cow on dairies with sprinklers for washing cow udders prior to milking. The water use included about 30 gallons of drinking water, 40 gallons for manure removal and 30 gallons for washing cow udders prior to milking. If the dairy does not use a cow washing system, the daily water use averaged about 80 gallons per milking cow. For an average of 100 gallons of water per day per milking cow, the BGRWPA dairy water use for 96.112 milking cows is 897 acre feet per month. The source of this water is virtually all ground water from the Trinity Aquifer as each dairy has its own water supply. With farm numbers declining and size increasing more producers are adopting the latest technology to increase profitability. The evolution from pasture and dry lot to free stall barns will require greater water use. Misting and evaporative systems for summer months will be needed for animal cooling purposes. Manure removal, sanitation, and disinfection will elevate water use as well

Other significant livestock raised in the BGRWPA in 2017 were cattle and calves, beef cattle, swine, and sheep. Total number of swine and sheep of all ages were 17,011 and 116,934, respectively. Beef cows numbered 609,657 head and all cattle and calves totaling 2,007,473.

Table E-1. 2017 Agricultural Production Statistics

Agricultural District	***Market Value ($1,000)***			***Livestock % Value***	***Area (Acres)***			
	Crops	***Livestock***	***Total***		***Farmland***	***Cropland***	***Harvested***	***Irrigated***
Rolling Plains (2N and 2S)								
Fisher	26,969	8,770	35,739	25%	477,985	248,701	117,465	10,483
Haskell	37,084	17,234	54,318	32%	565,019	292,993	171,959	14,799
Jones	29,853	11,637	41,490	28%	516,507	313,784	163,775	4,584
Kent	1,027	8,839	9,866	90%	577,532	45,233	8,274	*
Knox	13,546	46,982	60,528	78%	488,811	207,442	84,359	11,204
Nolan	25,790	10,819	36,609	30%	466,360	161,878	82,492	3,500
Stonewall	6,878	8,665	15,543	56%	468,896	113,441	32,801	829
Taylor	11,155	20,386	31,541	65%	484,257	159,183	73,715	1,237
Subtotal, Rolling Plains	152,302	133,332	285,634	47%	4,045,367	1,542,655	734,840	46,636
Cross Timbers (3)								
Callahan	3,043	28,197	31,240	90%	477,812	85,494	38,364	228
Comanche	23,374	149,891	173,265	87%	486,940	137,619	79,666	17,388
Eastland	4,969	18,550	23,519	79%	489,773	80,149	36,910	1,862
Erath	19,105	293,172	312,277	94%	625,532	134,317	83,481	14,310
Hood	7,693	11,251	18,944	59%	205,407	39,738	26,751	2,746
Palo Pinto	10,280	32,939	43,219	76%	572,847	72,990	24,915	4,383
Shackelford	812	15,797	16,609	95%	536,848	49,374	12,211	315
Somervell	1,152	2,948	4,100	72%	82,967	15,692	10,890	348
Stephens	568	10,056	10,624	95%	470,191	37,077	7,959	274
Throckmorton	5,519	21,741	27,260	80%	506,892	157,174	55,675	384
Young	2,599	19,095	21,694	88%	574,982	114,482	30,912	1,863
Subtotal, Cross Timbers	79,114	603,637	682,751	88%	5,030,191	924,106	407,734	44,101
Blacklands (4)								
Bell	38,084	38,947	77,031	51%	487,052	152,593	125,623	2,305
Bosque	6,950	38,109	45,059	85%	626,135	81,212	50,870	1,366
Coryell	8,180	28,096	36,276	77%	456,973	92,075	46,919	1,372
Falls	42,395	115,545	157,940	73%	391,898	203,819	134,445	3,964
Hamilton	6,358	55,668	62,026	90%	483,812	86,099	42,709	1,509
Hill	64,572	49,429	114,001	43%	523,070	256,384	222,565	1,197

Agricultural District	Market Value ($1,000)			Livestock % Value	Area (Acres)			
	Crops	Livestock	Total		Farmland	Cropland	Harvested	Irrigated
Johnson	17,116	40,734	57,850	70%	411,151	136,697	105,382	3,735
Lampasas	2,019	16,421	18,440	89%	469,013	40,422	17,210	447
Limestone	10,018	56,239	66,257	85%	492,631	72,996	51,347	479
McLennan	59,457	120,209	179,666	67%	573,288	262,493	222,963	2,232
Milam	33,273	96,245	129,518	74%	497,481	168,032	119,711	2,680
Williamson	66,101	48,822	114,923	42%	559,261	231,511	192,774	1,586
Subtotal, Blacklands	354,523	704,464	1,058,987	67%	5,971,765	1,784,333	1,332,518	22,872
Southeast and Central (5S and 8N)								
Brazos	15,603	76,034	91,637	83%	290,539	50,016	37,633	12,059
Burleson	22,340	36,251	58,591	62%	333,334	67,888	53,045	17,941
Grimes	14,041	33,468	47,509	70%	340,833	54,265	45,233	3,981
Lee	15,226	41,717	56,943	73%	328,668	41,365	31,673	788
Robertson	24,623	133,520	158,143	84%	474,785	107,261	82,635	20,356
Washington	5,456	30,159	35,615	85%	320,184	68,726	52,761	2,318
Subtotal, Southeast and Central	97,289	351,149	448,438	78%	2,088,343	389,521	302,980	57,443
Region Total	**683,228**	**1,792,582**	**2,475,810**	**72%**	**17,135,666**	**4,640,615**	**2,778,072**	**171,052**

Source: 2017 Census of Agriculture: https://www.nass.usda.gov/Quick_Stats/CDQT/chapter/1/table/1.

*Information withheld to avoid disclosing data for individual farms.

Table E-2. Livestock Numbers—2017 Census of Agriculture

Agricultural District	*Cattle and Calves*	*Beef Cows*	*Dairy Cows*	*Swine*	*Sheep*
Rolling Plains (2N and 2S)					
Fisher	19,981	11,006	3	*	138
Haskell	26,684	10,072	0	314	318
Jones	22,624	11,553	0	226	1,977
Kent	17,095	10,448	0	0	0
Knox	27,010	7,096	0	*	*
Nolan	13,935	6,896	0	486	205
Stonewall	24,364	11,018	0	54	480
Taylor	41,163	*	*	186	1,050
Subtotal, Rolling Plains	192,856	68,089	3	1,266	4,168
Cross Timbers (3)					
Callahan	49,682	27,442	0	156	1,645
Comanche	118,048	39,747	26,477	1,324	12,196
Eastland	43,876	24,496	86	1,210	3,953
Erath	183,469	42,250	54,378	296	9,041
Hood	22,453	13,182	0	198	1,460
Palo Pinto	43,186	21,998	0	127	2,397
Shackelford	29,764	15,949	0	6	*
Somervell	7,347	4,057	0	28	1,104
Stephens	23,196	12,982	0	125	549
Throckmorton	41,715	17,954	0	23	*
Young	38,181	*	*	257	621
Subtotal, Cross Timbers	600,917	220,057	80,941	3,750	32,966
Blacklands (4)					
Bell	36,868	*	*	803	5,150

Agricultural District	*Cattle and Calves*	*Beef Cows*	*Dairy Cows*	*Swine*	*Sheep*
Bosque	51,327	24,182	0	229	2,349
Coryell	54,847	26,279	0	538	12,101
Falls	115,649	*	*	206	2,242
Hamilton	66,072	26,686	8,324	471	15,680
Hill	60,770	*	*	640	3,579
Johnson	62,889	28,786	3,606	523	3,139
Lampasas	27,589	*	*	110	13,746
Limestone	77,749	37,435	310	239	737
McLennan	86,168	36,934	2,872	590	6,121
Milam	80,225	*	*	978	2,700
Williamson	78,853	34,109	0	377	6,929
Subtotal, Blacklands	799,006	214,411	15,112	5,704	74,473
Southeast and Central (5S and 8N)					
Brazos	63,394	31,506	56	1,468	2,450
Burleson	56,360	35,575	0	794	844
Grimes	57,350	*	*	858	726
Lee	76,128	40,019	0	1,144	767
Robertson	93,789	*	*	1,110	148
Washington	67,673	*	*	917	392
Subtotal, Southeast and Central	414,694	107,100	56	6,291	5,327
Region Total	***2,007,473***	***609,657***	***96,112***	***17,011***	***116,934***

Source: 2017 Census of Agriculture: https://www.nass.usda.gov/Quick_Stats/CDQT/chapter/1/table/1.

*Information withheld to avoid disclosing data for individual farms.

Table E-3. Selected Crop Acreages—2017 Census of Agriculture

	Grains							
Agricultural District	*Corn*	*Sorghum*	*Wheat*	*Cotton*	*Soybeans*	*All Hay & Silage*	*Peanuts*	*Total in County*
Rolling Plains (2N and 2S)								
Fisher	2,478	*	*	76,475	0	10,845	0	89,798
Haskell	*	5,767	81,389	85,786	0	6,340	1,107	180,389
Jones	0	1,852	67,055	79,795	0	13,687	0	162,389
Kent	0	*	4,639	2,043	0	1,440	0	8,122
Knox	0	*	62,024	16,527	0	5,482	0	84,033
Nolan	*	1,590	15,274	60,821	0	6,159	0	83,844
Stonewall	0	*	4,411	23,047	0	4,537	0	31,995
Taylor	0	3,095	31,449	18,085	0	20,481	0	73,110
Subtotal, Rolling Plains	2,478	12,304	266,241	362,579	0	68,971	1,107	713,680
Cross Timbers (3)								
Callahan	0	*	21,892	*	0	15,638	0	37,530
Comanche	1,060	781	3,103	6,050	*	48,609	2,136	61,739
Eastland	*	*	2,805	*	0	30,442	*	33,247
Erath	*	1,449	1,401	195	0	70,205	177	73,427
Hood	0	0	*	0	0	23,503	0	23,503
Palo Pinto	0	0	1,840	0	0	20,940	0	22,780
Shackelford	*	0	5,734	*	0	4,879	0	10,613
Somervell	0	0	0	0	0	10,483	0	10,483
Stephens	0	300	1,506	0	0	6,146	0	7,952
Throckmorton	0	*	45,532	2,681	0	6,956	0	55,169
Young	0	0	18,687	777	0	11,192	0	30,656
Subtotal, Cross Timbers	1,060	2,530	102,500	9,703	0	248,993	2,313	367,099
Blacklands (4)								
Bell	67,409	7,264	14,635	6,261	*	28,533	0	124,102

Agricultural District	Grains			Cotton	Soybeans	All Hay & Silage	Peanuts	Total in County
	Corn	Sorghum	Wheat					
Bosque	3,965	1,299	5,035	6,243	0	33,526	0	50,068
Coryell	1,657	4,705	6,596	*	5,111	23,891	0	41,960
Falls	66,617	2,455	18,087	4,676	3,499	28,434	0	123,768
Hamilton	*	1,335	2,946	742	*	30,199	0	35,222
Hill	102,992	3,587	38,929	20,690	352	46,187	0	212,737
Johnson	21,843	2,585	15,826	3,634	4,056	56,063	0	104,007
Lampasas	0	0	2,242	0	0	13,643	0	15,885
Limestone	7,114	637	*	4,687	*	34,760	0	47,198
McLennan	88,312	5,243	35,796	11,308	*	65,699	0	206,358
Milam	45,752	10,072	7,994	13,473	1,048	39,064	0	117,403
Williamson	108,423	8,970	13,714	27,204	0	33,790	0	192,101
Subtotal, Blacklands	514,084	48,152	161,800	98,918	14,066	433,789	0	1,270,809
Southeast and Central (5S and 8N)								
Brazos	1,788	1,428	0	11,527	0	20,642	0	35,385
Burleson	8,618	2,802	*	9,262	1,048	29,192	0	50,922
Grimes	*	*	900	*	0	40,308	0	41,208
Lee	355	*	*	0	*	30,504	0	30,859
Robertson	19,593	3,746	*	12,309	4,192	39,439	0	79,279
Washington	46	0	*	*	0	51,656	0	51,702
Subtotal, Southeast and Central	30,400	7,976	900	33,098	5,240	211,741	0	289,355
Region Total	548,022	70,962	531,441	504,298	19,306	963,494	3,420	2,640,943

Source: 2017 Census of Agriculture - https://www.nass.usda.gov/Quick_Stats/CDQT/chapter/1/table/1
*Information withheld to avoid disclosing data for individual farms.

Table E-4. Summary of Irrigation Surveys

Agricultural District	*Irrigated Acreage*		
	2007US Agricultural Census	***2012 US Agricultural Census***	***2017 US Agricultural Census***
Rolling Plains (2N and 2S)			
Fisher	4,569	2,553	10,483
Haskell	35,058	27,500	14,799
Jones	3,877	3,576	4,584
Kent	815	1,092	*
Knox	21,929	21,583	11,204
Nolan	5,158	3,307	3,500
Stonewall	2,399	741	829
Taylor	5,087	1,095	1,237
Subtotal, Rolling Plains	78,892	61,447	46,636
Cross Timbers (3)			
Callahan	633	704	228
Comanche	12,627	18,101	17,388
Eastland	5,141	8,930	1,862
Erath	12,101	12,337	14,310
Hood	4,336	2,821	2,746
Palo Pinto	601	712	4,383
Shackelford	*	*	315
Somervell	473	59	348
Stephens	226	*	274
Throckmorton	1,358	*	384
Young	*	229	1,863
Subtotal, Cross Timbers	37,496	43,893	44,101

Agricultural District	*Irrigated Acreage*		
	2007US Agricultural Census	***2012 US Agricultural Census***	***2017 US Agricultural Census***
Blacklands (4)			
Bell	2,746	3,084	2,305
Bosque	1,043	656	1,366
Coryell	767	420	1,372
Falls	4,361	5,069	3,964
Hamilton	763	619	1,509
Hill	1,189	920	1,197
Johnson	1,907	2,386	3,735
Lampasas	437	166	447
Limestone	759	330	479
McLennan	2,937	3,509	2,232
Milam	2,784	2,486	2,680
Williamson	964	1,281	1,586
Subtotal, Blacklands	20,657	20,926	22,872
Southeast and Central (5S and 8N)			
Brazos	9,027	7,291	12,059
Burleson	14,480	19,598	17,941
Grimes	1,991	1,609	3,981
Lee	1,433	940	788
Robertson	21,541	19,679	20,356
Washington	1,438	1,438	2,318
Subtotal, Southeast and Central	49,910	50,555	57,443
Region Total	186,955	176,821	171,052

Source: 2017 Census of Agriculture - https://www.nass.usda.gov/Quick_Stats/CDQT/chapter/1/table/1
* Withheld to avoid disclosing data for individual farms

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Appendix F
Surface Water Supplies

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TABLE F-1. Brazos River Basin Water Rights in the Brazos G Area

Water Right Number	Type (6 = Certificate of Adjudication, 1 = Permit)	Sequence	Permit #	OwnerName	Annual Authorized Diversion (acft)	Use Type	Priority Date	Reservoir Name	Reservoir Capacity (acft)
1015	6	1		BETTY JUNE PASCHAL	45	Irrigation	11/4/1969		
1030	6	1		ALVA C ALEXANDER	17	Irrigation	1/1/1964		
1051	6	1		DOUGLAS R STEVENS	4	Irrigation	1/1/1966		
1052	6	1		CAROLYN MAY BROWN	22	Irrigation	1/1/1963		
1053	6	1		JANET BURNS	110	Irrigation	1/1/1962		
1054	6	1		MARY L MARKS	26	Irrigation	1/1/1961		
1061	6	1		GARLAND H RICHARDS	549	Irrigation	9/2/1969		713
1103	6	1		BETTY SMITH WESSELS	50	Irrigation	6/20/1961		
1104	6	1		DAVID SMITH	25	Irrigation	4/1/1963		
1105	6	1		JAMES E SMITH JR	69	Irrigation	4/1/1963		
1106	6	1		LLOYD H GILES	5	Irrigation	1/1/1967		
1107	6	1		DALE K PRICE ET UX	30	Irrigation	5/1/1963		
1660	6	1		CITY OF CLYDE	1000	Municipal	2/2/1965	LAKE CLYDE	5748
1660	6	2		CITY OF CLYDE		Recreation	2/2/1965	LAKE CLYDE	
1661	6	1		L G CHRANE	26	Irrigation	5/15/1967		29
1662	6	1		L G CHRANE	35	Irrigation	5/15/1967		35
1663	6	1		LINDA JO PARKER	36	Irrigation	5/15/1967		36
1664	6	1		ROSALEA C BONNER ET AL	164	Irrigation	10/13/1969		200
1666	6	1		J H SMART	65	Irrigation	2/24/1969	LITTLE PECAN	76
1667	6	1		JOHN D MONTGOMERY	120	Irrigation	7/29/1974		124
1672	6	1		EDWIN M EDWARDS ET UX		Domestic/Livestock	1/26/1970		93
1673	6	1		ESTATE OF CLAUD JOY	22	Irrigation	1/1/1966		
1674	6	1		PAULINE COATS LAWSON	88	Irrigation	9/9/1968		88
1675	6	1		YVONNE PEEVEY & E GALLIVAN	2	Irrigation	1/1/1963		
1676	6	1		ESTATE OF DAN L CHILDRESS ET AL	45	Irrigation	3/16/1964		45
1677	6	1		CHAD CUNNINGHAM ET UX	90	Irrigation	5/13/1963		111
1678	6	1		WELDON J LAMB ET AL	134	Irrigation	12/9/1963		183
1679	6	1		DOROTHY W WHITTINGTON	40	Irrigation	3/24/1969		132
1680	6	1		COLLIS EAGER	40	Irrigation	3/24/1969		132
1681	6	1		MATACORP LTD A TEXAS LP	40	Irrigation	3/24/1969		132
1682	6	1		G V CUNNINGHAM	30	Irrigation	2/10/1971		185
1683	6	1		OLIVER D WORTHY	65	Irrigation	2/10/1971		185
1684	6	1		RAYMOND A DEBUSK	7	Irrigation	1/1/1966		
1689	6	1		LAKEWOOD RECREATIONAL CENTER	22	Irrigation	8/9/1965		150
1694	6	1		J W VINSON		Domestic/Livestock	2/21/1966		12
1695	6	1		R & N CATTLE CO	34.235	Irrigation	2/2/1970		
1695	6	2		BELIA I LOYOLA	145.765	Irrigation	2/2/1970		180
1696	6	1		GERALD N REID	49	Irrigation	3/1/1947		
1697	6	1		TOMMY JOE & HELEN R ABBOTT	5	Irrigation	11/22/1918		450
1697	6	2		TOMMY JOE & HELEN R ABBOTT	7	Irrigation	6/20/1961		
1697	6	3		TOMMY JOE & HELEN R ABBOTT	48	Industrial	6/20/1961		
1763	6	1		ERWIN T BAUCUM TRUSTEE	2.7	Irrigation	11/22/1918		
1763	6	2		ERWIN T BAUCUM TRUSTEE	3.5	Irrigation	6/20/1961		
1764	6	1		I H STEED TRUSTEE	26.9	Irrigation	11/22/1918		
1764	6	2		I H STEED TRUSTEE	34.5	Irrigation	6/20/1961		
2201	6	1		A B COPELAND JR	197	Irrigation	3/18/1968		
2202	6	1		JAMES F EVERETT		Domestic/Livestock	8/21/1972		252
2203	6	1		LARRY R JONES		Domestic/Livestock	8/21/1972		252
2204	6	1		JERRY J RANKIN ET AL		Domestic/Livestock	8/21/1972		252
2205	6	1		JACK BERRY	150	Irrigation	12/21/1970		307
2206	6	1		RONNIE DUANE BRANCH ET UX	60	Irrigation	1/3/1972		185
2207	6	1		ELVIS RAY STONE SR ET AL	23	Irrigation	1/3/1972		185
2208	6	1		B R FANNING	40	Irrigation	7/6/1971		121
2208	6	2		JOHN MOCEK ET UX	20	Irrigation	7/6/1971		
2209	6	1		H B LANE	3	Irrigation	9/12/1977		7
2210	6	1		RAYMOND L JARRATT	92	Irrigation	4/1/1953		
2211	6	1		J T HICKS	85	Irrigation	1/24/1977		147
2212	6	1		BRUCE S TERRILL		Domestic/Livestock	8/21/1972		200
2213	6	1		WILBURN L GAINES		Domestic/Livestock	8/21/1972		200

TABLE F-1. Brazos River Basin Water Rights in the Brazos G Area

Water Right Number	Type (6 = Certificate of Adjudication, 1 = Permit)	Sequence	Permit #	OwnerName	Annual Authorized Diversion (acft)	Use Type	Priority Date	Reservoir Name	Reservoir Capacity (acft)
2214	6	1		G K LEWALLEN		Domestic/Livestock	8/21/1972		200
2215	6	1		GREAT SOUTHERN RANCH INC	54	Irrigation	2/26/1968		160
2216	6	1		CRAIG W RAY	54	Irrigation	2/26/1968		160
2217	6	1		O H FRAZIER & M B CASEY		Domestic/Livestock	2/5/1973		240
2218	6	1		SAMUEL M FRAZIER ET AL		Domestic/Livestock	7/10/1978		240
2219	6	1		JAMES F JOHNSON ET UX	13	Irrigation	12/31/1964		
2220	6	1		HAROLD PACK	12	Irrigation	5/31/1963		
2221	6	1		KENNETH & BETTY YVON LESLEY	18	Irrigation	12/31/1962		
2221	6	2		KENNETH & BETTY YVON LESLEY	82	Irrigation	11/4/1999		
2222	6	1		HARM & ZWAANTINA TE VELDE TRST	110	Irrigation	10/31/1962		
2223	6	1		JEFF BUSBY		Irrigation	8/15/1977		
2224	6	1		VALERIE JANE HICKIE		Domestic/Livestock	3/11/1974		280
2225	6	1		TY MURRAY	34	Irrigation	6/30/1966		
2226	6	1		T T FAIR ET UX	61	Irrigation	7/31/1960		
2227	6	1		CHARLIE S EVERETT & WIFE	60	Irrigation	11/18/1965		
2228	6	1		ERMA GAYNELLE RICHARDSON	60	Irrigation	2/26/1968		272
2229	6	1		W T CRUMLEY ET UX	44	Irrigation	5/31/1953		
2230	6	1		TY MURRAY	76	Irrigation	10/24/1966		200
2231	6	1		ESTATE OF C C WINTERS	42	Irrigation	10/24/1966		200
2232	6	1		CHARLES A & ROBERT S ELLIOTT	16	Irrigation	3/25/1968		172
2233	6	1		J W OGLE ET AL	18	Irrigation	7/31/1957		
2234	6	1		BRUCE E TODD	125	Irrigation	12/31/1963		
2235	6	1		7 M RANCH TRUST	8	Irrigation	4/30/1963		
2236	6	1		BRUCE E TODD	24	Irrigation	12/31/1961		
2237	6	1		MAX L GORDON & ELOISE GORDON	90	Irrigation	6/4/1958		181
2238	6	1		JON DAVID MAYFIELD TRUST	106.02	Irrigation	7/31/1955		60
2238	6	2		LYNDA KIKER MAYFIELD	89.98	Irrigation	7/31/1955		
2239	6	1		A H LINNE	32	Irrigation	6/27/1955		164
2240	6	1		A DWAIN MAYFIELD ET AL	137	Irrigation	10/13/1970		137
2241	6	1		WAYNE PITTMAN ET AL	33	Irrigation	12/22/1969		148
2242	6	1		MRS W K RICHARDSON	40	Irrigation	12/22/1969		148
2243	6	1		BETTY E ROBBINS ET AL	90	Irrigation	9/8/1958		188
2244	6	1		DONALD MCLEAN	27	Irrigation	2/2/1965		54
2245	6	1		DORIS S HEIZER	20	Irrigation	2/2/1965		54
2246	6	1		DON MITCHELL ET AL	152	Irrigation	3/30/1966		199
2247	6	1		BAR-TO-LO CORPORATION	35	Irrigation	4/8/1968		179
2247	6	2		BAR-TO-LO CORPORATION	50	Irrigation	7/13/1995		27
2248	6	1		ALWINA LUINE HEIZER HANCOCK	62	Irrigation	9/30/1957		179
2249	6	1		THOMAS H & DOLORES C BENSON	19	Irrigation	4/8/1968		179
2250	6	1		JAMES ALLEN SHADDEN	4	Irrigation	7/31/1967		
2251	6	1		TOMMY W TRIMBLE JR	28	Irrigation	7/18/1963		
2252	6	1		J B PUTTY TRUSTEE	30	Irrigation	12/31/1963		
2253	6	1		J P CATTLE COMPANY		Domestic/Livestock	7/30/1973		270
2254	6	1		W E PUTTY	65	Irrigation	12/31/1955		
2255	6	1		WAYNE V DUNCAN ET UX	47.65	Irrigation	12/31/1962		
2255	6	2		ROBERT L BOYKIN ET AL	26.83	Irrigation	12/31/1962		
2255	6	3		GARY W DUNCAN ET AL	84.52	Irrigation	12/31/1962		
2258	6	1		ROBERT E SPOLEC ET UX	32	Irrigation	12/31/1966		
2259	6	1		F MELVIN JOHNSON	112	Irrigation	12/31/1965		
2260	6	1		F MELVIN & HELENE JOHNSON	56	Irrigation	7/31/1950		
2261	6	1		CECIL PARKS	8	Irrigation	12/31/1967		
2262	6	1		VERNON CLARK BEAIRD	30	Irrigation	12/31/1967		
2263	6	1		WILLIAM VAN ZANDT SLOAN & WIFE	65	Irrigation	12/31/1959		
2264	6	1		WILLIAM VAN ZANDT SLOAN & WIFE	45	Irrigation	12/31/1955		
2265	6	1		DEREL FILLINGIM	268	Irrigation	12/31/1955		
2266	6	1		KARL T BUTZ JR	18	Irrigation	12/31/1966		
2267	6	1		RONNIE W PARTAIN	0.2572	Irrigation	12/31/1947		
2267	6	2		MARGO JOY PARTAIN BATTERSHELL	0.7428	Irrigation	12/31/1947		
2268	6	1		BARRY L POLK ET UX	11	Irrigation	12/31/1963		

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Water Right Number	Type (6 = Certificate of Adjudication, 1 = Permit)	Sequence	Permit #	OwnerName	Annual Authorized Diversion (acft)	Use Type	Priority Date	Reservoir Name	Reservoir Capacity (acft)
2269	6	1		MICHAEL J LOTT ET UX	4	Irrigation	12/31/1966		
2270	6	1		J N BURNS	24	Irrigation	5/31/1967		26
2271	6	1		ALBERT N PIKE	15	Irrigation	12/31/1950		
2271	6	2		EUGENIA PIKE GOODMAN		Irrigation	12/31/1950		
2272	6	1		KKW2 LTD	42	Irrigation	12/31/1966		
2273	6	1		W F LONG	98	Irrigation	11/6/1979	UPPER HOUSE, HOUSE & SHIPMAN	528
2276	6	1		LOUIS A BEECHERL JR	90	Irrigation	12/31/1954	10 RESERVOIRS	3399
2276	6	2		LOUIS A BEECHERL JR	81	Irrigation	10/20/1969	10 RESERVOIRS	
2276	6	3		LOUIS A BEECHERL JR	155	Irrigation	10/20/1969	10 RESERVOIRS	
2277	6	1		THOMAS G PETERS ET UX	10	Irrigation	12/31/1951		
2278	6	1		WILLIAM E GIPSON	114	Irrigation	12/31/1966		
2279	6	1		JOHN DAVID BELL ET UX	9	Irrigation	12/31/1967		
2280	6	1		JOHN DAVID BELL ET UX	69	Irrigation	7/31/1955		
2281	6	1		RAY J MILLER	7	Irrigation	4/30/1960		
2282	6	1		LESTER M ALBERTHAL JR	253	Irrigation	12/31/1958		
2283	6	1		MARGARET D WHITE	8	Irrigation	12/31/1964		
2284	6	1		L C HOWARD JR ET UX	25	Irrigation	12/31/1939		
2284	6	2		E R HOWARD ET UX		Irrigation	12/31/1939		
2285	6	1		LEONARD C RADDE	35	Irrigation	12/31/1949		
2287	6	1		BILLY G AND IRIS S HODGES	7	Irrigation	12/31/1965		13
2288	6	1		SHANNON LAIRD HODGES ET AL	3.5	Irrigation	12/31/1965		
2289	6	1		TEXAS PARKS & WILDLIFE DEPT		Recreation	9/22/1969		360
2290	6	1		J L JENSON	16.1	Irrigation	12/31/1956		
2290	6	2		LINNIE B CROSLEY ET VIR	28.9	Irrigation	12/31/1956		
2291	6	1		CITY OF CLIFTON	600	Municipal	3/14/1963	EXEMPT	100
2291	6	2		CITY OF CLIFTON	7	Irrigation	12/31/1963		
2292	6	1		W O GLOFF	261	Irrigation	12/31/1949		
2293	6	1		PATRICK H WILSON ET UX	7	Irrigation	12/31/1905		
2294	6	1		RD JL & ML LUNDBERG	80	Irrigation	6/30/1946		
2295	6	1		REGINALD & NALLIE LINDBERG	49	Irrigation	6/30/1953		
2298	6	1		CHARLES E STEVENS	104	Irrigation	4/5/1965		
2299	6	1		D I BULLION	22	Irrigation	12/31/1960		
2300	6	1		WILLIAM J HIX ET AL	100	Irrigation	12/31/1967		
2301	6	1		ABIGAIL HALBERT KAMM	70	Irrigation	5/31/1958		
2302	6	1		STEVEN K CAPERTON ET UX	122	Irrigation	12/31/1966		
2303	6	1		THEODORE A NUGENT ET UX	30	Irrigation	6/30/1955		
2304	6	1		HUGH WHITFIELD DAVIS	3.132	Irrigation	6/30/1955		
2304	6	2		THEODORE A NUGENT ET UX	43.868	Irrigation	6/30/1955		
2305	6	1		TALBERT FARMS LLC	40	Irrigation	7/31/1963		
2306	6	1		LYNDA GAIL BRITTON POWERS	5	Irrigation	12/31/1899		
2307	6	1		SAMUEL N & TESSIE B CARROLL	23	Irrigation	12/31/1963		
2308	6	1		IRA H WESTERFIELD	10	Irrigation	7/31/1966		
2309	6	1		JERRY AND JOY CLEMMONS	10	Irrigation	12/31/1967		
2310	6	1		JIM HERING	16	Irrigation	12/31/1946		18
2311	6	1		W T HIX		Domestic/Livestock	5/16/1977		740
2312	6	1		ROBERT HALL	162	Irrigation	12/31/1950		55
2313	6	1		IRA H WESTERFIELD	14	Irrigation	7/31/1985		5
2314	6	1		RAINBOW LAKE INC		Recreation	12/31/1930		105
2315	6	1		CITY OF WACO	39100	Municipal	1/10/1929	LAKE WACO	104100
2315	6	2		CITY OF WACO		Industrial	1/10/1929	LAKE WACO	
2315	6	3		CITY OF WACO	19100	Municipal	4/16/1958	LAKE WACO	
2315	6	4		CITY OF WACO		Industrial	4/16/1958	LAKE WACO	
2315	6	5		CITY OF WACO	900	Irrigation	2/21/1979	LAKE WACO	
2315	6	6		CITY OF WACO	16802	Industrial	1/10/1929	LAKE WACO	
2316	6	1		C L SLIGH FARMS	193	Irrigation	10/30/1925		
2317	6	1		CHARLOTTE B JOHNSON ET AL	248	Irrigation	11/20/1918		
2318	6	1		FRANK W SIPAN ET AL	35	Irrigation	12/31/1957		
2579	6	1		JAMES GENE PLENTL ET UX	7.1	Irrigation	12/31/1942		
2579	6	2		JAMES LEE RICE ET UX	15.9	Irrigation	12/31/1942		

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Water Right Number	Type (6 = Certificate of Adjudication, 1 = Permit)	Sequence	Permit #	OwnerName	Annual Authorized Diversion (acft)	Use Type	Priority Date	Reservoir Name	Reservoir Capacity (acft)
2580	6	1		JAMES I HARDY ET UX	8.73	Irrigation	12/31/1930		
2580	6	2		LESLIE HARDY	33.98	Irrigation	12/31/1930		
2580	6	3		JANICE MILES	30.29	Irrigation	12/31/1930		
2581	6	1		BONNIE TERRY	24.95	Irrigation	12/31/1930		
2581	6	2		ROBERT E TERRY	47.51	Irrigation	12/31/1930		
2581	6	3		FLOYD G SELF JR ET UX	47.56	Irrigation	12/31/1930		
2581	6	4		DANNY LEE TERRY	23.98	Irrigation	12/31/1930		
2585	6	1		LAZY H INC	119	Irrigation	12/31/1959		
2586	6	1		W A SPIVEY	86	Irrigation	12/31/1955		
2587	6	1		LESTER GIBSON AND FOY GIBSON	83	Irrigation	2/28/1955		
2588	6	1		FOY GIBSON	15	Irrigation	12/31/1911		
2589	6	1		LESTER GIBSON	26	Irrigation	12/31/1911		
2590	6	1		LESTER GIBSON AND FOY GIBSON	66	Irrigation	12/31/1911		
2592	6	1		LESTER GIBSON AND FOY GIBSON	94	Irrigation	12/31/1911		
2594	6	1		MORRIS L ELLIS ET UX	122	Irrigation	12/31/1911		
2596	6	1		VICKIE R MARLEY MCDANIEL ET AL	6	Irrigation	12/31/1966		
2597	6	1		PHILLIP L MORRIS	4.9	Irrigation	3/31/1964		
2597	6	2		LOLA E MORRIS	2.1	Irrigation	3/31/1964		
2599	6	1		STANLEY MERLIN MCANELLY	96	Irrigation	12/31/1930		
2600	6	1		ELSIE MILLICAN ET AL	203	Irrigation	12/31/1954		
2605	6	1		VICKI LEE WILLIAMS BROWN	65	Irrigation	12/31/1965		
2813	6	1		RUDOLPH CARL DROSCHE JR	153	Irrigation	7/22/1965		
2814	6	1		GRACE OLENA ADAMS	0	Storage	12/31/1953		3
2814	6	2		LARRY WAYNE ADAMS	118.6	Irrigation	12/31/1953		
2814	6	3		LARRY WAYNE ADAMS	83	Irrigation	12/31/1953		
2814	6	4		CHARLIE THOMAS	170	Irrigation	12/31/1953		
2815	6	1		NANCY PAGE ALLEN ET VIR	69	Irrigation	12/31/1968		
2816	6	1		JOE B COOPER III ET UX	36	Irrigation	12/31/1968		
2818	6	1		P D GUNTER	18	Irrigation	8/31/1950		
2819	6	1		J B GUNTER	32	Irrigation	8/31/1950		
2820	6	1		WILLIAM R & CAROLINE MILLER	46	Irrigation	12/31/1966		
2821	6	1		JUANITA M ANDERS ET VIR	29	Irrigation	12/31/1965		
2822	6	1		MCMINN RANCHES LTD	106	Irrigation	12/31/1965		
2823	6	1		J E TATUM	22	Irrigation	12/31/1957		
2824	6	1		MAX DERDEN	39.42	Irrigation	12/31/1963		
2824	6	2		CHARLES S THOMAS ET UX	50.58	Irrigation	12/31/1963		
2825	6	1		MONTE CARMICHAEL ET AL	80	Irrigation	3/31/1967		
2826	6	1		BURK DENMAN	46	Irrigation	7/31/1966		
2827	6	1		J A DENMAN	6	Irrigation	12/31/1957		
2828	6	1		J A DENMAN	24	Irrigation	12/31/1957		
2829	6	1		MARTIN L GEYE ET AL	56	Irrigation	3/31/1960		
2830	6	1		O J BLAKEY	87	Irrigation	8/31/1954		
2830	6	2		DON GROMATZKY	30	Irrigation	8/31/1954		
2831	6	1		GARY CROW	57	Irrigation	12/31/1960		
2832	6	1		ANN WEAVER ADAIR	47	Irrigation	12/31/1966		
2833	6	1		JOANNA HOFER	24	Irrigation	7/31/1966		
2834	6	1		WILLIE EYVONNE MANNING RAY	43	Irrigation	12/31/1961		
2835	6	1		WILLIAM MILTON NORTH	293.62	Irrigation	5/31/1958		
2836	6	1		NELSON SHAVE	87	Irrigation	12/31/1967		
2837	6	1		WADE N CARAWAY	135.92	Irrigation	5/31/1958		
2837	6	2		WADE N CARAWAY	47.46	Irrigation	5/31/1967		
2838	6	1		ED A ROSS ET AL	37	Irrigation	12/31/1961		
2839	6	1		ED A ROSS ET AL	40	Irrigation	12/31/1961		
2840	6	1		ED A ROSS ET AL		Storage	11/6/1978		13
2841	6	1		WALTER E & JOYCE SWINDLE	26.7	Irrigation	8/31/1965		
2842	6	1		BILLY JACK & PATSY TYUS	4.3	Irrigation	8/31/1965		
2843	6	1		WINDY HILL RANCH LTD	29	Irrigation	1/30/1967		59
2844	6	1		WINDY HILL RANCH LTD	29	Irrigation	1/30/1967		
2845	6	1		WINDY HILL RANCH LTD	27.5	Irrigation	6/10/1968		55

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Water Right Number	Type (6 = Certificate of Adjudication, 1 = Permit)	Sequence	Permit #	OwnerName	Annual Authorized Diversion (acft)	Use Type	Priority Date	Reservoir Name	Reservoir Capacity (acft)
2846	6	1		GUY G HALL	27.5	Irrigation	6/10/1968		
2846	6	2		GUY G HALL	10.5	Irrigation	6/14/1971		
2847	6	1		G G HALL	13	Irrigation	12/31/1966		2.6
2848	6	1		M D STEPHEN	31.5	Irrigation	4/5/1971		
2849	6	1		J & J DAIRY	28.93	Irrigation	4/5/1971		
2849	6	2		BYRON JONES ET AL	2.57	Irrigation	4/5/1971		
2850	6	1		J A HULSEY	29	Irrigation	12/31/1966		
2851	6	1		J W BARBEE	72	Irrigation	12/31/1945		164
2851	6	2		J W BARBEE	87	Irrigation	8/1/1966		
2852	6	1		DEAN H BOTTLINGER ET UX	149	Irrigation	12/31/1964		
2853	6	1		GAYLON D & CLARA JONES	52	Irrigation	12/31/1957		
2854	6	1		ROY L NEWSOM	25.2	Irrigation	12/31/1963		
2854	6	2		VERNON N NEWSOM		Irrigation	12/31/1963		
2854	6	3		CLETA J (MILLER) STAPP	18.8	Irrigation	12/31/1963		
2855	6	1		CHARLES S THOMAS ET UX	91	Irrigation	12/31/1946		
2856	6	1		JACK D GRAHAM	1	Irrigation	12/31/1954		
2857	6	1		J L ROBERSON JR ET AL	47.723	Irrigation	12/31/1955		
2857	6	2		J RALPH LEE	105.277	Irrigation	12/31/1955		
2858	6	1		J RALPH LEE ET UX	18	Irrigation	12/31/1967		
2859	6	1		LARRY A DUNN ET UX	98	Irrigation	12/31/1965		
2860	6	1		EARL KAVANAUGH	15	Irrigation	12/31/1936		
2860	6	2		ORENA KAVANAUGH		Irrigation	12/31/1936		
2860	6	3		MAURINE K WATTS		Irrigation	12/31/1936		
2861	6	1		ACY L WATSON	1	Irrigation	12/31/1967		5
2862	6	1		MEL ANDERS ET UX	15	Irrigation	10/31/1955		
2863	6	1		RIVERSIDE RANCH LP	43	Irrigation	12/31/1961		
2864	6	1		K A SPARKS ET AL	185	Irrigation	12/31/1934		
2865	6	1		RIVERSIDE RANCH LP	169	Irrigation	12/31/1934		
2866	6	1		RIVERSIDE RANCH LP	82	Irrigation	12/31/1939		
2867	6	1		KIRBY JACK WARREN ET AL	4	Irrigation	12/31/1889		
2868	6	1		ARVORD M ABERNETHY	50	Irrigation	12/31/1908		
2869	6	1		BETTY JEAN HARRIS TOOLEY	105	Irrigation	12/31/1962		
2870	6	1		CITY OF HAMILTON	614	Municipal	1/22/1923		614
2871	6	1		TRUST FOR SETH THOMAS MOORE JR	72	Irrigation	12/31/1944		15
2872	6	1		TRUST FOR SETH THOMAS MOORE JR	2.5	Industrial	12/31/1944	3 RESERVOIRS	15
2873	6	1		R F MANNING	20	Irrigation	12/31/1964		
2874	6	1		PAULA MEADE KUNETKA ET AL	85	Irrigation	12/31/1954		75
2875	6	1		LEONARD T WARLICK ET UX	54	Irrigation	12/31/1958		75
2876	6	1		CHARLES CRAIG JR	15	Irrigation	12/31/1963		
2877	6	1		JOHNNY O HARPER ET UX	126.54	Irrigation	12/31/1954		
2877	6	2		JAMES CHESEBROUGH ET UX	14.03	Irrigation	12/31/1954		
2877	6	3		JOSEPH H MCGOWEN ET UX	9.43	Irrigation	12/31/1954		
2878	6	1		O C & WILLIE NADINE MARSHALL	37	Irrigation	12/31/1957		
2879	6	1		PAUL F MCCLINTON	46	Irrigation	12/31/1960		12
2879	6	2		PAUL F MCCLINTON	93	Irrigation	12/31/1960		
2880	6	1		TEXAS STARDANCE HOLDINGS LP	19	Irrigation	12/31/1945		
2881	6	1		MOODY E COURTNEY	124	Irrigation	12/31/1963		
2882	6	1		TEXAS STARDANCE HOLDINGS LP	196	Irrigation	12/31/1950		
2883	6	1		DAVID C COURTNEY	5	Irrigation	12/31/1960		
2884	6	1		TEXAS STARDANCE HOLDINGS LP	200	Irrigation	12/31/1954		
2885	6	1		MOODY E COURTNEY	71	Irrigation	12/31/1966		
2886	6	1		W J ALEXANDER	10	Irrigation	12/31/1966		
2887	6	1		JOHN F TAYLOR ET AL	30	Irrigation	7/31/1964		
2888	6	1		GEORGE T REYNOLDS III ET UX	2	Irrigation	12/31/1929		
2890	6	1		DON THOMAS ROGERS	8	Irrigation	12/31/1963		
2891	6	1		W F MORELAND BY PASS TRUST	57	Irrigation	8/31/1964		
2892	6	1		W N & MARY JANE WHISENHUNT	32	Irrigation	12/31/1957		
2893	6	1		SEABORN L ASHBY	10	Irrigation	8/1/1918		
2894	6	1		SAN PABLO CORPORATION	2	Irrigation	12/31/1965		

TABLE F-1. Brazos River Basin Water Rights in the Brazos G Area

Water Right Number	Type (6 = Certificate of Adjudication, 1 = Permit)	Sequence	Permit #	OwnerName	Annual Authorized Diversion (acft)	Use Type	Priority Date	Reservoir Name	Reservoir Capacity (acft)
2895	6	1		WILLIAM TRAVIS LAXSON	29	Irrigation	12/31/1959		
2896	6	1		MARGARET CALLAWAY	124	Irrigation	12/31/1965		
2897	6	1		R H MELTON	8	Irrigation	12/31/1967		
2898	6	1		DONALD J MACKIE ET UX	8	Irrigation	12/31/1925		
2898	6	2		GLENNIS G EGGER	15	Irrigation	12/31/1925		
2899	6	1		TEXAS DEPT OF CRIMINAL JUSTICE	70	Irrigation	1/25/1971		
2900	6	1		CHARLES C POWELL	14	Irrigation	12/31/1964		
2901	6	1		MORSE FAMILY PARTNERSHIP LTD	100	Irrigation	12/31/1965		
2902	6	1		QUENTIN G MCCORKLE ET UX	18	Irrigation	12/31/1957		
2903	6	1		GLENROOK FARMS	530	Irrigation	11/8/1913		
2904	6	1		STERLIN J BARNARD	40	Irrigation	12/31/1939		
2905	6	1		DAN G DAVIDSON ESTATE	14	Irrigation	12/31/1967		
2906	6	1		THELMA R CARTER	36	Irrigation	8/6/1925		
2907	6	1		LEO LUEDTKE ET UX	237	Irrigation	12/31/1958		
2907	6	2		DENNIS CHARLES LUEDTKE ET AL	150	Irrigation	12/31/1958		
2908	6	1		DAN G DAVIDSON	22	Irrigation	12/31/1967		
2909	6	1		RUDOLF DROSCHE	26	Irrigation	7/22/1965		
2910	6	1		CARL DROSCHE	77	Irrigation	12/31/1963		
2911	6	1		GLENN DIPPEL ET AL	74	Irrigation	4/30/1963		
2911	6	2		JOHN SHAUD ET UX		Irrigation	4/30/1963		
2914	6	1		PAT & MABEL RUTH GRIMES	18	Irrigation	12/31/1928		
2915	6	1		ROBERT L MOORE	38	Irrigation	3/31/1959		
2921	6	1		W J & ANITA FAYE HOPPER	28	Irrigation	3/31/1967		
2922	6	1		EDNA HOPPER	9	Irrigation	6/30/1966		
2923	6	1		HENRY MARWITZ ET AL	12.54	Irrigation	12/31/1913		
2923	6	2		BILLY H ROBERTS ET UX	32.46	Irrigation	12/31/1913		
2924	6	1		JERRY W & BONNIE JEAN HOPPER	59	Irrigation	5/31/1966		3
2926	6	1		WILLIAM JACKSON WISDOM	13	Irrigation	5/31/1938		
2927	6	1		ELVIN L GENTRY ET UX	9	Irrigation	6/30/1950		
2928	6	1		GARY L LUNDBERG ET UX	13	Irrigation	7/31/1950		
2929	6	1		REGINALD & NONA FA WIEDEBUSCH	4	Irrigation	3/31/1970		
2930	6	1		CYRUS B CATHEY ESTATE	31	Irrigation	9/30/1962		
2931	6	1		RONNAL S BEASLEY ET UX	52	Irrigation	12/31/1965		
2932	6	1		JAMES BILLINGSLEY	6	Irrigation	5/31/1962		
2933	6	1		MARSHALL JOE HANNA	46	Irrigation	8/31/1954		
2934	6	1		ROBERT M SCOTT ET AL	66	Irrigation	11/30/1965		
2935	6	1		ESTATE OF JEAN WOODWARD WHALEY	38	Storage	4/30/1963		190
2936	6	1		U S DEPT OF THE ARMY	10000	Municipal	8/24/1953	LAKE BELTON	12000
2936	6	2		U S DEPT OF THE ARMY	2000	Municipal	8/23/1954		
2937	6	1		BARGE RANCH LTD	59	Irrigation	7/31/1963		
2938	6	1		CITY OF TEMPLE	15804	Municipal	10/30/1915		500
2938	6	2		CITY OF TEMPLE		Industrial	10/30/1915		
2938	6	3		CITY OF TEMPLE	20000	Municipal	1/11/1957	BELTON RESERVOIR	
2939	6	1		BRAZOS RIVER AUTHORITY	38800	Industrial	2/7/1949		
2940	6	1		EVELYN FRANCES BYLER ET AL	63	Irrigation	6/30/1965		
2941	6	1		SHALLOW FORD CONSTRUCTION CO	36	Irrigation	12/31/1966		
2942	6	1		PYLE BROTHERS INC	5.135	Irrigation	12/31/1915		
2942	6	2		VAUGHN T BAIRD	194.865	Irrigation	12/31/1915		
2943	6	1		CITY OF KILLEEN & KILLEEN WILLOWS INC	220	Irrigation	7/31/1978	3 RES	46
2943	6	2		CITY OF KILLEEN & KILLEEN WILLOWS INC		Recreation	7/31/1978		
2944	6	1		FRANKLIN LIMESTONE COMPANY	138	Mining	4/28/1975		28
2945	6	1		GLENN BAIRD	36	Irrigation	6/30/1966		
2946	6	1		J BARRY SIEBENLIST ET UX	24	Irrigation	5/20/1974		
2947	6	1		PHILLIP E POWELL ET UX	11	Irrigation	8/31/1952		
2948	6	1		CHESTER E DICKSON ET UX	278	Irrigation	7/31/1960		
2949	6	1		CHESTER E DICKSON ET UX	37	Irrigation	7/31/1960		
2950	6	1		DAVID R KRAUSS ET UX	25	Irrigation	8/31/1962		
2951	6	1		MICHAEL ANDREW MONTGOMERY ET AL	33.83	Irrigation	7/31/1963		
2952	6	1		CLOUD CONSTRUCTION CO INC	16	Irrigation	12/31/1962		37

TABLE F-1. Brazos River Basin Water Rights in the Brazos G Area

Water Right Number	Type (6 = Certificate of Adjudication, 1 = Permit)	Sequence	Permit #	OwnerName	Annual Authorized Diversion (acft)	Use Type	Priority Date	Reservoir Name	Reservoir Capacity (acft)
2953	6	1		ROGER W HINDS ET UX	89.08	Irrigation	4/15/1984		
2953	6	2		CHARLES N VERHEYDEN ET UX	75.27	Irrigation	4/15/1984		
2953	6	3		DENNIS J LYNCH ET UX	69.65	Irrigation	4/15/1984		
2958	6	1		FOSSIL CREEK REALTY INC	2.63	Irrigation	9/27/1976		
2958	6	2		SAMUEL G TOUB	7.25	Irrigation	9/27/1976		
2958	6	3		W G BETTIS ET AL	0.12	Irrigation	9/27/1976		
2959	6	1		JOHN R & LYNN COATS	23	Irrigation	12/31/1950		
2960	6	1		NORTH MIDLAND DEVELOPMENT INC	46	Irrigation	12/31/1967		
2961	6	1		M K & RUTH NEAL PATTESON	54	Irrigation	5/31/1957		
2962	6	1		LEONARD J TROVERO SR	28	Irrigation	3/31/1925		
2963	6	1		FRANCES VIRGINIA NUCKLES ET AL	40.86	Irrigation	6/30/1957		45
2963	6	2		JOSEPH HENRY LANGFORD ET UX	7.14	Irrigation	6/30/1957		
2964	6	1		EARL BROOKS	1	Irrigation	5/31/1929		
2965	6	1		JIMMIE E BOULTINGHOUSE ET AL	34.25	Irrigation	6/30/1963		
2965	6	2		ROY LEE BOULTINGHOUSE	18.75	Irrigation	6/30/1963		
2966	6	1		MARVIN E & MARY BLANCHE WHITE	31	Irrigation	6/30/1963		4
2967	6	1		H Y JR & LOIS POLLARD PRICE	5	Irrigation	12/31/1963		40
2968	6	1		MARK J NASH JR		Recreation	1/7/1974		200
2969	6	1		BURRELL ROITCH	8	Irrigation	12/31/1946		
2970	6	1		FRED WILLIS ET UX	2.63	Irrigation	12/31/1946		
2970	6	2		CHARLES E BLANTON	51.17	Irrigation	12/31/1946		
2970	6	3		CITY OF LAMPASAS	6.2	Irrigation	12/31/1946		
2971	6	1		CITY OF LAMPASAS	3760	Municipal	6/23/1914		
2972	6	1		CITY OF LAMPASAS		Recreation	12/31/1956		20
2972	6	2		CITY OF LAMPASAS	228	Irrigation	12/31/1963		22
2973	6	1		MELVIN POTTS	6	Irrigation	3/31/1964		3
2974	6	1		E C O'NEAL JR	144	Irrigation	5/11/1913		
2975	6	1		RAY A & ELIZABETH K JONES	46	Irrigation	6/13/1914		
2976	6	1		RAY A JONES	48	Industrial	6/26/1914		
2977	6	1		CURTIS KIDD ET UX	42	Irrigation	5/7/1914		
2978	6	1		GUNDERLAND PARK RANCH INC	54	Irrigation	12/31/1961		15
2979	6	1		JOHN T HIGGINS	95	Irrigation	12/31/1915		21
2980	6	1		JUDITH ANN LANSFORD ET AL	1	Irrigation	1/29/1926		
2981	6	1		DOROTHY N CAPPS	6.32	Irrigation	5/31/1963		
2981	6	2		JOE D BOYD	45.36	Irrigation	5/31/1963		
2981	6	3		WYLIE R CAPPS	6.32	Irrigation	5/31/1963		
2982	6	1		A J DEWAYNE KENDRICK	6	Irrigation	5/31/1963		
2983	6	1		LARRY L BROWN ET UX	7	Irrigation	5/31/1963		
2984	6	1		DOYLE & BARBARA J WALKER	18	Irrigation	5/31/1963		
2985	6	1		RAYMOND DWAYNE JONAS ET UX	18	Irrigation	5/31/1963		
2986	6	1		JAMES BUFORD BRIGGS	46.8	Irrigation	2/6/1919		
2987	6	1		ROBERT C HALLMARK ET AL	2	Irrigation	6/24/1914		
2988	6	1		JOE T & CAROLINE PARKS	3	Irrigation	6/23/1914		
2996	6	1		BRADLEY B WARE	100	Irrigation	4/1/1966		
2997	6	1		SUNTEX FULLER CORP	60.1	Irrigation	9/30/1963		
2997	6	2		CLIFFORD D FRIESEN ET UX	3.9	Irrigation	9/30/1963		
2998	6	1		CW DUNCAN JR TRUSTEE	157	Irrigation	12/31/1925		
2999	6	1		PAUL EUGENE BLUM	3	Irrigation	5/31/1947		
3000	6	1		JAMES L SHEPHERD	105	Irrigation	4/30/1957		
3001	6	1		EDD MELTON	12	Irrigation	12/31/1967		
3002	6	1		GENE & NELDA FAY RAY	150	Irrigation	12/31/1961		
3003	6	1		BENNIE M GIBBS	32	Irrigation	6/30/1967		
3004	6	1		ESTATE OF DR JAMIE W BARTON	50	Irrigation	8/2/1967		
3005	6	1		VAIL E & BETTY LOGSDON	5	Irrigation	6/30/1965		
3006	6	1		KARL B WAGNER ESTATE	48	Irrigation	4/30/1967		
3007	6	1		RIVER FARM LTD	48	Irrigation	12/31/1947		
3007	6	2		RIVER FARM LTD	192	Irrigation	9/20/1982		
3008	6	1		ELEANOR B TUTTLE	61	Irrigation	6/30/1950		
3009	6	1		JOSEPH LEWIS ET UX	81	Irrigation	12/31/1962		

TABLE F-1. Brazos River Basin Water Rights in the Brazos G Area

Water Right Number	Type (6 = Certificate of Adjudication, 1 = Permit)	Sequence	Permit #	OwnerName	Annual Authorized Diversion (acft)	Use Type	Priority Date	Reservoir Name	Reservoir Capacity (acft)
3010	6	1		CLIFFORD D JONES	10	Irrigation	6/30/1955		
3011	6	1		LOYCE W RAY	16.55	Irrigation	12/31/1962		
3011	6	2		LAWANA ELLIS ET VIR	46.99	Irrigation	12/31/1962		
3011	6	3		MIKEL DUPES ET AL	0.46	Irrigation	12/31/1962		
3012	6	1		STAGECOACH INN PROPERTIES INC		Recreation	8/2/1976	1 ON-CHAN & 1 OFF-CHAN RES	9
3013	6	1		STAGECOACH MILL CREEK RESORTS INC	168	Irrigation	4/15/1965		10
3013	6	2		STAGECOACH MILL CREEK RESORTS INC	168	Irrigation	5/14/1999		
3014	6	1		EDWIN A BAILEY ESTATE	63	Irrigation	12/31/1883		6
3014	6	2		EDWIN A BAILEY ESTATE	2	Industrial	12/31/1883		
3015	6	1		PAUL T BOSTON	36	Irrigation	12/31/1963		
3355	1	1	3645	DAVID THOMAS BRIDGFORD	30	Irrigation	8/16/1976	2 RES	24
3364	6	1		MUSTANG CREEK RANCH	183	Irrigation	5/31/1963		70
3389	6	1		MOUNTAIN VALLEY COUNTRY CLUB		Recreation	6/11/1979		218
3410	6	1		UNITED FEDERAL SAVINGS & LOAN		Recreation	6/11/1979		24
3413	6	1		SAMUEL E CLONTS	182	Irrigation	8/31/1957		100
3413	6	2		MARION C PERDUE		Irrigation	8/31/1957		
3413	6	3		MABEL C WILSON		Irrigation	8/31/1957		
3414	6	1		CITY OF BENJAMIN	34	Municipal	1/2/1929		915
3440	6	1		LEAGUE RANCH	2000	Irrigation	6/13/1958	LAKE DAVIS	4477
3440	6	2		LEAGUE RANCH	31	Irrigation	5/17/1965	LAKE CATHERINE	1750
3440	6	3		LEAGUE RANCH		Recreation	5/17/1965	LAKE CATHERINE	
3440	6	4		LEAGUE RANCH		Storage	5/15/1972	LAKE DAVIS/LAKE CATHERINE	1252
3441	6	1		CITY OF MUNDAY		Recreation	12/18/1939		150
3446	6	1		J J KEETER TRUST	4.5	Irrigation	9/2/1959		
3446	6	2		CLYDE STUTEVILLE	4.5	Irrigation	9/2/1959		
3447	6	1		R T WELLS JR	45	Irrigation	5/31/1964		
3448	6	1		GEORGE W WILKINSON	45	Irrigation	2/28/1966		2
3449	6	1		THROCKMORTON LAND & CATTLE CO		Domestic/Livestock	1/23/1950		705
3450	6	1		CITY OF THROCKMORTON	600	Municipal	11/20/1940		1675
3451	6	1		GEORGE W WILKINSON	26	Irrigation	8/31/1966		
3451	6	2		GEORGE W WILKINSON	27	Industrial	8/31/1966		
3452	6	1		CITY OF NEWCASTLE	250	Municipal	11/22/1966	WHISKEY CR RES & NEWCASTLE L	801
3453	6	1		PITCOCK BROTHERS READY-MIX	100	Mining	12/19/1960		
3455	6	1		CHARLES D CROW & WANDA L CROW	76	Industrial	6/30/1967		
3455	6	2		CHARLES D CROW & WANDA L CROW	6	Industrial	6/20/1977		82
3455	6	3		CHARLES D CROW & WANDA L CROW		Irrigation	6/20/1977		
3456	6	1		RONALD D STEPHENS	59	Irrigation	12/31/1959		55
3457	6	1		LOUIS PITCOCK JR ET AL	60	Irrigation	12/8/1969		
3458	6	1		CITY OF GRAHAM	4000	Municipal	11/21/1927	LAKE EDDLEMAN	13386
3458	6	2		CITY OF GRAHAM	7000	Municipal	11/15/1954	LAKE GRAHAM	39000
3458	6	3		CITY OF GRAHAM	1000	Industrial	11/21/1927		
3458	6	4		CITY OF GRAHAM	7400	Industrial	11/15/1954		
3458	6	5		CITY OF GRAHAM	100	Irrigation	11/15/1954		
3458	6	6		CITY OF GRAHAM	500	Mining	11/15/1954		
3458	6	7		CITY OF GRAHAM		Storage	2/8/1982	SALT CREEK RESERVOIR	40
3459	6	1		ZACK BURKETT	12	Irrigation	8/31/1964		
3460	6	1		JANE H CRAVENS	76	Irrigation	8/20/1928		
3461	6	1		MRS T T CAMPBELL	27	Irrigation	3/31/1963		
3465	6	1		EASTLAND CO WSD	450	Municipal	10/28/1919	LAKE EASTLAND	1740
3465	6	2		EASTLAND CO WSD		Recreation	10/28/1919	LAKE EASTLAND	
3465	6	3		CITY OF EASTLAND	50	Industrial	10/28/1919		
3465	6	4		CITY OF EASTLAND	100	Irrigation	10/28/1919		
3466	6	1		CITY OF EASTLAND		Recreation	1/12/1976	RINGLING LAKE	144
3467	6	1		WAYNE HARGRAVE ET UX	12	Irrigation	12/31/1965		
3468	6	1		EBAA IRON INC	1000	Mining	12/15/1919	LAKE OLDEN	1607
3468	6	2		EASTLAND INDUSTRIAL FOUNDATION	607	Mining	12/15/1919		
3469	6	1		LARRY MORROW	21	Irrigation	8/21/1967		
3470	6	1		EASTLAND CO WSD	2437.5	Municipal	3/21/1952	LAKE LEON	28000
3470	6	2		EASTLAND CO WSD	1747.5	Municipal	3/25/1986	LAKE LEON	

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3470	6	3		EASTLAND CO WSD	1265	Municipal	5/17/1931	LAKE LEON	
3470	6	4		EASTLAND CO WSD	350	Industrial	3/25/1986		
3470	6	5		EASTLAND CO WSD	500	Irrigation	3/25/1986		
3471	6	1		GLYNN A WILSON	50	Irrigation	10/11/1977	RESERVOIR 1	115
3471	6	2		GLYNN A WILSON	50	Irrigation	4/1/1991	RESERVOIR 2	125
3473	6	1		RONNIE LOVE	40	Irrigation	10/27/1969		
3474	6	1		JERRY P MEHAFFEY	30	Irrigation	4/28/1969		
3475	6	1		C M PIPPIN JR	8	Irrigation	5/26/1969		
3476	6	1		GARTH PETTIT	51	Irrigation	4/30/1952		
3479	6	1		TEDDY J SNIDER ET UX	30	Irrigation	4/5/1966		35
3480	6	1		SAUL PULLMAN		Domestic/Livestock	10/31/1977		60
3481	6	1		WILL D BROWN ET UX	25	Irrigation	7/29/1968		40
3482	6	1		JOHNNY W & MARY C EAVES	13	Irrigation	7/31/1964		25
3483	6	1		MATTHEW STANLEY HOUSE	90	Irrigation	7/21/1969		244
3484	6	1		MURTICE C RODGERS	40	Irrigation	5/13/1970		
3485	6	1		H L PERRIN ET UX	148	Irrigation	1/2/1973		350
3485	6	2		H L PERRIN ET UX		Irrigation	4/6/1973		
3486	6	1		RONNIE N LOVE ET UX	150	Irrigation	10/20/1975	3 EXEMPT DAMS/RESERVOIRS	225
3486	6	2		RONNIE N LOVE ET UX	148	Irrigation	1/2/1973	1 RES	
3486	6	3		RONNIE N LOVE ET UX		Irrigation	4/6/1973		
3487	6	1		D B WARREN	40	Irrigation	2/19/1968		
3488	6	1		MAX BUSH ET UX	30	Irrigation	9/22/1969		
3489	6	1		THOMAS H BIRDSONG III	140	Irrigation	10/13/1969		323
3490	6	1		JOHN J HOLLAND	60	Irrigation	6/5/1967		60
3492	6	1		G D LINDLEY	52	Irrigation	8/21/1967		52
3493	6	1		EDDIE LINDLEY	35	Irrigation	4/27/1970		35
3494	6	1		MOODY B KOONCE	140	Irrigation	3/22/1971		
3495	6	1		MOODY B KOONCE	94	Irrigation	5/23/1967		
3496	6	1		NANNIE LEE THOMPSON	21	Irrigation	10/28/1968		
3497	6	1		HERRALD ABELS	50	Irrigation	7/28/1975		
3498	6	1		RAYMOND L GILDER	100	Irrigation	12/14/1970		189
3499	6	1		N L BOX	3	Irrigation	8/31/1951		25
3500	6	1		OBBCO RANCH CORPORATION	24	Irrigation	4/30/1966		
3501	6	1		HAROLD D HIGGINBOTTOM	65	Irrigation	3/22/1971		70
3502	6	1		DONALD K SETZLER	64	Irrigation	1/30/1978		
3503	6	1		HAROLD LEE MORRIS ET UX		Domestic/Livestock	2/28/1977		45
3504	6	1		ELMER RAY JOINER	20	Irrigation	4/8/1968		
3505	6	1		RONNIE P STEPHENS ET AL	36	Irrigation	7/22/1968		
3506	6	1		J V STEWART	3	Irrigation	3/31/1963		10
3511	6	1		A D MCCLELLAN	73	Irrigation	8/31/1966		
3512	6	1		JIMMY DALE JOHNSON	6	Irrigation	12/31/1963		
3514	6	1		GAINES OIL COMPANY	7	Irrigation	8/1/1966		
3515	6	1		ROBERT JESS HOFFMAN		Domestic/Livestock	5/1/1972		292
3516	6	1		RUBY JOHNSON		Domestic/Livestock	5/1/1972		292
3517	6	1		MERLE JO PARKS TRUSTEE	250	Irrigation	7/29/1968		266
3518	6	1		KELLER-HYDEN INC	110	Irrigation	8/8/1967		
3519	6	1		GARY D BEARD ET AL	25	Irrigation	6/15/1970		
3520	6	1		BEN HAMNER	40	Irrigation	9/11/1967		
3521	6	1		TRUETT & PATSY SPRUILL	40	Irrigation	5/5/1969		
3522	6	1		JAMES L HUGHES	7	Irrigation	7/31/1965		10
3523	6	1		ROBERT M & IMOGENE BURNS	20	Irrigation	6/9/1969		
3524	6	1		JULIA BETH COOK ET AL	25	Irrigation	12/8/1975		
3525	6	1		THOMAS H BIRDSONG III	10	Irrigation	10/13/1969		
3526	6	1		TROYAT UNDERWOOD	20	Irrigation	8/30/1976		20
3528	6	1		ROBERT EARL DENNIS	100	Irrigation	9/15/1969		121
3530	6	1		LOUIS SCHKADE ET AL	14	Irrigation	6/30/1967		
3530	6	2		LOUIS SCHKADE ET AL	46	Irrigation	9/9/1969		
3531	6	1		JOHN R SCOTT ET UX	40	Irrigation	12/8/1975		
3532	6	1		JIMMY L BINGHAM ET AL	29	Irrigation	3/29/1971		29

TABLE F-1. Brazos River Basin Water Rights in the Brazos G Area

Water Right Number	Type (6 = Certificate of Adjudication, 1 = Permit)	Sequence	Permit #	OwnerName	Annual Authorized Diversion (acft)	Use Type	Priority Date	Reservoir Name	Reservoir Capacity (acft)
3533	6	1		BOBBY L SKAGGS & GENE E SKAGGS	25	Irrigation	3/24/1969		
3534	6	1		JUNE M ROUNTREE TRUSTEE	24	Irrigation	7/31/1967		8
3535	6	1		JACK & THELMA LOU RILEY	8	Irrigation	10/26/1971		
3536	6	1		LYNDELL F COAN	31	Irrigation	4/26/1971		
3537	6	1		RODNEY C STEPHENS		Storage	12/17/1973		9
3538	6	1		WILLIAM T MORRIS ET UX	30	Irrigation	11/19/1973		
3539	6	1		ED GLOVER JR	75	Irrigation	3/17/1969		
3540	6	1		SPRUILL BROS DRILLING CO	1	Irrigation	4/25/1967		
3540	6	2		JAMES L FARLEY ET UX	89	Irrigation	4/25/1967	NORTH RESERVOIR & SOUTH RES	153
3540	6	3		JAMES L FARLEY ET UX	23	Irrigation	7/31/1967		
3541	6	1		SAM D & MARTHA L UPSHAW	45	Irrigation	5/6/1968		
3542	6	1		NABORS LAKE DEVELOPMENT CORP		Recreation	4/28/1976	NABORS LAKE	450
3543	6	1		PETER G FAGAN ET UX	28	Irrigation	5/4/1970		29
3544	6	1		JIM LAMPMAN ET AL	17	Irrigation	12/31/1964		
3546	6	1		E A WALKER	7.5	Irrigation	7/31/1965		11
3546	6	2		E A WALKER	1.5	Irrigation	4/26/1971		
3547	6	1		ELISABETH LEE SANDERS	70	Irrigation	4/1/1968		
3548	6	1		SEBORN E GOLDEN	166	Irrigation	5/17/1965		
3549	6	1		T A NOWLIN	42	Irrigation	5/20/1968		
3550	6	1		THOMAS A LEE JR ET UX	27.6	Irrigation	9/11/1967		
3551	6	1		BOBBY W STRAUB	30	Irrigation	4/5/1985		
3552	6	1		J V SKAGGS	80	Irrigation	6/7/1971		
3553	6	1		LEE ROY COTTON	53	Irrigation	6/13/1966		
3554	6	1		E J TERRY	25	Irrigation	6/30/1969		
3555	6	1		MARK C GRIFFIN ET UX	100	Irrigation	5/22/1978		
3556	6	1		GAYLE MCGINNIS	7.5	Irrigation	4/15/1968		
3557	6	1		LAKE PROCTOR IRRIGATION AUTHORITY	97.5	Irrigation	4/15/1968		
3558	6	1		STEVEN MARK BIGGS ET AL	12	Irrigation	7/31/1961		
3560	6	1		CHARLES BOB & DEALVA SNELL		Domestic/Livestock	12/8/1975		
3561	6	1		ROBERT S BUTLER		Domestic/Livestock	6/24/1974		267
3565	6	1		ROBERT S BUTLER		Domestic/Livestock	1/28/1974		236
3567	6	1		BYRON R GIBSON		Recreation	9/3/1974		81
3568	6	1		ALICE MAE JONES	50	Irrigation	9/17/1970		25
3569	6	1		MARGARET JANES	10	Irrigation	2/7/1972		
3572	6	1		A T GILCHREST	140	Irrigation	3/18/1968		
3573	6	1		G H BINGHAM DBA 4B FARMS	42.9	Irrigation	5/8/1972		
3573	6	2		MICHAEL BINGHAM	17.1	Irrigation	5/8/1972		
3575	6	1		BOBBY N HUDDLESTON	16	Irrigation	4/30/1955		
3575	6	2		BOBBY N HUDDLESTON	130	Irrigation	9/25/1972		130
3578	6	1		ORO PECANLANDS INC ET AL	700	Irrigation	11/11/1974		829
3579	6	1		T A NOWLIN	32	Irrigation	7/31/1969		50
3580	6	1		G E BINGHAM ET AL	70	Irrigation	4/24/1972		
3581	6	1		ELDON WADE BUTLER	65	Irrigation	1/5/1970		
3584	6	1		DINA BAXTER NEAL	30	Irrigation	12/31/1959		4
3585	6	1		WAYNE D GILLIAM	17	Irrigation	7/30/1973		17.39
3585	6	2		WAYNE D GILLIAM	23	Irrigation	9/2/1980		
3586	6	1		GLENDA G HENRY	154	Irrigation	10/13/1970		960
3587	6	1		GEORGE E BINGHAM ET UX	95.61	Irrigation	10/13/1970		
3587	6	2		GEORGE E BINGHAM ET AL	99.32	Irrigation	10/13/1970		
3587	6	3		GEORGE E BINGHAM ET AL		Recreation	10/13/1970		
3588	6	1		BILLY J GRESSETT ET AL	29.24	Irrigation	10/13/1970		
3588	6	2		BILLY J GRESSETT ET AL		Recreation	10/13/1970		
3589	6	1		LOUIS G & BETTY HARELIK	185.19	Irrigation	10/13/1970		
3589	6	2		LOUIS G & BETTY HARELIK		Recreation	10/13/1970		
3590	6	1		CLINTON D GEYE	321.64	Irrigation	10/13/1970		
3590	6	2		CLINTON D GEYE		Recreation	10/13/1970		
3592	6	1		LEON Y NICHOLS	109	Irrigation	4/23/1967		
3593	6	1		VERA MULL	8	Irrigation	6/30/1965		25
3593	6	2		VERA MULL	17	Irrigation	6/30/1969		

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Water Right Number	Type (6 = Certificate of Adjudication, 1 = Permit)	Sequence	Permit #	OwnerName	Annual Authorized Diversion (acft)	Use Type	Priority Date	Reservoir Name	Reservoir Capacity (acft)
3594	6	1		WOLFE PECANLANDS INC	16	Irrigation	2/22/1971		
3595	6	1		REX MCGINNIS	10	Irrigation	4/15/1956		4
3596	6	1		R C PINKARD	280	Irrigation	8/25/1969		400
3596	6	2		GENE E CAGLE ET UX		Irrigation	8/25/1969		
3596	6	3		BILLIE STEWART KINSEY		Irrigation	8/25/1969		
3597	6	1		J F REED		Recreation	2/7/1972		657
3598	6	1		JOE MCENTIRE & JOHN MCENTIRE		Recreation	2/7/1972		
3599	6	1		JOE J MCENTIRE		Recreation	2/7/1972		
3600	6	1		GARY HALL ET AL		Recreation	2/7/1972		
3601	6	1		H REESE WARD & DONALD L WARD		Recreation	2/7/1972		657
3601	6	2		H REESE WARD & DONALD L WARD		Domestic/Livestock	2/7/1972		
3602	6	1		DENNIS L & LAVORICE M SHELTON		Domestic/Livestock	5/28/1974		
3603	6	1		PAUL L RAINS		Domestic/Livestock	5/19/1975		
3604	6	1		LARRY C STEELE ET UX		Domestic/Livestock	8/10/1972		15
3604	6	2		LARRY C STEELE ET UX		Domestic/Livestock	5/19/1975		35
3605	6	1		GARY G & MARY LOU HALL		Domestic/Livestock	2/28/1972		41
3606	6	1		GARY G HALL ET UX	3	Irrigation	7/31/1963		
3607	6	1		T C MAZUREK JR		Domestic/Livestock	2/17/1975		
3608	6	1		NORMAN MOORE ET UX	21	Irrigation	10/26/1971		
3608	6	2		AVERY MOORE		Irrigation	10/26/1971		
3609	6	1		JOHN M HATHCOCK	50	Irrigation	10/18/1971		
3610	6	1		JOHN C TAYLOR ET UX	143	Irrigation	7/19/1971		193
3611	6	1		HUGH MONSELLE O'BRIEN	38	Irrigation	12/31/1969		
3612	6	1		FRED S DAVIS	93	Irrigation	5/31/1959		40
3613	6	1		HUGH MONSELLE O'BRIEN	95	Irrigation	5/17/1971		
3614	6	1		JAMES DONALD CHESTER	10	Irrigation	11/18/1965		10
3615	6	1		A E VINEYARD	48	Irrigation	6/16/1969		
3616	6	1		B J VINEYARD	12	Irrigation	6/16/1969		
3617	6	1		WALTER MAZUREK	3	Irrigation	4/29/1968		
3618	6	1		OBBCO RANCH CORPORATION	85	Irrigation	7/31/1967		
3618	6	2		OBBCO RANCH CORPORATION	9	Irrigation	5/6/1968		
3619	6	1		JFB FARMS A PARTNERSHIP	20	Irrigation	2/22/1971		30
3620	6	1		E J ALDERMAN	25	Irrigation	5/31/1967		
3620	6	2		E J ALDERMAN	72	Irrigation	9/11/1967		
3622	6	1		CURTIS LESLEY & ROYCE LESLEY	50	Irrigation	6/28/1976		50
3623	6	1		TIMOTHY LEN MATTHEWS	26	Irrigation	4/23/1966		10
3624	6	1		PAULINE HALL	14	Irrigation	4/23/1966		
3626	6	1		WOLFE PECANLANDS INC	160	Irrigation	7/15/1963		
3627	6	1		DINAH KAY DENSMAN	13	Irrigation	1/15/1967		
3629	6	1		CAROLUS VOLLEMAN ET UX	48	Irrigation	9/8/1975		
3630	6	1		J H VAN ZANT	30	Irrigation	12/31/1929		
3631	6	1		J Z STARK	50	Irrigation	7/31/1966		
3632	6	1		RANDLE JOE EVANS	3	Irrigation	6/10/1967		
3633	6	1		DONALD DEE SALTER ET AL	61	Irrigation	5/31/1967		
3634	6	1		BEATRICE LOGGINS	31	Irrigation	7/31/1964		
3635	6	1		JOE RILEY	84	Irrigation	6/30/1952		
3636	1	1	3931	GEORGE CHASE	109	Irrigation	11/6/1978	HOG CREEK WATERSHED PROJEC	419
3636	6	1		GAYLAND STEPHENS ET UX	40	Irrigation	7/31/1952		
3636	1	2	3931	EVELYN WILIE MOODY	110	Irrigation	11/6/1978	HOG CREEK WATERSHED PROJECT	
3637	6	1		GORES INCORPORATED	450	Irrigation	12/31/1946		84
3638	6	1		J B GUNTER & P D GUNTER	40	Irrigation	12/31/1958		25
3639	6	1		GAIL W & MARY L YORK	35	Irrigation	7/31/1951		4.5
3640	6	1		SCOTT G SALTER	23	Irrigation	12/31/1963		4
3641	6	1		BERRY RAY BINGHAM		Domestic/Livestock	10/29/1973		
3642	6	1		CARL DWAIN HALL	9	Irrigation	7/31/1960		
3643	6	1		JOE PAUL MCCULLOUGH ET UX	69	Irrigation	4/30/1953		36
3644	6	1		BILL BLUE	1.35	Irrigation	7/5/1976		
3644	6	2		RODNEY STEPHENS	13.65	Irrigation	7/5/1976		15
3645	6	1		CLAYTON W MERCER	18	Irrigation	7/12/1971		18

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3646	6	1		THOMAS E LUKER	7	Irrigation	6/30/1967		
3647	6	1		DONALD W MOORE	41	Irrigation	9/30/1954		126
3648	6	1		EVA F MOORE	49	Irrigation	8/31/1952		6
3649	6	1		CULLEN STEPHENS	130	Irrigation	6/30/1950		
3650	6	1		GUY E MOORE	34	Irrigation	7/31/1964		7.5
3651	6	1		JOHN R MOORE ET UX	107	Irrigation	7/31/1961		
3651	6	2		JOE D MOORE	15	Irrigation	7/31/1961		
3652	6	1		O A DICKEY	8	Irrigation	7/31/1964		
3653	6	1		LARRY WAYNE ADAMS	851.4	Irrigation	8/31/1963		
3654	6	1		CAROLYN RINEHART HAYES	32.67	Irrigation	7/31/1963		
3654	6	2		CAROLYN RINEHART HAYES ET VIR	32.66	Irrigation	7/31/1963		
3654	6	3		KENNETH RAY RINEHART	32.67	Irrigation	7/31/1963		
3655	6	1		ARBIE N BOYD ET UX	22	Irrigation	12/31/1957		
3655	6	2		GARY K BOYD		Irrigation	12/31/1957		
3656	6	1		MARTIN W & JUANITA SEIDER	36	Irrigation	7/31/1966		
3657	6	1		LEO C HAGGARD ET UX	56	Irrigation	7/31/1965		
3658	6	1		H L WILLINGHAM ESTATE	7	Irrigation	3/31/1963		
3659	6	1		ERW INC	200	Municipal	7/20/1925	LAKE EANES	1000
3659	6	2		ERW INC	200	Irrigation	3/29/1976	LAKE EANES	
3660	6	1		BELVE BEAN	58	Irrigation	7/31/1952		
3660	6	2		BELVE BEAN	11	Industrial	7/31/1961		
3661	6	1		C H MCCALL ET UX	187	Irrigation	6/30/1964		
3662	6	1		JIMMY E GORE	2.77	Irrigation	12/18/1947		
3662	6	2		DORIS S GORE	166.45	Irrigation	4/22/1975		4800
3662	6	3		JIMMY E GORE ET AL	291.46	Irrigation	4/22/1975		4800
3662	6	4		KENNETH D HARVICK ET AL	139.32	Irrigation	4/22/1975		
3663	6	1		R E BASHAM JR	67	Irrigation	4/30/1949		36
3701	6	1		COUNTY OF KENT		Storage	10/1/1925		296
3702	6	1		DON H MURPHY		Recreation	11/24/1969		850
3716	6	1		CAROL SUE REED	134	Irrigation	12/31/1958		2
3717	6	1		BALDRIDGE FAMILY LAND	420	Irrigation	8/31/1951		
3718	6	1		OCCIDENTAL PERMIAN LTD	3525	Mining	3/5/1958		
3718	6	2		OCCIDENTAL PERMIAN LTD	2375	Mining	7/22/1969		
3720	6	1		BILLIE JOE MCCOMBS	44	Irrigation	10/5/1963		185
3721	1	1	3969	MCTAN CORPORATION		Irrigation	3/12/1979		128
3721	6	1		BRUCE & PATSY K COX	100	Irrigation	2/28/1965		176
3721	1	2	3969	MCTAN CORPORATION		Recreation	3/12/1979		
3721	6	2		BRUCE & PATSY K COX	26	Industrial	3/31/1966		
3724	6	1		FRANCES DAVIS	1016	Irrigation	8/31/1955		
3725	6	1		OLIN E TEAGUE VETERANS CENTER		Recreation	1/24/1977		96
3726	6	1		MOLLIE H BROOKS ET AL	5	Irrigation	7/31/1960		12
3726	6	2		MOLLIE H BROOKS ET AL	5	Irrigation	11/6/1969		
3727	6	1		B R LAUTERBORN	72	Irrigation	10/11/1977		201
3727	6	2		DOYR CORNELISON ET UX		Irrigation	10/11/1977		
3727	6	3		ROBERT L OGDEN ET UX		Irrigation	10/11/1977		
3728	6	1		PATRICK J ATKINSON JR ET UX		Recreation	6/5/1978		246
3728	6	2		LARRY J HOWELL ET UX		Recreation	6/5/1978		
3728	6	3		JERRY D GRIFFITH ET UX		Recreation	6/5/1978		
3729	6	1		JOE GLASER	100	Industrial	9/27/1976		387
3730	6	1		JOE P (JR) & HENRIETTA CALLAN	21	Irrigation	3/1/1967		0.187
3731	6	1		REUBEN FLOYD CLARK	29	Irrigation	12/31/1962		
3732	6	1		SAN GABRIEL RIVER RANCH INC		Recreation	5/17/1976		26
3733	6	1		GEORGETOWN BUILDERS INC		Recreation	9/17/1970		40
3733	6	2		GEORGETOWN BUILDERS INC		Recreation	11/22/1976		4
3734	6	1		GEORGETOWN COUNTRY CLUB	45	Irrigation	12/31/1941		10
3736	6	1		HENRY GRADY RYLANDER	1	Irrigation	6/30/1961		
3737	6	1		ALAMO CONCRETE PRODUCTS LTD	300	Mining	5/4/1970		
3738	6	1		CITY OF GEORGETOWN		Recreation	12/6/1976		11
3739	6	1		GENE H BINGHAM ET AL	240	Mining	3/1/1964		

