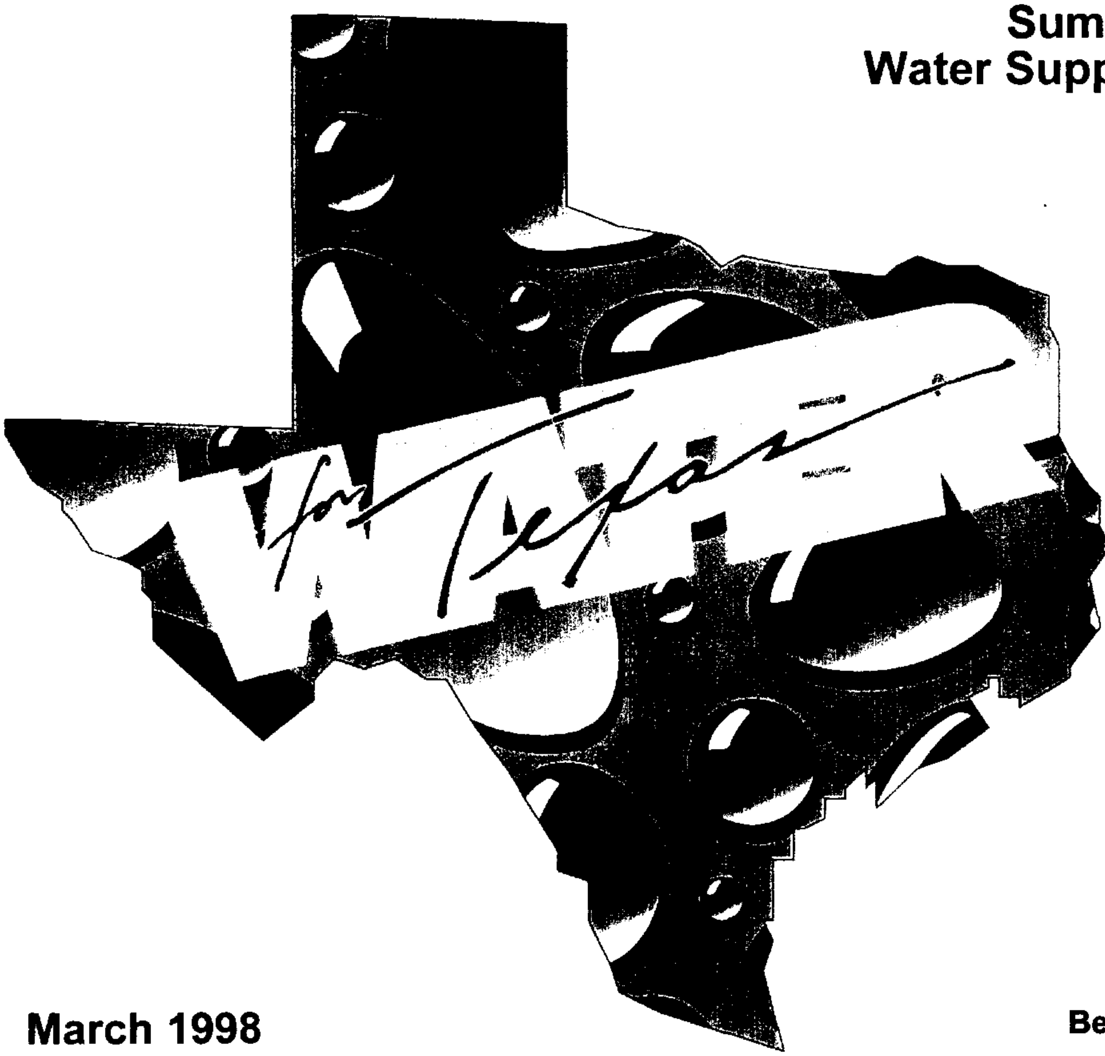
TRANS-TEXAS WATER PROGRAM

West Central Study Area

Phase II

Summary Report of Water Supply Alternatives



San Antonio River Authority

San Antonio Water System

Edwards Aquifer Authority

Guadalupe-Blanco River Authority

Lower Colorado River Authority

Bexar Metropolitan Water District

Nueces River Authority

Canyon Lake Water Supply Corporation

Bexar-Medina-Atascosa Counties WCID No. 1

Texas Natural Resource Conservation Commission

Texas Parks and Wildlife Department

Texas Water Development Board

March 1998

HDR Engineering, Inc.

TRANS-TEXAS WATER PROGRAM

WEST CENTRAL STUDY AREA

PHASE 2

SUMMARY REPORT OF WATER SUPPLY ALTERNATIVES

San Antonio River Authority
San Antonio Water System
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March 1998

3/25/98

STATE OF TEXAS
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REGISTERED
PROFESSIONAL ENGINEER

3/25/98

TRANS-TEXAS WATER PROGRAM
WEST TEXAS CENTRAL STUDY AREA

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1.0 INTRODUCTION

A study of the water supply needs of the 32-county West Central Trans-Texas study area (Figure 1-1) was begun in September of 1993.[1] The purpose of this report is to summarize information from the several principal reports that were prepared in the West Central planning effort as indicated in Table 1-1. This report will be useful in present water planning and management for the West Central area, and will serve as a foundation for the new regional planning for the area, as authorized in Senate Bill 1 in 1997.[2]

1.1 The Study Area

The West Central Trans-Texas study area includes the following 32 counties:

1. Atascosa	9. Colorado	17. Hays	25. Refugio
2. Bandera	10. Comal	18. Karnes	26. San Saba
3. Bastrop	11. DeWitt	19. Kendall	27. Travis
4. Bexar	12. Fayette	20. Kerr	28. Uvalde
5. Blanco	13. Frio	21. Lee	29. Victoria
6. Burnet	14. Goliad	22. Llano	30. Wharton
7. Caldwell	15. Gonzales	23. Matagorda	31. Wilson
8. Calhoun	16. Guadalupe	24. Medina	32. Zavala

The 32-county study area, along with the South Central and Southeast study areas is shown in Figure 1-1. Population of the area was 2.5 million in 1990 and is projected to be 6.4 million in 2050.

The Edwards Aquifer area is the area specified in Senate Bill (SB) 1477 and includes all of Bexar, Medina, and Uvalde counties, and parts of Atascosa, Comal, Caldwell, Hays, and Guadalupe counties (Figure 1-1).[3] This area depends upon the Edwards Aquifer for nearly 80 percent of its present water supply. The population of the Edwards Aquifer area (Figure 1-1) was 1.36 million in 1990 and is projected to be 3.60 million in 2050. In addition to supplying the people and economy of San Antonio and neighboring areas, the Edwards Aquifer is home to several endangered or threatened species and is the source of water for Comal and San Marcos Springs. The aquifer cannot meet the growing needs for water and, at the same time,

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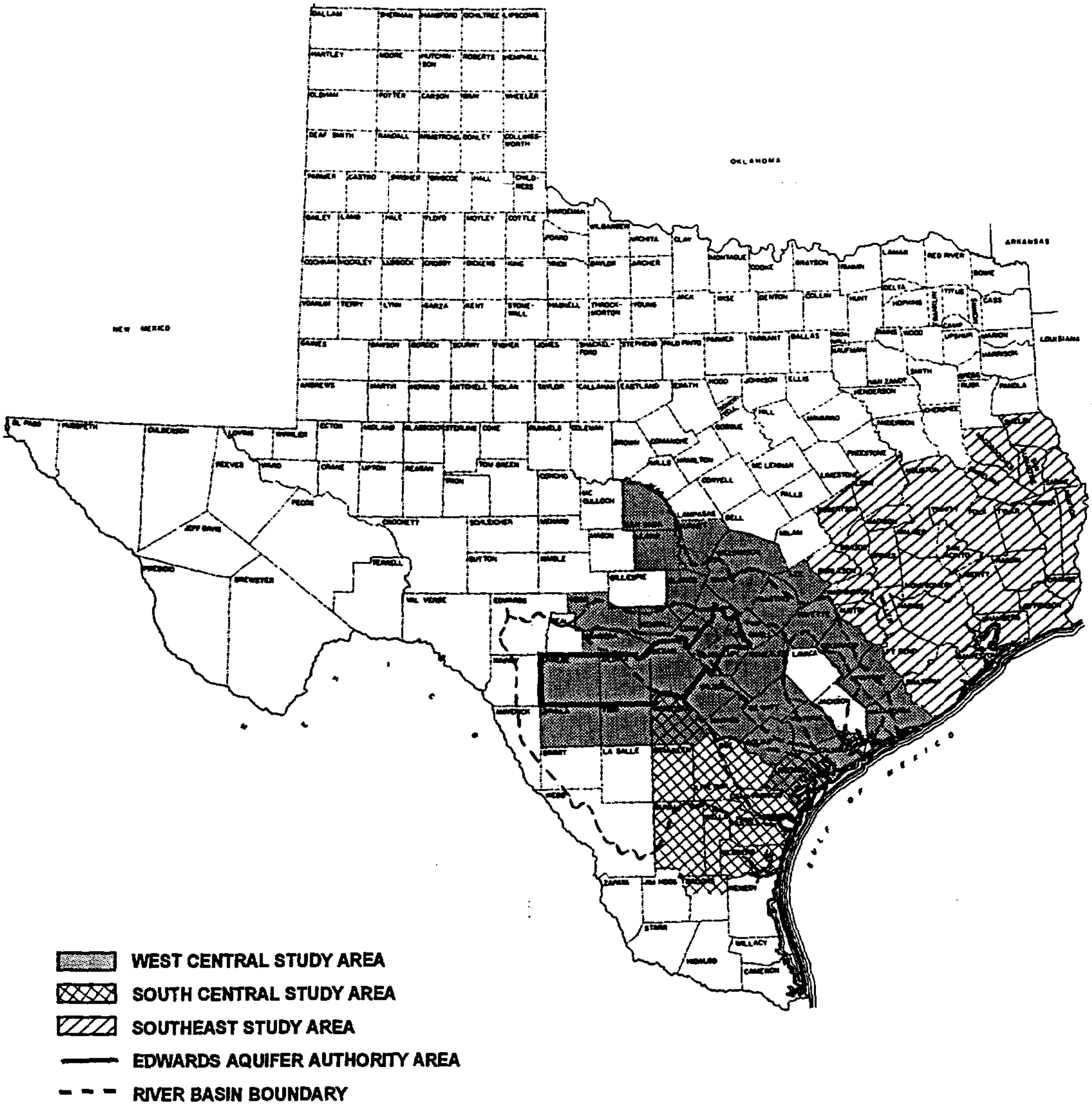
[1] "Water for Texas--Trans-Texas Water Program Description," Texas Water Development Board, Austin, Texas, June, 1992.

[2] Senate Bill 1, Texas Legislature, 1997 Regular Session.

[3] Senate Bill 1477, Texas Legislature, 1993 Regular Session.



TRANS TEXAS WATER PROGRAM / WEST CENTRAL STUDY AREA

STUDY AREA

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FIGURE 1 - 1

Table 1-1
List of Principal Reports — West Central Trans-Texas Study
Trans-Texas Water Program.

Phase 1	
May -94	Phase 1 Interim Report; Volumes 1 and 2.
Nov.-94	Phase 1 Interim Report; Volume 3.
Jan-96	Phase 1 Interim Report; Volume 4.
Aug.-96	Phase 1 Interim Report; Volume 5.
Phase 2	
Oct.-96	Phase 2 Letter of Intent Analysis Report.
Mar-98	Phase 2 Population Water Demand, and Water Supply Projections.
Mar-98	Phase 2 Edwards Aquifer Recharge Analysis.
Mar-98	Phase 2 Guadalupe-San Antonio River Basin Model Modifications and Enhancements.
Mar-98	Phase 2 Conceptual Evaluation of Springflow Recirculation.
Mar-98	Phase 2 Modification of Principal Spillways at Existing Flood Control Projects for Recharge Enhancement.
Mar-98	Phase 2 Updated Evaluation of Potential Reservoirs in the Guadalupe River Basin.
Mar-98	Phase 2 Guadalupe-San Antonio River Basin Environmental Criteria Refinement.
Mar.-98	Phase 2 Summary Report of Water Supply Alternatives.
Public Participation and Stakeholders Involvement Reports	
Jan -96	Technical Memorandum.
Sept.-96	Water Issues Survey Report.
Feb.-97	Issues Document.
Feb.-97	Public Participation Plan.
Mar-98	Integrated Resource Planning Committee Final Criteria Report.
Mar-98	Public Participation/Stakeholder Involvement Program Final Summary Report.

supply adequate spring flows for endangered species, downstream needs of the environment, and downstream water rights holders.

Areas outside of the Edwards Aquifer area within the Nueces, San Antonio, Guadalupe, and intervening Coastal Basins, and in the Lower Colorado and adjacent Coastal Basins to the east are also growing and in need of water planning. These areas depend upon the Carrizo and other aquifers, and upon surface water for their supplies.

1.2 Objectives

The objectives of this West Central Trans-Texas Study are to present summarized information from the previous Trans-Texas reports as follows:

- A summary of projected water demands and comparisons with existing water supplies for the West Central Study Area;
- Project data and information sheets describing each water supply alternative studied in the Trans-Texas program;
- A comparison of water supply alternatives studied in the Trans-Texas program; and
- Identification and discussion of other possible water supply alternatives.

The population and water demand projections are based upon the following conditions, assumptions, and data:

A. The TWDB 1996 consensus water planning projections, as follows:
   1. Most likely population;
   2. Most likely municipal water demand for below normal precipitation and advanced conservation;
   3. Bas oil prices, with conservation for manufacturing;
   4. Series 3 irrigation (aggressive adoption of irrigation technology and a reduction in Federal Farm Programs by one-half);
   5. Steam-Electric power high series;
   6. Mining - TWDB only series;
   7. Livestock - TWDB only series

B. The quantity of water supply from the Edwards Aquifer is based upon provisions of SB 1477, with pumpage set at 450,000 acft/yr for the period 1997 through 2007, and 400,000 acft/yr beginning in 2008, and the assumption that each entity which obtained water from the Edwards Aquifer in 1990 will have its 1990 pro rata share of Edwards pumpage in future years.

C. Texas Water Development Board (TWDB) groundwater information for counties of the study area.

D. The quantity of surface water supply from reservoirs of the study area is the firm yield of each respective reservoir, as determined by previous studies, and in accordance with water rights permits issued by the Texas Natural Resource Conservation Commission (TNRCC).

E. The quantity of dependable surface water supplies from run-of-river water rights permits was calculated for study area counties of the Nueces and Guadalupe-San Antonio River Basins using the existing Nueces and Guadalupe-San Antonio River Basin models developed by HDR Engineering, Inc.[4] These computations were based upon Edwards Aquifer pumpage of 400,000 acft/yr. Dependable supplies of surface water from run-of-river permits for counties of the Lower Colorado River Basin were tabulated from computer model results that were prepared by the Lower Colorado River Authority for use in the North Central Trans-Texas (NCTT) study.[5]

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[4] HDR Engineering, Inc. et al., "Regional Water Supply Planning Study-Phase I, Nueces River Basin," Nueces River Authority et al., Uvalde, Texas May 1991, and HDR Engineering, Inc. et al., "Guadalupe-San Antonio River Basin Recharge Enhancement Study," Edwards Underground Water District, San Antonio, Texas, September, 1993.

[5] Colorado River Base Case Availability," Unpublished tables, Lower Colorado River Authority, Austin, Texas, June 1997.

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2.0 SUMMARY OF PROJECTED POPULATION, WATER DEMANDS, AND EXISTING SUPPLIES

The Texas Water Development Board's (TWDB) 1996 consensus population and water demand projections for the 32-county West Central study area are summarized below.[1] Projections are shown in 10-year intervals beginning with 1990 and ending in 2050. Population is shown in numbers of people; water demand is shown in acft per year (one acre-foot is 325,851 gallons).

2.1 Population Projections

TWDB 1996 consensus projections are shown in tabular and graphic form for: (1) the 32 county study area, (2) the Edwards Aquifer Area, and (3) the Nueces, San Antonio, Guadalupe, and Lower Colorado River Basin areas.

The population of the 32-county study area was reported at 2.53 million in 1990 (Table 2-1) and is projected to be 3.15 million in 2000, 4.50 million in 2020, and 6.44 million in 2050 (Table 2-1 and Figure 2-1). The TWDB projections of the State of Texas population is from 16,986,510 in 1990 to 36,587,631 in 2050. The 32 county study area population is projected to increase from 14.89 percent of the State total in 1990 to 17.6 percent of the State total in 2050.

The Edwards Aquifer area includes all of Bexar, Medina, and Uvalde Counties, and parts of Atascosa, Comal, Caldwell, Hays, and Guadalupe Counties (Figure 1-1). The population of the Edwards Aquifer area was 1,360,937 in 1990 and is projected to be 3,602,473 in 2050 (Table 2-2 and Figure 2-1).

The population projections for the counties of the West Central Study Area that are located within the Nueces, San Antonio, Guadalupe, and Lower Colorado Basins, respectively were summed and are shown in Table 2-3 and Figure 2-2. The population of the counties of the Nueces Basin that are included in the 32 county study area (Uvalde, Medina, Zavala, Frio, Atascosa, and parts of Bexar, Wilson and Karnes counties) was 105,607 in 1990, and is projected

[1] For city and county projections for river basin areas, see, "West Central Study Area Phase II, Population, Water Demand and Water Supply Projections," San Antonio River Authority, et al.; HDR Engineering, Inc., Austin, Texas, January, 1998.

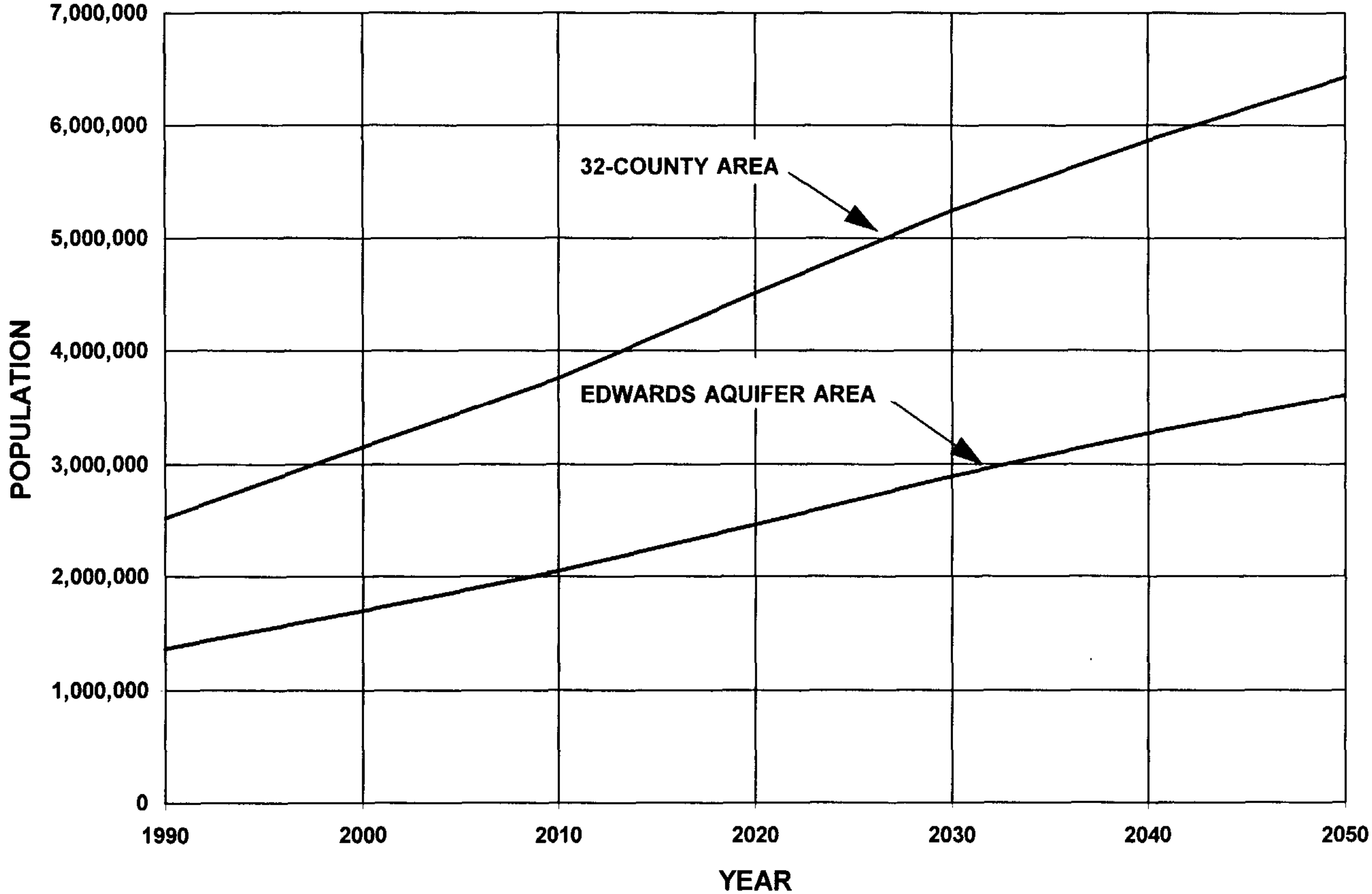
at 190,834 in 2050. The population of the 7-county area (parts of Dimmitt, Edwards, Kinney, LaSalle, Maverick, Real, and Webb Counties) of the Nueces Basin that are included here for information purposes, was 19,880 in 1990, and is projected at 39,779 (Table 2-3).

In the case of the San Antonio River Basin, the population was 1,270,884 in 1990, and is projected at 3,331,113 for 2050 (Table 2-3 and Figure 2-2). The population of that part of Goliad County that is located in the adjacent San Antonio-Nueces Coastal Basin was 450 in 1990, and is projected at 587 in 2050 (Table 2-3 and Figure 2-2).

In 1990, the population of the Guadalupe Basin was 302,409 and is projected at 824,550 in 2050 (Table 2-3). The population for the study areas adjacent to the Guadalupe Basin was 48,076 in 1990 and is projected to be 76,605 in 2050 (Table 2-3 and Figure 2-2).

The population of the Lower Colorado River Basin was 706,715 in 1990 and is projected to increase to 1,849,297 in 2050 (Table 2-3). The population of study areas adjacent to the Lower Colorado Basin are also shown in Table 2-3. Those parts of counties located in coastal basins adjacent to the Lower Colorado Basin (i.e., Colorado, Wharton, and Matagorda) had a 1990 population of 73,250. Projected 2050 population of these counties is 124,451 (Table 2-3 and Figure 2-2).

Table 2-1							
Population Projections--32 County West Central Trans-Texas Study Area							
Trans-Texas Water Program							
		Projections					
County	**1990**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Atascosa	30,533	35,893	41,807	47,587	52,911	57,037	59,560
Bandera	10,562	14,947	17,801	21,754	24,413	27,397	30,745
Bastrop	38,263	47,917	59,430	71,679	83,583	90,915	98,331
Bexar	1,185,394	1,474,512	1,776,965	2,130,820	2,491,291	2,817,680	3,081,381
Blanco	5,972	7,468	8,998	10,667	11,910	12,549	12,418
Burnet	22,677	28,055	34,010	40,536	45,936	47,834	49,810
Caldwell	26,392	32,158	37,872	43,279	47,086	47,220	47,355
Calhoun	19,053	21,893	23,809	25,968	28,180	30,504	33,255
Colorado	18,383	20,028	21,054	22,221	23,204	24,014	24,630
Comal	51,832	79,378	106,558	144,869	187,464	226,133	267,843
DeWitt	18,840	20,217	21,180	22,340	23,550	24,773	26,030
Fayette	20,095	22,611	25,213	28,714	32,190	35,847	40,437
Frio	13,472	15,421	17,356	18,993	19,918	20,733	21,343
Goliad	5,980	6,408	6,784	7,089	7,161	7,368	7,892
Gonzales	17,205	17,817	18,647	19,305	19,405	19,843	20,292
Guadalupe	64,873	86,668	111,437	140,370	176,873	203,201	235,139
Hays	65,614	88,614	117,201	145,619	180,349	219,637	250,091
Karnes	12,455	14,578	14,835	16,322	17,460	18,457	19,353
Kendall	14,589	17,129	19,752	22,435	25,007	27,906	31,140
Kerr	36,304	44,162	51,085	59,209	66,982	71,611	73,461
Lee	12,854	14,133	15,586	16,984	18,144	19,408	20,812
Llano	11,631	12,887	13,372	14,538	14,800	15,361	16,745
Matagorda	36,928	41,018	45,805	51,008	56,834	63,211	70,902
Medina	27,312	33,349	38,069	42,299	44,945	46,969	49,556
Refugio	7,976	8,421	8,844	9,110	9,081	9,020	8,896
San Saba	5,401	5,497	5,470	5,419	5,247	5,144	4,989
Travis	576,407	744,080	892,047	1,096,329	1,288,441	1,413,420	1,550,521
Uvalde	23,340	26,466	29,756	32,788	35,595	38,087	40,565
Victoria	74,361	81,909	89,539	96,977	104,205	111,710	120,836
Wharton	39,955	42,673	46,218	49,845	53,608	57,491	61,759
Wilson	22,650	26,578	30,757	34,597	36,953	39,332	42,972
Zavala	12,162	13,619	14,584	15,117	15,789	16,770	18,203
Total	2,529,465	3,146,504	3,761,841	4,504,787	5,248,515	5,866,582	6,437,262
Dimmitt*	10,385	12,023	13,874	15,738	17,844	20,049	22,478
Edwards*	704	820	914	978	1040	1082	1123
Kinney*	489	552	611	651	582	502	433
LaSalle*	5254	6092	6748	7285	7562	7854	8034
Maverick*	341	422	489	542	583	642	726
Real*	2297	2413	2475	2532	2584	2637	2690
Webb*	410	1337	1832	2399	3135	3311	4295
Total*	19,880	23,659	26,943	30,125	33,330	36,077	39,779
Source: Texas Water Development Board; 1996 Consensus Water Plan, Most Likely Case.							
*Not in West Central Trans-Texas study area; includes only part of county located in Nueces Basin.							
Note: Texas population in 1990 was 16,986,510. TWDB projections of Texas population in year 2000 is 20,220,182, and in 2050 is 36,587,631 (1.287% compound annual growth rate).							



TRANS TEXAS WATER PROGRAM / WEST CENTRAL STUDY AREA

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POPULATION PROJECTIONS 32 COUNTY WEST CENTRAL STUDY AND EDWARDS AQUIFER AREAS

FIGURE 2-1

Table 2-2							
Population Projections--Edwards Aquifer Area							
Trans-Texas Water Program							
	Total	**Projections**					
County	**in 1990**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Atascosa (part)	1,567	2,312	2,718	3,113	3,477	3,762	4,070
Bexar (all)	1,182,643	1,470,422	1,771,697	2,124,142	2,483,130	2,808,166	3,072,461
Medina (all)	27,312	33,349	38,069	42,299	44,945	46,969	49,556
Uvalde (all)	23,340	26,466	29,756	32,788	35,595	38,087	40,565
Comal (part)	30,981	43,647	57,488	75,667	96,839	112,766	130,945
Hays (part)	36,095	44,358	54,522	65,185	78,887	95,155	111,871
Guadalupe (part)	39,217	53,509	71,996	91,375	116,003	135,441	159,347
Caldwell (part)	19,782	23,702	27,569	31,193	33,732	33,690	33,658
Total	1,360,937	1,697,765	2,053,815	2,465,762	2,892,608	3,274,036	3,602,473

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Table 2-3 Population Projections for River Basins--32-County West Central Trans-Texas Study Area Trans-Texas Water Program							
		Projections					
River Basin	1990	2000	2010	2020	2030	2040	2050
NUECES							
Study Area In-Basin[1]	105,607	123,877	141,003	156,991	170,405	181,967	190,834
7-County Adj. Area[2]	19,880	23,659	26,943	30,125	33,330	36,077	39,779
SAN ANTONIO							
Total In-Basin	1,270,884	1,585,794	1,910,695	2,291,649	2,678,667	3,032,625	3,331,113
Adj. Area[3]	450	476	505	527	532	547	587
Study Area Subtotal	1,271,334	1,586,270	1,911,200	2,292,176	2,679,199	3,033,172	3,331,700
GUADALUPE							
Total In-Basin	302,409	376,518	456,574	549,599	653,361	739,799	824,550
Adj. Area[4]	48,076	53,562	57,980	62,510	66,814	71,207	76,605
Study Area Subtotal	350,485	430,080	514,554	612,109	720,175	811,006	901,155
LOWER COLORADO							
Total In-Basin	706,715	901,517	1,079,653	1,316,511	1,539,747	1,689,580	1,849,297
Adj. Coastal Area[5]	73,250	79,802	87,426	95,563	104,333	113,681	124,451
Area Subtotal	779,965	981,319	1,167,079	1,412,074	1,644,080	1,803,261	1,973,748
Adj. Inland Area[6]	22,074	24,958	28,005	31,437	34,656	37,176	39,825
Study Area Subtotal	802,039	1,006,277	1,195,084	1,443,511	1,678,736	1,840,437	2,013,573
Study Area Subtotal[7]	2,507,391	3,121,546	3,733,836	4,473,350	5,213,859	5,829,406	6,397,437
Study Area Total	2,529,465	3,146,504	3,761,841	4,504,787	5,248,515	5,866,582	6,437,262

Source: Texas Water Development Board; 1996 Consensus Water Plan, Most Likely Case.

[1]Counties of Nueces Basin included in study area (Uvalde, Medina, Zavala, Frio, Atascosa and parts of Bexar, Wilson, and Karnes Counties).

[2] Parts of Dimmitt, Edwards, Kinney, LaSalle, Maverick, Real, and Webb Counties of the Nueces Basin, but not included in the West Central Trans-Texas study area.

[3] Part of Goliad County located in adjacent San Antonio -Nueces Coastal Basin.

[4] Part of Victoria County located in adjacent Lavaca-Guadalupe Coastal Basin, plus all of Refugio and Calhoun Counties.

[5] Parts of Colorado, Matagorda, and Wharton Counties located in adjacent coastal basins, and obtain a part of their water supply from the Colorado River.

[6] Parts of Burnet, Bastrop, and Lee Counties located in the adjacent Brazos Basin.

[7] Does not include parts of Burnet, Bastrop, and Lee counties located in the adjacent Brazos Basin.

