



**TRANS-TEXAS WATER PROGRAM**  
**SOUTHEAST AREA**

**Memorandum Report**

---

**Projected Water Needs and  
Supply of the Upper Neches and  
Sabine River Basins**

*April 1998*

**Sabine River Authority of Texas  
Lower Neches Valley Authority  
San Jacinto River Authority  
City of Houston  
Brazos River Authority**

*This document is a product of the Trans-Texas Water Program: Southeast Area. The program's mission is to propose economically and environmentally beneficial methods to meet water needs in Texas for the long term. The program's four planning areas are the Southeast Area, which includes the Houston-Galveston metropolitan area, the South-Central Area (including Corpus Christi), the West-Central Area (including San Antonio), and the North-Central Area (including Austin).*

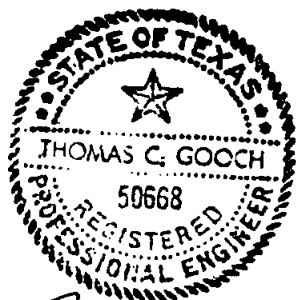
*The Southeast Area of the Trans-Texas Water Program draws perspectives from many organizations and citizens. The Policy Management Committee and its Southeast Area subcommittee guide the program; the Southeast Area Technical Advisory Committee serves as program advisor. Local sponsors are the Sabine River Authority of Texas, the Lower Neches Valley Authority, the San Jacinto River Authority, the City of Houston and the Brazos River Authority.*

*The Texas Water Development Board is the lead Texas agency for the Trans-Texas Water Program. The Board, along with the Texas Natural Resource Conservation Commission, the Texas Parks & Wildlife Department and the Texas General Land Office, set goals and policies for the program pertaining to water resources management and are members of the Policy Management Committee.*

*Brown & Root and Freese & Nichols are consulting engineers for the Trans-Texas Water Program: Southeast Area. Blackburn & Carter and Ekistics provide technical support. This document was written by:*

Freese and Nichols, Inc.

Thomas C. Gooch, P.E.



*Thomas C. Gooch*

Thomas C. Gooch, P.E.

## **Contents**

<b>1. Introduction</b>	<b>1-1</b>
<b>2. Population Projections</b>	<b>2-1</b>
<b>3. Water Need Projections</b>	<b>3-1</b>
<b>4. Projected Changes in the Upper Neches Basin</b>	<b>4-1</b>
<b>5. Projected Changes in the Upper Sabine Basin</b>	<b>5-1</b>
<b>6. Meeting the Projected Future Needs of the Upper Neches Basin</b>	<b>6-1</b>
<b>7. Meeting the Projected Future Needs of the Upper Sabine Basin</b>	<b>7-1</b>
<b>8. Factors of Uncertainty</b>	<b>8-1</b>

<b>Appendix A</b>	<b>References</b>
<b>Appendix B</b>	<b>Scope of Work for Upper Basin Needs</b>
<b>Appendix C</b>	<b>Water Need Projections for the Upper Neches Basin</b>
<b>Appendix D</b>	<b>Water Need Projections for the Upper Sabine Basin</b>
<b>Appendix E</b>	<b>Comments</b>

## Figures

<b>Figure 1: Map of Study Area</b> . . . . .	1-2
<b>Figure 2: Upper Neches and Sabine Combined Municipal Needs</b> . . . . .	8-2
<b>Figure 3: Smith County Population Historical and Consensus Projection</b> . . . . .	8-2
<b>Figure 4: Harrison County Population Historical and Consensus Projection</b> . . . . .	8-3
<b>Figure 5: Wood County Population Historical and Consensus Projection</b> . . . . .	8-3

## **Tables**

<b>Table 1: Projected Population of the Upper Neches River Basin</b> .....	2-1
<b>Table 2: Projected Population of the Upper Sabine River Basin</b> .....	2-2
<b>Table 3: Projected Water Needs of the Upper Neches River Basin</b> .....	3-1
<b>Table 4: Projected Water Needs of the Upper Sabine River Basin</b> .....	3-2
<b>Table 5: Projected Water Uses in the Upper Neches River Basin</b> .....	3-2
<b>Table 6: Projected Water Uses in the Upper Sabine River Basin</b> .....	3-3
<b>Table 7: Summary of Consensus Projection for the Upper Neches Basin: 1990-2050</b> .....	4-2
<b>Table 8: Summary of Consensus Projection for the Upper Sabine Basin: 1990-2050</b> .....	5-2
<b>Table 9: Comparison of Projected Water Needs and Supply in the Upper Neches River Basin as of the Year 2050</b> .....	6-2
<b>Table 10: Comparison of Projected Water Needs and Supply in the Upper Sabine River Basin as of the Year 2050</b> .....	7-2
<b>Table 11: Per Capita Municipal Water Use Amounts Assumed in the Consensus Projections for Key Counties of the Upper Neches and Sabine River Basins</b> .....	8-4



# 1. Introduction

---

The Southeast Area of the Trans-Texas Water Program includes part - but not all - of the Neches River Basin and the Sabine River Basin. As can be seen from Figure 1, the upstream reaches of these two basins lie outside the Southeast Area. (The Upper Neches and Upper Sabine Basins are shaded in the figure.) For that reason, the future water requirements of the upper basin areas have not been included in the projections that were used for earlier parts of the TTWP investigations.<sup>(1)</sup>

There are six counties in the upper Neches watershed and 15 counties in the upper Sabine watershed that were not covered in the population and water need projections developed for the Southeast Area. The portion of the Neches River Basin that is upstream from the Southeast Area consists of one entire county (Cherokee) and parts of five others (Anderson, Henderson, Rusk, Smith and Van Zandt). In the upper Sabine Basin, there is one complete county (Rains) that is outside the Southeast Area, plus parts of 14 others (Collin, Franklin, Gregg, Harrison, Hopkins, Hunt, Kaufman, Panola, Rockwall, Rusk, Smith, Upshur, Van Zandt and Wood).

The scope of work for Phase II of the TTWP studies includes an examination of the projected water requirements of the upper Neches and Sabine Basins through the year

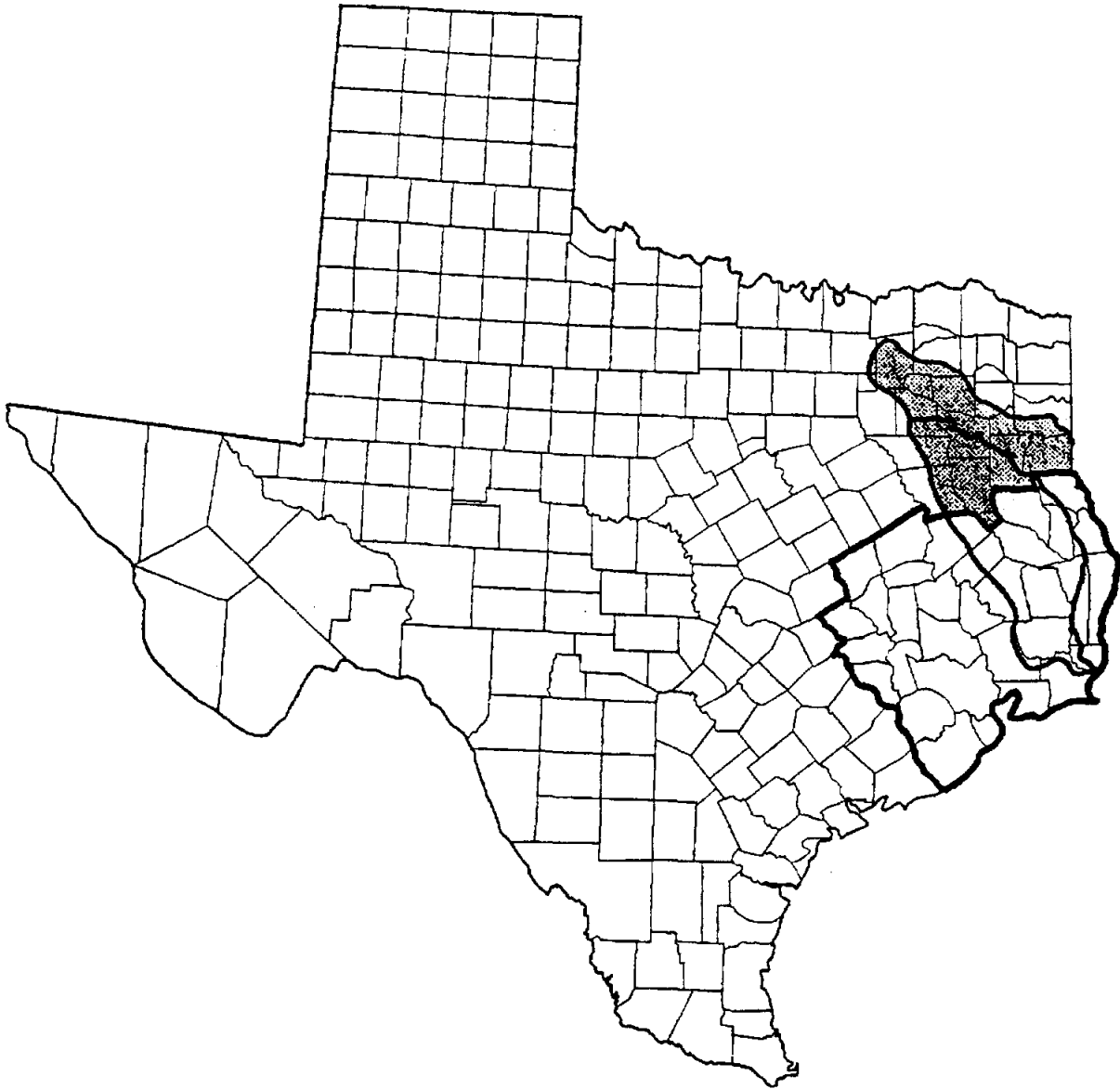
2050, to determine whether those areas are likely to need any of the supply available from the Southeast Area. The wording for that task in the scope of work is reproduced in Appendix B. The methods and results of that analysis are described in this report.

