REGION B

REGIONAL WATER PLAN

in accordance with

TEXAS STATE SENATE BILL 1

Prepared for

Region B Water Planning Group

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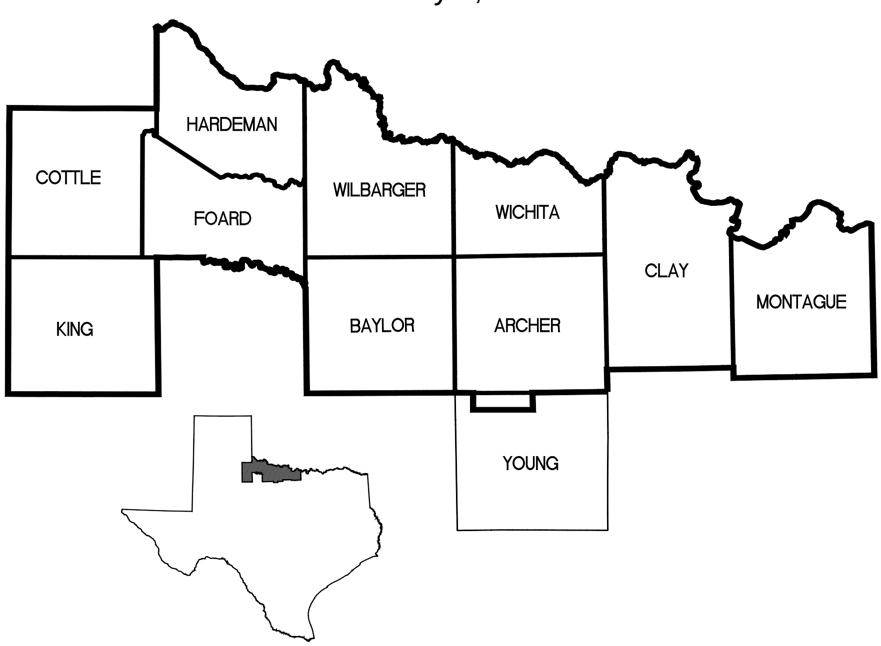
January 5, 2001



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REGION B

JANUARY 5, 2001

EXECUTIVE SUMMARY
TEXAS STATE SENATE BILL 1
REGION B

INTRODUCTION

In 1997, the 75th Texas Legislature passed Senate Bill 1, legislation designed to address Texas water issues. With the passage of Senate Bill 1, the Legislature put into place a grass-roots regional process to plan for the water needs of the entire state for the next 50 years. To implement the planning process, the Texas Water Development Board (TWDB) created 16 Regional Water Planning Groups within the state and established regulations governing the planning efforts.

Region B, one of the water planning groups created, (Figure 1), covers all or a part of eleven counties in North Texas including: Archer, Baylor, Clay, Cottle, Foard, Hardeman, King, Montague, Wichita, Wilbarger, and the northern portion of Young County.

The regional water planning process for Region B includes the following tasks:

- Description of the Region
- Development of Population and Water Use Projections
- Evaluation of Current Water Supplies
- Comparison of Supply and Demand
- Identification, Evaluation, and Selection of Water Management Strategies
- Recommendations Including Unique Ecological Stream Segments, Reservoir Sites, Legislative and Regional Policy Issues
- Plan Adoption, Including Public Participation

DESCRIPTION OF REGION B

Region B lies mainly in the Red River Basin, however, southern portions of Archer and Clay Counties lie within the Trinity River Basin, and southern portions of Archer, Baylor, and King Counties lie within the Brazos River Basin. Some of the largest ranches in the state are located in this region including the Waggoner Ranch in Wilbarger County and the Four Sixes Ranch in King County. In addition, Region B has over one million acres of croplands and over three million acres of open range. Typical crops include cotton, coastal bermuda, wheat, alfalfa, peanuts, grain sorghum, watermelons, pecans, peaches, and various other fruits. Cattle for beef and dairy production is the major component of the livestock industry, with sheep, swine, and equine also present.

Volatile is the best way to describe the climate of Region B. It has the ability to change from one extreme to another in a short period of time. The annual precipitation also varies greatly from year to year with an average annual rainfall of 27.4 inches; however, the extremes range from 47 inches in 1919

Figure 1

to 12 inches in 1896. Temperatures for the region are typically in the mid to upper twenties in January to the upper nineties in July.

In general, most of the population is concentrated in the eastern portion of the region with over one-half of the population located in and around Wichita Falls. In 1996, the total population of Region B was reported to be 201,984, and based on January 1, 1998 data, the estimated population density of the region ranged from a high of 200 persons per square mile in Wichita County to a low of less than one person per square mile in King County. It is anticipated that the population for Region B will increase by 7.5% over the next 50 years to 216,914.

Major surface water supply sources in Region B include: Lake Kemp, Lake Diversion, Lake Kickapoo, and Lake Arrowhead. Additionally, an adequate supply of groundwater is available in selected portions of Region B from the Seymour and Trinity Aquifers and also the Blaine Aquifer, which is located in Cottle, King, Foard, and Hardeman Counties.

The overall water use for Region B is projected to increase from approximately 167,000 acre-feet in 1996 to 183,214 acre-feet in the year 2050, an increase of approximately 10% throughout the planning period.

POPULATION AND WATER USE PROJECTIONS

The population projections for Region B were determined by the following:

- Using the latest information published by the State Data Center for city populations;
- Surveying the cities, smaller communities, rural water supply corporations, municipal utility districts, and river authorities to determine population based on existing meter counts; and
- Using growth trends derived from the surveys based on populations and meter counts from 1990 to 1998.

The population for the region is projected to have only a moderate increase for the next 50 years from 201,984 people in 1996 to 216,914 in 2050, or 7.5%.

Population projections are shown in Table ES-1 for each incorporated city by county and rural areas outside of any incorporated entity (Other Rural).

TABLE ES-1
PROJECTED TOTAL POPULATION OF CITIES IN REGION B

CITY	COUNTY	RIVER BASIN	1996 POP	2000 POP	2010 POP	2020 POP	2030 POP	2040 POP	2050 POP
Archer City	Archer	Red	1,938	1,855	1,916	1,925	1,910	1,868	1,806
Holliday	Archer	Red	1,563	1,564	1,613	1,621	1,609	1,575	1,524
Lakeside City	Archer	Red	1,019	1,100	1,177	1,350	1,400	1,400	1,400
Seymour	Baylor	Brazos	3,059	3,074	2,944	2,578	2,293	2,218	2,147
Byers	Clay	Red	530	556	546	527	515	523	533
Henrietta	Clay	Red	3,038	3,112	3,268	3,431	3,602	3,750	3,800
Petrolia	Clay	Red	809	834	814	779	746	742	744
Paducah	Cottle	Red	1,670	1,645	1,595	1,501	1,385	1,246	1,118
Crowell	Foard	Red	1,219	1,217	1,206	1,194	1,144	1,092	1,042
Chillicothe	Hardeman	Red	796	784	792	818	833	848	861
Quanah	Hardeman	Red	3,300	3,200	3,140	3,080	3,060	3,040	3,020
Guthrie	King	Red	150	150	152	144	124	98	77
Bowie	Montague	Trinity	5,389	5,350	5,250	5,300	5,350	5,400	5,450
Montague	Montague	Red	490	479	470	460	440	421	401
Nocona	Montague	Red	3,146	3,171	3,180	3,190	3,200	3,190	3,190
Saint Jo	Montague	Trinity	847	846	858	885	907	909	911
Saint Jo	Montague	Red	284	277	290	295	302	303	304
Burkburnett	Wichita	Red	11,154	11,154	11,600	12,000	12,314	12,557	12,805
Electra	Wichita	Red	3,397	3,270	3,431	3,612	3,652	3,725	3,799
Iowa Park	Wichita	Red	6,941	6,864	7,209	7,530	7,732	7,888	8,047
Wichita Falls	Wichita	Red	100,501	103,713	108,977	113,879	116,847	119,117	121,432
Vernon	Wilbarger	Red	12,481	12,590	12,755	13,215	13,480	13,568	13,576
Olney	Young	Brazos	3,365	3,365	3,525	3,618	3,648	3,645	3,642
Other Rural			34,898	27,623	27,813	27,702	26,768	26,073	25,285
Total			**201,984**	**197,793**	**204,521**	**210,634**	**213,261**	**215,196**	**216,914**

For analysis purposes, the water use for Region B has been divided into several categories. The various uses analyzed include water for municipal use (MUN), industrial or manufacturing (MFG), power cooling (PWR), mining (MIN), agricultural irrigation (IRR), and livestock watering (STK).

Table ES-2 shows a numerical listing of the water use for each category through the year 2050. The water use is shown in acre-feet with one acre-foot being equivalent to 325,851 gallons.

TABLE ES-2
PROJECTED WATER USE BY CATEGORY FOR REGION B

	1996	2000	2010	2020	2030	2040	2050
MFG	3,230	3,266	3,547	3,755	3,968	4,260	4,524
PWR	11,116	9,460	27,360	31,360	35,360	35,360	35,360
MIN	1,192	1,176	909	845	811	785	792
IRR	100,564	102,106	99,880	97,687	95,522	93,385	91,277
STK	11,574	12,169	12,169	12,169	12,169	12,169	12,169
MUN	38,976	41,395	40,715	39,820	39,373	39,068	39,092
TOTAL	166,652	169,572	184,580	185,636	187,203	185,027	183,214

Based on the above Table ES-2, the water demand within Region B is predicted to increase approximately 10% from 1996 to 2050.

EVALUATION OF CURRENT WATER SUPPLIES

Water supply sources available for Region B are shown in Table ES-3, and consist of surface water reservoirs, run-of-river supplies, local supplies, and groundwater.

From previous planning studies and updated operational studies, the total reservoir water supply available in Region B, including Greenbelt Reservoir in Region A, is 188,317 acre-feet per year. This supply is projected to decrease by 14% to 162,043 acre-feet per year in 2050.

The available run-of-river supply includes water from the Red River in Clay and Montague Counties, Little Wichita River, and Beaver Creek. The total available supply from this source as listed in Table ES-3 is 3,893 acre-feet per year. Additionally, as listed in Table ES-3, there is 11,786 acre-feet of local water supply in Region B, which includes stock tanks and other small local lakes.

Finally, Table ES-3 indicates that there is 197,600 acre-feet per year of groundwater supply with the Seymour Aquifer accounting for 54% of the supply, the Blaine Aquifer accounting for 42% of the supply, and the remaining 4% being supplied from the Trinity and other groundwater aquifers. Of that amount approximately 59,000 acre-feet per year of groundwater is estimated to be developed and currently used in the region.

The total of all current available supply within Region B is 393,800 acre-feet per year based on the year 2000 yields, with the total available supply within the region projected to decrease to 367,400 acre-feet per year by the year 2050. This does not include supplies from outside the region (e.g. Greenbelt Reservoir).

TABLE ES-3
CURRENT WATER SUPPLY SOURCES

Name of Specific Source	County	Type of Water Supply	Regional Water Planning Group	County Number for Supply Source	Basin Number for Supply Source	Specific Source Identifier Number	Year 2000 Total Supply During Drought of Record (Ac-Ft)	Year 2010 Total Supply During Drought of Record (Ac-Ft)	Year 2020 Total Supply During Drought of Record (Ac-Ft)	Year 2030 Total Supply During Drought of Record (Ac-Ft)	Year 2040 Total Supply During Drought of Record (Ac-Ft)	Year 2050 Total Supply During Drought of Record (Ac-Ft)	Comment	Author of Study
RESERVOIRS														
Greenbelt	Donley	0	A	65	2	2050	7,699	7,548	7,396	7,245	7,093	6,942	1996 Yield Study	F&N
Wichita System	Archer, Clay	2	B	5, 39	2	020A0	45,477	45,357	45,236	45,116	44,995	44,875	Kickapoo & Arrowhead	
Additional Supply Wichita System	Archer, Clay	2	B	5, 39	2	020A0	0	0	0	0	0	0		
Santa Rosa	Wilbarger	0	B	244	2	2120	0	0	0	0	0	0	Historical Performance	
Kemp	Baylor	0	B	12	2	2130	126,000	120,930	116,080	111,230	106,390	101,540	1976 Yield Study	F&N
Electra City Lake	Wilbarger	0	B	244	2	2150	470	470	470	470	470	470	1999 Yield Study	F&N
N.F.Buffalo Creek	Wichita	0	B	243	2	2170	2,100	2,100	2,100	2,100	2,100	2,100	1999 Yield Study	F&N
Farmers Creek/Nocona	Montague	0	B	169	2	2210	1,260	1,260	1,260	1,260	1,260	1,260	1986 Yield Study	F&N
Lake Pauline/Groesbeck	Hardeman	0	B	99	2	2100	1,800	1,746	1,693	1,639	1,585	1,532	1999 Yield Study	F&N
Amon G. Carter	Montague	0	B	169	8	8020	2,600	2,563	2,525	2,488	2,450	2,413	1979 Yield Study	HDR
Olney/Cooper	Archer	0	B	5	2	020B0	910	910	910	910	910	910	1999 Yield Study	F&N
RUN OF RIVER														
Little Wichita	Clay	0	B	39	2	3410205152A	1,463	1,463	1,463	1,463	1,463	1,463	Maximum Available During Drought	
Red River	Montague	0	B	169	2	3460204877	1,600	1,600	1,600	1,600	1,600	1,600	Water Right 4877	
Beaver Creek	Wilbarger	0	B	244	2	3460205127	30	30	30	30	30	30	Water Right 5127	
Beaver Creek	Wilbarger	0	B	244	2	3460205128	800	800	800	800	800	800	Water Right 5128	
LOCAL SUPPLY														
Irrigation	Cottle	0	B	52	2	052996	59	59	59	59	59	59	River Rights 5111 and 5114	
Irrigation	Montague	0	B	169	2	169996	100	100	100	100	100	100	River Right 5605	
Irrigation	Montague	0	B	169	8	169996	133	133	133	133	133	133	Historical Max Use	
Livestock	Archer	0	B	5	12	012997	125	125	125	125	125	125	Historical Max Use	
Livestock	Archer	0	B	5	2	002997	2,097	2,097	2,097	2,097	2,097	2,097	Historical Max Use	
Livestock	Archer	0	B	5	8	008997	272	272	272	272	272	272	Historical Max Use	
Livestock	Baylor	0	B	12	12	012997	373	373	373	373	373	373	Historical Max Use	
Livestock	Baylor	0	B	12	2	002997	621	621	621	621	621	621	Historical Max Use	
Livestock	Clay	0	B	39	12	012997	1,757	1,757	1,757	1,757	1,757	1,757	Historical Max Use	

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Livestock	Clay	0	B	39	2	002997	225	225	225	225	225	225	Historical Max Use	
Livestock	Cottle	0	B	51	2	002997	429	429	429	429	429	429	Historical Max Use	
Livestock	Foard	0	B	78	2	002997	291	291	291	291	291	291	Historical Max Use	
Livestock	Hardeman	0	B	99	2	002997	298	298	298	298	298	298	Historical Max Use	
Livestock	King	0	B	135	12	012997	255	255	255	255	255	255	Historical Max Use	
Livestock	King	0	B	135	2	002997	439	439	439	439	439	439	Historical Max Use	
Livestock	Montague	0	B	169	2	002997	951	951	951	951	951	951	Historical Max Use	
Livestock	Montague	0	B	169	8	008997	714	714	714	714	714	714	Historical Max Use	
Livestock	Wichita	0	B	243	2	002997	700	700	700	700	700	700	Historical Max Use	
Livestock	Wilbarger	0	B	244	2	002997	1,617	1,617	1,617	1,617	1,617	1,617	Historical Max Use	
Other	Wichita	0	B	243	2	002999	250	250	250	250	250	250	Half of Lake Iowa Park Right	
Other	Cottle	0	B	52	2	002999	40	40	42	43	47	47	Surface Water Use Reported for Mining and County Other	
Other	Hardeman	0	B	99	2	002999	7	7	7	7	7	7	Surface Water Use Reported for Mining	
Other	Clay	0	B	39	2	002999	33	26	16	11	9	8	Petrolia City Lake	
Groundwater														
Other Aquifers	Archer	1	B	5	2, 8, 12	00522	392	384	372	371	371	371	Historical Max Use	
Seymour	Baylor	1	B	12	2	1204	1,485	1,485	1,485	1,485	1,485	1,485	Effective Recharge	
Seymour	Baylor	1	B	12	12	1204	8,205	8,205	8,205	8,205	8,205	8,205	Effective Recharge	
Seymour	Clay	1	B	39	2	03904	8,217	8,217	8,217	8,217	8,217	8,217	Effective Recharge	
Other Aquifers	Clay	1	B	39	2, 8	03922	852	852	852	852	852	852	Historical Max Use	
Seymour	Cottle	1	B	51	2	05104	8,520	8,520	8,520	8,520	8,520	8,520	Effective Recharge	
Blaine	Cottle	1	B	51	2	05106	27,100	27,100	27,100	27,100	27,100	27,100	Effective Recharge	
Other Aquifers	Cottle	1	B	51	2	05122	847	836	836	836	836	836	Historical Max Use	
Other Aquifers	Dickens	1	O	63	2	06322	86	86	86	86	86	86		
Seymour	Foard	1	B	78	2	07804	12,473	12,473	12,473	12,473	12,473	12,473	Effective Recharge	
Blaine	Foard	1	B	78	2	07806	15,390	15,390	15,390	15,390	15,390	15,390	Effective Recharge	

TABLE ES-3
CURRENT WATER SUPPLY SOURCES

Name of Specific Source	County	Type of Water Supply	Regional Water Planning Group	County Number for Supply Source	Basin Number for Supply Source	Specific Source Identifier Number	Year 2000 Total Supply During Drought of Record (Ac-Ft)	Year 2010 Total Supply During Drought of Record (Ac-Ft)	Year 2020 Total Supply During Drought of Record (Ac-Ft)	Year 2030 Total Supply During Drought of Record (Ac-Ft)	Year 2040 Total Supply During Drought of Record (Ac-Ft)	Year 2050 Total Supply During Drought of Record (Ac-Ft)	Comment	Author of Study
Seymour	Hardeman	1	B	99	2	09904	18,359	18,359	18,359	18,359	18,359	18,359	Effective Recharge	
Blaine	Hardeman	1	B	99	2	09906	23,770	23,770	23,770	23,770	23,770	23,770	Effective Recharge	
Blaine	King	1	B	135	2	13506	17,590	17,590	17,590	17,590	17,590	17,590	Effective Recharge	
Other Aquifers	King	1	B	135	2, 12	13522	245	245	245	245	245	245	Historical Max Use	
Trinity	Montague	1	B	169	2	16928	239	239	239	199	199	163	TWDB Estimate	
Trinity	Montague	1	B	169	8	16928	2,443	2,443	2,443	2,033	2,033	1,667	TWDB Estimate	
Other Aquifers	Montague	1	B	169	2, 8	16922	1,210	1,205	1,204	1,204	1,204	1,204	Historical Max Use	
Seymour	Wichita	1	B	243	2	24304	14,375	14,375	14,375	14,375	14,375	14,375	Effective Recharge	
Other Aquifers	Wichita	1	B	243	2	24322	658	658	658	658	658	658	Historical Max Use	
Seymour	Wilbarger	1	B	244	2	24404	35,153	35,153	35,153	35,153	35,153	35,153	Effective Recharge	

Note: Final determination of available supply from Other Aquifers in Dickens County has not been made by Region O. This will be coordinated at a later time.

As required by the Texas Water Development Board (TWDB), the existing water supply was allocated to water users by city and category. This allocation is shown in Table ES-4, and represents a picture of where the existing water is being used today. If available, surface water allocations were based on current water rights, contracts, and available yields, while accounting for the most restraining limitation (e.g., reservoir yield or water treatment). Groundwater allocations were based on current developed well fields, while accounting for aquifer limits. For categories or cities with no associated contracts or rights, the historical use data provided by the TWDB was used. Surface water use reported to the TWDB for livestock watering was supplied by on farm stock ponds.

It should be noted that while historical use from Lake Kemp has not exceeded the reservoir yield, the City of Wichita Falls and Wichita County Water Improvement District No. 2 will need to develop operational policies to ensure there are sufficient supplies to the users, especially if Wichita Falls begins to use water from Lake Kemp for municipal use on a regular basis.

Once the allocations were made, they were compared to the source yields and adjustments made as needed.

The total available water supply allocated to the various entities for year 2000 is 239,449 acre-feet per year with a projected decrease in the available supply to 197,276 acre-feet per year by 2050. Approximately 75% of the total available supply in Region B is surface water and the remaining 25% is groundwater.

Table ES-4: Allocation of Existing Supplies – Region B

Basin Name	County Name	City Name	Source Name	Existing Supply (af/yr) 2000	2010	2020	2030	2040	2050	Comment
Red	Archer	Archer City	Wichita System	673	673	673	673	673	673	Long-term contract
Brazos	Archer	County-Other	Other Aquifer	36	30	30	30	30	30	80% of Historical Max Use (adjusted for aquifer limit)
Red	Archer	County-Other	Other Aquifer	107	107	107	107	107	107	80% of Historical Max Use (adjusted for aquifer limit)
Red	Archer	County-Other	Wichita System	1,009	1,009	1,009	1,009	1,009	1,009	Contracts
Trinity	Archer	County-Other	Other Aquifer	24	20	8	7	7	7	80% of Historical Max Use (adjusted for aquifer limit)
Red	Archer	Holliday	Wichita System	230	225	215	207	199	191	No Contract Amt, Supply = Demand
Red	Archer	Irrigation (On-Farm)	Kemp	4,891	4,048	3,765	3,483	3,201	3,100	5% Of Available Irrigation Releases
Red	Archer	Lakeside City	Wichita System	392	392	392	392	392	392	Contract, No Expiration Date
Brazos	Archer	Livestock	Other Aquifer	11	11	11	11	11	11	80% of Historical Max Use (adjusted for aquifer limit)
Brazos	Archer	Livestock	Local Supply	125	125	125	125	125	125	Historical Max Use, Stock Tanks
Red	Archer	Livestock	Other Aquifer	182	182	182	182	182	182	80% of Historical Max Use (adjusted for aquifer limit)
Red	Archer	Livestock	Local Supply	2,097	2,097	2,097	2,097	2,097	2,097	Historical Max Use, Stock Tanks
Trinity	Archer	Livestock	Other Aquifer	24	24	24	24	24	24	80% of Historical Max Use (adjusted for aquifer limit)
Trinity	Archer	Livestock	Local Supply	272	272	272	272	272	272	Historical Max Use, Stock Tanks
Red	Archer	Mining	Other Aquifer	1	1	1	1	1	1	Historical Max Use
Red	Archer	Scotland	Wichita System	280	280	280	280	280	280	Contract, No Expiration Date
Red	Archer	Steam Electric Power	Kemp	14,000	14,000	14,000	14,000	14,000	14,000	New Contract for proposed plant
Brazos	Baylor	County-Other	Seymour	226	215	205	199	199	199	Historical Max Use- 10 Yrs, Baylor WSC Max Use = 220 (Red & Brazos)
Red	Baylor	County-Other	Seymour	30	30	30	30	30	30	Historical Max Use- 10 Yrs

Table ES-4: Allocation of Existing Supplies – Region B (continued)

Basin Name	County Name	City Name	Source Name	Existing Supply (af/yr) 2000	2010	2020	2030	2040	2050	Comment
Brazos	Baylor	Irrigation (On-Farm)	Seymour	1,837	1,837	1,837	1,837	1,837	1,837	Historical Max Use
Red	Baylor	Irrigation (On-Farm)	Seymour	375	375	375	375	375	375	Historical Max Use
Brazos	Baylor	Livestock	Seymour	41	41	41	41	41	41	Historical Max Use
Brazos	Baylor	Livestock	Local Supply	373	373	373	373	373	373	Historical Max Use, Stock Tanks
Red	Baylor	Livestock	Seymour	69	69	69	69	69	69	Historical Max Use
Red	Baylor	Livestock	Local Supply	621	621	621	621	621	621	Historical Max Use, Stock Tanks
Brazos	Baylor	Mining	Seymour	47	47	47	47	47	47	Historical Max Use
Brazos	Baylor	Seymour	Seymour	747	747	747	747	747	747	Historical Max Use
Red	Clay	Byers	Seymour	91	89	89	89	89	89	Historical Max Use
Red	Clay	County-Other	Wichita System	1,766	1,766	1,766	1,766	1,766	1,766	Contracts with Arrowhead Prop/RRA/Dean Dale
Red	Clay	County-Other	Seymour	55	55	55	55	55	55	Historical Max Use
Red	Clay	County-Other	Other Aquifer	300	300	300	300	300	300	Historical Max Use
Trinity	Clay	County-Other	Other Aquifer	72	72	72	72	72	72	Historical Max Use
Red	Clay	Henrietta	Wichita System	600	600	600	600	600	600	Estimated amount from Lake Arrowhead for shortfall of superior run of river right
Red	Clay	Henrietta	Local Supply Little Wichita River	960	960	960	960	960	960	Run of River Right – Little Wichita (difference between right amount and Arrowhead make-up)
Red	Clay	Irrigation (On-Farm)	Other Aquifer	250	250	250	250	250	250	Historical Max Use – Split Between Seymour & Other
Red	Clay	Irrigation (On-Farm)	Seymour	287	287	287	287	287	287	Historical Max Use – Split Between Seymour & Other

Table ES-4: Allocation of Existing Supplies – Region B (continued)

Basin Name	County Name	City Name	Source Name	Existing Supply (af/yr)						Comment
				2000	2010	2020	2030	2040	2050	
Red	Clay	Irrigation (On-Farm)	Kemp	4,754	3,911	3,628	3,346	3,064	2,963	5% Of Available Irrigation Releases
Red	Clay	Livestock	Local Supply	1,757	1,757	1,757	1,757	1,757	1,757	Historical Max Use, Stock Tanks
Red	Clay	Livestock	Seymour	100	100	100	100	100	100	Historical Max Use
Red	Clay	Livestock	Other Aquifer	94	94	94	94	94	94	Historical Max Use
Trinity	Clay	Livestock	Local Supply	225	225	225	225	225	225	Historical Max Use, Stock Tanks
Trinity	Clay	Livestock	Other Aquifer	25	25	25	25	25	25	Historical Max Use
Red	Clay	Mining	Seymour	502	502	502	502	502	502	Historical Max Use
Trinity	Clay	Mining	Other Aquifer	6	6	6	6	6	6	Historical Max Use
Red	Clay	Petrolia	Local Supply	33	26	16	11	9	8	Petrolia City Lake (assume no long-term reliable supply)
Red	Clay	Petrolia	Seymour	70	70	70	70	70	70	Historical Use
Red	Cottle	County-Other	Other Aquifer	405	384	359	339	313	288	Historical Max Use
Red	Cottle	County-Other	Local Supply	15	15	15	15	15	15	Historical Max Use
Red	Cottle	Irrigation (On-Farm)	Blaine	4,525	4,525	4,525	4,525	4,525	4,525	Historical Max Use
Red	Cottle	Irrigation (On-Farm)	Other Aquifer	0	0	0	0	0	0	Historical Max Use
Red	Cottle	Irrigation (On-Farm)	Local Supply	59	59	59	59	59	59	Run of River Rts. 5111 & 5114
Red	Cottle	Livestock	Seymour	47	47	47	47	47	47	Historical Max Use
Red	Cottle	Livestock	Local Supply	429	429	429	429	429	429	Historical Max Use, Stock Tanks
Red	Cottle	Mining	Local Supply	25	25	25	25	25	25	Historical Max Use
Red	Cottle	Paducah	Other Aquifer	442	442	442	442	442	442	Historical Max Use - 10 Years
Red	Foard	County-Other	Greenbelt	68	68	68	68	68	68	1996 RRA Use
Red	Foard	County-Other	Seymour	113	113	113	113	113	113	Historical Max Use
Red	Foard	Crowell	Greenbelt	313	294	275	257	243	230	No Contract Amt, Supply = Demand

Table ES-4: Allocation of Existing Supplies – Region B (continued)

Basin Name	County Name	City Name	Source Name	Existing Supply (af/yr)						Comment
				2000	2010	2020	2030	2040	2050	
Red	Foard	Irrigation (On-Farm)	Seymour	5,200	5,200	5,200	5,200	5,200	5,200	Historical Max Use
Red	Foard	Irrigation (On-Farm)	Blaine	23	23	23	23	23	23	Historical Max Use
Red	Foard	Irrigation (On-Farm)	Seymour	32	32	32	32	32	32	Historical Max Use
Red	Foard	Livestock	Local Supply	291	291	291	291	291	291	Historical Max Use, Stock Tanks
Red	Foard	Mining	Seymour	23	24	24	25	26	27	Historical Max Use
Red	Hardeman	Chillicothe	Greenbelt	61	58	56	56	55	55	Assume Greenbelt Meets 50% Of Demands
Red	Hardeman	Chillicothe	Seymour	80	80	80	80	80	80	Current GW Use
Red	Hardeman	County-Other	Greenbelt	168	168	168	168	168	168	No Contract Amt, Supply = 1996 Use
Red	Hardeman	County-Other	Seymour	116	116	116	116	116	116	Historical Max Use
Red	Hardeman	Irrigation (On-Farm)	Pauline/Groesbeck	145	145	145	145	145	145	Historical Max Use, ROR Groesbeck Creek and Lake Pauline
Red	Hardeman	Irrigation (On-Farm)	Blaine	7,000	7,000	7,000	7,000	7,000	7,000	Historical Max Use
Red	Hardeman	Irrigation (On-Farm)	Seymour	150	150	150	150	150	150	Historical Max Use
Red	Hardeman	Livestock	Local Supply	298	298	298	298	298	298	Historical Max Use, Stock Tanks
Red	Hardeman	Livestock	Seymour	198	198	198	198	198	198	Historical Max Use
Red	Hardeman	Manufacturing	Greenbelt	347	374	398	424	452	480	No Contract Amt, Supply = Demand
Red	Hardeman	Mining	Local Supply	7	7	7	7	7	7	Historical Max Use
Red	Hardeman	Quanah	Greenbelt	614	572	532	514	502	492	No Contract Amt, Supply = Demand
Red	Hardeman	Steam Electric Power	Pauline/Groesbeck	1,655	1,601	1,548	1,494	1,440	1,387	Pauline/Groesbeck Creek Yield Minus Irrigation use
Brazos	King	County-Other	Other Aquifer	4	4	4	4	4	4	Historical Max Use

Table ES-4: Allocation of Existing Supplies – Region B (continued)

Basin Name	County Name	City Name	Source Name	Existing Supply (af/yr)						Comment
				2000	2010	2020	2030	2040	2050	
Red	King	County-Other	Blaine	275	272	270	268	267	266	Historical Max Use
Red	King	Guthrie	Other Aquifer	86	86	86	86	86	86	Historical Max- Supplied By RRA From Dickens Co
Red	King	Irrigation (On-Farm)	Blaine	750	750	750	750	750	750	Historical Max Use
Brazos	King	Livestock	Local Supply	255	255	255	255	255	255	Historical Max Use, Stock Tanks
Brazos	King	Livestock	Other Aquifer	28	28	28	28	28	28	Historical Max Use
Red	King	Livestock	Blaine	49	49	49	49	49	49	Historical Max Use
Red	King	Livestock	Local Supply	439	439	439	439	439	439	Historical Max Use, Stock Tanks
Trinity	Montague	Bowie	Amon G. Carter	2,457	2,420	2,382	2,345	2,307	2,270	Yield Of Reservoir- Sales
Red	Montague	County-Other	Nocona	38	38	38	38	38	38	Historical Max Use
Red	Montague	County-Other	Other Aquifer	416	416	416	416	416	416	Historical Max Use
Red	Montague	County-Other	Trinity	0	0	0	0	0	0	Historical Max Use
Trinity	Montague	County-Other	Other Aquifer	300	300	300	300	300	300	Historical Max Use
Trinity	Montague	County-Other	Amon G. Carter	143	143	143	143	143	143	Historical Max Use
Trinity	Montague	County-Other	Trinity	200	200	200	200	200	200	Historical Max Use
Red	Montague	Irrigation (On-Farm)	Other Aquifer	19	19	19	19	19	19	Historical Max Use
Red	Montague	Irrigation (On-Farm)	Nocona	100	100	100	100	100	100	Water Right 4879
Red	Montague	Irrigation (On-Farm)	Local Supply	100	100	100	100	100	100	Run Of River Rights
Trinity	Montague	Irrigation (On-Farm)	Trinity	179	179	179	179	179	179	Historical Max Use
Trinity	Montague	Irrigation (On-Farm)	Local Supply	133	133	133	133	133	133	Historical Max Use – Surface Water
Red	Montague	Livestock	Other Aquifer	106	106	106	106	106	106	Historical Max Use
Red	Montague	Livestock	Local Supply	951	951	951	951	951	951	Historical Max Use, Stock Tanks

Table ES-4: Allocation of Existing Supplies – Region B (continued)

Basin Name	County Name	City Name	Source Name	Existing Supply (af/yr)						Comment
				2000	2010	2020	2030	2040	2050	
Trinity	Montague	Livestock	Trinity	79	79	79	79	79	79	Historical Max Use
Trinity	Montague	Livestock	Local Supply	714	714	714	714	714	714	Historical Max Use, Stock Tanks
Red	Montague	Manufacturing	Nocona	10	10	12	15	19	24	Historical Max Use/Future Demand
Red	Montague	Mining	Local Supply	313	313	313	313	313	313	Run Of River Right, Hist Max
Red	Montague	Mining	Other Aquifer	310	310	310	310	310	310	Historical Max Use
Trinity	Montague	Mining	Trinity	18	18	18	18	18	18	Historical Max Use
Red	Montague	Montague	Other Aquifer	55	50	45	44	39	38	Historical Max Use
Red	Montague	Nocona	Nocona	1,112	1,112	1,110	1,107	1,103	1,098	Remainder of Water Right
Red	Montague	Saint Jo	Trinity	47	47	47	47	47	47	
Trinity	Montague	Saint Jo	Trinity	139	139	139	139	139	139	Historical Max Use
Red	Wichita	Burkburnett	Seymour	916	916	916	916	916	916	Historical Max- 10 Yrs
Red	Wichita	Burkburnett	Wichita System	2,795	2,795	2,795	2,795	2,795	2,795	Contract
Red	Wichita	County-Other	Wichita System	1,682	1,682	1,682	1,682	1,682	1,682	WSC Contracts In Wichita Co.
Red	Wichita	County-Other	Seymour	851	851	851	851	851	851	Historical Max- 10 Yrs
Red	Wichita	County-Other	N.F. Buffalo Creek	340	340	340	340	340	340	Iowa Park Sales To Wichita Co. WSC
Red	Wichita	Electra	Electra City Lake	440	440	440	440	440	440	Yield Study
Red	Wichita	Electra	Seymour	112	112	112	112	112	112	1998 Study
Red	Wichita	Iowa Park	N.F. Buffalo Creek	500	500	500	500	500	500	Water Right-Minus County Sales
Red	Wichita	Iowa Park	Local Supply	250	250	250	250	250	250	Half - Lake Iowa Park Water Right
Red	Wichita	Iowa Park	Wichita System	2,036	2,036	2,036	2,036	2,036	2,036	Contract, No Expiration Date
Red	Wichita	Irrigation (On-Farm)	Kemp	71,354	67,972	63,686	59,402	55,126	54,109	90% Of Available Irrigation Releases
Red	Wichita	Irrigation (On-Farm)	Seymour	712	712	712	712	712	712	Historical Max Use
Red	Wichita	Irrigation (On-Farm)	Other Aquifer	179	179	179	179	179	179	Historical Max Use

Table ES-4: Allocation of Existing Supplies – Region B (continued)

Basin Name	County Name	City Name	Source Name	Existing Supply (af/yr)						Comment
				2000	2010	2020	2030	2040	2050	
Red	Wichita	Livestock	Seymour	78	78	78	78	78	78	Historical Max Use
Red	Wichita	Livestock	Local Supply	700	700	700	700	700	700	Historical Max Use, Stock Tanks
Red	Wichita	Manufacturing	Wichita System	1,956	2,099	2,225	2,342	2,486	2,598	Demands – Existing Contracts
Red	Wichita	Manufacturing	Seymour	216	216	216	216	216	216	Historical Max Use
Red	Wichita	Mining	Seymour	594	594	594	594	594	594	Historical Max Use
Red	Wichita	Pleasant Valley	Wichita System	101	100	95	93	91	90	No Contract Amount, Supply = Demands
Red	Wichita	Steam Electric Power	Wichita System	360	360	360	360	360	360	Historical Max - 10 Yrs
Red	Wichita	Wichita Falls	Wichita System	28,048	27,791	27,559	27,332	27,077	26,854	Remainder of System Yield[1]
Red	Wilbarger	County-Other	Seymour	676	676	676	676	676	676	1997 Usage, 10-Yr Max = 2,324 (1988)
Red	Wilbarger	County-Other	Electra City Lake	30	30	30	30	30	30	Municipal Sales From Electra to Harrold WSC
Red	Wilbarger	Irrigation (On-Farm)	Seymour	23,989	23,989	23,989	23,989	23,989	23,989	Historical Max Use, Adjusted for Availability Limit
Red	Wilbarger	Livestock	Seymour	180	180	180	180	180	180	Historical Max Use
Red	Wilbarger	Livestock	Local Supply	1,617	1,617	1,617	1,617	1,617	1,617	Historical Max Use, Stock Tanks
Red	Wilbarger	Manufacturing	Seymour	685	685	685	685	685	685	Historical Max Use
Red	Wilbarger	Mining	Seymour	10	10	10	10	10	10	Historical Use
Red	Wilbarger	Mining	Local Supply	30	30	30	30	30	30	Run of River Right - 5127
Red	Wilbarger	Steam Electric Power	Kemp	20,000	20,000	20,000	20,000	20,000	20,000	West Texas Utility Co (Assume Contract Renewed)
Red	Wilbarger	Vernon	Seymour	2,640	2,640	2,640	2,640	2,640	2,640	Long-Term Average-Municipal (recent study)
Brazos	Young	Olney	Wichita System	1,121	1,121	1,121	1,121	1,121	1,121	Water Right
Brazos	Young	Olney	Local Supply	910	910	910	910	910	910	Lakes Olney/Cooper – Reservoir Yield

1. The Wichita System yield was reduced by 2,429 acre-feet per year to account for demands by Sheppard AFB.

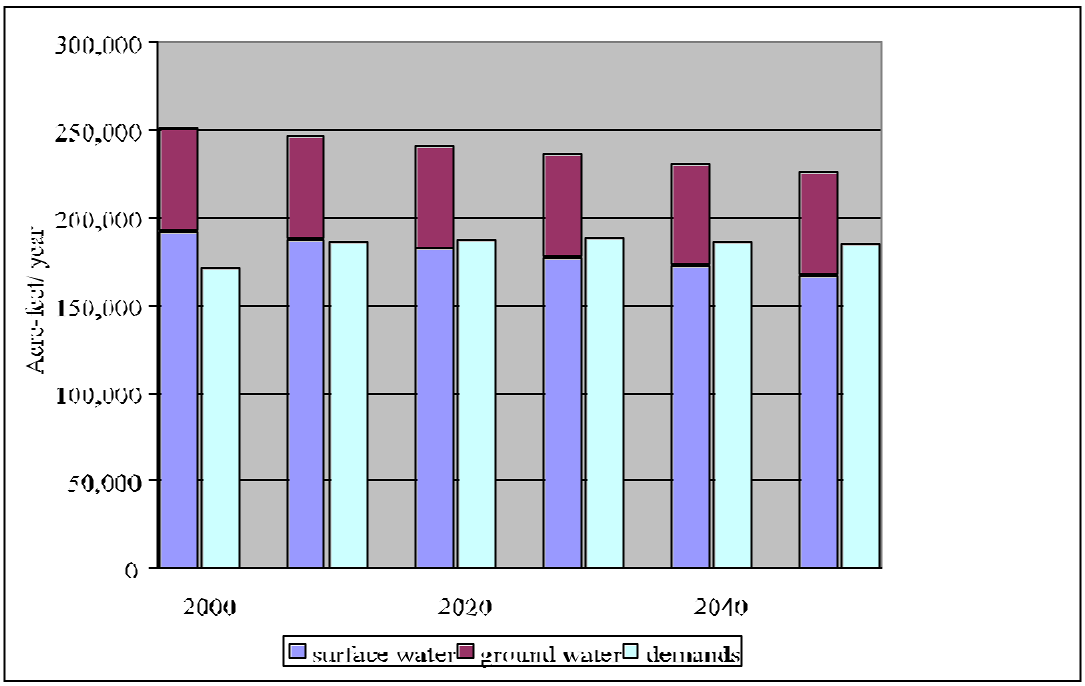
COMPARISON OF SUPPLY AND DEMAND

A comparison of current supply to demand was performed based on the projected regional demands and the allocation of the existing regional supplies. The allocation process did not directly address water quality issues, such as nitrates; however, salinity issues were addressed to some extent by not assigning water supplies with known high salinity levels for municipal use. This included Lake Kemp and most of the Blaine Aquifer.

As a region, there is adequate water supply to meet Region B's needs. A comparison of the total regional supply to demand is shown in Chart ES-1.

CHART ES-1

SUPPLY AND DEMAND FOR REGION B



An implied assumption of the water supply analysis and allocation is that the quality of existing water supplies is acceptable for the listed use. In effect, water supplies that are currently being used are assumed to continue to be available, regardless of quality. However, Senate Bill 1 requires that water quality issues be considered when determining the availability of water during the planning period.

To determine whether the quality of specific sources of supply imposes a potential limitation on their use, the quality of the major sources in Region B was compared to current and proposed primary drinking water standards. Based on records of the Texas Natural Resource Conservation Commission (TNRCC), it was determined that the systems listed in Table ES-5 utilize a water supply which exceeds the nitrate (NO_3) maximum contaminant level (MCL) as set by the TNRCC.

TABLE ES-5
WATER SYSTEMS NOT COMPLIANT WITH
PRIMARY DRINKING WATER QUALITY STANDARDS

Water System	County	Water Source	CURRENT STANDARD
			NO_3
			MCL = 10mg/L
Baylor WSC	Baylor	Seymour Aquifer	X
Seymour	Baylor	Seymour Aquifer	X
Byers	Clay	Seymour Aquifer	X
Charlie WSC	Clay	Seymour Aquifer	X
Thalia WSC	Foard	Seymour Aquifer	X
Burkburnett	Wichita	Seymour Aquifer and Wichita System	X
Friberg-Cooper WSC	Wichita	Seymour Aquifer	X
Electra	Wichita	Seymour Aquifer and Electra Lake	X
Box Community Water System	Wilbarger	Seymour Aquifer	X
Lockett Water System	Wilbarger	Seymour Aquifer	X
Oklaunion WSC	Wilbarger	Seymour Aquifer	X
Hinds-Wildcat System	Wilbarger	Seymour Aquifer	X
Vernon	Wilbarger	Seymour Aquifer	X

The high nitrate levels found in the Seymour Aquifer are believed to be partly attributed to agricultural activities in the area associated with fertilizing crops. Historically the nitrate concentrations range from slightly above the MCL of 10 mg/L to over 25 mg/L.

Another water quality concern in Region B is the high concentration of chlorides in the Wichita River Basin. Previous studies, dating back to 1957, have documented that the salt concentration in the region significantly limits the use of selected water for municipal, industrial, and irrigational purposes. Existing chloride control projects, such as the Truscott Brine Reservoir, are reducing chloride concentrations in the Wichita River Basin, including Lake Kemp and Diversion, but the full impact has not yet been realized.

Completion of the additional chloride control structures should further reduce the salinity levels in Region B and will result in more available water for municipal use and enable irrigators to grow a wider diversity of crops.

In addition to water supply and water quality issues, system limitations were identified for the municipalities within the region. System limitations include water treatment plant capacity, major water transmission pipelines, and associated pumping facilities. The municipalities in Region B generally have sufficient system capacities to treat and transport the available supplies, considering projected peak day demand conditions. The City of Wichita Falls was the only identified city that may not be able to treat sufficient water to meet peak demands for all its treated water customers at the same time.

In evaluating the current surface water supplies in Region B, the analyses were based on the firm yield of the reservoirs, as required by Senate Bill 1. Firm yield analyses determine the amount of water that is available on an annual basis during a repeat of historical drought of record condition, assuming all the water in the reservoir is available for use. This means that the reservoir content will approach zero sometime during the drought period if the firm yield is used. Therefore, in an attempt to provide a more conservative estimate of the available surface water supply within Region B, a safe yield analysis was conducted for the two largest reservoirs, Lake Kickapoo and Lake Arrowhead. Both of these lakes are operated by the City of Wichita Falls and provide a large portion of the municipal supply in Region B.

The safe yield analysis utilizes the same historical hydrology as the firm yield analysis, but assumes that a one-year supply of water is reserved in the reservoir at all times. However, the one-year reserve amount may still be less than the preferred minimum operating content in that the City of Wichita Falls initiates emergency drought measures when the content drops to 30% or 102,750 acre-feet capacity. At this stage, the remaining reserve capacity is estimated to be three years.

Using the existing reservoir operation models, the safe yields for the Wichita System (Lake Kickapoo and Lake Arrowhead) for years 2000 and 2050 were estimated at 41,400 and 36,900 acre-feet per year, respectively. This represents a decrease in annual supply from the firm yield analysis of approximately 18% by 2050.

Though the region as a whole has adequate water supply to meet the regional water demand through the year 2050, there were three water user groups within Region B that were identified with quantity needs.

As shown in Table ES-6, Electra, Vernon, and Wilbarger Manufacturing were identified as user groups requiring additional water supplies throughout the planning period.

TABLE ES-6
IDENTIFIED SUPPLY NEEDS FOR REGION B

WATER USER GROUP	COUNTY	BASIN	2000	2010	2020	2030	2040	2050
Electra	Wichita	Red	-65	-63	-61	-51	-52	-57
Manufacturing	Wilbarger	Red	-55	-164	-219	-286	-402	-521
Vernon	Wilbarger	Red	-272	-167	-137	-147	-105	-91

NOTE: Supply needs are based on firm yield analysis of surface water reservoirs and available supply from existing groundwater well fields.

In addition, based on the safe yield analysis and the comparison of supply and demand, the Wichita System showed a short-term (through 2030) need of 1,905 acre-feet per year and a long-term (through 2050) need of 4,277 acre-feet per year. This assumes that a one-year supply remains in the reservoirs at all times.

Should the City of Wichita Falls desire to maintain greater than a one-year reservoir system reserve and keep reservoir operating levels above the emergency drought condition trigger level of 30% capacity, (102,750 acre-feet) an additional water supply of 15,000 to 20,000 acre-feet per year will be needed through the year 2050.

IDENTIFICATION, EVALUATION, AND SELECTION OF WATER MANAGEMENT STRATEGIES

For each of the identified needs, water supply strategies were developed based on discussions with the water user group and the Regional Water Planning Group - B (RWPG) Technical Advisory Committee. In accordance with the Senate Bill 1 guidance, the potentially feasible strategies were then evaluated with respect to:

- Quantity, reliability and cost,
- Environmental factors,
- Impacts on water resources and other water management strategies,
- Impacts on agriculture and natural resources, and
- Other relevant factors.

The other considerations listed in TAC 357.7(a), such as interbasin transfers and third party impacts due to re-distribution of water rights, were not specifically reviewed because they were not applicable to strategies identified for Region B needs.

Strategies for Region B were developed to provide water of sufficient quantity and quality that is acceptable for its end use. As previously mentioned, water quality is a primary concern for many users in Region B and affects water use options and treatment requirements. For the evaluations of the strategies, it was assumed that the final water product would meet existing state water quality requirements for the specified use. For example, a strategy that provides water for municipal supply would meet existing drinking water standards, while water used for mining may have a lower quality. Strategies that improve water quality of other existing supplies, such as chloride control projects, were also considered.

CITY OF WICHITA FALLS

In consultation with the RWPG Technical Advisory Committee, three sources of additional water supply for the City of Wichita Falls were considered and are listed below:

- Wastewater Reuse - Approximately 11,000 acre-feet per year (10 MGD) of processed and treated effluent could be used for irrigation and industrial purpose or mixed with existing raw water supply at the secondary reservoir.
- Lake Kemp/Diversion - Approximately 25,150 acre-feet per year (23 MGD) of Kemp/Diversion water could be treated at the existing Cypress Water Treatment Plant (WTP) for municipal use.
- Lake Ringgold - Approximately 27,000 acre-feet per year (24.5 MGD) could be made available for municipal use by constructing a new lake near Ringgold.

After evaluating each strategy and in coordination with the City of Wichita Falls, the preferred strategy would be to use a combination of Wastewater Reuse and Water from Lake Kemp/Diversion Reservoirs.

Wastewater Reuse

Currently the City of Wichita Falls operates and maintains a wastewater treatment plant that discharges approximately 14,300 acre-feet per year (13 MGD) of very high quality treated effluent into the Wichita River for use downstream by other entities. This water would be a very reliable source for the City, and could be utilized to decrease the irrigation and industrial demands on the system, and/or increase the municipal water by 11,000 acre-feet per year (10 MGD). To produce 10 MGD of reusable water, this strategy would require advanced treatment at the River Road Wastewater Treatment Plant (RRWWTP) including denitrification, microfiltration, and ultraviolet (UV) disinfection. In addition, a 30-inch pipeline and 10 MGD pump station will be required to convey the water to the secondary reservoir prior to the final water treatment process and storage in an additional reservoir at the Jasper Water Treatment Plant (WTP). A summary of the capital and annual costs are presented below:

Total Capital Project Costs	**$48,700,000**
Total Annual Cost	**$5,615,000**
Available Water Yield (Acre-Feet Per Year)	11,000
Available Water Yield (MGD)	10
Cost of Water Delivered ($ Per Acre-Feet)	**$510**
Cost of Water Delivered ($ Per 1,000 Gallons)	**$1.57**

Water from Lake Kemp/Diversion Reservoirs

The City of Wichita Falls currently has water rights to 25,150 acre-feet of Lakes Kemp/Diversion water for municipal use. However, due to the high salinity content of the water, the City has not utilized it as a municipal water supply. Aside from water quality, this reservoir system would be a very reliable source of water supply in that it is in a different drainage basin than Lake Arrowhead and Lake Kickapoo.

To utilize 11,000 acre-feet per year (10 MGD) of Lakes Kemp/Diversion water, a pump station and approximately 13 miles of 42" transmission line would be required to convey the water from the reservoir system to the Cypress WTP located on the southwest side of Wichita Falls. In addition, Cypress WTP improvements will be required to include microfiltration and reverse osmosis for enhanced treatment of the high salinity water. Facilities will also need to be constructed for reject brine disposal into the Wichita River. A summary of the capital and annual costs is presented below:

Total Capital Project Costs	**$60,560,000**
Total Annual Cost	**$7,346,000**
Available Water Yield (Acre-Feet Per Year)	11,000
Available Water Yield (MGD)	10
Cost of Water Delivered ($ Per Acre-Feet)	**$668**
Cost of Water Delivered ($ Per 1,000 Gallons)	**$2.05**

CITY OF VERNON

In consultation with the RWPG Technical Advisory Committee, three sources of additional water supply for the City of Vernon were considered and are listed below:

- Purchase treated surface water from the City of Wichita Falls,
- Purchase raw surface water from Lake Kickapoo, and
- Purchase groundwater from the City of Altus (Round Timber Ranch) or develop new groundwater well fields.

The selected strategy for the City of Vernon is Groundwater from Round Timber Ranch Well Field and is described below:

Groundwater from Round Timber Ranch Well Field

The City of Altus is considering leasing their right to pump water from the Round Timber Ranch to the City of Vernon. The Round Timber Ranch is located in Wilbarger County, Texas, near the Texas-Oklahoma border. This option would include re-development of 13 existing water wells, new well controls and pumps, and a new pumping station. The water would be pumped from the well field to a new 0.5-MG storage tank. From the tank the water would be pumped approximately 11.5 miles through a new 14-inch transmission line to the Odell-Winston storage tank. The groundwater would then be transported to the City's treatment plant via an existing 21-inch pipeline. Previous water quality data indicate the Round Timber groundwater has nitrate levels at or just below the 10 mg/L limit. It is assumed that water from the Round Timber well field would be combined with the existing Odell-Winston water and treated for nitrates at a similar treat/blend ratio. No additional treatment system will be required. A summary of the capital and annual costs are presented below:

Total Capital Project Costs	**$3,783,000**
Total Annual Costs	**$429,000**
Available Water Yield (Acre-Feet Per Year)	1,100
Available Water Yield (MGD)	1
Cost of Water Delivered ($ Per Acre-Feet)	**$390**
Cost of Water Delivered ($ Per 1,000 Gallons)	**$1.19**

HINDS-WILDCAT WATER SYSTEM

For the Hinds-Wildcat System, it would be cost prohibitive to install an individual nitrate removal system. The smallest size system is approximately 100 gpm, which is more than twice the capacity needed. The only other alternative is a 2.5-mile, 6-inch pipeline from Vernon's treatment plant to the Hinds pump station located north of County Road 925. Vernon would then provide Hinds-Wildcat the same quantity of treated water blend (40 acre-feet per year). A summary of the capital and annual costs are presented below:

Total Capital Project Costs	**$648,000**
Total Annual Costs	**$52,000**
Available Water Yield (Acre-Feet Per Year)	40
Available Water Yield (MGD)	0.036
Cost of Water Delivered ($ Per Acre-Feet)	**$1,300**
Cost of Water Delivered ($ Per 1,000 Gallons)	**$4.00**

LOCKETT WATER SYSTEM

The City of Vernon provides Lockett approximately 2 to 10 acre-feet per year of water via a 4" pipeline. The remainder of Lockett's water supply (approximately 100 acre-feet per year) is from local wells in the Seymour Aquifer. The selected strategy for the Lockett Water System, Nitrate Removal System, is described as follows:

Nitrate Removal System

Lockett would install a small nitrate removal system to treat high nitrate water pumped from its existing well system. Lockett would continue to purchase a small amount of the treated, blended water from Vernon to supplement its peak demands in the summer. It is assumed that a 100 gpm ion exchange treatment plant would be sufficient to treat Lockett's current supply and meet peak flows. The plant would be installed near Lockett's well field and storage tank. The waste stream from the treatment plant would be small, approximately 0.5 gpm. There are no known wastewater treatment plants near the Lockett well field. Therefore, the waste stream would discharge to a 0.25 acre evaporation pond, located near the treatment plant. Based on existing water quality data, a 60 percent treated to 40 percent untreated blend would result in nitrate concentrations below the drinking water standard. A summary of the capital and annual costs are presented below:

Total Capital Project Costs	**$510,000**
Total Annual Costs	**$47,000**
Available Water Yield (Acre-Feet Per Yield)	109
Available Water Yield (MGD)	0.10
Cost of Water Delivered ($ Per Acre-Feet)	**$431**
Cost of Water Delivered ($ Per 1,000 Gallons)	**$1.32**

CITY OF ELECTRA

In consultation with the RWPG Technical Advisory Committee, three sources of additional water supply for the City of Electra were considered and are listed below:

- Redevelop existing capped wells and construct a reverse osmosis (RO) plant at the River Well Field,
- Construct a new raw water pipeline from Lake Diversion and construct an RO plant at the Central Plant, and
- Buy treated water from the City of Wichita Falls.

The selected strategy for the City of Electra is the River Well Fields, as described below:

River Well Fields

The plan initially includes reopening and reworking the capped wells at the existing well field and installing a reverse osmosis (RO) treatment unit at the River Plant. A portion of the high salinity/high nitrate water will be treated with reverse osmosis and the remaining portion will be treated with the current method, sand filtration. Before entering the transmission line, the two treated streams will be blended and transmitted to town via the existing pipeline. The result will be water that is low enough in salts and nitrates to be considered safe for drinking.

In addition to the existing well field to be redeveloped, the well plan includes three different potential well fields - Lalk, Sefcik, and Elliot. The fields range from two miles to six miles away from the existing treatment plant. As demand requires, new wells would be drilled at the other well field sites and water would be piped to the existing treatment plant. A summary of the capital and annual costs are presented below:

Total Capital Project Costs	**$2,357,000**
Total Annual Costs	**$372,000**
Available Water Yield (Acre-Feet Per Year)	617
Available Water Yield (MGD)	0.56
Cost of Water Delivered ($ Per Acre-Feet)	**$604**
Cost of Water Delivered ($ Per 1,000 Gallons)	**$1.85**

REGIONAL WATER TREATMENT PLANT ALTERNATIVE

The feasibility of a regional water treatment plant located at Lake Diversion was given consideration to meet the needs of the City of Wichita Falls, City of Vernon, and the City of Electra. The regional system consists of a raw water intake structure and pump station located at Lake Diversion. Raw water would be pumped to the 16 MGD treatment plant. Treated water from the MF/RO plant would be stored in the clearwell and then pumped via a 42-inch line constructed to Kadane Corner, east of Lake Diversion. At Kadane Corner the 42-inch transmission line would proceed eastward to Wichita Falls existing Cypress Water Treatment Plant. A 24-inch diameter line would also take a portion of the water at Kadane Corner north to Electra, carrying treated water for both Vernon and Electra. At Electra, the line will be reduced to an 18-inch line, which will turn northwestward along Highway 287 to Vernon. The City of Electra will receive treated water at its Central Plant from the 24-inch water line. Two booster stations are needed for the Vernon/Electra line. One will be located approximately halfway between Kadane Corner and Electra on the 24-inch line. The other will be located about halfway between Electra and Vernon. A summary of the capital and annual costs are presented below:

Total Capital Project Costs	**$129,336,000**
Allocate Project Cost of Regional System Based On Pro-Rata Design For Each Entity As Follows:	
City of Wichita Falls	74% of Cost
City of Vernon	9% of Cost
City of Electra	7% of Cost
Allocated Total Capital Project Costs:	
City of Wichita Falls	$95,709,000
City of Vernon	$24,574,000
City of Electra	$9,053,000
Total Annual Cost City of Wichita Falls	**$10,852,000**
Available Water Yield (Acre-Feet Per Year)	14,300
Available Water Yield (MGD)	13
Cost of Water Delivered ($ Per Acre-Feet)	**$759**
Cost of Water Delivered ($ Per 1,000 Gallons)	**$2.33**
Total Annual Cost City of Vernon	**$2,678,000**
Available Water Yield (Acre-Feet Per Year)	2,200
Available Water Yield (MGD)	2
Cost of Water Delivered ($ Per Acre-Feet)	**$1,217**
Cost of Water Delivered ($ Per 1,000 Gallons)	**$3.74**
Total Annual Cost City of Electra	**$1,058,000**
Available Water Yield (Acre-Feet Per Year)	1,100
Available Water Yield (MGD)	1
Cost of Water Delivered ($ Per Acre-Feet)	**$962**
Cost of Water Delivered ($ Per 1,000 Gallons)	**$2.95**

CHLORIDE CONTROL PROJECT

The concentration of dissolved salts, particularly chloride, in some surface waters in Region B limits the use of these waters for municipal, industrial, and agricultural purposes. The Red River Authority of Texas is the local sponsor and has been working in cooperation with the U.S. Army Corps of Engineers (USACE) for a number of years on a project to reduce the chloride concentration of waters in the Red

River Basin. The successful completion of this project would result in an increase in the volume of water available for municipal and industrial purposes in Region B and water would be available for a broader range of agricultural activities. Therefore, the Chloride Control Project (CCP) is included in the Regional Water Plan as one of the feasible strategies for meeting the water supply needed in Region B. The primary strategy for reducing the flow of highly saline waters to the Red River is to impound these flows behind low dams and pump the saline waters to off-channel brine reservoirs where the water evaporates or is disposed of by deep-well injection. During high-flow periods, when the chloride concentration is lower, waters flow over the low flow dams and proceed downstream. A summary of the capital and annual costs are presented below:

Total Capital Project Costs	**$77,500,000**
Total Annual Costs	**$5,989,000**
Available Water Yield (MGD)	32.2
Cost of Water Delivered ($Per Acre-Feet)	**193**
Cost of Water Delivered ($ Per 1,000 Gallons)	**0.59**

RECOMMENDED WATER MANAGEMENT STRATEGIES

Based on a comparison of the total regional water supply to demand, it was determined that there is adequate water supply to meet the needs of Region B as a whole through the year 2050.

However, water supply needs were identified for the City of Wichita Falls, City of Vernon, Hinds-Wildcat and Lockett Water Supply Systems, and the City of Electra. For each of these water user groups various alternatives were analyzed and evaluated as documented in this summary. Though all the strategies may be viable options and should be considered by each entity, the following described alternatives are recommended as the preferred water management strategy for each entity listed below:

- The recommended or preferred strategy for the City of Wichita Falls is Water from Lake Kemp/Diversion Reservoirs treated at the Cypress Water Treatment Plant.
- The recommended or preferred strategy for the City of Vernon is the Round Timber Well Field or equivalent new well field.
- The recommended or preferred strategy for the Hinds-Wildcat System is to install a pipeline from Vernon to the existing Hinds pump station.
- The recommended or preferred strategy for the Lockett System is to construct a Nitrate Removal System.
- The recommended or preferred strategy for the City of Electra is to develop the River Well Fields.
- In addition, the Chloride Control Project is recommended as a regional water supply management strategy.

SUMMARY OF REGIONAL RECOMMENDATIONS

In accordance with 31 TAC 357.7 (a)(9), 31 TAC 357.8, and 31 TAC 357.9, the following recommendations are proposed to facilitate the orderly development, management, and conservation of the water resources available within Region B:

- It is recommended that the Chloride Control Project on the Wichita River be made a regional priority in order to enhance the water quality of Lake Kemp and Lake Diversion, and reclaim those lakes as a viable cost effective short term and long term regional water supply source.
- It is recommended that Region B participate in the state study on brush management and water yields to be conducted on the Wichita River watershed upstream of Lake Kemp. Pending the results of that study, it may be beneficial for the region to adopt selected brush control programs as a water management strategy. In addition, should brush management programs be implemented in the future, it is recommended that the State provide adequate funding of the programs.
- Region B recommends that no segments be designated as "Unique Stream/River Segments" or "Unique Reservoir Sites" at this time. Pending the results of comprehensive studies and clarification by the Legislature of the significance and impacts of designation, the Regional Water Planning Group may consider designations within the region in the future.
- It is recommended that Region B encourage the regulatory agencies to consider allowing continued long-term use of bottled water programs, and/or providing a waiver for small user groups that can demonstrate they have no reasonable cost-effective means to comply with the current MCL of 10 mg/L.
- It is recommended that Region B support and seek adequate state funding to develop, implement, and evaluate the necessary management strategies adopted as part of this regional plan. This includes strategies identified to meet a specific need as well as general strategies to increase water supply in the region.
- It is recommended that Region B support the grass-roots regional water planning process enacted by SB1 and strongly encourages the process be continued with adequate state funding for all planning efforts including administrative activities, data collection, and Groundwater Availability Modeling (GAM).
- It recommended that Region B support State funding for agricultural water use data collection and agricultural water use management/conservation projects.
- Senate Bill 1 requires future projects to be consistent with the approved regional water plan to be eligible for TWDB funding and TNRCC permitting. It is recommended that surface water uses that will not have a significant impact on the region's water supply and water supply projects that do not involve the development of or connection to a new water source should be deemed consistent with the regional water plan even though not specifically recommended in the plan.

DESCRIPTION OF REGION
TEXAS STATE SENATE BILL 1
REGION B

1.1 Region B Overview

Senate Bill 1 of the 75th Texas Legislature was passed in 1997 to set the process of developing a comprehensive state water plan. To accomplish this task, the state was divided into 16 regional water planning groups. This report describes Region B as designated by Senate Bill 1. Region B is comprised of ten entire counties and a portion of one county in north central Texas. Specifically, those counties are Archer, Baylor, Clay, Cottle, Foard, Hardeman, King, Montague, Wichita, Wilbarger, and the City of Olney in Young County. Figure 1 shows the region, cities, towns, and the counties it encompasses.

Region B lies mainly in the Red River Basin, however, southern portions of Archer and Clay Counties lie in the Trinity River Basin, and southern portions of Archer, Baylor, and King Counties lie in the Brazos River Basin, as shown on the Surface Water Map in Figure 2.

In 1996, the total population of the region was reported to be 201,984, with the largest population center, the City of Wichita Falls, being 100,501 or 50 percent of the total. The second largest city was Vernon with a population of 12,481.

1.2 Population And Demographic Data

In general, most of the population is concentrated in eastern portions of the region with over one-half located in and around Wichita Falls[1]. The January 1, 1998 estimated population density of the region ranged from a high of 200 persons per square mile (Wichita County) to a low of less than one person per square mile (King County). Regional population is forecasted to increase by 10 percent over the study period. The forecasts of projected populations will be examined in more detail in Chapter 2 of this report. Table 1-1 shows the 1990 census population by county and the corresponding estimated population in 1998. Tables 1-2 through 1-5 give a more in-depth breakdown of the regional demographics.

Superscript denotes reference as shown in List of References

Table 1-1: County Populations[2,3]

County	Area (sq. mi)	1990 Population	Est. 1998 Population	% Change	Density people/sq.mi.
Archer	910	7,973	8,688	9.0%	10
Baylor	871	4,385	4,326	-1.3%	5
Clay	1,098	10,024	10,872	8.5%	10
Cottle	901	2,247	2,106	-6.3%	2
Foard	707	1,794	1,852	3.2%	3
Hardeman	695	5,283	5,006	-5.2%	7
King	912	354	335	-5.4%	< 1
Montague	931	17,274	18,191	5.3%	20
Wichita	628	122,378	127,975	4.6%	204
Wilbarger	971	15,121	15,349	1.5%	16
Average	862	18,683	19,470	1.4%	31

Note: The City of Olney is not included in this table.

The following tables describe the demography of the region as of the 1990 census.

Table 1-2: 1990 Demographics – Breakdown by Race[3]

	Percentage Of Population That Is…				
County	White	Black	Hispanic	Native	Asian
Archer	97.7%	0.1%	2.4%	0.5%	0.1%
Baylor	90.4%	4.0%	7.6%	0.2%	0.3%
Clay	97.3%	0.3%	2.4%	0.9%	0.2%
Cottle	82.5%	8.9%	16.3%	0.2%	0.2%
Foard	86.5%	4.9%	13.0%	0.6%	0.2%
Hardeman	83.8%	6.1%	11.1%	0.5%	0.3%
King	89.5%	0.0%	15.0%	0.0%	0.0%
Montague	97.5%	0.0%	3.2%	0.4%	0.1%
Wichita	83.7%	9.2%	8.6%	6.4%	1.5%
Wilbarger	79.4%	8.9%	14.5%	0.5%	0.5%
Young	93.9%	1.5%	6.4%	0.3%	0.3%
Average	89.3%	4.0%	9.1%	1.0%	0.3%

Table 1-3: 1990 Demographics – Breakdown by Age[3]

County	Percentage Of Population That Is Age…									
	<5 yrs.	5-17	18-20	21-24	25-34	35-44	45-54	55-64	65-74	75> yrs.
Archer	7.1%	20.8%	3.7%	3.7%	15.1%	14.1%	11.3%	10.1%	8.1%	5.9%
Baylor	6.3%	16.0%	2.9%	3.8%	11.4%	12.0%	10.3%	11.2%	12.7%	13.3%
Clay	6.3%	20.0%	3.1%	3.3%	14.0%	13.3%	11.9%	11.0%	9.1%	7.9%
Cottle	5.9%	19.8%	2.7%	2.9%	11.7%	11.2%	10.0%	11.6%	12.7%	11.5%
Foard	6.2%	17.7%	3.2%	4.0%	12.2%	11.4%	9.8%	10.2%	11.5%	13.8%
Hardeman	6.8%	19.3%	3.3%	3.7%	11.9%	11.5%	10.1%	10.3%	11.3%	11.8%
King	6.8%	24.0%	2.8%	4.5%	16.7%	17.5%	12.1%	9.3%	5.4%	0.8%
Montague	6.5%	18.1%	3.3%	3.8%	12.6%	12.1%	10.6%	10.9%	11.3%	10.7%
Wichita	7.6%	18.5%	6.1%	6.1%	17.3%	13.2%	9.3%	8.9%	7.1%	5.7%
Wilbarger	7.2%	19.2%	4.4%	4.5%	14.5%	12.7%	9.7%	9.2%	9.2%	9.6%
Young	7.2%	19.4%	3.2%	3.6%	14.6%	13.3%	10.0%	10.4%	9.1%	9.2%
Average	6.7%	19.3%	3.5%	4.0%	13.8%	12.9%	10.5%	10.3%	9.8%	9.1%

Table 1-4: 1990 Demographics – Breakdown by Income and Education[3]

County	Median Family Income	Percentage Of Population That…		
		Has High School Diploma or Better	Has Bachelor's Degree or Better	Has a Family Income Below Poverty Level
Archer	$ 29,617.00	72.2%	12.3%	8.9%
Baylor	$ 25,747.00	63.6%	10.3%	16.3%
Clay	$ 27,901.00	68.9%	11.1%	9.1%
Cottle	$ 21,799.00	51.8%	10.7%	22.1%
Foard	$ 22,105.00	62.2%	11.2%	15.7%
Hardeman	$ 24,705.00	62.8%	11.0%	14.8%
King	$ 29,000.00	78.2%	24.5%	7.4%
Montague	$ 22,948.00	63.6%	10.2%	15.1%
Wichita	$ 28,799.00	75.1%	16.5%	12.5%
Wilbarger	$ 25,603.00	62.9%	12.7%	15.5%
Young	$ 26,563.00	60.7%	11.2%	11.9%
Average	$ 25,889.73	65.6%	12.9%	13.6%

Table 1-5: 1990 Demographics – Breakdown by Occupation[3]

County	Percentage of Population That Works In…						
	Agriculture	Manufacturing	Trade	Finance	Health	Public	Unemployed
Archer	11.7%	9.2%	20.5%	4.8%	7.6%	4.2%	4.0%
Baylor	11.6%	7.8%	23.5%	5.0%	10.0%	3.9%	6.0%
Clay	9.9%	13.0%	19.4%	4.5%	9.0%	4.6%	5.0%
Cottle	26.1%	1.2%	15.8%	3.4%	6.2%	6.0%	5.9%
Foard	21.3%	8.3%	10.4%	4.6%	11.9%	6.6%	5.3%
Hardeman	15.9%	12.5%	20.3%	4.1%	10.8%	1.9%	8.8%
King	41.1%	0.0%	12.5%	2.1%	0.0%	7.3%	2.0%
Montague	5.5%	19.9%	19.9%	3.4%	7.7%	4.0%	5.6%
Wichita	1.6%	15.2%	23.1%	5.3%	11.6%	5.1%	7.1%
Wilbarger	9.1%	11.9%	16.8%	3.6%	20.4%	2.5%	5.3%
Young	6.4%	13.8%	18.5%	4.4%	8.1%	3.5%	5.9%
Average	14.6%	10.3%	18.2%	4.1%	9.4%	4.5%	5.5%

1.3 Water Use Demand Centers

The City of Wichita Falls is the largest demand center in the region. Other minor demand centers include Seymour, Henrietta, Quanah, Bowie, Nocona, Burkburnett, Electra, Iowa Park, Vernon, Olney, and Archer City. Table 1-6 below shows the population of these demand centers.

Table 1-6: Regional Demand Centers[5]

County	City	1996 Population	1996 Municipal Water Use (Ac-Ft)
Archer	Archer City	1,938	351
Baylor	Seymour	3,059	694
Clay	Henrietta	3,038	642
Hardeman	Quanah	3,300	720
Montague	Bowie	5,389	1,092
	Nocona	3,146	514
Wichita	Burkburnett	11,154	1,443
	Electra	3,397	557
	Iowa Park	6,941	1,192
	Wichita Falls	100,501	21,650
Wilbarger	Vernon	12,481	2,377
Young	Olney	3,365	719

While the population of Region B is only expected to reach near 220,000 by 2050, the Dallas-Fort Worth Metroplex, located just east of the region, is expected to top 8 million[1]. The Texas Parks and Wildlife Department believes that it is this population that will impose increasing pressures on the water-based recreation and natural resources of the region.

> "As the recreational demands of the Metroplex population grow, the water-based recreational resources of the study area will become more valuable to the people of the region. If the region's water resources are conserved and appropriately managed, the economic value of water-based recreational resources will greatly exceed present value and have the potential to become a major component of the study area's economy"
>
> -Daniel W. Moulton and Alison Baird,
> Texas Parks and Wildlife Department

As this enormous population center grows, the number of people willing to travel into Region B for recreational purposes will undoubtedly increase as well.

1.4 Water Supply and Use

Water providers have continuously strived to develop the water resources in Region B so that they can deliver potable water to the people, irrigation water to the farmers and ranchers, and water to promote industrial and economic growth. In 1910, the dam at Lake Wichita in Wichita County was completed, signifying the beginning of 90 years of water management for recreation, irrigation, and human consumption for north central Texas. In 1924, the dam at Lake Kemp was completed, making it one of the largest man-made lakes in the world[4]. The lake was originally designed for flood prevention and water supply, however, soon after construction, it was determined that its water was too saline to drink. This led to the discovery of natural salt-water springs in Foard, King, and Knox Counties which have caused the water in the Big Wichita and Pease Rivers to be very difficult to treat for human consumption, consequently it is only used for irrigation and steam electric power purposes today. This natural phenomenon has prompted the Red River Authority to initiate the Red River Chloride Control Project on the Big Wichita River. By building brine lakes and low-flow dams, the amount of dissolved solids and chlorides in the water has been reduced. As a result, water from Lake Kemp may be utilized for other uses. There are 10 significant lakes and 4 major streams that are used for water supply in the region.

Figure 2 - "Surface Water Map" shows the location of the major surface water sources in Region B. Charts 1-1, 1-2, 1-3, and 1-4 depict the annual stream flows at various USGS gauging stations which are shown on Figure 2. (NOTE: The number beside each chart represents the USGS gauging station shown on Figure 2.)

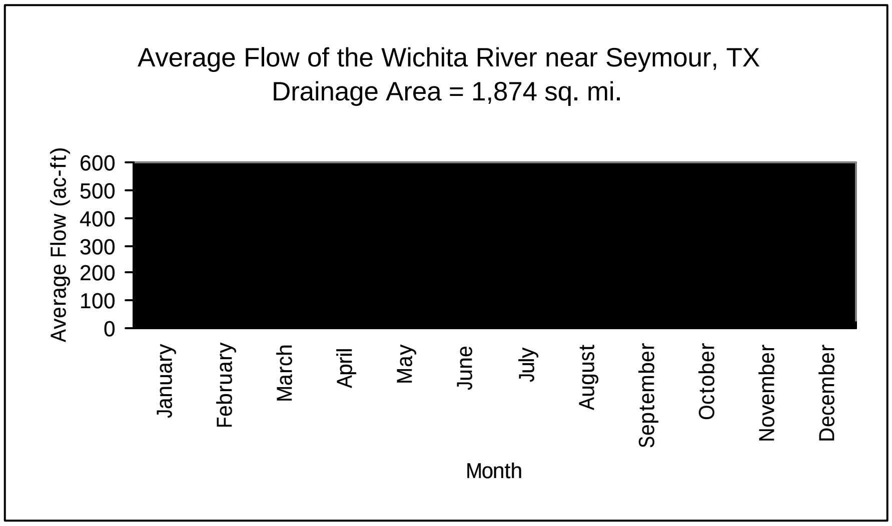
Table 1-7 shows the annual firm yield that a lake or reservoir can produce in a year, for each significant lake in Region B.

Table 1-7: Firm Yields for Lakes in Region B

Water Source	County	Lake Firm Yield (ac-ft)	Conservation Capacity (ac-ft)
Amon Carter Lake	Montague	2,600	20,050
Lake Arrowhead	Clay	29,532	262,100
Lake Diversion	Archer/Baylor	1,100	40,000
Lake Electra	Wichita	600	8,050
Lake Kemp	Baylor	116,000	319,600
Lake Kickapoo	Archer/Baylor	16,072	106,000
Lake Nocona	Montague	*1,260	*22,398
Millers Creek Reservoir	Baylor	n/a	30,700
Olney Lake	Young	1,260	n/a
Santa Rosa Lake	Wilbarger	n/a	11,570

Sources: Texas Natural Resource Conservation Commission
1999 Texas Almanac
*1986 Freese and Nichols, Inc. Report

In addition to the lakes listed in the previous table, some municipalities and water supply corporations obtain their raw water from wells and springs. As of 1980, however, many of the wells and springs have ceased to flow, due mainly to over-pumping of the area's groundwater.