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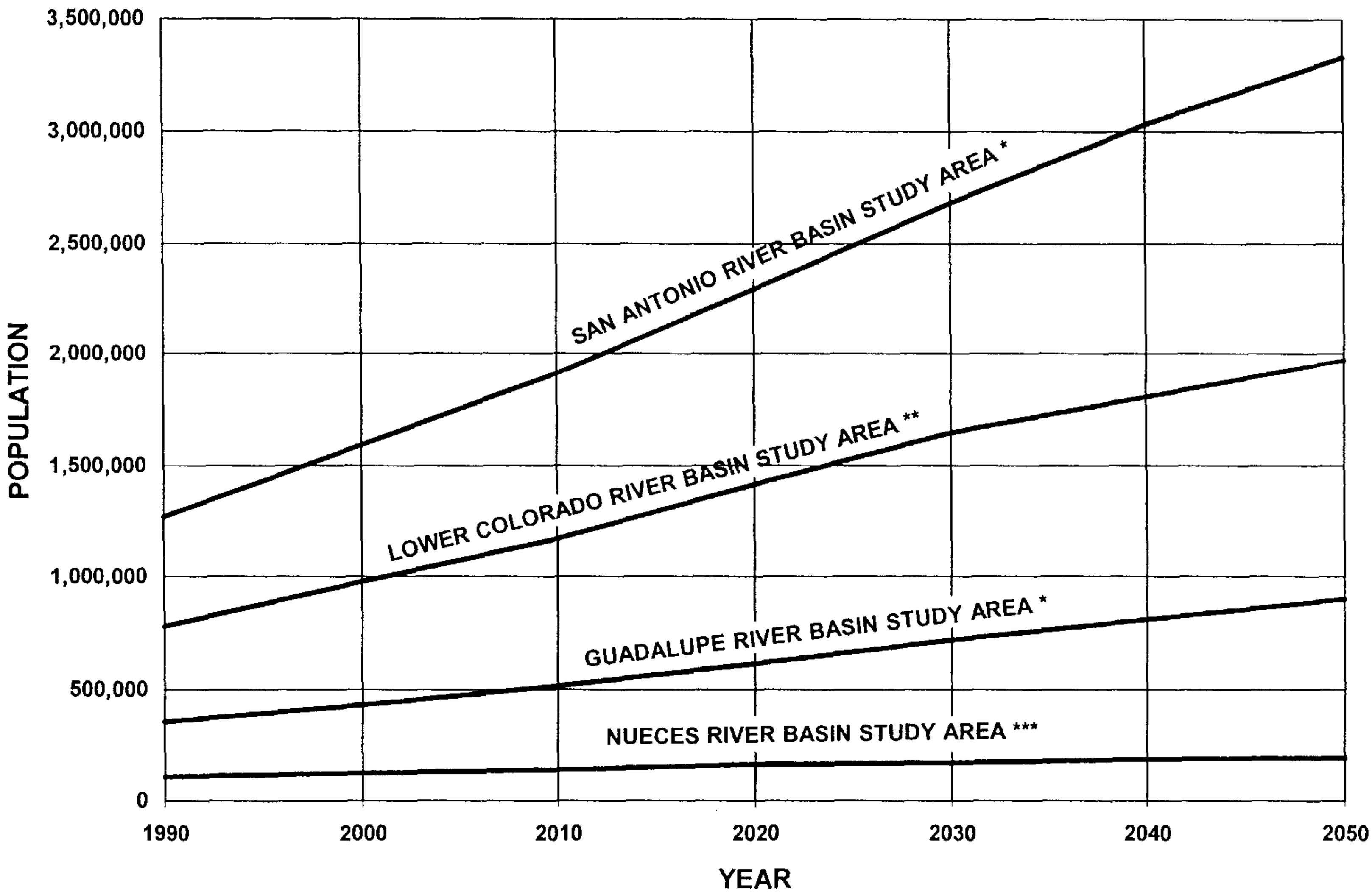

* In basin plus adjacent areas that obtain water from the basin.

** In basin plus adjacent coastal areas that obtain water from the Colorado Basin. Does not include parts of study area counties located in the Brazos Basin.

*** Includes only study area counties of the Nueces Basin.

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POPULATION PROJECTIONS RIVER BASIN STUDY AREAS

FIGURE 2-2

2.2 Water Demand Projections

The Texas Water Development Board's 1996 Consensus Water Plan total water demand projections, "most likely case" with advanced conservation, are tabulated for the counties and are shown in tabular and graphic form for : (1) the 32-county study area, (2) the Edwards Aquifer area (Bexar, Medina, Uvalde, Comal, Hays, and parts of Guadalupe, and Caldwell Counties), and (3) the Nueces, San Antonio, Guadalupe, and Lower Colorado River Basin areas included within the study area.[2] Water use in 1990 was 2,133,894 acft for the 32-county area (Table 2-4), with 15.5 percent in Wharton County, 14 percent in Bexar County, 12 percent in each of Matagorda and Colorado counties, 7.5 percent in Medina County, 6.7 percent in Uvalde County, 6.0 percent in Travis County, and 5.2 percent in Zavala County. The TWDB 1996 consensus water planning projection of water demand for below normal precipitation with advanced conservation for the 32-county area is approximately 2.38 million acft/yr in 2000, 2.40 million acft/yr in 2020, and 2.62 million acft/yr in 2050 (Table 2-4 and Figure 2-3).

Total water use for all purposes within the Edwards Aquifer area in 1990 was 647,769 acft. TWDB's 1996 consensus water planning projected total water demands for the area, with advanced water conservation, in 2000 is 773,352 acft/yr, in 2020 is 838,191 acft/yr, and in 2050 is 1,009,512 acft/yr (Table 2-5 and Figure 2-3).

Total water use in the 32-county study area in 1990 was 2,133,894 acft, of which 558,248 acft (26 percent) were in the Nueces Basin study area counties, 359,144 acft (17 percent) were in San Antonio Basin and adjacent areas, 197,928 acft (9 percent) were in the Guadalupe Basin and adjacent areas, and 1,018,574 acft (48 percent) were in the Lower Colorado Basin and adjacent areas (Table 2-6). Projected total water demands in 2050 are 2,622,184 acft/yr for the 32-county study area, with 498,105 acft/yr (19 percent) in Nueces Basin study area counties, 727,985 acft/yr (28 percent) in the San Antonio Basin and adjacent areas, 381,866 acft/yr (14 percent) in the Guadalupe Basin and adjacent areas, and 1,014,228 acft/yr (29 percent) in the Lower Colorado Basin and adjacent areas (Table 2-6 and Figure 2-4).

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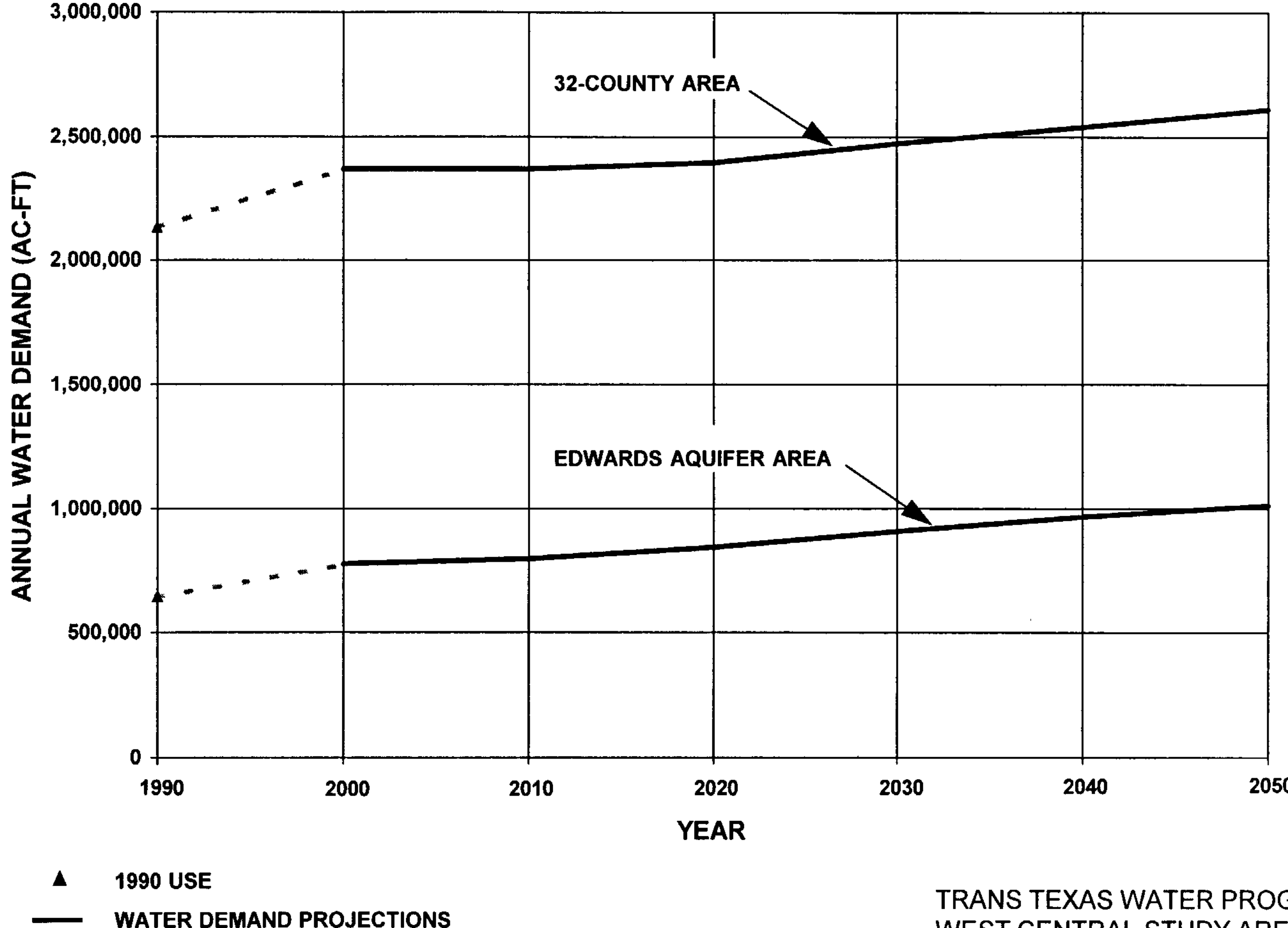
[2] For projections by type of use (municipal, industrial, steam-electric power, irrigation, mining, and livestock) see "West Central Study Area Phase II, Population, Water Demand, and Water Supply Projections," San Antonio River Authority, et al.; HDR Engineering, Inc., Austin, Texas, January, 1998.

Table 2-4							
Total Water Demand Projections--32 County West Central Trans-Texas Study Area							
Trans-Texas Water Program							
	Use in	**Projections**					
County	**1990**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
	acft	**acft**	**acft**	**acft**	**acft**	**acft**	**acft**
Atascosa	61,472	68,208	66,820	65,595	64,893	67,034	73,134
Bandera	2,080	2,476	2,547	2,736	2,951	3,187	3,452
Bastrop	11,333	14,869	19,310	20,370	21,848	22,739	23,665
Bexar	303,917	405,322	437,610	485,382	550,408	611,487	657,922
Blanco	1,940	2,287	2,332	2,389	2,474	2,499	2,460
Burnet	6,698	7,648	8,134	8,709	9,461	9,807	10,168
Caldwell	7,149	7,873	8,030	8,181	8,463	8,283	8,136
Calhoun	64,225	94,668	105,194	110,849	118,199	127,027	137,116
Colorado	253,847	230,377	206,791	186,870	170,071	161,018	153,009
Comal	15,404	28,422	32,527	38,640	46,924	51,994	58,528
DeWitt	5,901	6,035	5,827	5,718	5,836	5,989	6,152
Fayette	17,571	21,689	26,712	31,881	47,253	47,668	53,193
Frio	87,726	84,940	81,564	78,339	75,354	72,487	69,722
Goliad	14,650	17,713	17,569	22,446	22,373	22,326	22,330
Gonzales	12,366	12,932	12,396	11,948	11,636	11,477	11,370
Guadalupe	14,973	21,069	23,598	26,510	31,610	35,372	40,116
Hays	12,998	17,929	20,992	23,799	28,616	34,137	38,765
Karnes	6,049	6,194	5,749	5,584	5,558	5,546	5,537
Kendall	2,901	3,462	3,569	3,690	3,972	4,298	4,665
Kerr	7,259	9,881	10,553	11,283	12,282	12,766	12,988
Lee	4,677	5,141	5,173	5,217	5,387	5,587	5,817
Llano	5,520	5,721	6,495	6,424	6,383	6,432	6,590
Matagorda	244,859	230,248	218,603	200,130	187,135	179,131	171,854
Medina	164,600	176,094	164,583	158,107	152,131	146,307	140,833
Refugio	1,867	1,779	1,708	1,646	1,616	1,588	1,561
San Saba	8,213	8,473	8,069	7,725	7,463	7,226	7,001
Travis	131,280	193,165	213,238	244,696	283,241	306,671	338,507
Uvalde	147,897	144,315	139,328	134,509	130,355	126,341	122,592
Victoria	49,843	59,887	63,506	64,350	66,219	70,214	74,836
Wharton	329,686	341,786	319,523	292,663	269,018	252,226	236,654
Wilson	19,586	19,249	17,977	16,883	16,050	15,398	15,048
Zavala	115,407	127,466	124,955	121,282	116,726	112,471	108,462
Total	2,133,894	2,377,318	2,380,981	2,404,551	2,481,906	2,546,732	2,622,184
Dimmitt*	14,691	15,116	14,810	14,858	15,211	15,300	15,445
Edwards*	334	362	362	361	365	367	370
Kinney*	522	599	594	584	561	539	518
LaSalle*	9,513	9,512	9,309	9,095	8,917	8,753	8,584
Maverick*	6,021	5,728	5,492	5,281	5,091	4,914	4,752
Real*	1,568	1,539	1,469	1,418	1,396	1,378	1,364
Webb*	931	718	781	848	958	981	1,126
Total*	33,580	33,574	32,817	32,445	32,499	32,232	32,159
Source: Texas Water Development Board; 1996 Consensus Water Plan, Most Likely Case, below normal rainfall, and advanced water conservation.							
* Not in West Central Trans-Texas study area.							
**Does not include Nueces Basin Counties of South Central Trans-Texas Study Area (Duval, McMullen, Live Oak, Bee, San Patricio, Nueces, and Jim Wells).							



TRANS TEXAS WATER PROGRAM / WEST CENTRAL STUDY AREA

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TOTAL WATER DEMAND PROJECTIONS 32 COUNTY WEST CENTRAL AND EDWARDS AQUIFER AREAS

FIGURE 2-3

Table 2-5
Total Water Demand Projections
Edwards Aquifer Area*
West Central Trans-Texas Study Area
Trans-Texas Water Program

County	Total Use in 1990 acft	Projections 2000 acft	2010 acft	2020 acft	2030 acft	2040 acft	2050 acft
Atascosa (part)	1,802	2,003	1,943	1,924	1,938	1,942	1,953
Bexar (all)	303,586	404,291	436,383	483,931	548,644	609,441	656,013
Medina (all)	164,600	176,094	164,583	158,107	152,131	146,307	140,833
Uvalde (all)	147,897	144,315	139,328	134,509	130,355	126,341	122,592
Comal (part)	11,218	20,233	22,678	26,114	31,099	32,898	35,847
Hays (part)	7,882	10,674	12,013	13,411	15,884	18,882	22,136
Guadalupe (part)	6,509	10,831	12,929	14,925	18,371	21,159	24,730
Caldwell (part)	4,275	4,911	5,101	5,271	5,555	5,473	5,409
Total	647,769	773,352	794,959	838,191	903,976	962,443	1,009,512

Source: Texas Water Development Board; 1996 Consensus Water Plan, Most Likely Case, below normal rainfall and advanced water conservation.
*As specified in Senate Bill 1477, Texas Legislature, 73rd Session,1993, as amended.

Table 2-6							
Total Water Demand Projections for River Basins--32-County West Central Trans-Texas Study Area							
Trans-Texas Water Program							
		Projections					
River Basin	**1990**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
	acft	**acft**	**acft**	**acft**	**acft**	**acft**	**acft**
NUECES							
Study Area In-Basin[1]	558,248	579,961	557,648	539,069	521,544	507,574	498,105
7-County Adj. Area[2]	33,580	34,262	33,371	32,801	32,513	32,218	32,144
SAN ANTONIO							
Total In-Basin	358,741	465,222	495,983	544,416	611,854	675,913	727,459
Adj. Area[3]	403	533	528	524	523	523	526
Study Area Subtotal	359,144	465,755	496,511	544,940	612,377	676,436	727,985
GUADALUPE							
Total In-Basin	116,519	156,093	168,597	184,968	203,690	217,629	234,391
Adj. Area[4]	81,409	110,376	118,957	123,151	129,571	137,747	147,475
Study Area Subtotal	197,928	266,469	287,554	308,119	333,261	355,376	381,866
LOWER COLORADO							
Total In-Basin	370,300	425,346	440,975	472,264	521,919	544,231	578,657
Adj. Coastal Area[5]	641,627	633,391	591,382	532,616	484,428	454,163	426,254
Area Subtotal	1,011,927	1,060,940	1,034,411	1,006,758	1,008,099	1,000,027	1,006,435
Adj. Inland Area[6]	6,647	4,191	4,858	5,664	6,625	7,319	7,793
Study Area Subtotal	1,018,574	1,065,131	1,039,269	1,012,422	1,014,724	1,007,346	1,014,228
Study Area Subtotal[7]	2,127,247	2,373,126	2,376,123	2,398,887	2,475,281	2,539,413	2,614,390
Study Area Total	2,133,894	2,377,317	2,380,981	2,404,551	2,481,906	2,546,732	2,622,183

Source: Texas Water Development Board; 1996 Consensus Water Plan, Most Likely Case, below normal rainfall,and advanced water conservation.

[1] Counties of Nueces Basin included in study area (Uvalde, Medina, Zavala, Frio, Atascosa, and parts of Bexar, Wilson, and Karnes).

[2] Parts of Dimmitt, Edwards, Kinney, LaSalle, Maverick, Real, and Webb Counties of the Nueces Basin, but not included in the West Central Trans-Texas study area.

[3] Part of Goliad County located in adjacent San Antonio -Nueces Coastal Basin.

[4] Part of Victoria County located in adjacent Lavaca-Guadalupe Coastal Basin, plus all of Refugio and Calhoun Counties.

[5] Parts of Colorado, Matagorda, and Wharton Counties located in adjacent coastal basins, and obtain a part of their water supply from the Colorado River.

[6] Parts of Burnet, Bastrop, and Lee Counties located in the adjacent Brazos Basin.

[7] Does not include parts of Burnet, Bastrop, and Lee counties located in the adjacent Brazos Basin.

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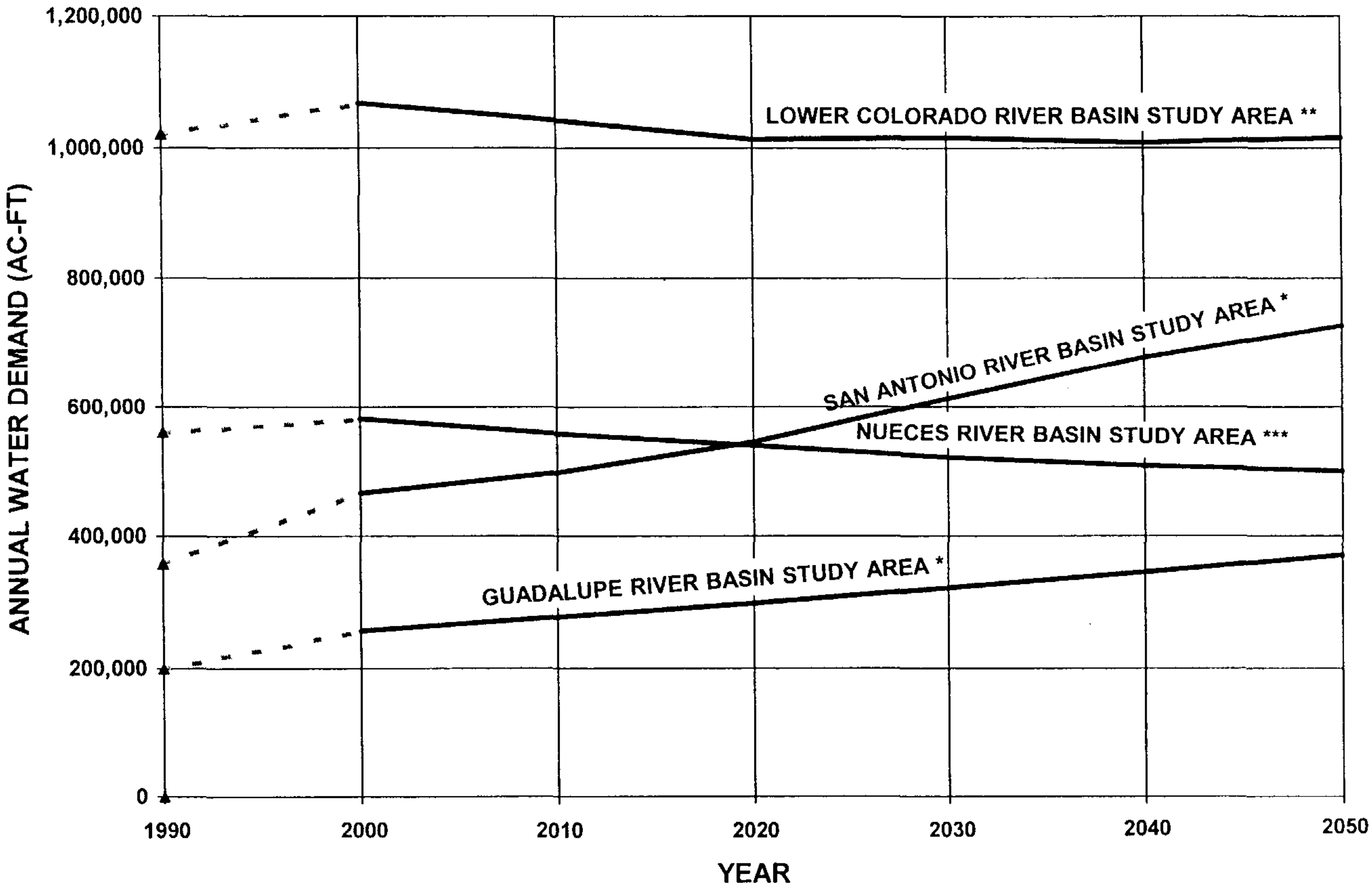

▲ **1990 USE**

—— **WATER DEMAND PROJECTIONS**

* In basin plus adjacent areas that obtain water from the basin.

** In basin plus adjacent coastal areas that obtain water from the Colorado Basin. Does not include parts of study area counties located in the Brazos Basin.

*** Includes only study area counties of the Nueces Basin.

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TRANS TEXAS WATER PROGRAM / WEST CENTRAL STUDY AREA

TOTAL WATER DEMAND PROJECTIONS RIVER BASIN STUDY AREAS

FIGURE 2-4

2.3 Water Supply Projections

In subsections 2.3.1 and 2.3.2 the ground and surface water resources of the West Central Trans-Texas study area are identified and described briefly. In Section 2.4, the water demand and water supply projections are summarized and compared for each river and coastal basin area.[3]

2.3.1 Groundwater Supply Projections

The Texas Water Development Board projects that the 32 county West Central Trans-Texas study area has an average annual supply of groundwater from the Carrizo-Wilcox, Edwards-Trinity, Trinity and minor aquifers of approximately 735,605 acft (Table 2-7). In addition, in accordance with provisions of Senate Bill 1477, the Edwards Aquifer area counties of the study area (all of Uvalde, Medina and Bexar Counties, and parts of Atascosa, Comal, Hays, Caldwell, and Guadalupe Counties) have a supply of 450,000 acft/yr from the Edwards Aquifer between the present and December 31, 2007.[4] Beginning in 2008, supplies from the Edwards Aquifer are specified at 400,000 acft/yr with the further condition, as specified in S.B. 1477, that by year 2012, the Edwards Aquifer Authority shall have a plan in place which limits pumpage from the Aquifer to a level that will assure that Comal and San Marcos springs will not go dry. For purposes of this analysis, it is assumed that the annual supply available from the Edwards Aquifer to the Edwards Aquifer Authority (EAA) counties, beginning in year 2008, is 400,000 acft/yr, and that this quantity is prorated among the EAA counties in the same proportions as each county's pumpage was of total pumpage in 1990; i.e., 27.72 percent to Uvalde, 16.02 percent to Medina, 51.58 percent to Bexar, 0.34 percent to Atascosa, 2.16 percent to Comal, 1.52 percent to Hays, 0.08 percent to Caldwell, and 0.58 percent to Guadalupe (Table 2-7). Refer to Section 2.4 for a comparison of projected water supplies with projected water demands of each county of the study area.

In 1990, groundwater use in seven of the non-Edwards Aquifer area counties was greater than the projected average long-term annual supply, meaning that in these counties (Calhoun,

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[3] Ibid.

[4] Senate Bill 1477, Texas Legislature, Regular Session, 1993.

Table 2-7								
1990 Water Use and Projected Annual Groundwater Supplies								
32 County West Central Trans-Texas Study Area—Trans-Texas Water Program								
	1990 Water Use (Acre-Feet)				Projected Annual Groundwater Supply(acre-Feet)			
County	Ground	Surface	Total		Aquifers[1]	Edwards[2]	Total	
Atascosa	60,019	1,453	61,472		47,134	1,385	48,519	
Bandera	1,848	232	2,080		7,285	0	7,285	
Bastrop	7,178	4,155	11,333		41,548	0	41,548	
Bexar	269,505	34,412	303,917		19,125	206,342	225,467	
Blanco	1,514	426	1,940		7,737	0	7,737	
Burnet	1,946	4,752	6,698		16,280	0	16,280	
Caldwell	4,371	2,778	7,149		10,383	326	10,709	
Calhoun	4,544	59,681	64,225		2,940	0	2,940	
Colorado	49,133	204,714	253,847		31,659	0	31,659	
Comal	13,243	2,161	15,404		1,800	8,633	10,433	
DeWitt	4,170	1,731	5,901		15,866	0	15,866	
Fayette	3,716	13,855	17,571		37,829	0	37,829	
Frio	85,073	2,653	87,726		30,914	0	30,914	
Goliad	1,344	13,306	14,650		12,809	0	12,809	
Gonzales	4,660	7,706	12,366		46,560	0	46,560	
Guadalupe	6,566	8,407	14,973		12,583	2,286	14,869	
Hays	11,994	1,004	12,998		1,810	6,065	7,875	
Karnes	4,610	1,439	6,049		18,780	0	18,780	
Kendall	2,322	579	2,901		4,840	0	4,840	
Kerr	3,281	3,978	7,259		9,810	0	9,810	
Lee	3,719	958	4,677		24,943	0	24,943	
Llano	2,122	3,398	5,520		11,882	0	11,882	
Matagorda	28,252	216,607	244,859		26,000	0	26,000	
Medina	83,509	81,091	164,600		7,826	64,079	71,905	
Refugio	1,360	507	1,867		7,768	0	7,768	
San Saba	1,919	6,294	8,213		30,224	0	30,224	
Travis	9,491	121,789	131,280		8,855	0	8,855	
Uvalde	144,522	3,375	147,897		8,213	110,884	119,097	
Victoria	29,222	20,621	49,843		41,130	0	41,130	
Wharton	153,809	175,877	329,686		100,000	0	100,000	
Wilson	15,898	3,688	19,586		60,597	0	60,597	
Zavala	80,138	35,269	115,407		30,475	0	30,475	
Total	1,094,998	1,038,896	2,133,894		735,605	400,000	1,135,605	
Dimmitt*	9,433	5,258	14,691		27,250	0	27,250	
Edwards*	184	77	261		13,868	0	13,868	
Kinney*[3]	452	70	522		7,708	3,403	11,111	
LaSalle*	7,529	1,984	9,513		36,635	0	36,635	
Maverick*	5,495	526	6,021		1,242	0	1,242	
Real*	747	821	1,568		1,970	0	1,970	
Webb*	51	880	931		18,868	0	18,868	
Total*	23,891	9,616	33,507		107,541	3,403	110,944	
Source: Texas Water Development Board, 1992.								
* Not in West Central Trans-Texas study area.								
[1] Includes Carrizo- Wilcox, Trinity, Edwards-Trinity, Queen City , and Sparta Aquifers.								
[2] Edwards Balcones Fault Zone Aquifer; As provided in SB 1477 for the period beginning January 1, 2008; Through December 31, 2007, SB 1477 sets the quantity at 450,000 acft/yr.								
[3] Not included in Edwards Aquifer Authority Area, as established by S.B.1477.								

Colorado, Frio, Matagorda, Travis, Wharton, and Zavala) groundwater overdrafting or mining was occurring. However, in 16 of the non-Edwards Aquifer area counties (Bastrop, Blanco, Burnet, DeWitt, Fayette, Goliad, Gonzales, Karnes, Kendall, Kerr, Lee, Llano, Refugio, San Saba, Victoria, and Wilson) 1990 groundwater use was less than projected annual supply, which means that groundwater resources can perhaps meet some projected growth in water demands in some of these counties, depending upon location of demands (Table 2-7).

2.3.2 Surface Water Supply Projections[5]

The existing surface water supplies of the West Central Trans-Texas Study Area include: (1) reservoirs that have a firm yield; (2) storage reservoirs for steam-electric power cooling; (3) storage reservoirs for water supply management and recreation; and (4) run-of-river water rights. Information about each of these surface water supply types is presented below.

Lakes and Reservoirs

Medina Lake is located on the Medina River at the boundary of Medina and Bandera Counties, with Diversion Lake on the Medina River downstream of Medina Lake. In addition to supplying irrigation water, percolation through the lake and river beds recharges the Edwards Aquifer. Although the firm yield of Medina Lake is only about 8,770 acft/yr, the computed average annual water supply that was obtainable from Medina Lake and Diversion Lake was 57,970 acft during the 1934-1989 period (Table 2-8).

Braunig and Calaveras Lakes are located in Bexar County to the southeast of San Antonio and are used for electric power plant cooling water (Table 2-8). Runoff from the watersheds above the lakes, diversion from the San Antonio River and diversions of San Antonio reclaimed wastewater are used to maintain the necessary lake levels and meet the cooling water demands (24,263 acft in 1990).

Canyon Lake in the Guadalupe Basin is located in Comal County on the main stem of the Guadalupe River. Yield of Canyon Lake is 82,627 acft/yr, of which 50,000 acft/yr is permitted

[5] West Central Study Area Phase I, Interim Report, Volume 1, San Antonio River Authority, San Antonio, Texas, May 1994.

Table 2-8
Reservoirs and Surface Water Supplies -- West Central Study Area
Trans-Texas Water Program*

Reservoir	Owner	Firm Yield (acft/yr)	Average Supply[2] (acft/yr)	Permit (acft/yr)	Purposes
San Antonio Basin					
Medina Lake	Bexar-Medina-Atascosa District	8,770[1]	57,970	66,750	Irrigation, municipal, domestic, livestock
Diversion Lake	Bexar-Medina-Atascosa District	---	---	---	Irrigation, municipal, domestic, livestock
Victor Braunig Lake	City Public Service Board of San Antonio	---	---	12,000[4]	Steam-electric power generation
Calaveras Lake	City Public Service Board of San Antonio	---	---	37,000[5]	Steam-electric power generation
Guadalupe Basin					
Canyon Lake	Guadalupe-Blanco River Authority/USCOE	82,627[3]	---	50,000[3]	Municipal, industrial, steam-electric & hydropower, irrigation, flood protection
Coleto Creek	Central Power and Light Company	---	---	12,500	Steam-electric power generation
Colorado Basin					
Highland Lakes**	Lower Colorado River Authority	445,266**	---	1,500,000	Municipal, industrial, steam-electric & hydropower, irrigation & hydroelectric power,
Lake Austin	City of Austin	---	---	---	Steam-electric power, water supply storage, rec.
Town Lake	City of Austin	---	---	---	Steam-electric power, water supply storage, rec.
Decker Lake	City of Austin	---	---	36,456	Steam-electric power
Lake Bastrop	Lower Colorado River Authority	---	---	---	Steam-electric power
Cedar Creek	Lower Colorado River Authority	---	---	---	Steam-electric power
Eagle Lake	Lower Colorado River Authority	---	---	---	Irrigation storage
South Texas Project	Houston Light & Power	---	---	---	Steam-electric power
TOTAL		536,663**			

*See Table 3-3 for reference to run-of-river permits.
**Includes Lakes Travis, Marble Falls, LBJ, Inks and Buchanan.
[1] Firm yield based on uniform monthly diversion directly from Medina Lake.
[2] Average supply based on the 1934-89 historical period.
[3] Based on subordination of GBRA hydropower rights.
[4] Includes the rights to divert up to 12,000 acft/yr from the San Antonio River to Braunig Lake and to consume up to 12,000 acft/yr at Braunig Lake.
[5] Includes the rights to divert up to 60,000 acft/yr of reclaimed wastewater from the San Antonio River to Calavares Lake and to consume up to 37,000 acft/yr at Calaveras Lake.

to the Guadalupe-Blanco River Authority (GBRA) by the TNRCC and made available by GBRA to water users within the basin.[6]

Lakes Dunlap, McQueeny, Placid, Nolte, H-4, and Wood are small hydroelectric power reservoirs located on the Guadalupe River in the reach from New Braunfels to about 8 miles west of Gonzales. The lakes and the water rights are owned by GBRA, and since hydroelectric power generation is a nonconsumptive use of water, these rights and permits (1,300 cfs at lake Dunlap) are not tabulated here.