Drafts of this report have been reviewed and commented on by members of the Southeast Area PMC and TAC. Where appropriate modifications to the text have been adopted in response to those comments.

---

<sup>(1)</sup> Superscript numbers in parentheses indicate references listed in Appendix A.

Figure 1: Map of Study Area





## 2. Population Projections

---

Table 1 is a summary of the projected population of the upper Neches Basin area through 2050. Table 2 is a similar summary for the upper Sabine Basin. This information is from the statewide "1996 consensus projection" which was developed recently by the Texas Natural Resource Conservation Commission, the Texas Parks and Wildlife Department, and the Texas Water Development Board.<sup>(2)</sup>

It will be referred to herein as the "consensus projection." Based on federal census counts, the TWDB has estimated that there were 239,627 people in the upper Neches area and 335,498 people in the upper Sabine area as of 1990. It is predicted that, in the 60 years from 1990 through 2050, the population of the upper Neches Basin will increase by 38.6 percent and the population of the upper Sabine Basin will increase by 43.0 percent.

That projection will be used in the 1996 update of the Texas Water Plan, and it was specifically designated for use in this task.

---

**Table 1: Projected Population of the Upper Neches River Basin**

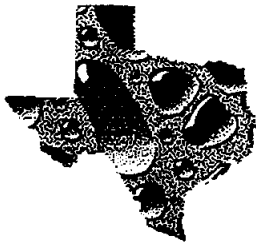
<i>County</i>	<i>1990</i>	<i>2000</i>	<i>2010</i>	<i>2020</i>	<i>2030</i>	<i>2040</i>	<i>2050</i>
Anderson	19,501	21,446	22,064	22,651	22,871	22,957	22,989
Cherokee	41,049	44,077	46,113	48,372	50,782	53,183	55,766
Henderson	16,485	18,940	20,742	22,253	22,798	23,198	24,091
Rusk	23,089	24,880	26,156	28,113	30,126	31,401	32,141
Smith	129,755	145,469	157,782	165,987	173,482	180,393	185,922
Van Zandt	9,748	10,902	11,793	12,356	12,201	11,728	11,217
<b>Total</b>	<b>239,627</b>	<b>265,714</b>	<b>284,650</b>	<b>299,732</b>	<b>312,260</b>	<b>322,860</b>	<b>332,126</b>

---



**Table 2: Projected Population of the Upper Sabine River Basin**

<i>County</i>	<i>1990</i>	<i>2000</i>	<i>2010</i>	<i>2020</i>	<i>2030</i>	<i>2040</i>	<i>2050</i>
Collin	2,015	3,144	2,646	5,432	9,555	14,759	20,211
Franklin	81	94	109	125	142	151	161
Gregg	103,325	112,188	119,566	127,469	134,662	141,231	148,128
Harrison	37,123	40,283	43,388	45,336	45,169	43,586	42,065
Hopkins	6,257	6,446	6,659	6,804	6,828	6,768	6,669
Hunt	51,714	57,464	62,772	66,990	69,750	70,849	73,395
Kaufman	964	1,135	1,346	1,579	1,782	1,938	2,029
Panola	21,998	23,561	24,716	25,306	25,357	24,650	23,943
Rains	6,715	7,444	8,210	8,870	9,436	9,807	10,506
Rockwall	3,480	5,494	7,711	11,068	15,229	20,162	24,949
Rusk	20,646	22,314	23,783	26,172	28,596	30,131	31,104
Smith	21,554	25,421	27,887	29,018	28,995	28,431	26,973
Upshur	11,139	12,464	13,593	14,630	15,484	16,091	16,593
Van Zandt	20,784	23,291	25,196	26,404	26,072	25,066	23,985
Wood	27,703	31,002	33,434	34,972	34,628	32,641	29,138
<b>Total</b>	<b>335,498</b>	<b>371,745</b>	<b>401,016</b>	<b>430,175</b>	<b>451,685</b>	<b>466,261</b>	<b>479,849</b>



### 3. Water Need Projections

Tables 3 and 4 show the overall consensus projections for growth in water needs in the upper Neches and Sabine Basins, respectively, from 1990 through 2050. More detailed tabulations of these projections are included in Appendix C and Appendix D.

In the process of arriving at the consensus projection values, the agencies prepared a number of alternative versions, with a range of assumptions relating to (a) population trends, (b) relative levels of water use per capita, (c) rainfall conditions and (d) water conservation activity. The numbers shown here are from the scenario which the State agencies selected as the "most likely" population, and the water use is projected with below normal rainfall and with conservation<sup>(2)</sup>.

Although the projections begin with the year 1990, the amounts shown for that year are not strictly comparable to the estimates of need for 2000 through 2050. The entries are the actual recorded uses for 1990, whereas the amounts given for other years represent predicted future requirements under below-normal rainfall conditions. The rainfall was above normal in 1990, and it was not a dry year. This distinction generally will not make a large difference in East Texas, but it should be kept in mind when working with the consensus projections.

Tables 5 and 6 show the projected water needs by type of use over the study period for the upper Neches and Sabine Basins, respectively.

**Table 3: Projected Water Needs of the Upper Neches River Basin (Acre-feet per Year)**

<i>County</i>	<i>1990</i>	<i>2000</i>	<i>2010</i>	<i>2020</i>	<i>2030</i>	<i>2040</i>	<i>2050</i>
Anderson	5,281	5,419	5,251	5,095	5,029	4,936	4,917
Cherokee	14,026	16,128	16,054	21,232	26,709	27,044	32,557
Henderson	2,478	3,047	3,084	3,087	3,070	3,034	3,099
Rusk	6,098	5,809	5,439	5,158	5,089	5,061	5,099
Smith	28,000	30,782	47,510	47,656	48,457	41,244	34,396
Van Zandt	1,946	2,209	2,199	2,161	2,080	1,969	1,912
<b>Total</b>	<b>57,829</b>	<b>63,394</b>	<b>79,537</b>	<b>84,389</b>	<b>90,434</b>	<b>83,288</b>	<b>81,980</b>

**Table 4: Projected Water Needs of the Upper Sabine River Basin  
(Acre-feet per Year)**

<i>County</i>	<i>1990</i>	<i>2000</i>	<i>2010</i>	<i>2020</i>	<i>2030</i>	<i>2040</i>	<i>2050</i>
Collin	357	523	415	754	1,269	2,032	2,638
Franklin	13	20	22	23	26	27	28
Gregg	32,892	40,802	43,634	46,458	49,822	53,543	58,822
Harrison	84,903	121,221	145,487	152,103	162,866	175,691	195,397
Hopkins	2,627	3,202	3,186	3,155	3,129	3,091	3,070
Hunt	11,668	12,225	11,560	11,525	11,641	11,558	11,765
Kaufman	181	225	241	258	276	287	295
Panola	9,004	9,608	9,009	14,974	23,101	23,221	22,908
Rains	1,906	2,037	2,097	2,135	2,183	2,207	2,299
Rockwall	516	1,030	1,306	1,760	2,373	3,110	3,705
Rusk	32,481	34,491	39,249	44,100	49,215	49,250	49,303
Smith	4,690	5,123	5,034	4,908	4,740	4,591	4,394
Upshur	1,987	2,313	2,348	2,372	2,406	2,421	2,459
Van Zandt	5,048	5,981	5,938	5,907	5,799	5,628	5,590
Wood	9,144	9,609	32,670	32,376	31,981	30,558	26,186
<b>Total</b>	<b>197,417</b>	<b>248,410</b>	<b>302,196</b>	<b>322,808</b>	<b>350,827</b>	<b>367,215</b>	<b>388,859</b>

**Table 5: Projected Water Uses in the Upper Neches River Basin  
(Acre-feet per Year)**

<i>Type of Use</i>	<i>1990</i>	<i>2000</i>	<i>2010</i>	<i>2020</i>	<i>2030</i>	<i>2040</i>	<i>2050</i>
Municipal	40,915	45,949	46,298	46,034	46,685	47,203	48,473
Manufacturing	3,828	4,180	4,547	4,831	5,106	5,390	5,678
Power	4,936	5,000	5,000	10,000	15,000	15,000	20,000
Mining	2,070	1,597	17,024	16,856	16,975	9,027	1,161
Irrigation	688	688	688	688	688	688	688
Livestock	5,392	5,980	5,980	5,980	5,980	5,980	5,980
<b>Total</b>	<b>57,829</b>	<b>63,394</b>	<b>79,537</b>	<b>84,389</b>	<b>90,434</b>	<b>83,288</b>	<b>81,980</b>

**Table 6: Projected Water Uses in the Upper Sabine River Basin  
(Acre-feet per Year)**

<i>Type of Use</i>	<i>1990</i>	<i>2000</i>	<i>2010</i>	<i>2020</i>	<i>2030</i>	<i>2040</i>	<i>2050</i>
Municipal	52,791	62,533	63,537	64,558	66,045	66,750	68,368
Manufacturing	90,334	127,616	154,097	163,278	171,951	188,411	206,707
Power	34,488	38,300	50,500	55,500	65,500	65,500	79,000
Mining	8,736	7,920	22,021	27,431	35,290	34,513	22,743
Irrigation	715	714	714	714	714	714	714
Livestock	10,353	11,327	11,327	11,327	11,327	11,327	11,327
<b>Total</b>	<b>197,417</b>	<b>248,410</b>	<b>302,196</b>	<b>322,808</b>	<b>350,827</b>	<b>367,215</b>	<b>388,859</b>



## 4. Projected Changes in the Upper Neches Basin

---

Table 7 is a summary of the predicted changes in population and in each use category from 1990 through 2050 for the upper Neches basin. The most significant long-term change in water needs predicted by the consensus projection for the upper Neches is the addition of approximately 15,000 acre-feet per year for steam electric cooling use. There is also a predicted temporary increase of about 15,000 acre-feet per year for mining use, but it lasts only from 2010 through 2030 and begins to disappear by 2040. It is no longer included as of the year 2050, and the total mining use is shown to be slightly less in 2050 than it was in 1990. Municipal and manufacturing use are expected to grow by moderate amounts. Irrigation and livestock use are indicated to remain essentially constant.