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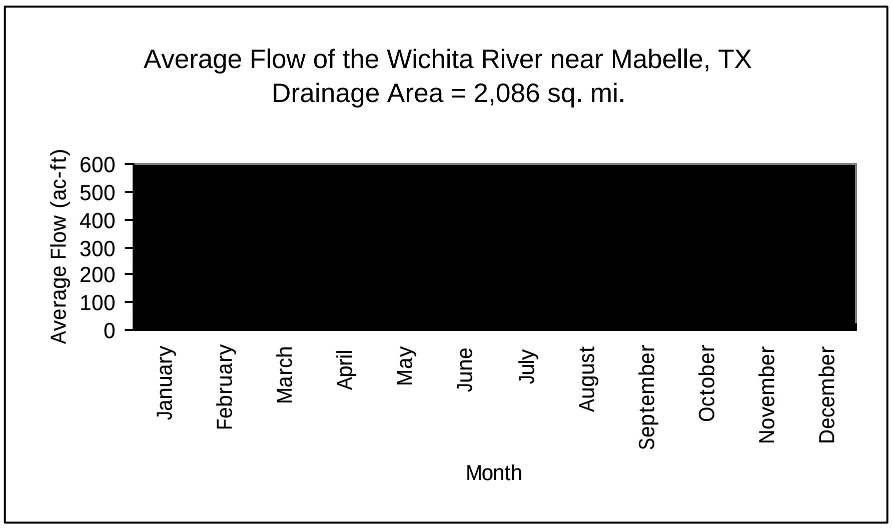

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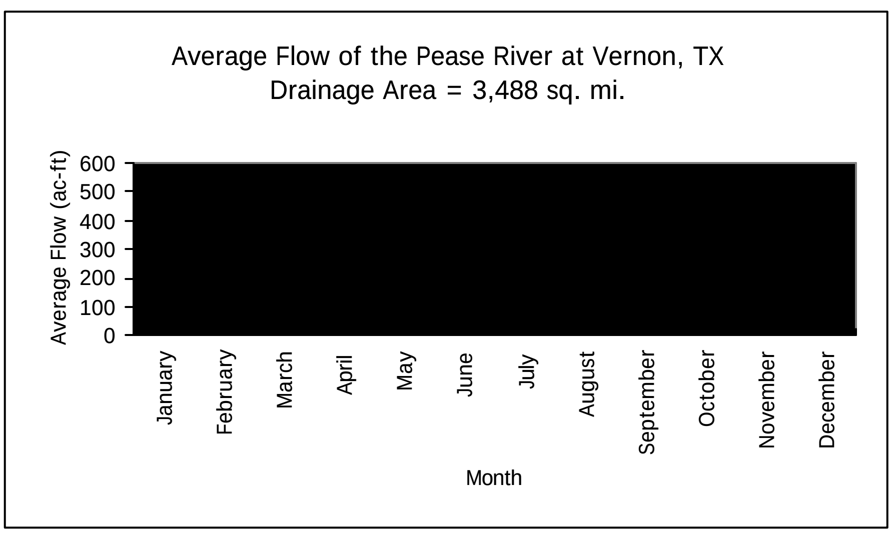

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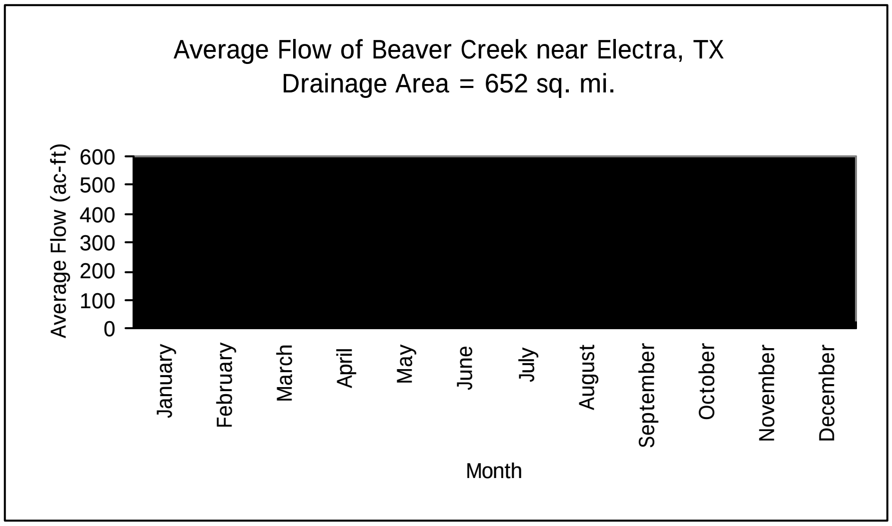
Chart 1-1
Average Stream Flow



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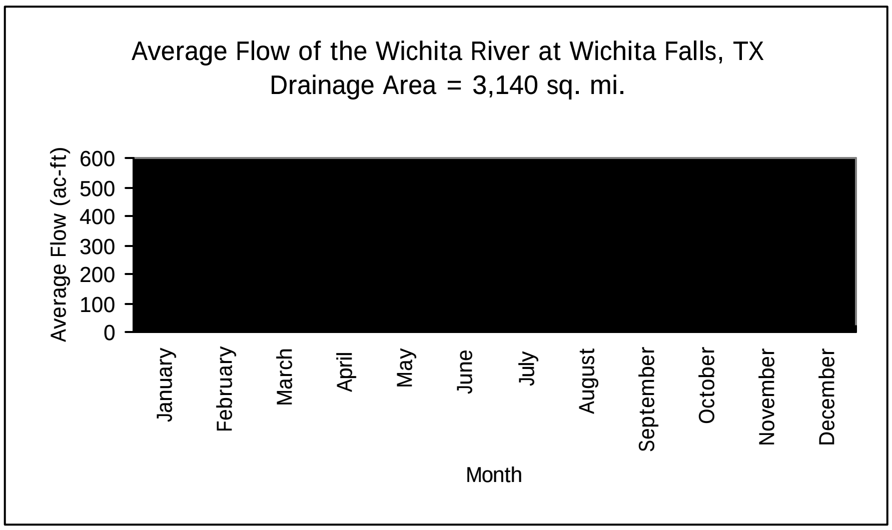

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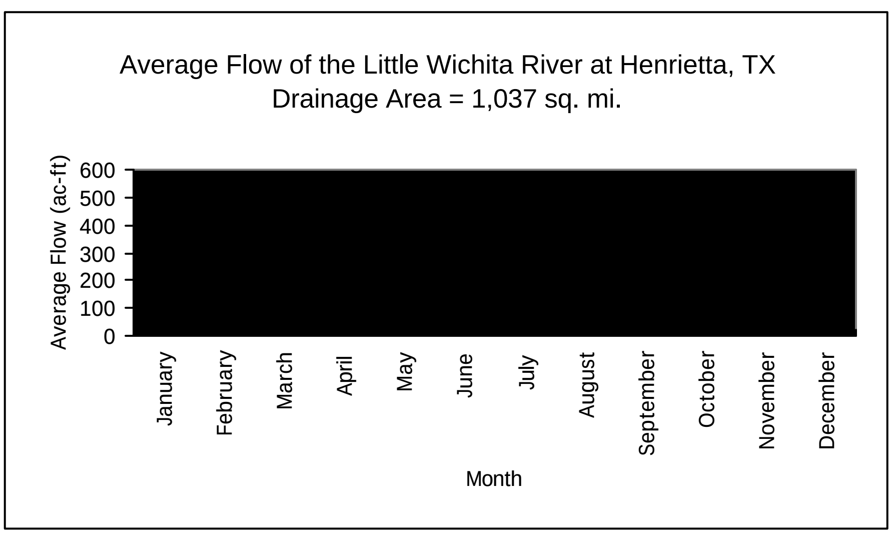

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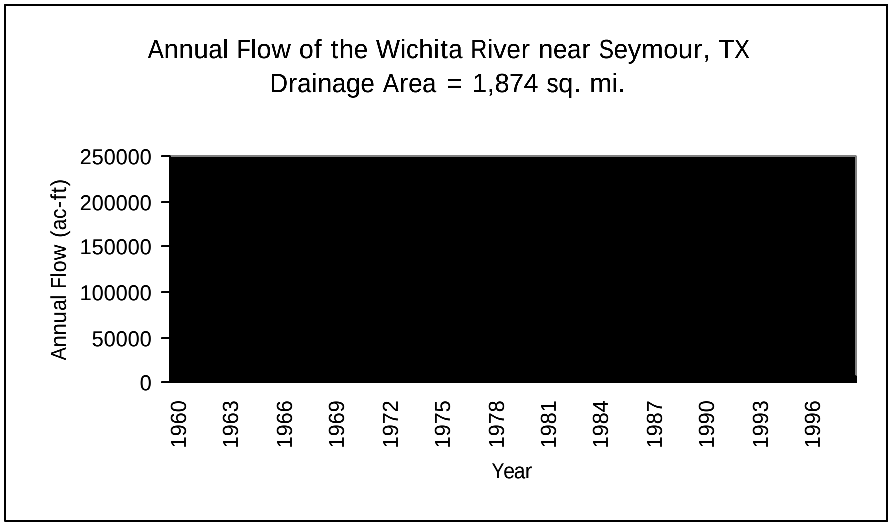
Chart 1-2
Average Stream Flow



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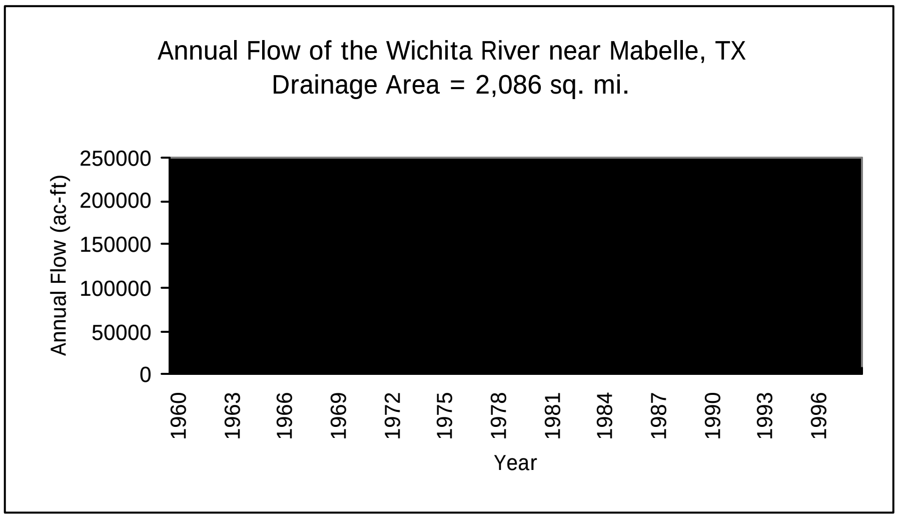

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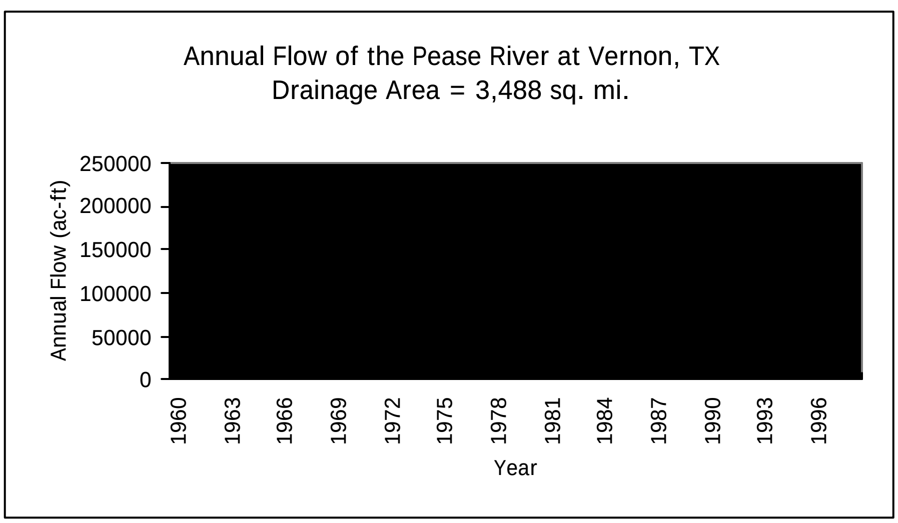
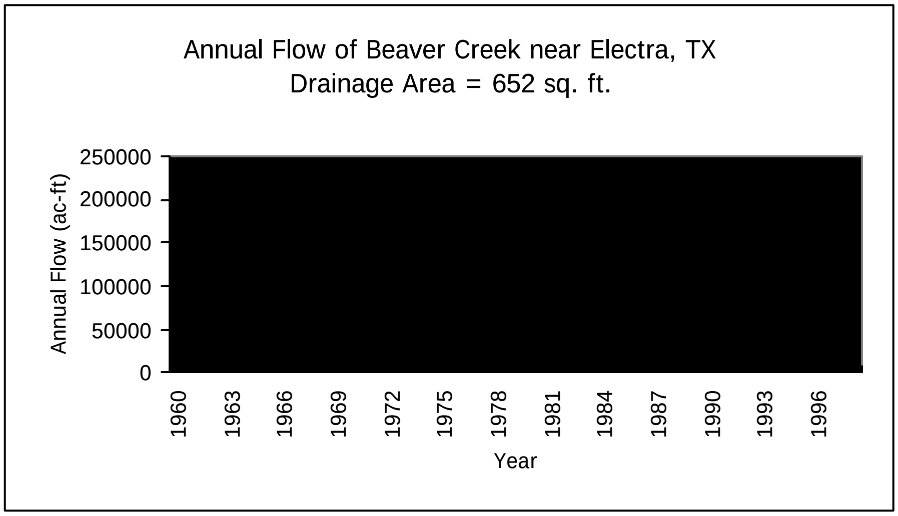


3

Chart 1-3
Annual Stream Flow

NOTE: Data obtained from the USGS was incomplete for Gauging Sta. 1 & 3.



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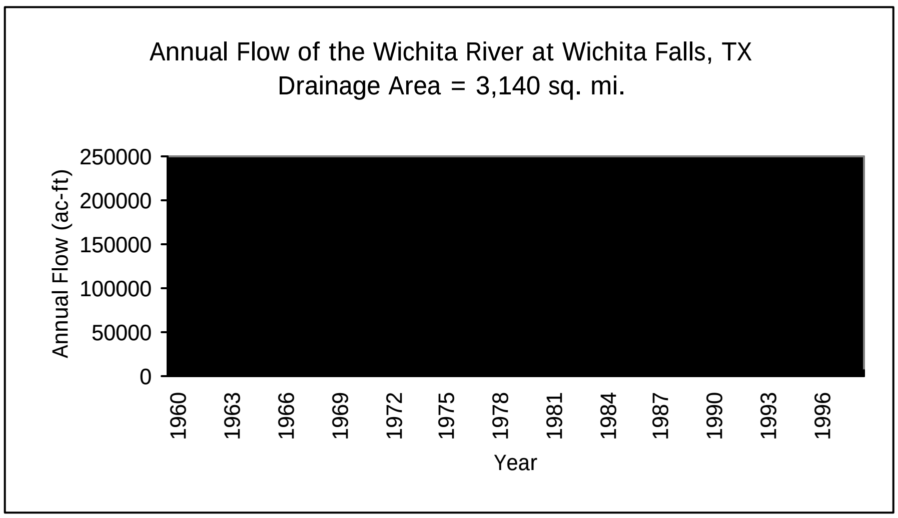

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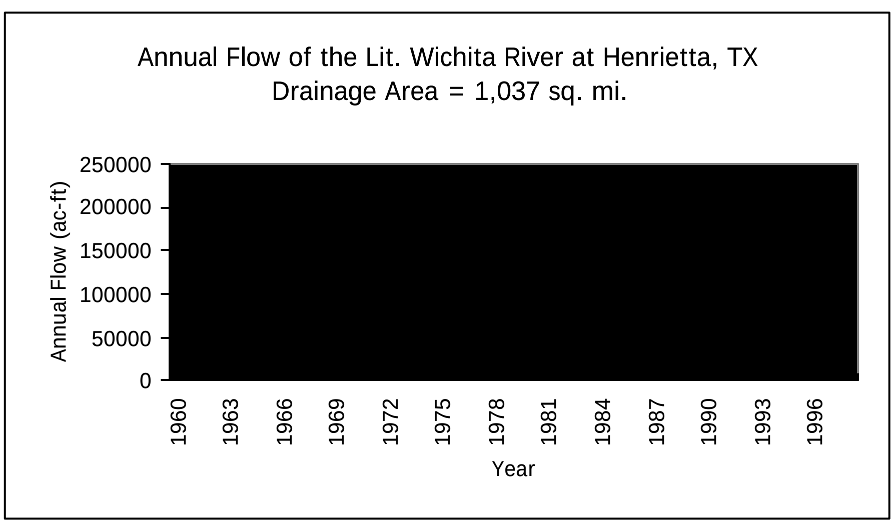

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Chart 1 - 4
Annual Stream Flow

There are two major aquifers (Seymour & Trinity) and one minor aquifer (Blaine) in Region B. The Seymour Aquifer, found mainly in the western portions of the region, provided 151,765 acre-feet of water to the area in 1994. According to the Texas Water Development Board, 93 percent of this supply was used for irrigation purposes and most of the remaining supply was pumped for municipal use by the cities of Vernon, Burkburnett, Electra, and Seymour.

Extreme northern reaches of one of the state's most expansive aquifers, the Trinity Aquifer, lie in western and southern Montague County, the easternmost county in Region B. Water from this area of the aquifer is used mainly for irrigation purposes; due to its relatively low well yield. Figure 3 shows the location of the major aquifers within Region B.

Figure 4 shows the location of the only minor aquifer in Region B, known as the Blaine Aquifer. The Blaine Aquifer is found only in Cottle, Foard, Hardeman, and King counties of Region B, and nearly 98 percent of the water pumped from this aquifer is used for agricultural purposes.[5] The water pumped from this aquifer is highly contaminated with dissolved solids from natural halite dissolution. In addition to the natural contamination, significant pollutants are also present in the aquifer as a direct result of oil and gas production.

Region B boast nearly 150 natural springs and seeps across the area.[10] While some continue to produce water today, many of these springs have dried up over time due to over-pumping of the groundwater for municipal, agriculture, industrial, and mining use. While it is important to note that the use of springs for water supply is not common across the region, due to excessive amounts of chlorides and dissolved solids, there exists several springs that are still utilized for domestic agricultural, and mining supply. In addition, the smaller producing springs feed natural ponds and creeks that are habitat for many plants and animals. It should be recognized that any future development of underground sources of water, as well as the overuse of existing surface water supplies, may cause a widespread decline in the viability of existing springs. On the other hand, the creation of new surface water supplies such as lakes, ponds, canals, etc., will serve to replenish the underground water supply, rejuvenate existing or extinct springs, and possibly create new springs and seeps.

Agriculture is the main component of regional water use, accounting for 67 percent of all water used. Irrigation water is currently provided from Lakes Kemp and Diversion in unlined canals by the Wichita County Water Improvement District, the major irrigation provider in the region. A significant amount of irrigation is also provided from groundwater. Irrigation use in the region is expected to decline to 56 percent throughout the study period as more efficient pumping and irrigation techniques and equipment are being implemented across the region. Municipal use is expected to remain relatively constant due to conservation, while commercial and industrial use is expected to increase by nearly 260 percent. This significant increase is due to a proposed power generation plant in Archer County. The overall increase in water use in the region is projected to be about 10 percent throughout the study period. Figure 5 shows the actual water use by category for Region B in 1990 and 1996 as published by the Texas Water Development Board[5]. The 2050 projections are taken from Chapter 2 of this report.

Figure 5

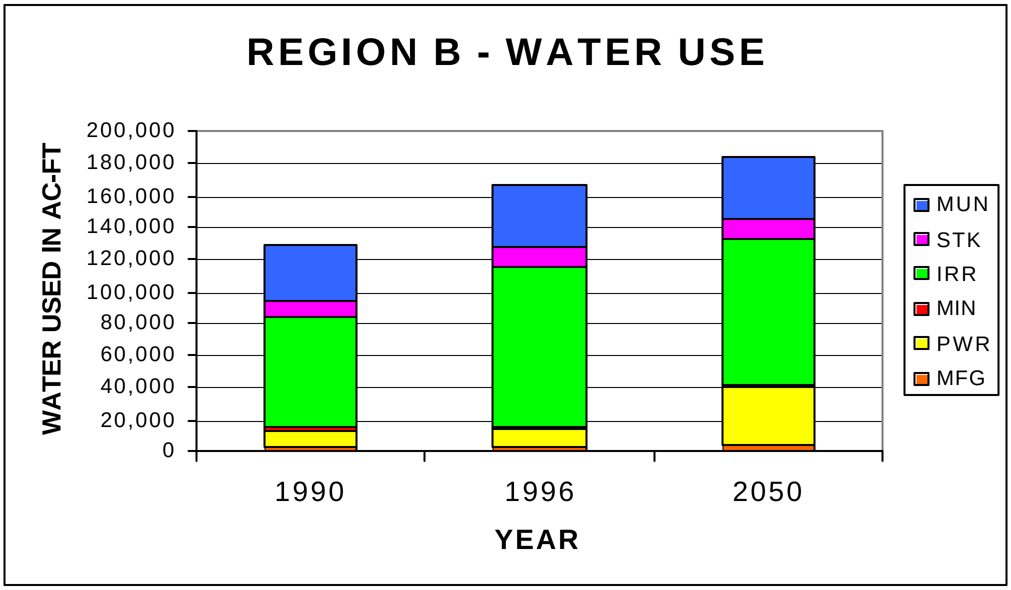


Table 1-8 shows the water rights holders of Region B and their permitted and actual usage.

Table 1-8: Water Rights Holders and Their Usage[5]

Rights Holder	Water Supply	Permitted Use (ac-ft)	Reported Use		
			1994	1995	1996
A.L. Rhodes	Little Wichita River	3,600	0	0	0
City of Bowie	Amon G. Carter	5,000	1,199	0	1,234
Peba Oil & Gas Co.	Red River	1,600	0	0	0
N. Montague Co. MWA	L. Nocona	1,260	597	563	599
Red River Authority	Truscott Brine Res.	3,050	0	0	0
Red River Authority	South Wichita River	8,780	4,838	5,489	5,104
Lonnie D. Allsup	Trib. Of Wichita River	2,150	360	360	360
City of Wichita Falls	Holliday Creek	7,950	0	0	0
Wichita County WID #2	Ls. Kemp & Diversion	193,000	60,572	50,490	35,720
W.T. Waggoner Estate	Ls. Santa Rosa & Wharton	3,070	324	353	314
City of Electra	L. Electra	1,400	693	307	440
City of Wichita Falls	L. Kickapoo	40,000	13,806	12,518	14,498
City of Olney	Ls. Olney & Cooper	1,260	649	604	0
City of Wichita Falls	L. Arrowhead	45,000	12,604	12,931	14,242
City of Wichita Falls	Little Wichita River	2,350	3,535	3,585	3,898
City of Henrietta	Little Wichita River	1,550	470	0	679
W. Tex. Utilities Co.	L. Pauline	7,140	3	0	4

A more detailed analysis of water use and water use projections is presented in Chapters 2 and 3 of this report.

1.5 Climate Data

The best way to describe the weather of Region B is volatile. It has the ability to change from one extreme to another in a short period of time. Annual precipitation can also vary greatly from year to year. The average annual rainfall for the region is 27.4 inches; however, the extremes range from 47 inches in 1919 to 12 inches in 1896[6]. Table 1-9 shows monthly averages and records for the Wichita Falls area and Table 1-10 lists temperatures and rainfall for each county in the region.

Table 1-9: Monthly Averages and Records for Wichita Falls[6]

Monthly Avg's	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
High Temp.	52	57	66	76	83	92	97	96	87	77	64	55
Low Temp.	28	32	41	50	59	68	73	71	64	52	41	31
Dewpoint	28	31	37	47	58	64	65	64	60	50	38	30
Precipitation	1.04	1.46	2.21	3.01	4.07	3.52	1.72	2.48	3.82	2.74	1.54	1.29
Snowfall	2.0	1.9	0.9	Tr.	0.0	0.0	0.0	0.0	0.0	Tr.	0.3	1.1
Wind Speed	11.2	12.1	13.4	13.1	12.1	12.1	11.2	10.4	10.5	10.7	11.4	11.2
Monthly Rec's	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
High Temp.	87	93	100	102	107	117	114	113	108	102	89	88
Low Temp.	-12	-8	6	24	36	50	54	53	38	21	14	-7
Precipitation	4.48	6.80	5.38	8.50	13.22	9.63	11.86	11.05	10.23	11.77	7.34	6.12

Table 1-10: Temperature Extremes and Average Rainfall[6]

	Temperature (of)		Annual
	Jan. Mean Min.	July Mean Max.	Rainfall (in)
Archer	29	98	29.3
Baylor	26	97	27.3
Clay	26	97	31.9
Cottle	25	96	22.3
Young	26	96	30.6
Foard	24	97	23.9
Hardeman	23	97	24.5
King	24	98	23.8
Montague	31	96	32.9
Wichita	28	97	28.9
Wilbarger	25	97	25.7

The region is obviously drier in the western areas and has more rainfall in eastern and southern counties.

Since 1930, the entire state has experienced 7 major droughts. Two of these droughts have occurred in the past 3 years, in 1996 and 1998. It has been predicted that between 15 and 30 percent of Texas farmers will quit the business this year due to recent droughts[7]. This fact is particularly significant for Region B since agriculture is a major contributor to the economy of the region.

1.6 Economic Aspects of Region B

The 3 main components of the region's economy are farming, ranching, and mineral production. As Table 1-11 shows, the market value of all agricultural products sold in the region is substantial, and the availability of water has a direct impact on this industry.

Table 1-11: Market Value of All Agricultural Products Sold

County	Value	Percent
Archer	$ 63,394,000	21%
Baylor	$ 38,007,000	13%
Clay	$ 37,592,000	13%
Cottle	$ 14,753,000	5%
Foard	$ 11,108,000	4%
Hardeman	$ 15,887,000	5%
King	$ 6,598,000	2%
Montague	$ 29,559,000	10%
Wichita	$ 21,861,000	8%
Wilbarger	$ 33,237,000	11%
Young	$ 23,193,000	8%
Total	$ 295,189,000	100%

The Texas Railroad Commission reports that Region B has over 33,000 producing oil wells and over 600 gas wells. Table 1-12 provides a tabulation by county of the current oil and gas wells.

Table 1-12: Number of Oil and Gas Wells[8,9]

County	Oil Wells	Gas Wells
Archer	6,949	4
Baylor	472	1
Clay	2,319	81
Cottle	52	47
Foard	172	34
Hardeman	303	0
King	995	38
Montague	2,749	48
Wichita	11,820	4
Wilbarger	2,301	2
Young	5,058	379
Total	33,190	638

The service infrastructure is also strong. Some of the services offered throughout Region B include agribusiness, oilfield service, grain, fiber, and food processing. Wichita County, the most populous county in the region, is the retail trade center for a large area. Sheppard Air Force Base and medical services also are big contributors to the economy of Wichita County. The region boasts a variety of manufacturing. Some areas of manufacturing include oilfield equipment, clothing, building products, plastics, electronics, wood products, and aircraft equipment. Table 1-13 depicts the payrolls of each county in 1996.

Table 1-13: 1996 County Payrolls

County	Annual Payroll ($1,000)
Archer	$13,109
Baylor	13,211
Clay	17,721
Cottle	7,302
Foard	4,339
Hardeman	19,122
King	N/A
Montague	54,686
Wichita	960,436
Wilbarger	83,542
Young	105,266

1.7 Land Use

Region B includes some of the largest ranches in the state, including the Waggoner Ranch in Wilbarger County and the Four Sixes Ranch in King County. It has over 1 million acres of croplands and over 3 million acres of open range. Table 1-14 shows land use percentages for each county in the region (data for King County was unavailable). Percentages under the heading of "Conservation" represent lands that had previously been croplands, but have been converted to the Conservation Reserve Program. The Conservation Reserve Program, or CRP, subsidizes farmers and landowners to convert highly erodible farmland to permanent grassland for a period of ten years[1].

Table 1-14: Percentage of Land Use by County[1]

County	Crops	Federal	Conservation	Pasture	Range	Urban	Water	Transportation	Total
Archer	16.2%	<0.1%	1.0%	1.6%	77.0%	0.9%	2.2%	1.1%	592.7
Baylor	29.0%	-	1.6%	1.7%	61.2%	0.7%	4.9%	0.8%	576.5
Clay	19.3%	-	0.6%	6.1%	67.9%	1.6%	3.1%	1.5%	708.6
Cottle	14.7%	-	12.7%	0.9%	65.3%	0.3%	2.1%	0.6%	578.6
Foard	21.2%	-	14.9%	-	62.4%	-	0.6%	0.9%	452.1
Hardeman	37.5%	-	15.4%	0.4%	42.2%	1.2%	1.7%	1.6%	444.7
King	9.7%	-	2.3%	0.4%	86.4%	0.0%	0.5%	0.6%	584.9
Montague	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Wichita	40.5%	1.1%	1.5%	3.8%	38.7%	9.9%	1.5%	3.0%	391.9
Wilbarger	37.2%	-	7.3%	6.7%	46.6%	<0.1%	0.9%	1.3%	612.9
Young	30.6%	-	0.8%	2.7%	61.0%	1.6%	2.1%	1.3%	595.4

Typical crops in Region B include cotton, coastal bermuda, wheat, alfalfa, peanuts, grain sorghum, watermelons, pecans, peaches, and other various fruits. Cattle for beef and dairy production is the major component of the livestock industry, with sheep, swine, and equine also present[1].

1.8 Ecology and Wildlife[1]

Most of Region B lies in the area known as the "Rolling Plains" with the exception of Montague County, which lies in the "Oakwoods and Prairies" area. The Texas Parks and Wildlife Department describes the "Rolling Plains" region as a "gently rolling plain of mesquite and short grass savanna." The open range is generally characterized by its mesquite brush, prairie grasses, and sandstone outcroppings and cottonwood, hackberry, and saltcedar brush can be found near most rivers and streams. This vegetation is important to the survival of both resident and migratory birds. It is evident by the widespread mesquite, however, that over-grazing, soil erosion, and the lowering of the groundwater table have all contributed to the decline of the native grasslands. The topography of the region gently slopes to the east and southeast. The Red River and its major tributaries drain most of the region; however, extreme southern reaches of the region are drained by tributaries of the Brazos and Trinity Rivers.

The Texas Parks and Wildlife Department uses freshwater mussels as water quality indicators because they are usually the first organisms to show their sensitivity to changes in aquatic quality. Recent surveys have determined that 52 separate species of mussels have declined[1]. Another organism used to indicate water quality is the minnow. Since 1950, minnows native to the Big Wichita River System have also shown serious declines[1]. These native minnows include the plains minnow, the silver chub, and the several varieties of shiner. The plains minnow is commonly used in support of a significant commercial baitfish industry. The decline of these organisms indicates poor water conservation and management. Runoff and scouring flows have increased with broad increases in over-grazing, highway development, and general land clearing. Scouring flows can cause excessive sedimentation, thus eliminating the natural habitats of these organisms.

The "Rolling Plains" region of Texas is not usually thought of as an area rich in wetland habitats. However, the region is actually very important to both migrating and wintering waterfowl. In fact many species of migrating shorebirds, raptors, and other birds stop over in the region to feed and rest on the available wetlands.[1]

There are over 40 species of water-dependant reptiles, amphibians, and mammals that live in the study area. Some of these include minks, muskrats, and beavers, snakes, turtles, salamanders, and frogs. Fish species present in the study area include drum, carp, buffalo, bluegill, sunfish, largemouth, white, spotted, and striped bass, white crappie, flathead, blue, and channel catfish, and walleye. Lake Kemp supports a notable striped bass fishery. Some endangered species are also present across the region. Table 1-15 lists the endangered and threatened species present in the region.

Copper Breaks State Park located 12 miles south of Quanah in Hardeman County contains 1,889 acres, and a 70 acre lake. The park has abundant wildlife, and according to the 1998 Texas Almanac, is home for part of the official Texas Longhorn herd.

Table 1-15
Region B - Endangered/Threatened Species[1]

SPECIES	STATE STATUS	FEDERAL STATUS
Reddish Egret	Threatened	
Peregrine Falcon	-	Endangered
American Peregrine Falcon	Endangered	Endangered
Arctic Peregrine Falcon	Threatened	Endangered
Whooping Crane	Endangered	Endangered
Bald Eagle	Threatened	Threatened
Brown Pelican	Endangered	Endangered
White-Faced Ibis	Threatened	-
Interior least tern	Endangered	Endangered
Black-capped Vireo	Endangered	Endangered
Shovelnose Sturgeon	Threatened	-
Texas Kangaroo Rat	Threatened	-
Black-footed Ferret	Endangered	Endangered
Brazos Water Snake	Threatened	-
Texas Horned Lizard	Threatened	-

1.9 Summary of Existing Local or Regional Water Plans

In April, 1999 surveys were sent to the water providers of Region B to determine, among other things, if they possessed a water conservation plan or a local or regional water plan. Table 1-16 lists the results of those surveys.

Table 1-16: Survey Results Regarding Water Plans

Water Provider	Existing Drought Contingency Plan?	Existing Water Conservation Plan?	Existing Local or Regional Water Plan?	Special Concerns of the Provider
Archer County MUD	Y	Y	N	Supply
Arrowhead Lake WSD	Y	Y	N	
Arrowhead Ranch Estates	Y	Y	N	
Baylor County WSC	N	N	N	Nitrates
Box CWSD	N	N	N	
City of Archer City	N	N	N	
City of Bowie	Y	Y	N	
City of Burkburnett	N	N	N	Nitrates
City of Byers	N	N	N	Nitrates
City of Charlie	N	N	N	Nitrates
City of Crowell	Y	N	N	Nitrates
City of Dumont	N	N	N	
City of Electra	N	Y	N	Nitrates
City of Henrietta	Y	Y	Y	
City of Holliday	N	N	N	
City of Iowa Park	N	N	N	
City of Lakeside City	N	N	N	Storage
City of Megargel	Y	N	N	
City of Nocona	N	N	N	
City of Nocona Hills	N	Y	Y	Nitrates
City of Olney	N	Y	N	Storage
City of Paducah	N	N	N	
City of Petrolia	N	N	N	
City of Pleasant Valley	N	N	N	
City of Quanah	N	N	N	
City of Saint Jo	Y	Y	N	
City of Scotland	Y	N	N	
City of Seymour	N	N	N	Nitrates
City of Sunset	N	N	N	Storage
City of Vernon	Y	Y	Y	Nitrates
City of Wichita Falls	Y	Y	Y	
Dean Dale WSC	Y	Y	N	
Farmers Valley WSD	Y	Y	N	
Foard County WSD	Y	Y	N	
Forestburg WSC	N	N	N	
Goodlett WSD	Y	Y	N	
Hinds CWSD	Y	Y	N	
Horseshoe Bend WSC	N	N	N	
Lockett WSD	Y	Y	N	
Medicine Mound WSD	Y	Y	N	
Northside WSC	Y	Y	Y	Nitrates
Quanah NE WSD	Y	Y	N	
Ringgold WSD	Y	Y	N	
South Quanah WSD	Y	Y	N	
West Texas Utilities	N	N	N	
Wichita Valley WSC	N	N	N	
Windthorst WSC	N	N	N	

The table shows that as of May 1, 1999 most providers did not have a drought contingency or water conservation plan that meets the new requirements of Senate Bill 1. However, as a part of the Senate Bill 1 planning efforts, most entities developed the plans as required.

1.10 Summary of Recommendations in the State Water Plan

The 1997 Consensus Texas Water Plan anticipates that Region B will have adequate water supplies throughout the planning period. The main recommendation of the Plan is to employ conservation measures to reduce water waste. Also, the heavy dissolved solid and chloride concentrations in the western portions of the region are preventing the full utilization of the available water resources. To reduce this, the 1997 Consensus Texas Water Plan recommends that the Red River Chloride Control Project, sponsored by the Red River Authority of Texas, continue to be funded and operated.

1.11 Identification of Known Threats to Agriculture or Natural Resources

Excessive concentrations of total dissolved solids, sulfate, and chloride are a general problem in most streams of the Red River Basin under low flow conditions. The high salt concentrations are caused, in large part, by the presence of salt water springs, seeps, and gypsum outcrops. Salt water springs are generally located in the western portion of the (Red River) basin in the upper reaches of the Wichita River, the North and South Forks of the Pease River, and the Little Red, which is a tributary to the Prairie Dog Town Fork of the Red River. Gypsum outcrops are found in the area ranging westward from Wichita County to the High Plains Caprock Escarpment".

The excessive amounts of dissolved solids and chlorides in the water present problems to managers, planners, and others concerned with water treatment for municipal use. For this reason, the quality of the available water supply is as much an issue as the quantity for Region B. Water consumers of all kinds, whether municipal, industrial, or agricultural, desire water that is less saline; however, these conditions have existed for many years, and the plants and animals that live with them have adapted well. The Red River Authority of Texas is sponsoring a federal chloride control project to control the natural chloride pollution in the Red River Basin by impounding high chloride waters from the natural brine springs. The planned reduction of the salinity will also reduce the base flow of water in the streams and rivers and may alter the aquatic ecosystem. Consequently, these changes may cause the decline in the numbers of native organisms. In addition, as was previously noted, runoff and scouring flows have increased with broad increases in over-grazing, highway development, and general land clearing. These flows can cause excessive sedimentation, thus eliminating the natural habitats of the native organisms.

1.12 Water Providers in Region B

Water is provided in Region B by a number of entities. The cities provide most of the water in the region with the City of Wichita Falls providing the majority of the water. Other major providers include the Red River Authority of Texas and the Greenbelt Water Authority. The wholesale suppliers in the region are the City of Wichita Falls and the Greenbelt Water Authority. The following Table 1-17 shows a comprehensive listing of the water providers and the municipal use for the year 1996. A more detailed discussion of water use is presented in the next section of this report. It should be noted that these use figures do not include water for irrigation, manufacturing, electrical power, livestock, or mining.

Table 1-17: Water Providers and Users in Region B[5]

USER	COUNTY	RIVER BASIN	1996 DEMAND AF/YR
Archer City	Archer	RED	351
Holliday	Archer	RED	226
Lakeside City	Archer	RED	149
Seymour	Baylor	BRAZOS	694
Byers	Clay	RED	86
Henrietta	Clay	RED	642
Petrolia	Clay	RED	104
Paducah	Cottle	RED	239
Crowell	Foard	RED	216
Chillicothe	Hardeman	RED	165
Quanah	Hardeman	RED	720
Guthrie	King	RED	64
Bowie	Montague	TRINITY	1,092
Montague	Montague	RED	31
Nocona	Montague	RED	577
Saint Jo	Montague	TRINITY	139
Saint Jo	Montague	RED	47
Burkburnett	Wichita	RED	1,443
Electra	Wichita	RED	557
Iowa Park	Wichita	RED	1,192
Wichita Falls	Wichita	RED	21,650
Vernon	Wilbarger	RED	2,377
Olney	Young	BRAZOS	719
Other Rural			5,496
TOTAL			38,976

USER	COUNTY	RIVER BASIN	1996 DEMAND AF/YR
Baylor WSC	Archer	RED	18
Archer Co. MUD #1	Archer	RED	110
Megargel	Archer	RED	46
Scotland	Archer	RED	222
Windthorst WSC	Archer	RED	224
Wichita Valley WSC	Archer	RED	212
Archer Co. Other	Archer	RED	10
Archer Co. Other	Archer	TRINITY	9
Archer Co. Other	Archer	BRAZOS	19
Baylor WSC	Baylor	BRAZOS	187
Baylor Co. Other	Baylor	RED	27
Baylor Co. Other	Baylor	BRAZOS	25
Bellevue	Clay	RED	42
Bluegrove WSC	Clay	RED	7
Charlie WSC	Clay	RED	9
Dean Dale WSC	Clay	RED	262
Arrowhead Lake WSD	Clay	RED	95
Arrowhead Ranch WSD	Clay	RED	86
Friberg-Cooper WSC	Clay	RED	83
Clay Co. Other	Clay	RED	522
Clay Co. Other	Clay	TRINITY	52
King-Cottle WSC	Cottle	RED	422
Cottle Co. Other	Cottle	RED	10
Foard Co. WSD	Foard	RED	68
Margaret WSD	Foard	RED	12
Thalia WSC	Foard	RED	15
Foard Co. Other	Foard	RED	49

USER	COUNTY	RIVER BASIN	1996 DEMAND AF/YR
Goodlet WSD	Hardeman	RED	17
Medicine Mound WSD	Hardeman	RED	17
Quanah NE WSD	Hardeman	RED	59
S Quanah WSD	Hardeman	RED	18
Hardeman Co. Other	Hardeman	RED	98
King-Cottle WSC	King	RED	215
Dumont WSD	King	RED	51
King Co. Other	King	RED	2
King Co. Other	King	BRAZOS	3
Forestburg	Montague	RED	22
Montague WSC	Montague	RED	31
Nocona Hills WSC	Montague	RED	77
Oak Shores WSC	Montague	RED	4
Sunset WSC	Montague	RED	18
Ringgold WSC	Montague	RED	21
Montague Co. Other	Montague	RED	230
Montague Co. Other	Montague	TRINITY	614
Friberg Cooper WSC	Wichita	RED	83
Horseshoe Bend WSC	Wichita	RED	14
Pleasant Valley	Wichita	RED	96
Wichita Valley WSC	Wichita	RED	494
Dean Dale WSC	Wichita	RED	65
Box Com. WSD	Wilbarger	RED	19
Farmers Valley WSD	Wilbarger	RED	28
Harrold WSC	Wilbarger	RED	30
Hinds Com WSD	Wilbarger	RED	26
Lockett WSD	Wilbarger	RED	94
Northside WSC	Wilbarger	RED	31
Odell WSC	Wilbarger	RED	16
Oklaunion WSC	Wilbarger	RED	40
Wilbarger Co. Other	Wilbarger	RED	230

Note: Water use shown is for municipal purposes.

1.13 Major Water Providers

Senate Bill 1 requires that each regional water planning group designate its "Major Water Providers" (MWP) and develop data related to those entities. According to the rules, "An MWP is an entity, which delivers and sells a significant amount of raw water for municipal and/or manufacturing use on a wholesale and/or retail basis. The entity can be public or private (non-profit or for-profit). Examples include municipalities with wholesale customers, river authorities, and water districts." The designated "Major Water Providers" in Region B are:

- Greenbelt M & I Authority
- City of Wichita Falls

It should be noted that an entity designated as MWP receives no special consideration in the plan and that each water provider is on an equal basis. The data required to be provided for the MWP's simply aids in the accounting for the water of the region.

LIST OF REFERENCES

1. *Evaluation of Selected Natural Resources in Parts of the Rolling Plains Region of North-Central Texas*. Water Resources Team, Resource Protection Division, Texas Parks and Wildlife Department, 1998, http://www.tpwd.state.tx.us/texaswater/sb1/wildlif/rolling/rolling index.htm.

2. *1998 Total Population Estimates for Texas Counties*, Department of Rural Sociology, Texas Agricultural Experiment Station, Texas A & M University System, August 1999, http://txsdc.tamu.edu/tpepp/1998_txpopest_county.html.

3. *County and City Data Books*, Geospatial and Statistical Data Center, The University of Virginia, 1994, http://fisher.lib.Virginia.EDU/ccdb/county94.html.

4. *J. A. Kemp's Vision Helped Area Prosper*, Wichita Falls Times & Record News, Page 1A, 7A, August 25, 1998.

5. The 1997 Consensus Water Plan, The Texas Water Development Board, 1997.

6. *Climate Data for Wichita Falls, TX*, National Climatic Data Center, National Oceanic and Atmospheric Administration, July, 2000, http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll/wwDI~StnSrch~StnID~20025762#ONLINE.

7. Interview with Susan Combs, Texas Agriculture Commissioner, Wichita Falls Times & Record News, Date Unknown.

8. *Oil Well Counts by County*, Oil and Gas Division, Texas Railroad Commission, February 2000, http://www.rrc.state.tx.us/divisions/og/information-data/stats/ogowlct.html.

9. *Gas Well Counts by County*, Oil and Gas Division, Texas Railroad Commission, February 2000, http://www.rrc.state.tx.us/divisions/og/information-data/stats/oggwlct.html.

10. Brune, Gumar M. Springs of Texas, "Volume I" Ft. Worth: Branch-Smith, Inc., 1981.

POPULATION AND WATER USE PROJECTIONS

TEXAS STATE SENATE BILL 1

REGION B

2.1 Region B Overview

The eleven North Central Texas counties of Region B contain only one city larger than 100,000, which is Wichita Falls. The other communities are smaller and more rural in nature with incomes that are dependent on agriculture and, to a lesser extent, the oil industry. Consequently, the population for the region is projected to have only a moderate increase for the next fifty years from 201,984 people in 1996 to 216,914 in 2050, or 7.5 percent. Tables A-1 through A-3, in Attachment 2-1 summarize all of the population projections for the region through the year 2050. These projections were made by using the 1996 through 1998 population information as provided by the Texas State Data Center in conjunction with questionnaires mailed to every water provider in the Region. Attachment 1 details the population projection procedure.

Per capita municipal water use is predicted to gradually decline over the planning period from 187 gallons per capita per day (gpcd) in 2000 to 161 gpcd in 2050 based on water use and population projections shown in Attachment 2-1. According to the 1997 amended Texas Water Plan published by the Texas Water Development Board, the use for the entire state was shown to be 168 gpcd in 1990 with an increase to 181 gpcd in 2000. In 2050 the statewide use is predicted to decline to 157 gpcd. Region B's water use is currently in-line with the statewide average and is expected to decline in the future as predicted with the average. Since a large majority of the region is rural in nature, the percentage of conservation savings for the state as a whole will probably not be realized to the same extent in this area. In the more densely populated areas where new construction is progressing at a faster pace, more water conserving measures can be implemented by requiring the newer plumbing fixtures and maintaining tighter controls on overall water use. Tables A-4 through A-8, in Attachment 2-1, summarize the projected water demands through the year 2050.

2.2 Population Growth

The Region B projected total population growth is shown in Figure 2-1. The projections were determined by:

- Using the latest information published by the State Data Center for city populations;
- Surveying the cities, smaller communities, rural water supply corporations, municipal utility districts, and river authorities to determine population based on existing meter counts;
- Using growth trends derived from the surveys based on populations and meter counts from 1990 to 1998.

Figure 2-1

Projected Population for Region B per Attachment 2-1

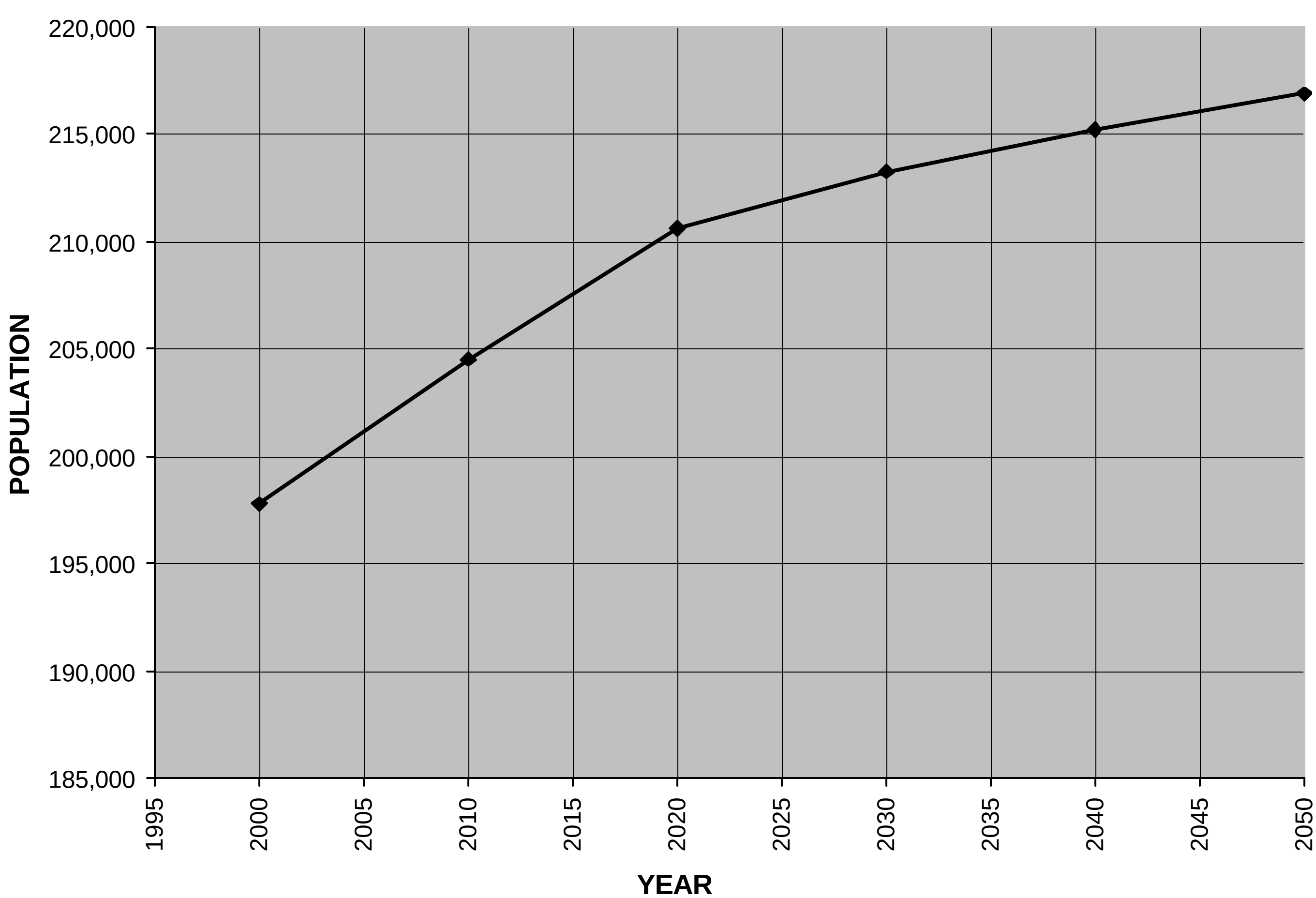


Table 2-1 - Projected Population Data Points per Attachment 2-1

YEAR	2000	2010	2020	2030	2040	2050
POPULATION	197,793	204,521	210,634	213,261	215,196	216,914

The city with the highest projected growth rate is Wichita Falls. It is expected to grow by slightly over 20 percent in the next fifty years for many reasons. Recently the city annexed additional property north and west of town. The Allred Prison has a construction project in progress to double the size of the facility, Midwestern State University student population has increased in recent years, and Sheppard Air Force Base continues to expand its training facilities. Other towns that may experience some growth include Lakeside City, Henrietta, Burkburnett, Iowa Park, and Vernon.

2.3 Water Uses

2.3.1 Total Region B Use

The water use for Region B has been divided into several categories for analysis purposes. The various uses analyzed include water for municipal use (MUN), industrial or manufacturing (MFG), power cooling (PWR), mining (MIN), agricultural irrigation (IRR), and livestock watering (STK). Figure 2-2 shows the amounts of water predicted to be required for these categories through the year 2050. The water use is shown in acre-feet (Ac-Ft) units with one acre-foot being equivalent to 325,851 gallons of water.

Figure 2-2

Projected Water Use for Region B per Attachment 2-1

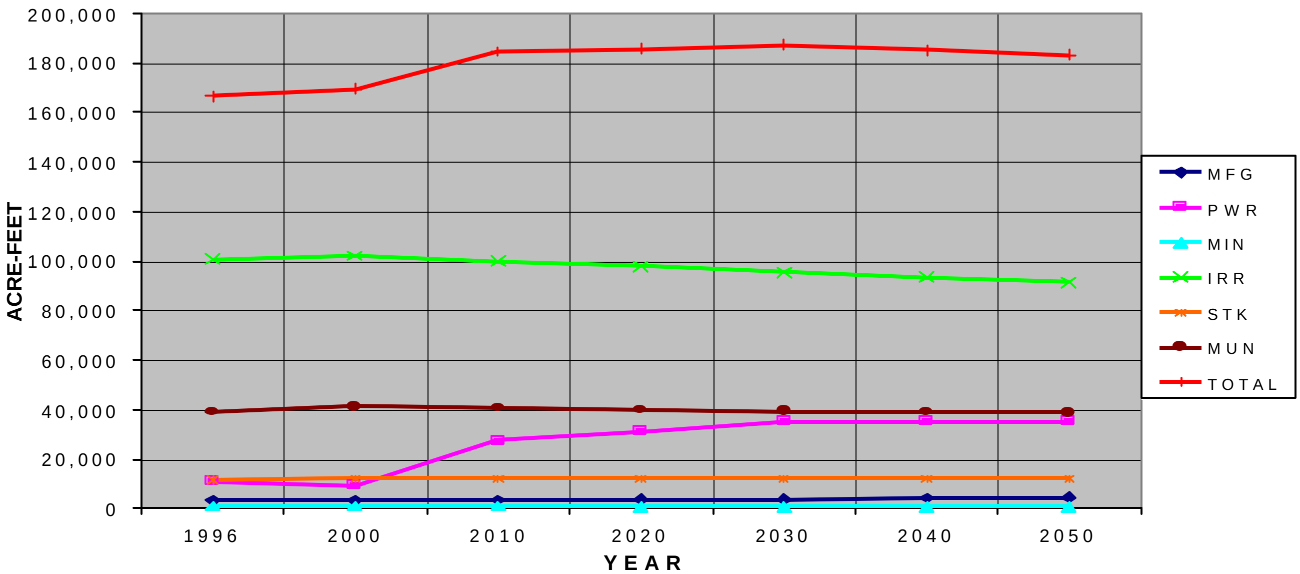


Table 2-2 - Projected Water Use Data Points (Acre-Feet)

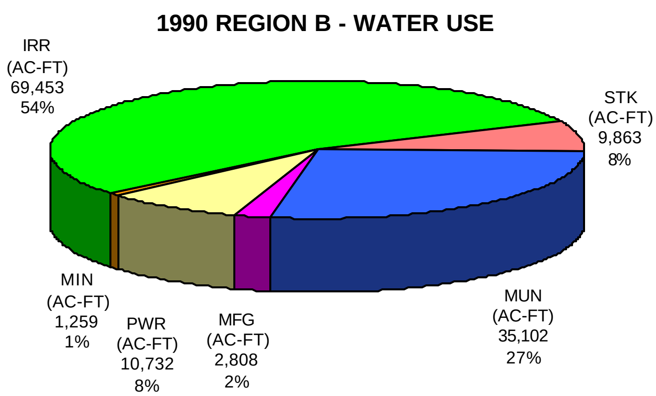
YEAR	**1996**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
MFG	3,230	3,266	3,547	3,755	3,968	4,260	4,524
PWR	11,116	9,460	27,360	31,360	35,360	35,360	35,360
MIN	1,192	1,176	909	845	811	785	792
IRR	100,564	102,106	99,880	97,687	95,522	93,385	91,277
STK	11,574	12,169	12,169	12,169	12,169	12,169	12,169
MUN	38,976	41,395	40,715	39,820	39,373	39,068	39,092
TOTAL	166,652	169,572	184,580	185,636	187,203	185,027	183,214

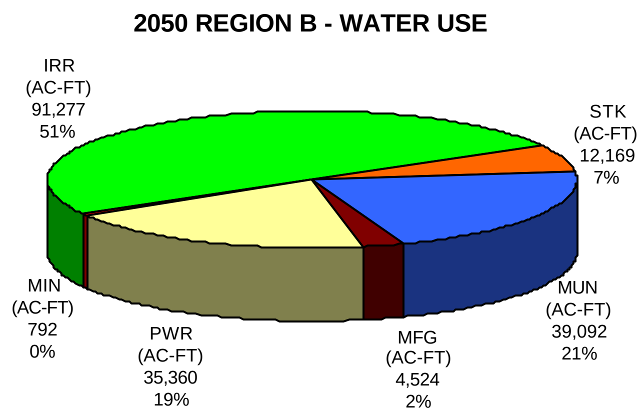
Total water consumption for the region is predicted to increase approximately 10 percent from 1996 to 2050. Figure 2-3 compares the water uses of 1990 to the projected water uses for 2050.

The two scenarios in Figure 2-3 show that the composition of water use for this region is not anticipated to change much. However, a proposed new power plant in Archer County will contribute to the more than doubling of the amount of water required for that category.

Figure 2-3

Composition of Past and Projected Region B Water Use





2.3.2 Municipal Water Use

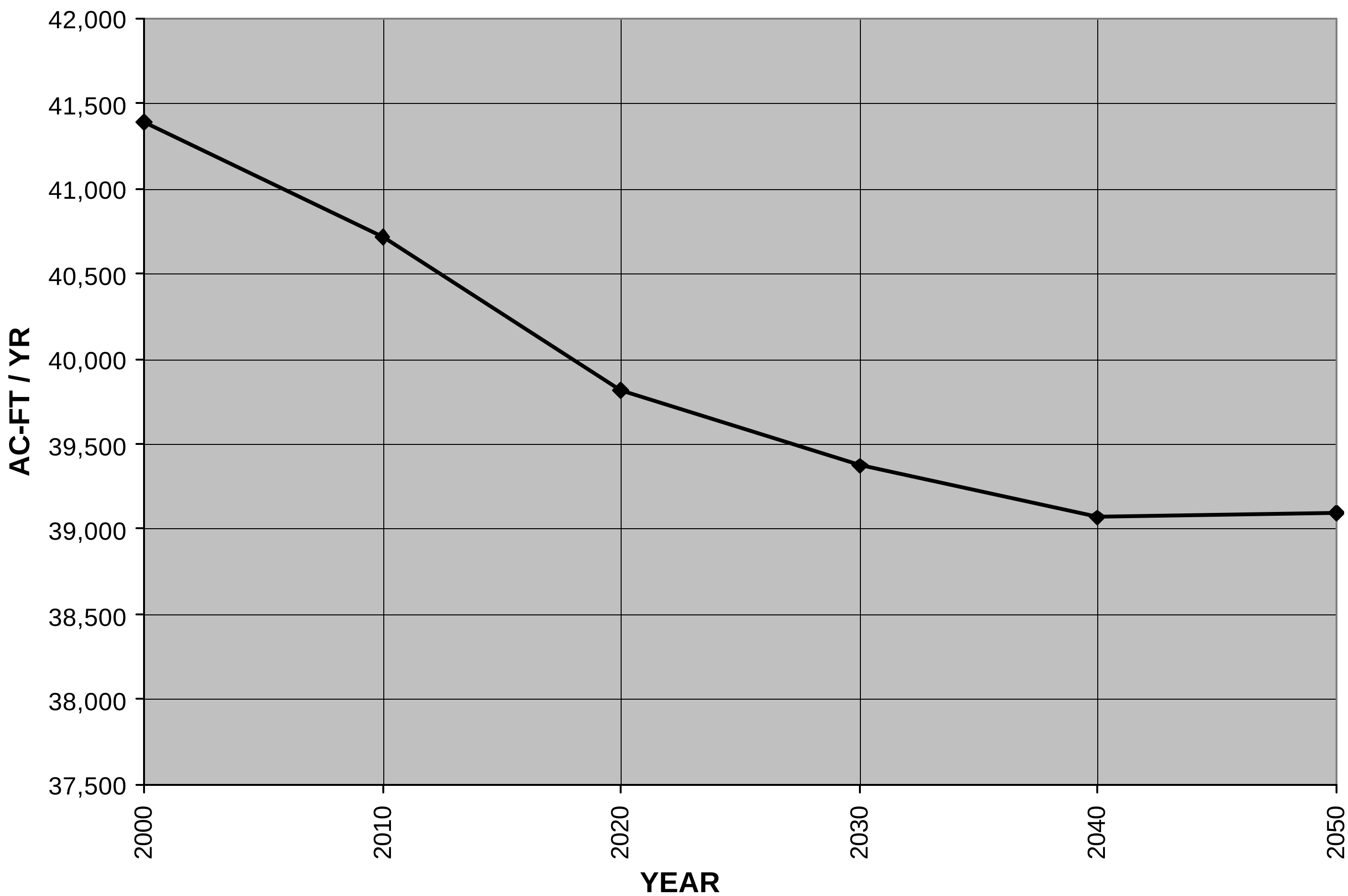
Municipal water use is defined by the TWDB as residential and commercial water use. Residential use includes single and multi-family household water use. Commercial use includes water used by business establishments, public offices, and institutions, but does not include industrial water use. Residential and commercial water uses are categorized together because they are similar types of uses, for example, each category uses water primarily for drinking, cleaning, sanitation, cooling and landscape watering.

The total municipal water use for Region B is shown to decline from 41,395 Ac-Ft in the year 2000 to 39,092 Ac-Ft in 2050 in spite of a population increase of over 10 percent. The decrease is anticipated because, as previously mentioned, the per capita water use is expected to decrease over the next fifty years. Decreases in water use are expected due to water conservation measures implemented by the cities and individual users including more efficient plumbing fixtures, better lawn watering procedures, and tighter controls on water losses by the water providers and other conservation measures.

The graph of the municipal water use line shown in Figure 2-4 indicates the declining water use trend from the year 2000 through 2050.

Figure 2-4

Total Municipal Water Use in Region B per Attachment 2-1



Since weather has a significant impact on municipal water use, all projections for the future have been based on a below average rainfall year. Water use data was accumulated for the water users of the region through research of records at the TWDB, the TNRCC, and through questionnaires sent to the sellers of municipal water. Many of the estimates of future use have been based on the water sold in 1996 as it was a particularly dry period in the North Texas region, and total water use peaked.

2.3.3 Manufacturing Water Use

Manufacturing, or industrial, water use has been defined as water used in the production process of manufactured products, including water used by employees for drinking and sanitation purposes. Water use for manufacturing products (MFG) in Region B is a small percentage, less than 5 percent, of the overall water use in this region.

The majority of the MFG water use is in Wichita County by the industrial facilities in and around Wichita Falls. Over 62 percent of the MFG water for the region is consumed in Wichita County. Wilbarger, Hardeman, and Montague Counties also have facilities that require water in the MFG category. The top six MFG facilities in Wichita County used slightly over 78 percent of the water in 1998, and they include: Vetrotex America, PPG Industries, Stanley Proto Tools, Howmet Corporation, Wichita Falls Castings, and Tranter Inc. Wilbarger County has Rhodia Inc. and Wright Brand Foods as the major industrial users for that area. There are numerous other small industrial users in Region B.

Based on the increasing trend of water required for MFG in Region B, an increase from 3,266 Ac-Ft in 2000 to 4,524 Ac-Ft in 2050 has been projected. While the percentage increase for the category is 38 percent, the amount of the increase of MFG water, as considered in the overall regional plan, is much smaller at 9 percent. Figure 2-5 shows the projections for manufacturing water use in Region B.

Region B will probably have some growth in the number of industrial facilities that locate in that area. That growth will be attributed to reasonable land prices, a good labor market, and above average power and water resources.

Figure 2-5

Projected Industrial Water Use for Region B per Attachment 2-1

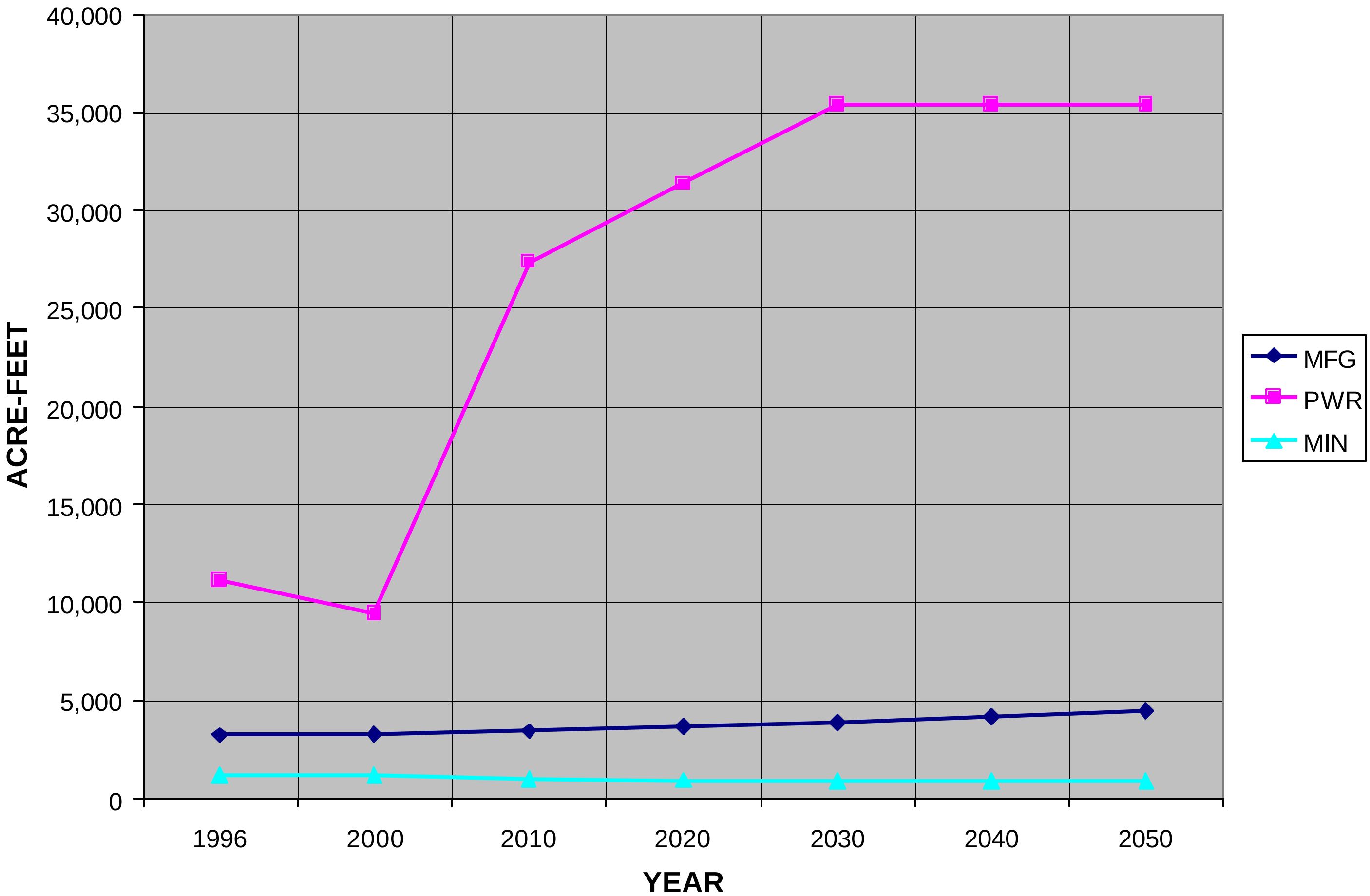


Table 2-3 - Projected Industrial Water Use Data Points per Attachment 2-1

YEAR	**1996**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
MFG	3,230	3,266	3,547	3,755	3,968	4,260	4,524
PWR	11,116	9,460	27,360	31,360	35,360	35,360	35,360
MIN	1,192	1,176	909	845	811	785	792

2.3.4 Steam-Electric Power Generation

The total water use required for steam-electric power generation for Region B is projected to be 9,460 Ac-Ft in the year 2000 and grow to 35,360 Ac-Ft in the year 2050. West Texas Utility Company (WTU) currently has power producing plants in Wilbarger and Hardeman Counties and there is a small cogeneration plant in Wichita Falls associated with the Vetrotex America manufacturing facility. On April 1, 1999 it was announced that Panda Energy International will break ground in the fall of 1999 on a new 1,000 megawatt electric generating plant in Archer County. Construction is expected to be complete by 2001. The City of Wichita Falls and the Wichita County Water Improvement District (WCWID) will deliver water for the new plant from Lake Diversion. With the new plant and possible future expansion of the WTU facilities, the water used in this category will be increased substantially over the fifty year planning period. The percentage of water used for power generation in Region B will increase from 8 percent in 1990 to 19 percent in 2050. The projections for water use for steam-electric power generation are also shown in Figure 2-5.

2.3.5 Mining Water Use

The oil and gas industry has played a large role in the history and development of the North Central Texas area and is essentially the only "mining" activity in the region. Fresh water has been used in the past to drill wells and in some cases to water flood oil fields. However, as the fields in this area are mature and will not see much more development, water required for production will decline as well. If oil prices remain below the $18 to $20 per barrel level, production will decrease even more. Based on current status of the oil industry and recent trends in water required for mining in this region, a decrease from 1,176 Ac-Ft required in the year 2000 to 792 Ac-Ft in the year 2050 is projected and is shown in Figure 2-5.

2.3.6 Agricultural Irrigation Water Use

The largest water use in Region B is irrigated agriculture. Irrigated crops in the region include cotton, wheat, peanuts, alfalfa, hay-pasture, vegetables, orchards, and others. The total acreage irrigated varies from year to year depending on weather, crop price, government programs, and other factors. Agricultural use accounted for approximately 54 percent of the water used in 1990 and is projected to be 50 percent of all the water used in 2050. Figure 2-6 shows the projected agricultural water use.

A portion of the water used for irrigation in Region B is from groundwater, but the majority of the water used is surface water. In 1996, 63,511 Ac-Ft of the total 99,764 Ac-Ft was delivered through the unlined ditches of the WCWID. However, due to the age and construction of the canal system, approximately 44 percent of water released into the canal system was lost due to evaporation, seepage, and leaks. A study was prepared for the WCWID to determine the costs for installing pipelines in the canals to prevent the losses, and it was shown to be cost

Figure 2-6

Projected Agricultural Water Use for Region B per Attachment 2-1

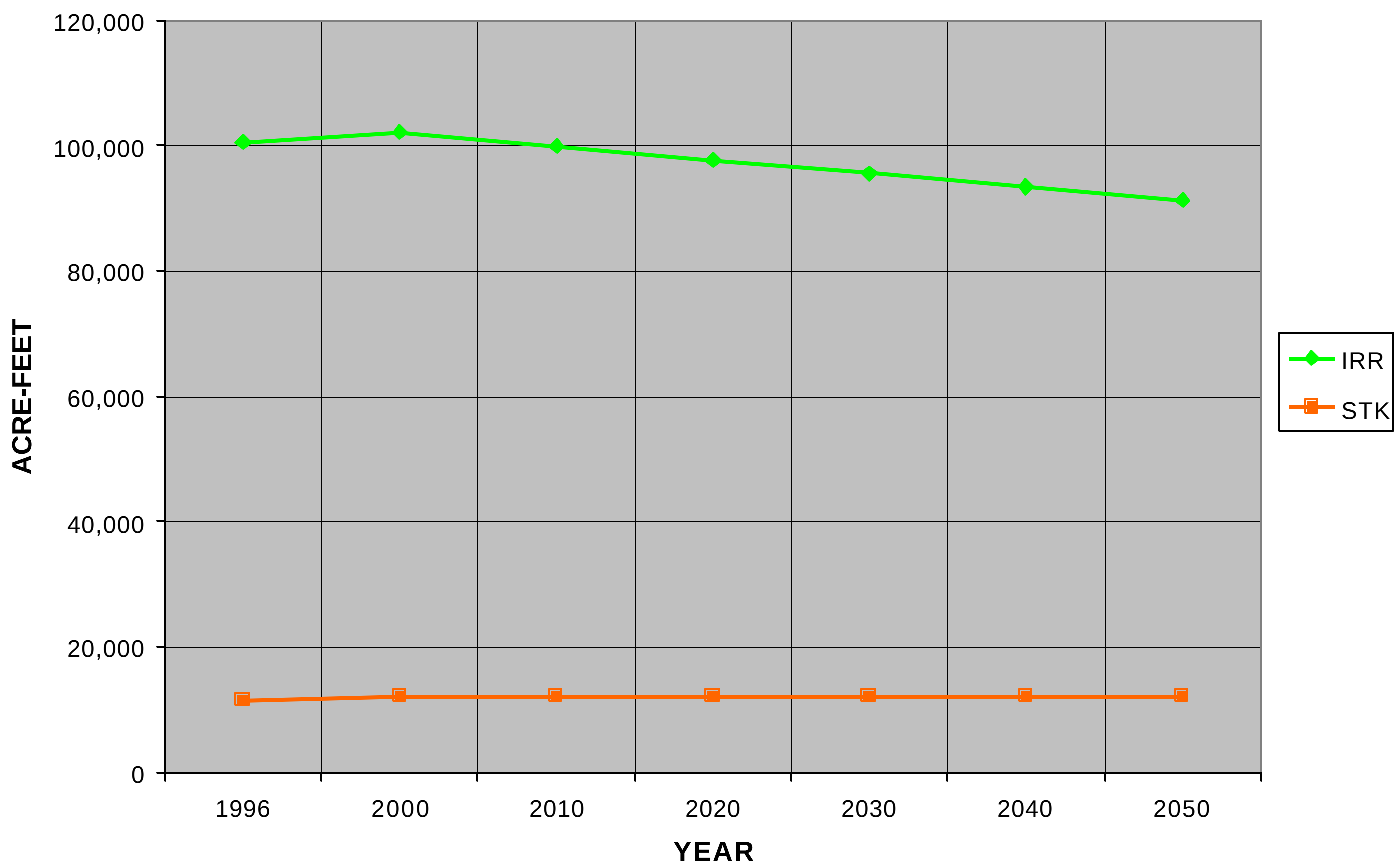


Table 2-4 - Projected Agricultural Water Use Data Points per Attachment 2-1

YEAR	1996	2000	2010	2020	2030	2040	2050
IRR	100,564	102,106	99,880	97,687	95,522	93,385	91,277
STK	11,574	12,169	12,169	12,169	12,169	12,169	12,169

prohibitive, approximately $25,000,000. Note that all surface water diversion losses are included in the water required for irrigation. Some reduction in underground water loss is anticipated due to the use of more efficient irrigation systems and improved irrigation management practices. If the chlorides are reduced in the Lake Kemp/Lake Diversion system, irrigated property by the WCWID may actually increase.

2.3.7 Livestock Watering

Livestock production is an important part of the economy in Region B. In 1996, the total water used in the region for livestock was 11,574 Ac-Ft, and the use is projected to have a small increase to 12,169 Ac-Ft in the year 2000 and then remain level from 2000 to 2050. This represents about 7 percent of the water used in the region. The livestock water use projections are shown in Figure 2-6.

2.4 Region B Amendments to 1997 Water Plan

This report has been prepared in accordance with the requirements of Texas State Senate Bill 1 (SB1). Subsequent to the passage of SB1 "Guidelines and Data Requirements for Addressing Revisions of the Consensus - Based Population and Water Demand Projections Senate Bill 1" were published by the Texas Water Development Board.

The rules promulgated for implementing Senate Bill 1 direct the Regional Water Planning Groups to use the consensus-based population and water use projections that were developed for and used in preparing the 1997 State Water Plan. Specifically, the rules state:

Section 357.5 Guidelines for Development of Regional Water Plans.

(d) *Use of population and water demands. In developing regional water plans, regional water planning groups shall use:*

(1) state population and water demand projections contained in the state water plan or adopted by the board after consultation with the Texas Natural Resource Conservation Commission and the Texas Parks and Wildlife Department in preparation for revision of the state water plan; or

(2) in lieu of paragraph (1) of this subsection, population and water demand projection revisions that have been adopted by the board, after coordination with the Texas Natural Resource Conservation Commission and the Texas Parks and Wildlife Department, based on changed conditions and availability of new information. Within 45 days of receipt of a request from a regional planning group for revision of population or water demand projections, the executive administrator shall consult with the requesting regional water planning group and respond to their request.

The RWPG for Region B presented a request to the TWDB for several changes to the 1997 State Water Plan projections in population and water. All requests were documented as required by the guidelines and the requests were approved by the TWDB. Attachment 2-1 contains the documentation for the proposed revisions to the population and water use projections. As previously mentioned, the results of those changes are the basis for this report.

EVALUATION OF CURRENT WATER SUPPLIES

TEXAS STATE SENATE BILL 1

REGION B

3.1 Existing Surface Water Supply

To evaluate the adequacy of supply from existing reservoirs in Region B, a review of the 1997 State Water Plan, previous water planning studies and historical operations were conducted. In addition, projected sedimentation in the reservoirs over the planning period (2000 – 2050) was evaluated. This information was used to assess the current firm yields of the reservoirs. Summaries of the 1997 State Water Plan data and the proposed reservoir yields based on this review are presented in Tables 3-1 and 3-2, respectively. For reservoirs whose reported firm yields could not be verified through previous studies, operation studies were conducted provided the data was available. The adequacy of supply for Greenbelt Lake was evaluated by Region A, and the findings are presented in this memorandum. The sedimentation analysis is discussed in Section 3.1.2.

3.1.1 Existing Water Supply Reservoirs

Greenbelt Lake

Greenbelt Lake is located in Region A, but water from the lake is used to supply several cities in Region B. The lake is owned and operated by the Greenbelt Municipal and Industrial Water Authority, and is located on the Salt Fork of the Red River in Donley County near the City of Clarendon. Construction of Greenbelt Lake was completed in 1968, and the lake had an initial conservation capacity of 60,400 acre-feet. Greenbelt Municipal and Industrial Water Authority has a diversion right of 12,000 acre-feet per year from the lake to provide municipal, industrial, mining and irrigation water supply. The firm yield of the reservoir in year 2000 is estimated to be 7,699 acre-feet per year.

Table 3-1: Summary of 1997 State Water Plan Yield Studies

Reservoir	County	Elev (MSL)	1997 State Water Plan Area (acres)	1997 State Water Plan Capacity (ac-ft)	1997 State Water Plan Yield (af/yr)	Uses	Operation Study Date	Operation Study Author	Operation Study Period of Record	Critical Period Dates	Critical Period Length (years)	Drought of Record	Comments
Lake Pauline	Hardeman	NA	NA	NA	3,000	Industrial	NA	NA	NA	NA	NA	NA	TWDB estimates the yield from Lake Pauline/Groesbeck Creek to be 3,000 AF/Y.
Lake Kemp	Baylor	1144	15,590	268,000	116,000	Municipal	1976	F&N	1949-1974	6/42-6/45	3	6/42 – 5/47	1973 capacity listed; yield based on 2020 capacity.
Lake Diversion	Archer, Baylor	1051	3,419	40,000	1,100	Industrial	1976	F&N	1949-1974	Firm yield was not determined			Original capacity; operation study evaluated required make-up from Lake Kemp to maintain elevation
Santa Rosa Lake	Wilbarger	NA	NA	NA	NA	Irrigation	1967	F&N	NA	10/55-2/57	1.3	NA	TWDB does not include lake in 1997 Water Plan. TWDB yield estimates of 3000 ac-ft/yr are based on operation studies conducted as part of Red River Master Plan (F&N, 1967).
Lake Electra	Wilbarger	1110	600	8,050	600	Municipal	NA	NA	NA	NA	NA	NA	TWDB yield is based on water right.
N.F. Buffalo Crk Reservoir	Wichita	1048	1,500	15,400	840	Municipal	NA	NA	NA	NA	NA	NA	TWDB yield is based on water right.
Lake Kickapoo	Archer	1045	6,200	106,000	16,072	Municipal	1997	TWDB	1940-1989	5/58 – 9/80	32.3	5/58 – 5/82	Original area-capacity. Yield does not account for sedimentation.
Lake Arrowhead	Clay, Archer	926	16,200	262,100	29,532	Municipal	1997	TWDB	1940-1989	5/58 – 9/80	32.3	5/58 – 5/82	Original area-capacity. Yield reflects 2050 sediment conditions.
Lake Olney/ Cooper	Archer	NA	NA	6,650	1,260	Municipal	NA	NA	NA	NA	NA	NA	TWDB yield is based on water right.
Lake Nocona	Montague	827	NA	NA	4,500	Municipal/ Rec/Ind	NA	NA	NA	NA	NA	NA	TWDB yield is based on original water right.
Lake Amon Carter	Montague	920	1,848	28,589	2,600	Municipal	1979	HDR	1941-1970	6/51 – 1/57	5.5	6/51 – 5/57	1980 area-capacity data, yield reflects 2000 capacity.

NA – Not Available

Table 3-2: Updated Reservoir Yields for Region B

Reservoir	County	Elev (MSL)	Year 2000 Area (acres)	Year 2000 Capacity (ac-ft)	Year 2000 Yield (af/yr)	Uses	Operation Study Date	Operation Study Author	Operation Study Period of Record	Critical Period Dates	Critical Period Length (years)	Drought of Record	Comments
Lake Pauline	Hardeman	1490	543	3,297	1,800	Industrial	1999	F&N	1962-1982	10/69 – 2/71	1.3	10/69 – 10/71	Lake yield with Groesbeck Crk diversion
Lake Kemp	Baylor	1144	12,475	204,000	126,000	Municipal	1976	F&N	1949-1974	6/42-6/45	3	6/42 – 8/49	Yield reflects year 2000 sediment conditions.
Lake Diversion	Archer, Baylor	1051	3,282	30,100	0	Industrial	1976	F&N	1949-1974	Firm yield was not determined			Operation study indicated Diversion required make-up from Lake Kemp to maintain elevation
Santa Rosa	Wilbarger	NA	NA	6,980	0	Irrigation							Yield estimate based on historical performance
Lake Electra	Wilbarger	1111	731	5,626	470	Municipal	1999	F&N	1940 - 1997	10/41 – 11/54	13.1	10/41 – 12/97	Area-capacity data updated in 1998. Reservoir most likely has never spilled. Separate study by Electra's consultant (DGRA) found similar yield.
N.F. Buffalo Crk Reservoir	Wichita	1048	1,500	14,378	2,100	Municipal	1999	F&N	1940 - 1997	7/58 – 2/81	22.5	7/58 – 6/87	Little change in yield through the planning period due to long critical period.
Kickapoo	Archer	1045	6,072	96,302	15,946	Municipal	1999	F&N	1940-1989	5/58 – 8/80	22.3	5/58 – 5/82	Revised yield to account for sedimentation.
Lake Arrowhead	Clay, Archer	926	14,000	246,800	29,532	Municipal	1997	TWDB	1940-1989	5/58 – 9/80	22.3	5/58 – 5/82	Yield reflects year 2050 sediment conditions. Year 2000 analysis was not conducted by TWDB.
Lake Olney/ Cooper	Archer	1150	465	6,165	910	Municipal	1999	F&N	1940 - 1997	7/58 – 9/84	26.2	7/58 – 5/90	Projected little change in yield due to long critical period.
Lake Nocona	Montague	827	1,413	21,750	1,260	Municipal/ Rec/Ind	1986	F&N	1940-1984	6/51-1/57	5.5	6/51-5/57	1986 area-capacity data. Projected little change in yield over planning period.
Lake Amon Carter	Montague	920	1,848	27,559	2,600	Municipal	1979	HDR	1941-1970	6/51 – 1/57	5.5	6/51 – 5/57	Yield study conducted for 1980 and 2030. 2000 yield interpolated.