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3740	6	1		WENDELL F GIBSON	20	Irrigation	5/1/1963		
3741	6	1		LINDA ANN SMITH	10.9	Irrigation	5/1/1964		
3741	6	2		THEODORE & MARY KALLUS REV LIVING TRUST	17.1	Irrigation	5/1/1964		
3742	6	1		MAXINE HARRIS	16.85	Irrigation	5/1/1964		
3742	6	2		R SCOTT POPE ET UX	7.15	Irrigation	5/1/1964		
3743	6	1		J L ENTERPRISES LLP	32	Irrigation	3/31/1954		
3744	6	1		T D VAUGHAN	110.3	Irrigation	9/30/1952		
3745	6	1		BEN W KURIO (BWK PARTNERSHIP)	33	Irrigation	12/31/1963		
3746	6	1		CHARLENE M SEFCIK	12	Irrigation	12/31/1957		
3747	6	1		JIMMY F BYERS	284	Irrigation	7/31/1966		
3748	6	1		A C STEARNS ESTATE	203	Industrial	12/31/1945		
3749	6	1		W T PEARSON JR	110	Irrigation	4/30/1967		
3750	6	1		T R COFFIELD	125	Irrigation	6/30/1943		
3751	6	1		BERTHA S JOHNSON	30	Irrigation	8/18/1922		
3752	6	1		CITY OF TAYLOR		Recreation	5/17/1976		26
3753	6	1		THE ESTATE OF JOHN V STILES	1	Irrigation	7/1/1963		0.5
3754	6	1		CITY OF THORNDALE	60	Municipal	6/20/1961		
3755	6	1		W A & JACK WINTERROWD	50	Irrigation	4/30/1963		263
3756	6	1		LESTER W STILES	3	Irrigation	7/1/1953		
3757	6	1		CITY OF THORNDALE	100	Municipal	9/15/1966		469
3757	6	2		CITY OF THORNDALE	150	Municipal	9/20/1982		
3758	6	1		ALCOA INC	18000	Industrial	12/12/1951	LAKE ALCOA	
3759	6	1		JAMES FERGUSON ET UX	300	Irrigation	8/29/1977		50
3760	6	1		CLIFFORD L GUSTAFSON ET UX	41.5	Irrigation	7/17/1925		
3761	1	1	4047	ROBERT W NORRIS	400	Irrigation	5/27/1980		
3761	6	1		CITY OF CAMERON	2792	Municipal	3/20/1914		10
3762	1	1	4048	ELLIS G & JEAN M MARSHALL	100	Irrigation	5/27/1980		
3762	6	1		B & B MINNOW FARM		Industrial	2/12/1973		
3763	1	1	4049	PAUL J MEYER ET AL	360.655	Irrigation	5/27/1980		20
3763	6	1		SHERWOOD PROPERTIES INC	40	Irrigation	7/31/1952		
3764	6	1		HAROLD B & OPAL B FISHER	45	Irrigation	7/1/1952		
3765	6	1		BRL RANCHES LP	148	Irrigation	7/28/1956		
3766	6	1		FORTY-FOUR FARMS LP	90	Irrigation	12/31/1952		2
3767	6	1		FIVE WELLS RANCH COMPANY	120	Irrigation	7/19/1971		358
3768	6	1		MICHAEL LLOYD ET UX	112	Industrial	2/28/1977		
3768	6	2		MICHAEL LLOYD ET UX	12.7	Irrigation	5/31/1965		
3768	6	3		MICHAEL LLOYD ET UX		Irrigation	2/28/1977		309
3769	6	1		LARRY WAYNE MCCLAREN	150	Irrigation	8/31/1956		
3770	6	1		COLVIN COBB ET AL	149	Irrigation	6/30/1959		
3771	6	1		ELLIOTT W ATKINSON ET AL	15	Irrigation	7/31/1962		
3772	6	1		V T WHITE	8	Irrigation	7/31/1966		
3773	6	1		ARLEDGE & SHANAHAN LP	1300	Irrigation	8/31/1956		11.56
3774	6	1		COLVIN COBB ET AL	30	Irrigation	6/30/1959		
3775	6	1		LLOYD E LEIFESTE ET UX	1200.25	Irrigation	4/10/1960		
3775	6	2		LLOYD E LEIFESTE ET UX	500	Irrigation	9/29/2000		
3775	6	3		JESSE ROBERTSON	66.75	Irrigation	4/10/1960		
3808	1	1	4087	DON FRAZIER CLARK ET AL	808.84	Irrigation	12/3/1980		1271
3808	1	2	4087	DON FRAZIER CLARK ET AL	251.16	Irrigation	12/3/1980		
3809	1	1	4079	L P REED RANCH LTD	230	Irrigation	11/3/1980	6 EXEMPT RESERVOIRS	
3826	1	1	4122	UPPER LEON RIVER MWD		Irrigation	5/11/1981	RELEASED FROM LAKE PROCTOR	45
3844	1	1	4088	CUSTER D SWIFT ET AL	107.22	Irrigation	11/10/1980		421
3844	1	2	4088	WINNIE D ANDERSON	246	Irrigation	11/10/1980		
3844	1	3	4088	DONALD FEIST ET AL	48.78	Irrigation	11/10/1980		
3851	1	1	4180	WALNUT CREEK FARMS OF GRANBURY	2.99	Irrigation	12/12/1981		
3851	1	2	4180	MURRAY RANDLE	2.4	Irrigation	12/12/1981		
3851	1	3	4180	SAM C COWAN JR	1.56	Irrigation	12/12/1981		
3851	1	4	4180	GERALD E KIMMEL ET UX	10.05	Irrigation	12/12/1981		17
3880	1	1	4197	LYNDELL F COAN ET AL		Domestic/Livestock	3/22/1982		60
3902	1	1	4210	ESTATE OF PAUL L RAINS	30	Irrigation	5/3/1982		

TABLE F-1. Brazos River Basin Water Rights in the Brazos G Area

Water Right Number	Type (6 = Certificate of Adjudication, 1 = Permit)	Sequence	Permit #	OwnerName	Annual Authorized Diversion (acft)	Use Type	Priority Date	Reservoir Name	Reservoir Capacity (acft)
3902	1	2	4210	GARY G HALL ET UX	20	Irrigation	5/3/1982		
3902	1	3	4210	DENNIS L SHELTON	10	Irrigation	5/3/1982		
3913	1	1	4212	CAPITOL AGGREGATES LTD	118	Mining	5/3/1982		70
3913	1	2	4212	CAPITOL AGGREGATES LTD		Industrial	5/3/1982		
3934	1	1	4263	TROY MORRIS ET UX	25	Irrigation	11/8/1982		25
3936	1	1	4235	HOLY LAND & CATTLE	2600	Irrigation	8/30/1982		
3939	1	1	4257	KENNETH & BETTY YVON LESLEY	245	Irrigation	11/1/1982		725
3941	6	1		SELECTED LANDS CORP	300	Irrigation	7/1/1974		160
3941	6	2		SELECTED LANDS CORP		Recreation	7/1/1974		
3953	6	1		LAKE WINONA PROP OWNERS ASSN		Recreation	10/27/1975		
3956	6	1		LAKE HOLLYHILL OWNERS ASSN		Recreation	11/10/1975		
3971	1	1	4314	TONKAWA SPRINGS HOMEOWNERS ASSN INC		Recreation	1/31/1983		7.5
3971	1	2	4314	TONKAWA SPRINGS HOMEOWNERS ASSN INC		Domestic/Livestock	1/31/1983		
3999	6	1		MARVIN H MCMURREY JR ET AL	25	Irrigation	8/16/1956		
4000	1	1	4246	THOMAS E LOVELACE ET AL	20	Irrigation	9/20/1982		
4000	6	1		CURTIS MITCHELL	31	Irrigation	4/30/1963		
4001	6	1		JENNIE M & M F EWTON	40	Irrigation	5/31/1962		
4002	1	1	4241	JOSEPH B MORROW ET UX	32.9	Irrigation	9/20/1982		
4002	1	2	4241	TIPTON MALONE MURRELL	7.1	Irrigation	9/20/1982		
4003	1	1	4242	MIKE H BERRY ET UX	29.7	Irrigation	9/20/1982		
4003	6	1		MRS G C MOORE	41	Irrigation	9/30/1974		
4004	6	1		CITY OF GRAFORD	50	Municipal	2/1/1957		50
4004	6	2		CITY OF GRAFORD	5	Municipal	3/18/1932		
4005	6	1		W J RHODES ET AL	781	Irrigation	4/30/1932		250
4006	6	1		SAN ROC LLC	63	Irrigation	12/31/1958		
4007	6	1		MARY E RIPPETOE	50	Irrigation	6/7/1976		
4008	6	1		LAWRENCE M CAREY ET AL	46.94	Irrigation	7/1/1956		
4008	6	2		CHRISTMANN CORPORATION	63.052	Irrigation	7/1/1956		
4009	6	1		ERNEST E AMMONS	4.32	Irrigation	12/31/1962		
4009	6	2		CHRISTMANN CORPORATION	19.68	Irrigation	12/31/1962		
4010	6	1		CHARLES W & JEAN WELCH	33	Irrigation	12/31/1962		
4011	1	1	4282	HARVEST GUARD INC	1398.29	Irrigation	12/20/1982		
4011	6	1		JACKIE LEE CHASTAIN ET AL	8	Irrigation	7/31/1966		
4011	1	2	4282	GERTRUDIS C ESTRADA ET UX (MARIA PAULA)	4.71	Irrigation	12/20/1982		
4012	1	1	4280	BILLY G CURRY ET AL	440	Irrigation	12/13/1982		
4012	6	1		EARL W & ANITA GARDNER	236	Irrigation	9/30/1964		
4013	1	1	4276	ROBERT L MACHA ET AL	1200	Irrigation	11/29/1982		
4013	6	1		ROCKING W RANCH LP	900	Irrigation	11/14/1947	7 RESERVOIRS	646
4013	6	2		DALTON BEND RANCH LTD	429	Storage	11/14/1947		
4014	1	1	4270	WALSH RANCH LTD PARTNERSHIP	1851	Irrigation	9/22/1982		
4014	6	1		FRED HAGAMAN ET AL	500	Irrigation	4/12/1926		1158
4014	6	2		FRED HAGAMAN ET AL	100	Industrial	4/12/1926		
4015	1	1	4249	CHAMBERLIN FAMILY TRUST	350	Irrigation	9/20/1982		
4015	6	1		FRED HAGAMAN ET AL	27	Irrigation	12/31/1963		
4015	1	2	4249	CALVIN KRAEMER ET UX	350	Irrigation	9/20/1982		
4016	1	1	4283	KR SOD-BRAZOS LP	1742.45	Irrigation	12/20/1982		
4016	6	1		HUBERT H CAPPS	22	Irrigation	5/17/1971		
4016	1	2	4283	KR SOD-BRAZOS LP	990	Irrigation	3/13/1984		
4016	1	3	4283	KR SOD-BRAZOS LP		Domestic/Livestock	12/20/1982	RES 1 (21 AF) & RES 3 (9 AF) ON BI	30
4016	1	4	4283	KR SOD-BRAZOS LP	1400	Irrigation	12/20/1982		
4016	1	5	4283	HARVEST GUARD INC	756.55	Irrigation	12/20/1982		
4016	1	6	4283	TED HIGGINBOTTOM ET AL	551	Irrigation	12/20/1982	RES 2	13
4017	1	1	4284	JERRY M MOORE	591.876	Irrigation	12/20/1982		
4017	6	1		LYNDAL D GARNER JR ET UX	40	Irrigation	11/19/1973		
4017	1	2	4284	MELANIE M KOLBY	370.524	Irrigation	12/20/1982		
4018	6	1		ROSS HODGES	40	Irrigation	11/19/1973		48
4019	6	1		CITY OF STRAWN	160	Municipal	4/19/1937		1200
4020	6	1		PERRY R HORTON ET AL	362	Irrigation	2/15/1963		
4021	6	1		R J CARAWAY	30	Irrigation	3/1/1971		164

TABLE F-1. Brazos River Basin Water Rights in the Brazos G Area

Water Right Number	Type (6 = Certificate of Adjudication, 1 = Permit)	Sequence	Permit #	OwnerName	Annual Authorized Diversion (acft)	Use Type	Priority Date	Reservoir Name	Reservoir Capacity (acft)
4021	6	2		R J CARAWAY	41	Mining	3/1/1971		
4022	6	1		PENNY SPARKS	60	Irrigation	4/30/1963		
4023	1	1	4320	DON WEINACHT ET AL	600	Irrigation	2/7/1983		
4023	6	1		A D CRAWFORD	30	Irrigation	4/30/1964		30
4024	1	1	4322	LVGC INC	300	Irrigation	2/7/1983		15
4024	6	1		CITY OF GORDON	360	Municipal	6/4/1973		1023
4024	6	2		CITY OF GORDON	45	Municipal	5/22/1978		60
4025	6	1		TARRANT INVESTMENT CO INC	60	Municipal	10/15/1973		700
4025	6	2		TARRANT INVESTMENT CO INC	30	Mining	10/15/1973		
4025	6	3		TARRANT INVESTMENT CO INC		Recreation	10/15/1973		
4026	6	1		WINGSHOT LP	20	Municipal	10/15/1973		
4027	6	1		JACK R DAUGHERTY	80	Irrigation	1/20/1965		969
4028	6	1		HELEN H MCDANIEL	38	Irrigation	5/31/1933		30
4029	6	1		FAWCETT LIMITED	2	Irrigation	1/5/1970		26
4030	6	1		FAWCETT LIMITED		Recreation	2/7/1977		307
4031	6	1		PALO PINTO CO MWD 1	10000	Municipal	7/3/1962	LAKE PALO PINTO	44100
4031	6	2		PALO PINTO CO MWD 1	2500	Municipal	9/8/1964	LAKE PALO PINTO	24
4031	6	3		PALO PINTO CO MWD 1	6000	Industrial	7/3/1962	LAKE PALO PINTO	
4032	6	1		CHARLIE RAY COCKBURN	16	Irrigation	7/31/1965		
4033	6	1		JAMES R & JANICE MOORE	12	Industrial	6/26/1972		24
4034	6	1		HELEN H MCDANIEL	30	Irrigation	3/31/1955		15
4035	6	1		HELEN H MCDANIEL	5	Irrigation	12/31/1963		
4036	6	1		FAWCETT LIMITED	55	Irrigation	10/11/1977		139
4037	6	1		WILLIAM S SQUYRES ET AL	100	Irrigation	4/30/1965		
4038	6	1		HERMAN PETTY	150	Irrigation	5/31/1964		
4042	1	1	4321	T W WHALEY JR	700	Irrigation	10/3/1983		
4048	6	1		H D HOWARD	25	Irrigation	11/8/1976		
4048	6	2		H D HOWARD	35	Municipal	11/8/1976		
4048	6	3		H D HOWARD		Recreation	11/8/1976		
4049	6	1		FRED L THORMANN	12	Irrigation	4/30/1964		2
4050	6	1		ROBIN THORMANN ET AL	23	Irrigation	4/30/1964		2
4054	6	1		JESSE T CROWDER JR TRUST	4.31	Irrigation	7/31/1962		
4054	6	2		JOHN WESSLER ET AL	26.85	Irrigation	7/31/1962		
4054	6	3		T J WELLMAN	7.84	Irrigation	7/31/1962		
4055	6	1		JUSRYN COMPANY INC	42	Irrigation	7/31/1955		
4056	6	1		J M LEONARD TRUST	144	Irrigation	8/31/1967		1454
4057	6	1		MARY L & C W KILLOUGH	109	Irrigation	6/30/1962		
4058	6	1		OAK TRAIL OWNERS ASSOCIATION		Recreation	12/20/1976		24
4059	6	1		HELEN T DURHAM ESTATE	35	Irrigation	12/31/1963		
4060	6	1		ESTATE OF E E DURHAM ET UX	248.438	Irrigation	7/31/1950		
4060	6	2		MAXIE OVERSTREET	74.344	Irrigation	7/31/1950		
4060	6	3		DURHAM OVERSTREET TRUST	146.609	Irrigation	7/31/1950		
4060	6	4		DURHAM OVERSTREET TRUST		Municipal	7/31/1950		
4060	6	5		DURHAM OVERSTREET TRUST		Industrial	7/31/1950		
4060	6	6		OVERSTREET FAMILY LP ET AL	146.609	Irrigation	7/31/1950		
4060	6	7		OVERSTREET FAMILY LP		Municipal	7/31/1950		
4060	6	8		OVERSTREET FAMILY LP		Industrial	7/31/1950		
4061	6	1		BURTON S BURKS SR ET AL	65	Irrigation	5/31/1956		
4062	6	1		MARK O THOMAS FAMILY IRREVOCABLE ASSET	383	Irrigation	12/31/1955	LAKE GRANBURY	
4063	1	1	4384	N S WATERMAN JR ET UX	270	Irrigation	7/11/1983		30
4063	6	1		GRANPEN ASSOCIATES LP	270.13	Irrigation	7/31/1963		
4063	6	2		ALAMO BUILDERS LP	4.42	Irrigation	7/31/1963		
4063	6	3		THE RESORT AT EAGLE MOUNTAIN LAKE LP	24.47	Irrigation	7/31/1963		
4063	6	4		JUSRYN COMPANY INC	48.98	Irrigation	7/31/1963		
4064	6	1		BURTON S BURKS ET UX	25	Irrigation	12/31/1963		
4065	6	1		ROBERT & C J WHITEHEAD	84	Irrigation	8/31/1963		
4066	6	1		COMANCHE HARBOR OWNERS ASSN		Recreation	12/20/1976		43
4067	6	1		COURTS K CLEVELAND JR	63	Irrigation	12/31/1956		
4068	6	1		LOU ANN LANGFORD	72	Irrigation	7/31/1967		

Water Right Number	Type (6 = Certificate of Adjudication, 1 = Permit)	Sequence	Permit #	OwnerName	Annual Authorized Diversion (acft)	Use Type	Priority Date	Reservoir Name	Reservoir Capacity (acft)
4069	6	1		WALKER MURRAY RANDLE	120	Irrigation	10/21/1974		
4070	6	1		LESLIE L MABERY	141	Irrigation	8/31/1956		
4071	6	1		R E MABERY	83	Irrigation	8/31/1956		
4072	6	1		LENMO INC	308	Irrigation	12/31/1956	OFF-CHANNEL RES	1
4072	6	2		LENMO INC	172	Irrigation	12/31/1963	FROM LAKE GRANBURY	
4072	6	3		LENMO INC	117	Irrigation	5/31/1962	FROM LAKE GRANBURY	
4073	6	1		JAMES R ROBINSON	42	Irrigation	8/19/1956		
4074	6	1		E F ALLISON	26	Irrigation	8/19/1956		
4075	6	1		THE R K HANGER TRUST		Recreation	7/5/1976		300
4076	1	1	4410	CULLEN V MANCUSO ET UX	93	Irrigation	11/7/1983		
4076	6	1		D J VAUGHN	15.49	Irrigation	7/10/1966		
4076	1	2	4410	JAMES BARNETT ET AL	157	Irrigation	11/7/1983		
4076	6	2		ROBIN K SNIDER ET AL	23.51	Irrigation	7/10/1966		
4077	6	1		D J BROWN ET UX	30	Irrigation	8/31/1964		
4078	1	1	4401	JOHN R WOODALL ET AL	825	Irrigation	9/26/1983		
4078	6	1		ROBERT & MARGARET KING INV INC	54	Irrigation	9/30/1957		
4079	6	1		JAMES ROBERT HILL	92	Irrigation	8/31/1964		20
4080	1	1	4398	GATHAN REISTINO	1500	Irrigation	7/19/1983		47
4080	6	1		J V & M G DURANT	112	Irrigation	7/2/1966		
4081	6	1		F L VAUGHN	160	Irrigation	7/2/1966		
4082	6	1		S B GRISSOM	203	Irrigation	7/31/1950		
4083	6	1		ROBERT L FOREE JR	45	Irrigation	9/30/1963		
4084	6	1		EARL R ALLISON	9.12	Irrigation	11/19/1973		25
4084	6	2		EARL R ALLISON	25	Other	11/19/1973		
4084	6	3		DANE ALLISON ET UX	15.88	Irrigation	11/19/1973		
4085	6	1		EARL R ALLISON	10.34	Irrigation	12/9/1974		
4085	6	2		DANE ALLISON ET UX	17.66	Irrigation	12/9/1974		
4086	6	1		GARY & BEVERLY LEWELLEN	15	Irrigation	9/2/1975		2
4087	6	1		LELAND A HODGES ET AL	81	Irrigation	9/30/1965		360
4088	6	1		MILTON C & VIVIAN YOUNG	55	Irrigation	6/30/1966		2
4089	6	1		JACOB T & LAURA DAMERON	31	Irrigation	3/31/1963		
4090	6	1		RICHARD T LIETZ ESTATE	197	Irrigation	8/14/1967		332
4091	1	1	4419	RIVER CHASE SUBDIVISION II LTD		Domestic/Livestock	1/3/1984		11
4091	6	1		KENNETH LESLEY	360	Irrigation	1/20/1965		511
4092	6	1		ROBERT D ADAMS SR	6	Irrigation	7/31/1964		
4093	6	1		ERNEST H CANNON	94	Irrigation	12/31/1963		
4094	6	1		J B SANDERSON ET AL	16	Irrigation	6/30/1935		
4095	1	1	4430	SIDNEY KACIR	240	Irrigation	1/17/1984		
4095	6	1		J C MCFALL	10	Irrigation	12/31/1949		
4095	1	2	4430	SIDNEY KACIR	308	Irrigation	8/16/1999		
4096	6	1		CITY OF GLEN ROSE		Recreation	5/28/1974		2
4097	6	1		TXU ELECTRIC CO	23180	Industrial	4/25/1973	SQUAW CREEK RESERVOIR	151500
4098	6	1		BOB HARRIS OIL CO	258	Irrigation	7/31/1954		
4099	6	1		DOROTHY W LITTLE ET AL	5	Irrigation	8/31/1949		
4100	6	1		TRINITY MATERIALS INC	125	Mining	12/31/1959		
4101	6	1		TEXAS PARKS & WILDLIFE DEPT		Recreation	9/9/1969	CEDAR LAKE	1450
4102	6	1		STANDARD INVESTMENT CO	77	Irrigation	12/31/1963		
4102	6	2		STANDARD INVESTMENT CO		Industrial	12/31/1963		
4103	6	1		CYRIL WAGNER JR ET AL	186	Irrigation	12/31/1955		
4104	6	1		CHISHOLM TRAIL VENTURES LP	3811	Irrigation	12/31/1957		
4105	6	1		WESLEY RAY CARSON	8.04	Irrigation	1/31/1977		
4105	6	2		CREPE MYRTLE OF TEXAS INC	3.96	Irrigation	1/31/1977		
4106	6	1		CITY OF CLEBURNE	5760	Municipal	8/6/1962	LAKE PAT CLEBURNE	25600
4106	6	2		CITY OF CLEBURNE		Industrial	8/6/1962	LAKE PAT CLEBURNE	
4106	6	3		CITY OF CLEBURNE	240	Irrigation	3/29/1976	LAKE PAT CLEBURNE	
4106	6	4		CITY OF CLEBURNE		Municipal	8/30/2004	LAKE PAT CLEBURNE	
4106	6	5		CITY OF CLEBURNE		Industrial	8/30/2004	LAKE PAT CLEBURNE	
4106	6	6		CITY OF CLEBURNE		Irrigation	8/30/2004	LAKE PAT CLEBURNE	
4107	6	1		RIVERVIEW GOLF CLUB LP	231	Irrigation	12/31/1964		12

TABLE F-1. Brazos River Basin Water Rights in the Brazos G Area

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4108	6	1		HARRY V DULICK	15.19	Irrigation	6/30/1961		
4108	6	2		HARRY V DULICK	5	Industrial	6/30/1961		
4108	6	3		DSF LTD	11.815	Irrigation	6/30/1961		
4109	1	1	4436	BETTY KACIR WHEELER	400	Irrigation	2/28/1984		
4109	6	1		LOUIS & VIRGINIA GREGORY	10	Irrigation	5/8/1969		10
4110	6	1		LUCILLE C BUTLER	20	Irrigation	7/31/1966		
4111	6	1		PAUL C MURPHY JR	6	Irrigation	7/31/1953		15
4112	6	1		LOUIS & VIRGINIA GREGORY	12	Irrigation	3/23/1964		
4113	6	1		JAMES M WALKER	43	Irrigation	5/31/1964		140
4114	6	1		THOMAS BROTHERS GRASS LTD	300	Irrigation	7/31/1955		
4114	6	2		THOMAS BROTHERS GRASS LTD		Irrigation	7/31/1955	LAKE GRANBURY	
4114	6	3		THOMAS BROTHERS GRASS LTD		Irrigation	7/31/1955	LAKE GRANBURY	
4115	6	1		H & H FEEDLOT INC	45	Industrial	12/31/1958		127
4116	6	1		MARJORIE HAMBRIGHT	2	Irrigation	12/31/1926		
4117	6	1		BETTY BELL	1	Irrigation	12/31/1955		
4118	6	1		ZANNA H ANDERSON	8	Irrigation	12/31/1963		
4119	6	1		ALFRED L CAREY ET UX	5	Irrigation	12/31/1963		5
4120	6	1		MAX D CARRIKER ESTATE ET AL	74	Irrigation	12/31/1937		15
4121	6	1		WILLARD L BURK	263	Irrigation	5/31/1936		26
4122	6	1		MAX D CARRIKER ESTATE	60	Irrigation	12/31/1962		22
4123	6	1		FREDDIE MAC STUART	17	Irrigation	2/29/1928		12
4124	1	1	4226	BRUCE E TODD	225	Irrigation	6/21/1982		180
4124	6	1		ALFRED S WALDROP ET AL	55	Irrigation	4/3/1926		
4126	6	1		BOYD H LAKEY	55	Irrigation	12/31/1949		20
4127	6	1		JAMES RANDOLPH SCOTT	120	Irrigation	4/30/1967		
4128	1	1	4451	FLOYD GUNN	102	Irrigation	5/8/1984		
4128	6	1		CITY OF SWEETWATER	2000	Municipal	10/8/1914	LAKE TRAMMEL	2500
4129	6	1		SWEETWATER COUNTRY CLUB INC	40	Irrigation	7/6/1916		892
4130	1	1	4450	UNITED STATES ARMY CORP ENG	5	Recreation	5/8/1984		5
4130	6	1		CITY OF SWEETWATER	2730	Municipal	10/17/1927	LAKE SWEETWATER	10000
4130	6	2		CITY OF SWEETWATER	960	Industrial	10/17/1927		
4130	6	3		CITY OF SWEETWATER	50	Irrigation	10/17/1927		
4132	6	1		HARRY C REAUGH & WIFE	212	Irrigation	12/31/1965		
4133	6	1		THOMAS HICKS ET UX	59.84	Irrigation	12/31/1964		
4133	6	2		KENNETH M FARRINGTON	165.16	Irrigation	12/31/1964		7
4134	6	1		BILLY DOAN	45	Irrigation	10/6/1969		
4135	1	1	4453	CITY OF CRAWFORD	55	Municipal	5/15/1983		230
4135	6	1		TIN CUP COUNTRY CLUB LP	28	Irrigation	5/2/1966		
4136	6	1		TLC INVESTMENTS LLC	338	Mining	7/22/1948		850
4136	6	2		TLC INVESTMENTS LLC	7	Industrial	7/22/1948		
4136	6	3		TLC INVESTMENTS LLC		Recreation	7/22/1948		
4137	6	1		TERRI THOMAS	54	Irrigation	7/13/1926		
4138	6	1		ROGER F BOYD ET UX	2	Irrigation	3/16/1964		
4139	6	1		CITY OF ABILENE		Municipal	8/3/1949	DIVERSION TO FT PHANTOM HILL	608
4140	1	1	4443	JOE D DUNCAN		Other	4/10/1984		
4140	6	1		RALPH BRIDWELL ET UX	10	Irrigation	12/31/1966		
4140	6	2		JAMES GRAY BRIDWELL	155	Irrigation	12/31/1966		
4141	6	1		DOLLY KEESEE	69	Irrigation	5/31/1967		
4142	6	1		CITY OF ABILENE	1675	Municipal	1/23/1918	LAKE ABILENE	11868
4143	6	1		KICKAPOO LAND CO	50	Recreation	12/18/1972		66
4144	6	1		FIRST CHOICE FEEDERS LP	73	Industrial	12/31/1964		120
4145	1	1	4454	JOHN W NIGLIAZZO ET UX	448	Irrigation	5/15/1984		
4145	6	1		BILL JAY ET AL	168	Industrial	12/31/1964		150
4146	6	1		J H TAYLOR GAS COMPANY	4	Irrigation	5/31/1948		6
4147	6	1		LEE ARTHUR PRESSWOOD	14	Irrigation	5/31/1963		
4148	6	1		RILEY G MAXWELL CO	3.48	Irrigation	8/31/1964		
4148	6	2		A L RHODES	0.01	Irrigation	8/31/1964		
4148	6	3		EDWARD DUSTY RHODES	1.51	Irrigation	8/31/1964		
4149	6	1		NOEL W PETRE	42	Irrigation	4/30/1963		

TABLE F-1. Brazos River Basin Water Rights in the Brazos G Area

Water Right Number	Type (6 = Certificate of Adjudication, 1 = Permit)	Sequence	Permit #	OwnerName	Annual Authorized Diversion (acft)	Use Type	Priority Date	Reservoir Name	Reservoir Capacity (acft)
4150	6	1		CITY OF ABILENE	3880	Municipal	10/10/1927	LAKE KIRBY	8500
4150	6	2		CITY OF ABILENE		Industrial	10/10/1927	LAKE KIRBY	
4150	6	3		CITY OF ABILENE		Irrigation	10/10/1927		
4151	6	1		AEP TEXAS NORTH COMPANY	2500	Industrial	10/12/1928	UPPER LYTLE LAKE	
4152	6	1		LYTLE LAKE WCID	230	Municipal	6/10/1914	LYTLE LAKE	1184
4152	6	2		LYTLE LAKE WCID	360	Industrial	11/21/1967	LYTLE LAKE	
4152	6	3		LYTLE LAKE WCID		Recreation	11/21/1967	LYTLE LAKE	
4153	6	1		CITY OF ABILENE		Industrial	6/10/1914		62
4153	6	2		CITY OF ABILENE		Recreation	6/10/1914		
4154	6	1		AEP TEXAS NORTH COMPANY		Industrial	5/12/1921	CEDAR CREEK	10
4155	6	1		RAYMOND MCNUTT	6	Irrigation	12/31/1959		
4156	6	1		ROY ELTON ROBBINS & WIFE	5	Irrigation	5/31/1964		
4157	6	1		H C WELCH	70	Irrigation	12/31/1967		
4158	6	1		ROY J GRIFFITH	75	Irrigation	11/30/1944		175
4158	6	2		ROY J GRIFFITH		Irrigation	11/30/1944		
4159	6	1		J C GRIFFITH	42	Irrigation	12/31/1938		80
4160	6	1		WOODROW W GRIFFITH		Recreation	10/15/1974		40
4161	6	1		CITY OF ABILENE	25690	Municipal	3/25/1937	FORT PHANTOM HILL RES	73960
4161	6	2		CITY OF ABILENE	4000	Industrial	3/25/1937	FORT PHANTOM HILL RES	
4161	6	3		CITY OF ABILENE	1000	Irrigation	3/25/1937	FORT PHANTOM HILL RES	
4162	6	1		JAMES H ICE	179	Irrigation	12/31/1959		
4163	6	1		PATRICIA A COOK ET AL	44	Irrigation	12/31/1959		
4164	6	1		J N MONTGOMERY & WIFE	32	Irrigation	12/31/1966		
4165	6	1		CITY OF ABILENE	3000	Municipal	9/3/1954		
4166	1	1	4470	SAMUEL W JONES ET UX	120	Irrigation	7/31/1984		
4166	6	1		IRLENE M SMITH ET AL	32	Irrigation	12/31/1965		
4166	1	2	4470	SAMUEL W JONES ET UX		Irrigation	7/31/1984		
4167	6	1		GEOCHEMICAL SURVEYS	40	Mining	8/28/1967		6
4168	6	1		ZOHN MILAM	15	Irrigation	5/31/1956		
4169	6	1		RICHARD SCHKADE	62	Irrigation	10/19/1970		
4169	6	2		RICHARD SCHKADE	5	Mining	10/19/1970		0.1
4170	6	1		J M ALEXANDER RANCH CO LTD	200	Irrigation	7/31/1962		
4171	1	1	4482	35/45 INVESTORS LP		Recreation	8/14/1984	EXEMPT RESERVOIR	19
4171	6	1		MARY LOIS WILSON	310	Irrigation	12/31/1918		
4172	6	1		VIOLET H FRAZIER	92	Irrigation	7/31/1963		
4173	6	1		VIOLET H FRAZIER	40	Irrigation	7/31/1965		
4174	6	1		MARILOU DOUTHIT RYDL		Recreation	10/2/1918		375
4174	6	2		ADRON STALEY		Recreation	10/2/1918		375
4174	6	3		C G VICKERS ET AL		Recreation	10/2/1918		375
4175	6	1		H R STASNEY & SONS LTD	21	Municipal	7/1/1926		108
4175	6	2		H R STASNEY & SONS LTD	63	Mining	7/1/1926		
4176	6	1		JOSEPH ELMER COX	28.8	Irrigation	12/31/1962		
4176	6	2		KIRK MERRITT ET UX	91.2	Irrigation	12/31/1962		1
4177	6	1		W B GRIFFITH ET AL	95	Irrigation	12/31/1955		18
4178	6	1		EMILEE G GOFF ET AL	78	Irrigation	12/31/1955		30
4179	6	1		CITY OF STAMFORD	10000	Municipal	6/8/1949	LAKE STAMFORD	59810
4179	6	2		CITY OF STAMFORD		Industrial	6/8/1949	LAKE STAMFORD	
4179	6	3		CITY OF STAMFORD		Storage	6/8/1949	COLLEGE LAKE	190
4179	6	4		CITY OF STAMFORD		Municipal	4/4/2000	DETENTION POND	705
4179	6	5		CITY OF STAMFORD		Industrial	4/4/2000	DETENTION POND	
4180	6	1		CITY OF HAMLIN	300	Municipal	3/3/1939		1900
4181	6	1		CITY OF ANSON	542	Municipal	4/18/1950	ANSON NORTH LAKE	2500
4182	6	1		CITY OF ANSON		Recreation	3/3/1975	CITY LAKE	560
4183	6	1		MARSHALL D O'DELL	150	Irrigation	5/8/1978		7
4184	6	1		HASKELL COUNTY COUNTRY CLUB	7	Irrigation	7/25/1977	2 RES: 75 AF & 15 AF	75
4184	6	2		HASKELL COUNTY COUNTRY CLUB		Recreation	7/25/1977	2 RES: 75 AF & 15 AF	
4185	6	1		ERNEST D FINCHER	10	Irrigation	7/14/1975		10
4186	6	1		RAYMOND C TAYLOR ET AL	43	Irrigation	9/16/1966		60
4187	6	1		GEORGE E CLARK EXEMPT INVESTMENT TRUST	300	Irrigation	12/31/1952		

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4188	6	1		T C HARRIS JR	40	Irrigation	12/31/1914		
4189	6	1		GEORGE E CLARK EXEMPT INVESTMENT TRUST	69	Irrigation	8/31/1958		
4190	6	1		BRECKENRIDGE PARTNERSHIP LTD	70	Irrigation	8/31/1958		
4191	6	1		MICHELLE SMITH	33.3803	Irrigation	5/31/1964		
4191	6	2		WILLIAM RANDOLPH SMITH	47.53	Irrigation	5/31/1964		
4191	6	3		DAVID IVAN BANDY ET AL	96.4122	Irrigation	5/31/1964		
4191	6	4		KILLION PARTNERS LTD	17.6775	Irrigation	5/31/1964		
4192	6	1		MRS W R POWERS ESTATE	30	Irrigation	12/31/1915		
4193	6	1		MONTY CHRIS CLEVELAND		Domestic/Livestock	4/13/1920		165
4194	6	1		CITY OF WOODSON		Storage	3/14/1963		1003
4194	6	2		STEPHENS REGIONAL SPECIAL UTILITY DIST	60	Municipal	3/14/1963		
4195	6	1		GILBERT E BRANDENBERGER ET UX	22	Irrigation	6/30/1962		
4196	6	1		ICBT BRAZOS BEND LLC	18	Irrigation	5/20/1967		
4197	6	1		J W SULLIVAN	20	Irrigation	12/31/1955		
4198	6	1		MONTY CHRIS CLEVELAND		Domestic/Livestock	2/16/1920		430
4199	6	1		OWEN D WOODWARD	98	Irrigation	12/31/1924		3
4200	6	1		CHARLES EZZELL ET UX		Domestic/Livestock	11/15/1976		200
4201	6	1		CITY OF BAIRD		Domestic/Livestock	6/19/1914	T P LAKE	390
4202	6	1		CITY OF BAIRD	550	Municipal	7/6/1949	BAIRD LAKE	2070
4203	6	1		A E DYER JR	24	Irrigation	7/31/1963	2 RES; 2.5 AF & 5 AF	7.5
4204	6	1		MARTHA W GEORGE ET AL	16	Irrigation	7/31/1963		
4205	6	1		EUGENE LEE FINLEY	50	Irrigation	12/31/1946		
4206	6	1		TERRY T POSEY ET UX	40	Irrigation	9/8/1927		13
4207	6	1		CITY OF MORAN	90	Municipal	4/2/1923	MORAN CITY LAKE & UNNAMED RE	181
4208	6	1		CITY OF ALBANY	600	Municipal	3/25/1941	MCCARTY LAKE	2600
4209	6	1		DAMSON OIL CORP ET AL	50	Industrial	3/3/1925	LAKE DELAFOSSE	773
4210	6	1		JAMES R GREEN	35	Irrigation	5/31/1965		72
4211	6	1		CITY OF CISCO	1971	Municipal	4/16/1920	LAKE CISCO	45000
4211	6	2		CITY OF CISCO	56	Industrial	9/5/1978		
4212	1	1	4528	CARL MOODY ET AL	300	Irrigation	1/3/1985		
4212	6	1		CITY OF CISCO	1000	Municipal	11/8/1954		110
4213	6	1		WEST CENTRAL TEXAS MWD	56000	Municipal	5/28/1957	HUBBARD CREEK LAKE	317750
4213	6	2		WEST CENTRAL TEXAS MWD		Industrial	5/28/1957		
4213	6	3		WEST CENTRAL TEXAS MWD		Irrigation	8/14/1972		
4213	6	4		WEST CENTRAL TEXAS MWD		Mining	5/28/1957		
4213	6	5		WEST CENTRAL TEXAS MWD		Domestic/Livestock	8/14/1972		
4214	6	1		CITY OF BRECKENRIDGE	2100	Municipal	4/26/1946	LAKE DANIEL	11400
4215	6	1		T C FAMBRO & SONS	6	Irrigation	7/31/1947		7
4216	6	1		SARAH SATTERWHITE	30	Irrigation	4/30/1966		
4217	6	1		SWANSON MULESHOE RANCH LTD	218	Mining	4/28/1975	GRAND LAKE	375
4218	1	1	4520	THE SILVER QUAIL COMPANY	172	Irrigation	11/27/1984		
4218	6	1		JACK T ROBERTSON JR	32	Irrigation	6/30/1955		
4219	6	1		ELLA PEARL ROBERTSON	22	Irrigation	12/31/1945		
4220	6	1		ELLA PEARL ROBERTSON	39	Irrigation	4/30/1964		
4221	6	1		ELLA PEARL ROBERTSON	42	Irrigation	8/31/1949		
4222	6	1		ELLA PEARL ROBERTSON	45	Irrigation	4/30/1961		
4223	6	1		BRECKENRIDGE GASOLINE CO	97	Industrial	6/1/1926		
4223	6	2		BRECKENRIDGE GASOLINE CO		Mining	6/1/1926		
4224	6	1		BRECKENRIDGE GASOLINE CO		Recreation	3/16/1920		454
4225	6	1		E E RILEY	30	Irrigation	12/31/1954		
4226	6	1		LAURA ELIZABETH STOKES ROACH	628	Irrigation	6/30/1961		
4227	6	1		C R BALDWIN JR	181	Irrigation	8/31/1946		
4242	6	1		WILLIAM T MORAN ESTATE		Recreation	10/6/1975		270
4244	6	1		DARRELL R HALL		Recreation	6/23/1975		290
4245	6	1		W T BRACEWELL		Recreation	4/14/1975		
4258	1	1	4567	CITY OF CLEBURNE	720	Municipal	5/21/1985		552
4264	1	1	4577	GEORGE BINGHAM ET AL	40	Irrigation	6/18/1985		
4266	1	1	4589	CITY OF ABILENE	4330	Irrigation	7/2/1985	7 HOLDING PONDS	1003.6
4266	1	2	4589	CITY OF ABILENE		Irrigation	7/2/1985	7 HOLDING PONDS	

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Water Right Number	Type (6 = Certificate of Adjudication, 1 = Permit)	Sequence	Permit #	OwnerName	Annual Authorized Diversion (acft)	Use Type	Priority Date	Reservoir Name	Reservoir Capacity (acft)
4279	1	1	4591	WARRENS TURF NURSERY INC	52.2	Irrigation	7/9/1985		
4279	1	2	4591	HILLIARD RANCHES INC	606.47	Irrigation	7/9/1985		38
4279	1	3	4591	JAMES GREGORY WILSON ET AL	91.33	Irrigation	7/9/1985		
4315	6	1		CLIFFORD N AUTEN	30	Irrigation	12/31/1960		
4316	6	1		B W BOWERS & WIFE	75	Irrigation	12/31/1961		
4317	6	1		MARY ANN JENKINS ET AL	243	Irrigation	12/31/1963		
4318	6	1		CHS FARMS LTD	497	Irrigation	12/31/1921		
4318	6	2		JOHN MCPHERSON ET AL	150	Irrigation	12/31/1921		
4318	6	3		LAKEVIEW RECREATION ASSOCIATION INC	20	Irrigation	12/31/1921	2 RES	8.54
4318	6	4		SMITH BEND RANCH LTD	2153	Irrigation	12/31/1921		288
4318	6	5		SMITH BEND RANCH LTD		Municipal	12/31/1921		
4318	6	6		SMITH BEND RANCH LTD		Industrial	12/31/1921		
4319	6	1		BIRCH WILFONG	34	Irrigation	3/31/1962		
4320	6	1		WARREN D WHITLOW ET UX	84	Irrigation	7/31/1967		
4321	6	1		DAVID BALLEW	337	Irrigation	8/31/1963		
4322	6	1		RONALD LEE BURNETTE	175	Irrigation	6/30/1964		
4323	6	1		RONALD LEE BURNETTE	18	Irrigation	6/30/1956		
4323	6	2		KENNETH GAGE BURNETTE	155	Irrigation	6/30/1956		
4324	6	1		CHARLES L HARLESS ET UX	305	Irrigation	6/30/1965		12
4325	6	1		NELDA KATHRYN CARGILL	48	Irrigation	6/30/1967		
4326	6	1		DAN WELDON WILLIAMS	6	Irrigation	12/31/1959		
4327	6	1		DAN WELDON WILLIAMS	4	Irrigation	12/31/1959		
4328	6	1		GEORGE L MOORE	40	Irrigation	7/1/1964		
4329	6	1		THOMAS BROTHERS GRASS LTD	74	Industrial	12/31/1964		
4329	6	2		JIMMY LEWIS GIFFORD ET UX	856	Irrigation	12/31/1964		
4330	6	1		KARL LEE REDDELL & WIFE	16	Irrigation	12/31/1940		
4331	6	1		DIANA M WELLBORN ET AL	44	Irrigation	12/31/1940		
4332	6	1		KARL LEE REDDELL ET AL	32	Irrigation	12/31/1940		
4333	6	1		HILLSBORO COUNTRY CLUB	8	Irrigation	6/14/1976		18
4334	6	1		JOE R CUNNINGHAM ET UX	1	Irrigation	8/11/1964		50
4335	6	1		ALPHONS D URBANOVSKY	40	Irrigation	7/31/1964		
4336	6	1		FAYE SMITH ROMINE	55	Irrigation	6/30/1953		
4336	6	2		KAYE SMITH BOYD	55	Irrigation	6/30/1953		
4337	6	1		NATALIE RISINGER	58	Irrigation	6/30/1966		
4338	6	1		JIM G DOLLINS SR	130	Irrigation	5/23/1963		
4339	6	1		BONNIE T GEORGE	100	Irrigation	5/23/1963		
4339	6	2		CHARLENE WALKER		Irrigation	5/23/1963		
4339	6	3		JEANNETTE & BILLY O ENGLISH		Irrigation	5/23/1963		
4340	6	1		CITY OF WACO	5600	Municipal	6/29/1914	LAKE BRAZOS	3537
4340	6	2		CITY OF WACO		Industrial	6/29/1914	LAKE BRAZOS	
4340	6	3		CITY OF WACO		Recreation	1/8/1968	LAKE BRAZOS	
4342	6	1		TRADINGHOUSE POWER CO LLC	12000	Industrial	8/21/1926	TRADINGHOUSE CREEK LAKE	37800
4342	6	2		TRADINGHOUSE POWER CO LLC	15000	Industrial	9/16/1966	TRADINGHOUSE CREEK LAKE	
4343	6	1		OAK LAKE CLUB		Recreation	2/12/1973		
4344	6	1		LOLA ROBINSON	1060	Irrigation	3/16/1918		
4345	6	1		LUMINANT GENERATION CO LLC	10000	Industrial	3/6/1951	LAKE CREEK	8500
4346	6	1		W J DUBE	200	Irrigation	8/28/1925		
4347	6	1		VANCE DUNNAM JR	12	Irrigation	11/2/1970	TRIB OF SOUTH FORK COW BAYOU	200
4348	6	1		JOE RAY HATTER SR	70	Irrigation	1/6/1965	TRIB OF S FK COW	
4349	6	1		RDS LAND CO LLC	199	Irrigation	1/23/1978		
4350	6	1		JOHN P ESTES ESTATE TRUST ET AL	20	Irrigation	5/24/1966	NORTH COW BAYOU	44
4351	6	1		MONT HAMM	160	Irrigation	5/2/1955		80
4352	6	1		GOELZER CATTLE COMPANY		Recreation	1/25/1965		569
4353	6	1		DENNIS L BIRKES ET AL	40	Irrigation	6/21/1965		200
4354	6	1		JEAN W EPPERSON	50	Irrigation	6/21/1965		
4355	6	1		CITY OF MARLIN	4000	Municipal	4/9/1948	NEW MARLIN RES	3135
4355	6	2		CITY OF MARLIN	2000	Municipal	11/27/1956		
4355	6	3		CITY OF MARLIN		Recreation	11/1/1976	MARLIN CITY LAKE	791
4355	6	4		CITY OF MARLIN	2000	Industrial	11/27/1956		

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Water Right Number	Type (6 = Certificate of Adjudication, 1 = Permit)	Sequence	Permit #	OwnerName	Annual Authorized Diversion (acft)	Use Type	Priority Date	Reservoir Name	Reservoir Capacity (acft)
4355	6	5		CITY OF MARLIN		Recreation	6/16/1986	BRUSHY CR RES	6560
4356	6	1		DAVID L ROBERTS ET UX	84	Irrigation	2/7/1967		512
4356	6	2		DAVID L ROBERTS ET UX		Recreation	2/7/1967		
4357	6	1		CAMP FIRE INC BLUEBONNET COUNCIL		Recreation	2/11/1965		195
4358	6	1		JOHN C ISAACS ET AL	991	Irrigation	5/3/1982		
4359	6	1		JOHN C ISAACS ET AL	991	Irrigation	10/22/1925		
4360	6	1		CITY OF ROSEBUD	224	Municipal	11/28/1961	CITY LAKE	408
4361	6	1		ELIOT FAMILY LIMITED PARTNERSHIP	184	Irrigation	12/31/1961		
4362	6	1		LEE J FAZZINO ET UX	363	Irrigation	6/30/1959		
4363	6	1		JOE REISTINO ESTATE	1068	Irrigation	9/19/1983		
4363	6	2		JOE REISTINO ESTATE	432	Irrigation	12/31/1951		
4364	6	1		CLIFF A SKILES JR	724	Irrigation	12/31/1958		6
4365	6	1		WESLEY E ANDERSON ET AL	976	Irrigation	12/31/1953		
4366	6	1		ELLEN WIESE BRIEN ET AL	275	Irrigation	6/30/1957		
4366	6	2		ELLEN WIESE BRIEN ET AL	125	Irrigation	10/31/1983		
4367	6	1		CLIFFORD A SKILES ET UX	46.83	Irrigation	12/31/1959		
4367	6	2		PLANTERS AND MERCHANTS STATE BANK	98.17	Irrigation	12/31/1959		
4368	6	1		GLORIA ELY HOLDEN	76	Irrigation	8/31/1956		
4369	6	1		GENE W BONORDEN	4	Irrigation	12/31/1965		4
4370	6	1		ONAH B PENN ET AL	297	Irrigation	12/31/1954		15
4371	6	1		SAM F DESTEFANO	410	Irrigation	7/31/1956		
4371	6	2		SAM F DESTEFANO	290	Irrigation	2/7/1983		
4372	6	1		FORBIN INVESTMENTS N V	700	Irrigation	3/9/1981		120
4373	6	1		DRAYTON MCLANE JR		Recreation	2/24/1975		177
4373	6	2		DRAYTON MCLANE JR		Recreation	2/24/1975		156
4374	6	1		LAKE WOODROW INC		Recreation	6/26/1972		166
4375	6	1		FLOYD KEMPENSKI	2.3	Irrigation	12/31/1963		
4375	6	2		JOHN D KEMPENSKI ET UX	1.7	Irrigation	12/31/1963	2 RES EQUALLING 20 AF	20
4376	6	1		NELSON FAMILY FARMING TRUST	74	Irrigation	8/31/1963		
4377	6	1		GEORGE C GASSEN	20	Irrigation	12/31/1958	3 DAMS & RESERVOIRS	48
4378	6	1		ROBERT H BENBOW		Recreation	6/27/1977		166
4767	6	1		JAMES IRA DUFF	60	Irrigation	12/31/1961		
4987	6	1		CITY OF HUBBARD		Recreation	12/15/1975		
4988	6	1		ROSSON RANCHES INC		Recreation	7/6/1970		
4989	6	1		VELMA MASH ET AL	24	Irrigation	7/24/1972		
4990	6	1		F J MCCAULEY	8	Irrigation	8/11/1964		
4990	6	2		F J MCCAULEY		Recreation	8/11/1964		
4991	6	1		THE RUDMAN PARTNERSHIP ET AL	83	Irrigation	8/11/1964		
4991	6	2		THE RUDMAN PARTNERSHIP ET AL		Recreation	8/11/1964		
4996	6	1		CITY OF COOLIDGE	160	Municipal	11/27/1956	RESERVOIRS 1, 2, & 3	538
4996	6	2		CITY OF COOLIDGE	2	Industrial	11/30/1981	RESERVOIRS 1, 2, & 3	
4996	6	3		CITY OF COOLIDGE		Recreation	11/30/1981	RESERVOIRS 1, 2, & 3	
4999	6	1		CARL G LARAMORE	43	Irrigation	5/31/1961		96
4999	6	2		CARL G LARAMORE		Recreation	5/31/1961		
5000	1	1	5000	CITY OF MART	500	Municipal	9/3/1985	NEW LAKE MART	1640
5000	6	1		JOHN MICHAEL PERCIFIELD ET AL	8	Irrigation	6/30/1966	SEE 08-4999 FOR 96-AF RES	
5000	1	2	5000	CITY OF MART		Recreation	9/3/1985	NEW LAKE MART	
5000	6	2		JOHN MICHAEL PERCIFIELD ET AL		Recreation	6/30/1966	SEE 08-4999 FOR 96-AF RES	
5001	6	1		CITY OF ALVARADO	500	Municipal	8/29/1961	LAKE ALVARADO	4781
5001	6	2		CITY OF ALVARADO	300	Industrial	8/29/1961		
5002	6	1		DAN A PARKER ET UX	135	Irrigation	8/17/1970		
5004	6	1		GEORGE W MARTI ET AL	30	Irrigation	5/31/1965		65
5005	6	1		BILLIE LOUISE YOUNG	21	Irrigation	7/31/1963		
5006	6	1		ISLAND GROVE RANCH LTD	200	Irrigation	4/8/1975		239
5028	1	1	5028	O'GRADY SIX O RANCH & CATTLE CO LC		Recreation	11/8/1985		895
5053	1	1	5053	TEXAS MUNICIPAL POWER AGENCY		Mining	4/3/1986	6 RES. RESERVOIR DP-1	1420
5053	1	2	5053	TEXAS MUNICIPAL POWER AGENCY		Recreation	4/3/1986	RESERVOIR DP-1	
5053	1	3	5053	TEXAS MUNICIPAL POWER AGENCY		Other	4/3/1986	RESERVOIR DP-1	
5053	1	4	5053	TEXAS MUNICIPAL POWER AGENCY		Domestic/Livestock	4/3/1986	RESERVOIR DP-1	

TABLE F-1. Brazos River Basin Water Rights in the Brazos G Area

Water Right Number	Type (6 = Certificate of Adjudication, 1 = Permit)	Sequence	Permit #	OwnerName	Annual Authorized Diversion (acft)	Use Type	Priority Date	Reservoir Name	Reservoir Capacity (acft)
5073	1	1	5073	THOMAS RANDOLPH SIMPSON	60	Irrigation	7/8/1986		
5076	1	1	5076	HAYNES CORPORATION	25	Irrigation	7/18/1986		
5077	1	1	5077	BILL F FULTON ET UX	600	Irrigation	7/21/1986		
5081	1	1	5081	BRAZOS COAL LIMITED		Recreation	8/6/1986	RES 4, RES 11, RES 12	106
5085	1	1	5085	CITY OF ROBINSON	3290	Municipal	8/14/1986		1550
5085	1	2	5085	CITY OF ROBINSON	3172	Municipal	8/14/1986		2197
5085	1	3	5085	CITY OF ROBINSON	1805	Municipal	8/14/1986		1290
5085	1	4	5085	CITY OF ROBINSON	4833	Municipal	8/14/1986		3000
5088	1	1	5088	TC & E REALTY INC	37	Irrigation	8/19/1986		
5089	1	1	5089	TC & E REALTY INC	60	Irrigation	8/19/1986		
5094	1	1	5094	CITY OF WACO	20081	Municipal	9/12/1986	LAKE WACO ENLARGEMENT	87962
5094	1	2	5094	CITY OF WACO	688	Municipal	1/21/1988	LAKE WACO ENLARGEMENT	
5094	1	3	5094	CITY OF WACO		Recreation	9/12/1986	LAKE WACO ENLARGEMENT	
5106	1	1	5106	WALNUT CREEK MINING COMPANY		Mining	10/22/1986		95
5116	6	1		RED RIVER AUTHORITY		Other	9/20/1976	TRUSCOTT BRINE RES	107000
5117	1	1	5117	WALNUT CREEK MINING COMPANY		Other	12/31/1986	SPC 17 & SPC 3	126
5118	1	1	5118	KILLEEN SAVINGS & LOAN ASSN		Recreation	1/12/1987		3
5119	6	1		INEZ H BOYD ET AL	20	Irrigation	9/8/1969		
5132	1	1	5132	TEXAS MUNICIPAL POWER AGENCY		Industrial	5/13/1987	RESERVOIRS P-14, SP-7, SP-4, SP-	2157
5132	1	2	5132	TEXAS MUNICIPAL POWER AGENCY		Recreation	5/13/1987	RESERVOIRS P-14, SP-7, SP-4, SP-8, DITCH CD-4	
5132	1	3	5132	TEXAS MUNICIPAL POWER AGENCY		Other	5/13/1987	RESERVOIRS P-14, SP-7, SP-4, SP-8, DITCH CD-4	
5132	1	4	5132	TEXAS MUNICIPAL POWER AGENCY		Domestic/Livestock	5/13/1987	RESERVOIRS P-14, SP-7, SP-4, SP-8, DITCH CD-4	
5148	1	1	5148	ALTURA POWER LP	458	Industrial	7/23/1987		178
5155	6	1		BRAZOS RIVER AUTHORITY	230750	Municipal	4/6/1938	POSSUM KINGDOM LAKE	724739
5155	6	2		BRAZOS RIVER AUTHORITY		Industrial	4/6/1938	POSSUM KINGDOM LAKE	
5155	6	3		BRAZOS RIVER AUTHORITY		Irrigation	4/6/1938	POSSUM KINGDOM LAKE	
5155	6	4		BRAZOS RIVER AUTHORITY		Mining	4/6/1938	POSSUM KINGDOM LAKE	
5155	6	5		BRAZOS RIVER AUTHORITY		Hydropower	4/6/1938	POSSUM KINGDOM LAKE	
5155	6	6		BRAZOS RIVER AUTHORITY		Recreation	4/6/1938	POSSUM KINGDOM LAKE	
5156	6	1		BRAZOS RIVER AUTHORITY	64712	Municipal	2/13/1964	LAKE GRANBURY	155000
5156	6	2		BRAZOS RIVER AUTHORITY		Industrial	2/13/1964	LAKE GRANBURY	
5156	6	3		BRAZOS RIVER AUTHORITY		Irrigation	2/13/1964	LAKE GRANBURY	
5156	6	4		BRAZOS RIVER AUTHORITY		Mining	2/13/1964	LAKE GRANBURY	
5156	6	5		BRAZOS RIVER AUTHORITY		Recreation	2/13/1964	LAKE GRANBURY	
5157	6	1		BRAZOS RIVER AUTHORITY	18336	Municipal	8/30/1982	LAKE WHITNEY	50000
5157	6	2		BRAZOS RIVER AUTHORITY		Industrial	8/30/1982	LAKE WHITNEY	
5157	6	7		BRAZOS RIVER AUTHORITY		Recreation	8/30/1982	LAKE WHITNEY	
5158	6	1		BRAZOS RIVER AUTHORITY	13896	Municipal	10/25/1976	LAKE AQUILLA	52400
5158	6	2		BRAZOS RIVER AUTHORITY		Industrial	10/25/1976	LAKE AQUILLA	
5158	6	3		BRAZOS RIVER AUTHORITY		Mining	10/25/1976	LAKE AQUILLA	
5158	6	4		BRAZOS RIVER AUTHORITY		Recreation	10/25/1976	LAKE AQUILLA	
5159	6	1		BRAZOS RIVER AUTHORITY	19658	Municipal	12/16/1963	LAKE PROCTOR	59400
5159	6	2		BRAZOS RIVER AUTHORITY		Industrial	12/16/1963	LAKE PROCTOR	
5159	6	3		BRAZOS RIVER AUTHORITY		Irrigation	12/16/1963	LAKE PROCTOR	
5159	6	4		BRAZOS RIVER AUTHORITY		Mining	12/16/1963	LAKE PROCTOR	
5159	6	5		BRAZOS RIVER AUTHORITY		Recreation	12/16/1963	LAKE PROCTOR	
5160	1	1	5160	CAMP COOLEY LTD		Domestic/Livestock	10/2/1987	ARTESIAN & WOLF LAKES DAMS	923.2
5160	6	1		BRAZOS RIVER AUTHORITY	100257	Municipal	12/16/1963	LAKE BELTON	457600
5160	1	2	5160	CAMP COOLEY LTD	456	Irrigation	7/27/1999	ARTESIAN & WOLF LAKES DAMS	
5160	6	2		BRAZOS RIVER AUTHORITY		Industrial	12/16/1963	LAKE BELTON	
5160	1	3	5160	CAMP COOLEY LTD	480	Storage	7/27/1999	ARTESIAN & WOLF LAKES DAMS	480
5160	6	3		BRAZOS RIVER AUTHORITY		Irrigation	12/16/1963	LAKE BELTON	
5160	6	4		BRAZOS RIVER AUTHORITY		Mining	12/16/1963	LAKE BELTON	
5160	6	5		BRAZOS RIVER AUTHORITY		Recreation	12/16/1963	LAKE BELTON	
5161	1	1	5161	WILLIAM D CARROLL ET UX	54	Irrigation	11/13/1987		
5161	6	1		BRAZOS RIVER AUTHORITY	67768	Municipal	12/16/1963	LAKE STILLHOUSE HOLLOW	235700
5161	6	2		BRAZOS RIVER AUTHORITY		Industrial	12/16/1963	LAKE STILLHOUSE HOLLOW	
5161	6	3		BRAZOS RIVER AUTHORITY		Irrigation	12/16/1963	LAKE STILLHOUSE HOLLOW	
5161	6	4		BRAZOS RIVER AUTHORITY		Mining	12/16/1963	LAKE STILLHOUSE HOLLOW	

TABLE F-1. Brazos River Basin Water Rights in the Brazos G Area

Water Right Number	Type (6 = Certificate of Adjudication, 1 = Permit)	Sequence	Permit #	OwnerName	Annual Authorized Diversion (acft)	Use Type	Priority Date	Reservoir Name	Reservoir Capacity (acft)
5161	6	5		BRAZOS RIVER AUTHORITY		Recreation	12/16/1963	LAKE STILLHOUSE HOLLOW	
5162	1	1	5162	CITY OF ASPERMONT	8	Irrigation	11/12/1987		1196
5162	6	1		BRAZOS RIVER AUTHORITY	13610	Municipal	2/12/1968	LAKE GEORGETOWN	37100
5162	6	2		BRAZOS RIVER AUTHORITY		Industrial	2/12/1968	LAKE GEORGETOWN	
5162	6	3		BRAZOS RIVER AUTHORITY		Irrigation	2/12/1968	LAKE GEORGETOWN	
5162	6	4		BRAZOS RIVER AUTHORITY		Mining	2/12/1968	LAKE GEORGETOWN	
5162	6	5		BRAZOS RIVER AUTHORITY		Recreation	2/12/1968	LAKE GEORGETOWN	
5163	6	1		BRAZOS RIVER AUTHORITY	19840	Municipal	2/12/1968	LAKE GRANGER	65500
5163	6	2		BRAZOS RIVER AUTHORITY		Industrial	2/12/1968	LAKE GRANGER	
5163	6	3		BRAZOS RIVER AUTHORITY		Irrigation	2/12/1968	LAKE GRANGER	
5163	6	4		BRAZOS RIVER AUTHORITY		Mining	2/12/1968	LAKE GRANGER	
5163	6	5		BRAZOS RIVER AUTHORITY		Recreation	2/12/1968	LAKE GRANGER	
5164	6	1		BRAZOS RIVER AUTHORITY	48000	Municipal	12/16/1963	LAKE SOMERVILLE	160110
5164	6	2		BRAZOS RIVER AUTHORITY		Industrial	12/16/1963	LAKE SOMERVILLE	
5164	6	3		BRAZOS RIVER AUTHORITY		Irrigation	12/16/1963	LAKE SOMERVILLE	
5164	6	4		BRAZOS RIVER AUTHORITY		Mining	12/16/1963	LAKE SOMERVILLE	
5164	6	5		BRAZOS RIVER AUTHORITY		Recreation	12/16/1963	LAKE SOMERVILLE	
5165	6	1		BRAZOS RIVER AUTHORITY	65074	Municipal	5/6/1974	LAKE LIMESTONE	225400
5165	6	2		BRAZOS RIVER AUTHORITY		Industrial	5/6/1974	LAKE LIMESTONE	
5165	6	3		BRAZOS RIVER AUTHORITY		Irrigation	5/6/1974	LAKE LIMESTONE	
5165	6	4		BRAZOS RIVER AUTHORITY		Mining	5/6/1974	LAKE LIMESTONE	
5165	6	5		BRAZOS RIVER AUTHORITY		Recreation	5/6/1974	LAKE LIMESTONE	
5188	1	1	5188	CITY OF TAYLOR		Recreation	7/20/1988		11.62
5226	1	1	5226	CITY OF TEMPLE		Recreation	3/28/1989		
5227	1	1	5227	FIVE WELLS RANCH COMPANY		Domestic/Livestock	3/30/1989		295
5255	1	1	5255	GLORIA JEAN DUKES	75	Irrigation	8/28/1989		
5268	6	1		CITY OF BRYAN	55708	Industrial	5/30/1972		15227
5268	6	2		CITY OF BRYAN		Recreation	5/30/1972		
5269	6	1		THE TRAVELERS INSURANCE CO	37.82	Irrigation	1/30/1978		
5269	6	2		R O LAWRENCE III ET UX	716.73	Irrigation	1/30/1978		
5269	6	3		WILLARD H ZUMWALT JR ET UX	180.45	Irrigation	1/30/1978		
5270	6	1		LEISURE LAKE INC		Recreation	6/1/1976		
5271	6	1		TEXAS A&M UNIVERSITY	1200	Irrigation	5/11/1954		64
5271	6	2		TEXAS A&M UNIVERSITY	420	Industrial	9/21/1970		
5272	6	1		ALCOA INC	14000	Industrial	12/12/1951	ALCOA LAKE	15650
5273	6	1		ROCKDALE COUNTRY CLUB	1	Irrigation	10/11/1977		2
5274	1	1	5274	J R GRIMSHAW ET UX	25	Irrigation	12/13/1989		
5274	6	1		JOHN MEKOLIK & WIFE	18	Irrigation	9/23/1974		
5275	6	1		LUDWIG M KIPP & WIFE	58	Irrigation	7/28/1969		
5276	6	1		GEORGE W SPRANKLE	2.25	Irrigation	6/26/1972		
5277	6	1		TOMMY BREDTHAUER ET AL	20	Irrigation	6/30/1959	RES 1, RES 2, RES 3	101
5278	6	1		K L NIXON		Recreation	11/16/1950		135.2
5279	6	1		BIRCH CREEK FOREST PROPERTIES		Recreation	12/2/1974	RES 1, RES 2, RES 3	15
5280	6	1		WALDO NIENSTEDT	20	Industrial	6/1/1981		4
5281	6	1		HARRY H BOWERS		Recreation	3/3/1980		60
5282	1	1	5282	CITATION 1994 INVEST LTD PART	235	Mining	2/2/1990		
5282	6	1		RUSSELL F WIGGINS		Recreation	11/9/1981	EAST-WEST LAKE & LAKE NO 3	675
5283	6	1		BEAVER CREEK DEVELOPERS		Recreation	2/3/1975		113
5284	6	1		SEALY & ROBERT HUTCHINGS	30	Irrigation	1/9/1967	EXEMPT LAKE	
5285	6	1		WILLIAM J TERRELL ET AL	752	Irrigation	12/20/1982		
5286	6	1		JOYCE ANN FREDE	463.973	Irrigation	12/31/1956		
5286	6	2		JOYCE ANN FREDE	403.455	Irrigation	12/31/1956		
5286	6	3		WILLIE BALDOBINO ET UX	53.527	Irrigation	12/31/1956		
5286	6	4		WILLIE BALDOBINO ET UX	46.545	Irrigation	12/31/1956		
5287	6	1		BISTONE MUNICIPAL WSD	2887	Municipal	4/15/1957	LAKE MEXIA	9600
5287	6	2		BISTONE MUNICIPAL WSD	65	Industrial	4/15/1957		
5288	6	1		TEXAS PARKS & WILDLIFE DEPT	6	Irrigation	1/18/1939	FORT PARKER LAKE	3100
5288	6	2		TEXAS PARKS & WILDLIFE DEPT		Recreation	1/18/1939	FORT PARKER LAKE	
5289	6	1		CITY OF GROESBECK	2500	Municipal	6/13/1921		150

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5290	1	1	5290	TEXAS DEPT OF CRIMINAL JUSTICE	250	Irrigation	4/3/1990		30
5290	6	1		ERNI LUNA ET AL	8	Irrigation	12/4/1972		
5290	1	2	5290	TEXAS DEPT OF CRIMINAL JUSTICE	598	Irrigation	4/3/1990		277
5294	6	1		D G BROWN		Recreation	12/31/1954	BROWNS LAKE	186.8
5295	1	1	5295	JAY D & DEBORAH MILLS	200	Irrigation	5/11/1990	RESERVOIR 1	175
5295	6	1		J G KENNEDY		Recreation	3/29/1976	KENNEDY LAKE	285
5297	6	1		CAMP COOLEY LTD		Recreation	4/3/1972	ANTELOPE LAKE	420
5298	6	1		TXU ELECTRIC CO	1378000	Industrial	7/1/1974	TWIN OAK RESERVOIR	30319
5300	6	1		DAVID PATE ET UX		Recreation	4/11/1955	KURY LAKE	290
5301	6	1		CAMP CREEK WATER CO		Recreation	6/14/1948	CAMP CREEK LAKE	8400
5305	6	1		JOHN E SMITH		Recreation	1/17/1977	OAKLAND LAKE	272
5306	6	1		SELECTED LANDS LTD NO 18		Recreation	4/28/1975	K RANCH LAKE	216
5307	6	1		TEXAS MUNICIPAL POWER AGENCY	6000	Industrial	12/15/1980	NAVASOTA RIVER INTAKE	17
5308	6	1		BRIARCREST COUNTRY CLUB INC	12	Irrigation	9/27/1976		12
5308	6	2		BRIARCREST COUNTRY CLUB INC		Recreation	9/27/1976		
5309	6	1		CITY OF BRYAN		Recreation	1/6/1975	COUNTRY CLUB LAKE	73
5310	6	1		CARTER LAKE HOME OWNERS CORP		Recreation	1/6/1969	CARTER LAKE	481
5311	6	1		TEXAS MUNICIPAL POWER AGENCY	9740	Industrial	2/22/1977	GIBBONS CREEK RES	32084
5312	6	1		TEXAS MUNICIPAL POWER AGENCY	200	Mining	5/24/1982	LAKE CARLOS	91.9
5312	6	2		TEXAS MUNICIPAL POWER AGENCY		Industrial	5/24/1982	LAKE CARLOS	
5312	6	3		TEXAS MUNICIPAL POWER AGENCY		Recreation	5/24/1982	LAKE CARLOS	
5312	6	4		TEXAS MUNICIPAL POWER AGENCY		Other	5/24/1982	LAKE CARLOS	
5312	6	5		TEXAS MUNICIPAL POWER AGENCY		Domestic/Livestock	5/24/1982	LAKE CARLOS	
5313	6	1		TEXAS MUNICIPAL POWER AGENCY		Recreation	8/9/1971	WALTRIP LAKE	519
5314	6	1		WOODLAKE PRESERVATION ASSOCIATION		Recreation	10/21/1974	FRIERSON LAKE	230
5315	6	1		NAVASOTA FISHING CLUB INC		Recreation	2/14/1972		
5316	6	1		CHAPPELL HILLS INC		Recreation	4/7/1980	RES 1, 2, 3, 4, 5	56
5326	1	1	5326	WALNUT CREEK MINING COMPANY		Industrial	10/24/1990	STRUCTURES SPC-4 & SPC-18	49.8
5329	1	1	5329	PEBBLE CREEK COUNTRY CLUB INC	325	Irrigation	11/16/1990		16
5329	1	2	5329	PEBBLE CREEK COUNTRY CLUB INC		Recreation	11/16/1990		16
5330	1	1	5330	CITY OF TEMPLE	187	Irrigation	11/19/1990	LAKE JIM THORNTON & MARVIN FE	210.5
5330	1	2	5330	CITY OF TEMPLE		Recreation	11/19/1990		
5345	1	1	5345	TAC REALTY INC		Recreation	2/8/1991		14.3
5346	1	1	5346	SPECIAL CAMPS FOR SPECIAL KIDS		Recreation	3/8/1991		90
5349	1	1	5349	BRAZOS FARM LTD	780	Irrigation	2/28/1991		
5354	1	1	5354	TEXAS MUNICIPAL POWER AGENCY	200	Industrial	4/1/1991	SP-13 & SP-20	191.4
5357	1	1	5357	COLLEGE STATION, CITY OF		Recreation	4/11/1991	WOLF PEN CR	13.35
5367	6	1		CAMP COOLEY LTD		Recreation	2/25/1974		1298
5385	1	1	5385	NANTUCKET LTD		Recreation	9/19/1991		
5416	1	1	5416	JAMES DONALD CHESTER	10	Irrigation	4/15/1992		13
5419	6	1		DELBERT L GERSCH	11	Irrigation	7/31/1965		
5422	1	1	5422	ARKEMA INC	119	Other	6/10/1992		
5430	6	1		DORMAN SELL FARM INC	20	Irrigation	6/28/1971	1 RESERVOIR	275
5431	6	1		KERMIT BLUME	15	Irrigation	7/31/1958	1 RESERVOIR	159
5435	1	1	5435	PLAINS PETROLEUM OPERATING CO	235	Mining	11/5/1992		
5447	1	1	5447	PALO PINTO MWD 1	1153	Recreation	2/3/1993		1153
5458	1	1	5458	TEXAS MUNICIPAL POWER AGENCY	100	Industrial	4/5/1993	POND SP-50	253
5470	6	1		CLIFFORD A SKILES JR ET UX	514	Irrigation	11/22/1917		
5473	1	1	5473	TEXAS MUNICIPAL POWER AGENCY	10	Industrial	11/19/1993	POND SP-64	5.7
5482	1	1	5482	WALNUT CREEK MINING COMPANY		Other	6/29/1994	POND SPC-22	7.6
5533	1	1	5533	DEL WEBB TEXAS LP	26.1	Irrigation	7/11/1995	RES 1, RES 2, RES 3	45.4
5540	1	1	5540	ALCOA INC		Domestic/Livestock	10/9/1995	NORTH END LAKE	356.1
5540	1	2	5540	ALCOA INC		Other	10/9/1995	E-AREA END LAKE	7173.3
5551	1	1	5551	CITY OF CLIFTON	2004	Municipal	4/3/1996		2000
5566	1	1	5566	STEWART & MARY THOMPSON &TRUST	250	Irrigation	1/15/1997		7
5570	1	1	5570	DAVID MOODY TRUSTEE ET AL	365	Irrigation	1/17/1997		
5594	1	1	5594	BRADLEY B WARE	130	Irrigation	7/1/1997		
5603	1	1	5603	WILLIAM GAVRANOVIC JR	3500	Irrigation	10/10/1997		
5603	1	2	5603	WILLIAM GAVRANOVIC JR	850	Irrigation	10/10/1997		

TABLE F-1. Brazos River Basin Water Rights in the Brazos G Area

Water Right Number	Type (6 = Certificate of Adjudication, 1 = Permit)	Sequence	Permit #	OwnerName	Annual Authorized Diversion (acft)	Use Type	Priority Date	Reservoir Name	Reservoir Capacity (acft)
5616	1	1	5616	PROTESTANT EPISCOPAL CHURCH COUNCIL TX		Recreation	9/30/1998		730.3
5619	1	1	5619	CITY OF STEPHENVILLE		Recreation	11/30/1998		2
5619	1	2	5619	CITY OF STEPHENVILLE		Recreation	11/30/1998		2
5628	1	1	5628	BLUEGREEN SOUTHWEST		Recreation	5/5/1999	RES NO 2, NORTH SITE RESERVOI	1773
5628	1	2	5628	BLUEGREEN SOUTHWEST		Recreation	5/5/1999	RES NO 1, SOUTH SITE RESERVOI	538
5658	1	1	5658	UNITED STATES ARMY CORPS OF ENGINEERS		Other	10/18/1999	MALLOW POND	10
5658	1	2	5658	UNITED STATES ARMY CORPS OF ENGINEERS		Other	10/18/1999	CEDAR ELM POND	30
5658	1	3	5658	UNITED STATES ARMY CORPS OF ENGINEERS		Other	10/18/1999	D'S POND	40
5658	1	4	5658	UNITED STATES ARMY CORPS OF ENGINEERS		Other	10/18/1999	FLIPPAN POND	30
5658	1	5	5658	UNITED STATES ARMY CORPS OF ENGINEERS		Other	10/18/1999	KITE POND	38
5658	1	6	5658	UNITED STATES ARMY CORPS OF ENGINEERS		Other	10/18/1999	ZGABAY POND	60
5658	1	7	5658	UNITED STATES ARMY CORPS OF ENGINEERS	1000	Other	10/18/1999	FLAG POND	900
5667	1	1	5667	NNP-TERAVISTA LP		Recreation	12/13/1999	12 ON-CHANNEL RESERVOIRS	90.64
5677	1	2	5677	LOWER COLORADO RIVER AUTHORITY		Municipal	2/2/2000		
5680	1	1	5680	RONNIE P STEPHENS ET UX		Irrigation	3/3/2000		3.3
5689	1	1	5689	LEE J FAZZINO ET UX	492	Irrigation	6/23/2000		
5690	1	1	5690	LEE J FAZZINO ET UX	414	Irrigation	6/23/2000		
5691	1	1	5691	LEE J FAZZINO ET UX	200	Irrigation	6/23/2000		
5692	1	1	5692	ZEBRA INVESTMENTS INC	67	Mining	7/19/2000		
5715	1	1	5715	LOWER COLORADO RIVER AUTHORITY	882	Municipal	10/30/2000	LOMETA RESERVOIR	
5715	1	2	5715	LOWER COLORADO RIVER AUTHORITY		Storage	10/30/2000	LOMETA RESERVOIR	554.6
5729	1	1	5729	MICHAEL HORTON ET UX	60	Irrigation	2/7/2001		
5729	1	2	5729	MICHAEL HORTON ET UX		Domestic/Livestock	2/7/2001		48
5730	1	1	5730	BRAZOS RIVER AUTHORITY	25000	Municipal	3/7/1938	LAKES TRAVIS & BUCHANAN	
5730	1	2	5730	BRAZOS RIVER AUTHORITY		Industrial	3/7/1938	LAKES TRAVIS & BUCHANAN	
5730	1	3	5730	BRAZOS RIVER AUTHORITY		Irrigation	3/7/1938	LAKES TRAVIS & BUCHANAN	
5738	1	1	5738	TEXAS MUNICIPAL POWER AGENCY ET AL		Recreation	2/5/2001	POND B1P-5	207.95
5741	1	1	5741	TEXAS MUNICIPAL POWER AGENCY		Recreation	5/24/2001	POND A1P-1	631.2
5741	1	2	5741	TEXAS MUNICIPAL POWER AGENCY		Recreation	5/24/2001	POND B1P-6	571.3
5744	1	1	5744	SOMERVELL COUNTY WATER DISTRICT	5000	Municipal	6/27/2001	PALUXY RIVER RESERVOIR	35.2
5744	1	2	5744	SOMERVELL COUNTY WATER DISTRICT		Industrial	6/27/2001	PALUXY RIVER RESERVOIR	
5744	1	3	5744	SOMERVELL COUNTY WATER DISTRICT		Irrigation	6/27/2001	PALUXY RIVER RESERVOIR	
5744	1	4	5744	SOMERVELL COUNTY WATER DISTRICT		Recreation	6/27/2001	PALUXY RIVER RESERVOIR	
5744	1	5	5744	SOMERVELL COUNTY WATER DISTRICT		Municipal	6/27/2001	WHEELER BRANCH RESERVOIR	4118
5744	1	6	5744	SOMERVELL COUNTY WATER DISTRICT		Industrial	6/27/2001	WHEELER BRANCH RESERVOIR	
5744	1	7	5744	SOMERVELL COUNTY WATER DISTRICT		Irrigation	6/27/2001	WHEELER BRANCH RESERVOIR	
5744	1	8	5744	SOMERVELL COUNTY WATER DISTRICT		Recreation	6/27/2001	WHEELER BRANCH RESERVOIR	
5748	1	1	5748	CITY OF NAVASOTA	430	Irrigation	2/28/2003		0.2521
5752	1	1	5752	WILLIAM GAVRANOVIC ET UX	1200	Irrigation	10/18/2001		
5752	1	2	5752	WILLIAM GAVRANOVIC ET UX		Irrigation	10/18/2001		
5752	1	3	5752	WILLIAM GAVRANOVIC ET UX		Irrigation	10/18/2001		
5752	1	4	5752	WILLIAM GAVRANOVIC ET UX		Irrigation	10/18/2001	OFF-CHANNEL RES	367.26
5752	1	5	5752	WILLIAM GAVRANOVIC ET UX	1260	Irrigation	10/18/2001		
5753	1	1	5753	BAR W RANCH	100	Irrigation	10/15/2001		83.5
5755	1	1	5755	RIVER PLACE PROPERTY OWNERS ASSN INC		Recreation	12/4/2001		132.65
5770	1	1	5770	TXU MINING COMPANY LP	685	Mining	4/3/2002		
5770	1	2	5770	TXU MINING COMPANY LP		Mining	4/3/2002		
5770	1	3	5770	TXU MINING COMPANY LP		Mining	4/3/2002		
5770	1	4	5770	TXU MINING COMPANY LP		Mining	4/3/2002		
5771	1	1	5771	BUHARI INC	2	Irrigation	4/12/2002		20.8
5771	1	2	5771	BURL G HARRIS	18	Irrigation	4/12/2002		
5788	1	1	5788	SMILING MALLARD DEVELOPMENT LTD		Recreation	9/30/2002	LAKE ARAPAHO	436
5791	1	1	5791	EDWARD D JOHNSON ET UX	40	Irrigation	11/14/2002	RES 1 AND RES 2	89.3
5802	1	1	5802	CITY OF ALBANY	50	Irrigation	4/10/2003		5
5802	1	2	5802	CITY OF ALBANY		Recreation	4/10/2003		
5803	1	1	5803	ALCOA INC	650	Industrial	7/24/2003	POND 026	936
5803	1	2	5803	ALCOA INC		Irrigation	7/24/2003	C AREA RESERVOIR	13492
5803	1	3	5803	ALCOA INC		Mining	7/24/2003		
5803	1	4	5803	ALCOA INC		Domestic/Livestock	7/24/2003		

TABLE F-1. Brazos River Basin Water Rights in the Brazos G Area

Water Right Number	Type (6 = Certificate of Adjudication, 1 = Permit)	Sequence	Permit #	OwnerName	Annual Authorized Diversion (acft)	Use Type	Priority Date	Reservoir Name	Reservoir Capacity (acft)
5816	1	1	5816	ALCOA INC	650	Industrial	10/23/2003	RESERVOIR F	506
5816	1	2	5816	ALCOA INC		Irrigation	10/23/2003	RESERVOIR FG-1	462
5816	1	3	5816	ALCOA INC		Mining	10/23/2003	RESERVOIR FG-2	1669
5816	1	4	5816	ALCOA INC		Domestic/Livestock	10/23/2003	RESERVOIR G	1743
5840	1	1	5840	CITY OF WACO		Irrigation	07/13/2004		
5851	1	1	5851	BRAZOS RIVER AUTHORITY	434703	Irrigation	10/15/2004		
5858	1	1	5858	TEXAS MUNICIPAL POWER AGENCY		Recreation	10/21/2004	26 ON-CHANNEL RESERVOIRS	3515.4
5858	1	1	5858	TEXAS MUNICIPAL POWER AGENCY		Irrigation	10/21/2004		3515.4
5858	1	2	5858	TEXAS MUNICIPAL POWER AGENCY		Other	10/21/2004	26 ON-CHANNEL RESERVOIRS	
5882	1	1	5882	KIMBERLIN PK TRST/CHARLOTTE J PARKS TRST		Recreation	4/18/2005		1282
5882	1	2	5882	KIMBERLIN PK TRST/CHARLOTTE J PARKS TRST		Other	4/18/2005		
5882	1	3	5882	KIMBERLIN PK TRST/CHARLOTTE J PARKS TRST		Domestic/Livestock	4/18/2005		

TABLE F-2. Summary of Surface Water Availability

Owner	Water_Right	Authorized Permitted Diversion	2020 Minimum Annual Diversion / Supply Reliability	2070 Minimum Annual Diversion / Supply Reliability	County	Use
"A. B. COPELAND, JR."	C2201_1	197	0	0	Erath	Irrigation
JACK BERRY	C2205_1	150	0	0	Erath	Irrigation
H. W. NORTHCUTT	C2206_1	60	0	0	Erath	Irrigation
"ELVIS RAY STONE SR, ET AL"	C2207_1	23	0	0	Erath	Irrigation
B R FANNING	C2208_1	40	0	0	Erath	Irrigation
JOHN MOCEK ET UX	C2208_2	20	0	0	McLennan	Irrigation
H. B. LANE	C2209_1	3	0	0	Erath	Irrigation
RAYMOND L. JARRATT	C2210_1	92	0	0	Erath	Irrigation
J. T. HICKS	C2211_1	85	0	0	Erath	Irrigation
GREAT SOUTHERN RANCH INC	C2215_1	54	0	0	Erath	Irrigation
CRAIG W. RAY	C2216_1	54	0	0	Erath	Irrigation
"JAMES F JOHNSON, ET UX"	C2219_1	13	0	0	Erath	Irrigation
HAROLD PACK	C2220_1	12	0	0	Erath	Irrigation
KENNETH & BETTY YVON LESLEY	C2221_1	18	0	0	Erath	Irrigation
HARM & ZWAANTINA TE VELDE TRST	C2222_1	110	0	0	Erath	Irrigation
TY MURRAY	C2225_1	34	0	0	Erath	Irrigation
T T FAIR ET UX	C2226_1	61	0	0	Erath	Irrigation
CHARLIE S EVERETT & WIFE	C2227_1	60	0	0	Erath	Irrigation
SWAN E RICHARDSON JR	C2228_1	60	14	12	Erath	Irrigation
J B MCCONNELL	C2229_1	44	0	0	Erath	Irrigation
TY MURRAY	C2230_1	76	0	0	Erath	Irrigation
ESTATE OF C C WINTERS	C2231_1	42	0	0	Erath	Irrigation
CHARLES A & ROBERT S ELLIOTT	C2232_1	16	6	6	Erath	Irrigation
J W OGLE ET AL	C2233_1	18	0	0	Erath	Irrigation
BRUCE E TODD	C2234_1	125	0	0	Erath	Irrigation
7 M RANCH TRUST	C2235_1	8	0	0	Erath	Irrigation
BRUCE E TODD	C2236_1	24	0	0	Erath	Irrigation
MAX L GORDON & ELOISE GORDON	C2237_1	90	0	0	Erath	Irrigation
JON DAVID MAYFIELD TRUST	C2238_1	130	1	1	Erath	Irrigation
A. H. LINNE	C2239_1	32	0	0	Erath	Irrigation
A DWAIN MAYFIELD ET AL	C2240_1	137	0	0	Erath	Irrigation
"WAYNE PITTMAN, ET AL"	C2241_1	33	0	0	Erath	Irrigation
MRS W K RICHARDSON	C2242_1	40	0	0	Erath	Irrigation
BEN E. ROBBINS	C2243_1	90	9	9	Erath	Irrigation
DONALD MCLEAN	C2244_1	27	0	0	Erath	Irrigation
DORIS S HEIZER	C2245_1	20	0	0	Erath	Irrigation
DON MITCHELL ET AL	C2246_1	152	0	0	Erath	Irrigation
BAR-TO-LO CORPORATION	C2247_1	35	0	0	Erath	Irrigation
ALWINA LUINE HEIZER HANCOCK	C2248_1	62	0	0	Erath	Irrigation
THOMAS H. & DOLORES C. BENSON	C2249_1	19	0	0	Erath	Irrigation
OTEY SHADDEN	C2250_1	4	0	0	Erath	Irrigation
WANDA TRIMBLE	C2251_1	28	0	0	Erath	Irrigation
J B PUTTY TRUSTEE	C2252_1	30	0	0	Erath	Irrigation
W E PUTTY	C2254_1	65	0	0	Hamilton	Irrigation
WAYNE V DUNCAN ET UX	C2255_1	47.7	0	0	Erath	Irrigation
ROBERT L BOYKIN ET AL	C2255_2	26.8	0	0	Erath	Irrigation
GARY W DUNCAN ET AL	C2255_3	84.5	0	0	Erath	Irrigation
RANDOLPH M ROTEN	C2258_1	32	0	0	Hamilton	Irrigation
F MELVIN JOHNSON	C2259_1	112	0	0	Hamilton	Irrigation
F. MELVIN & HELENE JOHNSON	C2260_1	56	0	0	Hamilton	Irrigation
CECIL PARKS	C2261_1	8	0	0	Hamilton	Irrigation
VERNON CLARK BEAIRD	C2262_1	30	0	0	Hamilton	Irrigation
WILLIAM VAN ZANDT SLOAN & WIFE	C2263_1	65	0	0	Hamilton	Irrigation
WILLIAM VAN ZANDT SLOAN & WIFE	C2264_1	45	0	0	Hamilton	Irrigation
DEREL FILLINGIM	C2265_1	268	0	0	Hamilton	Irrigation
KARL T BUTZ JR	C2266_1	18	0	0	Bosque	Irrigation
RONNIE W PARTAIN	C2267_1	0.3	0	0	Erath	Irrigation
MARGO JOY PARTAIN BATTERSHELL	C2267_2	0.7	0	0	Erath	Irrigation
"BARRY L. POLK, ET UX"	C2268_1	11	0	0	Erath	Irrigation
MICHAEL J LOTT ET UX	C2269_1	4	0	0	Bosque	Irrigation
J. N. BURNS	C2270_1	24	0	0	Bosque	Irrigation
ALBERT N PIKE & EUGENIA PIKE GOODMAI	C2271_1	15	0	0	Bosque	Irrigation
DAVID H. MONNICH	C2272_1	42	0	0	Bosque	Irrigation
W.F.LONG	C2273_1	98	0	0	Somervell	Irrigation
W.F.LONG	C2273_2	6.38	0	0	Somervell	Irrigation
LOUIS A BEECHERL JR	C2276_1	81	81	81	Bosque	Irrigation
LOUIS A BEECHERL JR	C2276_4	155	0	0	Bosque	Irrigation
LOUIS A BEECHERL JR	C2276_5	100.24	0	2	Bosque	Irrigation

