Chapter 3

Evaluation of Current Water Supplies in the Region

Under SB1 planning guidelines, each region is to identify currently available water supplies to the region by 1) source and 2) user. The supplies available by source are based on the supply available during drought of record conditions. Surface water and groundwater represent the primary types of sources of water supply, although, there are other potentially significant types of sources as well.

Surface water includes reservoirs and run-of-river supplies. For surface water reservoirs, this is the equivalent of firm yield supply or permitted amount (whichever is lower). For run-of-the-river supplies, this is the minimum supply available in a year over the historical record.

Texas is currently in the process of a groundwater joint planning initiative. Joint planning is conducted by the GCDs in the GMAs and is sometimes referred to as GMA planning. The counties in the ETRWPA fall in GMA-11 or GMA-14. The Texas Water Code now requires that RWPGs rely on the MAG estimates that are determined from the DFCs in each GMA. Neither of the GMAs in the ETRWPA had DFCs or MAGs prior to the deadline set by TWDB for inclusion in the 2011 Plan, therefore, groundwater supplies have not been modified.

Other water supplies considered for planning purposes include reuse of treated wastewater, saline sources, and local supplies. Local supplies generally include stock ponds that do not require water rights permits, and local mining supplies. These supplies are assessed based on historical and current use.

Currently, water supplies available to each user are those that have been permitted or contracted with infrastructure in place to transport and treat (if necessary) water. Some water supplies are permitted or are contracted for use, but the infrastructure is not yet in place. Connecting such supplies is considered a water management strategy for future use. Water supply limitations considered in this analysis include raw water source availability, well field production capacities, permit limits, contract amounts, water quality, transmission infrastructure, and water treatment capacities.

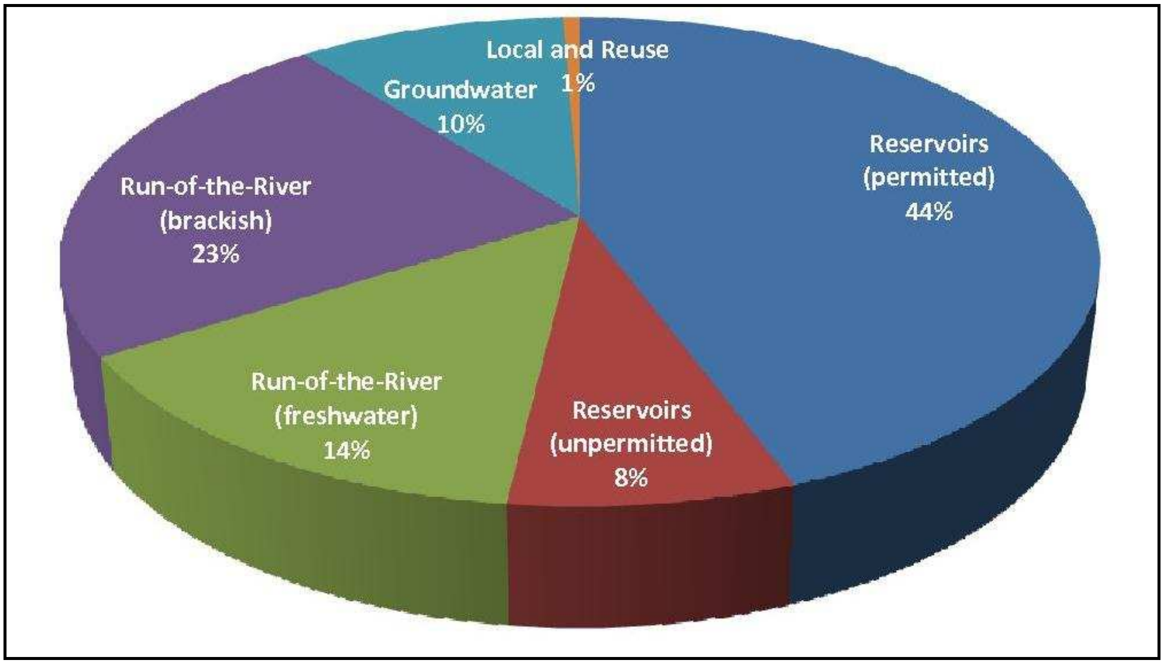
3.1 Regional Water Supply Availability

Table 3.1 and Figure 3.1 summarize overall water supply availability in the ETRWPA. Approximately 4.4 million ac-ft per year of permitted supplies are available in the region. Of this amount, about 3.4 million ac-ft per year are freshwater supplies. Most of the available water in the ETRWPA is associated with surface water sources. Approximately 15 percent of the total freshwater supply is groundwater. However, groundwater is a very important resource in the region and is used to supply much of the municipal and rural water needs of the region.

Table 3.1 Summary of Currently Available Water Supplies in the ETRWPA (ac-ft per year)

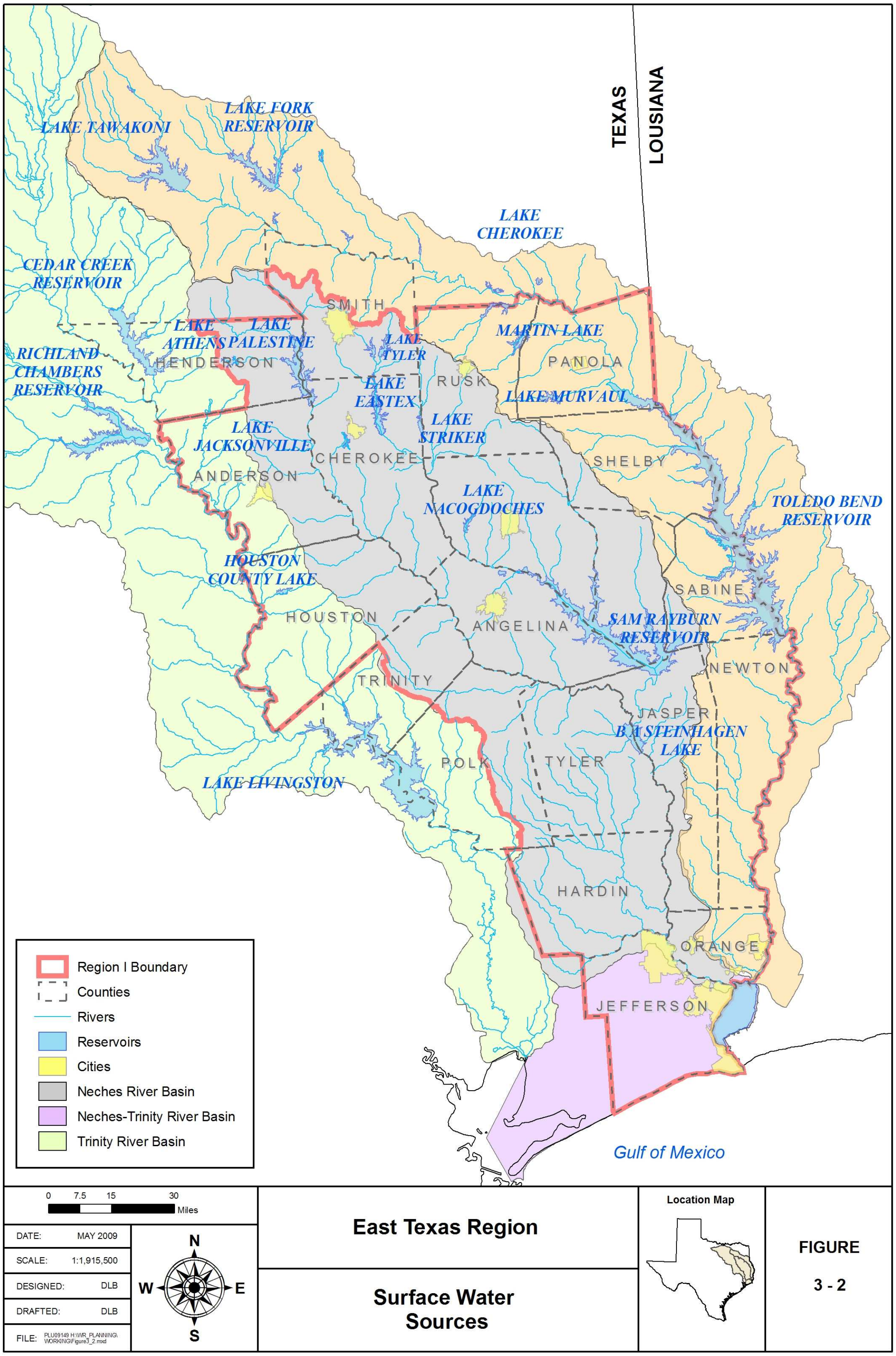
Source of Supply	2000	2010	2020	2030	2040	2050	2060
Reservoirs (permitted)	1,966,474	1,962,698	1,958,512	1,954,328	1,950,141	1,945,955	1,941,769
Reservoirs (unpermitted)	340,300	330,874	321,857	312,841	303,825	294,808	285,790
Run-of-the-River (freshwater)	623,004	623,004	623,004	623,004	623,004	623,004	623,004
Run-of-the-River (brackish)	1,035,982	1,035,982	1,035,982	1,035,982	1,035,982	1,035,982	1,035,982
Groundwater	446,043	446,043	446,043	446,043	446,043	446,043	446,043
Local Supplies	13,094	13,094	13,094	13,094	13,094	13,094	13,094
Direct Reuse	1,518	1,518	1,518	1,518	1,518	1,518	1,518
Indirect Reuse	16,559	16,559	13,687	13,687	13,687	13,687	13,687
Total	**4,442,974**	**4,429,772**	**4,413,697**	**4,400,497**	**4,387,294**	**4,374,091**	**4,360,887**

Figure 3.1 Year 2010 Available Supplies by Source Type



3.1.1 Surface Water Availability. In accordance with established procedures of the TWDB, the surface water supplies for the regional water plans were determined using the TCEQ-approved Water Availability Models (WAM). In the ETRWPA, four basins were evaluated: Neches, Neches-Trinity, Trinity, and Sabine. Figure 3.2 shows the river basins and major reservoirs.