Coleto Creek Reservoir is located at the borders of Victoria and Goliad counties in the lower Guadalupe Basin and is a cooling reservoir for steam-electric power generation. The source of water is drainage from the Coleto Creek watershed, with diversions from the Guadalupe River, backed by storage in Canyon Lake, when needed. The reservoir supplies water for steam-electric power generation at a power plant located in Goliad County (12,165 acft in 1990).

The Highland Lakes (Travis, Marble Falls, LBJ, Inks, and Buchanan) are located on the main steam of the Colorado River upstream of Austin (Table 2-8). The purposes of the Highland Lakes are water supply for municipal, industrial steam-electric power generation, hydroelectric power generation, irrigation, flood protection, and recreation. The firm yield of the Highland Lakes, as reported by the TWDB[7] in the 1990 Texas water plan is 445,266 acft/yr. The water supply of the Highland Lakes is made available through contracts with various downstream water users for municipal, industrial, steam-electric power generation, and irrigation purposes within the Colorado River Basin and adjacent coastal basins. In addition, LCRA uses water released from the lakes for hydroelectric power generation.

Downstream of the Highland Lakes at Austin on the main stem of the Colorado River are Lake Austin and Town Lake. The three City of Austin municipal water intakes are located on these lakes and Town Lake supplies steam-electric cooling water to Austin (Table 2-8). In addition to these main stem reservoirs, there are four steam-electric power cooling lakes (Decker, Bastrop, Cedar Creak, and the South Texas Project) and one irrigation storage reservoir

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[6] The Guadalupe-Blanco River Authority plans to apply to TNRCC for a change in its Canyon Lake permit to allow more of the yield to be used for municipal and industrial purposes.

[7] Water for Texas -- Today and Tomorrow, 1990, Texas Water Development Board, Austin, Texas, December, 1990.

(Eagle Lake in Colorado County) on tributaries to the Colorado River. These lakes are authorized to capture and store local runoff, with provisions for diversions from the Colorado River when needed.

In the West Central Study Area, the estimated firm water supply from storage reservoirs is 536,663 acft per year (Table 2-8). Of this total, 8,770 acft are in the San Antonio Basin, 82,627 acft are in the Guadalupe Basin, and 445,266 acft are in the Colorado Basin (Table 2-8).

Run-of-River Water Rights

In addition to surface water from reservoirs, rights have been issued by the TNRCC and predecessor agencies to individuals, cities, industries, and water districts and authorities for diversion of water from flowing streams of the West Central Study Area. The principle of prior appropriation or "first-in-time-first-in-right" is applied, which means that the senior or oldest rights (earliest date of permit) have first call on flows, with the second, third, and more recent rights having second, third, and later standings for diversions. This procedure gives senior rights holders priority when stream flows are low, as in periods of drought, and renders junior rights less reliable during droughts.

Run-of-river permits have been summarized for the streams of the West Central Study Area (Table 2-9). For the Nueces Basin study area upstream of the Edwards Aquifer recharge zone, the total is 12,915 acft/yr (Table 2-9). For the Nueces Basin study area downstream of the Edwards Aquifer recharge zone in Zavala, Frio, and Atascosa counties total run-of-river water rights are 35,302 acft, all of which are for irrigation purposes in those counties.

In the San Antonio Basin on the Medina River upstream of Medina Lake, there are 1,083 acft/yr of run-of-river rights. Downstream of Medina Lake there are 10,503 acft/yr of such rights (Table 2-9). On the San Antonio River from San Antonio to Goliad, 35,222 acft/yr of run-of-river rights have been awarded (Table 2-9). Most, if not all, of these rights are for irrigation and livestock water, and can be viewed as supply available to meet those needs in areas along the Medina and San Antonio Rivers. (Note: the Medina Lake rights are shown in Table 2-8.)

Total run-of-river rights in the Guadalupe Basin upstream of Canyon Lake are 13,229 acft/yr, and downstream of Canyon to Victoria are 44,599 acft/yr. These are for irrigation, municipal, and industrial purposes. In addition, GBRA and Sequin have hydroelectric power

Table 2-9
Summary of Run-of-River Water Rights
West Central Study Area
Trans-Texas Water Program

River Basin and Segment	Sum of Permits (acft)
Nueces Basin Study Area	
Upstream Edwards Recharge Zone	12,915
Downstream Edwards Recharge Zone	35,302
Subtotal	48,217
San Antonio Basin Study Area	
Medina Upstream Medina Lake	1,083
Medina Downstream Medina Lake	10,503
Downstream San Antonio to Goliad	35,222
Subtotal	46,808
Guadalupe Basin Study Area	
Upstream of Canyon Lake	13,229
Downstream Canyon Lake to Victoria	44,599[1]
Downstream Goliad and Victoria (consumptive)	214,499[1]
Subtotal	272,327
Colorado Basin Study Area	
Upstream of Highland Lakes (Study Area)	36,491
City of Austin	334,009[2]
Travis County to Colorado County	34,146
Gulf Coast Irrigation[3]	262,500[4]
Garwood Irrigation[3]	168,000[4]
Lakeside Irrigation[3]	131,250[4]
Pierce Ranch Irrigation[3]	110,000[4]
South Texas Project (HL&P/LCRA)[3]	102,000[5]
Subtotal	1,178,396
TOTAL FOR STUDY AREA	1,545,748

Source: Data from Water Rights Records of Texas Natural Resource Conservation Commission.
[1]Totals shown include only consumptive right for irrigation, industrial, and steam-electric cooling water. Does not include hydroelectric right of 1,300 cfs at Lake Dunlap, which is a non-consumptive right.
[2]Through agreement with LCRA for stored water 290,156 acft is firm supply during drought of record.
[3]Source: "LCRA Drought Management Plan," Lower Colorado River Authority, Austin, Texas, July, 1990.
[4]LCRA staff estimates that during the critical period of record (1946-1957), the dependable supply from all of these permits is about 350,921 acft annually. "Water Supply and Demand Assessment of Wharton County," Lower Colorado River Authority, Austin, Texas, October, 1991.
[5]Through agreement with LCRA for stored water, the 102,000 is firm supply during drought of record.

generation rights of 1,300 cfs at Dunlap for GBRA and 365 cfs at Sequin for Sequin. Since this is a nonconsumptive use, these rights were not included in this analysis.

In the Guadalupe and San Antonio Basin downstream of Victoria and Goliad, respectively, total run-of-river rights are 214,499 acft/yr considering only consumptive rights for municipal, irrigation and industrial process water (Table 2-9).

In the Colorado Basin, run-of-river water rights holders include the City of Austin (334,009 acft/yr), Gulf Coast Irrigation Division (262,500 acft/yr), Garwood Irrigation Company (168,000 acft/yr), Lakeside Irrigation Division (131,250 acft/yr), Pierce Ranch Irrigation (110,000 acft/yr), and the South Texas Nuclear Project (102,000 acft/yr). Austin's right is for municipal and steam-electric power generation, the south Texas Project right is for steam-electric power generation, and the others are for irrigation. Within the study area upstream of the Highland Lakes there are 36,491 acft/yr of run-of-river rights, and in the stretch from Travis County to Colorado County there are 34,146 acft/yr of such rights.

In the West Central Study Area, the sum of the major consumptive run-of-river permitted water rights is 1,545,748 acft/yr (Table 2-9). The supply from run-of-river rights plus the firm yield of reservoirs is the existing surface water supply for the study area. Refer to Section 2.4 for a comparison of projected water demands with available water supplies.

2.4 Comparison of Projected Water Demands with Projected Water Supplies

In Section 2.2 projected water demands are shown for the 32-county area, the Edwards Aquifer Area, and for each of the river basins (Nueces, San Antonio, Guadalupe, Lower Colorado, and adjacent coastal basins) of the study area. In Section 2.3, water supplies available within the 32-county area are shown. In this section, the municipal, industrial, steam-electric power, irrigation, mining, livestock, and total water demands are summarized for each river basin area of the study area, and compared with the available water supplies of the basin for the purpose of indicating whether additional quantities of water will be needed, the approximate dates at which additional supplies will be needed, and the projected quantities of water that will be needed to meet the projected demands of each basin.[8]

The water supply information tabulated for each river basin was developed from water supply data shown in Section 2.3.1. In the case of groundwater, the annual supplies for counties (Table 2-7) were prorated to the river or coastal basin in which that county or part of county is located (i.e., if 50 percent of the county is in the San Antonio Basin, it is assumed that 50 percent of the county's groundwater supply is also located in the San Antonio Basin). In the case of supplies from Edwards Aquifer, the provisions of SB 1477 were applied (i.e., 450,000 acft/yr until December 31, 2007, and 400,000 acft/yr beginning in 2008) with these quantities prorated among the Edwards Aquifer Authority counties in the same proportion as the county's water use from the Edwards Aquifer in 1990.

Local surface and groundwater is the estimated quantity of water from windmills, stock watering tanks, and stream flows consumed by livestock and is equated to the projected livestock water demands of each county or part of county of the river basin. For example, in practice, livestock water is produced or obtained on or very near the sites where it is used, and although livestock water demands are shown in the water demand projections, this water does not get included in the hydrology data from which water supply information is obtained. Thus the method used here includes projections of livestock water demands in the counties and parts of

[8] For individual county and parts of counties of each basin, see "West Central Study Area Phase II, Population, Water Demand, and Water Supply Projections," San Antonio River Authority, et al.; HDR Engineering, Inc., Austin, Texas, January, 1998.

counties of each river and coastal basin, and assumes that projected livestock water demands will be met from local supplies.

Surface water supplies have two components as follows: (1) firm yields of reservoirs ,and (2) run-of-river (ROR) water rights. Firm yields of reservoirs are known and quantities of firm yield were tabulated in the counties or parts of counties having rights or contracts to use the firm yield. The summaries of these county tabulations are shown for each respective river basin of the study area.[9]

With respect to run-of-river water rights, the Texas Natural Resource Conservation Commission (TNRCC) water rights records were obtained and the quantities of permitted diversions were tabulated as to county of location where the water is used. Computer models were then used to obtain estimates of the water supplies available from these permitted diversions for three weather conditions as follows: [10]

(1) Average quantity available for the period for which streamflow records are available, usually 1934 through 1989;
(2) Average quantity available for the drought of record of 1947 through 1956; and
(3) Quantity available for the driest year of record.

A summary of water supplies available for each of the three conditions is shown for each river basin, along with the companion computation of surplus or shortage for the basin.[11] The projections and comparisons are presented below for the Nueces and San Antonio River Basins, the Guadalupe Basin and adjacent Lavaca-Guadalupe Coastal Basin, the Lower Colorado Basin and adjacent Brazos-Colorado and Colorado-Lavaca Coastal Basins, the study area counties of the Brazos and Lavaca River Basins, and the study area counties of San Antonio-Nueces Coastal Basin.

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[9] Ibid.
[10] HDR Engineering, Inc. et al., "Regional Water Supply Planning Study-Phase I, Nueces River Basin," Nueces River Authority, et al., Uvalde, Texas, May, 1991; HDR Engineering, Inc. et al., "Guadalupe-San Antonio River Basin Recharge Enhancement Study," Edwards Underground Water District, San Antonio, Texas, September, 1993; and "Colorado River Base Case Availability," Unpublished, Lower Colorado River Authority, Austin, Texas, June, 1997.
[11] op.cit.

2.4.1 Nueces River Basin Study Area Projected Water Demand and Water Supply Comparisons

In the Nueces Basin, the west central study area includes all of Frio, Uvalde, and Zavala counties, and parts of Atascosa, Bandera, Bexar, Karnes, Kerr, Medina, and Wilson counties. The Nueces Basin study area water use in 1990 was 558,248 acft/yr and is projected to decrease to 498,105 acft/yr in 2050 due to reductions in Federal Farm Support programs and increased water conservation in irrigation (Table 2-10). Projected total supply available to meet the projected demands includes supply from the Edwards Aquifer of 163,243 acft/yr beginning in year 2008, 137,449 acft/yr from the Carrizo and other Aquifers, 7,345 acft/yr from local surface and groundwater sources for livestock use, and between 8,588 acft/yr of surface water in severe drought years and 80,017 acft/yr of surface water during high rainfall years from run-of-river (ROW) water rights, plus Medina Lake depending upon weather conditions that affect stream flow (Table 2-10). Given the demands and supply projections, the Nueces Basin study area is projected to have shortages ranging between 171,503 acft/yr and 242,932 acft/yr in year 2000, and shortages ranging between 110,051 acft/yr and 181,479 acft/yr in year 2050 (Table 2-10 and Figure 2-5).

Table 2-10
Comparison of Water Demand and Water Supply Projections
Nueces River Basin Area
West Central Trans-Texas Study Area
Trans-Texas Water Program

Basin/County/City		Total Use in 1990 acft	Projections 2000 acft	2010 acft	2020 acft	2030 acft	2040 acft	2050 acft
Demand								
Municipal Demand		20,844	27,000	28,119	29,019	31,340	33,214	34,728
Industrial Demand		2,149	2,320	2,482	2,611	2,719	2,942	3,164
Steam-Electric Power Demand		6,074	12,400	12,400	12,400	12,400	15,400	22,400
Irrigation Demand		521,395	528,390	504,948	485,204	465,090	445,828	427,381
Mining Demand		1,706	2,506	2,354	2,490	2,650	2,845	3,087
Livestock Demand		6,080	7,345	7,345	7,345	7,345	7,345	7,345
Total Demand		558,248	579,961	557,648	539,069	521,544	507,574	498,105
Supply								
Groundwater/Edwards		212,132	183,647	163,243	163,243	163,243	163,243	163,243
Groundwater/Other		254,544	137,449	137,449	137,449	137,449	137,449	137,449
Local Surface&Ground		6,080	7,345	7,345	7,345	7,345	7,345	7,345
Surface Water/Streams	RORrights+MedinaL 1	114,714	80,017	80,017	80,017	80,017	80,017	80,017
Surface Water/Streams	Ave.available 2	94,241	64,402	64,402	64,402	64,402	64,402	64,402
Surface Water/Streams	Ave.avail-dry 3	55,219	41,340	41,340	41,340	41,340	41,340	41,340
Surface Water/Streams	Min.Yr.Ava. 4	8,935	8,588	8,588	8,588	8,588	8,588	8,588
Total Supply	ROR rights 5	587,470	408,458	388,054	388,054	388,054	388,054	388,054
Total Supply	Ave.available 6	566,997	392,843	372,439	372,439	372,439	372,439	372,439
Total Supply	Ave.avail-dry 7	527,975	369,781	349,377	349,377	349,377	349,377	349,377
Total Supply	Min.Yr.Ava. 8	481,691	337,029	316,625	316,625	316,625	316,625	316,625
Surplus/Shortage	ROR rights 9	29,222	-171,503	-169,594	-151,015	-133,490	-119,520	-110,051
Surplus/Shortage	Ave.available 10	8,749	-187,119	-185,209	-166,631	-149,105	-135,135	-125,666
Surplus/Shortage	Ave.avail-dry 11	-30,273	-210,180	-208,270	-189,692	-172,167	-158,197	-148,727
Surplus/Shortage	Min.Yr.Ava. 12	-76,557	-242,932	-241,022	-222,444	-204,919	-190,949	-181,479

Source: Texas Water Development Board; 1996 Consensus Water Plan, Most Likely Case, below normal rainfall and advanced water conservation.

1 ROR plus Medina Lake is 48,217 acft/yr of run-of-river rights in Nueces Basin study area plus Medina Lake of 31,800 acft/yr.
2 Average quantity of water available annually from 48,217 acft/yr of run-of-river rights plus Medina Lake listed above.
3 Average quantity of water available annually during 1947-56 drought from 48,217 acft/yr of run-of-river rights plus Medina Lake.
4 Quantity of water available during worst year of drought (Min.Yr.Ava.) from 48,217 acft/yr of run-of-river rights plus Medina Lake.
5 Total supply from groundwater and full ROR rights plus Medina Lake (212,132+254,455+6,080+114,714=587,470).
6 Total supply from groundwater and average quantity available from ROR plus Medina Lake (566,997).
7 Total supply from groundwater and average available (1947-56 drought) from ROR plus Medina Lake (527,975).
8 Total supply from groundwater and minimum year available (1947-56 drought) from ROR plus Medina Lake (481,691).
9 Shortage in year 2000 for full ROR rigrts available plus Medina Lake (171,503).
10 Shortage in year 2000 for average available from ROR rights plus Medina Lake (187,119).
11 Shortage in year 2000 for average available from ROR rights during 1947-56 drought plus Medina Lake (210,180).
12 Shortage in year 2000 for quantity avaliable from ROR rights during worst year of drought plus Medina Lake (242,932).

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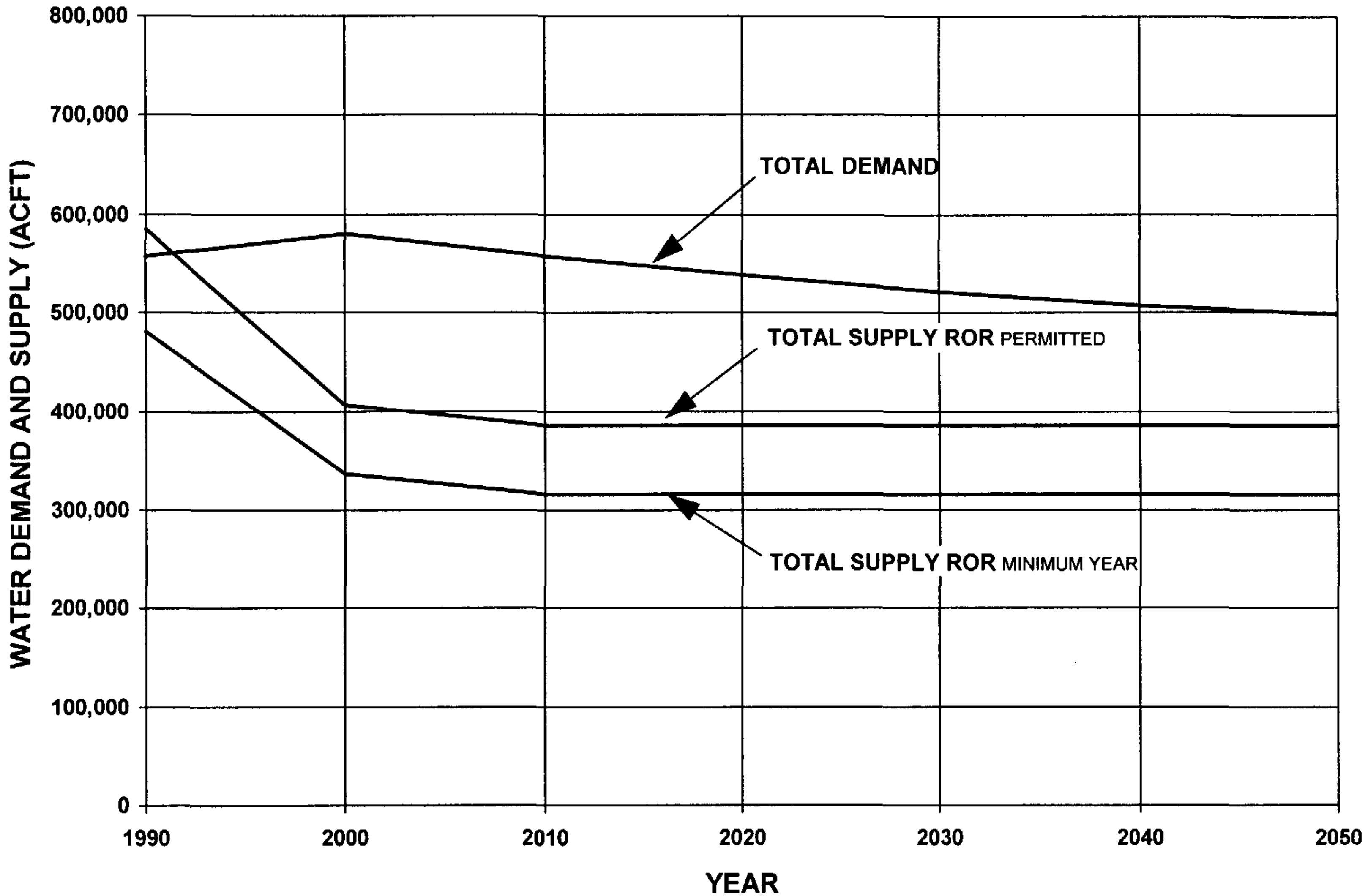

- Total Supply ROR is the sum of groundwater, firm yields of reservoirs, if any, and run-of-river permits at maximum permitted quantities.
- Total Supply ROR Minimum Year is the sum of groundwater, firm yields of reservoirs, if any, and quantities from run-of-river permits during driest year of record.

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NUECES BASIN PROJECTIONS WATER DEMAND/WATER SUPPLY

FIGURE 2-5

2.4.2 San Antonio River Basin Study Area Projected Water Demand and Water Supply Comparisons

The San Antonio River Basin study area includes parts of 14 counties, as follows: Atascosa, Bandera, Bexar, Comal, DeWitt, Goliad, Guadalupe, Karnes, Kendall, Kerr, Medina, Refugio, Victoria, and Wilson Counties. Water use in the San Antonio River Basin in 1990, was 358,741 acft/yr of which 84 percent was in Bexar County, 7 percent was in Medina County, 1.5 percent was in Karnes County, and the remaining 7.5 percent was in the remaining 12 counties having parts of their areas located within the basin (Table 2-11). Projected water demands in the San Antonio River Basin are 544,416 acft/yr in 2020, and 727,459 acft/yr in 2050, with approximately 88 percent of projected demands in Bexar County (Table 2-11).

Total water supply available to meet projected water demands in the year 2000 ranges between 468,566 acft/yr during severe droughts and 520,989 acft/yr during high rainfall years (Table 2-11). Of the total supply projected to be available in the year 2000, 48 percent is from the Edwards Aquifer, 19 percent is from the Carrizo, Trinity, and other aquifers, 15 percent is reclaimed wastewater, and between 8 percent and 16 percent is from run-of-river surface water rights. However, due to limits upon pumpage from the Edwards Aquifer, as specified in SB 1477, the annual supply is projected to decline in the year 2010 to a range of 440,868 acft/yr for severe drought to 493,301 acft/yr in high rainfall years (Table 2-11 and Figure 2-6).

The San Antonio River Basin summary shows a projected water shortage in the year 2010 of 2,682 acft/yr for a high rainfall year, and 55,115 acft/yr during severe droughts when surface water availability is at its lowest (Table 2-11). The projected San Antonio River Basin shortage in 2020 ranges between 51,115 acft/yr and 103,549 acft/yr, and for 2050 ranges between 234,158 acft/yr and 286,591 acft/yr (Table 2-11 and Figure 2-6). It should be noted, however, that in this analysis water demands have not been matched to supplies available (i.e., a part of the supply available within the basin may not be readily available to those parts to the basin where shortages are projected).

Table 2-11
Comparison of Water Demand and Water Supply Projections
San Antonio River Basin Area
West Central Trans Texas Study Area
Trans-Texas Water Program

Basin/County/City		Total Use in 1990 acft	Projections 2000 acft	2010 acft	2020 acft	2030 acft	2040 acft	2050 acft
Demand								
Municipal Demand		240,233	325,199	359,369	403,907	466,116	523,715	566,696
Industrial Demand		14,323	17,105	20,008	22,698	25,283	28,630	32,092
Steam-Electric Power Demand		24,263	36,000	36,000	40,000	45,000	50,000	56,000
Irrigation Demand		72,393	75,745	69,629	65,936	62,494	59,274	56,260
Mining Demand		1,993	5,213	5,017	5,915	7,001	8,334	10,451
Livestock Demand		5,536	5,960	5,960	5,960	5,960	5,960	5,960
Basin Total		358,741	465,222	495,983	544,416	611,854	675,913	727,459
Supply								
Groundwater/Edwards		287,947	249,283	221,585	221,585	221,585	221,585	221,585
Groundwater/Other		105,407	99,244	99,244	99,244	99,244	99,244	99,244
Local Surface&Ground		5,536	5,960	5,960	5,960	5,960	5,960	5,960
Surface/Cooling Water		49,000	49,000	49,000	49,000	49,000	49,000	49,000
Surface Water/Medina L	Medina Lake 1	34,030	34,030	34,030	34,030	34,030	34,030	34,030
Surface Water/Medina L	Ave.available(86%)	29,266	29,266	29,266	29,266	29,266	29,266	29,266
Surface Water/Medina L	Ave.avail-dry(40%)	13,612	13,612	13,612	13,612	13,612	13,612	13,612
Surface Water/Medina L	Min.Yr.Ava. (1%)	1,625	1,727	1,743	1,765	1,787	1,828	1,873
Surface Water/Streams	ROR rights	53,482	53,482	53,482	53,482	53,482	53,482	53,482
Surface Water/Streams	Ave.available	50,832	50,832	50,832	50,832	50,832	50,832	50,832
Surface Water/Streams	Ave.avail-dry	45,466	45,466	45,466	45,466	45,466	45,466	45,466
Surface Water/Streams	Min.Yr.Ava.	34,739	34,739	34,739	34,739	34,739	34,739	34,739
Surface Water/Recycle		0	30,000	30,000	30,000	30,000	30,000	30,000
Total Supply	ROR rights	535,402	520,999	493,301	493,301	493,301	493,301	493,301
Total Supply	Ave.available	527,988	513,585	485,887	485,887	485,887	485,887	485,887
Total Supply	Ave.avail-dry	506,968	492,565	464,867	464,867	464,867	464,867	464,867
Total Supply	Min.Yr.Ava.	482,969	468,566	440,868	440,868	440,868	440,868	440,868
Surplus/Shortage	ROR rights	176,661	55,777	-2,682	-51,115	-118,553	-182,612	-234,158
Surplus/Shortage	Ave.available	169,247	48,363	-10,095	-58,529	-125,967	-190,026	-241,572
Surplus/Shortage	Ave.avail-dry	148,227	27,342	-31,116	-79,550	-146,987	-211,046	-262,592
Surplus/Shortage	Min.Yr.Ava.	124,228	3,344	-55,115	-103,549	-170,986	-235,045	-286,591

Source: Texas Water Development Board; 1996 Consensus Water Plan, Most Likely Case, below normal rainfall and advanced water conservation.

1 Medina Lake Permit is for 65,830 acre-feet per year, and is allocated among Medina County in the Nueces Basin in the amount of 31,800 acft/yr, Medina County in the San Antonio Basin in the amount of 29,030 acft/yr, and Bandera County of the San Antonio Basin in the amount of 5,000 acft/yr. The allocations are based upon proportions of the acreages irrigated using Medina Lake water and an agreement between The Bexar-Medina-Atascosa Irrigation District and interests in Bandera County.

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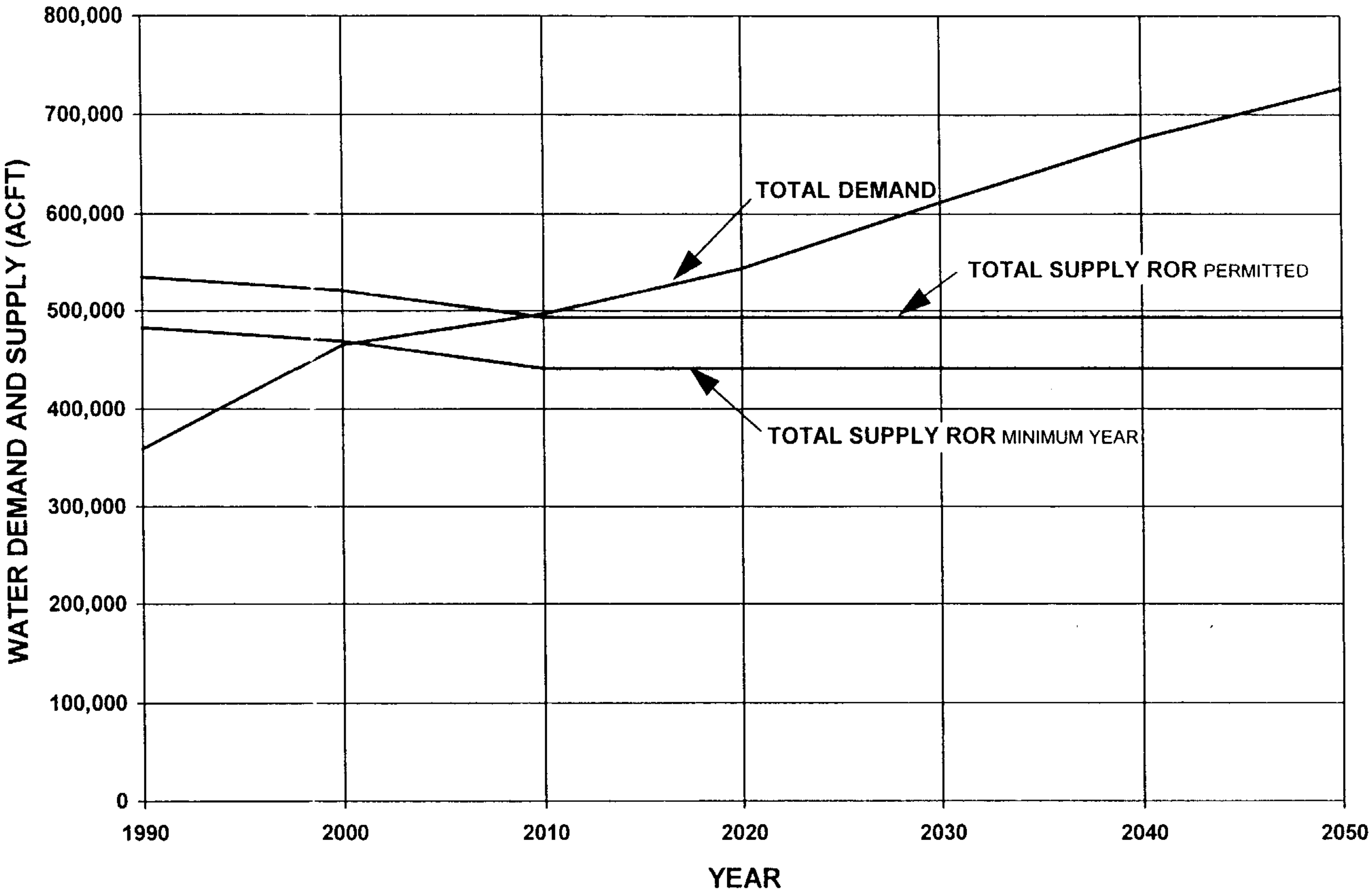

- Total Supply ROR is the sum of groundwater, firm yields of reservoirs, if any, and run-of-river permits at maximum permitted quantities.
- Total Supply ROR Minimum Year is the sum of groundwater, firm yields of reservoirs, if any, and quantities from run-of-river permits during driest year of record.

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SAN ANTONIO BASIN PROJECTIONS WATER DEMAND/WATER SUPPLY

FIGURE 2-6

2.4.3 Guadalupe River Basin and Adjacent Lavaca-Guadalupe Coastal Basin Study Area Projected Water Demand and Water Supply Comparisons

The study area counties and parts of counties within the Guadalupe Basin include Bandera, Bastrop, Blanco, Caldwell, Comal, Fayette, Goliad, Gonzales, Guadalupe, Hays, Karnes, Kendall, Kerr, Travis, Wilson, Calhoun, DeWitt, and Victoria. Those parts of counties of the Lavaca-Guadalupe Coastal Basin are included with the Guadalupe Basin, since parts of Calhoun and Victoria Counties obtain surface water via permits which authorize the diversion and use of water form the Guadalupe River.

In 1990, water use in the Guadalupe/Lavaca-Guadalupe area was 190,261 acft/yr, and water demand for the area is projected to increase to 352,329 acft/yr in 2050 (Table 2-12). In this area, municipal use was 30 percent of the total in 1990 and is projected to increase to 41 percent of total use in 2050. In 1990, industrial use was 22 percent of total water use, and is projected at 39 percent of total use in 2050. Irrigation accounted for 29 percent of water use in the area in 1990 and is projected to decline to 4 percent in 2050 due to reductions in Federal Farm Support Programs and increased water conservation in irrigation water use.