TABLE F-2. Summary of Surface Water Availability

Owner	Water_Right	Authorized Permitted Diversion	2020 Minimum Annual Diversion / Supply Reliability	2070 Minimum Annual Diversion / Supply Reliability	County	Use
LOUIS A BEECHERL JR	C2276_6	1.09	0	0	Bosque	Irrigation
LOUIS A BEECHERL JR	C2276_8	90	2	2	Bosque	Irrigation
"THOMAS G PETERS, ET UX"	C2277_1	10	0	0	Bosque	Irrigation
WILLIAM E. GIPSON	C2278_1	114	0	0	Bosque	Irrigation
LOUISE P L HAMPE ET AL	C2279_1	9	0	0	Bosque	Irrigation
JOHN DAVID BELL ET UX	C2280_1	69	0	0	Bosque	Irrigation
RAY J MILLER	C2281_1	7	0	0	Bosque	Irrigation
LESTER M ALBERTHAL JR	C2282_1	253	0	0	Bosque	Irrigation
MARGARET D WHITE	C2283_1	8	0	0	Bosque	Irrigation
L C AND ISABELLE C HOWARD	C2284_1	25	0	0	Bosque	Irrigation
LEONARD C RADDE	C2285_1	35	0	0	Bosque	Irrigation
BILLY G AND IRIS S HODGES	C2287_1	7	0	0	Hamilton	Irrigation
SHANNON LAIRD HODGES ET AL	C2288_1	3.5	0	0	Hamilton	Irrigation
J. L. JENSON	C2290_1	16.1	0	0	Bosque	Irrigation
JAMES CROSLEY ET UX	C2290_2	28.9	0	0	Bosque	Irrigation
CITY OF CLIFTON	C2291_1	7	0	0	Bosque	Irrigation
CLIFTON	C2291_2	600	0	0	Bosque	Municipal
W. O. GLOFF	C2292_1	261	0	0	Bosque	Irrigation
ESTHER K WIEDERAENDERS	C2293_1	7	7	7	Bosque	Irrigation
"R.D.,J.L.,&M.L. LUNDBERG"	C2294_1	80	0	0	Bosque	Irrigation
REGINALD & NALLIE LINDBERG	C2295_1	49	0	0	Bosque	Irrigation
CHARLES E. STEVENS	C2298_1	104	0	0	Hamilton	Irrigation
D. I. BULLION	C2299_1	22	0	0	Bosque	Irrigation
WILLIAM J. HIX ET AL	C2300_1	100	0	0	Bosque	Irrigation
ABIGAIL HALBERT KAMM	C2301_1	70	0	0	McLennan	Irrigation
STEVEN K CAPERTON ET UX	C2302_1	122	0	0	McLennan	Irrigation
"WALTER WARREN FAIR, ET UX"	C2303_1	30	0	0	McLennan	Irrigation
HUGH WHITFIELD DAVIS	C2304_1	3.1	0	0	McLennan	Irrigation
WALTER WARREN FAIR ET UX	C2304_2	43.9	0	0	McLennan	Irrigation
BERTRAND A TALBERT	C2305_1	40	0	0	McLennan	Irrigation
HARRY A. & ATHALIA P. BRITTON	C2306_1	5	5	5	McLennan	Irrigation
SAMUEL N. & TESSIE B. CARROLL	C2307_1	23	0	0	McLennan	Irrigation
IRA H WESTERFIELD	C2308_1	10	0	0	McLennan	Irrigation
JERRY AND JOY CLEMMONS	C2309_1	10	0	0	McLennan	Irrigation
JIM HERING	C2310_1	16	0	0	McLennan	Irrigation
ROBERT HALL	C2312_1	162	0	0	McLennan	Irrigation
IRA H. WESTERFIELD	C2313_1	14	0	0	McLennan	Irrigation
WACO	C2315_1	39100	36,745	35,470	McLennan	Municipal
WACO	C2315_2	19100	19,100	19,100	McLennan	Municipal
CITY OF WACO	C2315_3	900	900	900	McLennan	Irrigation
C. L. SLIGH FARMS	C2316_1	193	22	22	McLennan	Municipal
CHARLOTTE B JOHNSON ET AL	C2317_1	248	182	124	McLennan	Irrigation
FRANK W SIPAN ET AL	C2318_1	35	2	1	McLennan	Irrigation
RUDOLPH CARL DROSCHE JR	C2813_1	153	0	0	Coryell	Irrigation
ESTATE OF WAYNE ADAMS; GRACE OLENA ADAMS	C2814_1	83	6	6	Comanche	Irrigation
ESTATE OF WAYNE ADAMS; GRACE OLENA ADAMS	C2814_2	170	19	18	Comanche	Irrigation
NANCY PAGE ALLEN ET VIR	C2815_1	69	0	0	Comanche	Irrigation
E W CANTRELL ET UX	C2816_1	36	0	0	Comanche	Irrigation
P D GUNTER	C2818_1	18	3	3	Comanche	Irrigation
J B GUNTER	C2819_1	32	6	5	Comanche	Irrigation
WILLIAM R & CAROLINE MILLER	C2820_1	46	0	0	Comanche	Irrigation
ERICH & META SEIDER	C2821_1	29	0	0	Comanche	Irrigation
JUANITA MARTHA ANDERS	C2822_1	106	0	0	Comanche	Irrigation
J E TATUM	C2823_1	22	1	1	Comanche	Irrigation
MAX DERDEN & CHARLES S THOMAS ET U	C2824_1	90	0	0	Comanche	Irrigation
MONTE CARMICHAEL ET AL	C2825_1	80	0	0	Comanche	Irrigation
BURK DENMAN	C2826_1	46	0	0	Comanche	Irrigation
J A DENMAN	C2827_1	6	0	0	Comanche	Irrigation
J A DENMAN	C2828_1	24	1	1	Comanche	Irrigation
MARTIN L GEYE ET AL	C2829_1	56	3	3	Comanche	Irrigation
RICKIE STEPHENS	C2830_1	87	4	4	Comanche	Irrigation
DON GROMATZKY	C2830_2	30	2	2	Hamilton	Irrigation
GARY CROW	C2831_1	57	3	3	Comanche	Irrigation
ANN WEAVER ADAIR	C2832_1	47	0	0	Comanche	Irrigation
CHARLIE BRANDT SHOCKLEY	C2833_1	24	0	0	Comanche	Irrigation
WILLIE EYVONNE MANNING RAY	C2834_1	43	2	2	Comanche	Irrigation

TABLE F-2. Summary of Surface Water Availability

Owner	Water_Right	Authorized Permitted Diversion	2020 Minimum Annual Diversion / Supply Reliability	2070 Minimum Annual Diversion / Supply Reliability	County	Use
HARTENSE NORTH	C2835_1	294	15	15	Hamilton	Irrigation
NELSON SHAVE	C2836_1	87	0	0	Comanche	Irrigation
WADE N CARAWAY	C2837_1	136.4	7	7	Hamilton	Irrigation
WADE N CARAWAY	C2837_2	47	2	2	Hamilton	Irrigation
ED A ROSS ET AL	C2838_1	37	2	2	Hamilton	Irrigation
ED A ROSS ET AL	C2839_1	40	2	2	Hamilton	Irrigation
WALTER E & JOYCE SWINDLE	C2841_1	26.7	0	0	Erath	Irrigation
BILLY JACK & PATSY TYUS	C2842_1	4.3	0	0	Erath	Irrigation
DEBORAH VINES	C2843_1	29	0	0	Erath	Irrigation
BOBBY JOHN FOSTER	C2844_1	29	0	0	Erath	Irrigation
BOBBY JOHN FOSTER	C2845_1	27.5	0	0	Erath	Irrigation
GUY G HALL	C2846_1	27.5	0	0	Erath	Irrigation
GUY G HALL	C2846_2	10.5	0	0	Erath	Irrigation
G G HALL	C2847_1	13	0	0	Erath	Irrigation
M D STEPHEN	C2848_1	31.5	0	0	Erath	Irrigation
J & J DAIRY & BYRON JONES ET AL	C2849_1	31.5	0	0	Erath	Irrigation
J A HULSEY	C2850_1	29	0	0	Erath	Irrigation
J A HULSEY	C2850_2	10.81	0	0	Erath	Irrigation
J W BARBEE	C2851_1	72	22	22	Comanche	Irrigation
J W BARBEE	C2851_2	87	4	4	Comanche	Irrigation
DEAN H BOTTLINGER ET UX	C2852_1	149	0	0	Comanche	Irrigation
GAYLON D & CLARA JONES	C2853_1	52	3	3	Comanche	Irrigation
ERNEST L NEWSOM	C2854_1	44	0	0	Hamilton	Irrigation
LARRY WAYNE ADAMS	C2855_1	91	16	14	Hamilton	Irrigation
JACK D GRAHAM	C2856_1	1	0	0	Hamilton	Irrigation
J L ROBERSON JR ET AL	C2857_1	153	8	8	Hamilton	Irrigation
J L ROBERSON JR ET AL	C2858_1	18	0	0	Hamilton	Irrigation
LARRY A DUNN ET UX	C2859_1	98	0	0	Hamilton	Irrigation
EARL& ORENA KAVANAUGH & MAURINE K WATTS	C2860_1	15	3	3	Hamilton	Irrigation
ACY L WATSON	C2861_1	1	0	0	Hamilton	Irrigation
TOM J THOMPSON	C2862_1	15	1	1	Hamilton	Irrigation
RIVERSIDE ACQUISITIONS LLC	C2863_1	43	2	2	Hamilton	Irrigation
K A SPARKS ET AL	C2864_1	185	39	31	Hamilton	Irrigation
RIVERSIDE ACQUISITIONS LLC	C2865_1	169	36	28	Hamilton	Irrigation
RIVERSIDE ACQUISITIONS LLC	C2866_1	82	17	14	Hamilton	Irrigation
GERALDINE D WARREN ET AL	C2867_1	4	4	4	Hamilton	Irrigation
ARVORD M ABERNETHY	C2868_1	50	41	37	Hamilton	Irrigation
BETTY JEAN HARRIS TOOLEY	C2869_1	105	5	5	Hamilton	Irrigation
HAMILTON	C2870_1	614	16	16	Hamilton	Municipal
"SETH THOMAS MOORE, SR., ET AL"	C2871_1	72	4	4	Hamilton	Irrigation
SETH MOORE	C2872_1	2.5	0	0	Hamilton	Manufacturing
R F MANNING	C2873_1	20	0	0	Hamilton	Irrigation
HARRIET MEAD HAVENS	C2874_1	85	49	49	Hamilton	Irrigation
LEONARD T WARLICK ET UX	C2875_1	54	20	20	Hamilton	Irrigation
CHARLES CRAIG JR	C2876_1	15	0	0	Hamilton	Irrigation
THOMAS E MURDOCK ESTATE	C2877_1	150	8	8	Hamilton	Irrigation
O C & WILLIE NADINE MARSHALL	C2878_1	37	1	1	Hamilton	Irrigation
O C & WILLIE NADINE MARSHALL	C2878_2	14.88	0	0	Hamilton	Irrigation
PAUL F MCCLINTON	C2879_1	46	10	10	Hamilton	Irrigation
PAUL F MCCLINTON	C2879_2	93	5	5	Hamilton	Irrigation
BILLY R FISHER ET UX	C2880_1	19	3	3	Hamilton	Irrigation
MOODY E COURTNEY	C2881_1	124	0	0	Hamilton	Irrigation
JOHN C COURTNEY ET UX	C2882_1	196	34	30	Hamilton	Irrigation
DAVID C COURTNEY	C2883_1	5	0	0	Hamilton	Irrigation
JOHN C COURTNEY ET UX	C2884_1	200	10	10	Hamilton	Irrigation
MOODY E COURTNEY	C2885_1	71	0	0	Hamilton	Irrigation
W J ALEXANDER	C2886_1	10	0	0	Coryell	Irrigation
JOE TRUETT LIGHTSEY ET AL	C2887_1	30	0	0	Coryell	Irrigation
GEORGE T REYNOLDS III ET UX	C2888_1	2	0	0	Coryell	Irrigation
DON THOMAS ROGERS	C2890_1	8	0	0	Coryell	Irrigation
W F MORELAND BY PASS TRUST	C2891_1	57	0	0	Coryell	Irrigation
W N & MARY JANE WHISENHUNT	C2892_1	32	2	2	Coryell	Irrigation
SEABORN L ASHBY	C2893_1	10	2	3	Coryell	Irrigation
SAN PABLO CORPORATION	C2894_1	2	0	0	Coryell	Irrigation
WILLIAM TRAVIS LAXSON	C2895_1	29	1	1	Coryell	Irrigation
WILLIAM TRAVIS LAXSON	C2895_2	11.35	0	0	Coryell	Irrigation
MARGARET CALLAWAY	C2896_1	124	0	0	Coryell	Irrigation

TABLE F-2. Summary of Surface Water Availability

Owner	Water_Right	Authorized Permitted Diversion	2020 Minimum Annual Diversion / Supply Reliability	2070 Minimum Annual Diversion / Supply Reliability	County	Use
R H MELTON	C2897_1	8	0	0	Coryell	Irrigation
DONALD J MACKIE ET UX& GLENNIS G EGG	C2898_1	23	5	4	Coryell	Irrigation
CHARLES C POWELL	C2900_1	14	0	0	Coryell	Irrigation
JACK & MINNIE MORSE	C2901_1	100	0	0	Coryell	Irrigation
QUENTIN G MCCORKLE ET UX	C2902_1	18	1	1	Coryell	Irrigation
GLENROOK FARMS	C2903_1	530	530	530	Coryell	Irrigation
STERLIN J BARNARD	C2904_1	40	8	7	Coryell	Irrigation
DAN G DAVIDSON ESTATE	C2905_1	14	0	0	Coryell	Irrigation
THELMA R CARTER	C2906_1	36	8	6	Coryell	Irrigation
LEO LUEDTKE ET UX	C2907_1	237	0	0	Coryell	Irrigation
DENNIS CHARLES LUEDTKE ET AL	C2907_2	150	0	0	Coryell	Irrigation
DAN G DAVIDSON	C2908_1	22	0	0	Coryell	Irrigation
RUDOLF DROSCHE	C2909_1	26	0	0	Coryell	Irrigation
CARL DROSCHE	C2910_1	77	0	0	Coryell	Irrigation
GLENN DIPPEL ET AL& JOHN SHAUD ET UX	C2911_1	74	4	4	Coryell	Irrigation
PAT & MABEL RUTH GRIMES	C2914_1	18	4	3	Coryell	Irrigation
ROBERT L MOORE	C2915_1	38	0	0	Bell	Irrigation
W J & ANITA FAYE HOPPER	C2921_1	28	0	0	Hamilton	Irrigation
LEE R HOPPER	C2922_1	9	0	0	Hamilton	Irrigation
HENRY MARWITZ ET AL	C2923_1	12.5	5	5	Hamilton	Irrigation
BILLY H ROBERTS ET UX	C2923_2	32.5	8	8	Hamilton	Irrigation
JERRY W & BONNIE JEAN HOPPER	C2924_1	59	0	0	Hamilton	Irrigation
WILLIAM JACKSON WISDOM	C2926_1	13	2	2	Hamilton	Irrigation
ELVIN L GENTRY ET UX	C2927_1	9	1	1	Hamilton	Irrigation
GARY L LUNDBERG ET UX	C2928_1	13	2	2	Hamilton	Irrigation
REGINALD & NONA FA WIEDEBUSCH	C2929_1	4	0	0	Hamilton	Irrigation
CYRUS B CATHEY ESTATE	C2930_1	31	3	3	Hamilton	Irrigation
RONNAL S BEASLEY ET UX	C2931_1	52	0	0	Hamilton	Irrigation
JAMES BILLINGSLEY	C2932_1	6	1	1	Hamilton	Irrigation
MARSHALL JOE HANNA	C2933_1	46	4	4	Coryell	Irrigation
ROBERT M SCOTT ET AL	C2934_1	66	0	0	Coryell	Irrigation
JEAN ARMOR WHALEY	C2935_1	38	0	0	Coryell	Irrigation
JEAN ARMOR WHALEY	C2935_2	15.09	0	0	Coryell	Irrigation
FORT HOOD	C2936_1	10000	10,000	10,000	Bell	Municipal
FORT HOOD	C2936_2	2000	2,000	2,000	Bell	Municipal
VERNON & BETTY ANN BARGE	C2937_1	59	3	3	Bell	Irrigation
TEMPLE	C2938_1	15804	10,503	9,394	Bell	Municipal
"EVELYN FRANCES BYLER, ET AL"	C2940_1	63	1	1	Bell	Municipal
SHALLOW FORD CONSTRUCTION CO	C2941_1	36	1	1	Bell	Irrigation
PYLE BROTHERS INC&VAUGHN T BAIRD	C2942_1	200	200	200	Bell	Irrigation
CITY OF KILLEEN & Killeen Willows, Inc.	C2943_1	20	6	6	Bell	Irrigation
FRANKLIN LIMESTONE COMPANY	C2944_1	138	1	1	Bell	Irrigation
GLENN BAIRD	C2945_1	36	1	1	Bell	Mining
J BARRY SIEBENLIST ET UX	C2946_1	24	0	0	Bell	Irrigation
PETER GROTHAUS ET UX	C2947_1	11	2	2	Bell	Irrigation
"CHESTER E. DICKSON, ET UX"	C2948_1	278	29	29	Bell	Irrigation
"CHESTER E. DICKSON, ET UX"	C2949_1	37	4	4	Bell	Irrigation
DAVID R KRAUSS ET UX	C2950_1	25	3	3	Bell	Irrigation
ALFRED F NAGEL ET UX	C2951_1	35	4	4	Bell	Irrigation
CLOUD CONSTRUCTION CO INC	C2952_1	16	11	11	Bell	Irrigation
ROGER W HINDS ET UX	C2953_1	89	1	0	Bell	Irrigation
CHARLES N VERHEYDEN ET UX	C2953_2	75.3	1	0	Bell	Irrigation
DENNIS J LYNCH ET UX	C2953_3	69.7	1	0	Bell	Irrigation
HOMER MCCASLAND	C2954_1	285	0	0	Bell	Irrigation
FOSSIL CREEK REALTY INC	C2958_1	2.63	0	0	Lampasas	Irrigation
SAMUEL G TOUB	C2958_2	7.25	0	0	Lampasas	Irrigation
W G BETTIS ET AL	C2958_3	0.12	0	0	Lampasas	Irrigation
JOHN R & LYNN COATS	C2959_1	23	4	4	Lampasas	Irrigation
ALBERT S & WINIFRED L BAKER	C2960_1	46	0	0	Lampasas	Irrigation
M K & RUTH NEAL PATTESON	C2961_1	54	8	7	Lampasas	Irrigation
"LEONARD J TROVERO, SR"	C2962_1	28	21	21	Lampasas	Irrigation
FRANCES VIRGINIA NUCKLES ET AL	C2963_1	48	40	40	Lampasas	Irrigation
EARL BROOKS	C2964_1	1	0	0	Lampasas	Irrigation
JIMMIE E BOULTINGHOUSE ET AL	C2965_1	34.3	3	3	Lampasas	Irrigation
ROY LEE BOULTINGHOUSE	C2965_2	18.8	2	2	Lampasas	Irrigation
MARVIN E & MARY BLANCHE WHITE	C2966_1	31	8	8	Lampasas	Irrigation
H Y JR & LOIS POLLARD PRICE	C2967_1	5	0	0	Lampasas	Irrigation
BURRELL ROITCH	C2969_1	8	0	0	Lampasas	Irrigation

TABLE F-2. Summary of Surface Water Availability

Owner	Water_Right	Authorized Permitted Diversion	2020 Minimum Annual Diversion / Supply Reliability	2070 Minimum Annual Diversion / Supply Reliability	County	Use
FRED WILLIS ET UX	C2970_1	2.6	0	0	Lampasas	Irrigation
CHARLES E BLANTON	C2970_2	51.2	0	0	Lampasas	Irrigation
CITY OF LAMPASAS	C2970_3	6.2	0	0	Lampasas	Irrigation
LAMPASAS	C2971_1	3760	815	815	Lampasas	Municipal
CITY OF LAMPASAS	C2972_2	228	0	0	Lampasas	Irrigation
MELVIN POTTS	C2973_1	6	0	0	Lampasas	Irrigation
E C O'NEAL JR	C2974_1	144	70	70	Lampasas	Irrigation
RAY A & ELIZABETH K JONES	C2975_1	46	46	42	Lampasas	Irrigation
RAY A JONES	C2976_1	48	48	38	Lampasas	Manufacturing
CURTIS KIDD ET UX	C2977_1	42	42	42	Lampasas	Irrigation
"GUNDERLAND PARK RANCH, INC"	C2978_1	54	21	21	Lampasas	Irrigation
JOHN T HIGGINS	C2979_1	95	83	58	Lampasas	Irrigation
ROBERT L GUYLER	C2980_1	1	0	0	Lampasas	Irrigation
DOROTHY N CAPPS	C2981_1	6.3	1	1	Lampasas	Irrigation
JOE D BOYD	C2981_2	45.4	4	4	Lampasas	Irrigation
WYLIE R CAPPS	C2981_3	6.3	1	1	Lampasas	Irrigation
A J DEWAYNE KENDRICK	C2982_1	6	1	1	Lampasas	Irrigation
RALPH D & ROBBIE BURROW	C2983_1	7	1	1	Lampasas	Irrigation
DOYLE & BARBARA J WALKER	C2984_1	18	2	2	Lampasas	Irrigation
R B & FRANCES M PORTER	C2985_1	18	2	2	Lampasas	Irrigation
JAMES BUFORD BRIGGS	C2986_1	46.8	33	17	Lampasas	Irrigation
ROBERT C HALLMARK ET AL	C2987_1	2	2	2	Lampasas	Irrigation
JOE T & CAROLINE PARKS	C2988_1	3	3	3	Lampasas	Irrigation
WINTHROP ALDRICH ET UX	C2997_1	64	6	6	Bell	Irrigation
GRA'DELLE DUNCAN	C2998_1	157	157	144	Bell	Irrigation
LAVALLA R BLUM	C2999_1	3	1	1	Bell	Irrigation
JAMES L SHEPHERD	C3000_1	105	16	14	Bell	Irrigation
EDD MELTON	C3001_1	12	0	0	Bell	Irrigation
GENE & NELDA FAY RAY	C3002_1	150	14	14	Bell	Irrigation
BENNIE M GIBBS	C3003_1	32	0	0	Bell	Irrigation
ESTATE OF DR JAMIE W BARTON	C3004_1	50	0	0	Bell	Irrigation
VAIL E & BETTY LOGSDON	C3005_1	5	0	0	Bell	Irrigation
KARL B WAGNER ESTATE	C3006_1	48	0	0	Bell	Irrigation
RIVER FARM LTD	C3007_1	48	7	7	Bell	Irrigation
RIVER FARM LTD	C3007_2	192	3	2	Bell	Irrigation
ELEANOR B TUTTLE	C3008_1	61	11	11	Bell	Irrigation
JOSEPH LEWIS ET UX	C3009_1	81	7	7	Bell	Irrigation
CLIFFORD D JONES	C3010_1	10	1	1	Bell	Irrigation
W J RAY ET UX	C3011_1	16.6	2	2	Bell	Irrigation
LAWANA ELLIS ET VIR	C3011_2	47	4	4	Bell	Irrigation
MIKEL DUPES ET AL	C3011_3	0.5	0	0	Bell	Irrigation
MILL CREEK GOLF & COUNTRY CLUB	C3013_1	168	10	10	Bell	Irrigation
EDWIN A BAILEY ESTATE	C3014_1	63	8	8	Bell	Irrigation
PAUL T BOSTON	C3015_1	36	0	0	Bell	Irrigation
SAMUEL E CLONTS, ET AL	C3413_1	182	0	0	Knox	Irrigation
COUNTY-OTHER, KNOX	C3414_1	34	34	34	Knox	Municipal
LEAGUE RANCH	C3440_1	2000	0	0	Knox	Irrigation
LEAGUE RANCH	C3440_2	31	26	18	Knox	Irrigation
LEAGUE RANCH	C3440_3	0.1	0	0	Knox	NIF
J J KEETER TRUST & CLYDE STUTEVILLE	C3446_1	9	0	0	Throckmor	Irrigation
R T WELLS JR	C3447_1	45	0	0	Young	Irrigation
GEORGE W WILKINSON	C3448_1	45	0	0	Young	Irrigation
THROCKMORTON	C3450_1	600	0	0	Throckmor	Municipal
GEORGE W WILKINSON	C3451_1	26	0	0	Young	Irrigation
GEORGE W WILKINSON	C3451_2	27	0	0	Young	Manufacturing
NEWCASTLE	C3452_1	250	0	0	Young	Municipal
PITCOCK BROTHERS READY-MIX	C3453_1	100	0	0	Young	Mining
ROBERT O ANDREWS FAMILY TRUST	C3454_1	64	0	0	Young	Irrigation
CHARLES D CROW & WANDA L CROW	C3455_1	76	0	0	Young	Manufacturing
CHARLES D CROW & WANDA L CROW	C3455_2	6	0	0	Young	Manufacturing
RONALD D STEPHENS	C3456_1	59	0	0	Young	Irrigation
LOUIS PITCOCK JR ET AL	C3457_1	60	0	0	Young	Irrigation
GRAHAM	C3458_1	4000	487	487	Young	Municipal
CITY OF GRAHAM	C3458_2	1000	0	0	Young	Manufacturing
GRAHAM	C3458_3	7000	0	0	Young	Municipal
CITY OF GRAHAM	C3458_4	7400	0	0	Young	Manufacturing
CITY OF GRAHAM	C3458_5	100	0	0	Young	Irrigation
CITY OF GRAHAM	C3458_6	500	0	0	Young	Mining

TABLE F-2. Summary of Surface Water Availability

Owner	Water_Right	Authorized Permitted Diversion	2020 Minimum Annual Diversion / Supply Reliability	2070 Minimum Annual Diversion / Supply Reliability	County	Use
ZACK BURKETT	C3459_1	12	0	0	Young	Irrigation
EAFCO LIMITED PARTNERSHIP	C3460_1	76	13	13	Young	Irrigation
MRS T T CAMPBELL	C3461_1	27	0	0	Young	Irrigation
EASTLAND CO WSD	C3465_1	450	344	340	Eastland	Municipal
CITY OF EASTLAND	C3465_2	50	34	34	Eastland	Manufacturing
CITY OF EASTLAND	C3465_3	100	38	38	Eastland	Irrigation
WAYNE HARGRAVE, ET UX	C3467_1	12	0	0	Eastland	Irrigation
EASTLAND INDUSTRIAL FOUNDATION	C3468_1	1607	1,068	927	Eastland	Mining
LARRY MORROW	C3469_1	21	0	0	Eastland	Irrigation
EASTLAND CO WSD	C3470_1	810	59	59	Eastland	Municipal
EASTLAND CO WSD	C3470_2	455	0	0	Eastland	Municipal
EASTLAND CO WSD	C3470_3	1560	0	0	Eastland	Municipal
EASTLAND CO WSD	C3470_4	877.5	0	0	Eastland	Municipal
EASTLAND CO WSD	C3470_5	1118	0	0	Eastland	Municipal
EASTLAND CO WSD	C3470_6	629.5	0	0	Eastland	Municipal
EASTLAND CO WSD	C3470_7	350	0	0	Eastland	Manufacturing
EASTLAND CO WSD	C3470_8	500	0	0	Eastland	Municipal
RONNIE LOVE	C3473_1	40	0	0	Eastland	Municipal
JERRY P MEHAFFEY	C3474_1	30	0	0	Eastland	Irrigation
C M PIPPIN JR	C3475_1	8	0	0	Eastland	Irrigation
GARTH PETTIT	C3476_1	51	8	8	Comanche	Irrigation
TEDDY J SNIDER ET UX	C3479_1	30	0	0	Eastland	Irrigation
WILL D BROWN ET UX	C3481_1	25	0	0	Eastland	Irrigation
JOHNNY W & MARY C EAVES	C3482_1	13	0	0	Eastland	Irrigation
D B WARREN	C3483_1	90	0	0	Eastland	Irrigation
MURTICE C RODGERS	C3484_1	40	0	0	Eastland	Irrigation
D B WARREN	C3487_1	40	0	0	Eastland	Irrigation
HELEN L DICKSON	C3488_1	30	0	0	Eastland	Irrigation
THOMAS H BIRDSONG, III	C3489_1	140	0	0	Eastland	Irrigation
JOHN J HOLLAND	C3490_1	60	0	0	Comanche	Irrigation
G D LINDLEY	C3492_1	52	0	0	Comanche	Irrigation
EDDIE LINDLEY	C3493_1	35	0	0	Comanche	Irrigation
MOODY B KOONCE	C3494_1	140	0	0	Comanche	Irrigation
MOODY B KOONCE	C3495_1	94	0	0	Comanche	Irrigation
NANNIE LEE THOMPSON	C3496_1	21	0	0	Comanche	Irrigation
HERRALD ABELS	C3497_1	50	0	0	Comanche	Irrigation
RAYMOND L GILDER	C3498_1	100	0	0	Comanche	Irrigation
N L BOX	C3499_1	3	0	0	Comanche	Irrigation
OBBCO RANCH CORPORATION	C3500_1	24	0	0	Comanche	Irrigation
HAROLD D HIGGINBOTTOM	C3501_1	65	0	0	Comanche	Irrigation
ELMER RAY JOINER	C3504_1	20	0	0	Comanche	Irrigation
WAYNE MOORE ET UX	C3505_1	36	0	0	Comanche	Irrigation
J V STEWART	C3506_1	3	3	3	Erath	Irrigation
A D MCCLELLAN	C3511_1	73	0	0	Comanche	Irrigation
JIMMY DALE JOHNSON	C3512_1	6	0	0	Comanche	Irrigation
GAINES OIL COMPANY	C3514_1	7	0	0	Erath	Irrigation
MERLE JO PARKS TRUSTEE	C3517_1	250	0	0	Erath	Irrigation
KELLER-HYDEN INC	C3518_1	110	0	0	Erath	Irrigation
GARY D BEARD ET AL	C3519_1	25	0	0	Erath	Irrigation
BEN HAMNER	C3520_1	40	0	0	Eastland	Irrigation
TRUETT & PATSY S PRUILL	C3521_1	40	0	0	Eastland	Irrigation
JAMES L HUGHES	C3522_1	7	0	0	Eastland	Irrigation
ROBERT M & IMOGENE BURNS	C3523_1	20	0	0	Eastland	Irrigation
THOMAS H BIRDSONG III	C3525_1	10	0	0	Eastland	Irrigation
MARGRETTE JEAN MOON	C3528_1	121	0	0	Comanche	Irrigation
MARGRETTE JEAN MOON	C3528_2	59.86	0	0	Comanche	Irrigation
LOUIS SCHKADE ET AL	C3530_1	14	0	0	Comanche	Irrigation
LOUIS SCHKADE ET AL	C3530_2	7.86	0	0	Comanche	Irrigation
LOUIS SCHKADE ET AL	C3530_3	46	0	0	Comanche	Irrigation
LOUIS SCHKADE ET AL	C3530_4	28.79	0	0	Comanche	Irrigation
JIMMY L BINGHAM ET AL	C3532_1	29	0	0	Comanche	Irrigation
BOBBY L SKAGGS & GENE E SKAGGS	C3533_1	25	0	0	Comanche	Irrigation
JUNE M.ROUNTRE E, TRUSTEE	C3534_1	24	0	0	Comanche	Irrigation
JACK & THELMA LOU RILEY	C3535_1	8	0	0	Comanche	Irrigation
LYNDELL F COAN	C3536_1	31	0	0	Comanche	Irrigation
ED GLOVER JR	C3539_1	75	0	0	Comanche	Irrigation
SPRUILL BROTHERS DRILLING CO	C3540_1	90	0	0	Comanche	Irrigation
SPRUILL BROTHERS DRILLING CO	C3540_2	49.13	0	0	Comanche	Irrigation

TABLE F-2. Summary of Surface Water Availability

Owner	Water_Right	Authorized Permitted Diversion	2020 Minimum Annual Diversion / Supply Reliability	2070 Minimum Annual Diversion / Supply Reliability	County	Use
SPRUILL BROTHERS DRILLING CO	C3540_3	41.46	0	0	Comanche	Irrigation
SAM D & MARTHA L UPSHAW	C3541_1	45	0	0	Comanche	Irrigation
HELEN SUE WILSON	C3543_1	28	0	0	Comanche	Irrigation
JIM LAMPMAN ET AL	C3544_1	17	0	0	Comanche	Irrigation
E A WALKER	C3546_1	7.5	0	0	Comanche	Irrigation
E A WALKER	C3546_2	1.5	0	0	Comanche	Irrigation
A G LEE	C3547_1	70	0	0	Comanche	Irrigation
SEBORN E GOLDEN	C3548_1	166	0	0	Comanche	Irrigation
T A NOWLIN	C3549_1	42	0	0	Comanche	Irrigation
THOMAS A LEE JR ET UX	C3550_1	60	0	0	Comanche	Irrigation
J V SKAGGS	C3552_1	80	0	0	Comanche	Irrigation
LEE ROY COTTON	C3553_1	53	0	0	Comanche	Irrigation
E J TERRY	C3554_1	25	0	0	Comanche	Irrigation
GAYLE MCGINNIS	C3556_1	7.5	0	0	Comanche	Irrigation
LAKE PROCTOR IRR AUTH	C3557_1	97.5	0	0	Comanche	Irrigation
STEVEN MARK BIGGS ET AL	C3558_1	12	0	0	Comanche	Irrigation
ALICE MAE JONES	C3568_1	50	0	0	Comanche	Irrigation
HEARSHEL JANES	C3569_1	10	0	0	Comanche	Irrigation
A T GILCHREST	C3572_1	140	0	0	Comanche	Irrigation
BOBBY N HUDDLESTON	C3575_1	16	0	0	Comanche	Irrigation
T.A. NOWLIN COPP	C3579_1	32	0	0	Comanche	Irrigation
ELDON WADE BUTLER	C3581_1	65	0	0	Comanche	Irrigation
JULIA JO BAXTER MART	C3584_1	93.65	3	3	Comanche	Irrigation
WAYNE D GILLIAM	C3585_1	23	0	0	Comanche	Irrigation
DON P CHESTER ET UX	C3586_1	154	0	0	Comanche	Irrigation
GEORGE E BINGHAM ET AL	C3587_1	195	0	0	Comanche	Irrigation
BILLY J. GRESSETT, ET AL	C3588_1	29	0	0	Comanche	Irrigation
LOUIS G & BETTY HARELIK	C3589_1	185	0	0	Comanche	Irrigation
CLIFTON D & FRANKIE GEYE	C3590_1	322	0	0	Comanche	Irrigation
LEON Y NICHOLS	C3592_1	109	0	0	Comanche	Irrigation
VERA MULL	C3593_1	8	0	0	Comanche	Irrigation
VERA MULL	C3593_2	17	0	0	Comanche	Irrigation
WOLFE PECANLANDS INC	C3594_1	16	0	0	Comanche	Irrigation
REX MCGINNIS	C3595_1	10	3	3	Comanche	Irrigation
R C PINKARD	C3596_1	280	0	0	Comanche	Irrigation
BOBBIE G WILSON	C3606_1	3	0	0	Comanche	Irrigation
NORMAN MOORE ET UX	C3608_1	21	0	0	Comanche	Irrigation
JOHN M HATHCOCK	C3609_1	50	0	0	Comanche	Irrigation
JOHN O SIMPSON	C3610_1	143	0	0	Comanche	Irrigation
HUGH MONSELLE O'BRIEN	C3611_1	38	0	0	Comanche	Irrigation
FRED S DAVIS	C3612_1	93	0	0	Comanche	Irrigation
HUGH MONSELLE O'BRIEN	C3613_1	95	0	0	Comanche	Irrigation
DON P CHESTER	C3614_1	10	0	0	Comanche	Irrigation
A E VINEYARD	C3615_1	48	0	0	Comanche	Irrigation
B J VINEYARD	C3616_1	12	0	0	Comanche	Irrigation
WALTER MAZUREK	C3617_1	3	0	0	Comanche	Irrigation
OBBCO RANCH CORPORATION	C3618_1	47	0	0	Comanche	Irrigation
OBBCO RANCH CORPORATION	C3618_2	79.21	0	0	Comanche	Irrigation
OBBCO RANCH CORPORATION	C3618_3	9	0	0	Comanche	Irrigation
OBBCO RANCH CORPORATION	C3618_4	8.35	0	0	Comanche	Irrigation
JFB FARMS A PARTNERSHIP	C3619_1	20	0	0	Comanche	Irrigation
E J ALDERMAN	C3620_1	25	0	0	Comanche	Irrigation
E J ALDERMAN	C3620_2	72	0	0	Comanche	Irrigation
MRS MERLE MATTHEWS	C3623_1	26	0	0	Comanche	Irrigation
MRS MERLE MATTHEWS	C3623_2	18.53	0	0	Comanche	Irrigation
PAULINE HALL	C3624_1	14	0	0	Comanche	Irrigation
PAULINE HALL	C3624_2	10.7	0	0	Comanche	Irrigation
WOLFE PECANLANDS INC	C3626_1	160	8	8	Comanche	Irrigation
DINAH KAY DENSMAN ET AL	C3627_1	13	0	0	Comanche	Irrigation
BOBBY & LINDA SIKES	C3629_1	48	0	0	Erath	Irrigation
J H VAN ZANT	C3630_1	30	6	5	Comanche	Irrigation
J Z STARK	C3631_1	50	0	0	Comanche	Irrigation
RANDLE JOE EVANS	C3632_1	3	0	0	Comanche	Irrigation
DONALD DEE SALTER ET AL	C3633_1	61	0	0	Comanche	Irrigation
BEATRICE LOGGINS	C3634_1	31	0	0	Comanche	Irrigation
JOE RILEY	C3635_1	84	13	13	Comanche	Irrigation
GAYLAND STEPHENS ET UX	C3636_1	40	6	6	Comanche	Irrigation
GORES INCORPORATED	C3637_1	450	71	71	Comanche	Irrigation

TABLE F-2. Summary of Surface Water Availability

Owner	Water_Right	Authorized Permitted Diversion	2020 Minimum Annual Diversion / Supply Reliability	2070 Minimum Annual Diversion / Supply Reliability	County	Use
GORES INCORPORATED	C3637_2	176.71	0	0	Comanche	Irrigation
J B GUNTER & P D GUNTER	C3638_1	40	7	7	Comanche	Irrigation
GAIL W & MARY L YORK	C3639_1	35	0	0	Comanche	Irrigation
SCOTT G. SALTER	C3640_1	23	0	0	Comanche	Irrigation
CARL DWAIN HALL	C3642_1	9	1	1	Comanche	Irrigation
JOHN PAUL MCCULLOUGH ET UX	C3643_1	69	4	4	Comanche	Irrigation
BILL BLUE	C3644_1	15	0	0	Comanche	Irrigation
MARK & SHERRI GUNTER	C3645_1	18	0	0	Comanche	Irrigation
THOMAS E LUKER	C3646_1	7	0	0	Comanche	Irrigation
DONALD W MOORE	C3647_1	41	15	15	Comanche	Irrigation
EVA F MOORE	C3648_1	49	7	7	Comanche	Irrigation
EVA F MOORE	C3648_2	21.31	0	0	Comanche	Irrigation
CULLEN STEPHENS	C3649_1	130	23	20	Comanche	Irrigation
GUY E MOORE	C3650_1	34	0	0	Comanche	Irrigation
JOHN R MOORE ET UX	C3651_1	107	5	5	Comanche	Irrigation
JOE D MOORE	C3651_2	15	1	1	Comanche	Irrigation
O A DICKEY	C3652_1	8	0	0	Comanche	Irrigation
LARRY WAYNE ADAMS	C3653_1	12	1	1	Comanche	Irrigation
ESTATE OF WAYNE ADAMS; GRACE OLENA ADAMS	C3653_2	700	91	74	Comanche	Irrigation
GRACE OLENA ADAMS	C3653_3	258	0	0	Comanche	Irrigation
CAROLYN HAYES TRUSTEE	C3654_1	65.3	3	3	Comanche	Irrigation
CAROLYN RINEHART HAYES	C3654_2	32.7	2	2	Comanche	Irrigation
ARBIE N BOYD ET UX & GARY K BOYD	C3655_1	22	1	1	Comanche	Irrigation
MARTIN W & JUANITA SEIDER	C3656_1	36	0	0	Comanche	Irrigation
LEO C HAGGARD ET UX	C3657_1	56	0	0	Comanche	Irrigation
H L WILLINGHAM ESTATE	C3658_1	7	0	0	Comanche	Irrigation
COUNTY-OTHER, COMANCHE	C3659_1	200	137	126	Comanche	Municipal
ERW INC ET AL	C3659_2	200	79	69	Comanche	Irrigation
BELVE BEAN	C3660_1	58	0	0	Comanche	Irrigation
BELVE BEAN	C3660_2	11	0	0	Comanche	Manufacturing
C H MCCALL ET UX	C3661_1	187	0	0	Comanche	Irrigation
"JIMMY E GORE, ET AL"	C3662_1	600	489	465	Comanche	Irrigation
R E BASHAM JR	C3663_1	67	43	40	Comanche	Irrigation
CAROL SUE REED	C3716_1	134	0	0	Kent	Irrigation
BALDRIDGE FAMILY LAND TX PARTN	C3717_1	420	0	0	Kent	Irrigation
TEXACO INC	C3718_1	3525	0	0	Kent	Mining
TEXACO INC	C3718_2	2375	0	0	Kent	Mining
SUN EXPLORATION&PROD CO ET AL	C3719_1	165	0	0	Fisher	Mining
BILLIE JOE MCCOMBS	C3720_1	44	0	0	Fisher	Irrigation
BRUCE & PATSY K COX	C3721_1	100	0	0	Fisher	Irrigation
BRUCE & PATSY K COX	C3721_2	26	0	0	Fisher	Manufacturing
SUN EXPLORATION&PRODUCTION CO	C3722_1	565	0	0	Stonewall	Mining
DON W DAVIS	C3724_1	1016	0	0	Haskell	Irrigation
MOLLIE H BROOKS ET AL	C3726_1	5	4	4	Bell	Irrigation
MOLLIE H BROOKS ET AL	C3726_2	5	3	3	Bell	Irrigation
"B R LAUTERBORN, HERMAN NEUSCH"	C3727_1	72	28	28	Milam	Irrigation
JOE GLASER	C3729_1	100	3	3	Milam	Manufacturing
JOE P (JR) & HENRIETTA CALLAN	C3730_1	21	1	1	Williamson	Irrigation
REUBEN FLOYD CLARK	C3731_1	29	3	3	Williamson	Irrigation
GEORGETOWN COUNTRY CLUB	C3734_1	45	17	17	Williamson	Irrigation
HENRY GRADY RYLANDER	C3736_1	1	0	0	Williamson	Irrigation
GENE H BINGHAM ET AL	C3739_1	240	39	39	Williamson	Mining
WENDELL F. GIBSON	C3740_1	20	2	2	Williamson	Irrigation
LINDA ANN SMITH	C3741_1	10.9	0	0	Williamson	Irrigation
TED KALLUS ET UX	C3741_2	17.1	0	0	Williamson	Irrigation
MAXINE HARRIS	C3742_1	16.9	0	0	Williamson	Irrigation
R SCOTT POPE ET UX	C3742_2	7.2	0	0	Williamson	Irrigation
JL ENTERPRISES LLP	C3743_1	32	2	2	Williamson	Irrigation
T. D. VAUGHAN	C3744_1	110	17	17	Williamson	Irrigation
BEN W KURIO (BWK PARTNERSHIP)	C3745_1	33	1	1	Williamson	Irrigation
CHARLENE M SEFCIK	C3746_1	12	1	1	Williamson	Irrigation
JIMMY F. BYERS	C3747_1	284	4	4	Williamson	Irrigation
A C STEARNS ESTATE	C3748_1	203	103	103	Williamson	Manufacturing
W T PEARSON JR	C3749_1	110	2	2	Milam	Irrigation
T.R. COFFIELD	C3750_1	125	19	19	Milam	Irrigation
BERTHA S. JOHNSON	C3751_1	30	30	30	Williamson	Irrigation
THE ESTATE OF JOHN V STILES	C3753_1	1	1	1	Williamson	Irrigation

TABLE F-2. Summary of Surface Water Availability

Owner	Water_Right	Authorized Permitted Diversion	2020 Minimum Annual Diversion / Supply Reliability	2070 Minimum Annual Diversion / Supply Reliability	County	Use
THORNDALE	C3754_1	60	44	44	Williamson	Municipal
W.A. & JACK WINTERROWD	C3755_1	29	22	22	Williamson	Irrigation
W.A. & JACK WINTERROWD	C3755_2	21	21	21	Williamson	Irrigation
LESTER W. STILES	C3756_1	3	0	0	Williamson	Irrigation
THORNDALE	C3757_1	100	86	86	Williamson	Municipal
DONNY LINDNER ET UX	C3759_1	300	40	40	Milam	Irrigation
DONNY LINDNER ET UX	C3759_2	139.09	0	0	Milam	Irrigation
CLIFFORD L GUSTAFSON ET UX	C3760_1	41.5	42	42	Milam	Irrigation
CAMERON	C3761_1	2792	2,792	2,792	Milam	Municipal
ESTATE OF HUBERT L MCCLAREN	C3763_1	40	6	6	Milam	Irrigation
HAROLD B & OPAL B FISHER	C3764_1	45	7	7	Milam	Irrigation
LARRY WAYNE MCCLAREN ET AL	C3765_1	148	15	15	Milam	Irrigation
LINDA ETHRIDGE GROTHE	C3766_1	90	16	16	Milam	Irrigation
FIVE WELLS RANCH COMPANY	C3767_1	120	11	11	Bell	Irrigation
MICHAEL LLOYD ET UX	C3768_1	12.7	1	1	Milam	Irrigation
MICHAEL LLOYD ET UX	C3768_2	112	2	3	Milam	Manufacturing
LARRY WAYNE MCCLAREN	C3769_1	150	15	15	Milam	Irrigation
JANE SMOOT	C3770_1	149	15	15	Milam	Irrigation
"ELLIOTT W. ATKINSON, ET AL"	C3771_1	15	1	1	Milam	Irrigation
V.T. WHITE	C3772_1	8	0	0	Milam	Irrigation
ARLEDGE & SHANAHAN LP	C3773_1	1300	130	130	Milam	Irrigation
ARLEDGE & SHANAHAN LP	C3773_2	343.71	0	0	Milam	Irrigation
JANE SMOOT	C3774_1	30	3	3	Milam	Irrigation
LLOYD E LEIFESTE ET UX	C3775_1	577.66	52	52	Milam	Irrigation
VERONICA ROESSLER ET AL	C3775_2	622.59	56	56	Milam	Irrigation
Robertson (Fee)	C3775_3	66.75	6	6	Milam	Irrigation
LLOYD E LEIFESTE ET UX	C3775_4	500	0	0	Milam	Irrigation
MARVIN H MCMURREY JR ETAL	C3999_1	25	1	1	Palo Pinto	Irrigation
CURTIS MITCHELL	C4000_1	31	4	4	Palo Pinto	Irrigation
JENNIE M & M F EWTON	C4001_1	40	5	5	Palo Pinto	Irrigation
MRS G C MOORE	C4003_1	41	0	0	Palo Pinto	Irrigation
GRAFORD	C4004_1	5	1	1	Palo Pinto	Municipal
GRAFORD	C4004_2	50	41	41	Palo Pinto	Municipal
W. J. RHODES ETAL	C4005_1	781	2	2	Palo Pinto	Irrigation
"SAN ROC, LLC"	C4006_1	63	11	7	Palo Pinto	Irrigation
MARY E. RIPPETOE	C4007_1	50	0	0	Palo Pinto	Irrigation
W. A. CAREY	C4008_1	110	19	8	Palo Pinto	Irrigation
ERNEST E. AMMONS	C4009_1	24	3	2	Palo Pinto	Irrigation
CHARLES W. & JEAN WELCH	C4010_1	33	4	2	Palo Pinto	Irrigation
"JACKIE LEE CHASTAIN, ET AL"	C4011_1	8	0	0	Palo Pinto	Irrigation
EARL W. & ANITA GARDNER	C4012_8	236	0	0	Palo Pinto	Irrigation
ROCKING W RANCH LP	C4013_2	298.56	0	0	Palo Pinto	Irrigation
ROCKING W RANCH LP	C4013_3	294.57	0	0	Palo Pinto	Irrigation
ROCKING W RANCH LP	C4013_4	287.4	0	0	Palo Pinto	Irrigation
FRED HAGAMAN ET AL	C4014_1	500	214	214	Eastland	Irrigation
FRED HAGAMAN ET AL	C4014_2	100	25	25	Eastland	Manufacturing
FRED HAGAMAN ET AL	C4015_1	27	0	0	Eastland	Irrigation
HUBERT H CAPPS	C4016_1	22	0	0	Eastland	Irrigation
LYNDAL D GARNER JR ET UX	C4017_1	40	0	0	Eastland	Irrigation
ROSS HODGES	C4018_1	40	0	0	Eastland	Irrigation
STRAWN	C4019_1	160	160	160	Palo Pinto	Municipal
PERRY R. HORTON ETAL	C4020_1	362	0	0	Palo Pinto	Irrigation
R. J. CARAWAY	C4021_1	30	0	0	Palo Pinto	Irrigation
R. J. CARAWAY	C4021_2	41	0	0	Palo Pinto	Mining
PENNY SPARKS	C4022_1	60	0	0	Palo Pinto	Irrigation
A. D. CRAWFORD	C4023_1	30	0	0	Eastland	Irrigation
GORDON	C4024_1	115	0	0	Palo Pinto	Municipal
GORDON	C4024_2	45	0	0	Palo Pinto	Municipal
GORDON	C4024_3	245	0	0	Palo Pinto	Municipal
COUNTY-OTHER, ERATH	C4025_1	60	0	0	Erath	Municipal
TARRANT INVESTMENT CO INC	C4025_2	30	0	0	Erath	Mining
COUNTY-OTHER, ERATH	C4026_1	20	0	0	Erath	Municipal
JACK R DAUGHERTY	C4027_1	80	0	0	Palo Pinto	Irrigation
J L MCDANIEL	C4028_1	38	1	1	Erath	Irrigation
"EARL WADDELL, INC."	C4029_1	2	0	0	Palo Pinto	Irrigation
PALO PINTO CO MWD 1	C4031_1	5200	3,022	2,892	Palo Pinto	Municipal
PALO PINTO CO MWD 1	C4031_2	2800	1,176	1,176	Palo Pinto	Municipal
PALO PINTO CO MWD 1	C4031_3	1300	546	546	Palo Pinto	Municipal

TABLE F-2. Summary of Surface Water Availability

Owner	Water_Right	Authorized Permitted Diversion	2020 Minimum Annual Diversion / Supply Reliability	2070 Minimum Annual Diversion / Supply Reliability	County	Use
PALO PINTO CO MWD 1	C4031_4	700	294	294	Palo Pinto	Municipal
PALO PINTO CO MWD 1	C4031_5	3480	1,444	1,358	Palo Pinto	Steam-Electric
CHARLIE RAY COCKBURN	C4032_1	16	0	0	Palo Pinto	Municipal
J L MCDANIEL	C4034_1	30	4	4	Erath	Irrigation
J. E. MCDANIEL	C4035_1	5	0	0	Palo Pinto	Irrigation
"EARL WADDELL, INC."	C4036_1	55	0	0	Palo Pinto	Irrigation
ROY E SQUYRES ET AL	C4037_1	100	0	0	Palo Pinto	Irrigation
HERMAN PETTY	C4038_1	150	0	0	Palo Pinto	Irrigation
H D HOWARD	C4048_1	25	0	0	Hood	Irrigation
COUNTY-OTHER, HOOD	C4048_2	35	0	0	Hood	Municipal
FRED L THORMANN	C4049_1	12	0	0	Hood	Irrigation
FRED L THORMANN	C4050_1	23	0	0	Hood	Irrigation
JESSE T CROWDER JR TRUST	C4054_1	12.15	1	1	Hood	Irrigation
JOHN WESSLER ET AL	C4054_2	26.85	2	2	Hood	Irrigation
MCI LAND COMPANY	C4055_1	42	4	4	Hood	Irrigation
"BANK ONE TEXAS NA, TRUSTEE"	C4056_1	144	66	66	Hood	Irrigation
MARY L & C W KILLOUGH	C4057_1	109	12	10	Hood	Irrigation
HELEN T DURHAM ESTATE	C4059_1	35	3	3	Hood	Irrigation
LORENE DURHAM ESTATE ET AL	C4060_1	616	112	112	Hood	Irrigation
BURTON S BURKS SR ET AL	C4061_1	65	8	8	Hood	Irrigation
THOMAS FAMILY TRUST	C4062_1	383	49	49	Hood	Irrigation
FRED GRIMES ET AL	C4063_1	348	37	33	Hood	Irrigation
BURTON S BURKS JR	C4064_1	25	2	2	Hood	Irrigation
ROBERT & C J WHITEHEAD	C4065_1	84	9	8	Hood	Irrigation
COURTS K CLEVELAND JR	C4067_1	63	8	7	Hood	Irrigation
COLLIE W OLIVER	C4068_1	72	0	0	Hood	Irrigation
WALKER MURRAY RANDLE	C4069_1	120	0	0	Hood	Irrigation
LESLIE L. MABERY	C4070_1	141	18	18	Hood	Irrigation
R E MABERY	C4071_1	83	11	11	Hood	Irrigation
JAMES E ANTHONY ET AL	C4072_1	308	40	37	Hood	Irrigation
JAMES E ANTHONY ET AL	C4072_2	172	14	14	Hood	Irrigation
JAMES E ANTHONY ET AL	C4072_3	117	12	12	Hood	Irrigation
JAMES R. ROBINSON	C4073_1	42	5	5	Hood	Irrigation
E. F. ALLISON	C4074_1	26	3	3	Hood	Irrigation
D. J. VAUGHN	C4076_1	15.5	0	0	Hood	Irrigation
ROBIN K SNIDER ET AL	C4076_2	23.5	1	1	Hood	Irrigation
D. J. BROWN	C4077_1	30	1	1	Hood	Irrigation
ROBERT & MARGARET KING INV INC	C4078_1	54	7	6	Hood	Irrigation
JAMES ROBERT HILL	C4079_1	92	1	1	Hood	Irrigation
J V & M G DURANT	C4080_1	112	3	3	Somervell	Irrigation
F. L. VAUGHN	C4081_1	160	5	5	Somervell	Irrigation
S. B. GRISSOM	C4082_1	203	36	36	Somervell	Irrigation
ROBERT L FOREE JR	C4083_1	45	5	4	Hood	Irrigation
EARL R ALLISON	C4084_1	25	1	1	Erath	Irrigation
EARL R ALLISON	C4084_2	1.8	0	0	Erath	NIF
EARL R ALLISON	C4085_1	10.3	0	0	Erath	Irrigation
DANE ALLISON ET UX	C4085_2	17.7	6	6	Erath	Irrigation
GARY & BEVERLY LEWELLEN	C4086_1	15	0	0	Erath	Irrigation
LELAND A HODGES ET AL	C4087_1	81	73	73	Hood	Irrigation
MILTON C. & VIVIAN YOUNG	C4088_1	55	4	4	Hood	Irrigation
JACOB T. & LAURA DAMERON	C4089_1	31	3	3	Erath	Irrigation
RICHARD T. LIETZ ESTATE	C4090_1	197	32	32	Erath	Irrigation
KENNETH LESLEY	C4091_1	360	98	98	Erath	Irrigation
"ROBERT D. ADAMS, SR."	C4092_1	6	0	0	Erath	Irrigation
ERNEST H CANNON	C4093_1	94	8	8	Hood	Irrigation
J B SANDERSON ET AL	C4094_1	16	4	4	Somervell	Irrigation
J. C. MCFALL	C4095_1	10	2	2	Somervell	Irrigation
TEXAS UTILITIES ELECTRIC CO	C4097_1	23180	63	63	Somervell	Steam-Electric
BOB HARRIS OIL CO	C4098_1	258	44	44	Somervell	Irrigation
DOROTHY W. LITTLE ETAL	C4099_1	5	1	1	Somervell	Irrigation
LAFARGE CORPORATION	C4100_1	125	62	62	Johnson	Mining
STANDARD INVESTMENT CO.	C4102_1	77	6	6	Johnson	Irrigation
"CYRIL WAGNER, JR., ETAL"	C4103_1	186	32	32	Bosque	Irrigation
PERRY R BASS INC	C4104_1	3811	232	232	Bosque	Irrigation
WESLEY RAY CARSON	C4105_1	8	0	0	Johnson	Irrigation
CREPE MYRTLE OF TEXAS INC	C4105_2	4	0	0	Johnson	Irrigation
CLEBURNE	C4106_1	5760	3,722	2,888	Johnson	Municipal
CLEBURNE	C4106_3	240	140	76	Johnson	Irrigation

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Owner	Water_Right	Authorized Permitted Diversion	2020 Minimum Annual Diversion / Supply Reliability	2070 Minimum Annual Diversion / Supply Reliability	County	Use
RIVERVIEW INC	C4107_1	231	8	8	Johnson	Irrigation
RIVERVIEW INC	C4107_2	104.4	0	0	Johnson	Irrigation
HARRY V DULICK	C4108_1	27	1	1	Bosque	Irrigation
HARRY V DULICK	C4108_2	5	1	1	Bosque	Manufacturing
LOUIS & VIRGINIA GREGORY	C4109_1	10	6	6	Bosque	Irrigation
LUCILLE C BUTLER	C4110_1	20	1	1	Bosque	Irrigation
"PAUL C. MURPHY, JR."	C4111_1	6	3	3	Bosque	Irrigation
LOUIS & VIRGINIA GREGORY	C4112_1	12	2	2	Bosque	Irrigation
JAMES M. WALKER	C4113_1	43	43	43	Bosque	Irrigation
THOMAS BROTHERS GRASS LTD	C4114_1	300	38	38	Hood	Irrigation
H & H FEEDLOT INC	C4115_1	45	0	0	Nolan	Manufacturing
MARJORIE HAMBRIGHT	C4116_1	2	1	1	Fisher	Irrigation
DR HELEN F YEATS	C4117_1	1	0	0	Fisher	Irrigation
ZANNA H ANDERSON	C4118_1	8	0	0	Fisher	Irrigation
ALFRED L. CAREY ET UX	C4119_1	5	0	0	Fisher	Irrigation
MAX D. CARRIKER ESTATE ETAL	C4120_1	74	31	31	Fisher	Irrigation
WILLARD L. BURK	C4121_1	263	93	93	Fisher	Irrigation
MAX D. CARRIKER ESTATE	C4122_1	60	0	0	Fisher	Irrigation
FREDDIE MAC STUART	C4123_1	17	11	11	Fisher	Irrigation
"ALFRED S. WALDROP, ETAL"	C4124_1	55	24	24	Fisher	Irrigation
BOYD H. LAKEY	C4126_1	55	0	0	Fisher	Irrigation
JAMES RANDOLPH SCOTT	C4127_1	120	0	0	Jones	Irrigation
SWEETWATER	C4128_1	2000	90	90	Nolan	Municipal
SWEETWATER	C4128_2	7000	0	0	Nolan	Municipal
"SWEETWATER COUNTRY CLUB, INC"	C4129_1	40	40	40	Nolan	Irrigation
SWEETWATER	C4130_1	2730	173	173	Nolan	Municipal
CITY OF SWEETWATER	C4130_2	960	0	0	Nolan	Manufacturing
CITY OF SWEETWATER	C4130_3	50	0	0	Nolan	Irrigation
HARRY C. REAUGH & WIFE	C4132_1	212	0	0	Jones	Irrigation
JAMES FARRINGTON ET AL	C4133_1	225	0	0	Jones	Irrigation
BILLY DOAN	C4134_1	45	0	0	Taylor	Irrigation
HUGH T. LILLY	C4135_1	28	0	0	Taylor	Irrigation
NELSON PUETT	C4136_1	338	0	0	Jones	Mining
NELSON PUETT	C4136_2	7	0	0	Jones	Manufacturing
ROSS S BRADFORD ET UX	C4137_1	54	24	24	Jones	Irrigation
THOMAS J MARSHALL & WIFE	C4138_1	2	0	0	Jones	Irrigation
RALPH BRIDWELL ET UX	C4140_1	165	0	0	Jones	Irrigation
DOLLY KEESEE	C4141_1	69	0	0	Jones	Irrigation
ABILENE	C4142_1	1675	515	515	Taylor	Municipal
BILL JAY ET AL	C4144_1	73	0	0	Taylor	Manufacturing
"BILL JAY, ET AL"	C4145_1	168	0	0	Taylor	Manufacturing
J H TAYLOR GAS COMPANY	C4146_1	4	0	0	Taylor	Irrigation
LEE ARTHUR PRESSWOOD	C4147_1	14	0	0	Taylor	Irrigation
RILEY G MAXWELL CO ET AL	C4148_1	5	0	0	Taylor	Irrigation
NOEL W. PETRE	C4149_1	42	0	0	Jones	Irrigation
ABILENE	C4150_1	3765	215	215	Taylor	Municipal
ABILENE	C4150_2	115	0	0	Taylor	Irrigation
CLYDE	C4151_1	2500	952	952	Jones	Steam-Electric
COUNTY-OTHER, TAYLOR	C4152_1	230	0	230	Taylor	Municipal
RAYMOND MCNUTT	C4155_1	6	0	0	Taylor	Irrigation
ROY ELTON ROBBINS & WIFE	C4156_1	5	0	0	Taylor	Irrigation
H C WELCH	C4157_1	70	0	0	Taylor	Irrigation
ROY J. GRIFFITH	C4158_1	75	0	0	Taylor	Irrigation
J. C. GRIFFITH	C4159_1	42	0	0	Taylor	Irrigation
ABILENE	C4161_1	25690	258	258	Jones	Municipal
ABILENE	C4161_2	7640.98	0	0	Jones	Municipal
ABILENE	C4161_3	5331.4	0	0	Jones	Irrigation
JAMES H. ICE	C4162_1	179	0	0	Jones	Irrigation
BILLY MAC COOK	C4163_1	44	0	0	Jones	Irrigation
J. N. MONTGOMERY & WIFE	C4164_1	32	0	0	Jones	Irrigation
ABILENE	C4165_1	2023.06	0	0	Jones	Municipal
IRLENE M SMITH ET AL	C4166_1	32	0	0	Jones	Irrigation
GEOCHEMICAL SURVEYS	C4167_1	40	0	0	Jones	Mining
ZOHN MILAM	C4168_1	15	0	0	Young	Irrigation
RICHARD SCHKADE	C4169_1	62	0	0	Shackelfor	Irrigation
RICHARD SCHKADE	C4169_2	5	0	0	Shackelfor	Mining
J M ALEXANDER RANCH CO LTD	C4170_1	200	0	0	Jones	Irrigation
MARY LOIS WILSON	C4171_1	310	136	136	Jones	Irrigation

TABLE F-2. Summary of Surface Water Availability

Owner	Water_Right	Authorized Permitted Diversion	2020 Minimum Annual Diversion / Supply Reliability	2070 Minimum Annual Diversion / Supply Reliability	County	Use
VIOLET H FRAZIER	C4172_1	92	0	0	Jones	Irrigation
VIOLET H FRAZIER	C4173_1	40	0	0	Jones	Irrigation
H R STASNEY & SONS LTD	C4175_1	21	12	12	Shackelfor	D&L
H R STASNEY & SONS LTD	C4175_2	1.83	0	0	Shackelfor	D&L
H R STASNEY & SONS LTD	C4175_3	63	36	36	Shackelfor	Mining
H R STASNEY & SONS LTD	C4175_4	5.48	0	0	Shackelfor	Mining
JOSEPH ELMER COX	C4176_1	120	0	0	Haskell	Irrigation
W. B. GRIFFITH ETAL	C4177_1	95	0	0	Haskell	Irrigation
EMILEE G. GOFF ETAL	C4178_1	78	0	0	Haskell	Irrigation
STAMFORD	C4179_1	10000	2,822	1,505	Haskell	Municipal
HAMLIN	C4180_1	300	0	0	Jones	Municipal
ANSON	C4181_1	542	0	0	Jones	Municipal
HASKELL COUNTY COUNTRY CLUB	C4184_1	7	0	0	Haskell	Irrigation
ERNEST D. FINCHER	C4185_1	10	0	0	Shackelfor	Irrigation
RAYMOND C TAYLOR ET AL	C4186_1	20	0	0	Shackelfor	Irrigation
RAYMOND C TAYLOR ET AL	C4186_2	8.98	0	0	Shackelfor	Irrigation
BRECKENRIDGE PARTNERSHIP LTD	C4187_1	300	0	0	Stephens	Irrigation
T C HARRIS JR	C4188_1	40	18	18	Stephens	Irrigation
BRECKENRIDGE PARTNERSHIP LTD	C4189_1	69	0	0	Stephens	Irrigation
BRECKENRIDGE PARTNERSHIP LTD	C4190_1	70	0	0	Stephens	Irrigation
M RAY PUCKETT EST ET AL	C4191_1	98.59	0	0	Stephens	Irrigation
M RAY PUCKETT EST ET AL	C4191_2	96.41	0	0	Stephens	Irrigation
MRS. W. R. POWERS ESTATE	C4192_1	30	13	13	Stephens	Irrigation
COUNTY-OTHER, THROCKMORTON	C4194_1	60	0	0	Throckmor	Municipal
GILBERT E BRANDENBERGER ET UX	C4195_1	22	0	0	Stephens	Irrigation
JOE DAVIS	C4196_1	18	0	0	Stephens	Irrigation
J W SULLIVAN	C4197_1	20	0	0	Stephens	Irrigation
OWEN D WOODWARD	C4199_1	98	15	15	Stephens	Irrigation
OWEN D WOODWARD	C4199_2	70.49	18	18	Stephens	Irrigation
BAIRD	C4202_1	550	0	0	Callahan	Municipal
"A. E. DYER, JR."	C4203_1	24	0	0	Callahan	Irrigation
KENNETH M GEORGE & WIFE	C4204_1	16	0	0	Callahan	Irrigation
EUGENE LEE FINLEY	C4205_1	50	0	0	Callahan	Irrigation
TERRY T POSEY ET UX	C4206_1	40	20	20	Fisher	Irrigation
COUNTY-OTHER, SHACKELFORD	C4207_1	90	90	90	Shackelfor	Municipal
ALBANY	C4208_1	600	1	1	Shackelfor	Municipal
DAMSON OIL CORP ET AL	C4209_1	50	50	50	Shackelfor	Manufacturing
JAMES R. GREEN	C4210_1	35	0	0	Shackelfor	Irrigation
CISCO	C4211_1	1971	165	165	Eastland	Municipal
CITY OF CISCO	C4211_3	56	0	0	Eastland	Manufacturing
CISCO	C4212_1	1000	0	0	Eastland	Municipal
WEST CENTRAL TEXAS MWD	C4213_1	21008	2,924	2,869	Stephens	Municipal
WEST CENTRAL TEXAS MWD	C4213_2	17362	0	0	Stephens	Municipal
WEST CENTRAL TEXAS MWD	C4213_3	1882	0	0	Stephens	Municipal
WEST CENTRAL TEXAS MWD	C4213_4	2061	0	0	Stephens	Municipal
WEST CENTRAL TEXAS MWD	C4213_5	2487	0	0	Stephens	Municipal
WEST CENTRAL TEXAS MWD	C4213_6	2000	0	0	Stephens	Municipal
WEST CENTRAL TEXAS MWD	C4213_7	1200	0	0	Stephens	Municipal
WEST CENTRAL TEXAS MWD	C4213_8	6000	0	0	Stephens	Municipal
WEST CENTRAL TEXAS MWD	C4213_9	2000	0	0	Stephens	Municipal
BRECKENRIDGE	C4214_1	2100	0	0	Stephens	Municipal
T. C. FAMBRO & SONS	C4215_1	6	0	0	Stephens	Irrigation
SARAH SATTERWHITE	C4216_1	30	0	0	Stephens	Irrigation
SWANSON MULESHOE RANCH LTD	C4217_1	218	0	0	Stephens	Mining
JACK T ROBERTSON JR	C4218_1	32	0	0	Stephens	Irrigation
ELLA PEARL ROBERTSON	C4219_1	22	0	0	Stephens	Irrigation
ELLA PEARL ROBERTSON	C4220_1	39	0	0	Stephens	Irrigation
ELLA PEARL ROBERTSON	C4221_1	42	0	0	Stephens	Irrigation
ELLA PEARL ROBERTSON	C4222_1	45	0	0	Stephens	Irrigation
BRECKENRIDGE GASOLINE CO	C4223_1	97	61	58	Stephens	Manufacturing
E E RILEY	C4225_1	30	0	0	Young	Irrigation
SAMUEL JOHN ROACH	C4226_1	628	0	0	Young	Irrigation
"C. R. BALDWIN, JR."	C4227_1	181	0	0	Young	Irrigation
CHESLEY J AUTEN	C4315_1	30	3	4	Hill	Irrigation
B W & SARA J. BOWERS	C4316_1	75	8	8	Hill	Irrigation
MARY ANN JENKINS ET AL	C4317_1	243	19	19	Bosque	Irrigation
JOHN MCPHERSON ET AL	C4318_1	647	462	323	Bosque	Irrigation
ED HUDDLESTON & JOHN MCPHERSON ET	C4318_2	2820	1,685	1,685	Bosque	Irrigation

TABLE F-2. Summary of Surface Water Availability

Owner	Water_Right	Authorized Permitted Diversion	2020 Minimum Annual Diversion / Supply Reliability	2070 Minimum Annual Diversion / Supply Reliability	County	Use
BIRCH WILFONG	C4319_1	34	2	2	Hill	Irrigation
HERMAN L HORN	C4320_1	84	3	3	Hill	Irrigation
WALTON K BALLEW	C4321_1	337	36	36	Hill	Irrigation
ALTHIA B G BURNETTE	C4322_1	175	6	6	Hill	Irrigation
DOCK L BURNETTE	C4323_1	173	22	22	Hill	Irrigation
VANESSA A GILPIN	C4324_1	305	11	11	Hill	Irrigation
NELDA KATHRYN CARGILL	C4325_1	48	2	2	McLennan	Irrigation
DAN WELDON WILLIAMS	C4326_1	6	1	1	McLennan	Irrigation
DAN WELDON WILLIAMS	C4327_1	4	1	1	McLennan	Irrigation
GEORGE L MOORE	C4328_1	40	1	1	McLennan	Irrigation
THOMAS BOTHERS GRASS LTD	C4329_1	74	16	16	McLennan	Manufacturing
THOMAS BOTHERS GRASS LTD	C4329_2	856	31	31	McLennan	Irrigation
KARL LEE & ELSIE MAE REDDELL	C4330_1	16	4	4	McLennan	Irrigation
DIANA M WELLBORN ET AL	C4331_1	44	10	10	McLennan	Irrigation
KARL LEE REDDELL ET AL	C4332_1	32	7	7	McLennan	Irrigation
HILLSBORO COUNTRY CLUB	C4333_1	8	8	8	Hill	Irrigation
"GEORGE W. MCNIEL, ET AL"	C4334_1	1	1	1	Hill	Irrigation
ALPHONS D URBANOVSKY	C4335_1	40	1	1	Hill	Irrigation
FAYE SMITH ROMINE	C4336_1	55	3	3	McLennan	Irrigation
KAYE SMITH BOYD	C4336_2	55	3	3	McLennan	Irrigation
DONALD RISINGER PENSION PLAN	C4337_1	58	2	2	McLennan	Irrigation
"JIM G DOLLINS, SR"	C4338_1	130	14	14	McLennan	Irrigation
B.T. GEORGE, C. WALKER, & J&B ENGLISH	C4339_1	100	9	9	McLennan	Irrigation
WACO	C4340_1	5600	5,600	5,600	McLennan	Municipal
TEXAS UTILITIES ELECTRIC CO	C4342_1	12000	8,463	7,960	McLennan	Steam-Electric
TEXAS UTILITIES ELECTRIC CO	C4342_2	15000	972	972	McLennan	Steam-Electric
LOLA ROBINSON	C4344_1	400	299	400	McLennan	Irrigation
LOLA ROBINSON	C4344_2	660	116	116	McLennan	Irrigation
TEXAS UTILITIES ELECTRIC CO	C4345_1	10000	8,650	8,677	McLennan	Steam-Electric
TEXAS UTILITIES ELECTRIC CO	C4345_2	22.47	0	0	McLennan	Steam-Electric
W J DUBE	C4346_1	200	139	139	Falls	Irrigation
VANCE DUNNAM JR	C4347_1	12	12	12	McLennan	Irrigation
"JOE RAY HATTER, SR"	C4348_1	70	51	51	McLennan	Irrigation
RDS LAND CO LLC	C4349_1	199	13	13	McLennan	Irrigation
RDS LAND CO LLC	C4349_2	76.1	0	0	McLennan	Irrigation
RDS LAND CO LLC	C4349_3	24.19	0	0	McLennan	Irrigation
JOHN P ESTES ESTATE TRUST ETAL	C4350_1	20	20	20	McLennan	Irrigation
MONT HAMM	C4351_1	160	12	12	Falls	Irrigation
DENNIS L BIRKES ETAL	C4353_1	40	40	40	Falls	Irrigation
JEAN W EPPERSON	C4354_1	50	50	50	Falls	Irrigation
MARLIN	C4355_1	1500	971	971	Falls	Municipal
MARLIN	C4355_2	2000	1,339	1,377	Falls	Municipal
MARLIN	C4355_3	1500	856	712	Falls	Municipal
CITY OF MARLIN	C4355_4	2000	1,429	1,429	Falls	Manufacturing
MARLIN	C4355_7	1000	561	561	Falls	Municipal
DAVID L. ROBERTS & WIFE	C4356_1	84	84	84	Falls	Irrigation
JOHN C ISAACS ET AL	C4358_1	991	20	20	Falls	Irrigation
JOHN C ISAACS ET AL	C4359_1	496	345	345	Falls	Irrigation
JOHN C ISAACS ET AL	C4359_2	495	10	10	Falls	Irrigation
ROSEBUD	C4360_1	124	54	54	Falls	Municipal
ROSEBUD	C4360_2	14.23	0	0	Falls	Municipal
ROSEBUD	C4360_3	100	39	39	Falls	Municipal
AGNES FIELD ELIOT	C4361_1	184	17	17	Robertson	Irrigation
DOUGLAS A MCCRARY	C4362_1	363	36	36	Robertson	Irrigation
JOE REISTINO ESTATE	C4363_1	384	59	59	Robertson	Irrigation
JOE REISTINO ESTATE	C4363_2	1068	21	21	Robertson	Irrigation
JOE REISTINO ESTATE	C4363_3	48	7	7	Robertson	Irrigation
CLIFF A SKILES JR	C4364_1	724	72	72	Robertson	Irrigation
CLIFF A SKILES JR	C4364_2	193.64	0	0	Robertson	Irrigation
WESLEY E ANDERSON ET AL	C4365_1	976	149	149	Robertson	Irrigation
ELLEN WIESE BRIEN ET AL	C4366_1	275	28	28	Robertson	Irrigation
ELLEN WIESE BRIEN ET AL	C4366_2	125	3	3	Robertson	Irrigation
GERTRUD PAPP ETAL	C4367_1	145	22	20	Robertson	Irrigation
GLORIA ELY HOLDEN	C4368_1	76	8	8	Milam	Irrigation
GENE W BONORDEN	C4369_1	4	2	2	Milam	Irrigation
ONAH B PENN ETAL	C4370_1	297	30	30	Robertson	Irrigation
SAM F DESTEFANO	C4371_1	410	41	41	Robertson	Irrigation
SAM F DESTEFANO	C4371_2	290	6	6	Robertson	Irrigation

TABLE F-2. Summary of Surface Water Availability

Owner	Water_Right	Authorized Permitted Diversion	2020 Minimum Annual Diversion / Supply Reliability	2070 Minimum Annual Diversion / Supply Reliability	County	Use
FORBIN INVESTMENTS N V	C4372_1	235	5	5	Brazos	Irrigation
FORBIN INVESTMENTS N V	C4372_2	626.7	85	105	Brazos	Irrigation
FLOYD KEMPENSKI	C4375_1	4	3	3	Robertson	Irrigation
NELSON FAMILY FARMING TRUST	C4376_1	74	7	7	Robertson	Irrigation
GEORGE C GASSEN	C4377_1	20	20	20	Robertson	Irrigation
FIRST NATL BK ABILENE ET AL	C4767_1	60	0	0	Jones	Irrigation
OOR	C5171_3	19500	13,558	13,558	Limestone	Steam-Electric
OOR	C5171_4	33750	23,467	22,169	Limestone	Municipal
TEXAS UTILITIES ELECTRIC CO	C5268_1	85	85	85	Brazos	Steam-Electric
TEXAS A&M UNIVERSITY	C5271_1	500	77	77	Brazos	Irrigation
TEXAS A&M UNIVERSITY	C5271_2	80.51	0	0	Brazos	Irrigation
TEXAS A&M UNIVERSITY	C5271_3	700	58	58	Burleson	Irrigation
TEXAS A&M UNIVERSITY	C5271_4	178.76	0	0	Burleson	Irrigation
TEXAS A&M UNIVERSITY	C5271_5	420	95	95	Burleson	Manufacturing
ALUMINUM CO OF AMERICA	C5272_1	14000	14,000	14,000	Milam	Steam-Electric
ROCKDALE COUNTRY CLUB	C5273_1	1	0	0	Milam	Irrigation
GEORGE W SPRANKLE	C5276_1	2.3	0	0	Washingto	Irrigation
SEALY & ROBERT HUTCHINGS	C5284_1	30	15	15	Burleson	Irrigation
WILLIAM J TERRELL ET AL	C5285_1	752	17	17	Washingto	Irrigation
JOYCE ANN FREDE	C5286_1	218	33	33	Grimes	Irrigation
JOYCE ANN FREDE	C5286_2	232	4	4	Grimes	Irrigation
JOYCE ANN FREDE	C5286_3	259	5	5	Brazos	Irrigation
WILLIE BALDOBINO ET UX	C5286_4	258.5	5	5	Brazos	Irrigation
BISTONE MUNICIPAL WATER SUPPLY DIST	C5287_1	2165	1,219	861	Limestone	Municipal
BISTONE MUNICIPAL WATER SUPPLY DIST	C5287_2	722	405	228	Limestone	Municipal
BISTONE MUNICIPAL WATER SUPPLY DIST	C5287_3	65	44	24	Limestone	Manufacturing
TEXAS PARKS & WILDLIFE DEPT	C5288_1	6	6	6	Limestone	Irrigation
GROESBECK	C5289_1	2500	1,142	1,142	Limestone	Municipal
ERNI LUNA ET AL	C5290_1	8	8	8	Limestone	Irrigation
TEXAS UTILITIES ELECTRIC CO	C5298_1	13200	222	222	Robertson	Steam-Electric
BRIARCREST COUNTRY CLUB INC	C5308_1	12	0	1	Brazos	Irrigation
TEXAS MUNICIPAL POWER AGENCY	C5311_1	9740	9,740	9,740	Grimes	Steam-Electric
TEXAS MUNICIPAL POWER AGENCY	C5312_1	200	85	85	Grimes	Mining
CLIFFORD A SKILES JR ET UX	C5470_1	514	471	384	Robertson	Irrigation
ROBERT W NORRIS	P3761_1	400	6	3	Milam	Irrigation
ELLIS G & JEAN M MARSHALL	P3762_1	100	2	1	Bell	Irrigation
PAUL J MEYER ET AL	P3763_1	361	21	21	Bell	Irrigation
WALNUT CR FARMS OF GRANBURY	P3851_1	17	0	0	Hood	Irrigation
HOLY LAND & CATTLE	P3936_1	2600	52	52	McLennan	Irrigation
KENNETH & BETTY YVON LESLEY	P3939_1	98	98	98	Erath	Irrigation
THOMAS E LOVELACE ET AL	P4000_1	40	1	0	Palo Pinto	Irrigation
MIKE & ITHA LYNNE BERRY	P4003_1	29.7	0	0	Palo Pinto	Irrigation
ROBERT HARRY MOORE	P4011_1	905	20	20	Washingto	Irrigation
MELANIE MOORE KOLBY ET AL	P4011_2	498	11	11	Washingto	Irrigation
BILLY G. CURRY ET AL	P4012_1	440	6	0	Bell	Irrigation
ROBERT L MACHA ET AL	P4013_1	1200	24	24	Falls	Irrigation
MARY D WALSH	P4014_1	1851	37	37	Falls	Irrigation
CALVIN KRAEMER ET AL	P4015_1	350	5	3	Milam	Irrigation
CHAMBERLIN FAMILY TRUST	P4015_2	350	5	3	Milam	Irrigation
TOM J. MOORE FARMS	P4016_2	4450	98	98	Brazos	Irrigation
TOM J. MOORE FARMS	P4016_3	990	22	22	Brazos	Irrigation
ROBERT T & GERALDINE MOORE	P4017_1	962	19	19	Brazos	Irrigation
DON WEINACHT ET AL	P4023_1	600	12	12	Eastland	Irrigation
BELTON	P4024_1	300	0	0	Bell	Irrigation
T W WHALEY JR	P4042_1	700	14	14	Falls	Irrigation
N S WATERMAN JR ET UX	P4063_1	270	2	2	Falls	Irrigation
N S WATERMAN JR ET UX	P4063_2	195.37	0	0	Falls	Irrigation
JAMES H JONES ET UX	P4076_1	250	5	5	Hood	Irrigation
JOHN R WOODALL ET AL	P4078_1	825	17	17	Hood	Irrigation
GATHAN REISTINO	P4080_1	1500	30	30	Robertson	Irrigation
SIDNEY KACIR	P4095_1	240	4	2	Bell	Irrigation
SIDNEY KACIR	P4095_2	308	0	0	Bell	Irrigation
BETTY KACIR WHEELER	P4109_1	400	6	3	Milam	Irrigation
BRUCE E TODD	P4124_1	225	0	0	Erath	Irrigation
BRUCE E TODD	P4124_2	49.8	0	0	Erath	Irrigation
FLOYD GUNN	P4128_1	102	2	2	Nolan	Irrigation
CRAWFORD	P4135_1	55	0	0	McLennan	Municipal
JOHN W & JANIE NIGLIAZZO	P4145_1	448	9	9	Taylor	Irrigation

TABLE F-2. Summary of Surface Water Availability

Owner	Water_Right	Authorized Permitted Diversion	2020 Minimum Annual Diversion / Supply Reliability	2070 Minimum Annual Diversion / Supply Reliability	County	Use
SAMUEL W & MARGARET JONES	P4166_1	120	2	1	Williamson	Irrigation
CARL MOODY ET AL	P4212_1	300	5	2	Eastland	Irrigation
THE SILVER QUAIL COMPANY	P4218_1	172	2	0	Bell	Irrigation
CLEBURNE	P4258_1	720	0	0	Johnson	Municipal
ABILENE	P4266_1	4330	0	0	Jones	Irrigation
HILLIARD RANCHES INC	P4279_1	600	9	5	Milam	Irrigation
WARRENS TURF NURSERY INC	P4279_2	150	2	2	Milam	Irrigation
MART	P5000_1	500	0	0	McLennan	Municipal
HAYNES CORPORATION	P5076_1	25	0	0	Bell	Irrigation
DAVID B & AUDREY HATCHER	P5077_1	600	12	12	Milam	Irrigation
ROBINSON	P5085_1	6021	5,437	4,421	McLennan	Municipal
WACO	P5094_1	20082	13,025	11,401	McLennan	Municipal
WACO	P5094_2	688	388	388	McLennan	Municipal
TEXAS-NEW MEXICO POWER CO	P5148_1	458	1	0	Robertson	Steam-Electric
ASPERMONT	P5162_1	8	0	1	Stonewall	Irrigation
PHILLIPS PETROLEUM CO	P5242_1	1552	0	0	Stonewall	Mining
CITATION 1994 INVEST LTD PART	P5282_1	235	0	0	Stonewall	Mining
TEXAS DEPT OF CRIMINAL JUSTICE	P5290_1	250	0	0	Grimes	Irrigation
TEXAS DEPT OF CRIMINAL JUSTICE	P5290_2	598	0	0	Grimes	Irrigation
PEBBLE CREEK COUNTRY CLUB INC	P5329_1	325	0	0	Brazos	Irrigation
PEBBLE CREEK COUNTRY CLUB INC	P5329_2	270.05	0	0	Brazos	Irrigation
CITY OF TEMPLE	P5330_1	187	4	0	Bell	Irrigation
TEXAS MUNICIPAL POWER AGENCY	P5354_1	200	8	8	Grimes	Manufacturing
NANTUCKET LTD	P5385_1	140	85	85	Brazos	D&L
PLAINS PETROLEUM OPERATING CO	P5435_1	235	0	0	Knox	Mining
TEXAS MUNICIPAL POWER AGENCY	P5458_1	100	100	100	Grimes	Manufacturing
TEXAS MUNICIPAL POWER AGENCY	P5473_1	10	2	2	Grimes	Manufacturing
DEL WEBB TEXAS L P	P5533_2	26.1	0	0	Williamson	Irrigation
CLIFTON	P5551_4	2004	964	863	Bosque	Municipal
STEWART & MARY THOMPSON &TRUST	P5566_1	250	3	3	Grimes	Irrigation
DAVID MOODY TRUSTEE ET AL	P5570_1	365	0	0	Brazos	Irrigation
WALTER EXPLORATION INC	P5692_1	67	0	0	Stonewall	Mining
SOMERVELL COUNTY WATER DISTRICT	P5744_1	7533.47	88	88	Somervell	Municipal
SOMERVELL COUNTY WATER DISTRICT	P5744_2	2000	1,810	1,810	Somervell	Municipal
ALCOA	P5803_1	650	650	650	Milam	Steam-Electric
MERIDIAN	P5899_2	1336	522	443	Bosque	Municipal

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Appendix G
Economic Impacts of Not Meeting Needs

Socioeconomic Impacts of Projected Water Shortages for the Brazos G (Region G) Regional Water Planning Area

Prepared in Support of the 2021 Region G Regional Water Plan

Dr. John R. Ellis
Water Use, Projections, & Planning Division
Texas Water Development Board

November 2019

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Executive Summary

Evaluating the social and economic impacts of not meeting identified water needs is a required analysis in the regional water planning process. The Texas Water Development Board (TWDB) estimates these impacts for regional water planning groups (RWPGs) and summarizes the impacts in the state water plan. The analysis presented is for the Brazos G Regional Water Planning Group (Region G).