The WAMs were developed for the purpose of reviewing and granting new surface water rights permits using a hypothetical repetition of historical hydrology. The results from the modeling for regional water planning are used for planning purposes only and do not affect the right of an existing water right holder to divert and use the full amount of water authorized by its permit. The assumptions in the WAMs are based in part on the legal interpretation of water rights, and in some cases do not accurately reflect current operations. For planning purposes, adjustments were made to the TCEQ-


TEXAS
LOUSIANA
LAKE TAWAKONI
LAKE FORK RESERVOIR
LAKE CHEROKEE
CEDAR CREEK RESERVOIR
RICHLAND CHAMBERS RESERVOIR
LAKE ATHENS
LAKE PALESTINE
LAKE TYLER
LAKE EASTEX
MARTIN LAKE
LAKE MURVAUL
LAKE JACKSONVILLE
LAKE STRIKER
LAKE NACOGDOCHES
TOLEDO BEND RESERVOIR
HOUSTON COUNTY LAKE
SAM RAYBURN RESERVOIR
B A STEINHAGEN LAKE
LAKE LIVINGSTON
SMITH
HENDERSON
RUSK
PANOLA
CHEROKEE
ANDERSON
SHELBY
SABINE
HOUSTON
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East Texas Region
Surface Water Sources
Location Map
FIGURE
3 - 2

approved WAMs to better reflect current and future surface water conditions in the region. WAM Run 3, as modified below, was used to assess surface water supplies. The principal assumptions of Run 3 are that all water right holders divert the full permitted amount of their right by priority date order and do not return any of the diversion to the watershed unless an amount is specified in the permit. This assumption provides a conservative estimate of water supplies in the ETRWPA. Generally, changes to the WAMs include the following:

- Assessment of reservoir sedimentation rates, and the calculation of area-capacity conditions for current (2000) and future (2060) conditions. Since the 2006 regional water plan there have been three new volumetric surveys completed: Lake Jacksonville, Lake Palestine, and Sam Rayburn Reservoir. New sedimentation rates were calculated and estimates of the current storage volumes were updated.
- Inclusion of subordination agreements that are currently in place
- Inclusion of system operations where appropriate
- Basin-specific modifications

The specific changes to each river basin are described below. The modified Trinity WAM for Region C was used to assess the supplies in the ETRWPA from the Trinity Basin. There were no changes specific to the region's sources. Also, no changes were made to the Neches-Trinity WAM.

Neches River Basin WAM. Changes made to the Neches WAM include the following:

- Modeled the UNRMWA's water rights as a system (Lake Palestine and Rocky Point dam).
- Sam Rayburn/Steinhagen water right was modeled subordinate to flow upstream above the Ponta Dam site (which is now Lake Columbia) and

Weches Dam site (special condition (d) of Certificate of Adjudication 4411)[1.

- Sam Rayburn/Steinhagen industrial and irrigation water use was modeled subordinate to municipal rights located below the Ponta and Weches dam sites and above the reservoirs. This included Lake Nacogdoches, Pinkston Reservoir and the water rights for San Augustine Lake that are junior to 1963.
- The TCEQ input file did not consider hydropower use in Sam Rayburn. Hydropower was included in the model.
- The operation of LNVA's water rights was modeled as a system by including backup of LNVA's Pine Island water rights with storage from Sam Rayburn.
- The firm yield of Sam Rayburn/Steinhagen included a minimum elevation in Sam Rayburn of 149 ft. msl., and all storage available in Sam Rayburn up to elevation 164.4 ft. msl.

Sabine River Basin WAM. The Sabine WAM that was developed for the 2006 Plan was used to assess surface water supplies for the 2011 Plan update. The changes made to TCEQ-approved Sabine WAM include the following:

- Adjusted the sedimentation rate for Lake Fork to equal the rate determined for Lake Tawakoni. Based on soil types and watershed characteristics of the two lakes, sedimentation for Lake Fork should be less than Lake Tawakoni. This rate will be re-assessed after a new volumetric survey is completed for Lake Fork.
- The SRA's water rights in the lower basin were modeled as a system by backing up the Authority's canal water rights with releases from Toledo Bend Reservoir.

[1]Lake Columbia and the Weches Dam have not been constructed to date. Lake Columbia has a water right permit for 85,507 ac-ft per year.

- The remainder of the yield of Toledo Bend was evaluated assuming all diversions were taken lakeside.
- The TCEQ Sabine WAM models Toledo Bend with hydropower. For purposes of finding total available supply for Toledo Bend, hydropower was excluded. Hydropower was included in the evaluation of supplies for all other reservoirs and run-of-the-river supplies.

Reservoirs. Reservoirs in the ETRWPA with over 5,000 ac-ft of conservation storage (i.e., major reservoirs) were evaluated, as were some smaller reservoirs that are used for municipal supply. The available water supply is limited to currently permitted diversions or firm yield. The firm yield is the greatest amount of water a reservoir could have supplied on an annual basis without shortage during a repeat of historical hydrologic conditions, particularly the drought of record. Both Sam Rayburn and Toledo Bend Reservoirs were constructed for multiple purposes, and include hydropower generation. Hydropower is not considered a consumptive use of water, but it is an operational consideration. The inclusion of hydropower in the firm yield analyses was an operating decision by the reservoir owner. For this plan, hydropower is not considered in the yield determination of Toledo Bend Reservoir. Hydropower is included for the Sam Rayburn/Lake B. A. Steinhagen System; however, the actual operation of hydropower may differ from the assumptions in the WAM models. A summary of the available supplies for reservoirs in the ETRWPA is shown in Table 3.2.

Unpermitted Reservoir Yields. Table 3.3 includes information on "unpermitted reservoir yields". This provides an estimate of available supply that could be permitted for future use. The largest unpermitted reservoir yield in the ETRWPA is Texas' share of the yield of Toledo Bend Reservoir, which is nearly 225,000 ac-ft per year. Other unpermitted yields are located in the Lake Sam Rayburn/B.A. Steinhagen System, Houston County Lake, San Augustine City Lake, and Lake Jacksonville.

Table 3.2 Currently Available Supplies from Permitted Reservoirs Serving the ETRWPA (ac-ft per year)

Reservoir	Basin	County	Permitted Diversion	Currently Available Supply[1]						
				2000	2010	2020	2030	2040	2050	2060
Lake Athens	Neches	Henderson	8,500	6,145	6,064	5,983	5,903	5,822	5,741	5,660
Bellwood Lake	Neches	Smith	2,200	950	950	950	950	950	950	950
Lake Kurth	Neches	Angelina	19,100	18,425	18,421	18,417	18,413	18,408	18,404	18,400
Lake Columbia	Neches	Cherokee	85,507	0	0	0	0	0	0	0
Lake Jacksonville	Neches	Cherokee	6,200	6,200	6,200	6,200	6,200	6,200	6,200	6,200
Lake Nacogdoches	Neches	Nacogdoches	22,000	17,450	17,067	16,683	16,300	15,917	15,533	15,150
Lake Palestine system	Neches	Anderson	238,110	209,500	207,458	205,417	203,375	201,333	199,292	197,250
Lake Tyler/Tyler East	Neches	Smith	40,325	30,950	30,925	30,900	30,875	30,850	30,825	30,800
Pinkston Reservoir	Neches	Shelby	3,800	3,800	3,800	3,800	3,800	3,800	3,800	3,800
Rusk City Lake	Neches	Cherokee	160	65	64	63	63	62	61	60
San Augustine City Lake	Neches	San Augustine	1,285	1,285	1,285	1,285	1,285	1,285	1,285	1,285
Sam Rayburn & Steinhagen System	Neches	Jasper	820,000	820,000	820,000	820,000	820,000	820,000	820,000	820,000
Striker Lake	Neches	Rusk	20,600	20,600	20,183	19,357	18,530	17,703	16,877	16,050
Lake Timpson	Neches	Shelby	350	350	350	350	350	350	350	350
Lake Cherokee[2]	Sabine	Cherokee/ Gregg	62,400	29,120	28,885	28,650	28,415	28,180	27,945	27,710
Lake Center	Sabine	Shelby	1,460	754	754	754	754	754	754	754
Lake Murvaul	Sabine	Panola	22,400	22,380	21,792	21,203	20,615	20,027	19,438	18,850
Martin Lake	Sabine	Rusk	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000
Toledo Bend	Sabine	Sabine	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000
Houston County Lake	Trinity	Houston	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500
Total – Permitted Reservoirs				**1,966,474**	**1,962,698**	**1,958,512**	**1,954,328**	**1,950,141**	**1,945,955**	**1,941,769**

1. Supplies are determined by modified WAM Run 3. Supply for Lake Columbia is shown as “0” because the lake has not been constructed to date.
2. Lake Cherokee is located in both ETRWPA and Northeast Texas region. Most of the water from this source is used in Northeast Texas region.