The summary of projected water supplies and demands shows adequate supplies to meet projected demands for the Guadalupe/Lavaca-Guadalupe area (Table 2-12 and Figure 2-7).[12] For the Guadalupe/Lavaca-Guadalupe area, projected annual water supplies beginning in the year 2010 range from a low of 460,658 acft/yr during severe droughts to 570,451 acft/yr during wet weather conditions (Table 2-12 and Figure 2-7). These quantities are greater than projected total demands for the entire area; however, as mentioned in footnote number 12, shortages are projected for the upstream, Hill Country counties.

[12] However, it is noted and emphasized that in the Hill Country area, Counties (Bandera, Blanco, Kendall, and Kerr Counties) of Guadalupe River Basin, the margins between projected supply and demand are very thin, and, as a practical matter, groundwater supplies from the Trinity Group aquifers for these counties are not readily available to meet the needs of the growing cities within the area, due to the fact that well yields are quite low which would make it necessary to drill and equip a large number of widely-spaced wells in order to obtain the water that is indicated to be available from these aquifers..

Table 2-12								
Comparison of Water Demand and Water Supply Projections								
Guadalupe River Basin and Adjacent Lavaca-Guadalupe Coastal Basin Area								
West Central Trans Texas Study Area								
Trans-Texas Water Program								
		Total Use	**Projections**					
Basin/County/Water Utility		**in 1990**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
		acft	**acft**	**acft**	**acft**	**acft**	**acft**	**acft**
Demand								
Municipal Demand		60,360	81,251	89,593	99,959	116,618	130,695	145,364
Industrial Demand		44,226	77,155	92,557	101,736	111,573	123,776	136,593
Steam-Electric Power Demand		13,052	23,000	25,000	30,000	30,000	30,000	30,000
Irrigation Demand		58,400	46,308	39,129	33,812	29,482	26,265	23,781
Mining Demand		3,606	8,868	8,081	7,864	7,955	5,723	4,498
Livestock Demand		10.617	12,093	12,093	12,093	12,093	12,093	12,093
Basin Total 1		190,261	248,675	266,453	285,464	307,721	328,552	352,329
Supply								
Groundwater/Edwards		19,717	17,070	15,173	15,173	15,173	15,173	15,173
Groundwater/Other		158,541	155,508	155,508	155,508	155,508	155,508	155,508
Surface Water/Canyon	Firm Yield to users 2	17,592	36,099	47,305	47,305	47,305	47,305	47,305
Surface Water/Canyon	Firm Yield remaining 3	65,035	46,528	35,322	35,322	35,322	35,322	35,322
Local Surface&Ground		10,617	12,093	12,093	12,093	12,093	12,093	12,093
Surface Water/Streams	ROR rights Lavaca Basin	801	801	801	801	801	801	801
Surface Water/Streams	Ave.available(98%)	785	785	785	785	785	785	785
Surface Water/Streams	Ave.avail-dry(96%)	769	769	769	769	769	769	769
Surface Water/Streams	Min.Yr.Ava. (83%)	665	665	665	665	665	665	665
Surface Water/Streams	ROR rights Lav-Guad CB	548	548	548	548	548	548	548
Surface Water/Streams	Ave.available(95%) 4	521	521	521	521	521	521	521
Surface Water/Streams	Ave.avali-dry(85%)	466	466	466	466	466	466	466
Surface Water/Streams	Min.Yr.Ave. (55%)	301	301	301	301	301	301	301
Surface Water/Streams	ROR rights Guadalupe	303,701	303,701	303,701	303,701	303,701	303,701	303,701
Surface Water/Streams	Ave.available	292,245	292,245	292,245	292,245	292,245	292,245	292,245
Surface Water/Streams	Ave.avail-dry	268,356	268,356	268,356	268,356	268,356	268,356	268,356
Surface Water/Streams	Min.Yr.Ava.	194,291	194,291	194,291	194,291	194,291	194,291	194,291
Total Supply	ROR rights	576,552	572,348	570,451	570,451	570,451	570,451	570,451
Total Supply	Ave.available	565,053	560,849	558,952	558,952	558,952	558,952	558,952
Total Supply	Ave.avail-dry	541,093	536,889	534,992	534,992	534,992	534,992	534,992
Total Supply	Min.Yr.Ava.	466,759	462,555	460,658	460,658	460,658	460,658	460,658
Surplus/Shortage	ROR rights	386,291	323,673	303,998	284,987	262,730	241,899	218,122
Surplus/Shortage	Ave.available	374,792	312,174	292,499	273,488	251,231	230,400	206,623
Surplus/Shortage	Ave.avail-dry	350,832	288,214	268,539	249,528	227,271	206,440	182,663
Surplus/Shortage	Min.Yr.Ava.	276,498	213,880	194,205	175,194	152,937	132,106	108,329

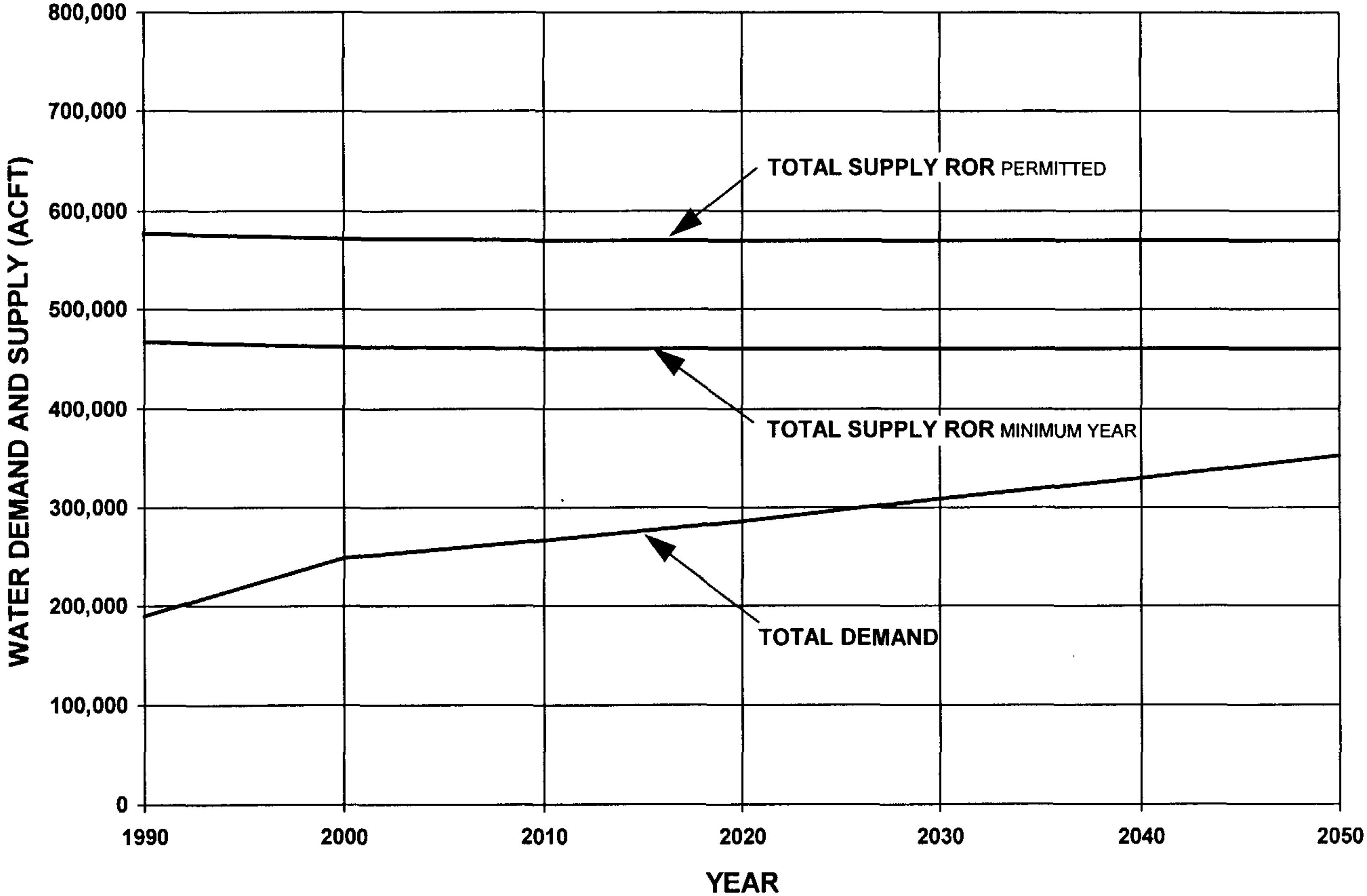
Source: Texas Water Development Board; 1996 Consensus Water Plan, Most Likely Case, below normal rainfall and advanced water conservtion.

1 Totals do not include demands for that part of Calhoun County that is located in the Colorado-Lavaca Coastal Basin.

2 Canyon Lake is located in Comal County, and has an estimated Firm Yield of 82,627 acft/yr. The quantity shown on this row is the sum of existing contracts and tentative commitments to customers located in counties of the Guadalupe-Blanco River Authority's service area.

3 The uncomitted supply from the yield of Canyon Lake; this quantity is included in basin totals for all cases of weather conditions.

4 Used availibility estimates for neighboring Calhoun County of the Guadalupe Basin.



- Total Supply ROR is the sum of groundwater, firm yields of reservoirs, if any, and run-of-river permits at maximum permitted quantities.
- Total Supply ROR Minimum Year is the sum of groundwater, firm yields of reservoirs, if any, and quantities from run-of-river permits during driest year of record.

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GUADALUPE AND ADJACENT COASTAL BASINS PROJECTIONS WATER DEMAND/WATER SUPPLY

FIGURE 2-7

2.4.4 Lower Colorado River Basin and Adjacent Coastal Basins Area Projected Water Demand and Water Supply Comparisons

The Lower Colorado River Basin and adjacent Coastal Basins area includes all of Colorado, Matagorda, and Wharton Counties, and parts of Bastrop, Blanco, Burnet, Caldwell, Fayette, Hays, Kendall, Kerr, Lee, Llano, San Saba and Travis Counties that are located within the Colorado River Basin. In the Lower Colorado River Basin Coastal area, parts of Colorado, Wharton, and Matagorda Counties are located in the adjacent Brazos-Colorado and Colorado-Lavaca Coastal Basins, with parts of Colorado and Wharton Counties also located in the adjacent Lavaca River Basin. Since these parts of those counties obtain surface water from the Lower Colorado River, they have been grouped with the Lower Colorado River Basin for purposes of presenting the water demand and water supply comparisons.

In 1990, water use in the Lower Colorado/Adjacent Coastal Basins area was 1,043,323 acft/yr, of which 14 percent was for municipal purposes, 1.5 percent was for industrial uses 5.5 percent was for steam-electric power generation, 71 percent was for irrigation, 3.6 percent was for mining, 1 percent was for livestock, and 3 percent was for in-stream flows (Table 2-13). Projected water demands in 2050, with advanced water conservation, are 1,038,987 acft/yr, of which 35 percent are for municipal purposes, 2.4 percent are for industrial purposes, 9.6 percent are for steam-electric power generation, 46 percent are for irrigation, 2.7 percent are for mining, 1 percent is for livestock, and 3 percent is for in-stream purposes. For the 1990 through 2050 projection period, municipal water demand is projected to increase from 148,325 acft/yr to 362,739 acft/yr, with industrial water demand increasing from 15,657 acft/yr to 25,124 acft/yr, and steam-electric power water demand increasing from 57,718 acft/yr to 100,000 acft/yr. Due to declining Federal Farm Support programs and increased water conservation in irrigated agriculture, irrigation water demands are projected to decrease from 740,655 acft/yr in 1990 to 480,018 acft/yr in 2050 (Table 2-13).

The total water supply available from ground and surface sources, including the firm yield of the Highland Lakes and permits to divert run-of-river flows is shown for the Lower Colorado/Adjacent Coastal Basins area (Table 2-13). The summary for all counties and parts of counties shows a total supply for the period 2000 through 2050 ranging from 1,095,256 during severe drought conditions to 1,972,093 acft/yr during wet weather conditions (Table 2-13). The comparison of projected water demands with projected water supplies, shows a surplus for the area in 2050 of 56,275 acft/yr for the severe drought condition and a surplus of 933,112 acft/yr for wet weather conditions during which run-of-river flows could potentially supply 1,178,396 acft/yr from run-of-river rights in the Lower Colorado River Basin (Table 2-13 and Figure 2-8). However, as is the case in other basins of the West Central Trans-Texas study area, in this study supplies have not been allocated to individual demands. There are several counties within the basin where shortages are projected.

Table 2-13 Comparison of Water Demand and Water Supply Projections Lower Colorado River and Adjacent Coastal Basins Area West Central Trans-Texas Study Area Trans-Texas Water Program								
		Total Use	Projections					
Basin and Adjacent Areas		in 1990	2000	2010	2020	2030	2040	2050
		acft	acft	acft	acft	acft	acft	acft
Demand								
Municipal Demand		148,325	210,947	232,048	264,719	306,406	332,133	362,739
Industrial Demand		15,657	17,462	19,151	20,255	21,410	23,112	25,124
Steam-Electric Power Demand		57,718	62,500	72,000	77,000	92,000	92,000	100,000
Irrigation Demand		740,655	725,192	675,887	608,759	552,487	514,968	480,018
Mining Demand		38,248	29,449	20,103	21,603	23,344	25,508	28,100
Livestock Demand		10,920	11,200	11,200	11,200	11,200	11,200	11,200
In-Stream Flows		31,800	31,800	31,800	31,800	31,800	31,800	31,800
Basin Total Demand		1,043,323	1,088,550	1,062,189	1,035,336	1,038,647	1,030,721	1,038,981
Supply								
Groundwater		419,314	313,606	313,606	313,606	313,606	313,606	313,606
Surface Water/HLakes/In-Basin/Firm*		403,736	403,736	403,736	403,736	403,736	403,736	403,736
Local Surface&Ground		10,920	11,200	11,200	11,200	11,200	11,200	11,200
Surface Water/HLakes/In-Stream/Firm*		31,800	31,800	31,800	31,800	31,800	31,800	31,800
Surface Water/Streams	Lavaca Basin ROR rights	33,355	33,355	33,355	33,355	33,355	33,355	33,355
Surface Water/Streams	Ave.available(60%)4 LB	20,013	20,013	20,013	20,013	20,013	20,013	20,013
Surface Water/Streams	Ave.avali-dry(54%) LB	18,012	18,012	18,012	18,012	18,012	18,012	18,012
Surface Water/Streams	Min.Yr.Ave. (43%) LB	14,343	14,343	14,343	14,343	14,343	14,343	14,343
Surface Water/Streams	ROR rightsFrom Colo	1,178,396	1,178,396	1,178,396	1,178,396	1,178,396	1,178,396	1,178,396
Surface Water/Streams	Ave.available	635,177	635,177	635,177	635,177	635,177	635,177	635,177
Surface Water/Streams	Ave.avali-dry	497,108	497,108	497,108	497,108	497,108	497,108	497,108
Surface Water/Streams	Min.Yr.Ave.	320,571	320,571	320,571	320,571	320,571	320,571	320,571
Total Supply	ROR rights	2,077,521	1,972,093	1,972,093	1,972,093	1,972,093	1,972,093	1,972,093
Total Supply	Ave.available	1,520,960	1,415,532	1,415,532	1,415,532	1,415,532	1,415,532	1,415,532
Total Supply	Ave.avali-dry	1,380,890	1,275,462	1,275,462	1,275,462	1,275,462	1,275,462	1,275,462
Total Supply	Min.Yr.Ave.	1,200,684	1,095,256	1,095,256	1,095,256	1,095,256	1,095,256	1,095,256
Surplus/Shortage	ROR rights	1,034,198	883,543	909,904	936,757	933,446	941,372	933,112
Surplus/Shortage	Ave.available	477,637	326,982	353,343	380,196	376,885	384,811	376,551
Surplus/Shortage	Ave.avali-dry	337,567	186,911	213,272	240,126	236,814	244,740	236,481
Surplus/Shortage	Min.Yr.Ave.	157,361	6,706	33,067	59,920	56,609	64,535	56,275
See Footnotes on Next Page								

Lower Colorado Basin Water Supply Summary							
Highland Lakes Yield/Allocation to Counties*							
San Saba County	20	20	20	20	20	20	20
Llano County	1,818	1,818	1,818	1,818	1,818	1,818	1,818
Gillespie County	18	18	18	18	18	18	18
Burnet County	8,901	8,901	8,901	8,901	8,901	8,901	8,901
Travis County/ City of Austin--M&I	148,300	148,300	148,300	148,300	148,300	148,300	148,300
Travis County/ Other Utilities--M&I	41,286	41,286	41,286	41,286	41,286	41,286	41,286
Reserved	50,000	50,000	50,000	50,000	50,000	50,000	50,000
Uncomitted	54,967	54,967	54,967	54,967	54,967	54,967	54,967
Total included in Travis County Comparison	294,553	294,553	294,553	294,553	294,553	294,553	294,553
Bastrop County	850	850	850	850	850	850	850
Fayette County	63,863	63,863	63,863	63,863	63,863	63,863	63,863
Matagorda County	33,743	33,743	33,743	33,743	33,743	33,743	33,743
Surface Water/HLakes/In-Basin/Firm*	403,766	403,766	403,766	403,766	403,766	403,766	403,766
Surface Water/HLakes/In-Stream/Firm*	31,800	31,800	31,800	31,800	31,800	31,800	31,800
Surface Water/HLakes/Out-Basin/Firm*1	9,700	9,700	9,700	9,700	9,700	9,700	9,700
Surface Water/HLakes/Firm*	445,266	445,266	445,266	445,266	445,266	445,266	445,266
Surface Water/Streams/In-Basin/ROR rights*	679,246	679,246	679,246	679,246	679,246	679,246	679,246
Surface Water/Streams/Out of Basin/RORrights*2	499,150	499,150	499,150	499,150	499,150	499,150	499,150
Surface Water/Streams/ROR rights*	1,178,396	1,178,396	1,178,396	1,178,396	1,178,396	1,178,396	1,178,396

Source: Texas Water Development Board; 1996 Consensus Water Plan, Most Likely Case, below normal rainfall and advanced water conservation.

* Firm Supply from Highland Lakes; "Water Management for the Lower Colorado River Basin," Lower Colorado River Authority, Austin, Texas, June, 1993. ROR means Run-of-Rights.

1 Sales of Highland Lakes Firm Yield to neighboring cities in Williamson County (Cedar Park and Leander).

2 Run of River Rights which are diverted into neighboring coastal basins (See Table 4-5; Brazos-Colorado and Colorado-Lavaca Coastal Basins, and the Lavaca Basin Tables.

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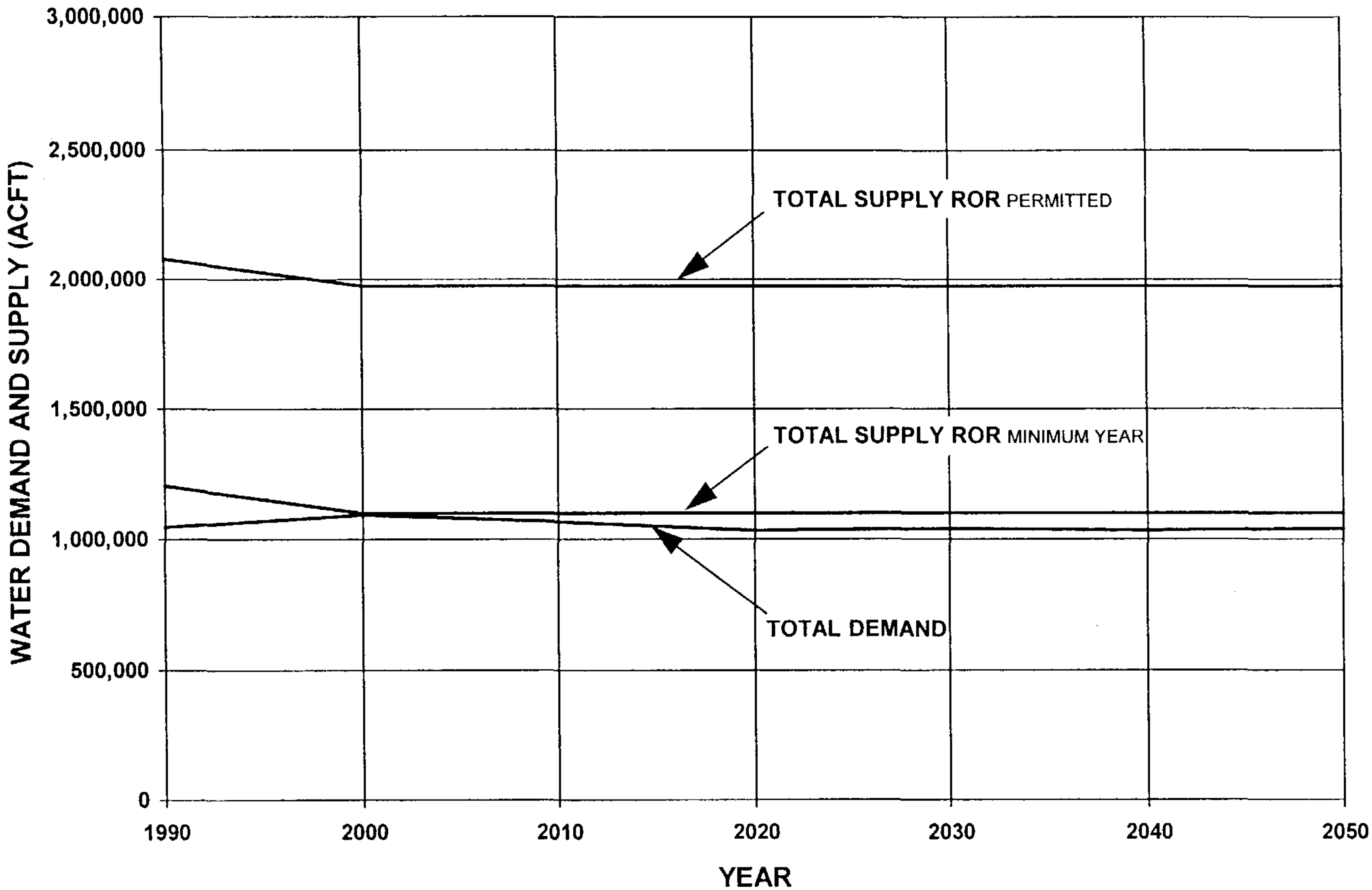

- Total Supply ROR is the sum of groundwater, firm yields of reservoirs, if any, and run-of-river permits at maximum permitted quantities.
- Total Supply ROR Minimum Year is the sum of groundwater, firm yields of reservoirs, if any, and quantities from run-of-river permits during driest year of record.

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TRANS TEXAS WATER PROGRAM / WEST CENTRAL STUDY AREA

LOWER COLORADO AND ADJACENT COASTAL BASINS PROJECTIONS WATER DEMAND/WATER SUPPLY

FIGURE 2-8

2.4.5 Projected Water Demand and Water Supply Comparison for Study Area Counties of Colorado-Lavaca Coastal Basin, Lavaca Basin, and San Antonio-Nueces Coastal Basin

In this section, water demand and water supply projections are presented for those parts of 10 study area counties that are located in adjacent river and coastal basins. Tabulations are shown for parts of Bastrop, Burnet, Lee, and Travis Counties that are located in the Brazos River Basin (Table 2-14). Tabulations are also shown for that part of Calhoun County that is located in the Colorado-Lavaca Coastal Basin; parts of Fayette and Gonzales Counties of the Lavaca River Basin; and parts of Calhoun, Goliad, Karnes, and Refugio Counties located in the San Antonio-Nueces Coastal Basin.

The comparison of projected water demands with projected water supplies for the parts of study area counties mentioned above shows that projected supplies available in each of the parts of counties are adequate to meet projected demands to 2050, except for the small area of Travis County that is located in the Brazos River Basin (Table 2-14). In the case of that part of Travis County, water use in 1990 was 335 acft/yr, with 2050 projected demands of 639 acft/yr. The only locally available water supply is about 80 acft/yr of groundwater, leaving a projected shortage of 559 acft/yr in 2050 (Table 2-14). In most other cases for this group of parts of counties of the study area (with the exception of the San Antonio-Nueces Coastal Basin), projected supply in 2050 is at least 50 percent higher than 2050 projected demands (Table 2-14). However, as is the case elsewhere, there may be local area shortages in addition to the Travis County area mentioned above.

Table 2-14 Comparison of Water Demand and Water Supply Projections Adjacent River and Coastal Basin Areas* West Central Trans Texas Study Area Trans-Texas Water Program								
		Total Use	Projections					
Basin/County/Water Utility*		in 1990	2000	2010	2020	2030	2040	2050
		acft	acft	acft	acft	acft	acft	acft
Brazos Basin Summary								
Total Municipal Demand		2,078	2,785	2,886	3,036	3,307	3,501	3,684
Industrial Demand		251	278	303	324	342	359	374
Steam-Electric Power Demand		0	0	0	0	0	0	0
Irrigation Demand		259	246	235	224	213	204	196
Mining Demand		14	64	49	35	23	19	20
Livestock Demand		1,808	2,071	2,071	2,071	2,071	2,071	2,071
Brazos Basin Total Demand		4,410	5,444	5,544	5,690	5,956	6,154	6,345
Supply								
Groundwater		18,989	18,734	18,734	18,734	18,734	18,734	18,734
Local Surface&Ground		1,808	2,071	2,071	2,071	2,071	2,071	2,071
Surface Water/Streams	ROR rights	2	2	2	2	2	2	2
Total Supply		20,799	20,807	20,807	20,807	20,807	20,807	20,807
Surplus/Shortage		16,389	15,363	15,263	15,117	14,851	14,653	14,462
Colorado-Lavaca Coastal Basin (1)								
Calhoun (part)								
Point Comfort		137	171	160	155	160	169	176
Rural		80	247	259	270	294	319	353
Total Municipal Demand		217	418	419	425	454	488	529
Industrial Demand		6,343	16,538	20,391	22,590	25,036	27,669	30,494
Steam-Electric Power Demand		62	100	100	100	100	100	100
Irrigation Demand		0	0	0	0	0	0	0
Mining Demand		0	1	1	0	0	0	0
Livestock Demand		13	15	15	15	15	15	15
Total Demand		6,635	17,072	20,926	23,130	25,605	28,272	31,138
Supply								
Groundwater		294	294	294	294	294	294	294
Local Surface&Ground		13	15	15	15	15	15	15
Surface Water	Lake Texana	7,000	32,000	32,000	32,000	32,000	32,000	32,000
Total Supply		7,307	32,309	32,309	32,309	32,309	32,309	32,309
Surplus/Shortage		672	15,237	11,383	9,179	6,704	4,037	1,171
Lavaca Basin Summary (2)								
Total Municipal Demand		915	954	961	980	1,070	1,175	1,300
Industrial Demand		32	37	44	50	55	63	71
Steam-Electric Power Demand		0	0	0	0	0	0	0
Irrigation Demand		21	19	18	17	15	14	13
Mining Demand		3	9	7	3	1	0	0
Livestock Demand		431	555	555	555	555	555	555
Lavaca Basin /Subtotal Demand		1,402	1,574	1,585	1,605	1,696	1,807	1,939
Supply								

Groundwater		2,357	2,357	2,357	2,357	2,357	2,357	2,357
Local Surface&Ground		431	555	555	555	555	555	555
Surface Water/Streams	In-BasinRORrights	1	1	1	1	1	1	1
Surface Water/Streams	Ave.available	2,789	2,913	2,913	2,913	2,913	2,913	2,913
Surface Water/Streams	Ave.avali-dry	1,387	1,339	1,328	1,308	1,217	1,106	974
Surface Water/Streams	Min.Yr.Ave.	0	0	0	0	0	0	0
Surface Water/Streams	ROR rightsFrom Colo	0	0	0	0	0	0	0
Surface Water/Streams	Ave.available	923	968	974	993	1,083	1,188	1,313
Surface Water/Streams	Ave.avali-dry	40	51	57	63	68	76	84
Surface Water/Streams	Min.Yr.Ave.	0	0	0	0	0	0	0
Total Supply	ROR rights	21	19	18	17	15	14	13
Total Supply	Ave.available	3	9	7	3	1	0	0
Total Supply	Ave.avali-dry	431	559	558	556	555	555	555
Total Supply	Min.Yr.Ave.	1,438	1,620	1,631	1,651	1,742	1,853	1,985
Surplus/Shortage	ROR rights	44	64	62	60	59	59	59
Surplus/Shortage	Ave.available	2,357	2,357	2,357	2,357	2,357	2,357	2,357
Surplus/Shortage	Ave.avali-dry	897	1,021	1,021	1,021	1,021	1,021	1,021
Surplus/Shortage	Min.Yr.Ave.	37	47	47	47	47	47	47
San Antonio-Nueces Coastal Basin Summary								
Total Municipal Demand		7,259	32,246	32,235	32,224	32,213	32,204	32,196
Industrial Demand		7,321	32,373	32,358	32,344	32,332	32,328	32,329
Steam-Electric Power Demand		3,403	18,276	14,428	12,243	9,858	7,296	4,555
Irrigation Demand		4,450	5,495	5,601	5,753	6,024	6,230	6,429
Mining Demand		0	0	0	0	0	0	0
Livestock Demand		19,925	19,707	19,713	19,731	19,819	19,923	20,047
San Antonio-Nueces Basin /Subtotal Dem		42,358	108,097	104,335	102,295	100,246	97,981	95,556
Supply								
Groundwater		22,258	22,446	22,456	22,475	22,564	22,674	22,805
Local Surface&Ground		16,436	15,436	15,332	15,180	14,911	14,712	14,521
Surface Water/Streams	ROR rights	2,788	2,912	2,912	2,912	2,912	2,912	2,912
Surface Water/Streams	Ave.available	2,788	2,912	2,912	2,912	2,912	2,912	2,912
Surface Water/Streams	Ave.avali-dry	2,788	2,912	2,912	2,912	2,912	2,912	2,912
Surface Water/Streams	Min.Yr.Ave.	2,925	3,083	3,072	3,067	3,072	3,081	3,088
Total Supply	ROR rights	41,482	40,794	40,700	40,567	40,387	40,298	40,238
Total Supply	Ave.available	41,482	40,794	40,700	40,567	40,387	40,298	40,238
Total Supply	Ave.avali-dry	41,482	40,794	40,700	40,567	40,387	40,298	40,238
Total Supply	Min.Yr.Ave.	41,619	40,965	40,860	40,722	40,547	40,467	40,414
Surplus/Shortage	ROR rights	-876	-67,303	-63,635	-61,728	-59,859	-57,683	-55,318
Surplus/Shortage	Ave.available	-876	-67,303	-63,635	-61,728	-59,859	-57,683	-55,318
Surplus/Shortage	Ave.avali-dry	-876	-67,303	-63,635	-61,728	-59,859	-57,683	-55,318
Surplus/Shortage	Min.Yr.Ave.	-739	-67,132	-63,475	-61,573	-59,699	-57,514	-55,142

Source: Texas Water Development Board; 1996 Consensus Water Plan, Most Likely Case, below normal rainfall and advanced water conservation.

* Parts of counties located in the Brazos River Basin, Colorado-Lavaca Coastal Basin, Lavaca River Basin and San Antonio-Nueces Coastal Basin of West Central Trans-Texas Study Area.

(1) Parts of Matagorda and Wharton Counties of the Brazos-Colorado andColorado-Lavaca Coastal Basins, and the Lavaca Basin are tabulated with the Lower Colorado Basin.

(2) Parts of DeWitt, Victoria, and Calhoun Counties located in the Lavaca-Guadalupe Coastal Basin are tabulated with the Guadalupe River Basin.