NA – Not Available

Lake Pauline

Lake Pauline is located on the upper reaches of Wanderers Creek near Quanah in Hardeman County. The dam was completed in 1928 and the reservoir had a reported conservation capacity of 4,137 acre-feet in 1968 (Bisset, 1999). Lake Pauline is owned and operated by West Texas Utilities Company. Its primary use is for cooling water for the Lake Pauline power plant. The lake is permitted for 7,137 acre-feet per year, which includes 3,000 acre-feet per year of diversions from Groesbeck Creek. The power plant at Lake Pauline is used to meet peak demands during the summer and winter months. As a result the water use from the lake varies with power demands. For the years 1994 through 1996, the reported water use from Lake Pauline was less than 5 acre-feet per year. The use for 1998 was reported as 119 acre-feet.

Previous yield studies for Lake Pauline/Groesbeck Creek were not available. The TWDB projects the yield of Lake Pauline and Groesbeck Creek to be approximately 3,000 acre-feet per year. The sedimentation analysis predicts the capacity of the reservoir to be about 1,850 acre-feet in 2050. With such a small capacity, it is unlikely that Lake Pauline alone can support a yield of 3,000 acre-feet per year. Therefore, a yield study of Lake Pauline with Groesbeck Creek diversions was conducted for the period of record from 1962 through 1982 (which was the available period for flows in Groesbeck Creek). Since flows in Groesbeck Creek are influenced by mining activities west of Quanah, flows into Lake Pauline were developed from drainage area ratios with the North Wichita River in Foard County. Flows from Groesbeck Creek were diverted to Lake Pauline to maintain the conservation storage. Limitations to the diversions included a maximum diversion rate (56 cfs), maximum yearly diversion (3,000 acre-feet) and the total flow in the river. Minimum flows were not considered. Based on the 1971 and projected 2050 area capacities of the lake, the yield of the Lake Pauline/ Groesbeck Creek system was determined to be 1,983 and 1,532 acre-feet per year, respectively. The estimated firm yield for year 2000 is 1,800 acre-feet per year.

Lakes Kemp and Diversion

Lake Kemp is located on the Wichita River, immediately upstream of State Highway 183 in Baylor County. The original storage was estimated at 268,000 acre-feet. Lake Diversion was constructed approximately 20 miles downstream of Lake Kemp for secondary storage. The reservoir lies in both Archer and Baylor counties, and has a capacity of 40,000 acre-feet.

Lake Diversion is operated in conjunction with Lake Kemp to provide water supply for municipal, industrial, irrigation, mining and recreational purposes. The City of Wichita Falls and Wichita County Improvement District No. 2 own both Lake Kemp and Lake Diversion. Water released from Lake Kemp travels to Lake Diversion for distribution. Irrigation water is diverted into canal systems.

Due to high salinity loads in the tributaries that flow to Lake Kemp, the use of water from Lake Kemp is limited. Most of the water from the Lake Kemp-Lake Diversion system is used for irrigation. To improve the water quality of the Wichita River, the Red River Authority sponsored the construction of a chloride control project, Truscott Brine Reservoir, that diverts saline water from the South Wichita River above Lake Kemp. Recent evaluations of the effectiveness of the project found these diversions reduce the total chloride load to Lake Kemp by approximately 25 percent. This results in a lower flow-weighted chloride concentration in the reservoir. However, there still is a significant chloride load to the reservoir system from the North and Middle Wichita Rivers. Future proposed diversions from these tributaries should further reduce the chloride loading into Lake Kemp.

The yield of Lake Kemp was most recently evaluated in 1976 (F&N, 1976). The yield reported in the 1997 State Water Plan was based on this study using the year 2020 area-capacity data. Assuming the average sedimentation rate determined from the 1973 sedimentation survey (1.13 acre-feet/ square mile of drainage area) continues over the planning period, the projected yield of Lake Kemp in 2050 is 101,540 acre-feet per year.

Lake Diversion, while considered secondary storage for Lake Kemp, actually may be a demand on Lake Kemp supplies during a drought. Water is supplied from Lake Kemp to maintain the water elevation in Lake Diversion. Under its current operation, it is assumed that Lake Diversion has no firm yield and is not a water supply source for this regional plan.

Santa Rosa Lake

Santa Rosa Lake is located in Wilbarger County on Beaver Creek. It was constructed in 1929 by Waggoner Estate for irrigation and had an original capacity of 15,755 acre-feet. Current use is for livestock and irrigation. It is permitted for 3,075 acre-feet per year, but recent historical use is much lower. According to a representative of Waggoner Estate, the lake went totally dry in 1971.

Based on the sedimentation analysis, the projected capacity of Santa Rosa Lake in 2050 is reduced to about 800 acre-feet due to the lake's large drainage area. Recent reported use from the lake is less than 70 acre-feet per year. The reported use when the lake purportedly went dry was not available, but was most likely less than the permitted use. In light of these findings, Santa Rosa Lake has little to no reliable supply, and is not considered a water supply source for planning purposes.

Lake Electra

Lake Electra is located on Camp Creek near the City of Electra in Wichita County. It is owned and operated by the City of Electra and has a diversion right of 600 acre-feet per year for municipal use. At normal pool elevation (1,111 feet MSL), the storage capacity of Lake Electra is 5,626 acre-feet. However, due to the relatively small drainage area (14.5 square miles), the lake often does not operate at normal pool elevation. Previous reports indicate the lake may never have completely filled since construction was completed in 1950.

Lake Electra is currently experiencing low lake levels and may be in a critical drought. A recent study conducted by DGRA for the City of Electra found that the firm yield of the lake is approximately 460 acre-feet per year. This analysis was based on the 1998 area-capacity survey, using inflows developed for a period of record from 1950 to 1970. To confirm these findings, a separate yield study was conducted as part of this evaluation for the period of record from 1940 to 1997. Inflows were based on a rainfall-runoff relationship developed from Lake Kirby for Lake Electra (F&N, 1948). This study found the firm yield of Lake Electra to be 470 acre-feet per year. It also indicated that the lake might never have filled, and that Lake Electra is still in its critical drought. Data received from the City's consultant indicate water levels for the lake have continued to decline in 1998 and 1999. It is possible that Lake Electra is entering another critical period and further study should be conducted to confirm the lake's yield. For this plan, it is assumed that the firm yield of Lake Electra is 470 acre-feet per year.

To supplement Lake Electra, the City has a permit to divert up to 800 acre-feet per year from Beaver Creek for emergency municipal use. This right has been used on occasion, but there is no permanent diversion structure or transmission line. A review of available flows in Beaver Creek indicates that during some years there is very little flow during the hot dry months. In 1984, the total flow during the dry spring and summer months was less than 800 acre-feet. Also, Beaver Creek has a higher salinity level than Lake Electra. Large diversions from Beaver Creek may require additional treatment, which is currently undesirable. During a drought, diversions from Beaver Creek will be minimal because of the water quality and low flow conditions. To fully utilize this emergency right, diversions from Beaver Creek must be planned over the year. Assuming this occurs and water is diverted at the allowable rate of 1.3 cfs, it is estimated that 550 acre-feet per year of supply is available from Beaver Creek during a dry year. However, since there is no existing diversion system in place, it is assumed that this supply is currently not available to Electra.

North Fork Buffalo Creek Reservoir

The North Fork Buffalo Creek Reservoir was constructed in 1964 to provide additional water for the City of Iowa Park. The dam is located below the confluence of North Fork Buffalo Creek and Lost Creek in Wichita County. The reservoir had an original storage capacity of 15,400 acre-feet with a drainage area of 33 square miles. The current permitted water right for the reservoir is 840 acre-feet per year. North Fork Buffalo Creek Reservoir is owned and operated by the City of Iowa Park.

The yield reported in the 1997 State Water Plan for North Fork Buffalo Creek Reservoir is the water right amount. The initial yield study of the reservoir was conducted in 1961 for a larger lake with historical flows through 1959 (BMI, 1961). Subsequent yield studies of North Fork Buffalo Creek Reservoir were not available. As part of this plan, a yield study was conducted for the reservoir for the period of 1940 through 1997. Since there was no available USGS gage in the North Fork Buffalo Creek watershed, historical flows were developed from the City of

Archer gage (1940 – 1961) and Beaver Creek (1962 – 1997) based on drainage area ratios. The yield of the reservoir was found to be 2,100 acre-feet per year throughout the planning period. There was little difference in yields between years 2000 and 2050 due to the long critical period and relative small reduction in capacity from sedimentation.

Wichita System

The Wichita System consists of Lake Kickapoo and Lake Arrowhead. These lakes are owned and operated by the City of Wichita Falls for municipal and industrial supply. Water from the lakes is transported to Wichita Falls' water treatment plants for treatment and distribution. Some raw water is sold directly to wholesale customers. A brief description of each lake follows:

Lake Kickapoo

Lake Kickapoo was built by the City of Wichita Falls in 1946 for municipal water supply with an initial conservation storage capacity of 106,000 acre-feet. The reservoir is located on the North Fork of the Little Wichita River in Archer County. It is owned and operated by the City of Wichita Falls. The diversion rights from the lake total 41,720 acre-feet per year. Recent reservoir operation analyses for Lake Kickapoo conducted by the TWDB reported the firm yield to be 16,072 acre-feet per year with an estimated conservation storage of 105,000. The TWDB analysis did not take into account sedimentation. Therefore, the long-term yield of Lake Kickapoo was re-analyzed. The results of these analyses indicated only a minimal decrease in reservoir yield over the planning period. This was attributed to the long critical period (1958 - 1982). The projected yields of Lake Kickapoo in years 2000 and 2050 are 15,945 and 15,343 acre-feet per year, respectively. The revised yields are used in the assessment of supply.

Lake Arrowhead

Lake Arrowhead was built in 1966 by the City of Wichita Falls for municipal, industrial and recreational use. The lake is located on Little Wichita River in Clay County, about 12 miles southeast of Wichita Falls. The lake is owned and operated by the City of Wichita Falls. The diversion rights from Lake Arrowhead are over 45,000 acre-feet per year. This reservoir was recently evaluated by TWDB (1997) in conjunction with Lake Kickapoo. Accounting for sedimentation, the yield of Lake Arrowhead in 2050 was reported to be 29,532 acre-feet per year, with a 2050 projected conservation storage of 224,241acre-feet.

Lakes Olney and Cooper

Lakes Olney and Cooper are a twin-lake system located on Mesquite Creek in Archer County. Lake Olney dam was constructed in 1935 to provide municipal water for the City of Olney. In 1953 the dam for Lake Cooper was built for additional storage. Collectively, the lakes have a conservation storage capacity of 6,650 acre-feet, with diversion rights of 1,260 acre-feet per year.

The yield reported for these lakes in the 1997 State Water Plan is based on the water right. Previous yield studies were not available for review. Since the lakes have a small drainage area (12.3 square miles) that may not be able to support the full diversion right, estimates of the firm yield of Lakes Olney and Cooper for years 2000 and 2050 were determined. Inflows were developed from the Archer City and Beaver Creek gages, and area-capacity relationships were estimated assuming a trapezoidal shape. The firm yield of the lakes was determined to be 910 acre-feet per year. This yield remains constant through the planning period due to the long critical period (26.2 years) and small amount of sedimentation.

Lake Nocona

Lake Nocona is a 25,400 acre-foot reservoir located on Farmers Creek in Montague County, approximately 8 miles northeast of the City of Nocona. Construction was completed in 1960 to provide municipal water supply to the City of Nocona. The lake is owned and operated by the North Montague County Water Supply District. The original permit for Lake Nocona allowed the diversion and use of 4,500 acre-feet per year for municipal, industrial, and mining purposes. In 1984, the final determination of water rights for the Middle Red River segment of the Red River Basin reduced the authorized diversion to 645 acre-feet per year for municipal use only. Subsequent studies reported the firm yield of the reservoir to be 1,260 acre-feet per year through year 2030 (F&N, 1986). The water right permit for diversions from Lake Nocona was amended in 1987 to 1,260 acre-feet per year for municipal, irrigation and recreational uses.

The 1986 study found that sedimentation is not expected to significantly affect the firm yield of Lake Nocona over the planning period. The yield analyses conducted in 1986 assumed 1986 area-capacity conditions and accounted for reduced inflows from Soil Conservation Services (SCS) structures. It was assumed that over time, the impact of the SCS structures on runoff would decrease as the sediment pools become silted. This would result in an increase of inflows over the critical period, which would negate the reduction in yield due to future sedimentation. The study concluded that the firm yield of Lake Nocona should be approximately 1,260 acre-feet per year through 2030. For this plan it is assumed that the firm yield remains constant through the planning period.

Amon G. Carter

Lake Amon G. Carter is located on Big Sandy Creek in Montague County, about 6 miles south of the City of Bowie, Texas. The lake was originally constructed in 1956 and enlarged in 1979. It has a current storage capacity of 28,600 acre-feet and an estimated yield of 2,600 acre-feet per year. The lake is owned and operated by the City of Bowie for water supply. The existing water right permit allows for a diversion of 5,000 acre-feet per year for municipal, industrial and mining water use.

Lake Amon Carter's yield reported by TWDB is based on year 2000 capacity. Operation studies using year 2030 area-capacity data indicate a reduction in yield of just over 100 acre-feet per year (2,488 acre-feet per year). Additional sedimentation may continue to slightly reduce the firm yield of this reservoir, but it should not be significant. For this study, the 2050 firm yield of Lake Amon Carter was estimated at 2,413 acre-feet per year.

Miller's Creek Reservoir

Miller's Creek Reservoir is located about 7 miles southeast of Bomarton, Texas. The dam was constructed in 1977 on Miller's Creek in Baylor County, and the reservoir extends southwest into Throckmorton County. It is owned and operated by the North Central Texas MWA. It has a permitted diversion of 5,000 acre-feet per year for municipal, industrial and mining uses. Since water from this reservoir is primarily used for municipal supply for cities located in Knox and

Haskell Counties in Region G, this reservoir will not be further considered in the Region B analyses.

Other Lakes and Reservoirs in the Region

Lake Wichita

Lake Wichita is located south of the City of Wichita Falls and lies in Archer and Wichita county. It was constructed in 1901 on Holliday Creek for irrigation and municipal use, but little water has been used for municipal purposes since Lake Kickapoo water supply became available. This is because Lake Wichita has a very high chloride content and must be blended with higher quality water to be acceptable for municipal use. Presently, Lake Wichita is used for recreational purposes only.

Lake Iowa Park

Lake Iowa Park is located on Stevens Creek, northwest of the City of Iowa Park, and has been a source of water for the City of Iowa Park since 1949. The lake has a storage capacity of 2,565 acre-feet and the water right permit allows a diversion of 500 acre-feet per year for municipal use. It is currently used in conjunction with North Fork Buffalo Creek for supply to the City of Iowa Park. No yield studies were conducted for this lake. For this plan, it is assumed that half of the water right is available for supply.

3.1.2 Sedimentation and Reservoir Yields

Sediment production rates in Region B vary considerably due to land use, soil types and topography. Wind erosion is quite active across the rolling prairies and cultivated fields. The USGS and U.S. Soil Conservation Services have compiled much of the sedimentation data available for reservoirs in Region B. Only Lake Kemp, Santa Rosa Lake, Lake Amon Carter and Lake Nocona have published sedimentation surveys. Therefore, for this study estimates of sedimentation rates were developed from several sources. For sedimentation rates developed from the Texas Board of Water Engineers Report 5912, the effects of SCS structures and development were considered. Estimates of reservoir capacities for years 2000 and 2050, based on the reservoir's drainage area and sedimentation rate, are presented in Table 3-3. Since the yield of a reservoir is affected by the reservoir's area-capacity relationship, high sedimentation rates will reduce the reservoir's storage capacity and firm yield. The projected reservoir yields over the planning period are presented in Appendix A, Table 4.

Table 3-3: Estimated Sedimentation Rates and Projected Capacities

Reservoir	Drainage Area (Sq mi)	Sediment Rate (af/yr/sq mi)	Year Began Filling	Year of Initial Capacity	Capacities (Ac-ft)			Source (sediment rate)
					Initial	2000	2050	
Lake Pauline	42.6	0.68	1928	1971	4,137	3,297	1,849	TBWE 1959
Lake Kemp	2086	1.13	1922	1973[1]	268,000	204,356	86,500	F&N 1976
Santa Rosa Lake	334	0.37	1929	1929	15,755	6,980	802	TWC 1979
Lake Electra	14.5	0.69	1950	1998[2]	5,626	5,626	5,126	TBWE 1959
North Fork Buffalo Creek	33	0.86	1964	1964	15,400	14,378	12,959	TBWE 1959
Lake Kickapoo	275	0.68	1946	1946	106,400	96,302	86,952	TBWE 1959
Lake Arrowhead	832	0.54	1966	1966	262,100	246,800	224,240	TWDB 1997
Olney/Cooper	12.3	0.68	1935/1953	1935/1953	6,650	6,165	5,747	TBWE 1959
Lake Nocona	94	0.48	1961	1961	25,400	21,750	19,500	F&N 1986
Amon Carter	101	0.51	1956	1980[3]	28,589	27,559	24,983	HDR 1979

1. Revised construction was completed in 1973. At that time, COE re-surveyed the lake.
2. 1998 area-capacity data. Previous survey conducted in 1987 indicated much larger capacity. This difference is currently being investigated.
3. Enlargement of the Lake Amon Carter was completed in 1980 and area-capacity was determined at that time.

3.1.3 Reservoir Water Rights

Water rights for reservoirs located in Region B are summarized on Table 3-4. Comparisons of rights to firm yields indicate that water rights for many of the reservoirs in Region B exceed firm yield. For most of the reservoirs, the existing contractual demands are typically less than reservoir yields. Only for Lake Electra are the historical use and municipal sales greater than the reservoir's firm yield. For Lake Kemp, the 2000 firm yield is approximately 65 percent of the permitted right. While historical use has not exceeded the reservoir yield, the City of Wichita Falls and Wichita County Water Improvement District No. 2 will need to develop operational policies to ensure there are sufficient supplies to the users, especially if Wichita Falls begins to use water from Lake Kemp for municipal use on a regular basis. Presently, water from Lake Kemp is used only for irrigation and industrial uses, with occasional emergency municipal use. A summary of the existing known contracts by reservoir is presented on Table 3-5. With the exception of the City of Wichita Falls, the primary water right holders are not included on Table 3-5.

Table 3-4: Summary of Reservoir Water Rights

Reservoir	Water Right No.	Holder	Water Right Amount (acre-feet/year)						2000 Yield (ac-ft/yr)
			Mun	Ind	Irr	Mining	Rec	Total	
Greenbelt	5233	Greenbelt MIWA	14,530	500	250	750		16,030	7,699
Pauline/ Groesbeck	5230	West Texas Utility Company		7,137	16		0	7,153	1,800
Kemp/ Diversion	5123	Wichita Co WID#2 Wichita Falls	25,150	40,000	120,000	2,000	5,850	193,000	126,000
Santa Rosa	5124	W.T. Waggoner Estate			3,075			3,075	0
Electra	5128 5128	City of Electra Emergency supply	600 800					1,400	400
Kickapoo	5144	Wichita Falls	40,000					40,000	15,945
Arrowhead	5150	Wichita Falls	45,000					45,000	29,532
Olney/ Cooper	5146	City of Olney	1,260					1,260	910
N.F. Buffalo Creek	5131	City of Iowa Park	840					840	2,100
Iowa Park	5132	City of Iowa Park	500					500	250[1]
Nocona	4879	North Montague Co. WSD	1,080		100		80	1,260	1,260
Amon Carter	3320	City of Bowie	3,500	1,300		200		5,000	2,600

Mun – Municipal Use Ind – Industrial Use Irr – Irrigation Use Rec – Recreational Use

1. No available yield studies. The yield was assumed to be half of the water right.

Source: Texas Natural Resource Conservation Commission, Water Rights Database, 1999.

Table 3-5: Summary of Existing Water Supply Contracts

Source Name	Contract Holder	Contract Amount		Comment
		MGD	AF/YR	
Greenbelt	Crowell		247	No Contract Amount – 1996 Historical Use
Greenbelt	Quanah		720	No Contract Amount – 1996 Historical Use
Greenbelt	Red River Authority		237	No Contract Amount – 1996 Historical Use
Greenbelt	Georgia Pacific		328	No Contract Amount – 1996 Historical Use
Kemp/Diversion	Panda Energy International	8	9,000	New Contract[1]
Kemp/Diversion	West Texas Utilities Co		20,000	Contract, Water Right No.398
Kemp/Diversion	TPW Dundee Fish Hatchery		2,200	
Nocona	Nocona Hills Owners Assoc		246	Contract, Water Right No.240
Wichita System	Archer City	0.6	673	Contract – Lake Kickapoo, Water Rt No.384
Wichita System	Archer County MUD #1	0.15	168	Contract, No Expiration Date
Wichita System	Burkburnett	2.493	2,795	Contract
Wichita System	Dean Dale WSC	0.825	925	Contract, No Expiration Date
Wichita System	Friberg-Cooper WSC	0.25	280	
Wichita System	Holliday		264	No Contract Amount – 1996 Historical Use
Wichita System	Iowa Park	1.995	2,236	
Wichita System	Lakeside City		392	
Wichita System	Olney	1	1,120	Contract – Lake Kickapoo, Water Rt No.1471
Wichita System	Pleasant Valley		78	No Contract Amount – 1996 Historical Use
Wichita System	Red River Authority	0.75	841	
Wichita System	Scotland	0.25	280	
Wichita System	Sheppard AFB	2.167	2,429	Budgeted amount. The AFB is not restricted to a maximum or minimum water supply.
Wichita System	Wichita Falls		21,650	1996 Historical Use
Wichita System	Wichita Valley WSC	0.25	280	
Wichita System	Windthorst WSC	0.75	841	

Table 3-5 (cont): Summary of Existing Water Supply Contracts

Source Name	Contract Holder	Contract Amount		Comment
		MGD	AF/YR	
Wichita System	AC Spark Plug		101	No Contract Amount - Historical Use
Wichita System	Pittsburg Plate Glass		303	No Contract Amount - Historical Use
Wichita System	Stanley Tool		95	No Contract Amount - Historical Use
Wichita System	Vetrotex America		842	No Contract Amount - Historical Use
Wichita System	Flake Ind. Serv.		106	No Contract Amount - Historical Use
Wichita System	Wichita Nat. Linen		93	No Contract Amount - Historical Use
Wichita System	Howmet Turbine		115	No Contract Amount - Historical Use
Wichita System	W F Energy		349	No Contract Amount - Historical Use
Wichita System	Howmet Refurb.		31	No Contract Amount - Historical Use
TOTAL AMOUNT – WICHITA SYSTEM			37,310	

Sources: Lehfeldt, David (City of Wichita). Communication with Simone Kiel (of Freese and Nichols, Inc.), Data as of May 1999, Received August 1999.
Kidd, Bobby (of Greenbelt Municipal and Industrial Water Authority). Communication with Simone Kiel (of Freese and Nichols, Inc.), August 1999.
Texas Natural Resource Conservation Commission, Water Rights Database, 1999.

[1] The contract with Panda Energy is for 8 MGD of water taken from the WCWID canal system, approximately 17 miles downstream of Lake Diversion. Accounting for losses during transport, the amount of water from the Kemp/Diversion system to Panda Energy is approximated at 14,000 acre-ft./yr.

3.1.4 Run-of-River Supplies

Portions of three river basins are located in Region B. The Red River and its tributaries represent the largest river system, flowing across the central and northern areas of the region. The Brazos River flows through the southern portion of King and Baylor counties, and the upper tributaries of the Trinity River lie in southwest Montague County.

The Red River forms the northern boundary of Region B and flows eastward along the Texas – Oklahoma border. Tributaries within the region include the Pease River, Wichita River and Little Wichita River. High concentrations of total dissolved solids, sulfate and chloride are concerns for the upper reaches of these streams during low flow conditions. Naturally occurring salt springs, seeps and gypsum outcrops are found in the area westward of Wichita County to the High Plains Caprock Escarpment in Region A. The quality of the water gradually improves downstream toward the eastern portion of the region. As a result water from these rivers in Cottle, Foard, King, Hardeman and parts of Baylor and Wilbarger counties is generally not used or is restricted to irrigation use only.

Existing run-of-the river water rights for the Red River system in Region B are shown on Table 3-6 and include rights on the Red River in Clay and Montague Counties, Little Wichita River, Wichita River and Beaver Creek. Beaver Creek is a tributary to the Wichita River, and flows eastward from Foard County to the Wichita River in Wichita County. Groesbeck Creek, which has a large water right associated with Lake Pauline, is addressed with this reservoir. Generally, rights associated with reservoirs, unnamed tributaries, or smaller rivers and streams are not included on Table 3-6.

Table 3-6: Run of the River Water Rights

Water Right	County	Amount (af/yr)	Use	Owner
Red River				
4877	Montague	1,600	Mining	Peba Oil & Gas
5143	Clay	200	Irrigation	Joe J. Parker
Little Wichita River				
4268	Clay	3,600	Irrigation	A.L. Rhodes
5152	Clay	1,560	Municipal	City of Henrietta
Wichita River				
4433	Wichita	300	Irrigation	Alvin & Nana Robertson
5135	Clay	357	Irrigation	Eagle Farms, Inc.
5136	Clay	200	Irrigation	Joe L. Hale Estate
5138	Clay	55	Irrigation	M.E. McBride
5139	Clay	30	Irrigation	Bob Brown
5140	Clay	270	Industrial	Red River Feed Yard, Inc.
5152A	Wichita	2,352	Recreation	City of Wichita Falls
5530	Wichita	32	Irrigation	Joe L. Burton
Beaver Creek				
5125	Wilbarger	675	Irrigation	W.T. Waggoner Estate
5126	Wilbarger	60	Municipal	W.T. Waggoner Estate
5127	Wilbarger	85	Municipal, Mining	W.T. Waggoner Estate
5129	Wichita	404	Irrigation	Harry L. Mitchell
5393	Wichita	450	Irrigation	James Brockriede
5128[1]	Wilbarger	800	Municipal	City of Electra

1. This water right is associated with Lake Electra. It is a right to divert water from Beaver Creek to Lake Electra for emergency municipal use.

Source: Texas Natural Resource Conservation Commission, Water Rights Database, 1999.

Methodology

To assess the availability of water from streams in Region B, the historical flows for the major rivers were reviewed. Many existing water rights are not limited by minimum flows for environmental protection, but future rights will be subject to minimum flow requirements. Therefore, a comparison of historical flows, water rights and future available supply was evaluated. The Lyons method, which is TNRCC's default method in the absence of specific studies, was used to determine the amount of flow that is available when minimum flows are considered (Lyons, 1979). The Lyons method recommends maintaining minimum stream flows of 40 percent of the median flow during October through February and 60 percent of the median flow during March through September. Flows above these amounts were assumed available for supply. After accounting for in-stream flow requirements, the minimum annual flow for the period of record was selected as the available supply during drought conditions. A summary of the run-of-the-river analysis is presented in Table 3-7.

Table 3-7: Run of the River Available Supply

River	USGS Gage	Period of Record	Minimum Flow (af/yr)[1]	Available Supply (af/yr)[2]	Existing Water Rights
Red River	7308500 (near Burkburnett)	1960 – 1998	99,506	3,127	200
Red River	7315500 (Terral, OK)	1960 – 1998	449,046	112,879	1,800
Little Wichita	7314900 (above Henrietta)	1966 – 1998	1,463	902	5,160 (3,600)[3]
Wichita	7312500 (at Wichita Falls)	1960 - 1998	60,725	20,833	2,684
Wichita	7212700 (near Charlie)	1968 - 1998	101,014	35,049	3,596
Beaver Creek	7312200 (at Electra)	1960 - 1998	11,645	7,004	2,474

1. Minimum annual flow recorded during the period of record
2. Minimum flow after accounting for instream requirements.
3. Existing water rights, excluding City of Henrietta

As shown on the above table, there are sufficient flows in the Red and Wichita Rivers and Beaver Creek to support existing water rights, and there may be additional flow for potential future diversions. However, the water in these streams is high in chlorides and suspended solids, which may unsuitable for municipal use. The analysis for the Little Wichita River found there is little available flow for diversions. This is due in part to impoundment of upstream flows in Lake Arrowhead. Since the water right for the City of Henrietta has priority over both Lakes Arrowhead and Kickapoo, much of this right is supplied via Lake Arrowhead. Water is released from Lake Arrowhead and flows downstream to the City's diversion point. Currently, it does not appear that the Little Wichita River can fully support all existing water rights during a drought. Some reductions in flows for upstream water right holders may already be accounted for in the analyses. However, the reported historical use for water rights greater than 1,000 acre-feet per year indicates that many of these rights are currently not being used.

3.2 Groundwater Supplies

3.2.1 General Description

Groundwater is primarily supplied in Region B by two aquifers, the Seymour and the Blaine Gypsum. The Seymour is designated a major aquifer and is found in the central and western portions of the region. It is currently used in Hardeman, Wilbarger, Wichita, Clay, Baylor, Foard and Cottle counties. The Blaine is considered a minor aquifer and useable groundwater is limited to the westernmost portion of the region. These aquifers provide a large percentage of available supply in these counties. In addition, the upper portion of the Trinity Aquifer occurs in Montague County in the eastern part of the region. Limited quantities of groundwater are used from the Trinity for municipal and irrigation uses. There are also unconsolidated formations within the region that are used for ground water supply in some areas. The TWDB identifies these sources as "Undifferentiated Other Aquifer". These formations are not well defined in the literature, but still provide substantial quantities of water in Archer, Clay, Cottle, Montague and Wichita Counties. For purposes of this report, the ground water availability for "Other Aquifers" will be determined from the reported historical use.

Seymour Aquifer

The Seymour Formation consists of isolated areas of alluvium that vary in saturated thickness from less than 10 feet to over 80 feet. This aquifer is relatively shallow and exists under water table conditions in most of its extent. Artesian conditions can occur where the water-bearing zone is overlain by clay. The upper portion of the Seymour consists of fine-grained and cemented sediments. The basal portion of the formation has greater permeability and produces greater volumes of water. Yields of wells typically range from 100 gpm to 1,300 gpm, depending on the saturated thickness, and average about 300 gpm.

Recharge to the Seymour is largely due to direct infiltration of precipitation over the outcrop area. Surface streams adjoining the outcrop are at elevations lower than the water levels in the Seymour aquifer and do not contribute to recharge. Other possible sources of recharge include infiltration from irrigation or upward leakage of water from underlying Permian formations, but these amounts are insignificant.

Natural discharge from the Seymour occurs through seeps and springs, evapotranspiration, and leakage to the Permian. Harden estimates that a large part of the Seymour's total natural discharge is from evapotranspiration from plants and is considerably larger than discharges to seeps and springs (TWDB Report 337, 1992).

Water quality of the Seymour is variable throughout the region, and generally ranges from fresh to slightly saline. Brine pollution from earlier oil activities and excessive pumping has caused localized concentrations of minerals in the alluvium, limiting the full utilization of the water resource. In addition, high nitrate concentrations occur in the ground water over a wide area. These nitrate concentrations are often due to agricultural practices, and can be attributed to nitrogen fertilizer or leaching from areas formerly covered by nitrogen fixing vegetation such as grasses or mesquite groves. Other sources of nitrate include organic matter from poorly functioning septic systems, infiltration of animal wastes or naturally occurring sources.

Blaine Aquifer

The Blaine Formation extends in a narrow outcrop band from Wheeler to King counties. Groundwater occurs in numerous solution channels and caverns in beds of gypsum and anhydrite. In most places the aquifer exists under water table conditions, but it is also artesian where overlain by the Dog Creek Shale. Saturated thickness of the aquifer approaches 300 feet in its northern extent, and is generally less in the Region B area. Well yields vary considerably from one location to another due to the nature of solution channels. It is common for dry holes to be found adjacent to wells of moderate to high yield. The average well yield is 400 gpm.

The primary source of recharge to the Blaine is precipitation that falls on the High Plains Escarpment to the west and the Blaine outcrop area. The solution openings and fractures in the gypsum provide access for water to percolate downward. The Blaine may also receive some recharge from the overlying Dog Creek Shale.

Water in the Blaine generally moves eastward through the solution channels, dissolving mineral deposits along the way, and discharging to low topographic areas. The dissolved solids concentrations in the aquifer increase with depth and generally range from 1,000 to over 10,000 mg/l. Due to the high mineral content, the TWDB has limited the extent of the Blaine to areas with water less than 10,000 mg/l of dissolved solids.

Natural salt springs and seeps from the Blaine contribute to increased salinity of surface water. Due to the high mineral content the Blaine has been used primarily for irrigation of salt tolerant crops.

Trinity Group

The Trinity Group consists of three formations, the Travis Peak, Glen Rose and Paluxy. In the northern part of its extent, the Glen Rose thins out and the Travis Peak and Paluxy coalesce into a single geologic unit known as the Antler Formation. In Region B, the Trinity Group outcrops in the eastern portion of Montague County. The thickness of the aquifer ranges from less than 10 feet to 600 feet. Water table conditions occur in outcrop area, while artesian conditions exist in the downdip formation. Well yields in the Trinity Group range from moderate to low. The effective recharge for the entire Trinity Aquifer as determined by TDWR is 1.5 percent of the mean annual precipitation over the outcrop area (TDWR, 1982).

Limited amounts of good quality water can be obtained from the Trinity in Montague County. Ground water is generally used for municipal, mining, irrigation and livestock purposes. Water level declines have been recorded in heavily pumped areas to the south and southeast of Montague County.

3.2.2 Groundwater Availability and Recharge

The average annual groundwater availability is the amount of water that could be reasonably developed from the aquifer. It is comprised of the annual effective recharge plus the amount of water that can be recovered annually from storage over a specified planning period without causing irreversible harm, such as subsidence or water quality deterioration.

As part of the 1997 State Water Plan, the TWDB evaluated the groundwater availability for the major and minor aquifers of the state. Previous publications and water well data were used to derive annual ground water availability. Effective recharge was determined by applying a percentage of the mean annual precipitation upon the aquifer's outcrop area. For the Seymour, the TWDB used a conservative estimate of 5 percent of the average annual precipitation for the entire Seymour formation. This percentage was generally based on the low flow analyses used in the ground water studies of Baylor and Jones counties (TDWR Report 238, 1979). In addition, an estimated annual amount recoverable from storage was determined based on 75 percent of the total storage for the planning period from 1974 through 2030. After 2030, it was assumed no water would be available from storage.

Reviews of previous ground water publications found a range of reportable recharge rates and availability estimates for the Seymour Aquifer. The Baylor study (TDWR, 1978) indicated an effective recharge rate of 10 percent of the average annual precipitation for the year 1969. However, ground water availability was limited in some areas due to thin saturated thickness and high loss to evapotranspiration. The Baylor study also did not include mining of ground water from storage due to the nature of the near surface aquifer (i.e., did not want to create abnormally low water levels. Most recently, a study by Woodward Clyde for the City of Vernon estimated the recharge to the Seymour in the Odell-Lockett area in Wilbarger County to be approximately 15 percent of the average rainfall (Woodward-Clyde, 1998).

This higher estimate of recharge appears to be limited to specific areas and cannot be applied over the regional aquifer. Also, it is unrealistic to expect that all aquifer recharge will be available for development. The TWDB estimate of 5 to 7 percent of the annual precipitation is a reasonable estimate of effective recharge for the Seymour, and is appropriate for regional water planning purposes. However, since the Seymour Aquifer is a near-surface unconfined aquifer and is sensitive to recharge and withdrawals, mining of the aquifer may adversely affect the water supply. Therefore, for this plan, the mining of storage is not included in the ground water availability estimates for the Seymour.

For the Blaine Gypsum formation, comparisons of declines of water levels and pumpage were used to estimate effective recharge. In Hardeman County, Maderak (TDWR, 1972) determined the effective recharge to the Blaine to be between 5 and 7 percent of the average annual precipitation. The TWDB used a conservative estimate of 5 percent for water availability planning. No recoverable storage from the Blaine was included in the availability estimates. For the Blaine, the ground water estimates include water with TDS up to 10,000 mg/l. For the other aquifers in the region, the availability estimates were limited to water containing less than 3,000 mg/l of dissolved solids.

The TWDB methodology for ground water availability for the Blaine Aquifer is appropriate for this planning effort. However, the Blaine Aquifer has a large amount of ground water with moderate to high salinity. As a result much of the water from this formation is not used in the region. The 1997 Water Plan includes water with moderate salinity in the availability numbers for irrigation, but is not appropriate for municipal use. Therefore, the ground water availability from the Blaine is broken down by TDS level. Based on historical water quality data, there is no water available for municipal purposes. Water with TDS levels between 1,000 and 3,000 is appropriate for irrigation, livestock, mining and some industrial uses. Water with TDS levels greater than 3,000 may be available with treatment or irrigation of salt tolerant crops.

The effective recharge for the Trinity Aquifer within the Brazos, Trinity and Red River basins was determined by the trough method (TDWR Report 238, 1979). Using this method, it was determined that approximately 1.5 percent of the annual precipitation over the outcrop area is available for development as effective recharge. In addition, the TWDB estimated that 1 million acre-feet of water could be withdrawn from artesian storage within the Trinity. However, much of the Trinity Group within Montague County is not artesian and the storage values may be less.

Since much of the Trinity Aquifer is artesian and the outcrop area is used to recharge the downdip portion of the aquifer, a direct application of effective recharge over the outcrop area is not appropriate to determine ground water availability. For this planning effort, the availability estimates determined by TWDB for the Trinity Aquifer will be used.

For the Seymour and Blaine aquifers, the recharge values used in the 1997 Water Plan were based on outcrop areas defined in 1979. Since 1979, the outcrop areas have been re-defined and there is a longer record of precipitation data available. As a result, the amount of groundwater that is available from these aquifers differs from the 1997 Water Plan. Groundwater availabilities for the Seymour and Blaine aquifers were re-calculated as 5 percent of the mean annual rainfall over the outcrop area, using the latest precipitation data and the most recent delineation of recharge areas. The availability estimates for the Trinity were taken directly from the 1997 Water Plan. A summary of ground water availability by aquifer and county is presented in Table 3-8. Table 3-9 shows the availability in the Blaine Aquifer by concentration of TDS.

Table 3-8: Ground Water Availability – Region B

County Name	Basin	Aquifer Name	Ground Water Availability (af/yr)	Effective Recharge Rate (in/yr)
Baylor	Brazos	Seymour	8,205	1.35
Baylor	Red	Seymour	1,485	1.35
Baylor	*Total*	*Seymour*	*9,690*	*1.35*
Clay	Red	Seymour	7,870	1.39
Cottle	Red	Seymour	8,410	1.11
Cottle	Red	Blaine	27,100	1.01
Foard	Red	Seymour	12,130	1.23
Foard	Red	Blaine	15,390	1.19
Hardeman	Red	Seymour	15,390	1.18
Hardeman	Red	Blaine	23,770	0.92
King	Red	Blaine	17,590	1.10
Montague	Red	Trinity	239	0.51
Montague	Trinity	Trinity	2,443	0.51
Montague	*Total*	*Trinity*	*2,682*	*0.51*
Wichita	Red	Seymour	13,920	1.38
Wilbarger	Red	Seymour	30,500	1.28

Table 3-9: Availability in Blaine Aquifer by TDS

County	Basin	Ground Water Availability (af/yr)			
TDS (mg/l):		*Total*	*1,000 - 3,000*	*3,000 - 10,000*	*>10,000*
Cottle	Red	27,100	6,494	18,153	2,453
Foard	Red	15,390	10,945	4,445	0
Hardeman	Red	23,770	13,601	10,169	0
King	Red	17,590	3,706	13,884	0

As shown on the above tables, there are large quantities of water available in the Seymour and Blaine aquifers, and limited quantities in the Trinity Aquifer. However, the water in the Blaine is unsuitable for municipal use without additional treatment, and only a portion is readily available for other uses. Water quality issues associated with the Seymour Aquifer (nitrates and TDS) also limit the usefulness of this resource. Historical use indicates that with the exception of Wilbarger County, much of the groundwater is not fully developed or not currently being used. A comparison of the 1997 historical use and groundwater availability estimates is shown on Table 3-10.

Table 3-10: Ground Water Historical Use

County	Aquifer	Availability (af/yr)	Historical Use-1997 (af/yr)
Baylor	Seymour	9,690	1,352
Clay	Seymour	7,870	921
Cottle	Seymour	8,410	22
Cottle	Blaine	27,100	2,517
Foard	Seymour	12,130	3,688
Foard	Blaine	15,390	23
Hardeman	Seymour	15,390	123
Hardeman	Blaine	23,770	3,901
King	Blaine	17,590	213
Montague	Trinity	2,682	419
Wichita	Seymour	13,920	2,631
Wilbarger	Seymour	30,500	23,344

3.2.3 Reliability of Local Supplies

Many of the local cities and communities in Region B rely on groundwater for all or a portion of their municipal supply. Those communities that use groundwater exclusively include the cities of Vernon, Seymour, Paducah, Saint Jo and Montague. The cities of Electra, Burkburnett and Chillicothe use a combination of groundwater and surface water. Also, several water supply corporations use groundwater to supply rural areas. Based on surveys of the water users in Region B, some of these users are experiencing lower water table elevations, nitrate contamination, and/or salt water intrusion of their groundwater supplies. Nitrate contamination is a particular concern in the Seymour Aquifer.

Two of the cities, Vernon and Electra, have recently conducted independent studies of their groundwater systems. The Vernon study (Woodward-Clyde, 1998) found that the City has an estimated reliable supply of 2.5 million gallons per day (MGD), which is about 2,800 acre-feet per year. In addition, there is approximately 0.5 MGD that is available from several older City wells. This supply has higher nitrate levels and historically has been used only for peak summer demands. The City plans to utilize these wells for manufacturing needs that do not have nitrate limits. The study for the City of Electra found that the system can sustain between 0.1 and 0.15 MGD without significant water table decline. This amount (112 acre-feet per year) was assumed available for future use. However, there are water quality issues with the groundwater (nitrates and TDS) that may preclude its use for municipal needs without additional treatment.

3.3 Inter-Basin Transfers and Inter-Region Transfers

There is only one known inter-basin transfer in Region B. This is from Lake Kickapoo in the Red River Basin to the City of Olney in the Brazos basin. The City of Olney has a contract with the City of Wichita Falls to provide 1 MGD of water during peak demands. Most years this additional supply is not used or minimally used.

The only surface water supply source located outside Region B is Greenbelt Lake. Water is supplied from Greenbelt Municipal and Industrial Water Authority to selected cities and communities in Hardeman and Foard Counties via a pipeline from Greenbelt Lake.

3.4 Allocation of Existing Supplies

3.4.1 Approach

TWDB has requested that existing water supply be allocated to water users by city and category (Appendix A Table 5). This includes a break down by county and river basin. This table represents a picture of where the existing water is being used today. If available, surface water allocations are based on current water rights, contracts and available yields, accounting for the most restraining limitation (e.g., reservoir yield or water treatment). Groundwater allocations are based on current developed well fields, accounting for aquifer limits. For categories or cities with no associated contracts or rights, the historical use data provided by TWDB was used. Where appropriate, the highest reported use over the past 10 years was used. Surface water use reported to TWDB for livestock watering was assumed supplied by on farm stock ponds.

Once the allocations were made, they were checked against source yields. Adjustments were made as needed. If a source's yield was less than the water rights, adjustments were made based on historical use and projected demands. If all future demands could be met by the source, then a hierarchy of water rights was not performed.

A similar approach was taken for groundwater. However, in lieu of water rights and contracts, the historical maximum use (past 10 years) and groundwater availability were considered. For the Cities of Vernon and Electra, who have recently had their groundwater supplies evaluated, the findings of these studies were used for long-term supply availability.

As a special case with mixed uses, the demands and water supply for Sheppard Airforce Base (SAFB) were accounted for separately. SAFB receives most of its water supply from the City of Wichita Falls. It's current contract does not specify a minimum or maximum amount, but it is expected that SAFB will use approximately 2,429 acre-feet per year of water over the planning period. This amount is accounted for in the total available supply from the Wichita system shown on Table 3-11.

Table 3-11: Allocation of Existing Supplies – Region B

Basin Name	County Name	City Name	Source Name	Existing Supply (af/yr)						Comment
				2000	2010	2020	2030	2040	2050	
Red	Archer	Archer City	Wichita System	673	673	673	673	673	673	Long-term contract
Brazos	Archer	County-Other	Other Aquifer	30	30	30	30	30	30	80% of Historical Max Use (adjusted for aquifer limit)
Red	Archer	County-Other	Other Aquifer	107	107	107	107	107	107	80% of Historical Max Use (adjusted for aquifer limit)
Red	Archer	County-Other	Wichita System	1,009	1,009	1,009	1,009	1,009	1,009	Contracts
Trinity	Archer	County-Other	Other Aquifer	7	7	7	7	7	7	80% of Historical Max Use (adjusted for aquifer limit)
Red	Archer	Holliday	Wichita System	230	225	215	207	199	191	No Contract Amt, Supply = Demand
Red	Archer	Irrigation (On-Farm)	Kemp	4,891	4,048	3,765	3,483	3,201	3,100	5% Of Available Irrigation Releases
Red	Archer	Lakeside City	Wichita System	392	392	392	392	392	392	Contract, No Expiration Date
Brazos	Archer	Livestock	Other Aquifer	11	11	11	11	11	11	80% of Historical Max Use (adjusted for aquifer limit)
Brazos	Archer	Livestock	Local Supply	122	122	122	122	122	122	Historical Max Use, Stock Tanks
Red	Archer	Livestock	Other Aquifer	182	182	182	182	182	182	80% of Historical Max Use (adjusted for aquifer limit)
Red	Archer	Livestock	Local Supply	2,051	2,051	2,051	2,051	2,051	2,051	Historical Max Use, Stock Tanks
Trinity	Archer	Livestock	Other Aquifer	24	24	24	24	24	24	80% of Historical Max Use (adjusted for aquifer limit)
Trinity	Archer	Livestock	Local Supply	266	266	266	266	266	266	Historical Max Use, Stock Tanks
Red	Archer	Mining	Other Aquifer	1	1	1	1	1	1	Historical Max Use
Red	Archer	Scotland	Wichita System	280	280	280	280	280	280	Contract, No Expiration Date
Red	Archer	Steam Electric Power	Kemp	14,000	14,000	14,000	14,000	14,000	14,000	New Contract for proposed plant
Brazos	Baylor	County-Other	Seymour	189	189	189	189	189	189	Historical Max Use- 10 Yrs, Baylor WSC Max Use = 220 (Red & Brazos)
Red	Baylor	County-Other	Seymour	30	30	30	30	30	30	Historical Max Use- 10 Yrs

Table 3-11: Allocation of Existing Supplies – Region B (continued)

Basin Name	County Name	City Name	Source Name	Existing Supply (af/yr) 2000	2010	2020	2030	2040	2050	Comment
Brazos	Baylor	Irrigation (On-Farm)	Seymour	1,837	1,837	1,837	1,837	1,837	1,837	Historical Max Use
Red	Baylor	Irrigation (On-Farm)	Seymour	375	375	375	375	375	375	Historical Max Use
Brazos	Baylor	Livestock	Seymour	41	41	41	41	41	41	Historical Max Use
Brazos	Baylor	Livestock	Local Supply	373	373	373	373	373	373	Historical Max Use, Stock Tanks
Red	Baylor	Livestock	Seymour	69	69	69	69	69	69	Historical Max Use
Red	Baylor	Livestock	Local Supply	621	621	621	621	621	621	Historical Max Use, Stock Tanks
Brazos	Baylor	Mining	Seymour	47	47	47	47	47	47	Historical Max Use
Brazos	Baylor	Seymour	Seymour	747	747	747	747	747	747	Historical Max Use
Red	Clay	Byers	Seymour	89	89	89	89	89	89	Historical Max Use
Red	Clay	County-Other	Wichita System	1,766	1,766	1,766	1,766	1,766	1,766	Contracts with Arrowhead Prop/RRA/Dean Dale
Red	Clay	County-Other	Seymour	55	55	55	55	55	55	Historical Max Use
Red	Clay	County-Other	Other Aquifer	300	300	300	300	300	300	Historical Max Use
Trinity	Clay	County-Other	Other Aquifer	72	72	72	72	72	72	Historical Max Use
Red	Clay	Henrietta	Wichita System	600	600	600	600	600	600	Estimated amount from Lake Arrowhead for shortfall of superior run of river right
Red	Clay	Henrietta	Local Supply Little Wichita River	960	960	960	960	960	960	Run of River Right – Little Wichita (difference between right amount and Arrowhead make-up)
Red	Clay	Irrigation (On-Farm)	Other Aquifer	250	250	250	250	250	250	Historical Max Use – Split Between Seymour & Other
Red	Clay	Irrigation (On-Farm)	Seymour	287	287	287	287	287	287	Historical Max Use – Split Between Seymour & Other

Table 3-11: Allocation of Existing Supplies – Region B (continued)

Basin Name	County Name	City Name	Source Name	Existing Supply (af/yr) 2000	2010	2020	2030	2040	2050	Comment
Red	Clay	Irrigation (On-Farm)	Kemp	4,754	3,911	3,628	3,346	3,064	2,963	5% Of Available Irrigation Releases
Red	Clay	Livestock	Local Supply	1,747	1,747	1,747	1,747	1,747	1,747	Historical Max Use, Stock Tanks
Red	Clay	Livestock	Seymour	100	100	100	100	100	100	Historical Max Use
Red	Clay	Livestock	Other Aquifer	94	94	94	94	94	94	Historical Max Use
Trinity	Clay	Livestock	Local Supply	225	225	225	225	225	225	Historical Max Use, Stock Tanks
Trinity	Clay	Livestock	Other Aquifer	25	25	25	25	25	25	Historical Max Use
Red	Clay	Mining	Seymour	502	502	502	502	502	502	Historical Max Use
Trinity	Clay	Mining	Other Aquifer	6	6	6	6	6	6	Historical Max Use
Red	Clay	Petrolia	Local Supply	0	0	0	0	0	0	Petrolia City Lake (assume no long-term reliable supply)
Red	Clay	Petrolia	Seymour	70	70	70	70	70	70	Historical Use
Red	Cottle	County-Other	Other Aquifer	155	155	155	155	155	155	Historical Max Use
Red	Cottle	County-Other	Local Supply	15	15	15	15	15	15	Historical Max Use
Red	Cottle	Irrigation (On-Farm)	Blaine	4,525	4,525	4,525	4,525	4,525	4,525	Historical Max Use
Red	Cottle	Irrigation (On-Farm)	Other Aquifer	0	0	0	0	0	0	Historical Max Use
Red	Cottle	Irrigation (On-Farm)	Local Supply	46	46	46	46	46	46	Historical Max Use
Red	Cottle	Livestock	Seymour	47	47	47	47	47	47	Historical Max Use
Red	Cottle	Livestock	Local Supply	429	429	429	429	429	429	Historical Max Use, Stock Tanks
Red	Cottle	Mining	Local Supply	23	23	23	23	23	23	Historical Max Use
Red	Cottle	Paducah	Other Aquifer	442	442	442	442	442	442	Historical Max Use - 10 Years
Red	Foard	County-Other	Greenbelt	80	75	73	72	71	65	No Contract Amt, Supply = Demand
Red	Foard	County-Other	Seymour	113	113	113	113	113	113	Historical Max Use
Red	Foard	Crowell	Greenbelt	313	294	275	257	243	230	No Contract Amt, Supply = Demand

Table 3-11: Allocation of Existing Supplies – Region B (continued)

Basin Name	County Name	City Name	Source Name	Existing Supply (af/yr) 2000	2010	2020	2030	2040	2050	Comment
Red	Foard	Irrigation (On-Farm)	Seymour	5,200	5,200	5,200	5,200	5,200	5,200	Historical Max Use
Red	Foard	Irrigation (On-Farm)	Blaine	23	23	23	23	23	23	Historical Max Use
Red	Foard	Irrigation (On-Farm)	Seymour	32	32	32	32	32	32	Historical Max Use
Red	Foard	Livestock	Local Supply	291	291	291	291	291	291	Historical Max Use, Stock Tanks
Red	Foard	Mining	Seymour	23	23	23	23	23	23	Historical Max Use
Red	Hardeman	Chillicothe	Greenbelt	61	58	56	56	55	55	Assume Greenbelt Meets 50% Of Demands
Red	Hardeman	Chillicothe	Seymour	80	80	80	80	80	80	Current GW Use
Red	Hardeman	County-Other	Greenbelt	168	168	168	168	168	168	No Contract Amt, Supply = 1996 use
Red	Hardeman	County-Other	Seymour	116	116	116	116	116	116	Historical Max Use
Red	Hardeman	Irrigation (On-Farm)	Pauline/Groesbeck	145	145	145	145	145	145	Historical Max Use, ROR Groesbeck Creek and Lake Pauline
Red	Hardeman	Irrigation (On-Farm)	Blaine	7,000	7,000	7,000	7,000	7,000	7,000	Historical Max Use
Red	Hardeman	Irrigation (On-Farm)	Seymour	150	150	150	150	150	150	Historical Max Use
Red	Hardeman	Livestock	Local Supply	298	298	298	298	298	298	Historical Max Use, Stock Tanks
Red	Hardeman	Livestock	Seymour	198	198	198	198	198	198	Historical Max Use
Red	Hardeman	Manufacturing	Greenbelt	347	374	398	424	452	480	No Contract Amt, Supply = Demand
Red	Hardeman	Mining	Local Supply	7	7	7	7	7	7	Historical Max Use
Red	Hardeman	Quanah	Greenbelt	614	572	532	514	502	492	No Contract Amt, Supply = Demand
Red	Hardeman	Steam Electric Power	Pauline/Groesbeck	1,655	1,601	1,548	1,494	1,440	1,387	Pauline/Groesbeck Creek Yield minus Irrigation use
Brazos	King	County-Other	Other Aquifer	4	4	4	4	4	4	Historical Max Use

Table 3-11: Allocation of Existing Supplies – Region B (continued)

Basin Name	County Name	City Name	Source Name	Existing Supply (af/yr)						Comment
				2000	2010	2020	2030	2040	2050	
Red	King	County-Other	Blaine	161	161	161	161	161	161	Historical Max Use
Red	King	Guthrie	Other Aquifer	86	86	86	86	86	86	Historical Max- Supplied By RRA From Dickens Co
Red	King	Irrigation (On-Farm)	Blaine	750	750	750	750	750	750	Historical Max Use
Brazos	King	Livestock	Local Supply	255	255	255	255	255	255	Historical Max Use, Stock Tanks
Brazos	King	Livestock	Other Aquifer	28	28	28	28	28	28	Historical Max Use
Red	King	Livestock	Blaine	49	49	49	49	49	49	Historical Max Use
Red	King	Livestock	Local Supply	439	439	439	439	439	439	Historical Max Use, Stock Tanks
Trinity	Montague	Bowie	Amon G. Carter	2,457	2,420	2,382	2,345	2,307	2,270	Yield Of Reservoir- Sales
Red	Montague	County-Other	Nocona	38	38	38	38	38	38	Historical Max Use
Red	Montague	County-Other	Other Aquifer	416	416	416	416	416	416	Historical Max Use
Red	Montague	County-Other	Trinity	0	0	0	0	0	0	Historical Max Use
Trinity	Montague	County-Other	Other Aquifer	300	300	300	300	300	300	Historical Max Use
Trinity	Montague	County-Other	Amon G. Carter	143	143	143	143	143	143	Historical Max Use
Trinity	Montague	County-Other	Trinity	200	200	200	200	200	200	Historical Max Use
Red	Montague	Irrigation (On-Farm)	Other Aquifer	19	19	19	19	19	19	Historical Max Use
Red	Montague	Irrigation (On-Farm)	Nocona	100	100	100	100	100	100	Water Right 4879
Red	Montague	Irrigation (On-Farm)	Local Supply	100	100	100	100	100	100	Run Of River Rights
Trinity	Montague	Irrigation (On-Farm)	Trinity	179	179	179	179	179	179	Historical Max Use
Trinity	Montague	Irrigation (On-Farm)	Local Supply	133	133	133	133	133	133	Historical Max Use – surface water
Red	Montague	Livestock	Other Aquifer	106	106	106	106	106	106	Historical Max Use
Red	Montague	Livestock	Local Supply	951	951	951	951	951	951	Historical Max Use, Stock Tanks

Table 3-11: Allocation of Existing Supplies – Region B (continued)

Basin Name	County Name	City Name	Source Name	Existing Supply (af/yr) 2000	2010	2020	2030	2040	2050	Comment
Trinity	Montague	Livestock	Trinity	79	79	79	79	79	79	Historical Max Use
Trinity	Montague	Livestock	Local Supply	714	714	714	714	714	714	Historical Max Use, Stock Tanks
Red	Montague	Manufacturing	Nocona	10	10	12	15	19	24	Historical Max Use/Future Demand
Red	Montague	Mining	Local Supply	313	313	313	313	313	313	Run Of River Right, Hist Max
Red	Montague	Mining	Other Aquifer	310	310	310	310	310	310	Historical Max Use
Trinity	Montague	Mining	Trinity	18	18	18	18	18	18	Historical Max Use
Red	Montague	Montague	Other Aquifer	38	38	38	38	38	38	Historical Max Use
Red	Montague	Nocona	Nocona	1,112	1,112	1,110	1,107	1,103	1,098	Remainder of water right
Red	Montague	Saint Jo	Trinity	47	47	47	47	47	47	
Trinity	Montague	Saint Jo	Trinity	139	139	139	139	139	139	Historical Max Use
Red	Wichita	Burkburnett	Seymour	916	916	916	916	916	916	Historical Max- 10 Yrs
Red	Wichita	Burkburnett	Wichita System	2,795	2,795	2,795	2,795	2,795	2,795	Contract
Red	Wichita	County-Other	Wichita System	1,682	1,682	1,682	1,682	1,682	1,682	WSC Contracts In Wichita Co.
Red	Wichita	County-Other	Seymour	851	851	851	851	851	851	Historical Max- 10 Yrs
Red	Wichita	County-Other	N.F. Buffalo Creek	340	340	340	340	340	340	Iowa Park Sales To Wichita Co. WSC
Red	Wichita	Electra	Electra City Lake	440	440	440	440	440	440	Yield Study
Red	Wichita	Electra	Seymour	112	112	112	112	112	112	1998 Study
Red	Wichita	Iowa Park	N.F. Buffalo Creek	500	500	500	500	500	500	Water Right-Minus County Sales
Red	Wichita	Iowa Park	Local Supply	250	250	250	250	250	250	Half - Lake Iowa Park Water Right
Red	Wichita	Iowa Park	Wichita System	2,036	2,036	2,036	2,036	2,036	2,036	Contract, less manufacturing sales
Red	Wichita	Irrigation (On-Farm)	Kemp	71,354	67,972	63,686	59,402	55,126	54,109	90% Of Available Irrigation Releases
Red	Wichita	Irrigation (On-Farm)	Seymour	712	712	712	712	712	712	Historical Max Use
Red	Wichita	Irrigation (On-Farm)	Other Aquifer	179	179	179	179	179	179	Historical Max Use

Table 3-11: Allocation of Existing Supplies – Region B (continued)

Basin Name	County Name	City Name	Source Name	Existing Supply (af/yr) 2000	2010	2020	2030	2040	2050	Comment
Red	Wichita	Livestock	Seymour	78	78	78	78	78	78	Historical Max Use
Red	Wichita	Livestock	Local Supply	700	700	700	700	700	700	Historical Max Use, Stock Tanks
Red	Wichita	Manufacturing	Wichita System	1,836	1,997	2,095	2,185	2,297	2,384	Demands – Existing contracts
Red	Wichita	Manufacturing	Seymour	216	216	216	216	216	216	Historical Max Use
Red	Wichita	Mining	Seymour	594	594	594	594	594	594	Historical Max Use
Red	Wichita	Pleasant Valley	Wichita System	101	100	95	93	91	90	No Contract Amount, Supply = Demands
Red	Wichita	Steam Electric Power	Wichita System	360	360	360	360	360	360	Historical Max - 10 Yrs
Red	Wichita	Wichita Falls	Wichita System	28,118	27,893	27,689	27,489	27,266	27,068	Remainder of System Yield[1]
Red	Wilbarger	County-Other	Seymour	676	676	676	676	676	676	1997 Usage, 10-Yr Max = 2,324 (1988)
Red	Wilbarger	County-Other	Electra City Lake	30	30	30	30	30	30	Municipal Sales From Electra to Harrolds WSC
Red	Wilbarger	Irrigation (On-Farm)	Seymour	23,989	23,989	23,989	23,989	23,989	23,989	Historical Max Use, Adjusted for availability limit
Red	Wilbarger	Livestock	Seymour	180	180	180	180	180	180	Historical Max Use
Red	Wilbarger	Livestock	Local Supply	1,617	1,617	1,617	1,617	1,617	1,617	Historical Max Use, Stock Tanks
Red	Wilbarger	Manufacturing	Seymour	685	685	685	685	685	685	Historical Max Use
Red	Wilbarger	Mining	Seymour	10	10	10	10	10	10	Historical Use
Red	Wilbarger	Mining	Local Supply	30	30	30	30	30	30	Run of River Right - 5127
Red	Wilbarger	Steam Electric Power	Kemp	20,000	20,000	20,000	20,000	20,000	20,000	Water Right (Assume Contract Renewed)
Red	Wilbarger	Vernon	Seymour	2,640	2,640	2,640	2,640	2,640	2,640	Long-Term Average-Municipal (recent study)
Brazos	Young	Olney	Wichita System	1,121	1,121	1,121	1,121	1,121	1,121	Water Right
Brazos	Young	Olney	Local Supply	910	910	910	910	910	910	Lakes Olney/Cooper – reservoir yield

1. The Wichita System yield was reduced by 2,429 acre-feet per year to account for demands by Sheppard AFB.

LIST OF REFERENCES

Alan Plummer & Associates. Wichita River Basin Chloride Monitoring Data Review, prepared for Red River Authority, January 1998.

Biggs and Matthews, Inc. Report of North Fork Buffalo Creek Project, Iowa Park, Texas, December 1961.

Bissett, Chris (of West Texas Utility Company). Communication with Simone Kiel (of Freese and Nichols, Inc.), September 8, 1999.

Bounds and Lyons, Existing reservoir and stream management recommendations statewide minimum stream flow recommendations. Federal Aid Project F-30-R-4. Texas Parks and Wildlife Department, Austin, Texas, 1979.

Freese and Nichols, Inc., Report on the Camp Creek Reservoir Project – Electra, Texas, 1948.

Freese and Nichols, Inc. Master Plan for Water Resource Development in the Texas Portion of the Red River Basin, *Part I, The Little Wichita River*, September 1961.

Freese and Nichols, Inc. Master Plan for Water Resource Development in the Texas Portion of the Red River Basin, *Part III, The Red River and its Texas Intrastate Tributaries above the Mouth of the Little Wichita River*, May 1967.

Freese and Nichols, Inc., Report on Yield Characteristics of the Lake Kemp-Lake Diversion Reservoir System, prepared for Texas Utilities Services, Inc., December 1976.

Freese and Nichols, Inc. Study of Water Supply for Increased Greenbelt System Services Area, prepared for Greenbelt Municipal and Industrial Water Authority, May 1981.

Freese and Nichols, Inc., Report on Future Water Requirements and Yield of Lake Nocona, prepared for the North Montague County Water Supply District, 1986.

Freese and Nichols, Inc., Project ELC87022 – Amendment to Permit, Lake Electra, 1987.

Freese and Nichols, Inc., Update Yield Study for Existing Greenbelt Lake, January 1996.

Geraghty & Miller, Inc., Groundwater Resources Evaluation of the City of Vernon Odell-Winston Well Field, Wilbarger County, Texas, June 1992.

Henningson, Durham & Richardson (HDR), Preliminary Studies of the Hydrology and Geology for the Proposed Lake Amon G. Carter Enlargement, prepared for the City of Bowie, Texas, March 1979.

Texas Board of Water Engineers (TBWE), Bulletin 5614: Records of Water Level Measurements in Foard and Wilbarger Counties (1936 to January 1956), August 1956.

TBWE, Groundwater Resources in the Vicinity of Nocona, Montague County, Texas, December 1944 (reprinted March 1959).

TBWE, Bulletin 5301: Groundwater Resources of the Odell Sand Hills, Wilbarger County, Texas, January 1953.

TBWE, Bulletin 5912. Inventory and Use of Sedimentation Data in Texas, January 1959.

Texas Department of Water Resources (TDWR), Report 58: Occurrence and Quality of Groundwater in Montague County, August 1967.

TDWR, Report 161. Groundwater Resources of Hardeman County, Texas, November 1972.

TDWR, Report 218: Occurrence and Quality of Groundwater in Baylor County, July 1978.

TDWR, Report 238. Ground Water Availability in Texas, September 1979.

TDWR, Report 240: Occurrence, Quality and Quantity of Groundwater in Wilbarger County, November 1979.

TDWR, Report 269: Occurrence, Availability, and Chemical Quality of Groundwater in the Cretaceous Aquifers of North Central Texas, April 1982.

TDWR, Report 268. Erosion and Sedimentation by Water in Texas, February 1982.

Texas Natural Resource Conservation Commission, Water Rights Database, 1999.

Texas Water Development Board (TWDB), Report 337. Evaluation of Water Resources in Parts of the Rolling Prairies Region of North Central Texas, March 1992.

TWDB, Report 345. Aquifers of Texas, November 1995.

TWDB, Water for Texas, A Consensus-Based Update to the State Water Plan, August 1997.

TWDB, Historical and Projected Population and Water Use Data for Regional Planning Groups, Updated Version, 4/26/99, with 1997 Data Included, published as a CD, Austin, Texas, 1999.

U.S Department of Agricultural, Publication No. 1362. Sediment Deposition in U.S. Reservoirs, Summary of Data Reported Through 1975, February 1978.

U.S. Department of the Interior, Sediment Deposition in U.S. Reservoirs, Summary of Data Reported 1976-80, May 1983.

U.S. Department of the Interior, Sediment Deposition in U.S. Reservoirs, Summary of Data Reported 1981-85, September 1992.

Wilbarger County Regional Water Supply, Preliminary Reconnaissance Study, May 1988.

Woodward-Clyde, Draft Report- Groundwater Resources Study for Odell-Winston and Round Timber Ranch Well Fields, prepared for the City of Vernon, October 1998.

COMPARISON OF WATER DEMANDS TO CURRENT SUPPLIES

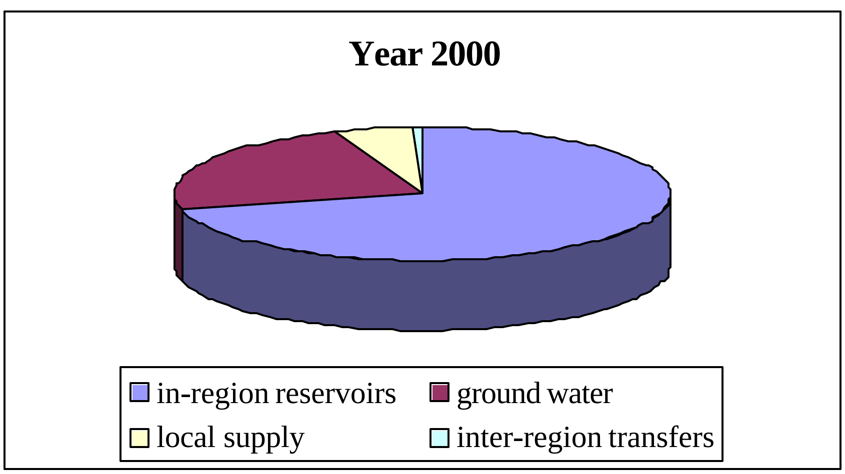
TEXAS STATE SENATE BILL 1

REGION B

4.1 Current Supply

The current supply in Region B consists of surface water from in-region reservoirs, groundwater, local supplies, and inter-regional transfers. Based on the year 2000 yields, the total in-region reservoir water supply in Region B is estimated at 180,500 acre-feet per year. This supply is projected to decrease by 14 percent to 155,000 acre-feet per year in 2050. The total developed groundwater supply in the region is about 59,000 acre-feet per year, with the Seymour Aquifer accounting for 71 percent and Blaine Aquifer accounting for 21 percent of the supply. The Trinity Aquifer provides only a small portion of the region's available supply. Since groundwater availability generally does not include mining of the aquifers, the groundwater supply is not projected to decline over the planning period. Local supplies consist of on-farm stock ponds, small reservoirs and several run of the river rights. Inter-regional transfers account for only a small percentage of the total water supply in the region, and include supply from Greenbelt Lake and groundwater from Dickens County. The total current available supply for the region is approximately 252,000 acre-feet per year. The existing distribution of supply by source type is shown on Figure 4-1.

Figure 4-1 Distribution of Current Supplies



4.2 Regional Demands

Regional demands were developed by city, county and category and are discussed in Chapter 2. In summary, the total demands for the region are projected to increase slightly from 169,600 to 183,200 acre-feet per year. The largest water demand category is irrigation, accounting for over 50 percent of the total use. Municipal and steam electric power are the next two largest water users in Region B. Mining is the smallest water demand category, accounting for less than 1 percent of the total demands. Most of the demands by category are not anticipated to change much over the planning period, with the exception of steam electric power. A proposed new power plant in Archer County will significantly increase the demands for that category.

4.3 Comparison of Supply and Demand

A comparison of current supply to demand was performed using the projected demands developed in Chapter 2 and the allocation of existing supplies developed in Chapter 3 as evaluated under drought of record conditions. As discussed in Chapter 3, allocations of existing supplies were based on the most restrictive of current water rights, contracts and available yields for surface water and historical use and groundwater availability for groundwater. The allocation process did not directly address water quality issues, such as nitrates. Salinity was addressed to some extent by not assigning supplies with known high salinity levels for municipal use. This included Lake Kemp and most of the Blaine Aquifer. Further discussion of water quality issues and the effect on supply is presented in Section 4.4.

As a region, there is adequate supply to meet the region's needs. A comparison of the total regional supply to demand is shown on Figure 4-2. Comparisons for the three largest water use types, irrigation, municipal and steam electric power are shown on Figures 4-3 through 4-5.

Figure 4-2 Supply and Demand for Region B

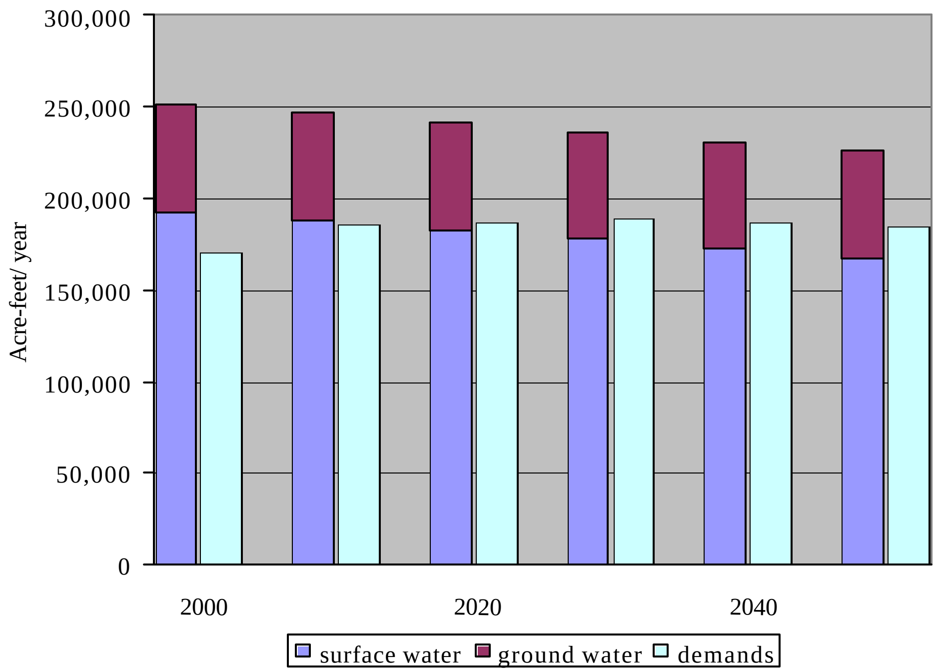


Figure 4-3 Irrigation Supply and Demand for Region B

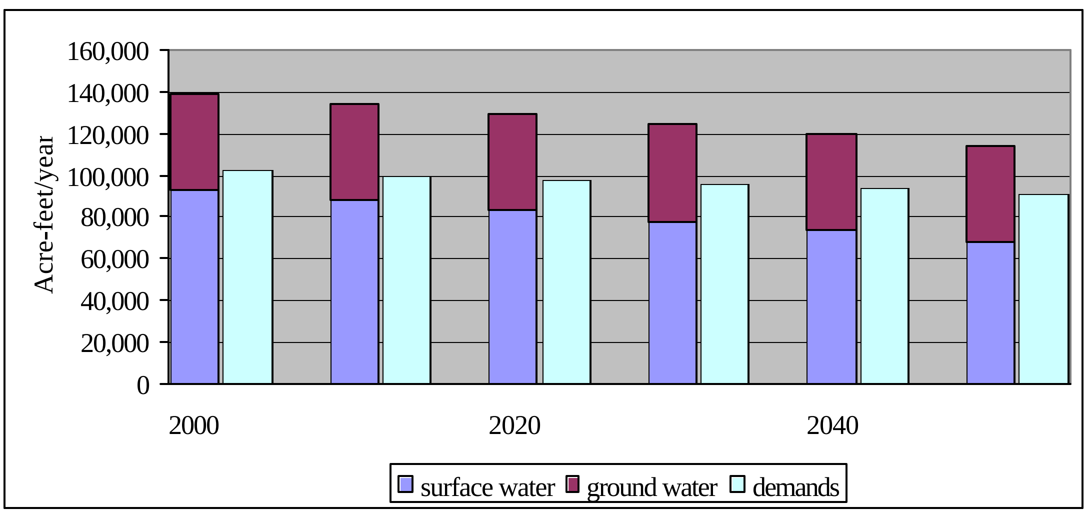


Figure 4-4 Municipal Supply and Demand for Region B

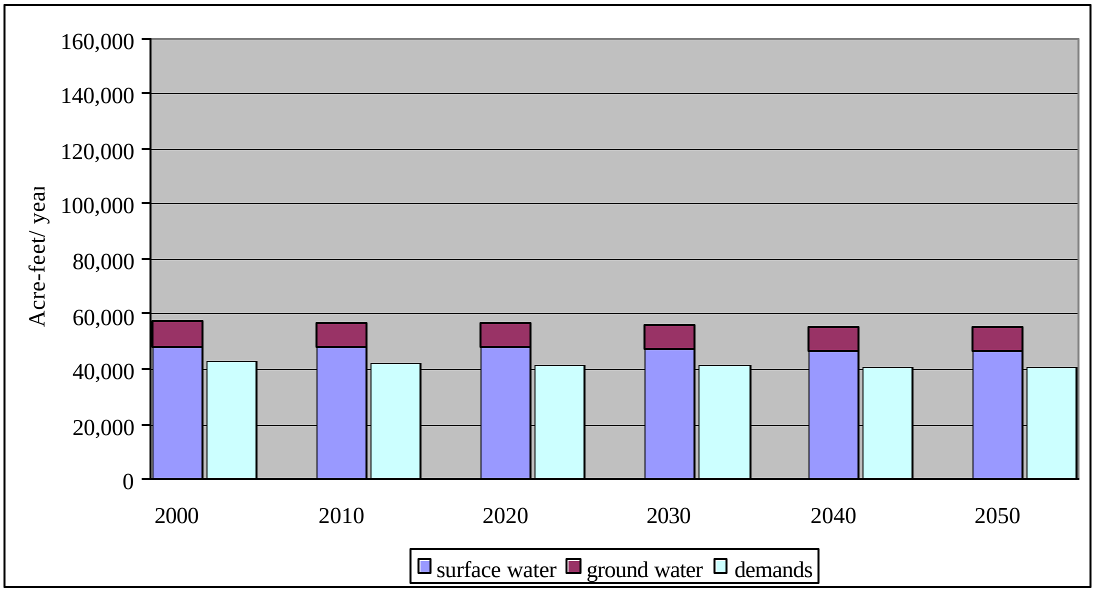
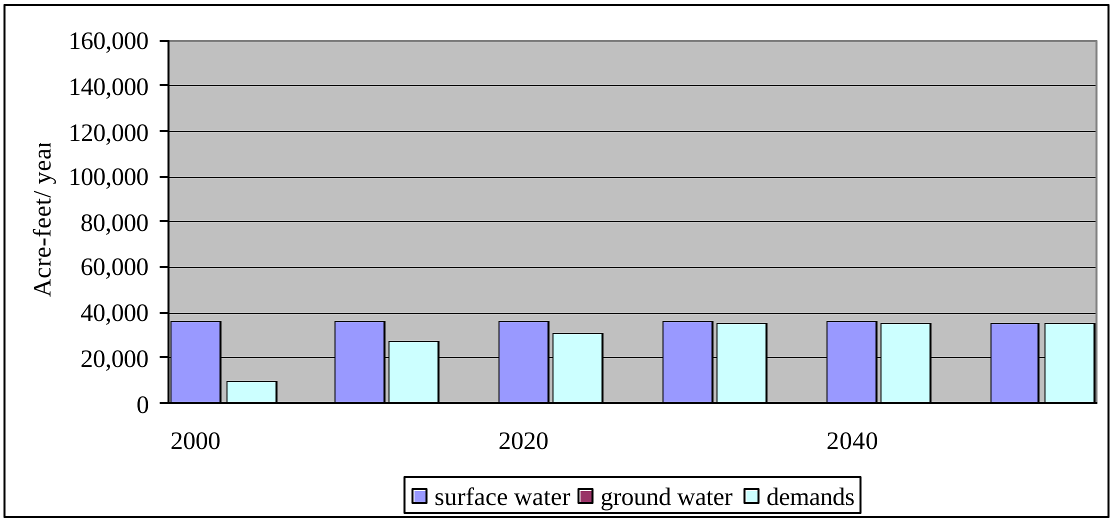


Figure 4-5 Steam Electric Power Supply and Demand for Region B



A summary of supply and demands by county for the years 2000 and 2050 are presented in Tables 4-1 and 4-2, respectively, and the comparison of supply versus demands by user group for Region B is presented on Table 4-3. There are only three identified shortages that cannot be met by existing infrastructure and supply. The municipal needs for the City of Vernon and manufacturing needs in Wilbarger County, which are supplied by Vernon, and the municipal needs of the City of Electra. These shortages are projected to be imminent, and both cities are currently investigating new supply sources and other alternatives. Discussion of the management strategies for these entities is presented in Chapter 5. Table 4-4 presents the identified water users with identified shortages over the planning period.