Table 3.3 Unpermitted Supply from Existing Reservoirs (ac-ft per year)

Reservoir	Basin	County	2000	2010	2020	2030	2040	2050	2060
Houston County Lake	Trinity	Houston	3,100	2,967	2,834	2,701	2,568	2,435	2,300
Lake Jacksonville	Neches	Cherokee	3,000	2,768	2,537	2,305	2,073	1,842	1,610
Sam Rayburn & B.A. Steinhagen System	Neches	Jasper	108,290	104,222	100,153	96,085	92,017	87,948	83,880
San Augustine City Lake	Neches	San Augustine	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Striker Lake	Neches	Rusk	410	0	0	0	0	0	0
Toledo Bend	Sabine	Sabine, Shelby	224,500	219,917	215,333	210,750	206,167	201,583	197,000
Total - Unpermitted Supply			**340,300**	**330,874**	**321,857**	**312,841**	**303,825**	**294,808**	**285,790**

Run-of-the-River Diversion. Table 3.4 presents the run-of-the-river supplies by county and basin. Some of the projected demands include industries that currently use these brackish supplies. Generally, brackish run-of-the-river water supplies are located in tidally influenced river segments and are not expected to be developed beyond current levels of use. These supplies are shown in red italics on Table 3.4.

Table 3.4 Summary of the Available Supply from Run-of-the-River Diversions (ac-ft per year)

County	Basin	Use	Owner	2000	2010	2020	2030	2040	2050	2060
Anderson	Neches	Irrigation		197	197	197	197	197	197	197
Anderson	Trinity	Irrigation		1,060	1,060	1,060	1,060	1,060	1,060	1,060
Angelina	Neches	Industrial	Temple Inland	57	57	57	57	57	57	57
Angelina	Neches	Irrigation		17	17	17	17	17	17	17
Cherokee	Neches	Irrigation		182	182	182	182	182	182	182
Hardin	Neches	Irrigation		57	57	57	57	57	57	57
Henderson	Neches	Irrigation		0	0	0	0	0	0	0
Houston	Neches	Irrigation		287	287	287	287	287	287	287
Houston	Trinity	Irrigation		1,783	1,783	1,783	1,783	1,783	1,783	1,783
Jasper	Neches	Industrial	TPWD (hatchery)	604	604	604	604	604	604	604
Jasper	Neches	Industrial	Louisiana Pacific	12	12	12	12	12	12	12
Jasper	Neches	Irrigation		127	127	127	127	127	127	127
Jefferson	Neches	Multi-use	LNVA	381,876	381,876	381,876	381,876	381,876	381,876	381,876
Jefferson	Neches	Industrial	Huntsman Corp.	434,400	434,400	434,400	434,400	434,400	434,400	434,400
Jefferson	Neches	Industrial	Independent Refining	2,700	2,700	2,700	2,700	2,700	2,700	2,700
Jefferson	Neches	Industrial	Union Oil	4,300	4,300	4,300	4,300	4,300	4,300	4,300
Jefferson	Neches	Industrial	Mobil Oil	17,922	17,922	17,922	17,922	17,922	17,922	17,922
Jefferson	Neches	Industrial		319	319	319	319	319	319	319
Jefferson	Neches	Industrial	Beaumont	2,806	2,806	2,806	2,806	2,806	2,806	2,806
Jefferson	Neches	Industrial	Motiva	12,900	12,900	12,900	12,900	12,900	12,900	12,900
Jefferson	Neches	Industrial	Gulf States Utilities	279,131	279,131	279,131	279,131	279,131	279,131	279,131
Jefferson	Neches-Trinity	Industrial	Premcor Refining	480	480	480	480	480	480	480
Jefferson	Neches-Trinity	Irrigation		54,746	54,746	54,746	54,746	54,746	54,746	54,746
Jefferson	Neches-Trinity	Industrial		680	680	680	680	680	680	680
Jefferson	Neches-Trinity	Mining		34	34	34	34	34	34	34
Jefferson	Neches	Municipal	Beaumont	25,160	25,160	25,160	25,160	25,160	25,160	25,160

Table 3.4 Summary of the Available Supply from Run-of-the-River Diversions (Cont.)

County	Basin	Use	Owner	2000	2010	2020	2030	2040	2050	2060
Jefferson	Neches	Municipal	Beaumont	4,145	4,145	4,145	4,145	4,145	4,145	4,145
Nacogdoches	Neches	Industrial		2	2	2	2	2	2	2
Nacogdoches	Neches	Irrigation		136	136	136	136	136	136	136
Orange	Neches	Industrial	TE Products	*100*	*100*	*100*	*100*	*100*	*100*	*100*
Orange	Neches	Industrial	Gulf States Utilities	*17,210*	*17,210*	*17,210*	*17,210*	*17,210*	*17,210*	*17,210*
Rusk	Neches	Irrigation		86	86	86	86	86	86	86
Rusk	Neches	Industrial		2	2	2	2	2	2	2
Sabine	Neches	Industrial	Temple Inland	182	182	182	182	182	182	182
Smith	Neches	Irrigation		50	50	50	50	50	50	50
Smith	Neches	Mining		0	0	0	0	0	0	0
Trinity	Neches	Irrigation	Temple Inland	62	62	62	62	62	62	62
Tyler	Neches	Irrigation		123	123	123	123	123	123	123
Newton	Sabine	Industrial	Weirgate Lumber	135	135	135	135	135	135	135
Newton	Sabine	Irrigation	SRA	46,700	46,700	46,700	46,700	46,700	46,700	46,700
Newton	Sabine	Irrigation		50	50	50	50	50	50	50
Newton	Sabine	Industrial	SRA	100,400	100,400	100,400	100,400	100,400	100,400	100,400
Orange	Sabine	Industrial	E.I. Dupont Nemours	*267,000*	*267,000*	*267,000*	*267,000*	*267,000*	*267,000*	*267,000*
Orange	Sabine	Irrigation		28	28	28	28	28	28	28
Panola	Sabine	Industrial	Hills Lake Fishing Club	114	114	114	114	114	114	114
Panola	Sabine	Industrial	TXU	129	129	129	129	129	129	129
Panola	Sabine	Irrigation		191	191	191	191	191	191	191
Panola	Sabine	Mining	TXU	167	167	167	167	167	167	167
Rusk	Sabine	Irrigation		127	127	127	127	127	127	127
Rusk	Sabine	Municipal	Henderson	10	10	10	10	10	10	10
TOTAL				**1,658,986**	**1,658,986**	**1,658,986**	**1,658,986**	**1,658,986**	**1,658,986**	**1,658,986**
Subtotal Freshwater				**623,004**	**623,004**	**623,004**	**623,004**	**623,004**	**623,004**	**623,004**
Subtotal Brackish water				***1,035,982***	***1,035,982***	***1,035,982***	***1,035,982***	***1,035,982***	***1,035,982***	***1,035,982***

Supplies shown in red are brackish water supplies and are generally not considered to meet the projected demands.