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3.0 SUMMARY OF WATER SUPPLY OPTIONS

During the West Central Trans-Texas regional water planning study, 122 water supply options (or partial options) were identified, of which 106 were evaluated with respect to potential quantities of water that each option could yield,[1] unit cost of water, number of acres of land impacted, and other factors. Table 3-1 is a listing of all 122 water supply options evaluated. This table includes the option number, the name of each option, the quantity of water provided, the unit costs in 1996 dollars, and the number of acres of land impacted for each option. Additionally, each option is ordered relative to the other 106 options with respect to each of the three key parameters (i.e. unit cost, quantity of water, and acres impacted). A one page summary of each option is included in Appendix A. The one page summary includes a brief description, unit cost of water, potential quantity of water that might be produced, acres impacted, and additional pertinent information about the option. A page number is shown on Table 3-1 for each option which corresponds to the page number in the appendix.

The water supply alternatives have all been studied on a stand-alone basis and many of the alternatives, if implemented, could affect water availability of other alternatives located in the same basin. For this reason, the quantity of water provided by the projects listed in Table 3-1 within the same river basin, cannot be added together. An example of this would be a reuse alternative, such as L-11, Exchange Reclaimed Water for Edwards Irrigation Water. The implementation of L-11 would significantly reduce the yield of the other reuse alternatives (e.g., L-12, L-13, and L-14). Further, the yield of downstream projects, such as Goliad Reservoir, could be affected. Thus, yield available from implementation of multiple options will require more detailed analysis.

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[1] Options involving the potential use of surface water were initially evaluated using the "Trans-Texas Environmental Criteria" specified by the Texas Water Development Board. The environmental criteria, which was subsequently modified into a "consensus criteria" by the Texas Water Development Board, Texas Natural Resource Conservation Commission, and Texas Parks and Wildlife Department established guidelines as to levels of stream flow which must be allowed to pass a potential surface water diversion point before any consideration could be given to divert surface water for other purposes. In addition, surface water options were evaluated considering full use of all existing surface water rights; i.e., only unappropriated surface water was considered to be available for potential development, except in cases where a particular option being considered was the purchase and relocation of use of existing surface water rights.

Table 3-1
Water Supply Options--32-County West Central Trans-Texas Study Area
Comparison and Order
Trans-Texas Water Program

Appendix Page No.	Appendix Option No	Water Supply Options	Quantity of Water acft/yr	Quantity of Water Order[4]	Unit Cost of Water 1st Qt. 1996 Prices $/acft	Unit Cost of Water Order[5]	Acres Impacted Long-Term No.	Acres Impacted Long-Term Order[6]
		Conservation / Local Alternatives						
1	L-10	Demand Reduction (Water Conservation)	90,000	23	276	5	0	3
2	L-11	Exchange Reclaimed Water for Edwards Irrigation Water	38,000	58	475	24	127	15
3	L-12	Exchange Reclaimed Water for BMA Medina Lake Water (Included with Option S-13)		NA		NA		NA
4	L-13A	Recycling/Reuse Plans by SAWS	35,000	64	380	8	0	4
5	L-13B	Reclaimed Water to Edwards Aquifer	92,000	22	771	61	240	34
6	L-14	Transfer of Reclaimed Water to Corpus Christi via Choke Canyon(Mitigation for other Options)		NA		NA		NA
7	L-15	Purchase or Lease of Edwards Irrigation Water for Municipal and Industrial Use	68,900	37	152	3	0	2
8	L-16	Demineralization of Edwards "Bad Water"	0	NA		NA		NA
9	L-17	Natural Recharge-Type 1 Projects; Nueces/Guadalupe/San Antonio Basins (1947-56 Drought Average)7	35,600	63	466	22	4,660	80
10	L-18A	Natural Recharge-Type 2 Projects; Nueces/Guadalupe/San Antonio Basins (1947-56 Drought Average)7	33,870	65	458	20	4,186	79
11	L-23A	Edwards Recirculation-Sustainable Yield Pumpage, Lake Dunlap Diversion to Recharge Zone	87,000	27	350	6	414	53
12	L-23B	Edwards Recirculation-Sustainable Yield Pumpage, Gonzales&Lake Dunlap Diversion to Recharge Zone	118,000	17	774	62	1,004	61
13	L-24	Flood Retarding Structures Outlet Modifications for Recharge Enhancement	1,000	106	7	1	0	1
14	L-19	Springflow Augmentation		NA		NA		NA
		Nueces River Basin						
15	N-10	Nueces River Basin Water Rights	0					
		San Antonio River Basin						
16	S-10[1]	Unappropriated Streamflow near Elmendorf--1988 Return Flows; 1947-56 Drought Average	15,100	NA		NA		NA
17	S-11[1]	Unappropriated Streamflow near Falls City--1988 Return Flows; 1947-56 Drought Average	15,100	NA		NA		NA
18	S-12[1]	Unappropriated Streamflow near Goliad--1988 Return Flows; 1947-56 Drought Average	27,600	NA		NA		NA
19	S-13A	Medina Lake--Divert & inject to aquifer; 1947-56 Drought Average7	26,700	70	896	76	172	31
20	S-13B	Medina Lake--Divert to aquifer recharge zone; 1947-56 Drought Average7	26,700	71	614	40	172	30

Table 3-1 Continued Next Page

Appendix Page No.	Option No	Water Supply Options	Quantity of Water acft/yr	Quantity of Water Order[4]	Unit Cost of Water 1st Qt. 1996 Prices $/acft	Unit Cost of Water Order[5]	Acres Impacted Long-Term No.	Acres Impacted Order[6]
21	S-13C	Medina Lake--Divert to WTP; Firm Yield with 20,200 acft/yr recharge7	29,000	69	451	19	298	35
22	S-13D	Medina Lake--Buy rights and release to Applewhite; Firm yield with 22,600 acft recharge	37,500	59	619	42	2,717	72
23	S-14A	Applewhite Reservoir--Divert & inject to aquifer; 1947-56 Drought Average	22,500	73	1,184	92	2,889	75
24	S-14B	Applewhite Reservoir--Divert to aquifer recharge zone; 1947-56 Drought Average	22,500	74	1,305	98	2,898	76
25	S-14C	Applewhite Reservoir--Divert to WTP; Firm yield	7,700	93	1,518	100	2,717	73
26	S-14D	Applewhite Reservoir--Operated in conjunction with Medina Lake; Firm yield to WTP	14,900	84	1,518	101	2,717	74
27	S-15A	Cibolo Reservoir--Divert & inject to aquifer; Firm yield	32,300	66	1,246	95	16,872	94
28	S-15B	Cibolo Reservoir--Divert to aquifer recharge zone; Firm yield	32,300	67	1,281	97	16,881	95
29	S-15C	Cibolo Reservoir--Divert to WTP; Firm yield	32,300	68	1,145	91	16,700	90
30	S-15Da	Cibolo Reservoir with Imported Water from the San Antonio River; Firm yield to WTP	75,600	29	712	51	16,746	91
31	S-15Db	Cibolo Reservoir with Imported Water from the San Antonio & Guadalupe Rivers;Firm yield to WTP	79,600	28	822	68	16,804	93
32	S-15Dc	Cibolo Reservoir with Imported Water from the San Antonio/Guadalupe/Colorado Rivers; Firm YtoWTP	162,900	12	723	53	17,272	96
33	S-15Ea	Cibolo Reservoir with Imported Water from the Guadalupe River at the SaltWaterBarrier-FY	65,100	41	965	82	16,779	92
34	S-15Eb	Cibolo Reservoir with Imported Water from the Guadalupe River at the Salt Water Barrier, and the Colorado River below Garwood--Firm yield	132,000	15	786	66	17,366	97
35	S-16A	Goliad Reservoir--Divert & inject to aquifer; Firm yield	115,500	18	709	49	28,147	102
36	S-16B	Goliad Reservoir--Divert to aquifer recharge zone; Firm yield	115,500	19	748	57	28,147	103
37	S-16C	Goliad Reservoir--Divert to WTP; Firm yield	115,500	20	662	43	28,147	101
38	S-17	Upper Cibolo Creek Reservoir Cost Analyses--Firm yield	8,700	89	2,016	102	3,400	78
		Guadalupe River Basin						
39	G-10	Unapp.Streamflow near Gonzales--1947-56 Drought Avg.& 400,000acft/yr Aquifer pumpage7	33,200	NA		NA		NA
40	G-11	Unapp.Streamflow near Cuero--1947-56 Drought Avg.& 400,000acft/yr Aquifer pumpage7	34,900	NA		NA		NA
41	G-12	Unapp.Streamflow at Salt Water Barrier--1947-56 Drou.Avg.& 400,000acft/yr Aquifer pump7	33,800	NA		NA		NA
42	G-13A	San Marcos River Div--Unapp flow below Blanco Confluence; Inject to aquifer,1947-56 Drought Ave.7	6,600	94	3,689	105	325	41
43	G-13B	San Marcos River Div--Unapp flow below Blanco Confluence;To recharge zone1947-56 Drought Ave.7	6,600	95	2,452	103	455	55
44	G-14A	Guadalupe River Div--Unapp flow at Lake Dunlap; Inject to aquifer, 1947-56 Drought Avg.7	3,500	100	5,870	106	232	33
45	G-14B	Guadalupe River Div--Unapp flow at Lake Dunlap; To recharge zone, 1947-56 Drought Avg.7	3,500	101	3,483	104	362	48
46	G-15A	Canyon Lake Released to Lake Dunlap--Divert & inject to aquifer; Firm yield	10,000	85	775	64	232	32
47	G-15B	Canyon Lake Released to Lake Dunlap--Divert to aquifer recharge zone; Firm yield	10,000	86	543	32	362	47
48	G-15C	Canyon Lake Released to Lake Dunlap--Divert to aquifer recharge zone; Firm yield	15,000	76	473	23	362	46

Table 3-1 Continued Next Page

Appendix Page No.	Appendix Option No	Water Supply Options	Quantity of Water acft/yr	Quantity of Water Order[4]	Unit Cost of Water 1st Qt. 1996 Prices $/acft	Unit Cost of Water Order[5]	Acres Impacted Long-Term No.	Acres Impacted Order[6]
49	G-15D	Canyon Lake Released to Lake Dunlap--Divert to WTP; Firm yield	10,000	87	540	31	131	23
50	G-15E	Canyon Lake Released to Lake Dunlap--Divert to WTP; Firm yield	15,000	77	504	28	131	22
51	G-16A	Cuero Reservoir--Divert & inject to aquifer; Firm yield (Phase 1 Environmental Criteria)	168,000	10	697	47	41,672	105
52	G-16B	Cuero Reservoir--Divert to aquifer recharge zone; Firm yield(Phase 1 Environmental Criteria)	168,000	11	740	56	41,681	106
53	G-16C1	Cuero Reservoir--Divert to WTP; Firm yield (TWDB/TNRCC/TPWD Consensus Envir. Crireria)	145,448	14	775	63	41,500	104
54	G-17A	Sandies Reservoir--Divert & inject to aquifer; Firm yield(Phase 1 Environmental Criteria)	45,800	52	1,227	94	27,047	99
55	G-17B	Sandies Reservoir--Divert to aquifer recharge zone; Firm yield(Phase 1 Environmental Criteria)	45,800	53	1,266	96	27,056	100
56	G-17C1	Sandies Reservoir--Divert to WTP; Firm yield(TWDB/TNRCC/TPWD Consensus Envir.Cri.)	74,741	34	827	70	26,875	98
57	G-18A	McFaddin Reservoir--Buy Water Rights in Calhoun Co, Divert & inject to aquifer; Firm yield	37,000	60	929	77	1,745	69
58	G-18B	McFaddin Reservoir--Buy Water Rights in Calhoun Co, Divert to aquifer recharge zone; Firm yield	37,000	61	968	83	1,875	71
59	G-18C	McFaddin Reservoir--Buy Water Rights in Calhoun Co, Divert to WTP; Firm yield	37,000	62	847	73	1,644	66
60	G-19	Guadalupe River Dam 7--Raw water at reservoir; Firm yield (Consensus Rnvironmental Criteria)	30,927	NA	804	NA	12,830	NA
61	G-20	Gonzales Reservoir--Raw water at reservoir; Firm yield(Consensus Environmental Criteria)	75,093	NA	320	NA	21,370	NA
62	G-21	Lockhart Reservoir--Raw water at reservoir; Firm yield(Consensus Environmental Criteria)	6,339	NA	618	NA	2,910	NA
63	G-22	Dilworth Reservoir--Raw water at reservoir; Firm yield(Consensus Environmental Criteria)	18,195	NA	590	NA	15,400	NA
64	G-23A	Canyon Lake Area WS (Areas adjacent to Canyon Lake)--2020 Demands	3,470	102	1,008	86	46	10
65	G-23B	Canyon Lake Area WS (Smithson Valley, Bulverde,and Oak Village North Areas)-2020Dem	1,280	105	1,487	99	16	5
66	G-24	Wimberley and Woodcreek WS from Canyon Lake, with G-23A & 2020 Demands	1,424	104	963	80	40	9
67	G-25	Northeast Hays and Northwest Caldwell Counties WS from near Lake Dunlap--2020 Dem	1,920	103	1,220	93	52	11
68	G-26	Md-Cities (IH-35 and Highway 78) WS From Near Lake Dunlap--2020 Demands	25,166	72	483	27	36	7
69	G-27	Guadalupe River Diversion Near Lake Dunlap to North WTP, with Transfer of Downstream Rights	49,785	51	749	58	36	8
70	G-28	Guadalupe River Diversion Near GonzalesTo NWTP with Transfer of Downstream Rights (WoIEC)[3]	71,260	35	828	71	102	12
71	L-20	Transfer of SAWS Reclaimed Water to Coleto Creek Reservoir	8,400	90	138	2	23	6
72	G-30	Guadalupe River Diversion Near Comfort to Recharge Zone via Medina Lake--Drought Ave 8	9,900	88	720	52	300	36
73	G-32	Diversion of Canyon Lake Flood Storage to Recharge Zone via Cibolo Creek--LongTermAv	16,100	75	750	59	537	58
74	G-33	Guadalupe River Diversions Near Lake Dunlap to Recharge Zone with Enhanced						
		Springflow, Water Rights Transfer, and Unappropriated Streamflow--1947-56 Drought Ave. 9	70,300	36	394	11	414	54
75	G-34A[2]	Canyon Lake Water to Canyon Lake WSC/Bulverde/North Bexar Co--Uniform Delivery	5,000	96	605	39	130	17
76	G-34B[2]	Canyon Lake Water to Canyon Lake WSC/Bulverde/North Bexar Co--Summer Peak Del.	5,000	97	829	72	130	19
77	G-34C[2]	Canyon Lake Water to Canyon Lake WSC/Bulverde/North Bexar Co--Uniform Delivery	8,000	91	479	25	130	16
78	G-34D[2]	Canyon Lake Water to Canyon Lake WSC/Bulverde/North Bexar Co--Summer Peak Del.	8,000	92	683	45	130	18

Table 3-1 Continued Next Page

Appendix Page No.	Option No	Water Supply Options	Quantity of Water acft/yr	Order[4]	Unit Cost of Water 1st Qt. 1996 Prices $/acft	Order[5]	Acres Impacted Long-Term No.	Order[6]
	G-35[2]	Guadalupe River Diversions at New Braunfels to Mid-Cities and Bexar County with expanded New Braunfels Utilities WTP						
79	G-35A[2]	Uniform Delivery to Mid-Cities & SAWS	15,000	78	405	14	119	13
80	G-35B[2]	Summer Peaking Delivery to Mid-Cities & SAWS	15,000	79	617	41	119	14
	G-36[2]	Guadalupe River Diversions at Lake Dunlap to Mid-Cities/CRWA/Bexar County with expanded CRWA WTP						
81	G-36A[2]	Uniform Delivery to Mid-Cities, CRWA, & SAWS	5,000	98	399	12	131	20
82	G-36B[2]	Summer Peaking Delivery to Mid-Cities CRWA, & SAWS	5,000	99	599	38	131	25
83	G-36C[2]	Uniform Delivery to Mid-Cities, CRWA, & SAWS	15,000	80	405	15	131	21
84	G-36D[2]	Summer Peaking Delivery to Mid-Cities, CRWA, & SAWS	15,000	81	594	37	131	24
	G-37[2]	Guadalupe River Diversions at Lake Dunlap to Mid-Cities/CRWA/Bexar County with Regional WTP						
85	G-37A[2]	Uniform Delivery to Mid-Cities, CRWA, & SAWS	15,000	82	394	10	136	27
86	G-37B[2]	Summer Peaking Delivery to Mid-Cities CRWA, & SAWS	15,000	83	576	34	136	29
87	G-37C[2]	Uniform Delivery to Mid-Cities, CRWA, & SAWS	50,000	45	266	4	136	26
88	G-37D[2]	Summer Peaking Delivery to Mid-Cities, CRWA, & SAWS	50,000	46	400	13	136	28
	G-38[2]	Guadalupe River Diversions at Gonzales to Mid-Cities/CRWA/Bexar County with Regional WTP						
89	G-38A[2]	Uniform Delivery to Mid-Cities, CRWA, & SAWS	40,000	54	435	17	316	38
90	G-38B[2]	Summer Peaking Delivery to Mid-Cities CRWA, & SAWS	40,000	55	581	36	316	40
91	G-38C[2]	Uniform Delivery to Mid-Cities, CRWA, & SAWS	75,000	30	381	9	316	37
92	G-38D[2]	Summer Peaking Delivery to Mid-Cities, CRWA, & SAWS	75,000	31	518	30	316	39
	G-39[2]	Guadalupe River Diversions at Lake Dunlap and near Gonzales to Mid-Cities/CRWA/Bexar County with Regional WTP						
93	G-39A[2]	Uniform Delivery (5,000 acft/yr Diversion at Lake Dunlap/35,000 acft/yr Div. at Gonzales)	40,000	56	436	18	342	43
94	G-39B[2]	Summer Peaking Delivery (5,000 acft/yr Div. at Lake Dunlap/35,000 acft/yr Div. at Gonzales)	40,000	57	578	35	342	45
95	G-39C[2]	Uniform Delivery (15,000 acft/yr Diversion at Lake Dunlap/60,000 acft/yr Div. at Gonzales)	75,000	32	371	7	342	42
96	G-39D[2]	Summer Peaking Delivery(15,000 acft/yr Div. at Lake Dunlap/60,000 acft/yr Div. at Gonzales)	75,000	33	516	29	342	44
97	G-40	Cloptin Crossing Reservoir--Raw water at reservoir; Firm yield	33,163	NA	476	NA	6,060	NA

Table 3-1 Continued Next Page

Appendix Page No.	Appendix Option No	Water Supply Options	Quantity of Water acft/yr	Quantity of Water Order[4]	Unit Cost of Water 1st Qt. 1996 Prices $/acft	Unit Cost of Water Order[5]	Acres Impacted Long-Term No.	Acres Impacted Long-Term Order[6]
		Colorado River Basin						
	C-10	Colorado River at Lake Austin						
	C-13	Lake Travis Delivered to Lake Austin						
98	C-13A	Lake Travis--Buy stored water & irrig rights; Divert & inject to aquifer; Firm yield	68,000	38	710	50	484	56
99	C-13B	Lake Travis--Buy stored water & irrig rights; Divert to aquifer recharge zone; Firm yield	68,000	39	690	46	614	59
100	C-13C	Lake Travis--Buy stored water & irrig rights; Divert to WTP; Firm yield	68,000	40	667	44	383	49
101	C-13D	Lake Travis--Buy stored water; Divert & inject to aquifer; Firm yield	50,000	47	785	65	484	57
102	C-13E	Lake Travis--Buy stored water; Divert to aquifer recharge zone; Firm yield	50,000	48	759	60	614	60
103	C-13F	Lake Travis--Buy stored water; Divert to WTP; Firm yield	50,000	49	725	54	383	50
104	C-17A	Colorado River at Columbus--Buy stored water & irrig rights; Divert to WTP; Firm yield	125,000	16	736	55	403	51
105	C-17B	Colorado River at Columbus--Buy stored water; Divert to WTP; Firm yield	50,000	50	793	67	403	52
106	C-18	Shaws Bend Reservoir--Divert to WTP; Firm yield	100,000	21	827	69	13,803	89
		Brazos River Basin						
107	B-10A	Allens Creek Reservoir--Divert & inject to aquifer; Firm yield	57,800	42	1,093	90	8,482	83
108	B-10B	Allens Creek Reservoir--Divert to aquifer recharge zone; Firm yield	57,800	43	1,061	89	8,612	84
109	B-10C	Allens Creek Reservoir--Divert to WTP; Firm yield	57,800	44	1,029	87	8,381	82
110	B-10D	Allens Creek Reservoir--Divert to WTP; Firm yield	152,800	13	709	48	8,381	81
		Sabine River Basin						
111	SB-10A	Toledo Bend Reservoir--Divert & inject to aquifer; Firm yield	300,000	6	990	85	1,651	67
112	SB-10B	Toledo Bend Reservoir--Divert to aquifer recharge zone; Firm yield	300,000	7	1,051	88	1,781	70
113	SB-10C	Toledo Bend Reservoir--Divert to WTP; Firm yield	300,000	8	957	79	1,550	64
114	SB-10D	Toledo Bend Reservoir--Divert to WTP; Firm yield	600,000	1	872	74	1,550	63
		Brazos and Sabine River Basins						
115	SBB10A	Allens Creek and Toledo Bend Reservoirs--Divert & inject to aquifer; Firm yield	357,800	3	990	84	9,374	87
116	SBB10B	Allens Creek and Toledo Bend Reservoirs--Divert to aquifer recharge zone; Firm yield	357,800	4	963	81	9,504	88
117	SBB10C	Allens Creek and Toledo Bend Reservoirs--Divert to WTP; Firm yield	357,800	5	957	78	9,273	86
118	SBB10D	Allens Creek and Toledo Bend Reservoirs--Divert to WTP; Firm yield	452,800	2	872	75	9,273	85

Table 3-1 Continued Next Page

Appendix Page No.	Option No	Water Supply Options	Quantity of Water acft/yr	Order[4]	Unit Cost of Water 1st Qt. 1996 Prices $/acft	Order[5]	Acres Impacted Long-Term No.	Order[6]
		Carrizo Aquifer						
119	CZ-10A	Carrizo Aquifer--Withdraw & inject to Edwards Aquifer; Firm yield	90,000	24	545	33	1,567	65
120	CZ-10B	Carrizo Aquifer--Withdraw & divert to Edwards Aquifer recharge zone; Firm yield	90,000	25	466	21	1,697	68
121	CZ-10C	Carrizo Aquifer--Withdraw & divert to WTP; Firm yield	90,000	26	419	16	1,466	62
122	CZ-10D	Carrizo Aquifer--Withdraw & divert to WTP; Firm yield	220,000	9	480	26	3,075	77

* Includes treatment costs.

[1] Applewhite excluded.

[2] Mid Cities include Marion, Cibolo, Schertz, and Garden Ridge; CRWA entities include Green Valley SUD, Springs Hill WSC, and Crystal Clear WSC; and SAWs Stahl secondary pump station facility.

[3] Without application of Trans-Texas In-Stream Environmental Criteria.

[4] Ordered from largest quantity to smallest quantity of the 106 options listed which have data for quantity of water, cost of water, and acreage affected.

[5] Ordered from lowest cost per acre-foot to highest cost per acre-foot of the 106 options listed which have data for quantity of water, cost of water, and acreage affected.

[6] Ordered from lowest quantity of acreage affected to highest quantity of acreage affected for the 106 which have data for quantity of water, cost of water, and acreage affected.

[7] For estimates of quantities and unit costs for 1934-89 average conditions, see text of option in Appendix. For Appendix page number see extreme left column of this table.

[8] Yields and costs for 72" pipeline are shown on Appendix A Page A-72. For a 96" pipeline, drought average is 12,150 acft/yr at $792 per acft, with long-term average of 50,050 acft/yr at $245 per acft; for a 120" pipeline, drought average is 12,370 acft/yr at $1,107 per acft, with long-term average of 58,500 acft/yr at $279 per acft.
Note: Aquifer modeling is needed to evaluate benefits of different recharge rates upon water supply.

[9] Yields and costs for 72" pipeline are shown on Appendix A Page A-74. For a 96" pipeline, drought average is 74,600 acft/yr at $437 per acft, with long-term average of 152,800 acft/yr at $263 per acft; for a 120" pipeline, drought average is 81,800 acft/yr at $544 per acft, with long-term average of 208,900 acft/yr at $270 per acft.
Note: Aquifer modeling is needed to evaluate benefits of different recharge rates upon water supply.
NA means not applicable.

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3.1 Classification of Alternatives

Alternatives have been classified into five basic groups, each of which considers alternative methods of supplying water to the study area. These groupings include:

Conservation and Leases: Includes options that reduce demand by conservation within municipal, commercial and/or agricultural uses as well as options which consider transfer of Edwards water through purchase or lease arrangements.

Reuse: Includes options which consider ways to reuse reclaimed water from study area's wastewater treatment facilities.

Natural Recharge: For purposes of this study, natural recharge is considered to be recharge to the aquifer with water originating from the Edwards Plateau catchment, recharge zone, or from springs originating from the Edwards Aquifer. Natural recharge to the aquifer can be accomplished through either injection wells or through the delivery of water to a stream or reservoir located in the recharge zone.

Imported Recharge: Imported recharge is recharge to the aquifer with all or a portion of the water originating from sources other than those listed under Natural Recharge, regardless of the delivery system into the aquifer.

Treatment and Distribution: This group considers alternatives which include conventional water treatment (or just disinfection in the case of Carrizo water) and delivery to a municipal water distribution system. (Note: Distribution costs are, for many options, based on costs as estimated in previous studies for delivery to the SAWS system. This is a simplifying assumption for this study and does not preclude other entities receiving treated water from a regional water treatment plant, from an interconnection with the SAWS system, or through trades of Edwards Aquifer water.).

3.2 Water Delivery Locations

The water supply from many of the alternatives could be delivered into the study area in one or more of the following three ways: (1) to the recharge zone by discharge into a stream or a recharge structure; (2) to an injection well placed into the Edwards formation; or, (3) to a water treatment plant.

For delivery to the recharge zone, the Edwards formation outcrop in northwestern Bexar County between Salado Creek and Medina Lake was identified as the primary delivery area as shown on Figure 3-1. A secondary recharge area located in Medina County west of Medina Lake was included as a potential delivery location for a few selected options. For recharge into the aquifer through injection wells, a possible recharge area along the BMA canal in Medina County, as identified in a previous study, was used to deliver water to the aquifer.[2]

For the treatment and distribution alternatives, two delivery areas were identified. For alternative sources located north or northeast of San Antonio, water would be delivered to a treatment facility to be located northeast of San Antonio; and, for sources east or southeast, delivery would be to the previously proposed water treatment plant site located in the vicinity of Highway 16 and FM 1604 (refer to Figure 3-1). Each alternative considered in this study is described in a figure in the various report volumes which show potential water sources and the various delivery options considered.

3.3 Ordering of Alternatives

Of the total 122 alternatives evaluated, 106 had complete information with respect to unit cost of water; quantity of water provided, and number of acres of land impacted over the long-term. These 106 alternatives were compared by preparing ordered bar graphs of the options. The following four bar graphs were prepared:

- Water Supply Alternatives (106) Ordered by Unit Cost (Figure 3-2);
- Water Supply Alternatives (106) Ordered by Quantity of Water (Figure 3-3);
- Water Supply Alternatives including: Conservation and Lease, Reuse, Natural Recharge, and Imported Recharge Ordered by Unit Cost (Figure 3-4); and
- Water Supply Alternatives including: Treatment and Distribution Ordered by Unit Cost of Water (Figure 3-5).

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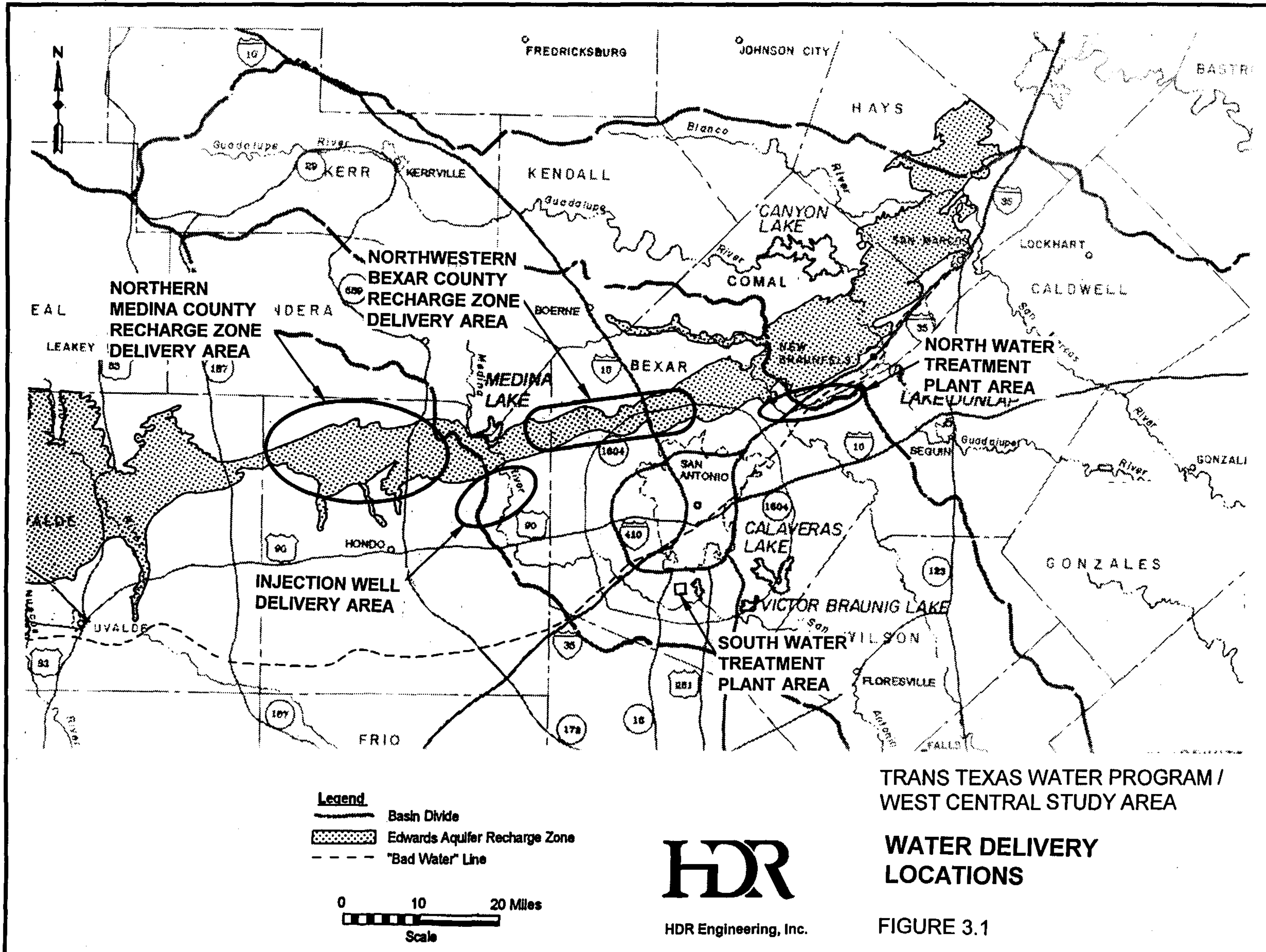
[2] W.E. Simpson Co. and William F. Guyton Assoc. Inc., "Medina Lake Study, Recharge Evaluation," Edwards Underground Water District, no date.



TRANS TEXAS WATER PROGRAM / WEST CENTRAL STUDY AREA

WATER DELIVERY LOCATIONS

FIGURE 3.1

3.4 Comparison of Unit Costs

A comparison of the unit cost for alternatives which cost less than $1,600 per acft shows that the composite average unit cost for the 101 alternatives that met this criteria was $724 per acft (Table 3-2 and Figures 3-6 and 3-7). Average unit costs for each of the five categories were also computed and compared to the composite average and are shown in Table 3-2 and Figures 3-6 and 3-7. Comparison of the average unit cost of each group of alternatives with the composite average shows the following: Conservation and Lease option unit costs averaged only 30 percent of the composite; Reuse options averaged 61 percent of the composite; Natural Recharge options averaged 75 percent of the composite; Imported Recharge options averaged 128 percent of the composite; and Treatment and Distribution options averaged 98 percent of the composite (Table 3-2 and Figures 3-6 and 3-7).