Table 4-1 Comparison of Supply versus Demand by County – Year 2000

County	Irrigation		Manufacturing		Mining		Municipal		Steam Electric		Livestock	
	Supply	Demand	Supply	Demand	Supply	Demand	Supply	Demand	Supply	Demand	Supply	Demand
Archer	4,891	3,600	0	0	1	0	2,752	1,688	14,000	0	2,711	2,711
Baylor	2,212	707	0	0	47	32	1,003	980	0	0	1,104	953
Clay	5,291	4,000	0	0	508	308	3,947	1,654	0	0	2,201	2,191
Cottle	4,584	4,434	0	0	23	25	870	796	0	0	476	387
Foard	5,255	4,978	0	0	23	23	494	393	0	0	291	289
Hardeman	7,295	4,999	347	347	7	3	1,039	936	1,655	1,000	496	480
King	750	20	0	0	0	0	365	355	0	0	771	771
Montague	531	297	10	7	641	627	4,907	2,921	0	0	1,850	1,850
Wichita	72,245	60,000	2,172	2,172	594	134	38,071	27,545	360	360	778	740
Wilbarger	23,989	19,071	**685**	**740**	40	24	**3,346**	**3,397**	20,000	8,100	1,797	1,797
Young							2,031	730				

Table 4-2 Comparison of Supply versus Demand by County – Year 2050

County	Irrigation		Manufacturing		Mining		Municipal		Steam Electric		Livestock	
	Supply	Demand	Supply	Demand	Supply	Demand	Supply	Demand	Supply	Demand	Supply	Demand
Archer	3,100	3,100	0	0	1	0	2,690	1,471	14,000	14,000	2,711	2,711
Baylor	2,212	607	0	0	47	0	976	655	0	0	1,104	953
Clay	3,500	3,500	0	0	508	180	3,920	1,410	0	0	2,201	2,191
Cottle	4,584	3,808	0	0	23	30	753	520	0	0	476	387
Foard	5,255	4,275	0	0	27	27	411	295	0	0	291	289
Hardeman	7,295	4,293	480	480	7	2	911	806	1,387	1,000	496	480
King	750	20	0	0	0	0	356	303	0	0	771	771
Montague	531	297	24	24	641	490	4,689	2,321	0	0	1,850	1,850
Wichita	55,000	55,000	2,814	2,814	594	39	36,866	27,373	360	360	778	740
Wilbarger	23,989	16,377	**685**	**1,206**	40	24	3,346	3,267	20,000	20,000	1,797	1,797
Young							2,031	672				

Table 4-3 Difference of Supply and Demand by User Group

WATER USER GROUP	COUNTY	BASIN	2000	2010	2020	2030	2040	2050
ARCHER CITY	ARCHER	RED	351	357	372	383	394	406
COUNTY-OTHER	ARCHER	BRAZOS	0	0	22	20	23	23
COUNTY-OTHER	ARCHER	RED	442	437	461	475	488	498
COUNTY-OTHER	ARCHER	TRINITY	0	0	0	5	5	5
HOLLIDAY	ARCHER	RED	0	0	0	0	0	0
IRRIGATION	ARCHER	RED	1,291	548	365	183	1	0
LAKESIDE CITY	ARCHER	RED	214	211	204	202	206	208
LIVESTOCK	ARCHER	BRAZOS	0	0	0	0	0	0
LIVESTOCK	ARCHER	RED	0	0	0	0	0	0
LIVESTOCK	ARCHER	TRINITY	0	0	0	0	0	0
MINING	ARCHER	RED	1	1	1	1	1	1
SCOTLAND	ARCHER	RED	56	54	66	72	75	78
STEAM ELECTRIC POWER	ARCHER	RED	14,000	0	0	0	0	0
COUNTY-OTHER	BAYLOR	BRAZOS	0	0	0	0	0	0
COUNTY-OTHER	BAYLOR	RED	8	13	15	17	17	18
IRRIGATION	BAYLOR	BRAZOS	1,335	1,350	1,364	1,378	1,392	1,406
IRRIGATION	BAYLOR	RED	170	177	182	188	194	199
LIVESTOCK	BAYLOR	BRAZOS	57	57	57	57	57	57
LIVESTOCK	BAYLOR	RED	94	94	94	94	94	94
MINING	BAYLOR	BRAZOS	15	26	37	42	47	47
SEYMOUR	BAYLOR	BRAZOS	15	79	197	261	284	303
BYERS	CLAY	RED	0	4	11	15	16	15
COUNTY-OTHER	CLAY	RED	1,420	1,483	1,556	1,598	1,659	1,610
COUNTY-OTHER	CLAY	TRINITY	11	27	39	44	50	50
HENRIETTA	CLAY	RED	862	863	867	853	836	835
IRRIGATION	CLAY	RED	1,291	548	365	183	1	0
LIVESTOCK	CLAY	RED	0	0	0	0	0	0
LIVESTOCK	CLAY	TRINITY	10	10	10	10	10	10

Table 4-3 (continued) Difference of Supply and Demand by User Group

WATER USER GROUP	COUNTY	BASIN	2000	2010	2020	2030	2040	2050
MINING	CLAY	RED	198	283	307	321	325	325
MINING	CLAY	TRINITY	2	3	3	3	3	3
PETROLIA	CLAY	RED	0	0	0	0	0	0
COUNTY-OTHER	COTTLE	RED	0	0	0	0	0	0
IRRIGATION	COTTLE	RED	150	283	412	537	659	776
LIVESTOCK	COTTLE	RED	89	89	89	89	89	89
MINING	COTTLE	RED	0	0	0	0	0	0
PADUCAH	COTTLE	RED	74	104	141	173	205	233
COUNTY-OTHER	FOARD	RED	101	106	108	109	110	116
CROWELL	FOARD	RED	0	0	0	0	0	0
IRRIGATION	FOARD	RED	277	426	571	712	848	980
LIVESTOCK	FOARD	RED	2	2	2	2	2	2
MINING	FOARD	RED	0	0	0	0	0	0
CHILLICOTHE	HARDEMAN	RED	19	22	24	24	25	25
COUNTY-OTHER	HARDEMAN	RED	84	90	82	84	83	80
IRRIGATION	HARDEMAN	RED	2,296	2,446	2,591	2,732	2,869	3,002
LIVESTOCK	HARDEMAN	RED	16	16	16	16	16	16
MANUFACTURING	HARDEMAN	RED	0	0	0	0	0	0
MINING	HARDEMAN	RED	4	4	4	5	5	5
QUANAH	HARDEMAN	RED	0	0	0	0	0	0
STEAM ELECTRIC POWER	HARDEMAN	RED	655	601	548	494	440	387
COUNTY-OTHER	KING	BRAZOS	1	1	1	3	3	3
COUNTY-OTHER	KING	RED	0	0	0	0	0	0
GUTHRIE	KING	RED	9	11	17	28	40	50
IRRIGATION	KING	RED	730	730	730	730	730	730
LIVESTOCK	KING	BRAZOS	0	0	0	0	0	0
LIVESTOCK	KING	RED	0	0	0	0	0	0
BOWIE	MONTAGUE	TRINITY	1,367	1,404	1,411	1,392	1,361	1,327

Table 4-3 (continued) Difference of Supply and Demand by User Group

WATER USER GROUP	COUNTY	BASIN	2000	2010	2020	2030	2040	2050
COUNTY-OTHER	MONTAGUE	RED	66	96	116	142	161	157
COUNTY-OTHER	MONTAGUE	TRINITY	91	172	195	232	265	323
IRRIGATION	MONTAGUE	RED	160	160	160	160	160	160
IRRIGATION	MONTAGUE	TRINITY	74	74	74	74	74	74
LIVESTOCK	MONTAGUE	RED	0	0	0	0	0	0
LIVESTOCK	MONTAGUE	TRINITY	0	0	0	0	0	0
MANUFACTURING	MONTAGUE	RED	3	1	0	0	0	0
MINING	MONTAGUE	RED	14	134	156	162	156	143
MINING	MONTAGUE	TRINITY	0	2	4	6	8	8
MONTAGUE	MONTAGUE	RED	0	0	0	0	0	2
NOCONA	MONTAGUE	RED	415	448	479	492	500	502
SAINT JO	MONTAGUE	RED	12	16	14	14	14	15
SAINT JO	MONTAGUE	TRINITY	35	44	39	40	41	42
BURKBURNETT	WICHITA	RED	1,824	1,846	1,883	1,888	1,884	1,869
COUNTY-OTHER	WICHITA	RED	2,214	2,164	2,157	2,165	2,164	2,181
ELECTRA	WICHITA	RED	-65	-63	-61	-51	-52	-57
IOWA PARK	WICHITA	RED	1,451	1,480	1,494	1,496	1,492	1,482
IRRIGATION	WICHITA	RED	12,245	9,863	6,577	3,293	17	0
LIVESTOCK	WICHITA	RED	38	38	38	38	38	38
MANUFACTURING	WICHITA	RED	0	0	0	0	0	0
MINING	WICHITA	RED	460	508	516	524	548	555
PLEASANT VALLEY	WICHITA	RED	0	0	0	0	0	0
SHEPPARD AFB	WICHITA	RED	2,429	2,429	2,429	2,429	2,429	2,429
STEAM ELECTRIC POWER	WICHITA	RED	0	0	0	0	0	0
WICHITA FALLS	WICHITA	RED	5,102	4,886	4,883	4,711	4,412	4,018
COUNTY-OTHER	WILBARGER	RED	221	194	189	186	187	170
IRRIGATION	WILBARGER	RED	4,918	5,490	6,045	6,583	7,105	7,612
LIVESTOCK	WILBARGER	RED	0	0	0	0	0	0

Table 4-3 (continued) Difference of Supply and Demand by User Group

WATER USER GROUP	COUNTY	BASIN	2000	2010	2020	2030	2040	2050
MANUFACTURING	WILBARGER	RED	-55	-164	-219	-286	-402	-521
MINING	WILBARGER	RED	16	17	16	16	16	16
STEAM ELECTRIC POWER	WILBARGER	RED	11,900	8,000	4,000	0	0	0
VERNON	WILBARGER	RED	-272	-167	-137	-147	-105	-91
OLNEY	YOUNG	BRAZOS	1,301	1,304	1,324	1,338	1,351	1,359

NOTE: Negative numbers indicate a shortage and a positive number indicates allocated supply in excess of projected demands.

Supply is based on allocations developed for Chapter 3, Appendix B, Table 5, incorporating the modifications specified on Table 4-2.

Demands were developed in Chapter 2 and summarized in Appendix B, Table 2.

Table 4-4 Identified Supply Needs for Region B

WATER USER GROUP	COUNTY	BASIN	2000	2010	2020	2030	2040	2050
ELECTRA	WICHITA	RED	-65	-63	-61	-51	-52	-57
MANUFACTURING	WILBARGER	RED	-55	-164	-219	-286	-402	-521
VERNON	WILBARGER	RED	-272	-167	-137	-147	-105	-91

NOTE: Supply needs based on firm yield analysis of surface water reservoirs and available supply from existing groundwater well fields.

4.4 EFFECT OF WATER QUALITY ON SUPPLY

Based on Table 4-3, an adequate supply of water is available for the various user groups and types of use within Region B as a whole. Many water user groups have supplies that exceed their projected needs. However, a few individual systems are projected to experience shortages of water during the planning period.

An implied assumption of the supply analysis is that the quality of existing water supplies is acceptable for the listed use. In other words, water supplies that are currently being used are assumed to continue to be available, regardless of the quality. However, Senate Bill 1 also requires that water quality issues be considered when determining the availability of water during the planning period. For this report, evaluations of source water quality are generally confined to waters used for human consumption. The effect of water quality of Lake Kemp on agricultural use is also reviewed.

4.4.1 Municipal Water Systems with Existing or Potential Quality Concerns

To determine whether the quality of specific sources of supply imposes a potential limitation on their use, the quality of the major sources of supply was compared to current and proposed drinking water standards. Pursuant to the Federal Safe Drinking Water Act, the U.S. Environmental Protection Agency (EPA) has adopted maximum contaminant levels (MCLs) for a list of organic and inorganic contaminants of drinking water. This list constitutes the primary drinking water standards, and water used for human consumption is to comply with the MCLs established by this list. The EPA is considering a number of changes to the primary drinking water standards. These potential changes include the addition of MCLs for a number of contaminants not currently on the list and the lowering of MCLs for some currently regulated contaminants. Consideration of the proposed standards when evaluating water quality is important because of the length of the planning horizon. Revised standards will be in effect long before the year 2050 and could potentially have a substantial impact on the availability of water supplies.

The consulting team reviewed the Texas Natural Resource Conservation Commission (TNRCC) records that identify systems that are not compliant with current and proposed primary drinking water standards. Compliance with secondary drinking water standards was not evaluated since the secondary standards do not have the same regulatory and public health implications. Also, compliance with the bacteriological standards (total coliform and fecal coliform) was not evaluated since violations of these standards, when they occur, are typically associated with operational techniques and not the quality of the raw water supply. The water systems in Region B that have existing or potential noncompliances were identified, and the parameter of concern was also identified. Table 4-5 provides the results of the review.

Table 4 - 5

Water Systems Not Compliant with Primary Drinking Water Quality Standards

Water System	County	Water Source	CURRENT STANDARD NO_3 MCL = 10mg/L
Baylor WSC	Baylor	Seymour Aquifer	X
Seymour	Baylor	Seymour Aquifer	X
Byers	Clay	Seymour Aquifer	X
Charlie WSC	Clay	Seymour Aquifer	X
Thalia WSC	Foard	Seymour Aquifer	X
Burkburnett	Wichita	Seymour Aquifer and Wichita System	X
Friberg-Cooper WSC	Wichita	Seymour Aquifer	X
Electra	Wichita	Seymour Aquifer and Electra City Lake	X
Box Community Water System	Wilbarger	Seymour Aquifer	X
Lockett Water System	Wilbarger	Seymour Aquifer	X
Oklaunion WSC	Wilbarger	Seymour Aquifer	X
Hinds-Wildcat Water System	Wilbarger	Seymour Aquifer	X
Vernon	Wilbarger	Seymour Aquifer	X

The TNRCC records indicate that the only primary drinking water standard (other than bacteriological) currently exceeded by water users in Region B is the nitrate criterion.

Thirteen water users have water supplies that exceed the MCL for nitrate. There are also two systems that may not comply with the proposed arsenic drinking water standard. However, since the EPA has not published the preferred MCL for arsenic, it is premature to assess compliance with this standard.

4.4.2 Nitrate Concerns

The nitrate MCL is 10 mg/L. Consumption of water with nitrate levels in excess of 10 mg/L by infants can cause methemoglobinemia or "blue baby syndrome", a potentially fatal condition. Additionally, pregnant women are urged not to drink water with a high concentration of nitrates because of the potential health effects on the unborn fetus.

In Region B, moderate to high nitrate levels are found in water from the Seymour Aquifer. These concentrations are partly attributed to agricultural activities in the area. Long-standing practices associated with fertilizing crops are believed to have caused an increase in nitrates in the groundwater. Not all water produced from the Seymour Aquifer has excessive nitrates, but the water users shown in Table 4 -5 have historically exhibited nitrate concentrations that range from slightly above the MCL of 10 mg/L to over 25 mg/L, in some cases.

Removal of nitrates from water can be expensive. Reverse osmosis or a comparable advanced membrane technique is required. Nitrates can also be reduced by blending the water with another water source with low nitrate levels, f such a source is available and otherwise of acceptable quality. The TNRCC currently is urging all water systems in the region using water with high nitrate levels to reduce the nitrate concentration by treatment, by blending, or by securing an alternate source of water. Deadlines for these water users to achieve the drinking water standard for nitrate have not been set. However, it can be expected that the TNRCC will continue to work toward achieving this goal and may eventually set deadlines for compliance.

According to the demand projection in Chapter 2, municipal water use for the 13 water users in Table 4-5 is estimated to be slightly less than 7,000 acre-feet in the year 2000, and the usage is projected to remain relatively constant throughout the planning period. These users account for about 17 percent of all municipal water use in the region. For many of these users, groundwater from the Seymour Aquifer is the only supply source. For the cities of Burkburnett and Electra, groundwater is only a portion of their supply. The largest water users in Region B that exceed the nitrate MCL and the estimated current groundwater supply are as follows:

- Vernon (2,800 acre-feet)
- Burkburnett (916 acre-feet)
- Seymour (747 acre-feet)
- Baylor Water Supply Corporation (WSC) (220 acre-feet)

The remaining water systems that exceed the nitrate MCL are projected to use approximately 700 acre-feet of water in 2000. Many of these systems have ongoing efforts to reduce the nitrate levels in their water. Several of these systems are working together to solve their problems. It is expected that the majority of these users will achieve substantial reductions within a few years. In some cases, the proposed program to improve the quality of the water supply includes obtaining water from another supplier or a different raw water source. These plans will be summarized in the discussion of alternative water supply plans presented in Chapter 5.

Due to the fact that most affected water systems are expected to solve their nitrate problem within a few years, the estimated volume of water available from the Seymour Aquifer has not been reduced based on quality limitations. However, the Seymour Aquifer should not be considered as an available source for municipal water use beyond the current usage, except in those areas where supplies do not exceed the nitrate MCL, or a supply strategy is identified that provides for achieving compliance with the nitrate standard.

4.4.3 Arsenic Concerns

The concentration of arsenic in water supplies is regulated because arsenic is believed to be a carcinogen. Currently, the MCL for arsenic is 50 ug/L. However, adoption of a lower MCL has been under evaluation by EPA for some time. Several alternative MCLs are currently being considered. According to the TNRCC, the EPA is considering a limit between 3 ug/L and 10 ug/L. The proposed MCL for arsenic is to be published for comments in May 2000, with the intent of adoption by September 2000.

Limited data available on the water sources in Region B suggest that Lake Arrowhead may contain arsenic levels above the lower limit of consideration. Several systems that rely entirely on water from Lake Arrowhead reported arsenic concentrations of 6 ug/L in 1999. Lake Arrowhead is a major source of water for the region and is used as supply for many water systems. While arsenic may be a potential water quality problem, further information is needed before it can be determined if any of the water supply in Region B is impacted because of the presence of arsenic. A decision by EPA is needed regarding the revised MCL for arsenic. Also, additional testing of Lake Arrowhead water should be performed to determine more accurately the current arsenic levels in the lake. If the arsenic concentrations in Lake Arrowhead are found to exceed the new MCL, then additional treatment or blending with another source may be required.

4.4.4 Salinity Concerns for Lake Kemp and Diversion Lake

Waters in the Wichita River Basin have historically exhibited high dissolved solids and chloride concentrations. Previous studies, dating back to 1957, have documented that the salt concentrations in the area significantly limit the use of these waters for municipal, industrial, and irrigation purposes.

The U.S. Army Corps of Engineers (USACE) determined that an average of over 3,600 tons per day of chlorides was being discharged to the Red River system from natural and man-made sources. A project, known as the Chloride Control Project, has been designed to reduce the amount of salt contamination from eight of the Red River

Basin's natural salt sources, three of which lie within the Wichita River Basin. To date only one of the proposed chloride control facilities has been constructed and is operational. This low-flow dam structure on the South Wichita River (within the Lake Kemp drainage basin) retains low flows that are high in salts, and diverts them via a pump station and pipeline to Truscott Brine Reservoir. Low-flow diversion dams are also planned for the Middle and North Wichita Rivers. When constructed, high chloride water that would normally flow to Lake Kemp and Diversion Lake would be diverted to the Truscott Brine Reservoir.

Recent water quality data of the Lake Kemp/Diversion system indicate that chloride levels have reduced since completion of the first chloride control project, but they still limit the water use. The primary uses impacted by the lakes' salt content are potable water supplies and irrigation. Water quality criteria established pursuant to the Safe Drinking Water Act considers high salt content aesthetically undesirable, and is regulated under the secondary drinking water standards. Chloride, sulfate, and total dissolved solids concentrations are subject to the secondary standards. The TNRCC established criteria for these parameters are somewhat higher than EPA criteria, and water systems in Texas are subject to the state criteria. Both the TNRCC and EPA standards and typical Lake Kemp levels for these parameters are presented in Table 4-6.

Table 4-6

Secondary Drinking Water Standards and Salinity Levels of Lake Kemp

Parameter	**TNRCC Criteria**	**EPA Criteria**	**Lake Kemp/Diversion Typical concentration**
Chloride (mg/L)	300	250	800 – 1,200
Sulfate (mg/L)	300	250	550 – 800
Total Dissolved Solids (mg/L)	1,000	500	2,000 – 3,500

It is sometimes possible to use water with salt concentrations that exceed the drinking water criteria by blending it with waters with lower salt content. This practice may be considered in the Wichita River Basin, but is often limited to emergency use only. At the present time, a blend containing less than 25 percent of the waters from Lake Kemp or Diversion Lake is typically necessary if TNRCC criteria are to be achieved. This obviously limits the extent to which waters from these reservoirs can be used for potable supply.

The salinity of irrigation water from Lake Kemp can also limit the crops to which it can be applied. There are several systems for classifying the salinity of waters that characterize the suitability of the water for various types of crops. One classification system developed by the U.S. Department of Agriculture (USDA) in 1954 identifies four classes of water, based on the chloride concentration of the water, and describes the suitability of each class for irrigation. The classes and their corresponding description of suitability are as follows:

Class I Low Salinity Water *Chloride < 250 mg/L*	Water is considered excellent to good and suitable for most plants growing on most soils with little likelihood that soil salinity will develop.
Class II Medium Salinity Water *Chloride > 250 mg/L, but* *Chloride < 750 mg/L*	Water can be used if a moderate amount of leaching occurs. Plants with moderate salt tolerance can be grown in most cases without special practices for salinity control.
Class III High Salinity Water *Chloride > 750 mg/L, but* *Chloride < 2,150 mg/L*	Water cannot be used on soils with restricted drainage. Even with adequate drainage, special management for salinity control may be required, and plants with good salt tolerance should be selected.
Class IV Very High Salinity *Chloride > 2,150 mg/L*	Water is not suitable for irrigation under ordinary conditions, but may be used occasionally under very special circumstances. Only very salt tolerant crops should be selected.

The water in Lake Kemp and Diversion Lake is generally Class III. Therefore, its use for irrigation is limited to plants with high salt tolerance. The USDA Plant Sciences Group has performed research on the salt tolerance of various herbaceous crops, and examples of salt tolerant crops include cotton, barley, sugar beet, Bermuda grass, and asparagus.

4.5 System Limitations

In addition to water supply and water quality issues, system limitations were identified for the municipalities within the region. System limitations include water treatment plant design capacity, major water transmission pipelines and associated pumping facilities. Distribution systems and storage facilities within a community were not addressed.

Municipal water systems are typically designed for peak flow conditions. The water supply analysis presented in Section 4.3 considered average day conditions and did not address limitations associated with peak demands. To assess peak demands for the municipalities in Region B, a peaking factor was applied to the average day demands developed in Chapter 2. Many of the larger municipalities provided this peaking factor based on historical use and these are shown on Table 4-7. For those users without a known peaking factor, a factor of 2 was assumed.

Water treatment plant capacities for surface water treatment were provided from a TNRCC database and confirmed by the municipalities. Transmission pipeline capacities were estimated from pipe diameters and average flow velocities. The water users provided the pumping capacities for the major transmission systems. Water treatment plant capacities were evaluated for all users who receive treated water from that system. For example, for the City of Wichita Falls, the sum of the peak demands for all treated water customers was compared to the City's water treatment plant's capacity. For customers that receive both raw and treated water, a representative portion of the customer's peak demand for treated water was determined. In addition to the physical system limitations, a comparison of available supply to peak demands was made for those entities with a contract that specified a peak demand limit (e.g., City of Wichita Falls customers). A summary of the findings is presented on Table 4-8.

Table 4-7 Peak Day Demands

Water User Group	Average Day Demand (MGD) Year 2000	Peaking Factor[1]	Peak Day Demand (MGD) Year 2000
Archer City	0.29		0.57
Holliday	0.21		0.41
Lakeside City	0.16		0.32
Scotland	0.20		0.40
Seymour	0.65		1.31
Byers	0.08		0.16
Henrietta	0.62	2.0	1.25
Petrolia	0.09		0.18
Paducah	0.34		0.67
Crowell	0.28		0.56
Chillicothe	0.11		0.22
Quanah	0.55		1.10
Guthrie	0.07		0.14
Bowie	0.97	2.25	2.19
Nocona	0.62	1.66	1.03
Saint Jo	0.13		0.25
Burkburnett	1.68	1.70	2.86
Electra	0.55		1.10
Iowa Park	1.19		2.38
Pleasant Valley	0.09		0.18
Wichita Falls	20.47	2.25	46.06
Vernon	2.60		5.20
Olney	0.65	1.87	1.22

1. For those cities without a given peaking factor, a factor of 2 was assumed.

As shown on Table 4-8, only the City of Wichita Falls may experience system limitations due to the capacities of their water treatment facilities. The other municipalities within the region appear to have sufficient capacities to transport and treat peak demands. However, the City of Scotland and several water supply corporations in Archer County appear to have contractual limits that are less than the projected peak demands. Further review of their respective contracts and water use may be warranted to ensure peak demands can be met.

Table 4-8 Water User Groups with System Limitations

								Peak Demand (MGD)					
Water User Group	County	Supply Source	Basin	WTP	Transmission	Supply	Limit (mgd)	2000	2010	2020	2030	2040	2050
City of Wichita Falls (treated water provider)	Wichita	Wichita System	Red	x			54.6	57.08	57.00	56.46	56.35	56.46	56.92
County- Other	Archer	Wichita System	Red			x	0.9	1.05	1.06	1.02	1.00	0.98	0.96
Scotland	Archer	Wichita System	Red			x	0.25	0.40	0.40	0.38	0.37	0.37	0.36

The limit specified for City of Wichita Falls is the existing capacity of the water treatment plant. The peak demands for the City of Wichita Falls are the sum of the peak demands of all customers with existing contracts for treated water. Customers who receive raw water are not included.

The limit for County – Other, Archer County, reflects existing contractual limits between the City of Wichita Falls and Archer County WSCs. County other peak day demands are based on the percentage of supply historically provided by the Wichita System.

The limit for Scotland is the contractual limit for treated water from the City of Wichita Falls. The peak demands are based on the projected demands for the City of Scotland with a peaking factor of 2.

4.6 System Operations and Reliability

The analysis for current surface water supplies within the region is based on the firm yield of the reservoirs. This approach is required by the Senate Bill One regulations, but it is often not reflective of how reservoir yields have been determined in other planning efforts. Firm yield analyses determine the amount of water that is available on an annual basis during a repeat of historical drought of record condition assuming all the water in the reservoir is available for use. This means that the reservoir content will approach zero sometime during the drought period if the firm yield is used. This analysis is also based on the historical rainfall and runoff for each reservoir. Experts at the University of Arizona's Climate Assessment Project for the Southwest recently indicated that Texas might be heading into a significant dry period. Since 1995 climatic patterns have shifted, bringing warmer drier weather to the Southern United States. This phenomenon called the Pacific Decadal Oscillation usually lasts 20 to 30 years (San Antonio Express News, 2/7/00). If this happens, then the region may be entering a new drought period that may surpass the historical drought of record and the firm yield may overestimate the available water supply. However, it is still too early to assess the impact of this weather shift.

Based on these concerns and the uncertainties inherent with the yield analyses, the available water supply for the region may be less than estimated in Chapter 3. For these reasons, most water supply systems will not allow their reservoir contents to drop to very low levels without utilizing alternative supplies and implementing drought contingency measures. Many cities within Region B have recently initiated drought contingency measures in response to continuing dropping reservoir levels and are actively considering alternative water sources.

To provide a more conservative estimate of the available surface water supply within the region, a safe yield analysis was conducted for the two largest reservoirs in Region B: Lakes Kickapoo and Arrowhead. Both these lakes are operated by the City of Wichita Falls and provide a large portion of the municipal supply in Region B. Many of the users of the smaller reservoirs in the region are supplemented with water from this system.

The safe yield analysis utilizes the same historical hydrology as the firm yield analysis, but assumes that a one-year supply of water is reserved in the reservoir at all times. This analysis has been commonly used for water resource planning in this region in the past. However, the one-year reserve amount may still be less than the preferred minimum operating content. For the City of Wichita Falls, severe drought contingency measures are initiated when the content of the Wichita System drops below 40 percent (137,000 acre-feet), which is much greater than a one-year reserve. Using existing reservoir operation models, the safe yields for the Wichita System for years 2000 and 2050 are estimated at 41,400 and 36,900 acre-feet per year, respectively. This represents a decrease in annual supply from the firm yield analysis of approximately 18 percent by 2050.

To assess the effect of this reduction in available supply on the City of Wichita Falls, a summary of supply and demand for the City is presented on Table 4-9. This analysis assumes that Wichita Falls' customers are entitled to their full contracted amounts, and any contracted supplies in excess of their needs are not available to the City of Wichita Falls. As a result, there are not sufficient supplies to meet contractual obligations and City of Wichita Falls demands. Therefore, the City of Wichita Falls may need to develop alternative supplies to maintain a minimum operation content of approximately 40,000 acre-feet in the Wichita System.

Table 4-9 Safe Yield Analysis for the Wichita System

	2000	2010	2020	2030	2040	2050
Safe Yield Supply						
Kickapoo	12,400	12,300	12,200	12,100	12,000	11,900
Arrowhead	29,000	28,200	27,400	26,600	25,800	25,000
Wichita System	*41,400*	*40,500*	*39,600*	*38,700*	*37,800*	*36,900*
Existing Customers (Contracted Amount)	17,359	17,464	17,547	17,627	17,729	17,927
Manufacturing Increase (see Table 4-1)	270	302	330	357	389	414
Wichita Falls (remaining supply)	23,771	22,734	21,723	20,716	19,682	18,559
Demands						
Wichita Falls	22,946	22,905	22,676	22,621	22,665	22,836
Needs						
Wichita Falls	825	-171	-953	-1,905	-2,983	-4,277

Safe yield analyses were conducted using reservoir operation studies developed by TWDB (1997).

4.7 Summary of Regional Needs

In Region B, water supply needs were identified for three water users, Electra, Vernon and manufacturing needs in Wilbarger County. This means that the existing water supplies to these users will not support the projected demand through the planning period. Both Vernon and Electra are aware of these needs and are currently looking for new water sources. There are existing supplies in excess of the demands in the region, and these options will be explored in more detail in Chapter 5.

In addition to the water supply needs, the Cities of Vernon and Electra are experiencing water quality issues with their groundwater supplies. Nitrates in excess of the current drinking water standard were identified for the several Seymour Aquifer users in Baylor, Clay, Foard, Wichita and Wilbarger counties. Approximately 5,400 acre-feet of allocated municipal supply do not meet the nitrate standard. These concerns are also currently being addressed by the local entities, and will be further discussed in Chapter 5.

Salinity levels in area lakes and aquifers are a continuing water quality concern within the region. Existing chloride control projects, such as the Truscott Brine Reservoir, are reducing chloride concentrations in Lake Kemp and Diversion, but the full impact has not been realized. Completion of the additional chloride control structures should further reduce the salinity levels in this water source. This will result in more water available for municipal use (by decreasing the required blending amount) and enable irrigators to grow a wider diversity of crops.

The municipalities in Region B generally have sufficient system capacities to treat and transport the available supplies, considering projected peak demand conditions. The City of Wichita Falls was the only identified city that may not be able to treat sufficient water to meet peak demands for all its treated water customers at the same time. This scenario may not happen, however, the water treatment plant capacity may limit the City in providing treated water to new customers or increase supply to existing customers.

Based on a safe yield analysis of the Wichita System, the City of Wichita Falls may need to utilize alternative supplies to maintain a one-year reserve in the Wichita System. The City has municipal rights in Lake Kemp and Diversion that could be used, but water quality issues limit this source. The City is currently exploring other alternatives to increase the reliability of their supplies and these will be discussed in Chapter 5.

4.8 Entities with Supplies in Excess of Needs

As shown on Table 4-10, there appears to be excess supply for the Cities of Bowie (from Amon Carter Lake), Burkburnett, Iowa Park, and Olney. With the exception of Bowie, all these cities receive water from the Wichita System. For these cities, the allocated supplies from the Wichita System are based on contract amounts that are determined from peak flow requirements. These contracts are used for supplemental supply needed to meet peak summer demands. Most likely, these cities do not receive the fully allocated annual amount, and therefore do not have a large surplus supply. This indicates that there may be additional supply for the City of Wichita Falls, but there is limited peak treatment capacity.

For the irrigation uses in Baylor, Hardeman and Wilbarger Counties, water is supplied primarily from groundwater. Groundwater for irrigation is typically used on a local basis and existing well fields may not be appropriate for other identified regional needs. However, the apparent reduction in irrigation use in these counties should reduce the stress on the respective aquifers, allowing continued use from these sources for other needs.

Other users with supplies in excess of 1,000 acre-feet per year include irrigation supply in Wichita County. This supply is allocated from Lake Kemp, which may not be suitable for municipal needs due to its salinity levels.

As a major water provider, the City of Wichita Falls has supplies in excess of their customers' projected needs (Table 8, Appendix A). However, most of these supplies are committed by contracts. As discussed above, these contracts specify a daily maximum rate. If an annual amount, as well as the daily rate, is specified on future contracts, then additional raw water may become available for other uses.

Regional surface water reservoirs and groundwater supplies in excess of the allocated amounts are shown on Table 4-11. Most of these supplies are groundwater sources that are not currently developed, but may be utilized to meet projected needs. The North Fork Buffalo Creek Reservoir, the only reservoir not fully allocated, has an estimated reservoir yield slightly greater than the water right. However, the yield analysis was not based on direct reservoir measurements and may not accurately reflect the true yield. If this source is considered for additional supply, a more detailed yield study will be needed.

Table 4-10 Water User Groups with Supply in Excess of Needs of 1,000 Ac-ft/yr

KEY	WATER USER GROUP	COUNTY	BASIN	SOURCE	2000	2010	2020	2030	2040	2050
**	IRRIGATION	BAYLOR	BRAZOS	Seymour	1,335	1,350	1,364	1,378	1,392	1,406
*	COUNTY-OTHER	CLAY	RED	Wichita System	1,420	1,483	1,556	1,598	1,659	1,610
**	IRRIGATION	HARDEMAN	RED	Blaine	2,296	2,446	2,591	2,732	2,869	3,002
	BOWIE	MONTAGUE	TRINITY	Amon Carter	1,367	1,404	1,411	1,392	1,361	1,327
*	BURKBURNETT	WICHITA	RED	Wichita System	1,824	1,846	1,883	1,888	1,884	1,869
*	COUNTY-OTHER	WICHITA	RED	Wichita System	2,214	2,164	2,157	2,165	2,164	2,181
*	IOWA PARK	WICHITA	RED	Wichita System	1,451	1,480	1,494	1,96	1,492	1,482
	IRRIGATION	WICHITA	RED	Kemp	12,245	9,863	6,577	3,293	17	0
**	IRRIGATION	WILBARGER	RED	Seymour	4,918	5,490	6,045	6,583	7,105	7,612
	STEAM ELECTRIC POWER	WILBARGER	RED	Kemp	11,900	8,000	4,000	0	0	0
*	OLNEY	YOUNG	BRAZOS	Wichita System	1,301	1,304	1,324	1,338	1,351	1,359

Key: * - Receives all or portion of supply from the Wichita System. ** - Receives all or most of supply from groundwater

Note: Supplies in excess of needs are based on firm yield analysis. The City of Wichita Falls also shows an excess of needs for firm yield analysis, but indicates a shortage for safe yield analysis. Therefore, the City of Wichita Falls is not included on this table.

Table 4-11 Regional Supplies Not Allocated to a User Group (Greater than 1,000 Ac-ft/yr)

WATER SUPPLY SOURCE	COUNTY	2000	2010	2020	2030	2040	2050
N.F. BUFFALO CREEK RESERVOIR	WICHITA	1,260	1,260	1,260	1,260	1,260	1,260
GROUNDWATER SOURCES							
SEYMOUR	BAYLOR	8,696	8,696	8,696	8,696	8,696	8,696
SEYMOUR	CLAY	7,114	7,114	7,114	7,114	7,114	7,114
BLAINE	COTTLE	22,575	22,575	22,575	22,575	22,575	22,575
SEYMOUR	COTTLE	8,473	8,473	8,473	8,473	8,473	8,473
BLAINE	FOARD	15,367	15,367	15,367	15,367	15,367	15,367
SEYMOUR	FOARD	7,105	7,105	7,105	7,105	7,105	7,105
BLAINE	HARDEMAN	16,770	16,770	16,770	16,770	16,770	16,770
SEYMOUR	HARDEMAN	17,815	17,815	17,815	17,815	17,815	17,815
BLAINE	KING	16,630	16,630	16,630	16,630	16,630	16,630
TRINITY	MONTAGUE	2,020	2,020	2,020	1,570	1,570	1,168
SEYMOUR	WICHITA	10,896	10,896	10,896	10,896	10,896	10,896
SEYMOUR	WILBARGER	6,973	6,973	6,973	6,973	6,973	6,973

Note: Surface water supplies are based on firm yield analyses.

LIST OF REFERENCES

Allison, L. E., et al, "Diagnosis and Improvements of Saline and Alkali Soils", United States Salinity Laboratory, United States Department of Agriculture, 1953.

Crops and Ornamentals Salt Tolerance Database, http://www.ussl.ars.usda.gov/saltoler.htm, February 2000.

Maas, E. V., "Physiological Response of Plants to Chloride", Chloride and Crop Production, American Society of Agronomy Annual Meeting, Las Vegas, NV, December 1984.

McKee, J. E., and Wolf, H.W., "Water Quality Criteria", State Water, Quality Control Board of California, 1963.

Needham, Jerry, *Aquifer Authority Gearing Up for Another Harsh Drought*, San Antonio Express Newspaper, February 7, 2000.

Texas Natural Resource Conservation Commission (TNRCC), Water Treatment Plant Database, provided by TNRCC on August 27, 1999.

Texas Water Development Board (TWDB), Reservoir Operation Study for Lake Arrowhead, revised 1997.

IDENTIFICATION, EVALUATION, AND SELECTION OF WATER MANAGEMENT STRATEGIES

TEXAS STATE SENATE BILL 1

REGION B

5.1 Identified Regional Needs and Evaluation Procedures

5.1.1 Regional Needs

In Region B, (See Figure 1 Vicinity Map) water supply needs were identified for three different categories: quantity, quality and water supply system limitations. As shown on Table 5-1, a total of twelve water user groups were identified with one or more of these need categories. Only three water user groups - Electra, Vernon and Wilbarger manufacturing - were identified with quantity needs. Several municipal suppliers were found to have water quality issues, and the City of Wichita Falls may have system limitations. Since this initial evaluation of water supply was performed, many of these entities are addressing their needs. Several municipalities have constructed, or are in the process of constructing water treatment systems to solve water quality concerns. The City of Wichita Falls has begun the process to expand their water treatment capacity, and Electra is pursuing additional groundwater supplies to meet their short-term needs. This chapter will address the identified needs in context of the most recent developments by the water user groups when possible, and strategies will be evaluated only for needs that have not been resolved. Chapter 5 will also address regional strategies to improve the reliability and quality of the region's water supply.

Table 5-1

Water Users with Identified Needs

		Water Supply Needs		
User	**County**	**Quantity**	**Quality**	**System**
County Other	Baylor		X	
Seymour	Baylor		X	
Byers	Clay		X	
County Other	Clay		X	
County Other	Foard		X	
Burkburnett	Wichita		X	
County Other	Wichita		X	
Electra	Wichita	X	X	
Wichita Falls	Wichita			X
County Other	Wilbarger		X	
Manufacturing	Wilbarger	X	X	
Vernon	Wilbarger	X	X	

Regional Water Planning Area B Vicinity Map

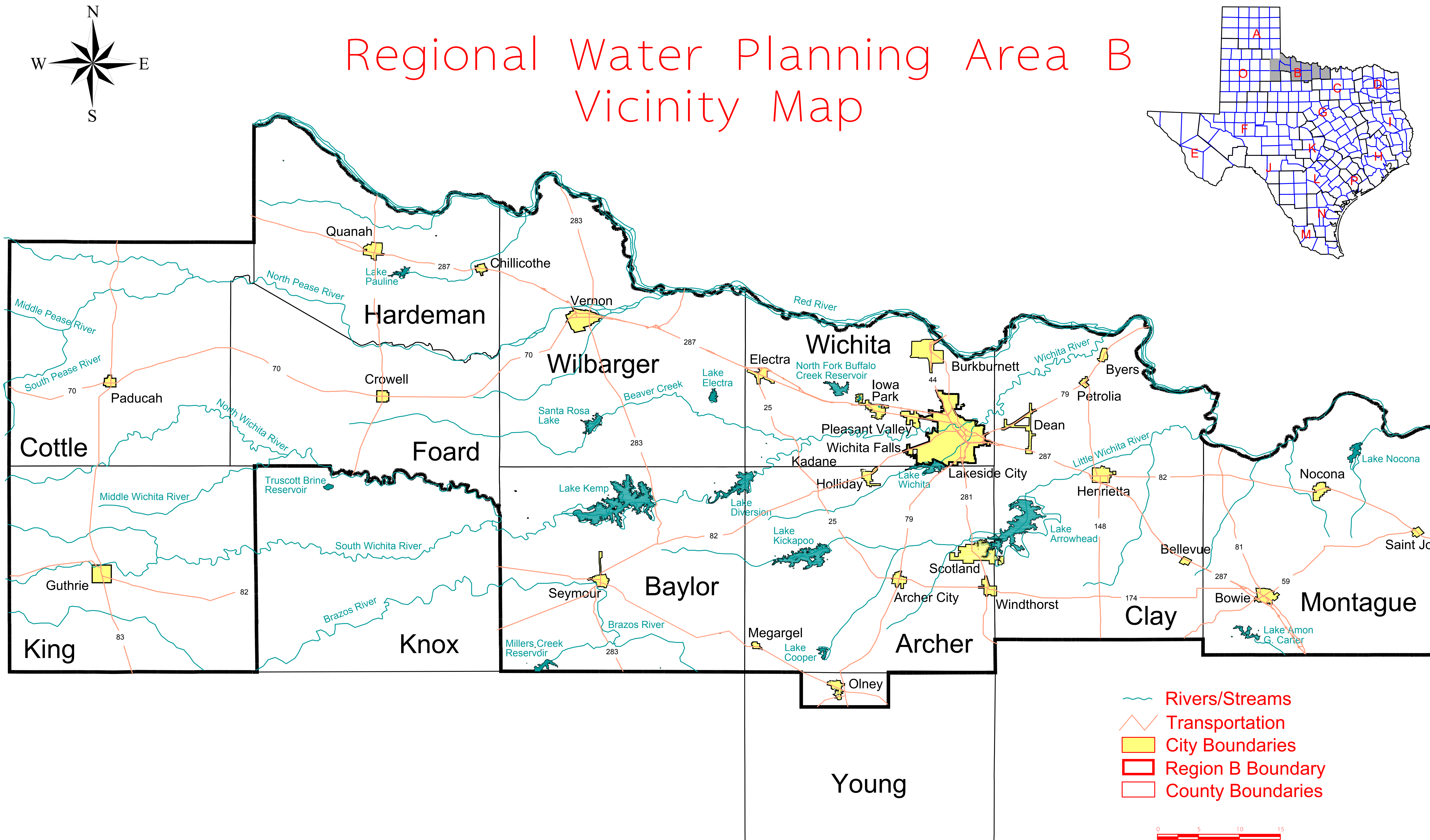


FIGURE 1

Note: Baylor - County Other includes Baylor Water Supply Corporation
Clay - County Other includes Charlie Water Supply Corporation
Foard - County Other includes Thalia Water Supply Corporation
Wichita - County Other includes Friberg-Cooper Water Supply Corp.
Wilbarger - County Other includes Box Community Water System, Lockett, Oklaunion Water System, and Hinds-Wildcat

5.1.2 Evaluation Procedures

For each of the identified needs water supply strategies were developed based on discussions with the water user group and the Regional Water Planning Group (RWPG) Technical Advisory Committee. In accordance with Senate Bill One (SB1) guidance, the potentially feasible strategies were then evaluated with respect to:

- Quantity, reliability and cost
- Environmental factors
- Impacts on water resources and other water management strategies
- Impacts on agriculture and natural resources
- Other relevant factors.

The other considerations listed in TAC 357.7(a), such as interbasin transfers and third party impacts due to re-distribution of water rights, were not specifically reviewed because they were not applicable to strategies identified for Region B needs.

The definition of quantity is the amount of water the strategy would provide to the respective user group in acre-feet per year. This amount is considered with respect to the user's short-term and long-term needs. Reliability is an assessment of the availability of the specified water quantity to the user over time. If the quantity of water is available to the user all the time, then the strategy has a high reliability. If the quantity of water is contingent on other factors, then reliability will be lower. The assessment of cost for each strategy is expressed in dollars for water delivered and treated for the end user requirements in acre-feet per year. Calculations of these costs follow SB1 guidelines for cost considerations, and identify capital and annual costs by decade. Project capital costs are based on 1999 price levels, and include construction costs, engineering, land acquisition, mitigation, right-of-way, contingencies and other project costs. Annual costs include power costs associated with transmission, water treatment costs, water purchase (if applicable), operation and maintenance, and other project-specific costs. For Region B projects, all debt service was calculated over 30 years at a 6 percent interest rate, except for Lake Ringgold, which was calculated over 40 years.

Potential impacts to sensitive environmental factors were considered for each strategy. Such sensitive environmental factors included wetlands, threatened and endangered species, unique wildlife habitats, effects on environmental water needs, and cultural resources. In an attempt to quantify the impact of each strategy, existing environmental reports were reviewed in addition to cursory environmental surveys in the area of the proposed project. Based on the above stated environmental factors, each strategy was evaluated and a judgement made as to whether it would be considered low impact, moderate impact, or high impact. If a strategy is selected, a more detailed environmental evaluation may be required.

The impact on water resources considers the effects of the strategy on water quantity, quality, and use of the water resource. A water management strategy may have a positive or negative effect on a water resource. This review also evaluated whether the strategy would impact the water quantity and quality of other water management strategies identified.

A water management strategy could potentially impact agricultural production or local natural resources. Impacts to agriculture may include reduction in agricultural acreage, reduced water supply for irrigation, or impact to water quality as it affects crop production. Some strategies may actually improve water quality, while others may have a negative impact. The impacts to natural resources may consider inundation of parklands, impacts to exploitable natural resources (such as mining), recreational use of a natural resource, and other strategy-specific factors.

Other relevant factors include regulatory requirements, political and local issues, public support, and time requirements to implement the strategy, recreational impacts of the strategy, and other socio-economic benefits or impacts.

Strategies for Region B were developed to provide water of sufficient quantity and quality that is acceptable for its end use. As shown on Table 5-1, water quality is a primary concern for many users in Region B. Water quality issues affect water use options and treatment requirements. For the evaluations of the strategies, it was assumed that the final water product would meet existing state water quality requirements for the specified use. For example, a strategy that provides water for municipal supply would meet existing drinking water standards, while water used for mining may have a lower quality. Strategies that improve water quality of other existing supplies, such as chloride control projects, were also considered.

A summary of all feasible strategies identified to meet needs in Region B is presented in the Strategies Matrix at the end of this chapter. The associated costs for each strategy are also summarized at the end of this chapter.

5.2 City of Wichita Falls

5.2.1 Background

The City of Wichita Falls, located in Wichita County, is a city of approximately 103,000 population. It is the largest city in a radius of about 100 miles, and the nearby communities and towns share economic and cultural ties to Wichita Falls.

Water resources are an important element in the quality of life and economic well being of the City and its citizens. Surface water reservoirs serve all the municipal, industrial, agricultural, and recreational needs of the City, in addition to numerous neighboring cities and water supply corporations.

The service area of Wichita Falls is approximately 65 percent of the entire Region B population and the municipal water demand on the Wichita Falls system accounts for approximately 65 percent of the total Region B municipal demand. With the majority of the municipal demand being dependent on the City of Wichita Falls for the next 50 years, it is imperative that management strategies be identified and evaluated to increase the system reliability.

As required by SB1 regulations, the analysis for current water supplies within the region including Lake Kickapoo and Lake Arrowhead, was based on the firm yield of the reservoirs.

Firm yield analyses determine the amount of water that is available on an annual basis during a repeat of historical drought of record condition assuming that all the water in the reservoir is available for use. Therefore, under the firm yield analyses, the reservoir is expected to approach zero sometime during the drought period. Also, the analysis is based on historical rainfall and runoff for each reservoir.

As discussed in Chapter 4 of the Region B Water Plan, experts at the University of Arizona's Climatic Assessment Project for the Southwest recently indicated that Texas could be heading into a significant dry period, which could potentially last for 20 to 30 years. If this occurs, the region may be entering a new drought period that surpasses the historical drought of record and the available water supply from Lake Kickapoo and Lake Arrowhead may be less than estimated in Chapter 3.

To provide for a more conservative estimate of the available surface water supply in Region B, a safe yield analysis was conducted for the two Wichita Falls reservoirs. This analysis utilizes the same historical hydrology as firm yield, but assumes that a one-year supply of water is reserved in the reservoir at all times. The results of the safe yield analysis for the Wichita System for the years 2000 to 2050 were estimated at 41,400 and 36,900 acre-feet per year respectively. This represents a decrease in annual supply from the firm yield analysis of approximately 18 percent by the year 2050, and will require the City to develop alternative supplies to meet their own water demands, in addition to meeting all customer contractual obligations.

Though the safe yield analysis was performed assuming a one-year supply of water remaining in the reservoirs, the City of Wichita initiates emergency drought contingency measures when the reservoir levels drop to 30 percent or 102,750 acre-feet capacity. At this stage, the remaining reserve is estimated to be three years.

Therefore, in order to maintain a minimum operational content in their reservoirs of from one to three years reserve, the City of Wichita Falls will need to consider developing alternative water supply strategies.

Finally, as Wichita Falls increases their water supply and system reliability, the City's customers who have water quality needs, including the City of Burkburnett, City of Byers, Charlie Water Supply Corporation, and Friberg Water Supply Corporation will be able to purchase additional water from the Wichita System to blend with their groundwater supply to reduce the nitrates in compliance with state regulatory requirements.

5.2.2 Water Demands

Based on the safe yield analysis shown in Table 4.11 of Chapter 4, the comparison of supply and demand indicated a short-term (through 2030) need for the Wichita System of 1,905 acre-feet per year and a long-term (through 2050) need of 4,277 acre-feet per year. This analysis assumes that a one-year supply remains in the reservoir at all times.

Should the city desire to maintain greater than a one-year reservoir system reserve and keep reservoir operating levels above the emergency drought condition trigger level of 30 percent capacity, (102,750 acre-feet) the City will need an additional water supply of 15,000 to 20,000 acre-feet per year through the year 2050.

5.2.3 Current Water Resources

The City of Wichita Falls currently utilizes two surface water reservoirs for their water supply, Lake Kickapoo and Lake Arrowhead.

Lake Kickapoo was constructed in 1946 for municipal water supply with an initial conservation capacity of 106,400 acre-feet. The reservoir is located approximately 18 miles southwest of Wichita Falls on the North Fork of the Little Wichita River in Archer County. The diversion rights from the reservoir total 40,000 acre-feet per year.

The projected firm yield of Lake Kickapoo in years 2000 and 2050 are 15,945 and 15,343 acre-feet per year respectively, and the projected safe yield of the lake in years 2000 and 2050 is 12,400 and 11,900 acre-feet per year respectively.

Raw water is conveyed from Lake Kickapoo to the secondary reservoir located in Wichita Falls through 18 miles of 39" transmission line. The main pump station is located at the dam with three intermediate booster stations along the route of the transmission line. The estimated maximum pumping capacity of the system is 27,500 acre-feet per year (25 MGD).

Lake Arrowhead was constructed in 1966 for municipal, industrial, and recreational use with an initial conservation capacity of 262,100 acre-feet. The reservoir is located approximately 10 miles southeast of Wichita Falls on the Little Wichita River in Clay County. The diversion rights from the reservoir total 45,000 acre-feet per year.

The projected firm yield of Lake Arrowhead through the year 2050 is 29,532 acre-feet, and the projected safe yield of the lake for the years 2000 and 2050 is 29,000 and 25,000 acre-feet per year respectively.

Raw water is conveyed from Lake Arrowhead to the secondary reservoir in Wichita Falls through 10 miles of 54" transmission line. The main pump is located at the dam with an estimated maximum pumping capacity of 50 MGD.

Therefore, the combination of Lake Kickapoo and Lake Arrowhead (Wichita System) has a safe yield for the years 2000 and 2050 of 41,400 and 36,900 acre-feet per year respectively. The maximum combined pumping capacity from the two lakes is estimated at 82,500 acre-feet per year (75 MGD).

5.2.4 Review of Alternative Water Supply Strategies

In consultation with the RWPG Technical Advisory Committee, four sources of additional water supply for the City of Wichita Falls were considered and are listed below:

- Wastewater Reuse - Approximately 11,000 acre-feet per year (10 MGD) of processed and treated effluent could be used for irrigation and industrial purpose or mixed with existing raw water supply at the secondary reservoir.

- Lake Kemp/Diversion - Approximately 25,150 acre-feet per year (23 MGD) of Kemp/Diversion water could be treated at the existing Cypress Water Treatment Plant (WTP) for municipal use.
- Lake Ringgold - Approximately 27,000 acre-feet per year (24.5 MGD) could be made available for municipal use by constructing a new lake near Ringgold.
- Regional Lake Kemp/Diversion Desalination Plant - 25,150 acre-feet per year (23 MGD) of Kemp/Diversion water could be treated at a new facility located near Lake Diversion for regional distribution.

5.2.5 Description of Potentially Feasible Alternatives

Each of the potentially feasible alternatives is described below and is shown in Figure 2.

Alternative WF-1: Wastewater Reuse

<u>Quantity, Reliability, and Cost</u>

Currently the City of Wichita Falls operates and maintains a wastewater treatment plant that discharges approximately 14,300 acre-feet per year (13 MGD) of very high quality treated effluent into the Wichita River for use downstream by other entities. This water would be a very reliable source for the City, and could be utilized to decrease the irrigation and industrial demands on the system, and/or to increase the municipal water by 11,000 acre-feet per year (10 MGD). To produce 10 MGD of reusable water, this alternative would require advanced treatment at the River Road Wastewater Treatment Plant (RRWWTP) including denitrification, microfiltration, and ultraviolet (UV) disinfection. In addition, a 30-inch pipeline and 10 MGD pump station will be required to convey the water to the secondary reservoir prior to the final water treatment process and storage in an additional reservoir at the Jasper WTP. A summary of the capital and annual costs are presented below.

Alternative WF-1 Wastewater Reuse

Construction Costs	
RRWWTP Denitrification Improvements	$6,000,000
Microfiltration Treatment	7,000,000
UV Disinfection	2,000,000
RRWWTP Pump Station	1,500,000
30" Pipeline to Secondary Reservoir (12 miles)	7,000,000
Storage Reservoir at Jasper WTP	1,500,000
10 MGD Pump Station and Water Treatment	9,000,000
Subtotal Construction Costs	$34,000,000
Other Project Costs	
Engineering, Legal, Financial, & Contingencies	$11,550,000
Land and Easements	100,000
Environmental Studies, Mitigation & Permitting	400,000
Interest During Construction (18 Months)	2,650,000
Subtotal Other Costs	$14,700,000
Total Capital Project Costs	**$48,700,000**
Annual Costs	
Debt Service (30 yrs. @ 6%)	$3,540,000
Operation and Maintenance	158,000
Power Costs (Pumping Facilities)	125,000
Water Treatment Costs ($0.50/1,000 Gal.)	1,792,000
Total Annual Cost	**$5,615,000**
Available Water Yield (Acre-Feet Per Year)	11,000
Available Water Yield (MGD)	10
Cost of Water Delivered ($ Per Acre-Feet)	**$510**
Cost of Water Delivered ($ Per 1,000 Gallons)	**$1.57**

Environmental Factors

This alternative would have low to moderate impacts on the environment since the pipeline route could be routed along the Holliday Creek Flood Control Project. In addition, the pump station would be located at the existing wastewater plant in an area of minimal impact.

Impact on Water Resources and Other Management Strategies

This alternative would have a low to moderate impact on the Wichita River in that the wastewater effluent would no longer be discharging into the river. During drought conditions this could cause a noticeable effect on the quantity and perhaps the quality of water in the Wichita River immediately downstream from the wastewater plant.

In addition, this alternative would reduce the quantity of water required from Lake Arrowhead and Lake Kickapoo reservoirs, and could significantly delay the need to construct Lake Ringgold.

Impact on Agriculture and Natural Resources

This alternative would have minimal to no impact on agriculture and natural resources, in that the route for the transmission pipeline is along a flood control creek. Also, though the flow from the treatment plant into the river would be significantly reduced, the effect would be minimal compared to the total flow of the river.

Other Relevant Factors

Public acceptance of this alternative may become an issue if perception prevails that properly treated wastewater effluent is a questionable source of raw water supply for the City due to unfounded health concerns or other misconceptions. In addition, this alternative will require a modification to the wastewater discharge permit which could take 1 to 2 years.

Alternative WF-2: Water from Lake Kemp/Diversion Reservoirs

Quantity, Reliability, and Cost

The City of Wichita Falls currently has water rights to 25,150 acre-feet of Kemp/Diversion water for municipal use. However, due to the high salinity content of the water, the City has not utilized it as a municipal water supply. Aside from water quality, this reservoir system would be a very reliable source of water supply in that it is in a different drainage basin than Lake Arrowhead and Lake Kickapoo.

To utilize 11,000 acre-feet per year (10 MGD) of Kemp/Diversion water, a pump station and approximately 13 miles of 42" transmission line would be required to convey the water from the reservoir system to the Cypress WTP located on the southwest side of Wichita Falls. In addition, Cypress WTP improvements will be required to include microfiltration and reverse osmosis for enhanced treatment of the high salinity water. Facilities will also need to be constructed for reject brine disposal into the Wichita River. A summary of the capital and annual costs is presented below.

Alternative WF-2 Water from Lake Kemp/Diversion Reservoirs

Construction Costs	
12 MGD Pump Station Near Diversion	$2,000,000
42" Raw Water Line to Cypress Plant (13 miles)	15,500,000
10 MGD Microfiltration/Reverse Osmosis Treatment	22,500,000
Treatment Brine Reject Disposal	2,500,000
Subtotal Construction Costs	$42,500,00
Other Project Costs	
Engineering, Legal, Financial & Contingencies	$14,100,000
Land and Easements	160,000
Environmental Studies, Mitigation, & Permitting	500,000
Interest During Construction (18 months)	3,300,000
Subtotal Other Costs	$18,060,000
Total Capital Project Costs	**$60,560,000**
Annual Costs	
Debt Service (30 yrs. @ 6%)	$4,403,000
Operation and Maintenance	205,000
Power Costs (Pumping Facilities)	50,000
Water Treatment Costs ($0.75/1,000 Gals .)	2,688,000
Total Annual Cost	**$7,346,000**
Available Water Yield (Acre-Feet Per Year)	11,000
Available Water Yield (MGD)	10
Cost of Water Delivered ($ Per Acre-Feet)	**$668**
Cost of Water Delivered ($ Per 1,000 Gallons)	**$2.05**

Environmental Factors

This alternative would have low to moderate impacts on the environment assuming the pipeline routes could be routed along highways or county roads. In addition, the pump station can be located in an area of minimal environmental impact. It is anticipated that the brine discharge will be into the Wichita River.

Impact on Water Resources and Other Management Strategies

This alternative would have a low to moderate impact on the Lake Kemp/Diversion system, in that the water levels in the lakes may have greater fluctuations as more water is utilized from this system. Also with the brine discharge into the Wichita River, the chloride content of the river may be impacted.

The quantity of water required from Lake Arrowhead and Lake Kickapoo reservoirs would be reduced using this alternative and could significantly delay the need to construct Lake Ringgold.

Impact on Agriculture and Natural Resources

This alternative would have a low to moderate impact on agriculture and natural resources, depending on the pipeline route selected.

Other Relevant Factors

This alternative would require the mixing of conventional treated water and water treated through a desalination process. Proper mixing and compatibility of the waters should be a consideration.

Alternative WF-3: Construct Lake Ringgold Reservoir

Quantity, Reliability, and Cost

In the early 1980's the City of Wichita Falls identified a potential reservoir site approximately 40 miles northeast of Wichita Falls, near the town of Ringgold. The site would be on the Little Wichita River and studies have concluded that, if constructed approximately 27,000 acre-feet per year (24.5 MGD) of water could be made available for municipal use.

This reservoir would be in the same drainage basin as Lake Arrowhead and Lake Kickapoo so it is anticipated that the water quality would be very similar to the existing reservoirs. The reliability of this water supply would be good, however, with the location of the Ringgold site being downstream and in the same drainage basin as the two existing lakes, the Ringgold Reservoir could be adversely affected during periods of extended drought. Also instream flow requirements for new reservoirs will most likely reduce the estimated firm yield.

Of the 17,000 acres of land needed for the reservoir site, the City currently owns approximately 5,000 acres. Along with purchasing the remaining lands for the site, additional facilities including a lake intake structure, pump station facilities, and 40 miles of 54" transmission line would be required to convey 27,000 acre-feet per year (24.5 MGD) of raw water into existing treatment facilities in Wichita Falls. A summary of the capital and annual costs are presented below.

Alternative WF-3 Construct Lake Ringgold Reservoir

Construction Costs	
Ringgold Reservoir (275,000 Acre-Feet Capacity)	$58,860,000
Pumping Facilities (2-24.5 MGD)	6,000,000
54" Raw Water Line to Storage. Reservoir (40 miles)	73,500,000
24.5 MGD Pumping Facility @ Storage Reservoir	3,000,000
24.5 MGD Water Treatment Facility	18,375,000
Subtotal Construction Cost	$159,735,000
Other Project Costs	
Engineering, Legal, Financial, & Contingencies	$52,232,000
Land and Easements	13,000,000
Environmental Studies, Mitigation & Permitting	15,000,000
Interest During Construction (5 years)	47,487,000
Subtotal Other Cost	$127,719,000
Total Capital Project Cost	**$287,454,000**
Annual Costs	
Debt Service (Reservoir 40 yrs. @ 6%)	$9,558,000
Debt Service (Pipeline/Pump Sta. 30 yrs. @ 6%)	10,449,000
Operation & Maintenance	1,818,000
Power Cost (Pumping Facilities)	600,000
Water Treatment Costs ($0.25/1,000 Gal.)	2,199,000
Total Annual Cost	**$24,624,000**
Available Water Yield (Acre-Feet Per Year)	27,000
Available Water Yield (MGD)	24.5
Cost of Water Delivered ($ Per Acre-Feet)	**$912**
Cost of Water Delivered ($ Per 1,000 Gallons)	**$2.80**

<ins>Environmental Factors</ins>

This alternative would have a moderate impact on the environment with the inundation of over 9,000 acres of existing pasture land. In addition, pump stations and the pipeline into the City should be located in areas of low to moderate impact.

Impact on Water Resources and Other Management Strategies

This alternative would have a high impact on the water resources of the City in that an additional 275,000 acre-feet of reservoir storage would be created while increasing the water supply to Wichita Falls by 27,000 acre-feet per year.

Though this alternative is the most expensive strategy, it would likely delay the need for the wastewater reuse project and/or the Lake Kemp/Diversion project beyond the year 2050.

Impact on Agriculture and Natural Resources

This alternative would have a moderate to high impact on agriculture in that well over 9,000 acres of pasture land or potential farmland would be inundated by the reservoir.

Also, it is anticipated that the average daily flow in the Red River downstream of the Little Wichita River will be diminished significantly.

Other Relevant Factors

This alternative would require the City to obtain a permit from the Texas Natural Resource Conservation Commission (TNRCC) to impound water from the Little Wichita River. Since the City of Wichita Falls already has approximately 25,000 acre-feet of water rights in Lake Kemp/Diversion that are not currently being utilized, the burden of proof will be on the City to justify the need for this permit.

Depending on the availability of the land, permitting issues, and environmental issues, this project could take 8 to 10 years to complete.

Regional Water Treatment Plant Alternative (Lake Kemp/Diversion Reservoirs)

This alternative is based on the City of Wichita Falls, City of Vernon, and the City of Electra participating in a regional plan to utilize Lake Kemp/Diversion and construct a desalination plant at the reservoir site. The regional plan is addressed in detail in Section 5.6 of this chapter, with the following costs allocated to the City of Wichita Falls as summarized below.

Total Regional Capital Project Cost	**$129,336,000**
City of Wichita Falls Portion (74%)	**95,709,000**
Annual Cost	
Debt Service (30 yrs. @ 6%)	$6,958,000
Operation and Maintenance	325,000
Power Cost (Pumping Facilities)	75,000
Water Treatment Costs ($0.75/1,000 Gals)	3,494,000
Total Annual Cost	**$10,852,000**
Available Water Yield (Acre-Feet Per Year)	14,300
Available Water Yield (MGD)	13
Cost of Water Delivered ($ Per Acre-Feet)	**$759**
Cost of Water Delivered ($ Per 1,000 Gallons)	**$2.33**

5.3 City of Vernon

5.3.1 Background

The City of Vernon is located in Wilbarger County in north Texas near the Texas/Oklahoma border. It is the largest city in the county with a population of about 12,500, which accounts for 80 percent of the total county population. As a result, the City of Vernon provides a large portion of the county's municipal water needs and nearly all of the county's industrial water needs. Vernon currently obtains all of its water supply from wells in the Seymour Aquifer, mostly located north of the city. The supply and demand comparisons presented in Chapter 4 indicate that the long-term reliable supply from the City's existing well fields may not meet increasing demands. Also, water from the City's wells in the Seymour Aquifer has elevated nitrate levels, which are often slightly in excess of the U.S. EPA primary drinking water standard of 10 milligrams per liter (mg/l) of nitrate as nitrogen.

Vernon provides water to local water supply corporations including Box Community Water System, Hinds-Wildcat, Northside, Oklaunion WSC and a small amount of water to the Lockett Water System. Each of these entities, with the exception of Northside, also has reported nitrate levels above the primary drinking water standard. In response to the nitrate levels in their water supply, the City of Vernon has begun the design and construction of a nitrate removal system. An ion-exchange system should be completed and in operation by 2002. This system is capable of providing up to 5 MGD of treated blended water for Vernon and its customers. Box Community and Oklaunion water systems will then purchase the treated water blend from Vernon, solving their water quality issues. However, the infrastructure for the Hinds-Wildcat system is not currently designed to supply treated water from the proposed plant location, and Hinds-Wildcat will continue to receive water directly from the well field. Also, the City of Vernon provides only a portion of Lockett's water needs. Continued purchase of a small amount of treated water will not significantly reduce the nitrate levels in Lockett's water supply. It is anticipated that Lockett will purchase low-nitrate treated water from Vernon by 2010 to blend with their existing supply.

Vernon is currently addressing the nitrate issues in its supply and the supply for some of its customers. Therefore, no additional water quality strategies will be identified for the City of Vernon, Box Community Water System and the Oklaunion Water System. However, water quality strategies will be identified for Hinds-Wildcat and Lockett since existing infrastructure does not readily support the purchase of treated water from the City of Vernon. The strategies identified for Vernon will focus on providing water supply for the City and manufacturing needs in Wilbarger County.

5.3.2 Water Demands

The comparison of supply and demand indicated short-term and long-term supply needs for the City of Vernon and manufacturing in Wilbarger County. Since the City of Vernon provides nearly all of the water for county manufacturing, the water needs for both user groups will be examined together. The total short-term need (through 2030) for Vernon and manufacturing is estimated at 433 acre-feet per year, and the long-term need (by 2050) is 612 acre-feet per year. The analysis shows an immediate need in the year 2000, which can be temporarily met by overdrafting the City's existing groundwater sources and implementing conservation. However, additional water supplies will most likely be needed within the next decade.

5.3.3 Current Water Resources

The City of Vernon currently uses groundwater from two principal well fields, the Odell and Winston well fields. The Odell water supply wells are located approximately 12 miles north of the City and the Winston wells are located 2 miles north of the Odell field. Water from these wells is pumped to a central storage tank at the Odell field, and then flows by gravity to the City for distribution. Since these well fields are operated as a single supply source, they are referred to collectively as the Odell-Winston well field. The reliable long-term yield of this system is approximately 2,800 acre-feet per year. Additional water supply wells are located within the city limits. These city wells have been used as needed to meet peak demands in the summer. The yield of the in-city wells is estimated at 560 acre-feet per year.

To reduce its demand on the Odell-Winston well field, Vernon has begun to use local wells for irrigation of parks and golf courses. Vernon is also proposing to directly connect Rhodia Industries to the City's existing in-city well field. The in-city wells have high nitrate levels, which are undesirable for municipal use but do not affect the manufacturing use for Rhodia. These modifications will reduce the amount of water that is required for treatment.

5.3.4 Review of Alternative Water Supply Strategies

In consultation with the RWPG Technical Advisory Committee and city staff, ten sources of additional water supply for the City of Vernon were considered:

Treated surface water from

- Altus, Oklahoma
- Wichita Falls

Raw surface water from

- Altus, Oklahoma
- Wichita Falls
- A new dam on Wildcat Creek
- A new dam on Beaver Creek
- Lake Diversion (with desalination)

Additional groundwater from

- Round Timber Ranch Well Field (Altus, Oklahoma) or develop a new well field
- Enhanced recharge for existing well fields
- Industrial Reuse

Treated and raw surface water from the City of Altus was eliminated because Altus does not want to sell any of its surface water from Tom Steed Reservoir. The comparative cost of these options is high because of the purchase costs, and the water would have to be transported 35 miles across the Red River.

Two potential reservoir sites were reviewed as possible new sources of water. The dam on Beaver Creek would provide approximately 2,500 acre-feet per year of fair quality water. The Wildcat Creek site would provide about 1,700 acre-feet per year of fair to poor water quality. Both of these alternatives were eliminated because building such impoundments would be very expensive and the supply may not be reliable. Permitting complexities would be high for a new reservoir, as would the institutional difficulties.

Industrial reuse would add an uncertain amount of fair to poor quality water to the City's existing water supply. Permitting complexities are expected to be moderate, but the institutional difficulties would be high. This option was eliminated because existing industries have indicated that they are not interested in industrial reuse.

Recharge rates of the Seymour Aquifer near Vernon's existing well fields may be increased by building small dams and infiltration wells in surface water drainage areas. An enhanced recharge program would add an uncertain amount of water to the City's existing supply. However, during a drought the reliability is low and the quantity is small. Therefore, this strategy was not retained for detailed evaluation for additional water supply. The City of Vernon may still choose to develop an enhanced recharge program to increase the reliability of its existing supply, but this option alone would not provide sufficient supply to meet the projected needs.

The alternative strategies retained for detailed analysis are shown in Figure 3 and include:

- Purchase treated surface water from the City of Wichita Falls
- Purchase raw surface water from Lake Kickapoo
- Purchase groundwater from the City of Altus (Round Timber Ranch)/ or develop new groundwater well field
- Purchase water from Lake Kemp/Diversion with desalination (regional option)

5.3.5 Description of Potentially Feasible Alternatives

Alternative V-1: Treated Surface Water from Wichita Falls

The City of Vernon would purchase up to 2 MGD of treated water from the City of Wichita Falls. The estimated purchase cost would be about $0.95 per thousand gallons. Water would be pumped approximately 42 miles to the City's existing 1.5-MG central storage tanks via an 18-inch pipeline from the existing Iowa Park pump station located east of the City of Iowa Park. The transmission pipeline would generally follow the right-of-way for Highway 287, crossing approximately 7 major roads/highways. A new pump station with a metering vault would be located at the Iowa Park station. A booster station and 0.5-MG storage tank would be located along the route (approximately 30 miles west of Wichita Falls). This water would not require additional treatment.

Alternative V-2: Raw Surface Water from Lake Kickapoo

The City of Vernon would purchase up to 2 MGD of raw surface water from the City of Wichita Falls. The estimated purchase cost would be about $0.21 per thousand gallons. Water would be pumped approximately 45 miles via an 18-inch pipeline from Lake Kickapoo to a new surface water treatment plant. The transmission pipeline would generally follow a rural route, crossing approximately 6 roads/highways and 1 railroad. This alternative would require the construction of an intake structure and a new pump station with metering vault at Lake Kickapoo, and a booster station with a 0.5-MG storage tank. It also would require constructing a new 2-MGD surface water treatment plant.

Alternative V-3: Groundwater from Round Timber Ranch well field

The City of Altus is considering leasing their right to pump water from the Round Timber Ranch to the City of Vernon. The Round Timber Ranch is located in Wilbarger County, Texas, near the Texas-Oklahoma border. This option would include re-development of 13 existing water wells, new well controls and pumps, and a new pumping station. The water would be pumped from the well field to a new 0.5-MG storage tank. From the tank the water would be pumped approximately 11.5 miles through a new 14-inch transmission line to the Odell-Winston storage tank. The groundwater would then be transported to the City's treatment plant via an existing 21-

inch pipeline. Previous water quality data indicate the Round Timber groundwater has nitrate levels at or just below the 10 mg/l limit. It is assumed that water from the Round Timber well field would be combined with the existing Odell-Winston water and treated for nitrates at a similar treat/blend ratio. No additional treatment system will be required.

Regional Water Treatment Plant Alternative (Lake Kemp/Diversion Reservoirs)

A regional water supply project using Lake Kemp/Diversion water with desalination could provide the City of Vernon with 2 MGD of treated water. At Lake Diversion, the water would be treated by reverse-osmosis, and then pumped to the City of Vernon via a regional pipeline system to an existing 1.5-MG storage tank in Vernon. Further description of this alternative is presented in Section 5.6.

5.3.6 Analysis of Viable Strategies

Alternate V-1: Treated Surface Water from Wichita Falls

Quantity, Reliability and Cost

The quantity of water (2,200 acre-feet per year) would be sufficient to meet the City of Vernon's needs and projected needs for manufacturing in Wilbarger County. The City of Wichita Falls has sufficient water to provide to Vernon, but they have limited treatment capacity. Wichita Falls is currently expanding their water treatment plant by 20 MGD, which would be sufficient to provide treated water to Vernon. The reliability would be moderate since the supply is contingent on Wichita Falls' water supply, and Wichita Falls may limit their customers' supply during drought. The water cost for this alternative is estimated at $2.83 per 1,000 gallons. These costs are moderately high due to the long pipeline needed to transport the water from the Iowa Park pump station to Vernon. A summary of the capital and annual costs are presented below.

Alternative V-1 Treated Water from Wichita Falls

Construction Costs	
18" Pipeline	$9,536,000
ROW costs	504,000
Pump Station (includes booster station and .5 MG storage tank)	630,000
Highway Crossings	126,000
Metering Vaults	16,000
Subtotal Construction Costs	$10,812,000
Other Project Costs	
Mitigation & Permitting	$324,000
Engineering/ Contingencies	3,244,000
Interest during construction (24 month construction period)	1,124,000
Subtotal Other Costs	$4,692,000
Total Capital Project Costs	**$15,504,000**
Annual Costs	
Debt Service (30 years @ 6%)	$1,126,000
Operation and Maintenance	111,000
Pumping costs	101,000
Treatment Costs	$0
Water Purchase Costs	694,000
Total Annual Costs	**$2,032,000**
Available Water Yield (Acre-Feet Per Year)	2,200
Available Water Yield (MGD)	2
Cost of Water Delivered ($ Per Acre-Feet)	**$923**
Cost of Water Delivered ($ Per 1,000 Gallons)	**$2.83**

<u>Environmental Factors</u>

Potential environmental impacts should be low since the route of the pipeline will generally follow Highway 287. The booster station required along the route can be located in an area of minimal environmental impact.

<u>Impacts on Water Resources and Other Water Management Strategies</u>

There should be low water resources impacts since the Wichita System has adequate yield. However, water levels in the lakes may have greater fluctuations as more of the system's yield is used. This may affect local lake owners and/or businesses on the lake. Other strategies that may be affected include the sale of water from Wichita Falls to Electra via an existing pipeline to Iowa Park. This pipeline has sufficient capacity for the existing supply to Iowa Park and the City of Vernon, but it most likely cannot supply Electra, Vernon and Iowa Park. Also, if Iowa Park utilizes its full contract amount from Wichita Falls, an additional transmission line may be needed to supply Vernon.

Impacts on Agriculture and Natural Resources

This strategy has minimal impacts on agriculture and natural resources. Since the pipeline follows an existing highway, there should be no impacts to agricultural lands and there are no identified natural resources along the route. The water sold to Vernon from Wichita Falls is designated for municipal use and should not affect irrigation supply

Other Relevant Factors

This strategy could be implemented between 2 and 5 years to meet Vernon's short-term and long term needs. The permitting and regulatory requirements are expected to be few. At a minimum, a nationwide 404 permit and an NPDES storm water permit during construction would be required for the pipeline. As the pipeline route is finalized, additional coordination with state and local agencies regarding sensitive environmental factors may be needed. Also, if the pipeline affects state-owned lands, additional permits and/or a Grant of Easement may be required. This strategy would increase Wichita Falls' prominence as a regional water provider and may provide means for additional supply for growth after 2050. However, the City of Wichita Falls is currently rationing water in compliance with their drought contingency plan. The City may not be receptive to providing water to Vernon until additional water supply alternatives are developed.

Alternate V-2: Raw Surface Water from Wichita Falls

Quantity, Reliability and Cost

As with Alternate V-1, the quantity of water would be sufficient to meet the City of Vernon's needs and projected needs for manufacturing in Wilbarger County. The reliability is moderate since it is contingent on the firm yield of the Wichita system, and may be subject to rationing during drought conditions. The costs for this alternative are estimated at $2.92 per 1,000 gallons. This is moderately high due to the long pipeline needed to transport the water from Lake

Kickapoo to Vernon, and the construction of a surface water treatment plant. Operation of the water treatment plant would require additional city staff. Also, since the City of Vernon has made a commitment to the nitrate removal system, the City would need to maintain two different treatment systems.

Alternative V-2 Raw Water from Wichita Falls

Construction Costs	
18" Pipeline	$10,217,000
ROW costs	540,000
Pump Station (includes booster station and .5 MG storage tank)	600,000
Crossings	136,000
Treatment Plant (2 MGD)	4,500,000
Kickapoo Intake structure/ metering vaults	1,016,000
Subtotal Construction Costs	$17,009,000
Other Project Costs	
Mitigation & Permitting	$510,000
Engineering/ Contingencies	1,700,000
Interest during construction (24 month construction period)	1,502,000
Subtotal Other Costs	$3,712,000
Total Capital Project Costs	**$20,721,000**
Annual Costs	
Debit Service (30 years @ 6%)	$1,506,000
Operation and Maintenance	117,000
Pumping costs	74,000
Treatment Costs	251,000
Water Purchase Costs	147,000
Total Annual Costs	**$2,095,000**
Available Water Yield (Acre-Feet Per Year)	2,200
Available Water Yield (MGD)	2
Cost of Water Delivered ($ Per Acre-Feet)	**$952**
Cost of Water Delivered ($ per 1,000 Gallons)	**$2.92**

<u>Environmental Factors</u>

The environmental impacts should be low to moderate depending on the route of the pipeline. It is assumed that the pipeline will travel in a direct route from Lake Kickapoo to Vernon. The booster station required along the route can be located in an area of minimal environmental impact.

Impacts on Water Resources and Other Water Management Strategies

There should be no water resources impacts since the Wichita System has adequate yield. However, water levels in the lakes may have greater fluctuations as more of the system's yield is used. This may affect local lake owners and/or businesses on the lake. This strategy should not affect identified strategies for other users. The Wichita System has sufficient yield to supply both Vernon and Electra, and the City of Wichita Falls is reviewing strategies to further increase the reliability of this system.

Impacts on Agriculture and Natural Resource

The impacts to agriculture should be low since the water from Lake Kickapoo is designated for municipal use. There may be some minimal impacts to agricultural lands to allow for the right of way easement since the pipeline may not follow highways. Potential impacts to natural resources should be low. The pipeline could be routed to minimize impacts to natural resources.

Other Relevant Factors

This strategy could be implemented between 3 and 5 years to meet Vernon's needs. The permitting and regulatory requirements would be low to moderate. A Corps of Engineers 404 permit would be required for the raw water intake structure at Lake Kickapoo and the 45-mile transmission pipeline. With the present transmission route, the pipeline crosses several streams, including the Wichita River and Beaver Creek. As the pipeline route is finalized, additional coordination with state and local agencies regarding sensitive environmental factors may be needed. If the pipeline affects state-owned lands, additional permits and/or a Grant of Easement may be required. Also, the surface water plant design will require TNRCC approval. During construction, a storm water NPDES permit will be required. As with Alternative V-1, this strategy may provide means for additional supply for growth after 2050, but may be contingent on Wichita Falls developing additional supply.