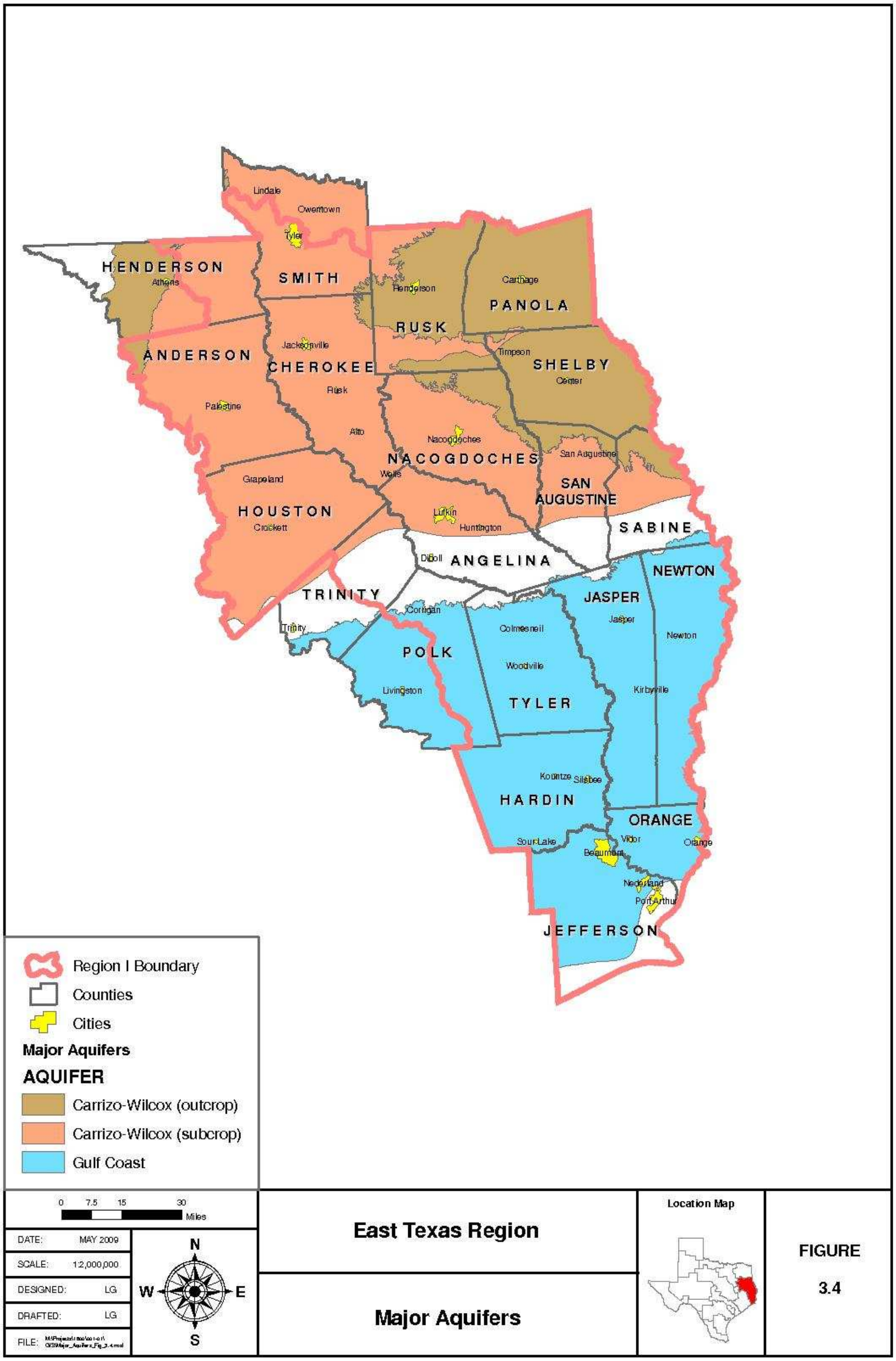
3.1.2 Groundwater Availability. As indicated in the introduction to this chapter, neither GMS-11 nor GMS-14 determined DFCs or MAGs before the TWDB deadline for inclusion in the 2011 Plan. However, on April 13, 2010, GMA-11 adopted initial DFCs intended to protect and conserve groundwater resources within the GMA, while allowing for anticipated growth in the area. The Yegua-Jackson, Sparta, Weches, Queen City, Reklaw, and Carrizo-Wilcox aquifers within GMA-11 now have a defined DFC of 17 feet of drawdown. The Trinity, Nacatoch, and Gulf Coast aquifers are not included in GMA-11 DFCs. As of September 1, 2010, GMA-14 has not adopted DFCs for aquifers within its designated area.

The Southeast Texas GCD had expressed interest in providing the ETRWPA with preliminary estimates of groundwater availability based on a GAM run completed by TWDB, but these numbers were not available when groundwater supplies were evaluated. The rest of the groundwater supplies were based on the previous ETRWPA plan. Those supply estimates were based on region-approved acceptable levels of drawdown.

The TWDB planning guidelines require that regional planning groups "Calculate the largest annual amount of water that can be pumped from a given aquifer without violating the most restrictive physical or regulatory or policy conditions limiting withdrawals, under drought-of-record conditions. Regulatory conditions refer specifically to any limitations on pumping withdrawals imposed by GCDs through their rules and permitting programs." This guideline requires that planning groups make a policy decision as to the interpretation of the term "most restrictive" as it relates to long-term groundwater availability. In addition, TWDB guidelines further require that, "Once GAM (Groundwater Availability Model) information is accessible for an area within a region, the planning group shall incorporate this information in its next planning cycle unless better site-specific information is developed."

Groundwater supplies in the ETRWPA can be divided into the northern and southern regions. The northern region is generally consistent with GMA-11 and the southern region is generally consistent with GMA-14. The conditions and available information for each region are presented separately.

Northern Region. The Carrizo-Wilcox Aquifer provides the majority of the groundwater supply in the northern region. Minor aquifers in the northern region include the Queen City, Sparta and Yegua-Jackson. In some areas, the Queen City aquifer provides a significant quantity of water, although the well yields are typically smaller than in the underlying Carrizo-Wilcox aquifer. Because it has a relatively large surface area, the Queen City aquifer also receives a significant volume of recharge from precipitation and thus provides significant baseflow to creeks and rivers in the region. The Yegua-Jackson aquifer provides water in the area between the downdip extent of the Carrizo-Wilcox and the outcrop area of the Gulf Coast aquifer. Figures 3.4 and 3.5 provide an overview of the location of the aquifers. Five GCDs are located in the northern region: Anderson County Underground Water Conservation District (UWCD), which is part of Anderson County, Neches and Trinity Valleys GCD (Anderson, Henderson and Cherokee Counties), Pineywoods GCD (Angelina and Nacogdoches Counties), Rusk County GCD (Rusk County), and Panola County GCD. All the districts have management plans, and some are beginning to register new and existing wells and monitor water levels. In the absence of specific production restrictions during the last round of planning, the ETRWPG selected a reasonably sustainable planning goal for the groundwater during the 50-year planning window as well as for future generations beyond the 50-year window. With that goal in mind, groundwater availability for the planning period was defined as the amount of groundwater that could be withdrawn from aquifers over the next 50 years that will not cause more than 50 feet of water level decline or 10% decrease in saturated thickness (in unconfined portions of the aquifer) whichever is less in the aquifers of the Northern Region.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Tyler
Athens
Henderson
Carthage
Jacksonville
Timpson
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Palestine
Alto
Nacogdoches
San Augustine
Wells
Grapeland
Lufkin
Huntington
Crockett
Diboll
Corrigan
Trinity
Colmesneil
Jasper
Newton
Woodville
Livingston
Kirbyville
Kountze
Silsbee
Sour Lake
Beaumont
Vidor
Orange
Nederland
Port Arthur
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Major Aquifers
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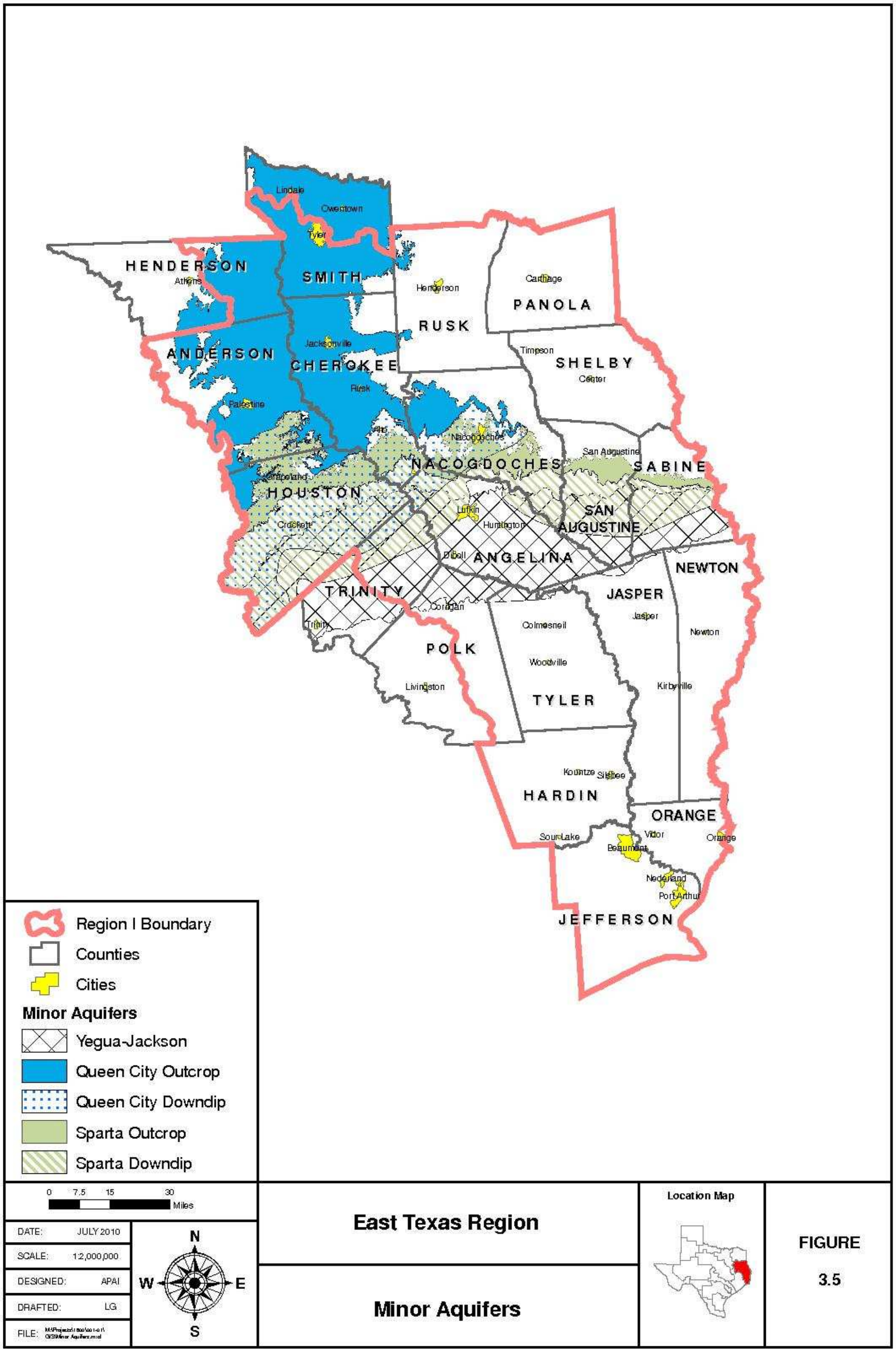
East Texas Region
Major Aquifers
Location Map
FIGURE 3.4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Jacksonville
Timpson
Center
Rusk
Palestine
Nacogdoches
San Augustine
Crockett
Lufkin
Huntington
Diboll
Corrigan
Trinity
Jasper
Colmesneil
Newton
Woodville
Livingston
Kirbyville
Kountze
Silsbee
Sour Lake
Vidor
Orange
Beaumont
Nederland
Port Arthur
Region I Boundary
Counties
Cities
Minor Aquifers
Yegua-Jackson
Queen City Outcrop
Queen City Downdip
Sparta Outcrop
Sparta Downdip
0 7.5 15 30 Miles
DATE: JULY 2010
SCALE: 1:2,000,000
DESIGNED: APAI
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N
W
E
S
East Texas Region
Minor Aquifers
Location Map
FIGURE
3.5