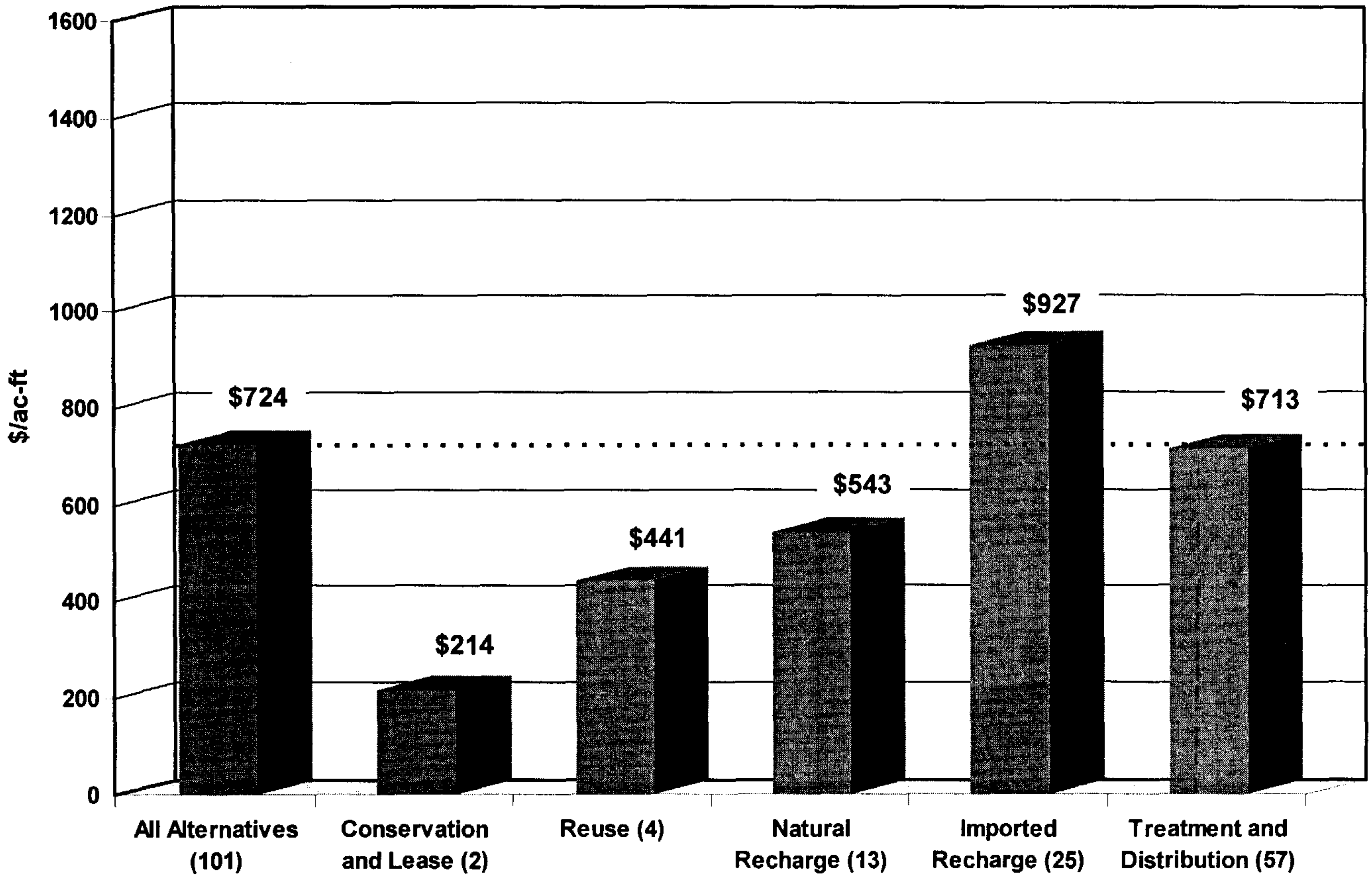
Table 3-2
Comparison of Average Unit Costs for Water Supply Options

Alternative Classification*	Number of Alternatives	Average Unit Cost $/acft	Percent of Composite Average
All Alternatives* (Composite)	101	724	N/A
Conservation and Lease	2	214	30%
Reuse	4	441	61%
Natural Recharge	13	543	75%
Imported Recharge	25	927	128%
Treatment and Distribution	57	713	98%

*Only includes options costing less than $1600 per acft.

3.5 Summary of Water Quantity Provided by All Options

A Summary of the quantity of water provided by the 101 alternatives costing less than $1,600 per acft is shown in the Table 3-3. This summary shows that about 32 percent of the options provide less than 30,000 acft per year; 27 percent provide between 30,000 and 60,000 acft/yr; and 19 percent provide between 60,000 and 90,000 acft per year; with the remaining 22 percent providing more than 90,000 acft per year.



NOTE: INCLUDES ALL OPTIONS WITH A UNIT COST LESS THAN $1,600 PER ACRE-FOOT.

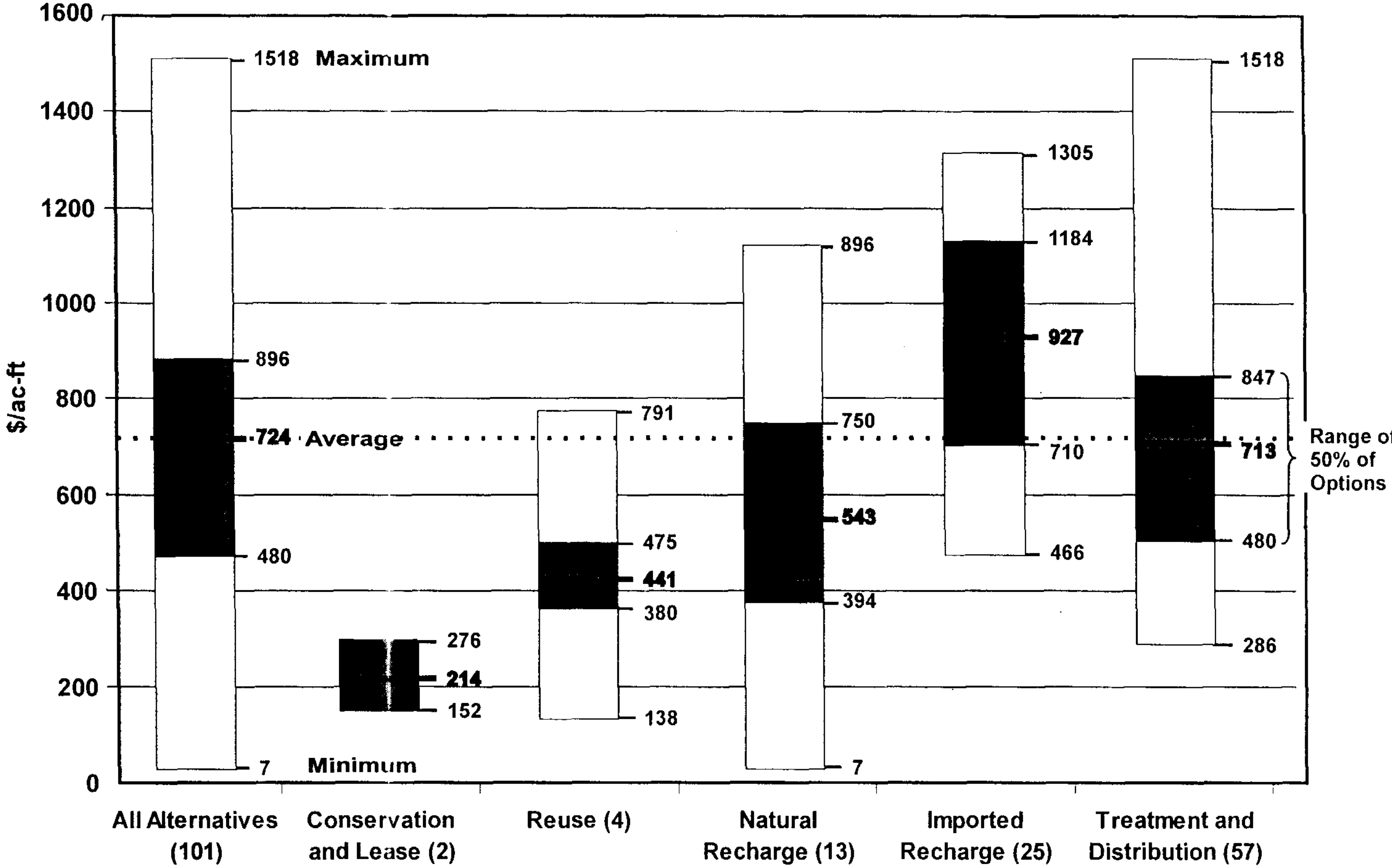
TRANS TEXAS WATER PROGRAM / WEST CENTRAL STUDY AREA

COMPARISON OF AVERAGE UNIT COSTS OF WATER SUPPLY OPTIONS

HDR

HDR Engineering, Inc.

FIGURE 3-6



NOTE: INCLUDES ALL OPTIONS WITH A UNIT COST LESS THAN $1,600 PER ACRE-FOOT.

HDR Engineering, Inc.

TRANS TEXAS WATER PROGRAM / WEST CENTRAL STUDY AREA

COMPARISON OF RANGE OF UNIT COSTS OF WATER SUPPLY OPTIONS

FIGURE 3-7

Table 3-3 Summary of Quantity of Water Provided by Alternatives		
Range of Quantity of Water*	**Number of Options**	**% of Total**
0 to 30,000	33	32%
30,001 to 60,000	27	27%
60,001 to 90,000	19	19%
90,001 to 120,000	6	6%
120,001 to 150,000	3	3%
150,001 to 180,000	4	4%
180,001 to 600,000	9	9%
Total	101*	100%
* Only includes options costing less than $1,600 per acft.		

3.6 Pro Rata Sharing of Delivered Water

Most of the water supply options evaluated include bringing supplemental water to the West Central study area to either recharge the Edwards Aquifer, or for use directly by area water purveyors. In the case of Edwards Aquifer recharge, the aquifer would be the method of distributing the supplemental water to area water users. In the case of treatment and distribution, it is anticipated that each water purveyor and industry of the area would be offered a pro rata share of the quantity available, based on their individual pro rata share of total water use from the aquifer within the area. However, those who do not receive supplemental water directly would receive an equivalent quantity of additional Edwards Aquifer pumping rights from entities who take direct delivery of any supplemental water. This procedure is based on the assumption that the Edwards Aquifer Authority will issue transferable pumping rights, such that surface water can be delivered to the water users of the area in the most economical way; i.e.; pumping rights for equivalent quantities of Edwards water can be transferred from those who actually receive supplemental water to those who pay their pro rata share of the cost of the supplemental water, with the latter being able to obtain the equivalent quantities of Edwards water. This procedure alleviates the necessity to deliver treated water to each of the dozens of water purveyors of the area.

4.0 FURTHER EVALUATION OF WATER SUPPLY ALTERNATIVES

During the course of this study, it has become apparent that several of the alternatives evaluated on a stand-alone basis should next be evaluated in combination with one another. Combining alternatives can, in some instances, result in significant cost savings, reduce environmental impacts, and provide incrementally greater water supply benefits. Some alternatives, however, are mutually exclusive as they compete for the same water. Following are recommendations for further evaluation of water supply alternatives:

- Improve the current version of the TWDB GWSIM4 Edwards Aquifer model to more accurately evaluate recharge enhancement projects and springflow recirculation projects on the bases of "sustained yield" and unit cost.
- Using GWSIM4 Edwards Model, evaluate recharge projects in combination with springflow recirculation projects to determine optimum combination of projects to enhance the "sustained yield" of the aquifer.
- Perform multi-watershed system analyses to determine the optimum use of existing and proposed reservoirs in the Guadalupe - San Antonio River Basin in combination with run-of-the-river diversions to maximize firm yield and minimize cost and environmental impact.
- Using the new Carrizo-Wilcox Aquifer model sponsored by the TWDB, consider the feasibility of multi-year and/or seasonal aquifer storage and recovery systems utilizing the San Antonio and/or Guadalupe Rivers as potential sources.
- In cooperation with regional planning authorities, synthesize and evaluate more comprehensive long-term water supply plans potentially involving several sources of supply and methods of distribution to consumers.

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5.0 SUMMARY OF PUBLIC PARTICIPATION AND STAKEHOLDER INVOLVEMENT

On October 17, 1995, the Policy Management Committee (PMC) engaged Robert Aguirre Consultants, L.C. to conduct a public participation/stakeholder involvement process for the West Central Trans-Texas Region. Major components of the process included: (1) surveys of the West Central Region's Advisory Committee for Public and Technical Input, (2) a 2-day public participation workshop for members of the PMC and senior staff of the participating entities, and (3) issues identification. Two important results of this process were: (1) the adoption of Principals of Participation, and (2) the development of components thought to be critical to a successful public participation program. The Principals of Participation are quoted below:

Principals of Participation

> "This declaration formally expresses our commitment to a comprehensive public participation/stakeholder involvement process. By adopting and implementing the principals embodied in this declaration, the public's input will play a critical role in evaluating the water planning strategies to be considered for this region.
>
> "While each participating agency is responsible to its respective constituents, our collective regional responsibility is "to identify the most cost-effective and environmentally sensitive strategies for meeting the current and future water needs of the West Central Region." In addition, we must ensure that the public and stakeholders significantly participate in deciding which strategies will be implemented.
>
> "By unanimous adoption of this statement, the West Central Policy Management Committee of the Trans-Texas Water Program commits itself to the following principles of public and stakeholder participation:
>
> - The public/stakeholder's participation must be broadly based and inclusive of all constituencies.
> - It is the responsibility of the Trans-Texas Water Program and its sponsors to be proactive in its commitment to seek public/ stakeholder participation and input.

- Public/stakeholder communication must be timely, truthful, consistent, and two-way.
- The Policy Management Committee, as the responsible decision-making body, must be accountable for the integrity of the public/stakeholder participation process and the manner in which the public's input shapes the final outcomes of the project.

"In this effort we recognize that the overall quality and depth of public/stakeholder participation can only be as good as our ability to effectively communicate the complex issues associated with water planning strategies.

"These Principals of Participation recognize that no present or long-term water strategy can be implemented without the general support and consent of the public and stakeholders."

The components of a successful public participation program were determined to be:

- "Credibility (of the sponsoring agencies *and of the public process*)
- "Commitment to the public process (by the sponsor agencies)
- "Communication (with and between the public and stakeholders)
- "Equal treatment (of public and stakeholders)."

A strategy for the formulation of a public process was developed based upon the premise that it was necessary to obtain input from the public and stakeholders involved. This involved gathering data from all sectors of the impacted public regarding their respective thoughts and opinions as to how a public process should be designed. This effort included a survey of the members of the Advisory Committee for Public and Technical Input and the following activities:

- PMC member interviews
- A random public issues survey of the study region[1]
- An analysis of under-represented groups
- Focus groups
- Public workshops
- Development of a mailing list/database
- Development of public process models
- Identification of the public's top criterion on water issues (decision analysis criteria).

[1] "Trans-Texas Water Issues Survey," Robert Aguirre Consultants, L.C., September, 1996.

A Public Issues Survey: A survey of 500 randomly selected households of the study area indicated that:

- The needs, experiences, and views of citizens about water issues within the West Central Study Area vary greatly;
- Conservation was by far and away the most well known and supported management strategy for ensuring future water supplies;
- Except for conservation, many citizens are not familiar with various water supply options, much less knowledgeable about them;
- Study area residents are concerned about water issues and want more information;
- Respondents named the study sponsors, more than they named any other groups or individuals, as the entities they would trust for guidance and for making decisions about their water futures.

Focus Groups — Round #1: A first round of focus groups was conducted in 32 counties from June 11 to August 15, 1996. These groups were designed to test and expound upon the data collected in the public issues surveys.

Workshop: The process was begun with a 2-day public participation workshop for the Policy Management Committee and their senior staff members (November 1995). The purpose of these meetings was to ensure a common understanding of the desired outcomes of the Trans-Texas Water Program planning effort for this region, and to focus on the public participation component specifically.

Committee Survey: The first data gathering step undertaken was to survey the members of the Advisory Committee for Technical and Public Input in December 1995. The purpose of the survey was to acquire a basic understanding of the issues facing the Trans-Texas Water Program effort from each committee member's perspective.

PMC Member Interviews: Each PMC member was privately interviewed in order to gain a better understanding of their respective issues, to identify historically active citizens/groups in their area, to assist in identifying under represented groups, and to identify organized areas of support and adversity. The data gathering identified six "mind sets," as follows:

- Agricultural,
- Urban flighters,
- Metropolitan areas,
- Highland Lakes and Springs,
- Downstream interests, and
- Bays and estuaries.

In addition, the public's decision analysis criteria, as applied to water resources planning, was identified as follows:

- Water quantity,
- Water quality, and
- Water cost.

The 10 core issues identified from the public surveys were:

- Trust in decision makers,
- Equity/economic impact,
- Conservation,
- Local elected officials (importance of),
- Environmental implications,
- Political will (of the decision makers *and* the public),
- Property rights,
- Communication/information,
- Complexity of water issues, and
- Population growth.

A public participation plan, designed as an integrated resource planning process (IRP), was developed. The IRP method is as follows:

- Investigates,
- Educates,
- Involves,
- Evaluates (input),
- Incorporates (input), and
- Decides.

The IRP balances trade-offs of water resource options such as water conservation, water supply development, and water supply facilities, and incorporates public input and environmental impacts into the decision-making process. The IRP is capable of considering a set of options rather than single projects. The IRP includes:

- A strong focus on water conservation as a resource,
- Careful consideration and public discussion of planning uncertainties and risks,
- Explicit treatment of conflicting objectives and resulting trade-offs,
- The treatment of the public/stakeholders as participants rather than disputants.

It was found that in the West Central Region, there must be a strong commitment to conservation, communication, and confidence. From the information gathered in the public participation effort, the key findings used in the design of the public participation/stakeholder involvement plan were as follows:

- "Residents chose having a reliable supply as the highest priority, followed closely by water quality and more distantly by keeping the cost of water low.
- "One-third of the region's residents *are not* concerned about future water shortages.
- "Conservation is most often mentioned as the single most important thing to do to ensure water for the future, and is the most well known and supported water management strategy.
- "Except for conservation, citizens are generally not familiar with other water supply options.
- "One-third of the residents do not feel they are informed on water issues.
- "Residents want to be kept informed on water issues.
- "When seeking reliable information on water issues, three-fourths of the residents turn to either their local water/utility department, city or county government, water districts or authority.
- "Residents most frequently state they trust elected local/state officials and local water officials to make decisions about meeting future water needs, however, one-third either trust nobody or do not know who to trust.
- "Three-quarters of residents in the study region strongly agree that elected and water utility officials should involve the public in water planning issues."

The public participation/stakeholder plan was centered around the issues listed above.

Since 1993, over 120 regional water supply and water management options were identified and evaluated as to quantity of water each could produce, cost of water, and potential environmental effects of each option. The options include a wide range of strategies including conservation and leasing, reuse, recharge enhancement, conjunctive management of surface and groundwater, coordinated operation of existing reservoirs with run-of-river rights, and sharing of water among river basins.

The next step of the Trans-Texas process was to have evaluated the alternatives for their public acceptability and recommend the alternatives that were both publicly acceptable and technically feasible. However, in its regular session in 1997, the Texas Legislature passed Senate Bill 1 (SB1) which redirected Texas water planning into a regional process with regions of the state to be identified by the Texas Water Development Board, with the requirement that each designated region develop its own plan. Thus, during the summer of 1997, the decision was made that the criteria for evaluating the alternatives would be developed, but not applied, since the SB1 process was to be started in February 1998. In order to accomplish this objective, the

PMC appointed an Integrated Resource Planning Committee (IRPC) in September 1997. The committee's membership was representative of the geographic and demographic breadth of the region and included representatives of municipalities, counties, industries, agricultural interests, environmental interests, small businesses, water districts, water utilities, and the general public. Their mission was to develop an informed public criteria by which regional water resource alternatives should be evaluated.

The PMC specified that the IRPC should use a modified Integrated Resource Planning process in order to accomplish their mission The committee's objectives were to:

- Develop a regional understanding of water resource issues, history, and options;
- Examine interdependent relationships among water resources and facilities;
- Review and validate regional growth and water demand assumptions and projections;
- Consider the need for, and role of, conservation in reducing future water demand;
- Ensure that community values and concerns are reflected in an expressed regional planning criteria; and
- Develop the public's regional criteria by which future water resource options should be considered.

The process the IRPC members followed in the development of their criteria consisted of the following seven steps:

- Agree to a common definition of their mission and the ground rules by which they will abide.
- Develop a regional understanding of water resource issues, history, options, and recent legislative impacts.
- Discuss present and potential interdependent relationships among water resources and facilities in the region.
- Develop a common definition of the problem(s) that need addressing.
- Develop an understanding of conservation's role in reducing water demand.
- Develop an understanding of when and where shortfalls in water supply may occur.
- Begin a process of identifying the criteria by which water resource options should be evaluated.

Between October 4, 1997 and January 10, 1998, the IRPC held five meetings in which a facilitator experienced in the development of an Integrated Resource Plan, assisted the committee through its process of developing water planning criteria. The criteria listed below were the result of the deliberations of the Integrated Resource Planning Committee over the 6-month period of its existence. These criteria will be submitted to the Texas Water Development Board as part of the record of work accomplished by the Trans-Texas Water

Program for the West Central study area. These criteria are intended for use by water planners as they evaluate the various alternatives to meet the water needs of the region.[2] The criteria the IRPC recommended to be considered in the development of the Integrated Resource Plan are quoted below:

> **"Economic**
> - Facilitates economic development
> - Minimizes long range negative socio-economic impacts (including loss of tax base)
> - Promotes opportunities for cost sharing and economic partnership
> - Provides cost effective solutions
>
> **"Water Quality**
> - Provides and maintains appropriate water quality for the intended use
>
> **"Fairness**
> - Maximizes efficient use of water in areas that import water
> - Promotes equitable distribution of costs in meeting region's water needs
>
> **"Feasibility**
> - Demonstrates feasibility in terms of timing, technical/scientific, economic, political, regulatory, legal, and public acceptance factors
>
> **"Efficiency**
> - Minimizes evaporative and distribution losses
> - Promotes conservation
> - Promotes conjunctive use
>
> **"Flexibility**
> - Adaptable to new and innovative technology
> - Adaptable to changes in demand projections
> - Adaptable to changes in law
> - Adaptable to future supply options
>
> **"Compatibility**
> - Maximizes regional compatibility with local water plans
> - Minimizes negative impacts on property rights

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[2] "Trans-Texas Water Program, West Central Study Region Integrated Resource Planning Committee Final Criteria Report," Robert Aguirre Consultant, L.C. March 1998.

- Maximizes consistency with local growth management plans
- Maximizes compatibility with plans from surrounding regions

"Reliability

- Maximizes a sustainable (referring to yield) supply of water for short-term and long-term needs
- Minimizes interruptions to water supplies

"Environment

- Minimizes short-term and long-term negative impacts on natural resources
  - ◊ Wildlife/habitat
  - ◊ Rivers
  - ◊ Bays
  - ◊ Estuaries
  - ◊ Lakes
  - ◊ Aquifers
  - ◊ Karsts
  - ◊ Air quality
  - ◊ Water quality
  - ◊ Wet lands
  - ◊ Lakes
- Minimizes short-term and long-term negative impact to the human environment
  - ◊ Recreational
  - ◊ Cultural/historical
  - ◊ Archeological
  - ◊ Aesthetics

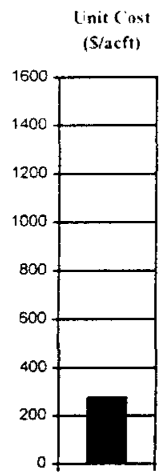
"Recommendations

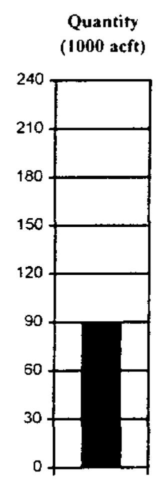
"The IRPC agreed on the following recommendations with the intention of providing more guidance to water planners to assure better regional water planning. The IRPC wanted to emphasize the need for water planners to take into account the indirect impact of their actions and decisions as well as their direct impact. The recommendations were:

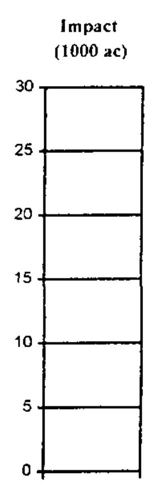
- Public participation and education should continue to be an integral part of a regional water planning process.
- When evaluating alternatives, ensure that indirect impacts such as growth inducing or inhibiting effects are considered."

Appendix A

West Central Trans-Texas
Water Supply Options
Options Data Sheets







OPTION NUMBER: L-10
OPTION NAME: Demand Reduction

OPTION DESCRIPTION: *Municipal and irrigation water conservation programs and practices to reduce per capita water use in cities and to reduce the quantity of water used per acre irrigated.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$276	per acft[1]
QUANTITY OF WATER:	90,000	acft/yr[2]
LAND IMPACTED:	0	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	5	of	106	(1=lowest unit)
QUANTITY OF WATER:	23	of	106	(1=highest volume)
LAND IMPACTED:	3	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Municipal demand reductions are a result of (1) public information and education; (2) conservation incentives; (3) conservation pricing; (4) leak detection and repair; (5) conservation landscaping; and (6) retrofit of plumbing fixtures. Costs will depend on which of these are implemented. Irrigation demand reductions, which are estimated to save an additional 11,200 acft/yr at a unit cost of $38 per acft, are a result of low energy precision application systems and furrow diking for irrigated acreage.

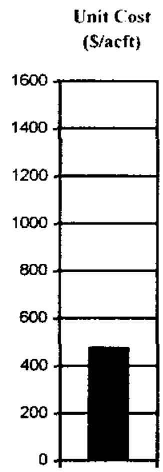
[2]**QUANTITY OF WATER:** Degree and rate of implementation of items (1) through (6) ; number of acres irrigated and equipped with low energy precision irrigation equipment.

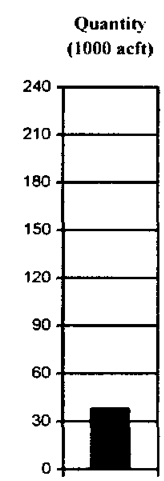
[3]**LAND IMPACTED:** Does not require any land.

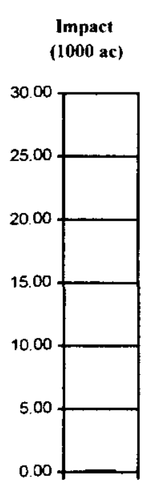
ENVIRONMENTAL ISSUES: Through reductions in water demand, avoids water supply development which may affect terrestrial and aquatic habitat. Some reduction in return flows to receiving streams.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Willingness of home and commercial decision-makers to implement conservation measures. In the case of irrigated agriculture, profitability of irrigation farming to support investments in irrigation equipment.

ADDITIONAL FACTORS: Willingness and ability of irrigation farmers to adopt and use low energy precision irrigation equipment.







OPTION NUMBER: L-11
OPTION NAME: Exchange Reclaimed Water for Edwards Irrigation Water

OPTION DESCRIPTION: *Use reclaimed municipal wastewater instead of pumping Edwards Aquifer water for irrigation in Medina and Bexar Counties near Castroville, thereby leaving the equivalent quantity of Edwards Aquifer water for other uses.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$475	per acft[1]
QUANTITY OF WATER:	38,000	acft/yr[2]
LAND IMPACTED:	127	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	24	of	106	(1=lowest unit)
QUANTITY OF WATER:	58	of	106	(1=highest volume)
LAND IMPACTED:	15	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Costs are based on using the top 3 feet of storage in both Brannig and Calavaras Lakes. If additional storage is needed or if payments for the reclaimed water are required, costs will increase.

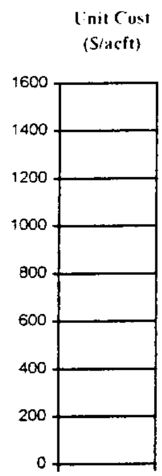
[2]**QUANTITY OF WATER:** Supply of reclaimed water available, location and quantity of acres to be irrigated, and types of crops to which reclaimed water can be applied (non-food crops).

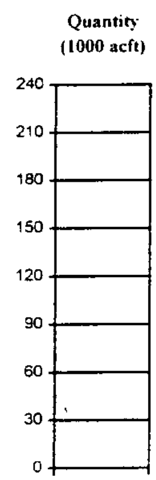
[3]**LAND IMPACTED:** Space for pipelines and pump station rights-of-way.

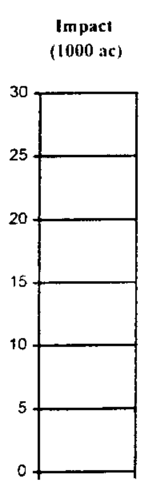
ENVIRONMENTAL ISSUES: Sites for storage of reclaimed water and reduction in volume of return flows.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Quantity of reclaimed water available considering degree of success of Demand Reduction (Option L-10) and acceptance of reclaimed water by irrigators.

ADDITIONAL FACTORS: Perceptions by the public as to whether or not the use of reclaimed water for irrigation will affect water quality in acquifers which underlie the land to be irrigated, and acceptance in the market of farm products that have been produced with reclaimed water.







OPTION NUMBER: L-12
OPTION NAME: Exchange Reclaimed Water for BMA Medina Lake Water

OPTION DESCRIPTION: *Use reclaimed municipal wastewater for irrigation and obtain an equivalent quantity of Medina Lake water for other uses, such as aquifer recharge and/or direct municipal use.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED			
UNIT COST OF WATER:	N/A	per acft[1]	(See Option S-13)
QUANTITY OF WATER:	N/A	acft/yr[2]	(See Option S-13)
LAND IMPACTED:	N/A	acres[3]	(See Option S-13)

POSITION RELATIVE TO ALL OPTIONS			
UNIT COST OF WATER:	N/A	of	(1=lowest unit)
QUANTITY OF WATER:	N/A	of	(1=highest volume)
LAND IMPACTED:	N/A	of	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Not Applicable (see Option S-13).

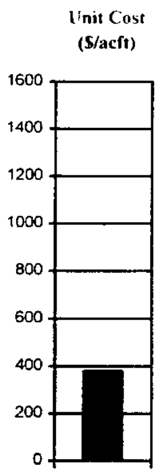
[2]**QUANTITY OF WATER:** Not Applicable (see Option S-13).

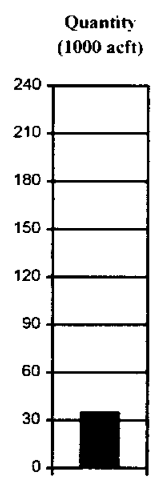
[3]**LAND IMPACTED:** Not Applicable (see Option S-13).

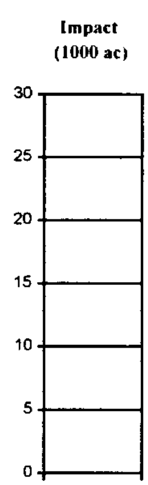
ENVIRONMENTAL ISSUES: Not Applicable (see Option S-13).

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Quantity of reclaimed water and Medina Lake water available, and acceptance of reclaimed water by irrigators. All farmers using water from BMA canals would have to switch to production of non-food crops.

ADDITIONAL FACTORS: Perceptions by the BMA irrigators and the public as to whether or not the use of reclaimed water in the BMA distribution system and on farms in the BMA service area will adversely affect water quality of underlying aquifers and/or neighboring crop production areas.