Based on projected water demands and existing water supplies, Region G identified water needs (potential shortages) that could occur within its region under a repeat of the drought of record for six water use categories (irrigation, livestock, manufacturing, mining, municipal and steam-electric power). The TWDB then estimated the annual socioeconomic impacts of those needs—if they are not met—for each water use category and as an aggregate for the region.

This analysis was performed using an economic impact modeling software package, IMPLAN (Impact for Planning Analysis), as well as other economic analysis techniques, and represents a snapshot of socioeconomic impacts that may occur during a single year repeat of the drought of record with the further caveat that no mitigation strategies are implemented. Decade specific impact estimates assume that growth occurs, and future shocks are imposed on an economy at 10-year intervals. The estimates presented are not cumulative (i.e., summing up expected impacts from today up to the decade noted), but are simply snapshots of the estimated annual socioeconomic impacts should a drought of record occur in each particular decade based on anticipated water supplies and demands for that same decade.

For regional economic impacts, income losses and job losses are estimated within each planning decade (2020 through 2070). The income losses represent an approximation of gross domestic product (GDP) that would be foregone if water needs are not met.

The analysis also provides estimates of financial transfer impacts, which include tax losses (state, local, and utility tax collections); water trucking costs; and utility revenue losses. In addition, social impacts are estimated, encompassing lost consumer surplus (a welfare economics measure of consumer wellbeing); as well as population and school enrollment losses.

IMPLAN data reported that Region G generated close to $99 billion in gross domestic product (GDP) (2018 dollars) and supported roughly 1.2 million jobs in 2016. The Region G estimated total population was approximately 2.2 million in 2016.

It is estimated that not meeting the identified water needs in Region G would result in an annually combined lost income impact of approximately $13.3 billion in 2020, and $12 billion in 2070 (Table ES-1). In 2020, the region would lose approximately 65,000 jobs, and by 2070 job losses would increase to approximately 98,000 if anticipated needs are not mitigated.

All impact estimates are in year 2018 dollars and were calculated using a variety of data sources and tools including the use of a region-specific IMPLAN model, data from TWDB annual water use estimates, the U.S. Census Bureau, Texas Agricultural Statistics Service, and the Texas Municipal League.

Table ES-1 Region G socioeconomic impact summary

Regional Economic Impacts	2020	2030	2040	2050	2060	2070
Income losses ($ millions)*	$13,299	$15,465	$13,353	$12,695	$12,154	$12,080
Job losses	65,131	86,060	80,693	86,373	91,113	98,141
Financial Transfer Impacts	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
Tax losses on production and imports ($ millions)*	$967	$1,152	$932	$836	$749	$712
Water trucking costs ($ millions)*	$68	$87	$108	$137	$186	$532
Utility revenue losses ($ millions)*	$171	$299	$446	$624	$839	$1,074
Utility tax revenue losses ($ millions)*	$3	$5	$8	$12	$16	$20
Social Impacts	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
Consumer surplus losses ($ millions)*	$352	$510	$729	$1,290	$2,816	$3,883
Population losses	11,958	15,801	14,815	15,858	16,728	18,019
School enrollment losses	2,287	3,022	2,834	3,033	3,200	3,447

* Year 2018 dollars, rounded**.** Entries denoted by a dash (-) indicate no estimated economic impact. Entries denoted by a zero ($0) indicate estimated income losses less than $500,000.

1 Introduction

Water shortages during a repeat of the drought of record would likely curtail or eliminate certain economic activity in businesses and industries that rely heavily on water. Insufficient water supplies could not only have an immediate and real impact on the regional economy in the short term, but they could also adversely and chronically affect economic development in Texas. From a social perspective, water supply reliability is critical as well. Shortages could disrupt activity in homes, schools and government, and could adversely affect public health and safety. For these reasons, it is important to evaluate and understand how water supply shortages during drought could impact communities throughout the state.

As part of the regional water planning process, RWPGs must evaluate the social and economic impacts of not meeting water needs (31 Texas Administrative Code §357.33 (c)). Due to the complexity of the analysis and limited resources of the planning groups, the TWDB has historically performed this analysis for the RWPGs upon their request. Staff of the TWDB's Water Use, Projections, & Planning Division designed and conducted this analysis in support of Region G, and those efforts for this region as well as the other 15 regions allow consistency and a degree of comparability in the approach.

This document summarizes the results of the analysis and discusses the methodology used to generate the results. Section 1 provides a snapshot of the region's economy and summarizes the identified water needs in each water use category, which were calculated based on the RWPG's water supply and demand established during the regional water planning process. Section 2 defines each of ten impact assessment measures used in this analysis. Section 3 describes the methodology for the impact assessment and the approaches and assumptions specific to each water use category (i.e., irrigation, livestock, manufacturing, mining, municipal, and steam-electric power). Section 4 presents the impact estimates for each water use category with results summarized for the region as a whole. Appendix A presents a further breakdown of the socioeconomic impacts by county.

1.1 Regional Economic Summary

The Region G Regional Water Planning Area generated close to $99 billion in gross domestic product (2018 dollars) and supported roughly 1.2 million jobs in 2016, according to the IMPLAN dataset utilized in this socioeconomic analysis. This activity accounted for 5.7 percent of the state's total gross domestic product of 1.73 trillion dollars for the year based on IMPLAN. Table 1-1 lists all economic sectors ranked by the total value-added to the economy in Region G. The manufacturing and mining sectors generated more than 16 percent of the region's total value-added and were also significant sources of tax revenue. The top employers in the region were in the public administration, retail trade, and health care sectors. Region G's estimated total population was approximately 2.2 million in 2016, close to 8 percent of the state's total.

This represents a snapshot of the regional economy as a whole, and it is important to note that not all economic sectors were included in the TWDB socioeconomic impact analysis. Data considerations prompted use of only the more water-intensive sectors within the economy because damage estimates could only be calculated for those economic sectors which had both reliable income and water use estimates.

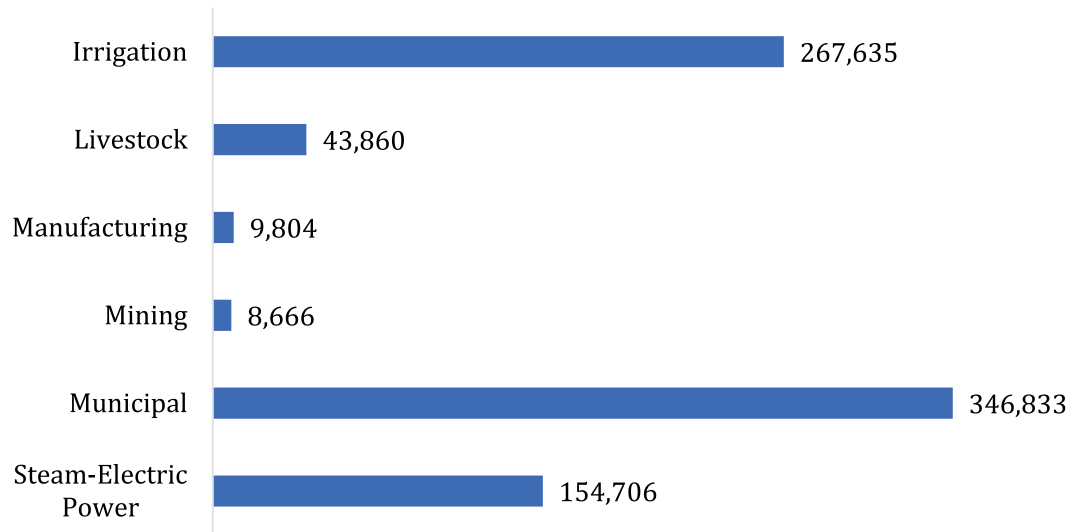
Table 1-1 Region G regional economy by economic sector*

Economic sector	Value-added ($ millions)	Tax ($ millions)	Jobs
Public Administration	$19,346.7	$(151.3)	215,290
Manufacturing	$12,157.9	$268.7	71,960
Real Estate and Rental and Leasing	$10,614.3	$1,623.5	43,661
Wholesale Trade	$6,948.9	$1,147.5	39,025
Health Care and Social Assistance	$6,377.0	$95.4	104,479
Retail Trade	$6,273.5	$1,607.6	116,667
Construction	$5,873.5	$88.1	79,659
Professional, Scientific, and Technical Services	$4,790.4	$168.9	65,140
Mining, Quarrying, and Oil and Gas Extraction	$3,916.7	$1,035.6	31,093
Finance and Insurance	$3,711.9	$339.8	54,254
Utilities	$3,452.8	$579.3	6,194
Accommodation and Food Services	$3,316.9	$541.0	90,398
Other Services (except Public Administration)	$3,042.0	$296.2	76,445
Transportation and Warehousing	$2,368.5	$77.5	32,541
Administrative and Support and Waste Management and Remediation Services	$2,199.7	$75.7	53,988
Information	$1,735.9	$511.5	11,286
Agriculture, Forestry, Fishing and Hunting	$1,117.0	$42.8	56,319
Educational Services	$781.0	$33.9	20,554
Arts, Entertainment, and Recreation	$441.2	$104.3	17,418
Management of Companies and Enterprises	$404.6	$15.8	5,597
Grand Total	$98,870.4	$8,501.7	1,191,969

*Source: 2016 IMPLAN for 536 sectors aggregated by 2-digit NAICS (North American Industry Classification System)

Figure 1-1 illustrates Region G's breakdown of the 2016 water use estimates by TWDB water use category. The categories with the highest use in Region G in 2016 were municipal (42 percent) and irrigated agriculture (32 percent). Notably, 33 percent of the state's water use for steam-electric power generation occurred within Region G.

Figure 1-1 Region G 2016 water use estimates by water use category (in acre-feet)



Source: TWDB Annual Water Use Estimates (all values in acre-feet)

1.2 Identified Regional Water Needs (Potential Shortages)

As part of the regional water planning process, the TWDB adopted water demand projections for water user groups (WUG) in Region G with input from the planning group. WUG-level demand projections were established for utilities that provide more than 100 acre-feet of annual water supply, combined rural areas (designated as county-other), and county-wide water demand projections for five non-municipal categories (irrigation, livestock, manufacturing, mining and steam-electric power). The RWPG then compared demands to the existing water supplies of each WUG to determine potential shortages, or needs, by decade.

Table 1-2 summarizes the region's identified water needs in the event of a repeat of the drought of record. Demand management, such as conservation, or the development of new infrastructure to increase supplies, are water management strategies that may be recommended by the planning group to address those needs. This analysis assumes that no strategies are implemented, and that the identified needs correspond to future water shortages. Note that projected water needs generally increase over time, primarily due to anticipated population growth, economic growth, or declining supplies. To provide a general sense of proportion, total projected needs as an overall percentage of total demand by water use category are also presented in aggregate in Table 1-2. Projected needs for individual water user groups within the aggregate can vary greatly and may reach 100% for a given WUG and water use category. A detailed summary of water needs by WUG and county appears in Chapter 4 of the 2021 Region G Regional Water Plan.

Table 1-2 Regional water needs summary by water use category

Water Use Category		2020	2030	2040	2050	2060	2070
Irrigation	water needs (acre-feet per year)	74,577	80,605	75,617	74,289	75,095	77,574
	% of the category's total water demand	21%	22%	21%	21%	21%	22%
Livestock	water needs (acre-feet per year)	2,569	2,491	2,491	2,491	2,491	2,491
	% of the category's total water demand	5%	5%	5%	5%	5%	5%
Manufacturing	water needs (acre-feet per year)	1,028	3,462	3,092	2,722	2,383	1,920
	% of the category's total water demand	8%	21%	19%	17%	15%	12%
Mining	water needs (acre-feet per year)	29,652	30,954	28,303	29,215	30,420	32,776
	% of the category's total water demand	48%	47%	48%	50%	52%	54%
Municipal*	water needs (acre-feet per year)	52,802	93,789	140,348	195,044	256,044	324,141
	% of the category's total water demand	13%	21%	28%	34%	40%	46%
Steam-electric power	water needs (acre-feet per year)	98,671	102,915	107,157	111,400	115,645	119,887
	% of the category's total water demand	42%	44%	46%	48%	50%	51%
Total water needs (acre-feet per year)		**259,299**	**314,216**	**357,008**	**415,161**	**482,078**	**558,789**

* Municipal category consists of residential and non-residential (commercial and institutional) subcategories.

2 Impact Assessment Measures

A required component of the regional and state water plans is to estimate the potential economic and social impacts of potential water shortages during a repeat of the drought of record. Consistent with previous water plans, ten impact measures were estimated and are described in Table 2-1.

Table 2-1 Socioeconomic impact analysis measures

Regional economic impacts	Description
Income losses - value-added	The value of output less the value of intermediate consumption; it is a measure of the contribution to gross domestic product (GDP) made by an individual producer, industry, sector, or group of sectors within a year. Value-added measures used in this report have been adjusted to include the direct, indirect, and induced monetary impacts on the region.
Income losses - electrical power purchase costs	Proxy for income loss in the form of additional costs of power as a result of impacts of water shortages.
Job losses	Number of part-time and full-time jobs lost due to the shortage. These values have been adjusted to include the direct, indirect, and induced employment impacts on the region.
Financial transfer impacts	**Description**
Tax losses on production and imports	Sales and excise taxes not collected due to the shortage, in addition to customs duties, property taxes, motor vehicle licenses, severance taxes, other taxes, and special assessments less subsidies. These values have been adjusted to include the direct, indirect and induced tax impacts on the region.
Water trucking costs	Estimated cost of shipping potable water.
Utility revenue losses	Foregone utility income due to not selling as much water.
Utility tax revenue losses	Foregone miscellaneous gross receipts tax collections.
Social impacts	**Description**
Consumer surplus losses	A welfare measure of the lost value to consumers accompanying restricted water use.
Population losses	Population losses accompanying job losses.
School enrollment losses	School enrollment losses (K-12) accompanying job losses.

2.1 Regional Economic Impacts

The two key measures used to assess regional economic impacts are income losses and job losses. The income losses presented consist of the sum of value-added losses and the additional purchase costs of electrical power.

Income Losses - Value-added Losses

Value-added is the value of total output less the value of the intermediate inputs also used in the production of the final product. Value-added is similar to GDP, a familiar measure of the productivity of an economy. The loss of value-added due to water shortages is estimated by input-output analysis using the IMPLAN software package, and includes the direct, indirect, and induced monetary impacts on the region. The indirect and induced effects are measures of reduced income as well as reduced employee spending for those input sectors which provide resources to the water shortage impacted production sectors.

Income Losses - Electric Power Purchase Costs

The electrical power grid and market within the state is a complex interconnected system. The industry response to water shortages, and the resulting impact on the region, are not easily modeled using traditional input/output impact analysis and the IMPLAN model. Adverse impacts on the region will occur and are represented in this analysis by estimated additional costs associated with power purchases from other generating plants within the region or state. Consequently, the analysis employs additional power purchase costs as a proxy for the value-added impacts for the steam-electric power water use category, and these are included as a portion of the overall income impact for completeness.

For the purpose of this analysis, it is assumed that power companies with insufficient water will be forced to purchase power on the electrical market at a projected higher rate of 5.60 cents per kilowatt hour. This rate is based upon the average day-ahead market purchase price of electricity in Texas that occurred during the recent drought period in 2011. This price is assumed to be comparable to those prices which would prevail in the event of another drought of record.

Job Losses

The number of jobs lost due to the economic impact is estimated using IMPLAN output associated with each TWDB water use category. Because of the difficulty in predicting outcomes and a lack of relevant data, job loss estimates are not calculated for the steam-electric power category.

2.2 Financial Transfer Impacts

Several impact measures evaluated in this analysis are presented to provide additional detail concerning potential impacts on a portion of the economy or government. These financial transfer impact measures include lost tax collections (on production and imports), trucking costs for imported water, declines in utility revenues, and declines in utility tax revenue collected by the state. These measures are not solely adverse, with some having both positive and negative impacts. For example, cities and residents would suffer if forced to pay large costs for trucking in potable water. Trucking firms, conversely, would benefit from the transaction. Additional detail for each of these measures follows.

Tax Losses on Production and Imports

Reduced production of goods and services accompanying water shortages adversely impacts the collection of taxes by state and local government. The regional IMPLAN model is used to estimate reduced tax collections associated with the reduced output in the economy. Impact estimates for this measure include the direct, indirect, and induced impacts for the affected sectors.

Water Trucking Costs

In instances where water shortages for a municipal water user group are estimated by RWPGs to exceed 80 percent of water demands, it is assumed that water would need to be trucked in to support basic consumption and sanitation needs. For water shortages of 80 percent or greater, a fixed, maximum of $35,000[1] per acre-foot of water applied as an economic cost. This water trucking cost was utilized for both the residential and non-residential portions of municipal water needs.

Utility Revenue Losses

Lost utility income is calculated as the price of water service multiplied by the quantity of water not sold during a drought shortage. Such estimates are obtained from utility-specific pricing data provided by the Texas Municipal League, where available, for both water and wastewater. These water rates are applied to the potential water shortage to estimate forgone utility revenue as water providers sold less water during the drought due to restricted supplies.

Utility Tax Losses

Foregone utility tax losses include estimates of forgone miscellaneous gross receipts taxes. Reduced water sales reduce the amount of utility tax that would be collected by the State of Texas for water and wastewater service sales.

2.3 Social Impacts

Consumer Surplus Losses for Municipal Water Users

Consumer surplus loss is a measure of impact to the wellbeing of municipal water users when their water use is restricted. Consumer surplus is the difference between how much a consumer is

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[1] Based on staff survey of water hauling firms and historical data concerning transport costs for potable water in the recent drought in California for this estimate. There are many factors and variables that would determine actual water trucking costs including distance to, cost of water, and length of that drought.

willing and able to pay for a commodity (i.e., water) and how much they actually have to pay. The difference is a benefit to the consumer's wellbeing since they do not have to pay as much for the commodity as they would be willing to pay. Consumer surplus may also be viewed as an estimate of how much consumers would be willing to pay to keep the original quantity of water which they used prior to the drought. Lost consumer surplus estimates within this analysis only apply to the residential portion of municipal demand, with estimates being made for reduced outdoor and indoor residential use. Lost consumer surplus estimates varied widely by location and degree of water shortage.

Population and School Enrollment Losses

Population loss due to water shortages, as well as the associated decline in school enrollment, are based upon the job loss estimates discussed in Section 2.1. A simplified ratio of job and net population losses are calculated for the state as a whole based on a recent study of how job layoffs impact the labor market population.[2] For every 100 jobs lost, 18 people were assumed to move out of the area. School enrollment losses are estimated as a proportion of the population lost based upon public school enrollment data from the Texas Education Agency concerning the age K-12 population within the state (approximately 19%).

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[2] Foote, Andrew, Grosz, Michel, Stevens, Ann. "Locate Your Nearest Exit: Mass Layoffs and Local Labor Market Response." University of California, Davis. April 2015, http://paa2015.princeton.edu/papers/150194. The study utilized Bureau of Labor Statistics data regarding layoffs between 1996 and 2013, as well as Internal Revenue Service data regarding migration, to model the change in the population as the result of a job layoff event. The study found that layoffs impact both out-migration and in-migration into a region, and that a majority of those who did move following a layoff moved to another labor market rather than an adjacent county.

3 Socioeconomic Impact Assessment Methodology

This portion of the report provides a summary of the methodology used to estimate the potential economic impacts of future water shortages. The general approach employed in the analysis was to obtain estimates for income and job losses on the smallest geographic level that the available data would support, tie those values to their accompanying historic water use estimate, and thereby determine a maximum impact per acre-foot of shortage for each of the socioeconomic measures. The calculations of economic impacts are based on the overall composition of the economy divided into many underlying economic sectors. Sectors in this analysis refer to one or more of the 536 specific production sectors of the economy designated within IMPLAN, the economic impact modeling software used for this assessment. Economic impacts within this report are estimated for approximately 330 of these sectors, with the focus on the more water-intensive production sectors. The economic impacts for a single water use category consist of an aggregation of impacts to multiple, related IMPLAN economic sectors.

3.1 Analysis Context

The context of this socioeconomic impact analysis involves situations where there are physical shortages of groundwater or surface water due to a recurrence of drought of record conditions. Anticipated shortages for specific water users may be nonexistent in earlier decades of the planning horizon, yet population growth or greater industrial, agricultural or other sector demands in later decades may result in greater overall demand, exceeding the existing supplies. Estimated socioeconomic impacts measure what would happen if water user groups experience water shortages for a period of one year. Actual socioeconomic impacts would likely become larger as drought of record conditions persist for periods greater than a single year.

3.2 IMPLAN Model and Data

Input-Output analysis using the IMPLAN software package was the primary means of estimating the value-added, jobs, and tax related impact measures. This analysis employed regional level models to determine key economic impacts. IMPLAN is an economic impact model, originally developed by the U.S. Forestry Service in the 1970's to model economic activity at varying geographic levels. The model is currently maintained by the Minnesota IMPLAN Group (MIG Inc.) which collects and sells county and state specific data and software. The year 2016 version of IMPLAN, employing data for all 254 Texas counties, was used to provide estimates of value-added, jobs, and taxes on production for the economic sectors associated with the water user groups examined in the study. IMPLAN uses 536 sector-specific Industry Codes, and those that rely on water as a primary input were assigned to their appropriate planning water user categories (irrigation, livestock, manufacturing, mining, and municipal). Estimates of value-added for a water use category were obtained by summing value-added estimates across the relevant IMPLAN sectors associated with that water use category. These calculations were also performed for job losses as well as tax losses on production and imports.

The adjusted value-added estimates used as an income measure in this analysis, as well as the job and tax estimates from IMPLAN, include three components:

- ***Direct effects*** representing the initial change in the industry analyzed;
- ***Indirect effects*** that are changes in inter-industry transactions as supplying industries respond to reduced demands from the directly affected industries; and,
- ***Induced effects*** that reflect changes in local spending that result from reduced household income among employees in the directly and indirectly affected industry sectors.

Input-output models such as IMPLAN only capture backward linkages and do not include forward linkages in the economy.

3.3 Elasticity of Economic Impacts

The economic impact of a water need is based on the size of the water need relative to the total water demand for each water user group. Smaller water shortages, for example, less than 5 percent, are generally anticipated to result in no initial negative economic impact because water users are assumed to have a certain amount of flexibility in dealing with small shortages. As a water shortage intensifies, however, such flexibility lessens and results in actual and increasing economic losses, eventually reaching a representative maximum impact estimate per unit volume of water. To account for these characteristics, an elasticity adjustment function is used to estimate impacts for the income, tax and job loss measures. Figure 3-1 illustrates this general relationship for the adjustment functions. Negative impacts are assumed to begin accruing when the shortage reaches the lower bound 'b1' (5 percent in Figure 3-1), with impacts then increasing linearly up to the 100 percent impact level (per unit volume) once the upper bound reaches the 'b2' level shortage (40 percent in Figure 3-1).

To illustrate this, if the total annual value-added for manufacturing in the region was $2 million and the reported annual volume of water used in that industry is 10,000 acre-feet, the estimated economic measure of the water shortage would be $200 per acre-foot. The economic impact of the shortage would then be estimated using this value-added amount as the maximum impact estimate ($200 per acre-foot) applied to the anticipated shortage volume and then adjusted by the elasticity function. Using the sample elasticity function shown in Figure 3-1, an approximately 22 percent shortage in the livestock category would indicate an economic impact estimate of 50% of the original $200 per acre-foot impact value (i.e., $100 per acre-foot).

Such adjustments are not required in estimating consumer surplus, utility revenue losses, or utility tax losses. Estimates of lost consumer surplus rely on utility-specific demand curves with the lost consumer surplus estimate calculated based on the relative percentage of the utility's water shortage. Estimated changes in population and school enrollment are indirectly related to the elasticity of job losses.

Assumed values for the lower and upper bounds 'b1' and 'b2' vary by water use category and are presented in Table 3-1.

Figure 3-1 Example economic impact elasticity function (as applied to a single water user's shortage)

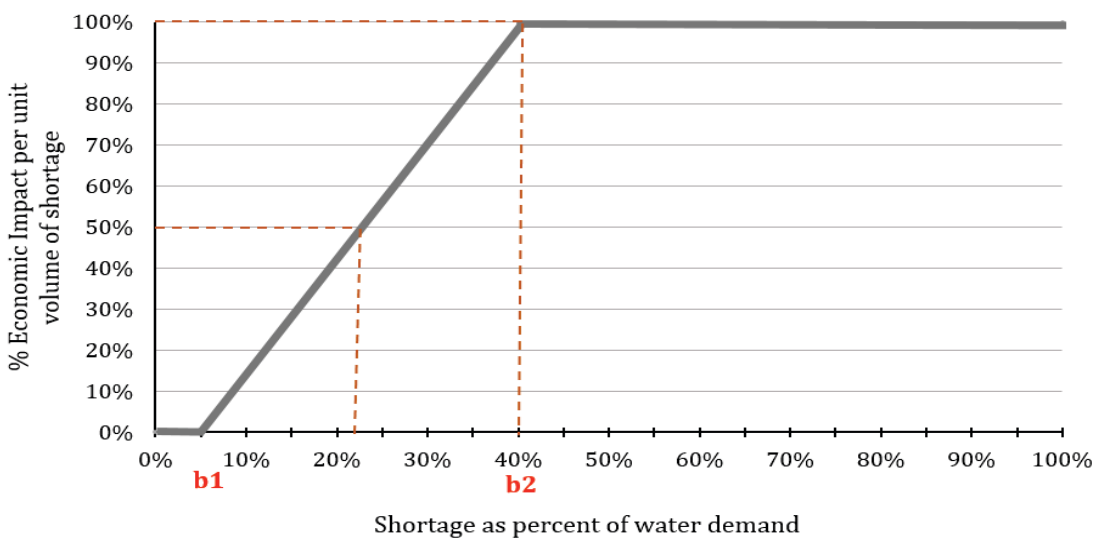

Table 3-1 Economic impact elasticity function lower and upper bounds

Water use category	Lower bound (b1)	Upper bound (b2)
Irrigation	**5%**	**40%**
Livestock	**5%**	**10%**
Manufacturing	**5%**	**40%**
Mining	**5%**	**40%**
Municipal (non-residential water intensive subcategory)	**5%**	**40%**
Steam-electric power	**N/A**	**N/A**

3.4 Analysis Assumptions and Limitations

The modeling of complex systems requires making many assumptions and acknowledging the model's uncertainty and limitations. This is particularly true when attempting to estimate a wide range of socioeconomic impacts over a large geographic area and into future decades. Some of the key assumptions and limitations of this methodology include:

1. The foundation for estimating the socioeconomic impacts of water shortages resulting from a drought are the water needs (potential shortages) that were identified by RWPGs as part of the

regional water planning process. These needs have some uncertainty associated with them but serve as a reasonable basis for evaluating the potential impacts of a drought of record event.

2. All estimated socioeconomic impacts are snapshots for years in which water needs were identified (i.e., 2020, 2030, 2040, 2050, 2060, and 2070). The estimates are independent and distinct "what if" scenarios for each particular year, and water shortages are assumed to be temporary events resulting from a single year recurrence of drought of record conditions. The evaluation assumed that no recommended water management strategies are implemented. In other words, growth occurs and future shocks are imposed on an economy at 10-year intervals, and the resulting impacts are estimated. Note that the estimates presented are not cumulative (i.e., summing up expected impacts from today up to the decade noted), but are simply snapshots of the estimated annual socioeconomic impacts should a drought of record occur in each particular decade based on anticipated water supplies and demands for that same decade.

3. Input-output models such as IMPLAN rely on a static profile of the structure of the economy as it appears today. This presumes that the relative contributions of all sectors of the economy would remain the same, regardless of changes in technology, availability of limited resources, and other structural changes to the economy that may occur in the future. Changes in water use efficiency will undoubtedly take place in the future as supplies become more stressed. Use of the static IMPLAN structure was a significant assumption and simplification considering the 50-year time period examined in this analysis. To presume an alternative future economic makeup, however, would entail positing many other major assumptions that would very likely generate as much or more error.

4. This is not a form of cost-benefit analysis. That approach to evaluating the economic feasibility of a specific policy or project employs discounting future benefits and costs to their present value dollars using some assumed discount rate. The methodology employed in this effort to estimate the economic impacts of future water shortages did not use any discounting methods to weigh future costs differently through time.

5. All monetary values originally based upon year 2016 IMPLAN and other sources are reported in constant year 2018 dollars to be consistent with the water management strategy requirements in the State Water Plan.

6. IMPLAN based loss estimates (income-value-added, jobs, and taxes on production and imports) are calculated only for those IMPLAN sectors for which the TWDB's Water Use Survey (WUS) data was available and deemed reliable. Every effort is made in the annual WUS effort to capture all relevant firms who are significant water users. Lack of response to the WUS, or omission of relevant firms, impacts the loss estimates.

7. Impacts are annual estimates. The socioeconomic analysis does not reflect the full extent of impacts that might occur as a result of persistent water shortages occurring over an extended duration. The drought of record in most regions of Texas lasted several years.

8. Value-added estimates are the primary estimate of the economic impacts within this report. One may be tempted to add consumer surplus impacts to obtain an estimate of total adverse economic impacts to the region, but the consumer surplus measure represents the change to the wellbeing of households (and other water users), not an actual change in the flow of dollars through the economy. The two measures (value-added and consumer surplus) are both valid impacts but ideally should not be summed.

9. The value-added, jobs, and taxes on production and import impacts include the direct, indirect and induced effects to capture backward linkages in the economy described in Section 2.1. Population and school enrollment losses also indirectly include such effects as they are based on the associated losses in employment. The remaining measures (consumer surplus, utility revenue, utility taxes, additional electrical power purchase costs, and potable water trucking costs), however, do not include any induced or indirect effects.

10. The majority of impacts estimated in this analysis may be more conservative (i.e., smaller) than those that might actually occur under drought of record conditions due to not including impacts in the forward linkages in the economy. Input-output models such as IMPLAN only capture backward linkages on suppliers (including households that supply labor to directly affected industries). While this is a common limitation in this type of economic modeling effort, it is important to note that forward linkages on the industries that use the outputs of the directly affected industries can also be very important. A good example is impacts on livestock operators. Livestock producers tend to suffer substantially during droughts, not because there is not enough water for their stock, but because reductions in available pasture and higher prices for purchased hay have significant economic effects on their operations. Food processors could be in a similar situation if they cannot get the grains or other inputs that they need. These effects are not captured in IMPLAN, resulting in conservative impact estimates.

11. The model does not reflect dynamic economic responses to water shortages as they might occur, nor does the model reflect economic impacts associated with a recovery from a drought of record including:
    a. The likely significant economic rebound to some industries immediately following a drought, such as landscaping;
    b. The cost and time to rebuild liquidated livestock herds (a major capital investment in that industry);
    c. Direct impacts on recreational sectors (i.e., stranded docks and reduced tourism); or,
    d. Impacts of negative publicity on Texas' ability to attract population and business in the event that it was not able to provide adequate water supplies for the existing economy.

12. Estimates for job losses and the associated population and school enrollment changes may exceed what would actually occur. In practice, firms may be hesitant to lay off employees, even in difficult economic times. Estimates of population and school enrollment changes are based on regional evaluations and therefore do not necessarily reflect what might occur on a statewide basis.

13. **The results must be interpreted carefully. It is the general and relative magnitudes of impacts as well as the changes of these impacts over time that should be the focus rather than the absolute numbers.** Analyses of this type are much better at predicting relative percent differences brought about by a shock to a complex system (i.e., a water shortage) than the precise size of an impact. To illustrate, assuming that the estimated economic impacts of a drought of record on the manufacturing and mining water user categories are $2 and $1 million, respectively, one should be more confident that the economic impacts on manufacturing are twice as large as those on mining and that these impacts will likely be in the millions of dollars. But one should have less confidence that the actual total economic impact experienced would be $3 million.

14. The methodology does not capture "spillover" effects between regions – or the secondary impacts that occur outside of the region where the water shortage is projected to occur.

15. The methodology that the TWDB has developed for estimating the economic impacts of unmet water needs, and the assumptions and models used in the analysis, are specifically designed to estimate potential economic effects at the regional and county levels. Although it may be tempting to add the regional impacts together in an effort to produce a statewide result, the TWDB cautions against that approach for a number of reasons. The IMPLAN modeling (and corresponding economic multipliers) are all derived from regional models – a statewide model of Texas would produce somewhat different multipliers. As noted in point 14 within this section, the regional modeling used by TWDB does not capture spillover losses that could result in other regions from unmet needs in the region analyzed, or potential spillover gains if decreased production in one region leads to increases in production elsewhere. The assumed drought of record may also not occur in every region of Texas at the same time, or to the same degree.

4 Analysis Results

This section presents estimates of potential economic impacts that could reasonably be expected in the event of water shortages associated with a drought of record and if no recommended water management strategies were implemented. Projected economic impacts for the six water use categories (irrigation, livestock, manufacturing, mining, municipal, and steam-electric power) are reported by decade.

4.1 Impacts for Irrigation Water Shortages

Twenty-one of the 37 counties in the region are projected to experience water shortages in the irrigated agriculture water use category for one or more decades within the planning horizon. Estimated impacts to this water use category appear in Table 4-1. Note that tax collection impacts were not estimated for this water use category. IMPLAN data indicates a negative tax impact (i.e., increased tax collections) for the associated production sectors, primarily due to past subsidies from the federal government. However, it was not considered realistic to report increasing tax revenues during a drought of record.

Table 4-1 Impacts of water shortages on irrigation in Region G

Impact measure	2020	2030	2040	2050	2060	2070
Income losses ($ millions)*	$26	$28	$26	$25	$25	$26
Job losses	672	729	667	651	653	683

* Year 2018 dollars, rounded. Entries denoted by a dash (-) indicate no estimated economic impact. Entries denoted by a zero ($0) indicate estimated income losses less than $500,000.

4.2 Impacts for Livestock Water Shortages

Ten of the 37 counties in the region are projected to experience water shortages in the livestock water use category for one or more decades within the planning horizon. Estimated impacts to this water use category appear in Table 4-2.

Table 4-2 Impacts of water shortages on livestock in Region G

Impact measure	2020	2030	2040	2050	2060	2070
Income losses ($ millions)*	$48	$47	$47	$47	$47	$47
Jobs losses	2,475	2,395	2,395	2,395	2,395	2,395
Tax losses on production and imports ($ millions)*	$3	$3	$3	$3	$3	$3

* Year 2018 dollars, rounded. Entries denoted by a dash (-) indicate no estimated economic impact. Entries denoted by a zero ($0) indicate estimated income losses less than $500,000.

4.3 Impacts of Manufacturing Water Shortages

Manufacturing water shortages in the region are projected to occur in ten of the 37 counties in the region for at least one decade of the planning horizon. Estimated impacts to this water use category appear in Table 4-3.

Table 4-3 Impacts of water shortages on manufacturing in Region G

Impacts measure	2020	2030	2040	2050	2060	2070
Income losses ($ millions)*	$1,027	$2,541	$2,202	$1,906	$1,683	$1,448
Job losses	11,354	26,150	22,898	20,073	17,926	15,679
Tax losses on production and Imports ($ millions)*	$51	$160	$134	$111	$94	$76

* Year 2018 dollars, rounded. Entries denoted by a dash (-) indicate no estimated economic impact. Entries denoted by a zero ($0) indicate estimated income losses less than $500,000.

4.4 Impacts of Mining Water Shortages

Mining water shortages in the region are projected to occur in 30 of the 37 counties in the region for one or more decades within the planning horizon. Estimated impacts to this water use type appear in Table 4-4.

Table 4-4 Impacts of water shortages on mining in Region G

Impacts measure	2020	2030	2040	2050	2060	2070
Income losses ($ millions)*	$9,032	$9,211	$6,867	$5,740	$4,788	$4,294
Job losses	43,972	43,422	32,722	29,014	26,143	25,256
Tax losses on production and Imports ($ millions)*	$877	$917	$677	$537	$415	$341

* Year 2018 dollars, rounded. Entries denoted by a dash (-) indicate no estimated economic impact. Entries denoted by a zero ($0) indicate estimated income losses less than $500,000.

4.5 Impacts for Municipal Water Shortages

Thirty-six of the 37 counties in the region are projected to experience water shortages in the municipal water use category for one or more decades within the planning horizon.

Impact estimates were made for two sub-categories within municipal water use: residential and non-residential. Non-residential municipal water use includes commercial and institutional users, which are further divided into non-water-intensive and water-intensive subsectors including car wash, laundry, hospitality, health care, recreation, and education. Lost consumer surplus estimates were made only for needs in the residential portion of municipal water use. Available IMPLAN and TWDB Water Use Survey data for the non-residential, water-intensive portion of municipal demand allowed these sectors to be included in income, jobs, and tax loss impact estimate.

Trucking cost estimates, calculated for shortages exceeding 80 percent, assumed a fixed, maximum cost of $35,000 per acre-foot to transport water for municipal use. The estimated impacts to this water use category appear in Table 4-5.

Table 4-5 Impacts of water shortages on municipal water users in Region G

Impacts measure	2020	2030	2040	2050	2060	2070
Income losses[1] ($ millions)*	$348	$699	$1,153	$1,796	$2,309	$2,842
Job losses[1]	6,657	13,364	22,010	34,241	43,997	54,128
Tax losses on production and imports[1] ($ millions)*	$36	$72	$119	$184	$237	$292
Trucking costs ($ millions)*	$68	$87	$108	$137	$186	$532
Utility revenue losses ($ millions)*	$171	$299	$446	$624	$839	$1,074
Utility tax revenue losses ($ millions)*	$3	$5	$8	$12	$16	$20

[1] Estimates apply to the water-intensive portion of non-residential municipal water use.
* Year 2018 dollars, rounded. Entries denoted by a dash (-) indicate no estimated economic impact. Entries denoted by a zero ($0) indicate estimated income losses less than $500,000.

4.6 Impacts of Steam-Electric Water Shortages

Steam-electric water shortages in the region are projected to occur in nine of the 37 counties in the region for one or more decades within the planning horizon. Estimated impacts to this water use category appear in Table 4-6.

Note that estimated economic impacts to steam-electric water users:

- Are reflected as an income loss proxy in the form of estimated additional purchasing costs for power from the electrical grid to replace power that could not be generated due to a shortage;
- Do not include estimates of impacts on jobs. Because of the unique conditions of power generators during drought conditions and lack of relevant data, it was assumed that the industry would retain, perhaps relocating or repurposing, their existing staff in order to manage their ongoing operations through a severe drought.
- Do not presume a decline in tax collections. Associated tax collections, in fact, would likely increase under drought conditions since, historically, the demand for electricity increases during times of drought, thereby increasing taxes collected on the additional sales of power.

Table 4-6 Impacts of water shortages on steam-electric power in Region G

Impacts measure	2020	2030	2040	2050	2060	2070
Income Losses ($ millions)*	$2,818	$2,939	$3,060	$3,181	$3,302	$3,423

* Year 2018 dollars, rounded. Entries denoted by a dash (-) indicate no estimated economic impact. Entries denoted by a zero ($0) indicate estimated income losses less than $500,000.

4.7 Regional Social Impacts

Projected changes in population, based upon several factors (household size, population, and job loss estimates), as well as the accompanying change in school enrollment, were also estimated and are summarized in Table 4-7.

Table 4-7 Region-wide social impacts of water shortages in Region G

Impacts measure	2020	2030	2040	2050	2060	2070
Consumer surplus losses ($ millions)*	$352	$510	$729	$1,290	$2,816	$3,883
Population losses	11,958	15,801	14,815	15,858	16,728	18,019
School enrollment losses	2,287	3,022	2,834	3,033	3,200	3,447

* Year 2018 dollars, rounded. Entries denoted by a dash (-) indicate no estimated economic impact. Entries denoted by a zero ($0) indicate estimated income losses less than $500,000.

Appendix A - County Level Summary of Estimated Economic Impacts for Region G

County level summary of estimated economic impacts of not meeting identified water needs by water use category and decade (in 2018 dollars, rounded). Values are presented only for counties with projected economic impacts for at least one decade.
(* Entries denoted by a dash (-) indicate no estimated economic impact)

		Income losses (Million $)*						Job losses					
County	**Water Use Category**	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
BELL	IRRIGATION	$0.08	$0.08	$0.08	$0.08	$0.09	$0.09	3	3	3	3	3	3
BELL	MANUFACTURING	$77.90	$131.78	$131.78	$131.78	$131.78	$131.78	711	1,202	1,202	1,202	1,202	1,202
BELL	MINING	$162.79	$220.64	$269.15	$327.94	$387.19	$454.83	1,216	1,649	2,011	2,451	2,893	3,399
BELL	MUNICIPAL	$136.17	$173.50	$236.56	$319.03	$412.44	$489.29	2,609	3,324	4,532	6,112	7,901	9,374
BELL Total		**$376.93**	**$526.00**	**$637.58**	**$778.83**	**$931.50**	**$1,075.99**	**4,539**	**6,178**	**7,748**	**9,768**	**12,000**	**13,978**
BOSQUE	IRRIGATION	$0.52	$0.52	$0.52	$0.52	$0.52	$0.52	17	17	17	17	17	17
BOSQUE	MINING	$113.17	$127.07	$97.20	$92.66	$83.99	$81.38	724	813	622	593	537	521
BOSQUE	MUNICIPAL	$0.33	$0.38	$0.41	$0.44	$0.48	$0.61	6	7	8	9	9	12
BOSQUE Total		**$114.02**	**$127.97**	**$98.13**	**$93.62**	**$84.99**	**$82.51**	**748**	**837**	**647**	**619**	**564**	**550**
BRAZOS	MUNICIPAL	$4.48	$24.35	$146.46	$314.90	$434.51	$588.40	86	466	2,806	6,033	8,324	11,272
BRAZOS	STEAM ELECTRIC POWER	$0.03	-	-	-	-	-	-	-	-	-	-	-
BRAZOS Total		**$4.51**	**$24.35**	**$146.46**	**$314.90**	**$434.51**	**$588.40**	**86**	**466**	**2,806**	**6,033**	**8,324**	**11,272**
BURLESON	MANUFACTURING	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	0	0	0	0	0	0
BURLESON	MUNICIPAL	-	$0.01	$0.03	$0.02	$0.03	$0.05	-	0	1	0	1	1
BURLESON Total		**$0.00**	**$0.01**	**$0.03**	**$0.03**	**$0.03**	**$0.05**	**0**	**0**	**1**	**0**	**1**	**1**
CALLAHAN	LIVESTOCK	$10.33	$10.33	$10.33	$10.33	$10.33	$10.33	558	558	558	558	558	558
CALLAHAN	MINING	$43.18	$42.88	$39.09	$35.30	$32.09	$29.17	232	231	211	190	173	157
CALLAHAN	MUNICIPAL	$1.00	$0.99	$0.98	$1.00	$1.03	$1.06	19	19	19	19	20	20
CALLAHAN Total		**$54.51**	**$54.21**	**$50.40**	**$46.63**	**$43.45**	**$40.56**	**810**	**808**	**787**	**767**	**751**	**735**
COMANCHE	IRRIGATION	$6.87	$6.91	$6.91	$6.94	$6.94	$6.97	178	178	178	179	179	180
COMANCHE	MINING	$18.18	$24.61	$11.84	$2.70	-	-	136	184	88	20	-	-
COMANCHE	MUNICIPAL	$1.07	$1.06	$1.04	$1.06	$1.11	$1.15	21	20	20	20	21	22
COMANCHE Total		**$26.13**	**$32.58**	**$19.78**	**$10.70**	**$8.05**	**$8.13**	**334**	**383**	**287**	**220**	**200**	**202**

		Income losses (Million $)*						Job losses					
County	Water Use Category	2020	2030	2040	2050	2060	2070	2020	2030	2040	2050	2060	2070
CORYELL	MINING	$737.75	$492.02	$166.06	$94.25	$113.89	$135.77	4,080	2,721	918	521	630	751
CORYELL	MUNICIPAL	$16.68	$40.63	$67.46	$86.99	$108.35	$129.59	320	778	1,292	1,667	2,076	2,483
CORYELL Total		**$754.43**	**$532.65**	**$233.52**	**$181.24**	**$222.23**	**$265.35**	**4,400**	**3,499**	**2,211**	**2,188**	**2,706**	**3,233**
EASTLAND	MINING	$72.19	$72.89	$53.77	$36.92	$21.55	$14.81	539	545	402	276	161	111
EASTLAND Total		**$72.19**	**$72.89**	**$53.77**	**$36.92**	**$21.55**	**$14.81**	**539**	**545**	**402**	**276**	**161**	**111**
ERATH	MANUFACTURING	-	$0.23	-	-	-	-	-	2	-	-	-	-
ERATH	MUNICIPAL	$0.07	$0.07	$0.07	$0.08	$0.08	$0.17	1	1	1	1	1	3
ERATH Total		**$0.07**	**$0.30**	**$0.07**	**$0.08**	**$0.08**	**$0.17**	**1**	**3**	**1**	**1**	**1**	**3**
FALLS	MINING	$13.29	$15.48	$16.84	$19.67	$21.86	$24.37	88	102	111	130	144	161
FALLS Total		**$13.29**	**$15.48**	**$16.84**	**$19.67**	**$21.86**	**$24.37**	**88**	**102**	**111**	**130**	**144**	**161**
FISHER	MINING	$140.97	$137.28	$105.04	$53.16	$19.09	$1.97	620	604	462	234	84	9
FISHER	MUNICIPAL	$0.64	$0.51	$0.54	$0.57	$0.60	$0.63	12	10	10	11	12	12
FISHER Total		**$141.61**	**$137.78**	**$105.58**	**$53.73**	**$19.69**	**$2.59**	**632**	**614**	**472**	**245**	**95**	**21**
GRIMES	IRRIGATION	$0.02	$0.02	$0.02	$0.02	$0.02	$0.02	1	1	1	1	1	1
GRIMES	LIVESTOCK	$18.61	$18.61	$18.61	$18.61	$18.61	$18.61	903	903	903	903	903	903
GRIMES	MINING	$125.63	$389.16	$265.42	$141.68	$11.10	-	468	1,449	988	527	41	-
GRIMES	MUNICIPAL	$0.14	$0.13	$0.11	$0.10	$0.09	$0.07	3	2	2	2	2	1
GRIMES	STEAM ELECTRIC POWER	$36.46	$36.46	$36.46	$36.46	$36.46	$36.46	-	-	-	-	-	-
GRIMES Total		**$180.87**	**$444.39**	**$320.63**	**$196.89**	**$66.29**	**$55.18**	**1,374**	**2,355**	**1,894**	**1,433**	**947**	**905**
HAMILTON	MINING	$9.16	-	-				68	-	-			
HAMILTON	MUNICIPAL	$0.01	$0.03	$0.05	$0.07	$0.10	$0.12	0	1	1	1	2	2
HAMILTON Total		**$9.17**	**$0.03**	**$0.05**	**$0.07**	**$0.10**	**$0.12**	**69**	**1**	**1**	**1**	**2**	**2**
HASKELL	IRRIGATION	$3.40	$3.45	$2.60	$2.70	$3.04	$3.09	90	91	69	71	80	82
HASKELL	MINING	$28.68	$28.37	$25.59	$22.82	$20.35	$18.19	159	158	142	127	113	101
HASKELL	MUNICIPAL	$2.70	$2.68	$2.65	$2.67	$2.73	$2.82	52	51	51	51	52	54
HASKELL Total		**$34.78**	**$34.50**	**$30.84**	**$28.19**	**$26.13**	**$24.11**	**301**	**300**	**262**	**249**	**246**	**237**
HILL	IRRIGATION	$0.05	$0.05	$0.05	$0.05	$0.05	$0.05	2	2	2	2	2	2
HILL	MINING	$4.99	-	-	-	-	-	37	-	-	-	-	-
HILL	MUNICIPAL	$0.21	$0.24	$0.31	$0.54	$0.71	$1.04	4	5	6	10	14	20

County	Water Use Category	Income losses (Million $)* 2020	2030	2040	2050	2060	2070	Job losses 2020	2030	2040	2050	2060	2070
HILL	STEAM ELECTRIC POWER	$117.65	$117.65	$117.65	$117.65	$117.65	$117.65	-	-	-	-	-	-
HILL Total		**$122.90**	**$117.94**	**$118.01**	**$118.24**	**$118.41**	**$118.74**	**44**	**7**	**8**	**13**	**16**	**22**
HOOD	MINING	$81.96	$159.02	$115.14	$94.21	$74.47	$77.44	448	870	630	515	407	424
HOOD	MUNICIPAL	$0.53	$0.32	$1.12	$2.25	$5.67	$9.06	10	6	21	43	109	174
HOOD	STEAM ELECTRIC POWER	$373.55	$388.86	$404.13	$419.44	$434.75	$450.02	-	-	-	-	-	-
HOOD Total		**$456.04**	**$548.20**	**$520.39**	**$515.89**	**$514.88**	**$536.52**	**458**	**876**	**651**	**558**	**516**	**597**
JOHNSON	IRRIGATION	$0.07	$0.07	$0.07	$0.07	$0.07	$0.07	4	4	4	4	4	4
JOHNSON	MINING	$1,370.53	$688.08	-	-	-	-	8,187	4,110	-	-	-	-
JOHNSON	MUNICIPAL	$8.15	$20.82	$41.11	$91.20	$156.01	$209.51	156	371	718	1,587	2,750	3,696
JOHNSON	STEAM ELECTRIC POWER	$16.30	$16.30	$16.30	$16.30	$16.30	$16.30	-	-	-	-	-	-
JOHNSON Total		**$1,395.06**	**$725.27**	**$57.49**	**$107.58**	**$172.38**	**$225.89**	**8,346**	**4,485**	**721**	**1,591**	**2,753**	**3,700**
JONES	IRRIGATION	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	0	0	0	0	0	0
JONES	MINING	$27.09	$26.24	$23.53	$20.32	$17.61	$15.24	163	158	141	122	106	92
JONES	MUNICIPAL	$0.24	$4.86	$6.26	$7.94	$9.70	$11.43	5	93	120	152	186	219
JONES Total		**$27.33**	**$31.11**	**$29.79**	**$28.26**	**$27.31**	**$26.67**	**167**	**251**	**261**	**274**	**292**	**311**
KENT	MUNICIPAL	$0.61	$0.59	$0.58	$0.57	$0.57	$0.57	12	11	11	11	11	11
KENT Total		**$0.61**	**$0.59**	**$0.58**	**$0.57**	**$0.57**	**$0.57**	**12**	**11**	**11**	**11**	**11**	**11**
KNOX	IRRIGATION	$4.57	$6.31	$4.21	$3.08	$2.70	$4.01	96	133	89	65	57	84
KNOX	MANUFACTURING	$2.09	$2.09	$2.09	$2.09	$2.09	$2.09	19	19	19	19	19	19
KNOX	MINING	$8.50	$9.45	$8.50	$8.50	$7.56	$7.56	32	35	32	32	28	28
KNOX	MUNICIPAL	$3.65	$3.72	$3.78	$3.92	$4.02	$4.11	70	71	72	75	77	79
KNOX Total		**$18.82**	**$21.57**	**$18.58**	**$17.60**	**$16.37**	**$17.77**	**217**	**258**	**212**	**191**	**181**	**210**
LAMPASAS	IRRIGATION	$0.13	$0.13	$0.13	$0.13	$0.13	$0.13	5	5	5	5	5	5
LAMPASAS	LIVESTOCK	$4.57	$4.57	$4.57	$4.57	$4.57	$4.57	222	222	222	222	222	222
LAMPASAS	MANUFACTURING	$0.12	$1.19	$0.67	$0.42	$0.01	-	2	17	9	6	0	-
LAMPASAS	MINING	$7.37	$9.17	$10.74	$12.31	$14.26	$16.38	55	69	80	92	107	122
LAMPASAS	MUNICIPAL	$1.64	$4.33	$7.37	$11.29	$15.78	$19.33	31	83	141	216	302	370
LAMPASAS Total		**$13.82**	**$19.39**	**$23.48**	**$28.73**	**$34.75**	**$40.42**	**315**	**395**	**458**	**542**	**636**	**720**

		Income losses (Million $)*						Job losses					
County	**Water Use Category**	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
LEE	LIVESTOCK	$3.76	$3.76	$3.76	$3.76	$3.76	$3.76	203	203	203	203	203	203
LEE	MINING	$0.32	$0.02					1	0				
LEE	MUNICIPAL	-	$0.00	$0.01	$0.01	$0.01	$0.02	-	0	0	0	0	0
LEE Total		**$4.08**	**$3.78**	**$3.78**	**$3.77**	**$3.77**	**$3.78**	**205**	**203**	**204**	**203**	**204**	**204**
LIMESTONE	MANUFACTURING	$867.89	$1,052.19	$1,052.19	$1,052.19	$1,048.84	$1,048.84	9,878	11,975	11,975	11,975	11,937	11,937
LIMESTONE	MINING	$586.06	$553.97	$549.06	$587.86	$626.01	$676.77	4,282	4,047	4,011	4,295	4,574	4,945
LIMESTONE	MUNICIPAL	$8.32	$8.19	$8.07	$8.05	$8.09	$8.78	159	157	155	154	155	168
LIMESTONE	STEAM ELECTRIC POWER	$11.08	$11.08	$11.08	$11.08	$11.08	$11.08	-	-	-	-	-	-
LIMESTONE Total		**$1,473.36**	**$1,625.43**	**$1,620.40**	**$1,659.19**	**$1,694.03**	**$1,745.47**	**14,319**	**16,180**	**16,141**	**16,425**	**16,666**	**17,050**
MCLENNAN	MANUFACTURING	$49.02	$1,323.47	$984.28	$689.08	$469.19	$234.29	469	12,657	9,413	6,590	4,487	2,241
MCLENNAN	MINING	$141.08	$177.29	$182.00	$217.11	$242.50	$272.60	1,054	1,325	1,360	1,622	1,812	2,037
MCLENNAN	MUNICIPAL	$3.52	$7.49	$12.76	$19.58	$25.45	$33.55	67	144	244	375	488	643
MCLENNAN Total		**$193.63**	**$1,508.25**	**$1,179.04**	**$925.77**	**$737.14**	**$540.44**	**1,591**	**14,126**	**11,018**	**8,588**	**6,787**	**4,921**
MILAM	MUNICIPAL	$0.04	$1.62	$6.38	$5.76	$5.86	$6.49	1	31	122	110	112	124
MILAM	STEAM ELECTRIC POWER	$384.00	$384.80	$385.57	$386.35	$387.14	$387.92	-	-	-	-	-	-
MILAM Total		**$384.04**	**$386.42**	**$391.95**	**$392.10**	**$393.00**	**$394.40**	**1**	**31**	**122**	**110**	**112**	**124**
NOLAN	IRRIGATION	$3.52	$3.52	$3.52	$3.52	$3.52	$3.52	67	67	67	67	67	67
NOLAN	LIVESTOCK	$2.29	$2.29	$2.29	$2.29	$2.29	$2.29	122	122	122	122	122	122
NOLAN	MANUFACTURING	-	$0.22	$0.33	$0.46	$0.46	$0.46	-	2	3	4	4	4
NOLAN	MINING	$62.45	$58.26	$30.75	$10.39	$0.58	-	232	217	114	39	2	-
NOLAN	MUNICIPAL	$26.41	$27.03	$27.31	$28.35	$29.28	$30.15	506	518	523	543	561	578
NOLAN Total		**$94.68**	**$91.32**	**$64.21**	**$45.01**	**$36.14**	**$36.42**	**927**	**926**	**830**	**775**	**756**	**771**
PALO PINTO	IRRIGATION	$4.98	$4.98	$4.98	$4.98	$4.98	$4.98	164	164	164	164	164	164
PALO PINTO	MUNICIPAL	$16.18	$17.70	$18.90	$20.21	$21.51	$22.70	310	339	362	387	412	435
PALO PINTO Total		**$21.16**	**$22.68**	**$23.87**	**$25.19**	**$26.49**	**$27.68**	**474**	**503**	**525**	**551**	**575**	**598**
ROBERTSON	IRRIGATION	$1.05	$1.82	$2.05	$2.21	$2.24	$2.27	24	41	46	50	51	51
ROBERTSON	MUNICIPAL	$0.18	$0.67	$1.33	$1.88	$2.50	$3.10	4	13	25	36	48	59
ROBERTSON	STEAM ELECTRIC POWER	$621.06	$661.87	$702.65	$743.45	$784.25	$825.06	-	-	-	-	-	-

		Income losses (Million $)*						Job losses					
County	Water Use Category	2020	2030	2040	2050	2060	2070	2020	2030	2040	2050	2060	2070
ROBERTSON Total		**$622.30**	**$664.36**	**$706.03**	**$747.54**	**$789.00**	**$830.43**	**27**	**54**	**72**	**86**	**99**	**111**
SHACKELFORD	MINING	$333.60	$508.43	$328.87	$219.25	$98.69	$7.65	1,241	1,892	1,224	816	367	28
SHACKELFORD Total		**$333.60**	**$508.43**	**$328.87**	**$219.25**	**$98.69**	**$7.65**	**1,241**	**1,892**	**1,224**	**816**	**367**	**28**
SOMERVELL	MINING	$30.98	$46.09	$35.36	$24.63	$17.71	$14.95	231	344	264	184	132	112
SOMERVELL	MUNICIPAL	-	$0.08	$0.45	$0.92	$1.48	$2.02	-	2	9	18	28	39
SOMERVELL	STEAM ELECTRIC POWER	$1,257.38	$1,321.68	$1,385.99	$1,450.26	$1,514.57	$1,578.85	-	-	-	-	-	-
SOMERVELL Total		**$1,288.36**	**$1,367.85**	**$1,421.80**	**$1,475.82**	**$1,533.76**	**$1,595.81**	**231**	**346**	**273**	**202**	**161**	**150**
STEPHENS	IRRIGATION	$0.04	$0.04	$0.04	$0.04	$0.04	$0.04	1	1	1	1	1	1
STEPHENS	MINING	$3,282.36	$3,355.09	$2,709.95	$2,112.04	$1,575.53	$1,118.36	12,219	12,490	10,089	7,863	5,865	4,163
STEPHENS	MUNICIPAL	$0.00	$0.01	$0.02	$0.03	$0.04	$0.04	0	0	0	1	1	1
STEPHENS Total		**$3,282.40**	**$3,355.14**	**$2,710.01**	**$2,112.11**	**$1,575.60**	**$1,118.44**	**12,221**	**12,492**	**10,090**	**7,865**	**5,867**	**4,165**
STONEWALL	MANUFACTURING	$30.33	$30.33	$30.33	$30.33	$30.33	$30.33	276	276	276	276	276	276
STONEWALL	MINING	$368.38	$360.82	$300.37	$238.03	$183.25	$136.02	1,371	1,343	1,118	886	682	506
STONEWALL	MUNICIPAL	$0.06	$0.06	$0.07	$0.11	$0.11	$0.12	1	1	1	2	2	2
STONEWALL Total		**$398.76**	**$391.21**	**$330.76**	**$268.46**	**$213.69**	**$166.46**	**1,648**	**1,620**	**1,395**	**1,164**	**960**	**785**
TAYLOR	IRRIGATION	$0.27	$0.27	$0.27	$0.27	$0.27	$0.27	13	13	13	13	13	13
TAYLOR	LIVESTOCK	$4.70	$4.70	$4.70	$4.70	$4.70	$4.70	252	252	252	252	252	252
TAYLOR	MINING	$242.75	$242.75	$219.14	$200.25	$184.19	$170.97	904	904	816	745	686	636
TAYLOR	MUNICIPAL	$4.97	$106.45	$136.09	$171.63	$208.26	$244.00	95	2,039	2,607	3,288	3,990	4,674
TAYLOR Total		**$252.70**	**$354.17**	**$360.20**	**$376.85**	**$397.42**	**$419.94**	**1,264**	**3,208**	**3,688**	**4,298**	**4,940**	**5,576**
THROCKMORTON	IRRIGATION	$0.02	$0.02	$0.02	$0.02	$0.02	$0.02	1	1	1	1	1	1
THROCKMORTON	MINING	$85.01	$82.18	$61.81	$31.86	$12.25	$1.73	316	306	230	119	46	6
THROCKMORTON	MUNICIPAL	$0.76	$0.80	$0.83	$0.89	$0.95	$1.00	15	15	16	17	18	19
THROCKMORTON Total		**$85.79**	**$82.99**	**$62.66**	**$32.77**	**$13.22**	**$2.75**	**332**	**322**	**247**	**136**	**64**	**26**
WASHINGTON	MINING	$463.78	$744.32	$590.35	$434.50	$278.65	$175.69	1,727	2,771	2,198	1,618	1,037	654
WASHINGTON	MUNICIPAL	$3.23	$7.02	$10.16	$14.19	$18.05	$21.55	62	135	195	272	346	413
WASHINGTON Total		**$467.01**	**$751.34**	**$600.51**	**$448.69**	**$296.70**	**$197.24**	**1,788**	**2,906**	**2,392**	**1,889**	**1,383**	**1,067**
WILLIAMSON	IRRIGATION	$0.14	$0.14	$0.14	$0.14	$0.14	$0.14	5	5	5	5	5	5
WILLIAMSON	MINING	$370.11	$455.07	$542.62	$635.97	$732.14	$842.18	2,766	3,400	4,055	4,752	5,471	6,293
WILLIAMSON	MUNICIPAL	$95.50	$231.08	$400.27	$664.76	$817.18	$981.50	1,830	4,427	7,668	12,735	15,655	18,803

		Income losses (Million $)*						Job losses					
County	Water Use Category	2020	2030	2040	2050	2060	2070	2020	2030	2040	2050	2060	2070
WILLIAMSON Total		**$465.75**	**$686.29**	**$943.03**	**$1,300.87**	**$1,549.46**	**$1,823.83**	**4,600**	**7,832**	**11,728**	**17,492**	**21,131**	**25,101**
YOUNG	IRRIGATION	$0.06	$0.06	$0.06	$0.06	$0.06	$0.06	3	3	3	3	3	3
YOUNG	LIVESTOCK	$4.04	$2.52	$2.52	$2.52	$2.52	$2.52	214	134	134	134	134	134
YOUNG	MINING	$100.12	$184.19	$108.62	$66.12	$11.57	-	373	686	404	246	43	-
YOUNG	MUNICIPAL	$10.03	$11.66	$13.04	$14.61	$16.29	$17.98	192	223	250	280	312	344
YOUNG Total		**$114.25**	**$198.43**	**$124.25**	**$83.31**	**$30.44**	**$20.56**	**782**	**1,046**	**791**	**663**	**492**	**481**
REGION G Total		**$13,298.95**	**$15,465.32**	**$13,353.37**	**$12,695.08**	**$12,153.68**	**$12,080.23**	**65,131**	**86,060**	**80,693**	**86,373**	**91,113**	**98,141**

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Appendix H
Written Comments Received on the Initially Prepared Plan

Brazos River Authority

QUALITY •CONSERVATION • SERVICE

July 31, 2020

HDR, Attn: David D. Dunn, PE
750 Old Hickory Blvd.
Building 1, Suite 200
Brentwood, TN 37027-4528

RE: Brazos River Authority Comments for the 2021 Initially Prepared Brazos G Regional Water Plan

Dear Mr. Dunn:

The Brazos River Authority (BRA) appreciates the efforts of the Brazos G Regional Water Planning Group (Brazos G), the Texas Water Development Board (TWDB), and the many others that have contributed their time and resources in working to develop the 2021 Initially Prepared Brazos G Regional Water Plan (2021 IPP). The BRA is committed to working through the regional water planning process with our customers and other Brazos River basin stakeholders to address the challenges of meeting future water needs within the Brazos River basin.

We have reviewed the 2021 IPP and offer the attached suggestions and comments (Attachment A) for consideration in finalizing the 2021 Brazos G Regional Water Plan.

In addition to the attached comments, the BRA would also like to emphasize its position on several major points within the 2021 IPP. These include subordination of BRA supplies and comments that the TWDB provided to HDR, Inc. (HDR) regarding BRA water management strategies within the 2021 IPP, particularly with respect to the Lake Granger Augmentation strategy.

Subordination

The current 2021 IPP, as well as the previous 2016 Brazos G Regional Water Plan, assumes that BRA can subordinate its water supplies for certain recommended upstream reservoir projects. In some cases, the feasibility of these water management strategies is dependent upon a subordination agreement with BRA. As stated in previous correspondence from the 2016 planning cycle and earlier in the current cycle, existing water supplies of the BRA water supply system are fully contracted, so subordination agreements for these water management strategies may not be possible. BRA reiterates our previous requests that Brazos G and HDR include a caveat in each water management strategy that assumes a subordination agreement with BRA that clearly states that subordination may not be possible.

Lake Granger Augmentation

BRA continues to develop additional water supply in Williamson County with the installation and completion of a Trinity Aquifer groundwater supply well, located near the East Williamson County Regional Water Treatment Plant (EWCRWTP) at Lake Granger in 2018. The Trinity Aquifer well development represents the first phase of the Lake Granger Augmentation water management strategy that utilizes both groundwater and surface water to meet needs in

4600 Cobbs Drive • P.O. Box 7555 • Waco, Texas 76714-7555
254-761-3100 • FAX 254-761-3215

Williamson County. Based on comments from the TWDB, the representation of the Lake Granger Augmentation water management strategy cannot be accepted within the final 2021 Brazos G Regional Water Plan due to insufficient managed available groundwater availability within Williamson County. However, BRA would like to note that this strategy was recommended in both the 2011 and 2016 Brazos G Regional Water Plans. As such, BRA has been in the process of implementing this strategy over the last ten years and will continue to move forward with this important project for Williamson County.

Additionally, due to TWDB Regional Water Planning rules, it appears that in some cases viable water supply projects that produce actual supply and meet real demands cannot be included in the final Regional and State Water Plans as a "recommended strategy." This results in beneficial strategies and projects being ineligible for State Participation funding, which is an unfortunate outcome that highlights a disconnect between TWDB Regional Water Planning rules and reality.

Comments from the TWDB regarding the use of additional groundwater from aquifers east of Williamson County as part of the second phase of the Lake Granger Augmentation strategy has caused re-evaluation of the Lake Granger Augmentation strategy. BRA recognizes the dilemma that HDR has with regard to the Lake Granger Augmentation strategy with respect to changes in the TWDB Regional Water Planning rules on use of managed available groundwater and the need for re-evaluation of this strategy. However, BRA was not provided this information in a timely manner and has not had adequate time to fully review the proposed re-evaluation of the Lake Granger Augmentation strategy.

Thank you again for the opportunity to provide comments on the 2021 IPP. The BRA looks forward to the completion of the 2021 Brazos G Regional Water Plan and continued participation in the regional water planning process. If you have any questions, please contact Aaron Abel, Water Services Manager, at 254-761-3175 or via email at aaron.abel@brazos.org.

Sincerely,

David Collinsworth
General Manager/CEO

Enclosure Attachment A

cc: Brazos G Chair, Wayne Wilson
Brazos G Administrator, Stephen Hamlin

Attachment A

Brazos River Authority Comments On

2021 Brazos G Initially Prepared Plan

Volume I, Chapter 4, Table 4.6. Page 4-13, Water Needs Projected for Wholesale Water Providers: Footnote 2 of this table refers to the water available and contracted per HB 1437, not HB 1763.

Volume I, Chapter 5, Section 5.7.5, Page 5.7-7, City of Gatesville: BRA recommends deletion of the text "The contracted supply volume is for 5,898 acft/yr; however, this contract is projected to be prorated and only provide a maximum of 4,902 acft/yr during the planning period." BRA water supply agreements are firm commitments.

Volume I, Chapter 5, Section 5.17.5, Page 5.17-4, City of Cleburne: BRA recommends deletion of the following text in the second sentence in this section, "….and a contract with BRA that ranges from 2,971 acft/yr to 885 acft/yr at 2020 to 2070, respectively." BRA water supply agreements are firm commitments.

Volume I, Chapter 5, Section 5.24.20, Page 5.24-15, City of McGregor: BRA recommends removing the following text from the first sentence… "and BRA from 518 to 473 acft/yr from 2020 to 2070, respectively." BRA water supply agreements are firm commitments.

Volume I, Chapter 5, Section 5.18.5 - City of Stamford, Pg. 5.18-2: Recommended removing the text "and BRA at 809 to 1,209acft/yr." The City has a contract with the BRA to compensate BRA for the reduction in yield of its System as the result of the City's upstream diversion. BRA does not supply water to the City.

Volume I, Chapter 5, Section 5.38, Various locations: References of the BRA System Rate at $76.50/acft is incorrect. The BRA System Rate for FY2020 is $79.00/acft.
Page 5.38-18: Unit Cost needs to be updated in the following locations: 5.38.14 West Central Texas Municipal Water District, Water Supply Plan, a. BRA Systems Operation Supply, Unit Cost: $79.00/acft, and in Table 5.38-19.

Volume I, Executive Summary, Page ES-13, and Volume II, Section 10.3: "Lake Whitney Hydropower Reallocation" should be renamed "Lake Whitney Reallocation" to be consistent with nomenclature in other references to Lake Whitney Reallocation in Volume I.

Volume I, Chapter 5, Section 5.38.13, Page 5.38-16 – Upper Leon River Municipal Water District: Second sentence under Description of Supply, the reference to WSD should be changed to MWD.

Volume II, Section 9.5.2, Page 9.5-3, Lake Belton to Lake Stillhouse Hollow Pipeline: The last sentence in the first paragraph under "Available Yield" states that, "The supply for this project is authorized under the existing BRA water right for Lake Belton and from the recently approved System Operation Permit." BRA recommends to remove "…and from the recently approved System Operation Permit." The Lake Belton to Lake Stillhouse Hollow Pipeline is authorized under BRA's reservoir water rights at Lakes Belton and Stillhouse Hollow not the System Operation Permit.

Barry Mahler, Chairman
Marty H. Graham, Vice Chairman
Scott Buckles, Member
José O. Dodier, Jr., Member

David Basinger, Member
Tina Y. Buford, Member
Carl Ray Polk, Jr., Member
Rex Isom, Executive Director

TEXAS STATE SOIL AND WATER CONSERVATION BOARD

Protecting and Enhancing Natural Resources for Tomorrow

June 18, 2020

Mr. Stephen Hamlin
Region G Administrator

Dear Mr. Hamlin;

For the past 2 years the Texas State Soil and Water Conservation Board (TSSWCB) has been participating in the Texas Water Development Board's (TWDB) Regional Water Planning meetings as directed by Senate Bill 1511, passed in the 2017 legislative session. We appreciate being included in the process and offer these constructive comments to the regional water plans and ultimately the State water plan. Attached you will find some specific comments to the Region G water plan as they pertain to the TSSWCB.

As you may know 82% of Texas' land area is privately-owned and are working lands, involved in agricultural, timber, and wildlife operations. These lands are important as they provide substantial economic, environmental, and recreational resources that benefit both the landowners and public. They also provide ecosystem services that we all rely on for everyday necessities, such as air and water quality, carbon sequestration, and wildlife habitat.

With that said, these working lands are where the vast majority of our rain falls and ultimately supply the water for all of our needs, such as municipal, industrial, wildlife, and agricultural to name a few. Texas' private working lands are a valuable resource for all Texans.

Over the years, the private landowners of these working lands have been good stewards of their property. In an indirect way they have been assisting the 16 TWDB's Regional Water Planning Groups in achieving their goals through voluntary incentive-based land conservation practices.

It has been proven over time if a raindrop is controlled where it hits the ground there can be a benefit to both water quality and water quantity. Private landowners have been providing benefits to our water resources by implementing Best Management Practices (BMP) that slow water runoff and provide for soil stabilization, which also slows the sedimentation of our reservoirs and allows for more water infiltration into our aquifers.

1497 Country View Lane • Temple, TX 76504-8806
Phone: 254-773-2250 • Fax: 254-773-3311
http://www.tsswcb.texas.gov

Some common BMPs include brush management, prescribed grazing, fencing, grade stabilization, irrigation land leveling, terrace, contour farming, cover crop, residue and tillage management, and riparian herbaceous cover.

The TSSWCB has been active with agricultural producers since 1939 as the lead agency for planning, implementing, and managing coordinated natural resource conservation programs for preventing and abating agricultural and sivicultural nonpoint sources of water pollution.

The TSSWCB also works to ensure that the State's network of over 2,000 flood control dams are protecting lives and property by providing operation, maintenance, and structural repair grants to local government sponsors.

The TSSWCB successfully delivers technical and financial assistance to private landowners of Texas through Texas' 216 local Soil and Water Conservation Districts (SWCD) which are led by 1,080 locally elected district directors who are active in agriculture. Through the TSSWCB Water Quality Management Plan Program (WQMP), farmers, ranchers, and silviculturalists receive technical and financial assistance to voluntarily conserve and protect our natural resources. Participants receive assistance with conservation practices, BMPs, that address water quality, water quantity, and soil erosion while promoting the productivity of agricultural lands. This efficient locally led conservation delivery system ensures that those most affected by conservation programs can make decisions on how and what programs will be implemented voluntarily on their private lands.

Over time, lands change ownership and many larger tracts are broken up into smaller parcels. Most new landowners did not grow up on working lands and therefore may not have a knowledge of land management techniques. The TSSWCB is writing new WQMPs for these new landowners who are implementing BMPs on their land. Education and implementation of proper land management and BMPs continues to be essential. Voluntary incentive-based programs are essential to continue to address soil and water conservation in Texas.

These BMPs implemented for soil and water conservation provide benefits not only to the landowner but ultimately to all Texans and our water supply.

Respectfully,

Barry Mahler

Barry Mahler
Chairman

Rex Isom
Executive Director

Attachment

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http://www.tsswcb.texas.gov

Region G

- Page ES-4, Table ES-1
    - Under Interest Group, possibly should be under Non-Voting Member, Include Texas State Soil and Water Conservation Board (TSSWCB), Rusty Ray
- Page 1-5, Table 1-1. Current and Recent Brazos G RWPG Voting Members (concluded), Non-Voting Member
    - Include Texas State Soil and Water Conservation Board (TSSWCB), Rusty Ray

CITY OF CAMERON

100 S. Houston Avenue, P. O. Box 833
Cameron, Texas 76520

254-697-6646
254-697-3040 Fax

May 29, 2020

Brazos River Authority
Attn: Steve Hamlin
P.O. Box 7555
Waco, TX 76714-7555

Re: Public comment on the Initially Prepared 2021 Brazos G Regional Water Plan

Dear Mr. Hamlin:

The City of Cameron has received notification regarding the availability of the Initially Prepared 2021 Brazos G Regional Water Plan (IPP) and appreciates the efforts of the Brazos G Regional Water Planning Group in this important process. Through its own planning processes, the City has identified a need to relocate surface water intake and pump station facilities to a slightly upstream location to address concerns with channel migration. Therefore, we wish to offer public comment requesting inclusion of this Little River Pump Station project in the 2021 Brazos G Regional Water Plan as well as in the associated project prioritization process. The City of Cameron appreciates this opportunity to provide comment and looks forward to coordinating with you regarding the technical details of the project. Please contact me if you have any questions.

Sincerely,

Rhett Parker
City Manager

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Robert L. "Bobby" Patton, Jr.
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Lee M. Bass
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Fort Worth

T. Dan Friedkin
Chairman-Emeritus
Houston

Carter P. Smith
Executive Director

August 25, 2020

Steve Hamlin
Brazos River Authority
P.O. Box 7555
Waco, TX 767144-7555

Re: 2021 Region G Brazos Initially Prepared Regional Water Plan

Dear Mr. Hamlin:

Thank you for seeking review and comment from the Texas Parks and Wildlife Department (TPWD) on the 2021 Initially Prepared Water Plan (IPP) for Brazos Region G, dated March 3, 2020. Water impacts every aspect of TPWD's mission to manage and conserve the natural and cultural resources of Texas. Although TPWD has limited regulatory authority over the use of state waters, it is the agency charged with primary responsibility for protecting the state's fish and wildlife resources. To that end, TPWD offers these comments intended to help avoid or minimize impacts from water management strategies (WMS) to state fish and wildlife resources and to more fully inform stakeholders and the public on potential impacts and benefits of proposed WMS on state fish and wildlife resources.

TPWD understands that regional water planning groups are guided by 31 Texas Administrative Code (TAC) §357 when preparing regional water plans. These water planning rules spell out requirements related to natural resource and environmental protection. Accordingly, TPWD staff reviewed the IPP with a focus on the following questions:

- Does the IPP include a quantitative reporting of environmental factors including the effects on environmental water needs and habitat?
- Does the IPP include a description of natural resources and threats to natural resources due to water quantity or quality problems?
- Does the IPP discuss how these threats will be addressed?
- Does the IPP describe how it is consistent with long-term protection of natural resources?
- Does the IPP include water conservation as a water management strategy?
- Does the IPP include Drought Contingency Plans?
- Does the IPP recommend any stream segments be nominated as ecologically unique?
- Does the IPP address concerns raised by TPWD in connection with the 2016 Water Plan?

The population of the Brazos G area is expected to reach 4.35 million by 2070 with the largest growth taking place along the I-35 corridor. Municipal and irrigation use is expected to increase by 65 percent (1.41 million acre-feet (ac-ft)), down from the 74 percent (1.48 million ac-ft) increase projected during the previous planning cycle. In 2017, total water use was 878,177 ac-ft, comprised of 51 percent surface water use and 49 percent

4200 SMITH SCHOOL ROAD
AUSTIN, TEXAS 78744-3291
512.389.4800
www.tpwd.texas.gov

To manage and conserve the natural and cultural resources of Texas and to provide hunting, fishing and outdoor recreation opportunities for the use and enjoyment of present and future generations.

groundwater use. To satisfy future water demands, the IPP recommends new supplies totaling 459,890 ac-ft/year, an increase from nearly 400,000 ac-ft/year in the 2016 IPP.

GENERAL COMMENTS

The draft March 2020 IPP provides information on potential water quality and quantity concerns related to surface and groundwater and includes limited information on fish and wildlife resources, spring systems, and groundwater-surface water interactions in the region. Such information could be useful in understanding and describing the impacts of WMS on fish and wildlife resources in Region G. In addition, please note there have been recent updates (March 30, 2020) to the list of state-listed species, including species in Region G counties. We recommend that you review and update the document with the latest information that is available at:
https://tpwd.texas.gov/huntwild/wild/wildlife_diversity/nongame/listed-species/.

Please review and amend all tables on Endangered, Threatened, Candidate, and Species of Concern (e.g., Table 4.1-1 in Volume II) for each WMS for accuracy of species ranges and habitat descriptions. Several tables have species listed in areas they are not known to occur, misspellings, or missing habitat descriptions. The Fishes of Texas website has distribution lists and habitat descriptions for Texas fishes. TPWD staff are also available to assist with updating this information.

The draft IPP describes the springs in Region G as “few” (Volume 1, page 1-38). A more accurate description is few major and historical springs as documented by Brune (1981). The draft IPP goes on to define major springs as discharging greater than 1 cubic foot per second (cfs) and lists five springs over 1 cfs. As noted in the IPP, there are springs in Region G that flow less than 1 cfs that are vital to maintaining flows, water quality, and fish and wildlife habitat. A dataset is available at databasin.org that maps the springs of Texas and shows a large number of springs in Brazos Region G (https://databasin.org/datasets/2400de0b78284e0fa44083e78824ff24).

Region G water user group’s water conservation savings continue to increase over the planning cycle(s). The estimated annual water savings for the 2020 plan represents an increase over previous years (111,339 ac-ft/year). TPWD supports water conservation strategies—the most environmentally benign—, to help maintain environmental flows while minimally impacting the environment and to delay or eliminate the need for more environmentally damaging strategies. TPWD supports Region G’s goal of 140 gallons per capita per day (gpcd) for all entities, even if there are no unmet needs, and Williamson County’s water conservation goals of 120 gpcd to assist with their unmet needs.

WATER MANAGEMENT STRATEGIES

The Regional Water Planning Guidelines (31 TAC §357.34) require that each regional WMS include a quantitative evaluation of environmental factors including effects on environmental water needs, wildlife habitat, cultural resources, agricultural resources, and effect of upstream development of bays, estuaries, arms of the Gulf of Mexico. Environmental impacts associated with WMS are provided in general terms but in some cases the lack of specificity underrepresents the threats to fish and wildlife. Where project impacts are described, a rating system of low, medium and high is used. This descriptor is made ambiguous and less useful in two ways. First, the methodology used to determine levels of impact (high, medium, low) are not described. Second, summaries of impacts change little between project descriptions seemingly not taking into account site-specific considerations. Water resource planners and the public would benefit from a more detailed description of threats posed by WMS as well as the characterization of the unique environmental challenges and opportunities inherent in each site and project. Below are a few examples where the threats to fish and wildlife resources could be better represented. These examples are organized by WMS and when appropriate reference individual projects or plan sections.

Wastewater Reuse

Though TPWD recognizes reuse as having relatively low environmental impacts, it is important to note return flows often provide a consistent instream flow, even when a portion is reused, that helps sustain aquatic habitats and biotic communities during drought. Table 3.2-10 in Volume II states that in general wastewater reuse produces instream flows. However, direct reuse strategies reduce instream flows by diverting water that would have otherwise been discharged to a water course. Please correct or further explain this apparent discrepancy.

Reservoirs

Construction and operation of reservoirs are important for storing water to meet water demand, provide water-based recreation, meeting hydropower demands, or for flood control purposes. However, reservoirs pose environmental threats since they inundate terrestrial habitats, trap sediments, alter water quality and flow regimes, block migration of aquatic organisms, and fragment the riverscape into shorter and shorter stream lengths that no longer support native fish and wildlife. Within the Brazos River system, existing dams and reservoir operations have had profound impacts on native fishes in both upstream and downstream directions. For example, significant reductions in the historical ranges (once throughout the Brazos River Basin) of Sharpnose Shiner and Smalleye Shiner (now limited to the Brazos River and its major tributaries upstream of Possum Kingdom Lake) are attributed primarily to reservoir construction and operation among other factors. Both species have been extirpated from the Double Mountain Fork upstream of Lake Alan Henry. The dramatic range reduction coupled with existing and future threats (including drought) led to the listing of these two prairie minnows as Endangered by the U.S. Fish and Wildlife Service (USFWS) in 2014 and by TPWD in 2020. The USFWS also designated the upper Brazos River and its major tributaries as Critical Habitat. These two fishes belong to the pelagic-broadcast spawning reproductive guild which require relatively long reaches of flowing river habitat to support annual spawning migrations, downstream drift of eggs and larvae, and recruitment. These prairie minnows as well as other fishes such as State Threatened Red River Pupfish and Chub Shiner, are emblematic of the unique and ecologically significant ecosystems supported by the upper Brazos River.