The Queen City/Sparta/Carrizo Wilcox GAM was available to analyze the availability of groundwater in each county based on the above criteria. The only county not meeting the criteria was Smith County. In Smith County, the GAM indicated that current demands could not be met with available supplies based on the above criteria. Average water-level decline was over 80 feet during the 50-year period. In this case, the groundwater supply was set equal to the demand because there is currently no GCD to limit pumping in that county. The ETRWPG acknowledges that additional water does occur in storage within the aquifers and that a portion of that water (above than the estimated supply) could be pumped if there is not a GCD in place to prevent such withdrawals. The groundwater availability for the counties in the Northern Region are provided in Table 3.5.

Southern Region. The Gulf Coast Aquifer provides most of the groundwater supply in the southern region. One GCD, the Southeast Texas GCD (Jasper, Newton, Tyler, and Hardin Counties), is located in the Southern Region. In the last round of planning, a predictive Gulf Coast GAM was not available to assess supplies for the Gulf Coast Aquifer, but since then, a predictive GAM has been developed and approved by the TWDB. The Southeast Texas GCD has worked with TWDB to complete several GAM runs to assess supplies, but these numbers were not available when groundwater supplies were estimated for this round of planning. Therefore, the supplies for the Southern Region were not modified, and were based on published information such as Baker (1986),[2] available well and water level records, and the knowledge base of the consultant team. Table 3.5 contains a summary of groundwater availability in the Southern Region.

Table 3.5 Total Available Groundwater by Aquifer (ac-ft per year)

County	Yegua Jackson	Queen City	Sparta	Carrizo Wilcox	Gulf Coast	Other
Northern Region						
Anderson		18,320	600	9,830		280
Angelina	6,472	1,060	670	28,330		1,450
Cherokee		21,850	350	10,870		
Henderson (P)		14,870		4,200		
Houston	1,380	400	870	5,220		1,380
Nacogdoches	60	4,860	400	31,140		80
Panola				10,370		
Rusk		4,250		20,290		
Sabine	1,100		290	6,710	1,100	200
San Augustine	540		200	1,690		60
Shelby				12,750		
Smith (P)		17,280		18,400		80
Trinity (P)	740		600	2,161	100	280
Northern Region Subtotal	**10,292**	**82,890**	**3,980**	**161,961**	**1,200**	**3,810**
Southern Region						
Hardin					23,500	
Jasper					52,000	6,000
Jefferson					2,500	
Newton					29,000	1,500
Orange					20,000	
Polk (P)	360				13,500	1,450
Tyler	180				30,300	1,620
Southern Region Subtotal	**540**	**–**	**–**	**–**	**170,800**	**10,570**
Aquifer Totals	**10,832**	**82,890**	**3,980**	**161,961**	**172,000**	**14,380**
Grand Total						**446,043**

Note: The above values are total supply available to meet both existing and projected demands and are available for each decade of the 50-year planning cycle.
(P) denotes Partial County

3.1.3 Local Supply. Local supply generally includes small surface water supplies that are not associated with a water right. Most of the local supply is surface water used from livestock ponds. A small amount of local supply is for mining purposes. This generally represents recycled water captured from surface flow that has not entered the waters of the State. The maximum recent historical use from these sources (according to TWDB records) is assumed to be available in the future. Local supplies are listed on Table 3.6.

Table 3.6 Summary of Available Local Supply (ac-ft per year)

County	Basin	Use	Supply (ac-ft per year)
Local Supplies			
Anderson	Neches	Livestock	599
Anderson	Trinity	Livestock	684
Angelina	Neches	Livestock	347
Cherokee	Neches	Livestock	1,059
Cherokee	Neches	Mining	2
Hardin	Neches	Livestock	139
Hardin	Trinity	Livestock	2
Henderson	Neches	Livestock	279
Houston	Neches	Livestock	388
Houston	Trinity	Livestock	783
Jasper	Neches	Livestock	115
Jasper	Sabine	Livestock	75
Jefferson	Neches	Livestock	43
Jefferson	Neches-Trinity	Livestock	280
Jefferson	Neches	Mining	242
Nacogdoches	Neches	Livestock	910
Nacogdoches	Neches	Mining	220
Newton	Sabine	Livestock	66
Newton	Sabine	Mining	28
Orange	Neches	Livestock	56
Orange	Sabine	Livestock	70
Orange	Sabine	Mining	1
Panola	Cypress	Livestock	30
Panola	Sabine	Livestock	1,828
Polk	Neches	Livestock	122
Rusk	Neches	Livestock	386
Rusk	Sabine	Livestock	308
Rusk	Sabine	Mining	287
Sabine	Neches	Livestock	59
Sabine	Sabine	Livestock	320
San Augustine	Neches	Livestock	490
San Augustine	Sabine	Livestock	71
Shelby	Neches	Livestock	334
Shelby	Sabine	Livestock	1,755
Smith	Neches	Livestock	416
Trinity	Neches	Livestock	135
Tyler	Neches	Livestock	165
Total Local Supply			**13,094**

3.1.4 Reuse. The reuse listed as available to the region is for existing projects based on current permits and authorizations. Categories of reuse include (1) currently permitted and operating indirect reuse projects for non-industrial purposes, in which water is reused after being returned to the stream; (2) existing indirect reuse for industrial purposes; and (3) authorized direct reuse projects for which facilities are already developed. The specific reuse projects are listed in Table 3.7.

Table 3.7 Summary of Available Reuse Supply (ac-ft per year)

County	Basin	Use	Supply
Direct Reuse Supplies			
Angelina	Neches	Manufacturing	1,265
Sabine	Neches	Manufacturing	20
Orange	Sabine	Irrigation	15
Shelby	Sabine	Irrigation	82
Shelby	Sabine	Manufacturing	136
Indirect Reuse Supplies			
Henderson	Neches	Livestock	2,872
Jefferson	Neches-Trinity	Irrigation	13,687
Total Reuse Supply			**18,077**

3.1.5 Imports and Exports. There are several small imported supplies to the ETRWPA from adjoining regions and Louisiana. Water from Lake Fork in the Northeast Region is used by the Cities of Henderson and Kilgore and their customers. Other surface water imports include water from Lake Livingston to Groveton and surface water for the City of Joaquin from the City of Logansport, Louisiana. The specific source for this import is the Louisiana portion of the Toledo Bend Reservoir.

There are also uses of groundwater from sources located outside of the ETRWPA. Most are associated with entities that extend over multiple regions. Groundwater from the Northeast Region is provided to Crystal Water System, Kilgore, Elderville WSC, and West Gregg WSC. Groundwater in the Region C portion of Henderson County is provided to the small portion of the City of Athens that lies in the ETRWPA.

Water from the ETRWPA is used to supply the City of Tyler's customers in the Northeast Region, City of Athens in Region C and several customers of the LNVA in Region H. Water from Lake Cherokee is provided to customers in both the Northeast Region and ETRWPA through the Cherokee Water Company and the City of Longview. There is also an existing contract to supply water to Dallas from Lake Palestine. The infrastructure for this supply has not been constructed. A summary of exports and imports is provided in Table 3.8.

Table 3.8 Summary of Exports and Imports in ETRWPA (ac-ft per year)

Source	2010	2020	2030	2040	2050	2060
Exports						
Lake Athens	1,581	1,706	1,826	1,935	2,046	2,147
Sam Rayburn/B.A. Steinhagen	63,863	63,863	63,863	63,863	63,863	63,863
Lake Cherokee	25,675	25,675	25,675	25,675	25,675	25,675
Lake Tyler	358	464	567	668	844	1,081
Total	**91,477**	**91,743**	**92,014**	**92,285**	**92,648**	**93,080**
Imports						
Carrizo-Wilcox Aquifer (Henderson, Smith and Gregg Counties)	659	649	638	624	613	602
Lake Fork	3,413	3,413	3,413	3,413	3,413	3,413
Lake Livingston	114	121	122	118	113	109
Toledo Bend - Louisiana	235	235	235	235	235	235
Sabine River	303	290	278	266	251	233
Total	**4,724**	**4,708**	**4,686**	**4,656**	**4,625**	**4,592**

3.2 Impacts of Water Quality on Supplies

The quality of a surface water body or groundwater aquifer can be a significant factor in the determination of water supply availability. Water quality can dictate the level of treatment necessary to render a water body available for its intended use, which can affect the quantity of produced water. In cases of severe contamination, it is possible that a water supply source could be considered untreatable and, hence, unusable. The ETRWPA is fortunate in that water quality impacts are generally minor with respect to their effect on availability and treatability.