Cherokee County is the predicted location of the expected increase in power plant cooling water demand, and it is therefore the county with the most significant projected growth in water use in the upper Neches area. The largest urban area is Tyler, in Smith County, and it is shown as having the most noticeable increases in municipal and manufacturing use. Smith County is also the site of the predicted short-term rise in mining use.

Henderson County is indicated to have a small increase in total need. The Neches portions of the other three counties (Anderson, Rusk and Van Zandt) all are shown by the consensus

projection to need less water in 2050 than they are recorded as having used in 1990.

**Table 7: Summary of Consensus Projection for the Upper Neches Basin: 1990-2050**  
**(Quantities in acre-feet per year except for population numbers and percentages)**

	<i>1990</i>	<i>2050</i>	<i>Change</i>	<i>% Change</i>
Population	239,627	332,126	92,499	38.6%
Municipal Use	40,915	48,473	7,558	18.5%
Manufacturing Use	3,828	5,678	1,850	48.3%
Steam Electric Use	4,936	20,000	15,064	305.2%
Mining Use	2,070	1,161	-909	-43.9%
Irrigation Use	688	688	None	None
Livestock Use	5,392	5,980	588	10.9%
<b>Total Use</b>	<b>57,829</b>	<b>81,980</b>	<b>24,151</b>	<b>41.8%</b>

---



## 5. Projected Changes in the Upper Sabine Basin

---

Table 8 summarizes the consensus projection's anticipated shifts in population and water needs from 1990 through 2050 for the upper Sabine Basin. The largest amount of change is predicted to be in manufacturing use, and the next-largest is in power plant cooling use. Municipal use is expected to rise slowly. Mining use reflects a significant increase in 2010 but peaks and begins to drop in about the year 2030. Irrigation and livestock use remain essentially constant.

Gregg County, which includes most of Longview, and Harrison County, which is the location of the Texas Eastman division of Eastman Chemical Company, have the largest water needs. Other counties with significant requirements in the upper Sabine Basin are Rusk, Wood, Panola and Hunt. Together, these six counties account for approximately 94 percent of the predicted total upper Sabine Basin water needs as of 2050. The Sabine portion of Hunt County is shown to have moderately large needs, but its needs are not indicated to grow significantly between 1990 and 2050.

The Sabine portions of six counties (Franklin, Hopkins, Kaufman, Rains, Upshur and Van Zandt) are predicted to have only small amounts of use and small net increases from 1990 through 2050. Collin County and Rockwall County are expected to have substantial percentage growth, but their areas within the Sabine Basin are small and do not

involve major amounts of water use. The Sabine Basin area of Smith County is shown as having a net reduction in water use over the 60-year study period.

The rise in steam electric cooling use is predicted to be in Rusk County and Wood County. As pointed out in correspondence from the Texas Water Development Board, the locations of future demands for power plant cooling water are only approximate, based on the agency's best judgement at this time. Because of the interconnected nature of the power distribution network, new generating facilities can give satisfactory service from a variety of locations, and actual future requirements for that type of use in any given county could be appreciably more or less than predicted.

The rise in mining use is shown to occur in Panola County and Wood County. Panola County's mining use is predicted to continue strongly through 2050, but the mining use in Wood County is shown to peak in 2010 and then to decline so that by 2050 it is little more than it was in 1990.

**Table 8: Summary of Consensus Projection for the Upper Sabine Basin: 1990-2050  
(Quantities in acre-feet per year except for population numbers and percentages)**

	<i>1990</i>	<i>2050</i>	<i>Change</i>	<i>% Change</i>
Population	335,498	479,849	144,351	43.0%
Municipal Use	52,791	68,368	15,577	29.5%
Manufacturing Use	90,334	206,707	116,373	128.8%
Steam Electric Use	34,488	79,000	44,512	129.1%
Mining Use	8,736	22,743	14,007	160.3%
Irrigation Use	715	714	None	None
Livestock Use	10,353	11,327	974	9.4%
<b>Total Use</b>	<b>197,417</b>	<b>388,859</b>	<b>191,442</b>	<b>97.0%</b>

---





## 6. Meeting the Projected Future Needs of the Upper Neches Basin

---

In round numbers, the anticipated future needs of the upper Neches River Basin through 2050 are approximately 24,000 acre-feet per year more than 1990 use according to the consensus projection. Of this total amount, some 6,400 acre-feet per year are expected to be needed to meet the growth in municipal and manufacturing use in Smith County, mainly in or near the City of Tyler. Tyler has a suitable reserve of additional supply available in Lake Palestine and can meet its anticipated increases in requirements from that source.

Nearly all of the remaining projected permanent growth in requirements is anticipated to be in Cherokee County. The site of the proposed Eastex Reservoir, for which the Angelina and Neches River Authority holds a current water right, is also in Cherokee County. That project is estimated to have a firm yield of 85,507 acre-feet per year<sup>(3)</sup>, which would more than satisfy the predicted new demands in that area.

The significant but temporary rise in mining use spans a period of roughly 35 to 40 years but is not predicted to be present in 2050. It is shown as being located in Smith County. The timing and location of this need are such that it, too, could be provided by the proposed Eastex Reservoir.

The main source of supply in the lower Neches River Basin is the existing Sam Rayburn Reservoir, which is owned and

operated by the U.S. Army Corps of Engineers. Construction of the Eastex Reservoir in the upper basin would diminish inflows to Lake Sam Rayburn to a moderate degree. However, the potential future needs of the upper basin were taken into consideration when the original water rights were granted for Sam Rayburn, and those rights were made subordinate to subsequent upstream development in an area that includes the Eastex project site. The yield that the lower Neches Basin is entitled to derive from Sam Rayburn is based on the assumption that upstream needs might be satisfied at some future time by construction of a reservoir such as Eastex, with the right to impound runoff that otherwise would flow downstream to Sam Rayburn<sup>(4)</sup>.

Table 9 is a comparison of projected 2050 demands in the Upper Neches River Basin and available supplies. The table shows that available supplies exceed currently projected 2050 water needs. However, the available supplies in the basin may be committed to specific users and may not be available to meet growing demands.

All of the projected additional requirements in the upper Neches Basin can be provided either from existing sources or from the Eastex project, for which substantial planning has already been completed. There is no present indication that the future needs of the upper

Neches area through the year 2050 will require water from the TTWP Southeast Area.

**Table 9: Comparison of Projected Water Needs and Supply in the Upper Neches River Basin as of the Year 2050**

	<i>Acre-Feet per Year</i>
In-basin water needs (consensus projection)	81,980
Commitments for exports to other basins	
Athens	7,100
Dallas	114,337
Palestine (57% of Palestine's share of Lake Palestine)	15,960
Champion International (in lower Neches)	10,000
<b>Total of in-basin needs plus exports</b>	<b>229,377</b>
Available from existing reservoirs	
Lake Athens <sup>(6)</sup>	7,100
Lake Palestine <sup>(6)</sup>	212,700
Lake Jacksonville <sup>(6)</sup>	5,000
Lake Tyler and Lake Tyler East <sup>(6)</sup>	38,500
Striker Creek Lake	15,000
Run-of-the-river supply	7,892
Imports	
From Sabine River to Henderson	5,048
<b>Total available surface water supply</b>	<b>291,240</b>
<b>1990 groundwater pumpage</b>	<b>29,123</b>
<b>Difference between total needs and supply (unused supply)</b>	<b>90,986</b>



## 7. Meeting the Projected Future Needs of the Upper Sabine Basin

---

The outlook for the upper Sabine River Basin is more complex. The consensus projection predicts that the overall increase in water requirements for this area from 1990 through 2050 will total approximately 191,400 acre-feet per year. Of this amount, some 184,200 acre-feet per year are associated with Gregg, Harrison, Panola, Rusk and Wood Counties.

The Collin County and Rockwall County areas within the Sabine Basin are predicted to need a combined total of roughly 5,500 more acre-feet per year, which should be available from the established supply systems that serve the suburban areas around Dallas. The indicated additional needs in the Sabine Basin areas of Franklin, Hopkins, Hunt, Kaufman, Rains and Van Zandt Counties total about 1,600 acre-feet per year, part of which is already committed from Lake Tawakoni and part of which is expected to come from minor local sources.

No new supply is indicated to be needed in the Sabine Basin area of Smith County. The projected increase in need for Upshur County is roughly 500 acre-feet per year. In the context of this report, this is a relatively small amount, but there is not a clearly identifiable source to which that need could be related at the present time.

Gregg County is predicted to need 26,000 acre-feet per year more in 2050 than it did in 1990. This is made up of approximately 7,400 acre-feet per year for municipal use,

15,100 acre-feet per year for manufacturing, and 3,500 acre-feet per year for power plant cooling. The City of Longview has entered into an agreement to purchase 20,000 acre-feet per year from the existing Lake O' the Pines, in the Cypress Basin. This new supply will cover most of the projected growth in Gregg County. Kilgore has a supply of water committed from the existing Lake Fork Reservoir, which should account for most of the needs not associated with Longview. The added power plant cooling use is not currently identified with a specific source of supply.

Essentially all of the firm yields of the existing surface water reservoirs in the upper Sabine Basin are now committed. All or most of the projected increases in needs for the Sabine Basin portions of Harrison, Panola, Rusk and Wood Counties are beyond the supply capabilities of the existing sources unless they happen to be uses for which specific commitments of existing supply have already been made.