Further, proposed reservoir projects such as Brushy Creek, Cedar Ridge, Lake Creek, South Bend, Throckmorton, Coryell County Off-Channel Reservoir (OCR), and Red River OCR have the potential to further fragment and alter hydrology and water quality thereby negatively impacting fish and wildlife resources. To mitigate these negative impacts, TPWD recommends new reservoir projects be equipped with fish passage structures and multi-level outlet works capable of passing enough flows to support downstream natural flow regimes (i.e., subsistence, base and pulse flows) and water quality. For example, dam outlet works should allow for releases from various reservoir depths so that inflow and release water temperatures and quantities can be matched, as appropriate. To minimize adverse effects downstream, water should not be released from depths associated with poor water quality (e.g., low dissolved oxygen).

In section 6-1 of Volume I of the IPP, it is not clear how cumulative impacts to freshwater inflows in the Brazos River Estuary are quantified. The lowest control point in cumulative impacts analysis, the Brazos River at Richmond, stops short of the estuary and the basin's largest water users. How the cumulative impact of multiple projects of this type may reduce freshwater inflows is an important consideration in maintaining the health and productivity of the estuary and should be addressed in the plan.

South Bend Reservoir
South Bend Reservoir is a proposed on-channel reservoir located downstream of the confluence of the Brazos River and Clear Fork Brazos River. The proposed reservoir will potentially inundate 29,877 acres, impound an estimated 771,604 ac-ft of water, and inundate approximately 30 river miles of the Brazos River (including Critical Habitat for the Smalleye Shiner and Sharpnose Shiner) and 20 miles of the Clear Fork. The dam itself will span 2.8 miles of the Brazos River. While the draft IPP acknowledges that these two Endangered Species "potentially occur in the project area", it does not mention the inundation of Critical Habitat. TPWD respectfully requests this addition. Further, as outlined in Table 4.9-4 in Volume II, the draft IPP downplays impacts to fish and wildlife and natural resources by stating there will be negligible impacts for Environmental Water Needs and Habitat and low impact on Threatened and Endangered Species.

As discussed previously, reservoirs like South Bend Reservoir pose significant environmental threats. If constructed, South Bend Reservoir would stand to further fragment the Brazos River reducing the range of suitable habitat by eliminating the reach of the Brazos River downstream of the South Bend dam to Possum Kingdom Lake as well as all riverine habitat inundated by the impoundment. Upstream impacts are also very likely given that these two species no longer occur upstream of Lake Alan Henry located on the Double Mountain Fork Brazos River. The IPP should acknowledge these facts to ensure that all stakeholders and the public are fully aware of the consequences.

Cedar Ridge Reservoir
Pages 4.3-17 and -18 discuss Brazos water snake habitat and potential for survival in the proposed Cedar Ridge Reservoir on the Clear Fork Brazos River. While a population does exist in Possum Kingdom Lake, it is less clear that the habitat within Cedar Ridge Reservoir would be sufficient through time to support Brazos water snake populations. For example,

Cedar Ridge Reservoir modeled storage levels show significant fluctuations and long periods of reduced storage (see Figure 4.3-2) which may limit the ability of Brazos water snake to establish and maintain populations especially during a repeat of recent drought periods.

The cumulative effect of both proposed reservoirs, Cedar Ridge and South Bend, has the potential to substantially change the quality and quantity of water flowing into the Critical Habitat in the upper Brazos River and Possum Kingdom Lake which would increase the risk of Golden Algae blooms and increase salinities requiring more water treatment when used for public water supply.

Chloride Control Projects
Natural brine springs that feed the upper Brazos River and its major tributaries contribute to high chloride concentrations as well as stable environmental flows. Proposed chloride control projects by design alter natural salinity regimes, alter habitats, reduce connectivity, and can dewater downstream habitats. Natural brine springs play an important role in these prairie river ecosystems since they contribute a strong salinity gradient, structuring fish assemblages whereby only salt tolerant species such as State Threatened Red River Pupfish occur in high salinity headwater reaches. The IPP should acknowledge potential impacts of these strategies to the State Threatened Red River Pupfish as well as to the federal and state-listed Endangered Smalleye Shiner and Sharpnose Shiner and the designated Critical Habitat for these shiners. Other fishes emblematic of the upper Brazos River prairie stream ecosystem could also be impacted including State Threatened Chub Shiner.

INVASIVE AND EXOTIC SPECIES
In our 2016 Brazos G IPP comment letter dated August 14, 2015, TPWD requested that the Brazos G Regional Water Plan address zebra mussels and aquatic invasive species. TPWD again requests Region G address invasive and exotic species in the IPP and regional water plan and their potential impacts on WMS. The introduction of invasive exotic species can directly and/or indirectly impact native species, their habitats and associated ecosystem functions, recreational opportunities (e.g., anglers and boaters), public water supply and other water infrastructure negatively. In particular, the zebra mussel is an invasive freshwater mollusk that could affect water management by clogging intake structures and fouling pipelines, resulting in increased maintenance needs and potentially hazardous conditions for workers. The presence of zebra mussels also raises concerns with the transfer of water from affected waterbodies that may require mitigation to prevent transfer. The potential transport of zebra mussels and other invasive species via pipeline falls under Parks and Wildlife Code §66.007(n) and §66.0072(g).

To prevent the transmission of invasive species, TPWD recommends avoiding transport of water from water bodies where these species are known to occur, including rivers downstream of infested lakes. If this is unavoidable, effective mitigative measures should be considered and implemented for preventing the transfer of zebra mussels. TPWD regularly updates information on the TPWD website to clearly identify lakes with zebra mussels in Texas, as it is subject to change; this information can be found at https://tpwd.texas.gov/huntwild/wild/species/exotic/zebramusselmap.phtml.

We acknowledge that the proposed Red River Off-channel Reservoir WMS (i.e., water from the Red River to Lake Ray Roberts then to Possum Kingdom Lake) includes the cost for the treatment of zebra mussel control. This WMS does set a good example for including cost estimates for individual WMS that involve transferring waters with invasive species. However, the potential to introduce zebra mussels between Ray Roberts and Possum Kingdom is not addressed. We would like to see more information regarding strategies that reduce potential impacts to uninfected waters in this WMS.

Discussions on environmental issues with proposed Lake Granger and Lake Georgetown ASR projects address plants, animals and historic concerns, but lack information about zebra mussel control and reduction of spread. Please address these issues in the IPP.

In summary, TPWD recommends that the Brazos G IPP address zebra mussels (and other aquatic invasive species), review the TPWD website for guidance, and coordinate with TPWD to identify areas with infestations in order to avoid or reduce the negative impacts from invasive, exotic or nuisance species on the State's natural resources, economy, and recreational activities.

AQUATIC RESOURCE RELOCATION PLANS

If a WMS requires a dewatering event, then an Aquatic Resource Relocation Plan (ARRP) and a relocation permit maybe required from TPWD. Providing this information in the final Regional Water Plan will help to ensure coordination and reduction of impacts to natural resources at the beginning of WMS planning. For example, in Volume II, page 3.2-9 (Implementation Issues) TPWD Sand, Shell, Gravel and Marl permit is mentioned. Adding the ARRP and relocation permit information provides a clear understanding for stakeholders and the public. For more information please visit:

https://tpwd.texas.gov/landwater/water/environconcerns/kills_and_spills/minimize.phtml

ECOLOGICALLY SIGNIFICANT STREAM SEGMENTS

TPWD continues to support regional water planning groups in recommending ecologically significant river and stream segments. The nomination of stream segments is an opportunity to demonstrate a regional commitment towards the long-term protection of natural resources. TPWD would support an update if Region G would find it beneficial in making a decision to recommend a river or stream segment as ecologically unique. New natural resources information is likely available for the river and stream segments TPWD has previously identified as well as for other segments not yet identified as candidates for the ecologically unique designation.

Please change the TPWD non-voting representative from Dan Opdyke to Jennifer Bronson Warren (Executive Summary and Table 1-1); Dr. Opdyke no longer works for TPWD. Please add David Young as an alternate non-voting representative for TPWD.

We appreciate the opportunity to provide these comments. While TPWD values and appreciates the need to meet future water supply demands, we must do so in a thoughtful and sound manner that ensures the ecological health of our state's aquatic and natural resources important for healthy economies and providing Texans with opportunities to recreate outdoors and connect with nature. If you have any questions, or if we can be of any assistance, please contact me at 512-389-8715 or Cindy.loeffler@tpwd.texas.gov. Thank you.

Sincerely,

Cindy Loeffler

Cindy Loeffler, Chief
Water Resources Branch

Cll:dy:jbw:kbm

Cc: Jennifer Bronson Warren, Coastal Fisheries Division, TPWD
David Young, Coastal Fisheries Division, TPWD

References

Brune, G. 1981. Springs of Texas. Volume 1. Branch-Smith, Ft. Worth, Texas.

Texas Water Development Board

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

Mr. Wayne Wilson, Chair
c/o Wilson Cattle Company
7026 East OSR
Bryan, Texas 77808

Mr. Stephen Hamlin
Brazos River Authority
4600 Cobbs Dr.
Waco, Texas 76710

Re: Texas Water Development Board Comments for the Brazos G (Region G) Regional Water Planning Group Initially Prepared Plan, Contract No. 1548301835

Dear Mr. Wilson and Mr. Hamlin:

Texas Water Development Board (TWDB) staff have completed their review of the Initially Prepared Plan (IPP) submitted by March 3, 2020 on behalf of the Brazos G Regional Water Planning Group (RWPG). The attached comments follow this format:

- **Level 1:** Comments, questions, and data revisions that must be satisfactorily addressed in order to meet statutory, agency rule, and/or contract requirements; and,

- **Level 2:** Comments and suggestions for consideration that may improve the readability and overall understanding of the regional water plan.

Please note that rule references are based on recent revisions to 31 Texas Administrative Code (TAC) Chapter 357, adopted by the TWDB Board on June 4, 2020. 31 TAC § 357.50(f) requires the RWPG to consider timely agency and public comment. Section 357.50(g) requires the final adopted plan include summaries of all timely written and oral comments received, along with a response explaining any resulting revisions or why changes are not warranted. Copies of TWDB's Level 1 and 2 written comments and the region's responses must be included in the final, adopted regional water plan (*Contract Exhibit C, Section 13.1.2)*.

Standard to all planning groups is the need to include certain content in the final regional water plans that was not yet available at the time that IPPs were prepared and submitted. In your final regional water plan, please be sure to also incorporate the following:

Our Mission

To provide leadership, information, education, and support for planning, financial assistance, and outreach for the conservation and responsible development of water for Texas

Board Members

Peter M. Lake, Chairman | Kathleen Jackson, Board Member | Brooke T. Paup, Board Member

Jeff Walker, Executive Administrator

a) Completed results from the RWPG's infrastructure financing survey for sponsors of recommended projects with capital costs, including an electronic version of the survey spreadsheet *[31 TAC § 357.44]*;
b) Completed results from the implementation survey, including an electronic version of the survey spreadsheet *[31 TAC § 357.45(a)]*;
c) Documentation that comments received on the IPP were considered in the development of the final plan *[31 TAC § 357.50(f)]*; and
d) Evidence, such as a certification in the form of a cover letter, that the final, adopted regional water plan is complete and adopted by the RWPG *[31 TAC § 357.50(h)(1)]*.

Please ensure that the final plan includes updated State Water Planning Database (DB22) reports, and that the numerical values presented in the tables throughout the final, adopted regional water plan are consistent with the data provided in DB22. For the purpose of development of the 2022 State Water Plan, water management strategy and other data entered by the RWPG in DB22 shall take precedence over any conflicting data presented in the final regional water plan *[Contract Exhibit C, Sections 13.1.3 and 13.2.2]*.

Additionally, subsequent review of DB22 data is being performed. If issues arise during our ongoing data review, they will be communicated promptly to the planning group to resolve. Please anticipate the need to respond to additional comments regarding data integrity, including any source overallocations, prior to the adoption of the final regional water plans.

The provision of certain content in an electronic-only form is permissible as follows: Internet links are permissible as a method for including model conservation and drought contingency plans within the final regional water plan; hydrologic modeling files may be submitted as electronic appendices, however all other regional water plan appendices should also be incorporated in hard copy format within each plan *[31 TAC § 357.50(g)(2)(C), Contract Exhibit C, Section 13.1.2 and 13.2.1]*.

The following items must accompany, the submission of the final, adopted regional water plan:

1. The prioritized list of all recommended projects in the regional water plan, including an electronic version of the prioritization spreadsheet *[31 TAC § 357.46];* and,
2. All hydrologic modeling files and GIS files, including any remaining files that may not have been provided at the time of the submission of the IPP but that were used in developing the final plan *[31 TAC § 357.50(g)(2)(C), Contract Exhibit C, Section 13.1.2, and 13.2.1].*

The following general requirements that apply to recommended water management strategies must be adhered to in all final regional water plans including:

1. Regional water plans must not include any recommended strategies or project costs that are associated with simply maintaining existing water supplies or replacing existing infrastructure. Plans may include only infrastructure costs that are associated with volumetric increases of treated water supplies delivered to water

user groups or that result in more efficient use of existing supplies *[31 TAC § 357.10(39), § 357.34(e)(3)(A), Contract Exhibit C, Sections 5.5.2 and 5.5.3]*; and,

2. Regional water plans must not include the costs of any retail distribution lines or other infrastructure costs that are not directly associated with the development of additional supply volumes (e.g., via treatment) other than those line replacement costs related to projects that are for the primary purpose of achieving conservation savings via water loss reduction *[§ 357.34(e)(3)(A), Contract Exhibit C, Section 5.5.3]*.

Please be advised that, within the attached document, your region has received a comment specifically requesting that the RWPG provide the basis for how the RWPG considers it feasible that certain water management strategies will actually be implemented by January 5, 2023 (see Level 1, Comment 1), especially for projects with long lead times. This comment is aimed at making sure RWPGs do not present projects in their plans to provide water during the 2020 decade that cannot reasonably be expected to be online, *and provide water supply*, by January 5, 2023. For project types whose drought yields rely on *previously stored water*, the 2020 supply volume should take into consideration reasonably expected accumulated storage that would already be available in the event of drought. The RWPG must adequately address this Level 1 comment in the final, adopted regional water plan, which might require making changes to your regional plan.

It is preferable that RWPGs adopt a realistic plan that acknowledges the likelihood of unmet needs in a near-term drought, rather than to present a plan that overlooks reasonably foreseeable, near-term shortages due to the inclusion of unrealistic project timelines. If a '2020' decade project cannot reasonably be expected to come online by January 2023, for example if a reservoir has not started the permitting process, it should be moved to the 2030 decade. Any potential supply gaps (unmet needs) created by moving out projects to the 2030 decade may be shown as simply 'unmet' in the 2020 decade or be shown as met by a 'demand management' strategy. Doing so will appropriately reflect the fact that some entities would likely face an actual shortage if a drought of record were to occur in the very near future despite projects (that may be included in the plan but associated with a later decade) that will eventually address those same potential shortages in future years.

It is imperative that you provide the TWDB with information on how you intend to address this comment and all other comments well in advance of your adoption the regional water plan to ensure that the response is adequate for the Executive Administrator to recommend the plan to the TWDB Board for consideration in a timely and efficient manner. Your TWDB project manager will review and provide feedback to ensure all IPP comments and associated plan revisions have been addressed adequately. Failure to adequately address this comment (or any Level 1 comment) may result in the delay of the TWDB Board approval of your final regional water plan.

As a reminder, the deadline to submit the final, adopted regional water plan and associated material to the TWDB is **October 14, 2020**. Any remaining data revisions to DB22 must be communicated to Sabrina Anderson at Sabrina.Anderson@twdb.texas.gov by **September 14, 2020.**

If you have any questions regarding these comments or would like to discuss your approach to addressing any of these comments, please do not hesitate to contact Jean Devlin at (512) 475-1529 or Jean.Devlin@twdb.texas.gov. TWDB staff will be available to assist you in any way possible to ensure successful completion of your final regional water plan.

Sincerely,

Date: 6/18/2020

Jessica Zuba
Deputy Executive Administrator
Water Supply and Infrastructure

Attachment

c w/att.: Mr. David Collinsworth, Brazos River Authority
Mr. David Dunn, HDR, Inc.

TWDB comments on the Initially Prepared 2021 Brazos G (Region G) Regional Water Plan.

Level 1: Comments, questions, and data revisions that must be satisfactorily addressed in order to meet statutory, agency rule, and/or contract requirements.

1. Volume II and the State Water Planning Database (DB22). The plan includes the following recommended water management strategies (WMS) by WMS type, providing supply in 2020 (not including demand management): 18 *groundwater wells & other*, two *aquifer storage and recovery,* 13 *other direct reuse*, six *new major reservoir,* two *conjunctive use*, and 24 *other surface water, including the Groesbeck minor reservoir*. **Strategy supply with an online decade of 2020 must be constructed and delivering water by January 5, 2023**.
    a) Please confirm that all strategies shown as providing supply in 2020 are expected to be providing water supply by January 5, 2023. *[31 § TAC 357.10(21); Contract Exhibit C, Section 5.2]*
    b) Please provide the specific basis on which the planning group anticipates that it is feasible that the two *aquifer storage and recovery,* six *new major reservoir,* two *conjunctive use*, and 24 *other surface water* WMSs will all actually be online and providing water supply by January 5, 2023. For example, provide information on actions taken by sponsors and anticipated future project milestones that demonstrate sufficient progress toward implementation. *[31 § TAC 357.10(21); Contract Exhibit C, Section 5.2]*
    c) In the event that the resulting adjustment of the timing of WMSs in the plan results in an increase in near-term unmet water needs, please update the related portions of the plan and DB22 accordingly, and also indicate whether 'demand management' will be the WMS used in the event of drought to address such water supply shortfalls or if the plan will show these as simply 'unmet'. If municipal shortages are left 'unmet' and without a 'demand management' strategy to meet the shortage, please also ensure that adequate justification is included in accordance with 31 TAC § 357.50(j). *[TWC § 16.051(a); 31 § TAC 357.50(j); [31 TAC § 357.34(i)(2); Contract Exhibit C, Section 5.2]*
    d) **Please be advised that, in accordance with Senate Bill 1511, 85th Texas Legislature, the planning group will be expected to rely on its next planning cycle budget to amend its 2021 Regional Water Plan during development of the 2026 Regional Water Plan, if recommended WMSs or projects become infeasible, for example, due to timing of projects coming online.** Infeasible WMSs include those WMSs where proposed sponsors have not taken an affirmative vote or other action to make expenditures necessary to construct or file applications for permits required in connection with implementation of the WMS on a schedule in order for the WMS to be completed by the time the WMS is needed to address drought in the plan. *[TWC § 16.053(h)(10); 31 TAC § 357.12(b)]*

2. Section 2.3.9, Table 2.13. Major Water Provider (MWP) demands presented in Table 2.13 are not presented by category of use. Please report demands for MWPs by decade and category of use in the final, adopted regional water plan. *[31 TAC § 357.31(b); 31 TAC § 357.31(f)]*

3. Section 3.4, page 3-63. Table 3.9 represents groundwater availability, however values in Table 3.9 for most counties does not represent modeled available groundwater (MAG) volumes. For example, the MAG for the Trinity Aquifer, Bell County ranges from 9,267 ac-ft/yr in 2020 to 9,241 ac-ft/yr in 2070 and is presented as 3,984 ac-ft/yr in 2020 to 4,270 ac-ft/yr in 2070, in Table 3.9. In some cases, aquifers are listed for counties where those aquifers do not exist. Please update Table 3.9 with the correct MAG volumes for all counties and verify that aquifers exist where they are listed in the final, adopted regional water plan. *[31 TAC § 357.32(d)]*

4. Section 3.4.1, page 3-61, second paragraph and Table 3.9. The plan discusses the use of an approved MAG Peak Factor for the Carrizo-Wilcox aquifer in Brazos County; however, the values in Table 3.9 for the Carrizo-Wilcox Aquifer in Brazos County are not equal to MAG volumes with the MAG Peak Factor applied. Please update Table 3.9 with the correct MAG Peak Factor volumes for the Carrizo-Wilcox Aquifer in Brazos County. *[31 TAC § 357.32(d)(3)]*

5. Section 3.4, Table 3.9, pages 3-63 to 3-66. The groundwater availability values listed in Table 3.9 for the Carrizo-Wilcox Aquifer in Brazos County represent neither the unmodified MAG nor the availability with the MAG Peak Factor applied. Please update Table 3.9 to represent groundwater availability for the Carrizo-Wilcox Aquifer in Brazos County with the MAG Peak Factor applied, and also report the unmodified MAG volumes, in the final, adopted regional water plan. *[Contract Exhibit C, Section 3.6.1]*

6. Chapter 3, Table 3.9, pages 3-63 to 3-66, and Appendix B. The groundwater availability for aquifer areas with no desired future conditions (DFC) appear to be inconsistent with the source availability values presented in DB22. Additionally, some non-MAG volumes appear to be missing from Table 3.9, for example, the Brazos River Alluvium Aquifer in Bosque County. Please update Table 3.9 with groundwater availability consistent with DB22 in the final, adopted regional water plan. *[Contract Exhibit C, Section 3.5.2]*

7. Chapter 3, Table 3.9, pages 3-63 to 3-66, and Appendix B. It is not clear what groundwater availability methodologies have been utilized for aquifers with no DFCs. For example, Appendix B (page B-4) states availability for aquifers with no DFC "are based on results from groundwater modeling during the development of the MAGs for other aquifers", suggesting that the values of "not-relevant DFC compatible availability" from the MAG run were used. However, the availability values with Table 3.9 do not support confirmation of these methodologies. Please

clarify the methodologies utilized for aquifer areas with no DFCs in the final, adopted regional water plan. *[Contract Exhibit C, Section 3.5.2]*

8. Chapter 3. The plan does not appear to include the evaluation results of existing supplies for MWPs. Please report existing supplies for MWP by decade and category of use in the final, adopted regional water plan. *[31 TAC § 357.32(g)]*

9. Chapter 3. Please include the methodology used to determine local surface water supplies and clarify whether the local surface water supplies are firm supplies under drought of record conditions in the final, adopted regional water plan. *[Contract Exhibit C, Section 3.2 and Section 3.7]*

10. Chapter 3 and Chapter 5 (Sections 5.13, 5.19, 5.22). Please provide justification for setting existing water supplies equal to demands during the planning period, for example Manufacturing, Hamilton County, County-Other, Kent County, and Aqua WSC, Lee County in the final, adopted regional water plan. *[Contract Exhibit C, Section 3.7 item 4]*

11. Appendix B, MAG tables. In some cases for counties which are split between more than one basin, the MAG totals in the MAG tables include the total for only one basin. In addition, for some aquifers, for example the Marble Falls and the Woodbine aquifers, the MAG totals appear to be incorrect. Please review the tables in Appendix B for each aquifer and county, verify the data presented, and update as necessary in the final, adopted regional water plan. *[31 TAC § 357.32(d)]*

12. Chapter 4. The plan does not appear to include identified water need volumes for MWPs reported by category of use including municipal, mining, manufacturing, irrigation, steam electric, mining, and livestock. Please report the results of the needs analysis for MWPs by categories of use as applicable in the region in the final, adopted regional water plan. *[31 TAC § 357.33(b)]*

13. Chapter 4. While the results of the secondary needs analysis is presented in Appendix A for WUGs, please add a discussion of this needs analysis to Chapter 4 or reference the current location in the final, adopted regional water plan. *[31 TAC § 357.33(e)]*

14. Chapter 4. The plan does not appear to include a secondary needs analysis for MWPs Please present the results of the secondary needs analysis by decade for MWPs in the final, adopted regional water plan. *[31 TAC § 357.33(e)]*

15. Chapter 5. The plan does not appear to discuss the region's assessment of significant water needs relating to the assessment of aquifer storage and recovery potential for meeting the identified significant water needs. Please include at a minimum, how the region determined the threshold of significant water needs for this requirement in the final, adopted regional water plan. *[TWC § 16.053(e)(10); 31 TAC § 357.34(h)]*

16. Volume II, Chapter 3. The plan in some instances appears to include infrastructure components that are not required to increase the volume of supply for the WUG but

are associated with internal distribution systems, which are ineligible per contract *Exhibit C, Section 5.5.3*. For example, but not limited to, page 3.3-5 states the North Reuse Project will include branch pipelines and page. 3.7-2 states that Cleburne Reuse Project will serve future commercial developments. Please make clear in the plan that evaluations for all Reuse WMSs does not include reuse distribution lines directly to residences or commercial businesses in the final, adopted regional water plan. *[Contract Exhibit C, Section 5.5.3]*

17. Volume II, Section 9.5. Table 9.5-2 presents the available project yield for the Lake Belton to Lake Stillhouse Hollow Pipeline WMS as 30,000 ac-ft/yr, however the yield reported in DB22 is zero ac-ft/yr in all decades. The WMS appears to move existing supply to areas of need more efficiently and does not appear to make new supply available to any WUGs. Please clarify whether the WMS increases the volume of water supply delivered to WUGs. If so, the volume of water supply must be represented in DB22 in at least one planning decade. If not, the WMS must be removed as a recommended WMS from DB22, and the WMS evaluation must be presented in a separate section in the final, adopted regional water plan. *[31 TAC § 357.34(d)]*

18. Volume II, page 9.7-1 and DB22. The WMS evaluation for Somervell County Water Supply Projects, states that the strategy would be completed by 2035, yet supply in DB22 is shown online in 2030. Strategy supply must be assumed to come online and be providing water in or prior to the online decade year. Please reconcile all online decades accordingly in the final, adopted regional water plan. *[31 TAC § 357.10(21); Contract Exhibit C, Section 5.2]*

19. Volume II, Chapter 13. The plan does not include the WMS project costing tool's output report for any of the Miscellaneous WMSs in Chapter 13, or *analogously* present the capital cost for each project component. Please submit the costing tool's standardized cost output report or present capital cost estimates for each project component for each WMS evaluated in the final, adopted regional water plan. *[31 TAC § 357.34(f); 31 TAC § 358.3(21); Contract Exhibit C, Section 5.5.1]*

20. Volume II, Chapter 13. The plan does not appear to include technical evaluations for any of the WMS or projects presented in Chapter 13. Please include technical evaluations for each WMS evaluated in the final, adopted regional water plan. *[31 TAC § 357.34(a); 31 TAC § 357.34(e); Contract Scope of Work, Task 5A]*

21. Volume II and DB22. The plan includes WMS projects that appear to come online after the related WMS is initially online providing supply. For example, the Georgetown WTP Expansion WMS is reported to provide supply in 2020, however the related WMS project in DB22 on which it relies does not come online until 2030. For WMS projects that are the basis for a strategy to deliver water, please ensure that the project is associated with the initial decade, or earlier decade, that the dependent strategy is expected to deliver supply. In the event that the resulting adjustment of the timing of WMSs in the plan results in an increase in near-term

unmet water needs, please update the related portions of the plan and DB22 accordingly. *[31 TAC § 357.10(21); Contract Exhibit C, Section 5.2]*

22. Volume II. The plan, in some instances, does not appear to include pipe diameters, or pipe length information in some strategy evaluations costing report tables for example, Bell County WCID No.1 North Reuse Project. Please provide this information, if known, or remove the zeros from the costing outputs in the final, adopted regional water plan. *[Contract Exhibit C, Section 5.6]*

23. Volume II. The plan does not clearly state if or how a quantitative analysis of environmental flow needs was taken into account in calculation of yield for the following WMSs: Coryell County OCR (Vol. II Section 4.4), Lake Aquilla Reallocation (Vol. II Section 10.1), and Millers Creek Reservoir Augmentation (Vol. II Section 10.5). Please include a statement regarding how environmental flow criteria were considered in these strategy evaluations in the final, adopted regional water plan. Additionally, the Red River OCR (Vol. II Section 4.8), evaluation states that it was modeled in accordance with TCEQ environmental flow requirements; however, there are no Chapter 298 requirements for the Red River Basin. Please ensure that the evaluation for Red River OCR addresses environmental flows using the consensus criteria in the final, adopted regional water plan. *[31 TAC § 357.34(e)(3)(B); 31 TAC § 358.3(22); 31 TAC § 358.3(23)]*

24. Volume II. The plan does not appear to include quantitative evaluation of impacts for all environmental factors. For example, in Table 4.6-3. the Environmental Water Needs are reported as" Moderate impact". It is not clear what quantitative values are assigned for impacts to wildlife habitat, wetlands, threatened and endangered species, and cultural resources in this table. Additionally, not all of the "Environmental Issues" sections for each WMS appear to include a quantitative evaluation of all environmental factors, for example Table 9.2-1. Please include a quantitative reporting of environmental factors for all WMSs in the final, adopted regional water plan. *[31 TAC § 357.34(e)(3)(B)]*

25. Volume II. The plan, in some instances, does not appear to include a quantitative reporting of impacts to agricultural resources. For example, on page 4.11-20 of Volume II, in reference to the Turkey Peak Reservoir, the plan states, "some impacts are expected for agricultural land use" and in Table 4.11-3, Threats to Agricultural and Natural Resources are listed as "Low to None". Please include quantitative reporting of impacts, including impacts considered negligible, to agricultural resources for all WMS evaluations in the final, adopted regional water plan. *[31 TAC § 357.34(e)(3)(C)]*

26. Volume II, Section 7.1. The representation of the Lake Granger Augmentation WMS phases and data structure as entered DB22 appears to be inconsistent with how the WMSs is described in the plan. Please reconcile how the WMS and projects are described in the final, adopted regional water plan and presented in DB22. The MAG volume for recommended WMSs in the plan and in DB22 may not be over-drafted in any decade year. At the time of review, there did not appear to be sufficient MAG

availability in DB22 available for either phase of this WMS. Additionally, WMS supplies may not be presented as zero in all decades in the final, adopted regional water plan *[31 § TAC 357.34(b); Contract Exhibit C, Section 3.5.4]*

27. Volume II, Section 7.2 The evaluation of the Oak Creek Reservoir WMS indicates that the MAG will be exceeded in multiple years but does not appear to include a supporting 'peak factor' analysis to support short-term overdrafts. Please reconcile how the WMS and projects are described in the plan and presented in DB22 in the final, adopted regional water plan. The MAG volume for recommended WMSs in the plan and in DB22 may not be over-drafted in any decade year. At the time of review, there did not appear to be sufficient MAG availability in DB22 available for this WMS. Additionally, please ensure that the region has coordinated with Region F on the volume of water available through the Region F Oak Creek Reservoir Subordination WMS. *[31 § TAC 357.34(b); Contract Exhibit C, Section 3.5.4]*

28. Volume II, Sections 4.2, 4.7, and 4.10. Brushy Creek, Lake Creek, and Throckmorton reservoirs are presented as new, proposed major reservoirs in the plan and DB22, and the evaluations indicate these reservoir WMSs have not been implemented. These reservoirs are also represented as providing existing supply in DB22 as early as 2020. Existing supply must be physically and legally available to the WUG. Please revise the existing supply data as necessary, in the final, adopted regional water plan, if the WUGs are not currently receiving water from these sources, or clarify in the evaluations whether the WMSs are to expand an existing reservoir. *[Contract Exhibit C, Section 5.2.1]*

29. Volume II. Table 1.1-1. The plan appears to identify West Central Brazos Water Distribution System as a potentially feasible WMS, however the WMS does not appear to have been evaluated. Please document why this WMSs indicated as potentially feasible was not evaluated in the final, adopted regional water plan. *[31 TAC § 357.34(a); Contract Scope of Work, Task 5A]*

30. Volume II. The plan does not appear to include the documented process used by the planning group to identify potentially feasible WMSs, as presented to the planning group in accordance with 31 TAC § 357.21(b). Please include this information in the final, adopted regional water plan. *[Contract Exhibit C, Section 5.1]*

31. Volume II. The plan does not appear to include the process of selecting recommended WMSs and projects. Please include documentation of the process of selecting recommended WMSs and projects in the final, adopted regional water plan. *[Contract Scope of Work, Task 5A subtask 5]*

32. Volume II. Please include documentation of why seawater desalination and brackish groundwater desalination were not selected as recommended WMSs in the final, adopted regional water plan. *[TWC § 16.053(e)(5)(j); Contract Exhibit C, Section 5.2; 31 § TAC 357.34(g)]*

33. Chapter 6. Please include the TWDB Socioeconomic Impacts of Projected Water Shortages Report as an appendix to Chapter 6 rather than Chapter 4 in the final, adopted regional water plan. *[31 TAC § 357.40(a)]*

34. Chapter 6. Please provide a description of the impacts of the regional water plan on navigation in the final, adopted regional water plan. *[31 TAC § 357.40(b)(6)]*

35. Chapter 6. Please include a summary of unmet water needs identified in Chapter 6 rather than Chapter 4 of the final, adopted regional water plan. *[31 TAC § 357.40(c)]*

36. Section 7.5.3, page 7-72. The plan refers to Appendix H for copies of the Waco and Thrall model drought contingency plans, however Appendix H appear to be a placeholder for comments on the IPP. Please ensure that copies of the model drought contingency plans are included, or operational links to the model plans are included if they are to be included only by online reference in the final, adopted regional water plan. *[31 TAC § 357.42(j)]*

37. Chapter 7. The plan does not appear to include discussion of unnecessary or counterproductive variations in drought response strategies that may impede drought response efforts. Please include discussion of any unnecessary or counterproductive variations in drought response strategies that were identified by the planning group in the final, adopted regional water plan. *[TWC § 16.053(e)(3)(E); 31 TAC § 357.42(b)(2)]*

38. Chapter 7. The plan does not appear to state how the region addressed recommendations from the Drought Preparedness Council, provided to planning groups on August 1, 2019. Please include a discussion on how the planning group considered the Drought Preparedness Council recommendations in the final, adopted regional water plan. *[31 TAC § 357.42(h)]*

39. Chapter 7. The plan does not appear to include a discussion of recommendations to the Drought Preparedness Council or recommendations regarding the State Drought Preparedness Plan. Please include any such recommendations in the final, adopted regional water plan. *[31 TAC § 357.42(i)(3)]*

40. Section 8.2, pages 8-1 and 8-2. Please ensure that Section 8.2 is updated to clearly document which unique reservoir sites have been previously designated by the legislature; which are being recommended for designation by the RWPG; and whether the planning group is recommending that the legislature re-designate a previously designated unique reservoir site. *[31 TAC § 357.43(c); Contract Exhibit C, Section 8.2]*

41. Chapter 10. Please include a statement that indicates whether the planning group complied with all Texas Open Meetings Act and Public Information Act requirements in the final, adopted regional water plan. *[31 TAC § 357.21; 31 TAC § 357.50(f)]*

42. Chapter 11. Please provide a brief summary of how the 2016 Plan differs from the 2021 Plan with regards to recommended and alternative WMS *projects* in the final, adopted regional water plan. *[31 TAC § 357.45(c)(4)]*

43. Chapter 11. The plan does not appear to assess the progress of the regional water planning area in encouraging cooperation between water user groups for the purpose of achieving economies of scale and otherwise incentivizing strategies that benefit the entire region. Please provide a general assessment of these items in the final, adopted regional water plan. *[TWC § 16.053(e)(12); 31 TAC § 357.45(c)]*

44. Please remove use of the TWDB logo from the final, adopted regional water plan. In accordance with TWDB's Logo and Seal Policy, use of the TWDB logo requires an approved licensing agreement.

45. The GIS files submitted did not appear to include the locations of every recommended and alternative WMS project. Please include the locations of every recommended and alternative WMS project listed in the final, adopted regional water plan with the final GIS data submitted. *[Contract Exhibit C, Section 13.1.2]*

46. The WMS Project vector data was submitted across more than one shapefile/feature class for the same feature type. The vector data must be divided into point, line, and polygon feature types across a maximum of three shapefiles in a single folder or three feature classes in a single file geodatabase (one for each feature type). Please combine all feature classes in the 'Brazos_G_2021' GBD into a single feature class or shapefile for each feature type in the final GIS data submitted. *[Contract Exhibit D, Section 2.4.5]*

Level 2: Comments and suggestions for consideration that may improve the readability and overall understanding of the regional water plan.

1. Section ES.5. The text refers the reader to Appendix L for details on Second-Tier needs, however Appendix L appears to include WAM files. Please correct the reference on page ES-14 as appropriate.

2. Table ES-2 refers to the DB17 Summary of Second-Tier Water Needs. Please ensure to refer readers to DB22 data. The DB22 Second-Tier Needs reports are currently included in the ES Appendix.

3. Section 1.12.1, page 1-50, first paragraph. The text appears to incorrectly reference Table 1-11. Please replace Table 1-11 reference with Table 1-12.

4. Section 1.12.1, page 1-50, second paragraph, last sentence. The text appears to incorrectly reference Table 1-12. Please replace Table 1-12 reference with Table 1-13.

5. Section 1.12.1, page 1-49, last paragraph discusses counties in Region G related to priority groundwater management areas that are in groundwater conservation districts. Please consider adding a reference to Figure 1-23: Groundwater Conservation Districts and Groundwater Management Areas Located Wholly or Partially within the Brazos G Area.

6. Section 1.12.1, page 1-51. Please replace the outdated term Managed Available Groundwater with Modeled Available Groundwater throughout the plan.

7. Chapter 3. As reuse is considered a separate water source, please consider presenting reuse in a separate section within Chapter 3.

8. Section 3.2.3, page 3-43. To assist with TWDB's review of surface water data, please consider providing more information about reservoir sedimentation considerations, such as sediment rate, data source, and method(s) for determining projected rating curves in the final plan.

9. Section 3.4.1, page 3-61, last paragraph. The text states that a reference for the source of groundwater availability estimates in Table 3.9 is included; however, no reference is listed. Please include the reference for the source of the groundwater availability estimates and consider including the MAG Peak Factor TWDB approval letter in the appendices of the final plan.

10. Appendix B. Citations for the model (GAM) used to determine the MAG for the Carrizo-Wilcox, Queen City and Sparta aquifers are listed as Dutton and others, 2003. The reference should be Kelley and others, 2004. Please update the citations for the GAM. Also, please list each of the authors for Kelley and others in the list of references rather than just "Kelley and others".

11. Section 4.1. Please consider moving the discussion of water supply allocation to Chapter 3.

12. Page. 4-3. Section 4.2 appears to refer to Appendix C for additional data on water needs, however Appendix C represents Water Rights data. Please correct the reference on page 4-3 as appropriate.

13. Consider reconciling the number of counties with projected irrigation needs presented in Volume II, Section 2.2.2 (20 counties) and Volume I, Section 4.2.5 (21 counties).

14. Volume II, Chapter 2 includes rainwater harvesting and reuse in the list of water conservation best practices measures. While the TWDB acknowledges that the municipal conservation best practices guide includes rainwater harvesting and reuse, for regional water planning purposes these practices are considered separate sources and should not be classified as conservation. Please consider clarifying this information within Volume II, Chapter 2 in the final, adopted regional water plan. *[Contract Exhibit C, Section 5.6]*

15. Volume II, Section 9.6. The header for the Lake Whitney Water Supply Project (Cleburne) includes and Error! message. Please update the header in the final plan.

16. Volume II, Chapter 12. Please consider clarifying more explicitly in the strategy evaluation for Brush Control, that it is *not* a recommended WMS, in the final, adopted regional water plan. *[31 TAC § 357.34(d)]*

17. The GIS files submitted for WMS projects do not adhere to the contractually required naming convention. Please rename the GIS files following the naming convention outlined in Exhibit D, Section 2.4.5 in the final GIS files submitted. *[Contract Exhibit D, Section 2.4.5]*

18. The GIS files submitted for WMS projects do not include minimum metadata requirements. Please include at a minimum, metadata about the data's projection, with the final GIS data submitted. *[Contract Exhibit D, Section 2.4.1]*

19. Appendix K appears to be a blank placeholder for DB22 reports, however the DB22 reports are included as part of the Executive Summary. Please remove Appendix K, if necessary, in the final plan.

Appendix I
Requested Population and Water Demand Revisions

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2021 Regional Water Plan Water Demand Projections:
Summary of the Brazos (Region G) Regional Water Planning Group's Official Revision Requests & TWDB Recommendations
1/25/2018

The Brazos G Regional Water Planning Group (Region G) submitted their official revision requests to the Texas Water Development Board (TWDB) on December 21, 2017. The TWDB reviewed the requests in accordance with criteria established in Section 2 of the *First Amended General Guidelines for Fifth Cycle of Regional Water Plan Development* (Exhibit C), which was updated by the TWDB in April 2017. This document summarizes the recommended population and water demand projections released as draft by the TWDB, the revisions requested by Region G, and the final demand projections recommended by the TWDB staff. All the water demand projections are displayed in acre-feet.

1. Population & Municipal Water Demand Projections

Population	2020	2030	2040	2050	2060	2070
Draft	2,371,064	2,720,696	3,097,007	3,494,544	3,918,197	4,351,042
Requested Changes	*2,371,064*	*2,720,696*	*3,097,007*	*3,494,544*	*3,918,197*	*4,351,042*
Recommended	2,371,064	2,720,696	3,097,007	3,494,544	3,918,197	4,351,042

Region G requested revisions to the TWDB draft projections for 33 Water User Groups (WUGs), mostly based on collected local information on growth trends and anticipated build-out of service areas. Most of these adjustments were made within individual counties with adjustments to the County-Other population, and the total population projected at the regional level remained the same. Population increases were requested for Bell, Brazos, and Robertson counties, while a decrease was requested for Williamson County as Region G made minor adjustments to where they project future growth to occur. The planning group requested two notable changes to the WUG list for the region. The City of Georgetown acquired the water supply assets of Chisholm Trail SUD. Thus, Georgetown absorbed the population of Chisholm Trail SUD, and Chisholm Trail SUD was removed from the WUG list. A new WUG was also created in Bell and Williamson counties called Jarrell-Schwertner Consolidated Reporting Unit (CRU). It includes Jarrell Schwertner WSC, which was previously a stand-alone WUG, and the population of the City of Jarrell, which was previously included in Williamson County-Other because it did not meet the 100 acre-feet per year WUG criteria on its own. The TWDB staff recommends the population revisions requested by Region G.

Municipal Demand	2020	2030	2040	2050	2060	2070
Draft	409,122	457,345	510,237	568,729	634,353	702,007
Requested Changes	*404,497*	*452,887*	*507,262*	*567,635*	*634,017*	*702,669*
Recommended	406,477	455,217	510,229	571,256	638,046	707,782

Region G requested changes to the gallons per capita per day (GPCD) values for nine WUGs. The municipal demand projections submitted by Region G vary from the recommended demand projections due to Region G using a different formula to calculate demands. The TWDB staff confirmed with Region G that the demands would be recalculated using the recommended formula. The GPCD revisions along with the revised population projections result in a 0.7% decrease in water demand projections in 2020 and a 0.8% increase by 2070, compared to the TWDB draft projections. The TWDB staff recommends these requested revisions to the GPCD values and municipal demand projections.

2. Non-Municipal Water Demand Projections

2.1 Irrigation Demand Projections:

Irrigation Demand	2020	2030	2040	2050	2060	2070
Draft	359,497	359,497	353,696	352,526	355,955	355,955
Requested Changes	*359,497*	*359,497*	*353,696*	*352,526*	*355,955*	*355,955*
Recommended	359,497	359,497	353,696	352,526	355,955	355,955

Region G did not request any changes to the irrigation demand projections.

2.2 Manufacturing Demand Projections:

Manufacturing Demand	2020	2030	2040	2050	2060	2070
Draft	12,695	16,175	16,175	16,175	16,175	16,175
Requested Changes	*12,695*	*16,175*	*16,175*	*16,175*	*16,175*	*16,175*
Recommended	12,695	16,175	16,175	16,175	16,175	16,175

Region G did not request any changes to the manufacturing demand projections.

2.3 Steam-Electric Demand Projections:

Steam-Electric Demand	2020	2030	2040	2050	2060	2070
Draft	232,894	232,894	232,894	232,894	232,894	232,894
Requested Changes	*232,894*	*232,894*	*232,894*	*232,894*	*232,894*	*232,894*
Recommended	232,894	232,894	232,894	232,894	232,894	232,894

Region G did not request any changes to the steam-electric demand projections. A facility in Milam County is in the process of closing, per approval by the Electric Reliability Council of Texas (ERCOT), which would reduce the projected demands to zero for the county and reduce the demand for the region by 32,254 acre-feet. However, Region G chose not to remove the demands because of the uncertainty about the future of the facility and water rights, thus no changes were made to Region G's steam-electric demand projections.

2.4 Livestock Demand Projections:

Livestock Demand	2020	2030	2040	2050	2060	2070
Draft	47,939	47,939	47,939	47,939	47,939	47,939
Requested Changes	*47,939*	*47,939*	*47,939*	*47,939*	*47,939*	*47,939*
Recommended	47,939	47,939	47,939	47,939	47,939	47,939

Region G did not request any changes to the livestock demand projections.

2.5 Mining Demand Projections:

Mining Demand	2020	2030	2040	2050	2060	2070
Draft	61,586	70,381	68,875	70,949	75,038	81,409
Requested Changes	*61,586*	*66,272*	*59,340*	*58,423*	*58,917*	*60,838*
Recommended	61,586	66,272	59,340	58,423	58,917	60,838

Region G requested changes to the mining projections for Lee and Robertson counties. In Lee County, the General Manager of the Lost Pines Groundwater Conservation District stated that a mine is expected to limit its operations and therefore, the Lee County water demand projections should be decreased. In Robertson County, water use for mining has dropped significantly since 2010, and the General Manager of the Brazos Valley Groundwater Conservation District does not expect it to increase back to pre-2010 levels. Overall, Region G requested a 6% decrease in 2020 and a 25% decrease by 2070 in mining demand projections compared to the TWDB draft projections. The TWDB staff recommend the revisions to the mining demand projections.

SUSAN ROTH
water and wastewater consulting

Memorandum

Brazos G RWPG – Recommended Revisions to the 2021 Draft Population and Water Demand Projections

TO: *David D. Dunn, P.E.*

CC: *Peter Newell, P.E.*

FROM: *Susan K. Roth, P.E.*

DATE: *December 20, 2017*

Brazos River Authority mailed out the TWDB 2021 Draft Population and Water Demand Projections to 285 Municipal Water User Groups (WUGs), 32 wholesale water providers (WWPs), 37 County Judges, 7 Councils of Government and 13 Groundwater Conservation Districts on May 31, 2017. Municipal WUGs and wholesale water providers requesting population and/or water demand revisions are listed below; additional detailed information regarding their revision requests is also provided in this memorandum.

Municipal WUGs & Wholesale Water Providers	Service Area – Primary County
Bell County WCID No. 3	Bell
Wellborn Special Utility District	Brazos
City of Bryan	Brazos
City of College Station	Brazos
City of Cleburne	Johnson
Johnson County Special Utility District	Johnson
Cities of Franklin and Hearne	Robertson
Robertson County Water Supply Corporation	Robertson
Brushy Creek Municipal Utility District	Williamson
City of Georgetown	Williamson
City of Hutto	Williamson
Jarrell CRU	Williamson
City of Leander	Williamson
City of Round Rock	Williamson
Jonah Water Special Utility District	Williamson
Manville Water Supply Corporation	Williamson

1.0 Summary of Draft Projections and Requested Revisions – Bell County

TWDB 2021 Draft Projections	2020	2030	2040	2050	2060	2070
439 WSC	10,220	12,327	14,490	16,700	18,961	21,285
Armstrong WSC	2,616	2,810	2,994	3,168	3,338	3,507
Bartlett	827	972	1,123	1,272	1,417	1,561
Bell County WCID 2	2,239	2,535	2,835	3,130	3,419	3,704
Bell County WCID 3	4,639	5,454	6,295	7,130	7,951	8,758
Bell-Milam Falls WSC	2,255	2,430	2,596	2,754	2,909	3,061
Belton	21,753	25,571	29,514	33,433	37,278	41,063
Central Texas College District	70	71	71	71	71	71
Chisholm Trail SUD	2,967	3,488	4,027	4,562	5,086	5,602
Bell County-Other	5,458	4,618	7,635	12,863	17,816	22,565
Dog Ridge WSC	5,211	6,126	7,070	8,008	8,930	9,836
East Bell WSC	3,486	4,122	4,781	5,436	6,079	6,710
Elm Creek WSC	2,257	2,685	3,129	3,572	4,006	4,434
Harker Heights	31,372	36,879	42,566	48,218	53,763	59,222
Holland	1,100	1,132	1,154	1,172	1,189	1,206
Jarrell-Schwertner WSC	2,264	2,826	3,488	4,182	4,956	5,751
Kempner WSC	1,900	2,166	2,393	2,603	2,803	2,991
Killeen	144,243	169,560	195,711	221,697	247,195	272,291
Little Elm Valley WSC	1,505	1,769	2,042	2,313	2,580	2,842
Moffat WSC	4,019	4,242	4,440	4,621	4,799	4,974
Morgans Point Resort	5,077	6,110	7,187	8,261	9,315	10,353
Pendleton WSC	2,284	2,430	2,565	2,691	2,813	2,934
Rogers	1,343	1,450	1,551	1,648	1,743	1,837
Salado WSC	6,001	6,648	7,288	7,913	8,525	9,128
South Fort Hood	16,936	17,196	17,282	17,282	17,282	17,282
Temple	81,736	96,082	110,900	125,626	140,074	154,295
The Grove WSC	1,218	1,306	1,509	1,709	1,904	2,098
Troy	2,049	2,321	2,598	2,869	3,136	3,398
West Bell County WSC	4,911	5,321	5,348	5,348	5,348	5,348
Total Bell County	**371,956**	**430,647**	**494,582**	**560,252**	**624,686**	**688,107**

Requested Revisions	2020	2030	2040	2050	2060	2070
Bell County WCID No. 3	7,403	10,072	13,930	16,468	18,362	20,216
Georgetown (Chisholm Trail SUD)	2,967	3,488	4,027	4,562	5,086	5,602
Chisholm Trail SUD	0	0	0	0	0	0
Bell County-Other	2,694	2,971	3,248	3,525	7,405	11,107
From Williamson County-Other	0	2,971	3,248	0	0	0
New Total Bell County	**371,956**	**433,618**	**497,830**	**560,252**	**624,686**	**688,107**

1.1 Bell County WCID No. 3

Summary of Comments Received:

1. Request for revision to population and water demand projections.
2. The CCN for Bell County WCID No. 3 only includes the City of Nolanville as a result of the City's recent annexation activities.
3. Based on the Census data for the City of Nolanville, the city's population is listed as 4,593 in 2014 and 4,953 in 2016 (estimate as of July 1, 2017).
4. The City of Nolanville's revision request from the City Manager (Kara Escajeda) is based on the City's Comprehensive Plan; population projections were developed by Texas A&M for 2020 and 2030, and the City has requested to use the median between the low and high growth scenarios.
5. The source of the city's growth is Bella Charca; a very large development that is periodically constructing new phases of residential homes.

Summary of Supporting Materials Received (reference attachments see p. 129-136):

1. Revision request received by email on July 6, 2017 from the General Manager (Ricky Garrett).

RWPG Recommendation:

1. Methodology: Projections from 2020-2030 are based on those developed by Texas A&M for the City of Nolanville using the median between the low and high growth scenarios. Projections from 2040-2070 based on decadal growth pattern from original TWDB projections (15.4%, 13.3%, 11.5%, 10.1%).

2. Revise population projections for Bell County WCID No. 3 as shown in the table below:

Bell County WCID No. 3	2020	2030	2040	2050	2060	2070
TWDB 2021 Draft Projections	**4,639**	**5,454**	**6,295**	**7,130**	**7,951**	**8,758**
Difference (from Bell County-Other)	**2,764**	**4,618**	**7,635**	**9,338**	**10,411**	**11,458**
Revised Population Projections	**7,403**	**10,072**	**13,930**	**16,468**	**18,362**	**20,216**

1.2 City of Georgetown (from Chisholm Trail SUD)

Summary of Comments Received:

1. Request for revision to population and water demand projections.
2. The City of Georgetown has acquired all of the water supply assets of Chisholm Trail SUD; Chisholm Trail SUD is no longer a water supply entity. This change has been approved by the Public Utility Commission, and the Chisholm Trail SUD CCN has been transferred to the City of Georgetown.
3. The City's population and water demand projections need to include those previously identified for Chisholm Trail SUD. Georgetown also added as a WUG in Bell County to accommodate the portion of Chisholm Trail SUD located in Bell County.
4. Utilize Georgetown base GPCD for consistency within the new, revised Georgetown WUG.
5. Numerous entities in Williamson County, including City of Georgetown, previously met three times to discuss their population projections and agreed on their overall revisions on August 16, 2017.

Summary of Supporting Materials Received (reference attachments p. 62 and 63-108):

1. Revision request received by email on June 28, 2017 from the Utility Director (Glenn Dishong).

RWPG Recommendation:

1. Revise the WUG's population projections as shown in the table below:

City of Georgetown (Bell County)	2020	2030	2040	2050	2060	2070
TWDB 2021 Draft Projections	0	0	0	0	0	0
Difference (from Chisholm Trail SUD)	2,967	3,488	4,027	4,562	5,086	5,602
Revised Population Projections	2,967	3,488	4,027	4,562	5,086	5,602

1.3 Bell County-Other

Summary of Comments Received:

1. No requests received.

Summary of Supporting Materials Received:

1. None.

RWPG Recommendation & Methodology:

2. Move population from Bell County-Other to Bell County WCID No. 3.
3. Move population from Williamson County-Other during 2030 and 2040 to Bell County-Other in order to maintain a consistent growth pattern.

Bell County-Other	2020	2030	2040	2050	2060	2070
TWDB 2021 Draft Projections	**5,458**	**4,618**	**7,635**	**12,863**	**17,816**	**22,565**
Difference (to Bell County WCID No. 3)	**(2,764)**	**(4,618)**	**(7,635)**	**(9,338)**	**(10,411)**	**(11,458)**
Difference (from Williamson County-Other)	**0**	**2,971**	**3,248**	**0**	**0**	**0**
Revised Population Projections	**2,694**	**2,971**	**3,248**	**3,525**	**7,405**	**11,107**

2.0 Summary of Draft Projections and Requested Revisions – Brazos County

TWDB 2021 Draft Projections	2020	2030	2040	2050	2060	2070
City of Bryan	88,475	93,588	119,466	139,045	159,663	181,882
City of College Station	100,537	130,606	139,724	161,911	185,756	212,162
Texas A&M University	11,851	12,000	12,000	12,000	12,000	12,000
Wellborn SUD	10,866	12,597	14,389	16,582	18,931	21,521
Wickson Creek SUD	11,202	12,965	14,731	16,815	18,992	21,339
Brazos County-Other	4,723	2,909	2,687	3,541	4,793	6,625
Total Brazos County	**227,654**	**264,665**	**302,997**	**349,894**	**400,135**	**455,529**
Requested Revisions	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
City of Bryan	84,196	99,959	118,714	140,827	167,176	211,266
City of College Station	100,854	129,102	165,261	195,852	195,852	195,852
Wellborn SUD	16,864	25,740	29,094	32,870	37,074	41,402
Brazos County-Other	2,687	2,687	2,687	2,687	2,687	2,687
From Williamson County-Other	0	17,788	39,490	51,157	33,646	29,017
New Total Brazos County	**227,654**	**267,352**	**305,684**	**352,581**	**402,822**	**458,216**

2.1 Wellborn Special Utility District (WSUD)

Summary of Comments Received:

1. Request for revision to population and water demand projections.
2. The draft population projections for Wellborn Special Utility District (WSUD) in Brazos and Robertson Counties is 14,166. WSUD's current meter count is 7,021 and 1,125 in Brazos and Robinson Counties, respectively.
3. Based on WSUD historical data, they have maintained a 5% annual growth rate for the last 10 years, and their current 2017 population is 20,362.

4. WSUD's total water produced and purchased during 2016 was 3,279 acre-feet (1,065,781,818 gallons). The 2021 Draft TWDB Projections of 2,795 acre-feet for 2020 are too low for WSUD's projected water demands.

Summary of Supporting Materials Received (reference attachments p. 2-4; p. 158-159; p. 167-191):

1. Letter dated May 17, 2017 from the General Manager (Stephen Cast); additional information provided on September 29, 2017.
2. Revision request received by email on May 17, 2017 from Julia Skrivanek.

RWPG Recommendation:

1. Methodology: Assume WSUD's current population (8,146 connections x 2.5 people per connection) represents their 2020 population; 2030 projections for service area located in Brazos County based on WSUD average annual growth rate of 5.0%. Projections for service area located in Brazos County from 2040-2070 are based on decadal growth pattern from original TWDB projections (12%, 12%, 12%, 11%). Projections for service area located in Robertson County are based on 5.0% decadal growth from 2030-2070.

2. Increase WSUD's population projections as shown in the table below:

Wellborn SUD	2020	2030	2040	2050	2060	2070
TWDB 2021 Draft Projections-Brazos	10,866	12,597	14,389	16,582	18,931	21,521
TWDB 2021 Draft Projections-Robertson	3,300	3,635	3,983	4,407	4,864	5,366
Total Draft TWDB Projections	14,166	16,232	18,372	20,989	23,795	26,887
Brazos Difference (from Brazos County-Other)	5,998	13,413	14,705	16,288	18,143	19,881
Robertson Difference (from Robertson County-Other)	1,444	1,346	1,247	1,085	902	689
Revised Population-Brazos	16,864	25,740	29,094	32,870	37,074	41,402
Revised Population-Robertson	4,744	4,981	5,230	5,492	5,766	6,055
Total Revised Pop. Projections	20,362	30,721	34,324	38,362	42,840	47,457

3. Recalculate WSUD's GPCD projections using a 2015 base rate of 143 GPCD from the TWDB Water Use Survey (see Attachments p. 167-191).

Wellborn SUD	2020	2030	2040	2050	2060	2070
TWDB 2021 Draft Projections	176	173	171	171	170	170
WSUD's revised GPCD	133	130	128	128	127	127

2.2 City of Bryan

Summary of Comments Received:

1. Request for revision to population and water demand projections.
2. The draft population projections for the City of Bryan are not accurate and do not reflect the discussion and agreement between the Cities of Bryan and College Station, HDR and BRA during the 2016 Region G planning process.
3. City of College Station was listed as a wholesale water customer of the City of Bryan in the 2016 Region G Water Plan to account for College Station's population located within Bryan's Water CCN.
4. City of Bryan has conducted an independent analysis of population growth within their water CCN by an outside consultant; these projections are quite different than those currently proposed by TWDB for the 2021 Region G planning process.
5. City of Bryan's Water CCN has expanded and now includes additional service area (i.e. Brushy Creek WSC).

Summary of Supporting Materials Received (reference attachments p. 5-7 and p. 160-166):

1. Letter dated June 27, 2017 from the Director of Public Works (Jayson Barfknecht).
2. City of Bryan Long-Term Water Supply Evaluation (memorandum and spreadsheet); received from Allen Woelke w/ CDM Smith on September 29, 2017.
3. Revision request received by email on June 26, 2017 from Jayson Barfknecht.

RWPG Recommendation:

1. Revise the City of Bryan's population projections as shown in the table below:

City of Bryan	2020	2030	2040	2050	2060	2070
TWDB 2021 Draft Projections	**88,475**	**93,588**	**119,466**	**139,045**	**159,663**	**181,882**
Difference (to/from Brazos C-O)	**(4,279)**	**6,371**	**(752)**	**1,782**	**7,513**	**29,384**
Revised Population Projections	**84,196**	**99,959**	**118,714**	**140,827**	**167,176**	**211,266**

2.3 City of College Station

Summary of Comments Received:

1. Request for revision to population and water demand projections.
2. The City of College Station has submitted population projections based on their recent Water Master Plan and a 2.5% growth rate with a 'most dense' scenario for future land use and development; they are estimating their population to plateau at 195,852 by 2050.
3. The City of College Station's Water CCN is fixed (other water providers located adjacently), and their service area will not grow.
4. The City has also provided projected GPCD targets lower than TWDB's estimates.

Summary of Supporting Materials Received (reference attachments p. 8 and p. 167-191):

1. Revision request received by email on May 25, 2017 from David Coleman.
2. Phone discussion with Jennifer Nations regarding GPCD on October 2, 2017.

RWPG Recommendation:

1. Revise the City of College Station's population projections as shown in the table below:

City of College Station	2020	2030	2040	2050	2060	2070
TWDB 2021 Draft Projections	100,537	130,606	139,724	161,911	185,756	212,162
Difference (to/from Brazos C-O)	317	(1,504)	25,537	33,941	10,096	(16,310)
Revised Population Projections	100,854	129,102	165,261	195,852	195,852	195,852

2. Recalculate the City of College Station's GPCD projections using a 2011 base rate of 155 GPCD from the TWDB Water Use Survey (see Attachments p. 167-191).

City of College Station	2020	2030	2040	2050	2060	2070
TWDB 2021 Draft Projections	168	164	162	161	160	160
City's revised GPCD	146	142	140	139	139	138

2.4 Brazos County-Other

Summary of Comments Received:

1. No requests received.

Summary of Supporting Materials Received:

1. None.

RWPG Recommendation & Methodology:

1. Move population from Brazos County Other to City of Bryan, City of College Station and Wellborn SUD.

2. Brazos County-Other for 2020-2070 held constant at 2,687 based on population for 2040 Brazos County-Other (lowest amount during planning period).

3. Move population from Williamson County-Other during 2030-2070.

Brazos County-Other	2020	2030	2040	2050	2060	2070
TWDB 2021 Draft Projections	4,723	2,909	2,687	3,541	4,793	6,625
Difference (to WSUD)	(5,998)	(13,413)	(14,705)	(16,288)	(18,143)	(19,881)
Difference (to/from Bryan)	4,279	(6,371)	752	(1,782)	(7,513)	(29,384)
Difference (to/from College Station)	(317)	1,504	(25,537)	(33,941)	(10,096)	16,310
Difference (from Williamson County-Other)	0	17,788	39,490	51,157	33,646	29,017
Revised Population Projections	2,687	2,687	2,687	2,687	2,687	2,687

3.0 Summary of Draft Projections and Requested Revisions – Johnson County

TWDB 2021 Draft Projections	2020	2030	2040	2050	2060	2070
Action MUD	255	411	514	569	627	693
Alvarado	4,174	4,715	5,273	5,884	6,544	7,250
Bethany WSC	3,879	4,392	4,921	5,501	6,127	6,797
Bethesda WSC	18,180	20,976	23,861	27,024	30,437	34,090
Burleson	34,351	41,851	48,862	53,368	59,303	66,588
Cleburne	38,220	42,564	47,045	51,960	57,261	62,934
Johnson County-Other	11,470	10,919	11,145	9,624	9,334	9,209
Crowley	61	96	132	170	212	257
Double Diamond Utilities	122	127	132	136	139	249
Fort Worth CRU	0	0	0	5,036	8,057	10,072
Godley	1,009	1,139	1,271	1,418	1,574	1,743
Grandview	1,755	1,981	2,214	2,470	2,745	3,039
Johnson County SUD	39,437	45,811	52,381	59,562	67,296	75,558
Keene	7,307	8,557	9,846	11,260	12,785	14,416
Mansfield	2,576	3,695	4,849	6,115	7,481	8,942
Mountain Peak SUD	3,579	4,362	5,170	6,056	7,012	8,035
Parker WSC	3,008	3,763	4,544	5,398	6,320	7,307
Rio Vista	1,117	1,366	1,623	1,906	2,210	2,535
Venus	3,335	3,848	4,377	4,957	5,583	6,253
Total Johnson County	**173,835**	**200,573**	**228,160**	**258,414**	**291,047**	**325,967**

Requested Revisions	2020	2030	2040	2050	2060	2070
Cleburne	38,220	42,564	51,236	60,121	70,546	78,919
Johnson County SUD	42,033	45,973	51,300	56,628	61,955	67,282
Johnson County-Other	8,874	10,757	8,035	4,397	1,390	1,500

3.1 City of Cleburne

Summary of Comments Received:

1. Request for revision to population and water demand projections.
2. The City of Cleburne's revision request is based on the City's Long Range Water Supply Plan.

Summary of Supporting Materials Received (reference attachments p. 142-147):

1. Revision request received by email on July 13, 2017 from the City's Consultant (Lissa Gregg, Freese & Nichols)

RWPG Recommendation:

1. Revise the City's population projections as shown in the table below:

City of Cleburne	2020	2030	2040	2050	2060	2070
TWDB 2021 Draft Projections	**38,220**	**42,564**	**47,045**	**51,960**	**57,261**	**62,934**
Difference (from Johnson C-O)	**0**	**0**	**4,191**	**8,161**	**13,285**	**15,985**
Revised Population Projections	**38,220**	**42,564**	**51,236**	**60,121**	**70,546**	**78,919**

2. Recalculate the City of Cleburne's GPCD projections using a 2011 base rate of 180 GPCD from the TWDB Water Use Survey (see Attachments p. 167-191).:

City of Cleburne	2020	2030	2040	2050	2060	2070
TWDB 2021 Draft Projections	**163**	**159**	**156**	**155**	**155**	**155**
City's proposed GPCD	**171**	**167**	**164**	**163**	**163**	**163**

3.2 Johnson County Special Utility District (JCSUD)

Summary of Comments Received:

1. Request for revision to population and water demand projections.
2. Johnson County Special Utility District's revision request is based on their Water Conservation Plan.
3. Johnson County SUD has coordinated their revision request with both Regions G and C.

Summary of Supporting Materials Received (reference attachments p. 137-141 and p. 148-149):

1. Revision request received by email on July 31, 2017 from the City's consultant.

RWPG Recommendation:

1. Revise Johnson County SUD's population projections as shown in the table below:

JCSUD	2020	2030	2040	2050	2060	2070
TWDB 2021 Draft Projections-Hill	127	147	168	191	216	243
TWDB 2021 Draft Projections -Johnson	39,437	45,811	52,381	59,562	67,296	75,558
TWDB 2021 Draft Projections-Region C	2,485	2,887	3,301	3,753	4,240	4,761
Total Draft TWDB Projections (C&G)	**42,049**	**48,845**	**55,850**	**63,506**	**71,752**	**80,562**
Difference (to/from Brazos G, Hill C-O)	**8**	**1**	**(3)**	**(9)**	**(17)**	**(27)**
Difference (to/from Brazos G, John. C-O)	**2,596**	**162**	**(1,081)**	**(2,934)**	**(5,341)**	**(8,276)**
Difference (to/from Reg. C, Tarrant C-O)	**164**	**10**	**(68)**	**(185)**	**(336)**	**(521)**
Revised Population-Hill (Brazos G)	135	148	165	182	199	216
Revised Population-Johnson (Brazos G)	42,033	45,973	51,300	56,628	61,955	67,282
Total Revised Pop. Projections (Brazos G)	**42,168**	**46,121**	**51,465**	**56,810**	**62,154**	**67,498**
Total Revised Pop. Projections (Region C)	**2,649**	**2,897**	**3,233**	**3,568**	**3,904**	**4,240**
Total Revised Population Projections (C&G)	**44,817**	**49,018**	**54,698**	**60,378**	**66,058**	**71,738**

3.3 Johnson County-Other

Summary of Comments Received:

1. No requests received.

Summary of Supporting Materials Received:

1. None.

RWPG Recommendation & Methodology:

1. Move population from Johnson County-Other to City of Cleburne and Johnson County SUD.

Johnson County-Other (Brazos G)	2020	2030	2040	2050	2060	2070
TWDB 2021 Draft Projections	**11,470**	**10,919**	**11,145**	**9,624**	**9,334**	**9,209**
Difference (to Cleburne)	**0**	**0**	**(4,191)**	**(8,161)**	**(13,285)**	**(15,985)**
Difference (to/from JCSUD)	**(2,596)**	**(162)**	**1,081**	**2,934**	**5,341**	**8,276**
Revised Population Projections	**8,874**	**10,757**	**8,035**	**4,397**	**1,390**	**1,500**

4.0 Summary of Draft Projections and Requested Revisions – Hill County

TWDB 2021 Draft Projections	2020	2030	2040	2050	2060	2070
Birome WSC	741	789	822	855	881	901
Bold Springs WSC	155	167	178	188	199	209
Brandon-Irene WSC	1,750	1,863	1,940	2,018	2,080	2,126
Chatt WSC	726	772	805	837	862	882
Hill County-Other	1,982	2,167	2,138	2,093	1,919	1,854
Double Diamond Utilities	1,863	1,939	2,018	2,078	2,126	2,213
Files Valley WSC	2,538	2,702	2,812	2,928	3,014	3,065
Gholson WSC	677	752	818	885	952	1,017
Hilco United Services	4,039	4,352	4,579	4,819	5,048	5,201
Hill County WSC	3,446	3,669	3,820	3,976	4,093	4,189
Hillsboro	9,313	9,916	10,324	10,744	11,063	11,226
Hubbard	1,585	1,687	1,756	1,827	1,882	1,912
Itasca	1,727	1,839	1,914	1,991	2,051	2,099
Johnson County SUD	127	147	168	191	216	243
Parker WSC	285	303	316	329	338	345
Post Oak SUD	898	963	1,020	1,112	1,239	1,369
Whitney	2,570	2,624	2,732	2,843	2,928	2,997
Woodrow-Osceola WSC	3,406	3,626	3,775	3,929	4,046	4,141
Total Hill County	**37,828**	**40,277**	**41,935**	**43,643**	**44,937**	**45,989**
Requested Revisions	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
Johnson County SUD	135	148	165	182	199	216
Hill County-Other	1,974	2,166	2,141	2,102	1,936	1,881

4.1 Hill County-Other

Summary of Comments Received:

1. No requests received.

Summary of Supporting Materials Received:

1. None.

RWPG Recommendation & Methodology:

1. Move population from Hill County-Other to Johnson County SUD.

Hill County-Other	2020	2030	2040	2050	2060	2070
TWDB 2021 Draft Projections	**1,982**	**2,167**	**2,138**	**2,093**	**1,919**	**1,854**
Difference (to/from JCSUD)	**(8)**	**(1)**	**3**	**9**	**17**	**27**
Revised Population Projections	**1,974**	**2,166**	**2,141**	**2,102**	**1,936**	**1,881**

5.0 Summary of Draft Projections and Requested Revisions – Robertson County

TWDB 2021 Draft Projections	2020	2030	2040	2050	2060	2070
Bethany Hearne WSC	323	354	384	414	443	471
Bremond	989	1,085	1,174	1,266	1,355	1,442
Calvert	1,193	1,193	1,193	1,193	1,193	1,193
Robertson County-Other	1,353	2,007	2,564	3,075	3,509	3,860
Franklin	1,851	2,031	2,199	2,373	2,539	2,699
Hearne	4,474	4,474	4,474	4,474	4,474	4,474
Robertson County WSC	2,957	3,245	3,510	3,789	4,054	4,311
Twin Creek WSC	1,496	1,643	1,776	1,918	2,052	2,183
Wellborn SUD	3,300	3,635	3,983	4,407	4,864	5,366
Wickson Creek SUD	422	483	544	616	691	772
Total Robertson County	**18,358**	**20,150**	**21,801**	**23,525**	**25,174**	**26,771**
Requested Revisions	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
City of Franklin	1,851	2,031	2,357	2,735	3,175	3,684
City of Hearne	4,474	5,454	6,648	6,648	6,648	6,648
Robertson County WSC	2,849	3,458	4,072	4,806	5,541	6,208
Wellborn SUD	4,744	4,981	5,230	5,492	5,766	6,055

Robertson County-Other	1,353	1,353	1,353	1,353	1,353	1,353
From Williamson County-Other	1,336	1,885	2,930	2,916	3,043	3,238
New Total Robertson County	**19,694**	**22,035**	**24,731**	**26,441**	**28,217**	**30,009**

5.1 Cities of Franklin and Hearne

Summary of Comments Received:

1. Request for revision to population and water demand projections.
2. The County Judge is concerned that the draft population and water demand projections for the Cities of Calvert and Hearne should be much higher.
3. Bethany WSC and Humble Addition WSC customers are now entirely served by the City of Hearne and would like the projections adjusted accordingly.
4. The City of Franklin sells water to North Hamilton Hill WSC; Franklin has 875 meters in their ETJ and service area. County Judge stated that the 2010 Census was administered incorrectly for the City of Franklin.
5. Based on population data collected by Robertson County, an increase in growth rate (approximately 3-6%) is requested for Bremond, Franklin and Hearne.
6. Calvert has minimal amenities to significantly enhance sustainable growth at this time. United Gypsum is scheduled to construct a dry wall production facility in the near future; this plant will employ 70 people and will be completed within three years.
7. Union Pacific Railroad scheduled to implement $600M project; they will initially employ 400 people plus an additional 1,500 over a 5-year period in the City of Hearne.

Summary of Supporting Materials Received (reference attachments p. 14-24 and p. 31-32):

1. Revision request received by email on June 28, 2017 from Judge Ellison
2. Supporting data provided by Cathy Lazarus (Hearne EDC Board Member) on behalf of Judge Ellison; emails including attachments submitted on June 16, 21 and 28.

RWPG Recommendation:

1. Methodology: City of Franklin - Average annual growth rate of 1.5% applied to TWDB Draft 2030 population and projected through 2070; City of Hearne - Average annual growth rate of 2.0% applied to TWDB Draft 2020 population and projected through 2040. The draft TWDB population projections for the Cities of Bremond and Calvert remain unchanged.

2. Increase each of the Cities' population projections as shown in the table below:

Franklin	2020	2030	2040	2050	2060	2070
TWDB 2021 Draft Projections	**1,851**	**2,031**	**2,199**	**2,373**	**2,539**	**2,699**
Difference (from Robertson C-O)	**0**	**0**	**158**	**362**	**636**	**985**
Revised Population-Franklin	**1,851**	**2,031**	**2,357**	**2,735**	**3,175**	**3,684**

Hearne	2020	2030	2040	2050	2060	2070
TWDB 2021 Draft Projections	4,474	4,474	4,474	4,474	4,474	4,474
Difference (from Robertson C-O)	0	980	2,174	2,174	2,174	2,174
Revised Population-Hearne	4,474	5,454	6,648	6,648	6,648	6,648

5.2 Robertson County Water Supply Corporation (RCWSC)

Summary of Comments Received:

1. Request for revision to population and water demand projections.
2. Robertson County Water Supply Corporation (RCWSC) states that the draft population projections are incorrect and on the low side. RCWSC will compile and submit their supporting documentation soon.

Summary of Supporting Materials Received (reference attachments p. 36-37, p. 155-157, and 167-191):

1. Revision request received by email on June 20, 2017 from the General Manager (John Elliott).
2. Spreadsheet summary of population growth projections (prepared by consultant) submitted by General Manager on October 2, 2017.

RWPG Recommendation:

1. Revise Robertson County WSC's population projections as shown in the table below:

Robertson County WSC	2020	2030	2040	2050	2060	2070
TWDB 2021 Draft Projections	2,957	3,245	3,510	3,789	4,054	4,311
Difference (to/from Robertson C-O)	(108)	213	562	1,017	1,487	1,897
Revised Population Projections	2,849	3,458	4,072	4,806	5,541	6,208

2. Recalculate RCWSC's GPCD projections using a 2015 base rate of 125 GPCD from the TWDB Water Use Survey.

Robertson County WSC	2020	2030	2040	2050	2060	2070
TWDB 2021 Draft Projections	72	68	66	64	64	64
RCWSC's revised GPCD	116	112	120	108	108	108

5.3 Robertson County-Other

Summary of Comments Received:

1. No requests received.

Summary of Supporting Materials Received:

1. None.

RWPG Recommendation & Methodology:

1. Move population from Robertson County-Other to City of Franklin, City of Hearne and Robertson County WSC.

2. Robertson County-Other for 2020-2070 held constant at 1,353 based on population for 2020 Robertson County-Other (lowest amount during planning period).

Robertson County-Other	2020	2030	2040	2050	2060	2070
TWDB 2021 Draft Projections	1,353	2,007	2,564	3,075	3,509	3,860
Difference (to Franklin)	0	0	(158)	(362)	(636)	(985)
Difference (to Hearne)	0	(980)	(2,174)	(2,174)	(2,174)	(2,174)
Difference (to/from RCWSC)	108	(213)	(562)	(1,017)	(1,487)	(1,897)
Difference (to Wellborn SUD)	(1,444)	(1,346)	(1,247)	(1,085)	(902)	(689)
Difference (from Williamson C-O)	1,336	1,885	2,930	2,916	3,043	3,238
Revised Population Projections	1,353	1,353	1,353	1,353	1,353	1,353

6.0 Summary of Draft Projections and Requested Revisions – Williamson County

TWDB 2021 Draft Projections	2020	2030	2040	2050	2060	2070
Bartlett	1,047	1,119	1,207	1,303	1,411	1,523
Bell-Milam Falls WSC	289	363	455	554	666	783
Block House MUD	6,419	6,419	6,419	6,419	6,419	6,419
Brushy Creek MUD	25,350	27,595	27,595	27,595	27,595	27,595
Cedar Park	81,716	90,641	90,641	90,641	90,641	90,641
Chisholm Trail SUD	24,194	30,392	38,113	46,427	55,854	65,602
Williamson County-Other	28,684	37,315	52,198	44,899	69,190	91,040
Fern Bluff MUD	5,793	5,793	5,793	5,793	5,793	5,793
Florence	1,357	1,439	1,542	1,653	1,779	1,909
Georgetown	78,297	98,358	123,342	150,248	180,757	212,304
Granger	1,551	1,659	1,796	1,942	2,108	2,280

Hutto	31,492	43,919	59,394	76,060	94,959	114,500
Jarrell-Schwertner WSC	4,106	5,049	6,202	7,436	8,810	10,224
Jonah Water SUD	15,254	19,163	24,031	29,273	35,217	41,364
Leander	41,071	69,551	115,635	188,502	238,648	293,630
Liberty Hill	2,063	2,592	3,250	3,959	4,763	5,595
Manville WSC	10,728	13,476	16,900	20,586	24,767	29,089
Paloma Lake MUD 1	1,468	1,846	2,293	2,776	3,322	3,891
Paloma Lake MUD 2	1,647	2,067	2,570	3,110	3,723	4,360
Pflugerville	373	469	588	717	862	1,013
Round Rock	157,819	198,258	248,614	302,845	364,345	427,932
Sonterra MUD	2,450	3,829	4,811	5,979	7,237	8,664
Southwest Milam WSC	1,816	2,283	2,862	3,486	4,196	4,927
Taylor	17,233	18,728	20,589	22,594	24,868	27,220
Thorndale	3	3	4	5	7	8
Walsh Ranch MUD	1,073	1,348	1,676	2,028	2,428	2,844
Williamson County MUD #10	4,487	5,638	7,070	8,612	10,361	12,169
Williamson County MUD #11	2,809	3,530	4,426	5,392	6,486	7,619
Williamson County MUD #9	4,247	5,336	6,691	8,151	9,806	11,518
Williamson County WSID 3	2,323	2,917	3,626	4,389	5,255	6,154
Williamson Travis Co. MUD 1	4,596	4,596	4,596	4,596	4,596	4,596
Total Williamson County	**561,755**	**705,691**	**884,929**	**1,077,970**	**1,296,869**	**1,523,206**

Requested Revisions	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
Brushy Creek MUD	20,248	20,248	20,248	20,248	20,248	20,248
Chisholm Trail SUD	0	0	0	0	0	0
Georgetown	118,763	157,075	196,912	244,043	296,697	358,109
Hutto	17,326	35,646	37,963	56,194	83,181	101,202
Jarrell-Schwertner WSC	0	0	0	0	0	0
Jarrell CRU*	4,786	5,838	7,118	8,499	10,044	11,656
Jonah Water SUD	23,500	29,522	37,022	45,097	54,255	63,275
Leander	48,575	74,150	97,757	121,365	150,905	185,879
Manville WSC	12,107	14,528	17,434	20,920	25,105	30,126
Paloma Lake MUD 1	2,339	3,210	3,210	3,210	3,210	3,210
Paloma Lake MUD 2	2,058	2,469	2,469	2,469	2,469	2,469
Round Rock	123,598	154,326	193,827	239,565	239,565	239,565
Sonterra MUD	5,895	6,195	6,495	6,795	7,095	7,395
Walsh Ranch MUD	714	714	714	714	714	714
Williamson County MUD 10	3,402	3,402	3,402	3,402	3,402	3,402
Williamson County MUD 11	4,074	4,084	4,094	4,104	4,114	4,124

Number updated from 63,725 (just a typo.)

Number updated from 25,646 to 35,646 to correct difference from Hutto to Willco-Other

Williamson County MUD 9	2,724	2,724	2,724	2,724	2,724	2,724
Williamson County WSID 3	6,828	7,128	7,428	7,728	8,028	8,328
Williamson County-Other	39,226	25,684	60,702	93,158	200,315	295,818
Revised Williamson County Total	**560,419**	**683,047**	**839,261**	**1,023,897**	**1,260,180**	**1,490,951**

* New WUG created that is comprised of both the City of Jarrell and Jarrell-Schwertner WSC (Williamson County only)

Corrected for Hutto correction

Corrected for Jonah SUD correction

6.1 Creek Municipal Utility District (BCMUD)

Su ments Received:

1. Request for revision to population and water demand projections.
2. The Census data includes all of Brushy Creek Municipal Utility District (BCMUD), but also includes multiple other MUDs, neighborhoods, and rural areas not served by BCMUD. These other areas are served by the cities of Cedar Park, Round Rock, and Leander.
3. BCMUD is requesting to have the population estimates corrected for the Brazos G study to reflect 20,248 in all future years since BCMUD has reached build out for residential connections.
4. The documentation included in the Brazos G letter indicates that the gallons per capita per day (GPCD) amount for BCMUD is predicted to be 221 in 2020, dropping to 215 by 2070. BCMUD states this data is inconsistent with information produced by the District. Calendar year 2011 was a significant drought year and not a preferred data point for the demand baseline; BCMUD has addressed the water loss issue and consumption has been fairly consistent in the years since 2011 and 2012 BCMUD is requesting a demand revision to use an average GPCD of 146 based on 2015 data.

Summary of Supporting Materials Received (reference attachments p. 44-61):

1. Revision request received by email on May 22, 2017 from the General Manager (Mike Petter).

RWPG Recommendation:

1. Revise BCMUD's population projections as shown in the table below:

BCMUD	2020	2030	2040	2050	2060	2070
TWDB 2021 Draft Projections	**25,350**	**27,595**	**27,595**	**27,595**	**27,595**	**27,595**
Difference (to Williamson C-O)	**(5,102)**	**(7,347)**	**(7,347)**	**(7,347)**	**(7,347)**	**(7,347)**
Revised Population Projections	**20,248**	**20,248**	**20,248**	**20,248**	**20,248**	**20,248**

2. Recalculate BCMUD's GPCD projections using a 2015 base rate of 146 GPCD from the TWDB Water Use Survey:

BCMUD	2020	2030	2040	2050	2060	2070
TWDB 2021 Draft Projections	221	218	217	216	215	215
BCMUD's revised GPCD	136	133	132	131	131	131

6.2 City of Georgetown

Summary of Comments Received:

1. Request for revision to population and water demand projections.
2. The City of Georgetown has acquired all of the water supply assets of Chisholm Trail SUD; Chisholm Trail SUD is no longer a water supply entity. This change has been approved by the Public Utility Commission, and the Chisholm Trail SUD CCN has been transferred to the City of Georgetown.
3. The City's population and water demand projections need to include those previously identified for Chisholm Trail SUD. Note that Georgetown also added as a WUG in Bell County to accommodate portion of Chisholm Trail SUD located in Bell County.
4. Numerous entities in Williamson County, including City of Georgetown, previously met three times to discuss their population projections and agreed on their overall revisions on August 16, 2017.

Summary of Supporting Materials Received (reference attachments p. 63-108):

1. Revision request received by email on June 28, 2017 from the Utility Director (Glenn Dishong).

RWPG Recommendation:

1. Revise the WUG's population projections as shown in the table below:

City of Georgetown	2020	2030	2040	2050	2060	2070
TWDB 2021 Draft Projections-Georgetown	78,297	98,358	123,342	150,248	180,757	212,304
TWDB 2021 Draft Projections-Chisholm Trail SUD (Will. Co.)	24,194	30,392	38,113	46,427	55,854	65,602
Difference (from Williamson C-O)	16,272	28,325	35,457	47,368	60,086	80,203
Revised Population Projections-Georgetown	118,763	157,075	196,912	244,043	296,697	358,109

6.3 City of Hutto

Summary of Comments Received:

1. Request for revision to population and water demand projections.
2. The City of Hutto's revision request is based on the City's Water Master Plan.

Summary of Supporting Materials Received (reference attachme

1. Revision request received by email on June 29, 2017 from the C (Matt Rector).

Changed difference to Willco from (18,273) to (8,273), resulting in 10,000 additional in 2030.