Key water quality parameters for the ETRWPA are identified and discussed in Chapter 5. These parameters are generally a consideration for surface waters. Some of these parameters could be an issue for groundwater as well. The key water quality parameters identified include the following:

- Total Dissolved Solids
- Dissolved Oxygen
- Nutrients
- Metals
- Turbidity

In general, these parameters potentially affect some aspect of aquatic life or the use of the water for recreation. However, in some cases they could affect its availability for water supply as well. Water quality impacts for surface water and groundwater are discussed as they relate to availability, and treatment requirements are discussed in the following subsections.

3.2.1 Water Quality Impacts on Surface Water Availability. Surface water quality in the ETRWPA is addressed in Chapter 1, Appendix 1-B, where it is noted that a total of 69 water quality impairments have been identified in the Draft 2008 303(d) List. These impairments are found on 48 classified segments within the ETRWPA. The specific impairments include the following:

- Bacteria (28 impairments)
- Dissolved Oxygen (18)
- Toxicity in water or sediment (4)
- Metals in water (4)
- Mercury in fish/shellfish (9)
- pH (3)
- Biological (3)

In comparing surface quality impairments with the key water quality parameters identified in Chapter 5, it is seen that metals and dissolved solids are common to both lists. The metals identified include mercury in fish tissue in nine segments, lead in two segments, aluminum in one segment, and zinc in one segment.

Mercury in fish tissue is a human health concern (through ingestion), but is not considered a limiting factor to either water supply availability or the treatability of the water. Mercury has not been demonstrated to be a concern in the water in any segment in the ETRWPA.

Lead in water can be either a human health protection concern or an aquatic life protection concern. Lead levels in the two segments identified as impaired in the ETRWPA are not identified in the Draft 2008 303(d) List. However, the water quality inventory on which the list is based indicates that the data for lead are inadequate or limited. It is unlikely that levels exceed the Primary Drinking Water Standard action level of 0.015 mg/L. Furthermore, lead can be readily removed in the water treatment process. Therefore, lead is not anticipated to be a limiting factor in water supply availability or treatment for the ETRWPA.

Excessive aluminum in water is an aquatic life protection concern for surface water bodies, but is generally not considered to affect water supply availability or treatability. Aluminum is a secondary drinking water contaminant. Conventional water treatment processes readily remove aluminum. Therefore, aluminum is not considered to be a limiting factor in water supply availability or treatment for the ETRWPA.

Excessive zinc in water is also an aquatic life protection concern for surface water bodies. Zinc is a secondary drinking water contaminant. It is not generally considered to affect water supply availability or treatability. Conventional water treatment processes also readily remove zinc. In the case of zinc found in the one segment in the ETRWPA (Segment 0606, Neches River above Lake Palestine), the average concentrations observed in the water are only slightly above the surface water quality standard and well below the secondary drinking water standard. Therefore, zinc is not considered to be a concern for water supply availability or treatment in the ETRWPA.

Of the remaining listed impairments, none are considered to limit the availability of water supply or treatability of the water.

3.2.2 Water Quality Impacts on Groundwater Availability. Appendix 1-C provides a detailed discussion of water quality in four water supply aquifers in the ETRWPA. The four aquifers evaluated were the Carrizo-Wilcox, the Gulf Coast, the Queen City-Sparta, and the Yegua-Jackson. In the evaluation, a range of primary and secondary drinking water contaminants was evaluated. Water quality data for wells within the TWDB database were reviewed and summarized. Based on this evaluation, it may be stated that limitations on water supply availability or treatability are rare for groundwater supplies in the ETRWPA.

Primary drinking water contaminants evaluated included alpha particles, arsenic, barium, cadmium, chromium, lead, nitrate (as nitrogen), and selenium. Although individual wells sometimes detect concentrations of contaminants, none are considered to be widespread in any of the aquifers at levels of concern. The most prevalent of the primary drinking water contaminants was found to be nitrate (as nitrogen), which exceeded the primary standard of 10 mg/L in about 4% of samples from all aquifers. However, the median concentration of nitrate (as nitrogen) was less than 0.25 mg/L and the average less than 3 mg/L. Nitrate can be removed from water using advanced treatment processes such as reverse osmosis or ion exchange. This would result in a reduced availability as a significant portion of the supply becomes the reject or waste stream. Given the low incidence of nitrate contamination, it is unlikely that it would become a significant issue for the ETRWPA.

Secondary drinking water contaminants evaluated included copper, fluoride, chloride, iron, manganese, pH, sulfate, and TDS. Of these, iron, manganese, and pH were commonly found in excess of secondary standards in all aquifers. TDS was found to exceed the Texas secondary standard of 1,000 mg/L in only the Yegua-Jackson Aquifer.

Iron and manganese are naturally occurring constituents in groundwater. In excess, they can cause taste and odor problems in drinking water, but not significant health problems. A common means of managing iron and manganese concentrations in drinking water is through aeration of the groundwater as it is pumped from the ground and to a storage tank. The aeration causes the iron and manganese to precipitate and settle to the bottom of the storage tank. The drinking water then distributed to customers, therefore, contains lower concentrations of the constituents. Industrial users of water with excessive levels of iron or manganese may require significant removal prior to using the water in industrial processes.

In the ETRWPA, approximately 26% of all wells evaluated exceeded the secondary standard for iron (i.e., 0.3 mg/L). Median values for iron were within the secondary standard, but averages exceeded the standard by over four times in some cases. Approximately 16% of all wells exceeded the secondary standard for manganese (i.e., 0.05 mg/L). Median values for manganese were well within the standard. The average manganese level exceeded the standard in only Gulf Coast Aquifer wells, at a concentration of 0.065 mg/L.

Although it is not known whether any existing public water supply system or industrial user is currently contending with excessive iron or manganese in its groundwater source, these results indicate that iron and manganese could be a significant issue in groundwater in some parts of the ETRWPA. As indicated above, treatment may be relatively simple and would not generally result in a reduction of water supply availability or treatability. In extreme cases of excessive iron or where the water is desired for industrial uses, it is possible that more comprehensive treatment could be necessary to remove a sufficient amount of the constituent to enable its use.

It was found to be relatively common for pH concentrations in groundwater to be outside the allowable range (i.e., 6.5 to 8.5 standard units) for the four aquifers evaluated. The pH was outside the range in approximately 33% of the groundwater samples. However, neither the median nor the average values were found outside the range for any of the aquifers. This indicates that the pH concerns for groundwater in the ETRWPA may be a minimal issue.

Control of pH, if necessary, could be accomplished by the addition of pH adjusting chemicals, such as soda ash (to raise pH), or sulfuric acid (to lower pH). Treatment would not result in a significant reduction of the source availability. Therefore, pH is not considered to be a significant limiting factor in availability or treatability.

The concentration of TDS in the Yegua-Jackson Aquifer was found to exceed the Texas secondary standard in approximately 18% of the groundwater samples evaluated. However, the average concentration for all wells in the aquifer was only approximately 672 mg/L. This indicates that TDS concerns for the Yegua-Jackson Aquifer are probably minimal.

Treatment for TDS, if necessary, could include processes such as reverse osmosis or ion exchange. This would result in reduced availability as a significant portion of the supply becomes the reject or waste stream. Given the low incidence of TDS contamination in most of the region, it is unlikely that it would become a significant issue for groundwater availability for the ETRWPA.

3.3 Impact of Environmental Flow Policies on Water Rights, Water Availability, and Water Planning

The objective of this section of the 2011 Plan is to provide an evaluation of the effect of environmental flow policies on water rights, water availability, and water planning in the ETRWPA. Much has occurred in the area of environmental flow recommendations since the 2006 Plan was adopted, including the development of new recommendations for the Sabine and Neches watersheds. However, it is not clear how much effect these recommendations will have in the short-term.

The Legislature passed Senate Bill 3 (SB3) in the 2007 80th Regular Session. SB3 is the third in a series of three omnibus water bills related to the State of Texas' meeting the future needs for water. SB3 created a basin-by-basin process for developing recommendations to meet the instream flow needs of rivers as well as freshwater inflow needs of affected bays and estuaries and required TCEQ to adopt the recommendations in the form of environmental flow standards. Such standards will be utilized in the decision-making process for new water right applications and in establishing an amount of unappropriated water to be set aside for the environment.

Prior to SB3, Texas law recognized the importance of balancing the biological soundness of the state's rivers, lakes, bays, and estuaries with the public's economic health and general well-being. The Texas Water Code (TWC) requires the TCEQ, while balancing all other interests, to consider and provide for the freshwater inflows necessary to maintain the viability of Texas' bay and estuary systems in TCEQ's regular granting of permits for the use of state water. Balancing the effect of authorizing a new use of water with the need for that water to maintain a sound ecological system was done on a case-by-case basis as part of the water rights permitting process.