OPTION NUMBER: L-13A
OPTION NAME: Recycling/Reuse Plans by SAWS

OPTION DESCRIPTION: *Reuse of reclaimed wastewater for non-potable purposes, as a substitute for other sources.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$380	per acft[1]
QUANTITY OF WATER:	35,000	acft/yr[2]
LAND IMPACTED:	0	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	8	of	106	(1=lowest unit)
QUANTITY OF WATER:	64	of	106	(1=highest volume)
LAND IMPACTED:	4	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Transmission and pumping from wastewater treatment plants to golf courses, parks, and businesses that can use non-potable water.

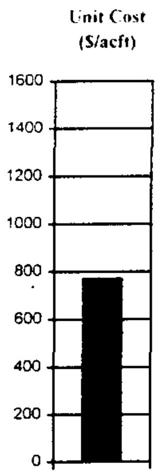
[2]**QUANTITY OF WATER:** Available supply of reclaimed water and size of the market per non-potable supplies.

[3]**LAND IMPACTED:** No land impacted. Conveyance facilities can use existing corridors for pipelines.

ENVIRONMENTAL ISSUES: Reduction in return flows to streams will reduce streamflows.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Acceptance of non-potable water for golf courses, parks, and other irrigation.

ADDITIONAL FACTORS: SAWS has implemented this option.



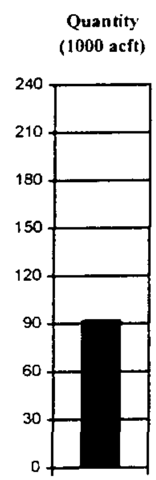
OPTION NUMBER: L-13B

OPTION NAME: Reclaimed Water to the Edwards Aquifer

OPTION DESCRIPTION: *Purify the water with a high level of treatment and augment the Edwards Aquifer supply by injecting the highly treated (treated to Safe Drinking Water Standards) water into the aquifer through recharge wells.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$771	per acft[1]
QUANTITY OF WATER:	92,000	acft/yr[2]
LAND IMPACTED:	240	acres[3]



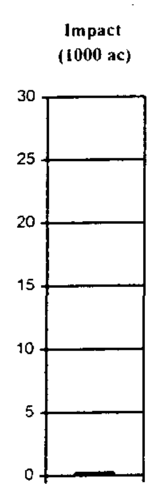
POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	61	of	106	(1=lowest unit)
QUANTITY OF WATER:	22	of	106	(1=highest volume)
LAND IMPACTED:	34	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Cost for reclaimed water treatment plant may be higher than estimated.

[2]**QUANTITY OF WATER:** Is a function of volume of wastewater produced by city of San Antonio, which depends upon population growth and degree of water conservation.

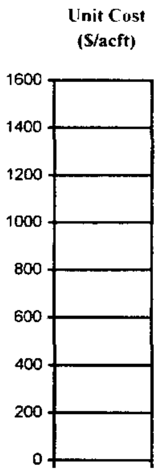
[3]**LAND IMPACTED:** Size of injection well field and rights-of-way for treatment plant, pipelines, and pump stations.

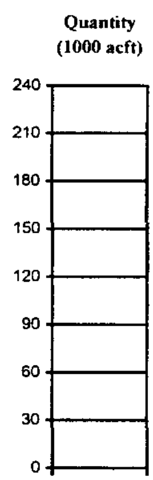


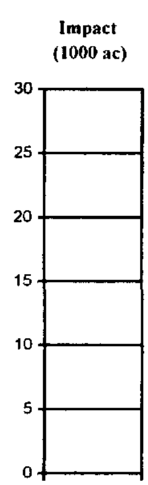
ENVIRONMENTAL ISSUES: Sites for water treatment and conveyance facilities, reduced quantities of treated wastewater discharged into the San Antonio River, and water quality protection for the Edwards Aquifer.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Ability to obtain approval and permits, and efficiency of high level water treatment plants.

ADDITIONAL FACTORS: Public acceptance of the idea of using highly treated wastewater to recharge the Edwards Aquifer.







OPTION NUMBER: L-14
OPTION NAME: Transfer of Reclaimed Water to Corpus Christi through Choke Canyon Reservoir

OPTION DESCRIPTION: *Diversion of 8,400 acft/yr of San Antonio Water System reclaimed water from the San Antonio River near Falls City and transferring it via pipeline to Choke Canyon Reservoir to mitigate effects of Edwards Aquifer recharge dams (Option L-18) upon yield of Lake Corpus Christi/Choke Canyon reservoir System.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED			
UNIT COST OF WATER:	N/A	per acft[1]	(See Option L-18)
QUANTITY OF WATER:	N/A	acft/yr[2]	(See Option L-18)
LAND IMPACTED:	N/A	acres[3]	(See Option L-18)

POSITION RELATIVE TO ALL OPTIONS			
UNIT COST OF WATER:	N/A	of	(1=lowest unit)
QUANTITY OF WATER:	N/A	of	(1=highest volume)
LAND IMPACTED:	N/A	of	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Not Applicable (see Option L-18).

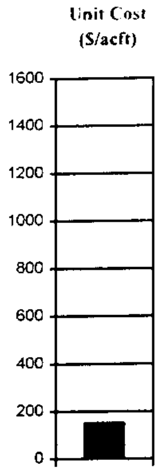
[2]**QUANTITY OF WATER:** Not Applicable (see Option L-18).

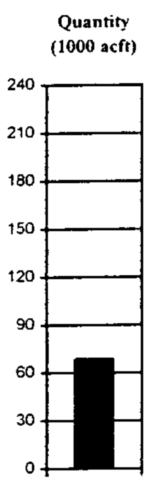
[3]**LAND IMPACTED:** Not Applicable (see Option L-18).

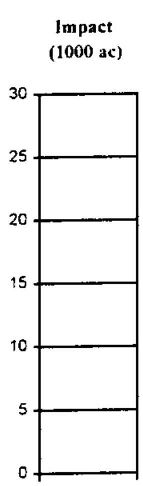
ENVIRONMENTAL ISSUES: Not Applicable (see Option L-18).

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Willingness of affected Nueces Basin water suppliers to consider Edwards Aquifer recharge projects with replacement of downstream yields through diversion of 8,400 acft/yr of San Antonio River flows into Choke Canyon Reservoir.

ADDITIONAL FACTORS: Public acceptance of idea of diversion of San Antonio River flows, having high percentages of reclaimed water into a raw water supply reservoir of a neighboring area.







OPTION NUMBER: L-15

OPTION NAME: Purchase or Lease of Edwards Irrigation Water for Municipal and Industrial Use

OPTION DESCRIPTION: *Senate Bill 1477 regulates the quantity of pumpage from the Edwards Aquifer and establishes a withdrawal permit system, which potentially allows a permit holder to lease up to 50 percent of irrigation permits.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$152	per acft[1]
QUANTITY OF WATER:	68,900	acft/yr[2]
LAND IMPACTED:	N/A	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	3	of	106	(1=lowest unit)
QUANTITY OF WATER:	37	of	106	(1=highest volume)
LAND IMPACTED:	2	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Based upon estimates of lease prices that irrigation permit holders would accept.

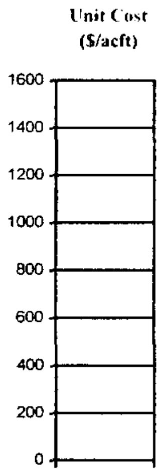
[2]**QUANTITY OF WATER:** Based upon estimates of irrigated acreages that qualify for irrigation permits and that assumes no more than 50 percent of permits can be leased.

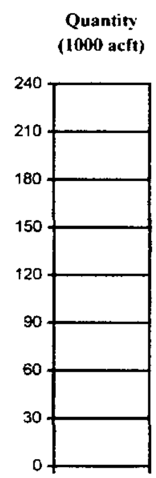
[3]**LAND IMPACTED:** It is estimated that 27,830 acres would be converted to dryland production in order to provide the water for lease.

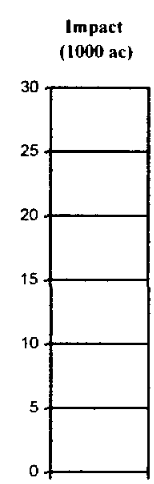
ENVIRONMENTAL ISSUES: Conversion from irrigated to dryland crops results in changes of vegetation to less dense vegetative cover and more exposure to wind erosion.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Profitability of irrigation and dryland farming establishes prices and quantities of water available.

ADDITIONAL FACTORS: Reduction in irrigation adversely affects farm supply and farm marketing services and support industries and could result in reduced local area economic activity.







OPTION NUMBER: L-16

OPTION NAME: Demineralization of Edwards Bad Water

OPTION DESCRIPTION: *Demineralize (desalt) saline water pumped from south of the "Bad Water Line" to drinking water standards.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	N/A	per acft[1]
QUANTITY OF WATER:	0	acft/yr[2]
LAND IMPACTED:	N/A	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	N/A	of		(1=lowest unit)
QUANTITY OF WATER:	N/A	of		(1=highest volume)
LAND IMPACTED:	N/A	of		(1=least acreage)

<u>FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED</u>

[1]**COST:** Salinity of feed water, quantity of feed water available to wells to obtain feed water, energy prices, and brine disposal.

[2]**QUANTITY OF WATER:** Withdrawal of saline water would draw an equivalent quantity of Edwards freshwater into the bad water zone. The result would be a zero change in quantity available.

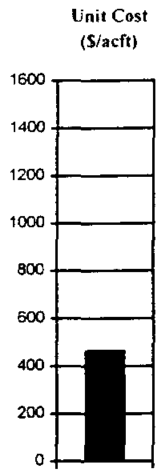
[3]**LAND IMPACTED:** Not Applicable.

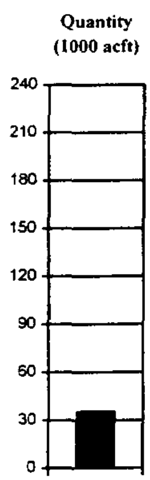
ENVIRONMENTAL ISSUES: Not Applicable.

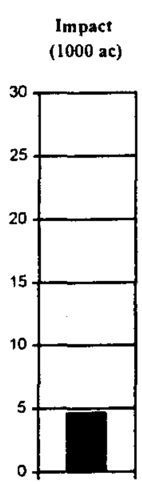
SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Not Applicable.

ADDITIONAL FACTORS: Not Applicable.

WEST CENTRAL TRANS-TEXAS WATER SUPPLY OPTIONS
OPTION DATA SHEET







OPTION NUMBER: L-17
OPTION NAME: Natural Recharge - Type 1 Projects

OPTION DESCRIPTION: *Type 1 recharge projects are located upstream of the Edwards Recharge Zone. These structures capture high flood flows and release water at the maximum recharge rate of the downstream channel.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$466	per acft[1]
QUANTITY OF WATER:	35,600	acft/yr[2]
LAND IMPACTED:	4,660	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	22	of	106	(1=lowest unit)
QUANTITY OF WATER:	63	of	106	(1=highest volume)
LAND IMPACTED:	80	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Price of land for recharge reservoir sites, costs of dams, including emergency spillways, and outlet works to regulate rate of release.

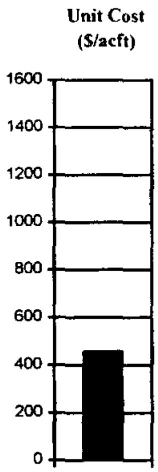
[2]**QUANTITY OF WATER:** Quantities listed here are for optimum reservoir sizes during 10 years drought conditions. Recent studies utilizing the TWDB's GWSIM 4 model indicate the benefits to increases in aquifer pumpage may exceed the 10-year drought average recharge volume indicated here, especially for structures located west of Bexar County. For average conditions, the potential quantities for optimum reservoir sizes are 75,900 acft/yr at a cost of $219 per acrefoot. However, a detailed simulation analysis of the Edward Aquifer is needed in order to ascertain the potential effects of this quantity of recharge upon water supplies from the Edwards Aquifer.

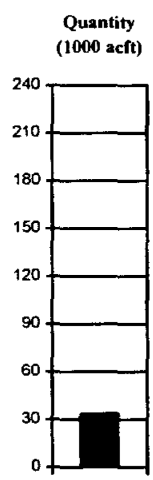
[3]**LAND IMPACTED:** Number and sizes of storage reservoirs.

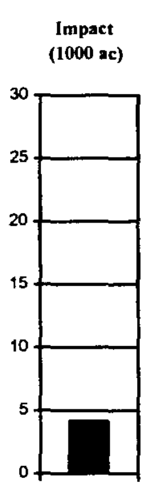
ENVIRONMENTAL ISSUES: Effects of periodic (lasting for several weeks or months) inundation of the lakebeds (storage reservoirs) upon terrestrial habitat located within the lakes.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Ability to obtain agreements with local landowners for storage reservoirs and ability to obtain water rights and the necessary construction permits.

ADDITIONAL FACTORS: Ability of recharge sponsors to obtain permits and/or other protection of the security and ownership, or credits for quantities of water recharged to the aquifer to justify expenditures.







OPTION NUMBER: L-18A
OPTION NAME: Natural Recharge - Type 2 Projects

OPTION DESCRIPTION: *Type 2 recharge structures are located within or directly over the Edwards Recharge Zone. The structures impound water for only a few days or weeks and are normally dry.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$458	per acft[1]
QUANTITY OF WATER:	33,870	acft/yr[2]
LAND IMPACTED:	4,186	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	20	of	106	(1=lowest unit)
QUANTITY OF WATER:	65	of	106	(1=highest volume)
LAND IMPACTED:	79	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Price of land for recharge reservoir sites, costs of dams and emergency spillways, and maintenance costs for recharge features such as trash control and removal.

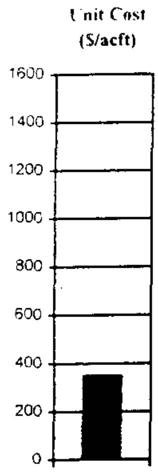
[2]**QUANTITY OF WATER:** Quantities listed here are for optimum sizes of structures during 10-year drought conditions. Recent studies utilizing the TWDB's GWSIM 4 model indicate the benefits to increases in aquifer pumpage may significantly exceed the 10-year drought average recharge volume indicated here, especially for structures located west of Bexar County. For average conditions, the potential quantities for optimum sizes of structures are 107,762 acft/yr at a cost of $144 per acft. However, a detailed analysis of the Edwards Aquifer is needed in order to ascertain the potential effects of this level of recharge upon water supplies from the Edwards Aquifer.

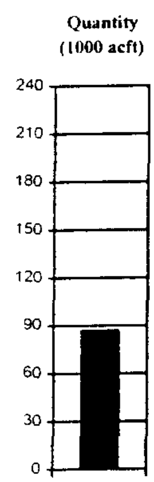
[3]**LAND IMPACTED:** Number and sizes of recharge structures.

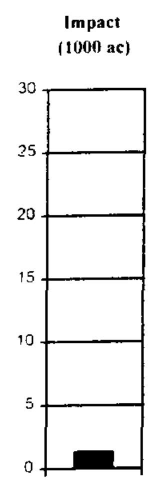
ENVIRONMENTAL ISSUES: Effects of periodic inundation lasting for a few days or weeks of the recharge structure sites upon terrestrial habitat located within the recharge sites.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Ability to obtain agreements with local landowners for recharge sites, and ability to obtain water rights and the necessary construction permits.

ADDITIONAL FACTORS: Ability of recharge sponsors to obtain permits and/or other protection of the security and ownership, or credits for quantities of water recharge to the aquifer to justify expenditures.







OPTION NUMBER: L-23A

OPTION NAME: Edwards Recirculation--Sustainable Yield Pumpage--Lake Dunlap Diversion

OPTION DESCRIPTION: *Includes diversion of up to 200 cfs of springflows originating from Comal Springs from Lake Dunlap to the recharge zone in northwestern Bexar County.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	350	per acft[1]
QUANTITY OF WATER:	87,000	acft/yr[2]
LAND IMPACTED:	1,351	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	6	of	106	(1=lowest unit)
QUANTITY OF WATER:	27	of	106	(1=highest volume)
LAND IMPACTED:	53	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Costs of pump stations, pipelines and recharge structures including land prices. Power costs will effect annual O&M cost.

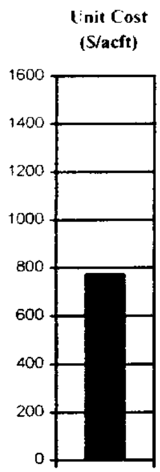
[2]**QUANTITY OF WATER:** The 87,000 acft/yr could vary, subject to institutional and permitting constraints.

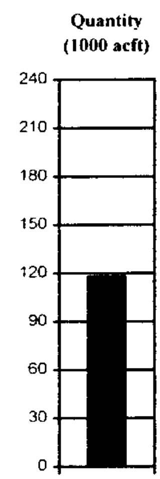
[3]**LAND IMPACTED:** Size of recharge structures.

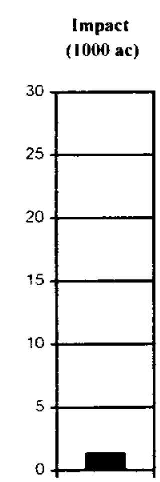
ENVIRONMENTAL ISSUES: Effects of reduce flows on Guadalupe River below Lake Dunlap.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Ability to obtain water rights for Guadalupe River Diversions.

ADDITIONAL FACTORS: Ability of recirculation sponsors to obtain permits and/or other protection for the security and ownership or credits for quantities of water recharged to the aquifer to justify expenditures.







OPTION NUMBER: L-23B
OPTION NAME: Edwards Recirculation--Sustainable Yield Pumpage--Gonzales Diversion

OPTION DESCRIPTION: *Includes diversion of up to 400 cfs of springflows originating from Comal and San Marcos Springs with up to 200 cfs from Lake Dunlap and the remaining from the Guadalupe River near Gonzales. Water would be delivered to locations in the recharge zone in northwestern Bexar County and in Medina County.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	**774**	**per acft[1]**
QUANTITY OF WATER:	**118,000**	**acft/yr[2]**
LAND IMPACTED:	**1,351**	**acres[3]**

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	**62**	**of**	**106**	(1=lowest unit)
QUANTITY OF WATER:	**17**	**of**	**106**	(1=highest volume)
LAND IMPACTED:	**61**	**of**	**106**	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Costs of pump stations, pipelines and recharge structures including land prices. Power costs will effect annual O&M cost.

[2]**QUANTITY OF WATER:** The 118,000 acft/yr could vary, subject to institutional and permitting constraints.

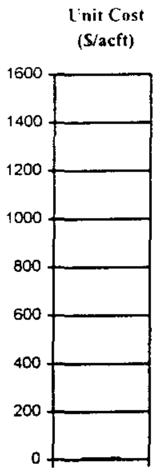
[3]**LAND IMPACTED:** Size of recharge structures.

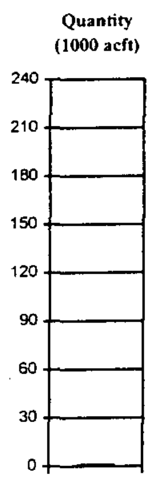
ENVIRONMENTAL ISSUES: Effects of reduce flows on Guadalupe River below diversion locations.

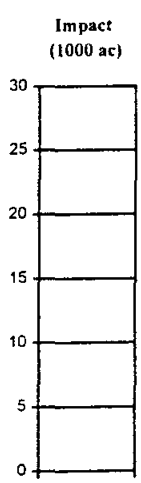
SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Ability to obtain water rights for Guadalupe River Diversions.

ADDITIONAL FACTORS: Ability of recirculation sponsors to obtain permits and/or other protection for the security and ownership or credits for quantities of water recharged to the aquifer to justify expenditures.

WEST CENTRAL TRANS-TEXAS WATER SUPPLY OPTIONS
OPTION DATA SHEET







OPTION NUMBER: L-24

OPTION NAME: Flood Retarding Structures Outlet Modifications

OPTION DESCRIPTION: *A number of existing flood retarding structures located on or near the Edwards Recharge area could have their existing outlets reduced in size to provide for additional recharge.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$7	per acft[1]
QUANTITY OF WATER:	1,000	acft/yr[2]
LAND IMPACTED:	0	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	1	of	106	(1=lowest unit)
QUANTITY OF WATER:	106	of	106	(1=highest volume)
LAND IMPACTED:	1	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Costs of modifications of structures will vary by site, but are generally minimal.

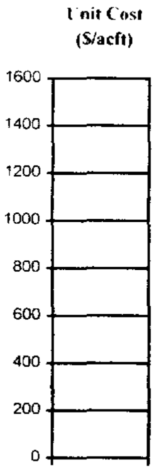
[2]**QUANTITY OF WATER:** The quantity of water indicated is based on long-term average conditions, based upon modifications of 5 sites.. The value of this quantity of water during drought conditions would need to be determined using a model of the aquifer.

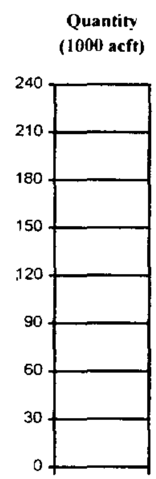
[3]**LAND IMPACTED:** None.

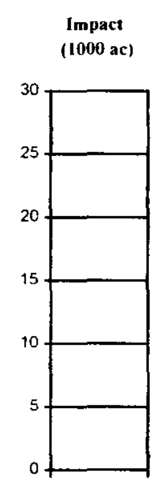
ENVIRONMENTAL ISSUES: None anticipated.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Ability to obtain water rights for recharge water.

ADDITIONAL FACTORS: Ability of recharge sponsors to obtain permits and/or other protection for the security and ownership or credits for quantities of water recharged to the aquifer to justify expenditures.







OPTION NUMBER: L-19

OPTION NAME: Springflow Augmentation for Comal and San Marcos Springs Source: "Springflow Augmentation of Comal Springs and San Marcos Springs, Texas: Phase 1 - Feasibility Study", March 1, 1994, Center for Research in Water Resources, University of Texas at Austin, Draft Report.

OPTION DESCRIPTION: *Supplemental water discharges into spring lake, local recharge to the aquifer or injection into the geological formation near the springhead.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	*	per acft[1]
QUANTITY OF WATER:	**	acft/yr[2]
LAND IMPACTED:	N/A	acres[3]

POSITION RELATIVE TO ALL OPTIONS			
UNIT COST OF WATER:	N/A	of	(1=lowest unit)
QUANTITY OF WATER:	N/A	of	(1=highest volume)
LAND IMPACTED:	N/A	of	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** *Nearest potential sources of water are located at considerable distances from the springs (45 to 90 miles) and quantities available are uncertain. Project cost estimates range from $45 million to $692 million

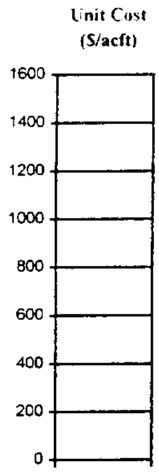
[2]**QUANTITY OF WATER:** **Augmentation with Edwards Aquifer pumpage of 400,000 acft/yr requires make-up water of 108,800 acft/yr at Comal Springs and 32,500 acft/yr at San Marcos Springs to maintain minimum springflows of 200 cfs and 100 cfs respectively.

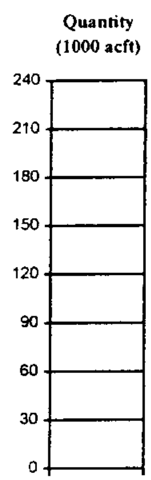
[3]**LAND IMPACTED:** Not addressed in study.

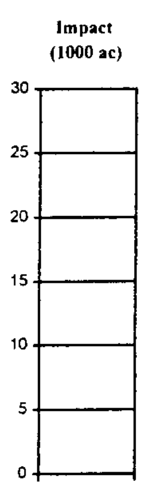
ENVIRONMENTAL ISSUES: Adequate springflows for threatened and endangered species and compatibility of quality of augmentation water with aquifer and springs environment.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Unknown as to whether or not springflow augmentation can be accomplished and maintained on a schedule suitable for protection of the habitats of the species, and costs of augmentation.

ADDITIONAL FACTORS: Public acceptance of springflow augmentation idea in relation to other available measures.







OPTION NUMBER: N-10
OPTION NAME: Existing Water Rights in Neuces River Basin

OPTION DESCRIPTION: *Consider obtaining any unused water rights in the Nueces River Basin for use in the West Central study area.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	N/A	per acft[1]
QUANTITY OF WATER:	N/A	acft/yr[2]
LAND IMPACTED:	N/A	acres[3]

POSITION RELATIVE TO ALL OPTIONS			
UNIT COST OF WATER:	N/A	of	(1=lowest unit)
QUANTITY OF WATER:	N/A	of	(1=highest volume)
LAND IMPACTED:	N/A	of	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** A review of existing Nueces River Basin water rights and use of existing rights did not show any significant quantities of unused or underutilized water rights in the Nueces Basin which could be economically acquired.

[2]**QUANTITY OF WATER:** Not Applicable.

[3]**LAND IMPACTED:** Not Applicable.

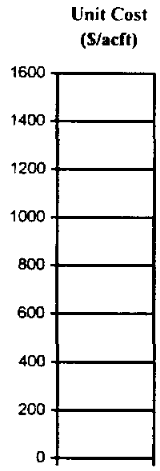
ENVIRONMENTAL ISSUES: Not Applicable.

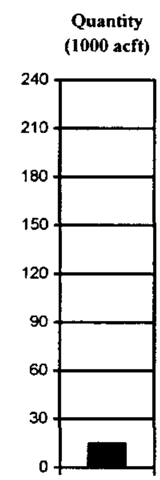
SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Not Applicable.

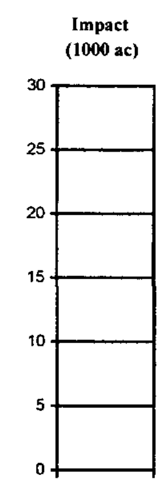
ADDITIONAL FACTORS: Not Applicable.

WEST CENTRAL TRANS-TEXAS WATER SUPPLY OPTIONS

OPTION DATA SHEET







OPTION NUMBER: S-10

OPTION NAME: San Antonio River Unappropriated Streamflow at Elmendorf

OPTION DESCRIPTION: *Calculations of unappropriated streamflow at Elmendorf, Texas; 1947-56 drought average with Edwards Aquifer pumpage at 400,000 acft/yr, wastewater return flows at 1988 levels, hydropower water rights at Lake Dunlap of 600 cfs, Canyon Lake firm yield of 50,000 acft/yr, and diversion rate of 1,000 cfs.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	N/A	per acft[1]
QUANTITY OF WATER:	15,100	acft/yr[2]
LAND IMPACTED:	N/A	acres[3]

POSITION RELATIVE TO ALL OPTIONS			
UNIT COST OF WATER:	N/A	of	(1=lowest unit)
QUANTITY OF WATER:	N/A	of	(1=highest volume)
LAND IMPACTED:	N/A	of	(1=least acreage)

<u>FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED</u>

[1]**COST:** Cost not computed, calculations were done in order to obtain information as to quantities of unappropriated water available at this location.

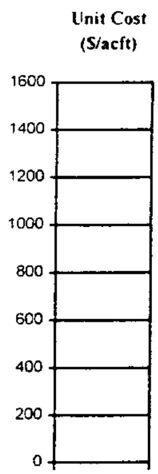
[2]**QUANTITY OF WATER:** Dependent on diversion rate, Edwards Aquifer pumpage levels, instream flow requirements, and quantities of wastewater return flows.

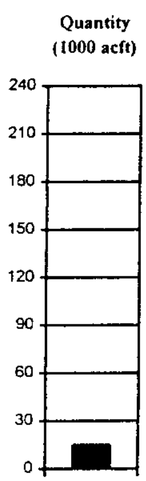
[3]**LAND IMPACTED:** Not Applicable.

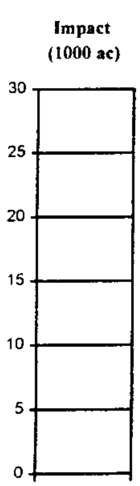
ENVIRONMENTAL ISSUES: Not Applicable.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Not Applicable.

ADDITIONAL FACTORS: Not Applicable.







OPTION NUMBER: S-11
OPTION NAME: San Antonio River Unappropriated Streamflow at Falls City

OPTION DESCRIPTION: *Calculations of unappropriated streamflow at Falls City, Texas; 1947-56 drought average with Edwards Aquifer pumpage at 400,000 acft/yr, wastewater return flows at 1988 levels, hydropower water rights at Lake Dunlap of 600 cfs, Canyon Lake firm yield of 50,000 acft/yr and diversion rate of 1,000 cfs.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	N/A	per acft[1]
QUANTITY OF WATER:	15,100	acft/yr[2]
LAND IMPACTED:	N/A	acres[3]

POSITION RELATIVE TO ALL OPTIONS			
UNIT COST OF WATER:	N/A	of	(1=lowest unit)
QUANTITY OF WATER:	N/A	of	(1=highest volume)
LAND IMPACTED:	N/A	of	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Cost not computed, calculations were done in order to obtain information as to quantities of unappropriated water available at this location.

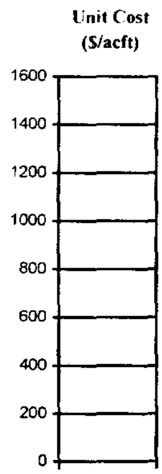
[2]**QUANTITY OF WATER:** Dependent on diversion rate, Edwards Aquifer pumpage levels, instream flow requirements, and quantities of wastewater return flows.

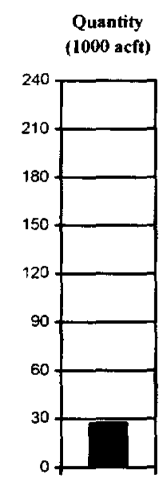
[3]**LAND IMPACTED:** Not Applicable.

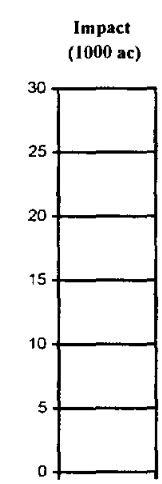
ENVIRONMENTAL ISSUES: Not Applicable.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Not Applicable.

ADDITIONAL FACTORS: Not Applicable.







OPTION NUMBER: S-12

OPTION NAME: San Antonio River Unappropriated Streamflow at Goliad

OPTION DESCRIPTION: *Calculations of unappropriated streamflow at Goliad, Texas; 1947-56 drought average with Edwards Aquifer pumpage at 400,000 acft/yr, wastewater return flows at 1988 levels, hydropower water rights at Lake Dunlap of 600 cfs, Canyon Lake firm yield of 50,000 acft/yr, and diversion rate of 1,000 cfs.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	N/A	per acft[1]
QUANTITY OF WATER:	27,600	acft/yr[2]
LAND IMPACTED:	N/A	acres[3]

POSITION RELATIVE TO ALL OPTIONS			
UNIT COST OF WATER:	N/A	of	(1=lowest unit)
QUANTITY OF WATER:	N/A	of	(1=highest volume)
LAND IMPACTED:	N/A	of	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Cost not computed, calculations were done in order to obtain information as to quantities of unappropriated water available at this location.

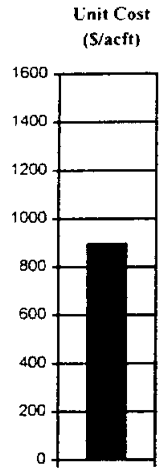
[2]**QUANTITY OF WATER:** Dependent on diversion rate, Edwards Aquifer pumpage levels, instream flow requirements, and quantities of wastewater return flows.

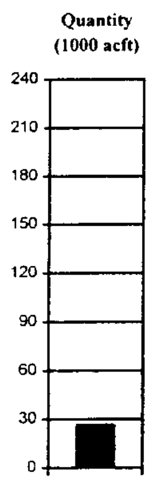
[3]**LAND IMPACTED:** Not Applicable.

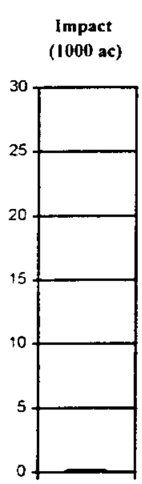
ENVIRONMENTAL ISSUES: Not Applicable.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Not Applicable.

ADDITIONAL FACTORS: Not Applicable.