RWPG Recommendation:

1. Revise the City's population projections as shown in the table below:

City of Hutto	2020	2030	2040	2050	2060	2070
TWDB 2021 Draft Projections	31,492	43,919	59,394	76,060	94,959	114,500
Difference (to Williamson C-O)	(14,166)	(8,273)	(21,431)	(19,866)	(11,778)	(13,298)
Revised Population Projections	17,326	35,646	37,963	56,194	83,181	101,202

6.4 New WUG – Jarrell CRU

Summary of Comments Received:

1. Jarrell-Schwertner WSC serves a substantial portion of the City of Jarrell.
2. The City of Jarrell operates a retail water system that serves several commercial properties and approximately 200 homes in a development called 'Home Place'. The City is expecting several additional developments that will further increase the number of water connections. The City of Jarrell water system serves approximately 680 people according to the Assistant City Manager.
3. Since the City of Jarrell's 2016 water demands are 28 acre-feet per year, the City's use is below the criteria to be classified as a WUG. As a result, a new WUG (Jarrell CRU) will be created that is comprised of both the City of Jarrell and Jarrell-Schwertner WSC. This only applies to the portion of Jarrell-Schwertner WSC that is located in Williamson County. The Bell County portion will remain separate as Jarrell-Schwertner WSC in Bell County.

Summary of Supporting Materials Received (reference attachments p. 128):

1. Revision request received by email on July 25, 2017 from the Assistant City Manager (Bill Lawson).

RWPG Recommendation:

1. Methodology: 2020 Population provided by Assistant City Manager; 2030-2070 projections based on average annual growth rate of 1.5% applied to 2020 population.

2. Revise the City's population projections as shown in the table below:

Jarrell CRU	2020	2030	2040	2050	2060	2070
City of Jarrell – from Williamson County-Other	680	789	916	1,063	1,234	1,432
TWDB 2021 Draft Projections - Jarrell-Schwertner WSC	4,106	5,049	6,202	7,436	8,810	10,224
Total Jarrell CRU	4,786	5,838	7,118	8,499	10,044	11,656

6.5 City of Leander

Summary of Comments Received:

1. Request for revision to population and water demand projections.
2. The City of Leander's revision request is based on the City's Comprehensive Plan.
3. The City of Leander has coordinated their revision request with both Regions G and K.

Summary of Supporting Materials Received (reference attachments p. 113-121 and p. 167-191):

1. Revision requests received by email on June 30 and August 4, 2017 from the Public Works Director (Pat Womack).

RWPG Recommendation:

1. Revise the City's population projections as shown in the table below:

City of Leander	2020	2030	2040	2050	2060	2070
TWDB 2021 Draft Projections-Brazos G	41,071	69,551	115,635	188,502	238,648	293,630
TWDB 2021 Draft Projections-Region K	9,491	24,827	43,093	46,640	48,403	50,610
Total TWDB 2021 Draft Projections (G&K)	50,562	94,378	158,728	235,142	287,051	344,240
Difference (to/from Williamson C-O) (Brazos G)	7,504	4,599	(17,878)	(67,137)	(87,743)	(107,751)
Revised Population Projections-Brazos G	48,575	74,150	97,757	121,365	150,905	185,879
Difference (to/from Travis C-O) (Region K)	1,755	1,908	(20,570)	(16,677)	(17,714)	(18,577)
Revised Population Projections-Region K	11,246	26,735	28,349	29,963	30,689	32,033
Total Revised Projections (G&K)	59,821	100,885	126,106	151,328	181,594	217,912

2. Recalculate the City of Leander's GPCD projections using a 2015 GPCD of 128, as provided by the TWDB in the Historical Population and GPCD estimates spreadsheet (see Attachment p. 192 - 198):

City of Leander	2020	2030	2040	2050	2060	2070
TWDB 2021 Draft Projections	**107**	**105**	**104**	**104**	**104**	**104**
City's revised GPCD	**120.60**	**118.54**	**117.99**	**117.78**	**117.71**	**117.67**

6.6 City of Round Rock

Summary of Comments Received:

1. Request for revision to population and water demand projections.
2. The City of Round Rock's revision request is based on the City's Water Master Plan prepared by the Utilities Department, the City's Planning Department (estimated population growth) and actual growth rates occurring within the City.
3. The population projections listed for Round Rock do not include the MUDs located in the City's ETJ since they are listed separately in the Region G Water Plan.
4. The City of Round Rock population projections do not include the portion of the City's ETJ currently served by Jonah Water SUD.
5. Fern Bluff MUD is completely built out; their population projections remain unchanged.

Summary of Supporting Materials Received (reference attachments p. 122 and p. 124-126):

1. Revision requests received by email on July 24, August 17, September 25 and October 2, 2017 from the Utility and Environmental Services Director (Michael Thane).

RWPG Recommendation:

1. Revise the City's population projections as shown in the table below:

City of Round Rock	2020	2030	2040	2050	2060	2070
TWDB 2021 Draft Projections	**157,819**	**198,258**	**248,614**	**302,845**	**364,345**	**427,932**
Difference (to Williamson C-O)	**(34,221)**	**(43,932)**	**(54,787)**	**(63,280)**	**(124,780)**	**(188,367)**
Revised Population Projections	**123,598**	**154,326**	**193,827**	**239,565**	**239,565**	**239,565**

2. Revisions to the population projections for the MUDs (all WUGs) located within the City's ETJ are shown in the table below:

Paloma Lake MUD No. 1	2020	2030	2040	2050	2060	2070
TWDB 2021 Draft Projections	1,468	1,846	2,293	2,776	3,322	3,891
Difference (to/from Williamson County-Other)	871	1,364	917	434	(112)	(681)
Revised Population Projections*	2,339	3,210	3,210	3,210	3,210	3,210

*Developer estimates construction of total 1070 lots (3 persons/lot) completed about 2022 and built out afterwards. The average of the original 2020 and new 2030 values were used to calculate the new 2020.

Paloma Lake MUD No. 2	2020	2030	2040	2050	2060	2070
TWDB 2021 Draft Projections	1,647	2,067	2,570	3,110	3,723	4,360
Difference (to/from Williamson County-Other)	411	402	(101)	(641)	(1,254)	(1,891)
Revised Population Projections**	2,058	2,469	2,469	2,469	2,469	2,469

**Developer estimates construction of total 823 lots (3 persons/lot) completed about 2022 and built out afterwards. The average of the original 2020 and new 2030 values were used to calculate the new 2020.

Sonterra MUD	2020	2030	2040	2050	2060	2070
TWDB 2021 Draft Projections	2,450	3,829	4,811	5,979	7,237	8,664
Difference (to/from Williamson County-Other)	3,445	2,366	1,684	816	(142)	(1,269)
Revised Population Projections	5,895	6,195	6,495	6,795	7,095	7,395

Walsh Ranch MUD	2020	2030	2040	2050	2060	2070
TWDB 2021 Draft Projections	1,073	1,348	1,676	2,028	2,428	2,844
Difference (to/from Williamson County-Other)	(359)	(634)	(962)	(1,314)	(1,714)	(2,130)
Revised Population Projections	714	714	714	714	714	714

Williamson Co. MUD #9	2020	2030	2040	2050	2060	2070
TWDB 2021 Draft Projections	4,247	5,336	6,691	8,151	9,806	11,518
Difference (to Williamson C-O)	(1,523)	(2,612)	(3,967)	(5,427)	(7,082)	(8,794)
Revised Population Projections	2,724	2,724	2,724	2,724	2,724	2,724

Williamson Co. MUD #10	2020	2030	2040	2050	2060	2070
TWDB 2021 Draft Projections	4,487	5,638	7,070	8,612	10,361	12,169
Difference (to Williamson C-O)	(1,085)	(2,236)	(3,668)	(5,210)	(6,959)	(8,767)
Revised Population Projections	3,402	3,402	3,402	3,402	3,402	3,402

Williamson Co. MUD #11	2020	2030	2040	2050	2060	2070
TWDB 2021 Draft Projections	2,809	3,530	4,426	5,392	6,486	7,619
Difference (to/from Williamson County-Other)	1,265	554	(332)	(1,288)	(2,372)	(3,495)
Revised Population Projections	4,074	4,084	4,094	4,104	4,114	4,124

Williamson Co. WSID No. 3	2020	2030	2040	2050	2060	2070
TWDB 2021 Draft Projections	2,323	2,917	3,626	4,389	5,255	6,154
Difference (from Williamson C-O)	4,505	4,211	3,802	3,339	2,773	2,174
Revised Population Projections	6,828	7,128	7,428	7,728	8,028	8,328

6.7 Jonah Water Special Utility District

Summary of Comments Received:

1. Request for revision to population and water demand projections.
2. Jonah Water Special Utility District's revision request is based on their water master plan.

Summary of Supporting Materials Received (reference attachments):

1. Revision request submitted by the General Manager during the Williamson County discussion at the City of Georgetown on August 9, 2017.

RWPG Recommendation:

1. Methodology: Assume today's population at 23,500 (6,728 connections x 3.5 persons/connection). Projections from 2030-2070 based on decadal growth pattern from original TWDB projections (26%, 25%, 22%, 20%, 17%).

2. Revise Jonah Water SUD's population projections as shown in the table below:

Jonah Water SUD	2020	2030	2040	2050	2060	2070
TWDB 2021 Draft Projections	15,254	19,163	24,031	29,273	35,217	41,364
Difference (from Williamson C-O)	8,246	10,359	12,991	15,824	19,038	21,911
Revised Population Projections	23,500	29,522	37,022	45,097	54,255	63,275

Corrected transcription error, from 63,725 to 63,275.

6.8 Manville Water Supply Corporation

Summary of Comments Received:

1. Request for revision to population and water demand projections.
2. Manville Water Supply Corporation's revision request is based on their historical connection trend.
3. Manville WSC is coordinating their revision request with both Regions G and K.

Summary of Supporting Materials Received (reference attachments p. 154):

1. Revision request submitted via email by the General Manager's Assistant (Rexanne Pilkenton) on October 2, 2017.

RWPG Recommendation:

1. Methodology: Determine today's population based on 1.4% average annual growth rate applied to 2016 population. Projections from 2030-2070 based on decadal growth pattern from original TWDB projections (assume 20% for each decade).

2. Revise Manville WSC's population projections as shown in the table below:

Manville WSC	2020	2030	2040	2050	2060	2070
TWDB 2021 Draft Projections	10,728	13,476	16,900	20,586	24,767	29,089
Difference (from Williamson C-O)	1,379	1,052	534	334	338	1,037
Revised Population Projections	12,107	14,528	17,434	20,920	25,105	30,126

6.9 Williamson County-Other

Summary of Comments Received:

1. No requests received.

Summary of Supporting Materials Received:

1. None.

RWPG Recommendation & Methodology:

1. Move population from Williamson County-Other to/from Brushy Creek MUD, City of Georgetown, City of Hutto, Jarrell CRU, City of Leander, City of Round Rock, Paloma Lake MUD No. 1, Paloma Lake MUD No. 2, Sonterra MUD, Walsh Ranch MUD, Williamson County MUD #9, Williamson County MUD #10, Williamson County MUD #11, Williamson County WSID No. 3, Jonah Water SUD, and Manville WSC.

Williamson County-Other	2020	2030	2040	2050	2060	2070
TWDB 2021 Draft Projections	28,684	37,315	52,198	44,899	69,190	91,040
Difference (to Bell County-Other)	0	(2,971)	(3,248)	0	0	0
Difference (to Brazos County-Other)	0	(17,788)	(39,490)	(51,157)	(33,646)	(29,017)
Difference (to Robertson C-O)	(1,336)	(1,885)	(2,930)	(2,916)	(3,043)	(3,238)
Difference (from Brushy Creek MUD)	5,102	7,347	7,347	7,347	7,347	7,347
Difference (to City of Georgetown)	(16,272)	(28,325)	(35,457)	(47,368)	(60,086)	(80,203)
Difference (from City of Hutto)	14,166	8,273	21,431	19,866	11,778	13,298
Difference (to Jarrell CRU)	(680)	(789)	(916)	(1,063)	(1,234)	(1,432)
Difference (to/from City of Leander)	(7,504)	(4,599)	17,878	67,137	87,743	107,751
Difference (from City of Round Rock)	34,221	43,932	54,787	63,280	124,780	188,367
Difference (to/from Paloma Lake MUD No. 1)	(871)	(1,364)	(917)	(434)	112	681
Difference (to/from Paloma Lake MUD No. 2)	(411)	(402)	101	641	1,254	1,891
Difference (to/from Sonterra MUD)	(3,445)	(2,366)	(1,684)	(816)	142	1,269
Difference (from Walsh Ranch MUD)	359	634	962	1,314	1,714	2,130
Difference (from Williamson Co. MUD #9)	1,523	2,612	3,967	5,427	7,082	8,794
Difference (from Williamson Co. MUD #10)	1,085	2,236	3,668	5,210	6,959	8,767
Difference (to/from Williamson Co. MUD #11)	(1,265)	(554)	332	1,288	2,372	3,495
Difference (to Williamson Co. WSID No. 3)	(4,505)	(4,211)	(3,802)	(3,339)	(2,773)	(2,174)
Difference (to Jonah Water SUD)	(8,246)	(10,359)	(12,991)	(15,824)	(19,038)	(21,911)
Difference (to Manville WSC)	(1,379)	(1,052)	(534)	(334)	(338)	(1,037)
Revised Population Projections	39,226	25,684	60,702	93,158	200,315	295,818

From:	Temple McKinnon <Temple.McKinnon@twdb.texas.gov>
Sent:	Tuesday, February 6, 2018 3:24 PM
To:	wlwilsoncattlecompany@gmail.com
Cc:	'stephen.hamlin@Brazos.org'; 'amy.muttoni@Brazos.org'; Trey Buzbee (Trey.Buzbee@brazos.org); Dunn, David; Thomas Barnett; Ron Ellis; Sarah Backhouse; Yun Cho; Matt Nelson; Jessica Zuba
Subject:	TWDB Response to Revision Request from Region G
Attachments:	TWDB_Review_Region G.zipx

Dear Chairman Wilson,

The TWDB Staff and representatives of the Texas Commission on Environmental Quality, Texas Parks and Wildlife Department, and Texas Department of Agriculture have reviewed the request to revise the 2021 Regional Water Plan draft population and water demand projections submitted by Region G.

It is the consensus of the four agencies that the requested revisions to the draft projections are reasonable and consistent with criteria and data requirements as identified in the General Guidelines for the Fifth Cycle of Regional Water Plan Development (Exhibit C) and will be recommended to our Board to consider for adoption.

The Board is responsible for adopting population and water demand projections as specified in 31 TAC §357.31(e)(1). We plan to present the projections to our Board for consideration of adoption at an April Board meeting.

Attached are copies of the recommended population and water demand projections for all water user groups in your region. Basin split level projections for both municipal and non-municipal projections are also included in the attached file #4. **While the review period for whole WUG projections has ended, please take this opportunity to review both sets of basin level projections and send any suggested changes to us in the attached Excel file by February 22nd** or anytime earlier. If we do not hear from you by then, it is assumed that the planning group has no suggested changes to the basin level projections provided by the TWDB.

Attached are:

1. **Region G_Summary_Revision (pdf):** The summary of the region's overall request and the TWDB staff review and recommendations
2. **Region G_Population and Municipal Revision Request_TWDBReview**: (Excel table): The TWDB staff comment & recommendation for each municipal WUG level request
3. **Region G_Non-Municipal Revision Request_TWDBReview**: (Excel table – 5 separate tabs for each water demand category): The TWDB staff comment & recommendation for each non-municipal WUG level request
4. **Region G_Recommended Projections split by basin** (Excel table – 2 separate tabs): basin level municipal & non-municipal projections

If you or any member of your group has any questions regarding this matter, please contact Yun Cho, Manager of Economic and Demographic Analysis.

Thank you.

Temple

Temple McKinnon
Director, Water Use, Projections & Planning Division
Texas Water Development Board www.twdb.texas.gov
1700 N. Congress Avenue, P.O. Box 13231, Austin, TX 78711-3231
(512) 475-2057
FB | Twitter | TWDB News Sign-up

Appendix J
Model Drought and Water Conservation Plans

J-1. City of Waco Water Conservation and Drought Contingency Plan

J-2. City of Thrall Drought Contingency Plan

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City of Waco

2019 Water Conservation & Drought Contingency Plan

A – 2019 Water Conservation Plan

B – 2019 Drought Contingency Plan

A

City of Waco
Water Conservation Plan

2019

The City of Waco Water Conservation Plan is intended to enable the city to meet or exceed its own water conservation goals, including: quantified 5 and 10 year GPCD targets and in general, reduce consumption, loss, waste and peak demand while improving water use efficiency and extending the life of the water supply and system.

Water Conservation Plan: Updated for 2019

CITY OF WACO WATER CONSERVATION PLAN

1. INTRODUCTION AND OBJECTIVES

Water supply has always been a key issue in the development of Texas. In recent years, the increasing population and economic development in Region G have led to growing demands for water. Additional supplies to meet higher demands will be expensive and difficult to develop. Therefore, it is important that we make efficient use of existing supplies and make them last as long as possible. This will delay the need for new supplies, minimize the environmental impacts associated with developing new supplies, and delay the high cost of additional water supply development.

Recognizing the need for efficient use of existing water supplies, the Texas Commission on Environmental Quality (TCEQ) has developed guidelines and requirements governing the development of water conservation and drought contingency plans for public water suppliers.

The City of Waco has adopted this water conservation and drought contingency plan pursuant to TAC Title 30, Part 1, Chapter 288. The objectives of the water conservation plan are:

- To reduce water consumption
- To reduce the loss and waste of water
- To reduce summertime peak demand
- To improve efficiency in the use of water
- To extend the life of current water supplies

2. UTILITY PROFILE

Current Service Area: 99 square miles
Current Population of Service Area: 137,801
Served by Water and Wastewater: 137,801

Historical Population

Year	Historical Population Served by Retail Water Service	Historical Population Served by Wholesale Water Service	Historical Population Served by Wastewater Service
2014	132,384	53,909	132,384
2015	133,722	54,449	133,722
2016	135,072	54,994	135,072
2017	136,436	55,544	136,436
2018	137,801	56,100	137,801

Projected Populations

Year	Projected Population Served by Retail Water Service	Projected Population Served by Wholesale Water Service	Projected Population Served by Wastewater Service
2020	140,557	57,222	140,557
2030	154,613	62,944	154,613
2040	170,075	69,238	170,075
2050	187,083	76,162	187,083
2060	205,791	83,778	205,791

Population and projected populations calculated using U.S. Census data and assuming 1% growth annually, which has been approximate growth for the previous 30 years.

Historical System Input

Year	Self-Supplied Water in Gallons	Purchased/Imported Water in Gallons	Exported Water in Gallons	Total System Input	Total GCPD
2014	11,953,475,325	0	1,086,517,700	10,866,957,625	237
2015	11,521,589,656	0	1,035,560,340	10,486,029,316	207
2016	12,690,845,926	0	782,424,600	11,908,421,326	215
2017	11,909,094,190	0	854,049,700	11,055,044,490	207
2018	11,372,793,939	0	1,148,884,184	10223909755	203
Historic 5 Yr. Average	11,889,559,807	0	981,487,305	10,908,072,502	214

Historical water use data reflects treated water, determined from master meter at the point where treated water leaves the treatment plant and enters the distribution system.

Water Supply System

Designed Daily Capacity of System:	90 MGD
Elevated Storage:	20.5 million gallons
Ground Storage:	10.6 million gallons

Water Supply Sources

Water Supply Source	Source Type*	Total Gallons
Lake Waco	Surface	25,700,000,000
Trinity Aquifer	Ground	289,168,943
Brazos River	Surface	1,800,000,000

Projected Demands

Year	Population	Water Demand (gallons)
2020	194,199	11,733,844,471
2021	196,141	11,780,779,849
2022	198,102	11,827,902,968
2023	200,083	11,875,214,580
2024	202,083	11,922,715,438
2025	204,103	11,970,406,299
2026	206,144	12,018,287,924
2027	208,205	12,066,361,075
2028	210,287	12,114,626,519
2029	212,389	12,163,085,025

Projected populations calculated using U.S. Census data and assuming1% growth annually, which has been approximate growth for the previous 30 years. Projected water demands calculated using 0.4% increase annually which is slightly higher than historical trends to account for anticipated economic growth in the downtown/river area.

High Volume Retail Customers

Retail Customer	Water Use Category	Annual Water Use	Treated or Raw
Cargill Meat Solutions	**Industrial**	**258,177,200**	**Treated**
Coca Cola North America	**Industrial**	**256,075,000**	**Treated**
Pilgrim's Pride Corporation	**Industrial**	**224,8,95,000**	**Treated**
Mars Chocolate North America	**Industrial**	**131,130,000**	**Treated**
Huck Fasteners	**Industrial**	**73,916,000**	**Treated**

Wholesale Customers

Wholesale Customer	Contracted Amount (Acre Ft)	Previous year Amount of Water Delivered (Acre Ft)
Hewitt		**306.63**
Lacy Lakeview	**1120.14**	**794.14**
Robinson	**561**	**545.32**
West	**1120.14**	**151.11**
Woodway	**1120.14**	**1,565.22**
Central Bosque	**96.68**	**92.87**
Bold Springs	**560.07**	**0.00**

Wholesale Customer Service Area Specific, Quantified 5 & 10 Year Targets for Water Savings

	5-year goal	10-year goal
TOTAL GCPD	196	176
Water Loss Percentage	8%	7%

Retail Connections

Water Use Category	Active Retail Connections			
	Metered	Unmetered	Total Connections	% of Total Connections
Residential - Single Family	37599		37599	87%
Residential - Multi Family	849		849	2%
Industrial	64		64	0%
Commercial	4600		4600	11%
Institutional	0		0	0%
Agricultural	0		0	0%
TOTAL	43112		43112	

New Retail Connections Historically

Water Use Category	Net number of New Retail Connections				
	2014	2015	2016	2017	2108
Residential - Single Family	0	536	564	362	515
Residential - Multi Family	132	558	51	25	9
Industrial	0	36	0	0	2
Commercial	0	0	0	0	677
Institutional	0	0	0	0	0
Agricultural	0	0	0	0	0
TOTAL	132	1130	615	387	1203

Historic Water Use

Water Use Category	Total Gallons of Retail Water				
	2014	2015	2016	2017	2108
Residential - Single Family	3,932,373,520	3,266,095,230	3,257,036,500	3,264,384,860	4,261,772,800
Residential - Multi Family	819,112,800	827,255,600	841,296,400	843,148,600	52,177,900
Industrial	963,615,100	1,120,681,600	1,053,618,600	1,094,750,700	1,067,748,000
Commercial	3,477,654,400	2,500,786,424	3,781,496,000	3,234,052,700	3,861,849,000
Institutional	0	0	0	0	0
Agricultural	0	0	0	0	0
TOTAL	9,192,755,820	7,714,818,854	8,933,447,500	8,436,336,860	9,243,547,700

Residential GPCD

Water Use Category	Residential GCPD				
	2014	2015	2016	2017	2108
Residential - Single Family	99	86	85	82	86
Residential - Multi-Family					

Seasonal Water Use

Month	Total Gallons of Treated Retail Water				
	2014	2015	2016	2017	2108
January	602,153,900	539,444,800	569,741,600	578,023,000	605,623,500
February	594,958,300	517,196,200	564,911,200	574,244,500	553,944,200
March	566,343,800	494,039,200	585,119,800	579,560,900	559,327,600
April	632,541,200	565,732,500	670,263,400	642,959,100	588,297,100
May	775,654,300	585,940,600	557,512,400	683,643,300	790,576,300
June	811,978,100	609,908,100	644,380,200	853,553,800	982,069,000
July	801,305,000	827,465,900	952,940,600	902,281,300	1,110,627,700
August	974,082,100	1,183,320,800	1,065,732,100	925,534,200	1,205,749,400
September	1,025,761,800	1,152,005,500	956,842,800	1,008,325,000	1,713,016,300
October	848,059,800	1,132,403,200	934,469,300	868,428,100	1,023,174,100
November	781,767,100	780,983,400	808,262,700	710,849,400	619,169,700
December	573,519,200	558,690,200	641,019,100	651,652,200	508,447,000
TOTAL	8,988,124,600	8,947,130,400	8,951,195,200	8,979,054,800	10,260,021,900

Seasonal Raw Water Use

Month	Total Gallons of Raw Retail Water				
	2014	2015	2016	2017	2108
January	59,391,000	65,439,000	55,676,000	45,716,000	37,206,000
February	52,251,000	61,252,000	49,443,000	38,309,000	11,986,000
March	51,214,000	58,978,000	52,064,000	42,688,000	30,908,000
April	51,739,000	64,529,000	65,346,000	49,215,000	40,752,000
May	53,983,000	70,733,000	40,317,700	43,718,000	41,810,000
June	60,130,000	63,996,000	42,183,700	53,947,000	55,124,000
July	57,037,000	65,169,000	80,904,600	50,315,000	36,727,000
August	64,905,000	61,984,000	42,487,000	46,151,000	45,511,000
September	48,635,000	57,370,000	40,163,000	41,156,000	50,587,000
October	62,896,000	64,247,000	38,588,000	33,663,000	45,312,000
November	51,827,000	54,181,000	51,066,000	40,498,000	53,520,000
December	51,840,000	55,130,000	54,456,000	35,410,000	50,889,000
TOTAL	665,848,000	743,008,000	612,695,000	520,786,000	500,332,000

Seasonal vs. Annual Water Use

Water Use	Seasonal and Annual Water Use					Average in Gallons
	2014	2015	2016	2017	2018	
Summer Retail (Treated + Raw)	2,769,437,200	2,811,843,800	2,828,628,200	2,831,782,300	3,435,808,100	2,935,499,920 5yr Average
TOTAL Retail (Treated + Raw)	9,653,972,600	9,690,138,400	9,563,890,200	9,499,840,800	10,760,353,900	9,833,639,180 5yr Average

Water Loss

Year	Total Water Loss in Gallons	Water Loss in GPCD	Water Loss %
2014	1,110,090,955	23	10%
2015	186,507,166	35	17%
2016	1,098,663,683	21	10%
2017	1,549,303,812	29	14%
2018	742,427,292	13	7%
5 year average	937,398,582	24.2	12%

Peak Water Use

Year	Average Daily use (gal)	Peak Day Use (gal)	Ratio (peak/avg)
2014	27,642,000	46,115,000	1.67
2015	28,402,000	49,702,000	1.75
2016	28,180,000	54,076,000	1.92
2017	25,986,000	41,504,000	1.60
2018	30,053,000	49,269,000	1.64

Wastewater System

Design Capacity of Wastewater Treatment Plants: 46.5 MGD
Percentage of Water Serviced by Wastewater System: 99%

Description of Wastewater Systems of Wholesale Customer Areas

With the exception of Bold Springs and Central Bosque, all wastewater systems of wholesale customer areas, while separate collections systems, all feed into the Waco Metropolitan Regional Sewerage System for transportation to and treatment at one of two wastewater treatment plants. Bold Springs and Central Bosque remain completely reliant on individual septic systems.

Wastewater Connections

Water Use Category	Active Wastewater Connections			
	Metered	Unmetered	Total Connections	% of Total Connections
Municipal		39,995	39,995	90%
Industrial		65	65	0%
Commercial		3328	3328	10%
Institutional		0	0	0%
Agricultural		0	0	0%
TOTAL	**0**	43,388	43,388	

Historic Gallons of Wastewater Treated

Month	Total Gallons of Treated Wastewater				
	2014	**2015**	**2016**	**2017**	**2108**
January	569,616,800	591,897,200	747,961,700	523,728,000	479,494,800
February	492,243,000	525,333,100	598,532,100	514,985,000	455,198,400
March	545,208,100	726,138,300	899,243,800	586,325,000	566,635,400
April	508,880,300	712,596,800	786,029,300	583,570,800	511,948,700
May	630,545,100	1,052,360,000	858,790,800	517,203,300	498,596,800
June	657,041,900	938,250,000	815,867,100	514,461,300	456,120,500
July	538,838,100	605,774,000	518,075,400	495,948,600	479,384,500
August	537,437,000	529,168,600	562,188,500	533,587,200	492,191,000
September	522,017,400	507,938,000	481,863,300	447,645,200	524,518,100
October	542,980,500	689,635,500	483,693,100	449,199,200	885,032,000
November	540,048,500	992,028,300	512,721,500	437,797,800	767,159,300
December	512,830,500	968,745,900	508,600,500	475,432,500	798,168,300
TOTAL	6,597,687,200	8,839,865,700	7,773,567,100	6,079,883,900	6,914,447,800

Reuse Information

Type of Reuse	Total Annual Volume (in gallons)
Industrial	3,551,899,000

3. SPECIFIC, QUANTIFIED 5 & 10-YEAR TARGETS

The projected reductions are shown at 5 and 10 year increments as required by HB 2660. These targets and goals will be updated every five years, or whenever the Water Conservation Plan is revised.

	Historic 5-yr Average	Baseline	5-yr Goal for 2024	10-yr Goal for 2029
TOTAL GPCD	214	226	196	176
Residential GCPD	88	74	64	64
Water Loss (GPCD)	26	16	15	13
Water Loss Percentage	12%	7%	8%	7%

4. IMPLEMENTATION

- Metering and measuring the amount of raw water diverted from Lake Waco will continue as an essential part of city's treatment process control and reporting requirements.

- The meter replacement program will be maintained, replacing all meters within 8 years or 1.5 million gallons. Accuracy of meters and fail rates will be continually monitored and appropriate adjustments made to the replacement program.

- Annual water audits to determine water loss will continue to be conducted. The city will continue maintaining accurate records of leaks, repairs, flushing, construction and firefighting exercises. The city will continue monitoring daily diversion amounts with daily water treatment production to determine water loss prior to distribution. Production amounts will also be compared to metered consumption to determine distribution loss.

- Leaking water lines will continue to be repaired or replaced as quickly as is possible. On-call, after-hours crews will continue responding to leaks at all hours. In situations where repair is not immediately possible, water loss will be mitigated by reduction of pressure.

- The city will continue efforts to inform and educate the public on water conservation issues. In addition to year-round efforts, each year, as the high-use season of summer approaches, these efforts will be increased and expanded. Just prior to and during the summer months, press releases will be issued regarding the city's conservation and drought contingency plans, multiple notices will be inserted in all customer bills, items promoting conservation will also be offered as "give-away" items at the customer service center and any public events or speaking engagements.

- The current non-promotional, inclining block rate will continue to be the rate structure for the City of Waco. The rate structure will be evaluated on an ongoing basis and adjustments will be made as appropriate.

5. METHOD FOR TRACKING IMPLEMENTATION AND EFFECTIVENESS

Overall progress toward conservation goals of reducing consumption, loss, waste and peak demand and improving efficiency of usage will be evaluated annually when the water conservation annual report is completed. The following methods will be used to evaluate individual portions of the plan:

- Records regarding meter replacement will be maintained and examined annually. Failure rates, along with “re-read” work orders (orders to re-read a meter are automatically generated whenever there is a high or low discrepancy outside normal variance), leaks and meter model/make will be compared in order to evaluate the replacement cycle.

- Water loss accounting will be evaluated by periodically examining multi-year loss trends, with the specific goal of identifying any discrepancies or variances and determining the cause.

- Leak detection and repair will be evaluated annually by examining comprehensive records showing number of leaks, locations, time before repair, estimated loss of water through leak, estimated loss of water through flushing. This information will compared to water loss information for the same time period.

- Public information and education efforts will be evaluated by documenting actions, such as: number of press releases issued, number or stories written or produced, number of interviews given, number of bill inserts sent, number of presentations given and number and location of advertisements placed. This information will then be evaluated with consumption during the same time period and compared against data from previous years.

- The city’s water rate structure will continue to be evaluated by examining consumption trends. Records will be kept on consumption for each rate class. This information will be compared, along with cost of service considerations, with historic trends and adjustments will be made to the rate structure as appropriate.

6. METHOD FOR MEASURING WATER DIVERTED FROM SOURCE

Raw water diversions from Lake Waco are metered, calculated, and tracked at least daily as part of the treatment process control and reporting agreement with the U.S. Army Corps of Engineers. A spreadsheet of water use (treated water) is updated on a daily basis.

7. UNIVERSAL METERING

The City maintains meters to ensure that accurate readings (meters registering at an accuracy of no less than ninety-five percent (95%) or no higher than one hundred five percent (105%) expressed as a percentage of the full scale of the meter and performing to American Water Works Association water metering standards) are being recorded. This ensures fair and equitable billing and reduces unaccounted for water. The most common size meter in the City is 5/8”, which are replaced at 1.5 million gallons of usage.

The City of Waco requires meters for all connections and bills by volume of use. The City collects and tabulates metered water usage data on Commercial, Industrial, Residential (Single-Family, Multi-Family, and Duplex), Municipal and Wholesale accounts. Further, the City collects data on dedicated irrigation meters for all the above-mentioned classes.

8. MEASURING AND CONTROLLING WATER LOSS

The City of Waco performs periodic visual inspections along distribution lines as well as maintaining accurate water leak and repair records. The City also measures and collects data on firefighting, construction, and main flushing. Annual internal audits of water usage are conducted to determine water loss.

9. LEAK DETECTION AND REPAIR

Measures to control unaccounted water are part of the routine operations of the City of Waco. Meter readers and operations crews watch for and report signs of illegal connections so they can be addressed quickly. Crews and personnel look for and report evidence of leaks in the water distribution system. Repair crews respond quickly to repair leaks reported by the public and city personnel. The city has 70 full-time distribution line employees and two on-call crews after hours responding to all leaks as quickly as possible. Areas of the water distribution system in which numerous leaks and line breaks occur are targeted for replacement as funds are available.

10. CONTINUING PUBLIC EDUCATION AND INFORMATION

The City of Waco's water utility will produce written materials in the form of

- Brochures
- Newsletter articles
- Media releases
- Public service announcements.

These are distributed to the customers, the local media, and to nonprofit local organizations such as neighborhood associations and civic improvement organizations so they may educate their members as well.

The water utility ensures that multimedia materials are also available through the utility's web site, http://www.wacowater.com/ The information is also broadcast over the city public access channel, and in cooperation with local media outlets for the release of information for both television and radio audiences.
Specific efforts include:

- Interactive screens on the city's web site
- Interviews with city experts in irrigation and plant water demand on the local access channel
- Interviews with city water utility management on the local access channel and with local television stations
- Press conferences to promote key educational programs
- Press events, such as giveaways or educational events focused on reducing water use
- Booths at public events sponsored by neighborhood associations, civic organizations, not-for-profit education groups, and other city departments.

The water utility creates and distributes promotional items encouraging water conservation on a regular basis.

11. NON-PROMOTIONAL WATER RATE STRUCTURE

Waco's conservation water rate is an increasing block rate, which increases as the quantity used increases. Prices per thousand gallons increase at specific "tiers" in consumption. Each tier of the rate structure is designed to send a price signal to consumers as their discretionary consumption of water increases.

Residential Water Rates *(Inside City)*			**Residential Water Rates *(Outside City)***		
Rate is based on meter size + usage tier			*Rate is based on meter size + usage tier*		
5/8 inch meter	$20.24		5/8 inch meter	$23.28	
1 inch meter	$32.69		1 inch meter	$37.59	
1.5 inch meter	$47.08		1.5 inch meter	$54.14	
2 inch meter	$64.88		2 inch meter	$74.61	
3 inch meter	$102.43		3 inch meter	$117.79	
0-15,000 Gallons	$3.32	*per 1,000*	0-15,000 Gallons	$3.82	*per 1,000*
15,001-25,000 Gallons	$4.16	*per 1,000*	15,001-25,000 Gallons	$4.78	*per 1,000*
Over 25,000 Gallons	$5.77	*per 1,000*	Over 25,000 Gallons	$6.64	*per 1,000*

12. RESERVOIR SYSTEMS OPERATIONS PLAN

A reservoir systems operations plan is not applicable to the City of Waco. The operation of the reservoir systems is conducted by the Army Corps of Engineers.

13. WHOLESALE WATER CONTRACT PROVISIONS

For every water supply contract or wholesale water supply contract entered into or renewed or extended after official adoption of the water conservation plan, each successive wholesale customer is contractually obliged to develop and implement a water conservation plan or water conservation measures in accordance with 30 TAC Chapter 288. If the customer intends to resell the water, then the customer is contractually obligated to ensure that the contract for the resale of the water has water conservation requirements so that each successive customer in the resale of the water will be required to implement water conservation measures in accordance with applicable provisions of 30 TAC Chapter 288. Customers with older contracts not requiring water conservation provisions are asked to voluntarily implement a water conservation plan or water conservation measures similar to those implemented by the City of Waco.

14. AGRICULTURAL WATER USE

Agricultural use is for golf course and sports field irrigation, not for irrigation in the production of crops, so no production process is applicable to the City of Waco's Plan. Therefore the City does not intend to use state-of-the-art equipment or process modifications to improve water use efficiency. The amount of usage will remain constant. The City does not anticipate any water savings because the intent is to use all acre feet (per year) allowed for irrigation; therefore the City does not have specific, quantified five-year and ten-year targets for water savings. The City uses meters that are within an accuracy of plus or minus 5.0% to measure and account for the amount of water diverted from the source of the supply. City staff monitors the meters on a monthly basis in order to detect, repair and account for water loss in the water distribution system. 30 TAC §§ 288.4(a)(2) and (a)(3) are not applicable to the City of Waco.

15. IMPLEMENTATION AND ENFORCEMENT

This plan is part of an ordinance approved by the City of Waco City Council. A copy of the ordinance is provided in Appendix A.

16. COORDINATION WITH REGIONAL WATER PLANNING GROUP

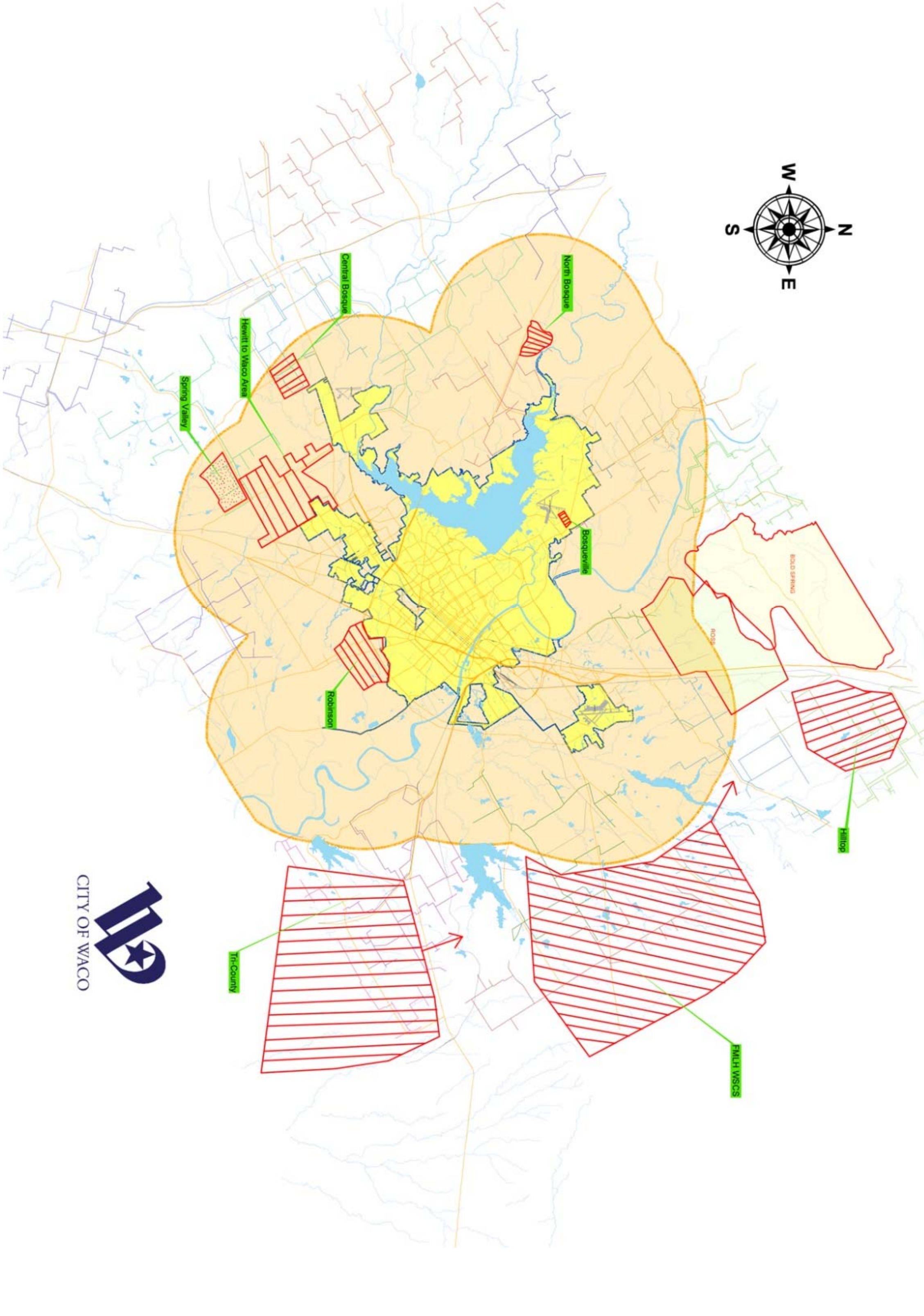
The service area of the City of Waco is located within the Brazos G Regional Planning area and the City of Waco has provided a copy of this Water Conservation and Drought

Contingency Plan to the Region Planning Group (RPG). A copy of the transmittal letter to the planning group is provided in Appendix B.

This Plan is consistent with Waco's role as a leader in water supply planning in the RPG, and meets the standards for water conservation planning in TAC Chapter 288.

17. CCN MAP

(following page)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Hewitt to Waco Area
Spring Valley
Bosqueville
Robinson
Hilltop
Tri-County
FMLH WSCS
CITY OF WACO

<u>APPENDIX A</u>

Copy of Transmittal Letter to Brazos G Regional Planning Group

CITY OF WACO

Water Utility Services

P.O. Box 2570
Waco, Texas 76702-2570
254 / 750-8040
Fax: 254 / 750-8032

May 1, 2019

Wayne Wilson, Chair – Brazos G RWPG
CIO
Trey Buzbee
Brazos River Authority
P.O. Box 7555
Waco, TX 76714

Re: Amended City of Waco Water Conservation Plan Information for the Region G Planning Group

Dear Wayne,

Recently, the City of Waco amended its Water Conservation Plan for the 5 year update. The Drought Contingency Plan was not changed for this update. This plan is consistent with Waco's role as a leader in water supply planning in Region G and meets the standards for water conservation planning in TAC Chapter 28.

Enclosed you will find copies of the amended Water Conservation and Drought Contingency Plan. If any additional information is needed for the Planning Group, please contact the City of Waco Water Utilities Department at 254-750-8040.

Sincerely,

Lisa Tyer
Director, Water Utilities Services

B

City of Waco

Drought Contingency Plan

2019

The City of Waco Drought Contingency Plan is intended to conserve the available water supply and protect the integrity of water supply facilities, with particular regard to domestic water use, to sanitation and fire protection, and to protect and preserve public health, welfare and safety to minimize the adverse impacts of water supply shortage or other water supply emergency conditions.

Drought Contingency Plan: Updated for 2019

CITY OF WACO DROUGHT CONTINGENCY PLAN

Section I: Declaration of Policy, Purpose, and Intent

In order to conserve the available water supply and protect the integrity of water supply facilities, with particular regard to domestic water use, to sanitation and fire protection, and to protect and preserve public health, welfare, and safety to minimize the adverse impacts of water supply shortage or other water supply emergency conditions, the City of Waco hereby adopts the following regulations and restrictions on the delivery and consumption of water through Ordinance No. 2014 – 206. A copy is attached as appendix A.

Water uses regulated or prohibited under this Drought Contingency Plan (the Plan) are considered to be non-essential and continuation of such uses during times of water shortage or other emergency water supply condition are deemed to constitute a waste of water which subjects the offender(s) to penalties as defined in Section IX of this plan.

Section II: Public Involvement

Opportunity for the public to provide input into the preparation of the Plan was provided by the City of Waco by means of a public meeting and by publishing the Plan on the Water Utility Services website (www.wacowater.com). A public notice was provided regarding a public meeting, which was held to accept input on the Plan. Additionally, citizens were invited to send comments electronically after viewing the Plan online.

Section III: Public Education and Notification

The City of Waco will provide the public with information about the Plan, including information about the conditions under which each stage of the Plan is to be initiated or terminated and the drought response measures to be implemented in each stage. This information will be provided by means of press releases, bill inserts, presentations to community organizations, website updates and other outreach methods as appropriate. Upon implementation and/or termination of any stage of the plan, the public will be notified through local media and website updates.

Section IV: Wholesale Contract Provisions

All wholesale water contracts entered into, renewed or extended after adoption of this plan, shall include a provision that in case of a shortage of water resulting from drought, the water to be distributed shall be divided in accordance with Texas Water Code, §11.039.

Section V: Coordination with Regional Water Planning Groups

The service area of the City of Waco is located within the Brazos G Regional Water Planning Group. The City of Waco has provided a copy of this Plan to the Brazos G Regional Water Planning Group.

Section VI: Authorization

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

Section VII: Application

The provisions of this Plan shall apply to all persons, customers, and property utilizing water provided by the City of Waco. The terms "person" and "customer" as used in the Plan include individuals, corporations, partnerships, associations, and all other legal entities.

Section VIII: Definitions

For the purposes of this Plan**,** the following definitions shall apply:

Aesthetic water use: water use for ornamental or decorative purposes such as fountains, reflecting pools, and water gardens.

Commercial and institutional water use: water use, which is integral to the operations of commercial and non-profit establishments and governmental entities such as retail establishments, hotels and motels, restaurants, and office buildings.

Conservation: those [triggering conditions] practices, techniques, and technologies greater than the baseline conservation practices, that reduce the consumption of water, reduce the loss or waste of water, improve the efficiency in the use of water or increase the recycling and reuse of water so that a supply is conserved and made available for future or alternative uses. Baseline conservation practices are those actions expected from customers as good citizens; including, but not limited to:

- Turning off or re-programming automatic sprinkler systems during precipitation events or in soil-saturated conditions;
- Implementing landscape irrigation to maximize impact, e.g., not irrigating in the afternoon or highest evaporative loss hours;

Customer: any person, company, or organization using water supplied by the City of Waco.

Domestic water use: water use for personal needs or for household or sanitary purposes such as drinking, bathing, heating, cooking, sanitation, or for cleaning a residence, business, industry, or institution.

Even number address: street addresses, box numbers, or rural postal route numbers ending in 0, 2, 4, 6, or 8 and locations without addresses.

Industrial water use: the use of water in processes designed to convert materials of lower value into forms having greater usability and value.

Landscape irrigation use: water used for the irrigation and maintenance of landscaped areas, whether publicly or privately owned, including residential and commercial lawns, gardens, golf courses, parks, and rights-of-way and medians.

Mean Sea Level (msl): the level of the ocean's surface, especially the level halfway between high and low tide, used as a standard in reckoning land elevation or sea depths.

Non-essential water use: water uses that are neither essential nor required for the protection of public, health, safety, and welfare, including:

(a) irrigation of landscape areas, including parks, athletic fields, and golf courses, except otherwise provided under this Plan;
(b) use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle;
(c) use of water to wash down any sidewalks, walkways, driveways, parking lots, tennis courts, or other hard-surfaced areas;
(d) use of water to wash down buildings or structures for purposes other than immediate fire protection;
(e) flushing gutters or permitting water to run or accumulate in any gutter or street;
(f) use of water to fill, refill, or add to any indoor or outdoor swimming pools or Jacuzzi-type pools;
(g) use of water in a fountain or pond for aesthetic or scenic purposes except where necessary to support aquatic life;
(h) failure to repair a controllable leak(s) within a reasonable period after having been given notice directing the repair of such leak(s); and
(i) use of water from hydrants for construction purposes or any other purposes other than fire fighting.

Odd numbered address: street addresses, box numbers, or rural postal route numbers ending in 1, 3, 5, 7, or 9.

Water shortage emergency: a condition in which the ordinary water demands and requirements of the City's wholesale and retail customers cannot be met such that there would be insufficient water for human consumption, public health (sanitation), and fire protection. A water shortage emergency may be limited in either areal or temporal extent.

Section IX: Criteria for Initiation and Termination of Drought Response Stages

The City Manager or his/her designee shall monitor water supply and/or demand conditions on a daily basis and shall determine when conditions warrant initiation or termination of each stage of the Plan, that is, when the specified triggers are reached.

Criteria triggering the implementation of various stages of the Drought Contingency Plan, include, but are not limited to, the following:

1. General, geographical, or weather related condition or emergency, including but not limited to drought conditions resulting in a decrease in the Lake Waco reservoir level

2. Water system failures/emergencies (i.e., pressure zone deficiencies, chemical spills, broken water mains, power outages, electrical failures, failures of storage tanks or other equipment, treatment plant breakdown, and water contamination)

3. An inability to recover approximately ninety (90) percent of water stored in all Storage facilities within a defined period

4. A catastrophic decrease in the Lake Waco reservoir level and/or delivery capabilities resulting in an inability, presently or in the immediate future, to recover resources sufficient to provide services necessary for the public health and welfare

The level of the Lake Waco reservoir shall be determined based on the official reading by the U.S. Army Corps of Engineers and stated as an elevation above mean sea level (msl).

Triggering Stages, Responses and Goals

Generally. Should a water shortage emergency occur, the City Manager may exercise his or her discretion to: 1) request special voluntary water restrictions, 2) initiate Stages 1 - 4 mandatory restrictions, and/or 3) prohibit wastage and restrict certain uses of water deemed nonessential during the emergency. Initiation of a specific Stage is dependent on climatic and water system conditions, and does NOT necessarily require a progression from Stage One through Stage Three to reach Stage Four.

Pro rata curtailment of water delivery to wholesale water customers, as provided in Texas Water Code, §11.039, may be triggered by criteria within or without the plan and may be implemented during in any stage of the plan.

The City of Waco has no alternative source of water from which to draw or make use of as a water supply management measure during a water shortage.

Stage 1 Triggers – MILD Water Shortage

1. Criteria for implementation of Stage 1. The city manager shall implement stage 1 restrictions when:

    (a) The Lake Waco reservoir level decreases to 455 msl (at which the reservoir is at about 72% of its capacity).

(b) Weather forecasts and stream flow conditions, in the opinion of the city manager, warrant restrictions on the use of water.

2. Criteria for termination - Stage 1 shall be terminated at the discretion of the City Manager.

Stage 1 Responses

Mandatory restrictions – Upon implementation by the city, the following restrictions shall apply unless specifically exempted:

1. The city shall limit use of water for municipal purposes to those activities necessary to maintain the public health, safety and welfare and any computer-controlled irrigation systems that incorporate evapotranspiration data in setting irrigation run times.

2. The city shall monitor “excessive watering” and issue notifications to customers. “Excessive watering” occurs where run-off extends for a distance greater than ten (10) feet from the customer’s property or where there is washing or hosing down of buildings, sidewalks, driveways, patios, porches, parking surfaces or other paved surfaces. Criminal penalties do not apply during Stage 1 restrictions.

Stage 1 Goal

Reduction of previous three-year average daily use by 1%

Stage 2 Triggers – MODERATE Water Shortage

1. Criteria for implementation of Stage 2. The city manager shall implement stage 2 restrictions when:

   (a) The Lake Waco reservoir level decreases to 452 msl (at which the reservoir is at about 60% of its capacity)

   (b) There is an inability to recover approximately ninety (90) percent of water stored in all storage facilities within a twenty-four (24) hour period. Upon recommendation of the City Manager, Stage 2 response procedures shall become effective.

   (c) Weather forecasts and stream flow conditions, in the opinion of the city manager, warrant restrictions on the use of water.

2. Criteria for termination - Stage 2 shall be terminated at the discretion of the City Manager.

Stage 2 Responses

Mandatory restrictions – Upon implementation by the city, the following restrictions shall apply unless specifically exempted:

1. All landscape and other outdoor water usage at each service address shall be limited to two days a week based on the last digit in the meter service address or the type of connection; however, landscape and outdoor water usage is prohibited from 6:00 A.M. to 7:00 P.M.

Last Digit Address Residential:	Allowed Landscape Water Days
Odd	Tuesday and Saturday
Even	Wednesday and Sunday
All Non-Residential accounts	Monday and Friday

   Thursday – No Watering, Storage Recovery day

2. Apartments, office building complexes, or other properties containing multiple addresses, will be identified by the lowest physical street address number. Where there are no numbers, a number will be assigned by the Building Official. Criminal penalties <u>do</u> apply during Stage 2 restrictions.

3. Watering of newly installed landscaping is exempt from Stage 2 restrictions for no more than one month from the date of planting. After the first month, the landscape water day's schedule and hourly restrictions must be followed.

Stage 2 Goal

Reduction of previous three-year average daily use by 5%

Stage 3 Triggers – SEVERE Water Shortage

1. Criteria for implementation of Stage 3. The city manager shall implement stage 3 restrictions when:

   (a) The Lake Waco reservoir level to 449 msl (at which the reservoir is at about 50% of its capacity) or inability to recover approximately ninety (90) percent of water stored in all storage facilities within a thirty (30) hour period.

   (b) Weather forecasts and stream flow conditions, in the opinion of the city manager, warrant restrictions on the use of water.

   (c) The total amount of water available, as determined by the water utilities director, to the city from its developed water sources is less than a 24-month supply.

2. Criteria for Termination – Stage 3 shall be terminated at the discretion of the City Manager.

Stage 3 Responses

Mandatory restrictions – Upon implementation by the city, the following restrictions shall apply unless specifically exempted:

1. All landscape and outdoor water usage at each service address shall continue according to the landscape water days schedule identified below; however, landscape and outdoor water usage is prohibited from 6:00 A.M. to 7:00 P.M.

Last Digit Address:	Allowed Landscape Water Day
0, 1	Monday
2, 3	Tuesday
4, 5	Wednesday
6, 7	Thursday
8, 9	Friday

Saturday and Sunday – No Watering, Storage Recovery days

2. Apartments, office building complexes, or other property containing multiple addresses will be identified by the lowest physical address number. Where there are no numbers, a number will be assigned by the Building Official.

3. Existing swimming pools, hot tubs, spas, ornamental ponds and fountains may be replenished with a hand-held hose to maintain operational purposes only.

4. Permitting of new swimming pools, hot tubs, spas, ornamental ponds or fountain construction is **<u>prohibited</u>**, except that those previously permitted or under construction at the time Stage 3 restrictions are initiated may complete construction and may be filled one time only. Filling occurs when an amount of water equal to at least seventy-five (75) percent of the water capacity is placed in the structure or facility.

5. Excessive water run-off from any landscaped area onto streets, alleys, or parking lots is prohibited. Run-off is excessive when it extends for a distance greater than ten (10) feet from the customer's property.

6. Washing or hosing down of buildings, sidewalks, driveways, patios, porches, parking areas, or other paved surfaces is prohibited.

Exceptions:

(a) Commercial landscape nurseries are exempt from Stage 3 restrictions (except for restrictions on hours when watering may occur), but all such nurseries shall cease using water to clean pavement and sidewalk areas except for health and safety reasons.

(b) Commercial full-service or self-service car wash facilities, including those at service stations and automobile dealership facilities, shall cease using water to clean pavement and sidewalk areas except for health and safety reasons and are exempt from Stage 3 restrictions if they meet one or more of the following conditions:
(i) Commercial car wash facilities using conveyorized, touchless, and / or rollover in-bay technology if they reuse a minimum of fifty percent of water from previous vehicle rinses in subsequent washes.
(ii) Commercial car wash facilities using reverse osmosis to produce water rinse with a lower mineral content if they incorporate the unused concentrate in subsequent vehicle washes.
(iii) Self-service spray wands used that emit no more than three gallons of water per minute.

(c) Golf course landscape watering is exempt from Stage 3 restrictions so long as golf course irrigation systems are operated with a computer controlled irrigation system that incorporates evapotranspiration data in setting irrigation run times.

Stage 3 Goal

Reduction of previous three-year average daily use by 7%

Stage 4 Triggers – EMERGENCY Water Shortage

1. Requirements for implementation of Stage 4. The city manager shalle implement stage 4 restrictions when:

(a) The Lake Waco reservoir level to 445 msl (at which the reservoir is at about 40% of its capacity)

(b) There is a determination by the City Manager that catastrophically decreasing lake reservoir levels and/or delivery capabilities with an inability to recover to provide services necessary for public health, safety, and welfare exist.

(c) Weather forecasts and stream flow conditions, in the opinion of the city manager, warrant restrictions on the use of water.

(d) The total amount of water available, as determined by the water utilities director, to the city from its developed water sources is less than a 12-month supply.

2. Criteria for termination – Stage 4 shall be terminated at the discretion of the City Manager.

Stage 4 Responses

Mandatory restrictions – Upon implementation by the city, the following restrictions shall apply unless specifically exempted:

1. Any and all outdoor/landscaping water usage is prohibited until the emergency is alleviated. This applies to all metered water users using the city's public water supply and includes all residential (single or multi-family), commercial (car wash, nurseries, business), recreational (public/private golf courses, parks, athletic fields), religious, health care, school and municipal entities.

2. Use of water for municipal purposes shall be limited to only those activities necessary to maintain the public health, safety and welfare, as determined by the city.

3. Use of water from fire hydrants is prohibited except for fire fighting and health and safety related activities.

Stage 4 Goal

Reduction of previous three-year average daily use by 10%

Section X: Enforcement

1. No person shall intentionally, knowingly, recklessly or with criminal negligence allow the use of water from the city for residential, commercial, industrial, agricultural, governmental, or any other purpose in a manner contrary to any provision of this Division or in an amount in excess of that permitted by the drought response stage in effect at the time pursuant to action taken by the city, in accordance with provisions of this Division.

2. Any person, including a person classified as a water customer of the city, in apparent control of the property where a violation occurs or originates shall be presumed to be the violator, and proof that the violation occurred on the person's property shall constitute a rebuttable presumption that the person in apparent control of the property committed the violation, but any such person shall have the right to show that he/she did not commit the violation. Parents shall be presumed to be responsible for violations of

their minor children, but any such parent may be excused if he/she proves that he/she had previously directed the child not to use the water as it was used in violation of this plan and that the parent could not have reasonably known of the violation. Proof that the notices required under Section 26-94 have been given shall constitute a rebuttal presumption that the person has knowledge of and/or is aware of the declaration of a drought or emergency contingency stage, but such presumption may be rebutted by evidence that the person was out of city at the time of the declaration and could not reasonably have become aware of the declaration since returning to the city.

3. Any person who violates this Division is guilty of a misdemeanor and upon conviction shall be punished by a fine as provided in Section 1-14, General Penalty. Each day that one or more of the provisions in this plan is violated shall constitute a separate offense.

4. If a person is observed violating a Stage 2 or greater restriction, including but not limited to vehicle washing, landscape watering, or construction water use, for a second time, the city shall, upon due notice to the customer, be authorized to discontinue water service to the premises where such violations occur.

5. If a person is convicted of three (3) or more distinct violations of this Division, the city shall, upon due notice to the customer, be authorized to discontinue water service to the premises where such violations occur.

6. Services discontinued under such circumstances shall be restored only upon payment of reconnection charge established by city policy and any other costs incurred by the city in discontinuing service. In addition, suitable assurance must be given to the city that the same action shall not be repeated while the plan is in effect.

7. The City is entitled to pursue all other criminal and civil remedies to which it is entitled under statutes or other ordinances. Compliance with this Division may also be sought through injunctive relief in the district court.

Section XI: Variances

1. A customer may file an application for a variance from this plan for the property receiving water service with the City Manager. The City Manager may determine the proper information and require that the applicant provide such information to evaluate the variance request.

2. The City Manager may grant a variance from the Plan upon his/her determination that special circumstances exist that upon strict enforcement

of the plan will adversely affect the health, sanitation, or fire protection for the public or the applicant.

3. Variances granted under this section will expire upon escalation of the plan to the next higher phase or termination of the plan.

Section XII: State Mandated Water Restrictions

1. If a State agency with jurisdiction over water rights and use lawfully orders that drought response restrictions on water usage be imposed, the water restrictions shall be implemented, regardless of whether any of the criteria for implementation stated in Sec. 26-97 or Sec. 26-98 have been met.

2. The city manager shall notify the public of the implementation of the state mandated restrictions as provided in Sec. 26-94. Said notice shall set out the specific restrictions to be implemented.

3. No person shall intentionally, knowingly, recklessly, or with criminal negligence allow the use of water from the city for residential, commercial, industrial, agricultural, governmental, or any other purpose in a manner:
   (a) Contrary to the notice issued under subsection 2 above; or

   (b) Contrary to the state mandated restriction; or

   (c) In excess of state mandated usage limits.

4. If a violation of the mandated restriction occurs, notice of the violation may be given as provided in Sec. 26-95 and the violation may be punished as provided in Sec. 26-96.

ORDINANCE # 120903

DROUGHT CONTINGENCY PLAN FOR THE CITY OF THRALL NOVEMBER 14, 2003

Section I: Declaration of Policy, Purpose, and Intent

In order to conserve the available water supply and protect the integrity of water supply facilities, with particular regard for domestic water use, sanitation, and fire protection, and to protect and preserve public health, welfare, and safety and minimize the adverse impacts of water supply shortage or other water supply emergency conditions, the THRALL (City of Thrall) hereby adopts the following regulations and restrictions on the delivery and consumption of water.

Water uses regulated or prohibited under this Drought Contingency Plan (the Plan) are considered to be non-essential and continuation of such uses during times of water shortage or other emergency water supply condition are deemed to constitute a waste of water which subjects the offender(s) to penalties as defined in Section XI of this Plan.

Section II: Public Involvement

Opportunity for the public to provide input into the preparation of the Plan was provided by the City of Thrall by means of Public Meetings which are held on the second Tuesday of each month at 7:00p.m. At the Thrall City Hall.

Section III: Public Education

The City of Thrall will periodically provide the public with information about the Plan, including information about the conditions under which each stage of the Plan is to be initiated or terminated and the drought response measures to be implemented in each stage. This information will be provided by means of Public news paper and water billing inserts.

Section IV: Coordination with Regional Water Planning Groups

The service area of the City of Thrall is located within the Region G (name of regional water planning area or areas) and the City of Thrall (name of water supplier) has provided a copy of this Plan to the Region G (name of regional water planning group or groups).
(See P. 21 of the Handbook for Drought Contingency Planning)

Section V: Authorization

The Mayor (designated official; for example, the mayor, city manager, utility director, general manager, etc.), or his/her designee is hereby authorized and directed to implement the applicable provisions of this Plan upon determination that such implementation is necessary to protect public health, safety, and welfare. The Mayor, (designated official) or his/her designee shall have the authority to initiate or terminate drought or other water supply emergency response measures as described in this Plan.

Section VI: Application

The provisions of this Plan shall apply to all persons, customers, and property utilizing water provided by the City of Thrall (name of supplier). The terms "person" and "customer" as used in the Plan include individuals, corporations, partnerships, associations, and all other legal entities.

Section VII: Definitions

For the purposes of this Plan, the following definitions shall apply:

<u>Aesthetic water use</u>: water use for ornamental or decorative purposes such as fountains, reflecting pools, and water gardens.

<u>Commercial and institutional water use</u>: water use which is integral to the operations of commercial and non-profit establishments and governmental entities such as retail establishments, hotels and motels, restaurants and office buildings.

<u>Conservation</u>: those practices, techniques, and technologies that reduce the consumption of water, reduce the loss or waste of water, improve the efficiency in the use of water or increase the recycling and reuse of water so that a supply is conserved and made available for future or alternative uses.

<u>Customer</u>: any person, company, or organization using water supplied by the City of Thrall (name of water supplier).

<u>Domestic water use</u>: water use for personal needs or for household or sanitary purposes such as drinking, bathing, heating, cooking, sanitation, or for cleaning a residence, business, industry, or institution.

<u>Even number address</u>: street addresses, box numbers, or rural postal route numbers ending in 0, 2, 4, 6, or 8 and locations without addresses.

<u>Industrial water use</u>: the use of water in processes designed to convert materials or lower value into forms having greater usability and value.

Landscape irrigation use: water used for the irrigation and maintenance of landscaped areas, whether publicly or privately owned, including residential and commercial lawns, gardens, golf courses, parks, and rights-of-way and medians.

Non-essential water use: water uses that are not essential nor required for the protection of public, health, safety, and welfare, including:

(a) Irrigation of landscape areas, including parks, athletic fields, and golf courses, except otherwise provided under this Plan;
(b) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle;
(c) use of water to wash down any sidewalks, walkways, driveways, parking lots, tennis courts, or other hard-surfaced areas;
(d) Use of water to wash down buildings or structures for purposes other than immediate fire protection;
(e) Flushing gutters or permitting water to run or accumulate in any gutter or street;
(f) Use of water to fill, refill, or add to any indoor or outdoor swimming pools or Jacuzzi-type pools;
(g) Use of water in a fountain or pond for aesthetic or scenic purposes except where necessary to support aquatic life;
(h) Failure to repair a controllable leak(s) within a reasonable period after having been given notice directing the repair of such leak(s); and
(i) Use of water from hydrants for construction purposes or any other purposes other than fire fighting.

Odd numbered address: street addresses, box numbers, or rural postal route numbers ending in 1, 3, 5, 7, or 9.

Section VIII: Criteria for Initiation and Termination of Drought Response Stages

The Mayor (designated official) or his/her designee shall monitor water supply and/or demand conditions on a Daily (*e.g., daily, weekly, monthly*) basis and shall determine when conditions warrant initiation or termination of each stage of the Plan, that is, when the specified "triggers" are reached.

The triggering criteria described below are based on known system capacity limits.

Stage 1 Triggers – MILD Water Shortage Conditions

Requirements for initiation
Customers shall be requested to voluntarily conserve water and adhere to the prescribed restrictions on certain water uses, defined in Section VII – Definitions, when Yearly May 1st. – September 30th.

Requirements for termination
Stage 1 of the Plan will be rescinded at the end of Sept. 30th.

Stage 2 Triggers – MODERATE Water Shortage Conditions

<u>Requirements for initiation</u>
Customers shall be required to comply with the requirements and restrictions on certain non-essential water uses provided in Section IX of this Plan when the ground storage does not gain over 20ft. and Notify TCEQ initiation and termination.

<u>Requirements for termination</u>
Stage 2 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of 3 (e.g., 3) consecutive days. Upon termination of Stage 2, Stage 1 becomes operative.

Stage 3 Triggers – SEVERE Water Shortage Conditions

<u>Requirements for initiation</u>
Customers shall be required to comply with the requirements and restrictions on certain non-essential water uses for Stage 3 of this Plan when the ground storage does not gain over 15ft., notify TCEQ initiation and termination.

<u>Requirements for termination</u>
Stage 3 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of 3 (e.g., 3) consecutive days. Upon termination of Stage 3, Stage 2 becomes operative.

Stage 4 Triggers – CRITICAL Water Shortage Conditions

<u>Requirements for initiation</u>
Customers shall be required to comply with the requirements and restrictions on certain non-essential water uses for Stage 4 of this Plan when the ground storage does not gain over the 10ft water level. Notify TCEQ of initiation termination.

<u>Requirements for termination</u>
Stage 4 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of 3 (e.g., 3) consecutive days. Upon termination of Stage 4, Stage 3 becomes operative.

Stage 5 Triggers – EMERGENCY Water Shortage Conditions

Requirements for initiation
Customers shall be required to comply with the requirements and restrictions for Stage 5 of this Plan when the Mayor (designated official), or his/her designee determines that a water supply emergency exists based on:

1. Major water line breaks, or pump or system failures occur, which cause unprecedented loss of capability to provide water service; or

2. Natural or man-made contamination of the water supply source(s).

3. System outage notify TCEQ

Requirements for termination
Stage 5 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of 3 consecutive days.

Section IX: Drought Response Stages

The Mayor, or his/her designee, shall monitor water supply and/or demand conditions on a daily basis and, in accordance with the triggering criteria set forth in Section VIII of this Plan, shall determine that a mild, moderate, severe, critical, emergency or water shortage condition exists and shall implement the following notification procedures:

Notification

<u>Notification of the Public</u>:
The Mayor or his/ here designee shall notify the public by means of: Public meeting and or Local news papers, or direct mail.

Additional Notification:
The Mayor or his/ her designee shall notify directly, or cause to be notified directly, the following individuals and entities:

Examples:
Mayor / Chairman and members of the City Council / Utility Board
Fire Chief(s)
City and/or County Emergency Management Coordinator(s)
County Judge & Commissioner(s)
State Disaster District / Department of Public Safety
TNRCC (required when mandatory *restrictions are imposed)*
Major water users
Critical water users, i.e. hospitals
Parks / street superintendents & public facilities managers
School
Note: The plan should specify direct notice only as appropriate to respective drought stages.

Stage 1 Response – MILD Water Shortage Conditions

Goal: Achieve a voluntary 10 percent reduction in daily water demand.

Supply Management Measures:

The City of Thrall will reduce the flushing of the water mains.

Voluntary Water Use Restrictions:

(a) Water customers are requested to voluntarily limit the irrigation of landscaped areas to Sundays and Thursdays for customers with a street address ending in an even number (0, 2, 4, 6 or 8), and Saturdays and Wednesdays for water customers with a street address ending in an odd number (1, 3, 5, 7 or 9), and to irrigate landscapes only between the hours of midnight and 10:00 a.m. and 8:00 p.m to midnight on designated watering days.

(b) All operations of the City of Thrall shall adhere to water use restrictions prescribed for Stage 2 of the Plan.

(c) Water customers are requested to practice water conservation and to minimize or discontinue water use for non-essential purposes.

Stage 2 Response – MODERATE Water Shortage Conditions

Goal: Achieve a 4.0 percent reduction in the daily water demand.

Supply Management Measures:

Describe measures, if any, to be implemented directly by the City of Thrall to manage limited water supplies and/or reduce water demand. Examples include: reduced or discontinued flushing of water mains, reduced or discontinued irrigation of public landscaped areas; use of an alternative supply source(s); use of reclaimed water for non-potable purposes.

Water Use Restrictions. Under threat of penalty for violation, the following water use restrictions shall apply to all persons:

(a) Irrigation of landscaped areas with hose-end sprinklers or automatic irrigation systems shall be limited to Sundays and Thursdays for customers with a street address ending in an even number (0, 2, 4, 6 or 8), and Saturdays and Wednesdays for water customers with a street address ending in an odd number (1, 3, 5, 7 or 9), and irrigation of landscaped areas is further limited to the hours of 12:00 midnight until 10:00 a.m. and between 8:00 p.m. and 12:00 midnight on designated watering days. However, irrigation of landscaped areas is permitted at anytime if it is by means of a hand-held hose, a faucet filled bucket or watering can of five (5) gallons or less, or drip irrigation system.

(b) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle is prohibited except on designated watering days between the hours of 12:00 midnight and 10:00 a.m. and between 8:00 p.m. and 12:00 midnight. Such washing, when allowed, shall be done with a hand-held bucket or a hand-held hose equipped with a positive shutoff nozzle for quick rises. Vehicle washing may be done at any time on the immediate premises of a commercial car wash or commercial service station. Further, such washing may be exempted from these regulations if the health, safety, and welfare of the public is contingent upon frequent vehicle cleansing, such as garbage trucks and vehicles used to transport food and perishables.

(c) Use of water to fill, refill, or add to any indoor or outdoor swimming pools, wading pools, or Jacuzzi-type pools is prohibited except on designated watering days between the hours of 12:00 midnight and 10:00 a.m. and between 8 p.m. and 12:00 midnight.

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

(e) Use of water from hydrants shall be limited to fire fighting, related activities, or other activities necessary to maintain public health, safety, and welfare, except that use of water from designated fire hydrants for construction purposes may be allowed under special permit from the City of Thrall.

(f) All restaurants are prohibited from serving water to patrons except upon request of the patron.

(g) The following uses of water are defined as non-essential and are prohibited:

1. Wash down of any sidewalks, walkways, driveways, parking lots, tennis courts, or other hard-surfaced areas;
2. Use of water to wash down buildings or structures for purposes other than immediate fire protection;
3. Use of water for dust control;
4. Flushing gutters or permitting water to run or accumulate in any gutter or street; and
5. Failure to repair a controllable leak(s) within a reasonable period after having been given notice directing the repair of such leak(s).

Stage 3 Response – SEVERE Water Shortage Conditions

Goal: Achieve an 8 percent reduction in the daily water demand.

Supply Management Measures:

Describe measures, if any, to be implemented directly by the City of Thrall (name of water supplier) to manage limited water supplies and/or reduce water demand. Examples include: reduced or discontinued flushing of water mains, reduced or discontinued irrigation of public landscaped areas; use of an alternative supply source(s); use of reclaimed water for non-potable purposes.

Water Use Restrictions. All requirements of Stage 2 shall remain in effect during Stage 3 except:

(a) Irrigation of landscaped areas shall be limited to designated watering days between the hours of 12:00 midnight and 10:00 a.m. and between 8 p.m. and 12:00 midnight and shall be by means of hand-held hoses, hand-held buckets, drip irrigation, or permanently installed automatic sprinkler system only. The use of hose-end sprinklers is prohibited at all times.

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

Stage 4 Response – CRITICAL Water Shortage Conditions

Goal: Achieve a 90 percent reduction in daily water demand.

Supply Management Measures:

Describe measures, if any, to be implemented directly by the City of Thrall to manage limited water supplies and/or reduce water demand. Examples include: reduced or discontinued flushing of water mains, reduced or discontinued irrigation of public landscaped areas; use of an alternative supply source(s); use of reclaimed water for non-potable purposes.

Water Use Restrictions. All requirements of Stage 2 and 3 shall remain in effect during Stage 4 except:

(a) Irrigation of landscaped areas shall be limited to designated watering days between the hours of 6:00 a.m. and 10:00 a.m. and between 8:00 p.m. and 12:00 midnight and shall be by means of hand-held hoses, hand-held buckets, or drip irrigation only. The use of hose-end sprinklers or permanently installed automatic sprinkler systems are prohibited at all times.

(b) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle not occurring on the premises of a commercial car wash and commercial service stations and not in the immediate interest of public health, safety, and welfare is prohibited. Further, such vehicle washing at commercial car washes and commercial service stations shall occur only between the hours of 6:00 a.m. and 10:00 a.m. and between 6:00 p.m. and 10 p.m.

(c) The filling, refilling, or adding of water to swimming pools, wading pools, and jacuzzi-type pools is prohibited.

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

(e) No application for new, additional, expanded, or increased-in-size water service connections, meters, service lines, pipeline extensions, mains, or water service facilities of any kind shall be approved, and time limits for approval of such applications are hereby suspended for such time as this drought response stage or a higher-numbered stage shall be in effect.

Stage 5 Response – EMERGENCY Water Shortage Conditions

Goal: Achieve a 98 percent reduction in daily water demand.

Supply Management Measures:

Describe measures, if any, to be implemented directly by the City of Thrall to manage limited water supplies and/or reduce water demand. The City of Thrall will check for water leaks.

Water Use Restrictions. All requirements of Stage 2, 3, and 4 shall remain in effect during Stage 5 except:

(a) Irrigation of landscaped areas is absolutely prohibited.

(b) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle is absolutely prohibited.

Section X: Enforcement

(a) No person shall knowingly or intentionally allow the use of water from the City of Thrall for residential, commercial, industrial, agricultural, governmental, or any other purpose in a manner contrary to any provision of this Plan, or in an amount in excess of that permitted by the drought response stage in effect at the time pursuant to action taken by the Mayor, or his/her designee, in accordance with provisions of this Plan.

(b) Any person who violates this Plan is guilty of a misdemeanor and, upon conviction shall be punished by a fine of not less than _______ dollars ($__) and not more than _______ dollars ($__). Each day that one or more of the provisions in this Plan is violated shall constitute a separate offense. If a person is convicted of three or more distinct violations of this Plan, the _____________ (designated official) shall, upon due notice to the customer, be authorized to discontinue water service to the premises where such violations occur. Services discontinued under such circumstances shall be restored only upon payment of a re-connection charge, hereby established at $______, and any other costs incurred by the _________________ (name of water supplier) in discontinuing service. In addition, suitable assurance must be given to the ________________ (designated official) that the same action shall not be repeated while the Plan is in effect. Compliance with this plan may also be sought through injunctive relief in the district court.

(c) Any person, including a person classified as a water customer of the ______________ (name of water supplier), in apparent control of the property where a violation occurs or originates shall be presumed to be the violator, and proof that the violation occurred on the person's property shall constitute a rebuttable presumption that the person in apparent control of the property committed the violation, but any such person shall have the right to show that he/she did not commit the violation. Parents shall be presumed to be responsible for violations of their minor children and proof that a violation, committed by a child, occurred on property within the parents' control shall constitute a rebuttable presumption that the parent committed the violation, but any such parent may be excused if he/she proves that he/she had previously directed the child not to use the water as it was used in violation of this Plan and that the parent could not have reasonably known of the violation.

(d) Any employee of the ________________ (name of water supplier), police officer, or other _____ employee designated by the ___________ (designated official), may issue a citation to a person he/she reasonably believes to be in violation of this Ordinance. The citation shall be prepared in duplicate and shall contain the name and addresses of the alleged violator, if known, the offense charged, and shall direct him/her to appear in the ____________ (e.g., municipal court) on the date shown on the citation for which the date shall not be less than 3 days nor more than 5 days from the date the citation was issued. The alleged violator shall be served a copy of the citation. Service of the citation shall be complete upon delivery of the citation to the alleged violator, to an agent or employee of a violator, or to a person over 14 years of age who is a member of the violator's immediate family or is a resident of the violator's residence. The alleged violator shall appear in _________ (e.g., municipal court) to enter a plea of guilty or not guilty for the violation of this Plan. If the alleged violator fails to appear in _________ (e.g., municipal court), a warrant for his/her arrest may be issued. A summons to appear may be issued in lieu of an arrest warrant. These cases shall be expedited and given preferential setting in _________ (e.g., municipal court) before all other cases.

Section XI: Variances

The Mayor, or his/her designee, may, in writing, grant temporary variance for existing water uses otherwise prohibited under this Plan if it is determined that failure to grant such variance would cause an emergency condition adversely affecting the health, sanitation, or fire protection for the public or the person requesting such variance and if one or more of the following conditions are met:

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

Persons requesting an exemption from the provisions of this Ordinance shall file a petition for variance with the ________________ (name of water supplier) within 5 days after the Plan or a particular drought response stage has been invoked. All petitions for variances shall be reviewed by the __________ (designated official), or his/her designee, and shall include the following:

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

Variances granted by the __________________ (name of water supplier) shall be subject to the following conditions, unless waived or modified by the ____________ (designated official) or his/her designee:

(a) Variances granted shall include a timetable for compliance.

(b) Variances granted shall expire when the Plan is no longer in effect, unless the petitioner has failed to meet specified requirements.

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

PASSED AND APPROVED ON THIS 9th DAY OF DECEMBER 2003.
CITY OF THRALL TEXAS

ATTEST:

Karen Pumphrey
Karen Pumphrey
City Secretary

BY:

James Dvorak
James Dvorak
Mayor

Appendix K
Documentation of the Process to Determine MAG Peak Factors

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Memorandum

Date:	Tuesday, May 29, 2018
Project:	2021 Brazos G Regional Water Plan
To:	Executive Director, Texas Water Development Board
Cc:	Brazos G RWPG Thomas Barnett, Texas Water Development Board Sarah Backhouse, Texas Water Development Board Stephen Hamlin, Brazos River Authority Alan Day, Brazos Valley GCD Gary Westbrook, Chair, Groundwater Management Area 12 Dave Coleman, City of College Station
From:	David D. Dunn, P.E.
Subject:	Request to utilize a MAG Peak Factor for the Carrizo-Wilcox Aquifer in Brazos County

On April 9, 2018, the Brazos G Regional Water Planning Group (BGRWPG) took action to request use of Modeled Available Groundwater (MAG) Peak Factors for the Carrizo-Wilcox Aquifer in Brazos County in developing the 2021 Brazos G Regional Water Plan. This memorandum documents the request by the BGRWPG and the process by which the requested MAG Peak Factors were developed and approved by the Brazos Valley GCD and GMA-12, and presents supporting technical information demonstrating that use of the MAG Peak Factors will not cause the Desired Future Conditions (DFCs) within Groundwater Management Area (GMA)-12 to be exceeded.

Justification for MAG Peak Factors in the Carrizo-Wilcox Aquifer

The water demands used in the planning process are defined as "dry-year" demands, or water demands that will occur in abnormally dry or drought years without drought restrictions in place. The overall goal of the planning process is to produce a regional water plan that will fully supply the projected dry-year demands through a repeat of drought of record hydrology without shortages. This is a rational approach when comparing surface water supplies with water demands, because the basis of supply for surface water sources is dry, drought-of-record conditions. For some groundwater systems sensitive to annual hydrologic variability, such as the Northern Edwards Aquifer, this is also a rational approach, as the MAG by necessity is based upon dry or drought-of-record conditions which would occur simultaneously with the increased, dry-year demands. However, supplies from some aquifer systems, such as the Carrizo-Wilcox Aquifer, are not sensitive to annual or short-term fluctuations in hydrology. This has resulted in an overly conservative approach to planning for groundwater supplies. The methodology effectively assumes that the dry-year demands will occur in each year of the planning horizon (2020 – 2070), because the MAG is pumped annually in the modeling process used to determine the MAG. In actuality, water demands for most water use types only infrequently reach the level of the dry-year demands upon which the planning is based.

With the realization that demands in many years will be substantially less than the dry-year demands, the BGRWPG desires to use a MAG Peak Factor to increase the planning supplies from specific aquifers to values greater than the MAG. This would be accomplished by multiplying a MAG Peak Factor (greater than 100 percent) by the MAG in each decade to represent the available groundwater to be used for planning purposes. However, the bottom line is that these adjustments to the MAG must honor the approved DFCs.

Development of MAG Peak Factors for the Carrizo-Wilcox Aquifer in Brazos County

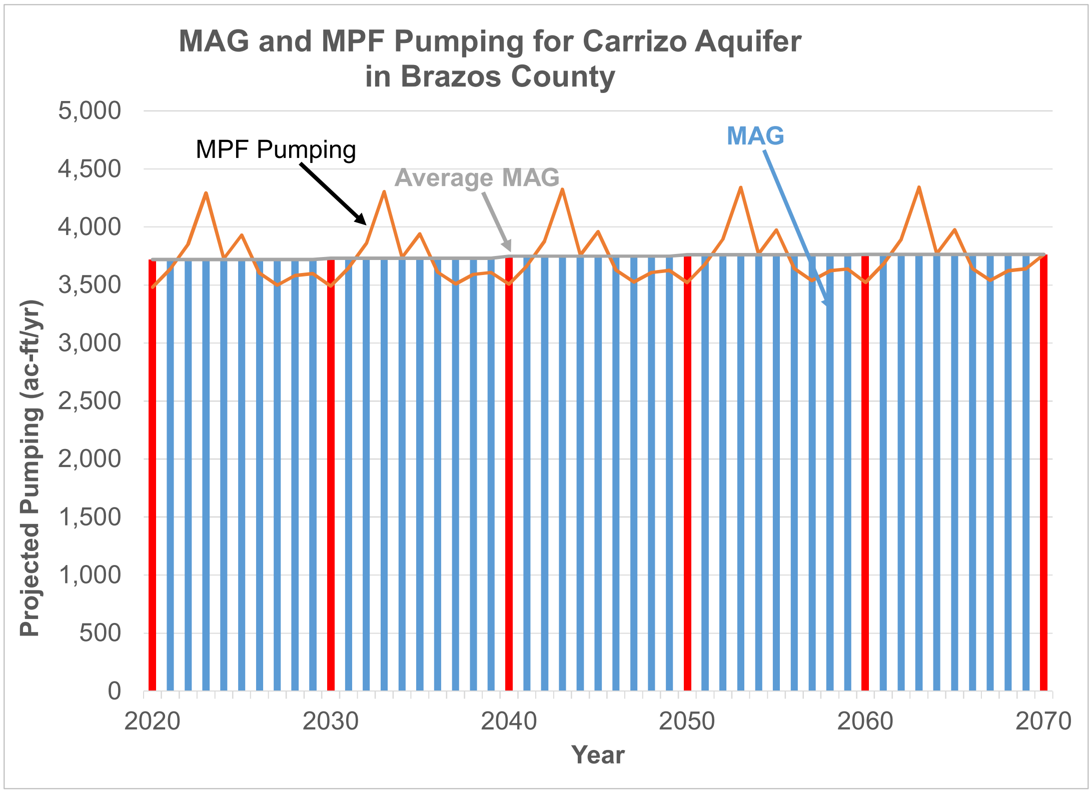
The methodology for determining MAG Peak Factors is based on developing an annual pumping pattern that reflects actual annual variation in pumping from the aquifer over a 10-year period, while not exceeding the 10-year volume that would be pumped by the MAG over that 10-year period. An underlying assumption is that this annual variability in pumping will be exhibited by users in future years. This annual pumping pattern can be repeated each decade from 2020 through 2070, adjusted each decade so that the total volume pumped does not exceed the MAG pumping for that decade. The largest annual pumping volume divided by the MAG at the start of the decade will determine the MAG Peak Factor for that decade. The annual pumping volumes thus derived can be inputted into the Groundwater Availability Model (GAM) that was used to develop the MAG to determine if that pumping pattern will cause the DFCs to be violated. If the total volume of the annual pumping over a 10-year period will be limited to the total MAG volume over that period, it is unlikely that the DFCs will be violated.