Alternate V-3: Groundwater from Round Timber Ranch

Quantity, Reliability and Cost

A preliminary assessment of the groundwater supply at the Round Timber ranch well field indicates that the well field could sustain an average water supply rate of 1.2 MGD, assuming average recharge conditions. During a drought, it is estimated that the well field could supply 1,100 acre-feet per year. This supply would be adequate to meet Vernon's projected needs through 2050, but may be able to provide for growth beyond 2050. The reliability is moderate to high, depending on local recharge and other groundwater use. The cost for this alternative is $1.16 per 1,000 gallons, depending on the purchase price from the City of Altus. This is relatively low because a pipeline would be needed only to the existing Odell-Winston well field, and the well field is already developed. A summary of the cost estimate follows.

Alternative V-3 Round Timber Well Field

Construction Costs	
Study of well field	$150,000
14" Pipeline	2,125,000
ROW costs	138,000
Pump Station with 0.5 MG storage tank	410,000
Crossings, metering vaults and well field tie-in	113,000
Re-development of wells/ testing/ pumps/ well controls	300,000
Subtotal Construction Costs	$3,236,000
Other Project Costs	
Mitigation & Permitting	$93,000
Engineering/ Contingencies	309,000
Interest during construction (12 month construction period)	145,000
Subtotal Other Costs	$547,000
Total Capital Project Costs	**$3,783,000**
Annual Costs	
Debit Service (30 years @ 6%)	$275,000
Operation and Maintenance	27,000
Pumping costs	19,000
Treatment Costs	53,000
Water Purchase Costs	55,000
Total Annual Costs	**$429,000**

Available Water Yield (Acre-Feet Per Year)	1100
Available Water Yield (MGD)	1
Cost of Water Delivered ($ Per Acre-Feet)	**$390**
Cost of Water Delivered ($ Per 1,000 Gallons)	**$1.19**

Environmental Factors

The environmental impacts would be low because the pipeline route would follow existing roadways and the well field is already in place. The waste stream from the nitrate removal system would be treated at the City's wastewater treatment plant.

Impacts on Water Resources and Other Water Management Strategies

There should be few impacts to water resources. The availability of water from the Seymour Aquifer is adequate to meet this additional demand. There are no other strategies that would be affected.

Impacts on Agriculture and Natural Resources

Threats to agriculture would be low since the well field has historically been used for municipal water supply, not farming. Also the projected demands for irrigation in Wilbarger County are expected to decrease over the planning period.

Other Relevant Factors

This strategy could be implemented between 2 and 3 years. The permitting and regulatory requirements are expected to be few. A nationwide 404 permit would be required for the transmission pipeline from the Round Timber Ranch to the Odell well field. A storm water NPDES permit will be required during construction. Since the pipeline route generally follows existing roads, it is unlikely that additional permitting will be required. However, when the pipeline route is finalized, additional coordination with state and local agencies regarding other permitting or review requirements should be conducted. Since the quality of the groundwater is moderate, it is assumed that the water will require treatment for nitrates. Vernon is constructing a nitrate removal system for its existing supply, and the plant is designed for expansion as needed.

Also, the City of Vernon is already using groundwater and additional groundwater supply would complement its existing system.

Regional Water Treatment Plant Alternative (Lake Kemp/Diversion Reservoirs)

This strategy is based on the City of Wichita Falls, City of Vernon, and the City of Electra participating in a regional plan to utilize Lake Kemp/Diversion and construct a desalination plant at the reservoir site. The regional plan is addressed in detail in Section 5.6 of this chapter with the following costs allocated to the City of Vernon as summarized below.

Total Regional Capital Project Cost	**$129,336,000**
City of Vernon Portion (19%)	**24,574,000**
Annual Cost	
Debt Service (30 yrs. @ 6%)	$1,787,000
Operation and Maintenance	166,000
Power Cost (Pumping Facilities)	36,000
Water Treatment Costs ($0.75/1,000 Gals)	538,000
Water Purchase (From W.F. @ $0.21/1,000 Gals)	151,000
Total Annual Cost	**$2,678,000**
Available Water Yield (Acre-Feet Per Year)	2,200
Available Water Yield (MGD)	2
Cost of Water Delivered ($ Per Acre-Feet)	**$1,217**
Cost of Water Delivered ($ Per 1,000 Gallons)	**$3.74**

5.3.7 Hinds-Wildcat and Lockett Water Supply Systems

As previously discussed in Section 5.3.1, Vernon provides water to five local water supply systems. Due to the levels of nitrates in Vernon's current supply and the local Seymour Aquifer, several suppliers were identified with water quality needs. Most of these needs will be resolved with no additional capital improvements when Vernon's nitrate removal system is completed. Two systems, Hinds-Wildcat and Lockett, cannot receive treated water from Vernon without the construction of a pipeline from Vernon's water treatment plant to the respective entity. Other options for these systems are limited due to their size and available resources. The primary source of water for this area is the Seymour Aquifer. Both systems currently employ a bottled water program for customers needing low nitrate water (pregnant women and babies under one year old). It is the intent of the Red River Authority of Texas, who owns and manages these water supply systems, to continue the bottled water program until such time that the required capital improvements can be completed.

Hinds-Wildcat Water System

For the Hinds-Wildcat system, it would be cost prohibitive to install an individual nitrate removal system. The smallest size system is approximately 100 gpm, which is more than twice the capacity needed. The only other alternative is a 2.5-mile, 6-inch pipeline from Vernon's treatment plant to the Hinds pump station located north of County Road 925. Vernon would then provide Hinds-Wildcat the same quantity of treated water blend (40 acre-feet per year), rather than raw water.

<u>Quantity, Reliability and Cost</u>

The quantity of the supply to Hinds-Wildcat is adequate for their needs and the reliability will be high after Vernon develops one of the water supply strategies. The cost of the Hinds transmission system is moderately high because the pipeline must cross the Pease River and the quantity of water is small. A summary of the costs is presented below.

Alternative Hinds-Wildcat Pipeline

Construction Costs	
6" Pipeline	$238,000
ROW Costs	24,000
Pump Stations	250,000
Road Crossings	9,000
Railroad Crossings	18,000
River Crossings	18,000
Metering Vaults	16,000
Subtotal Construction Costs	$573,000
Other Project Costs	
Mitigation & Permitting	$13,000
Engineering/ Contingencies	50,000
Interest during construction (6 month construction period)	12,000
Subtotal Other Costs	$75,000
Total Capital Project Costs	**$648,000**

Annual Costs	
Debt Service (30 years @ 6%)	$47,000
Operation and Maintenance	4,000
Pumping Costs	1,000
Treatment Costs	0
Water Purchase Costs	0
Total Annual Costs	**$52,000**
Available Water Yield (Acre-Feet Per Year)	40
Available Water Yield (MGD)	0.036
Cost of Water Delivered ($ Per Acre-Feet)	**$1,300**
Cost of Water Delivered ($Per 1,000 Gallons)	**$4.00**

Environmental Factors

The environmental impacts would be low because the pipeline route would generally follow existing roadways. The pipeline would have to cross the Pease River and there may be temporary environmental impacts during construction.

Impacts on Water Resources and Other Water Management Strategies

There should be no water resource impacts since no additional water is used from the Seymour Aquifer.

Impacts on Agriculture and Natural Resource

There should be no impacts on agriculture since no additional water is used from the Seymour Aquifer.

Other Relevant Factors

This strategy could be implemented between 2 and 5 years. The permitting and regulatory requirements are expected to be low. A 404 permit would be required for the transmission pipeline from Vernon to Hinds since it crosses the Pease River. As the pipeline routes are finalized, additional coordination with state and local agencies regarding sensitive environmental factors may be needed. An NPDES storm water permit will be required during construction. If a pipeline affects state-owned lands, additional permits and/or a Grant of Easement may be required.

Lockett Water System

Alternative L-1 Pipeline from Vernon to Lockett

Vernon currently provides Lockett approximately 2 to 10 acre-feet per year of water via a 3 or 4-inch pipeline. The remainder of Lockett's supply (approximately 100 acre-feet per year) is from local wells in the Seymour Aquifer. To provide Lockett with low-nitrate treated water to blend with Lockett's existing supply, a new 6-inch pipeline would need to be constructed from Vernon's treatment plant to Lockett's ground storage tank. Vernon would then provide an additional 60 acre-feet per year of water to Lockett. This supply will be available when Vernon develops one of the potential water supply strategies.

<u>Quantity, Reliability and Cost</u>

The cost for low-nitrate water to Lockett is high due to the relatively long pipeline and small amount of water. Also, the purchase price for low-nitrate water is higher than the blended supply provided to other customers. The cost per acre-foot presented below is based on the final blended supply for Lockett, not the purchase supply from Vernon. Costs to produce 40 acre-feet per year of supply from Lockett's existing well field are not included. According to Red River Authority of Texas, these costs are relatively small, ranging from $ 0.35 to $ 0.75 per 1,000 gallons.

Alternative L-1 Lockett Pipeline

Construction Costs	
6" Pipeline	$827,000
ROW Costs	84,000
Pump Station	100,000
Highway Crossings	54,000
Metering Vaults	16,000
Subtotal Construction Costs	1,081,000
Other Project Costs	
Mitigation & Permitting	$32,000
Engineering/ Contingencies	108,000
Interest During Construction	51,000
(12 month construction period)	
Subtotal Other Costs	$191,000
Total Capital Project Costs	**$1,272,000**

Annual Costs	
Debt Service (30 years @ 6%)	$92,000
Operation and Maintenance	13,000
Pumping Costs	700
Treatment Costs	0
Water Purchase Costs	48,000
Total Annual Costs	**$153,700**
Available Water Yield (Acre-Feet Per Year)	109
Available Water Yield (MGD)	0.10
Cost of Water Delivered ($ Per Acre-Feet)	**$1,405**
Cost of Water Delivered ($ Per 1,000 Gallons	**$4.31**

Environmental Factors

The environmental impacts would be low because the pipeline route would generally follow existing roadways.

Impacts on Water Resources and Other Water Management Strategies

There should be no water resource impacts since no additional water is used from the Seymour Aquifer.

Impacts on Agriculture and Natural Resources

Impacts to agriculture should be minimal. For the Lockett system, purchasing additional water from Vernon may increase available supply for agriculture in the vicinity of the Lockett well field.

Other Relevant Factors

This strategy could be implemented between two and five years. The permitting and regulatory requirements are expected to be low. The Lockett pipeline project may only require a nationwide 404 permit if it does not affect state-owned waters. As the pipeline route is finalized, additional coordination with state and local agencies regarding sensitive environmental factors may be needed. An NPDES storm water permit will be required during construction. If the pipeline affects state-owned lands, additional permits and/or a Grant of Easement may be required.

Alternative L-2 Nitrate Removal System

Alternatively, Lockett could install a small nitrate removal system to treat high nitrate water pumped from its existing well system. Lockett would continue to purchase a small amount of the treated blended water from Vernon to supplement its peak demands in the summer. It is assumed that a 100 gpm ion exchange treatment plant would be sufficient to treat Lockett's current supply and meet peak flows. The plant would be installed near Lockett's well field and storage tank. The waste stream from the treatment plant would be small, approximately 0.5 gpm. There are no known wastewater treatment plants near the Lockett well field. Therefore, the waste stream would discharge to a 0.25 acre evaporation pond, located near the treatment plant. Based on existing water quality data, a 60 percent treated to 40 percent untreated blend would result in nitrate concentrations below the drinking water standard.

Quantity, Reliability and Cost

The quantity of water would be sufficient to meet Lockett's needs, provided Lockett continues to supplement their peak summer demands with purchased water from Vernon. The reliability is high and the cost for a nitrate removal system is relatively low. The cost per acre-foot is based on the final blended supply for Lockett. For comparison purposes to Alternative L-1, the costs to produce supply from Lockett's existing well field are not included. According to the Red River Authority of Texas, these costs are relatively small, ranging from $ 0.35 to $ 0.75 per 1,000 gallons, which would be added directly to the cost per 1,000 gallons shown below.

Alternative L-2 Lockett Ion-Exchange System

Construction Costs	
Ion-Exchange Equipment (100 gpm)	$175,000
Building/Electrical	150,000
Evaporation Pond (.25 ac)	30,000
Land Purchase	10,000
Subtotal Construction Costs	$365,000
Other Project Costs	
Permitting	$15,000
Engineering/ Contingencies	110,000
Interest During Construction	20,000
(12 month construction period)	
Subtotal Other Costs	$145,000

Total Capital Project Costs	**$510,000**
Annual Costs	
Debt Service (30 years @ 6%)	$37,000
Operation and Maintenance	5,000
Pumping costs	0
Treatment Costs	5,000
Water Purchase Costs	0
Total Annual Costs	**$47,000**
Available Water Yield (Acre-Feet Per Yield)	109
Available Water Yield (MGD)	0.10
Cost of Water Delivered ($ Per Acre-Feet)	**$431**
Cost of Water Delivered ($ Per 1,000 Gallons)	**$1.32**

Environmental Factors

The environmental impacts would be low because there will be no discharge of the brine wastewater stream. Also, the salt concentration of the waste stream should not be very high.

Impacts on Water Resources and Other Water Management Strategies

There should be no water resource impacts since no additional water is used from the Seymour Aquifer. The nitrate removal system improves the water quality of the supply from the Seymour Aquifer.

Impacts on Agriculture and Natural Resources

Impacts to agriculture should be low. A minimum of one acre of existing agricultural land would need to be purchased for the treatment plant and evaporation pond. No additional water would be pumped from the Seymour Aquifer. Therefore, there should be no additional impacts to agricultural supply.

Other Relevant Factors

This strategy could be implemented between two and five years. The permitting and regulatory requirements are expected to be moderate. The water treatment plant would require approval from TNRCC and the system would require a no discharge wastewater permit. An NPDES storm water permit will be required during construction. This alternative may require additional staff to maintain and operate the system. Also, the evaporation ponds may require periodic disposal of accumulated salt deposits.

5.4 City of Electra

5.4.1 Background

The City of Electra is located in Wichita County between Wichita Falls and Vernon on Highway 287. Electra has a population of 3,100 people. Approximately 60 percent of the City's drinking water is currently derived from surface water (Lake Electra). Groundwater from the Seymour Aquifer provides the remainder of the City's water supply.

With recent droughts, the City of Electra has frequently experienced a shortage of water. As of March 2000 curtailment of water usage on the City's part had been ongoing for at least 36 months and the City had implemented Stage 5 of its drought contingency plan.

In an application to the Texas Water Development Board Drinking Water State Revolving Fund, filed on behalf of the City in February 2000, it was estimated that only a six-month supply of water was left in Lake Electra, the City's main water supply source. In March, the news media placed Lake Electra at only 20 percent of capacity.

Because of Electra's recent water shortage, it has already begun taking measures to acquire water to meet its immediate and short-term needs. The long-term needs of Electra will be addressed in the following sections.

5.4.2 Water Demands

Electra provides service to approximately 1,650 connections including the Harrold Water Supply Corporation. Current normal usage (no drought restrictions enforced) averages about 0.54 MGD (605 acre-feet per year) with peaks of 0.9 MGD according to the City's consulting engineer, Donald G. Rauschuber and Associates, Inc. (DGR).

Water use projections established by the Texas Water Development Board (TWDB) show Electra's year 2000 demand to be 0.55 MGD (617 acre-feet per year). Assuming a peaking factor of two, the projected peak demand would be 1.10 MGD. The TWDB demand projections decline gradually to 609 acre-feet per year by the year 2050.

In addition to TWDB demands, water demand projections have been performed for the City by DGR. DGR projections extend to the year 2020. The DGR demands projections anticipate much more industrial and population growth for Electra than the TWDB projections. DGR projects Electra's water demand in the year 2020 at about 1,100 acre-feet per year.

For Senate Bill 1 (SB1) planning purposes, 617 acre-feet per year demand will be evaluated by the alternatives in this report. The DGR demands are given here for informational purposes. The DGR demand projections are important because the system improvements currently being undertaken by Electra will use the higher projected demand predictions in the sizing of facilities and appurtenances.

5.4.3 Current Water Resources

Lake Electra

Lake Electra is a small-to-medium-sized reservoir located approximately seven miles southwest of the City. The lake is located on land owned by the W. T. Waggoner Estate. An agreement between W. T. Waggoner Estate and the City grants rights to the water in the reservoir to the City, but the W. T. Waggoner Estate retains ownership of the land and dam that forms the lake. W. T. Waggoner Estate also pumps some water from the lake for its own use, including watering livestock and irrigating crops. Additional facilities related to this water source and owned by the City include a raw water pump station, a raw water transmission line to town, and a water treatment plant, known as the "Central Plant," located in town.

Approximately 60 percent of Electra's water is currently produced from Lake Electra. Due to its small drainage area, Lake Electra has historically been unreliable in drought conditions. Additional water sources are needed to supplement available water and improve reliability.

River Well Field

The remaining water supply for Electra is a shallow water well field located approximately eight miles north of town near the Red River. While the well field is generally an abundant source of supply, it's water quality has been a problem. Over time salinity and nitrate levels in the wells have risen. As a result, the City has been forced to shut down and cap some of the wells. Capacity of the remaining wells currently averages 220,000 gallons per day (gpd).

The City also operates a sand filter treatment plant at the well field, known as the "River Plant," and a transmission pipeline to town. The treatment plant is in place because the water pumped from the wells is considered by the TNRCC to be "groundwater under the influence of surface water" and, by regulation, must be treated. The transmission pipeline consists of two parallel 8-inch lines extending from the treatment plant to a booster pump station located midway to town. From the booster station to town, the line is a single 10-inch line.

In addition, the City maintains a water pumping lease on land near the River Plant. The lease was established to allow the City to drill wells and to pump water. However, well development has not yet taken place on the lease property.

5.4.4 Review Of Alternative Water Supply Strategies

Alternative water supply strategies were identified through consultation with Electra's engineer and the RWPG Technical Advisory Committee. Initially, eleven potential water supply options were investigated. The preliminary investigation reviewed various alternatives related to development of new groundwater supply, development of new surface water supply, and purchase of treated water. Most alternatives were eliminated in the preliminary investigation by one or more fatal flaws. Only four alternatives were found to be potentially feasible. These alternatives are discussed here in more detail. Detailed analysis of these alternatives was performed using procedures required by the TWDB.

The potentially feasible options selected for detailed analysis are shown in Figure 4 and include:

1. Redevelop existing capped wells and construct an RO plant at the River Well Field.

2. Construct a new raw water pipeline from Lake Diversion and construct RO plant at the Central Plant.

3. Buy treated water from Wichita Falls.

4. Participate in a regional water treatment plant using Lake Kemp/Lake Diversion water.

A detailed description of each potentially feasible alternative and analysis of each follows.

Alternative E-1: River Well Fields

Electra has made a commitment to meet its existing and short-term demands with a plan to redevelop the capped wells at the existing well field located north of town to increase its yield of the groundwater resource and reduce its dependence on Lake Electra. A design-build contract for this plan has been awarded, and the well field and treatment plant improvements are scheduled to go on-line in October 2000.

In addition to the existing well field to be redeveloped, the well plan includes three different potential well fields—Lalk, Sefcik, and Elliot. The fields range from 2 miles to 6 miles away from the existing treatment plant. As demand requires, new wells would be drilled at the other well field sites and water would be piped to the existing treatment plant.

The plan initially includes reopening and reworking the capped wells at the existing well field and installing a reverse osmosis (RO) treatment unit at the River Plant. A portion of the high salinity/high nitrate water will be treated with reverse osmosis and the remaining portion will be treated with the current method, sand filtration. Before entering the transmission line, the two treated streams will be blended and transmitted to town via the existing pipeline. The result will be a water that is low enough in salts and nitrates to be considered safe for drinking.

The capacity of this RO blend system will be 0.5 MGD (finished water), sufficient to meet 90 percent of Electra's average daily requirement. For the remaining demand and for peak demand, Electra will use water from Lake Electra. In the future, the well fields will be the primary supply source.

This plan requires a significant financial obligation for the City of Electra. Therefore, this "short-term" commitment is in actuality likely to be a medium-to-long-range commitment for Electra. It is expected that stages of this plan will be phased in over time as necessary to meet Electra's water needs for the next 20 years.

The phases of the current plan are as follows:

- Build RO plant at existing treatment facilities
- Rework existing capped wells
- Develop new well fields
- Build pipelines from new well fields to existing plant
- Increase capacity of RO treatment as necessary

It is expected that development of at least some new wells will be required. Initial pumping tests indicate the uncapped wells can produce enough quantity of water to meet Electra's needs, but the quality could degrade once pumping begins. The wells were originally capped because the quality had degraded after some period of pumping. As the water quality degrades, additional wells will be brought on-line to improve the quality of the feed/blend water.

Other phases of the well field alternative, could potentially take the capacity to 1.0 MGD. Other alternatives are not evaluated here because it is assumed that the projected 617 acre-feet per year demand can be satisfied using the well field and Lake Electra as described above.

Alternative E-2: Construct New Raw Water Pipeline and RO Plant

The City of Electra would purchase raw water from the City of Wichita Falls and/or Wichita County Water Improvement District No. 2 (WCWID #2) out of Lake Diversion. This alternative would involve the construction of 18 miles of new 12-inch line from Lake Diversion to Electra.

Water would be pumped to Electra and treated at a new RO plant to be constructed at the Central Plant location.

There is an existing pump platform on Lake Diversion that is owned by West Texas Utilities (WTU). It is understood that there is enough room on the existing pump platform to accommodate additional pumps, and that WTU is willing to allow Electra to purchase access to the pump platform.

Lake Diversion water is high in dissolved solids. Advanced membrane treatment, such as RO, would be required to produce drinkable water.

Alternative E-3: Buy Treated Water from Wichita Falls

This alternative consists of purchasing treated water from Wichita Falls. Wichita Falls has an existing contract to sell water to the City of Iowa Park, which is located between Electra and Wichita Falls. Electra would tap into the Wichita Falls to Iowa Park line at the Iowa Park terminus. Electra would also construct a new ground storage tank and booster station at the terminus of the existing line. In addition, 16 miles of 10-inch line would be constructed between the booster station and Electra. The pipeline route would generally follow US Highway 287.

Regional Water Treatment Plant Alternative

A regional water supply project using Lake Kemp/Diversion water with desalination could provide the City of Electra with 1 MGD of treated water. At Lake Diversion, the water would be treated by reverse-osmosis (RO), and then pumped to the City of Electra through a regional pipeline system. Further description of this alternative is presented in Section 5.6.

5.4.5 Analysis of Viable Strategies

The analysis of viable strategies was performed following the evaluation procedures identified in Section 5.1.2. The results of this evaluation are presented as follows:

Alternative E-1: River Well Fields

Quantity, Reliability, and Cost

Currently, Electra produces an average of 0.22 MGD from the river well field. After the planned uncapping of old wells and installation of an RO plant, the capacity of the well field will be increased to 0.5 MGD (approximately 90 percent of TWDB demands). Lake Electra will make up the remainder of the daily demand.

The shallow aquifer used by the City is capable of producing the required quantity of water, although the reliability of shallow aquifer yields during extreme drought conditions may be uncertain. The decreased normal use of Lake Electra should enable greater dependence on this surface water resource in dry periods.

The limiting factor for the groundwater will likely be quality. The quality is expected to degrade over time through pumping induced migration of salts increasing the required blend ratio of RO-treated to filter-treated water. This could require increasing the RO plant capacity.

Another issue affecting the reliability of the well fields is their close proximity to the Red River. The wells are actually located in the 100-year flood plain of the Red River. As such, there is some inherent danger that the wells may be temporarily unusable because of flooding. Flooding can cause damage to pumping and transmission equipment as well as potential contamination of the wells. The existing wells have an average depth of 40 feet and are hydraulically connected to surface water. Therefore, there is a potential danger that the aquifer might become contaminated through an unexpected release of pollutants.

For costing purposes, the proposed well field rehabilitation was broken into phases. Because it is expected that the uncapped wells will rapidly degrade in the first five years, development of one of the three future well fields was included in Phase 1. The first phase involves reworking the existing capped wells, drilling new wells at the Lalk well field, constructing a pipeline from the new well field to the River Plant, and constructing an RO plant. A summary of the capital and annual costs are presented below.

Alternative E-1 Redevelop River Well Fields

Construction Costs	
Water Wells	$168,000
Ground Storage/Pump Station	100,000
8" Water Line from Wells to River Plant	344,000
RO Treatment Plant	726,000
Brine Disposal	213,000
Subtotal Construction Costs	$1,551,000
Other Project Costs	
Engineering, Contingencies and Legal Services	$542,000
Easement Costs	121,000
Environmental and Archeological Studies, Mitigation, and Permitting	15,000
Interest During Construction (18 Months)	128,000
Subtotal Other Costs	$806,000
Total Capital Project Costs	**$2,357,000**
Annual Costs	
Debt Service (30 yrs. @ 6%))	$171,000
Operation and Maintenance	164,000
Power Costs	12,000
Lake Electra Plant O&M	25,000
Total Annual Costs	**$372,000**
Available Water Yield (Acre-Feet Per Year)	617
Available Water Yield (MGD)	0.56
Annual Cost of Water Delivered ($ Per Acre-Feet)	**$604**
Annual Cost of Water Delivered ($ Per 1,000 Gallons)	**$1.85**

This alternative includes 560 acre-feet per year from groundwater, which is less than the 617 acre-feet per year projected as demand. The additional 57 acre-feet per year will be made up by Lake Electra water, which the City already has infrastructure in place. To account for this, an annual operations and maintenance cost to keep the Central Plant operating was included in the cost opinion. Costs for treating the additional Lake Electra water are therefore reflected in the unit cost of water for this option.

Environmental Impacts

Environmental impacts of the proposed well field rehabilitation center mainly on disposal of the residual salt brine from the RO treatment process. The method of disposal has not yet been decided, although the City is currently negotiating with the TNRCC for a surface water discharge permit to the Red River. Other options for disposal investigated include evaporative ponds, deep well injection, and surface application.

Discharge to the Red River is the City's preferred disposal alternative. A discharge of this sort will likely require acceptance by both the TNRCC and the Oklahoma Department of Environmental Quality (ODEQ) since the south bank of the Red River is the state boundary.

Impacts on Water Resources and Water Management Strategies

The major potential water resources impacts would come through disposal of the salt brine. As mentioned in the Environmental Impacts Section, the disposal options available are direct discharge to the Red River, deep well injection, evaporative ponds, or land application.

Other impacts that might be associated with the well field are a lower aquifer level and quality degradation in the vicinity of the well fields. Also, since the aquifer is hydraulically connected to the Red River, subsurface flow to the Red River may be decreased near the wells.

Electra's acute short-term need for additional water has forced the implementation of the initial stages of this alternative. As such, it is likely that this alternative will become the preferred alternative to the City, simply due to the significant investment required. Other potentially feasible alternatives, including participation in any regional alternative, will likely become less attractive to the City.

Impacts on Agriculture and Natural Resources

Agricultural impacts should be minimal. A declining aquifer level and degradation of the aquifer in the vicinity of the well field could potentially impact local irrigation, if such irrigation is practiced. This alternative should not impact natural resources of Texas.

Other Relevant Factors

The long-term viability of this alternative may depend on the success of development of new shallow well fields. Since tests in all other potential well fields have not been completed, the ultimate capacity and water quality of these future fields are not known. In addition, the City's own projections for future water use exceed those of the TWDB. Should this become a reality, the City may eventually desire to implement other potentially feasible alternatives.

Alternative E-2: New Pipeline from Lake Diversion/Advanced Treatment at Central Plant

Quantity, Reliability, and Cost

Assuming Wichita Falls and/or WCWID #2 will sell the water, Lake Diversion can provide 100 percent of Electra's demand to the year 2050. Lake Diversion could be considered a reliable source of water because it is located downstream of the larger Lake Kemp, which is also owned and controlled by the City of Wichita Falls and WCWID #2. Lake Kemp has the largest yield of any lake in the region and would be needed to support Lake Diversion. A summary of the estimated cost of this alternative follows:

Alternative E-2 Buy Raw Water from Wichita Falls at Lake Diversion

Construction Costs	
0.5 MGD Pumps at Lake Diversion	$71,000
12" Raw Water Line (Lake Diversion to Electra)	2,821,000
RO Treatment Plant	766,000
Brine Disposal	184,000
Subtotal Construction Costs	$3,842,000
Other Project Costs	
Engineering, Contingencies and Legal Services	$1,344,000
Easement Costs	371,000
Environmental and Archaeological Studies, Mitigation, and Permitting	15,000
Interest During Construction (24 Months)	436,000
Subtotal Other Costs	$2,166,000
Total Capital Project Costs	**$6,008,000**
Annual Costs	
Debt Service (30 yrs @ 6%)	$436,000

Operation and Maintenance (Including Pipeline, Pump Station, and Treatment Plant)	146,000
Power Costs	16,000
Purchased Water Cost	66,000
Total Annual Costs	**$664,000**
Available Water Yield (Acre-Feet Per Year)	617
Available Water Yield (MGD)	0.56
Cost of Water Delivered ($ Per Acre-Feet)	**$1,076**
Cost of Water Delivered ($ Per 1,000 Gallons)	**$3.97**

Environmental Impacts

Environmental impacts from the pipeline would be minimal. The preferred route would be primarily along the Highway 25 right-of-way and would likely involve only one major creek crossing. The most critical potential environmental impact is the disposal of the RO brine from the treatment process. The City's consultant had evaluated this alternative on the assumption of using evaporation ponds for brine disposal. While this is technically feasible, disposal of liquids in this manner will require careful monitoring of the operation to prevent accidental releases of highly saline wastewater.

Impacts on Water Resources and Water Management Strategies

Water resource impacts should be minimal. A pump platform/intake structure is already in place at Lake Diversion, minimizing additional impacts from construction within the body of the lake. Should Electra pursue this alternative, its participation in any regional strategy would be unlikely.

Impacts on Agriculture and Natural Resources

Agricultural impacts should be very minimal. As mentioned previously, the preferred pipeline route would be along existing road right-of-way. Lake Diversion is an existing reservoir, so the amount of agricultural land disturbed would be minimal.

Other Relevant Factors

No other relevant factors regarding this alternative have been identified at this time.

Alternative E-3: Buy Treated Water from Wichita Falls

Quantity, Reliability, and Cost

This alternative would likely provide for all of Electra's water demand, provided Wichita Falls has the water to sell. For comparison purposes, it was assumed that Wichita Falls will have sufficient supply of water to enter into a contractual agreement with Electra to provide the necessary treated water. It was also assumed that the treated water would be provided to Electra at $0.95 per 1,000 gallons.

Reliability of this alternative system should be good. Because the water would be sold by contract, Wichita Falls would be obligated to provide the water to Electra. The only maintenance requirement would be on the booster pump station and the Iowa Park to Electra line. A summary of the cost of this alternative follows:

Alternative E-3 Buy Treated Water from Wichita Falls at Iowa Park

Construction Costs	
Ground Storage/Booster Pump Station	$105,000
12" Treated Water Line from Iowa Park to Electra	2,575,000
Subtotal Construction Costs	2,680,000
Other Project Costs	
Engineering, Contingencies and Legal Services	$938,000
Easement Costs	280,000
Environmental and Archaeological Studies, Mitigation, and Permitting	15,000
Interest During Construction (12 Months)	163,000
Subtotal Other Costs	$1,396,000
Total Capital Project Costs	**$4,076,000**
Annual Costs	
Debt Service (30 yrs @ 6%)	$296,000
Operation and Maintenance	50,000
Power Costs	13,000
Purchased Water Cost	173,000
Total Annual Costs	**$532,000**
Available Water Yield (Acre-Feet Per Year)	617
Available Water Yield (MGD)	0.56

Cost of Water Delivered ($ Per Acre-Feet)	**$863**
Cost of Water Delivered ($ Per 1,000 Gallons)	**$2.65**

Environmental Impacts

Environmental impacts should be minimal since the pipeline route would generally follow Highway 287. There will likely be some creek crossings along the pipeline route, but there are no major issues that are readily apparent at this level of study.

Impacts on Water Resources and Water Management Strategies

The impacts to other resources and strategies involved with this option would be indirect. In order for Wichita Falls to provide the water to Electra, it must first have the water to sell. That means Wichita Falls will potentially have to develop new sources of water prior to entering into a contract with Electra. Therefore, the timing of such a project would likely be dependant on the development of Wichita Falls' own alternatives.

Impacts on Agriculture and Natural Resources

Because the pipeline route would follow the highway alignment, it is not expected that agriculture or natural resources would be significantly impacted.

Other Relevant Factors

No other relevant factors regarding this alternative have been identified at this time.

Regional Water Treatment Plant Alternative

This alternative is based on the City of Wichita Falls, City of Vernon, and the City of Electra participating in a regional plan to utilize Lake Kemp/Diversion and construct a desalination plant at the reservoir site.

Annual Cost - City of Electra	
Debt Service (30yrs @ 6%)	$658,000
Operation and Maintenance	41,000
Power Costs (Pumping Facilities)	15,000
Water Treatment Costs ($0.75/1,000gal)	269,000
Raw Water Purchase (From W.F.@0.21/1,000gal)	75,000

Total Annual Cost	**$1,058,000**
Available Water Yield (Acre-Feet Per Year)	1100
Available Water Yield (MGD)	1
Cost of Water Delivered ($ Per Acre-Feet)	**$962**
Cost of Water Delivered ($ Per 1,000 Gallons)	**$2.95**

5.5 Thalia Water Supply Corporation

In Chapter 4, Thalia WSC was listed as deficient in water supply due to water quality. The specific parameter of concern was the concentration of nitrate in the water source. Thalia WSC has historically utilized the Seymour Aquifer to supply 100 percent of its water.

In 1997, the Thalia WSC applied to the TWDB Drinking Water State Revolving Fund for assistance with a project to reduce nitrate concentrations in their drinking water to acceptable levels. The project was planned to construct a water line from the City of Crowell to Thalia WSC to enable the purchase of water for blending purposes. According to the City of Crowell, a water line has been constructed and the City is selling water to Thalia WSC at this time. Sufficient water exists from Crowell's supplier, Greenbelt Municipal & Industrial Water Authority to provide Thalia WSC with all its water demand, if desired.

Recent water quality data from Thalia WSC suggest that nitrate levels in the distribution system have dropped substantially. It is presumed that this is a result of the purchase of sufficient water from Crowell to accomplish an adequate blend. At this time, Thalia WSC is still officially on the TNRCC list of MCL violators for nitrate. However, as recent data indicate, Thalia WSC now has the capability to eliminate this problem. Therefore, an analysis of water management alternatives for Thalia WSC is not necessary.

5.6 Regional Water Treatment Plant Alternative (Lake Kemp/Diversion Reservoirs)

5.6.1 Background

As indicated in the previous discussions of alternatives, the feasibility of meeting demand through participation in a regional water treatment plant has been investigated. The feasibility of such an alternative is dependent on having wide participation of the region’s water suppliers.

For purposes of this analysis, the participation of those water suppliers with identified needs -- Wichita Falls, Vernon, and Electra -- has been assumed.

5.6.2 Water Demands

For the regional plan, it was assumed that the maximum yield from the Lake Kemp/Lake Diversion system would be used for sizing the plant. The maximum raw water allocation of the Kemp/Diversion reservoirs for municipal use is 25,150 acre-feet per year. Substantial water rights allocations also exist for agriculture, mining, and industrial purposes.

Lake Kemp/Diversion waters are naturally high in chloride, sulfates, and total dissolved solids. Reducing these constituents to acceptable levels will require advanced membrane technology, specifically, reverse osmosis (RO). Prior to RO treatment, microfiltration (MF) will be used. Assuming a 70 percent recovery rate for MF/RO treatment, the total finished water available would be 17,600 acre-feet per year.

Allocation of the treated water for the three participating water suppliers was assumed as follows:

City of Electra	1,100 acre-feet per year
City of Vernon	2,200 acre-feet per year
City of Wichita Falls	14,300 acre-feet per year

5.6.3 Facilities Description

The regional water system is depicted in Figure 5. The facilities consist of a raw water intake structure and pump station located at Lake Diversion. Raw water would be pumped to the 16 MGD treatment plant. Treated water from the MF/RO plant would be stored in the clearwell and then pumped via a 42-inch line constructed to Kadane Corner, east of Lake Diversion. At Kadane Corner the 42-inch transmission line proceeds eastward to Wichita Falls existing Cypress Water Treatment Plant. A 24-inch diameter line would also take a portion of the water at Kadane Corner north to Electra, carrying treated water for both Vernon and Electra. At Electra, the line will be reduced to an 18-inch line, which will turn northwestward along Highway 287 to Vernon. The City of Electra will receive treated water at its Central Plant from the 24-inch water line. Two booster stations are needed for the Vernon/Electra line. One will be located approximately halfway between Kadane Corner and Electra on the 24-inch line. The other will be located about halfway between Electra and Vernon.

Cost allocations will be established by each participant's allocation of water as well as amount and size of pipeline required for each. The resulting cost allocation for capital costs is as follows:

City of Wichita Falls	74%
City of Vernon	19%
City of Electra	7%

Each entity would be responsible for the cost of delivery of its share of the treated water to its customers.

Quantity, Reliability, and Cost

The quantity of water provided by the regional treatment plant would be greater than the TWDB demand for each city. Electra would receive 1,100 acre-feet per year, Vernon 2,200 acre-feet per year, and Wichita Falls 14,300 acre-feet per year.

Current reliability of the Kemp/Diversion system is moderate to high. Lake Kemp has the highest yield of any reservoir in the region, so meeting water demands with Kemp/Diversion water should not be an issue. However, as the reservoir ages, sedimentation will likely reduce the yield and may pose reliability problems in the future. Future reliability of Lake Kemp, beyond 2050, could be classified as moderate to low.

The cost breakdown of the proposed regional treatment plant is as follows:

Regional Water Treatment Plant Alternative

Construction Costs	
16 MGD Pump Station Near Diversion	$2,500,000
3 MGD Pump Station Near Electra	900,000
2 MGD Pump Station Near Vernon	750,000
Lake Intake Structure	3,500,000
16 MGD Microfiltration/Reverse Osmosis Treatment	36,000,000
Treatment Brine Reject Disposal	3,000,000
42" Treated Water Line (To Kadane) (7 Miles)	8,100,000
42" Treated Water Line (Kadane To W.F.) (17.5 Miles)	20,925,000
24" Treated Water Line (Kadane to Electra) (16 Miles)	7,183,000
18" Treated Water Line (Electra to Vernon) (21 Miles)	6,660,000
Subtotal Construction Costs	$89,518,000
Engineering, Legal, Financial & Contingencies	$29,188,000
Land and Easements	750,000
Environmental Studies, Mitigation, and Permitting	500,000
Interest During Construction (24 months)	9,380,000
Subtotal Other Costs	$39,818,000
Total Capital Project Costs	**$129,336,000**

Allocate Project Cost of Regional System Based On Pro-Rata Design For Each Entity As Follows:

City of Wichita Falls	74% of Cost
City of Vernon	19% of Cost
City of Electra	7% of Cost
Allocated Total Capital Project Costs:	
City of Wichita Falls	$95,709,000
City of Vernon	$24,574,000
City of Electra	$9,053,000
Annual Costs - City of Wichita Falls:	
Debt Service (30yrs @ 6%)	$6,958,000
Operation and Maintenance	325,000
Power Costs (Pumping Facilities)	75,000
Water Treatment Costs ($0.75/1,000gals)	3,494,000
Total Annual Cost – City of Wichita Falls	**$10,852,000**
Available Water Yield (Acre-Feet Per Year)	14,300
Available Water Yield (MGD)	13
Cost of Water Delivered ($ Per Acre-Feet)	**$759**
Cost of Water Delivered ($ Per 1,000 Gallons)	**$2.33**

Annual Costs - City of Vernon	
Debt Service (30yrs @ 6%)	$1,787,000
Operations and Maintenance	166,000
Power Costs (Pumping Facilities)	36,000
Water Treatment Costs ($0.75/1,000gals)	538,000
Raw Water Purchase (From W.F. @ 0.21/ 1,000 gals)	151,000
Total Annual Cost – City of Vernon	**$2,678,000**
Available Water Yield (Acre-Feet Per Year)	2,200
Available Water Yield (MGD)	2
Cost of Water Delivered ($ Per Acre-Feet)	**$1,217**
Cost of Water Delivered ($ Per 1,000 Gallons)	**$3.74**

Annual Cost - City of Electra	
Debt Service (30yrs @ 6%)	$658,000
Operation and Maintenance	41,000
Power Costs (Pumping Facilities)	15,000
Water Treatment Costs ($0.75/1,000gals)	269,000
Raw Water Purchase (From W.F. @ $0.21/1,000 gals)	75,000
Total Annual Cost – City of Electra	**$1,058,000**
Available Water Yield (Acre-Feet Per Year)	1,100
Available Water Yield (MGD)	1
Cost of Water Delivered ($ Per Acre-Feet)	**$962**
Cost of Water Delivered ($ Per 1,000 Gallons)	**$2.95**

Environmental Impacts

The environmental impacts due to the pipeline construction should be low to moderate depending on the final route of the pipelines. The ground storage facility and booster stations required along the routes can be located in areas of minimal environmental impact.

Disposal of brine reject from the RO treatment plant will likely be the most significant environmental factor. The preferred disposal option would be to discharge brine reject water into the Wichita River below the water treatment plant. Other options include evaporation ponds and injection wells.

Impacts on Water Resources and Other Water Management Strategies

There may be low to moderate water resources impacts as more of the Lake Kemp/Diversion system's yield is used. Water levels in the lakes may have greater fluctuations and this may affect recreational users, local property owners and/or businesses on the lake. This alternative is a regional strategy that is feasible only if several users support its development. If one of the cities chooses another strategy for water supply, it is unlikely that this alternative will be cost effective. Also, if Wichita Falls proceeds with developing a reverse osmosis treatment system at the existing Cypress Water Treatment Plant to treat Lake Kemp water (see WF-2), there would not be sufficient additional municipal supply at Lake Kemp.

Impacts on Agriculture and Natural Resources

The impact on agricultural lands should be low. The amount of water available for irrigation may be reduced as water from Lake Kemp is used for municipal supply. Lakes Kemp and Diversion are existing and therefore will not require impoundment of additional acreage.

Other Relevant Factors

One of the items discussed in Section 5.1 regarding review of alternatives addressed interbasin transfers. Interbasin transfer could be possible if additional entities other than Electra, Vernon, and Wichita Falls are allowed to and elect to participate. With the scenario given here, however, with only the three mentioned entities participating, no interbasin transfer will result. All source waters, users, and waste discharges are located within the Red River Basin.

This strategy could be implemented between five and ten years. The permitting and regulatory requirements are expected to be low to moderate. A 404 permit would be required for the transmission pipelines. As the pipeline routes are finalized, additional coordination with state and local agencies regarding sensitive environmental factors may be needed. If the pipeline affects state-owned lands, additional permits and/or a Grant of Easement may be required.

5.7 Chloride Control Project

The concentration of dissolved salts, particularly chloride, in some surface waters in Region B limits the use of these waters for municipal, industrial, and agricultural purposes. The Red River

Authority of Texas is the local sponsor and has been working in cooperation with the U.S. Army Corps of Engineers (USACE) for a number of years on a project to reduce the chloride concentration of waters in the Red River Basin. The successful completion of this project would result in an increase in the volume of water available for municipal and industrial purposes in Region B and water would be available for a broader range of agricultural activities. Therefore, the Chloride Control Project (CCP) is included in the Regional Water Plan as one of the feasible strategies for meeting the water supply needed in Region B. Following is a summary of the CCP that presents the background of the project, the components, and current status of the project, and an analysis of the CCP as a regional water resource strategy.

5.7.1 Background

In 1957 the U.S. Public Health Service initiated a study to locate the natural sources that contribute high concentrations of chloride to surface waters in the Red River Basin. It was determined that ten natural salt source areas in the basin contribute approximately 3,300 tons of chloride each day to the Red River.

In 1959 the USACE performed a study to identify control measures for these salt sources. Subsequently, structural measures were recommended for eight source areas.

5.7.2 Description of the Chloride Control Project

The primary strategy for reducing the flow of highly saline waters to the Red River is to impound these flows behind low dams and pump the saline waters to off-channel brine reservoirs where the water evaporates or is disposed of by deep-well injection. During high-flow periods, when the chloride concentration is lower, waters flow over the low dams and proceed downstream. Figure 6 identifies the locations of the eight saline inflow areas, the existing and proposed low-flow dams, and the existing and proposed brine reservoirs.

There are four saline inflow areas that impact water quality in Region B:

- Areas VII, VIII, and X affect the quality of water in the Wichita River including Lake Kemp and Lake Diversion.

- Area IX affects the quality of waters in the Pease River, including the proposed Pease River Reservoir.

Construction of the chloride control facilities at Area VIII on the South Fork of the Wichita River in King County and Knox County was authorized in 1974. These facilities include a low dam near Guthrie, Texas, with a deflatable weir to collect the saline inflows; the Truscott Brine Reservoir near Truscott, Texas; and, a pump station and pipeline to transport the saline water from the impoundment at Guthrie to the Truscott Brine Reservoir. These facilities have been in operation since May 1987. Construction of the facilities at Area X was initiated in 1991, but they have not been completed due to a decision to modify the design of these facilities, a change to the project area, and a need to address environmental issues identified by the U.S. Fish and Wildlife Service (USFWS) and the Texas Parks and Wildlife Department (TPWD). An Environmental Impact Statement (EIS) was prepared for the project and published in 1977. A supplement to the EIS is being prepared currently that describes the proposed changes in the design of the facilities and addresses the issues raised by USFWS. Public hearings on the Supplemental Final Environmental Impact Statement (SFEIS) may be held in 2001. When the SFEIS is approved, work will proceed on the CCP facilities at Area X and Area VII.

The effectiveness and environmental impacts of the project will be evaluated as the CCP facilities are fully installed within the Wichita River Basin. The results of this evaluation will be used to determine if and, if so, how CCP facilities will be provided for Area IX on the Pease River. The proposed Pease River Reservoir would not be viable for a municipal water supply without completion of the CCP for the Pease River Basin.

5.7.3 Analysis of Strategy

Because of the substantial volume of good quality water that will be available as a result of implementation of the CCP, it has been identified as a feasible supply alternative for Region B. Accordingly, following is an evaluation of the quantity and quality of water that would be provided; the reliability of the supply; the cost to provide the water; potential impacts on the environment and agriculture in the area; the regulatory and political acceptability of, and public support for, the project; and the extent to which this strategy could affect other strategies.

This is not a stand-alone alternative. Rather, it is a variation of the other alternatives that include the use of Lake Kemp/Diversion waters. The CCP is a component of a regional alternative in which the requirement for membrane treatment of municipal supplies to remove salts is replaced by source control for the salt being introduced to the Lake Kemp/Diversion systems.

However, the benefits of this alternative are not restricted solely to the elimination of the cost of membrane treatment (which is certainly beneficial because it may increase the feasibility of providing Lake Kemp/Diversion waters to some of the smaller communities). In addition, it minimizes or eliminates the problems and potential adverse environmental impacts of disposal of the brine waste stream from membrane treatment, provides economic benefits to the agricultural and industrial sectors of the economy, and extends water supplies for steam electric power generation. These benefits are discussed in more detail later in this section.

Quantity, Reliability, and Cost

The Wichita Basin phase of the CCP that is currently being implemented will increase water resources in the Wichita River Basin and is addressed in this initial regional plan. When the scheduling for the Pease River Basin phase of the project is more certain, the regional plan should be amended to include an evaluation of the effects of the Pease River phase of the project on water resources in Region B.

The water supply source that will be enhanced by the Wichita Basin CCP is the Lake Kemp/Diversion system. As previously described in Chapter 3 of the Region B Water Plan, the firm yield of this system is estimated at 126,000 acre-feet per year in 2000, 116,080 acre-feet per year in 2020, and 101,540 acre-feet per year in 2050. The decrease in yield is attributable to sedimentation.

Waters from the Lake Kemp/Diversion system can be used for municipal purposes and agricultural irrigation pursuant to existing water rights. By contract, waters from the system can be used for steam generation of electricity and mining purposes. The waters are also used for recreation.

The total volume of water permitted for use from Lake Kemp/Diversion, and which can be provided in most non-drought years, is 193,000 acre-feet per year. Of this permitted amount, 90,150 acre-feet per year are not being used currently.

A significant barrier to the further use of Lake Kemp/Diversion water is the quality of the water. The water quality improvement that would occur as a result of the CCP would make this water suitable for a wider variety of uses, including municipal use that does not require membrane treatment, and more diverse agricultural use.

The CCP strategy alternative has been evaluated to determine yield and cost using the methods specified by the TWDB for the regional planning process. Significant features of these evaluation methods, as they apply to the CCP, are as follows:

- The yield is based on the amount of water available during critical drought conditions.
- The storage volume of the reservoirs will decrease over time as a result of sedimentation.
- The volume of water being used by existing irrigators is expected to decrease over time as a result of the use of water conservation measures. However, as the quality improves, the quantity utilized for irrigation of additional acreage within the existing irrigation district may increase.

It was also assumed that the full benefit of the CCP may not be realized until the year 2020, in accordance with the EIS for the CCP, which was prepared in 1976 [1]

The EIS projected that the salt content in Lake Kemp would decrease over time after project completion. The projected concentrations that would not be exceeded 98 percent of the time are as follows:

Time	Chloride mg/L	Sulfate mg/L	TDS mg/L
Pre-project	1,300	810	3,520
Five years after implementation	350	450	1,520
Twenty years after implementation	250	320	1,080

These estimates are based on the assumption that the CCP will control 80 to 85 percent of the chloride load from Areas VII, VIII, and X.

Studies by the U.S. Geological Survey and others [2] have evaluated the effectiveness of the Area VIII control structure (which was completed in 1987). These studies confirm that the Area VIII CCP removes approximately 80 percent of the chloride load introduced by Area VIII sources. Accordingly, the average chloride concentration in Lake Kemp has decreased to approximately 1,000 milligrams per liter (mg/L). Since current studies tend to confirm the general reliability of the 1976 projections regarding the effectiveness of salt removal, it appears that within 20 years

[1] Department of the Army Corps of Engineers, Tulsa District, Final Environmental Statement; Arkansas-Red River Basin; Chloride Control; Texas, Oklahoma, and Kansas (Red River Basin), July 1976, Tulsa, Oklahoma.

[2] Red River Authority and Alan Plummer Associates, Inc., Wichita River Basin, Chloride Monitoring Data Review, November 1997, Wichita Falls, Texas.

after the completion of the CCP for Areas X and VII, it may no longer be necessary to remove chlorides from waters withdrawn from Lake Kemp/Diversion for municipal supply by demineralization.

More water will be available for municipal use as a result of the CCP. At the present time, small amounts of water from Lake Kemp/Diversion can be used to extend other available supplies. However, the percentage of Lake Kemp/Diversion water in the blend must be kept low to control the final salt content of the blended water. More Lake Kemp/Diversion water can be used for municipal supply if it is treated using a membrane treatment process. However, there are substantial losses of water associated with membrane treatment. As indicated in the discussion of the regional water treatment plant alternative (Section 5.6), of the total water volume permitted and available for municipal use (25,150 acre-feet per year), only 17,600 acre-feet per year would be produced as drinking water. This loss of approximately 30 percent is due primarily to the membrane treatment process.

In accordance with the preceding discussion, the yield of the CCP is estimated to be the amount of water that will be available from Lake Kemp/Diversion in the year 2020 that is not currently being used for agricultural or industrial purposes. This yield is 31,080 acre-feet per year.

The cost of the CCP strategy calculated according to Senate Bill 1 procedures, is summarized as follows:

Construction Costs	
Raise Truscott Brine Reservoir Dam	$ 21,763,000
Construct North Fork Wichita River Dam	19,900,000
Construct Pipeline from Middle Fork Wichita River to Truscott Brine Reservoir (14 miles)	3,721,000
Replace Pipeline from South Fork Wichita River to Truscott Brine Reservoir (22 miles)	8,986,000
Subtotal Construction Cost	$ 54,370,000
Other Project Costs	
Engineering, Legal, Financial, and Contingencies	16,311,000
Land and Easements	432,000
Environmental Studies, Mitigation, Permitting	200,000
Interest During Construction (24 months)	6,187,000
Subtotal Other Costs	23,130,000

Total Capital Project Costs	**$ 77,500,000**
Annual Costs	
Debt Service (40 years @ 6%)	$ 5,154,000
Operation and Maintenance	675,000
Power Costs	160,000
Total Annual Costs	**$ 5,989,000**
Available Water Yield (Acre-feet per Year)	31,080
Available Water Yield (MGD)	32.2
Cost of Water Delivered ($ per Acre-Foot)	193
Cost of Water Delivered ($ per 1,000 gallons)	0.59

This cost has been calculated on the additional supply available during drought conditions (31,080 acre-feet per year) rather than the currently non-used permitted amount (90,150 acre-feet per year). When calculated on this basis, the cost of water provided by the CCP is $0.59 per 1,000 gallons in the year 2020. This additional cost would be at least partially offset by the lessened treatment requirements to remove chlorides at a water treatment plant. Additionally, the effective output of the water treatment plant would be increased since there would be less brine reject from the RO treatment process.

It should also be noted that the cost impacts of the CCP on residents of Region B and the State of Texas are different than the cost impacts of membrane treatment or other supply strategies. The capital costs of the CCP facilities will be funded with federal monies. The full capital costs of membrane treatment will be funded by local users.

In addition, there are other economic benefits to the region and further value added to the water resources of the region because the quality improvement associated with the CCP will result in more efficient utilization of water. Improvement of the quality of the water will make it feasible for irrigators to grow a wider range of crops. At the present time, only crops with a high salt tolerance can be irrigated with water from Lake Kemp/Diversion. Being able to irrigate a wider range of crops can allow the irrigators to grow crops of higher value.

The CCP will also provide benefits to the industrial sector of the economy and have a positive effect on water supplies for steam power generation because it will reduce the water demand.

The concentration of TDS in a water supply limits the number of times the water can be cycled through the cooling system. If the TDS concentration is decreased, the number of cooling cycles can be increased. Subsequently, the blow-down volume will decrease, so the volume of make-up water will decrease.

The water supply produced by the CCP would be of high reliability. However, the ability of the Lake Kemp/Diversion system to deliver the full volume of water authorized by existing water rights during drought conditions is questionable because the sum of authorized water rights for all uses exceeds the firm yield of the Lake Kemp/Diversion system. Therefore, in times of drought, appropriate adjustments may be required if all users wish to take their fully authorized amount. However, a significant volume of water will be reliably available for each of the authorized uses if the CCP is implemented.

This alternative provides an additional quantity of water that has a quality suitable for a wide variety of municipal, industrial, agricultural, and steam electric purposes. The resultant water supply is projected to achieve the EPA secondary criteria for drinking water 94 to 98 percent of the time.

Environmental Factors

As previously noted, an EIS for the project was published in 1977. At the time the EIS was published, the project had the concurrence of all natural resource agencies.

During the development of the project, improved methods of brine collection and disposal were identified, and design changes were proposed. In 1994, notice was published of the intent of the USACE to prepare a supplement to the EIS that would address these changes. A draft of Supplement I to the EIS was published May 1995. During the period between 1977 and 1994, the natural resource agencies changed their position and identified a number of concerns regarding the CCP. Therefore, completion of the SFEIS has been delayed to allow further studies to evaluate these concerns. The publication of an SFEIS is now scheduled for November 2000. The remaining components of the Wichita River Basin CCP will not be completed until after the publication of the SFEIS.

Monitoring to evaluate the environmental issues that have been raised will continue after construction of the remaining CCP facilities in the Wichita River Basin in order to determine if the preconstruction assessments are valid. If significant adverse impacts attributable to the CCP are not identified, consideration will be given to proceeding with the Pease River Basin CCP facilities.

The environmental issues that have been identified are summarized below:

- Selenium (Se) is a naturally occurring element in soils in the western United States. Se in trace amounts is an essential dietary component. However, it has been concluded that, in higher concentrations, Se adversely impacts waterfowl in some areas of the country. Concern has been expressed that the concentration of Se in the brine disposal reservoirs will increase due to evaporation and pose a threat to local and migratory birds, fish, and wildlife.

- Small decreases in flows are projected to occur in the Wichita River and the Red River between the Wichita River confluence and Lake Texoma. These flow decreases will result from the diversion of low flows to the brine disposal reservoirs and increased use of the river flow for irrigation when the quality improves. Changes in water quality and quantity could impact the composition of vegetation along these river reaches and result in vegetative encroachment on the stream channel. There is a concern that decreased flows and changes in vegetative composition will adversely affect the habitat for aquatic life, birds, and wildlife.

- There is a concern that wetlands in the Red River flood plain will be adversely impacted as a result of both changes in the hydrologic regime and the conversion of land adjacent to the river to cropland and pasture.

- Concern has been expressed that the reduction in the TDS concentration in Lake Texoma, associated changes in physical characteristics of the lake (turbidity), a decrease in primary production rates due to a decrease in the depth of the eutrophic zone, and alterations in nutrient cycling will reduce the sport fish harvest in the lake and may affect the aesthetic quality of the lake.

Supplement I to the SFEIS addresses most of these issues and concludes there will not be significant impacts in most cases. Where potential impacts have been identified, mitigation measures are proposed. These issues will be evaluated further when the SFEIS is issued late in 2000.

Several state and federally listed threatened and endangered species are present in, or migrate through, the project area. To address concerns related to the bald eagle, whooping crane, and least tern, in 1994 the USFWS and USACE agreed upon a Biological Opinion that defines Reasonable and Prudent Measures to protect these species. These measures are described in Supplement I to the SFEIS.

<u>Impacts on Water Resources and Other Water Management Strategies</u>

Some of the other alternative strategies would provide Lake Kemp/Diversion water to the communities of Wichita Falls, Electra, and/or Vernon. In the absence of the CCP, these alternatives require treatment of Lake Kemp/Diversion water using membrane technology. Successful implementation of the CCP will ultimately reduce treatment costs for any alternative that utilizes Lake Kemp/Diversion as a water source by 1) reducing the amount of treatment needed to produce high quality drinking water; and, 2) increasing the ratio of produced water to raw water. This could significantly affect the feasibility of some alternatives in a more positive manner.

<u>Impacts on Agriculture and Natural Resources</u>

The impacts on agriculture associated with the CCP are positive. The improvements in the quality of water will allow the water to be used to irrigate a wider variety of crops and reduce the potential for salt build-up in soils.

Other Relevant Factors

The regulatory issue to be addressed is the issuance and approval of the SFEIS. This is scheduled to be accomplished near the end of the year 2000.

The political acceptability of the project varies depending on the sector of the community. Municipalities, industries, and the agricultural community are supportive of the project. The degree of support for the project is evidenced by the congressional approval and funding of the project in bills enacted in 1962, 1966, 1970, 1974, 1976, and 1986. In 1988, a special panel created by the Water Resource Development Act of 1986 issued a report favorable to the project.
The natural resource agencies, Lake Texoma sport fishermen, and related lake businesses have expressed opposition of the project. However, substantial progress has been made in addressing the natural resource and fishing concerns. It appears probable that the Wichita River Basin portion of the CCP will proceed following completion of the SFEIS.

5.8 Recommended Water Management Strategies

Based on a comparison of the total regional water supply to demand as performed in Chapter 4, it was determined that there is adequate water supply to meet the needs of Region B as a whole through the year 2050.

However, water supply needs were identified for the City of Wichita Falls, City of Vernon, Hinds-Wildcat and Lockett Water Supply Systems, and the City of Electra. For each of these water user groups various alternatives were analyzed and evaluated as documented in this chapter. Though all the strategies may be viable options and should be considered by each entity, the following described alternatives are recommended as the preferred water management strategy for each entity listed below, and are shown in Figure 7.

City of Wichita Falls

The City of Wichita Falls has four viable water supply strategies. Two of the strategies involve utilizing existing water rights on Lake Kemp/Diversion, a third involves wastewater reuse, and the fourth requires the construction of a new reservoir site. Having evaluated each strategy and in coordination with the City of Wichita Falls, the recommended preferred strategy is Alternative WF-2: Water from Lake Kemp/Diversion Reservoirs, in tandem with Alternative WF-1: Wastewater Reuse. The combination of these two strategies will provide the additional water supply necessary to maintain existing reservoir levels above the emergency drought trigger condition.

City of Vernon

The City of Vernon has four viable water supply strategies. Three of these strategies involve purchasing water from Wichita Falls' existing water supply sources, and one expands the use of groundwater from the Seymour Aquifer. Having evaluated each strategy and in coordination with the City of Vernon, the recommended preferred strategy is Alternative V-3: Round Timber Well Field or equivalent new well field. This alternative provides sufficient supply to meet the City's growing needs and the water source complements Vernon's existing system.

Hinds-Wildcat System

The only strategy evaluated for the Hinds-Wildcat System, and therefore the recommended strategy is to install a pipeline from Vernon to the existing Hinds pump station. This alternative would provide sufficient water, however the cost will be significantly higher than the current supply.

Lockett System

Two viable strategies were evaluated for the Lockett System. One involved constructing a pipeline from the City of Vernon and the other involved constructing a small ion exchange water treatment system to treat Lockett's existing supply. Having evaluated each alternative, the recommended preferred strategy is Alternative L-2: Nitrate Removal System. This alternative has several permitting and staffing issues, but has the potential for a long-term solution to Lockett's water quality problems.

City of Electra

The City of Electra has four viable water supply strategies. Three of these strategies involve purchasing water from Wichita Falls' existing water supply sources, and one involved redevelopment of existing capped wells and constructing an enhanced treatment facility. Having evaluated each alternative and in coordination with the City of Electra, the recommended preferred strategy is Alternative E-1: River Well Fields. This alternative in combination with the water supply from the City's existing lake, will meet Electra's projected water supply needs.

Chloride Control Project

The concentration of dissolved salts, particularly chloride, in the Lake Kemp/Diversion reservoir system limits the use of this water for municipal, industrial, and agricultural purposes. Having evaluated the potential benefits of the Chloride Control Project, and based on the need to reclaim the Lake Kemp/Diversion reservoirs as a municipal water supply for Region B use, the Chloride Control Project is recommended as a regional water supply management strategy. In the long-term it is anticipated that the Chloride Control Project will reduce the cost of water treatment for those entities, which are utilizing the Lake Kemp/Diversion water for municipal purposes, in addition to making more water available for a broader range of agricultural activities.

5.9 Summary of Drought Contingency Plans

Drought Contingency Plans are required of all wholesale and retail public water suppliers and irrigation districts by the Texas Water Code (Sections 11.1271 and 1272) and by TNRCC Rules (30 TAC Chapter 288). These plans must meet specific requirements provided in Chapter 288. In general, drought contingency plans must include, at a minimum, the following elements:

- Provisions for public input in development of the plan
- Provisions for public education regarding the drought contingency plan
- Coordination with the Regional Water Planning Group
- Criteria for initiation and termination of drought response stages
- Identification of drought response stages
- Assessment of water management strategies for specific drought conditions

- Procedures for notification of the public
- Methods for determining the allocation of supplies to individual users (irrigation plans)
- Monitoring procedures to initiate or terminate a drought response stage
- Procedures for accounting for use during implementation of water allocation (irrigation plans)
- Procedures for transfer of water allocations among users (irrigation plans)
- Supply or demand measures to be implemented during stages of the plan
- Procedures for granting variances
- Procedures for enforcement of water-use restrictions

Senate Bill 1 (30 TAC Chapter 357) requires the regional plan to incorporate drought contingency planning into the near-term and long-term strategies to address water supply needs. Chapter 357 also requires existing drought contingency plans to be considered in the development of the regional water plan. In response to these requirements of Senate Bill 1, the Regional Water Planning Group for Region B invited representatives from retail water systems, wholesale water providers, and irrigation districts within the region to a series of workshops on drought contingency planning. The intent of the workshops was to aid the water providers in the development of drought contingency plans for each of their organizations. Most of the region's water systems responded to this process and worked closely with the RWPG to develop appropriate drought responses. Each participant worked with the regional water planning staff and consultants to prepare an appropriate draft drought contingency plan for their water system. Once the governing bodies of the water providers had approved the drought contingency plans, they were submitted to the RWPG, as required by Chapter 288.

A summary of the drought contingency plans currently in effect in Region B is contained in Table 5-2. These plans satisfy drought contingency plan requirements of 30 TAC Chapter 288. Drought contingency triggers for each plan are based on sources, where sufficient source information is available, or on water system constraints. The applicable trigger criteria and response actions are included in the table.

Table 5-2
Region B Drought Contingency Plan Summary

Water Provider	Water Source(s)	Basis of Triggers			Drought Contingency Stages				
		System	Source		Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Archer City		Capacity		**Goals**	Awareness; 5% reduction in daily demand	10% reduction in daily demand	25% reduction in daily demand	Discontinue operation of all or part of the system	
				Factors/ Triggers	Demand exceeds 80% of system capacity for 7 consecutive days	Demand exceeds 90% of system capacity for 7 consecutive days	Demand exceeds 100% of system capacity for 3 consecutive days	Emergency	
				Actions*	VL,VG	ML,MG,MA,MP	ML,MG,MV,MP	Possible elimination of service	
Archer Co. MUD	City of Wichita Falls		Supplier contract	**Goals**	5% reduction in total water use	10% reduction in total water use	20% reduction in total water use	30% reduction in total water use; maintain sufficient quantity and quality for health and safety; or relieve demand for emergency repair	
				Factors/ Triggers	Notification from supplier to achieve 5% reduction; or complaints of low pressure or low flow	Notification from supplier to achieve 10% reduction; complaints of low pressure or flow after Stage 1; or daily consumption does not meet the Stage 1 consumption requirements within 7 days after implementation	Notification from supplier to achieve 20% reduction; complaints of low pressure or low flow after Stage 2; or daily consumption does not drop to meet the Stage 2 consumption requirement within 7 days	Notification from supplier to achieve 30% reduction; complaints of low pressure or low flow after Stage 3; daily consumption does not drop to meet Stage 3 consumption requirements within 7 days; or emergency conditions	
				Actions	VU	ML	ML,MG,MF,MA,MS,MP	ML,MG,MF,MA,MS,MP, surcharge, possible elimination of service	
Arrowhead Lake WSD	Lake Arrowhead, City of Wichita Falls Contract	Capacity	Supplier Notification	**Goals**	Achieve up to a 20% reduction in demand	Increase Public Awareness; Achieve between a 20% and 50% reduction in demand	Inform Public of critical and possible hazardous situation; Reduce demand to a level necessary to maintain public health and safety;		
				Factors/ Triggers	System Pumpage reaches or exceeds 2.5 times the established average daily pumpage for a period of at least 14 consecutive days; Raw Water Supplier issues a request to reduce demand on its system by 20% or less; The System's ability to meet the current peak demand is reduced by 20%.	System pumpage reaches and/or exceeds 5 times the established daily average and remains consistent for a period of at least 7 consecutive days; Raw Water Supplier issues a request to reduce demand between 20% and 50%; the system's ability to meet the current peak demand is reduced between 20% and 50%.	System pumpage reaches and/or exceeds 7.5 times the established daily average and remains consistent for a period of at least 3 consecutive days; Raw Water Supplier issues a request to reduce demand above 50%; The system's ability to meet the current demand is reduced by 50% or more;		
				Actions	VA, VF, VL, VS, VP, VU and/or MA,MF,ML,MS,MP,MU depending on circumstances.	MA, MB, MC,MF,MG,ML,MM,MS,MP,M,MW, Livestock and household is reduced and monitored	MA, MB, MC,MF,MG,ML,MM,MS,MP,M,MW, Livestock and household use is reduced and monitored.		
Arrowhead Ranch WSD	Lake Arrowhead Water System	Capacity	Supplier Notification	**Goals**	Achieve up to a 20% reduction in demand	Increase Public Awareness; Achieve between a 20% and 50% reduction in demand	Inform Public of critical and possible hazardous situation; Reduce demand to a level necessary to maintain public health and safety;		
				Factors/ Triggers	System Pumpage reaches or exceeds 2.5 times the established average daily pumpage for a period of at least 14 consecutive days; Raw Water Supplier issues a request to reduce demand on its system by 20% or less; The System's ability to meet the current peak demand is reduced by 20%.	System pumpage reaches and/or exceeds 5 times the established daily average and remains consistent for a period of at least 7 consecutive days; Raw Water Supplier issues a request to reduce demand between 20% and 50%; the system's ability to meet the current peak demand is reduced between 20% and 50%.	System pumpage reaches and/or exceeds 7.5 times the established daily average and remains consistent for a period of at least 3 consecutive days; Raw Water Supplier issues a request to reduce demand above 50%; The system's ability to meet the current demand is reduced by 50% or more;		
				Actions	VA, VF, VL, VS, VP, VU and/or MA,MF,ML,MS,MP,MU depending on circumstances.	MA, MB, MC,MF,MG,ML,MM,MS,MP,M,MW, Livestock and household is reduced and monitored	MA, MB, MC,MF,MG,ML,MM,MS,MP,M,MW, Livestock and household use is reduced and monitored.		
Baylor WSC	City of Seymour and Seymour Aquifer	Cannot maintain adequate storage due to supply and demand requirements	Notification by supplier or decreased well levels at well field	**Goals**	Raise awareness	10% reduction in total weekly water use	20% reduction in total weekly water use	Discontinue operation of all or part of the system	
				Factors/ Triggers	Supplier storage tank operates at less than 80% of capacity for 3 days	Notification from supplier to achieve 10% reduction in water use	Notification from supplier to achieve 10% reduction in water use and one or more of wells pumps air; or supplier storage tank operates at less than 60% of capacity for 3 days	Notification from supplier to achieve greater than 20% reduction in water use; or emergency	
				Actions	VL,VG	ML,MA,MS,MP,MG, MW	ML,MA,MS,MP,MG,MW,MR	ML,MA,MS,MP,MG,MW,MR, surcharge, possible elimination of service	

Table 5-2
Region B Drought Contingency Plan Summary

Water Provider	Water Source(s)	Basis of Triggers			Drought Contingency Stages				
		System	Source		Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Bellevue		See Note		**Goals**					
				Factors/ Triggers					
				Actions					
Bluegrove WSC		See Note		**Goals**					
				Factors/ Triggers					
				Actions					
Bowie	Lake Among G. Carter	Pumping and storage capacities	Lake levels	**Goals**	5% reduction in daily demand	10% reduction in daily demand	20% reduction in daily demand		
				Factors/ Triggers	Daily consumption 90% of system firm pumping or treatment capacity for 3 consecutive days; or lake level drops to 916'	Daily consumption 100% of system firm pumping or treatment capacity for 3 consecutive days; not able to maintain storage when operating at 100%; or lake level drops to 912'	Daily consumption 110% of treatment capacity for 3 consecutive days; storage not maintained due to daily water consumption; lake level drops to 908'; o emergencies		
				Actions	VL,VC	VC,MS, MA, ML, MW, MP, MG, MU	MC,MS, MA, ML, MW, MP, MG, MU, surcharge		
Box Community WSD	City of Vernon	Pumping Capacity	Supplier Notification	**Goals**	Achieve up to a 20% reduction in demand	Increase Public Awareness; Achieve between a 20% and 50% reduction in demand	Inform Public of critical and possible hazardous situation; Reduce demand to a level necessary to maintain public health and safety;		
				Factors/ Triggers	System Pumpage reaches or exceeds 2.5 times the established average daily pumpage for a period of at least 14 consecutive days; Raw Water Supplier issues a request to reduce demand on its system by 20% or less; The System's ability to meet the current peak demand is reduced by 20%.	System pumpage reaches and/or exceeds 5 times the established daily average and remains consistent for a period of at least 7 consecutive days; Raw Water Supplier issues a request to reduce demand between 20% and 50%; the system's ability to meet the current peak demand is reduced between 20% and 50%.	System pumpage reaches and/or exceeds 7.5 times the established daily average and remains consistent for a period of at least 3 consecutive days; Raw Water Supplier issues a request to reduce demand above 50%; The system's ability to meet the current demand is reduced by 50% or more;		
				Actions	VA, VF, VL, VS, VP, VU and/or MA,MF,ML,MS,MP,MU depending on circumstances.	MA, MB, MC,MF,MG,ML,MM,MS,MP,M,MW, Livestock and household is reduced and monitored.	MA, MB, MC,MF,MG,ML,MM,MS,MP,M,MW, Livestock and household use is reduced and monitored.		
Burkburnett	City of Wichita Falls	Capacity - average daily demand.	Supplier contract	**Goals**	Awareness; 5% reduction in total use	15% reduction in total use	25% reduction in total use	Maintain sufficient quantity and quality for health and safety; or discontinue operation of all or part of the system	
				Factors/ Triggers	May 1	Total demand equal or > 20 million gallons for 10 consecutive days; or notification supplier will reduce supply 10-20%	Total demand exceeds 27 million gallons for 10 consecutive days after implementing Stage 2; or notification supplier will reduce supply 25-35%	Total demand exceeds 30 million gallons for 10 consecutive days after implementing Stage 3; notification supplier will reduce supply 40% or more or emergency	
				Actions	Publish conservation methods and explanation of drought stages, VU	ML,MA, MP	ML,MA,MS,MP,MU	ML,MA,MS,MP,MU,MW, surcharge, possible elimination of service	

Table 5-2
Region B Drought Contingency Plan Summary

Water Provider	Water Source(s)	Basis of Triggers: System	Basis of Triggers: Source		Drought Contingency Stages: Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Byers	City of Wichita Falls, Dean Dale WSC, and Seymour Aquifer	Capacity of WTP	Supplier notification; well pumpage	**Goals**	Raise public awareness	15% reduction in total water use	30% reduction in total water use	Discontinue operation of all or part of the system	
				Factors/ Triggers	Notification from supplier's); or well pumpage exceeds 4 MG per month	Notification from supplier's); or when well pumpage exceeds 5 MG per month	Notification from supplier's); or when well pumpage exceeds 5 MG for two consecutive months	Emergency; well field depleted; or extreme curtailment by supplier's)	
				Actions		VL,MA,MS,MP,MW	ML,MA,MP,ML, MW, MLivestock	Possible elimination of service	
Charlie WSC	Wholesale supplier?	Capacity of storage and distribution system		**Goals**	5% reduction in daily water demand	10% reduction in daily water demand	20% reduction in daily water demand	30% reduction in daily water demand or discontinue operation of all or part of the system	
				Factors/ Triggers	Storage capacity below 60% between 7-11 pm for more than 2 consecutive days; or notification by supplier of 20% or more source reduction	Storage capacity below 50% between 7-11 pm for more than 2 consecutive days; or notification by supplier of 25% or more source reduction	Storage capacity below 40% between 7-11 pm for more than 2 consecutive days; or notification by supplier of 30% or more source reduction	Storage capacity below 30% between 7-11 pm for more than 2 consecutive days; notification by supplier of 40% or more source reduction; or equipment failure	
				Actions	VL,VA	Mandatory limit use to predetermined amount based on plant capacity	Mandatory limit use to predetermined amount based on plant capacity, ML	M All outdoor uses	
Chillicothe	Red River Authority, Seymour Aquifer		Decreased well levels at wells; supplier notification	**Goals**	Raise awareness	10% reduction in total weekly use	15% reduction in total weekly use	25% reduction in total weekly use	Maintain sufficient quantity and quality for health and safety; or discontinue operation of all or part of the system
				Factors/ Triggers	Static well level's) drop to 10% below normal level	Static well level's) drop to 15% below normal level; or notification from supplier to reduce consumption by 10% or less	Static well level's) drop to 20% below normal level; or notification from supplier to reduce consumption by 10-15% or less	Static well level's) drop to 30% below normal level; or notification from supplier to reduce consumption by greater than 15%	Emergency
				Actions	VU	ML,MA,MU	ML,MA,MU,MC,MS,MP,MW	ML,MA,MU,MC,MS,MP,MW	Possible elimination of service
Crowell		Capacity of distribution and pumping system		**Goals**	Raise public awareness; and 5% reduction in total water use	20% reduction in total water use	25% reduction in total water use		
				Factors/ Triggers	Water use reaches 85% of distribution capacity on 2 consecutive days	Water use reaches 95% of distribution capacity on 2 consecutive days	Water use reaches 100% of distribution capacity on 2 consecutive days		
				Actions	VU,VW	MU,MW,ML,MA	MU,MW,ML,MA,MS,MP		
Dean Dale WSC	City of Wichita Falls	Reliability of storage and distribution system	Supplier notification	**Goals**	Raise public awareness; and 5% reduction in daily water demand	10% reduction in daily water demand	30% reduction in daily water demand	40% reduction in daily water demand; or discontinue operation of all or part of the system	
				Factors/ Triggers	May 1	Consumption 80% of daily max. for 3 consecutive days; water supply reduced to level that is only 20% greater than average consumption for previous month; 8 weeks of low rainfall and daily use 20% above same period of previous year; or supplier imposes water use restrictions	Consumption 90% of daily max. for 3 consecutive days; water level in any of the storage tanks cannot be replenished for 3 consecutive days; or supplier imposes water use restrictions	Major component failure or event which reduces the min. residual system pressure below 20 PSI for 24 hours or longer; consumption 95% of daily max. for 3 consecutive days; water consumption of 100% of max. and water storage levels drop during one 24 hour period; supplier imposes water use restrictions; or other emergency	
				Actions		VW,VL	MW,ML,MP,MB	MW,ML,MP,MB, M%Reduction, Possible elimination of service	

Table 5-2
Region B Drought Contingency Plan Summary

Water Provider	Water Source(s)	Basis of Triggers			Drought Contingency Stages				
		System	Source		Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Electra	Lake Electra and Seymour Aquifer	WTP capacity - 1 MGD	Low lake volume or lowered aquifer level	**Goals**	5% reduction in total weekly demand and 5% reduction by wholesale customers	10% reduction in total weekly demand and 10% reduction by wholesale customers	15% reduction in total weekly demand and 15% reduction by wholesale customers	25% reduction in total weekly demand and 25% reduction by wholesale customers	40% reduction In total weekly water demand and 40% reduction by wholesale customer; or discontinue operation of all or part of the system
				Factors/ Triggers	Volume in Lake Electra 1,700 acre-ft or less	Volume in Lake Electra 1,500 acre-ft or less; or WTP treats > .9 MGD for 3 consecutive days	Volume in Lake Electra 1,300 acre-ft or less and well No. 5 is 13.00' msl or less; or WTP treats > .9 MGD for 3 consecutive days	Volume in Lake Electra 1,000 acre-ft or less and well No. 5 is 13.00' msl or less	Emergency
				Actions	ML,MB	ML,MA, MB	ML,MA,MS,MB, surcharge	ML,MA,MS,MP,MG,MB, surcharge	ML,MA,MS,MP,MG,MB, surcharge, no new service, elimination of service
Farmers Valley WSD	Seymour Aquifer and Greenbelt Municipal & Industrial Water Authority	Pumping Capacity	Lowered Aquifer, Supplier Notification	**Goals**	Achieve up to a 20% reduction in demand	Increase Public Awareness; Achieve between a 20% and 50% reduction in demand	Inform Public of critical and possible hazardous situation; Reduce demand to a level necessary to maintain public health and safety;		
				Factors/ Triggers	System Pumpage reaches or exceeds 2.5 times the established average daily pumpage for a period of at least 14 consecutive days; Raw Water Supplier issues a request to reduce demand on its system by 20% or less; The System's ability to meet the current peak demand is reduced by 20%.	System pumpage reaches and/or exceeds 5 times the established daily average and remains consistent for a period of at least 7 consecutive days; Raw Water Supplier issues a request to reduce demand between 20% and 50%; the system's ability to meet the current peak demand is reduced between 20% and 50%.	System pumpage reaches and/or exceeds 7.5 times the established daily average and remains consistent for a period of at least 3 consecutive days; Raw Water Supplier issues a request to reduce demand above 50%; The system's ability to meet the current demand is reduced by 50% or more;		
				Actions	VA, VF, VL, VS, VP, VU and/or MA,MF,ML,MS,MP,MU depending on circumstances.	MA, MB, MC,MF,MG,ML,MM,MS,MP,M,MW, Livestock and household is reduced and monitored	MA, MB, MC,MF,MG,ML,MM,MS,MP,M,MW, Livestock and household use is reduced and monitored.		
Frieberg-Cooper WSC	City of Wichita Falls	Reliability of storage and distribution system	Supplier notification	**Goals**	5% reduction in daily water demand	10% reduction in daily water demand	25% reduction in daily water demand	50% reduction in daily water demand; or discontinue operation of all or part of the system	
				Factors/ Triggers	Notification by supplier; and/or water use exceeds 85% of distribution capacity for more than 5 consecutive days	Notification by supplier; and/or water use exceeds 90% of distribution capacity for more than 5 consecutive days	Notification by supplier restricting water supply by 30%; and/or water use exceeds 95% of distribution capacity for more than 5 consecutive days	Notification by supplier restricting water supply by 50%; and/or water use exceeds 100% of distribution capacity for more than 2 consecutive days	
				Actions	VL	ML,MP,MU	ML,MP,MU,MF,MA,MS	ML,MP,MU,MF,MA,MS,MW, Possible elimination of service	
Foard County WSD	Greenbelt Municipal & Industrial Water Authority	Pumping Capacity	Supplier Notification	**Goals**	Achieve up to a 20% reduction in demand	Increase Public Awareness; Achieve between a 20% and 50% reduction in demand	Inform Public of critical and possible hazardous situation; Reduce demand to a level necessary to maintain public health and safety;		
				Factors/ Triggers	System Pumpage reaches or exceeds 2.5 times the established average daily pumpage for a period of at least 14 consecutive Day; Raw Water Supplier issues a request to reduce demand on its system by 20% or less; The System's ability to meet the current peak demand is reduced by 20%.	System pumpage reaches and/or exceeds 5 times the established daily average and remains consistent for a period of at least 7 consecutive days; Raw Water Supplier issues a request to reduce demand between 20% and 50%; the system's ability to meet the current peak demand is reduced between 20% and 50%.	System pumpage reaches and/or exceeds 7.5 times the established daily average and remains consistent for a period of at least 3 consecutive days; Raw Water Supplier issues a request to reduce demand above 50%; The system's ability to meet the current demand is reduced by 50% or more;		
				Actions	VA, VF, VL, VS, VP, VU and/or MA,MF,ML,MS,MP,MU depending on circumstances.	MA, MB, MC,MF,MG,ML,MM,MS,MP,M,MW, Livestock and household se is reduced and monitored.	MA, MB, MC,MF,MG,ML,MM,MS,MP,M,MW, Livestock and household use is reduced and monitored.		
Forestburg WSC	Trinity Aquifer	Pumping Capacity	Aquifer Level	**Goals**	Achieve a 5% reduction in daily demand	Achieve a 15% reduction in daily demand	Achieve a 30% reduction in daily demand	Achieve a 95% reduction in daily demand; or discontinue operation of water system or that portion of the system affected	
				Factors/ Triggers	Daily demand exceeds 35,000 gallons for 3 consecutive days or if the well pump operates for more than 12 hours each day	Daily demand exceeds 45,000 gallons for 3 consecutive days or if the well pump operates for more than 15 hours each day	Daily demand exceeds 55,000 gallons for 3 consecutive days or if the well pump operates for more than 19 hours each day	When well pump is inactive due to pump or motor failure or loss of water supply	
				Actions	MA, ML, MS, MP, MU, MW	MA, ML, MS, MP, MU, MW	MA, ML, MS, MP, MU, MW, No new connections allowed	Use for any reason other than drinking, cooking, fir and health reasons is prohibited	

Table 5-2
Region B Drought Contingency Plan Summary

Water Provider	Water Source(s)	Basis of Triggers			Drought Contingency Stages				
		System	Source		Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Goodlett WSD	Greenbelt Municipal & Industrial Water Authority	Pumping Capacity	Supplier Notification	**Goals**	Achieve up to a 20% reduction in demand	Increase Public Awareness; Achieve between a 20% and 50% reduction in demand	Inform Public of critical and possible hazardous situation; Reduce demand to a level necessary to maintain public health and safety;		
				Factors/ Triggers	System Pumpage reaches or exceeds 2.5 times the established average daily pumpage for a period of at least 14 consecutive days; Raw Water Supplier issues a request to reduce demand on its system by 20% or less; The System's ability to meet the current peak demand is reduced by 20%.	System pumpage reaches and/or exceeds 5 times the established daily average and remains consistent for a period of at least 7 consecutive days; Raw Water Supplier issues a request to reduce demand between 20% and 50%; the system's ability to meet the current peak demand is reduced between 20% and 50%.	System pumpage reaches and/or exceeds 7.5 times the established daily average and remains consistent for a period of at least 3 consecutive days; Raw Water Supplier issues a request to reduce demand above 50%; The system's ability to meet the current demand is reduced by 50% or more;		
				Actions	VA, VF, VL, VS, VP, VU and/or MA,MF,ML,MS,MP,MU depending on circumstances.	MA, MB, MC,MF,MG,ML,MM,MS,MP,M,MW, Livestock and household is reduced and monitored	MA, MB, MC,MF,MG,ML,MM,MS,MP,M,MW, Livestock and household use is reduced and monitored.		
Guthrie-Dumont WSD	Blaine Gypsum Aquifer	Pumping Capacity	Aquifer levels	**Goals**	Achieve up to a 20% reduction in demand	Increase Public Awareness; Achieve between a 20% and 50% reduction in demand	Inform Public of critical and possible hazardous situation; Reduce demand to a level necessary to maintain public health and safety;		
				Factors/ Triggers	System Pumpage reaches or exceeds 2.5 times the established average daily pumpage for a period of at least 14 consecutive days; Raw Water Supplier issues a request to reduce demand on its system by 20% or less; The System's ability to meet the current peak demand is reduced by 20%.	System pumpage reaches and/or exceeds 5 times the established daily average and remains consistent for a period of at least 7 consecutive days; Raw Water Supplier issues a request to reduce demand between 20% and 50%; the system's ability to meet the current peak demand is reduced between 20% and 50%.	System pumpage reaches and/or exceeds 7.5 times the established daily average and remains consistent for a period of at least 3 consecutive days; Raw Water Supplier issues a request to reduce demand above 50%; The system's ability to meet the current demand is reduced by 50% or more;		
				Actions	VA, VF, VL, VS, VP, VU and/or MA,MF,ML,MS,MP,MU depending on circumstances.	MA, MB, MC,MF,MG,ML,MM,MS,MP,M,MW, Livestock and household is reduced and monitored	MA, MB, MC,MF,MG,ML,MM,MS,MP,M,MW, Livestock and household use is reduced and monitored.		
Harold WSC		See Note		**Goals**					
				Factors/ Triggers					
				Actions					
Henrietta		WTP capacity		**Goals**	Raise awareness; 5% reduction in daily demand	10% reduction in daily demand	20% reduction in daily demand	25% reduction in daily demand	Discontinue operation of all or part of the system
				Factors/ Triggers	WTP produces 1.20 MGD in single day	WTP produces 1.25 MGD in single day	WTP produces 1.35 MGD in single day	WTP produces 1.385 MGD in single day	Unable to deliver water of suitable quality
				Actions	VU,VM	VU,VM,ML	VU,VN,ML,MA,MP	VN,ML,MA,MP,MS,MU	Possible elimination of service
Hinds Wildcat WSD	City of Vernon	Pumping Capacity	Supplier Notification	**Goals**	Achieve up to a 20% reduction in demand	Increase Public Awareness; Achieve between a 20% and 50% reduction in demand	Inform Public of critical and possible hazardous situation; Reduce demand to a level necessary to maintain public health and safety;		
				Factors/ Triggers	System Pumpage reaches or exceeds 2.5 times the established average daily pumpage for a period of at least 14 consecutive days; Raw Water Supplier issues a request to reduce demand on its system by 20% or less; The System's ability to meet the current peak demand is reduced by 20%.	System pumpage reaches and/or exceeds 5 times the established daily average and remains consistent for a period of at least 7 consecutive days; Raw Water Supplier issues a request to reduce demand between 20% and 50%; the system's ability to meet the current peak demand is reduced between 20% and 50%.	System pumpage reaches and/or exceeds 7.5 times the established daily average and remains consistent for a period of at least 3 consecutive days; Raw Water Supplier issues a request to reduce demand above 50%; The system's ability to meet the current demand is reduced by 50% or more;		
				Actions	VA, VF, VL, VS, VP, VU and/or MA,MF,ML,MS,MP,MU depending on circumstances.	MA, MB, MC,MF,MG,ML,MM,MS,MP,M,MW, Livestock and household is reduced and monitored	MA, MB, MC,MF,MG,ML,MM,MS,MP,M,MW, Livestock and household use is reduced and monitored.		