Table 10 is a comparison of the projected water requirements in 2050 versus the available supply from existing and reasonably probable future sources. This comparison reflects a shortfall of 103,061 acre-feet per year at that time. Actually, the deficiency in supply as of 2050 probably would be more than shown in Table 10. It is seldom possible to match the individual elements of supply and the various components of need perfectly, and

**Table 10: Comparison of Projected Water Needs and Supply in the Upper Sabine River Basin as of the Year 2050**

	<i>Acre-Feet per Year</i>
In-basin water needs (consensus projection)	388,859
Commitments for exports to other basins	
Dallas	310,480
Others	21,847
<b>Total of in-basin needs plus exports</b>	<b>721,186</b>
Available from existing reservoirs <sup>(5)</sup>	
Lake Tawakoni	238,100
Lake Fork Reservoir	188,660
Lake Gladewater	1,679
Lake Cherokee	22,500
Martin Lake*	25,000
Lake Murvaul	22,400
Run-of-the-river supply	
City of Longview <sup>(5)</sup>	9,742
Eastman Chemical Company	22,500
Other rights <sup>(5)</sup>	
Municipal, industrial and mining use	8,405
Irrigation use	714
Livestock use	11,327
Imports	
From Lake O' the Pines to Longview	20,000
Brandy Branch <sup>(5)</sup>	18,000
<b>Total available surface water supply</b>	<b>589,027</b>
<b>1990 groundwater pumpage</b>	<b>29,098</b>
<b>Difference between total needs and supply (shortfall)</b>	<b>(103,061)</b>

\* According to the Texas Water Development Board, Martin Lake should be used to meet only steam power needs due to quality and permit limitations.

in an area as large as this it would be almost impossible to do so. Realistically, it is to be expected that the need for additional supply could be considerably more than indicated by the simple comparison of total needs and availability in Table 10.

There are no new reservoir projects now being developed in the upper Sabine Basin, and no water right has been granted for a major new reservoir in the area. Based on the consensus projection, it would be only prudent to recognize that (a) the upper Sabine Basin could need to draw water from within the Southeast Area between now and 2050 and (b) the total need for such water from the Southeast Area could be in the range of 100,000 to 200,000 acre-feet per year.



## 8. Factors of Uncertainty

---

Over the years, there have been several statewide projections of future water use. In general, each projection has been different from the one before in significant ways. It is clear that the process involves a considerable amount of judgment, and some of the key assumptions have been modified from time to time. The overall trend has been toward prediction of lower total requirements with each new version.

In the Upper Neches and Sabine River Basins, the consensus projection is characterized by low estimates of future municipal need. Historically, municipal use has been the single largest requirement in most counties. In the areas covered by this report, the consensus projection concludes, in effect, that the era of growing municipal water needs is ending and that most communities will need very little new supply of drinking water for the next 55 years or more.

Figure 2 is a graph showing the total municipal needs in the upper Neches and Sabine Basins according to the version of the consensus projection that the three cooperating state agencies consider most likely. As can be seen from the graph, there is very little anticipated increase in municipal use from the year 2000 on.

One factor leading to this result is the assumption that the counties in question will have relatively slow population growth and, in some instances, will actually lose population. For example, Figure 3 is a plot of recent

historical census counts in Smith County, along with the consensus projection through 2050. As is apparent from this figure, future changes in population are predicted to be less rapid than recent actual experience. Figure 4 and Figure 5 are similar plots for Harrison County and Wood County. In those counties, the population is forecast to crest in 2020 and to decrease from that time forward.

The population projections are, of course, basic to the estimates of municipal water use. They are multiplied by anticipated future levels of per capita use to arrive at the predicted annual volumes of municipal demand. In addition to the relatively low population numbers, the consensus procedure also assumed a downward trend in per capita use. It was reasoned that recent Texas legislation requiring installation of low-water-use plumbing fixtures in new residential or commercial structures, together with programs of public education and cultivation of a strict water-saving ethic, will bring the per capita use down steadily from 2000 through 2050.

Table 11 is a summary of the per capita consumption rates adopted for those years for the counties with the largest amounts of municipal use in the consensus projection for the Upper Neches and Sabine Basins. The indicated decreases are significant, approaching or exceeding 20 percent in some instances.

Figure 2: Upper Neches and Sabine Combined Municipal Needs

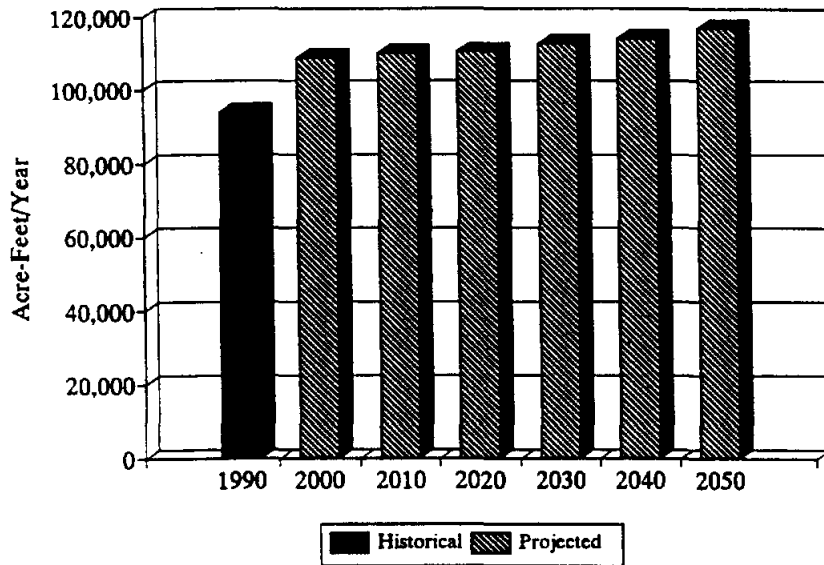


Figure 3: Smith County Population Historical and Consensus Projection

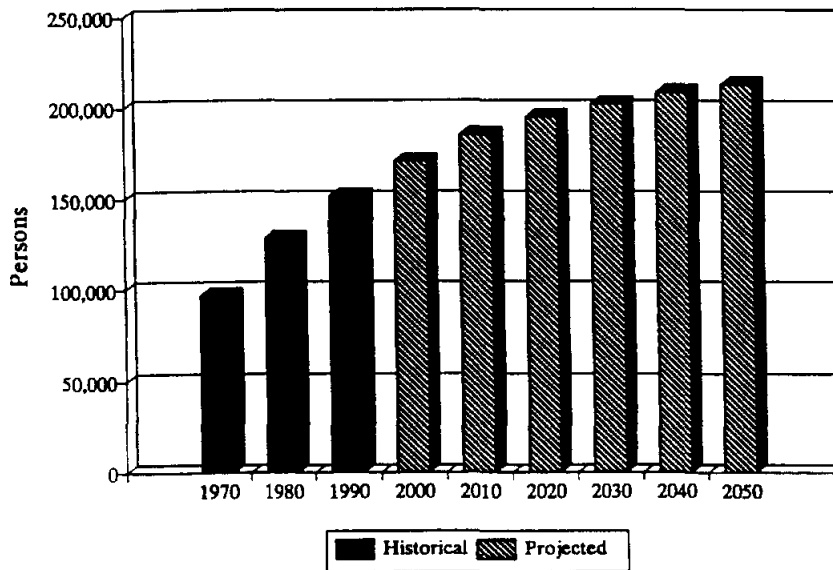


Figure 4: Harrison County Population  
Historical and Consensus Projection

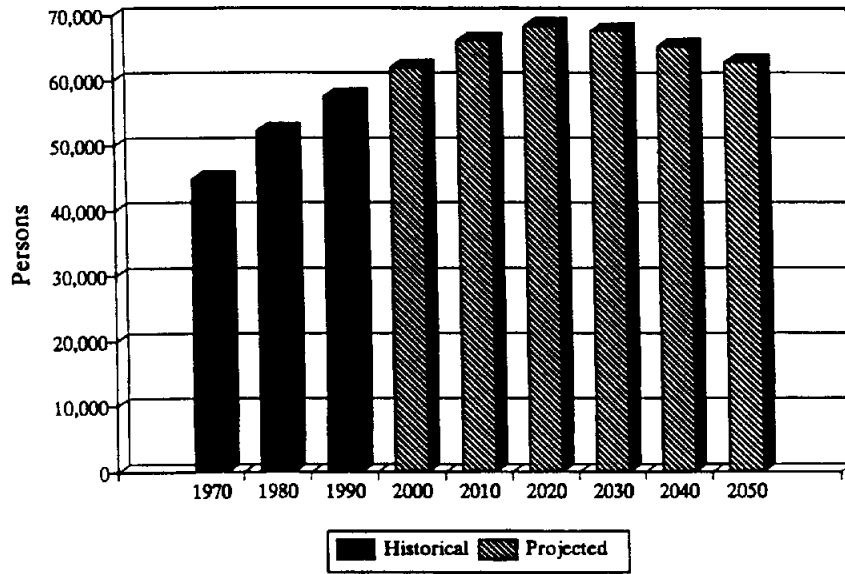
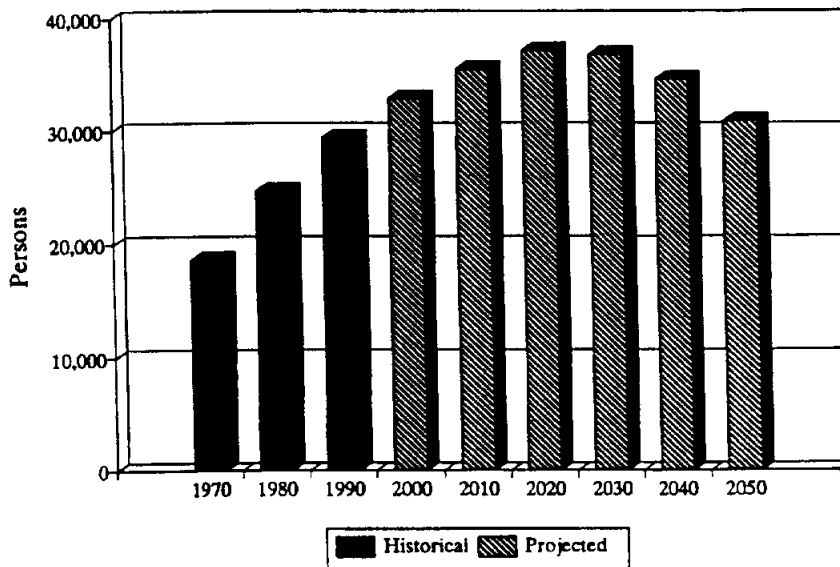