SB3 called for the appointment of stakeholder committees for the various watersheds feeding bays and estuaries for the Texas coast. For that portion of the Texas coast within the ETRWPA, the primary basins of interest were the Sabine and Neches Rivers, and part of the Neches-Trinity Coastal basin. These basins feed fresh water to Sabine Lake and the upper Texas coast. Since a portion of the Trinity River basin is in the region and the Trinity River forms a portion of the western boundary of the region, another stakeholder group for the Trinity-San Jacinto-Galveston Bay area is also of potential interest. Stakeholder committees for both areas were appointed in 2008. Each stakeholder committee then appointed a "bay and basin expert science team" (BBEST) in the fall of 2008 to address the development of environmental flow recommendations in accordance with SB3. The BBESTs met individually over the course of 12 months to develop environmental flow recommendations for their respective areas. Appendix 3-A contains the Sabine and Neches Executive Summary (ES), which is the primary area of interest to the ETRWPA. The ES describes, generally, the process undertaken and the recommendations made by the BBEST.

The Sabine and Neches Rivers and Sabine Lake Bay Basin and Bay Area Stakeholder's Committee (Sabine-Neches Bay and Basin Area Stakeholder Committee [BBASC]) evaluated the recommendations of the BBEST and prepared its own report. The report, dated May 4, 2010, has been presented to the TCEQ for its review. A copy of the report is provided in Appendix 3-A.

Environmental flow recommendations will impact the procurement of water rights in the future by creating a comprehensive process of evaluating environmental flow needs whenever a new water right application is processed. The process of approving water rights is likely to become more complex under the new environmental flow policies that will be implemented by the TCEQ. However, it should result in more clarity in how diversions can be made, and better ensure that sufficient water is available in the streams of the Sabine and Neches basins.

As a result of the implementation of new environmental flow recommendations, the operation of reservoirs will become more dependent on the development of an "accounting plan," which is a feature that the TCEQ is already implementing within the State. Whether such accounting plans will have a significant impact on the availability of water is not known at this time.

The implementation of environmental flow recommendations will result in a need to more carefully consider environmental flow needs during the process of water planning in the ETRWPA. In future planning cycles, the ETRWPG will need to analyze new water rights in light of these recommendations to determine how the new environmental flow requirements are consistent with the long-term protection of the region's water resources.

3.4 Water Availability by Water User Group

The water availability by WUG is limited by the ability to deliver and/or use the water. These limitations include firm yield of reservoirs, well field capacity, aquifer characteristics, water quality, water rights, permits, contracts, regulatory restrictions, raw water delivery infrastructure and water treatment capacities where appropriate. Appendix 3-B presents the current water available for each WUG by county. (WUGs are cities, water supply corporations, county-other municipal users and countywide manufacturing, irrigation, mining, livestock, and steam electric uses.) For county-wide user groups, historical use was considered in the determination of currently available supplies.

The table in Appendix 3-B shows the amount of supply available to each user group from each source by decade based on existing facilities. The total supply to water users by use type is shown on Figure 3.6. These developed supplies represent about one third of the currently available supply to the region. The supplies by county are shown in Table 3.9.

Figure 3.6 Currently Available Supply to Water User Groups

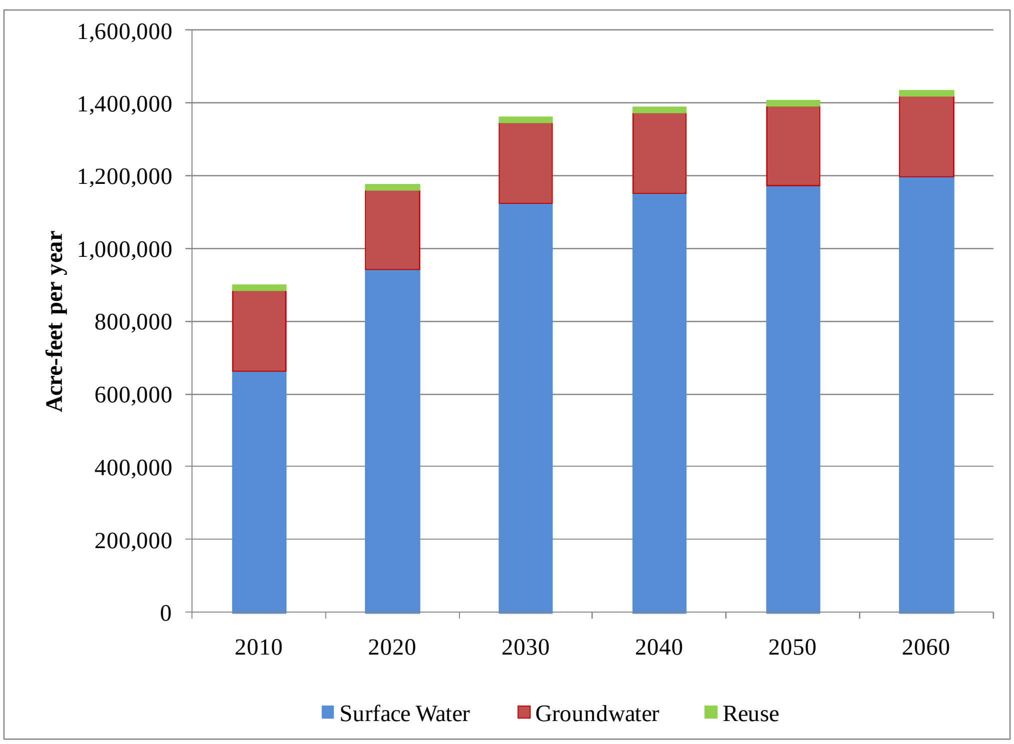

Table 3.9 Summary of Available Supply to Water Users by County (ac-ft per year)

County	Available Supply					
	2010	2020	2030	2040	2050	2060
Anderson	17,649	17,649	17,649	17,649	17,649	17,649
Angelina	25,957	26,321	26,392	26,458	26,521	26,579
Cherokee	18,684	18,273	18,625	19,046	19,539	20,126
Hardin	14,296	14,296	14,296	14,296	14,296	14,271
Henderson (P)	9,509	7,890	7,705	7,538	7,365	7,205
Houston	10,248	10,246	10,246	10,247	10,246	10,246
Jasper	72,835	76,218	78,731	80,928	82,575	82,638
Jefferson	414,903	686,525	866,571	892,088	918,150	944,597
Nacogdoches	33,596	37,693	37,289	36,856	29,640	29,129
Newton	19,908	19,908	19,908	19,908	19,908	19,908
Orange	98,484	98,484	98,484	98,484	98,484	98,484
Panola	16,758	17,067	17,256	17,448	17,641	17,826
Polk (P)	2,626	2,626	2,626	2,626	2,626	2,626
Rusk	60,725	60,732	60,732	60,722	60,719	60,729
Sabine	4,101	4,101	4,101	4,101	4,101	4,101
San Augustine	2,933	2,933	2,933	2,933	2,933	2,933
Shelby	11,430	11,445	11,458	11,471	11,482	11,496
Smith (P)	59,273	58,953	58,711	58,484	58,186	57,842
Trinity (P)	1,021	1,028	1,029	1,025	1,020	1,016
Tyler	5,328	5,328	5,328	5,328	5,328	5,328
TOTAL	**900,264**	**1,177,716**	**1,360,070**	**1,387,636**	**1,408,409**	**1,434,729**

Note: (P) denotes Partial County

3.5 Water Availability by Wholesale Water Provider

There are 16 designated WWPs in the ETRWP area. A WWP is a provider that has wholesale water contracts for 1,000 ac-ft per year or is expected to contract for 1,000 ac-ft per year or more during the planning period. Similar to the available supply to WUGs, the water availability for each WWP is limited by the ability to deliver the raw water. These limitations include firm yield of reservoirs, well field capacity, aquifer characteristics, water quality, water rights, permits, contracts, regulatory restrictions and infrastructure. A summary of supplies of each WWP is included in Appendix 3-B. Total available supply by decade for each wholesale provider is shown in Table 3.10.

Table 3.10 Summary of Currently Available Supplies for Wholesale Water Provider (ac-ft per year)

Water Provider	Currently Available Supply					
	2010	2020	2030	2040	2050	2060
ANRA	60	65	70	70	70	70
A-N WCID 1	20,183	19,357	18,530	17,703	16,877	16,050
Athens MWA	5,772	2,900	2,900	2,900	2,900	2,900
Beaumont	31,420	31,420	31,420	31,420	31,420	31,420
Carthage	6,461	6,461	6,461	6,461	6,461	6,461
Center	4,554	4,554	4,554	4,554	4,554	4,554
Houston Co. WCID 1	3,500	3,500	3,500	3,500	3,500	3,500
Jacksonville	7,391	7,391	7,391	7,391	7,391	7,391
LNVA	1,173,876	1,173,876	1,173,876	1,173,876	1,173,876	1,173,876
Lufkin	11,000	11,000	11,000	11,000	11,000	11,000
Nacogdoches	20,167	19,783	19,400	19,017	18,633	18,250
Panola Co. FWSD 1	21,792	21,203	20,615	20,027	19,438	18,850
Port Arthur	15,852	16,380	16,907	17,436	18,029	18,753
SRA	1,300,726	1,297,888	1,295,045	1,292,194	1,289,323	1,286,456
Tyler	44,996	44,996	44,996	44,996	44,996	44,996
UNRMWA	207,458	205,417	203,375	201,333	199,292	197,250
Wholesale Water Provider Totals	**2,875,208**	**2,866,191**	**2,860,040**	**2,853,878**	**2,847,760**	**2,841,777**

A brief description of the supply sources is presented below. As previously discussed, the analyses of the available supplies by source were determined using the assumptions outlined in Sections 3.2.1 and 3.2.2. The results of these analyses are for planning purposes and do not affect the right of a water holder to divert and use the full amount of water authorized by its permit.