Table 5-2
Region B Drought Contingency Plan Summary

Water Provider	Water Source(s)	Basis of Triggers			Drought Contingency Stages				
		System	Source		Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Holliday	City of Wichita Falls	Pumping Capacity	Supplier Notification	**Goals**	Achieve Public Awareness	Achieve a 10% reduction in weekly water use	Achieve a 20% reduction in daily water use	Achieve a 25% reduction in daily water use	Discontinue operation of all or part of the system
				Factors/ Triggers	1-May	Ground Storage Tank contains less than 60% of its capacity for seven days; or the City is notified by the City of Wichita Falls to reduce its water use by 10%;	Ground Storage Tank contains less than 50% of its capacity for seven days; or the City is notified by the City of Wichita Falls to reduce its water use by a maximum of 20%	Ground Storage Tank contains less than 30% of its capacity for seven days; or the City is notified by the City of Wichita Falls to reduce its water use by more than 20%	Unable to deliver water of suitable quantity or quality
				Actions	VU	MF, MG, ML	MA, MF, MG, ML, MS, MP, MU, MW	MA, MF, MG, ML, MS, MP, MU, MW	
Horseshoe Bend WSC	City of Iowa Park	Capacity of distribution system	Supplier notification	**Goals**	5% reduction in daily water demand	15% reduction in daily water demand	30% reduction in daily water demand	40% reduction in daily water demand; or discontinue operation of all or part of the system	
				Factors/ Triggers	June 1	Water consumption reaches 80% of daily max. for 3 consecutive days; 8 weeks of low rainfall and daily use 20% above same period of previous year; or supplier imposes water use restrictions	Water consumption reaches 90% of daily max. for 3 consecutive days; 8 weeks of low rainfall and daily use 30% above same period of previous year; or supplier imposes water use restrictions	Major component failure or event which reduces the min. residual system pressure below 20 PSI for 24 hours or longer; consumption 95% of daily max. for 3 consecutive days; 8 weeks of low rainfall and daily use 50% above same period of previous year; supplier imposes water use restrictions; or other emergency	
				Actions	Raise public awareness,VU	Raise public awareness,MU,MW,ML	Raise public awareness,MU,MW,ML,MP,MS,MA	Raise public awareness,MU,MW,ML,MP,MS,MA, M%Reduction, Possible elimination of service	
Iowa Park	City of Wichita Falls, Lake Buffalo	Capacity of WTP and/or raw water intake	Supplier notification	**Goals**	Raise public awareness; and 5% reduction in daily water demand	10% reduction in daily water demand	15% reduction in daily water demand	25% reduction in daily water demand	40% reduction in daily water demand; or discontinue operation of all or part of the system
				Factors/ Triggers	June 1	Level of Lake Buffalo falls to 1040' MSL; water use is 90% of WTP capacity; or supplier notification	Level of Lake Buffalo falls to 1038' MSL; water use is 100% of WTP capacity; or supplier notification	Level of Lake Buffalo falls to 1032' MSL; or supplier notification	Level of Lake Buffalo falls to 1030' MSL; or emergency
				Actions	VU,VM	MU,MM,MW,MS,MF	MU,MM,MW,MS,MF,ML,MA,MB	MU,MM,MW,MS,MF,ML,MA,MB,MP	MU,MM,MW,MS,MF,ML,MA,MB,MP, Possible elimination of service
King-Cottle WSC		See Note		**Goals**					
				Factors/ Triggers					
				Actions					
Lakeside City	City of Wichita Falls		Supplier notification	**Goals**	Raise public awareness	5% reduction in total water use; or as directed by supplier	15% reduction in total water use; or as directed by supplier	25% reduction in total water use; or as directed by supplier	Discontinue operation of all or part of the system; or as directed by supplier
				Factors/ Triggers	Supplier notification	Supplier notification	Supplier notification	Supplier notification	Supplier notification; or emergency
				Actions		ML,MA,MS,MP,MW	ML,MA,MS,MP,MW	ML,MA,MS,MP,MW	ML,MA, or Possible elimination of service

Table 5-2
Region B Drought Contingency Plan Summary

Water Provider	Water Source(s)	Basis of Triggers: System	Basis of Triggers: Source		Drought Contingency Stages: Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Lockett WSD	Seymour Aquifer and City of Vernon	Pumping Capacity	Aquifer Levels and/or Supplier Notification	**Goals**	Achieve up to a 20% reduction in demand	Increase Public Awareness; Achieve between a 20% and 50% reduction in demand	Inform Public of critical and possible hazardous situation; Reduce demand to a level necessary to maintain public health and safety;		
				Factors/ Triggers	System Pumpage reaches or exceeds 2.5 times the established average daily pumpage for a period of at least 14 consecutive days; Raw Water Supplier issues a request to reduce demand on its system by 20% or less; The System's ability to meet the current peak demand is reduced by 20%.	System pumpage reaches and/or exceeds 5 times the established daily average and remains consistent for a period of at least 7 consecutive days; Raw Water Supplier issues a request to reduce demand between 20% and 50%; the system's ability to meet the current peak demand is reduced between 20% and 50%.	System pumpage reaches and/or exceeds 7.5 times the established daily average and remains consistent for a period of at least 3 consecutive days; Raw Water Supplier issues a request to reduce demand above 50%; The system's ability to meet the current demand is reduced by 50% or more;		
				Actions	VA, VF, VL, VS, VP, VU and/or MA,MF,ML,MS,MP,MU depending on circumstances.	MA, MB, MC,MF,MG,ML,MM,MS,MP,M,MW, Livestock and household is reduced and monitored	MA, MB, MC,MF,MG,ML,MM,MS,MP,M,MW, Livestock and household use is reduced and monitored.		
Margaret WSC		See Note		**Goals**					
				Factors/ Triggers					
				Actions					
Medicine Mound WSD	Greenbelt Municipal & Industrial Water Authority	Pumping Capacity	Supplier Notification	**Goals**	Achieve up to a 20% reduction in demand	Increase Public Awareness; Achieve between a 20% and 50% reduction in demand	Inform Public of critical and possible hazardous situation; Reduce demand to a level necessary to maintain public health and safety;		
				Factors/ Triggers	System Pumpage reaches or exceeds 2.5 times the established average daily pumpage for a period of at least 14 consecutive days; Raw Water Supplier issues a request to reduce demand on its system by 20% or less; The System's ability to meet the current peak demand is reduced by 20%.	System pumpage reaches and/or exceeds 5 times the established daily average and remains consistent for a period of at least 7 consecutive days; Raw Water Supplier issues a request to reduce demand between 20% and 50%; the system's ability to meet the current peak demand is reduced between 20% and 50%.	System pumpage reaches and/or exceeds 7.5 times the established daily average and remains consistent for a period of at least 3 consecutive days; Raw Water Supplier issues a request to reduce demand above 50%; The system's ability to meet the current demand is reduced by 50% or more;		
				Actions	VA, VF, VL, VS, VP, VU and/or MA,MF,ML,MS,MP,MU depending on circumstances.	MA, MB, MC,MF,MG,ML,MM,MS,MP,M,MW, Livestock and household is reduced and monitored	MA, MB, MC,MF,MG,ML,MM,MS,MP,M,MW, Livestock and household use is reduced and monitored.		
Megargel	City Lake		Capacity of City Lake	**Goals**	Raise public awareness; and 5% reduction in total water use	20% reduction in total water use	25% reduction in total water use		
				Factors/ Triggers	Lake level falls to 7' below normal pool elevation	Lake level falls to 9' below normal pool elevation	Lake level falls to 11' below normal pool elevation		
				Actions	VU,VW	MU,ML,MW,MA	MU,ML,MA,MW,MS,MP		
Montague WSC		See Note		**Goals**					
				Factors/ Triggers					
				Actions					

Table 5-2
Region B Drought Contingency Plan Summary

Water Provider	Water Source(s)	Basis of Triggers			Drought Contingency Stages				
		System	Source		Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
New Goodlett WSD	Greenbelt Municipal & Industrial Water Authority	Pumping Capacity	Supplier Notification	**Goals**	Achieve up to a 20% reduction in demand	Increase Public Awareness; Achieve between a 20% and 50% reduction in demand	Inform Public of critical and possible hazardous situation; Reduce demand to a level necessary to maintain public health and safety;		
				Factors/ Triggers	System Pumpage reaches or exceeds 2.5 times the established average daily pumpage for a period of at least 14 consecutive days; Raw Water Supplier issues a request to reduce demand on its system by 20% or less; The System's ability to meet the current peak demand is reduced by 20%.	System pumpage reaches and/or exceeds 5 times the established daily average and remains consistent for a period of at least 7 consecutive days; Raw Water Supplier issues a request to reduce demand between 20% and 50%; the system's ability to meet the current peak demand is reduced between 20% and 50%.	System pumpage reaches and/or exceeds 7.5 times the established daily average and remains consistent for a period of at least 3 consecutive days; Raw Water Supplier issues a request to reduce demand above 50%; The system's ability to meet the current demand is reduced by 50% or more;		
				Actions	VA, VF, VL, VS, VP, VU and/or MA,MF,ML,MS,MP,MU depending on circumstances.	MA, MB, MC,MF,MG,ML,MM,MS,MP,M,MW, Livestock and household is reduced and monitored	MA, MB, MC,MF,MG,ML,MM,MS,MP,M,MW, Livestock and household use is reduced and monitored.		
Nocona		Capacity of treatment and distribution system		**Goals**	Raise awareness; 30% reduction in peak daily demand	10% reduction in daily demand by customers and 5% reduction by bulk customers	15% reduction in daily demand by customers and 5% reduction by bulk customers	Discontinue operation of all or part of the system	
				Factors/ Triggers	May 1	Daily demand > 90% WTP capacity for 3 consecutive days	Storage level < 50% of 24-hour demand for 3 consecutive days	Emergency or storage level < predetermined safe level	
				Actions	VL,VS,VW,VG	ML,MS,MG,MB	ML,MS,MG,MB	Possible elimination of service	
Nocona Hills WSC		Storage capacity during burn ban	Elevated storage tank level	**Goals**	5% reduction in average daily use	10% reduction in average daily use	15% reduction in average daily use	25% reduction in average daily use	
				Factors/ Triggers	May 1 if rainfall Is 20% or more below average for year up through April	Storage tank volume < 30% of maximum capacity	Storage tank volume < 10% of maximum capacity; or burn ban is announced by county	Storage tank volume reaches 0; or emergency	
				Actions	Publish conservation methods and explanation of drought stages	ML,MA,MP	ML,MA,MP	ML,MA,MP,MS, possible elimination of service	
Northside WSC	City of Vernon		Supplier contract	**Goals**	5% reduction in total weekly use	10% reduction in total weekly use	Discontinue operation of all or part of the system		
				Factors/ Triggers	Notification from supplier to achieve 5% reduction	Notification from supplier to achieve greater than 5% reduction	Emergency		
				Actions	ML,MC,MA,MN	ML,MC,MA,MN	ML,MA,MU,possible elimination of service		
Oak Shores WSC		See Note		**Goals**					
				Factors/ Triggers					
				Actions					

Table 5-2
Region B Drought Contingency Plan Summary

Water Provider	Water Source(s)	Basis of Triggers: System	Basis of Triggers: Source		Drought Contingency Stages: Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Odell WSC		See Note		**Goals**					
				Factors/ Triggers					
				Actions					
Oklaunion WSC		See Note		**Goals**					
				Factors/ Triggers					
				Actions					
Olney	Lake Olney		Lake level	**Goals**	Reduce demand	Reduce demand	Reduce demand	Reduce demand	
				Factors/ Triggers	Lake level drops to 1135' msl	Lake level drops to 1133' msl	Lake level drops to 1130' msl	Lake level drops to 1127' msl	
				Actions	Publish voluntary conservation plans	ML,MG	ML,MG	ML,MS,MA,MP	
Paducah		Capacity		**Goals**	Raise awareness; 5% reduction in total use	10% reduction in total use	15% reduction in total use; or discontinue operation of all or part of the system		
				Factors/ Triggers	Total usage is 1 MGD for 2 consecutive days; or storage < 95% of maximum capacity for > 48 hours	Total usage is 1.2 MGD for 2 consecutive days; or storage < 90% of maximum capacity for > 48 hours	Total usage is 1.5 MGD for 2 consecutive days; storage < 80% of maximum capacity for > 48 hours; or emergency		
				Actions	VL	ML,MA	ML,MA,MS,MP,surcharge		
Petrolia	Petrolia City Lake		Lake capacity or level	**Goals**	Raise public awareness	15% reduction in total water use	30% reduction in total water use	Discontinue operation of all or part of the system	
				Factors/ Triggers	Lake reaches 60% of capacity	Lake reaches 50% of capacity	Lake reaches 35% of capacity	Emergency	
				Actions		ML,MA,MS,MP,MW	ML,MA,MS,MP,MW, MLivestock	Elimination of service	

Table 5-2
Region B Drought Contingency Plan Summary

Water Provider	Water Source(s)	Basis of Triggers			Drought Contingency Stages				
		System	Source		Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Pleasant Valley	City of Wichita Falls	Capacity of distribution system	Supplier notification	**Goals**	5% reduction in daily water demand	15% reduction in daily water demand	30% reduction in daily water demand	40% Reduction in daily water demand; or discontinue operation of all or part of the system	
				Factors/ Triggers	June 1; or supplier notification	Water consumption reaches 80% of daily max. for 3 consecutive days; 8 weeks of low rainfall and daily use 20% above same period of previous year; or supplier imposes water use restrictions	Water consumption reaches 90% of daily max. for 3 consecutive days; 8 weeks of low rainfall and daily use 30% above same period of previous year; or supplier imposes water use restrictions	Major component failure or event which reduces the min. residual system pressure below 20 PSI for 24 hours or longer; consumption 95% of daily max. for 3 consecutive days; 8 weeks of low rainfall and daily use 50% above same period of previous year; supplier imposes water use restrictions; or other emergency	
				Actions	Raise public awareness, VU	Raise public awareness, VU,VW,VL	Raise public awareness, MU,MW,ML,MP,MS,MA	Raise public awareness, MU,MW,ML,MP,MS,MA, M% Reduction	
Quanah		See Note		**Goals**					
				Factors/ Triggers					
				Actions					
Quanah NE WSD	Greenbelt Municipal & Industrial Water Authority	Pumping Capacity	Supplier Notification	**Goals**	Achieve up to a 20% reduction in demand	Increase Public Awareness; Achieve between a 20% and 50% reduction in demand	Inform Public of critical and possible hazardous situation; Reduce demand to a level necessary to maintain public health and safety;		
				Factors/ Triggers	System Pumpage reaches or exceeds 2.5 times the established average daily pumpage for a period of at least 14 consecutive days; Raw Water Supplier issues a request to reduce demand on its system by 20% or less; The System's ability to meet the current peak demand is reduced by 20%.	System pumpage reaches and/or exceeds 5 times the established daily average and remains consistent for a period of at least 7 consecutive days; Raw Water Supplier issues a request to reduce demand between 20% and 50%; the system's ability to meet the current peak demand is reduced between 20% and 50%.	System pumpage reaches and/or exceeds 7.5 times the established daily average and remains consistent for a period of at least 3 consecutive days; Raw Water Supplier issues a request to reduce demand above 50%; The system's ability to meet the current demand is reduced by 50% or more;		
				Actions	VA, VF, VL, VS, VP, VU and/or MA,MF,ML,MS,MP,MU depending on circumstances.	MA, MB, MC,MF,MG,ML,MM,MS,MP,M,MW, Livestock and household is reduced and monitored.	MA, MB, MC,MF,MG,ML,MM,MS,MP,M,MW, Livestock and household use is reduced and monitored.		
Ringgold WSD	Trinity Aquifer	Pumping Capacity	Aquifer Level	**Goals**	Achieve up to a 20% reduction in demand	Increase Public Awareness; Achieve between a 20% and 50% reduction in demand	Inform Public of critical and possible hazardous situation; Reduce demand to a level necessary to maintain public health and safety;		
				Factors/ Triggers	System Pumpage reaches or exceeds 2.5 times the established average daily pumpage for a period of at least 14 consecutive days; Raw Water Supplier issues a request to reduce demand on its system by 20% or less; The System's ability to meet the current peak demand is reduced by 20%.	System pumpage reaches and/or exceeds 5 times the established daily average and remains consistent for a period of at least 7 consecutive days; Raw Water Supplier issues a request to reduce demand between 20% and 50%; the system's ability to meet the current peak demand is reduced between 20% and 50%.	System pumpage reaches and/or exceeds 7.5 times the established daily average and remains consistent for a period of at least 3 consecutive days; Raw Water Supplier issues a request to reduce demand above 50%; The system's ability to meet the current demand is reduced by 50% or more;		
				Actions	VA, VF, VL, VS, VP, VU and/or MA,MF,ML,MS,MP,MU depending on circumstances.	MA, MB, MC,MF,MG,ML,MM,MS,MP,M,MW, Livestock and household is reduced and monitored.	MA, MB, MC,MF,MG,ML,MM,MS,MP,M,MW, Livestock and household use is reduced and monitored.		
St. Jo		See Note		**Goals**					
				Factors/ Triggers					
				Actions					

Table 5-2
Region B Drought Contingency Plan Summary

Water Provider	Water Source(s)	Basis of Triggers			Drought Contingency Stages				
		System	Source		Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Scotland		See Note		**Goals**					
				Factors/ Triggers					
				Actions					
Seymour	Seymour Aquifer	Capacity of WTP	Draw down level of aquifer	**Goals**	Raise public awareness and 5% reduction in total water use	20% reduction in total water use	30% reduction in total water use		
				Factors/ Triggers	Pumping draw down level exceeds 18" below normal for 7 consecutive days	Pumping draw down level exceeds 38" below normal for 7 consecutive days	Pumping draw down level exceeds 5' below normal for 7 consecutive days		
				Actions	VL	ML,MA,MP	ML,MA,MP,Surcharge		
South Quanah WSD	Greenbelt Municipal & Industrial Water Authority	Pumping Capacity	Supplier Notification	**Goals**	Achieve up to a 20% reduction in demand	Increase Public Awareness; Achieve between a 20% and 50% reduction in demand	Inform Public of critical and possible hazardous situation; Reduce demand to a level necessary to maintain public health and safety;		
				Factors/ Triggers	System Pumpage reaches or exceeds 2.5 times the established average daily pumpage for a period of at least 14 consecutive daya; Raw Water Supplier issues a request to reduce demand on its system by 20% or less; The System's ability to meet the current peak demand is reduced by 20%.	System pumpage reaches and/or exceeds 5 times the established daily average and remains consistent for a period of at least 7 consecutive days; Raw Water Supplier issues a request to reduce demand between 20% and 50%; the system's ability to meet the current peak demand is reduced between 20% and 50%.	System pumpage reaches and/or exceeds 7.5 times the established daily average and remains consistent for a period of at least 3 consecutive days; Raw Water Supplier issues a request to reduce demand above 50%; The system's ability to meet the current demand is reduced by 50% or more;		
				Actions	VA, VF, VL, VS, VP, VU and/or MA,MF,ML,MS,MP,MU depending on circumstances.	MA, MB, MC,MF,MG,ML,MM,MS,MP,M,MW, Livestock and household is reduced and monitored	MA, MB, MC,MF,MG,ML,MM,MS,MP,M,MW, Livestock and household use is reduced and monitored.		
Sunset WSC		See Note		**Goals**					
				Factors/ Triggers					
				Actions					
Thalia WSC		See Note		**Goals**					
				Factors/ Triggers					
				Actions					

Table 5-2
Region B Drought Contingency Plan Summary

Water Provider	Water Source(s)	Basis of Triggers: System	Basis of Triggers: Source		Drought Contingency Stages: Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Vernon	Seymour Aquifer	Inoperable wells due to water level	Water level	**Goals**	Raise public awareness and 5% reduction in total water use	10% reduction in total water use	15% reduction in total water use	20% reduction in total water use	Discontinue operation of all or part of the system
				Factors/ Triggers	5 inoperable wells due to low water levels	7 inoperable wells due to low water levels	10 inoperable wells due to low water levels	11 inoperable wells due to low water levels	13 inoperable wells due to low water levels; or emergency
				Actions	VU,VW,VL	VU,VW,VL,VB	MU,MW,ML,MB,MA,MP	MU,MW,ML,MB,MA,MP,MS,MF	Possible elimination of service
Wichita County Water Irrigation District #2	Lakes Kemp and Diversion		Water level	**Goals**					
				Factors/ Triggers	Water elevation in Lake Kemp drops below 1136' MSL	Water elevation in Lake Kemp drops below 1132' MSL	Water elevation in Lake Kemp drops below 1126' MSL	Water elevation in Lake Kemp drops below 1118.5' MSL	
				Actions	VReduce use of water	ML,MP,MU,MW	ML,MP,MU,MW,MC	ML,MP,MU,MW,MM	
Wichita Falls	Lakes Kickapoo and Arrowhead	Treatment Capacity	Water level in Lakes	**Goals**	Reduce net withdrawal from reservoirs by 15%	Reduce net withdrawal from reservoirs by 35%	Reduce net withdrawal from reservoirs > 35%		
				Factors/ Triggers	Combined storage level declines to 50% total storage in Lakes Kickapoo and Arrowhead or demand exceeds designed treatment capacity for 3 days after a drought watch as been declared or exceeds 110% of design.	Combined storage level of Lakes Kickapoo and Arrowhead drops to 40% of the total conservation pool storage capacity or demand exceeds design capacity for 4 weeks or exceeds design capacity by 115%.	Combined storage level declines to 30% total storage in Lakes Kickapoo and Arrowhead or demand exceeds 120% of design.		
				Actions	MA, MB, MC, MF, MG, ML, MS, MU	MA, MB, MC, MF, MG, ML, MO, MS, MU	MA, MB, MC, MF, MG, ML, MO, MS, MU		
Wichita Valley WSC	City of Wichita Falls	Capacity storage and distribution system	Supplier notification	**Goals**	5% reduction in daily demand	20% reduction in daily demand	30% reduction in daily demand	35% reduction In total weekly water demand ; or discontinue operation of all or part of the system	
				Factors/ Triggers	WTP production exceeds 0.65 MGD for than 3days in any 7 consecutive days; or storage tank levels fa below 60% between 7-11 p.m. for more than 2 consecutive days	WTP production exceeds 0.70 MGD for than 3 days in any 7 consecutive days; notification from supplier of 20% or more curtailment of source; or storage tank levels fall below 50% between 7-11 p.m. for more than 2 consecutive days	WTP production exceeds 0.75 MGD for than 3 days in any 7 consecutive days; notification from supplier of 30% or more curtailment of source; or storage tank levels fall below 40% between 7-11 p.m. for more than 2 consecutive days	WTP production exceeds 0.80 MGD for than 3 days in any 7 consecutive days; notification from supplier of 35% or more curtailment of source; or emergency	
				Actions	VL	ML,MP,MU	ML,MF,MA,MS,MU		
Windthorst	City of Wichita Falls	Reliability of storage and distribution system	Supplier notification	**Goals**	Raise public awareness	5% reduction in total water use	25% reduction in total water use	50% reduction in total water use; or discontinue operation of all or part of the system	
				Factors/ Triggers	July 1	Total treated water reaches 700,000 gpd for 5 days in any 10 day period; or supplier notification	Total treated water reaches 820,000 gpd for 5 days in any 10 day period; or supplier notification	Total treated water reaches 900,000 gpd for 2 consecutive days	
				Actions		ML,MA,MP,MW	ML,MA,MP,MW,MS	ML,MA,MP, Possible elimination of service	

Note: Drought Contingency Plan not available to RWPG at this time

* The first letter indicates the following with regard to regulation compliance:
V - Voluntary Compliance
M - Mandatory compliance

The second letter indicates which of the following water uses is affected by the regulation:
A - Automobile/Vehicle Washing
B - Bulk/Wholesale Sales
C - Commercial Plant Nurseries
F - Architectural Water Features
G - Golf Course Irrigation
L - Landscape Irrigation
M - Major commercial users
P - Pools
S - Outside Surfaces
R - Restaurants
U - Unnecessary Uses
W - Fire Hydrants and Water Line Flushing

RECOMMENDATIONS INCLUDING UNIQUE ECOLOGICAL STREAM SEGMENTS, RESERVOIR SITES, LEGISLATIVE & REGIONAL POLICY ISSUES
TEXAS STATE SENATE BILL 1
REGION B

6.1 Introduction

With the passage of Senate Bill 1, the 75th Legislature established a regional process to plan for the water needs of Texas through the year 2050. As a part of this planning process, the Texas Water Development Board created 16 regional water planning groups and implemented rules and regulations to govern the process on a regional basis.

Region B, as designated by Senate Bill 1, is comprised of 10 counties and a portion of another in North Central Texas.

As a part of the plan, this report identifies and makes recommendations that the Regional Water Planning Group deems vital to the management and conservation of the water resources in Region B.

6.2 Discussion of Regional Issues

In addition to the specific water management strategies recommended for Region B in Chapter 5 of the plan, there were several other issues that the Regional Water Planning Group deemed to be significant water management concepts to be given further consideration as part of the Region B Plan. The Chloride Control Project on the Wichita and Pease Rivers is a water management strategy with high regional support. Other strategies that enhance and/or increase the existing supplies in the region, such as brush control, ground water recharge enhancement weather modification, and increased conservation storage for Lake Kemp, are each potentially feasible management strategies throughout and perhaps beyond the 50 year planning horizon.

Senate Bill 1 requires future projects to be consistent with the approved regional water plan to be eligible for TWDB funding and TNRCC permitting. However, it is the intention of the RWPG that surface water uses that will not have a significant impact on the region's water supply and water supply projects that do not involve the development of or connection to a new water source are deemed consistent with the regional water plan even though not specifically recommended in the plan.

6.2.1 Chloride Control Project

Natural mineral pollutants, primarily chloride and sulfates in the upper reaches of the Red River Basin in Region B, render downstream waters unusable for most beneficial purposes. From a study initiated by the U.S. Public Health Service in 1957, it was determined that 10 natural salt source areas located in the Red River Basin contribute a daily average of about 3,300 tons of chlorides to the Red River. Subsequent to that study, in 1959 the U.S. Army Corps of Engineers proposed measures to control the natural chloride pollution by recommending control/structural facilities for 8 of the 10 salt source areas.

These recommended chloride control structures are proposed to improve the water quality conditions of the Red River and its tributaries to the extent that the water may be utilized for municipal, industrial, and agricultural uses on a regular basis.

It is anticipated that the Wichita River Basin Chloride Control Project will effectively remove 362 tons per day of the 429 tons per day of chloride entering the Wichita River System. This improved water quality will allow for full utilization of Lakes Kemp and Diversion.

This additional source, would not only increase the reliability of the City of Wichita Falls system, but it would also provide for more diverse and expanded agricultural use and more efficient industrial use.

Also, in the long term, as chloride control facilities are constructed on the Pease River in conjunction with the Crowell Brine Reservoir, the potential exists for another freshwater supply reservoir on the Pease River near Crowell in Foard County, with an estimated yield of 138,000 acre-feet per year.

6.2.2 Brush Control Program

The U.S. Natural Resource Conservation Service (NRCS) estimates that brush in Texas uses about 10 million acre-feet of water annually versus the 15 million acre-feet per year for current human use. Possible advantages of brush control, groundwater enhancement, and weather modification could be additions to water supplies, recharge of shallow groundwater aquifers and spring flow enhancement.

Though water yield following brush control has been investigated in several areas of Texas, the economic benefits and overall productivity of a brush control program may vary significantly depending on geology, nature of water yield, presence of brush, type of brush, and impact on threatened or endangered species.

Recently, the Texas Legislature approved a brush and water study to be conducted through the Texas State Soil and Water Conservation Board, upstream of Lake Kemp on a portion of the Region B Wichita River watershed. The stated goal of this study is to increase streamflow and water availability for industrial, municipal, and other uses through brush control and management.

It is anticipated that this study will provide the Region B Water Planning Group with an estimate of potential streamflow changes in the Wichita River if a large-scale brush management program is conducted, in addition to identifying and prioritizing areas within the Wichita River watershed that contribute the most to streamflow. The results of this study should be utilized by the planning group to gauge the potential effect of brush control on water flow and ecosystem components such as wildlife, livestock production, aesthetics and land values.

6.2.3 Recharge Enhancement

Recharge enhancement is the process in which surface water is purposefully directed to areas where permeable soils or fractured rock allow rapid infiltration of the surface water into the subsurface to increase localized ground water recharge. This would include any man-made structure that would slow down or hold surface water to increase the probability of ground water recharge.

In Region B, ground water is a major source of water for much of the western portion of the region. The Seymour Aquifer, which is generally unconfined, is fairly responsive to local recharge and may benefit from enhanced recharge programs. Further study is needed to determine the applicability of such programs in Region B, the quantity of increased ground water supplies from enhanced recharge structures, and the potential impacts to surface water rights.

6.2.4 Weather Modification

Weather modification is an attempt to increase the efficiency of a cloud to produce precipitation. Efforts to enhance rainfall in Texas began in 1880 and have continued to present day. Several weather modification programs are in place in areas to the west of Region B. While research has suggested increases of 15 % or more of rainfall in areas participating in weather modification, some areas in west Texas have shown greater increases in rainfall. Weather modification programs in Region B could potentially increase surface runoff to reservoirs, reduce irrigation demands, and increase recharge to ground water sources. Based on existing programs, the cost of operating a weather modification program is approximately 10 cents per acre.

6.2.5 Increase Conservation Storage for Lake Kemp

The U.S. Army Corps of Engineers (USCOE) constructed Lake Kemp for flood control and water supply. It is located in an area with high sedimentation rates, and as a result, the firm yield of the reservoir is expected to decrease significantly over the planning period. A new sedimentation survey of Lake Kemp was initiated in 1999, but due to low lake levels, the survey has not been completed. With the completion of the chloride control project, water quality in the Wichita basin is expected to improve such that the water from Lake Kemp will become more desirable for existing and future users. This could result in increased demands that may exceed the available supply of the lake.

The USCOE has provisions to transfer a portion of the flood storage to conservation storage to compensate for siltation, if there is a need for water supply. Since there is regional concern over the long-term quantity of supply from Lake Kemp, it is recommended that following the completion of the sedimentation study, the feasibility of transferring flood storage to conservation storage be evaluated during the next planning cycle.

6.3 Designation of Unique Stream Segments and Reservoir Sites

In accordance with TAC Section 357.8, the Regional Water Planning Group is not required, but may include in the adopted regional water plan recommendations for river and stream segments of unique ecological value, in addition to unique sites for reservoir construction. Such designation would provide for protection of these specific sites to the extent that a state agency or political subdivision may not obtain a fee title or an easement that would destroy the unique ecological value of the designated stream segment or significantly prevent the construction of a reservoir on a designated site.

6.3.1 Unique Stream Segments

Within Region B, the Texas Parks & Wildlife (TPWD) has suggested that certain stream segments of the Middle Pease River in Cottle County, the Pease River in Foard County, and the Red River from the Wichita/Clay County line upstream through Hardeman County be considered for recommendation as stream and/or river segments of unique value. The TPWD believes that each of these segments satisfy at least one of the designation criteria defined in Senate Bill 1.

The Region B Water Planning Group is committed to the protection and conservation of unique and sensitive areas within the region. To that end, the consensus of the planning group is that a more comprehensive study with supporting data is necessary to accurately characterize and evaluate the listed stream/river segments in order to determine if it is appropriate to recommend them for designation.

In addition, the significance and impact of the designation are not clearly delineated in the legislation or implementing rules. It is not clear what governmental or private activities, other than reservoir construction, might be subject to additional constraints or limitations as a result of designation. It is also not clear what geographic extent might be impacted by the designation. For example, is the entire watershed of the designated stream subject to additional limitations, and how far upstream of the designated stream would limitations apply? The Region B Water

Planning Group suggests that the Legislature may wish to clarify their intent with regard to these results of designation.

6.3.2 Reservoir Sites

It is generally recognized that past studies over the last forty years have identified perhaps the last remaining reservoir site within Region B in which the chemical concentrations are low enough for municipal use.

This site known as the Ringgold Reservoir site is located on the Little Wichita River in Clay County, approximately one half mile upstream from the confluence with the Red River.

With the potential for an estimated increase in water supply yield for Region B of approximately 27,000 acre-feet per year, it is the consensus of the Regional Water Planning Group that this identified site could reasonably be needed to meet regional water needs beyond the 50-year planning period.

6.4 Discussion of Regulatory and Legislative Actions

To facilitate the orderly development, management, and conservation of water resources within the region, and to assist the region in preparing for and responding to drought conditions, the Region B Water Planning Group believes that the regulatory agencies and legislature should consider certain actions relating to water quality and funding issues which affect Region B.

6.4.1 Regulatory Review of Nitrate MCL

In Region B, there are a number of small user groups which utilize water with nitrate levels in excess of 10 mg/l. For the most part this supply is their only source of water, and advanced treatment for the removal of nitrates is very costly. Presently these systems employ bottled water programs for customers that may be sensitive to nitrate concentrations (pregnant women and infants). This program is considered an interim measure by TNRCC until the system can comply with the nitrate standards.

It is the consensus of the Region B Water Planning Group that the regulatory agency review its MCL standards for smaller systems which have no cost effective means to comply with the current nitrate MCL of 10 mg/l, and consider funding new studies to determine the health effects of nitrates in drinking water.

In addition, the planning group requests that the regulatory agencies consider bottled water programs as a long-term strategy to meet the nitrate water quality standards, or alternatively simply provide for a waiver process.

6.4.2 Funding for Comprehensive Studies

In preparing the Region B Water Plan there are several regional water planning, management, and conservation related issues which will require additional funding for data collection and administrative activities in order to adequately assess their viability or feasibility as a cost effective management strategy for Region B. For example, additional funds are needed to identify and evaluate brush control programs in an effort to increase water yields, to complete the Groundwater Availability Models (GAM), to identify and designate unique stream segments and/or reservoir sites for protection of these areas, and to implement various other chloride control measures and wastewater reuse programs throughout Region B.

6.5 Summary of Regional Recommendations

In accordance with 31 TAC 357.7 (a)(9), 31 TAC 357.8, and 31 TAC 357.9, the following recommendations are proposed to facilitate the orderly development, management, and conservation of the water resources available within Region B:

- It is recommended that the Chloride Control Project on the Wichita River be made a regional priority in order to enhance the water quality of Lake Kemp and Lake Diversion, and reclaim those lakes as a viable cost effective short term and long term regional water supply source.

- It is recommended that Region B participate in the State study on brush management and water yields to be conducted on the Wichita River watershed upstream of Lake Kemp. Pending the results of that study, it may be beneficial for the region to adopt selected brush control programs as a water management strategy. In addition, should brush management programs be implemented in the future, it is recommended that the State provide for adequate funding of the programs.

- Region B recommends that no segments be designated as "Unique Stream/River Segments" or "Unique Reservoir Sites" at this time. Pending the results of comprehensive studies and clarification by the Legislature of the significance and impacts of designation, the Regional Water Planning Group may consider designations within the region in the future.

- It is recommended that Region B encourage the regulatory agencies to consider allowing continued long-term use of bottled water programs, and/or providing a waiver for small user groups that can demonstrate they have no reasonable cost-effective means to comply with the current MCL of 10 mg/l.

- It is recommended that Region B support and seek adequate state funding to develop, implement, and evaluate the necessary management strategies adopted as part of this regional plan. This includes strategies identified to meet a specific need as well as general strategies to increase water supply in the region.

- It is recommended that Region B support the grass-roots regional water planning process enacted by SB1 and strongly encourages the process be continued with adequate state funding for all planning efforts including administrative activities, data collection, and Groundwater Availability Modeling (GAM).

- It recommended that Region B support State funding for agricultural water use data collection and agricultural water use management/conservation projects.

- Senate Bill 1 requires future projects to be consistent with the approved regional water plan to be eligible for TWDB funding and TNRCC permitting. It is recommended that surface water uses that will not have a significant impact on the region's water supply and water supply projects that do not involve the development of or connection to a new water source should be deemed consistent with the regional water plan even though not specifically recommended in the plan.

PLAN ADOPTION AND PUBLIC PARTICIPATION
TEXAS STATE SENATE BILL 1
REGION B

7.1 Introduction

This section describes the plan approval process for the Region B Water Plan and the efforts made to encourage public participation in the planning process.

The Regional Water Planning Group - Area B (RWPG-B) agreed that public outreach and education was of paramount importance if a regional water plan was to be developed that accurately represented the regional area. To this end, a public education and outreach strategy was prepared with the goal to insure that all water users and the public were informed of each meeting and the progress of the plan's development, given an opportunity to present and discuss their concerns and participate in the planning process.

7.2 Regional Water Planning Group

As required by Senate B 1 regional water planning groups were formed to guide the planning process. These groups were comprised of representatives of specific interests:

- General public
- Counties
- Municipalities
- Industrial
- Agricultural
- Environmental
- Small businesses
- Electric generating utilities
- River authorities
- Water districts
- Water utilities

Table 7-1 below lists the 17 members of the Region B Water Planning Group, the interests they represent, their organizations, and their counties.

Table 7-1

Regional Water Planning Group - Area B			
Name	**Organization**	**Interest**	**County**
Jimmy Banks	Wichita County WID #2	Water District	Wichita
Chris Bissett	West Texas Utilities	Electric Utility	Wilbarger
J. K. (Rooter) Brite		Environmental	Montague/All
Mayor Kelly Couch	City of Vernon	Municipal	Wilbarger
Ronald J. Glenn	Red River Authority of Texas	River Authority	All
Paul Hawkins		Public	Wilbarger
Dr. Norman Horner	Midwestern State University	Environmental	Wichita/All
Dale Hughes	W.T. Waggoner Estate	Agriculture	Wilbarger
Bobbie Kidd	Greenbelt Water District	Water District	Foard/Hardeman
Mayor Robert Kincaid	City of Crowell	Municipal	Foard
Lawrence Harmel	Baylor Water Supply Corp.	Water Utility	Baylor
Judge Kenneth Liggett	Clay County	County	Clay
Judge Kenneth McNabb	Hardeman County	County	Hardeman
Dean Myers	Bowie Industries, Inc.	Small Business	Montague
Wilson Sealing	Scaling Ranch	Agriculture	Clay
Fred Stephens	Stephens Engineering	Industry	Wichita
Kay Yeager	City of Wichita Falls	Municipal	Wichita

The RWPG-B Planning Board unanimously pledged to support the interest of all of the region as the primary objective in meeting the needs of the region as a whole. Accordingly the scope of the public education and participation strategy was designed as an outreach to identify and address the needs of all water use entities through:

- Planning Group Meetings and Hearings
- Presentations at Civic Groups and Media Communications
- Survey of Water Use Entities

- Drought Planning Workshops
- Internet Web Site
- Enhanced Water Conservation Planning
- Implementation of the Water Plan

7.3 Planning Group Meetings

The RWPG-B held 21 open public meetings from March 3, 1998 through August 23, 2000 with personal invitations going to each category of interest groups and water use entities within the region including a current agenda for each meeting and encouraging attendance and participation in the process. The RWPG Board participated actively as a group during each meeting, relying upon information provided by its consultant group and appeared to be well informed of all matters concerning the regional planning area.

Each meeting was well attended with an average of 35 guests present and participation was informal, interactive and very productive. A total of 814 persons attended the public meetings and appeared to be satisfied by the representation of their interest by the RWPG Board. Average attendance was maintained at 96% for all meetings held. All recorded votes on issues brought before the RWPG Board was with a unanimous vote of the members present.

Representatives from the Texas Water Development Board, the Texas Department of Agriculture, Texas State Soil and Water Conservation Districts, and the Texas Parks and Wildlife Department were always in attendance and other agencies were periodically represented and offered presentations. Some of these were agencies such as the U.S. Army Corps of Engineers, Texas Department of Transportation; State and Federal Legislators representing the local districts within the regional planning area. All meetings were posted in accordance with the Texas Open Meeting's Law, Article 6252-17, Section 3a, VATCS and 31 TAC, Section 357.12(a)(5).

During each meeting, a presentation of materials, discoveries and relevant issues were provided for discussion and deliberation prior to receiving a vote on any specific measures, action or strategies to be taken on the part of the RWPG-B. Members of the public were given an opportunity to participate in discussions of individual agenda items as well as to provide public comments prior to the close of each meeting. Minutes were prepared of all meetings and filed with the secretary and the Texas Water Development Board.

7.4 Presentations to Civic Groups and Media Communications

The RWGP-B members and/or members of the consultant group presented overviews of the regional water plan development and specific issues that arose during the process to several public events that hosted persons from a diverse cross-section of society throughout the regional planning areas in north Texas. These events included the following:

- Two Regional Water Resource Conferences - Wichita Falls, Texas with 50-60 persons attending.
- Red River Basin Advisory Committee meetings of the Texas Clean Rivers Program - Two in Amarillo and two in Wichita Falls, Texas with about 35-42 persons attending each meeting.
- Periodical public presentations concerning the general planning process, water quantity and quality issues, improved conservation practices and water rights issues were given to several civic organizations including: two Lions Club meetings, two Rotary Club meetings, one Red River Environmental Science Club meeting, two League of Women Voters conferences, one Texas Farm Bureau meeting, and three area city council meetings in Vernon, Holliday and Wichita Falls.

The RWPG-B Board members promoted numerous media coverage events of issues pending before the board in an effort to encourage public involvement and heighten awareness of concerns vital to the regional planning area. Several newspaper articles have been published and television coverage of meetings and topics have been placed before the general public with a good response and support for the direction the RWPG Board elected to pursue.

The RWPG-B newsletter was mailed to over 250 persons on four separate occasions throughout the planning area and provided to local newspapers and television stations in an effort to keep the region informed of current activities.

The Times and Record News (TRN) was invited to each meeting and attended most which produced good summary coverage of agenda items being considered together with actions taken by the RWPG Board. Accordingly, the TRN utilized a public forum to seek questions concerning area water resources with responses provided from reliable sources in laymen terms to increase public understanding of water resource issues.

7.5 Surveys of Water Use Entities

The RWPG authorized its management agency to conduct a survey of all water use entities within the region to ascertain current and long-term water resource needs relevant to the individual entity. The survey questionnaire was designed to gather pertinent information about the individual entity's population, water source and use characteristics, determine if the entity had a current conservation and drought contingency plan. Sixty-five questionnaires were mailed and 41 returned. The questionnaire revealed that over 85% of the entities surveyed did not have a conservation or drought management plan.

A follow-up telephone survey was conducted to complete missing information from the returned questionnaires and determine if the entity would be willing to participate in a formal drought contingency plan workshop sponsored by the RWPG and conducted by the TWDB and the TNRCC. In light of the rules and regulations, most entities agreed to participate and received a qualified drought management plan suitable for filing with the State.

Personal visits to entities within the region were conducted for clarification of the SB-1 requirements and to provide explanation of how the new law will impact and benefit their public water supply operations. In all cases, support for the SB-1 and the Regional Water Plan was solicited with a very high degree of success. With the exception of eight public entities, the majority of all the water use entities within the region (85%), including water supply corporations, provided monetary support for the program administration and public endorsement of the proposed methods being employed by the RWPG Board and the consultant group to produce a Regional Water Plan for Area B.

7.6 Drought Planning Workshops

The RWPG organized and conducted four drought planning workshops throughout the region with the assistance of the TWDB, TNRCC and the consultant group engaged to prepare the regional water plan. The workshops were designed to interact with the individual entity and collect sufficient information to construct a drought management plan according to the TNRCC suggested guidelines. Workshops were held in:

	Attendees
• Vernon	10
• Seymour	14
• Henrietta	21
• Wichita Falls	14

The RWPG's consultant group participated and evaluated the information obtained from the entities then compiled draft documents for the entity's review. The RWPG's management agency revised the draft received from the entities and prepared the final version for their adoption. A total of 40 drought management plans and five conservation plans were provided to the participating entities within Region B. This represents 95% of the entities within the region who did not have an acceptable drought management plan.

The drought plans were judged an overwhelming success by the recipients due to the extended drought conditions being experienced throughout the region and enabled the entities to begin utilizing the plans alternate resource management strategies based on the emergency trigger conditions being encountered at the time.

7.7 Internet Web Page

Due to the public interest being generated from the initial meetings and subsequent drought planning workshops, an Internet Web Page was designed and hosted by the RWPG's management agency for disseminating information about the water resources within the region and to publish notices of meetings, hearings and issues being considered and addressed by the RWPG Planning Board.

The web pages are maintained by the RWPG's management agency and updated at least monthly, or more often as needed, to publicize current information of interest and solicit input from the viewers. The web site is located at www.rra.dst.tx.us/rwpg and is available on a 24-hour basis.

The web site contains numerous links to other pages of common interest for the viewer and begins with a front page that includes a publications library, regional data inventories, names and addresses of the Regional Planning Board, public events calendar, enabling legislation (SB-1), maps of the region and a place for written comments to the RWPG-B.

7.8 Public Hearings and Other Public Meetings

The RWPG-B conducted three public hearings to receive comments on the initial organization of the planning group and to review and comment on the Initially Prepared (draft) Water Plan for Region B. Comments, both oral and written, were transcribed from each hearing and filed with the secretary and the TWDB. The RWPG also maintains a complete record of all hearings and public meetings at the office of its management agency, the Red River Authority of Texas. The hearings were held on March 30, 1998, June 9, 1998, and August 23, 2000, respectfully. The Initially Prepared Water Plan for Region B was adopted on August 23, 2000 by a unanimous vote of the RWPG-B Board.

Additionally, the RWPG Board appointed a Technical Advisory Committee (TAC) comprised of three board members, representatives of the consultant group, the public and invited guests of various expertise for review of technical materials and matters to which the RWPG Board would ultimately have to decide upon. The TAC also qualified the consultant group and recommended selection to the RWPG Board. During the Regional Water Plan development process, the TAC met and evaluated alternatives for recommendations to the RWPG Board and discussed proposed water management strategies with the affected water use entities prior to consideration for adoption by the RWPG Board.

The TAC was instrumental in reducing confusion of sensitive matters and neutralizing controversial issues before being considered by the RWPG Board. The process was very successful and was a useful means of keeping the RWPG Board well informed concerning forthcoming matters that could develop into potentially volatile situations.

7.9 Enhanced Water Conservation Planning

During the course of developing the regional water plan and working closely with the water use entities, one apparent need surfaced as being common among the majority of the public sector - water conservation practices in the home. The RWPG's goal is to reduce the per capita water use over the region by 30% over the next five years and measure the results with the next revision to the Regional Water Plan for Area B.

Several traditional conservation programs were evaluated to determine the most effective means of encouraging the general public to implement and practice water conservation in the home and business sectors. Most programs evaluated were cost prohibitive and did not have a productive track record in areas needed for the Region B Planning Area.

Because of the media attention and extended drought conditions being experienced within the regional planning area, a small group of concerned citizens not directly associated with the RWPG challenged members of the Board to participate in a non-profit organization to solicit the necessary funds from the private sector to promote and encourage an effective water conservation program within the regional planning area. The organization has currently filed its Articles of Incorporation with the Secretary of State as a 501 (c)(3) Corporation and selected a number of directors from the region to serve on the governing board. The newly formed corporation, Wichita Water Conservation, Inc. has adopted the mission to educate the people of SB-1 Regional Planning Area B on the need for short term and long term water conservation.

7.10 Regional Water Plan Implementation Issues

Implementation issues identified for the *Initially Prepared Region B Water Plan* include: 1) financial issues associated with paying for the proposed capital improvements, 2) identification of the governing authorities for general regional strategies such as brush control, recharge enhancement and weather modification, 3) public acceptance of selected strategies, and 4) public participation in water conservation measures that were assumed in this plan.

Financial Issues

It is assumed that the entities for which strategies were developed will utilize existing financial resources, incur debt through bond sales and/or receive state-supported financial assistance. Most likely the funding of identified strategies will increase the cost of water to the customers. The economic feasibility to implement the strategies will depend on the cost increases the customer base can assume. Some strategies may not be able to be implemented without state assistance.

Governing Authorities

In Region B there is an identified governing authority for each of the preferred strategies discussed in Section 5.8. However, for general strategies, such as brush control or weather modification, no governing authority has been identified. As part of the feasibility of these strategies for Region B, a governing authority will need to be identified to implement such strategies.

Public Acceptance

The public has expressed concerns regarding using wastewater effluent and/or water from Lake Kemp for municipal supplies. Both of these strategies are proposed to meet demands for the City of Wichita Falls. While the final treated water supply from either strategy will meet or exceed the City's current water quality, the perception persists that the water would be of lesser quality. To gain public acceptance of wastewater reuse and Lake Kemp strategies for municipal use, additional public educational programs may be needed.

Public Participation

The projected demands developed for this plan include a significant level of conservation to be implemented over the planning period. These assumed demand reductions were applied to municipal, manufacturing and agricultural water uses. Some of the demand reductions will occur simply through improvements in technology. However, a moderate level of public participation is required to fully realize the expected conservation. If the conservation is less than expected, then there may be additional shortages that were not identified in this plan.

APPENDIX A

TEXAS WATER DEVELOPMENT BOARD
TABLES 1 THROUGH 13
AND SUMMARY TABLES

TEXAS STATE WATER PLAN

REGION B

JANUARY 5, 2001

TWDB TABLE 1:
Population by City and Rural County

WUGNAME	COUNTYNAME	BASINNAME	WUGNUM	RWPG	SEQ#	CITY#	COUNTY#	BASIN#	pop1996	pop2000	pop2010	pop2020	pop2030	pop2040	pop2050
ARCHER CITY	ARCHER	RED	20035000	B	35	24	5	2	1938	1855	1916	1925	1910	1868	1806
HOLLIDAY	ARCHER	RED	20411000	B	411	280	5	2	1563	1564	1613	1621	1609	1575	1524
LAKESIDE CITY	ARCHER	RED	20504000	B	504	894	5	2	1019	1100	1177	1350	1400	1400	1400
COUNTY-OTHER	ARCHER	RED	20996005	B	996	757	5	2	3762	4470	4637	4803	4825	4815	4805
COUNTY-OTHER	ARCHER	TRINITY	20996005	B	996	757	5	8	72	100	80	60	20	20	20
COUNTY-OTHER	ARCHER	BRAZOS	20996005	B	996	757	5	12	240	126	100	50	30	30	30
SEYMOUR	BAYLOR	BRAZOS	20819000	B	819	552	12	12	3059	3074	2944	2578	2293	2218	2147
COUNTY-OTHER	BAYLOR	RED	20996012	B	996	757	12	2	240	106	50	50	50	50	50
COUNTY-OTHER	BAYLOR	BRAZOS	20996012	B	996	757	12	12	990	930	935	970	1010	1020	1030
BYERS	CLAY	RED	20133000	B	133	836	39	2	530	556	546	527	515	523	533
HENRIETTA	CLAY	RED	20396000	B	396	273	39	2	3038	3112	3268	3431	3602	3750	3800
PETROLIA	CLAY	RED	20691000	B	691	936	39	2	809	834	814	779	746	742	744
COUNTY-OTHER	CLAY	RED	20996039	B	996	757	39	2	5593	4708	4724	4663	4588	4577	4572
COUNTY-OTHER	CLAY	TRINITY	20996039	B	996	757	39	8	596	400	300	250	200	200	200
PADUCAH	COTTLE	RED	20666000	B	666	447	51	2	1670	1645	1595	1501	1385	1246	1118
COUNTY-OTHER	COTTLE	RED	20996051	B	996	757	51	2	447	460	440	420	375	350	325
CROWELL	FOARD	RED	20217000	B	217	144	78	2	1219	1217	1206	1194	1144	1092	1042
COUNTY-OTHER	FOARD	RED	20996078	B	996	757	78	2	626	524	530	537	523	512	471
CHILLICOTHE	HARDEMAN	RED	20165000	B	165	110	99	2	796	784	792	818	833	848	861
QUANAH	HARDEMAN	RED	20727000	B	727	488	99	2	3300	3200	3140	3080	3060	3040	3020
COUNTY-OTHER	HARDEMAN	RED	20996099	B	996	757	99	2	1037	972	1025	1110	1130	1150	1166
GUTHRIE	KING	RED	20371000	B	371	257	135	2	150	150	152	144	124	98	77
COUNTY-OTHER	KING	RED	20996135	B	996	757	135	2	181	230	225	225	210	205	200
COUNTY-OTHER	KING	BRAZOS	20996135	B	996	757	135	12	26	20	20	20	10	10	10
BOWIE	MONTAGUE	TRINITY	20102000	B	102	69	169	8	5389	5350	5250	5300	5350	5400	5450
MONTAGUE	MONTAGUE	RED	20606000	B	606	411	169	2	490	479	470	460	440	421	401
NOCONA	MONTAGUE	RED	20639000	B	639	433	169	2	3146	3171	3180	3190	3200	3190	3190
SAINT JO	MONTAGUE	RED	20786000	B	786	528	169	2	284	277	290	295	302	303	304
SAINT JO	MONTAGUE	TRINITY	20786000	B	786	528	169	8	847	846	858	885	907	909	911
COUNTY-OTHER	MONTAGUE	RED	20996169	B	996	757	169	2	4045	2925	2899	2820	2665	2535	2575
COUNTY-OTHER	MONTAGUE	TRINITY	20996169	B	996	757	169	8	3993	3535	3296	2961	2364	1808	1038
BURKBURNETT	WICHITA	RED	20130000	B	130	86	243	2	11154	11154	11600	12000	12314	12557	12805
ELECTRA	WICHITA	RED	20277000	B	277	187	243	2	3397	3270	3431	3612	3652	3725	3799
IOWA PARK	WICHITA	RED	20435000	B	435	297	243	2	6941	6864	7209	7530	7732	7888	8047
WICHITA FALLS	WICHITA	RED	20970000	B	970	654	243	2	100501	103713	108977	113879	116847	119117	121432
COUNTY-OTHER	WICHITA	RED	20996243	B	996	757	243	2	9668	5192	5238	5329	5266	5266	5266
VERNON	WILBARGER	RED	20930000	B	930	623	244	2	12481	12590	12755	13215	13480	13568	13576
COUNTY-OTHER	WILBARGER	RED	20996244	B	996	757	244	2	3382	2925	3314	3434	3502	3525	3527

TWDB TABLE 1:
Population by City and Rural County

WUGNAME	COUNTYNAME	BASINNAME	WUGNUM	RWPG	SEQ#	CITY#	COUNTY#	BASIN#	pop1996	pop2000	pop2010	pop2020	pop2030	pop2040	pop2050
OLNEY	YOUNG	BRAZOS	20655000	B	655	441	252	12	3365	3365	3525	3618	3648	3645	3642

TWDB TABLE 2 WATER DEMAND BY CITY AND CATEGORY

WUGNAME	COUNTYNAME	BASINNAME	DATACAT	WUGNUM	RWPG	SEQ#	CITY#	COUNTY#	BASIN#	h1996	d2000	d2010	d2020	d2030	d2040	d2050
ARCHER CITY	ARCHER	RED	MUN	20035000	B	35	24	5	2	351	322	316	301	290	279	267
COUNTY-OTHER	ARCHER	BRAZOS	MUN	20996005	B	996	757	5	12	19	36	30	8	10	7	7
COUNTY-OTHER	ARCHER	RED	MUN	20996005	B	996	757	5	2	620	674	679	655	641	628	618
COUNTY-OTHER	ARCHER	TRINITY	MUN	20996005	B	996	757	5	8	9	24	20	8	2	2	2
HOLLIDAY	ARCHER	RED	MUN	20411000	B	411	280	5	2	226	230	225	215	207	199	191
IRRIGATION	ARCHER	RED	IRR	21004005	B	1004	1004	5	2	3200	3600	3500	3400	3300	3200	3100
LAKESIDE CITY	ARCHER	RED	MUN	20504000	B	504	894	5	2	149	178	181	188	190	186	184
LIVESTOCK	ARCHER	BRAZOS	STK	21005005	B	1005	1005	5	12	136	136	136	136	136	136	136
LIVESTOCK	ARCHER	RED	STK	21005005	B	1005	1005	5	2	2279	2279	2279	2279	2279	2279	2279
LIVESTOCK	ARCHER	TRINITY	STK	21005005	B	1005	1005	5	8	296	296	296	296	296	296	296
MINING	ARCHER	RED	MIN	21003005	B	1003	1003	5	2	1	0	0	0	0	0	0
SCOTLAND	ARCHER	RED	MUN	20996005	B	996	757	5	2	222	224	226	214	208	205	202
STEAM ELECTRIC POWER	ARCHER	RED	PWR	21002005	B	1002	1002	5	2	0	0	14000	14000	14000	14000	14000
COUNTY-OTHER	BAYLOR	BRAZOS	MUN	20996012	B	996	757	12	12	212	226	215	205	199	199	199
COUNTY-OTHER	BAYLOR	RED	MUN	20996012	B	996	757	12	2	27	22	17	15	13	13	12
IRRIGATION	BAYLOR	BRAZOS	IRR	21004012	B	1004	1004	12	12	518	502	487	473	459	445	431
IRRIGATION	BAYLOR	RED	IRR	21004012	B	1004	1004	12	2	211	205	198	193	187	181	176
LIVESTOCK	BAYLOR	BRAZOS	STK	21005012	B	1005	1005	12	12	212	357	357	357	357	357	357
LIVESTOCK	BAYLOR	RED	STK	21005012	B	1005	1005	12	2	354	596	596	596	596	596	596
MINING	BAYLOR	BRAZOS	MIN	21003012	B	1003	1003	12	12	39	32	21	10	5	0	0
SEYMOUR	BAYLOR	BRAZOS	MUN	20819000	B	819	552	12	12	694	732	668	550	486	463	444
BYERS	CLAY	RED	MUN	20133000	B	133	836	39	2	86	91	85	78	74	73	74
COUNTY-OTHER	CLAY	RED	MUN	20996039	B	996	757	39	2	1023	701	638	565	523	462	511
COUNTY-OTHER	CLAY	TRINITY	MUN	20996039	B	996	757	39	8	52	61	45	33	28	22	22
HENRIETTA	CLAY	RED	MUN	20396000	B	396	273	39	2	642	698	697	693	707	724	725
IRRIGATION	CLAY	RED	IRR	21004039	B	1004	1004	39	2	4000	4000	3900	3800	3700	3600	3500
LIVESTOCK	CLAY	RED	STK	21005039	B	1005	1005	39	2	1863	1951	1951	1951	1951	1951	1951
LIVESTOCK	CLAY	TRINITY	STK	21005039	B	1005	1005	39	8	240	240	240	240	240	240	240
MINING	CLAY	RED	MIN	21003039	B	1003	1003	39	2	304	304	219	195	181	177	177
MINING	CLAY	TRINITY	MIN	21003039	B	1003	1003	39	8	6	4	3	3	3	3	3
PETROLIA	CLAY	RED	MUN	20691000	B	691	936	39	2	104	103	96	86	81	79	78
COUNTY-OTHER	COTTLE	RED	MUN	20996051	B	996	757	51	2	432	420	399	374	354	328	303
IRRIGATION	COTTLE	RED	IRR	21004051	B	1004	1004	51	2	4571	4434	4301	4172	4047	3925	3808
LIVESTOCK	COTTLE	RED	STK	21005051	B	1005	1005	51	2	387	387	387	387	387	387	387
MINING	COTTLE	RED	MIN	21003051	B	1003	1003	51	2	23	25	25	27	28	30	30
PADUCAH	COTTLE	RED	MUN	20666000	B	666	447	51	2	239	376	346	309	277	245	217
COUNTY-OTHER	FOARD	RED	MUN	20996078	B	996	757	78	2	117	80	75	73	72	72	65
CROWELL	FOARD	RED	MUN	20217000	B	217	144	78	2	216	313	294	275	257	243	230
IRRIGATION	FOARD	RED	IRR	21004078	B	1004	1004	78	2	5132	4978	4829	4684	4543	4407	4275
LIVESTOCK	FOARD	RED	STK	21005078	B	1005	1005	78	2	289	289	289	289	289	289	289
MINING	FOARD	RED	MIN	21003078	B	1003	1003	78	2	22	23	24	24	25	26	27
CHILLICOTHE	HARDEMAN	RED	MUN	20165000	B	165	110	99	2	165	122	116	112	112	110	110
COUNTY-OTHER	HARDEMAN	RED	MUN	20996099	B	996	757	99	2	209	200	194	202	200	201	204
IRRIGATION	HARDEMAN	RED	IRR	21004099	B	1004	1004	99	2	5154	4999	4849	4704	4563	4426	4293
LIVESTOCK	HARDEMAN	RED	STK	21005099	B	1005	1005	99	2	480	480	480	480	480	480	480
MANUFACTURING	HARDEMAN	RED	MFG	21001099	B	1001	1001	99	2	347	347	374	398	424	452	480
MINING	HARDEMAN	RED	MIN	21003099	B	1003	1003	99	2	6	3	3	3	2	2	2
QUANAH	HARDEMAN	RED	MUN	20727000	B	727	488	99	2	720	614	572	532	514	502	492

TWDB TABLE 2 WATER DEMAND BY CITY AND CATEGORY

WUGNAME	COUNTYNAME	BASINNAME	DATACAT	WUGNUM	RWPG	SEQ#	CITY#	COUNTY#	BASIN#	h1996	d2000	d2010	d2020	d2030	d2040	d2050
STEAM ELECTRIC POWER	HARDEMAN	RED	PWR	21002099	B	1002	1002	99	2	2737	1000	1000	1000	1000	1000	1000
COUNTY-OTHER	KING	BRAZOS	MUN	20996135	B	996	757	135	12	3	3	3	3	1	1	1
COUNTY-OTHER	KING	RED	MUN	20996135	B	996	757	135	2	268	275	272	270	268	268	266
GUTHRIE	KING	RED	MUN	20371000	B	371	257	135	2	64	77	75	69	58	46	36
IRRIGATION	KING	RED	IRR	21004135	B	1004	1004	135	2	20	20	20	20	20	20	20
LIVESTOCK	KING	BRAZOS	STK	21005135	B	1005	1005	135	12	239	283	283	283	283	283	283
LIVESTOCK	KING	RED	STK	21005135	B	1005	1005	135	2	412	488	488	488	488	488	488
BOWIE	MONTAGUE	TRINITY	MUN	20102000	B	102	69	169	8	1092	1090	1016	971	953	946	943
COUNTY-OTHER	MONTAGUE	RED	MUN	20996169	B	996	757	169	2	403	388	358	338	312	293	297
COUNTY-OTHER	MONTAGUE	TRINITY	MUN	20996169	B	996	757	169	8	614	552	471	448	411	378	320
IRRIGATION	MONTAGUE	RED	IRR	21004169	B	1004	1004	169	2	59	59	59	59	59	59	59
IRRIGATION	MONTAGUE	TRINITY	IRR	21004169	B	1004	1004	169	8	238	238	238	238	238	238	238
LIVESTOCK	MONTAGUE	RED	STK	21005169	B	1005	1005	169	2	1057	1057	1057	1057	1057	1057	1057
LIVESTOCK	MONTAGUE	TRINITY	STK	21005169	B	1005	1005	169	8	793	793	793	793	793	793	793
MANUFACTURING	MONTAGUE	RED	MFG	21001169	B	1001	1001	169	2	7	7	9	12	15	19	24
MINING	MONTAGUE	RED	MIN	21003169	B	1003	1003	169	2	609	609	489	467	461	467	480
MINING	MONTAGUE	TRINITY	MIN	21003169	B	1003	1003	169	8	18	18	16	14	12	10	10
MONTAGUE	MONTAGUE	RED	MUN	20606000	B	606	411	169	2	31	55	50	45	41	39	36
NOCONA	MONTAGUE	RED	MUN	20639000	B	639	433	169	2	577	697	664	631	615	603	596
SAINT JO	MONTAGUE	RED	MUN	20786000	B	786	528	169	2	47	35	31	33	33	33	32
SAINT JO	MONTAGUE	TRINITY	MUN	20786000	B	786	528	169	8	139	104	95	100	99	98	97
BURKBURNETT	WICHITA	RED	MUN	20130000	B	130	86	243	2	1443	1887	1865	1828	1823	1827	1842
COUNTY-OTHER	WICHITA	RED	MUN	20996243	B	996	757	243	2	656	659	709	716	708	697	692
ELECTRA	WICHITA	RED	MUN	20277000	B	277	187	243	2	557	617	615	613	603	604	609
IOWA PARK	WICHITA	RED	MUN	20435000	B	435	297	243	2	1192	1335	1306	1292	1290	1294	1304
IRRIGATION	WICHITA	RED	IRR	21004243	B	1004	1004	243	2	57800	60000	59000	58000	57000	56000	55000
LIVESTOCK	WICHITA	RED	STK	21005243	B	1005	1005	243	2	740	740	740	740	740	740	740
MANUFACTURING	WICHITA	RED	MFG	21001243	B	1001	1001	243	2	2172	2172	2315	2441	2558	2702	2814
MINING	WICHITA	RED	MIN	21003243	B	1003	1003	243	2	134	134	86	78	70	46	39
PLEASANT VALLEY	WICHITA	RED	MUN	20996243	B	996	757	243	2	96	101	100	95	93	91	90
SHEPPARD AFB	WICHITA	RED	MUN	20996243	B	996	757	243	2	0	0	0	0	0	0	0
STEAM ELECTRIC POWER	WICHITA	RED	PWR	21002243	B	1002	1002	243	2	349	360	360	360	360	360	360
WICHITA FALLS	WICHITA	RED	MUN	20970000	B	970	654	243	2	21650	22946	22905	22676	22621	22665	22836
COUNTY-OTHER	WILBARGER	RED	MUN	20996244	B	996	757	244	2	514	485	512	517	520	519	536
IRRIGATION	WILBARGER	RED	IRR	21004244	B	1004	1004	244	2	19661	19071	18499	17944	17406	16884	16377
LIVESTOCK	WILBARGER	RED	STK	21005244	B	1005	1005	244	2	1797	1797	1797	1797	1797	1797	1797
MANUFACTURING	WILBARGER	RED	MFG	21001244	B	1001	1001	244	2	704	740	849	904	971	1087	1206
MINING	WILBARGER	RED	MIN	21003244	B	1003	1003	244	2	30	24	23	24	24	24	24
STEAM ELECTRIC POWER	WILBARGER	RED	PWR	21002244	B	1002	1002	244	2	8030	8100	12000	16000	20000	20000	20000
VERNON	WILBARGER	RED	MUN	20930000	B	930	623	244	2	2377	2912	2807	2777	2787	2745	2731
OLNEY	YOUNG	BRAZOS	MUN	20655000	B	655	441	252	12	719	730	727	707	693	680	672
									totals	166652	169572	184580	185636	187203	185027	183214

REGION B - REVIEW OF INITIALLY PREPARED PLAN DRAFT SUBMITTAL OF EXHIBIT B TABLE 3

The enclosed worksheet (RegB_QA_Table3_IPP) is a duplicate of the Exhibit B Table 3 submitted by the RWPG for review by TWDB staff. Fields that are highlighted indicate a possible correction or clarification is needed. Please refer to the column entitled "TWDB REVIEW COMMENTS" for details. Fields corrected by TWDB staff are in bold and the field has a bold border. If the RWPG disagrees with the changes made by TWDB staff, please provide an explanation. The Table has been slightly modified for quality assurance purposes and to reflect the table structure needed for database development. Any additional unrequired fields that were provided by the RWPG were moved to the far right end of the submitted spreadsheet. Any comments or footnotes made by the RWPG directly on the submitted spreadsheet were moved to a field entitled RWPG Comments. Also note that any totals, subtotals, extra headers, etc. were deleted. Merged fields have been adjusted as needed.

Please address the comments included in the TWDB REVIEW COMMENT field.

MWP Alpha Number is incorrect for Wichita Falls (Should be 944456 not 9444456).

The TWDB database references the following entity as buying water from Wichita Falls in 1996. Please clarify.
If a contract exists, this transaction should be reported in Table 3 as a recipient from Wichita Falls.

RECIPIENT ALPHA	MUN-1/ MFG-2	PS-PURCHASE SURFACE WATER	COUNTY	SELLER ALPHA	AMOUNT REPORTED 1996	NAME
145698	2	PS	5	944456	842.04	CERTAIN-TEED CORPORATION

Response: This entity is Vetrotex America, which is included in Table 3.

The TWDB database references the following entities as buying water from Greenbelt MWA. These entities should be checked to determine if contracts exist with Greenbelt MWA. If contracts exist, they should be reported in Table 3 as recipients from Greenbelt MWA.