Figure 5: Wood County Population  
Historical and Consensus Projection





**Table 11: Per Capita Municipal Water Use Amounts Assumed in the Consensus Projections for Key Counties of the Upper Neches and Sabine River Basins (Gallons per Capita per Day)**

	<i>GPCD in the Year 2000</i>	<i>GPCD in the Year 2050</i>	<i>Percentage Decrease</i>
<b>In the Neches Basin</b>			
Cherokee County	158	131	17.1%
Smith County	162	139	14.2%
<b>In the Sabine Basin</b>			
Gregg County	171	150	12.3%
Harrison County	140	118	15.7%
Hunt County	152	122	19.7%
Panola County	138	115	16.7%
Rusk County	130	103	20.8%
Wood County	140	118	15.7%

**Note: Less than normal rainfall assumed.**

The combined effect of the low population growth estimates and the assumed future reductions in per capita use is to predict almost no need for additional municipal water supply after the turn of the century. This relatively extreme position is uncertain at best. In general, these are not highly urbanized counties, and the per capita water use is relatively low to begin with in most cases. It remains to be seen whether the anticipated decrease in per capita use will prove to be a reasonable assumption. It is doubtful whether cities in East Texas will feel secure in basing their long-term planning on the premise that they can do without new water supply to the extent indicated by the consensus projection.

To understand the importance of such an assumption, one has but to consider what might have been the impact if the Texas Board of Water Engineers had decided in 1935 that further growth of per capita water use was unlikely and statewide water planning should

adopt that as a basic assumption. We are dealing with a forecast of conditions over a 60-year period of time. Many key factors that influence today's water needs were hardly foreseeable 60 years ago.

As an example of the kind of development in question, it has been proposed that there should be a new interstate-class highway route linking Montreal and Mexico City. Such a highway would pass through the area being considered here and could have a major impact on economic growth.

It would be logical and prudent to recognize that there may be a number of such developments in the coming decades and that they may tend to cause higher water demands. Our planning for the future should leave some slack and should recognize that there can be important new trends that we do not yet know about.

**APPENDIX A**  
**REFERENCES**



## References

---

- (1) Brown and Root, Inc., and Freese and Nichols, Inc.: *Trans-Texas Water Program Southeast Area Phase I Report*, March 1994.
- (2) Water Demand/Drought Management Technical Advisory Committee of the Consensus-Based State Water Plan: *Water for Texas - Today and Tomorrow, Volume III, Water Use Planning Data Appendix*, January 1995.
- (3) Letter from Mr. Gary Neighbors, General Manager, Angelina and Neches River Authority, November 27, 1996.
- (4) Freese and Nichols, Inc.: *Hydrologic Studies of the Neches River Basin*, prepared for the Lower Neches Valley Authority, September 1994.
- (5) Texas Water Development Board: *Water for Texas - Today and Tomorrow*, December 1990.
- (6) Freese and Nichols, Inc.: *Upper Sabine Basin Regional Water Supply Plan*, prepared for the Sabine River Authority of Texas, May 1988.

**APPENDIX B**

**SCOPE OF WORK FOR UPPER BASIN NEEDS**

**TRANS-TEXAS WATER PROGRAM - SOUTHEAST AREA  
SCOPE OF SERVICES FOR PHASE II**

**1.0 PLANNING STUDIES**

**1.1 Upper Basin Needs**

The Upper Sabine Basin and the Upper Neches Basin are outside of the Southeast Area of the Trans-Texas Water Program (TTWP), but both areas have water needs that might be supplied from the Southeast Area. (The areas of the Brazos Basin and the Trinity Basin upstream from the Southeast Area are not likely to require supplies from within the study area.)

- 1.1.1 Using Texas Water Development Board (TWDB) consensus water planning data, develop projected water needs through year 2050 for the Upper Sabine Basin and the Upper Neches Basin.
- 1.1.2 Meet with the Sabine River Authority (SRA), Lower Neches Valley Authority (LNVA), the Angelina & Neches River Authority, and the Upper Neches River Municipal Water Authority to review the projected water needs, available in-basin sources of water supply, potential future sources, and potential sources for import. Consider issues such as availability, reliability, cost, water quality, regional permits, local preferences, and environmental impacts.
- 1.1.3 Prepare a draft memorandum report on the water needs and potential supplies for the Upper Sabine Basin and the Upper Neches Basin. Outline the impact of various scenarios of future supply development on the availability of water for the Southeast Area.
- 1.1.4 Review the memorandum report with the SRA, LNVA, the Angelina & Neches River Authority, and the Upper Neches River Municipal Water Authority. Review the memorandum report with the Southeast PMC and TAC.
- 1.1.5 Respond to comments and prepare a final memorandum report on the projected needs of the Upper Sabine Basin and the Upper Neches Basin, potential sources of supply, and the effect on water availability for the Southeast Area of the TTWP.

**APPENDIX C**

**WATER NEED PROJECTIONS FOR THE UPPER NECHES BASIN**

## Projected Water Requirements for Anderson County by Category

Type of Use	Projected Water Requirements in Acre-Feet						
	1990	2000	2010	2020	2030	2040	2050
<u>In the Upper Neches Basin</u>							
Municipal	4,012	4,033	3,939	3,851	3,811	3,725	3,703
Manufacturing	128	138	148	155	161	175	187
Steam Electric (Power)	0	0	0	0	0	0	0
Irrigation	23	23	23	23	23	23	23
Mining	303	227	143	68	36	15	6
Livestock	815	998	998	998	998	998	998
Upper Neches Basin Total	5,281	5,419	5,251	5,095	5,029	4,936	4,917
<u>County Total</u>							
Municipal	8,442	9,827	9,599	9,385	9,290	9,077	9,025
Manufacturing	142	153	164	172	179	194	208
Steam Electric (Power)	0	0	0	0	0	0	0
Irrigation	334	334	334	334	334	334	334
Mining	303	252	623	8,366	9,514	10,676	11,850
Livestock	1,745	2,138	2,138	2,138	2,138	2,138	2,138
County Total	10,966	12,704	12,858	20,395	21,455	22,419	23,555

## Projected Water Requirements for Cherokee County by Category

Type of Use	Projected Water Requirements in Acre-Feet						
	1990	2000	2010	2020	2030	2040	2050
<u>In the Upper Neches Basin</u>							
Municipal	6,405	7,798	7,715	7,638	7,773	7,919	8,214
Manufacturing	329	334	368	408	448	493	541
Steam Electric (Power)	4,936	5,000	5,000	10,000	15,000	15,000	20,000
Irrigation	548	548	548	548	548	548	548
Mining	55	77	52	267	569	713	883
Livestock	<u>1,753</u>	<u>2,371</u>	<u>2,371</u>	<u>2,371</u>	<u>2,371</u>	<u>2,371</u>	<u>2,371</u>
Upper Neches Basin Total	14,026	16,128	16,054	21,232	26,709	27,044	32,557
<u>County Total</u>							
Municipal	6,405	7,798	7,715	7,638	7,773	7,919	8,214
Manufacturing	329	334	368	408	448	493	541
Steam Electric (Power)	4,936	5,000	5,000	10,000	15,000	15,000	20,000
Irrigation	548	548	548	548	548	548	548
Mining	55	77	52	267	569	713	883
Livestock	<u>1,753</u>	<u>2,371</u>	<u>2,371</u>	<u>2,371</u>	<u>2,371</u>	<u>2,371</u>	<u>2,371</u>
County Total	14,026	16,128	16,054	21,232	26,709	27,044	32,557



## Projected Water Requirements for Gregg County by Category

Type of Use	Projected Water Requirements in Acre-Feet						
	1990	2000	2010	2020	2030	2040	2050
<u>In the Upper Sabine Basin</u>							
Municipal	17,469	21,438	21,761	22,248	23,048	23,769	24,849
Manufacturing	14,634	16,538	18,576	20,934	23,507	26,515	29,716
Steam Electric (Power)	465	2,500	3,000	3,000	3,000	3,000	4,000
Irrigation	0	0	0	0	0	0	0
Mining	124	96	67	46	37	29	27
Livestock	<u>200</u>	<u>230</u>	<u>230</u>	<u>230</u>	<u>230</u>	<u>230</u>	<u>230</u>
Upper Sabine Basin Total	32,892	40,802	43,634	46,458	49,822	53,543	58,822
<u>County Total</u>							
Municipal	17,666	21,629	21,928	22,391	23,181	23,886	24,953
Manufacturing	14,634	16,538	18,576	20,934	23,507	26,515	29,716
Steam Electric (Power)	465	2,500	3,000	3,000	3,000	3,000	4,000
Irrigation	0	0	0	0	0	0	0
Mining	124	96	67	46	37	29	27
Livestock	<u>230</u>	<u>265</u>	<u>265</u>	<u>265</u>	<u>265</u>	<u>265</u>	<u>265</u>
County Total	33,119	41,028	43,836	46,636	49,990	53,695	58,961

## Projected Water Requirements for Rusk County by Category

Type of Use	Projected Water Requirements in Acre-Feet						
	1990	2000	2010	2020	2030	2040	2050
<u>In the Upper Neches Basin</u>							
Municipal	3,576	3,896	3,841	3,815	3,854	3,860	3,928
Manufacturing	257	290	323	360	398	436	476
Steam Electric (Power)	0	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0	0
Mining	1,559	935	587	295	149	77	7
Livestock	706	688	688	688	688	688	688
Upper Neches Basin Total	6,098	5,809	5,439	5,158	5,089	5,061	5,099
<u>County Total</u>							
Municipal	6,319	7,146	7,093	7,122	7,285	7,350	7,517
Manufacturing	305	344	382	425	469	512	559
Steam Electric (Power)	28,320	30,000	35,000	40,000	45,000	45,000	45,000
Irrigation	75	75	75	75	75	75	75
Mining	2,291	1,498	901	399	238	137	14
Livestock	1,269	1,237	1,237	1,237	1,237	1,237	1,237
County Total	38,579	40,300	44,688	49,258	54,304	54,311	54,402