3.5.1 Angelina and Neches River Authority. ANRA has a state water right permit to construct Lake Columbia on Mud Creek in the Neches River Basin and divert 85,507 ac-ft per year. ANRA estimates that development of the lake could be complete by the year 2015. No currently available supply is shown since the reservoir is not constructed. The estimated firm yield using the modified Neches WAM Run 3 is 75,700 ac-ft per year.

3.5.2 Angelina-Nacogdoches Water Control Improvement District No 1. The A-N WCID No. 1 owns and operates Lake Striker in Rusk and Cherokee Counties. The firm yield from Lake Striker in 2010 is estimated at 20,183 ac-ft per year, which is expected to decrease to 16,050 ac-ft per year by 2060.

3.5.3 Athens Municipal Water Authority. Athens MWA has 8,500 ac-ft per year of water rights in Lake Athens. The firm yield of the lake using the modified Neches WAM Run 3 was estimated at 6,145 ac-ft per year in 2000. However, the intake structure for the fish hatchery does not allow the water level to drop below 431 feet msl and maintain inflow to hatchery. Using this operational constraint, the yield of Lake Athens is 2,900 ac-ft per year. The Athens MWA also has a wastewater reuse permit for 2,677 ac-ft per year, but the infrastructure is not in place to utilize this source. The City of Athens and Athens MWA continue to study indirect reuse as a supplement to the yield of Lake Athens.

3.5.4 City of Beaumont. The City of Beaumont obtains water from the Neches River and groundwater wells from the Gulf Coast Aquifer in Hardin County. The reliable surface water supplies are estimated at 32,111 ac-ft per year (ac-ft per year) based on the firm yield of the City's run-of-the-river water rights. The City's current water treatment system is rated for 40 MGD, limiting the available treated surface water to 22,420 ac-ft per year. The City currently uses about 10,000 ac-ft per year of groundwater with a current well capacity of about 23 MGD. However, due to limited aquifer availability, the estimated reliable groundwater supply for Beaumont is limited to 9,000 ac-ft per year. Considering both its groundwater and surface water sources the City's currently available treated water supplies total 31,420 ac-ft per year.

3.5.5 City of Carthage. The City of Carthage obtains its water from groundwater from the Carrizo-Wilcox Aquifer and surface water from Panola County FWSD. The City has a contract with Panola County FWSD for 12 MGD of water from Lake Murvaul. Considering its current water system capacities, the city of Carthage has approximately 6,400 ac-ft per year of reliable supply.

3.5.6 City of Center. The City of Center currently obtains water from Lake Center and Lake Pinkston for use within the City and for distribution to its municipal and industrial customers. The City owns and operates Lake Center, with a firm yield of 754 ac-ft of municipal water. Water from Lake Pinkston is pumped from the Neches River Basin to the City, located in the Sabine River Basin. The City holds rights to 3,800 ac-ft of water in Lake Pinkston. The total available supply for the City of Center is 4,554 ac-ft per year.

3.5.7 Houston County WCID No. 1. Houston County WCID No. 1's water rights to Houston County Lake include a right to divert 3,500 ac-ft per year at a rate not to exceed 6,300 gpm. Supplies to Houston County WCID No. 1 are limited to its permitted diversions.

3.5.8 City of Jacksonville. The City of Jacksonville obtains water supplies from Lake Jacksonville and the Carrizo-Wilcox Aquifer. The city holds 6,200 ac-ft per year in water rights in Lake Jacksonville. The firm yield of the lake exceeds the permitted diversions. The ability to use this water for municipal purposes is limited by the city's water treatment capacity (estimated at 5,173 ac-ft per year). The groundwater supplies are based on current well field production. The total supply available to Jacksonville is estimated at 7,391 ac-ft per year.

3.5.9 Lower Neches Valley Authority. The LNVA maintains water rights from Lake Sam Rayburn, Lake B.A. Steinhagen and Run-of-the-River diversion from the Neches River. LNVA's water rights total 1,173,876 ac-ft per year. The firm yield analyses using the modified Neches WAM Run 3 show that the full permitted amount is available, and there are also unpermitted supplies associated with the Sam Rayburn/ B.A. Steinhagen system. The LNVA currently possesses the infrastructure to divert these water rights to its municipal, manufacturing, mining and irrigation users.

3.5.10 City of Lufkin. The City of Lufkin presently obtains groundwater from the Carrizo-Aquifer in Angelina County. Supplies for the City of Lufkin are based on its present well field pumping capacity.

The City has recently purchased additional groundwater rights in the Carrizo-Wilcox Aquifer and the surface water rights in Lake Kurth that were held by Abitibi Bowater. The City is currently evaluating the infrastructure improvements needed to utilize these sources. Lufkin also has a water right for 28,000 ac-ft per year of water from Lake Sam Rayburn. Currently there are no transmission facilities to use this water.

3.5.11 City of Nacogdoches. The City of Nacogdoches obtains groundwater from the Carrizo-Wilcox aquifer and Lake Nacogdoches. The groundwater supply is based on the average annual current well field pumping capacity. The City currently has water rights to divert 22,000 ac-ft per year of water from Lake Nacogdoches. The modified Neches WAM Run 3 shows the current firm yield of this lake to be 17,450 ac-ft per year, and reducing to 15,150 ac-ft per year by 2060.

3.5.12 Panola County Freshwater Supply District No. 1. The Panola County FWSD 1 owns and operates Lake Murvaul in the ETRWPA. The estimated firm yield of Lake Murvaul using the modified Sabine WAM Run 3 is 22,380 ac-ft per year in year 2000, decreasing to 18,850 ac-ft per year by 2060.

3.5.13 City of Port Arthur. The City of Port Arthur receives raw water supply from the LNVA. Treated water is supplied to industrial users in addition to its citizens. It is assumed that LNVA will provide for 100% of the City's demands. The projected supply from LNVA is 15,846 ac-ft per year in 2010, increasing to 18,747 ac-ft per year by 2060.

3.5.14 Sabine River Authority. The SRA owns and operates Lake Tawakoni, Lake Fork, and the Toledo Bend Reservoir. In addition, the SRA maintains run-of-the-river rights from the Sabine in Newton and Orange County. The SRA provides water to municipal and industrial customers in Region C and Region D from Lake Fork and Lake Tawakoni, located outside of the ETRWPA. Water in the ETRWPA is provided from Toledo Bend Reservoir and diversions from the Sabine River through the SRA Canal System. SRA holds water rights of 238,100 ac-ft per year from Lake Tawakoni, 188,660 ac-ft per year from Lake Fork, 750,000 ac-ft per year from Toledo Bend Reservoir and

147,100 ac-ft per year from the Sabine River. The reliable supply from SRA's Lower basin sources (Toledo Bend Reservoir and Canal System) is approximately 1.3 million ac-ft per year.

3.5.15 City of Tyler. The City of Tyler receives raw water supply from Lake Tyler and Tyler East with a firm yield of 30,950 ac-ft per year. Supply from these reservoirs is limited to 23,541 ac-ft per year by the water treatment plant capacity. The City also has a contract with the Upper Neches River Municipal Water Authority for 60 MGD from Lake Palestine. The City of Tyler has constructed a 30 MGD treatment facility at the lake and currently can use 16,815 ac-ft per year from Lake Palestine. The City possesses water rights to Lake Bellwood; however, the raw water from this source is used directly by industry or for irrigation. Water is not treated by the City from this source. The City also obtains water from the Carrizo-Wilcox aquifer. The estimated reliable supply from groundwater is 4,340 ac-ft per year, which was reduced from its production capacity due to limited aquifer availability. Collectively, the City has a total of 44,696 ac-ft per year of treated water and an additional 950 ac-ft per year of raw water from Lake Bellwood.

3.5.16 Upper Neches River Municipal Water Authority. The UNRMWA maintains a total water right of 238,110 ac-ft per year for diversions from Lake Palestine and a downstream location at Rocky Point Dam. The UNRMWA operates these rights as a system. Available supply using the modified Neches WAM Run 3 is estimated at 209,500 ac-ft per year in year 2000, decreasing to 197,250 ac-ft per year by 2060.

3.6 Summary of Current Water Supply in East Texas Regional Water Planning Area

The projected overall reliable fresh water supply to the ETRWPA from current sources will be about 3 million ac-ft per year in 2060. (This figure does not consider supply limitations due to the capacities of current raw water transmission facilities and wells nor does it include brackish water sources). Approximately 85% of the supply is associated with in-region reservoirs and run-of-the river diversions. Nearly 15% of the supply is from groundwater. Very little supply is currently obtained from reuse.

There are some sources of supply that will not be utilized fully during the period covered by this plan. Others are fully utilized today, including groundwater from the Carrizo-Wilcox aquifer in Smith County and several smaller reservoirs.

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