Recipient Name	Recipient Alpha	Recipient Region	Mun-1 Ind-2	Use County-Basin	Year	Type	Source County-Basin	MWP
CITY OF CHILDRESS	149000	A	1	038-02	1996	PS	065-02	20
CITY OF CLARENDON	156200	A	1	065-02	1996	PS	065-02	20
CITY OF HEDLEY	378800	A	1	065-02	1996	PS	065-02	20
CITY OF MEMPHIS	555800	A	1	096-02	1996	PS	065-02	20
G-P GYPSUM CORP.	72050	B	2	099-02	1996	PS	065-02	20
RED RIVER AUTH	721188	A	1	096-02	1996	PS	065-02	20
RED RIVER AUTH.	721154	A	1	096-02	1996	PS	065-02	20
RED RIVER AUTH.	721160	A	1	038-02	1996	PS	065-02	20
RED RIVER AUTH.	721172	A	1	038-02	1996	PS	065-02	20
RED RIVER AUTH.	721173	A	1	038-02	1996	PS	065-02	20
RED RIVER AUTH.	721174	A	1	038-02	1996	PS	065-02	20
RED RIVER AUTH.	721175	A	1	038-02	1996	PS	065-02	20
RED RIVER AUTH.	721176	A	1	038-02	1996	PS	065-02	20
RED RIVER AUTH.	721177	A	1	065-02	1996	PS	065-02	20
RED RIVER AUTH.	721183	A	1	096-02	1996	PS	065-02	20
RED RIVER AUTH.	721185	A	1	044-02	1996	PS	065-02	20
RED RIVER AUTH.	721186	A	1	096-02	1996	PS	065-02	20
RED RIVER AUTH.	721192	B	1	099-02	1996	PS	065-02	20
RED RIVER AUTH.	721193	B	1	099-02	1996	PS	065-02	20
RED RIVER AUTH.	721198	B	1	099-02	1996	PS	065-02	20

Table 3: Water Demand by Major Water Provider

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
MWP NAME	**RECIPIENT NAME**	**RECIPIENT CITY NAME**	**RECIPIENT COUNTY NAME**	**RECIPIENT BASIN NAME**	**DATA CAT**	**MWP Alpha Number**	**Recipient Alpha Number**	**R. Group**	**R. Group Letter**	**R. Sequence**	**R. City**	**R. County**	**R. Basin**	**1996**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
WICHITA FALLS	ARCHER CITY	ARCHER CITY	ARCHER	RED	MUN.	944456	033660	020035000	B	35	24	5	2	268	246	240	225	215	205	200
WICHITA FALLS	ARCHER CO. MUD #1	COUNTY - OTHER	ARCHER	RED	MUN.	944456	033715	020996005	B	996	757	5	2	110	138	152	150	151	149	147
WICHITA FALLS	HOLLIDAY	HOLLIDAY	ARCHER	RED	MUN.	944456	392440	020411000	B	411	280	5	2	252	256	251	241	233	225	217
WICHITA FALLS	LAKESIDE CITY	LAKESIDE CITY	ARCHER	RED	MUN.	944456	481385	020504000	B	504	894	5	2	149	178	181	188	190	186	184
WICHITA FALLS	SCOTLAND	SCOTLAND	ARCHER	RED	MUN.	944456	778765	020996005	B	996	757	5	2	222	224	226	214	208	205	202
WICHITA FALLS	WINDTHORST WSC	COUNTY - OTHER	ARCHER	RED	MUN.	944456	951400	020996005	B	996	757	5	2	224	233	234	214	208	205	202
WICHITA FALLS	DEAN DALE WSC	COUNTY - OTHER	CLAY	RED	MUN.	944456	216950	020996039	B	996	757	39	2	142	150	155	155	155	155	155
WICHITA FALLS	RED RIVER AUTH.	ARROWHEAD RANCH EST.	CLAY	RED	MUN.	944456	721152	020996039	B	996	757	39	2	86	89	87	84	82	81	81
WICHITA FALLS	RED RIVER AUTH.	LAKE ARROWHEAD	CLAY	RED	MUN.	944456	721171	020996039	B	996	757	39	2	95	95	90	85	83	81	80
WICHITA FALLS	TX. PARKS AND WILDLIFE	LAKE ARROWHEAD	CLAY	RED	MUN.	944456	854237	020996039	B	996	757	39	2	7	7	7	7	7	7	7
WICHITA FALLS	BURKBURNETT	BURKBURNETT	WICHITA	RED	MUN.	944456	109600	020130000	B	130	86	243	2	702	918	900	860	850	840	830
WICHITA FALLS	DEAN DALE WSC	COUNTY - OTHER	WICHITA	RED	MUN.	944456	216950	020996243	B	996	757	243	2	65	69	76	72	72	71	70
WICHITA FALLS	FRIBERG COOPER W.S.C.	COUNTY - OTHER	WICHITA	RED	MUN.	944456	306075	020996243	B	996	757	243	2	83	92	110	119	119	119	119
WICHITA FALLS	IOWA PARK	IOWA PARK	WICHITA	RED	MUN.	944456	422250	020435000	B	435	297	243	2	78	87	80	75	70	65	60
WICHITA FALLS	PLEASANT VALLEY	PLEASANT VALLEY	WICHITA	RED	MUN.	944456	686945	020996243	B	996	757	243	2	96	101	100	95	93	91	90
WICHITA FALLS	SHEPPARD A.F.B.	WICHITA FALLS	WICHITA	RED	MUN.	944456	889610	020996243	B	996	757	243	2	1829	1829	1829	1829	1829	1829	1829
WICHITA FALLS	WICHITA VALLEY W.S.C.	COUNTY - OTHER	WICHITA	RED	MUN.	944456	944457	020996243	B	996	757	243	2	394	390	400	400	395	390	385
WICHITA FALLS	OLNEY	OLNEY	YOUNG	BRAZOS	MUN.	944456	623610	020655000	B	655	441	252	12	69	70	68	65	60	60	60
WICHITA FALLS	AC SPARK PLUG	WICHITA FALLS	WICHITA	RED	MFG	944456	320998	021001243	B	1001	1001	243	2	101	101	108	114	119	126	131
WICHITA FALLS	PPG IND.	WICHITA FALLS	WICHITA	RED	MFG	944456	683510	021001243	B	1001	1001	243	2	303	303	323	341	357	377	393
WICHITA FALLS	STANLEY TOOL	WICHITA FALLS	WICHITA	RED	MFG	944456	419348	021001243	B	1001	1001	243	2	95	95	101	106	111	117	122
WICHITA FALLS	VETROTEX AMERICA	WICHITA FALLS	WICHITA	RED	MFG	944456	145698	021001243	B	1001	1001	243	2	842	842	897	946	991	1047	1090
WICHITA FALLS	FLAKE IND. SERV.	WICHITA FALLS	WICHITA	RED	MFG	944456	287140	021001243	B	1001	1001	243	2	106	106	113	119	125	132	137
WICHITA FALLS	WICHITA NAT. LINEN	WICHITA FALLS	WICHITA	RED	MFG	944456	944420	021001243	B	1001	1001	243	2	93	93	99	104	109	115	120
WICHITA FALLS	HOWMET TURBINE	WICHITA FALLS	WICHITA	RED	MFG	944456	398840	021001243	B	1001	1001	243	2	115	115	123	130	136	144	150
WICHITA FALLS	W F ENERGY	WICHITA FALLS	WICHITA	RED	MFG	944456	944447	021001243	B	1001	1001	243	2	349	349	372	392	411	434	452
WICHITA FALLS	HOWMET REFURB.	WICHITA FALLS	WICHITA	RED	MFG	944456	398840	021001243	B	1001	1001	243	2	31	31	33	35	37	39	41

Table 3: Water Demand by Major Water Provider

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
MWP NAME	RECIPIENT NAME	RECIPIENT CITY NAME	RECIPIENT COUNTY NAME	RECIPIENT BASIN NAME	DATA CAT	MWP Alpha Number	Recipient Alpha Number	R. Group	R. Group Letter	R. Sequence	R. City	R. County	R. Basin	1996	2000	2010	2020	2030	2040	2050
Greenbelt MWA	City of Childress	Childress	Childress	RED	MUN	20	149000	010164000	A	164	109	38	2	1365	1370	1394	1379	1392	1410	1443
Greenbelt MWA	Red River Authority	County-Other	Childress	RED	MUN	20	multiple	010996038	A	996	757	38	2	244	244	244	244	244	244	244
Greenbelt MWA	Red River Authority	County-Other	Collingsworth	RED	MUN	20	721185	010996044	A	996	757	44	2	7	6	6	6	6	6	6
Greenbelt MWA	City of Clarendon	Clarendon	DONLEY	RED	MUN	20	156200	010170000	A	170	112	65	2	397	503	465	433	396	365	332
Greenbelt MWA	City of Hedley	Hedley	DONLEY	RED	MUN	20	378800	010996065	A	996	757	65	2	91	91	91	91	91	91	91
Greenbelt MWA	Red River Authority	County-Other	Donley	RED	MUN	20	721177	010996065	A	996	757	65	2	27	27	27	27	27	27	27
Greenbelt MWA	City of Crowell	Crowell	Foard	RED	MUN	20	195400	020217000	B	217	144	78	2	247	313	294	275	257	243	230
Greenbelt MWA	Red River Authority	County-Other	Foard	RED	MUN	20	721178	020996078	B	996	757	78	2	68	68	68	68	68	68	68
Greenbelt MWA	City of Memphis	Memphis	Hall	RED	MUN	20	555800	010585000	A	585	394	96	2	69	71	67	62	58	56	54
Greenbelt MWA	Red River Authority	County-Other	Hall	RED	MUN	20	multiple	010996096	A	996	757	96	2	106	106	106	106	106	106	106
Greenbelt MWA	City of Quanah	Quanah	Hardeman	RED	MUN	20	708800	020727000	B	727	488	99	2	752	614	572	532	514	502	492
Greenbelt MWA	City of Chillicothe	Chillicothe	Hardeman	RED	MUN	20	149800	020165000	B	165	110	99	2	36	61	58	56	56	55	55
Greenbelt MWA	Georgia Pacific	manufacturing	Hardeman	RED	MFG	20	72050	021001099	B	1001	1001	99	2	346	347	374	398	424	452	480
Greenbelt MWA	Red River Authority	County-Other	Hardeman	RED	MUN	20	multiple	020996099	B	996	757	99	2	166	168	168	168	168	168	168
Greenbelt MWA	Red River Authority	County-Other	Wilbarger	RED	MUN	20	721168	020996244	B	996	757	244	2	3	3	3	3	3	3	3

REGION B - REVIEW OF INITIALLY PREPARED PLAN DRAFT SUBMITTAL OF EXHIBIT B TABLE 4

The enclosed worksheet (RegB_QA_Table4_IPP) is a duplicate of the Exhibit B Table 4 submitted by the RWPG for review by TWDB staff. Fields that are highlighted indicate a possible correction or clarification is needed. Please refer to the column entitled "TWDB REVIEW COMMENTS" for details. Fields corrected by TWDB staff are in bold and the field has a bold border. If the RWPG disagrees with the changes made by TWDB staff, please provide an explanation. The Table has been slightly modified for quality assurance purposes and to reflect the table structure needed for database development. Any additional unrequired fields that were provided by the RWPG were moved to the far right end of the submitted spreadsheet. Any comments or footnotes made by the RWPG directly on the submitted spreadsheet were moved to a field entitled RWPG Comments. Also note that any totals, subtotals, extra headers, etc. were deleted. Merged fields have been adjusted as needed.

Please address the comments included in the TWDB REVIEW COMMENT field.

In addition to comments included in the spreadsheet, please note the following:

Per TWDB website, direct reuse is currently being used as a supply for the City of Wichita Falls, Sheppard AFB, and to a small degree, the City of Burkburnett. Please clarify that this is not a viable supply during drought conditions.

RESPONSE:

According to the TWDB provided histmun.xls file, only the city of Burkburnett is reusing effluent for golf course irrigation. The small amount o
Sheppard AFB was inadvertently left out of the projected demands for Region B, therefore, there is no direct reuse supply identified for them
Direct reuse is a strategy identified for the City of Wichita Falls.

Table 4: Current Water Supply Sources

A	B	C	D	E	F	G	H	I	J	K	L
Name of Specific Source	**Type of Water Supply**	**Regional Water Planning Group**	**County Number for Supply Source**	**Basin Number for Supply Source**	**Specific Source Identifier Number**	**Year 2000 Total Supply During Drought of Record (Ac-Ft)**	**Year 2010 Total Supply During Drought of Record (Ac-Ft)**	**Year 2020 Total Supply During Drought of Record (Ac-Ft)**	**Year 2030 Total Supply During Drought of Record (Ac-Ft)**	**Year 2040 Total Supply During Drought of Record (Ac-Ft)**	**Year 2050 Total Supply During Drought of Record (Ac-Ft)**
GREENBELT	00	A	65	02	02050	7,699	7,548	7,396	7,245	7,093	6,942
WICHITA SYSTEM	02	B		02	020A0	45,478	45,358	45,237	45,117	44,996	44,876
ADDITIONAL SUPPLY - WICHITA SYSTEM	02	B		02	020A0	0	0	0	0	0	0
SANTA ROSA	00	B	244	02	02120	0	0	0	0	0	0
KEMP	00	B	12	02	02130	126,000	120,931	116,080	111,231	106,391	101,540
ELECTRA CITY LAKE	00	B	244	02	02150	470	470	470	470	470	470
N.F. BUFFALO CREEK	00	B	243	02	02170	2,100	2,100	2,100	2,100	2,100	2,100
FARMERS CREEK/ NOCONA	00	B	169	02	02210	1,260	1,260	1,260	1,260	1,260	1,260

Table 4: Current Water Supply Sources

A	B	C	D	E	F	G	H	I	J	K	L
Name of Specific Source	**Type of Water Supply**	**Regional Water Planning Group**	**County Number for Supply Source**	**Basin Number for Supply Source**	**Specific Source Identifier Number**	**Year 2000 Total Supply During Drought of Record (Ac-Ft)**	**Year 2010 Total Supply During Drought of Record (Ac-Ft)**	**Year 2020 Total Supply During Drought of Record (Ac-Ft)**	**Year 2030 Total Supply During Drought of Record (Ac-Ft)**	**Year 2040 Total Supply During Drought of Record (Ac-Ft)**	**Year 2050 Total Supply During Drought of Record (Ac-Ft)**
LAKE PAULINE/GROESBECK	00	B	99	02	02400	1,800	1,746	1,693	1,639	1,585	1,532
AMON G. CARTER	00	B	169	08	08020	2,600	2,563	2,525	2,488	2,450	2,413
OLNEY/ COOPER	02	B	5	02	020B0	910	910	910	910	910	910
LITTLE WICHITA	00	B	39	02	3410205152A	1,463	1,463	1,463	1,463	1,463	1,463
RED RIVER	00	B	169	02	3460204877	1,600	1,600	1,600	1,600	1,600	1,600
BEAVER CREEK	00	B	244	02	3460205127	30	30	30	30	30	30
BEAVER CREEK	00	B	244	02	3460205128	800	800	800	800	800	800
IRRIGATION	00	B	51	02	051996	59	59	59	59	59	59
IRRIGATION	00	B	169	02	169996	100	100	100	100	100	100
IRRIGATION	00	B	169	08	169996	133	133	133	133	133	133
LIVESTOCK	00	B	5	12	12997	125	125	125	125	125	125
LIVESTOCK	00	B	5	02	02997	2,097	2,097	2,097	2,097	2,097	2,097
LIVESTOCK	00	B	5	08	08997	272	272	272	272	272	272
LIVESTOCK	00	B	12	12	12997	373	373	373	373	373	373
LIVESTOCK	00	B	12	02	02997	621	621	621	621	621	621
LIVESTOCK	00	B	39	02	02997	1,757	1,757	1,757	1,757	1,757	1,757
LIVESTOCK	00	B	39	08	08997	225	225	225	225	225	225
LIVESTOCK	00	B	51	02	02997	429	429	429	429	429	429

Table 4: Current Water Supply Sources

A	B	C	D	E	F	G	H	I	J	K	L
Name of Specific Source	**Type of Water Supply**	**Regional Water Planning Group**	**County Number for Supply Source**	**Basin Number for Supply Source**	**Specific Source Identifier Number**	**Year 2000 Total Supply During Drought of Record (Ac-Ft)**	**Year 2010 Total Supply During Drought of Record (Ac-Ft)**	**Year 2020 Total Supply During Drought of Record (Ac-Ft)**	**Year 2030 Total Supply During Drought of Record (Ac-Ft)**	**Year 2040 Total Supply During Drought of Record (Ac-Ft)**	**Year 2050 Total Supply During Drought of Record (Ac-Ft)**
LIVESTOCK	00	B	78	02	02997	291	291	291	291	291	291
LIVESTOCK	00	B	99	02	02997	298	298	298	298	298	298
LIVESTOCK	00	B	135	12	12997	255	255	255	255	255	255
LIVESTOCK	00	B	135	02	02997	439	439	439	439	439	439
LIVESTOCK	00	B	169	02	02997	951	951	951	951	951	951
LIVESTOCK	00	B	169	08	08997	714	714	714	714	714	714
LIVESTOCK	00	B	243	02	02997	700	700	700	700	700	700
LIVESTOCK	00	B	244	02	02997	1,617	1,617	1,617	1,617	1,617	1,617
OTHER LOCAL SUPPLY	00	B	39	02	02999	33	26	16	11	9	8
OTHER LOCAL SUPPLY	00	B	243	02	02999	250	250	250	250	250	250
OTHER LOCAL SUPPLY	00	B	51	02	02999	40	40	42	43	47	47
OTHER LOCAL SUPPLY	00	B	99	02	02999	7	7	7	7	7	7
OTHER AQUIFER	01	B	5	02	00522	297	297	297	297	297	297
OTHER AQUIFER	01	B	5	12	00522	47	43	43	43	43	43

Table 4: Current Water Supply Sources

A	B	C	D	E	F	G	H	I	J	K	L
Name of Specific Source	**Type of Water Supply**	**Regional Water Planning Group**	**County Number for Supply Source**	**Basin Number for Supply Source**	**Specific Source Identifier Number**	**Year 2000 Total Supply During Drought of Record (Ac-Ft)**	**Year 2010 Total Supply During Drought of Record (Ac-Ft)**	**Year 2020 Total Supply During Drought of Record (Ac-Ft)**	**Year 2030 Total Supply During Drought of Record (Ac-Ft)**	**Year 2040 Total Supply During Drought of Record (Ac-Ft)**	**Year 2050 Total Supply During Drought of Record (Ac-Ft)**
OTHER AQUIFER	01	B	5	08	00522	48	44	32	31	31	31
SEYMOUR	01	B	12	02	01204	1,485	1,485	1,485	1,485	1,485	1,485
SEYMOUR	01	B	12	12	01204	8,205	8,205	8,205	8,205	8,205	8,205
SEYMOUR	01	B	39	02	03904	8,217	8,217	8,217	8,217	8,217	8,217
OTHER AQUIFER	01	B	39	02	03922	734	734	734	734	734	734
OTHER AQUIFER	01	B	39	08	03922	118	118	118	118	118	118
SEYMOUR	01	B	51	02	05104	8,520	8,520	8,520	8,520	8,520	8,520
BLAINE	01	B	51	02	05106	27,100	27,100	27,100	27,100	27,100	27,100
OTHER AQUIFER	01	B	51	02	05122	847	836	836	836	836	836
OTHER AQUIFER	01	O	63	02	06322	86	86	86	86	86	86
SEYMOUR	01	B	78	02	07804	12,473	12,473	12,473	12,473	12,473	12,473
BLAINE	01	B	78	02	07806	15,390	15,390	15,390	15,390	15,390	15,390
SEYMOUR	01	B	99	02	09904	18,359	18,359	18,359	18,359	18,359	18,359

Table 4: Current Water Supply Sources

A	B	C	D	E	F	G	H	I	J	K	L
Name of Specific Source	**Type of Water Supply**	**Regional Water Planning Group**	**County Number for Supply Source**	**Basin Number for Supply Source**	**Specific Source Identifier Number**	**Year 2000 Total Supply During Drought of Record (Ac-Ft)**	**Year 2010 Total Supply During Drought of Record (Ac-Ft)**	**Year 2020 Total Supply During Drought of Record (Ac-Ft)**	**Year 2030 Total Supply During Drought of Record (Ac-Ft)**	**Year 2040 Total Supply During Drought of Record (Ac-Ft)**	**Year 2050 Total Supply During Drought of Record (Ac-Ft)**
BLAINE	01	B	99	02	09906	23,770	23,770	23,770	23,770	23,770	23,770
BLAINE	01	B	135	02	13506	17,590	17,590	17,590	17,590	17,590	17,590
OTHER AQUIFER	01	B	135	02	13522	179	179	179	179	179	179
OTHER AQUIFER	01	B	135	12	13522	66	66	66	66	66	66
TRINITY	01	B	169	02	16928	239	239	239	199	199	163
TRINITY	01	B	169	08	16928	2,443	2,443	2,443	2,033	2,033	1,667
OTHER AQUIFER	01	B	169	02	16922	906	901	900	900	900	900
OTHER AQUIFER	01	B	169	08	16922	304	304	304	304	304	304
SEYMOUR	01	B	243	02	24304	14,375	14,375	14,375	14,375	14,375	14,375
OTHER AQUIFER	01	B	243	02	24322	658	658	658	658	658	658
SEYMOUR	01	B	244	02	24404	35,153	35,153	35,153	35,153	35,153	35,153

REGION B - REVIEW OF INITIALLY PREPARED PLAN DRAFT SUBMITTAL OF EXHIBIT B TABLE 5

The enclosed worksheet (RegB_QA_Table5_IPP) is a duplicate of the Exhibit B Table 5 submitted by the RWPG for review by TWDB staff. Fields that are highlighted indicate a possible correction or clarification is needed. Please refer to the column entitled "TWDB REVIEW COMMENTS" for details. Fields corrected by TWDB staff are in bold and the field has a bold border. If the RWPG disagrees with the changes made by TWDB staff, please provide an explanation. The Table has been slightly modified for quality assurance purposes and to reflect the table structure needed for database development. Any additional unrequired fields that were provided by the RWPG were moved to the far right end of the submitted spreadsheet. Any comments or footnotes made by the RWPG directly on the submitted spreadsheet were moved to a field entitled RWPG Comments. Also note that any totals, subtotals, extra headers, etc. were deleted. Merged fields have been adjusted as needed.

Please address the comments included in the TWDB REVIEW COMMENT field.

For consistency between tables, some source names have been adjusted in Table 5 to match the name used in Table 4. Please attempt to use the same source names and Water User Group names in all Exhibit B tables.

Please review available supply for Lake Kemp. Table 6 indicates a portion of Lake Kemp is used by Wichita Falls. Table 5 shows the entire firm yield used for Irrigation and Steam Electric Power. Table 5 does not show Wichita Falls as a provider or that Wichita Falls currently uses Lake Kemp.

Table 5: Current Water Supplies by City and Category

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T		G	I
Water User Group	**WUG Identifier**	**RWPG for WUG**	**Sequence Number**	**City Number**	**County Number**	**Basin Number**	**Type of Water Supply Source**	**Major Water Provider Number**	**Supply Source (RWPG Letter)**	**Groundwater Supply Source (County Number)**	**Supply Source (Basin Number)**	**Specific Source Identifier**	**Specific Source Name**	**Available Supply Year 2000 (Ac-Ft)**	**Available Supply Year 2010 (Ac-Ft)**	**Available Supply Year 2020 (Ac-Ft)**	**Available Supply Year 2030 (Ac-Ft)**	**Available Supply Year 2040 (Ac-Ft)**	**Available Supply Year 2050 (Ac-Ft)**	**Comment**	**County Name**	**Basin Name**
Archer City	020035000	B	35	24	5	02	03	944456	B		02	020A0	Wichita System	673	673	673	673	673	673	Long Term Contract	Archer	Red
County-Other	020996005	B	996	757	5	12	01		B	5	12	00522	Other Aquifer	36	30	30	30	30	30	Historical Use	Archer	Brazos
County-Other	020996005	B	996	757	5	02	01		B	5	02	00522	Other Aquifer	107	107	107	107	107	107	Historical Use	Archer	Red
County-Other	020996005	B	996	757	5	02	03	944456	B		02	020A0	Wichita System	1,009	1,009	1,009	1,009	1,009	1,009	Contracts	Archer	Red
County-Other	020996005	B	996	757	5	08	01		B	5	08	00522	Other Aquifer	24	20	8	7	7	7	Historical Use	Archer	Trinity
Holliday	020411000	B	411	280	5	02	03	944456	B		02	020A0	Wichita System	230	225	215	207	199	191	No Contract Amt, Supply = Demand	Archer	Red
Irrigation (On_Farm)	021004005	B	1004	1004	5	02	00		B		02	02130	Kemp	4,891	4,048	3,765	3,483	3,201	3,100	5% Of Available Irrigation Releases	Archer	Red
Lakeside City	020504000	B	504	894	5	02	03	944456	B		02	020A0	Wichita System	392	392	392	392	392	392	Contract, No Expiration Date	Archer	Red
Livestock	021005005	B	1005	1005	5	12	01		B	5	12	00522	Other Aquifer	11	11	11	11	11	11	80% of Historical Max Use (aquifer limit)	Archer	Brazos
Livestock	021005005	B	1005	1005	5	12	00		B		12	12997	LIVESTOCK	125	125	125	125	125	125	Increased to meet demands, Stock Tanks	Archer	Brazos
Livestock	021005005	B	1005	1005	5	02	01		B	5	02	00522	Other Aquifer	182	182	182	182	182	182	80% of Historical Max Use (aquifer limit)	Archer	Red
Livestock	021005005	B	1005	1005	5	02	00		B		02	02997	LIVESTOCK	2,097	2,097	2,097	2,097	2,097	2,097	Increased to meet demands, Stock Tanks	Archer	Red
Livestock	021005005	B	1005	1005	5	08	01		B	5	08	00522	Other Aquifer	24	24	24	24	24	24	80% of Historical Max Use (aquifer limit)	Archer	Trinity
Livestock	021005005	B	1005	1005	5	08	00		B		08	08997	LIVESTOCK	272	272	272	272	272	272	Increased to meet demands, Stock Tanks	Archer	Trinity
Mining	021003005	B	1003	1003	5	02	01		B	5	02	00522	Other Aquifer	1	1	1	1	1	1	Historical Max Use	Archer	Red
Scotland	020996005	B	996	757	5	02	03	944456	B		02	020A0	Wichita System	280	280	280	280	280	280	Contract, No Expiration Date	Archer	Red
Steam Electric Power	021002005	B	1002	1002	5	02	03		B		02	02130	Kemp	14,000	14,000	14,000	14,000	14,000	14,000	New Contract	Archer	Red
County-Other	020996012	B	996	757	12	12	01		B	12	12	01204	Seymour	226	215	205	199	199	199	Historical Max Use- 10 Yrs, Baylor WSC Max Use = 220 (Red & Brazos), Increased to meet demands	Baylor	Brazos
County-Other	020996012	B	996	757	12	02	01		B	12	02	01204	Seymour	30	30	30	30	30	30	Historical Max Use- 10 Yrs	Baylor	Red
Irrigation (On_Farm)	021004012	B	1004	1004	12	12	01		B	12	12	01204	Seymour	1,837	1,837	1,837	1,837	1,837	1,837	Historical Max Use	Baylor	Brazos
Irrigation (On_Farm)	021004012	B	1004	1004	12	02	01		B	12	02	01204	Seymour	375	375	375	375	375	375	Historical Max Use	Baylor	Red
Livestock	021005012	B	1005	1005	12	12	01		B	12	12	01204	Seymour	41	41	41	41	41	41	Historical Max Use	Baylor	Brazos
Livestock	021005012	B	1005	1005	12	12	00		B		12	12997	LIVESTOCK	373	373	373	373	373	373	Historical Max Use, Stock Tanks	Baylor	Brazos
Livestock	021005012	B	1005	1005	12	02	01		B	12	02	01204	Seymour	69	69	69	69	69	69	Historical Max Use	Baylor	Red
Livestock	021005012	B	1005	1005	12	02	00		B		02	02997	LIVESTOCK	621	621	621	621	621	621	Historical Max Use, Stock Tanks	Baylor	Red
Mining	021003012	B	1003	1003	12	12	01		B	12	12	01204	Seymour	47	47	47	47	47	47	Historical Max Use	Baylor	Brazos
Seymour	020819000	B	819	552	12	12	01		B	12	12	01204	Seymour	747	747	747	747	747	747	Historical Max Use- 10 Yrs	Baylor	Brazos
Byers	020133000	B	133	836	39	02	01		B	39	02	03904	Seymour	91	89	89	89	89	89	Historical Max Use	Clay	Red
County-Other	020996039	B	996	757	39	02	03	944456	B		02	020A0	Wichita System	1,766	1,766	1,766	1,766	1,766	1,766	Contracts W/ Arrowhead Prop/RRA/Dean Dale	Clay	Red
County-Other	020996039	B	996	757	39	02	01		B	39	02	03904	Seymour	55	55	55	55	55	55	Historical Max Use (Lmt=Historical Pump)	Clay	Red
County-Other	020996039	B	996	757	39	02	01		B	39	02	03922	Other Aquifer	300	300	300	300	300	300	Historical Max Use	Clay	Red
County-Other	020996039	B	996	757	39	08	01		B	39	08	03922	Other Aquifer	72	72	72	72	72	72	Historical Max Use	Clay	Trinity

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T		G	I
Water User Group	**WUG Identifier**	**RWPG for WUG**	**Sequence Number**	**City Number**	**County Number**	**Basin Number**	**Type of Water Supply Source**	**Major Water Provider Number**	**Supply Source (RWPG Letter)**	**Groundwater Supply Source (County Number)**	**Supply Source (Basin Number)**	**Specific Source Identifier**	**Specific Source Name**	**Available Supply Year 2000 (Ac-Ft)**	**Available Supply Year 2010 (Ac-Ft)**	**Available Supply Year 2020 (Ac-Ft)**	**Available Supply Year 2030 (Ac-Ft)**	**Available Supply Year 2040 (Ac-Ft)**	**Available Supply Year 2050 (Ac-Ft)**	**Comment**	**County Name**	**Basin Name**
Henrietta	020396000	B	396	273	39	02	00		B		02	3410205152A	Little Wichita River	960	960	960	960	960	960	Run of River Right - Little Wichita (difference between right amount and Arrowhead make-up)	Clay	Red
Henrietta	020396000	B	396	273	39	02	03	944456	B		02	020A0	Wichita System	600	600	600	600	600	600	Estimated amount from Lake Arrowhead for shortfall of superior run of river right	Clay	Red
Irrigation (On_Farm)	021004039	B	1004	1004	39	02	01		B	39	02	03922	Other Aquifer	250	250	250	250	250	250	Historical Max Use - Split Between Seymour & Other	Clay	Red
Irrigation (On_Farm)	021004039	B	1004	1004	39	02	01		B	39	02	03904	Seymour	287	287	287	287	287	287	Historical Max Use - Split Between Seymour & Other	Clay	Red
Irrigation (On_Farm)	021004039	B	1004	1004	39	02	00		B		02	02130	Kemp	4,754	3,911	3,628	3,346	3,064	2,963	5% Of Available Irrigation Releases	Clay	Red
Livestock	021005039	B	1005	1005	39	02	00		B		02	02997	LIVESTOCK	1,757	1,757	1,757	1,757	1,757	1,757	Historical Max Use, Stock Tanks	Clay	Red
Livestock	021005039	B	1005	1005	39	02	01		B	39	02	03904	Seymour	100	100	100	100	100	100	Historical Max Use	Clay	Red
Livestock	021005039	B	1005	1005	39	02	01		B	39	02	03922	Other Aquifer	94	94	94	94	94	94	Historical Max Use	Clay	Red
Livestock	021005039	B	1005	1005	39	08	00		B		08	08997	LIVESTOCK	225	225	225	225	225	225	Historical Max Use, Stock Tanks	Clay	Trinity
Livestock	021005039	B	1005	1005	39	08	01		B	39	08	03922	Other Aquifer	25	25	25	25	25	25	Historical Max Use	Clay	Trinity
Mining	021003039	B	1003	1003	39	02	01		B	39	02	03904	Seymour	502	502	502	502	502	502	Historical Max Use	Clay	Red
Mining	021003039	B	1003	1003	39	08	01		B	39	08	03922	Other Aquifer	6	6	6	6	6	6	Historical Max Use	Clay	Trinity
Petrolia	020691000	B	691	936	39	02	00		B		02	02999	OTHER LOCAL SUPPLY	33	26	16	11	9	8	Petrolia City Lake, assume supply is used only to meet demands during drought	Clay	Red
Petrolia	020691000	B	691	936	39	02	01		B	39	02	03904	Seymour	70	70	70	70	70	70	Historical Use	Clay	Red
County-Other	020996051	B	996	757	51	02	01		B	51	02	05122	Other Aquifer	405	384	359	339	313	288	Increased to meet demands, demands inadvertently calculated from population numbers. Actual demand is less.	Cottle	Red
County-Other	020996051	B	996	757	51	02	00		B		02	02999	OTHER LOCAL SUPPLY	15	15	15	15	15	15	Historical Max Use	Cottle	Red
Irrigation (On_Farm)	021004051	B	1004	1004	51	02	01		B	51	02	05106	Blaine	4,525	4,525	4,525	4,525	4,525	4,525	Historical Max Use	Cottle	Red
Irrigation (On_Farm)	021004051	B	1004	1004	51	02	01		B	51	02	05122	Other Aquifer	0	0	0	0	0	0	Historical Max Use	Cottle	Red
Irrigation (On_Farm)	021004051	B	1004	1004	51	02	00		B		02	051996	IRRIGATION	59	59	59	59	59	59	Run of River rights 5111 and 5114	Cottle	Red
Livestock	021005051	B	1005	1005	51	02	01		B	51	02	05104	Seymour	47	47	47	47	47	47	Historical Max Use	Cottle	Red
Livestock	021005051	B	1005	1005	51	02	00		B		02	02997	LIVESTOCK	429	429	429	429	429	429	Historical Max Use, Stock Tanks	Cottle	Red
Mining	021003051	B	1003	1003	51	02	00		B		02	02999	OTHER LOCAL SUPPLY	25	25	27	28	30	30	Supply was increased from local source to meet small increase in demands.	Cottle	Red
Paducah	020666000	B	666	447	51	02	01		B	51	02	05122	Other Aquifer	442	442	442	442	442	442	Historical Max Use - 10 Years	Cottle	Red
County-Other	020996078	B	996	757	78	02	03	20	A		02	02050	Greenbelt	68	68	68	68	68	68	1996 Use - RRA	Foard	Red
County-Other	020996078	B	996	757	78	02	01		B	78	02	07804	Seymour	113	113	113	113	113	113	Historical Max Use	Foard	Red
Crowell	020217000	B	217	144	78	02	03	20	A		02	02050	Greenbelt	313	294	275	257	243	230	No Contract Amt, Supply = Demand	Foard	Red
Irrigation (On_Farm)	021004078	B	1004	1004	78	02	01		B	78	02	07804	Seymour	5,200	5,200	5,200	5,200	5,200	5,200	Historical Max Use	Foard	Red
Irrigation (On_Farm)	021004078	B	1004	1004	78	02	01		B	78	02	07806	Blaine	23	23	23	23	23	23	Historical Max Use	Foard	Red
Irrigation (On_Farm)	021004078	B	1004	1004	78	02	01		B	78	02	07804	Seymour	32	32	32	32	32	32	Historical Max Use	Foard	Red
Livestock	021005078	B	1005	1005	78	02	00		B		02	02997	LIVESTOCK	291	291	291	291	291	291	Historical Max Use, Stock Tanks	Foard	Red
Mining	**021003078**	B	1003	1003	78	02	01		B	78	02	07804	Seymour	23	24	24	25	26	27	Increased to meet demands	Foard	Red

Table 5: Current Water Supplies by City and Category

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T		G	I
Water User Group	**WUG Identifier**	**RWPG for WUG**	**Sequence Number**	**City Number**	**County Number**	**Basin Number**	**Type of Water Supply Source**	**Major Water Provider Number**	**Supply Source (RWPG Letter)**	**Groundwater Supply Source (County Number)**	**Supply Source (Basin Number)**	**Specific Source Identifier**	**Specific Source Name**	**Available Supply Year 2000 (Ac-Ft)**	**Available Supply Year 2010 (Ac-Ft)**	**Available Supply Year 2020 (Ac-Ft)**	**Available Supply Year 2030 (Ac-Ft)**	**Available Supply Year 2040 (Ac-Ft)**	**Available Supply Year 2050 (Ac-Ft)**	**Comment**	**County Name**	**Basin Name**
Chillicothe	020165000	B	165	110	99	02	03	20	A		02	02050	Greenbelt	61	58	56	56	55	55	No contract amount. Assume Greenbelt Meets 50% Of Demands (based on historical split)	Hardeman	Red
Chillicothe	020165000	B	165	110	99	02	01		B	99	02	09904	Seymour	80	80	80	80	80	80	Current Gw Use	Hardeman	Red
County-Other	020996099	B	996	757	99	02	03	20	A		02	02050	Greenbelt	168	168	168	168	168	168	1996 Historical Use - RRA	Hardeman	Red
County-Other	020996099	B	996	757	99	02	01		B	99	02	09904	Seymour	116	116	116	116	116	116	Historical Max Use	Hardeman	Red
Irrigation (On_Farm)	021004099	B	1004	1004	99	02	00		B		02	02400	LAKE PAULINE/ GROESBECK	145	145	145	145	145	145	Historical Max Use, Groesbeck Creek	Hardeman	Red
Irrigation (On_Farm)	021004099	B	1004	1004	99	02	01		B	99	02	09906	Blaine	7,000	7,000	7,000	7,000	7,000	7,000	Historical Max Use	Hardeman	Red
Irrigation (On_Farm)	021004099	B	1004	1004	99	02	01		B	99	02	09904	Seymour	150	150	150	150	150	150	Historical Max Use	Hardeman	Red
Livestock	021005099	B	1005	1005	99	02	00		B		02	02997	LIVESTOCK	298	298	298	298	298	298	Historical Max Use, Stock Tanks	Hardeman	Red
Livestock	021005099	B	1005	1005	99	02	01		B	99	02	09904	Seymour	198	198	198	198	198	198	Historical Max Use	Hardeman	Red
Manufacturing	021001099	B	1001	1001	99	02	03	20	A		02	02050	Greenbelt	347	374	398	424	452	480	No Contract Amt, Supply = Demand	Hardeman	Red
Mining	021003099	B	1003	1003	99	02	00		B		02	02999	OTHER LOCAL SUPPLY	7	7	7	7	7	7	Historical Max Use	Hardeman	Red
Quanah	020727000	B	727	488	99	02	03	20	A		02	02050	Greenbelt	614	572	532	514	502	492	No Contract Amt, Supply = Demand	Hardeman	Red
Steam Electric Power	021002099	B	1002	1002	99	02	00		B		02	02400	LAKE PAULINE/ GROESBECK	1,655	1,601	1,548	1,494	1,440	1,387	Pauline/Groesbeck Creek Yield	Hardeman	Red
County-Other	020996135	B	996	757	135	12	01		B	135	12	13522	Other Aquifer	4	4	4	4	4	4	Historical Max Use	King	Brazos
County-Other	020996135	B	996	757	135	02	01		B	135	02	13506	Blaine	275	272	270	268	267	266	Increased to meet demands. Demand was inadverently calculated from population. Actual demand is less.	King	Red
Guthrie	020371000	B	371	257	135	02	01		O	63	02	06322	Other Aquifer	86	86	86	86	86	86	Historical Max- Supplied By RRA From Dickens Co	King	Red
Irrigation (On_Farm)	021004135	B	1004	1004	135	02	01		B	135	02	13506	Blaine	750	750	750	750	750	750	Historical Max Use	King	Red
Livestock	021005135	B	1005	1005	135	12	00		B		12	12997	LIVESTOCK	255	255	255	255	255	255	Historical Max Use, Stock Tanks	King	Brazos
Livestock	021005135	B	1005	1005	135	12	01		B	135	12	13522	Other Aquifer	28	28	28	28	28	28	Historical Max Use	King	Brazos
Livestock	021005135	B	1005	1005	135	02	01		B	135	02	13506	Blaine	49	49	49	49	49	49	Historical Max Use	King	Red
Livestock	021005135	B	1005	1005	135	02	00		B		02	02997	LIVESTOCK	439	439	439	439	439	439	Historical Max Use, Stock Tanks	King	Red
Bowie	020102000	B	102	69	169	08	00		B		08	08020	Amon G. Carter	2,457	2,420	2,382	2,345	2,307	2,270	Yield Of Reservoir- Sales	Montague	Trinity
County-Other	020996169	B	996	757	169	02	00		B		02	02210	FARMERS CREEK/ NOCONA	38	38	38	38	38	38	Historical Max Use	Montague	Red
County-Other	020996169	B	996	757	169	02	01		B	169	02	16922	Other Aquifer	416	416	416	416	416	416	Historical Max Use	Montague	Red
County-Other	020996169	B	996	757	169	02	01		B	169	02	16928	Trinity	0	0	0	0	0	0	Historical Max Use	Montague	Red
County-Other	020996169	B	996	757	169	08	01		B	169	08	16922	Other Aquifer	300	300	300	300	300	300	Historical Max Use	Montague	Trinity
County-Other	020996169	B	996	757	169	08	00		B		08	08020	Amon G. Carter	143	143	143	143	143	143	Historical Max Use	Montague	Trinity
County-Other	020996169	B	996	757	169	08	01		B	169	08	16928	Trinity	200	200	200	200	200	200	Historical Max Use	Montague	Trinity
Irrigation (On_Farm)	021004169	B	1004	1004	169	02	01		B	169	02	16922	Other Aquifer	19	19	19	19	19	19	Historical Max Use	Montague	Red
Irrigation (On_Farm)	021004169	B	1004	1004	169	02	00		B		02	02210	FARMERS CREEK/ NOCONA	100	100	100	100	100	100	Water Right 4879	Montague	Red
Irrigation (On_Farm)	021004169	B	1004	1004	169	02	00		B		02	169996	IRRIGATION	100	100	100	100	100	100	Run Of River Right 5605	Montague	Red

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A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T		G	I
Water User Group	**WUG Identifier**	**RWPG for WUG**	**Sequence Number**	**City Number**	**County Number**	**Basin Number**	**Type of Water Supply Source**	**Major Water Provider Number**	**Supply Source (RWPG Letter)**	**Groundwater Supply Source (County Number)**	**Supply Source (Basin Number)**	**Specific Source Identifier**	**Specific Source Name**	**Available Supply Year 2000 (Ac-Ft)**	**Available Supply Year 2010 (Ac-Ft)**	**Available Supply Year 2020 (Ac-Ft)**	**Available Supply Year 2030 (Ac-Ft)**	**Available Supply Year 2040 (Ac-Ft)**	**Available Supply Year 2050 (Ac-Ft)**	**Comment**	**County Name**	**Basin Name**
Irrigation (On_Farm)	021004169	B	1004	1004	169	08	01		B	169	08	16928	Trinity	179	179	179	179	179	179	Historical Max Use	Montague	Trinity
Irrigation (On_Farm)	021004169	B	1004	1004	169	08	00		B		08	169996	IRRIGATION	133	133	133	133	133	133	Historical Max Use	Montague	Trinity
Livestock	021005169	B	1005	1005	169	02	01		B	169	02	16922	Other Aquifer	106	106	106	106	106	106	Historical Max Use	Montague	Red
Livestock	021005169	B	1005	1005	169	02	00		B		02	02997	LIVESTOCK	951	951	951	951	951	951	Historical Max Use, Stock Tanks	Montague	Red
Livestock	021005169	B	1005	1005	169	08	01		B	169	08	16928	Trinity	79	79	79	79	79	79	Historical Max Use	Montague	Trinity
Livestock	021005169	B	1005	1005	169	08	00		B		08	08997	LIVESTOCK	714	714	714	714	714	714	Historical Max Use, Stock Tanks	Montague	Trinity
Manufacturing	021001169	B	1001	1001	169	02	00		B		02	02210	FARMERS CREEK/ NOCONA	10	10	12	15	19	24	Historical Max Use/Future Demand	Montague	Red
Mining	021003169	B	1003	1003	169	02	00		B		02	3460204877	Red River	313	313	313	313	313	313	Run Of River Right, Historical Max Use	Montague	Red
Mining	021003169	B	1003	1003	169	02	01		B	169	02	16922	Other Aquifer	310	310	310	310	310	310	Historical Max Use	Montague	Red
Mining	021003169	B	1003	1003	169	08	01		B	169	08	16928	Trinity	18	18	18	18	18	18	Historical Max Use	Montague	Trinity
Montague	020606000	B	606	411	169	02	01		B	169	02	16922	Other Aquifer	55	50	45	41	39	38	Increased to meet demands	Montague	Red
Nocona	020639000	B	639	433	169	02	00		B		02	02210	FARMERS CREEK/ NOCONA	1,112	1,112	1,110	1,107	1,103	1,098	Yield minus other allocations	Montague	Red
Saint Jo	020786000	B	786	528	169	02	01		B	169	02	16928	Trinity	47	47	47	47	47	47		Montague	Red
Saint Jo	020786000	B	786	528	169	08	01		B	169	08	16928	Trinity	139	139	139	139	139	139	Historical Max Use	Montague	Trinity
Burkburnett	020130000	B	130	86	243	02	01		B	243	02	24304	Seymour	916	916	916	916	916	916	Historical Max- 10 Yrs	Wichita	Red
Burkburnett	020130000	B	130	86	243	02	03	944456	B		02	020A0	Wichita System	2,795	2,795	2,795	2,795	2,795	2,795	Contract	Wichita	Red
County-Other	020996243	B	996	757	243	02	03	944456	B		02	020A0	Wichita System	1,682	1,682	1,682	1,682	1,682	1,682	WSC Contracts In Wichita Co.	Wichita	Red
County-Other	020996243	B	996	757	243	02	01		B	243	02	24304	Seymour	851	851	851	851	851	851	Historical Max- 10 Yrs	Wichita	Red
County-Other	020996243	B	996	757	243	02	00		B		02	02170	N.F. Buffalo Creek	340	340	340	340	340	340	Iowa Park Sales To Wichita Valley WSC	Wichita	Red
Electra	020277000	B	277	187	243	02	00		B		02	02150	Electra City Lake	440	440	440	440	440	440	1999 Yield Study minus sales	Wichita	Red
Electra	020277000	B	277	187	243	02	01		B	243	02	24304	Seymour	112	112	112	112	112	112	1998 Study (DGRA)	Wichita	Red
Iowa Park	020435000	B	435	297	243	02	00		B		02	02170	N.F. Buffalo Creek	500	500	500	500	500	500	Water Right-Minus County Sales	Wichita	Red
Iowa Park	020435000	B	435	297	243	02	00		B		02	02999	OTHER LOCAL SUPPLY	250	250	250	250	250	250	Half - Lake Iowa Park Water Rt #05132 (Based on historical use for self-supplied >1,000 af/y)	Wichita	Red
Iowa Park	020435000	B	435	297	243	02	03	944456	B		02	020A0	Wichita System	2,036	2,036	2,036	2,036	2,036	2,036	Contract less industrial sales	Wichita	Red
Irrigation (On_Farm)	021004243	B	1004	1004	243	02	00		B		02	02130	Kemp	71,354	67,972	63,686	59,402	55,126	54,109	90% Of Available Irrigation Releases	Wichita	Red
Irrigation (On_Farm)	021004243	B	1004	1004	243	02	01		B	243	02	24304	Seymour	712	712	712	712	712	712	Historical Max Use	Wichita	Red
Irrigation (On_Farm)	021004243	B	1004	1004	243	02	01		B	243	02	24322	Other Aquifer	179	179	179	179	179	179	Historical Max Use	Wichita	Red
Livestock	021005243	B	1005	1005	243	02	01		B	243	02	24304	Seymour	78	78	78	78	78	78	Historical Max Use	Wichita	Red
Livestock	021005243	B	1005	1005	243	02	00		B		02	02997	LIVESTOCK	700	700	700	700	700	700	Historical Max Use, Stock Tanks	Wichita	Red
Manufacturing	021001243	B	1001	1001	243	02	03	944456	B		02	020A0	Wichita System	1,956	2,099	2,225	2,342	2,486	2,598	Increased to meet demands	Wichita	Red
Manufacturing	021001243	B	1001	1001	243	02	01		B	243	02	24304	Seymour	216	216	216	216	216	216	Historical Max - 10 Yrs	Wichita	Red
Mining	021003243	B	1003	1003	243	02	01		B	243	02	24304	Seymour	594	594	594	594	594	594	Historical Max Use	Wichita	Red
Pleasant Valley	020996243	B	996	757	243	02	03	944456	B		02	020A0	Wichita System	101	100	95	93	91	90	No Contract Amt, Supply = Demands	Wichita	Red

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Water User Group	**WUG Identifier**	**RWPG for WUG**	**Sequence Number**	**City Number**	**County Number**	**Basin Number**	**Type of Water Supply Source**	**Major Water Provider Number**	**Supply Source (RWPG Letter)**	**Groundwater Supply Source (County Number)**	**Supply Source (Basin Number)**	**Specific Source Identifier**	**Specific Source Name**	**Available Supply Year 2000 (Ac-Ft)**	**Available Supply Year 2010 (Ac-Ft)**	**Available Supply Year 2020 (Ac-Ft)**	**Available Supply Year 2030 (Ac-Ft)**	**Available Supply Year 2040 (Ac-Ft)**	**Available Supply Year 2050 (Ac-Ft)**	**Comment**	**County Name**	**Basin Name**
Steam Electric Power	021002243	B	1002	1002	243	02	03	944456	B		02	020A0	Wichita System	360	360	360	360	360	360	Historical Max - 10 Yrs	Wichita	Red
Wichita Falls	020970000	B	970	654	243	02	02	944456	B		02	020A0	Wichita System	28,048	27,791	27,559	27,332	27,077	26,854	Remainder Of System Yield	Wichita	Red
County-Other	020996244	B	996	757	244	02	01		B	244	02	24404	Seymour	676	676	676	676	676	676	1997 Usage, 10-Yr Max = 2324(1988)	Wilbarger	Red
County-Other	020996244	B	996	757	244	02	00		B		02	02150	Electra City Lake	30	30	30	30	30	30	Municipal Sales from Electra to Harrolds WSC	Wilbarger	Red
Irrigation (On_Farm)	021004244	B	1004	1004	244	02	00		B		02	02120	Santa Rosa	0	0	0	0	0	0	Water Right	Wilbarger	Red
Irrigation (On_Farm)	021004244	B	1004	1004	244	02	01		B	244	02	24404	Seymour	23,989	23,989	23,989	23,989	23,989	23,989	Hist Max -Seymour Minus Other Demands, Hist Max - Irrigation = 25,846	Wilbarger	Red
Livestock	021005244	B	1005	1005	244	02	01		B	244	02	24404	Seymour	180	180	180	180	180	180	Historical Max Use	Wilbarger	Red
Livestock	021005244	B	1005	1005	244	02	00		B		02	02997	LIVESTOCK	1,617	1,617	1,617	1,617	1,617	1,617	Historical Max Use, Stock Tanks	Wilbarger	Red
Manufacturing	021001244	B	1001	1001	244	02	01		B	244	02	24404	Seymour	685	685	685	685	685	685	Historical Max- 10 Yrs	Wilbarger	Red
Mining	021003244	B	1003	1003	244	02	01		B	244	02	24404	Seymour	10	10	10	10	10	10	Historical Use	Wilbarger	Red
Mining	021003244	B	1003	1003	244	02	00		B		02	3460205127	Beaver Creek	30	30	30	30	30	30	Water Right - 5127	Wilbarger	Red
Steam Electric Power	021002244	B	1002	1002	244	02	03		B		02	02130	Kemp	20,000	20,000	20,000	20,000	0	0	Contract - West Tx Utility Co	Wilbarger	Red
Vernon	020930000	B	930	623	244	02	01		B	244	02	24404	Seymour	2,640	2,640	2,640	2,640	2,640	2,640	Long-Term Supply- Municipal	Wilbarger	Red
Olney	020655000	B	655	441	252	12	03	944456	B		02	020A0	Wichita System	1,121	1,121	1,121	1,121	1,121	1,121	Water Right	Young	Brazos
Olney	020655000	B	655	441	252	12	02		B		02	020B0	OLNEY/ COOPER	910	910	910	910	910	910	Lakes Olney/Cooper - reservoir yield	Young	Brazos

REGION B - REVIEW OF INITIALLY PREPARED PLAN DRAFT SUBMITTAL OF EXHIBIT B TABLE 6

The enclosed worksheet (RegB_QA_Table6_IPP) is a duplicate of the Exhibit B Table 6 submitted by the RWPG for review by TWDB staff. Fields that are highlighted indicate a possible correction or clarification is needed. Please refer to the column entitled "TWDB REVIEW COMMENTS" for details. Fields corrected by TWDB staff are in bold and the field has a bold border. If the RWPG disagrees with the changes made by TWDB staff, please provide an explanation. The Table has been slightly modified for quality assurance purposes and to reflect the table structure needed for database development. Any additional unrequired fields that were provided by the RWPG were moved to the far right end of the submitted spreadsheet. Any comments or footnotes made by the RWPG directly on the submitted spreadsheet were moved to a field entitled RWPG Comments. Also note that any totals, subtotals, extra headers, etc. were deleted. Merged fields have been adjusted as needed.

Please address the comments included in the TWDB REVIEW COMMENT field.

Table 6 Current Water Supplies Available by Major Water Provider

Major Water Provider Name	Major Water Provider Number	Type of Water Supply Source	MWP Number-Seller	RWPG (supply source)	County Number	Basin	Specific Source Identifier	Specific Source Name	Available Supply for Year 2000 (Ac-Ft)	Available Supply for Year 2010 (Ac-Ft)	Available Supply for Year 2020 (Ac-Ft)	Available Supply for Year 2030 (Ac-Ft)	Available Supply for Year 2040 (Ac-Ft)	Available Supply for Year 2050 (Ac-Ft)	RWPG Comments
WICHITA FALLS	944456	02		B		02	020A0	Wichita System	45,478	45,358	45,237	45,117	44,996	44,876	System yield
WICHITA FALLS	944456	00		B		02	02130	Lake Kemp	11,000	11,000	11,000	11,000	11,000	7,368	portion of water rights for municipal use
Greenbelt MWA	20	00		A		02	02050	Greenbelt	7,699	7,548	7,396	7,245	7,093	6,942	reservoir yield

REGION B - REVIEW OF INITIALLY PREPARED PLAN DRAFT SUBMITTAL OF EXHIBIT B TABLE 7

The enclosed worksheet (RegB_QA_Table7_IPP) is a duplicate of the Exhibit B Table 7 submitted by the RWPG for review by TWDB staff. Fields that are highlighted indicate a possible correction or clarification is needed. Please refer to the column entitled "TWDB REVIEW COMMENTS" for details. Fields corrected by TWDB staff are in bold and the field has a bold border. If the RWPG disagrees with the changes made by TWDB staff, please provide an explanation. The Table has been slightly modified for quality assurance purposes and to reflect the table structure needed for database development. Any additional unrequired fields that were provided by the RWPG were moved to the far right end of the submitted spreadsheet. Any comments or footnotes made by the RWPG directly on the submitted spreadsheet were moved to a field entitled RWPG Comments. Also note that any totals, subtotals, extra headers, etc. were deleted. Merged fields have been adjusted as needed.

Please address the comments included in the TWDB REVIEW COMMENT field.

Table 7 Comparison of Water Demands with Current Supplies by City and Category

WUGNAME	WUGNUM	RWPG	SEQ#	CITY#	COUNTY#	BASIN#	2000	2010	2020	2030	2040	2050
ARCHER CITY	020035000	B	35	24	5	02	351	357	372	383	394	406
COUNTY-OTHER	020996005	B	996	757	5	12	0	0	22	20	23	23
COUNTY-OTHER	020996005	B	996	757	5	02	442	437	461	475	488	498
COUNTY-OTHER	020996005	B	996	757	5	08	0	0	0	5	5	5
HOLLIDAY	020411000	B	411	280	5	02	0	0	0	0	0	0
IRRIGATION	021004005	B	1004	1004	5	02	1291	548	365	183	1	0
IRRIGATION	021004005	B	1004	1004	5	12	0	0	0	0	0	0
IRRIGATION	021004005	B	1004	1004	5	08	0	0	0	0	0	0
LAKESIDE CITY	020504000	B	504	894	5	02	214	211	204	202	206	208
LIVESTOCK	021005005	B	1005	1005	5	12	0	0	0	0	0	0
LIVESTOCK	021005005	B	1005	1005	5	02	0	0	0	0	0	0
LIVESTOCK	021005005	B	1005	1005	5	08	0	0	0	0	0	0
MANUFACTURING	021001005	B	1001	1001	5	12	0	0	0	0	0	0
MANUFACTURING	021001005	B	1001	1001	5	02	0	0	0	0	0	0
MANUFACTURING	021001005	B	1001	1001	5	08	0	0	0	0	0	0
MINING	021003005	B	1003	1003	5	02	1	1	1	1	1	1
MINING	021003005	B	1003	1003	5	12	0	0	0	0	0	0
MINING	021003005	B	1003	1003	5	08	0	0	0	0	0	0
SCOTLAND	020996005	B	996	757	5	02	56	54	66	72	75	78
STEAM ELECTRIC POWER	021002005	B	1002	1002	5	12	0	0	0	0	0	0
STEAM ELECTRIC POWER	021002005	B	1002	1002	5	02	14000	0	0	0	0	0
STEAM ELECTRIC POWER	021002005	B	1002	1002	5	08	0	0	0	0	0	0
COUNTY-OTHER	020996012	B	996	757	12	12	0	0	0	0	0	0
COUNTY-OTHER	020996012	B	996	757	12	02	8	13	15	17	17	18
IRRIGATION	021004012	B	1004	1004	12	12	1335	1350	1364	1378	1392	1406
IRRIGATION	021004012	B	1004	1004	12	02	170	177	182	188	194	199
LIVESTOCK	021005012	B	1005	1005	12	12	57	57	57	57	57	57
LIVESTOCK	021005012	B	1005	1005	12	02	94	94	94	94	94	94
MANUFACTURING	021001012	B	1001	1001	12	12	0	0	0	0	0	0

Table 7 Comparison of Water Demands with Current Supplies by City and Category

WUGNAME	WUGNUM	RWPG	SEQ#	CITY#	COUNTY#	BASIN#	2000	2010	2020	2030	2040	2050
MANUFACTURING	021001012	B	1001	1001	12	02	0	0	0	0	0	0
MINING	021003012	B	1003	1003	12	12	15	26	37	42	47	47
MINING	021003012	B	1003	1003	12	02	0	0	0	0	0	0
SEYMOUR	020819000	B	819	552	12	12	15	79	197	261	284	303
STEAM ELECTRIC POWER	021002012	B	1002	1002	12	12	0	0	0	0	0	0
STEAM ELECTRIC POWER	021002012	B	1002	1002	12	02	0	0	0	0	0	0
BYERS	020133000	B	133	836	39	02	0	4	11	15	16	15
COUNTY-OTHER	020996039	B	996	757	39	02	1420	1483	1556	1598	1659	1610
COUNTY-OTHER	020996039	B	996	757	39	08	11	27	39	44	50	50
HENRIETTA	020396000	B	396	273	39	02	862	863	867	853	836	835
IRRIGATION	021004039	B	1004	1004	39	02	1291	548	365	183	1	0
IRRIGATION	021004039	B	1004	1004	39	08	0	0	0	0	0	0
LIVESTOCK	021005039	B	1005	1005	39	02	0	0	0	0	0	0
LIVESTOCK	021005039	B	1005	1005	39	08	10	10	10	10	10	10
MANUFACTURING	021001039	B	1001	1001	39	02	0	0	0	0	0	0
MANUFACTURING	021001039	B	1001	1001	39	08	0	0	0	0	0	0
MINING	021003039	B	1003	1003	39	02	198	283	307	321	325	325
MINING	021003039	B	1003	1003	39	08	2	3	3	3	3	3
PETROLIA	020691000	B	691	936	39	02	0	0	0	0	0	0
STEAM ELECTRIC POWER	021002039	B	1002	1002	39	02	0	0	0	0	0	0
STEAM ELECTRIC POWER	021002039	B	1002	1002	39	08	0	0	0	0	0	0
COUNTY-OTHER	020996051	B	996	757	51	02	0	0	0	0	0	0
IRRIGATION	021004051	B	1004	1004	51	02	150	283	412	537	659	776
LIVESTOCK	021005051	B	1005	1005	51	02	89	89	89	89	89	89
MANUFACTURING	021001051	B	1001	1001	51	02	0	0	0	0	0	0
MINING	021003051	B	1003	1003	51	02	0	0	0	0	0	0

Table 7 Comparison of Water Demands with Current Supplies by City and Category

WUGNAME	WUGNUM	RWPG	SEQ#	CITY#	COUNTY#	BASIN#	2000	2010	2020	2030	2040	2050
PADUCAH	020666000	B	666	447	51	02	74	104	141	173	205	233
STEAM ELECTRIC POWER	021002051	B	1002	1002	51	02	0	0	0	0	0	0
COUNTY-OTHER	020996078	B	996	757	78	02	101	106	108	109	110	116
CROWELL	020217000	B	217	144	78	02	0	0	0	0	0	0
IRRIGATION	021004078	B	1004	1004	78	02	277	426	571	712	848	980
LIVESTOCK	021005078	B	1005	1005	78	02	2	2	2	2	2	2
MANUFACTURING	021001078	B	1001	1001	78	02	0	0	0	0	0	0
MINING	021003078	B	1003	1003	78	02	0	0	0	0	0	0
STEAM ELECTRIC POWER	021002078	B	1002	1002	78	02	0	0	0	0	0	0
CHILLICOTHE	020165000	B	165	110	99	02	19	22	24	24	25	25
COUNTY-OTHER	020996099	B	996	757	99	02	84	90	82	84	83	80
IRRIGATION	021004099	B	1004	1004	99	02	2296	2446	2591	2732	2869	3002
LIVESTOCK	021005099	B	1005	1005	99	02	16	16	16	16	16	16
MANUFACTURING	021001099	B	1001	1001	99	02	0	0	0	0	0	0
MINING	021003099	B	1003	1003	99	02	4	4	4	5	5	5
QUANAH	020727000	B	727	488	99	02	0	0	0	0	0	0
STEAM ELECTRIC POWER	021002099	B	1002	1002	99	02	655	601	548	494	440	387
COUNTY-OTHER	020996135	B	996	757	135	12	1	1	1	3	3	3
COUNTY-OTHER	020996135	B	996	757	135	02	0	0	0	0	0	0
GUTHRIE	020371000	B	371	257	135	02	9	11	17	28	40	50
IRRIGATION	021004135	B	1004	1004	135	02	730	730	730	730	730	730
IRRIGATION	021004135	B	1004	1004	135	12	0	0	0	0	0	0
LIVESTOCK	021005135	B	1005	1005	135	12	0	0	0	0	0	0
LIVESTOCK	021005135	B	1005	1005	135	02	0	0	0	0	0	0
MANUFACTURING	021001135	B	1001	1001	135	12	0	0	0	0	0	0
MANUFACTURING	021001135	B	1001	1001	135	02	0	0	0	0	0	0
MINING	021003135	B	1003	1003	135	12	0	0	0	0	0	0
MINING	021003135	B	1003	1003	135	02	0	0	0	0	0	0
STEAM ELECTRIC POWER	021002135	B	1002	1002	135	12	0	0	0	0	0	0
STEAM ELECTRIC POWER	021002135	B	1002	1002	135	02	0	0	0	0	0	0
BOWIE	020102000	B	102	69	169	08	1367	1404	1411	1392	1361	1327
COUNTY-OTHER	020996169	B	996	757	169	02	66	96	116	142	161	157
COUNTY-OTHER	020996169	B	996	757	169	08	91	172	195	232	265	323

Table 7 Comparison of Water Demands with Current Supplies by City and Category

WUGNAME	WUGNUM	RWPG	SEQ#	CITY#	COUNTY#	BASIN#	2000	2010	2020	2030	2040	2050
IRRIGATION	021004169	B	1004	1004	169	02	160	160	160	160	160	160
IRRIGATION	021004169	B	1004	1004	169	08	74	74	74	74	74	74
LIVESTOCK	021005169	B	1005	1005	169	02	0	0	0	0	0	0
LIVESTOCK	021005169	B	1005	1005	169	08	0	0	0	0	0	0
MANUFACTURING	021001169	B	1001	1001	169	02	3	1	0	0	0	0
MANUFACTURING	021001169	B	1001	1001	169	08	0	0	0	0	0	0
MINING	021003169	B	1003	1003	169	02	14	134	156	162	156	143
MINING	021003169	B	1003	1003	169	08	0	2	4	6	8	8
MONTAGUE	020606000	B	606	411	169	02	0	0	0	0	0	2
NOCONA	020639000	B	639	433	169	02	415	448	479	492	500	502
SAINT JO	020786000	B	786	528	169	02	12	16	14	14	14	15
SAINT JO	020786000	B	786	528	169	08	35	44	39	40	41	42
STEAM ELECTRIC POWER	021002169	B	1002	1002	169	02	0	0	0	0	0	0
STEAM ELECTRIC POWER	021002169	B	1002	1002	169	08	0	0	0	0	0	0
BURKBURNETT	020130000	B	130	86	243	02	1824	1846	1883	1888	1884	1869
COUNTY-OTHER	020996243	B	996	757	243	02	2214	2164	2157	2165	2164	2181
ELECTRA	020277000	B	277	187	243	02	-65	-63	-61	-51	-52	-57
IOWA PARK	020435000	B	435	297	243	02	1451	1480	1494	1496	1492	1482
IRRIGATION	021004243	B	1004	1004	243	02	12245	9863	6577	3293	17	0
LIVESTOCK	021005243	B	1005	1005	243	02	38	38	38	38	38	38
MANUFACTURING	021001243	B	1001	1001	243	02	0	0	0	0	0	0
MINING	021003243	B	1003	1003	243	02	460	508	516	524	548	555
PLEASANT VALLEY	020996243	B	996	757	243	02	0	0	0	0	0	0
STEAM ELECTRIC POWER	021002243	B	1002	1002	243	02	0	0	0	0	0	0
WICHITA FALLS	020970000	B	970	654	243	02	5102	4886	4883	4711	4412	4018
COUNTY-OTHER	020996244	B	996	757	244	02	221	194	189	186	187	170
IRRIGATION	021004244	B	1004	1004	244	02	4918	5490	6045	6583	7105	7612
LIVESTOCK	021005244	B	1005	1005	244	02	0	0	0	0	0	0
MANUFACTURING	021001244	B	1001	1001	244	02	-55	-164	-219	-286	-402	-521
MINING	021003244	B	1003	1003	244	02	16	17	16	16	16	16
STEAM ELECTRIC POWER	021002244	B	1002	1002	244	02	11900	8000	4000	0	-20000	-20000
VERNON	020930000	B	930	623	244	02	-272	-167	-137	-147	-105	-91
OLNEY	020655000	B	655	441	252	12	1301	1304	1324	1338	1351	1359

WUGNAME	COUNTYN/	BASINNAM	DATACAT	WUGNUM	RWPG	SEQ NO	CITY NO	COUNTY N
ARCHER C	ARCHER	RED	MUN	20035000	B	35	24	5
COUNTY-C	ARCHER	BRAZOS	MUN	20996005	B	996	757	5
COUNTY-C	ARCHER	RED	MUN	20996005	B	996	757	5
COUNTY-C	ARCHER	TRINITY	MUN	20996005	B	996	757	5
HOLLIDAY	ARCHER	RED	MUN	20411000	B	411	280	5
IRRIGATIO	ARCHER	RED	IRR	21004005	B	1004	1004	5
LAKESIDE	ARCHER	RED	MUN	20504000	B	504	894	5
LIVESTOCI	ARCHER	BRAZOS	STK	21005005	B	1005	1005	5
LIVESTOCI	ARCHER	RED	STK	21005005	B	1005	1005	5
LIVESTOCI	ARCHER	TRINITY	STK	21005005	B	1005	1005	5
MINING	ARCHER	RED	MIN	21003005	B	1003	1003	5
SCOTLANE	ARCHER	RED	MUN	20996005	B	996	757	5
STEAM ELI	ARCHER	RED	PWR	21002005	B	1002	1002	5
COUNTY-C	BAYLOR	BRAZOS	MUN	20996012	B	996	757	12
COUNTY-C	BAYLOR	RED	MUN	20996012	B	996	757	12
IRRIGATIO	BAYLOR	BRAZOS	IRR	21004012	B	1004	1004	12
IRRIGATIO	BAYLOR	RED	IRR	21004012	B	1004	1004	12
LIVESTOCI	BAYLOR	BRAZOS	STK	21005012	B	1005	1005	12
LIVESTOCI	BAYLOR	RED	STK	21005012	B	1005	1005	12
MINING	BAYLOR	BRAZOS	MIN	21003012	B	1003	1003	12
SEYMOUR	BAYLOR	BRAZOS	MUN	20819000	B	819	552	12
BYERS	CLAY	RED	MUN	20133000	B	133	836	39
COUNTY-C	CLAY	RED	MUN	20996039	B	996	757	39
COUNTY-C	CLAY	TRINITY	MUN	20996039	B	996	757	39
HENRIETT/	CLAY	RED	MUN	20396000	B	396	273	39
IRRIGATIO	CLAY	RED	IRR	21004039	B	1004	1004	39
LIVESTOCI	CLAY	RED	STK	21005039	B	1005	1005	39
LIVESTOCI	CLAY	TRINITY	STK	21005039	B	1005	1005	39
MINING	CLAY	RED	MIN	21003039	B	1003	1003	39
MINING	CLAY	TRINITY	MIN	21003039	B	1003	1003	39
PETROLIA	CLAY	RED	MUN	20691000	B	691	936	39
COUNTY-C	COTTLE	RED	MUN	20996051	B	996	757	51
IRRIGATIO	COTTLE	RED	IRR	21004051	B	1004	1004	51
LIVESTOCI	COTTLE	RED	STK	21005051	B	1005	1005	51
MINING	COTTLE	RED	MIN	21003051	B	1003	1003	51
PADUCAH	COTTLE	RED	MUN	20666000	B	666	447	51
COUNTY-C	FOARD	RED	MUN	20996078	B	996	757	78
CROWELL	FOARD	RED	MUN	20217000	B	217	144	78
IRRIGATIO	FOARD	RED	IRR	21004078	B	1004	1004	78
LIVESTOCI	FOARD	RED	STK	21005078	B	1005	1005	78
MINING	FOARD	RED	MIN	21003078	B	1003	1003	78
CHILLICOT	HARDEMAI	RED	MUN	20165000	B	165	110	99
COUNTY-C	HARDEMAI	RED	MUN	20996099	B	996	757	99
IRRIGATIO	HARDEMAI	RED	IRR	21004099	B	1004	1004	99
LIVESTOCI	HARDEMAI	RED	STK	21005099	B	1005	1005	99
MANUFACT	HARDEMAI	RED	MFG	21001099	B	1001	1001	99
MINING	HARDEMAI	RED	MIN	21003099	B	1003	1003	99
QUANAH	HARDEMAI	RED	MUN	20727000	B	727	488	99

STEAM EL	HARDEMAI	RED	PWR	21002099	B	1002	1002	99
COUNTY-C	KING	BRAZOS	MUN	20996135	B	996	757	135
COUNTY-C	KING	RED	MUN	20996135	B	996	757	135
GUTHRIE	KING	RED	MUN	20371000	B	371	257	135
IRRIGATIO	KING	RED	IRR	21004135	B	1004	1004	135
LIVESTOCI	KING	BRAZOS	STK	21005135	B	1005	1005	135
LIVESTOCI	KING	RED	STK	21005135	B	1005	1005	135
BOWIE	MONTAGUI	TRINITY	MUN	20102000	B	102	69	169
COUNTY-C	MONTAGUI	RED	MUN	20996169	B	996	757	169
COUNTY-C	MONTAGUI	TRINITY	MUN	20996169	B	996	757	169
IRRIGATIO	MONTAGUI	RED	IRR	21004169	B	1004	1004	169
IRRIGATIO	MONTAGUI	TRINITY	IRR	21004169	B	1004	1004	169
LIVESTOCI	MONTAGUI	RED	STK	21005169	B	1005	1005	169
LIVESTOCI	MONTAGUI	TRINITY	STK	21005169	B	1005	1005	169
MANUFACT	MONTAGUI	RED	MFG	21001169	B	1001	1001	169
MINING	MONTAGUI	RED	MIN	21003169	B	1003	1003	169
MINING	MONTAGUI	TRINITY	MIN	21003169	B	1003	1003	169
MONTAGUI	MONTAGUI	RED	MUN	20606000	B	606	411	169
NOCONA	MONTAGUI	RED	MUN	20639000	B	639	433	169
SAINT JO	MONTAGUI	RED	MUN	20786000	B	786	528	169
SAINT JO	MONTAGUI	TRINITY	MUN	20786000	B	786	528	169
BURKBURI	WICHITA	RED	MUN	20130000	B	130	86	243
COUNTY-C	WICHITA	RED	MUN	20996243	B	996	757	243
ELECTRA	WICHITA	RED	MUN	20277000	B	277	187	243
IOWA PAR	WICHITA	RED	MUN	20435000	B	435	297	243
IRRIGATIO	WICHITA	RED	IRR	21004243	B	1004	1004	243
LIVESTOCI	WICHITA	RED	STK	21005243	B	1005	1005	243
MANUFACT	WICHITA	RED	MFG	21001243	B	1001	1001	243
MINING	WICHITA	RED	MIN	21003243	B	1003	1003	243
PLEASANT	WICHITA	RED	MUN	20996243	B	996	757	243
SHEPPARI	WICHITA	RED	MUN		B			243
STEAM EL	WICHITA	RED	PWR	21002243	B	1002	1002	243
WICHITA F	WICHITA	RED	MUN	20970000	B	970	654	243
COUNTY-C	WILBARGE	RED	MUN	20996244	B	996	757	244
IRRIGATIO	WILBARGE	RED	IRR	21004244	B	1004	1004	244
LIVESTOCI	WILBARGE	RED	STK	21005244	B	1005	1005	244
MANUFACT	WILBARGE	RED	MFG	21001244	B	1001	1001	244
MINING	WILBARGE	RED	MIN	21003244	B	1003	1003	244
STEAM EL	WILBARGE	RED	PWR	21002244	B	1002	1002	244
VERNON	WILBARGE	RED	MUN	20930000	B	930	623	244
OLNEY	YOUNG	BRAZOS	MUN	20655000	B	655	441	252

BASIN NO	QA_Needs2	2000	2000QA	QA_Needs2	2010	2010QA	QA_Needs2	2020
2	351	351	yes	357	357	yes	372	372
12	0	0	yes	0	0	ok	22	22.4
2	442	442	yes	437	437	yes	461	461
8	0	0	yes	0	0	yes	0	0
2	0	0	yes	0	0	yes	0	0
2	989	989	yes	847	847	ok	704	704
2	214	214	yes	211	211	yes	204	204
12	0	0	yes	0	0	yes	0	0
2	0	0	yes	0	0	yes	0	0
8	0	0	yes	0	0	yes	0	0
2	1	1	yes	1	1	yes	1	1
2	56	56	yes	54	54	yes	66	66
2	14000	14000	yes	0	0	yes	0	0
12	0	0	yes	0	0	yes	0	0
2	8	8	yes	13	13	yes	15	15
12	1335	1335	yes	1350	1350	yes	1364	1364
2	170	170	yes	177	177	yes	182	182
12	57	57	yes	57	57	yes	57	57
2	94	94	yes	94	94	yes	94	94
12	15	15	yes	26	26	yes	37	37
12	15	15	yes	79	79	yes	197	197
2	0	0	yes	4	4	ok	11	10.96552
2	1420	1420	ok	1483	1482.575	ok	1556	1555.575
8	11	11	yes	27	27	yes	39	39
2	862	862	yes	863	863	yes	867	867
2	1126	1126	yes	984	984	ok	841	841
2	0	0	yes	0	0	yes	0	0
8	10	10	yes	10	10	yes	10	10
2	198	198	yes	283	283	yes	307	307
8	2	2	yes	3	3	yes	3	3
2	0	0	yes	0	0	yes	0	0
2	0	0	yes	0	0	yes	0	0
2	150	150	yes	283	283	yes	412	412
2	89	89	yes	89	89	yes	89	89
2	0	0	yes	0	0	yes	0	0
2	74	74	yes	104	104	yes	141	141
2	101	101	yes	106	106	yes	108	108
2	0	0	yes	0	0	yes	0	0
2	277	277	yes	426	426	yes	571	571
2	2	2	yes	2	2	yes	2	2
2	0	0	yes	0	0	yes	0	0
2	19	19	ok	22	22.0024	ok	24	23.81607
2	84	84	yes	90	90	yes	82	82
2	2296	2296	yes	2446	2446	yes	2591	2591
2	16	16	yes	16	16	yes	16	16
2	0	0	yes	0	0	yes	0	0
2	4	4	yes	4	4	yes	4	4
2	0	0	yes	0	0	yes	0	0

2	655	655	yes	601	601	yes	548	548
12	1	1	yes	1	1	yes	1	1
2	0	0	yes	0	0	yes	0	0
2	9	9	yes	11	11	yes	17	17
2	730	730	yes	730	730	yes	730	730
12	0	0	yes	0	0	yes	0	0
2	0	0	yes	0	0	yes	0	0
8	1367	1367	yes	1404	1404	yes	1411	1411
2	66	66	yes	96	96	yes	116	116
8	91	91	yes	172	172	yes	195	195
2	160	160	yes	160	160	yes	160	160
8	74	74	yes	74	74	yes	74	74
2	0	0	yes	0	0	yes	0	0
8	0	0	yes	0	0	yes	0	0
2	3	3	yes	1	1	yes	0	0
2	14	14	yes	134	134	yes	156	156
8	0	0	yes	2	2	yes	4	4
2	0	0	yes	0	0	yes	0	0
2	415	415	yes	448	448	yes	479	479
2	12	12	yes	16	16	yes	14	14
8	35	35	yes	44	44	yes	39	39
2	908	1824	no	930	1846	no	967	1883
2	2214	2214	yes	2164	2164	yes	2157	2157
2	-65	-65	yes	-63	-63	yes	-61	-61
2	1451	1451	ok	1480	1480.395	ok	1494	1494.395
2	23493	23493	yes	20128	20128	yes	16763	16763
2	38	38	yes	38	38	yes	38	38
2	0	0	yes	0	0	yes	0	0
2	460	460	yes	508	508	yes	516	516
2	0	0	yes	0	0	yes	0	0
2			yes			yes		
2	0	0	yes	0	0	yes	0	0
2	5102	5102	yes	4886	4886	ok	4883	4883.177
2	221	221	yes	194	194	yes	189	189
2	4918	4918	yes	5490	5490	yes	6045	6045
2	0	0	yes	0	0	yes	0	0
2	-55	-55	yes	-164	-164	yes	-219	-219
2	16	16	yes	17	17	yes	16	16
2	11900	11900	yes	8000	8000	yes	4000	4000
2	-272	-272	yes	-167	-167	yes	-137	-137
12	1301	1301	yes	1304	1304	yes	1324	1324

2020QA	QA_Needs:	2030	2030QA	QA_Needs:	2040	2040QA	SumOfS_2(	2050
yes	383	383	yes	394	394	yes	673	406
ok	20	20.4	ok	23	23.4	ok	23	23.4
yes	475	475	yes	488	488	yes	498	498
yes	5	5.2	ok	5	5.2	ok	5	5.2
yes	0	0	yes	0	0	yes	191	0
yes	562	561.5	ok	420	419.5	ok	3377	277
yes	202	202	yes	206	206	yes	392	208
yes	0	0	yes	0	0	yes	136	0
yes	0	0	yes	0	0	yes	2279	0
yes	0	0	yes	0	0	yes	296	0
yes	1	1	yes	1	1	yes	1	1
yes	72	72	yes	75	75	yes	78	78
yes	0	0	yes	0	0	yes	14000	0
yes	0	0	yes	0	0	yes	199	0
yes	17	17	yes	17	17	yes	30	18
yes	1378	1378	yes	1392	1392	yes	1837	1406
yes	188	188	yes	194	194	yes	375	199
yes	57	57	yes	57	57	yes	414	57
yes	94	94	yes	94	94	yes	690	94
yes	42	42	yes	47	47	yes	47	47
yes	261	261	yes	284	284	yes	747	303
ok	15	15.12266	ok	16	16.27198	ok	15	15.2986
ok	1598	1597.575	ok	1659	1658.575	ok	2121	1609.575
yes	44	44	yes	50	50	yes	72	50
yes	853	853	yes	836	836	yes	1560	835
yes	699	698.5	ok	557	556.5	ok	3914	414
yes	0	0	yes	0	0	yes	1951	0
yes	10	10	yes	10	10	yes	250	10
yes	321	321	yes	325	325	yes	502	325
yes	3	3	yes	3	3	yes	6	3
yes	0	0	yes	0	0	yes	78	0
yes	0	0	yes	0	0	yes	303	0
yes	537	537	yes	659	659	yes	4584	776
yes	89	89	yes	89	89	yes	476	89
yes	0	0	yes	2	0	no	32	0
yes	173	173	yes	205	205	yes	450	233
yes	109	109	yes	110	110	yes	181	116
yes	0	0	yes	0	0	yes	230	0
yes	712	712	yes	848	848	yes	5255	980
yes	2	2	yes	2	2	yes	291	2
yes	0	0	yes	0	0	yes	27	0
ok	24	24.24428	ok	25	25.15186	ok	135	25.11364
yes	84	84	yes	83	83	yes	284	80
yes	2732	2732	yes	2869	2869	yes	7295	3002
yes	16	16	yes	16	16	yes	496	16
yes	0	0	yes	0	0	yes	480	0
yes	5	5	yes	5	5	yes	7	5
yes	0	0	yes	0	0	yes	492	0

yes	494	494	yes	440	440	yes	1387	387
yes	3	3	yes	3	3	yes	4	3
yes	0	0	yes	0	0	yes	266	0
yes	28	28	yes	40	40	yes	86	50
yes	730	730	yes	730	730	yes	750	730
yes	0	0	yes	0	0	yes	283	0
yes	0	0	yes	0	0	yes	488	0
yes	1392	1392	yes	1361	1361	yes	2270	1327
yes	142	142	yes	161	161	yes	454	157
yes	232	232	yes	265	265	yes	643	323
yes	160	160	yes	160	160	yes	219	160
yes	74	74	yes	74	74	yes	312	74
yes	0	0	yes	0	0	yes	1057	0
yes	0	0	yes	0	0	yes	793	0
yes	0	0	yes	0	0	yes	24	0
yes	162	162	yes	156	156	yes	623	143
yes	6	6	yes	8	8	yes	18	8
yes	0	0	yes	0	0	yes	38	2
yes	492	492	yes	500	500	yes	1098	502
yes	14	14	yes	14	14	yes	47	15
yes	40	40	yes	41	41	yes	139	42
no	972	1888	no	968	1884	no	2795	1869
yes	2165	2165	yes	2164	2164	yes	2181	2181
yes	-51	-51	yes	-52	-52	yes	552	-57
ok	1496	1496.395	ok	1492	1492.395	ok	2786	1482.395
yes	13398	13398	yes	10042	10042	yes	61677	6677
yes	38	38	yes	38	38	yes	778	38
yes	0	0	yes	0	0	yes	2814	0
yes	524	524	yes	548	548	yes	594	555
yes	0	0	yes	0	0	yes	0	0
yes			yes			yes		
yes	0	0	yes	0	0	yes	360	0
ok	4711	4710.777	ok	4412	4412.377	ok	4018	4017.977
yes	186	186	yes	187	187	yes	706	170
yes	6583	6583	yes	7105	7105	yes	23989	7612
yes	0	0	yes	0	0	yes	1797	0
yes	-286	-286	yes	-402	-402	yes	685	-521
yes	16	16	yes	16	16	yes	40	16
yes	0	0	yes	0	0	yes	20000	0
yes	-147	-147	yes	-105	-105	yes	2640	-91
yes	1338	1338	yes	1351	1351	yes	2031	1359

2050QA	
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no	Table 5 lists 2 sources for Burkburnett and lists Burkburnett in counties 243 and 244..Should or
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nly be in 243…

REGION B - REVIEW OF INITIALLY PREPARED PLAN DRAFT SUBMITTAL OF EXHIBIT B TABLE 8

The enclosed worksheet (RegB_QA_Table8_IPP) is a duplicate of the Exhibit B Table 8 submitted by the RWPG for review by TWDB staff. Fields that are highlighted indicate a possible correction or clarification is needed. Please refer to the column entitled "TWDB REVIEW COMMENTS" for details. Fields corrected by TWDB staff are in bold and the field has a bold border. If the RWPG disagrees with the changes made by TWDB staff, please provide an explanation. The Table has been slightly modified for quality assurance purposes and to reflect the table structure needed for database development. Any additional unrequired fields that were provided by the RWPG were moved to the far right end of the submitted spreadsheet. Any comments or footnotes made by the RWPG directly on the submitted spreadsheet were moved to a field entitled RWPG Comments. Also note that any totals, subtotals, extra headers, etc. were deleted. Merged fields have been adjusted as needed.