## Projected Water Requirements for Hopkins County by Category

Type of Use	Projected Water Requirements in Acre-Feet						
	1990	2000	2010	2020	2030	2040	2050
<u>In the Upper Sabine Basin</u>							
Municipal	828	1,070	1,053	1,022	995	956	935
Manufacturing	2	2	3	3	4	5	5
Steam Electric (Power)	0	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0	0
Mining	0	0	0	0	0	0	0
Livestock	<u>1,797</u>	<u>2,130</u>	<u>2,130</u>	<u>2,130</u>	<u>2,130</u>	<u>2,130</u>	<u>2,130</u>
Upper Sabine Basin Total	2,627	3,202	3,186	3,155	3,129	3,091	3,070
<u>County Total</u>							
Municipal	4,890	5,142	5,054	4,900	4,793	4,612	4,509
Manufacturing	591	637	685	724	756	819	881
Steam Electric (Power)	0	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0	0
Mining	123	125	122	120	117	116	116
Livestock	<u>5,990</u>	<u>7,100</u>	<u>7,100</u>	<u>7,100</u>	<u>7,100</u>	<u>7,100</u>	<u>7,100</u>
County Total	11,594	13,004	12,961	12,844	12,766	12,647	12,606

## Projected Water Requirements for Van Zandt County by Category

Type of Use	Projected Water Requirements in Acre-Feet						
	1990	2000	2010	2020	2030	2040	2050
<u>In the Upper Neches Basin</u>							
Municipal	1,330	1,472	1,494	1,476	1,404	1,298	1,241
Manufacturing	0	0	0	0	0	0	0
Steam Electric (Power)	0	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0	0
Mining	6	80	48	28	19	14	14
Livestock	<u>610</u>	<u>657</u>	<u>657</u>	<u>657</u>	<u>657</u>	<u>657</u>	<u>657</u>
Upper Neches Basin Total	1,946	2,209	2,199	2,161	2,080	1,969	1,912
<u>County Total</u>							
Municipal	5,356	5,874	5,962	5,891	5,613	5,190	4,970
Manufacturing	223	280	344	396	451	508	566
Steam Electric (Power)	0	0	0	0	0	0	0
Irrigation	50	50	50	50	50	50	50
Mining	836	1,359	1,167	1,099	1,077	1,084	1,115
Livestock	<u>2,213</u>	<u>2,381</u>	<u>2,381</u>	<u>2,381</u>	<u>2,381</u>	<u>2,381</u>	<u>2,381</u>
County Total	8,678	9,944	9,904	9,817	9,572	9,213	9,082

**APPENDIX D**

**WATER NEED PROJECTIONS FOR THE UPPER SABINE BASIN**

## Projected Water Requirements for Collin County by Category

Type of Use	Projected Water Requirements in Acre-Feet						
	1990	2000	2010	2020	2030	2040	2050
<u>In the Upper Sabine Basin</u>							
Municipal	320	485	377	716	1,231	1,994	2,600
Manufacturing	0	0	0	0	0	0	0
Steam Electric (Power)	0	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0	0
Mining	0	0	0	0	0	0	0
Livestock	<u>37</u>	<u>38</u>	<u>38</u>	<u>38</u>	<u>38</u>	<u>38</u>	<u>38</u>
Upper Sabine Basin Total	357	523	415	754	1,269	2,032	2,638
<u>County Total</u>							
Municipal	57,478	85,980	110,026	137,739	164,091	187,193	207,479
Manufacturing	2,073	2,368	2,677	2,963	3,245	3,664	4,110
Steam Electric (Power)	1,635	1,650	1,650	2,500	3,500	3,500	3,500
Irrigation	0	0	0	0	0	0	0
Mining	65	182	183	175	171	163	172
Livestock	<u>1,098</u>	<u>1,095</u>	<u>1,095</u>	<u>1,095</u>	<u>1,095</u>	<u>1,095</u>	<u>1,095</u>
County Total	62,349	91,275	115,631	144,472	172,102	195,615	216,356

## Projected Water Requirements for Franklin County by Category

Type of Use	Projected Water Requirements in Acre-Feet						
	1990	2000	2010	2020	2030	2040	2050
<u>In the Upper Sabine Basin</u>							
Municipal	13	18	20	21	24	25	26
Manufacturing	0	0	0	0	0	0	0
Steam Electric (Power)	0	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0	0
Mining	0	0	0	0	0	0	0
Livestock	<u>0</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>
Upper Sabine Basin Total	13	20	22	23	26	27	28
<u>County Total</u>							
Municipal	1,652	2,005	2,216	2,413	2,689	2,830	3,002
Manufacturing	0	0	0	0	0	0	0
Steam Electric (Power)	0	0	0	0	0	0	0
Irrigation	33	33	33	33	33	33	33
Mining	706	1,479	1,384	1,338	1,278	1,297	1,359
Livestock	<u>1,303</u>	<u>1,595</u>	<u>1,595</u>	<u>1,595</u>	<u>1,595</u>	<u>1,595</u>	<u>1,595</u>
County Total	3,694	5,112	5,228	5,379	5,595	5,755	5,989

## Projected Water Requirements for Henderson County by Category

Type of Use	Projected Water Requirements in Acre-Feet						
	1990	2000	2010	2020	2030	2040	2050
<u>In the Upper Neches Basin</u>							
Municipal	1,675	2,419	2,456	2,459	2,441	2,404	2,467
Manufacturing	2	2	3	3	4	4	5
Steam Electric (Power)	0	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0	0
Mining	6	13	12	12	12	13	14
Livestock	<u>795</u>	<u>613</u>	<u>613</u>	<u>613</u>	<u>613</u>	<u>613</u>	<u>613</u>
Upper Neches Basin Total	2,478	3,047	3,084	3,087	3,070	3,034	3,099
<u>County Total</u>							
Municipal	7,514	9,759	10,029	10,190	10,319	10,200	10,394
Manufacturing	88	98	110	118	133	151	172
Steam Electric (Power)	2,299	3,000	10,000	20,000	25,000	30,000	35,000
Irrigation	30	30	30	30	30	30	30
Mining	199	197	173	152	136	121	108
Livestock	<u>1,963</u>	<u>1,513</u>	<u>1,513</u>	<u>1,513</u>	<u>1,513</u>	<u>1,513</u>	<u>1,513</u>
County Total	12,093	14,597	21,855	32,003	37,131	42,015	47,217



## Projected Water Requirements for Harrison County by Category

Type of Use	Projected Water Requirements in Acre-Feet						
	1990	2000	2010	2020	2030	2040	2050
<u>In the Upper Sabine Basin</u>							
Municipal	5,287	6,338	6,435	6,407	6,222	5,791	5,583
Manufacturing	74,107	109,321	133,587	140,270	146,244	159,506	174,422
Steam Electric (Power)	4,869	5,000	5,000	5,000	10,000	10,000	15,000
Irrigation	50	50	50	50	50	50	50
Mining	170	186	89	50	24	18	16
Livestock	<u>420</u>	<u>326</u>	<u>326</u>	<u>326</u>	<u>326</u>	<u>326</u>	<u>326</u>
Upper Sabine Basin Total	84,903	121,221	145,487	152,103	162,866	175,691	195,397
<u>County Total</u>							
Municipal	7,773	9,225	9,296	9,167	8,826	8,183	7,896
Manufacturing	75,039	110,588	135,166	141,913	147,949	161,370	176,471
Steam Electric (Power)	4,869	5,000	5,000	5,000	10,000	10,000	15,000
Irrigation	100	100	100	100	100	100	100
Mining	351	362	185	107	56	40	35
Livestock	<u>991</u>	<u>768</u>	<u>768</u>	<u>768</u>	<u>768</u>	<u>768</u>	<u>768</u>
County Total	89,123	126,043	150,515	157,055	167,699	180,461	200,270

## Projected Water Requirements for Smith County by Category

Type of Use	Projected Water Requirements in Acre-Feet						
	1990	2000	2010	2020	2030	2040	2050
<u>In the Upper Neches Basin</u>							
Municipal	23,917	26,331	26,853	26,795	27,402	27,997	28,920
Manufacturing	3,112	3,416	3,705	3,905	4,095	4,282	4,469
Steam Electric (Power)	0	0	0	0	0	0	0
Irrigation	117	117	117	117	117	117	117
Mining	141	265	16,182	16,186	16,190	8,195	237
Livestock	<u>713</u>	<u>653</u>	<u>653</u>	<u>653</u>	<u>653</u>	<u>653</u>	<u>653</u>
Upper Neches Basin Total	28,000	30,782	47,510	47,656	48,457	41,244	34,396
<u>County Total</u>							
Municipal	27,265	30,251	30,895	30,771	31,248	31,677	32,389
Manufacturing	3,341	3,678	4,003	4,230	4,441	4,659	4,872
Steam Electric (Power)	0	0	0	0	0	0	0
Irrigation	180	180	180	180	180	180	180
Mining	696	690	16,360	16,277	16,222	8,213	243
Livestock	<u>1,208</u>	<u>1,106</u>	<u>1,106</u>	<u>1,106</u>	<u>1,106</u>	<u>1,106</u>	<u>1,106</u>
County Total	32,690	35,905	52,544	52,564	53,197	45,835	38,790