The Brazos Valley GCD provided records of annual pumping from permitted wells and estimates of pumping from exempt wells (domestic and livestock wells) for the 10-year period of 2008 through 2017 for the Carrizo and Simsboro Aquifers, which together with the Hooper and Calvert Bluff formations comprise the Carrizo-Wilcox Aquifer. HDR summarized those data and developed a 10-year annual pumping pattern. For each decade from 2020 through 2070, the 10-year annual pumping pattern was adjusted such that its total volume pumped was equal to the total MAG volume pumped in that decade in the GAM. Pumping patterns were developed separately for the Carrizo and Simsboro Aquifers, as shown in Figure 1.[1]

The City of College Station provided funding for WSP USA, Inc. (WSP) to perform a modeling analysis to verify that the proposed pumping patterns would not violate DFCs. Pumping in the GAM was replaced with the "MPF Pumping" (MAG Peak Factor Pumping) patterns shown in Figure 1, and the GAM was run to determine if drawdown from that pumping in the Brazos County GCD and all GCDs associated with GMA-12 would violate the DFCs within GMA-12. Only the pumping in Brazos County was modified to match the patterns in Figure 1; pumping used to determine the MAG was retained in all other counties. The attached memorandum from WSP further documents the modeling process. The GAM files developed have been provided to TWDB staff for their review via a separate transmittal.

Figure 2 illustrates the overall MAG Peak Factor pumping for the combined Carrizo-Wilcox Aquifer in Brazos County. The resulting MAG Peak Factors are presented in Table 1.

[1] Brazos Valley GCD reported no pumping from the Hooper and Calvert Bluff formations in Brazos County, so no pumping patterns were established for those formations.



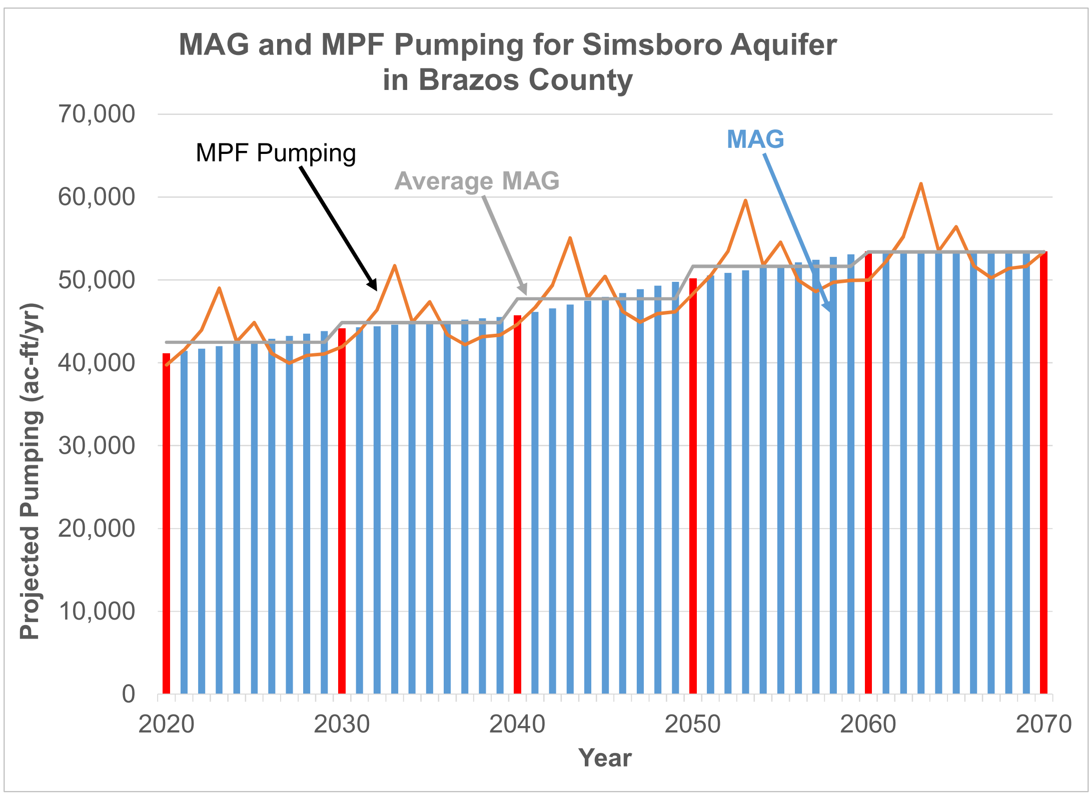


Figure 1. MAG and MPF Pumping Patterns for the Carrizo and Simsboro Aquifers in Brazos County

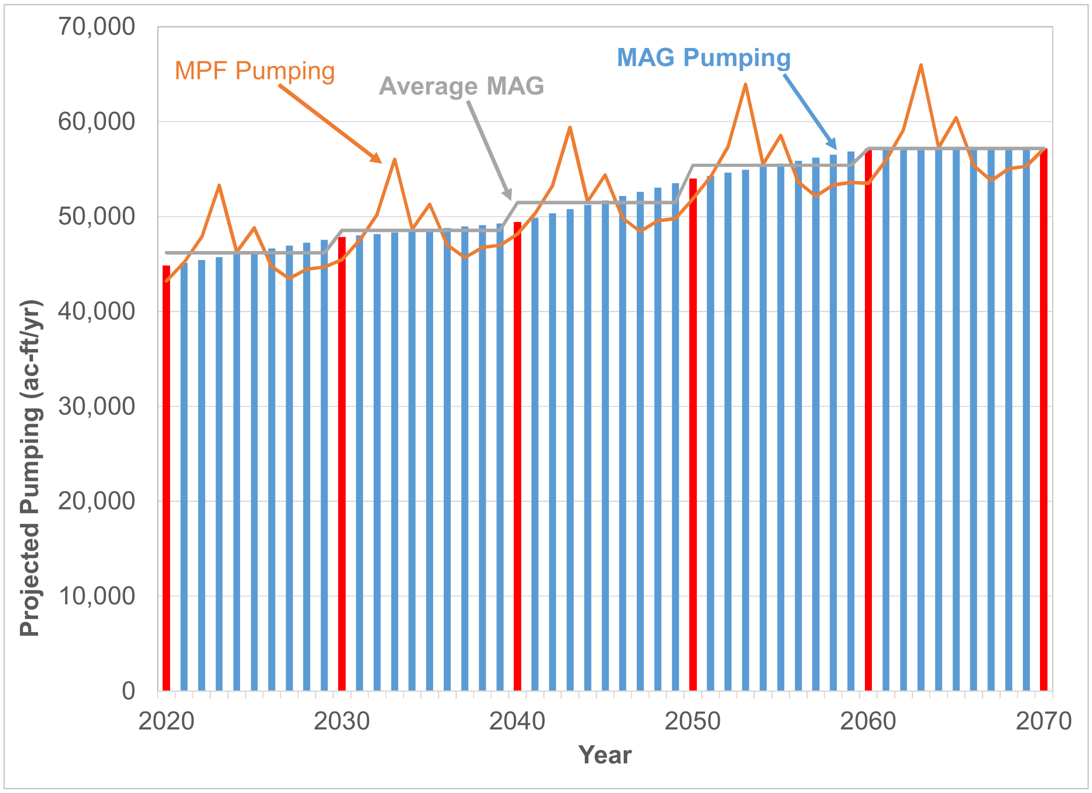


Figure 2. Pumping patterns from the Carrizo-Wilcox Aquifer in Brazos County used to determine MAG Peak Factors

Table 1. Proposed MAG Peak Factors – Carrizo-Wilcox Aquifer, Brazos County, Brazos River Basin

Decade	MAG Peak Factor
2020	1.19
2030	1.17
2040	1.20
2050	1.18
2060	1.15
2070	1.15

Coordination with Brazos Valley GCD and GMA-12

The Brazos Valley GCD approved the requested MAG Peak Factors on May 10, 2018, and the representatives of GMA-12 approved them on May 11, 2018. Letters from Brazos Valley GCD and GMA-12 affirming their support of the MAG Peak Factors are attached.

Utilization of MAG Peak Factors for the Carrizo-Wilcox Aquifer in Brazos County will not prevent the Brazos Valley GCD from managing groundwater resources to achieve the DFCs adopted by the GCD and by GMA-12. This is because the Brazos Valley GCD has sufficient rules and policies in place to monitor groundwater levels in relation to the DFCs and to take action to enforce pumping limitations in order to achieve the DFCs. Please see the attached letter from the Brazos Valley GCD explaining the District's policies and pro-active monitoring program.

Attachments

1. Memorandum from WSP USA, Inc. summarizing the modeling process used to determine that the proposed MAG Peak Factors will not violate the DFCs.
2. Model files developed by WSP USA, Inc. (under separate transmittal)
3. Letter from the Brazos Valley GCD in support of the proposed MAG Peak Factors.
4. Letter from GMA-12 in support of the proposed MAG Peak Factors.
5. Letter from the Brazos Valley GCD describing the District's monitoring plan and regulations to ensure that DFCs are attained.

May 25, 2018

Mr. David M. Coleman, P.E.
Director, Water Services Department
City of College Station
1601 Graham Road
College Station, Texas 77845

Subject: Results of MAG Peak Factor Groundwater Flow Modeling

Dear Mr. Coleman:

The Texas Water Development Board (TWDB) has added an option to regional water planning regarding groundwater supply assessment using a modeled available groundwater (MAG) Peak Factor or MPF. Region G has done a statistical analysis of pumping from the Carrizo and Simsboro aquifers in Brazos County over the past decade and incorporated that into the estimates of future pumping from the aquifers for the period from 2020 through 2069, as represented in the decadal MAGs developed by the TWDB as part of groundwater management area (GMA) planning. Our firm has completed groundwater flow modeling for a MPF of about 1.2, as represented in a scenario developed by Region G for the two aquifers. An objective of the modeling was to evaluate whether the MPF is a consideration for water resources planning by the City of College Station. One of those considerations was to determine whether the MPF pumping for the Carrizo and Simsboro aquifers had any effect on the desired future conditions (DFCs) in 2070 for the Brazos Valley Groundwater Conservation District (GCD), Mid-East Texas GCD, Post Oak Savannah GCD and Lost Pine GCD. The DFCs for 2070 were developed as part of the 2017 cycle of planning performed by Groundwater Management Area 12 (GMA 12).

GROUNDWATER FLOW MODELING TASKS

The effort to develop results regarding whether the MPF had any effect on DFCs included the following sequence of work.

- Development by Region G of a scenario of potential future variations in pumping from the Carrizo and Simsboro aquifers in Brazos County based on variations in pumping from the two aquifers over the past 10 years. Two illustrations of the variations in pumping

WSP USA
Formerly
LBG-Guyton Associates
11111 Katy Freeway, Suite 850
Houston, TX 77079

Tel.: T +1-713-468-8600
wsp.com

developed by Region G are attached. A table also is attached that shows the variations in pumping from the two aquifers in a tabular form for 2020 through 2069.

- The pumping that was represented during that period for the two aquifers was inputted to the well file for the regional groundwater model with the MPF pumping replacing the pumping for the two aquifers that was in simulation PS 12 that was used to develop the DFCs for GMA 12 that were submitted to the TWDB in September of 2017. As shown on the attached figures, the pumping varies from year to year and the variation in pumping was spread over the county by adjusting the pumping in each model cell with pumping, by the percentage change in pumping represented by the MPF pumping compared to the average MAG pumping shown on the two figures. The results of this approach were that the total amount of groundwater withdrawal over the planning period from 2020 to 2070 for the MPF pumping was the same as for the average MAG pumping. For the period 2000 through 2019 pumping as represented in the PS 12 simulation was used in the MPF simulation.

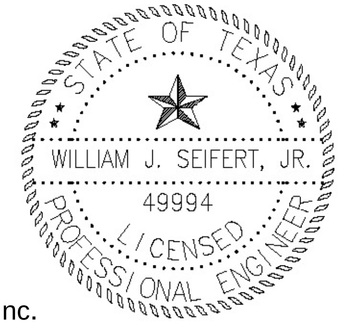
- The simulation was performed using the Regional Queen City / Sparta Groundwater Availability Model developed by the TWDB, the same model that was used in the GMA 12 planning effort in 2017. The results of the GMA 12 effort regarding MAGs and DFCs is documented in TWDB GAM Run 17-030 MAG: Modeled Available Groundwater for the Carrizo-Wilcox, Queen City, Sparta, Yegua-Jackson, and Brazos River Alluvium Aquifers in Groundwater Management Area 12 released by the TWDB on December 1, 2017. The results of the MPF simulation show that the utilization of the MPF pumping did not result in any increase in the DFCs for GCDs within GMA 12 nor for GMA 12 in total for the Carrizo, Calvert Bluff, Simsboro and Hooper aquifers. A table providing results from the two simulations is attached. The methodology utilized to calculate the DFCs was the same as was used during the last cycle of GMA 12 water planning. If there is any variation in the DFCs, the results were that the DFCs were slightly lower for the MPF pumping compared to the average MAG, but were so close that the differences are inconsequential.

- As provided yesterday, the modeling files are available via a link that has been provided to you and David Dunn with HDR. The files will be transmitted to the TWDB by Region G.

Our firm has appreciated the opportunity to be of service during the study and believe that the results add some flexibility for the consideration of future water resources planning and development of water supply projects for the City of College Station.

Sincerely,

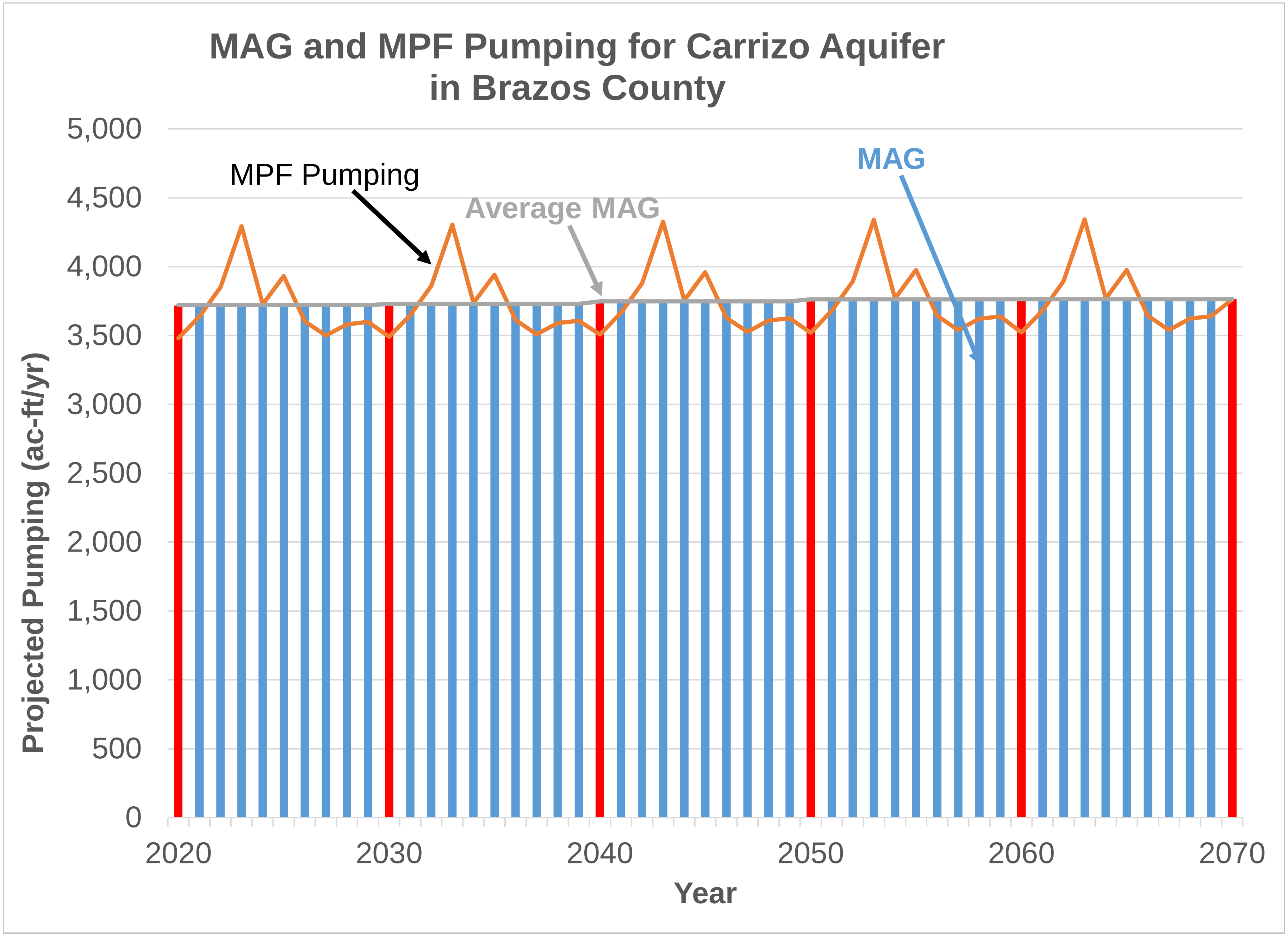
W. John Seifert, Jr., P.E.
Senior Supervising Engineer

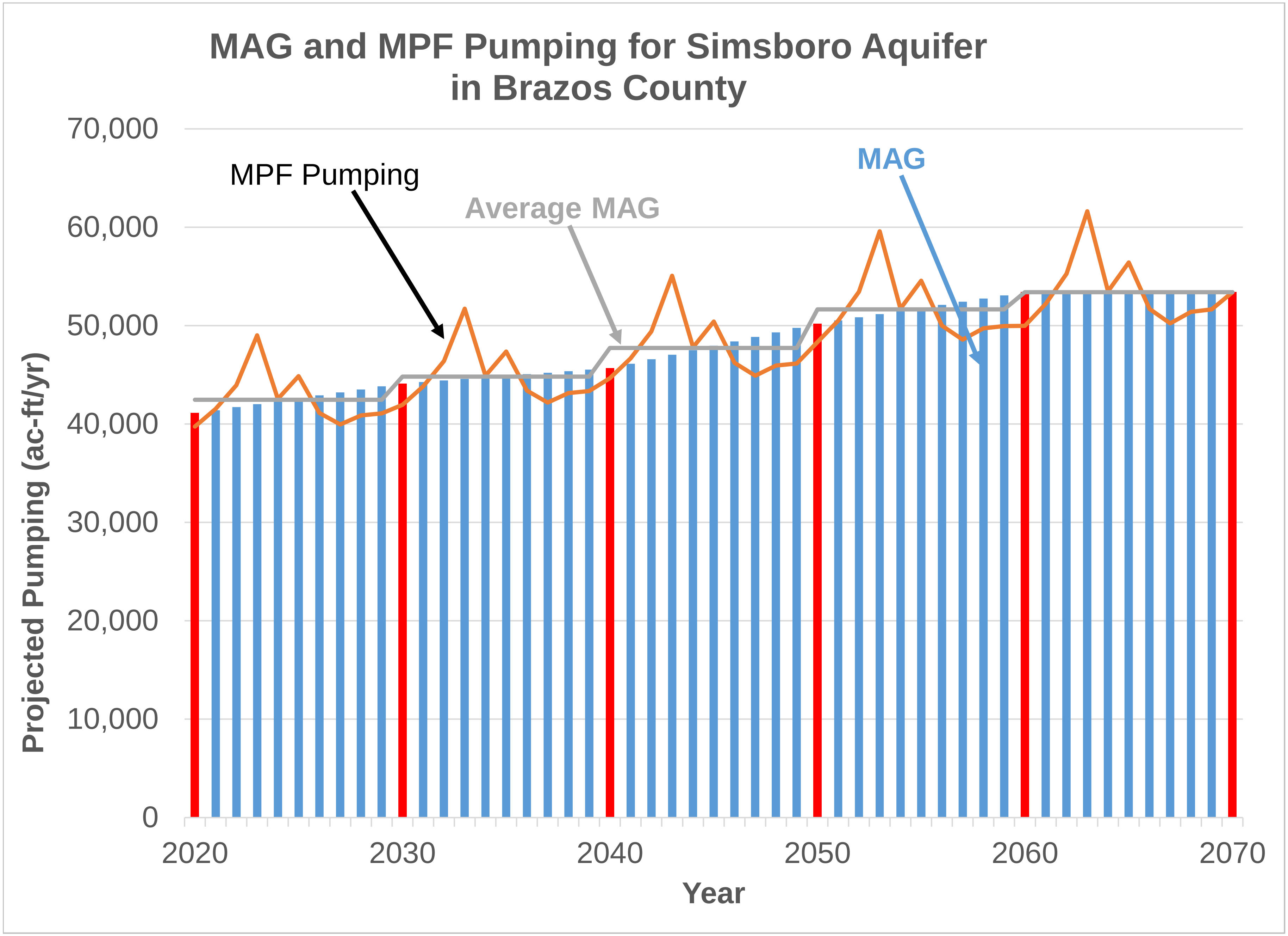


WJS/lks
Attachements

WSP USA, Inc.
F-2263

5/25/2018


MAG and MPF Pumping for Carrizo Aquifer in Brazos County
MPF Pumping
Average MAG
MAG
Projected Pumping (ac-ft/yr)
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
2020
2030
2040
2050
2060
2070
Year



MAG and MPF Pumping for Simsboro Aquifer
in Brazos County
MPF Pumping
Average MAG
MAG
Projected Pumping (ac-ft/yr)
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
2020
2030
2040
2050
2060
2070
Year

All values in acre-feet/year

Total Carrizo-Wilcox Aquifer (initial pattern)

Year	MAG	MPF Pumping Pattern	Average MAG
2020	44832	48413	51733
2021	45133	50590	51733
2022	45434	53546	51733
2023	45735	59700	51733
2024	46036	51822	51733
2025	46337	54658	51733
2026	46638	50089	51733
2027	46939	48672	51733
2028	47240	49802	51733
2029	47541	50037	51733
2030	47844	48413	51733
2031	48001	50590	51733
2032	48158	53546	51733
2033	48315	59700	51733
2034	48472	51822	51733
2035	48629	54658	51733
2036	48786	50089	51733
2037	48943	48672	51733
2038	49100	49802	51733
2039	49257	50037	51733
2040	49418	48413	51733
2041	49873	50590	51733
2042	50328	53546	51733
2043	50783	59700	51733
2044	51238	51822	51733
2045	51693	54658	51733
2046	52148	50089	51733
2047	52603	48672	51733
2048	53058	49802	51733
2049	53513	50037	51733
2050	53969	48413	51733
2051	54289	50590	51733
2052	54609	53546	51733
2053	54929	59700	51733
2054	55249	51822	51733
2055	55569	54658	51733
2056	55889	50089	51733
2057	56209	48672	51733
2058	56529	49802	51733
2059	56849	50037	51733
2060	57167	48413	51733
2061	57167	50590	51733
2062	57167	53546	51733
2063	57167	59700	51733
2064	57167	51822	51733
2065	57167	54658	51733
2066	57167	50089	51733
2067	57167	48672	51733
2068	57167	49802	51733
2069	57167	50037	51733
2070	57167	57167	51733

Carrizo Aquifer

Year	MAG	MPF Pumping Pattern	Average MAG	MPF Pumping		
2020	3717	48413	3720	3,481	**Cum Diff**	(0.00)
2021	3717.7	50590	3720	3,638	**Adj. Factor**	0.071911
2022	3718.4	53546	3720	3,851	**MPF**	1.155
2023	3719.1	59700	3720	4,293		
2024	3719.8	51822	3720	3,727		
2025	3720.5	54658	3720	3,930		
2026	3721.2	50089	3720	3,602		
2027	3721.9	48672	3720	3,500		
2028	3722.6	49802	3720	3,581		
2029	3723.3	50037	3720	3,598		
2030	3724	48413	3730	3,490	**Cum Diff**	(0.00)
2031	3725.3	50590	3730	3,647	**Adj. Factor**	0.072098
2032	3726.6	53546	3730	3,861	**MPF**	1.156
2033	3727.9	59700	3730	4,304		
2034	3729.2	51822	3730	3,736		
2035	3730.5	54658	3730	3,941		
2036	3731.8	50089	3730	3,611		
2037	3733.1	48672	3730	3,509		
2038	3734.4	49802	3730	3,591		
2039	3735.7	50037	3730	3,608		
2040	3737	48413	3748	3,507	**Cum Diff**	(0.00)
2041	3739.4	50590	3748	3,665	**Adj. Factor**	0.072445
2042	3741.8	53546	3748	3,879	**MPF**	1.157
2043	3744.2	59700	3748	4,325		
2044	3746.6	51822	3748	3,754		
2045	3749	54658	3748	3,960		
2046	3751.4	50089	3748	3,629		
2047	3753.8	48672	3748	3,526		
2048	3756.2	49802	3748	3,608		
2049	3758.6	50037	3748	3,625		
2050	3761	48413	3762	3,520	**Cum Diff**	0.00
2051	3761.2	50590	3762	3,679	**Adj. Factor**	0.072718
2052	3761.4	53546	3762	3,894	**MPF**	1.154
2053	3761.6	59700	3762	4,341		
2054	3761.8	51822	3762	3,768		
2055	3762	54658	3762	3,975		
2056	3762.2	50089	3762	3,642		
2057	3762.4	48672	3762	3,539		
2058	3762.6	49802	3762	3,621		
2059	3762.8	50037	3762	3,639		
2060	3763	48413	3763	3,522	**Cum Diff**	0.00
2061	3763	50590	3763	3,680	**Adj. Factor**	0.072739
2062	3763	53546	3763	3,895	**MPF**	1.154
2063	3763	59700	3763	4,343		
2064	3763	51822	3763	3,769		
2065	3763	54658	3763	3,976		
2066	3763	50089	3763	3,643		
2067	3763	48672	3763	3,540		
2068	3763	49802	3763	3,623		
2069	3763	50037	3763	3,640		
2070	3763	57167	3763	3,763		

Simsboro Aquifer

Year	MAG	MPF Pumping Pattern	Average MAG	MPF Pumping		
2020	41115	48413	42470	39,745	**Cum Diff**	0.00
2021	41416.2	50590	42470	41,532	**Adj. Factor**	0.820955
2022	41717.4	53546	42470	43,959	**MPF**	1.192
2023	42018.6	59700	42470	49,011		
2024	42319.8	51822	42470	42,544		
2025	42621	54658	42470	44,872		
2026	42922.2	50089	42470	41,121		
2027	43223.4	48672	42470	39,958		
2028	43524.6	49802	42470	40,885		
2029	43825.8	50037	42470	41,078		
2030	44120	48413	44828	41,951	**Cum Diff**	(0.00)
2031	44277.4	50590	44828	43,838	**Adj. Factor**	0.866534
2032	44434.8	53546	44828	46,399	**MPF**	1.173
2033	44592.2	59700	44828	51,732		
2034	44749.6	51822	44828	44,906		
2035	44907	54658	44828	47,363		
2036	45064.4	50089	44828	43,404		
2037	45221.8	48672	44828	42,176		
2038	45379.2	49802	44828	43,155		
2039	45536.6	50037	44828	43,359		
2040	45681	48413	47729	44,666	**Cum Diff**	-
2041	46136.1	50590	47729	46,675	**Adj. Factor**	0.922603
2042	46591.2	53546	47729	49,402	**MPF**	1.206
2043	47046.3	59700	47729	55,079		
2044	47501.4	51822	47729	47,811		
2045	47956.5	54658	47729	50,428		
2046	48411.6	50089	47729	46,212		
2047	48866.7	48672	47729	44,905		
2048	49321.8	49802	47729	45,947		
2049	49776.9	50037	47729	46,164		
2050	50208	48413	51647	48,333	**Cum Diff**	0.00
2051	50527.8	50590	51647	50,506	**Adj. Factor**	0.998341
2052	50847.6	53546	51647	53,457	**MPF**	1.187
2053	51167.4	59700	51647	59,601		
2054	51487.2	51822	51647	51,736		
2055	51807	54658	51647	54,567		
2056	52126.8	50089	51647	50,006		
2057	52446.6	48672	51647	48,591		
2058	52766.4	49802	51647	49,719		
2059	53086.2	50037	51647	49,954		
2060	53404	48413	53404	49,977	**Cum Diff**	0
2061	53404	50590	53404	52,224	**Adj. Factor**	1.032302
2062	53404	53546	53404	55,276	**MPF**	1.154
2063	53404	59700	53404	61,628		
2064	53404	51822	53404	53,496		
2065	53404	54658	53404	56,424		
2066	53404	50089	53404	51,707		
2067	53404	48672	53404	50,244		
2068	53404	49802	53404	51,411		
2069	53404	50037	53404	51,653		
2070	53404	53404	53404	53,404		

Total Carrizo-Wilcox Aquifer (final)

Year	MAG	MPF Pumping	Average MAG		
2020	44832	43,226	46190		
2021	45133	45,170	46190		
2022	45434	47,809	46190	**MPF**	1.189
2023	45735	53,304	46190		
2024	46036	46,270	46190		
2025	46337	48,802	46190		
2026	46638	44,723	46190		
2027	46939	43,458	46190		
2028	47240	44,467	46190		
2029	47541	44,676	46190		
2030	47844	45,442	48558		
2031	48001	47,485	48558		
2032	48158	50,260	48558	**MPF**	1.171
2033	48315	56,036	48558		
2034	48472	48,642	48558		
2035	48629	51,304	48558		
2036	48786	47,015	48558		
2037	48943	45,685	48558		
2038	49100	46,746	48558		
2039	49257	46,966	48558		
2040	49418	48,173	51477		
2041	49873	50,340	51477		
2042	50328	53,281	51477	**MPF**	1.202
2043	50783	59,404	51477		
2044	51238	51,565	51477		
2045	51693	54,387	51477		
2046	52148	49,841	51477		
2047	52603	48,431	51477		
2048	53058	49,555	51477		
2049	53513	49,789	51477		
2050	53969	51,853	55409		
2051	54289	54,185	55409		
2052	54609	57,351	55409	**MPF**	1.185
2053	54929	63,942	55409		
2054	55249	55,504	55409		
2055	55569	58,542	55409		
2056	55889	53,648	55409		
2057	56209	52,131	55409		
2058	56529	53,341	55409		
2059	56849	53,593	55409		
2060	57167	53,498	57167		
2061	57167	55,904	57167		
2062	57167	59,171	57167	**MPF**	1.154
2063	57167	65,971	57167		
2064	57167	57,265	57167		
2065	57167	60,399	57167		
2066	57167	55,350	57167		
2067	57167	53,785	57167		
2068	57167	55,033	57167		
2069	57167	55,293	57167		
2070	57167	57,167	57167		

Results of MAG Peak Factor Modeling

January 2000 through December 2069 Average Drawdown, ft

Entity Scenario	Carrizo (Aquifer)	Calvert Bluff (Aquifer)	Simsboro (Aquifer)	Hooper (Aquifer)
Brazos Valley GCD				
MAG	60	125	295	207
MPF	60	123	290	205
Mid-East Texas GCD				
MAG	80	89	138	125
MPF	80	89	136	124
Lost Pines GCD				
MAG	68	109	252	181
MPF	68	109	250	181
Post Oak Savannah GCD				
MAG	66	149	322	206
MPF	66	147	318	205
GMA-12				
MAG	75	114	228	168
MPF	75	113	226	167

MAG = Results from GMA-12 simulation used to develop DFCs for 2017 cycle of GMA planning.

MPF = Results from simulation using pumping from the Simsboro Aquifer modified in Brazos County by a peaking factor of about 1.2 provided by Region G.

BRAZOS VALLEY GROUNDWATER CONSERVATION DISTRICT

P.O. BOX 528 · HEARNE, TX 77859 · (979)279-9350 · FAX: (979)279-0035
WWW.BRAZOSVALLEYGCD.ORG

May 11, 2018

Wayne Wilson
c/o Stephen Hamlin
Brazos G Regional Water Planning Group Coordinator
4600 Cobbs Drive
Waco, TX 76710

Dear Wayne,

The Brazos Valley Groundwater Conservation District met on Thursday, May 10, 2018 discuss and possibly adopt a 1.2 or 1.3 MAG Peaking Factor for the Carrizo-Wilcox Aquifer within Brazos County for use during the currently state water planning cycle.

Item 4 - Discussion and possible action on the approval of a 1.30 Modeled Available Groundwater Peaking Factor for Brazos County in response to a proposed groundwater project for the City of College Station.

Following a unanimous vote, the Board adopted a 1.20 MAG Peaking Factor in the Carrizo-Wilcox Aquifer in Brazos for use during the current state water planning cycle in Region G. If you have any questions concerning this matter, please do not hesitate to contact me at your convenience.

Best regards,

Alan M. Day
General Manager

BOARD OF DIRECTORS:
DAVID STRATTA, SECRETARY
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BRYAN F. RUSS, JR.
JAYSON BARFKNECHT

Post Oak Savannah Groundwater Conservation District

310 East Avenue C
P. O. Box 92
Milano, Texas 76556

Phone: 512-455-9900
Fax: 512-455-9909
Email: gwestbrook@posgcd.org
Website: www.posgcd.org

Gary Westbrook, General Manager

May 17, 2018

Mr. Wayne Wilson, Chairman
Brazos G Regional Water Planning Group
c/o Mr. Stephen Hamlin, Brazos G Coordinator
4600 Cobbs Drive
Waco, TX 76710

Sent via email to stephen.hamlin@Brazos.org

Dear ~~Chairman Wilson~~ Wayne,

Groundwater Management Area 12 met on Friday, May 11, 2018, at the offices of the Post Oak Savannah GCD offices, and, during the course of the meeting, considered agenda item 6, "Discussion and possible action on the approval of a 1.30 Modeled Available Groundwater Peaking Factor for Brazos County in response to a proposed groundwater project for the City of College Station."

After receiving presentations, and following discussion on this item, the voting representatives of GMA 12 voted unanimously to approve a 1.2 Modeled Available Groundwater Peaking Factor for Brazos County in response to a proposed groundwater project for the City of College Station in the current cycle of regional water planning.

Please do not hesitate to contact me for further information.

Sincerely,

Gary Westbrook

Gary Westbrook
General Manager
Post Oak Savannah GCD

BRAZOS VALLEY GROUNDWATER CONSERVATION DISTRICT
P.O. BOX 528 · HEARNE, TX 77859 · (979)279-9350 · FAX: (979)279-0035
WWW.BRAZOSVALLEYGCD.ORG

May 26, 2018

Larry French
Director, Groundwater Division
Texas Water Development Board
1700 North Congress Avenue
Austin, Texas 78701

Dear Larry,

The Brazos Valley Groundwater Conservation District Board of Directors recently approved a Modeled Available Groundwater Peaking Factor for the Carrizo and Simsboro aquifers in Brazos County for use in the 5th cycle of state water planning. It has been brought to my attention that the Texas Water Development Board needs:

"documentation (for example, monitoring plans) of how the temporary availability increase will not prevent the associated GCD(s) from managing groundwater resources to achieve the DFC(s)…."

The District has numerous rules and policy in place to enforce and take action based on aquifer response to pumping:

- District Rule 7.2 (Actions Based on Aquifer Response to Pumping) details trigger levels and actions available to the Board of Directors to keep the District compliant with the adopted DFC(s). The details of the rule can be viewed on pages 21-25 of the District Rules.

  https://brazosvalleygcd.org/wp-content/uploads/2012/12/BVGCD-Rules-Adopted-11-9-17-1.pdf

- The District maintains a robust monitoring well network of 157 wells which are measured quarterly. Fifty-six (56) of the wells screen the Simsboro Aquifer. Twelve (12) of those wells have been designated as "DFC" wells. Ten (10) of the wells have water level data dating back to 1999 (the beginning point for the DFC(s)). Beginning water levels for the remaining two (2) wells were interpolated. The DFC wells were chosen for spatial

BOARD OF DIRECTORS: JAN ROE, PRESIDENT MARK CARRABBA, VICE PRESIDENT
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diversity. District DFCs are based on the average artesian reduction across the entire two-county district. The proposed groundwater projects envisioned as water strategies by the City of College Station will be in the Simsboro Aquifer.

- All water level measurements are available for public viewing on the District website.

  https://brazosvalleygcd.halff.com/portal1/Map.aspx

- A strict water level measurement protocol was adopted by the Board in order to validate all data collected. The District will base any curtailment of pumping on data collected by District staff. The adopted protocol provides reliable data collection allowing the Board to make informed decisions and assuring permit holders that any reductions are based on high quality information. A copy of the adopted protocol is enclosed.

If you have any questions concerning this matter, please feel free to contact me at 979-279-9350 (office) or 817-774-6412 (cell).

Best regards,

Alan M. Day
General Manager

Adopted August 11, 2016

Brazos Valley GCD
Steel Tape Measuring Protocol

1. The well where the static water level is to be measured should not be pumped for 24 hours, if possible, prior to taking the static water-level measurements. If the well has been pumped less than 24 hours prior to taking the water-level measurement, record in the official record how long the pump has been off prior to taking the measurement, if known. Confirm and indicate in the official record that no non-exempt well completed in the same aquifer within a ½ mile radius to the well being measured is being actively pumped at the time of taking the water-level measurement. Unless this can be confirmed, no water-level measurement should be taken. Obtain permission to collect measurement at a later time.

2. If well is equipped with a submersible pump, confirm and record in the official record that the pump is not in operation. Unless it is determined that the pump is not operational, no water-level measurement should be taken or recorded. Obtain permission to collect measurement at a later time.

3. Identify a port or opening in the pump discharge head or casing or in the pump foundation (surface casing vent pipe) that provides access for the steel tape to the annulus between the surface casing and the pump column assembly, water-level measuring pipe or open casing if the well is not equipped with a pump.

4. Measure and record the height of the opening above ground level and this will become the measuring point. Describe the measuring point in the official record for the well, and use the same measuring point each time when measuring the water level. If not possible, record the height of the measuring point above land surface each time the static water-level is measured.

5. Prior to taking the water-level measurement, review previous water-level measurements to estimate the current water level depth.

6. Use carpenter's chalk to coat the lowest 15-30 feet of the steel tape.

7. Lower the steel tape in the annulus between the pump column and casing, down the open casing if not equipped with a pump or down a water-level measuring pipe until the depth of the tape is 10 feet lower than the last recorded static water level. Record the length of tape installed in the well with the footage marker exactly at the measuring point. Refer to this length as the "hold". Retract the steel tape and record the length of the tape to the nearest hundredth of a foot that is wet. This measurement is called the "cut". Record both measurements. Remove the wet chalk on the tape.

8. Wait 5 minutes after initial measurement, re-chalk tape and lower the tape 1-2 feet deeper than the hold depth for the previous measurement. Retract the tape and record the cut length. Subtract the cut length from the hold length to calculate the depth to water. The

difference between the two measurements should be no greater than 0.02 feet. If the difference in depth to water is greater than 0.02 feet, note in the field log and schedule for water-level measurement at a future date.

9. Subtract the measuring point height from the measured depth to water to obtain depth of water below land surface and record in the official record.

10. Record date and time of measurement.

11. Remove the chalk from the steel tape and clean the lowest 30 feet with Clorox bleach wipes, bleach wipes with an equivalent percentage sodium hypochlorite or a minimum 0.5% sodium hypochlorite solution (NaOCl and water) before measuring the water level in another well.

12. Replace cap on any port in discharge head or casing. Leave the well and pump in same condition as observed on arrival.

Adopted August 11, 2016

Brazos Valley GCD
Pressure Transducer Utilization Protocol

1) Select and purchase all equipment best suited for long term monitoring needs (static water-level and well depth). The equipment needed for the transducer includes pressure transducer, cable, adapters for computer and software.

2) Install manufacturer supplied software to computer(s) that will be used to interface with the transducers.

3) Install transducer onto cable and follow manufacturer's instructions.

4) Use an open-ended pipe perforated at its bottom and extending to at least the transducer setting or open casing void of a pump to provide protective housing for the transducer.

5) Measure the water level in the water-level measuring pipe or open casing with a steel tape following the steel tape measuring protocol.

6) Connect transducer cable to computer allowing software to establish signal to transducer.

7) Input correct settings for data recording task. Start with a data collection frequency of one measurement per hour. After signal established and transducer programmed, disconnect transducer from computer.

8) Install transducer in well at a depth deemed suitable to capture all anticipated water levels. Secure transducer and cable following manufacturer's recommendations to keep unit stable. Reconnect transducer to computer and program the pressure transducer so that water level measured is the same as the water level measured with the steel tape. Use ground level as the depth datum.

9) Record water level data for two months and download data. Measure water level in the well with a steel tape and record depth to water. Compare depth to water measured with the steel tape with the depth to water measured with the pressure transducer. Record both readings in the official record. Both readings should be within 1.0 foot of each other.

10) If pressure transducer and steel tape depth to water measurements are within 1.0 foot of each other after the first two months of data collection, record measurements in the official record and resume data collection. Repeat Step 9. If the water level measurements are not within 1.0 foot of each other, recalibrate or replace transducer and reinstall the recalibrated or new transducer. Record the transducer equipment change and any transducer depth setting change in the official record.

11) Program transducer to collect water-level data at least once per day and resume data collection. Repeat Steps 9 and 10.

Adopted August 11, 2016

Brazos Valley GCD
Airline Measuring Protocol

1. The well where the static water-level is to be measured should not be pumped for 24 hours, if possible, prior to taking the static water-level measurement. If the well has been pumped less than 24 hours prior to taking the water-level measurement, record in the official record how long the pump had been off prior to taking the measurement, if known. Confirm and indicate in the official record that no non-exempt well completed in the same aquifer within a ½ mile radius to the well being measured is being actively pumped at the time of taking the water-level measurement. Unless this can be confirmed, no water-level measurement should be taken. Obtain permission to collect measurement at a later time.

2. Prior to taking the water-level measurement, review previous measurements regarding how deep the water level may be encountered and records showing the depth setting of the air line.

3. Measure and record the height of the base of the pump discharge head above ground level, and this will become the measuring point. Describe the measuring point in the records for the well, and use the same measuring point each time when measuring the depth to water.

4. Determine the manufacturer of the gauge to be used, the serial number, and the date last calibrated. Record this in the official record.

5. Check and record depth of air line setting below ground level or below pump base based on air line setting data from well owner and/or pump setting contractor.

6. If well is equipped with a submersible pump, confirm and record in the official record that the pump is not in operation. Unless it is determined that the pump is not operational, no water-level measurement should be taken or recorded. Obtain permission to collect measurement for a later time.

7. Use an air or nitrogen source with adequate pressure to blow air out the bottom of the air line.

8. Open the valve on the air supply.

9. Attach the air hose nozzle to the valve on the air line.

10. The needle on the pressure gauge should rise to the approximate pressure at bottom of air line as the water has been purged from the bottom of the air line.

11. Remove the air hose nozzle, and then the needle on the pressure gauge will slowly descend and stabilize at the current water-level pressure. If this does not occur, have a

spare, quality pressure gauge available that can be installed and used on a temporary basis. Repeat Steps 7-10.

12. Record the measurement from the pressure gauge in units provided on the gauge. If the pressure gauge only has psi readings, multiply the psi reading by 2.31 to convert the reading to feet of water.

13. The recorded measurement in Item 12 is how many feet of water are above the bottom of the air line. Subtract the measurement from the depth setting of the air line to convert the measurement to depth to water below land surface. (Example: If air line is installed to a depth of 400 feet below land surface and the pressure gauge reading is 150 feet above the bottom of the air line, the depth to water from land surface is = 400’-150’= 250’ below land surface). If the air line setting is depth below the pump base, subtract the measuring point from the depth to water reading to calculate depth to water below land surface.

14. Only record data if the air gauge pressure holds constant for five minutes.

15. Record date and time of measurement.

Adopted August 11, 2016

Brazos Valley GCD
E-line Measuring Protocol

1. The well where the static water level is to be measured should not be pumped for 24 hours, if possible, prior to taking the static water-level measurements. If the well has been pumped less than 24 hours prior to taking the water-level measurement, record in the official record how long the pump has been off prior to taking the measurement, if known. Confirm and indicate in the official record that no non-exempt well completed in the same aquifer within a ½ mile radius to the well being measured is being actively pumped at the time of taking the water-level measurement. Unless this can be confirmed, no water-level measurement should be taken. Obtain permission to collect measurement at a later time.

2. If well is equipped with a submersible pump, confirm and record in the official record that the pump in not in operation. Unless it is determined that the pump in not operational, no water-level measurement should be taken or recorded. Obtain permission to collect measurement at a later time.

3. Identify a port or opening in the pump discharge head or in the pump foundation (surface casing vent pipe) that provides access for the e-line to the annulus between the surface casing and the pump column assembly, water-level measuring pipe or open casing if the well is not equipped with a pump.

4. Measure and record the height of the opening above ground level and this will become the measuring point. Describe the measuring point in the official record for the well, and use the same measuring point each time when measuring the water level. If not possible, record the height of the measuring point above land surface each time the water level is measured.

5. Prior to taking the water-level measurement, review previous water-level measurements to estimate the current water level depth.

6. Turn on power to the e-line and adjust sensitivity of sound meter to about halfway. If light used to detect water level, no need to adjust sound level.

7. Lower the e-line into the well until the e-line signals it has encountered the water level in the well. Retract the e-line about one foot above where the e-line signaled water encountered and slowly lower again until the water level is encountered again.

8. Hold the electric line with a fingertip at the measuring point when the water is encountered. Using the 0.01 feet markings on the electric line, determine depth to water to the nearest 0.01 of a foot and record in the official record.

9. Retract the e-line about 5 feet, wait five minutes and repeat the process to ensure an accurate reading has been made of a stable water level. If both measurements are not within 0.05-foot of each other, note in the field log and schedule for water-level measurement at a future date.

10. Subtract the measuring point height from the measured depth to water obtained in Step 8 to determine depth of water from land surface, and record in the official record.

11. Record date and time of measurement.

12. Retract the e-line from the well and clean the lower 20 feet with Clorox bleach wipes, bleach wipes with an equivalent percentage sodium hypochlorite or a minimum 0.5% sodium hypochlorite in solution (NaOCl and water) prior to measuring the water level in the next well.

13. Replace cap on any port in discharge head or casing. Leave the well and pump in same condition as observed on arrival.

Texas Water Development Board

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

July 24, 2018

Mr. Wayne Wilson
Region G Chair
c/o Wilson Cattle Company
7026 East OSR
Bryan, TX 77808

RE: Brazos G Regional Water Planning Group (RWPG) request to utilize Modeled Available Groundwater (MAG) Peak Factors for the Carrizo-Wilcox Aquifer in Brazos County in the 2021 Brazos G Regional Water Plan (RWP)

Dear Mr. Wilson:

The Texas Water Development Board (TWDB) has reviewed the request submitted by Mr. David Dunn on behalf of the Brazos G RWPG dated May 29, 2018 for approval to utilize MAG Peak Factors for the Carrizo-Wilcox Aquifer in Brazos County, for the purpose of establishing groundwater availability in the 2021 Brazos G RWP. This letter confirms that the TWDB approves the request as shown in the table below:

	2020	2030	2040	2050	2060	2070
Approved MAG Peak Factors for the Carrizo-Wilcox Aquifer, Brazos County	1.19	1.17	1.20	1.18	1.15	1.15

This approval is specific to the Carrizo-Wilcox Aquifer within Brazos County. Any additional MAG Peak Factor requests for use in the Brazos G RWP will be subject to the TWDB's review and approval.

While the TWDB authorizes these groundwater availability modifications for development of the 2021 Brazos G RWP, it is the responsibility of the RWPG to ensure that the estimates of water availability are reasonable for drought planning purposes and will reflect conditions expected in the event of actual drought conditions; and in all other regards will be evaluated in accordance with the contract Exhibit C, *Second Amended General Guidelines for Fifth Cycle of Regional Water Plan Development.*

Our Mission

To provide leadership, information, education, and support for planning, financial assistance, and outreach for the conservation and responsible development of water for Texas

Board Members

Peter M. Lake, Chairman | Kathleen Jackson, Board Member | Brooke T. Paup, Board Member

Jeff Walker, Executive Administrator

If you have any questions, please do not hesitate to contact Sarah Backhouse, Regional Water Planning manager, at 512-936-2387 or via email at sarah.backhouse@twdb.texas.gov.

Sincerely,

Jeff Walker
Executive Administrator

c: Mr. Stephen Hamlin, Brazos River Authority
Mr. Alan Day, Brazos Valley Groundwater Conservation District
Mr. Gary Westbrook, Groundwater Management Area 12
Mr. David Dunn, HDR, Inc.
Mr. Dave Coleman, City of College Station
Mr. Larry French, TWDB
Mr. Tom Barnett, TWDB

Appendix L
Water Availability Model Files

(electronic)

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[The Water Availability Model (WAM) electronic files used in the development of water supplies for the 2021 Brazos G Regional Water Plan are available for download from the TWDB website.]

Folder	Subfolder	Description of WAM Files
Reservoir Yields	BRA Reservoirs	• Brazos G WAM (Period of Record: 1940-2015) • 2020 and 2070 sediment conditions • 2020 and 2070 return flows • Subordination agreements included • BRA System Operations removed • Used to calculate current and future individual yields of existing BRA reservoirs
	Minor Reservoirs	• Brazos G WAM (Period of Record: 1940-2015) • 2020 and 2070 sediment conditions • 2020 and 2070 return flows • Subordination agreements • BRA System Operations included • Used to calculate current and future yields of existing minor reservoirs in Brazos G planning area
	Large Non-BRA Reservoirs	• Brazos G WAM (Period of Record: 1940-2015) • 2020 and 2070 sediment conditions • 2020 and 2070 return flows • Subordination agreements included • BRA System Operations included • Used to calculate current and future yields of existing large non-BRA reservoir downstream of Possum Kingdom Reservoir in Brazos G planning area
	Upper Basin Reservoirs	• Brazos G WAM (Period of Record: 1940-2015) • 2020 and 2070 sediment conditions • 2020 and 2070 return flows • Subordination agreements included • BRA System operations included • Used to calculate current and future yields of existing large non-BRA reservoir upstream of Possum Kingdom Reservoir in Brazos G planning area

Run of River	2020 Brazos G with Sys Ops	• Brazos G WAM (Period of Record: 1940-2015) • 2020 sediment conditions • 2020 return flows • Subordination Agreements included • BRA System Operations included • Used to calculate current reliability of existing water rights with less than 5,000 acft of storage in Brazos G planning area
	2070 Brazos G with Sys Ops	• Brazos G WAM (Period of Record: 1940-2015) • 2070 sediment conditions • 2070 return flows • Subordination agreements included • BRA System Operations included • Used to calculate future reliability of existing water rights with less than 5,000 acft of storage in Brazos G planning area
Water Management Strategies	Individual Strategies	• TCEQ Brazos WAM Run 3 (Period of Record: 1940-1997) • Permitted storage • No return flows • Subordination agreements not included unless required for specific strategy • BRA System Operations included • Used to calculate yields of water management strategies

Appendix M
Implementation of the 2016 Brazos G Regional Water Plan

M-1. Memorandum – Implementation of Strategies Recommended in the
2016 Brazos G Regional Water Plan

M-2. Spreadsheet – RegionG_2017SWP_ImplementationSurvey.xlsx
(electronic, not included in report)

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MEMORANDUM

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TO: David Dunn (HDR)

CC: File

FROM: Spencer Schnier (FNI)

SUBJECT: Implementation of Strategies Recommended in the 2016 Brazos G Regional Water Plan

DATE: 12/31/2019

PROJECT: 2021 Brazos G Regional Water Plan (HDR19363)

The purpose of this memorandum is to provide information regarding the status of water management strategies (WMSs) recommended in the 2016 Brazos G Regional Water Plan, including information regarding water rights applications, funding sought, construction initiated, real estate purchased, and other information that provides an update as to the status of various strategies in the plan. This memorandum provides a summary of the information known to Freese and Nichols, Inc. (FNI) regarding the strategies being pursued by entities in the Brazos G Area, rather than an exhaustive summary of all WMSs recommended in the 2016 Plan. The focus is on strategies that have been or are currently being implemented. WMSs that were recommended in the 2016 Plan for future decades (2040-2070), and that were retained in the 2021 Plan for future decades, were reevaluated and are discussed in Chapter 5 (Water Management Strategies) of the 2021 Plan.

This memorandum provides updates for the following water management strategies recommended in the 2016 Brazos G Regional Water Plan:

- Cleburne Reuse
- Other Cleburne Strategies
- Brazos River Authority System Operation Permit
- West Central Brazos Water Distribution System

Responses to the Texas Water Development Board (TWDB) Region G Implementation Survey for the strategies listed above are provided in an Excel file as part of this memorandum. The status of each strategy is briefly described below. FNI did not provide an update for the Turkey Peak Project or Cedar Ridge Reservoir, two projects that are currently being pursued, because HDR is more familiar with the details of these strategies.

Cleburne Reuse

The information in Table 1 through Table 4 is from Cleburne's 2019 Water Supply Plan. The updated Cleburne Reuse water management strategy is summarized in Table 1.

Table 1. Summary of Cleburne's Reuse Strategy

WMS	Recommended or Alternative	Decade Implemented	Capital Cost	Unit Cost ($/kGal)	Quantity (ac-ft/yr)
West Loop Reuse Phase 1	Recommended	2020	$10,203,000	$1.22	2,240
West Loop Reuse Phase 2	Recommended	2030	$19,600,000	$1.24	5,377*

* 4 MGD of additional Indirect Potable Reuse water and 0.8 MGD of reuse supplies for Cleburne's industrial customers

Phase 1, which has already received funding, consists of an Indirect Potable Reuse (IPR) pump station and pipeline to deliver supplies to Lake Pat Cleburne from the existing wastewater treatment facility. The pipeline was sized for 6 million gallons per day (MGD) but will only be able to utilize 2 MGD due to high levels of total dissolved solids (TDS). Construction of a reuse system at the existing plant is included in Cleburne's Wastewater System CIP so it was not included in the costs shown in Table 1.

Phase 2 consists of construction of a new industrial wastewater reuse system and additional pumps at the IPR pump station. This system will serve to treat Cleburne's industrial customers only. Removing this high TDS stream will allow Cleburne to utilize the remaining 4 MGD capacity available at the existing plant's reuse system constructed in Phase 1.

The information in the bullet points below is summarized in Appendix A.

- The initial phase of the IPR project will yield 2 MGD upon completion and future phases will expand that to 6 MGD plus 0.8 MGD for Cleburne's industrial customers. The ultimate volume of water supplied by the reuse project is 6.8 MGD, or 7,617 acre-feet per year (ac-ft/yr).

- The cost of Phase 1 is estimated to be $10.2 million and the cost of Phase 2 is estimated to be $19.6 million for an ultimate project cost of $29.8 million. To date, $660,000 has been expended for the design of Phase 1 ($0 have been expended for construction).

- Initial planning for the IPR project began in 2014 and design began in 2019. The project is currently in the acquisition and design phase. Construction of Phase 1 is scheduled to begin in 2020, and the facilities are scheduled to be operating starting in 2023. The project reaches maximum capacity when Phase 2 comes online around 2030 (depending on population growth).

- The funding source for the construction phase of the project is the Texas Water Development Board's State Revolving Fund. Cleburne's reuse strategy is included in the 2021 Brazos G Regional Water Plan. The project does not involve reallocation of flood control, nor does it provide any measurable flood risk reduction.

Other Cleburne Strategies

The remainder of this section describes the current status of Cleburne's future water management strategies. The reuse project summarized in Table 1 and described in the preceding paragraphs has delayed the need for Cleburne to purchase water from prospective sellers in the Dallas-Fort Worth Metroplex area (Trinity Basin, Region C), Phase 1 of which is scheduled to be implemented by 2040 (Table 2).

Table 2. Summary of Cleburne's Trinity Basin Purchase Strategy

WMS	Recommended or Alternative	Decade Implemented	Capital Cost	Unit Cost ($/kGal)	Quantity (ac-ft/yr)
Trinity Basin Purchase Phase 1	Recommended	2040	$26,468,000	$3.71	5,601
Trinity Basin Purchase Phase 2	Recommended	2050	$17,668,000	$3.42	5,601

The City of Cleburne and Region G can decide which Trinity Basin water supplier they would like to indicate in the 2021 Brazos G Regional Water Plan. Cleburne's 2019 Water Supply Plan considered Arlington, Mansfield, and Fort Worth as potential sellers, all of which are Region C wholesale water providers. The costs shown in Table 2 are for a hypothetical purchase from Fort Worth.

In the 2021 Plan, the Lake Whitney Desalination strategy is recommended to meet the water supply needs expected to arise in the later decades, with the first phase implemented in the 2060 decade (Table 3). The cost per thousand gallons for the desalination strategy is higher than the Trinity Basin Purchase strategy.

Table 3. Summary of Cleburne's Lake Whitney Desalination Strategy from the Water Supply Update

WMS	Recommended or Alternative	Decade Implemented	Capital Cost	Unit Cost ($/kGal)	Quantity (ac-ft/yr)
Lake Whitney Desalination Phase 1	Recommended	2060	$54,370,000	$5.65	4,257
Lake Whitney Desalination Phase 2	Recommended	2070	$17,797,000	$4.14	3,136

The City of Cleburne has an existing supply of water provided by the Brazos River Authority (BRA) out of Lake Aquilla. Cleburne has another contract with the BRA for 9,700 ac-ft/yr of BRA system water. The project will consist of an intake (White Bluff), advanced water treatment facility, pump station and a pipeline to transfer Lake Whitney supplies to Lake Pat Cleburne.

In the 2016 Plan, the predecessor to the Lake Whitney Desalination strategy was the Lake Aquilla Augmentation strategy. Previous variants of the strategy involved the Aquilla Water Supply District and pumping water from Lake Whitney to Lake Aquilla before connecting to the existing Barkman Pipeline for delivery to Cleburne. These variants are no longer under consideration and were not evaluated in Cleburne's 2019 Water Supply Plan. The version of the strategy evaluated and recommended in Cleburne's 2019 Water Supply Plan is a strategy for Cleburne only, in which approximately 7,400 ac-ft/yr are ultimately delivered from Lake Whitney directly to the City of Cleburne.

Table 4 summarizes alternative strategies for the City of Cleburne. These are the strategies the City would consider if something changed to make them more feasible, or if the recommended strategies in Table 1, Table 2 and Table 3 became less feasible or suitable for some reason.

Table 4. Summary of Cleburne's Alternative Strategies

WMS	Recommended or Alternative	Decade Implemented	Capital Cost	Unit Cost ($/kGal)	Quantity (ac-ft/yr)
Johnson County SUD Connection	Alternative	2060	$6,902,000	$4.90	3,360
Lake Aquilla Reallocation	Alternative				

Johnson County Special Utility District (JCSUD) obtains both treated water from Mansfield as well as desalinated supplies from Lake Granbury. At the time of the development of Cleburne's 2019 Water Supply Plan, the JCSUD Connection alternative had a high unit cost for water (dollars per thousand gallons) and there were concerns with TDS. The feasibility of this strategy could change in the future and therefore it is suggested to retain it in the Regional Water Plan as an alternative strategy.

The Lake Aquilla Reallocation strategy was not evaluated in Cleburne's 2019 Water Supply Plan since it was not expected for Cleburne's portion of the Lake Aquilla yield to drop below the contracted amount prior to 2045 and the Lake Aquilla reallocation study was ongoing. However, more supplies could become potentially available through a reallocation of flood pool to conservation pool storage at Lake Aquilla. If additional supply is made available through reallocation and the BRA is willing to increase the contracted amount to Cleburne this could be a potentially feasible strategy.

Brazos River Authority System Operation Permit

The Brazos River Authority (BRA) began pursuit of a System Operations Permit and began work on a Water Management Plan (WMP) to accompany the application. The analysis and permitting effort were necessary to obtain the State authorization to take advantage of additional water supplies that could be made available through the integrated management of the BRA's multiple water supply reservoirs and other potential sources (e.g. return flows). The BRA wanted to operate its 12 Brazos basin reservoirs as a system with available unappropriated flow to increase the water supply available for the basin. The project was initiated in 2003.

The information in the bullet points below is summarized in Appendix B.

- Prior to the System Operations (Sys Ops) Permit, the Texas Commission on Environmental Quality (TCEQ) had not issued a permit to operate a basin-wide system of reservoirs in a coordinated way so as to increase the total yield available from the system. The permitting process took approximately 15 years.

- The TCEQ formally issued the Sys Ops Permit to the BRA on November 30, 2016. TCEQ required BRA to modify the Water Management Plan (WMP) and Accounting Plan so that each conformed with the final version of the Permit. The TCEQ Executive Director approved the conformed documents on April 2, 2018.

- The permitted diversion amount is 434,703 ac-ft/yr according to a database of active water rights maintained by the TCEQ.

- The total project cost estimated for the 2016 Brazos G Regional Water Plan was $23,581,674. The project was funded primarily through rates, not loans. The costs involved primarily legal, administrative and engineering fees associated with obtaining the permit.

- The project is currently operating, and the BRA is in the process of evaluating potential contracts for system water. The System Rate for 2020 is $79.00 per acre-foot per year.

- The strategy is included in the 2021 Plan as an existing supply (Chapter 3) and is no longer included as a potential water management strategy (Chapter 5).

- The project does not involve reallocation of flood control storage, nor is any measurable flood risk reduction expected as a result of the project.

West Central Brazos Water Distribution System

The West Central Brazos Water Distribution System (WCBWDS) was originally developed to provide water for oil and gas production in the late seventies and early eighties. The West Central Texas Municipal Water District (WCTMWD), the current owner of the system, has repurposed the system to provide municipal water to WCTMWD customers and the Stephens Regional Special Utility District (SUD), as well as water for mining and domestic and livestock use.

In the 2016 Plan, the transport of water from Possum Kingdom Lake using the WCBWDS was being considered by several west Texas entities including Fort Griffin SUD (formerly Shackleford WSC), Stephens Regional SUD, and the City of Throckmorton. Although some individual project elements have been implemented, the project as described in the 2016 Plan was not implemented because the sponsors elected to pursue their own projects rather than a regional solution. Fort Griffin SUD recommended that the strategy not be included in the 2021 Plan, and the Stephens Regional SUD concurred.

Appendix A

Responses to TWDB's 2016 Implementation Survey
For Cleburne's Reuse Strategy

WMS or WMS Project Name	REUSE- CLEBURNE
Database Online Decade	2020
Related Sponsor Entity and/or Benefitting WUGs	PROJECT SPONSOR(S): CLEBURNE
Implementation Survey Record Type	RECOMMENDED WMS PROJECT
Database ID	1838

*Survey questions that tie directly to meeting statutory requirements are **bolded**. Please regard bolded questions as more important.

1. **Has Sponsor taken affirmative vote or actions?* (TWC 16.053(h)(10))**
   - ☒ Yes
   - ☐ No

2. **If yes, in what year did this occur?**
   - ☒ 2014
   - ☐ 2015
   - ☐ 2016
   - ☐ 2017
   - ☐ 2018
   - ☐ 2019

   Initial planning for the Indirect Potable Reuse (IPR) project began in 2014. Design began in 2019.

3. **If yes, by what date is the action on schedule for implementation?**

   2020

   Construction is scheduled to begin in 2020. Startup of the facilities is scheduled for 2023.

4. **At what level of implementation is the project currently?***
   - ☐ Not Implemented
   - ☐ Sponsor has taken official action to initiate project
   - ☐ Feasibility study ongoing
   - ☐ Permit application submitted/pending
   - ☒ Acquisition and design phase
   - ☐ Under construction
   - ☐ Currently operating
   - ☐ All phases fully implemented

5. **If not implemented, why?* (When "If other, please describe" is selected, please add the descriptive text to that field)**
   - ☐ Too soon
   - ☐ Financing
   - ☐ Permit constraints
   - ☐ Environmental obstacles
   - ☐ If other, please describe: ______________________________

6. **What impediments presented to implementation?* (When "If other, please describe" is selected, please add the descriptive text to that field)**
   - ☐ Not applicable

- ☐ Access to funding
- ☐ Permitting process
- ☐ Political support/governance
- ☐ If other, please describe: ____

7. Current water supply project yield (ac-ft/yr)
   0 The initial phase of the IPR project will yield 2 MGD upon completion.

8. Funds expended to date ($)
   $660,000 expended so far for design of Phase 1. $0 expended for construction.

9. Project Cost ($)
   $29,803,000 This is the updated ultimate cost.

10. Year the project is online?*
- ☐ 2014
- ☐ 2015
- ☐ 2016
- ☐ 2017
- ☐ 2018
- ☐ 2019
- ☐ 2020
- ☐ 2021
- ☐ 2022
- ☒ 2023

Start of construction in 2020.
Online and operational in 2023.

11. Is this a phased project?*
- ☒ Yes
- ☐ No

2 MGD in Phase 1 (2,240 ac-ft/yr) plus Phase 2 includes an additional 4 MGD of IPR water and 0.8 MGD of reuse supplies for Cleburne's industrial customers.

12. (Phased) Ultimate volume (ac-ft/yr)
    7,617 = 2,240 (Phase 1) + 5,377 (Phase 2)

13. (Phased) Ultimate project cost ($)
    $29,803,000 = $10,203,000 (Phase 1) + $19,600,000 (Phase 2)

14. Year project reaches maximum capacity?*
- ☐ 2014
- ☐ 2015
- ☐ 2016
- ☐ 2017
- ☐ 2018
- ☐ 2019
- ☐ 2020

- ☐ 2025
- ☒ 2030
- ☐ 2035
- ☐ 2040
- ☐ 2045
- ☐ 2050
- ☐ 2055
- ☐ 2060
- ☐ 2065
- ☐ 2070

The project reaches maximum capacity when Phase 2 comes online around 2030 (depending on population growth).

15. What is the project funding source(s)?*

- ☐ Commercial/Bank loan
- ☐ Market
- ☐ TWDB - SWIFT
- ☒ TWDB - Other
- ☐ Federal - EPA
- ☐ Federal - USDA
- ☐ Federal - Other
- ☐ Other

TWDB State Revolving Fund for Construction

16. Funding Mechanism if Other?

____

17. Included in 2021 plan?*

- ☒ Yes
- ☐ No

18. Does the project or WMS involve reallocation of flood control?*

- ☐ Yes
- ☒ No

19. Does the project or WMS provide any measurable flood risk reduction?*

- ☒ No
- ☐ Potentially, but no technical flood analysis performed
- ☐ Yes, flood risk study confirmed benefits

20. Optional Comments

____
____
____
____
____
____

Appendix B

Responses to TWDB's 2016 Implementation Survey for The Brazos River Authority's System Operations Permit

WMS or WMS Project Name	1) BRA SYSTEM OPERATION-MAIN STEM 2) BRA SYSTEM OPERATIONS-LITTLE RIVER
Database Online Decade	1) 2020 2) 2050
Related Sponsor Entity and/or Benefitting WUGs	PROJECT SPONSOR(S): BRAZOS RIVER AUTHORITY
Implementation Survey Record Type	RECOMMENDED WMS PROJECT
Database ID	1) 2447 2) 1920

*Survey questions that tie directly to meeting statutory requirements are **bolded**. Please regard bolded questions as more important.

1. **Has Sponsor taken affirmative vote or actions?* (TWC 16.053(h)(10))**
   - ☒ Yes
   - ☐ No

2. **If yes, in what year did this occur?**
   - ☐ 2014
   - ☐ 2015
   - ☒ 2016
   - ☐ 2017
   - ☐ 2018
   - ☐ 2019

   The BRA initiated the project in 2003.
   TCEQ approved the permit in 2016, pending a modified Water Management Plan (WMP), Accounting Plan and other documents.

3. **If yes, by what date is the action on schedule for implementation?**
   April 2, 2018 TCEQ approved revised WMP, Accounting Plan and other documents.

4. **At what level of implementation is the project currently?***
   - ☐ Not Implemented
   - ☐ Sponsor has taken official action to initiate project
   - ☐ Feasibility study ongoing
   - ☐ Permit application submitted/pending
   - ☐ Acquisition and design phase
   - ☐ Under construction
   - ☒ Currently operating
   - ☐ All phases fully implemented

5. **If not implemented, why?* (When "If other, please describe" is selected, please add the descriptive text to that field)**
   - ☐ Too soon
   - ☐ Financing
   - ☐ Permit constraints
   - ☐ Environmental obstacles
   - ☐ If other, please describe: ____

6. What impediments presented to implementation?* (When "If other, please describe" is selected, please add the descriptive text to that field)

- ☐ Not applicable
- ☐ Access to funding
- ☒ Permitting process
- ☐ Political support/governance
- ☐ If other, please describe: ____

7. Current water supply project yield (ac-ft/yr)
   ___434,703 ac-ft/yr___ This is the permitted diversion amount according to TCEQ database of active water rights.

8. Funds expended to date ($)
   ___$23,581,674 (assumed)___

9. Project Cost ($)
   ___$23,581,674___ This is the amount estimated in the 2016 Plan.

10. Year the project is online?*

- ☐ 2014
- ☐ 2015
- ☐ 2016
- ☐ 2017
- ☒ 2018
- ☐ 2019
- ☐ 2020
- ☐ 2021
- ☐ 2022
- ☐ 2023

11. Is this a phased project?*

- ☐ Yes
- ☒ No

12. (Phased) Ultimate volume (ac-ft/yr)
   ___N/A___

13. (Phased) Ultimate project cost ($)
   ___N/A___

14. Year project reaches maximum capacity?*

- ☐ 2014
- ☐ 2015
- ☐ 2016
- ☐ 2017

- [x] 2018
- [ ] 2019
- [ ] 2020
- [ ] 2025
- [ ] 2030
- [ ] 2035
- [ ] 2040
- [ ] 2045
- [ ] 2050
- [ ] 2055
- [ ] 2060
- [ ] 2065
- [ ] 2070

15. What is the project funding source(s)?*

- [ ] Commercial/Bank loan
- [ ] Market
- [ ] TWDB - SWIFT
- [ ] TWDB - Other
- [ ] Federal - EPA
- [ ] Federal - USDA
- [ ] Federal - Other
- [x] Other

16. Funding Mechanism if Other?

Rates

17. Included in 2021 plan?*

- [ ] Yes
- [x] No

The strategy is included in the 2021 Plan as an existing supply, not as a future water management strategy.

18. Does the project or WMS involve reallocation of flood control?*

- [ ] Yes
- [x] No

19. Does the project or WMS provide any measurable flood risk reduction?*

- [x] No
- [ ] Potentially, but no technical flood analysis performed
- [ ] Yes, flood risk study confirmed benefits

20. Optional Comments

Appendix N
Hydrologic Variance Request

N-1. Brazos G Memorandum – Hydrologic Variance Request for Surface Water Availability Analyses in Brazos G

N-2. TWDB Letter – Brazos G Regional Water Planning Group (RWPG) request for approval to modify surface water availability modeling assumptions for development of the 2021 Brazos G Regional Water Plan (RWP)

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Memorandum

Date:	Friday, February 23, 2018
Project:	2021 Brazos G Regional Water Plan
To:	Jeff Walker, Executive Administrator, Texas Water Development Board
CC:	Brazos G RWPG, Thomas Barnett, Stephen Hamlin
From:	David D. Dunn, P.E.
Subject:	Hydrologic Variance Request for Surface Water Availability Analyses in Brazos G

The Brazos G Regional Water Planning Group (Brazos G) met on February 7, 2018 and discussed the process to determine the amount of surface water available from existing water rights and future water management strategies. During this meeting, Brazos G discussed specific deviations from the standard Texas Water Development Board (TWDB) guidance that will be employed to develop the 2021 Brazos G Regional Water Plan. As you know, the guidance provided by the TWDB in the base scope of work for the Fifth Cycle of Regional Water Planning requires the use of the Run 3 (full authorization) version of the Brazos River Basin and Brazos-San Jacinto Coastal Basin Water Availability Model (Brazos WAM) maintained by the Texas Commission on Environmental Quality (TCEQ). This model is used by the TCEQ for evaluating legal water available to applications for new or amended water rights, and as such, includes some aspects that limit its usefulness for water planning.

Brazos G requests that the TWDB allow specific variations from the base TCEQ Brazos WAM for analyses that determine surface water available to existing rights. These variations will allow a more accurate assessment of supplies available to existing water rights, and will provide consistency with the analyses used to develop the 2006, 2011 and 2016 Brazos G Plans. The resulting WAM containing these necessary modifications to the TCEQ Brazos WAM will be referred to as the "Brazos G WAM."

1. Utilize naturalized flow and evaporation data developed by the Brazos River Authority (BRA) to extend the period of record through 2015.

   The TCEQ Brazos WAM includes a period of record of 1940 – 1997. This period of record does not include the severe drought experienced recently, which in some areas of Texas has replaced the 1950's drought as the "drought of record." The BRA, in support of the development of its Water Management Plan for its recently-granted System Operations Permit, has extended the naturalized flow and evaporation datasets through 2015 in order to analyze the impact of the new potential drought of record on the agency's water supplies. The hydrology has been updated throughout the Brazos Basin. Although developed in response to TCEQ requirements for the BRA's Management Plan, the TCEQ does not consider these extended flows to be the "official" dataset for analyzing water right appropriations because the flow naturalization process did not include adjust gaged records for water rights with authorized annual diversions less than 1,000 acre-feet, reservoirs with storage less than 5,000 acre-feet, or wastewater effluent discharges less than 1 million gallons per day.. The resulting naturalized flows are somewhat more conservative (smaller) than those that would have been developed with a full flow naturalization process because diversions and water added to storage are added back into the gage flows during the flow naturalization process. The smaller return flows would

make an even smaller difference. Brazos G believes that this is a relatively small limitation in comparison to the opportunity to utilize an extended period of record that encompasses the existing and potentially new "droughts of record" in the Brazos Basin.
Benefit: Improved estimation of flows available to existing water rights considering the likelihood that a new drought of record exists in many parts of the Brazos Basin.

2. Separate individual BRA contractual diversions from cumulative contractual diversions.

   The TCEQ Brazos WAM formerly assumed all diversions from storage occur lakeside and did not take into account the multiple BRA contracts located throughout the basin. The more recent TCEQ Brazos WAM now accumulates the BRA's contracts within various reaches throughout the river basin. Those cumulative contractual diversions will need to be broken out to individual contract holders in the input data set to that water available to specific WUGs and WWPs can be determined.

   Benefits: Improved estimates of water available to WUGs and WWPs that receive supplies from BRA.

3. Include estimated current and future return flows. (utilized in the 2006, 2011 and 2016 Brazos G Plans)

   The Brazos G WAM will include a certain level of current and future return flows (wastewater treatment plant effluent) discharged by entities located throughout the basin that are permitted to discharge in excess of 0.9 million gallons per day (MGD). These return flows are based on historical discharges and projected future discharges assuming an aggressive plan for future reuse of each entity's effluent. For determining a conservatively low estimate of return flows available to existing water rights, it was assumed that 25% of existing levels of discharge would be directly reused and not continued to be discharged, and 50% of any increases in wastewater plan flows would be reused. These return flow amounts were reviewed and acknowledged by each entity during the development of the 2006 Plan and were used during the development of the 2006, 2011 and 2016 Plans following approval by the TWDB. These return flow amounts will be revisited for the 2021 Plan and will be adjusted for any changes including new discharges, new reuse permits and requests by entities to revise their estimated discharges.

   Benefits: Improved estimates of water available to existing water rights; improved estimates of streamflows throughout the Brazos Basin; provide an estimate of wastewater flows potentially available for direct reuse throughout the Brazos Basin.

4. Update reservoir operating rules to work correctly under recent drought conditions.

   The reservoir operating rules in the TCEQ Brazos G WAM were developed to allow the BRA's system of reservoirs to optimize water supply through the drought of the 1950's. However, these operating rules do not allow the system to operate optimally during the more recent drought. The BRA has developed an alternative set of rules that allow the reservoir system to operate optimally through both the 1950's and more recent drought, and the Brazos G WAM will incorporate these rules into the model.

5. Include existing subordination agreements in the Brazos G WAM. (utilized in the 2006, 2011 and 2016 Brazos G Plans)

   Several agreements exist between parties in the Brazos River Basin whereby one party agrees to not exercise a priority call on the other party's upstream junior water right during times of low flow. This increases water available to the junior water right and decreases water available to the downstream senior water right when insufficient flows exist to satisfy both water rights. Some subordination agreements are included by TCEQ in the TCEQ Brazos WAM, but only those that are identified specifically in the language of the water rights involved. Many others are not included in the language of any water right and therefore are not included in the TCEQ Brazos WAM. The Brazos G WAM will be modified to include additional subordination agreements between entities in the Brazos Basin that are not included in the TCEQ Brazos WAM. Specific agreements currently identified to be added to the Brazos G WAM include:

   - Possum Kingdom Reservoir water rights are subordinated to Lake Alan Henry;
   - Possum Kingdom Reservoir water rights are subordinated to the City of Stamford's California Creek pump-back operation into Lake Stamford;
   - Lake Waco is subordinated to the City of Clifton's 1996 priority date water right;
   - Possum Kingdom Reservoir water rights are subordinated to rights held by the West Central Texas Municipal Water District in Hubbard Creek Reservoir; and
   - Possum Kingdom Reservoir water rights are subordinated to rights held by the City of Abilene to divert flows from the Clear Fork of the Brazos River into Lake Fort Phantom Hill.

   Some of these may already be incorporated into the TCEQ Brazos WAM. Other subordination agreements will also be incorporated when identified during the planning process.

   <u>Benefits</u>: Provides a more realistic determination of water available to existing water rights; improved estimates of streamflows throughout the Brazos Basin.

6. Utilize safe yield analyses for reservoirs upstream of Possum Kingdom Reservoir and for Lake Palo Pinto. (utilized in the 2011 and 2016 Brazos G Plans)

   Supplies available from reservoirs will use either a firm or safe yield depending on the location of the reservoir and the preference of the reservoir owner. In the upper Brazos Basin (upstream of Possum Kingdom Reservoir), both 1-year and 2-year safe yields are used by reservoir owners as their preferred basis of supply. These same approaches will be used, as requested by individual reservoir owners to best reflect the operation of their facilities. In addition, the Palo Pinto County Municipal Water District No. 1 has decided to operate on a percent storage reserve basis for Lake Palo Pinto, which is approximately equivalent to a 0.5-year safe yield. The same safe and firm yield assumptions employed in the 2016 Plan will be used in the 2021 Plan, unless a change is specifically requested by a reservoir owner. For reservoirs in which a 0.5-, 1-, or 2-year safe yield is used as the basis for supply, Brazos G will also determine and report the firm yield, as required by TWDB guidance.

   <u>Benefits</u>: Provides a more realistic method for determining water supplies in west Texas because it matches that area's preferred approach for managing reservoir water supplies.

7. Utilize the Brazos Mini-WAM to determine supplies in the Clear Fork portion of the Brazos Basin.

   During the Phase I studies leading into the 2011 planning cycle, Brazos G developed a subset of the Brazos WAM that extended the period of record through June 2008 for a portion of the upper Brazos Basin (16 primary control points) including the Clear Fork of the Brazos River. This model is referred to as the "Brazos Mini-WAM." This model was used to determine water available to rights in the applicable portion of the Brazos Basin for the 2011 and 2016 Brazos G Plans. Hydrology for this model has now been updated through 2015 to incorporate the potential new drought of record. Naturalized streamflows for this model were developed using all water rights in the subwatershed and therefore are somewhat more precise than those developed by the BRA for the entire Brazos Basin. Brazos G requests that Brazos G Mini-WAM be used to determine surface water supplies for its applicable portion of the upper Brazos Basin, if it is determined that it provides greater than a 10-percent difference in supply (yield or run-of-river) than results from using the hydrology updated by the BRA.

   <u>Benefit</u>: The Brazos G Mini-WAM may provide a better estimate of water available to water rights in the applicable part of the Brazos Basin; provide water supply estimates consistent with recent permitting and management decisions made by the City of Abilene.

8. Utilize the same water supply model for strategy evaluations as is used to determine supplies available to existing water rights.

   TWDB guidance requires that evaluations of new water management strategies utilize a strict application of the TCEQ Run 3 WAM. The rationale for this guidance is to ensure that the supply from a water management strategy is consistent with what might actually be permitted by the TCEQ. However, TCEQ takes into account more information than a simple application of the WAM when making water right permitting decisions. Additionally, many water management strategies utilize or are intended to supplement existing supplies, and therefore should be evaluated consistent with the existing supplies they are intended to supplement. The existing supply and the supplementing water management strategy need to be evaluated consistently. Furthermore, the same aspects of the Run 3 WAM that limit its usefulness for determining supplies available to existing rights also limit its ability to determine supplies to new water management strategies. The TCEQ Run 3 WAM is a legal permitting tool that has only limited utility for water supply planning. Brazos G requests that the Brazos G WAM be utilized to evaluate water management strategies instead of the base TCEQ Run 3 WAM.

   <u>Benefits</u>: This will provide a consistent basis of evaluation between existing supplies and new water management strategies.

Brazos G thanks the TWDB for considering these alternative technical approaches for determining surface water supplies to existing water rights and new water management strategies. We welcome any questions you may have regarding this hydrologic variance request for surface water supplies. Note that we have coordinated with the technical consultants for Region O and Region H, and they have indicated they intend to utilize the same approaches as outlined above.

Please direct any questions to the Brazos G technical consultant, David Dunn of HDR at david.dunn@hdrinc.com or (512) 912-5136.

Texas Water Development Board

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

April 17, 2018

Mr. Wayne Wilson
Region G Chair
c/o Wilson Cattle Company
7026 East OSR
Bryan, TX 77808

RE: Brazos G Regional Water Planning Group (RWPG) request for approval to modify surface water availability hydrologic assumptions for development of the 2021 Brazos G Regional Water Plan (RWP)

Dear Mr. Wilson:

The Texas Water Development Board (TWDB) has reviewed the request submitted by Mr. David Dunn on behalf of the Brazos G RWPG dated February 23, 2018 for approval of alternative water supply assumptions to be used in determining surface water availability. This letter confirms that the TWDB approves the following requests:

1. Utilize naturalized flow and evaporation data developed by the Brazos River Authority (BRA), which extends the hydrologic record through 2015.
2. Separate BRA individual contractual diversions from cumulative contractual diversions.
3. Include a conservative estimate of current and future return flows.
4. Incorporate updated reservoir system operating rules to more accurately reflect recent conditions.
5. Include existing subordination agreements in the Brazos G Water Availability Model (WAM).
6. Utilize 0.5, 1, or 2-year safe yields for reservoirs upstream of Possum Kingdom Reservoir and for Lake Palo Pinto (to be clearly specified, by reservoir, in the 2021 Brazos G RWP).
7. Utilize the Brazos Mini-WAM to determine supplies in the Clear Fork sub-basin of the Brazos basin.

Region G also requested to use the same water supply assumptions for strategy evaluations as used for existing supply. While the use of these modified conditions may be reasonable for planning purposes, WAM RUN 3 would be utilized by the Texas Commission on Environmental Quality for analyzing permit applications. It is acceptable to use modified conditions for water management strategy supply evaluations only if the yield produced is

Board Members

Peter Lake, Chairman | Kathleen Jackson, Board Member | Brooke T. Paup, Board Member

Jeff Walker, Executive Administrator

more conservative for surface water appropriations than WAM RUN 3. However, TWDB is of the understanding that the modified conditions will result in greater yields than WAM RUN 3. Therefore, strategy evaluations involving new surface water appropriations must be based on WAM RUN 3. Accounting for subordination agreements and use of future return flows are acceptable modifications for strategy evaluations as outlined in Exhibit C, Section 5.2.1.

Although the TWDB approves the use of safe yields for developing estimates of current water supplies, firm yield for each reservoir must still be reported to TWDB in the online planning database and plan documents.

While the TWDB authorizes these modifications to evaluate existing water supplies for development of the 2021 Brazos G RWP, it is the responsibility of the RWPG to ensure that the resulting estimates of water availability are reasonable for drought planning purposes and will reflect conditions expected in the event of actual drought conditions; and in all other regards will be evaluated in accordance with the contract Exhibit C, *Second Amended General Guidelines for Fifth Cycle of Regional Water Plan Development.*

If you have any questions, please do not hesitate to contact Tom Barnett, project manager for Region G, at 512-463-4209 or via email at thomas.barnett@twdb.texas.gov.