Please address the comments included in the TWDB REVIEW COMMENT field.

As a check, Table 6 (MWP supplies) was summed by Major Water Provider and subtracted from the sum of demands from Table 3 (MWP demands) from the Tables submitted for review. The following table summarizes the results of this check. Please clarify and adjust the appropriate table as needed. Note: it appears demands for recipients located in Region A for Greenbelt MWA are missing in Table 3.

MWP NAME		**Year 2000**	**Year 2010**	**Year 2020**	**Year 2030**	**Year 2040**	**Year 2050**
WICHITA FALLS Total	Total Supplies (table6)	88,008	86,178	84,417	82,667	80,906	79,156
	Total demand (table 3)	7207	7355	7365	7416	7495	7554
	Needs (Subtract 3 from 6)	80,801	78,823	77,052	75,251	73,411	71,602
	Table 8 Submitted for review Needs	48,395	28,559	23,011	17,259	15,366	13,383
GREENBELT MWA Total	Total Supplies (table6)	7,699	7,548	7,396	7,245	7,093	6,942
	Total demand (table 3)	1213	1137	1065	1023	992	969
	Needs (Subtract 3 from 6)	6,486	6,411	6,331	6,222	6,101	5,973
	Table 8 Submitted for review Needs	73	82	91	97	100	100

Table 8 Comparison of Water Demands with Current Water Supplies by Major Water Provider

Major Water Provider Name	Major Water Provider Number	County Number	Basin Number	n2000	n2010	n2020	n2030	n2040	n2050	WUGNAME
WICHITA FALLS	944456	5	2	427	433	448	458	468	473	Archer City
WICHITA FALLS	944456	5	2	402	398	419	432	444	453	County Other
WICHITA FALLS	944456	5	2	0	0	0	0	0	0	Holliday
WICHITA FALLS	944456	5	2	214	211	204	202	206	208	Lakeside City
WICHITA FALLS	944456	5	2	56	54	66	72	75	78	Scotland
WICHITA FALLS	944456	39	2	1,425	1,427	1,435	1,439	1,442	1,443	County Other
WICHITA FALLS	944456	39	2	331	332	333	328	321	321	Henrietta
WICHITA FALLS	944456	243	2	1,877	1,895	1,935	1,945	1,955	1,965	Burkburnett
WICHITA FALLS	944456	243	2	1,131	1,096	1,091	1,096	1,102	1,108	County Other
WICHITA FALLS	944456	243	2	2,149	2,156	2,161	2,166	2,171	2,176	Iowa Park
WICHITA FALLS	944456	243	2	0	0	0	0	0	0	Manufacturing
WICHITA FALLS	944456	243	2	0	0	0	0	0	0	Pleasant Valley
WICHITA FALLS	944456	243	2	0	0	0	0	0	0	Steam Electric Power
WICHITA FALLS	944456	243	2	4,902	4,686	4,683	4,511	4,212	3,818	Wichita Falls
WICHITA FALLS	944456	252	12	1,051	1,053	1,056	1,061	1,061	1,061	OLNEY
WICHITA FALLS	944456	<blank>	<blank>	11,000	11,000	11,000	11,000	11,000	7,368	portion of Kemp wtr rt
Greenbelt MWA	20	99	2	0	0	0	0	0	0	Manufacturing
Greenbelt MWA	20	38	2	0	0	0	0	0	0	City of Childress
Greenbelt MWA	20	65	2	0	0	0	0	0	0	City of Clarendon
Greenbelt MWA	20	78	2	0	0	0	0	0	0	City of Crowell
Greenbelt MWA	20	65	2	0	0	0	0	0	0	City of Hedley
Greenbelt MWA	20	96	2	0	0	0	0	0	0	City of Memphis
Greenbelt MWA	20	99	2	0	0	0	0	0	0	City of Quanah
Greenbelt MWA	20	<blank>	<blank>	0	0	0	0	0	0	Red River Authority
Greenbelt MWA	20	<blank>	<blank>	3,707	3,611	3,548	3,435	3,297	3,143	unassigned

MWP NAME		Year 2000	Year 2010	Year 2020	Year 2030	Year 2040	Year 2050
Wichita Falls	Table 6 totals	88,008	86,178	84,417	82,667	80,906	79,156
	Table 3 totals	7,207	7,355	7,365	7,416	7,495	7,554
	Subtract 3 from 6	80,801	78,823	77,052	75,251	73,411	71,602
	Table 8 totals	48,395	28,559	23,011	17,259	15,366	13,383

MWP NAME		Year 2000	Year 2010	Year 2020	Year 2030	Year 2040	Year 2050
Greenbelt	Table 6 totals	7,699	7,548	7,396	7,245	7,093	6,942
	Table 3 totals	1,213	1,137	1,065	1,023	992	969
	Subtract 3 from 6	6,486	6,411	6,331	6,222	6,101	5,973
	Table 8 totals	73	82	91	97	100	100

Note: Only Region B customers of Greenbelt MIWA are included in this draft Table 8. Coordination with Region A cus stomers wll be completed at a later time.

Lake Kemp Evaluation

Demands on wichita Falls

WICHITA FALLS	944456	5	2	Steam Electric Power	Kemp	0
WICHITA FALLS	944456	244	2	Steam Electric Power	Kemp	8100
						8100

Supplies - Wichita Falls	42,530
assigned supplies	34000
unassigned supplies	8,530

14000	14000	14000	14000	14000
12000	16000	20000	20000	20000
26000	30000	34000	34000	34000

40,820	39,180	37,550	35,910	34,280
34000	34000	34000	34000	34000
6,820	5,180	3,550	1,910	280

DRAFT - SUBJECT TO REVISION

Table 9.00 - Social and Economic Impacts of Not Meeting Needs by Region, 2000

RWPG Letter, Water User Group Identifier, Name	Value of Need (Acre-Feet)	Impact of Need on Employment	Impact of Need on Gross Business Output in 1999 US Dollars (Millions)	Impact of Need on Population	Impact of Need on School Enrollment	Impact of Need on Income in 1999 US Dollars (Millions)
B 20277000 ELECTRA	-65	92	6.6	190	46	2.2
B 20930000 VERNON	-272	508	33.4	1,061	263	12.7
B 21001244 MANUFACTURING	-55	78	7.8	158	35	2.5

Impacts based on water needs identified in Table 7 delivered to TWDB as of 9/11/2001
Refer to the introduction of Section 3 for information on identification of the county where a need occurs.

Table 9.10 - Social and Economic Impacts of Not Meeting Needs by Region, 2010

RWPG Letter, Water User Group Identifier, Name			Value of Need (Acre-Feet)	Impact of Need on Employment	Impact of Need on Gross Business Output in 1999 US Dollars (Millions)	Impact of Need on Population	Impact of Need on School Enrollment	Impact of Need on Income in 1999 US Dollars (Millions)
B	20277000	ELECTRA	-63	89	6.4	148	37	2.2
B	20930000	VERNON	-167	312	20.5	600	159	7.8
B	21001244	MANUFACTURING	-164	233	23.3	432	110	7.5

Impacts based on water needs identified in Table 7 delivered to TWDB as of 9/11/2001
Refer to the introduction of Section 3 for information on identification of the county where a need occurs.

DRAFT - SUBJECT TO REVISION

Table 9.20 - Social and Economic Impacts of Not Meeting Needs by Region, 2020

RWPG Letter, Water User Group Identifier, Name	Value of Need (Acre-Feet)	Impact of Need on Employment	Impact of Need on Gross Business Output in 1999 US Dollars (Millions)	Impact of Need on Population	Impact of Need on School Enrollment	Impact of Need on Income in 1999 US Dollars (Millions)
B 20277000 ELECTRA	-61	86	6.2	148	23	2.1
B 20930000 VERNON	-137	256	16.8	524	121	6.4
B 21001244 MANUFACTURING	-219	312	31.1	644	151	10.0

Impacts based on water needs identified in Table 7 delivered to TWDB as of 9/11/2001
Refer to the introduction of Section 3 for information on identification of the county where a need occurs.

Table 9.30 - Social and Economic Impacts of Not Meeting Needs by Region, 2030

RWPG Letter, Water User Group Identifier, Name			Value of Need (Acre-Feet)	Impact of Need on Employment	Impact of Need on Gross Business Output in 1999 US Dollars (Millions)	Impact of Need on Population	Impact of Need on School Enrollment	Impact of Need on Income in 1999 US Dollars (Millions)
B	20277000	ELECTRA	-51	72	5.2	155	37	1.8
B	20930000	VERNON	-147	275	18.1	572	144	6.9
B	21001244	MANUFACTURING	-286	407	40.6	840	216	13.1

Impacts based on water needs identified in Table 7 delivered to TWDB as of 9/11/2001
Refer to the introduction of Section 3 for information on identification of the county where a need occurs.

Table 9.40 - Social and Economic Impacts of Not Meeting Needs by Region, 2040

RWPG Letter, Water User Group Identifier, Name	Value of Need (Acre-Feet)	Impact of Need on Employment	Impact of Need on Gross Business Output in 1999 US Dollars (Millions)	Impact of Need on Population	Impact of Need on School Enrollment	Impact of Need on Income in 1999 US Dollars (Millions)
B 20277000 ELECTRA	-52	73	5.3	184	41	1.8
B 20930000 VERNON	-105	196	12.9	424	118	4.9
B 21001244 MANUFACTURING	-402	572	57.0	1,210	313	18.3

Impacts based on water needs identified in Table 7 delivered to TWDB as of 9/11/2001
Refer to the introduction of Section 3 for information on identification of the county where a need occurs.

Table 9.50 - Social and Economic Impacts of Not Meeting Needs by Region, 2050

RWPG Letter, Water User Group Identifier, Name	Value of Need (Acre-Feet)	Impact of Need on Employment	Impact of Need on Gross Business Output in 1999 US Dollars (Millions)	Impact of Need on Population	Impact of Need on School Enrollment	Impact of Need on Income in 1999 US Dollars (Millions)
B 20277000 ELECTRA	-57	80	5.8	206	64	2.0
B 20930000 VERNON	-91	170	11.2	360	103	4.3
B 21001244 MANUFACTURING	-521	742	73.9	1,565	413	23.8

Impacts based on water needs identified in Table 7 delivered to TWDB as of 9/11/2001
Refer to the introduction of Section 3 for information on identification of the county where a need occurs.

Table 10.00 - Social and Economic Impacts of Not Meeting Needs by Basin, 2000

Water User Group Name	Water User Group Identifier	Regional Water Planning Group	Basin	Value of Need (Acre-Feet)	Impact of Need on Employment	Impact of Need on Gross Business Output in 1999 US Dollars (Millions)	Impact of Need on Population	Impact of Need on School Enrollment	Impact of Need on Income in 1999 US Dollars (Millions)
ELECTRA	20277000	B	2	-65	92	6.6	190	46	2.2
VERNON	20930000	B	2	-272	508	33.4	1,061	263	12.7
MANUFACTURING	21001244	B	2	-55	78	7.8	158	35	2.5

Impacts based on water needs identified in Table 7 delivered to TWDB as of 9/11/2001
Refer to the introduction of Section 3 for information on identification of the county where a need occurs.

Table 10.10 - Social and Economic Impacts of Not Meeting Needs by Basin, 2010

Water User Group Name	Water User Group Identifier	Regional Water Planning Group	Basin	Value of Need (Acre-Feet)	Impact of Need on Employment	Impact of Need on Gross Business Output in 1999 US Dollars (Millions)	Impact of Need on Population	Impact of Need on School Enrollment	Impact of Need on Income in 1999 US Dollars (Millions)
ELECTRA	20277000	B	2	-63	89	6.4	148	37	2.2
VERNON	20930000	B	2	-167	312	20.5	600	159	7.8
MANUFACTURING	21001244	B	2	-164	233	23.3	432	110	7.5

Impacts based on water needs identified in Table 7 delivered to TWDB as of 9/11/2001
Refer to the introduction of Section 3 for information on identification of the county where a need occurs.

Table 10.20 - Social and Economic Impacts of Not Meeting Needs by Basin, 2020

Water User Group Name	Water User Group Identifier	Regional Water Planning Group	Basin	Value of Need (Acre-Feet)	Impact of Need on Employment	Impact of Need on Gross Business Output in 1999 US Dollars (Millions)	Impact of Need on Population	Impact of Need on School Enrollment	Impact of Need on Income in 1999 US Dollars (Millions)
ELECTRA	20277000	B	2	-61	86	6.2	148	23	2.1
VERNON	20930000	B	2	-137	256	16.8	524	121	6.4
MANUFACTURING	21001244	B	2	-219	312	31.1	644	151	10.0

Impacts based on water needs identified in Table 7 delivered to TWDB as of 9/11/2001
Refer to the introduction of Section 3 for information on identification of the county where a need occurs.

Table 10.30 - Social and Economic Impacts of Not Meeting Needs by Basin, 2030

Water User Group Name	Water User Group Identifier	Regional Water Planning Group	Basin	Value of Need (Acre-Feet)	Impact of Need on Employment	Impact of Need on Gross Business Output in 1999 US Dollars (Millions)	Impact of Need on Population	Impact of Need on School Enrollment	Impact of Need on Income in 1999 US Dollars (Millions)
ELECTRA	20277000	B	2	-51	72	5.2	155	37	1.8
VERNON	20930000	B	2	-147	275	18.1	572	144	6.9
MANUFACTURING	21001244	B	2	-286	407	40.6	840	216	13.1

Impacts based on water needs identified in Table 7 delivered to TWDB as of 9/11/2001
Refer to the introduction of Section 3 for information on identification of the county where a need occurs.

Table 10.40 - Social and Economic Impacts of Not Meeting Needs by Basin, 2040

Water User Group Name	Water User Group Identifier	Regional Water Planning Group	Basin	Value of Need (Acre-Feet)	Impact of Need on Employment	Impact of Need on Gross Business Output in 1999 US Dollars (Millions)	Impact of Need on Population	Impact of Need on School Enrollment	Impact of Need on Income in 1999 US Dollars (Millions)
ELECTRA	20277000	B	2	-52	73	5.3	184	41	1.8
VERNON	20930000	B	2	-105	196	12.9	424	118	4.9
MANUFACTURING	21001244	B	2	-402	572	57.0	1,210	313	18.3

Impacts based on water needs identified in Table 7 delivered to TWDB as of 9/11/2001
Refer to the introduction of Section 3 for information on identification of the county where a need occurs.

Table 10.50 - Social and Economic Impacts of Not Meeting Needs by Basin, 2050

Water User Group Name	Water User Group Identifier	Regional Water Planning Group	Basin	Value of Need (Acre-Feet)	Impact of Need on Employment	Impact of Need on Gross Business Output in 1999 US Dollars (Millions)	Impact of Need on Population	Impact of Need on School Enrollment	Impact of Need on Income in 1999 US Dollars (Millions)
ELECTRA	20277000	B	2	-57	80	5.8	206	64	2.0
VERNON	20930000	B	2	-91	170	11.2	360	103	4.3
MANUFACTURING	21001244	B	2	-521	742	73.9	1,565	413	23.8

Impacts based on water needs identified in Table 7 delivered to TWDB as of 9/11/2001
Refer to the introduction of Section 3 for information on identification of the county where a need occurs.

REGION B - REVIEW OF INITIALLY PREPARED PLAN DRAFT SUBMITTAL OF EXHIBIT B TABLE 11

The enclosed worksheet (RegB_QA_Table11_IPP) is a duplicate of the Exhibit B Table 11 submitted by the RWPG for review by TWDB staff. Fields that are highlighted indicate a possible correction or clarification is needed. Please refer to the column entitled "TWDB REVIEW COMMENTS" for details. Fields corrected by TWDB staff are in bold and the field has a bold border. If the RWPG disagrees with the changes made by TWDB staff, please provide an explanation. The Table has been slightly modified for quality assurance purposes and to reflect the table structure needed for database development. Any additional unrequired fields that were provided by the RWPG were moved to the far right end of the submitted spreadsheet. Any comments or footnotes made by the RWPG directly on the submitted spreadsheet were moved to a field entitled RWPG Comments. Also note that any totals, subtotals, extra headers, etc. were deleted. Merged fields have been adjusted as needed.

Please address the comments included in the TWDB REVIEW COMMENT field.

Fields Q-V (Annual Cost) should be reported as total annual cost per acre-foot of supply.

To facilitate the development of a database, please do not merge fields. It was suggested in the final Technical Memorandum to list water user groups sharing the same strategy and Total capital cost as the same in field I (Strategy type) with a number to group them together. For example: 4j1 could be used for Vernon and manufacturing. The Total capital cost should only be listed once per strategy. However, to correlate needs in Table 7 or Table 8 to Table 11, the projected supplies should be listed separately by water user group.

Table 11 Potentially Feasible Water Management Strategies

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	BB	
Major Water Provider Name (If Applicable)	**Water User Group Name**	**Major Water Provider (TWDB Alpha Number)**	**Water User Group Identifier**	**Regional Water Planning Group Letter**	**Sequence Number for Water User Group**	**City Number for Water User Group**	**County Number for Water User Group**	**Basin Number for Water User Group**	**Type of Water Supply**	**Regional Water Planning Group of Source**	**County Number of Source**	**Basin Number of Source**	**Specific Source Identifier**	**Name of Specific Source**	**Total Capital Cost**	**Cost for 2000 (Total Annual Cost)**	**Cost for 2010 (Total Annual Cost)**	**Cost for 2020 (Total Annual Cost)**	**Cost for 2030 (Total Annual Cost)**	**Cost for 2040 (Total Annual Cost)**	**Cost for 2050 (Total Annual Cost)**	**Year 2000 Value of Total Supply from Strategy**	**Year 2010 Value of Total Supply from Strategy**	**Year 2020 Value of Total Supply from Strategy**	**Year 2030 Value of Total Supply from Strategy**	**Year 2040 Value of Total Supply from Strategy**	**Year 2050 Value of Total Supply from Strategy**	**RWPG Comments**
Wichita Falls	Wichita Falls	944456	20970000	B	970	654	243	2	4b	B	243	2	36049	Reuse	$48,700,000	$0	$510	$510	$510	$189	$189	0	10900	10900	10900	10900	10900	Wastewater Reuse
Wichita Falls	Wichita Falls	944456	20970000	B	970	654	243	2	4c	B	12	2	02130	Kemp	$60,560,000	$0	$668	$668	$668	$268	$268	0	10900	10900	10900	10900	7268	Utilize existing water right at Lake Kemp and treat using RO at Cypress WTP
Wichita Falls	Wichita Falls	944456	20970000	B	970	654	243	2	4j	B	39	2	02200	Lake Ringgold	$287,454,000	$0	$0	$912	$912	$912	$912	0	0	26900	26900	26900	26900	Lake Ringgold
Wichita Falls	Wichita Falls	944456	20970000	B	970	654	243	2	4c	B	12	2	02130	Kemp	$95,709,000	$0	$759	$759	$759	$272	$272	0	14200	14200	14200	14200	14200	Regional desalination plant at Lake Kemp
Wichita Falls	Vernon	944456	20930000	B	930	623	244	2	4e	B		2	020A0	Wichita System	$15,504,000	$0	$924	$924	$924	$412	$412	272	1887	1832	1765	1649	1530	Temporarily overdraft existing well fields, utilize high nitrate wells for manufacturing sales, and implement advanced conservation during drought (year 2000). Purchase treated water from the City of Wichita Falls
Wichita Falls	Vernon	944456	20930000	B	930	623	244	2	4e	B		2	020A0	Wichita System	$20,721,000	$0	$952	$952	$952	$268	$268	272	1887	1832	1765	1649	1530	Temporarily overdraft existing well fields, utilize high nitrate wells for manufacturing sales, and implement advanced conservation during drought (year 2000). Purchase raw water from the City of Wichita Falls (Lake Kickapoo)
	Vernon		20930000	B	930	623	244	2	4j	B	244	2	24404	Seymour	$3,783,000	$0	$390	$390	$390	$140	$140	272	787	732	665	549	430	Temporarily overdraft existing well fields, utilize high nitrate wells for manufacturing sales, and implement advanced conservation during drought (year 2000). Develop new ground water supply by 2010 (Round Timber ranch)
Wichita Falls	Vernon	944456	20930000	B	930	623	244	2	4c	B	12	2	02130	Kemp	$24,574,000	$0	$1,217	$1,217	$1,217	$405	$405	272	1887	1832	1765	1649	1530	Temporarily overdraft existing well fields, utilize high nitrate wells for manufacturing sales, and implement advanced conservation during drought (year 2000). Purchase water from regional desalination plant at Lake Kemp
	County-Other		20996244	B	996	757	244	2	4e	B	244	2	24404	Seymour	$1,272,000	$0	$1,410	$1,410	$1,410	$566	$566	0	109	109	109	109	109	Lockett - purchase from Vernon
	County-Other		20996244	B	996	757	244	2	4o	B	244	2	24404	Seymour	$510,000	$0	$431	$431	$431	$92	$92	0	109	109	109	109	109	Lockett - nitrate removal system
	County-Other		20996244	B	996	757	244	2	4e	B	244	2	24404	Seymour	$648,000	$0	$1,300	$1,300	$1,300	$125	$125	0	40	40	40	40	40	Hines-Wildcat - purchase from Vernon
	Electra		20277000	B	277	187	243	2	4j	B	243	2	24304	Seymour	$2,357,000	$603	$603	$603	$326	$326	$326	65	617	617	617	617	617	Implement advanced conservation until strategy can be developed. Develop new ground water supply
Wichita Falls	Electra	944456	20277000	B	277	187	243	2	4c	B	12	2	02130	Kemp	$6,008,000	$0	$1,076	$1,076	$1,076	$370	$370	65	617	617	617	617	617	Implement advanced conservation until strategy can be developed. Purchase raw water from the City of Wichita Falls (Lake Diversion), treat with RO
Wichita Falls	Electra	944456	20277000	B	277	187	243	2	4e	B		2	020A0	Wichita System	$4,076,000	$0	$862	$862	$862	$382	$382	65	617	617	617	617	617	Implement advanced conservation until strategy can be developed. Buy treated water from Wichita Falls; use existing Wichita Falls line to Iowa Park line

Table 11 Potentially Feasible Water Management Strategies

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	BB	
Major Water Provider Name (If Applicable)	**Water User Group Name**	**Major Water Provider (TWDB Alpha Number)**	**Water User Group Identifier**	**Regional Water Planning Group Letter**	**Sequence Number for Water User Group**	**City Number for Water User Group**	**County Number for Water User Group**	**Basin Number for Water User Group**	**Type of Water Supply**	**Regional Water Planning Group of Source**	**County Number of Source**	**Basin Number of Source**	**Specific Source Identifier**	**Name of Specific Source**	**Total Capital Cost**	**Cost for 2000 (Total Annual Cost)**	**Cost for 2010 (Total Annual Cost)**	**Cost for 2020 (Total Annual Cost)**	**Cost for 2030 (Total Annual Cost)**	**Cost for 2040 (Total Annual Cost)**	**Cost for 2050 (Total Annual Cost)**	**Year 2000 Value of Total Supply from Strategy**	**Year 2010 Value of Total Supply from Strategy**	**Year 2020 Value of Total Supply from Strategy**	**Year 2030 Value of Total Supply from Strategy**	**Year 2040 Value of Total Supply from Strategy**	**Year 2050 Value of Total Supply from Strategy**	**RWPG Comments**
Wichita Falls	Electra	944456	20277000	B	277	187	243	2	4c	B	12	2	02130	Kemp	$9,053,000	$0	$962	$962	$962	$364	$364	65	1100	1100	1100	1100	1100	Implement advanced conservation until strategy can be developed. Purchase water from regional desalination plant at Lake Kemp
	Manufacturing		21001244	B	1001	1001	244	2	4e	B	244	2	24404	Seymour	$0	$733	$733	$733	$733	$733	$733	55	164	219	286	402	521	Purchase water from Vernon. Cost based on $2.25 per 1,000 gallons. Actual sale cost may differ.
Wichita Falls	County-Other	944456	20996243	B	996	757	243	2	4e	B		2	020A0	Wichita System	$0	$733	$733	$733	$733	$733	$733	50	50	50	50	50	50	Purchase water from Wichita Falls to blend with existing supply to meet nitrate standards. Cost based on $2.25 per 1,000 gallons. Actual sale cost may differ.
Wichita Falls	Byers	944456	20133000	B	133	836	39	2	4e	B		2	020A0	Wichita System	$0	$733	$733	$733	$733	$733	$733	50	50	50	50	50	50	Purchase water from Wichita Falls to blend with existing supply to meet nitrate standards. Cost based on $2.25 per 1,000 gallons. Actual sale cost may differ.
	Steam Electric Power		021002244	B	1002	1002	244	2	4e	B	12	2	02130	Kemp	$0	$0	$0	$0	$0	NA	NA	0	0	0	0	20000	20000	Renew existing contract with Wichita Falls and WCWID #2. Assume at same costs as present. Actual sale costs may differ. Current contractual costs are not available.
	<Regional>			B				2	4h	B	12	2	02130	Kemp	$77,500,000	NA	NA	$166	$192	$227	$39	0	0	36,080	31,230	26,390	21,540	Chloride control project in Wichita Basin

REGION B - REVIEW OF INITIALLY PREPARED PLAN DRAFT SUBMITTAL OF EXHIBIT B TABLE 12

The enclosed worksheet (RegB_QA_Table12_IPP) is a duplicate of the Exhibit B Table 12 submitted by the RWPG for review by TWDB staff. Fields that are highlighted indicate a possible correction or clarification is needed. Please refer to the column entitled "TWDB REVIEW COMMENTS" for details. Fields corrected by TWDB staff are in bold and the field has a bold border. If the RWPG disagrees with the changes made by TWDB staff, please provide an explanation. The Table has been slightly modified for quality assurance purposes and to reflect the table structure needed for database development. Any additional unrequired fields that were provided by the RWPG were moved to the far right end of the submitted spreadsheet. Any comments or footnotes made by the RWPG directly on the submitted spreadsheet were moved to a field entitled RWPG Comments. Also note that any totals, subtotals, extra headers, etc. were deleted. Merged fields have been adjusted as needed.

Please address the comments included in the TWDB REVIEW COMMENT field.

To facilitate the development of a database, please do not merge fields. It was suggested in the final Technical Memorandum to list water user groups sharing the same strategy and Total capital cost as the same in field I (Strategy type) with a number to group them together. For example: 4j1 could be used for Vernon and manufacturing. The Total capital cost should only be listed once per strategy so table 12 can be summed per region. However, to correlate needs in Table 7 to Table 12, the projected supplies should be listed separately by water user group.

Table 12 Recommended Management Strategies by City and Category

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	
Water User Group Name	**Water User Group Identifier**	**Regional Water Planning Group Letter**	**Sequence Number for Water User Group**	**City Number for Water User Group**	**County Number for Water User Group**	**Basin Number for Water User Group**	**Name of Water Management Strategy**	**Type of Water Supply**	**Major Water Provider Number (TWDB Alpha Number)**	**Regional Water Planning Group of Source**	**County Number of Source**	**Basin Number of Source**	**Specific Source Identifier**	**Name of Specific Source**	**Total Capital Cost**	**Year 2000 Value of Total Supply from Strategy**	**Year 2010 Value of Total Supply from Strategy**	**Year 2020 Value of Total Supply from Strategy**	**Year 2030 Value of Total Supply from Strategy**	**Year 2040 Value of Total Supply from Strategy**	**Year 2050 Value of Total Supply from Strategy**	**Exception from Meeting Needs Due To**	**Scenario Number for Meeting Long-Term Needs (Blank if only one listed)**	RWPG Comments
Wichita Falls	20970000	B	970	654	243	2	Desalination with reverse osmosis	4c	944456	B	12	2	02130	Kemp	$60,560,000	0	10900	10900	10900	10900	7268		WF-2	Lake Kemp with RO at Cypress plant
Vernon	20930000	B	930	623	244	2	New ground water supply	4j		B	244	2	24404	Seymour	$3,783,000	272	787	732	665	549	430		V-3	Temporarily overdraft existing well fields, utilize high nitrate wells for manufacturing sales, and implement advanced conservation during drought (year 2000). Develop new ground water supply by 2010 (Round Timber ranch)
County-other	20996244	B	996	757	244	2	Nitrate removal system	4o		B	244	2	24404	Seymour	$510,000	0	109	109	109	109	109		L-2	Lockett nitrate removal system
County-other	20996244	B	996	757	244	2	Purchase treated water from Vernon	4e		B	244	2	24404	Seymour	$648,000	0	40	40	40	40	40			Hines-Wildcat
Manufacturing	21001244	B	1001	1001	244	2	Purchase water from Vernon	4e		B	244	2	24404	Seymour		55	164	219	286	402	521		V-3	Purchase water from Vernon
Electra	20277000	B	277	187	243	2	Develop ground water supply	4j		B	243	2	24304	Seymour	$2,357,000	65	617	617	617	617	617		E-1	

Table 12 Recommended Management Strategies by City and Category

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	
Water User Group Name	**Water User Group Identifier**	**Regional Water Planning Group Letter**	**Sequence Number for Water User Group**	**City Number for Water User Group**	**County Number for Water User Group**	**Basin Number for Water User Group**	**Name of Water Management Strategy**	**Type of Water Supply**	**Major Water Provider Number (TWDB Alpha Number)**	**Regional Water Planning Group of Source**	**County Number of Source**	**Basin Number of Source**	**Specific Source Identifier**	**Name of Specific Source**	**Total Capital Cost**	**Year 2000 Value of Total Supply from Strategy**	**Year 2010 Value of Total Supply from Strategy**	**Year 2020 Value of Total Supply from Strategy**	**Year 2030 Value of Total Supply from Strategy**	**Year 2040 Value of Total Supply from Strategy**	**Year 2050 Value of Total Supply from Strategy**	**Exception from Meeting Needs Due To**	**Scenario Number for Meeting Long-Term Needs (Blank if only one listed)**	RWPG Comments
County-other	20996243	B	996	757	243	2	Purchase water from Wichita Falls	4e	944456	B		2	020A0	Wichita System		50	50	50	50	50	50		WF-2	Purchase water from Wichita Falls
Byers	20133000	B	133	836	39	2	Purchase water from Wichita Falls	4e	944456	B		2	020A0	Wichita System		50	50	50	50	50	50		WF-2	Purchase water from Wichita Falls
Steam Electric Power		B					Renew existing contract with Wichita Falls and WCWID #2 for Kemp water							Kemp		0	0	0	0	20000	20000			
<Regional>		B				2	Chloride control project	4h		B	12	2	02130	Kemp	$77,500,000	0	0	36080	31230	26390	21540			Will improve water quality for entire yield of Kemp/Diversion system. Value listed is quantity not used due to quality problems.

REGION B - REVIEW OF INITIALLY PREPARED PLAN DRAFT SUBMITTAL OF EXHIBIT B TABLE 13

The enclosed worksheet (RegB_QA_Table13_IPP) is a duplicate of the Exhibit B Table 13 submitted by the RWPG for review by TWDB staff. Fields that are highlighted indicate a possible correction or clarification is needed. Please refer to the column entitled "TWDB REVIEW COMMENTS" for details. Fields corrected by TWDB staff are in bold and the field has a bold border. If the RWPG disagrees with the changes made by TWDB staff, please provide an explanation. The Table has been slightly modified for quality assurance purposes and to reflect the table structure needed for database development. Any additional unrequired fields that were provided by the RWPG were moved to the far right end of the submitted spreadsheet. Any comments or footnotes made by the RWPG directly on the submitted spreadsheet were moved to a field entitled RWPG Comments. Also note that any totals, subtotals, extra headers, etc. were deleted. Merged fields have been adjusted as needed.

Please address the comments included in the TWDB REVIEW COMMENT field.

Strategy listed is not consistent with previous tables. Please clarify. Table 6 lists Lake Kemp as a supply source for Wichita Falls. Table 5 shows the entire firm yield is distributed among irrigation and stream electric users (and does not list Wichita Falls as seller). Please clarify.

Table 13 Recommended Management Strategies by Major Water Provider

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
Major Water Provider Name	**Major Water Provider Number (TWDB Alpha Number)**	**Basin Number for Basin of Use**	**Type of Water Supply**	**Regional Water Planning Group of Source**	**County Number of Source**	**Basin Number of Source**	**Name of Water Management Strategy**	**Specific Source Identifier**	**Name of Specific Source**	**Total Capital Cost**	**Year 2000 Value of Total Supply from Strategy**	**Year 2010 Value of Total Supply from Strategy**	**Year 2020 Value of Total Supply from Strategy**	**Year 2030 Value of Total Supply from Strategy**	**Year 2040 Value of Total Supply from Strategy**	**Year 2050 Value of Total Supply from Strategy**	**Exception from Meeting Needs Due To**	**Scenario Number for Meeting Long-Term Needs (Blank if only one listed)**
Wichita Falls	944456	2	4c	B	12	2	Desalination with reverse osmosis	02130	Kemp	$60,560,000	0	11000	11000	11000	11000	7368		WF-2

SUMMARY TABLES

Water User Group:	**Archer City - Archer**				
	2000	**2010**	**2020**	**2030**	**2040**
Population (number of persons)	1,855	1,916	1,925	1,910	1,868
Water Demand (ac-ft/yr)	322	316	301	290	279
Current Supply (ac-ft/yr)	673	673	673	673	673
Supply - Demand (ac-ft/yr)	351	357	372	383	394
Recommended Short Term Strategy (ac-ft/yr)	None Identified				
Long Term Strategy (ac-ft/yr)	None Identified				

Water User Group:	**County-Other - Archer**				
	2000	**2010**	**2020**	**2030**	**2040**
Population (number of persons)	**4,696**	**4,817**	**4,913**	**4,875**	**4,865**
Water Demand (ac-ft/yr)	734	729	671	653	637
Current Supply (ac-ft/yr)	1,176	1,166	1,154	1,153	1,153
Supply - Demand (ac-ft/yr)	442	437	483	500	516
Recommended Short Term Strategy (ac-ft/yr)	None Identified				
Long Term Strategy (ac-ft/yr)	None Identified				

Water User Group:	**Holliday - Archer**				
	2000	**2010**	**2020**	**2030**	**2040**
Population (number of persons)	1,564	1,613	1,621	1,609	1,575
Water Demand (ac-ft/yr)	230	225	215	207	199
Current Supply (ac-ft/yr)	230	225	215	207	199
Supply - Demand (ac-ft/yr)	0	0	0	0	0
Recommended Short Term Strategy (ac-ft/yr)	None Identified				
Long Term Strategy (ac-ft/yr)	None Identified				

Water User Group:	**Irrigation - Archer**				
	2000	**2010**	**2020**	**2030**	**2040**
Population (number of persons)					
Water Demand (ac-ft/yr)	3,600	3,500	3,400	3,300	3,200
Current Supply (ac-ft/yr)	4,891	4,048	3,765	3,483	3,201
Supply - Demand (ac-ft/yr)	1,291	548	365	183	1
Recommended Short Term Strategy (ac-ft/yr)	None Identified				
Long Term Strategy (ac-ft/yr)	None Identified				

Water User Group:	Lakeside City - Archer				
	2000	**2010**	**2020**	**2030**	**2040**
Population (number of persons)	1,100	1,177	1,350	1,400	1,400
Water Demand (ac-ft/yr)	178	181	188	190	186
Current Supply (ac-ft/yr)	392	392	392	392	392
Supply - Demand (ac-ft/yr)	214	211	204	202	206
Recommended Short Term Strategy (ac-ft/yr)	None Identified				
Long Term Strategy (ac-ft/yr)	None Identified				

Water User Group:	Livestock - Archer				
	2000	**2010**	**2020**	**2030**	**2040**
Population (number of persons)					
Water Demand (ac-ft/yr)	2,711	2,711	2,711	2,711	2,711
Current Supply (ac-ft/yr)	2,711	2,711	2,711	2,711	2,711
Supply - Demand (ac-ft/yr)	0	0	0	0	0
Recommended Short Term Strategy (ac-ft/yr)	None Identified				
Long Term Strategy (ac-ft/yr)	None Identified				

Water User Group:	Mining - Archer				
	2000	**2010**	**2020**	**2030**	**2040**
Population (number of persons)					
Water Demand (ac-ft/yr)	0	0	0	0	0
Current Supply (ac-ft/yr)	1	1	1	1	1
Supply - Demand (ac-ft/yr)	1	1	1	1	1
Recommended Short Term Strategy (ac-ft/yr)	None Identified				
Long Term Strategy (ac-ft/yr)	None Identified				

Water User Group:	Scotland - Archer				
	2000	**2010**	**2020**	**2030**	**2040**
Population (number of persons)					
Water Demand (ac-ft/yr)	224	226	214	208	205
Current Supply (ac-ft/yr)	280	280	280	280	280
Supply - Demand (ac-ft/yr)	56	54	66	72	75
Recommended Short Term Strategy (ac-ft/yr)	None Identified				
Long Term Strategy (ac-ft/yr)	None Identified				

Water User Group:	Steam Electric Power - Archer				
	2000	**2010**	**2020**	**2030**	**2040**
Population (number of persons)					
Water Demand (ac-ft/yr)	0	14,000	14,000	14,000	14,000
Current Supply (ac-ft/yr)	14,000	14,000	14,000	14,000	14,000
Supply - Demand (ac-ft/yr)	14,000	0	0	0	0
Recommended Short Term Strategy (ac-ft/yr)	None Identified				
Long Term Strategy (ac-ft/yr)	None Identified				

2050
1,806
267
673
406

2050
4,855
627
1,153
526

2050
1,524
191
191
0

2050
3,100
3,100
0

2050
1,400
184
392
208

2050
2,711
2,711
0

2050
0
1
1

2050
202
280
78

2050
14,000
14,000
0

Water User Group:	County-Other - Baylor				
	2000	**2010**	**2020**	**2030**	**2040**
Population (number of persons)	1,036	985	1,020	1,060	1,070
Water Demand (ac-ft/yr)	248	232	220	212	212
Current Supply (ac-ft/yr)	256	245	235	229	229
Supply - Demand (ac-ft/yr)	8	13	15	17	17
Recommended Short Term Strategy (ac-ft/yr)	None Identified				
Long Term Strategy (ac-ft/yr)	None Identified				

Water User Group:	Irrigation - Baylor				
	2000	**2010**	**2020**	**2030**	**2040**
Population (number of persons)					
Water Demand (ac-ft/yr)	707	685	666	646	626
Current Supply (ac-ft/yr)	2,212	2,212	2,212	2,212	2,212
Supply - Demand (ac-ft/yr)	1,505	1,527	1,546	1,566	1,586
Recommended Short Term Strategy (ac-ft/yr)	None Identified				
Long Term Strategy (ac-ft/yr)	None Identified				

Water User Group:	**Livestock - Baylor**				
	2000	**2010**	**2020**	**2030**	**2040**
Population (number of persons)					
Water Demand (ac-ft/yr)	953	953	953	953	953
Current Supply (ac-ft/yr)	1,104	1,104	1,104	1,104	1,104
Supply - Demand (ac-ft/yr)	151	151	151	151	151
Recommended Short Term Strategy (ac-ft/yr)	None Identified				
Long Term Strategy (ac-ft/yr)	None Identified				

Water User Group:	**Mining - Baylor**				
	2000	**2010**	**2020**	**2030**	**2040**
Population (number of persons)					
Water Demand (ac-ft/yr)	32	21	10	5	0
Current Supply (ac-ft/yr)	47	47	47	47	47
Supply - Demand (ac-ft/yr)	15	26	37	42	47
Recommended Short Term Strategy (ac-ft/yr)	None Identified				
Long Term Strategy (ac-ft/yr)	None Identified				

Water User Group:	**Seymour - Baylor**				
	2000	**2010**	**2020**	**2030**	**2040**
Population (number of persons)	3,074	2,944	2,578	2,293	2,218
Water Demand (ac-ft/yr)	732	668	550	486	463
Current Supply (ac-ft/yr)	747	747	747	747	747
Supply - Demand (ac-ft/yr)	15	79	197	261	284
Recommended Short Term Strategy (ac-ft/yr)	None Identified				
Long Term Strategy (ac-ft/yr)	None Identified				

2050
1,080
211
229
18

2050
607
2,212
1,605

2050
953
1,104
151

2050
0
47
47

2050
2,147
444
747
303

Water User Group:	**Byers - Clay**				
	2000	**2010**	**2020**	**2030**	**2040**
Population (number of persons)	556	546	527	515	523
Water Demand (ac-ft/yr)	91	85	78	74	73
Current Supply (ac-ft/yr)	91	89	89	89	89
Supply - Demand (ac-ft/yr)	0	4	11	15	16
Recommended Short Term Strategy - Purchase water from Wichita Falls (ac-ft/yr)	0	51	47	44	44
Long Term Strategy (ac-ft/yr)	None Identified				

Water User Group:	**County-Other - Clay**				
	2000	**2010**	**2020**	**2030**	**2040**
Population (number of persons)	5,108	5,024	4,913	4,788	4,777
Water Demand (ac-ft/yr)	762	683	598	551	484
Current Supply (ac-ft/yr)	2,193	2,193	2,193	2,193	2,193
Supply - Demand (ac-ft/yr)	1,431	1,510	1,595	1,642	1,709
Recommended Short Term Strategy (ac-ft/yr)	None Identified				
Long Term Strategy (ac-ft/yr)	None Identified				

Water User Group:	Henrietta - Clay				
	2000	**2010**	**2020**	**2030**	**2040**
Population (number of persons)	3,112	3,268	3,431	3,602	3,750
Water Demand (ac-ft/yr)	698	697	693	707	724
Current Supply (ac-ft/yr)	1,560	1,560	1,560	1,560	1,560
Supply - Demand (ac-ft/yr)	862	863	867	853	836
Recommended Short Term Strategy (ac-ft/yr)	None Identified				
Long Term Strategy (ac-ft/yr)	None Identified				

Water User Group:	Irrigation - Clay				
	2000	**2010**	**2020**	**2030**	**2040**
Population (number of persons)					
Water Demand (ac-ft/yr)	4,000	3,900	3,800	3,700	3,600
Current Supply (ac-ft/yr)	5,291	4,448	4,165	3,883	3,601
Supply - Demand (ac-ft/yr)	1,291	548	365	183	1
Recommended Short Term Strategy (ac-ft/yr)	None Identified				
Long Term Strategy (ac-ft/yr)	None Identified				

Water User Group:	**Livestock - Clay**				
	2000	**2010**	**2020**	**2030**	**2040**
Population (number of persons)					
Water Demand (ac-ft/yr)	2,191	2,191	2,191	2,191	2,191
Current Supply (ac-ft/yr)	2,201	2,201	2,201	2,201	2,201
Supply - Demand (ac-ft/yr)	10	10	10	10	10
Recommended Short Term Strategy (ac-ft/yr)	None Identified				
Long Term Strategy (ac-ft/yr)	None Identified				

Water User Group:	**Mining - Clay**				
	2000	**2010**	**2020**	**2030**	**2040**
Population (number of persons)					
Water Demand (ac-ft/yr)	308	222	198	184	180
Current Supply (ac-ft/yr)	508	508	508	508	508
Supply - Demand (ac-ft/yr)	200	286	310	324	328
Recommended Short Term Strategy (ac-ft/yr)	None Identified				
Long Term Strategy (ac-ft/yr)	None Identified				

Water User Group:	**Petrolia - Clay**				
	2000	**2010**	**2020**	**2030**	**2040**
Population (number of persons)	834	814	779	746	742
Water Demand (ac-ft/yr)	103	96	86	81	79
Current Supply (ac-ft/yr)	103	96	86	81	79
Supply - Demand (ac-ft/yr)	0	0	0	0	0
Recommended Short Term Strategy (ac-ft/yr)	None Identified				
Long Term Strategy (ac-ft/yr)	None Identified				

2050
533
74
89
15
44

2050
4,772
533
2,193
1,660

2050
3,800
725
1,560
835

2050
3,500
3,500
0

2050
2,191
2,201
10

2050
180
508
328

2050
744
78
78
0

Water User Group:	County-Other - Cottle				
	2000	**2010**	**2020**	**2030**	**2040**
Population (number of persons)	460	440	420	375	350
Water Demand (ac-ft/yr)	420	399	374	354	328
Current Supply (ac-ft/yr)	420	399	374	354	328
Supply - Demand (ac-ft/yr)	0	0	0	0	0
Recommended Short Term Strategy (ac-ft/yr)	None Identified				
Long Term Strategy (ac-ft/yr)	None Identified				

Water User Group:	Irrigation - Cottle				
	2000	**2010**	**2020**	**2030**	**2040**
Population (number of persons)					
Water Demand (ac-ft/yr)	4,434	4,301	4,172	4,047	3,925
Current Supply (ac-ft/yr)	4,584	4,584	4,584	4,584	4,584
Supply - Demand (ac-ft/yr)	150	283	412	537	659
Recommended Short Term Strategy (ac-ft/yr)	None Identified				
Long Term Strategy (ac-ft/yr)	None Identified				

Water User Group:	Livestock - Cottle				
	2000	**2010**	**2020**	**2030**	**2040**
Population (number of persons)					
Water Demand (ac-ft/yr)	387	387	387	387	387
Current Supply (ac-ft/yr)	476	476	476	476	476
Supply - Demand (ac-ft/yr)	89	89	89	89	89
Recommended Short Term Strategy (ac-ft/yr)	None Identified				
Long Term Strategy (ac-ft/yr)	None Identified				

Water User Group:	Mining - Cottle				
	2000	**2010**	**2020**	**2030**	**2040**
Population (number of persons)					
Water Demand (ac-ft/yr)	25	25	27	28	30
Current Supply (ac-ft/yr)	25	25	27	28	30
Supply - Demand (ac-ft/yr)	0	0	0	0	0
Recommended Short Term Strategy (ac-ft/yr)	None Identified				
Long Term Strategy (ac-ft/yr)	None Identified				

Water User Group:	**Paducah - Cottle**				
	2000	**2010**	**2020**	**2030**	**2040**
Population (number of persons)	1,645	1,595	1,501	1,385	1,246
Water Demand (ac-ft/yr)	376	346	309	277	245
Current Supply (ac-ft/yr)	450	450	450	450	450
Supply - Demand (ac-ft/yr)	74	104	141	173	205
Recommended Short Term Strategy (ac-ft/yr)	None Identified				
Long Term Strategy (ac-ft/yr)	None Identified				

2050
325
303
303
0

2050
3,808
4,584
776

2050
387
476
89

2050
30
30
0

2050
1,118
217
450
233

Water User Group:	**County-Other - Foard**				
	2000	**2010**	**2020**	**2030**	**2040**
Population (number of persons)	524	530	537	523	512
Water Demand (ac-ft/yr)	80	75	73	72	71
Current Supply (ac-ft/yr)	181	181	181	181	181
Supply - Demand (ac-ft/yr)	101	106	108	109	110
Recommended Short Term Strategy (ac-ft/yr)	None Identified				
Long Term Strategy (ac-ft/yr)	None Identified				

Water User Group:	**Crowell - Foard**				
	2000	**2010**	**2020**	**2030**	**2040**
Population (number of persons)	1,217	1,206	1,194	1,144	1,092
Water Demand (ac-ft/yr)	313	294	275	257	243
Current Supply (ac-ft/yr)	313	294	275	257	243
Supply - Demand (ac-ft/yr)	0	0	0	0	0
Recommended Short Term Strategy (ac-ft/yr)	None Identified				
Long Term Strategy (ac-ft/yr)	None Identified				

Water User Group:	Irrigation - Foard				
	2000	**2010**	**2020**	**2030**	**2040**
Population (number of persons)					
Water Demand (ac-ft/yr)	4,978	4,829	4,684	4,543	4,407
Current Supply (ac-ft/yr)	5,255	5,255	5,255	5,255	5,255
Supply - Demand (ac-ft/yr)	277	426	571	712	848
Recommended Short Term Strategy (ac-ft/yr)	None Identified				
Long Term Strategy (ac-ft/yr)	None Identified				

Water User Group:	Livestock - Foard				
	2000	**2010**	**2020**	**2030**	**2040**
Population (number of persons)					
Water Demand (ac-ft/yr)	289	289	289	289	289
Current Supply (ac-ft/yr)	291	291	291	291	291
Supply - Demand (ac-ft/yr)	2	2	2	2	2
Recommended Short Term Strategy (ac-ft/yr)	None Identified				
Long Term Strategy (ac-ft/yr)	None Identified				

Water User Group:	**Mining - Foard**				
	2000	**2010**	**2020**	**2030**	**2040**
Population (number of persons)					
Water Demand (ac-ft/yr)	23	24	24	25	26
Current Supply (ac-ft/yr)	23	24	24	25	26
Supply - Demand (ac-ft/yr)	0	0	0	0	0
Recommended Short Term Strategy (ac-ft/yr)	None Identified				
Long Term Strategy (ac-ft/yr)	None Identified				

2050
471
65
181
116

2050
1,042
230
230
0

2050
4,275
5,255
980

2050
289
291
2

2050
27
27
0

Water User Group:	**Chillicothe - Hardeman**				
	2000	**2010**	**2020**	**2030**	**2040**
Population (number of persons)	784	792	818	833	848
Water Demand (ac-ft/yr)	122	116	112	112	110
Current Supply (ac-ft/yr)	141	138	136	136	135
Supply - Demand (ac-ft/yr)	19	22	24	24	25
Recommended Short Term Strategy (ac-ft/yr)	None Identified				
Long Term Strategy (ac-ft/yr)	None Identified				

Water User Group:	**County-Other - Hardeman**				
	2000	**2010**	**2020**	**2030**	**2040**
Population (number of persons)	972	1,025	1,110	1,130	1,150
Water Demand (ac-ft/yr)	200	194	202	200	201
Current Supply (ac-ft/yr)	284	284	284	284	284
Supply - Demand (ac-ft/yr)	84	90	82	84	83
Recommended Short Term Strategy (ac-ft/yr)	None Identified				
Long Term Strategy (ac-ft/yr)	None Identified				

Water User Group:	**Irrigation - Hardeman**				
	2000	**2010**	**2020**	**2030**	**2040**
Population (number of persons)					
Water Demand (ac-ft/yr)	4,999	4,849	4,704	4,563	4,426
Current Supply (ac-ft/yr)	7,295	7,295	7,295	7,295	7,295
Supply - Demand (ac-ft/yr)	2,296	2,446	2,591	2,732	2,869
Recommended Short Term Strategy (ac-ft/yr)	None Identified				
Long Term Strategy (ac-ft/yr)	None Identified				

Water User Group:	**Livestock - Hardeman**				
	2000	**2010**	**2020**	**2030**	**2040**
Population (number of persons)					
Water Demand (ac-ft/yr)	480	480	480	480	480
Current Supply (ac-ft/yr)	496	496	496	496	496
Supply - Demand (ac-ft/yr)	16	16	16	16	16
Recommended Short Term Strategy (ac-ft/yr)	None Identified				
Long Term Strategy (ac-ft/yr)	None Identified				

Water User Group:	**Manufacturing - Hardeman**				
	2000	**2010**	**2020**	**2030**	**2040**
Population (number of persons)					
Water Demand (ac-ft/yr)	347	374	398	424	452
Current Supply (ac-ft/yr)	347	374	398	424	452
Supply - Demand (ac-ft/yr)	0	0	0	0	0
Recommended Short Term Strategy (ac-ft/yr)	None Identified				
Long Term Strategy (ac-ft/yr)	None Identified				

Water User Group:	**Mining - Hardeman**				
	2000	**2010**	**2020**	**2030**	**2040**
Population (number of persons)					
Water Demand (ac-ft/yr)	3	3	3	2	2
Current Supply (ac-ft/yr)	7	7	7	7	7
Supply - Demand (ac-ft/yr)	4	4	4	5	5
Recommended Short Term Strategy (ac-ft/yr)	None Identified				
Long Term Strategy (ac-ft/yr)	None Identified				

Water User Group:	**Quanah - Hardeman**				
	2000	**2010**	**2020**	**2030**	**2040**
Population (number of persons)	3,200	3,140	3,080	3,060	3,040
Water Demand (ac-ft/yr)	614	572	532	514	502
Current Supply (ac-ft/yr)	614	572	532	514	502
Supply - Demand (ac-ft/yr)	0	0	0	0	0
Recommended Short Term Strategy (ac-ft/yr)	None Identified				
Long Term Strategy (ac-ft/yr)	None Identified				

Water User Group:	**Steam Electric Power - Hardeman**				
	2000	**2010**	**2020**	**2030**	**2040**
Population (number of persons)					
Water Demand (ac-ft/yr)	1,000	1,000	1,000	1,000	1,000
Current Supply (ac-ft/yr)	1,655	1,601	1,548	1,494	1,440
Supply - Demand (ac-ft/yr)	655	601	548	494	440
Recommended Short Term Strategy (ac-ft/yr)	None Identified				
Long Term Strategy (ac-ft/yr)	None Identified				

2050
861
110
135
25

2050
1,166
204
284
80

APPENDIX B

SOCIO-ECONOMIC IMPACTS OF NOT MEETING WATER NEEDS

TEXAS STATE WATER PLAN

REGION B

JANUARY 5, 2001

TABLE 1. RELATIONSHIP OF WATER NEEDS AND IMPACTS TO PROJECTIONS WITHOUT CONSTRAINTS, REGION B, 2000 - 2050

WATER

Decade	Projected Demand	Projected Water Shortage	Percent Shortage
	(acre-feet)		
2000	169,573	392	0.2%
2010	184,578	394	0.2%
2020	185,634	417	0.2%
2030	187,202	484	0.3%
2040	185,026	559	0.3%
2050	183,213	669	0.4%

EMPLOYMENT

Decade	Baseline Employment	Employment With Water Shortage	Percent Loss
	(FTE jobs)		
2000	87,860	87,182	0.8%
2010	93,547	92,913	0.7%
2020	94,135	93,481	0.7%
2030	93,840	93,086	0.8%
2040	96,846	96,005	0.9%
2050	98,517	97,525	1.0%

POPULATION

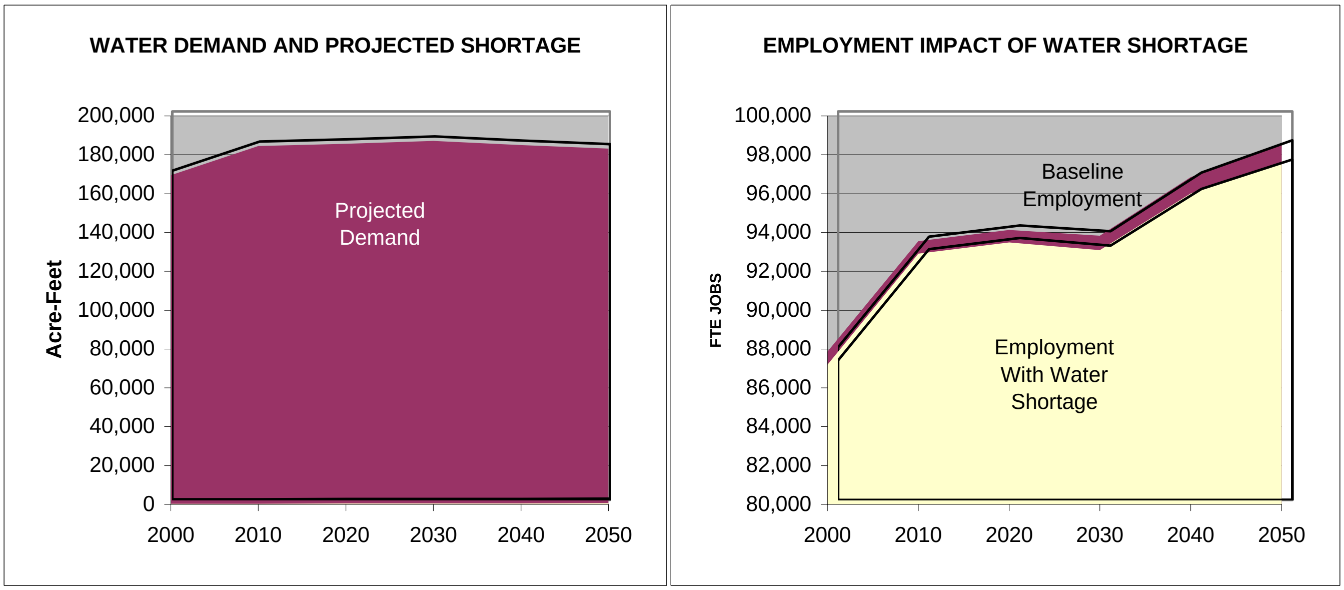
Decade	Baseline Population	Population With Water Shortage	Percent Loss
2000	197,793	196,384	0.7%
2010	204,521	203,341	0.6%
2020	210,634	209,318	0.6%
2030	213,261	211,694	0.7%
2040	215,196	213,378	0.8%
2050	216,914	214,783	1.0%

INCOME

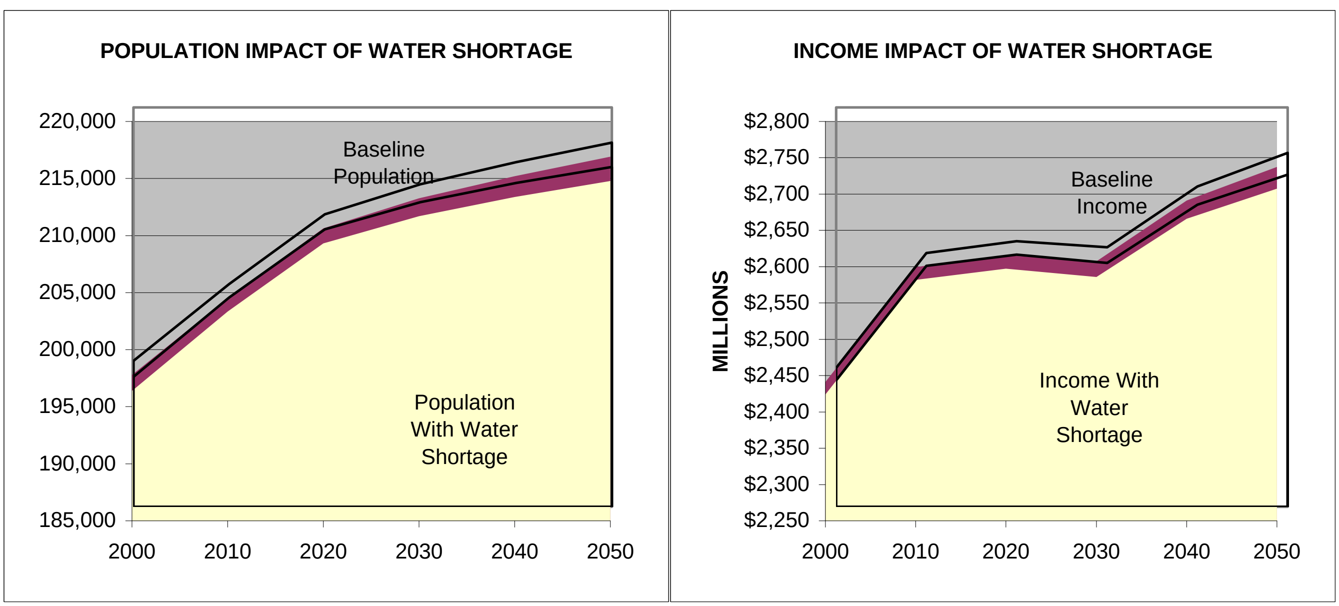
Decade	Baseline Income	Income With Water Shortage	Percent Loss
	(millions, 1999 $)		
2000	2,441	2,424	0.7%
2010	2,599	2,582	0.7%
2020	2,616	2,597	0.7%
2030	2,608	2,586	0.8%
2040	2,691	2,666	0.9%
2050	2,737	2,707	1.1%

Impacts based on water needs identified in Table 7 delivered to TWDB as of 9/11/2001

FIGURE 1. SUMMARY OF SOCIO-ECONOMIC IMPACTS OF NOT MEETING WATER NEEDS, REGION B, 2000 - 2050



Note: The magnitude of projected water shortage is too small to appear on the above graph.



Impacts based on water needs identified in Table 7 delivered to TWDB as of 9/11/2001

TABLE 2. SUMMARY OF IMPACTS BY DECADE AND CATEGORY
REGION B, 2000 - 2050

Category	Decade	Value of Need (Acre Feet)	Impact of Need on Employment	Impact of Need on Gross Business Output in 1999 US Dollars (Millions)	Impact of Need on Population	Impact of Need on School Enrollment	Impact of Need on Income in 1999 US Dollars (Millions)	Number of WUGs with Needs
Municipal	2000	-337	600	40.0	1,251	309	15.0	2
Manufacturing	2000	-55	78	7.8	158	35	2.5	1
Steam Elec.	2000	0	0	0.0	0	0	0.0	0
Mining	2000	0	0	0.0	0	0	0.0	0
Irrigation	2000	0	0	0.0	0	0	0.0	0
Livestock	2000	0	0	0.0	0	0	0.0	0
TOTAL		**-392**	**678**	**47.8**	**1,409**	**344**	**17.5**	
Municipal	2010	-230	401	26.9	748	196	10.0	2
Manufacturing	2010	-164	233	23.3	432	110	7.5	1
Steam Elec.	2010	0	0	0.0	0	0	0.0	0
Mining	2010	0	0	0.0	0	0	0.0	0
Irrigation	2010	0	0	0.0	0	0	0.0	0
Livestock	2010	0	0	0.0	0	0	0.0	0
TOTAL		**-394**	**634**	**50.2**	**1,180**	**306**	**17.5**	
Municipal	2020	-198	342	23.1	672	144	8.5	2
Manufacturing	2020	-219	312	31.1	644	151	10.0	1
Steam Elec.	2020	0	0	0.0	0	0	0.0	0
Mining	2020	0	0	0.0	0	0	0.0	0
Irrigation	2020	0	0	0.0	0	0	0.0	0
Livestock	2020	0	0	0.0	0	0	0.0	0
TOTAL		**-417**	**654**	**54.1**	**1,316**	**295**	**18.5**	
Municipal	2030	-198	347	23.3	727	181	8.6	2
Manufacturing	2030	-286	407	40.6	840	216	13.1	1
Steam Elec.	2030	0	0	0.0	0	0	0.0	0
Mining	2030	0	0	0.0	0	0	0.0	0
Irrigation	2030	0	0	0.0	0	0	0.0	0
Livestock	2030	0	0	0.0	0	0	0.0	0
TOTAL		**-484**	**754**	**63.8**	**1,567**	**397**	**21.7**	
Municipal	2040	-157	270	18.2	608	159	6.7	2
Manufacturing	2040	-402	572	57.0	1,210	313	18.3	1
Steam Elec.	2040	0	0	0.0	0	0	0.0	0
Mining	2040	0	0	0.0	0	0	0.0	0
Irrigation	2040	0	0	0.0	0	0	0.0	0
Livestock	2040	0	0	0.0	0	0	0.0	0
TOTAL		**-559**	**842**	**75.2**	**1,818**	**472**	**25.1**	
Municipal	2050	-148	250	17.0	566	167	6.2	2
Manufacturing	2050	-521	742	73.9	1,565	413	23.8	1
Steam Elec.	2050	0	0	0.0	0	0	0.0	0
Mining	2050	0	0	0.0	0	0	0.0	0
Irrigation	2050	0	0	0.0	0	0	0.0	0
Livestock	2050	0	0	0.0	0	0	0.0	0
TOTAL		**-669**	**992**	**90.9**	**2,131**	**580**	**30.0**	

Impacts based on water needs identified in Table 7 delivered to TWDB as of 9/11/2001

Table 9.00 - Social and Economic Impacts of Not Meeting Needs by Region, 2000

RWPG Letter, Water User Group Identifier, Name			Value of Need (Acre-Feet)	Impact of Need on Employment	Impact of Need on Gross Business Output in 1999 US Dollars (Millions)	Impact of Need on Population	Impact of Need on School Enrollment	Impact of Need on Income in 1999 US Dollars (Millions)
B	20277000	ELECTRA	-65	92	6.6	190	46	2.2
B	20930000	VERNON	-272	508	33.4	1,061	263	12.7
B	21001244	MANUFACTURING	-55	78	7.8	158	35	2.5

Impacts based on water needs identified in Table 7 delivered to TWDB as of 9/11/2001
Refer to the introduction of Section 3 for information on identification of the county where a need occurs.

Table 9.10 - Social and Economic Impacts of Not Meeting Needs by Region, 2010

RWPG Letter, Water User Group Identifier, Name			Value of Need (Acre-Feet)	Impact of Need on Employment	Impact of Need on Gross Business Output in 1999 US Dollars (Millions)	Impact of Need on Population	Impact of Need on School Enrollment	Impact of Need on Income in 1999 US Dollars (Millions)
B	20277000	ELECTRA	-63	89	6.4	148	37	2.2
B	20930000	VERNON	-167	312	20.5	600	159	7.8
B	21001244	MANUFACTURING	-164	233	23.3	432	110	7.5

Impacts based on water needs identified in Table 7 delivered to TWDB as of 9/11/2001
Refer to the introduction of Section 3 for information on identification of the county where a need occurs.

Table 9.20 - Social and Economic Impacts of Not Meeting Needs by Region, 2020

RWPG Letter, Water User Group Identifier, Name			Value of Need (Acre-Feet)	Impact of Need on Employment	Impact of Need on Gross Business Output in 1999 US Dollars (Millions)	Impact of Need on Population	Impact of Need on School Enrollment	Impact of Need on Income in 1999 US Dollars (Millions)
B	20277000	ELECTRA	-61	86	6.2	148	23	2.1
B	20930000	VERNON	-137	256	16.8	524	121	6.4
B	21001244	MANUFACTURING	-219	312	31.1	644	151	10.0

Impacts based on water needs identified in Table 7 delivered to TWDB as of 9/11/2001
Refer to the introduction of Section 3 for information on identification of the county where a need occurs.

Table 9.30 - Social and Economic Impacts of Not Meeting Needs by Region, 2030

RWPG Letter, Water User Group Identifier, Name			Value of Need (Acre-Feet)	Impact of Need on Employment	Impact of Need on Gross Business Output in 1999 US Dollars (Millions)	Impact of Need on Population	Impact of Need on School Enrollment	Impact of Need on Income in 1999 US Dollars (Millions)
B	20277000	ELECTRA	-51	72	5.2	155	37	1.8
B	20930000	VERNON	-147	275	18.1	572	144	6.9
B	21001244	MANUFACTURING	-286	407	40.6	840	216	13.1

Impacts based on water needs identified in Table 7 delivered to TWDB as of 9/11/2001
Refer to the introduction of Section 3 for information on identification of the county where a need occurs.

Table 9.40 - Social and Economic Impacts of Not Meeting Needs by Region, 2040

RWPG Letter, Water User Group Identifier, Name			Value of Need (Acre-Feet)	Impact of Need on Employment	Impact of Need on Gross Business Output in 1999 US Dollars (Millions)	Impact of Need on Population	Impact of Need on School Enrollment	Impact of Need on Income in 1999 US Dollars (Millions)
B	20277000	ELECTRA	-52	73	5.3	184	41	1.8
B	20930000	VERNON	-105	196	12.9	424	118	4.9
B	21001244	MANUFACTURING	-402	572	57.0	1,210	313	18.3

Impacts based on water needs identified in Table 7 delivered to TWDB as of 9/11/2001
Refer to the introduction of Section 3 for information on identification of the county where a need occurs.

Table 9.50 - Social and Economic Impacts of Not Meeting Needs by Region, 2050

RWPG Letter, Water User Group Identifier, Name			Value of Need (Acre-Feet)	Impact of Need on Employment	Impact of Need on Gross Business Output in 1999 US Dollars (Millions)	Impact of Need on Population	Impact of Need on School Enrollment	Impact of Need on Income in 1999 US Dollars (Millions)
B	20277000	ELECTRA	-57	80	5.8	206	64	2.0
B	20930000	VERNON	-91	170	11.2	360	103	4.3
B	21001244	MANUFACTURING	-521	742	73.9	1,565	413	23.8

Impacts based on water needs identified in Table 7 delivered to TWDB as of 9/11/2001
Refer to the introduction of Section 3 for information on identification of the county where a need occurs.

Table 10.00 - Social and Economic Impacts of Not Meeting Needs by Basin, 2000

Water User Group Name	Water User Group Identifier	Regional Water Planning Group	Basin	Value of Need (Acre-Feet)	Impact of Need on Employment	Impact of Need on Gross Business Output in 1999 US Dollars (Millions)	Impact of Need on Population	Impact of Need on School Enrollment	Impact of Need on Income in 1999 US Dollars (Millions)
ELECTRA	20277000	B	2	-65	92	6.6	190	46	2.2
VERNON	20930000	B	2	-272	508	33.4	1,061	263	12.7
MANUFACTURING	21001244	B	2	-55	78	7.8	158	35	2.5

Impacts based on water needs identified in Table 7 delivered to TWDB as of 9/11/2001
Refer to the introduction of Section 3 for information on identification of the county where a need occurs.

Table 10.10 - Social and Economic Impacts of Not Meeting Needs by Basin, 2010

Water User Group Name	Water User Group Identifier	Regional Water Planning Group	Basin	Value of Need (Acre-Feet)	Impact of Need on Employment	Impact of Need on Gross Business Output in 1999 US Dollars (Millions)	Impact of Need on Population	Impact of Need on School Enrollment	Impact of Need on Income in 1999 US Dollars (Millions)
ELECTRA	20277000	B	2	-63	89	6.4	148	37	2.2
VERNON	20930000	B	2	-167	312	20.5	600	159	7.8
MANUFACTURING	21001244	B	2	-164	233	23.3	432	110	7.5

Impacts based on water needs identified in Table 7 delivered to TWDB as of 9/11/2001
Refer to the introduction of Section 3 for information on identification of the county where a need occurs.

Table 10.20 - Social and Economic Impacts of Not Meeting Needs by Basin, 2020

Water User Group Name	Water User Group Identifier	Regional Water Planning Group	Basin	Value of Need (Acre-Feet)	Impact of Need on Employment	Impact of Need on Gross Business Output in 1999 US Dollars (Millions)	Impact of Need on Population	Impact of Need on School Enrollment	Impact of Need on Income in 1999 US Dollars (Millions)
ELECTRA	20277000	B	2	-61	86	6.2	148	23	2.1
VERNON	20930000	B	2	-137	256	16.8	524	121	6.4
MANUFACTURING	21001244	B	2	-219	312	31.1	644	151	10.0

Impacts based on water needs identified in Table 7 delivered to TWDB as of 9/11/2001
Refer to the introduction of Section 3 for information on identification of the county where a need occurs.

Table 10.30 - Social and Economic Impacts of Not Meeting Needs by Basin, 2030

Water User Group Name	Water User Group Identifier	Regional Water Planning Group	Basin	Value of Need (Acre-Feet)	Impact of Need on Employment	Impact of Need on Gross Business Output in 1999 US Dollars (Millions)	Impact of Need on Population	Impact of Need on School Enrollment	Impact of Need on Income in 1999 US Dollars (Millions)
ELECTRA	20277000	B	2	-51	72	5.2	155	37	1.8
VERNON	20930000	B	2	-147	275	18.1	572	144	6.9
MANUFACTURING	21001244	B	2	-286	407	40.6	840	216	13.1

Impacts based on water needs identified in Table 7 delivered to TWDB as of 9/11/2001
Refer to the introduction of Section 3 for information on identification of the county where a need occurs.

Table 10.40 - Social and Economic Impacts of Not Meeting Needs by Basin, 2040

Water User Group Name	Water User Group Identifier	Regional Water Planning Group	Basin	Value of Need (Acre-Feet)	Impact of Need on Employment	Impact of Need on Gross Business Output in 1999 US Dollars (Millions)	Impact of Need on Population	Impact of Need on School Enrollment	Impact of Need on Income in 1999 US Dollars (Millions)
ELECTRA	20277000	B	2	-52	73	5.3	184	41	1.8
VERNON	20930000	B	2	-105	196	12.9	424	118	4.9
MANUFACTURING	21001244	B	2	-402	572	57.0	1,210	313	18.3

Impacts based on water needs identified in Table 7 delivered to TWDB as of 9/11/2001
Refer to the introduction of Section 3 for information on identification of the county where a need occurs.

Table 10.50 - Social and Economic Impacts of Not Meeting Needs by Basin, 2050

Water User Group Name	Water User Group Identifier	Regional Water Planning Group	Basin	Value of Need (Acre-Feet)	Impact of Need on Employment	Impact of Need on Gross Business Output in 1999 US Dollars (Millions)	Impact of Need on Population	Impact of Need on School Enrollment	Impact of Need on Income in 1999 US Dollars (Millions)
ELECTRA	20277000	B	2	-57	80	5.8	206	64	2.0
VERNON	20930000	B	2	-91	170	11.2	360	103	4.3
MANUFACTURING	21001244	B	2	-521	742	73.9	1,565	413	23.8

Impacts based on water needs identified in Table 7 delivered to TWDB as of 9/11/2001
Refer to the introduction of Section 3 for information on identification of the county where a need occurs.

IMPLAN REPORT
OF INDUSTRY FINAL DEMAND
AGGREGATED TO 7 SECTORS

REGION B PRIME A

Industry	Households	Federal Gov't	State & Local Gov't	Capital	Inventory	Domestic Exports	Foreign Exports	Final Demand (Sum)
	Millions of Dollars							
Livestock	3.899	0.126	0.3	0.04	0.016	100.703	1.711	106.795
Irrigation	1.91	0.105	0.124	0.009	0.462	73.493	53.478	129.581
Mining	8.924	0.006	1.197	1.241	0.592	694.826	8.701	715.487
Manufacturing	237.842	0.174	29.657	30.478	12.98	499.826	169.432	980.389
Steam Electric	35.726	12.298	8.526	0.003	0.001	0.009	0.14	56.703
Municipal Commercial	920.236	278.817	175.835	21.924	7.29	64.948	37.216	1506.266
Municipal Household	88.8	773.8	0.0	0.0	143.9	0.0	174.1	1180.6

NOTE: The sum of these final demands are not total final demand for the region. These numbers include only selected sectors from a larger (528 sector) regional model that reported significant water use in the base year. Total final demand for the region would include all remaining, lower water use sectors.

IMPLAN REPORT
OF MULTIPLIERS

Region B Water Planning Region

Employment

Industry	Direct Effects	Indirect Effects	Induced Effects	Total	Type I Multiplier	Type II Multiplier
	Jobs Per Million Dollars of Output					
Livestock	19.8	8.7	5.2	33.7	1.441	1.704
Irrigation	23.0	9.1	5.0	37.2	1.396	1.615
Municipal Commercial	24.6	3.5	10.3	38.3	1.141	1.559
Mining	6.9	2.6	4.4	13.8	1.373	2.013
Manufacturing	7.7	5.7	6.5	19.8	1.737	2.585
Steam Electric	2.7	2.2	4.5	9.4	1.836	3.530
Municipal Household	9.8	1.7	2.6	14.0	1.173	1.429

Output
(Gross Business Receipts/Sales)

Industry	Direct Effects	Indirect Effects	Induced Effects	Total	Type I Multiplier	Type II Multiplier
Livestock	1	0.496	0.301	1.798	1.496	1.798
Irrigation	1	0.494	0.292	1.787	1.494	1.787
Municipal Commercial	1	0.226	0.596	1.822	1.226	1.822
Mining	1	0.247	0.255	1.502	1.247	1.502
Manufacturing	1	0.431	0.377	1.808	1.431	1.808
Steam Electric	1	0.178	0.261	1.440	1.178	1.440
Municipal Household	1	0.120	0.148	1.268	1.120	1.268

Labor Income

Industry	Direct Effects*	Indirect Effects*	Induced Effects*	Total*	Type I Multiplier	Type II Multiplier
Livestock	0.179	0.165	0.120	0.465	1.921	2.590
Irrigation	0.149	0.186	0.117	0.451	2.253	3.038
Municipal Commercial	0.591	0.091	0.237	0.919	1.154	1.555
Mining	0.219	0.073	0.102	0.393	1.331	1.795
Manufacturing	0.280	0.152	0.150	0.582	1.542	2.079
Steam Electric	0.234	0.065	0.104	0.403	1.278	1.724
Municipal Household	0.191	0.041	0.051	0.283	1.215	1.484

*** Income Portion of Gross Outputs**

APPENDIX C

PLAN COMMENTS AND RESPONSES

TEXAS STATE WATER PLAN

REGION B

JANUARY 5, 2001