## Projected Water Requirements for Hunt County by Category

Type of Use	Projected Water Requirements in Acre-Feet						
	1990	2000	2010	2020	2030	2040	2050
<u>In the Upper Sabine Basin</u>							
Municipal	9,337	9,762	9,879	9,829	9,933	9,826	10,011
Manufacturing	409	426	443	456	466	488	508
Steam Electric (Power)	834	800	0	0	0	0	0
Irrigation	271	271	271	271	271	271	271
Mining	0	70	71	73	75	77	79
Livestock	<u>817</u>	<u>896</u>	<u>896</u>	<u>896</u>	<u>896</u>	<u>896</u>	<u>896</u>
Upper Sabine Basin Total	11,668	12,225	11,560	11,525	11,641	11,558	11,765
<u>County Total</u>							
Municipal	12,000	12,594	12,826	12,801	13,047	12,942	13,212
Manufacturing	521	573	634	699	773	874	988
Steam Electric (Power)	834	800	0	0	0	0	0
Irrigation	271	271	271	271	271	271	271
Mining	0	70	71	73	75	77	79
Livestock	<u>1,127</u>	<u>1,237</u>	<u>1,237</u>	<u>1,237</u>	<u>1,237</u>	<u>1,237</u>	<u>1,237</u>
County Total	14,753	15,545	15,039	15,081	15,403	15,401	15,787

## Projected Water Requirements for Kaufman County by Category

Type of Use	Projected Water Requirements in Acre-Feet						
	1990	2000	2010	2020	2030	2040	2050
<u>In the Upper Sabine Basin</u>							
Municipal	109	153	169	186	204	215	223
Manufacturing	0	0	0	0	0	0	0
Steam Electric (Power)	0	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0	0
Mining	0	0	0	0	0	0	0
Livestock	<u>72</u>	<u>72</u>	<u>72</u>	<u>72</u>	<u>72</u>	<u>72</u>	<u>72</u>
Upper Sabine Basin Total	181	225	241	258	276	287	295
<u>County Total</u>							
Municipal	7,544	9,954	11,201	12,366	13,584	14,241	14,914
Manufacturing	322	343	364	387	406	433	463
Steam Electric (Power)	0	0	0	0	0	0	0
Irrigation	780	767	755	742	730	718	707
Mining	65	96	106	121	136	151	168
Livestock	<u>1,297</u>	<u>1,282</u>	<u>1,282</u>	<u>1,282</u>	<u>1,282</u>	<u>1,282</u>	<u>1,282</u>
County Total	10,008	12,442	13,708	14,898	16,138	16,825	17,534

## Projected Water Requirements for Panola County by Category

Type of Use	Projected Water Requirements in Acre-Feet						
	1990	2000	2010	2020	2030	2040	2050
<u>In the Upper Sabine Basin</u>							
Municipal	3,010	3,651	3,607	3,488	3,377	3,171	3,072
Manufacturing	641	685	730	762	785	844	897
Steam Electric (Power)	0	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0	0
Mining	3,208	3,245	2,645	8,697	16,912	17,179	16,912
Livestock	<u>2,145</u>	<u>2,027</u>	<u>2,027</u>	<u>2,027</u>	<u>2,027</u>	<u>2,027</u>	<u>2,027</u>
Upper Sabine Basin Total	9,004	9,608	9,009	14,974	23,101	23,221	22,908
<u>County Total</u>							
Municipal	3,015	3,656	3,611	3,492	3,381	3,175	3,076
Manufacturing	641	685	730	762	785	844	897
Steam Electric (Power)	0	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0	0
Mining	3,208	3,245	2,645	8,697	16,912	17,179	16,912
Livestock	<u>2,146</u>	<u>2,029</u>	<u>2,029</u>	<u>2,029</u>	<u>2,029</u>	<u>2,029</u>	<u>2,029</u>
County Total	9,010	9,615	9,015	14,980	23,107	23,227	22,914

## Projected Water Requirements for Rains County by Category

Type of Use	Projected Water Requirements in Acre-Feet						
	1990	2000	2010	2020	2030	2040	2050
<u>In the Upper Sabine Basin</u>							
Municipal	1,096	1,317	1,377	1,415	1,463	1,487	1,579
Manufacturing	0	0	0	0	0	0	0
Steam Electric (Power)	0	0	0	0	0	0	0
Irrigation	20	20	20	20	20	20	20
Mining	0	0	0	0	0	0	0
Livestock	<u>790</u>	<u>700</u>	<u>700</u>	<u>700</u>	<u>700</u>	<u>700</u>	<u>700</u>
Upper Sabine Basin Total	1,906	2,037	2,097	2,135	2,183	2,207	2,299
<u>County Total</u>							
Municipal	1,096	1,317	1,377	1,415	1,463	1,487	1,579
Manufacturing	0	0	0	0	0	0	0
Steam Electric (Power)	0	0	0	0	0	0	0
Irrigation	20	20	20	20	20	20	20
Mining	0	0	0	0	0	0	0
Livestock	<u>790</u>	<u>700</u>	<u>700</u>	<u>700</u>	<u>700</u>	<u>700</u>	<u>700</u>
County Total	1,906	2,037	2,097	2,135	2,183	2,207	2,299

## Projected Water Requirements for Rockwall County by Category

Type of Use	Projected Water Requirements in Acre-Feet						
	1990	2000	2010	2020	2030	2040	2050
<u>In the Upper Sabine Basin</u>							
Municipal	482	1,004	1,280	1,734	2,347	3,084	3,679
Manufacturing	0	0	0	0	0	0	0
Steam Electric (Power)	0	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0	0
Mining	0	0	0	0	0	0	0
Livestock	34	26	26	26	26	26	26
Upper Sabine Basin Total	516	1,030	1,306	1,760	2,373	3,110	3,705
<u>County Total</u>							
Municipal	5,087	8,324	11,419	15,500	20,999	27,628	34,402
Manufacturing	5	5	6	6	6	6	6
Steam Electric (Power)	0	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0	0
Mining	0	0	0	0	0	0	0
Livestock	181	136	136	136	136	136	136
County Total	5,273	8,465	11,561	15,642	21,141	27,770	34,544

## Projected Water Requirements for Rusk County by Category

Type of Use	Projected Water Requirements in Acre-Feet						
	1990	2000	2010	2020	2030	2040	2050
<u>In the Upper Sabine Basin</u>							
Municipal	2,743	3,250	3,252	3,307	3,431	3,490	3,589
Manufacturing	48	54	59	65	71	76	83
Steam Electric (Power)	28,320	30,000	35,000	40,000	45,000	45,000	45,000
Irrigation	75	75	75	75	75	75	75
Mining	732	563	314	104	89	60	7
Livestock	<u>563</u>	<u>549</u>	<u>549</u>	<u>549</u>	<u>549</u>	<u>549</u>	<u>549</u>
Upper Sabine Basin Total	32,481	34,491	39,249	44,100	49,215	49,250	49,303
<u>County Total</u>							
Municipal	6,319	7,146	7,093	7,122	7,285	7,350	7,517
Manufacturing	305	344	382	425	469	512	559
Steam Electric (Power)	28,320	30,000	35,000	40,000	45,000	45,000	45,000
Irrigation	75	75	75	75	75	75	75
Mining	2,291	1,498	901	399	238	137	14
Livestock	<u>1,269</u>	<u>1,237</u>	<u>1,237</u>	<u>1,237</u>	<u>1,237</u>	<u>1,237</u>	<u>1,237</u>
County Total	38,579	40,300	44,688	49,258	54,304	54,311	54,402



## Projected Water Requirements for Smith County by Category

Type of Use	Projected Water Requirements in Acre-Feet						
	1990	2000	2010	2020	2030	2040	2050
<u>In the Upper Sabine Basin</u>							
Municipal	3,348	3,920	4,042	3,976	3,846	3,680	3,469
Manufacturing	229	262	298	325	346	377	403
Steam Electric (Power)	0	0	0	0	0	0	0
Irrigation	63	63	63	63	63	63	63
Mining	555	425	178	91	32	18	6
Livestock	<u>495</u>	<u>453</u>	<u>453</u>	<u>453</u>	<u>453</u>	<u>453</u>	<u>453</u>
Upper Sabine Basin Total	4,690	5,123	5,034	4,908	4,740	4,591	4,394
<u>County Total</u>							
Municipal	27,265	30,251	30,895	30,771	31,248	31,677	32,389
Manufacturing	3,341	3,678	4,003	4,230	4,441	4,659	4,872
Steam Electric (Power)	0	0	0	0	0	0	0
Irrigation	180	180	180	180	180	180	180
Mining	696	690	16,360	16,277	16,222	8,213	243
Livestock	<u>1,208</u>	<u>1,106</u>	<u>1,106</u>	<u>1,106</u>	<u>1,106</u>	<u>1,106</u>	<u>1,106</u>
County Total	32,690	35,905	52,544	52,564	53,197	45,835	38,790

## Projected Water Requirements for Upshur County by Category

Type of Use	Projected Water Requirements in Acre-Feet						
	1990	2000	2010	2020	2030	2040	2050
<u>In the Upper Sabine Basin</u>							
Municipal	1,700	1,895	1,930	1,954	1,988	2,003	2,041
Manufacturing	0	0	0	0	0	0	0
Steam Electric (Power)	0	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0	0
Mining	0	0	0	0	0	0	0
Livestock	<u>287</u>	<u>418</u>	<u>418</u>	<u>418</u>	<u>418</u>	<u>418</u>	<u>418</u>
Upper Sabine Basin Total	1,987	2,313	2,348	2,372	2,406	2,421	2,459
<u>County Total</u>							
Municipal	4,592	5,230	5,352	5,433	5,551	5,608	5,724
Manufacturing	192	215	232	241	243	277	314
Steam Electric (Power)	0	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0	0
Mining	0	1	1	1	1	1	0
Livestock	<u>1,325</u>	<u>1,928</u>	<u>1,928</u>	<u>1,928</u>	<u>1,928</u>	<u>1,928</u>	<u>928</u>
County Total	6,109	7,374	7,513	7,603	7,723	7,814	6,966