Sincerely,

A Lavin for

Jeff Walker
Executive Administrator

c w/o enc: Mr. Stephen Hamlin, Brazos River Authority
Mr. David Dunn, HDR, Inc.
Ms. Paula Jo Lemonds, HDR, Inc.
Ms. Simone Kiel, Freese & Nichols, Inc
Mr. Tom Barnett, TWDB

Appendix O
Major Water Provider Tables

O-1. Major Water Providers Demands by Category of Use

O-2. Major Water Providers Supplies by Category of Use

O-3. Major Water Providers Needs by Category of Use

O-4. Major Water Providers Secondary Needs

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Table O-1. Major Water Providers
Demands by Category of Use

Major Water Provider/ Use Category		MWP Demands by Category of Use in Each Decade (acft/yr)					
		2020	2030	2040	2050	2060	2070
439 WSC	MUNICIPAL	1,407	1,656	1,917	2,191	2,483	2,785
439 WSC Total		**1,407**	**1,656**	**1,917**	**2,191**	**2,483**	**2,785**
ABILENE	MANUFACTURING	585	671	671	671	671	671
	MUNICIPAL	38,463	38,900	39,252	39,642	40,076	40,440
ABILENE Total		**39,048**	**39,571**	**39,923**	**40,313**	**40,747**	**41,111**
ACTON MUD	MUNICIPAL	3,627	5,223	6,299	6,881	8,106	9,376
ACTON MUD Total		**3,627**	**5,223**	**6,299**	**6,881**	**8,106**	**9,376**
ANSON	MUNICIPAL	1,120	1,120	1,120	1,120	1,120	1,120
ANSON Total		**1,120**	**1,120**	**1,120**	**1,120**	**1,120**	**1,120**
AQUILLA WSD	MUNICIPAL	6,512	5,952	5,952	5,952	5,952	5,952
AQUILLA WSD Total		**6,512**	**5,952**	**5,952**	**5,952**	**5,952**	**5,952**
ARLINGTON	MUNICIPAL	1,597	1,840	2,096	2,380	2,697	3,029
	IRRIGATION	281	281	281	281	281	281
	MANUFACTURING	2,000	2,181	2,181	2,181	2,181	2,181
	MINING	105	105	105	105	105	105
ARLINGTON Total		**3,983**	**4,407**	**4,663**	**4,947**	**5,264**	**5,596**
BELL COUNTY WCID #1	MUNICIPAL	41,070	44,069	47,447	50,736	54,014	57,279
BELL COUNTY WCID #1 Total		**41,070**	**44,069**	**47,447**	**50,736**	**54,014**	**57,279**
BELL COUNTY WCID 3	MUNICIPAL	1,207	1,601	2,176	2,552	2,840	3,125
BELL COUNTY WCID 3 Total		**1,207**	**1,601**	**2,176**	**2,552**	**2,840**	**3,125**
BELLMEAD	MUNICIPAL	1,233	1,261	1,288	1,331	1,388	1,448
BELLMEAD Total		**1,233**	**1,261**	**1,288**	**1,331**	**1,388**	**1,448**
BELTON	MUNICIPAL	3,791	4,353	4,951	5,568	6,198	6,824
BELTON Total		**3,791**	**4,353**	**4,951**	**5,568**	**6,198**	**6,824**
BETHESDA WSC	MUNICIPAL	6,036	6,752	7,504	8,342	9,268	10,245
BETHESDA WSC Total		**6,036**	**6,752**	**7,504**	**8,342**	**9,268**	**10,245**
BISTONE MUNICIPAL WATER SUPPLY DISTRICT	MUNICIPAL	3,079	3,067	2,967	2,867	2,767	2,667
BISTONE MUNICIPAL WATER SUPPLY DISTRICT Total		**3,079**	**3,067**	**2,967**	**2,867**	**2,767**	**2,667**
BLUEBONNET WSC	MUNICIPAL	7,125	7,125	7,125	7,125	7,125	7,125
BLUEBONNET WSC Total		**7,125**	**7,125**	**7,125**	**7,125**	**7,125**	**7,125**

Table O-1. Major Water Providers
Demands by Category of Use

Major Water Provider/ Use Category		MWP Demands by Category of Use in Each Decade (acft/yr)					
		2020	2030	2040	2050	2060	2070
BRAZOS RIVER AUTHORITY (includes Region H contracts)	IRRIGATION	14,180	14,180	14,180	14,180	14,180	14,180
	MANUFACTURING	52,241	52,241	52,241	52,241	52,241	52,241
	MINING	3,000	3,000	3,000	3,000	3,000	3,000
	MUNICIPAL	454,978	455,151	455,396	455,689	456,049	456,317
	STEAM ELECTRIC POWER	213,725	213,725	213,725	213,725	213,725	213,725
BRAZOS RIVER AUTHORITY Total		**738,124**	**738,297**	**738,542**	**738,835**	**739,195**	**739,463**
BRECKENRIDGE	MANUFACTURING	7	8	8	8	8	8
	MUNICIPAL	1,002	1,012	1,006	1,004	1,005	1,015
BRECKENRIDGE Total		**1,009**	**1,020**	**1,014**	**1,012**	**1,013**	**1,023**
BRENHAM	MANUFACTURING	208	208	208	208	208	208
	MUNICIPAL	4,329	4,627	4,821	5,038	5,225	5,382
BRENHAM Total		**4,537**	**4,835**	**5,029**	**5,246**	**5,433**	**5,590**
BRUCEVILLE EDDY	MUNICIPAL	1,030	1,084	1,135	1,193	1,259	1,326
BRUCEVILLE EDDY Total		**1,030**	**1,084**	**1,135**	**1,193**	**1,259**	**1,326**
BRUSHY CREEK MUD	MUNICIPAL	3,602	3,540	3,503	3,483	3,478	3,477
BRUSHY CREEK MUD Total		**3,602**	**3,540**	**3,503**	**3,483**	**3,478**	**3,477**
BRYAN	MANUFACTURING	95	95	95	95	95	95
	MUNICIPAL	19,419	21,655	24,354	27,810	32,099	39,426
	STEAM ELECTRIC POWER	1	1	1	1	1	1
BRYAN Total		**19,515**	**21,751**	**24,450**	**27,906**	**32,195**	**39,522**
BURLESON	MANUFACTURING	2	2	2	2	2	2
	MUNICIPAL	6,466	7,484	8,553	9,718	10,980	12,309
BURLESON Total		**6,468**	**7,486**	**8,555**	**9,720**	**10,982**	**12,311**
CALDWELL	MUNICIPAL	1,027	1,043	1,072	1,072	1,091	1,108
CALDWELL Total		**1,027**	**1,043**	**1,072**	**1,072**	**1,091**	**1,108**
CAMERON	MANUFACTURING	14	14	14	14	14	14
	MUNICIPAL	1,526	1,576	1,609	1,667	1,724	1,780
CAMERON Total		**1,540**	**1,590**	**1,623**	**1,681**	**1,738**	**1,794**
CEDAR PARK	MANUFACTURING	292	347	347	347	347	347
	MUNICIPAL	21,208	23,069	23,144	23,107	23,088	23,080
CEDAR PARK Total		**21,500**	**23,416**	**23,491**	**23,454**	**23,435**	**23,427**

Table O-1. Major Water Providers
Demands by Category of Use

Major Water Provider/ Use Category		MWP Demands by Category of Use in Each Decade (acft/yr)					
		2020	2030	2040	2050	2060	2070
CENTRAL TEXAS WSC	MUNICIPAL	10,537	10,537	10,537	10,537	10,537	10,537
CENTRAL TEXAS WSC Total		**10,537**	**10,537**	**10,537**	**10,537**	**10,537**	**10,537**
CLEBURNE	MANUFACTURING	2,329	2,714	3,105	3,455	3,801	4,182
	MUNICIPAL	6,969	7,580	8,977	10,446	12,234	13,678
	STEAM ELECTRIC POWER	1,344	1,344	1,344	1,344	1,344	1,344
CLEBURNE Total		**10,642**	**11,638**	**13,426**	**15,245**	**17,379**	**19,204**
COLLEGE STATION	MANUFACTURING	6	6	6	6	6	6
	MUNICIPAL	16,451	20,480	25,877	30,439	30,382	30,363
COLLEGE STATION Total		**16,457**	**20,486**	**25,883**	**30,445**	**30,388**	**30,369**
COLORADO RIVER MWD	MUNICIPAL	78,371	62,961	65,628	68,533	71,491	74,968
	IRRIGATION	400	400	400	400	400	400
COLORADO RIVER MWD Total		**78,771**	**63,361**	**66,028**	**68,933**	**71,891**	**75,368**
COPPERAS COVE	MUNICIPAL	4,436	4,851	5,351	5,832	6,392	6,958
COPPERAS COVE Total		**4,436**	**4,851**	**5,351**	**5,832**	**6,392**	**6,958**
CORIX UTILITIES TEXAS INC	MUNICIPAL	1,315	1,356	1,403	1,463	1,513	1,565
CORIX UTILITIES TEXAS INC Total		**1,315**	**1,356**	**1,403**	**1,463**	**1,513**	**1,565**
CORYELL CITY WATER SUPPLY DISTRICT	MUNICIPAL	933	1,044	1,171	1,287	1,413	1,542
CORYELL CITY WATER SUPPLY DISTRICT Total		**933**	**1,044**	**1,171**	**1,287**	**1,413**	**1,542**
DOG RIDGE WSC	MUNICIPAL	724	821	924	1,036	1,152	1,268
DOG RIDGE WSC Total		**724**	**821**	**924**	**1,036**	**1,152**	**1,268**
EASTLAND COUNTY WSD	MANUFACTURING	48	56	56	56	56	56
	MUNICIPAL	5,339	5,339	5,339	5,339	5,339	5,339
EASTLAND COUNTY WSD Total		**5,387**	**5,395**	**5,395**	**5,395**	**5,395**	**5,395**
FERN BLUFF MUD	MUNICIPAL	1,187	1,175	1,168	1,163	1,161	1,161
FERN BLUFF MUD Total		**1,187**	**1,175**	**1,168**	**1,163**	**1,161**	**1,161**
FHLM							
FHLM Total		**-**	**-**	**-**	**-**	**-**	**-**
FORT HOOD	MUNICIPAL	7,080	6,988	6,909	6,898	6,889	6,888
FORT HOOD Total		**7,080**	**6,988**	**6,909**	**6,898**	**6,889**	**6,888**

Table O-1. Major Water Providers
Demands by Category of Use

Major Water Provider/ Use Category		MWP Demands by Category of Use in Each Decade (acft/yr)					
		2020	2030	2040	2050	2060	2070
FORT WORTH	IRRIGATION	2,000	2,000	2,000	2,000	2,000	2,000
	MANUFACTURING	9,612	10,505	10,505	10,505	10,505	10,505
	MINING	1,754	1,811	1,677	1,677	1,677	1,677
	MUNICIPAL	86,608	97,019	106,506	120,012	131,197	143,780
FORT WORTH Total		**99,974**	**111,335**	**120,688**	**134,194**	**145,379**	**157,962**
GATESVILLE	MANUFACTURING	4	4	4	4	4	4
	MUNICIPAL	5,939	6,558	7,289	7,955	8,686	9,424
GATESVILLE Total		**5,943**	**6,562**	**7,293**	**7,959**	**8,690**	**9,428**
GEORGETOWN	MANUFACTURING	137	163	163	163	163	163
	MUNICIPAL	30,188	39,103	48,647	59,924	72,618	87,202
GEORGETOWN Total		**30,325**	**39,266**	**48,810**	**60,087**	**72,781**	**87,365**
GIDDINGS	MANUFACTURING	13	14	15	16	17	18
	MUNICIPAL	1,154	1,268	1,328	1,347	1,364	1,374
GIDDINGS Total		**1,167**	**1,282**	**1,343**	**1,363**	**1,381**	**1,392**
GRAHAM	MANUFACTURING	2	2	2	2	2	2
	MUNICIPAL	3,886	4,001	4,074	4,169	4,281	4,393
	STEAM ELECTRIC POWER	248	248	248	248	248	248
GRAHAM Total		**4,136**	**4,251**	**4,324**	**4,419**	**4,531**	**4,643**
GRANBURY	MUNICIPAL	1,738	2,046	2,267	2,466	2,627	2,753
GRANBURY Total		**1,738**	**2,046**	**2,267**	**2,466**	**2,627**	**2,753**
HARKER HEIGHTS	MUNICIPAL	6,099	7,043	8,042	9,060	10,087	11,106
HARKER HEIGHTS Total		**6,099**	**7,043**	**8,042**	**9,060**	**10,087**	**11,106**
HEARNE	MANUFACTURING	1	1	1	1	1	1
	MUNICIPAL	802	943	1,113	1,113	1,114	1,118
HEARNE Total		**803**	**944**	**1,114**	**1,114**	**1,115**	**1,119**
HEWITT	MUNICIPAL	3,029	3,393	3,721	4,071	4,442	4,811
HEWITT Total		**3,029**	**3,393**	**3,721**	**4,071**	**4,442**	**4,811**
HILLSBORO	MANUFACTURING	6	7	9	10	11	12
	MUNICIPAL	1,987	2,070	2,122	2,189	2,251	2,283
HILLSBORO Total		**1,993**	**2,077**	**2,131**	**2,199**	**2,262**	**2,295**

Table O-1. Major Water Providers
Demands by Category of Use

Major Water Provider/ Use Category		MWP Demands by Category of Use in Each Decade (acft/yr)					
		2020	**2030**	**2040**	**2050**	**2060**	**2070**
HUNTSVILLE	MUNICIPAL	5,240	5,240	5,240	5,240	5,240	5,240
	STEAM ELECTRIC POWER	6,720	6,720	6,720	6,720	6,720	6,720
HUNTSVILLE Total		**11,960**	**11,960**	**11,960**	**11,960**	**11,960**	**11,960**
HUTTO	MUNICIPAL	2,072	4,211	4,469	6,602	9,761	11,868
HUTTO Total		**2,072**	**4,211**	**4,469**	**6,602**	**9,761**	**11,868**
JARRELL-SCHWERTNER	MUNICIPAL	1,518	1,700	1,929	2,183	2,476	2,782
JARRELL-SCHWERTNER Total		**1,518**	**1,700**	**1,929**	**2,183**	**2,476**	**2,782**
JOHNSON COUNTY SUD	MINING	20	20	20	20	20	20
	MUNICIPAL	13,233	12,891	13,134	13,730	14,240	14,653
JOHNSON COUNTY SUD Total		**13,253**	**12,911**	**13,154**	**13,750**	**14,260**	**14,673**
JONAH WATER SUD	MUNICIPAL	3,312	4,052	5,008	6,062	7,281	8,485
JONAH WATER SUD Total		**3,312**	**4,052**	**5,008**	**6,062**	**7,281**	**8,485**
KEMPNER WSC	MINING	25	25	25	25	25	25
	MUNICIPAL	4,410	4,680	4,910	5,151	5,385	5,604
KEMPNER WSC Total		**4,435**	**4,705**	**4,935**	**5,176**	**5,410**	**5,629**
KILLEEN	MANUFACTURING	7	7	7	7	7	7
	MUNICIPAL	18,308	20,913	23,716	26,629	29,619	32,599
KILLEEN Total		**18,315**	**20,920**	**23,723**	**26,636**	**29,626**	**32,606**
LAMPASAS	MANUFACTURING	137	151	165	178	195	213
	MUNICIPAL	1,265	1,356	1,424	1,506	1,590	1,668
LAMPASAS Total		**1,402**	**1,507**	**1,589**	**1,684**	**1,785**	**1,881**
LEANDER	MUNICIPAL	8,081	13,396	16,667	19,965	23,943	28,722
LEANDER Total		**8,081**	**13,396**	**16,667**	**19,965**	**23,943**	**28,722**
LEE COUNTY WSC	MUNICIPAL	1,268	1,409	1,516	1,604	1,716	1,850
LEE COUNTY WSC Total		**1,268**	**1,409**	**1,516**	**1,604**	**1,716**	**1,850**

Table O-1. Major Water Providers
Demands by Category of Use

Major Water Provider/ Use Category		MWP Demands by Category of Use in Each Decade (acft/yr)					
		2020	2030	2040	2050	2060	2070
LOWER COLORADO RIVER AUTHORITY	MUNICIPAL	269,347	269,347	269,347	269,347	269,347	269,347
	IRRIGATION	144,245	144,245	144,245	144,245	144,245	144,245
	MANUFACTURING	31,334	31,334	31,334	31,334	31,334	31,334
	MINING	1,808	1,808	1,808	1,808	1,808	1,808
	STEAM ELECTRIC POWER	102,189	102,189	102,189	102,189	102,189	102,189
	BRA	25,000	25,000	25,000	25,000	25,000	25,000
LOWER COLORADO RIVER AUTHORITY Total		**573,923**	**573,923**	**573,923**	**573,923**	**573,923**	**573,923**
MANSFIELD	MUNICIPAL	4,673	10,836	11,838	11,838	11,838	11,838
	MANUFACTURING	220	239	239	239	239	239
MANSFIELD Total		**4,893**	**11,075**	**12,077**	**12,077**	**12,077**	**12,077**
MANVILLE WSC	MUNICIPAL	2,147	2,147	2,147	2,147	2,147	2,147
MANVILLE WSC Total		**2,147**	**2,147**	**2,147**	**2,147**	**2,147**	**2,147**
MARLIN	MUNICIPAL	1,849	1,908	1,901	1,850	1,904	1,961
MARLIN Total		**1,849**	**1,908**	**1,901**	**1,850**	**1,904**	**1,961**
MCGREGOR	MANUFACTURING	4	4	4	4	4	4
	MUNICIPAL	929	948	965	993	1,030	1,069
MCGREGOR Total		**933**	**952**	**969**	**997**	**1,034**	**1,073**
MEXIA	MANUFACTURING	43	44	44	44	45	45
	MUNICIPAL	1,494	1,560	1,613	1,671	1,719	1,752
MEXIA Total		**1,537**	**1,604**	**1,657**	**1,715**	**1,764**	**1,797**
MINERAL WELLS	MANUFACTURING	35	35	35	35	35	35
	MUNICIPAL	5,266	5,366	5,421	5,492	5,563	5,621
MINERAL WELLS Total		**5,301**	**5,401**	**5,456**	**5,527**	**5,598**	**5,656**
MORGANS POINT RESORT	MUNICIPAL	582	681	787	897	1,009	1,121
MORGANS POINT RESORT Total		**582**	**681**	**787**	**897**	**1,009**	**1,121**
MOUNTAIN PEAK SUD		4,094	5,084	5,529	7,493	8,666	9,769
MOUNTAIN PEAK SUD Total		**4,094**	**5,084**	**5,529**	**7,493**	**8,666**	**9,769**
NAVASOTA	MANUFACTURING	114	114	114	114	138	183
	MUNICIPAL	1,474	1,486	1,493	1,514	1,541	1,567
NAVASOTA Total		**1,588**	**1,600**	**1,607**	**1,628**	**1,679**	**1,750**

Table O-1. Major Water Providers
Demands by Category of Use

Major Water Provider/ Use Category		MWP Demands by Category of Use in Each Decade (acft/yr)					
		2020	2030	2040	2050	2060	2070
NORTH BOSQUE WSC	MUNICIPAL	566	687	795	905	1,017	1,127
NORTH BOSQUE WSC Total		**566**	**687**	**795**	**905**	**1,017**	**1,127**
NORTH CENTRAL TEXAS MUNICIPAL WATER AUTHORITY	MUNICIPAL	1,797	1,797	1,769	1,739	1,710	1,678
NORTH CENTRAL TEXAS MUNICIPAL WATER AUTHORITY Total		**1,797**	**1,797**	**1,769**	**1,739**	**1,710**	**1,678**
PALO PINTO COUNTY MWD #1	MUNICIPAL	5,551	5,651	5,706	5,777	5,848	5,906
	STEAM ELECTRIC POWER	4,000	4,000	4,000	4,000	4,000	4,000
PALO PINTO COUNTY MWD #1 Total		**9,551**	**9,651**	**9,706**	**9,777**	**9,848**	**9,906**
POSSUM KINGDOM WSC	MUNICIPAL	868	921	956	990	1,018	1,040
POSSUM KINGDOM WSC Total		**868**	**921**	**956**	**990**	**1,018**	**1,040**
ROBINSON	MUNICIPAL	3,032	3,456	3,835	4,231	4,638	5,042
ROBINSON Total		**3,032**	**3,456**	**3,835**	**4,231**	**4,638**	**5,042**
ROCKDALE	MUNICIPAL	1,173	1,213	1,237	1,285	1,333	1,380
ROCKDALE Total		**1,173**	**1,213**	**1,237**	**1,285**	**1,333**	**1,380**
ROUND ROCK	MANUFACTURING	569	674	674	674	674	674
	MINING	6	6	6	6	6	6
	MUNICIPAL	24,483	29,204	35,272	42,480	42,722	43,008
ROUND ROCK Total		**25,058**	**29,884**	**35,952**	**43,160**	**43,402**	**43,688**
SALADO WSC	MUNICIPAL	1,954	2,136	2,320	2,504	2,691	2,877
SALADO WSC Total		**1,954**	**2,136**	**2,320**	**2,504**	**2,691**	**2,877**
SALT FORK WATER QUALITY CORPORATION							
SALT FORK WATER QUALITY CORPORATION Total		**-**	**-**	**-**	**-**	**-**	**-**
SOUTHWEST MILAM WSC	MUNICIPAL	1,668	1,777	1,887	2,026	2,179	2,333
SOUTHWEST MILAM WSC Total		**1,668**	**1,777**	**1,887**	**2,026**	**2,179**	**2,333**
STAMFORD	MUNICIPAL	1,098	1,129	1,149	1,174	1,197	1,216
STAMFORD Total		**1,098**	**1,129**	**1,149**	**1,174**	**1,197**	**1,216**
STEPHENVILLE	MANUFACTURING	29	35	42	48	55	64
	MUNICIPAL	2,659	2,867	3,047	3,241	3,448	3,645
STEPHENVILLE Total		**2,688**	**2,902**	**3,089**	**3,289**	**3,503**	**3,709**
SWEETWATER	MANUFACTURING	361	358	356	354	354	354
	MUNICIPAL	3,214	3,257	3,278	3,345	3,401	3,453
SWEETWATER Total		**3,575**	**3,615**	**3,634**	**3,699**	**3,755**	**3,807**

Table O-1. Major Water Providers
Demands by Category of Use

Major Water Provider/ Use Category		MWP Demands by Category of Use in Each Decade (acft/yr)					
		2020	2030	2040	2050	2060	2070
TARRANT REGIONAL WD	IRRIGATION	2,190	2,190	2,190	2,190	2,190	2,190
	MINING	14,418	11,149	11,167	12,836	14,270	16,674
	MUNICIPAL	461,166	543,950	619,498	691,263	763,128	851,248
	STEAM ELECTRIC POWER	14,249	16,512	15,680	15,680	15,680	15,680
TARRANT REGIONAL WD Total		**492,023**	**573,801**	**648,535**	**721,969**	**795,268**	**885,792**
TAYLOR	MANUFACTURING	4	5	5	5	5	5
	MUNICIPAL	3,275	3,447	3,692	3,985	4,345	4,724
TAYLOR Total		**3,279**	**3,452**	**3,697**	**3,990**	**4,350**	**4,729**
TEMPLE	MANUFACTURING	481	481	481	481	481	481
	MUNICIPAL	23,347	26,483	29,784	33,155	36,553	39,918
TEMPLE Total		**23,828**	**26,964**	**30,265**	**33,636**	**37,034**	**40,399**
TEXAS A&M UNIVERSITY	MUNICIPAL	6,322	6,349	6,308	6,292	6,288	6,288
TEXAS A&M UNIVERSITY Total		**6,322**	**6,349**	**6,308**	**6,292**	**6,288**	**6,288**
TEXAS STATE TECHNICAL COLLEGE	MUNICIPAL	888	954	1,013	1,073	1,132	1,193
TEXAS STATE TECHNICAL COLLEGE Total		**888**	**954**	**1,013**	**1,073**	**1,132**	**1,193**
UPPER LEON MWD	MUNICIPAL	4,572	4,572	4,572	4,572	4,572	4,572
UPPER LEON MWD Total		**4,572**	**4,572**	**4,572**	**4,572**	**4,572**	**4,572**
VENUS	MUNICIPAL	638	728	824	933	1,052	1,182
VENUS Total		**638**	**728**	**824**	**933**	**1,052**	**1,182**
WACO	MANUFACTURING	2,503	2,888	3,249	3,618	3,948	4,403
	MUNICIPAL	38,731	40,585	42,472	44,609	46,919	49,249
	STEAM ELECTRIC POWER	15,000	15,000	15,000	15,000	15,000	15,000
WACO Total		**56,234**	**58,473**	**60,721**	**63,227**	**65,867**	**68,652**
WELLBORN SUD	MUNICIPAL	3,876	5,408	5,974	6,638	7,401	8,193
WELLBORN SUD Total		**3,876**	**5,408**	**5,974**	**6,638**	**7,401**	**8,193**
WEST CENTRAL TEXAS MWD	MUNICIPAL	17,977	15,620	13,260	10,900	8,540	6,200
WEST CENTRAL TEXAS MWD Total		**17,977**	**15,620**	**13,260**	**10,900**	**8,540**	**6,200**

Table O-1. Major Water Providers
Demands by Category of Use

Major Water Provider/ Use Category		MWP Demands by Category of Use in Each Decade (acft/yr)					
		2020	2030	2040	2050	2060	2070
WICKSON CREEK SUD	MANUFACTURING	8	8	8	8	9	10
	MUNICIPAL	1,648	1,828	2,022	2,267	2,537	2,832
WICKSON CREEK SUD Total		**1,656**	**1,836**	**2,030**	**2,275**	**2,546**	**2,842**
WILLIAMSON COUNTY WSID 3	MUNICIPAL	1,018	1,063	1,086	1,116	1,152	1,189
WILLIAMSON COUNTY WSID 3 Total		**1,018**	**1,063**	**1,086**	**1,116**	**1,152**	**1,189**
WOODWAY	MANUFACTURING	2	2	2	2	2	2
	MUNICIPAL	3,465	3,690	3,892	4,114	4,347	4,579
WOODWAY Total		**3,467**	**3,692**	**3,894**	**4,116**	**4,349**	**4,581**

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Table O-2. Major Water Providers
Supplies by Category of Use

Major Water Provider	Category of Use	Supplies Available (acft/yr)					
		2020	2030	2040	2050	2060	2070
439 WSC		**1,624**	**1,624**	**1,624**	**1,624**	**1,624**	**1,624**
BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	Municipal	1,624	1,624	1,624	1,624	1,624	1,624
ABILENE		**21,624**	**18,921**	**16,287**	**10,907**	**8,017**	**4,467**
BRAZOS INDIRECT REUSE	Municipal	1,250	1,250	1,250	1,250	1,250	2,260
BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM	Municipal	10,400	10,400	9,142	4,369	1,357	907
FORT PHANTOM HILL LAKE/RESERVOIR	Municipal	2,300	2,200	2,100	2,000	1,900	338
HUBBARD CREEK LAKE/RESERVOIR	Municipal	4,431	1,978	866	987	1,160	-
OH IVIE LAKE/RESERVOIR NON-SYSTEM PORTION	Municipal	3,243	3,093	2,929	2,301	2,350	962
ACTON MUD		**4,391**	**4,372**	**4,329**	**4,285**	**3,677**	**3,096**
BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM	Municipal	2,866	2,847	2,804	2,760	2,152	1,571
TRINITY AQUIFER | HOOD	Municipal	1,525	1,525	1,525	1,525	1,525	1,525
ANSON		**365**	**373**	**376**	**386**	**394**	**402**
HUBBARD CREEK LAKE/RESERVOIR	Municipal	365	373	376	386	394	402
AQUILLA WSD							
CONTRACT: BRAZOS RIVER AUTHORITY	Municipal	5,953	5,953	5,953	5,953	5,952	5,690
ARLINGTON							
CONTRACT: TARRANT REGIONAL WD	Municipal	70,793	72,520	73,174	74,366	74,546	74,873
ARLINGTON	Municipal	**66,819**	**60,028**	**53,553**	**48,960**	**44,990**	**41,625**
TRWD LAKE/RESERVOIR SYSTEM	Municipal	66,819	60,028	53,553	48,960	44,990	41,625
BELL COUNTY WCID #1		**71,219**	**72,345**	**73,469**	**74,594**	**75,718**	**76,843**
CONTRACT: BRAZOS RIVER AUTHORITY	Municipal	51,955	51,613	51,270	50,927	50,584	50,241
DIRECT REUSE	Municipal	19,264	20,732	22,199	23,667	25,134	26,602
BELL COUNTY WCID 3	Municipal	**1,207**	**1,601**	**2,176**	**2,552**	**2,840**	**3,125**
BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	Municipal	1,207	1,601	2,176	2,552	2,840	3,125
BELTON							
CONTRACTS: BELL COUNTY WCID #1, BRA, CENTRAL TEXAS WSC	Municipal	8,566	8,566	8,566	8,566	8,566	8,566
BELLMEAD		**3,344**	**3,344**	**3,344**	**3,344**	**3,344**	**3,344**
TRINITY AQUIFER | MCLENNAN	Municipal	2,000	2,000	2,000	2,000	2,000	2,000
WACO LAKE/RESERVOIR	Municipal	1,344	1,344	1,344	1,344	1,344	1,344
BELTON		**7,399**	**7,399**	**7,399**	**7,399**	**7,399**	**5,752**
BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	Municipal	7,399	7,399	7,399	7,399	7,399	5,752

Table O-2. Major Water Providers
Supplies by Category of Use

Major Water Provider	Category of Use	Supplies Available (acft/yr)					
		2020	2030	2040	2050	2060	2070
BETHESDA WSC		**6,035**	**6,191**	**6,337**	**6,515**	**6,771**	**6,865**
TRINITY AQUIFER | JOHNSON	Municipal	580	579	580	579	580	579
TRINITY AQUIFER | TARRANT	Municipal	1,755	1,753	1,753	1,753	1,753	1,753
TRWD LAKE/RESERVOIR SYSTEM	Municipal	3,700	3,859	4,004	4,183	4,438	4,533
BISTONE MUNICIPAL WATER SUPPLY DISTRICT		**349**	**269**	**275**	**286**	**295**	**301**
CARRIZO-WILCOX AQUIFER | LIMESTONE	Municipal	28	48	154	265	295	301
MEXIA LAKE/RESERVOIR	Municipal	321	221	121	21	-	-
BLUEBONNET WSC							
CONTRACT: BRAZOS RIVER AUTHORITY	Municipal	6,900	6,854	6,808	6,763	6,717	6,672
BRAZOS RIVER AUTHORITY		**733,103**	**731,223**	**729,343**	**727,463**	**725,583**	**723,703**
BRA SYSTEM OPERATIONS PERMIT SUPPLY	Municipal	149,510	153,630	157,750	161,870	165,990	170,110
CONTRACT: LOWER COLORADO RIVER AUTORITY	Municipal	25,000	25,000	25,000	25,000	25,000	25,000
BRAZOS RIVER AUTHORITY AQUILLA LAKE/RESERVOIR SYSTEM	Municipal	13,400	12,900	12,400	11,900	11,400	10,900
BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	Steam Electric	4,156	4,128	4,101	4,074	4,046	4,019
BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	Irrigation	5,797	5,759	5,721	5,683	5,644	5,606
BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	Municipal	199,204	197,889	196,575	195,261	193,946	192,632
BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM	Steam Electric	125,725	125,725	125,725	125,725	125,725	125,725
BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM	Irrigation	12,690	12,690	12,690	12,690	12,690	12,690
BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM	Mining	3,000	3,000	3,000	3,000	3,000	3,000
BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM	Manufacturing	11,200	11,200	11,200	11,200	11,200	11,200
BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM	Municipal	183,421	179,301	175,181	171,061	166,941	162,821
BRECKENRIDGE		**1,884**	**1,883**	**1,883**	**1,883**	**1,883**	**1,883**
DANIEL LAKE/RESERVOIR	Manufacturing	175	170	165	160	155	150
HUBBARD CREEK LAKE/RESERVOIR	Municipal	1,709	1,713	1,718	1,723	1,728	1,733
BRENHAM	Municipal	**3,701**	**3,701**	**3,701**	**3,701**	**3,701**	**3,701**
BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM	Municipal	3,701	3,701	3,701	3,701	3,701	3,701
BRUCEVILLE EDDY		**1,526**	**1,520**	**1,514**	**1,508**	**1,502**	**1,496**
BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	Municipal	908	902	896	890	884	878
TRINITY AQUIFER | MCLENNAN	Municipal	618	618	618	618	618	618
BRUSHY CREEK MUD	Municipal	**2,838**	**2,816**	**2,794**	**2,772**	**2,750**	**2,728**
BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	Municipal	2,807	2,785	2,763	2,741	2,719	2,697
EDWARDS-BFZ AQUIFER | WILLIAMSON	Municipal	31	31	31	31	31	31

Table O-2. Major Water Providers
Supplies by Category of Use

Major Water Provider	Category of Use	Supplies Available (acft/yr)					
		2020	2030	2040	2050	2060	2070
BRYAN		**19,730**	**19,855**	**19,872**	**19,872**	**19,872**	**19,872**
CARRIZO-WILCOX & SPARTA AQUIFER	Manufacturing	95	95	95	95	95	95
CARRIZO-WILCOX & SPARTA AQUIFER	Steam Electric	1	1	1	1	1	1
CARRIZO-WILCOX AQUIFER	Municipal	19,011	19,011	19,011	19,011	19,011	19,011
SPARTA AQUIFER	Municipal	623	748	765	765	765	765
BURLESON		**6,463**	**6,439**	**6,516**	**6,652**	**6,868**	**7,105**
TRWD LAKE/RESERVOIR SYSTEM	Municipal	6,463	6,439	6,516	6,652	6,868	7,105
CALDWELL	Municipal	**2,276**	**2,276**	**2,276**	**2,276**	**2,276**	**2,276**
CARRIZO-WILCOX AQUIFER | BURLESON	Municipal	2,276	2,276	2,276	2,276	2,276	2,276
CAMERON		**2,615**	**2,615**	**2,615**	**2,615**	**2,615**	**2,615**
BRAZOS RUN-OF-RIVER	Manufacturing	14	14	14	14	14	14
BRAZOS RUN-OF-RIVER	Municipal	2,601	2,601	2,601	2,601	2,601	2,601
CEDAR PARK		**15,608**	**15,553**	**15,553**	**15,553**	**15,553**	**15,553**
HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	Municipal	15,608	15,553	15,553	15,553	15,553	15,553
CENTRAL TEXAS WSC		**10,930**	**11,026**	**11,089**	**11,023**	**10,957**	**10,891**
CONTRACT: BRAZOS RIVER AUTHORITY	Municipal	10,011	9,945	9,879	9,813	9,747	9,681
TRINITY AQUIFER	Manufacturing	54	54	54	54	54	54
TRINITY AQUIFER	Municipal	865	1,027	1,156	1,156	1,156	1,156
CLEBURNE		**8,800**	**8,343**	**7,880**	**7,458**	**7,039**	**6,354**
PAT CLEBURNE LAKE/RESERVOIR	Manufacturing	1,086	1,086	1,086	1,086	1,086	1,086
DIRECT REUSE	Steam-Electric	1,344	1,344	1,344	1,344	1,344	1,344
PAT CLEBURNE LAKE/RESERVOIR	Municipal	2,610	2,538	2,466	2,394	2,322	2,250
BRAZOS RIVER AUTHORITY AQUILLA LAKE/RESERVOIR SYSTEM	Municipal	2,971	2,586	2,195	1,845	1,498	885
TRINITY AQUIFER	Municipal	789	789	789	789	789	789
COLLEGE STATION		**16,864**	**16,988**	**17,003**	**17,003**	**17,003**	**17,003**
CARRIZO-WILCOX AQUIFER | BRAZOS	Municipal	16,255	16,255	16,255	16,255	16,255	16,255
CARRIZO-WILCOX & SPARTA AQUIFER	Manufacturing	6	6	6	6	6	6
SPARTA AQUIFER | BRAZOS	Municipal	603	727	742	742	742	742

Table O-2. Major Water Providers
Supplies by Category of Use

Major Water Provider	Category of Use	Supplies Available (acft/yr)					
		2020	2030	2040	2050	2060	2070
COLORADO RIVER MWD		**72,284**	**70,386**	**67,621**	**63,120**	**60,355**	**57,590**
COLORADO RIVER MWD LAKE/RESERVOIR SYSTEM	Municipal	14,285	13,670	13,153	12,633	12,133	11,709
CRMWD DIVERTED WATER SYSTEM	Municipal	-	-	-	-	-	-
DIRECT REUSE	Municipal	1,855	1,855	1,855	1,855	1,855	1,855
EDWARDS-TRINITY-PLATEAU AND PECOS VALLEY AQUIFERS	Municipal	39,044	38,176	36,441	32,970	31,235	29,500
EV SPENCE LAKE/RESERVOIR NON-SYSTEM PORTION	Municipal	-	-	-	-	-	-
OGALLALA AND EDWARDS-TRINITY-HIGH PLAINS AQUIFERS	Municipal	1,035	1,035	1,035	1,035	1,035	1,035
OH IVIE LAKE/RESERVOIR NON-SYSTEM PORTION	Municipal	16,065	15,650	15,137	14,627	14,097	13,491
COPPERAS COVE		**8,692**	**8,695**	**8,698**	**8,699**	**6,142**	**5,031**
BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	Municipal	8,692	8,695	8,698	8,699	6,142	5,031
CORIX UTILITIES TEXAS INC	Municipal	**1,284**	**1,283**	**1,283**	**1,283**	**1,283**	**1,284**
ELLENBURGER-SAN SABA AQUIFER | BURNET	Municipal	9	9	9	9	9	9
GULF COAST AQUIFER SYSTEM | COLORADO	Municipal	36	36	36	36	36	36
GULF COAST AQUIFER SYSTEM | MATAGORDA	Municipal	84	84	84	84	84	84
GULF COAST AQUIFER SYSTEM | WASHINGTON	Municipal	525	525	525	525	525	525
HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	Municipal	526	525	525	525	525	526
OTHER AQUIFER | BURNET	Municipal	104	104	104	104	104	104
CORYELL CITY WATER SUPPLY DISTRICT	Municipal	**1,265**	**1,375**	**1,500**	**1,614**	**1,739**	**1,866**
BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	Municipal	1,182	1,292	1,417	1,531	1,656	1,783
TRINITY AQUIFER | CORYELL	Municipal	83	83	83	83	83	83
DOG RIDGE WSC		**1,638**	**1,638**	**1,638**	**1,638**	**1,638**	**1,638**
BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	Municipal	1,638	1,638	1,638	1,638	1,638	1,638
EASTLAND COUNTY WSD		**4,500**	**4,470**	**4,440**	**4,410**	**4,380**	**4,350**
EASTLAND LAKE/RESERVOIR	Municipal	500	500	500	500	500	500
LEON LAKE/RESERVOIR	Municipal	4,000	3,970	3,940	3,910	3,880	3,850
FERN BLUFF MUD		**1,187**	**1,175**	**1,168**	**1,163**	**1,161**	**1,161**
BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	Municipal	1,187	1,175	1,168	1,163	1,161	1,161
FHLM		**-**	**-**	**-**	**-**	**-**	**-**
NONE	Municipal	-	-	-	-	-	-
FORT HOOD		**11,995**	**11,995**	**11,995**	**11,995**	**11,995**	**11,995**
BRAZOS RUN-OF-RIVER	Municipal	11,995	11,995	11,995	11,995	11,995	11,995

Table O-2. Major Water Providers
Supplies by Category of Use

Major Water Provider	Category of Use	Supplies Available (acft/yr)					
		2020	2030	2040	2050	2060	2070
FORT WORTH	Municipal	**182,972**	**184,617**	**188,438**	**187,992**	**188,397**	**188,099**
TRINITY INDIRECT REUSE	Municipal	35,931	40,202	44,455	49,078	53,899	59,762
TRWD LAKE/RESERVOIR SYSTEM	Municipal	147,041	144,415	143,983	138,914	134,498	128,337
GATESVILLE	Municipal	**3,260**	**3,109**	**2,922**	**2,743**	**2,555**	**2,362**
BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	Municipal	3,260	3,109	2,922	2,743	2,555	2,362
GEORGETOWN		**16,579**	**15,831**	**15,205**	**14,305**	**13,006**	**11,720**
BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	Municipal	16,341	15,477	14,067	12,721	11,422	10,136
EDWARDS-BFZ AQUIFER | WILLIAMSON	Municipal	119	177	569	792	792	792
EDWARDS-BFZ AQUIFER	Manufacturing	30	30	30	30	30	30
EDWARDS-BFZ AQUIFER	Municipal	89	147	539	762	762	762
GIDDINGS		**1,730**	**1,729**	**1,728**	**1,727**	**1,726**	**1,725**
CARRIZO-WILCOX AQUIFER	Manufacturing	13	14	15	16	17	18
CARRIZO-WILCOX AQUIFER | LEE	Municipal	1,717	1,715	1,713	1,711	1,709	1,707
GRAHAM		**1,426**	**1,309**	**1,190**	**1,070**	**949**	**828**
GRAHAM/EDDLEMAN LAKE/RESERVOIR	Steam-Electric	248	248	248	248	248	248
BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM	Municipal	1,000	1,000	942	822	701	580
GRAHAM/EDDLEMAN LAKE/RESERVOIR	Municipal	178	61	-	-	-	-
GRANBURY		**2,411**	**2,411**	**2,411**	**2,411**	**2,411**	**2,411**
BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM	Municipal	1,400	1,400	1,400	1,400	1,400	1,400
TRINITY AQUIFER | HOOD	Municipal	1,011	1,011	1,011	1,011	1,011	1,011
HARKER HEIGHTS		**8,203**	**8,184**	**8,164**	**8,145**	**8,125**	**8,106**
BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	Municipal	8,203	8,184	8,164	8,145	8,125	8,106
HEARNE		**2,799**	**2,797**	**2,794**	**2,791**	**2,788**	**2,784**
CARRIZO-WILCOX AQUIFER | ROBERTSON	Municipal	2,799	2,797	2,794	2,791	2,788	2,784
HEWITT		**2,549**	**2,549**	**2,549**	**2,549**	**2,549**	**2,549**
TRINITY AQUIFER | MCLENNAN	Municipal	1,429	1,429	1,429	1,429	1,429	1,429
WACO LAKE/RESERVOIR	Municipal	1,120	1,120	1,120	1,120	1,120	1,120
HILLSBORO		**3,833**	**3,634**	**3,632**	**3,631**	**3,629**	**3,468**
BRAZOS RIVER AUTHORITY AQUILLA LAKE/RESERVOIR SYSTEM	Municipal	3,833	3,634	3,632	3,631	3,629	3,468
HUNTSVILLE		**22,290**	**22,323**	**22,344**	**22,373**	**22,402**	**22,428**
GULF COAST AQUIFER SYSTEM | WALKER	Municipal	2,890	2,923	2,944	2,973	3,002	3,028
INDIRECT REUSE	Steam-Electric	342	342	342	342	342	342
LIVINGSTON-WALLISVILLE LAKE/RESERVOIR SYSTEM	Municipal	19,058	19,400	19,400	19,400	19,400	19,400

Table O-2. Major Water Providers
Supplies by Category of Use

Major Water Provider	Category of Use	Supplies Available (acft/yr)					
		2020	2030	2040	2050	2060	2070
HUTTO		**1,165**	**1,165**	**1,165**	**1,165**	**1,165**	**1,165**
BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	Municipal	336	336	336	336	336	336
EDWARDS-BFZ AQUIFER | TRAVIS	Municipal	560	560	560	560	560	560
EDWARDS-BFZ AQUIFER | WILLIAMSON	Municipal	269	269	269	269	269	269
JARRELL-SCHWERTNER	Municipal	**3,199**	**3,194**	**3,188**	**3,183**	**3,177**	**3,061**
BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	Municipal	3,199	3,194	3,188	3,183	3,177	3,061
JOHNSON COUNTY SUD		**5,453**	**7,547**	**8,169**	**7,414**	**7,106**	**6,984**
BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM	Municipal	3,160	3,160	3,160	3,160	3,160	3,160
TRINITY AQUIFER | JOHNSON	Municipal	1,526	1,522	1,526	1,522	1,526	1,522
TRINITY AQUIFER	Mining	20	20	20	20	20	20
TRWD LAKE/RESERVOIR SYSTEM	Municipal	747	2,845	3,463	2,712	2,400	2,282
JONAH WATER SUD		**3,602**	**4,342**	**5,298**	**6,352**	**7,571**	**8,775**
BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	Municipal	3,312	4,052	5,008	6,062	7,281	8,485
EDWARDS-BFZ AQUIFER | WILLIAMSON	Municipal	290	290	290	290	290	290
KEMPNER WSC		**2,281**	**2,267**	**2,251**	**2,236**	**2,222**	**2,209**
BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	Municipal	2,281	2,267	2,251	2,236	2,222	2,209
KILLEEN		**18,308**	**20,913**	**23,716**	**26,629**	**29,619**	**32,599**
BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	Municipal	16,068	18,673	21,476	24,389	27,379	30,359
DIRECT REUSE	Municipal	2,240	2,240	2,240	2,240	2,240	2,240
LAMPASAS		**1,144**	**1,130**	**1,116**	**1,103**	**1,086**	**1,068**
BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	Municipal	1,144	1,130	1,116	1,103	1,086	1,068
LEANDER		**6,400**	**6,400**	**6,400**	**6,400**	**6,400**	**6,400**
HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	Municipal	6,400	6,400	6,400	6,400	6,400	6,400
LEE COUNTY WSC		**4,339**	**4,339**	**4,340**	**4,341**	**4,342**	**4,342**
CARRIZO-WILCOX AQUIFER | LEE	Municipal	3,934	3,934	3,934	3,934	3,934	3,934
QUEEN CITY AQUIFER | LEE	Municipal	133	133	134	135	136	136
SPARTA AQUIFER | LEE	Municipal	272	272	272	272	272	272
LOWER COLORADO RIVER AUTHORITY		**538,899**	**539,109**	**538,855**	**539,337**	**538,274**	**537,392**
CARRIZO-WILCOX AQUIFER	Municipal	2,609	3,522	4,022	5,156	4,836	4,727
COLORADO RUN-OF-RIVER	Municipal	184,264	184,264	184,264	184,264	184,264	184,264
HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	Municipal	352,026	351,323	350,569	349,917	349,174	348,401

Table O-2. Major Water Providers
Supplies by Category of Use

Major Water Provider	Category of Use	Supplies Available (acft/yr)					
		2020	2030	2040	2050	2060	2070
MANSFIELD		**17,922**	**17,341**	**17,823**	**18,886**	**19,525**	**20,050**
TRWD LAKE/RESERVOIR SYSTEM	Municipal	17,922	17,341	17,823	18,886	19,525	20,050
MANVILLE WSC		**7,509**	**7,567**	**7,645**	**7,742**	**7,793**	**7,793**
CARRIZO-WILCOX AQUIFER | BURLESON	Municipal	377	470	557	634	676	676
CARRIZO-WILCOX AQUIFER | LEE	Municipal	3,244	3,244	3,244	3,244	3,244	3,244
CARRIZO-WILCOX AQUIFER | MILAM	Municipal	220	185	176	196	205	205
EDWARDS-BFZ AQUIFER | TRAVIS	Municipal	424	424	424	424	424	424
EDWARDS-BFZ AQUIFER | WILLIAMSON	Municipal	322	322	322	322	322	322
HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	Municipal	2,128	2,128	2,128	2,128	2,128	2,128
OTHER AQUIFER | WILLIAMSON	Municipal	269	269	269	269	269	269
TRINITY AQUIFER | TRAVIS	Municipal	525	525	525	525	525	525
MARLIN		**2,800**	**2,800**	**2,800**	**2,800**	**2,800**	**2,800**
BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM	Municipal	550	600	650	700	750	800
NEW MARLIN CITY LAKE/RESERVOIR	Municipal	2,250	2,200	2,150	2,100	2,050	2,000
MCGREGOR		**2,369**	**2,349**	**2,330**	**2,309**	**2,287**	**2,265**
BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	Municipal	2,369	2,349	2,330	2,309	2,287	2,265
MEXIA		**1,098**	**1,077**	**971**	**860**	**750**	**644**
CARRIZO-WILCOX AQUIFER | LIMESTONE	Municipal	1,098	1,077	971	860	750	644
MINERAL WELLS		**2,754**	**2,619**	**2,483**	**2,348**	**2,212**	**2,077**
PALO PINTO LAKE/RESERVOIR	Municipal	2,754	2,619	2,483	2,348	2,212	2,077
MORGANS POINT RESORT		**1,935**	**1,935**	**1,935**	**1,935**	**1,935**	**1,935**
CONTRACT: TEMPLE	Municipal	1,935	1,935	1,935	1,935	1,935	1,935
MOUNTAIN PEAK SUD		**3,389**	**3,385**	**3,389**	**2,264**	**2,268**	**2,264**
JOE POOL LAKE/RESERVOIR	Municipal	1,121	1,121	1,121	-	-	-
TRINITY AQUIFER | ELLIS	Municipal	1,200	1,200	1,200	1,200	1,200	1,200
TRINITY AQUIFER | JOHNSON	Municipal	1,068	1,064	1,068	1,064	1,068	1,064
NAVASOTA		**2,039**	**2,039**	**2,039**	**2,039**	**2,015**	**1,970**
GULF COAST AQUIFER SYSTEM	Manufacturing	114	114	114	114	114	114
GULF COAST AQUIFER SYSTEM | GRIMES	Municipal	1,925	1,925	1,925	1,925	1,901	1,856
NORTH BOSQUE WSC	Municipal	**605**	**605**	**605**	**605**	**605**	**605**
TRINITY AQUIFER | MCLENNAN	Municipal	605	605	605	605	605	605

Table O-2. Major Water Providers
Supplies by Category of Use

Major Water Provider	Category of Use	Supplies Available (acft/yr)					
		2020	2030	2040	2050	2060	2070
NORTH CENTRAL TEXAS MUNICIPAL WATER AUTHORITY		**75**	**60**	**45**	**30**	**15**	**-**
MILLERS CREEK LAKE/RESERVOIR	Municipal	75	60	45	30	15	-
PALO PINTO COUNTY MWD #1		**7,800**	**7,660**	**7,520**	**7,380**	**7,240**	**7,100**
PALO PINTO LAKE/RESERVOIR	Steam-Electric	4,000	4,000	4,000	4,000	4,000	4,000
PALO PINTO LAKE/RESERVOIR	Municipal	7,800	7,660	7,520	7,380	7,240	7,100
PALO PINTO WSC		**179**	**179**	**179**	**179**	**179**	**179**
PALO PINTO LAKE/RESERVOIR	Municipal	179	179	179	179	179	179
POSSUM KINGDOM WSC		**750**	**750**	**750**	**750**	**750**	**750**
BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM	Municipal	750	750	750	750	750	750
ROBINSON		**2,227**	**2,227**	**2,227**	**2,227**	**2,227**	**2,227**
BRAZOS RUN-OF-RIVER	Municipal	1,126	1,126	1,126	1,126	1,126	1,126
TRINITY AQUIFER | MCLENNAN	Municipal	1,101	1,101	1,101	1,101	1,101	1,101
ROCKDALE	Municipal	**1,094**	**924**	**624**	**727**	**771**	**771**
CARRIZO-WILCOX AQUIFER | MILAM	Municipal	1,094	924	624	727	771	771
ROUND ROCK		**22,146**	**21,850**	**21,768**	**21,585**	**21,328**	**21,057**
BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	Municipal	15,855	15,454	15,236	14,917	14,524	14,116
EDWARDS-BFZ AQUIFER | WILLIAMSON	Manufacturing	511	479	479	479	479	479
HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	Municipal	5,780	5,917	6,053	6,189	6,325	6,462
SALADO WSC		**2,236**	**2,236**	**2,236**	**2,236**	**2,236**	**2,236**
BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	Municipal	183	183	183	183	183	183
EDWARDS-BFZ AQUIFER | BELL	Municipal	2,053	2,053	2,053	2,053	2,053	2,053
SALT FORK WATER QUALITY CORPORATION		**-**	**-**	**-**	**-**	**-**	**-**
NONE	Municipal	-	-	-	-	-	-
SOUTHWEST MILAM WSC		**1,635**	**1,350**	**1,266**	**1,438**	**1,512**	**1,512**
CARRIZO-WILCOX AQUIFER | MILAM	Municipal	1,635	1,350	1,266	1,438	1,512	1,512
STAMFORD		**1,209**	**1,209**	**1,209**	**1,209**	**1,209**	**1,209**
BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM	Municipal	809	889	969	1,049	1,129	1,209
STAMFORD LAKE/RESERVOIR	Municipal	400	320	240	160	80	-

Table O-2. Major Water Providers
Supplies by Category of Use

Major Water Provider	Category of Use	Supplies Available (acft/yr)					
		2020	2030	2040	2050	2060	2070
STEPHENVILLE		**5,613**	**5,607**	**5,600**	**5,594**	**5,587**	**5,578**
TRINITY AQUIFER	Manufacturing	33	33	33	33	33	33
BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	Municipal	1,862	1,862	1,862	1,862	1,862	1,862
TRINITY AQUIFER | ERATH	Municipal	3,718	3,712	3,705	3,699	3,692	3,683
SWEETWATER		**1,657**	**1,663**	**1,667**	**1,671**	**1,671**	**1,671**
DOCKUM AQUIFER	Manufacturing	361	358	356	354	354	354
DOCKUM AQUIFER | NOLAN	Municipal	1,296	1,305	1,311	1,317	1,317	1,317
TARRANT REGIONAL WD		**487,025**	**483,503**	**479,965**	**476,797**	**473,825**	**471,897**
INDIRECT REUSE	Municipal	35,931	40,202	44,455	49,078	53,899	59,762
TRWD LAKE/RESERVOIR SYSTEM	Municipal	451,094	443,301	435,510	427,719	419,926	412,135
TAYLOR		**2,844**	**3,010**	**3,245**	**3,527**	**3,873**	**4,237**
BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	Municipal	2,844	3,010	3,245	3,527	3,873	4,237
TEMPLE		**19,563**	**19,563**	**19,563**	**19,563**	**19,563**	**19,563**
BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	Municipal	17,066	17,350	17,634	17,919	18,203	18,487
BRAZOS RUN-OF-RIVER	Manufacturing	433	433	433	433	433	433
BRAZOS RUN-OF-RIVER	Municipal	2,064	1,780	1,496	1,211	927	643
TEXAS A&M UNIVERSITY		**6,223**	**6,392**	**6,412**	**6,412**	**6,412**	**6,412**
CARRIZO-WILCOX AQUIFER | BRAZOS	Municipal	5,397	5,397	5,397	5,397	5,397	5,397
SPARTA AQUIFER | BRAZOS	Municipal	826	995	1,015	1,015	1,015	1,015
TEXAS STATE TECHNICAL COLLEGE	Municipal	**888**	**954**	**1,013**	**1,073**	**1,132**	**1,193**
WACO LAKE/RESERVOIR	Municipal	888	954	1,013	1,073	1,132	1,193
UPPER LEON MWD		**6,437**	**6,437**	**6,437**	**6,437**	**6,437**	**6,437**
CONTRACT: BRAZOS RIVER AUTHORITY	Municipal	6,437	6,437	6,437	6,437	6,437	6,437
VENUS		**546**	**419**	**413**	**471**	**503**	**528**
TRWD LAKE/RESERVOIR SYSTEM	Municipal	443	316	310	368	400	425
WOODBINE AQUIFER | JOHNSON	Municipal	103	103	103	103	103	103
WACO		**58,886**	**58,431**	**57,796**	**57,108**	**56,469**	**55,692**
BRAZOS RUN-OF-RIVER	Municipal	5,600	5,600	5,600	5,600	5,600	5,600
TRINITY AQUIFER | MCLENNAN	Municipal	540	540	540	540	540	540
BRAZOS RUN-OF-RIVER	Manufacturing	3,097	3,097	3,097	3,097	3,097	3,097
DIRECT REUSE	Steam-Electric	15,000	15,000	15,000	15,000	15,000	15,000
WACO LAKE/RESERVOIR	Municipal	34,649	34,194	33,559	32,871	32,232	31,455

Table O-2. Major Water Providers
Supplies by Category of Use

Major Water Provider	Category of Use	Supplies Available (acft/yr)					
		2020	2030	2040	2050	2060	2070
WELLBORN SUD		**7,759**	**7,759**	**7,759**	**7,759**	**7,759**	**7,759**
BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM	Municipal	1,120	1,120	1,120	1,120	1,120	1,120
CARRIZO-WILCOX AQUIFER | BRAZOS	Municipal	5,265	5,140	5,123	5,123	5,123	5,123
SPARTA AQUIFER | BRAZOS	Municipal	623	748	765	765	765	765
YEGUA-JACKSON AQUIFER | BRAZOS	Municipal	751	751	751	751	751	751
WEST CENTRAL TEXAS MWD		**20,235**	**20,135**	**20,035**	**19,935**	**19,835**	**19,735**
BRAZOS RIVER AUTHORITY	Municipal	235	235	235	235	235	235
HUBBARD CREEK LAKE/RESERVOIR	Municipal	20,000	19,900	19,800	19,700	19,600	19,500
WICKSON CREEK SUD		**3,292**	**3,361**	**3,223**	**3,098**	**2,985**	**2,896**
CARRIZO-WILCOX AQUIFER | BRAZOS	Municipal	1,712	1,536	1,368	1,243	1,130	1,041
CARRIZO-WILCOX AQUIFER | ROBERTSON	Municipal	98	98	98	98	98	98
SPARTA AQUIFER | BRAZOS	Municipal	1,205	1,450	1,480	1,480	1,480	1,480
YEGUA-JACKSON AQUIFER | GRIMES	Municipal	277	277	277	277	277	277
WILLIAMSON COUNTY WSID 3	Municipal	**1,189**	**1,189**	**1,189**	**1,189**	**1,189**	**1,189**
CARRIZO-WILCOX AQUIFER | LEE	Municipal	939	939	939	939	939	939
TRINITY AQUIFER | TRAVIS	Municipal	250	250	250	250	250	250
WOODWAY		**3,773**	**3,768**	**3,974**	**4,225**	**4,466**	**4,718**
BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	Municipal	1,319	1,310	1,301	1,293	1,284	1,275
TRINITY AQUIFER | MCLENNAN	Municipal	2,454	2,454	2,454	2,454	2,454	2,454
WACO LAKE/RESERVOIR	Municipal	-	4	219	478	728	989

Table O-3. Major Water Providers
Needs

Major Water Provider	Category of Use	Needs/Surplus* (acft/yr)					
		2020	2030	2040	2050	2060	2070
439 WSC	Municipal	217	(32)	(293)	(567)	(859)	(1,161)
ABILENE	Municipal	(637)	(3,777)	(6,763)	(12,533)	(15,857)	(19,771)
ACTON MUD	Municipal	1,546	(50)	(1,126)	(1,708)	(2,933)	(4,203)
ANSON	Municipal	-	-	-	-	-	-
AQUILLA WSD	Municipal	(559)	1	1	1	-	(262)
ARLINGTON	Municipal	9	(8,085)	(14,958)	(20,459)	(24,292)	(27,652)
BELL COUNTY WCID #1	Municipal	30,149	28,276	26,022	23,858	21,704	19,564
BELL COUNTY WCID 3	Municipal	-	-	-	-	-	-
BELLMEAD	Municipal	2,111	2,083	2,056	2,013	1,956	1,896
BELTON	Municipal	3,608	3,046	2,448	1,831	1,201	(1,072)
BETHESDA WSC	Municipal	(1)	(561)	(1,167)	(1,827)	(2,497)	(3,380)
BISTONE MUNICIPAL WATER SUPPLY DISTRICT	Municipal	116	28	28	28	28	28
BLUEBONNET WSC	Municipal	(225)	(271)	(317)	(362)	(408)	(453)
BRAZOS RIVER AUTHORITY	Municipal	(5,021)	(7,074)	(9,199)	(11,372)	(13,612)	(15,760)
BRECKENRIDGE	Municipal	882	871	877	879	878	868
BRENHAM	Municipal	(628)	(926)	(1,120)	(1,337)	(1,524)	(1,681)
BRUCEVILLE EDDY	Municipal	496	436	379	315	243	170
BRUSHY CREEK MUD	Municipal	(246)	(206)	(191)	(193)	(210)	(231)
BRYAN	Municipal	215	(1,896)	(4,578)	(8,034)	(12,323)	(19,650)
BURLESON	Municipal	(3)	(1,045)	(2,037)	(3,066)	(4,112)	(5,204)
CALDWELL	Municipal	1,249	1,233	1,204	1,204	1,185	1,168
CAMERON	Municipal	1,252	1,202	1,169	1,111	1,054	998
CEDAR PARK	Municipal	(3,500)	(5,416)	(5,491)	(5,454)	(5,435)	(5,427)
CENTRAL TEXAS WSC	Municipal	393	489	552	486	420	354
CLEBURNE	Municipal	1,831	763	(1,097)	(2,988)	(5,195)	(7,324)
COLLEGE STATION	Municipal	413	(3,492)	(8,874)	(13,436)	(13,379)	(13,360)
COLORADO RIVER MWD	Municipal	(6,487)	7,025	1,593	(5,813)	(11,536)	(17,778)
COPPERAS COVE	Municipal	4,388	3,973	3,473	2,992	(125)	(1,802)

Table O-3. Major Water Providers
Needs

Major Water Provider	Category of Use	Needs/Surplus* (acft/yr)					
		2020	2030	2040	2050	2060	2070
CORIX UTILITIES TEXAS INC	Municipal	(31)	(73)	(120)	(180)	(230)	(281)
CORYELL CITY WATER SUPPLY DISTRICT	Municipal	332	331	329	327	326	324
DOG RIDGE WSC	Municipal	914	817	714	602	486	370
EASTLAND COUNTY WSD	Municipal	(887)	(925)	(955)	(985)	(1,015)	(1,045)
FERN BLUFF MUD	Municipal	-	-	-	-	-	-
FHLM WSC	Municipal	-	-	-	-	-	-
FORT HOOD	Municipal	4,915	5,007	5,086	5,097	5,106	5,107
FORT WORTH	Municipal	(6,138)	(49,980)	(97,839)	(129,779)	(157,072)	(185,311)
GATESVILLE	Municipal	(1,041)	(1,692)	(2,455)	(3,154)	(3,917)	(4,688)
GEORGETOWN	Municipal	(10,272)	(19,148)	(28,300)	(39,354)	(52,048)	(66,632)
GIDDINGS	Municipal	576	461	400	380	362	351
GRAHAM	Municipal	(1,362)	(1,582)	(1,769)	(1,982)	(2,208)	(2,434)
GRANBURY	Municipal	673	365	144	(55)	(216)	(342)
HARKER HEIGHTS	Municipal	2,104	1,141	122	(915)	(1,962)	(3,000)
HEARNE	Municipal	2,040	1,899	1,729	1,729	1,728	1,724
HEWITT	Municipal	(480)	(844)	(1,172)	(1,522)	(1,893)	(2,262)
HILLSBORO	Municipal	1,846	1,564	1,510	1,442	1,378	1,185
HUNTSVILLE	Municipal	14,429	14,269	14,167	14,029	13,885	13,760
HUTTO	Municipal	(907)	(3,046)	(3,304)	(5,437)	(8,596)	(10,703)
JARRELL-SCHWERTNER	Municipal	2,241	2,054	1,819	1,560	1,261	839
JOHNSON COUNTY SUD	Municipal	(318)	1,427	1,473	94	(880)	(1,681)
JONAH WATER SUD	Municipal	290	290	290	290	290	290
KEMPNER WSC	Municipal	(470)	(740)	(970)	(1,211)	(1,445)	(1,664)
KILLEEN	Municipal	-	-	-	-	-	-
LAMPASAS	Municipal	(121)	(226)	(308)	(403)	(504)	(600)
LEANDER	Municipal	(1,681)	(6,996)	(10,267)	(13,565)	(17,543)	(22,322)
LEE COUNTY WSC	Municipal	3,071	2,930	2,824	2,737	2,626	2,492
LOWER COLORADO RIVER AUTHORITY	Municipal	(35,024)	(34,814)	(35,068)	(34,586)	(35,649)	(36,531)

Table O-3. Major Water Providers
Needs

Major Water Provider	Category of Use	Needs/Surplus* (acft/yr)					
		2020	2030	2040	2050	2060	2070
MANSFIELD	Municipal	(1,308)	(7,025)	(11,261)	(17,104)	(21,860)	(26,747)
MANVILLE WSC	Municipal	3,184	2,402	1,574	601	(474)	(1,696)
MARLIN	Municipal	951	892	899	950	896	839
MCGREGOR	Municipal	1,568	1,536	1,505	1,463	1,413	1,360
MEXIA	Municipal	530	443	284	115	(43)	(182)
MINERAL WELLS	Municipal	(168)	(403)	(594)	(800)	(1,007)	(1,200)
MORGANS POINT RESORT	Municipal	1,353	1,254	1,148	1,038	926	814
MOUNTAIN PEAK SUD	Municipal	(705)	(1,699)	(2,140)	(5,229)	(6,398)	(7,505)
NAVASOTA	Municipal	565	553	546	525	474	403
NORTH BOSQUE WSC	Municipal	39	(82)	(190)	(300)	(412)	(522)
NORTH CENTRAL TEXAS MUNICIPAL WATER AUTHORITY	Municipal	(1,722)	(1,737)	(1,724)	(1,709)	(1,695)	(1,678)
PALO PINTO COUNTY MWD #1	Municipal	(1,751)	(1,991)	(2,186)	(2,397)	(2,608)	(2,806)
POSSUM KINGDOM WSC	Municipal	(118)	(171)	(206)	(240)	(268)	(290)
ROBINSON	Municipal	(245)	(669)	(1,048)	(1,444)	(1,851)	(2,255)
ROCKDALE	Municipal	(79)	(289)	(613)	(558)	(562)	(609)
ROUND ROCK	Municipal	2,064	(2,762)	(8,830)	(16,038)	(16,280)	(16,566)
SALADO WSC	Municipal	337	155	(29)	(213)	(400)	(586)
SALT FORK WATER QUALITY CORPORATION	Municipal	-	-	-	-	-	-
SOUTHWEST MILAM WSC	Municipal	169	(225)	(419)	(386)	(465)	(619)
STAMFORD	Municipal	360	329	309	284	261	242
STEPHENVILLE	Municipal	2,954	2,740	2,553	2,353	2,139	1,933
SWEETWATER	Municipal	(296)	(333)	(350)	(413)	(469)	(521)
TARRANT REGIONAL WD	Municipal	(4,998)	(90,298)	(168,570)	(245,172)	(321,443)	(413,895)
TAYLOR	Municipal	-	-	-	-	-	-
TEMPLE	Municipal	(532)	(3,668)	(6,969)	(10,340)	(13,738)	(17,103)
TEXAS A&M UNIVERSITY	Municipal	(99)	43	104	120	124	124
TEXAS STATE TECHNICAL COLLEGE	Municipal	-	-	-	-	-	-
UPPER LEON MWD	Municipal	1,865	1,865	1,865	1,865	1,865	1,865

Table O-3. Major Water Providers
Needs

Major Water Provider	Category of Use	Needs/Surplus* (acft/yr)					
		2020	2030	2040	2050	2060	2070
VENUS	Municipal	(92)	(309)	(411)	(462)	(549)	(654)
WACO	Municipal	9,510	7,271	5,023	2,517	(123)	(2,908)
WELLBORN SUD	Municipal	3,883	2,351	1,785	1,121	358	(434)
WEST CENTRAL TEXAS MWD	Municipal	2,258	4,515	6,775	9,035	11,295	13,535
WICKSON CREEK SUD	Municipal	1,644	1,533	1,201	831	448	64
WILLIAMSON COUNTY WSID 3	Municipal	171	126	103	73	37	-
WOODWAY	Municipal	308	78	82	111	119	139

*Note: Needs for WWPs and WUG/WWPs based upon actual water used by customers, not contractual demands.

Table O-4. Major Water Providers
Secondary Needs

Major Water Provider	Category of Use	Second Tier Needs Analysis (After Conservation and Direct Reuse) (acft/yr)					
		2020	2030	2040	2050	2060	2070
439 WSC	Municipal	0	0	108	382	859	1,141
ABILENE	Municipal	637	2,153	4,566	10,532	13,862	17,748
ACTON MUD	Municipal	-	50	1,126	1,708	2,933	4,203
ANSON	Municipal	0	0	0	0	0	0
AQUILLA WSD	Municipal	(559)	1	1	1	-	(262)
ARLINGTON	Municipal	9	(8,085)	(14,958)	(20,459)	(24,292)	(27,652)
BELL COUNTY WCID #1	Municipal	10,885	7,544	3,823	191	(3,430)	(7,038)
BELL COUNTY WCID 3	Municipal	0	0	0	0	0	0
BELLMEAD	Municipal	0	0	0	0	0	0
BELTON	Municipal	0	0	0	0	0	688
BETHESDA WSC	Municipal	0	32	16	0	314	768
BISTONE MUNICIPAL WATER SUPPLY DISTRICT	Municipal	0	0	0	0	0	0
BLUEBONNET WSC	Municipal	(225)	(271)	(317)	(362)	(408)	(453)
BRAZOS RIVER AUTHORITY	Municipal	(5,021)	(7,074)	(9,199)	(11,372)	(13,612)	(15,760)
BRECKENRIDGE	Municipal	0	0	0	0	0	0
BRENHAM	Municipal	628	559	365	167	0	33
BRUCEVILLE EDDY	Municipal	0	0	0	0	0	0
BRUSHY CREEK MUD	Municipal	246	0	0	0	0	0
BRYAN	Municipal	0	585	2,972	6,315	10,335	17,161
BURLESON	Municipal	0	819	1651	2374	3187	4062
CALDWELL	Municipal	0	0	0	0	0	0
CAMERON	Municipal	0	0	0	0	0	0
CEDAR PARK	Municipal	1	1	1	0	0	0
CENTRAL TEXAS WSC	Municipal	393	489	552	486	420	354
CLEBURNE	Municipal	0	0	0	0	0	0
COLLEGE STATION	Municipal	0	0	642	5,204	5,147	5,128

Table O-4. Major Water Providers
Secondary Needs

Major Water Provider	Category of Use	Second Tier Needs Analysis (After Conservation and Direct Reuse) (acft/yr)					
		2020	2030	2040	2050	2060	2070
COLORADO RIVER MWD	Municipal	(6,487)	7,025	1,593	(5,813)	(11,536)	(17,778)
COPPERAS COVE	Municipal	0	0	0	0	125	1802
CORIX UTILITIES TEXAS INC	Municipal	349	370	399	437	468	498
CORYELL CITY WATER SUPPLY DISTRICT	Municipal	0	0	0	0	0	0
DOG RIDGE WSC	Municipal	0	0	0	0	0	0
EASTLAND COUNTY WSD	Municipal	(887)	(925)	(955)	(985)	(1,015)	(1,045)
FERN BLUFF MUD	Municipal	0	0	0	0	0	0
FHLM WSC	Municipal	-	-	-	-	-	-
FORT HOOD	Municipal	0	0	0	0	0	0
FORT WORTH*	Municipal	0	0	0	293	551	789
GATESVILLE	Municipal	1,041	1,308	1,603	1,768	1,929	2,296
GEORGETOWN*	Municipal	10,272	14,735	19,573	24,772	30,082	35,948
GIDDINGS	Municipal	0	0	0	0	0	0
GRAHAM	Municipal	1,362	1,351	1,306	1,274	1,246	1,224
GRANBURY	Municipal	0	0	0	55	216	342
HARKER HEIGHTS	Municipal	0	0	0	0	121	996
HEARNE	Municipal	0	0	0	0	0	0
HEWITT	Municipal	480	0	0	62	420	771
HILLSBORO	Municipal	0	0	0	0	0	0
HUNTSVILLE	Municipal	14,429	14,269	14,167	14,029	13,885	13,760
HUTTO	Municipal	907	3,046	3,304	5,437	8,596	10,703
JARRELL-SCHWERTNER	Municipal	0	0	0	0	0	0
JOHNSON COUNTY SUD*	Municipal	299	0	0	0	737	1491
JONAH WATER SUD	Municipal	0	0	0	0	0	0
KEMPNER WSC*	Municipal	470	506	737	982	1208	1415
KILLEEN	Municipal	0	0	0	0	0	0

Table O-4. Major Water Providers
Secondary Needs

Major Water Provider	Category of Use	Second Tier Needs Analysis (After Conservation and Direct Reuse) (acft/yr)					
		2020	2030	2040	2050	2060	2070
LAMPASAS	Municipal	121	226	308	403	504	600
LEANDER*	Municipal	1,364	5,130	8,258	10,881	14,576	19,041
LEE COUNTY WSC*	Municipal	0	0	0	0	0	0
LOWER COLORADO RIVER AUTHORITY	Municipal	(35,024)	(34,814)	(35,068)	(34,586)	(35,649)	(36,531)
MANSFIELD*	Municipal	20	168	246	329	365	385
MANVILLE WSC*	Municipal	0	0	0	0	0	0
MARLIN	Municipal	0	0	0	0	0	0
MCGREGOR	Municipal	0	0	0	0	0	0
MEXIA	Municipal	0	0	0	0	43	182
MINERAL WELLS*	Municipal	173	325	533	722	913	1,093
MORGANS POINT RESORT	Municipal	0	0	0	0	0	0
MOUNTAIN PEAK SUD*	Municipal	0	146	368	602	859	1,145
NAVASOTA	Municipal	0	0	0	0	0	0
NORTH BOSQUE WSC	Municipal	0	25	59	81	93	109
NORTH CENTRAL TEXAS MUNICIPAL WATER AUTHORITY	Municipal	(1,722)	(1,737)	(1,724)	(1,709)	(1,695)	(1,678)
PALO PINTO COUNTY MWD #1	Municipal	(1,751)	(1,991)	(2,186)	(2,397)	(2,608)	(2,806)
POSSUM KINGDOM WSC	Municipal	115	89	45	0	0	0
ROBINSON	Municipal	245	449	544	887	1,239	1,583
ROCKDALE	Municipal	79	200	433	360	360	400
ROUND ROCK*	Municipal	0	827	4,638	11,012	11,308	11,615
SALADO WSC	Municipal	0	0	0	0	0	0
SALT FORK WATER QUALITY CORPORATION	Municipal	-	-	-	-	-	-
SOUTHWEST MILAM WSC	Municipal	0	200	365	325	392	534
STAMFORD	Municipal	0	0	0	0	0	0
STEPHENVILLE	Municipal	0	0	0	0	0	0
SWEETWATER	Municipal	296	333	350	413	469	521

Table O-4. Major Water Providers
Secondary Needs

Major Water Provider	Category of Use	Second Tier Needs Analysis (After Conservation and Direct Reuse) (acft/yr)					
		2020	2030	2040	2050	2060	2070
TARRANT REGIONAL WD	Municipal	(4,998)	(90,298)	(168,570)	(245,172)	(321,443)	(413,895)
TAYLOR	Municipal	0	0	0	0	0	0
TEMPLE	Municipal	532	1,800	2,737	3,283	3,475	4,634
TEXAS A&M UNIVERSITY	Municipal	99	0	0	0	0	0
TEXAS STATE TECHNICAL COLLEGE	Municipal	0	0	0	0	0	0
UPPER LEON MWD	Municipal	1,865	1,865	1,865	1,865	1,865	1,865
VENUS*	Municipal	86	239	281	315	382	462
WACO	Municipal	0	0	0	0	0	0
WELLBORN SUD	Municipal	0	0	0	0	0	0
WEST CENTRAL TEXAS MWD	Municipal	2258	4515	6775	9035	11295	13535
WICKSON CREEK SUD	Municipal	0	0	0	0	0	0
WILLIAMSON COUNTY WSID 3*	Municipal	0	0	0	0	0	0
WOODWAY	Municipal	0	0	0	0	0	0

*A single asterisk next to a WUG's name denotes that the WUG is split by two or more planning regions.
Needs for WWPs and WUG/WWPs based upon actual water used by customers, not contractual demands.

Appendix P
Water Management Strategies
Environmental Impacts Matrix

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Water Management Strategies Environmental Impacts Matrix

Volume II Section	WMS	Sponsor	County	Basin	Pipeline Acres	Intake Pump Station Acres	Pump Station Acres	Water Treatment Plant Acres	Well Acres	WMS Type	Total Impacted Area (acres)	Reservoir Footprint (acres)	Wetlands Impacted (acres)	Agricultural Resources Impacted (acres)	Threatened and Endangered Species Present	Scoring: Environmental Water Needs	Scoring: Wildlife Habitat	Scoring: Wetlands	Scoring: Threatened and Endangered Species	Scoring: Cultural Resource	Scoring: Bays and Estuaries	Scoring: Agricultural Resources
2.1	Municipal Water Conservation	Multiple	Multiple	Multiple						Conservation					Variable	3	3	3	1	3	3	3
2.2	Irrigation Water Conservation	Multiple	Multiple	Multiple						Conservation						3	3	3	3	3	3	3
2.3	Industrial Water Conservation	Multiple	Multiple	Multiple						Conservation						3	3	3	3	3	3	3
3.2	General Evaluation of Direct Reuse Potential For Multiple WUGs	Multiple	Multiple	Multiple	Variable	Variable	Variable	Variable		Reuse	Variable	Variable	Variable	Variable	Variable	2	3	3	2	3	3	3
3.3	Bell County WCID No.1 – Reuse Projects	Bell County WCID No.1	Bell	Multiple	50		10	5		Reuse	65			65	Variable	2	3	3	2	3	3	3
3.4	City of Bryan Lake Bryan Reuse	Bryan	Brazos	Brazos	33	5	5	5		Reuse	48		5	48	Variable	2	3	3	2	3	3	3
3.5	City of Bryan – Miramont Reuse	Bryan	Brazos	Brazos	21		5	5		Reuse	31			31	Variable	2	3	3	2	3	3	3
3.6	Cedar Park Reuse	Cedar Park	Williamson	Brazos	17		5			Reuse	22			22	Variable	2	3	3	2	3	3	3
3.7	City of Cleburne Reuse	Cleburne	Johnson	Brazos	27		5			Reuse	32			32	Variable	2	3	3	2	3	3	3
3.8	City of College Station Non-Potable Reuse	College Station	Brazos	Brazos	13		5	5		Reuse	23			23	Variable	2	3	3	2	3	3	3
3.9	College Station Direct Potable Reuse	College Station	Brazos	Brazos	43		5	5		Reuse	53			53	Variable	2	2	3	2	3	3	3
3.10	City of Georgetown Reuse	Georgetown	Williamson	Brazos	15		5			Reuse	20			20	Variable	2	2	3	2	3	3	3
3.11	Waco WMARSS Reuse Projects	Multiple	McLennan	Brazos	134		30			Reuse	164			164	Variable	2	3	3	2	3	3	3
4.1	Brazos River Main Stem Off-Channel Reservoirs	BRA	Multiple	Multiple	16	5				Reservoir	21	1,932	1,937	21	48	3	3	3	3	3	3	3
4.2	Brushy Creek Reservoir	Marlin	Falls	Brazos	73		5			Reservoir	78	697	697	78	24	3	3	3	3	3	3	3
4.3	Cedar Ridge Reservoir	Abilene	Shackelford	Brazos	176	5				Reservoir	181		5	93	1	2	1	3	2	2	3	2
4.4	Coryell County Off Channel Reservoir	Multi County WSC	Coryell	Brazos	1	5				Reservoir	6	445	450	6	23	3	3	3	3	3	3	3
4.5	City of Groesbeck Off-Channel Reservoir	Groesbeck	Limestone	Brazos	4	5	5			Reservoir	14	146	151	14	56	3	3	3	3	3	3	3
4.6	Hamilton County Off-Channel Reservoir	Hamilton	Hamiltion	Multiple	127	10	5	5		Reservoir	147	1,374	1,384	147	49	2	2	3	3	3	3	3
4.7	NCTMWA Lake Creek Reservoir	North Central Texas MWA	Knox & Baylor	Brazos	67	5	10	5		Reservoir	87	2,866	2,871	87	2	2	1	3	2	3	3	2
4.8	Red River Off-Channel Reservoir	DWU and UTRWD (Region C)	Multiple	Red	1,267	5	5			Reservoir	1,277	803	808	1,277	96	2	2	3	2	2	3	2
4.9	South Bend Reservoir	BRA	Young	Brazos						Reservoir		29,877	29,877		42	3	3	3	3	3	3	3
4.10	New Throckmorton Reservoir	Throckmorton	Throckmorton	Brazos	30	5		5		Reservoir	40	1,161	1,166	40	39	2	1	3	3	1	3	2
4.11	Turkey Peak Dam – Lake Palo Pinto Enlargement	Palo Pinto County MWD No. 1	Palo Pinto	Brazos						Reservoir		2,176	2,176		49	3	3	3	3	3	3	3
5.1	City of Bryan Groundwater Strategies	Bryan	Brazos	Brazos	64		5	5	12	Groundwater	86			86	15	3	3	3	3	3	3	3
5.2	College Station Groundwater Strategies	College Station	Brazos	Brazos	13		5	5	8	Groundwater	31			31	13	3	3	3	3	3	3	3
5.3	Williamson County Groundwater Strategies	BRA	Multiple	Multiple	1,973		5	5	86	Groundwater	2,069			2,069	18	3	3	3	3	3	3	3
5.4	West Texas Partnership Water to Abilene (Region F)	Abilene	Multiple	Multiple	1,252		10	5	24	System Operations	1,291			1,291	Variable	3	3	3	3	3	3	2
6.1	BRA System Operations	BRA	Multiple	Multiple						System Operations					Variable	3	3	3	3	3	3	3
7.1	Lake Granger Augmentation	BRA	Williamson	Brazos	22		5	5	60	Resevior Augmentation	92			92	Variable	3	3	3	3	3	3	3
7.2	Oak Creek Reservoir Conjunctive Use	Sweetwater	Coke and Nolan	Colorado & Brazos						Resevior Augmentation						3	3	3	3	3	3	3
8.1	City of Bryan ASR	Bryan	Brazos	Brazos	15		5	5	20	ASR	45			45	15	3	3	3	3	3	3	3
8.2	City of College Station ASR	College Station	Brazos	Brazos	43		5	5	40	ASR	93			93	15	3	3	3	3	3	3	3
8.3	Lake Georgetown ASR	Georgetown	Williamson	Brazos	73			10	50	ASR	133			133	19	3	3	3	3	3	3	3
8.4	Lake Granger ASR	BRA	Williamson	Brazos	8			5	44	ASR	57			57	19	3	3	3	3	3	3	3
8.5	Johnson County SUD and Acton MUD ASR	Johnson County SUD & Acton MUD	Johnson & Hood	Brazos			5		26	ASR	31			31	12	3	3	3	3	3	3	3
8.6	Trinity ASR in McLennan County	Waco	McLennan	Brazos					58	ASR	58			58	12	3	3	3	3	3	3	3
9.1	Bosque County Regional Project	Multiple	Bosque	Multiple	170		10	5		Regional Project	185			185	12	3	3	3	3	3	3	3
9.2	Milam County Groundwater and Alcoa Supply for Williamson County	BRA & Williamson County Entities	Williamson & Milam	Brazos	255	5	5	5	28	Regional Project	298		5	298	Variable	3	3	3	3	3	3	3
9.3	Brushy Creek Regional Utility Authority System	Multiple	Williamson & Travis	Colorado & Brazos		10		10		Regional Project	20		10	20	15	3	3	3	3	3	3	3
9.4	East Williamson County Water Supply Project	Lone Star Regional Water Authority	Multiple	Multiple	18,274		10			Regional Project	18,284			18,284	Variable	3	3	3	3	3	3	1
9.5	Lake Belton to Lake Stillhouse Hollow Pipeline	BRA	Bell and Coryell	Brazos	41	5	5			Water Supply	51		5	51	Variable	3	3	3	3	3	3	3
9.6	Lake Whitney Water Supply Project (Cleburne)	Cleburne	Johnson & Hill	Brazos	116	5	20	10		Water Supply	151		5	151	12	3	3	3	3	3	3	3
9.7	Somervell County Water Supply Project	Somervell County Water District	Somervell	Brazos	21,394		5	5		Water Supply	21,404			21,404	Varaible	3	3	3	3	3	3	1
9.8	Trinity Basin Supplies to Middle Brazos	None	Freestone & Limestone	Trinity & Brazos	182		5			Water Supply	187			187	65	3	3	3	3	3	3	3
10.1	Lake Aquilla Storage Reallocation	BRA	Hill	Brazos						Reallocation		3,084	3,084		14	3	3	3	3	3	3	3
10.2	Lake Granger Storage Reallocation	BRA	Willamson	Brazos						Reallocation		4,159	4,159		25	3	3	3	3	3	3	3
10.3	Lake Whitney Reallocation	BRA	Hill & Bosque	Brazos						Reallocation		23,220	23,220		Variable	2	2	3	3	3	3	3
10.4	Lake Whitney Over-Drafting Supply with Off-Channel Reservoir	BRA	Bosque	Brazos	18	5				Reallocation	23		5	23	7	3	3	3	3	3	3	3
10.5	Millers Creek Reservoir Augmentation	North Central Texas MWA	Multiple	Multiple						Reallocation		2,541	2,541		44	2	2	3	3	2	3	3
11	Upper Basin Chloride Control Project	Salt Fork Water Quality Control District	Multiple	Brazos	103	5		10		Salinity Control	118		5	118	8	2	1	3	3	2	3	3
12	Brush Control	Multiple	Multiple	Multiple						Brush Control				48,792	9	3	2	3	2	3	3	3
13	Miscellaneous Strategies	Multiple	Multiple	Multiple						Miscellaneous				Variable	Variable	3	3	3	2	2	3	3

LEGEND

Score	Impact	Environmental Water Needs	Wildlife Habitat (total acres impacted)	Threatened and Endangered Species	Cultural Resources (Reservoir Footprint Acres)
1	High	None	>10,000	>100	>1,000
2	Medium	Reuse, Surface Water	1,000 - 10,000	50 - 100	1 - 1,000
3	Low	Conservation, Groundwater	0 - 1,000	0-50	0

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