## Projected Water Requirements for Van Zandt County by Category

Type of Use	Projected Water Requirements in Acre-Feet						
	1990	2000	2010	2020	2030	2040	2050
<u>In the Upper Sabine Basin</u>							
Municipal	3,017	3,368	3,421	3,385	3,234	2,995	2,869
Manufacturing	223	280	344	396	451	508	566
Steam Electric (Power)	0	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0	0
Mining	785	1,233	1,073	1,026	1,014	1,025	1,055
Livestock	<u>1,023</u>	<u>1,100</u>	<u>1,100</u>	<u>1,100</u>	<u>1,100</u>	<u>1,100</u>	<u>1,100</u>
Upper Sabine Basin Total	5,048	5,981	5,938	5,907	5,799	5,628	5,590
<u>County Total</u>							
Municipal	5,356	5,875	5,962	5,891	5,613	5,190	4,970
Manufacturing	223	280	344	396	451	508	566
Steam Electric (Power)	45	46	46	45	44	45	46
Irrigation	50	50	50	50	50	50	50
Mining	791	1,313	1,121	1,054	1,033	1,039	1,069
Livestock	<u>2,213</u>	<u>2,381</u>	<u>2,381</u>	<u>2,381</u>	<u>2,381</u>	<u>2,381</u>	<u>2,381</u>
County Total	8,678	9,945	9,904	9,817	9,572	9,213	9,082

## Projected Water Requirements for Wood County by Category

Type of Use	Projected Water Requirements in Acre-Feet						
	1990	2000	2010	2020	2030	2040	2050
<u>In the Upper Sabine Basin</u>							
Municipal	4,032	4,864	4,934	4,870	4,702	4,264	3,843
Manufacturing	41	48	57	67	77	92	107
Steam Electric (Power)	0	0	7,500	7,500	7,500	7,500	15,000
Irrigation	236	235	235	235	235	235	235
Mining	3,162	2,102	17,584	17,344	17,107	16,107	4,641
Livestock	<u>1,673</u>	<u>2,360</u>	<u>2,360</u>	<u>2,360</u>	<u>2,360</u>	<u>2,360</u>	<u>2,360</u>
Upper Sabine Basin Total	9,144	9,609	32,670	32,376	31,981	30,558	26,186
<u>County Total</u>							
Municipal	4,250	5,124	5,197	5,128	4,950	4,487	4,044
Manufacturing	41	48	57	67	77	92	107
Steam Electric (Power)	0	0	7,500	7,500	7,500	7,500	15,000
Irrigation	354	354	354	354	354	354	354
Mining	3,162	2,102	17,584	17,344	17,107	16,107	4,641
Livestock	<u>1,816</u>	<u>2,562</u>	<u>2,562</u>	<u>2,562</u>	<u>2,562</u>	<u>2,562</u>	<u>2,562</u>
County Total	9,623	10,190	33,254	32,955	32,550	31,102	26,708

**APPENDIX E**  
**COMMENTS**

## RESPONSE TO COMMENTS

### Response to Comments from TWDB:

#### A. Projected water needs and supply:

1. Text added in Section 8, Factors of Uncertainty.
2. Considered, but not implemented. A division of demand between groundwater and surface water on an entity by entity basis was not in the scope of this project. Additionally, some entities currently using groundwater wish to convert to surface water.
3. Supply available to Texas Eastman was based on detailed analysis of their system.
4. Incorporated in report as suggested by TWDB.
5. Text added in Section 8, Factors of Uncertainty.
6. Text added in Section 8, Factors of Uncertainty.
7. Incorporated into report, Table 10.
8. Noted.

#### B. Population projections, conservation, and per capita water:

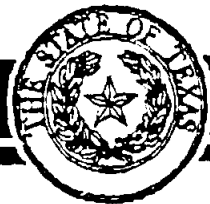
1. Noted.
2. Noted.
3. Noted.
4. Noted.

Wood County to a low of 53 percent for Collin County. As a comparison, 52 percent of the state's population is 30 years of age or older. Additionally, most of the counties are not in close proximity to large metropolitan areas, with the exception of Collin, Rockwall, and Kaufman Counties, which often tends to reduce the influence of migration into predominately rural counties.

It is true that some of the counties' population projections begin to decline after a certain future decade. The reason for this occurrence is that the population is becoming older, and with modest numbers of migrating into these counties, the natural increase in population begins to decline over time. These consensus population projections are based on 1990 Census information provided to the Board, TNRCC, and TWPD staffs by the State Data Center and include projected fertility rates, survival rates, and recent migration rates for each of the counties in the study areas.

Historically, many of these counties experienced slow to modest population growth between 1950 and 1990. For example, the population of Cherokee County has only increased by 2,355 people over this forty year period. Population increases over this same forty year period for other counties include an increase of 2,785 people in Panola County, 1,384 people in Rusk County, 1,545 people in Franklin County, 5,343 people in Hopkins County and relative modest increases for other predominately rural counties in the study area.

2. The major component of water savings associated with the expected municipal conservation case is the continued implementation of state and federal laws requiring installation of more water use efficient plumbing fixtures in new residential and commercial structures as well as replacements of these types of fixtures in current structures. For example, the portion of the potential municipal water savings attributed to plumbing fixture improvements for the Upper Neches basin in the year 2050 accounts for about 65 percent of the projected decrease in per capita water use. These are water savings that are anticipated to occur with future residential and commercial construction and replacement of old fixtures due to age and failure. With just the replacement of the old five-gallon toilet with a new 1.6 gallon toilet, a savings of 3.4 gallons per flush or about 68 percent can be realized. Board staff believes that these water savings are going to occur with a relatively high degree of predictability and are not dependent upon active water utility or consumer support.
3. In response to the statement regarding what the impact would have been if the Texas Department of Water Engineers had decided in 1935 that further growth in per capita water use was unlikely, per capita water use did in fact increase with the significant growth in the state's population as well as the introduction of modern household fixtures. However, over the last 15 years or so, the trend of increasing per capita water use has been reversed. With the exception of years of very dry climatic conditions, average statewide per capita water use has trended



# TEXAS WATER DEVELOPMENT BOARD

William B. Madden, *Chairman*  
 Charles W. Jenness, *Member*  
 Lynwood Sanders, *Member*

Craig D. Pedersen  
*Executive Administrator*

Noé Fernández, *Vice-Chairman*  
 Elaine M. Barrón, M.D., *Member*  
 Charles L. Geren, *Member*

September 3, 1996

Mr. Jack Tatum, P.E.  
 Sabine River Authority  
 P. O. Box 579  
 Orange, Texas 77630

Re: Texas Water Development Board (Board staff) Comments on the Projected Water Needs and Supply of the Upper Neches and Sabine River Basins, July, 1996

Dear Mr. Tatum:

Board staff has reviewed the above-referenced report and offer the following comments:

## A. PROJECTED WATER NEEDS AND SUPPLY

1. Approximately 44,000 ac.ft. of the projected future water needs in the Upper Sabine basin is due to steam power generation. These projected needs are due to growth in the basin or known expansions at power plants. While known expansion could be met with present supplies, the additional needs due to growth could be anywhere in-basin or out-of-basin under the present electrical grid system. This could also be true of power needs in other basins, i.e., power needs that Board staff has projected for one basin could in reality be located in another basin. In order to reduce confusion, Board staff has assigned future power needs to existing projects. Board staff recommends that these uncertainties with regard to the location of future power generation water demands be pointed out in the report.
2. Board staff does not recommend limiting ground water to the 1990 pumping levels. There appears to be adequate ground water resources to meet the needs of most cities that are currently using ground water. In fact, some of the cities that have options or contracts for surface water may not require or use surface water. This unused surface water might be available to meet other basin demands.

### *Our Mission*

*Exercise leadership in the conservation and responsible development of water resources for the benefit of the citizens, economy, and environment of Texas.*

P.O. Box 13231 • 1700 N. Congress Avenue • Austin, Texas 78711-3231  
 Telephone (512) 463-7847 • Telefax (512) 475-2053 • 1-800-RELAY TX (for the hearing impaired)  
 URL Address: <http://www.cwdb.state.tx.us> • E-Mail Address: [info@cwdb.state.tx.us](mailto:info@cwdb.state.tx.us)



3. The estimate of supply for Texas Eastman (TE) appears to be low. TE has permits for 135,000 ac.ft. and an analysis by Board staff indicates that TE's ~~demand~~<sup>supply</sup> to be about 80,000 ac.ft. Board staff recommends that the consultant review the TE ~~demands~~<sup>supplies</sup> and if there is information available to support the projections in the report that copies of the information be provided to the Board.
4. Information available to Board staff indicates that contracted supplies from Lake O' the Pines to Brandy Branch is 18,000 ac.ft. rather than 15,100 ac.ft.
5. Generally, livestock demands are met from local supplies or ground water resources. Board staff recommends that livestock demands not be included in Table 10.
6. Presently most of the mining water needs are met from local supplies or ground water from mining operations. In the 1990 Water Plan, it was anticipated that this practice would continue and that future mining demands would be met with ground water at or near the mines.
7. Board staff recommends that Martin Lake be reserved for meeting only steam power needs since permit and water quality limits would prohibit uses for other water demands.
8. A general comment is that if the assumptions presented in the report are followed then 115,000-150,000 ac.ft. of water should be reserved. However, if the recommendations and assumptions offered here are used then the maximum amount of water needed for reserve may not exceed 100,000 ac.ft.

## B. POPULATION PROJECTIONS, CONSERVATION, AND PER CAPITA WATER

1. The report indicates that the population projections in both basins are characterized by low estimates of population growth. This is true for most of the counties in both basins because the basic demographic characteristics of these counties tend to lead to relatively slow growth. These counties have populations that are substantially older than the state as a whole and are mostly rural in nature. The most significant characteristic with respect to future growth for these counties is the age of the population. The median age of the state's population is 30.8 years as compared to 39.6 for Wood County, 38.9 for Henderson County, 38.2 for Rains County, 33.2 for Smith County, and 35.0 for Cherokee and Rusk Counties. Collin and Anderson Counties have the youngest population with a median age of 30.9 and 31.4, respectively. With respect to the 1990 Census age structure for those counties in the Upper Neches basin, the percentage of county residents of 30 years of age and older range from a high of 66 percent for Cherokee County to a low of 56 percent for Smith County. For the Upper Sabine basin, the percentage of county residents 30 years of age and older range from high of 62 percent for