OPTION NUMBER: S-13A
OPTION NAME: Medina Lake--Divert and Inject to Aquifer

OPTION DESCRIPTION: *Divert, treat to drinking water standards, and inject to Edwards Aquifer through injection well field in eastern Medina County.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$896	per acft[1]
QUANTITY OF WATER:	26,700	acft/yr[2]
LAND IMPACTED:	172	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	76	of	106	(1=lowest unit)
QUANTITY OF WATER:	70	of	106	(1=highest volume)
LAND IMPACTED:	31	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Canal intake and pump station, raw and treated water transmission lines, water treatment injection wells, and potential cost of reclaimed water to replace irrigation supply.

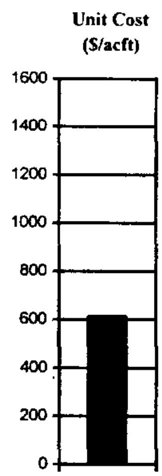
[2]**QUANTITY OF WATER:** Firm yield of Medina Lake is 8,800 acft/yr; estimate quoted here is average annual quantity available during 1947-56 drought. Average quantity for 1934-89 was 57,970 acft/yr and would have a cost of $413 per acft.

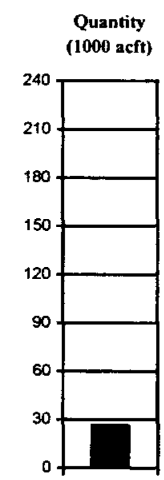
[3]**LAND IMPACTED:** Sites and rights-of-way for diversion works, treatment plant, pipelines, and injection wells.

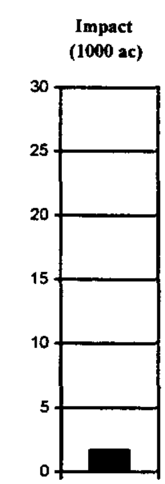
ENVIRONMENTAL ISSUES: Diversion rates would not differ from present uses, however, water treatment is included in order to protect water quality within the Edwards Aquifer. If irrigation is continued using reclaimed water, see option L-12 for environmental effects.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: TNRCC approval to change use and points of diversion, ability to obtain agreements with Medina Lake owners to either sell Medina Lake water or exchange Medina Lake water for other supplies, and technical ability of injection wells.

ADDITIONAL FACTORS: Ability of recharge sponsors to obtain permits and/or other protection of the security and ownership or credits for quantities of water recharged to the aquifer.







OPTION NUMBER: S13-B

OPTION NAME: Medina Lake--Divert to Edwards Aquifer Recharge Zone in North Bexar County

OPTION DESCRIPTION: *Divert Medina Lake water to the Edwards Aquifer recharge structures in northwestern Bexar County (structures located on Recharge Zone).*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$614	per acft[1]
QUANTITY OF WATER:	26,700	acft/yr[2]
LAND IMPACTED:	172	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	40	of	106	(1=lowest unit)
QUANTITY OF WATER:	71	of	106	(1=highest volume)
LAND IMPACTED:	30	of	106	(1=least acreage)

<u>FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED</u>

[1]**COST:** Intake, pump stations, raw water transmission lines, delivery system, recharge structures, and potential cost of reclaimed water to replace irrigation supply.

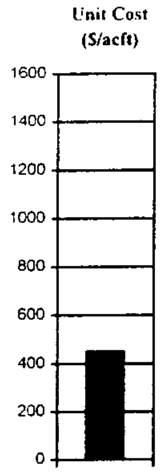
[2]**QUANTITY OF WATER:** Firm yield of Medina Lake is 8,800 acft/yr; estimate quotes here is average annual quantity available during 1947-56 drought. For 1934 - 89 average conditions, the quantity is 57,970 acft/yr at a cost of $281 per acft.

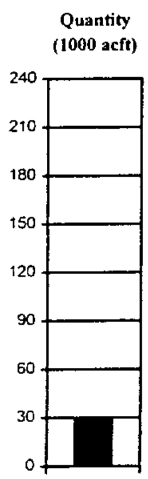
[3]**LAND IMPACTED:** Sites and rights-of-way for diversion works, conveyance facilities, and recharge structures sites.

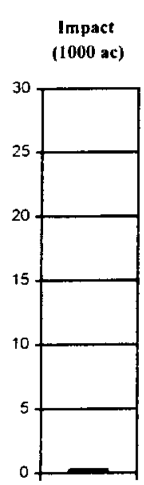
ENVIRONMENTAL ISSUES: Diversion rates would not differ from those of present uses. Natural recharge would not require water treatment as in S13-A. If irrigation is continued using reclaimed water, see option L-12 for environmental effects.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: TNRCC approval to change use and points of diversion, ability to obtain agreements with Medina Lake owners to either sell Medina Lake water or exchange Medina Lake water for other supplies, ability to obtain recharge sites, and approvals for recharge.

ADDITIONAL FACTORS: Ability of recharge sponsors to obtain permits and/or other protection of the security and ownership or credits for quantities of water recharged to the aquifer.







OPTION NUMBER: S-13C

OPTION NAME: Medina Lake--Divert to Water Treatment Plant and then to Municipal Distribution System

OPTION DESCRIPTION: *Divert Medina Lake firm yield to a water treatment plant located in northwest San Antonio near FM1604 and then distribute treated water directly to municipal customers. Includes taking credits for extra 20,200 acft/yr estimate to recharge Edwards Aquifer during drought at Medina Lake due to reduced irrigation demands.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$451	per acft[1]
QUANTITY OF WATER:	29,000	acft/yr[2]
LAND IMPACTED:	298	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	19	of	106	(1=lowest unit)
QUANTITY OF WATER:	69	of	106	(1=highest volume)
LAND IMPACTED:	35	of	106	(1=least acreage)

<u>FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED</u>

[1]**COST:** Reservoir intake and pump station, raw water transmission line, water treatment plant, finished water pump station, distribution system improvements, and potential cost of reclaimed water to replace irrigation supply.

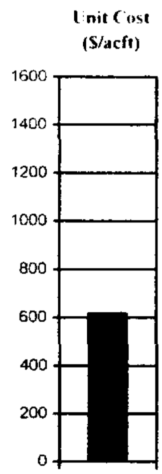
[2]**QUANTITY OF WATER:** Sized for firm yield of Medina Lake (8,800 acft/yr), but with replacement of 26,700 acft/yr drought average (1947-56) supply of reclaimed water to replace irrigation water.

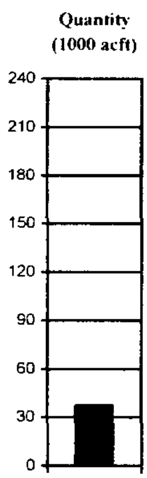
[3]**LAND IMPACTED:** Sites and rights-of-way for intakes, transmission lines, and water treatment plant.

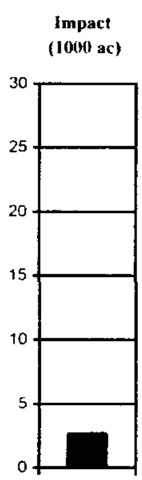
ENVIRONMENTAL ISSUES Change in operation of Medina Lake keeps lake levels higher and results in higher recharge to Edwards Aquifer (24% greater than for present conditions) and more frequent spills from the lake resulting in higher annual flows in the Medina River below Diversion Lake.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: TNRCC approval to change use and points of diversion, ability to obtain agreements with Medina Lake owners to either sell Medina Lake water or exchange Medina Lake water for other sources, costs of improvements to San Antonio Water System distribution system.

ADDITIONAL FACTORS: Ability of sponsors to obtain permits and/or other protection of the security and ownership or credits for quantities of water recharge to aquifer.







OPTION NUMBER: S-13D
OPTION NAME: Medina Lake--Buy Water Rights and Release to Applewhite

OPTION DESCRIPTION: *Operate Medina Lake as a System with Applewhite, with releases to Applewhite when needed for diversion to water treatment plant. Includes taking credits for extra 22,600 acft/yr estimate to recharge Edwards Aquifer during drought at Medina Lake due to reduced irrigation demands.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	**$619**	**per acft**[1]
QUANTITY OF WATER:	**37,500**	**acft/yr**[2]
LAND IMPACTED:	**2,717**	**acres**[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	**42**	**of**	**106**	(1=lowest unit)
QUANTITY OF WATER:	**59**	**of**	**106**	(1=highest volume)
LAND IMPACTED:	**72**	**of**	**106**	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Not Applicable, since the Applewhite project has been canceled.

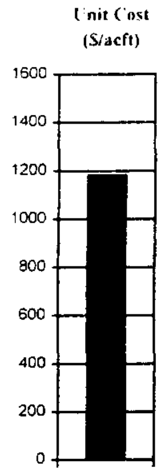
[2]**QUANTITY OF WATER:** Not Applicable.

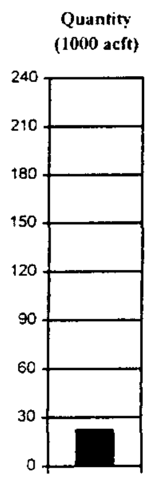
[3]**LAND IMPACTED:** Not Applicable.

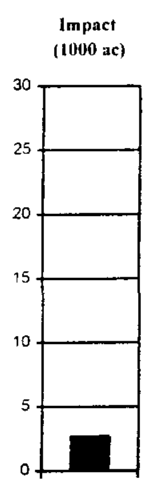
ENVIRONMENTAL ISSUES: Not Applicable.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Not Applicable.

ADDITIONAL FACTORS: Not possible, since the Applewhite project has been canceled.







OPTION NUMBER: S-14A
OPTION NAME: Applewhite Reservoir--Divert and Inject to Aquifer

OPTION DESCRIPTION: *Water diverted from Applewhite Reservoir treated to drinking water standards and transferred via pipeline to an injection well field in eastern Medina County.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$1,184	per acft[1]
QUANTITY OF WATER:	22,500	acft/yr[2]
LAND IMPACTED:	2,717	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	92	of	106	(1=lowest unit)
QUANTITY OF WATER:	73	of	106	(1=highest volume)
LAND IMPACTED:	75	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Dam and reservoir intake and pump station, raw water pipeline to treatment plant, water treatment plant, finished water pipeline and pump station to injection well field, and aquifer injection well field.

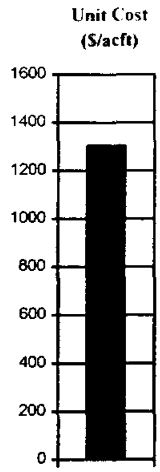
[2]**QUANTITY OF WATER:** 1947-56 drought average for the site; instream flow requirements, return flows of reclaimed water to meet downstream water rights and levels of Edwards Aquifer pumpage.

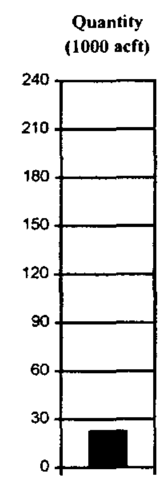
[3]**LAND IMPACTED:** Reservoir site, and sites for pipelines, pump stations, water treatment plant, and injection well field.

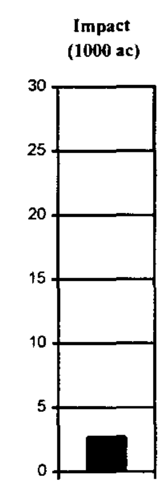
ENVIRONMENTAL ISSUES: Mitigation for inundation of 2,717 acres of habitat and minimum releases for instream flows downstream of the reservoir.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Public opinion, as expressed in an election in 1995, opposed the project and resulted in its abandonment.

ADDITIONAL FACTORS: Not Applicable.







OPTION NUMBER: S-14B
OPTION NAME: Applewhite Reservoir--Divert to Recharge Zone

OPTION DESCRIPTION: *Water diverted from Applewhite Reservoir, treated to drinking water standards and transferred via pipeline to small recharge structures in northwestern Bexar County.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$1,305	per acft[1]
QUANTITY OF WATER:	22,500	acft/yr[2]
LAND IMPACTED:	2,717	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	98	of	106	(1=lowest unit)
QUANTITY OF WATER:	74	of	106	(1=highest volume)
LAND IMPACTED:	76	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Dam and reservoir intake and pump station, raw water pipeline to treatment plant, water treatment plant, finished water pipeline and pump station to recharge structures in northwestern Bexar County.

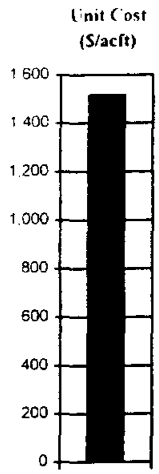
[2]**QUANTITY OF WATER:** 1947-56 drought average for the site; instream flow requirements, return flows of reclaimed water to meet downstream water rights and levels of Edwards Aquifer pumpage.

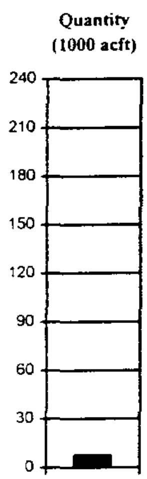
[3]**LAND IMPACTED:** Reservoir site, and sites for pipelines, pump stations, water treatment plant, and recharge structures.

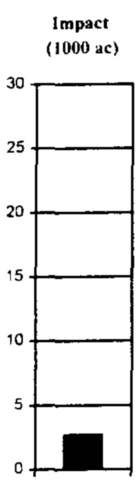
ENVIRONMENTAL ISSUES : Mitigation for inundation of 2,717 acres of habitat and minimum releases for instream flows downstream of the reservoir.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Public opinion, as expressed in an election in 1995, opposed the project and resulted in its abandonment.

ADDITIONAL FACTORS: Not Applicable.







OPTION NUMBER: S-14C

OPTION NAME: Applewhite Reservoir--Divert to Water Treatment Plant and Municipal System

OPTION DESCRIPTION: *Firm yield of Applewhite diverted to water treatment plant in south San Antonio, where it would be treated to drinking water standards and then put into the San Antonio municipal distribution system.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED

UNIT COST OF WATER:	$1,518	per acft[1]
QUANTITY OF WATER:	7,700	acft/yr[2]
LAND IMPACTED:	2,717	acres[3]

POSITION RELATIVE TO ALL OPTIONS

UNIT COST OF WATER:	100	of	106	(1=lowest unit)
QUANTITY OF WATER:	93	of	106	(1=highest volume)
LAND IMPACTED:	73	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Dam and reservoir, intake and pump station, raw water pipeline to treatment plant, water treatment plant, finished water pipeline and pump station to distribution system.

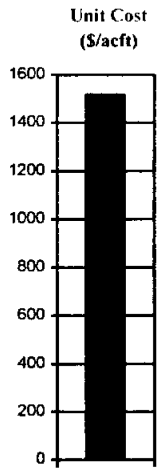
[2]**QUANTITY OF WATER:** Firm yield for the site; instream flow requirements, return flows of reclaimed water to meet downstream water rights and levels of Edwards Aquifer pumpage.

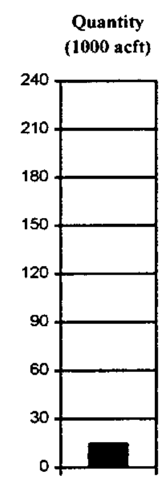
[3]**LAND IMPACTED:** Reservoir site, and sites for pipelines, pump stations, and water treatment plant.

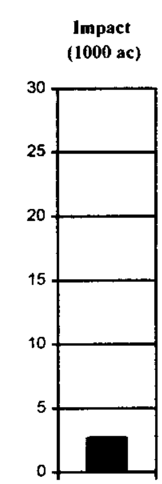
ENVIRONMENTAL ISSUES: Mitigation for inundation of 2,717 acres of habitat and minimum releases for instream flows downstream of the reservoir.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Public opinion, as expressed in an election in 1995, opposed the project and resulted in its abandonment.

ADDITIONAL FACTORS: Not Applicable.







OPTION NUMBER: S-14D

OPTION NAME: Applewhite Reservoir--Operated in Conjunction with Medina Lake, with Diversion to Water Treatment Plant and Distribution System

OPTION DESCRIPTION: *The combined yield of Medina Lake and Applewhite Reservoir would be diverted from Applewhite to a water treatment plant located in south San Antonio, treated to drinking water standards and then put into the San Antonio distribution system. (Same as option S-13D without credit for increased recharge to aquifer).*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$1,518	per acft[1]
QUANTITY OF WATER:	14,900	acft/yr[2]
LAND IMPACTED:	2,717	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	101	of	106	(1=lowest unit)
QUANTITY OF WATER:	84	of	106	(1=highest volume)
LAND IMPACTED:	74	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Dam and reservoir, intake and pump station, raw water pipeline to treatment plant, water treatment plant, finished water pipeline and pump station to distribution system.

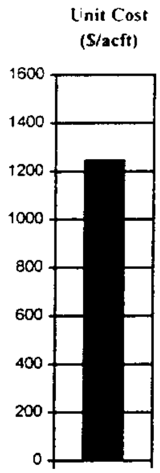
[2]**QUANTITY OF WATER:** Combined firm yield of Medina Lake and Applewhite Reservoir; instream flow requirements, return flows of reclaimed water to meet downstream water rights and levels of Edwards Aquifer pumpage.

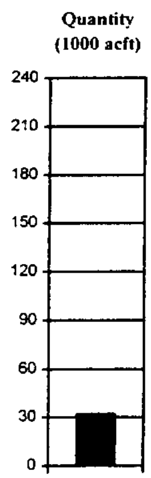
[3]**LAND IMPACTED:** Reservoir site, and sites for pipelines, pump stations, and water treatment plant.

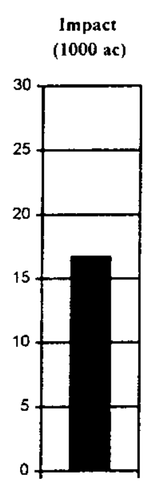
ENVIRONMENTAL ISSUES: Mitigation for inundation of 2,717 acres of habitat and minimum releases for instream flows downstream of the reservoir.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Public opinion, as expressed in an election in 1995, opposed the project and resulted in its abandonment.

ADDITIONAL FACTORS: Not Applicable.







OPTION NUMBER: S-15A

OPTION NAME: Cibolo Reservoir--Divert and Inject to Edwards Aquifer

OPTION DESCRIPTION: *The firm yield from the proposed Cibolo Reservoir located in Wilson County would be diverted via a pipeline to a water treatment plant and treated water would be pumped to an injection well field in eastern Medina County.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$1,246	per acft[1]
QUANTITY OF WATER:	32,300	acft/yr[2]
LAND IMPACTED:	16,700	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	95	of	106	(1=lowest unit)
QUANTITY OF WATER:	66	of	106	(1=highest volume)
LAND IMPACTED:	94	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Dam and reservoir, intake and pump station, raw and finished water pipelines, water treatment plant and treatment costs, booster pump station mitigation, aquifer injection well field and operating costs.

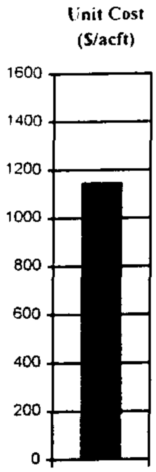
[2]**QUANTITY OF WATER:** Project was originally evaluated using the Trans-Texas environmental criteria which has recently been revised. Latest environmental criteria would result in increase in firm yield of Cibolo Reservoir and reduction in unit costs.

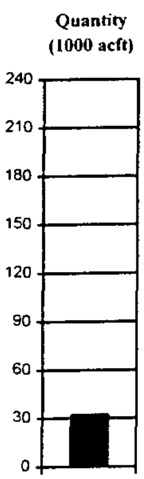
[3]**LAND IMPACTED:** Reservoir site size and sites for pipelines, pump stations, water treatment plant and injection well field size.

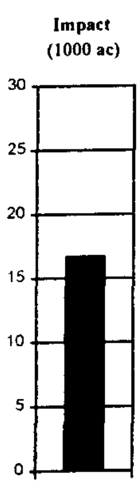
ENVIRONMENTAL ISSUES: Inundation of 18 miles of stream channel, much of which is bottomland hardwood and riparian communities. Habitat mitigation of 28,958 acres has been estimated.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Level of water treatment required for injection to the Edwards Aquifer, quantity of instream flows required, and habitat mitigation requirements.

ADDITIONAL FACTORS: Not Applicable.







OPTION NUMBER: S-15C

OPTION NAME: Cibolo Reservoir--Divert to Water Treatment Plant and then to Municipal Distribution System

OPTION DESCRIPTION: *The firm yield from the proposed Cibolo Reservoir located in Wilson County would be diverted and pumped to the south water treatment plant and then into the San Antonio distribution system.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$1,145	per acft[1]
QUANTITY OF WATER:	32,300	acft/yr[2]
LAND IMPACTED:	16,700	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	91	of	106	(1=lowest unit)
QUANTITY OF WATER:	68	of	106	(1=highest volume)
LAND IMPACTED:	90	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Dam and reservoir, intake and pump station, mitigation, raw and finished water pipelines, water treatment plant, and treatment costs.

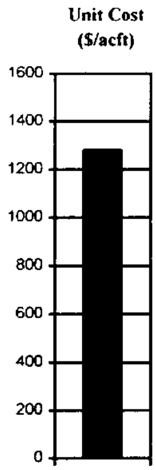
[2]**QUANTITY OF WATER:** Project was originally evaluated using the Trans-Texas environmental criteria which has recently been revised. Latest environmental criteria would result in increase in firm yield of Cibolo Reservoir and reduction in unit costs.

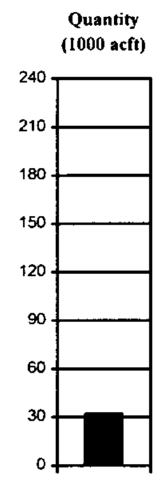
[3]**LAND IMPACTED:** Reservoir site size and sites for pipelines, pump stations, and water treatment plant.

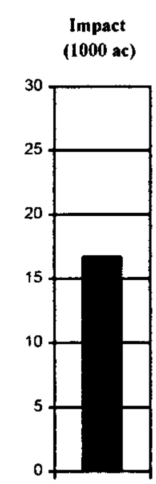
ENVIRONMENTAL ISSUES: Inundation of 18 miles of stream channel, much of which is bottomland hardwood and riparian communities. Habitat mitigation of 28,958 acres has be estimated.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Quantity of instream flows required and habitat mitigation requirements.

ADDITIONAL FACTORS: Not Applicable.







OPTION NUMBER: S-15B

OPTION NAME: Cibolo Reservoir--Divert to Recharge Structures in the Edwards Aquifer Recharge Zone

OPTION DESCRIPTION: *The firm yield from the proposed Cibolo Reservoir located in Wilson County would be diverted, treated, and piped to small recharge structures in northwestern Bexar County.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	**$1,281**	**per acft[1]**
QUANTITY OF WATER:	**32,300**	**acft/yr[2]**
LAND IMPACTED:	**16,700**	**acres[3]**

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	97	of	106	(1=lowest unit)
QUANTITY OF WATER:	67	of	106	(1=highest volume)
LAND IMPACTED:	95	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Dam and reservoir, intake and pump station, mitigation, raw and finished water, pipelines, water treatment plant and treatment costs, recharge structures, and booster pump station, and operation costs. If treatment is not required, unit costs are reduced to about $1,173 per acft.

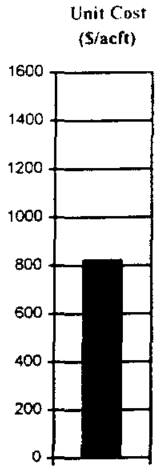
[2]**QUANTITY OF WATER:** Project was originally evaluated using the Trans-Texas environmental criteria which has recently been revised. Latest environmental criteria would result in increase in firm yield of Cibolo Reservoir and reduction in unit costs.

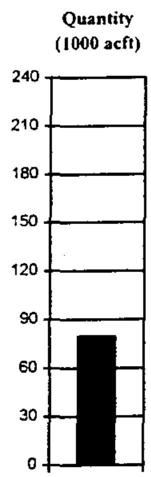
[3]**LAND IMPACTED:** Reservoir site size and sites for pipelines, pump stations, water treatment plant, and recharge structure.

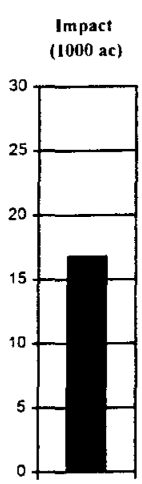
ENVIRONMENTAL ISSUES: Inundation of 18 miles of stream channel, much of which is bottomland hardwood and riparian communities. Habitat mitigation of 28,958 acres has be estimated.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Level of water treatment required for recharge to the Edwards Aquifer, quantity of instream flows required and habitat mitigation requirements.

ADDITIONAL FACTORS: Not Applicable.







OPTION NUMBER: S-15Db

OPTION NAME: Cibolo Reservoir with Imported Water from the San Antonio River near Floresville and the Guadalupe River at Cuero

OPTION DESCRIPTION: *The firm yield of Cibolo Reservoir located in Wilson County would be supplemented with water diverted from the San Antonio River near Floresville via a 72-inch diameter pipeline, and water from the Guadalupe River at Cuero via an 84-inch diameter pipeline, and then diverted to the south water treatment plant and then to the municipal distribution system.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$822	per acft[1]
QUANTITY OF WATER:	79,600	acft/yr[2]
LAND IMPACTED:	16,804	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	68	of	106	(1=lowest unit)
QUANTITY OF WATER:	28	of	106	(1=highest volume)
LAND IMPACTED:	93	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Dam and reservoir, intakes and pump station at the reservoir, San Antonio and Guadalupe Rivers intakes and pump stations, raw and treated water pipelines, treatment plant and costs, and mitigation. (Note: Under alternative Trans-Texas environmental criteria, the yield increases to 106,100 acft/yr and the unit costs decrease to $734 per acft.)

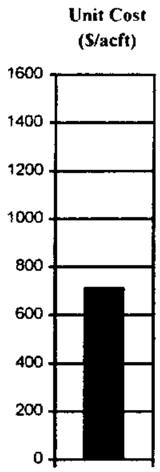
[2]**QUANTITY OF WATER:** Water availability from the San Antonio and Guadalupe Rivers and diversion pipeline sizes; instream flow requirements, Edwards Aquifer pumpage levels, and quantities of return flows needed in the San Antonio and Guadalupe Rivers to meet downstream water rights. Project was originally evaluated using the Trans-Texas environmental criteria which has recently been revised. Latest environmental criteria would result in increase in firm yield of Cibolo Reservoir and reduction in unit costs.

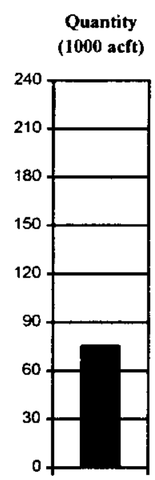
[3]**LAND IMPACTED:** Reservoir site size, and sites for pipelines, pump stations, and water treatment plant.

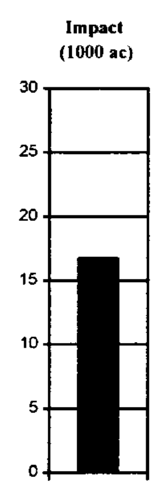
ENVIRONMENTAL ISSUES: Inundation of 18 miles of stream channel, much of which is bottomland hardwoods and riparian communities. Habitat mitigation has been estimated at 28,958 acres.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Quantity of instream flow requirements, habitat mitigation, and technical factors affecting use of San Antonio River water via storage in Cibolo Reservoir.

ADDITIONAL FACTORS: Ability to obtain permits to move water from the Guadalupe River Basin to the San Antonio area. Additional studies considering water quality issues need to be undertaken for this option.







OPTION NUMBER: **S-15Da**

OPTION NAME: **Cibolo Reservoir With Imported Water From the San Antonio River near Floresville**

OPTION DESCRIPTION: *The firm yield of the proposed Cibolo Reservoir located in Wilson County would be supplemented with water diverted from the San Antonio River near Floresville via a 72-inch diameter pipeline, and then diverted to the south water treatment plant and then to the municipal distribution system.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	**$712**	**per acft**[1]
QUANTITY OF WATER:	**75,600**	**acft/yr**[2]
LAND IMPACTED:	**16,746**	**acres**[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	**51**	**of**	**106**	(1=lowest unit)
QUANTITY OF WATER:	**29**	**of**	**106**	(1=highest volume)
LAND IMPACTED:	**91**	**of**	**106**	(1=least acreage)

<u>FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED</u>

[1]**COST:** Dam and reservoir, intake and pump station at the reservoir, San Antonio River intake and pump station, raw and treated water pipelines, treatment plant and treatment costs, and mitigation. (Note: Under alternative Trans-Texas environmental criteria, the yield increases to 80,600 acft/yr and the unit costs decrease to $691 per acft.)

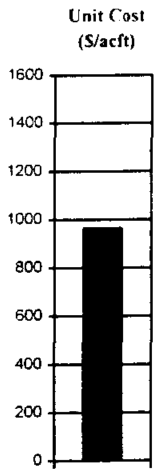
[2]**QUANTITY OF WATER:** Reclaimed water availability from the San Antonio River and diversion pipeline size, instream flow requirements, Edwards Aquifer pumpage levels, and quantities of return flows needed in the San Antonio River to meet downstream water rights. Project was originally evaluated using the Trans-Texas environmental criteria which has recently been revised. Latest environmental criteria would result in increase in firm yield of Cibolo Reservoir and reduction in unit costs.

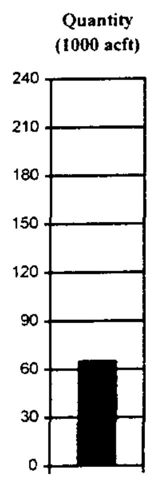
[3]**LAND IMPACTED:** Reservoir site size, and sites for pipelines, pump stations, and water treatment plant.

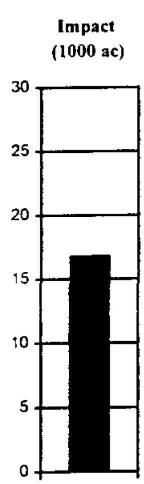
ENVIRONMENTAL ISSUES: Inundation of 18 miles of stream channel, much of which is lined with bottomland hardwoods and riparian communities. Habitat mitigation has been estimated at 28,958 acres.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Instream flow requirements, habitat mitigation, and technical factors affecting use of San Antonio River water via storage in Cibolo Reservoir.

ADDITIONAL FACTORS: Additional studies considering water quality issues need to be undertaken for this option.







OPTION NUMBER: S-15Ea

OPTION NAME: Cibolo Reservoir with Imported Water from the Guadalupe River at the Salt Water Barrier

OPTION DESCRIPTION: *The firm yield of Cibolo Reservoir located in Wilson County would be supplemented with unappropriated water from the Guadalupe River at the Saltwater Barrier via a 60-inch diameter pipeline and then diverted to the south water treatment plant and then to the municipal distribution system.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$965	per acft[1]
QUANTITY OF WATER:	65,100	acft/yr[2]
LAND IMPACTED:	16,779	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	82	of	106	(1=lowest unit)
QUANTITY OF WATER:	41	of	106	(1=highest volume)
LAND IMPACTED:	92	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Dam and reservoir, intakes and pump stations, raw water pipelines, Guadalupe River intake and pump station, water treatment plant, treatment costs and mitigation.

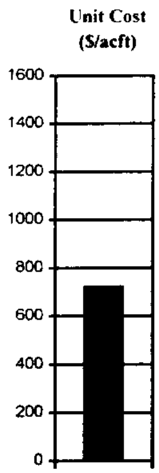
[2]**QUANTITY OF WATER:** Water availability from the San Antonio and Guadalupe Rivers, including quantity of unappropriated water at the Salt Water Barrier.

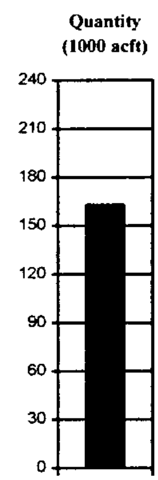
[3]**LAND IMPACTED:** Reservoir site size and sites for pipelines and pump stations.

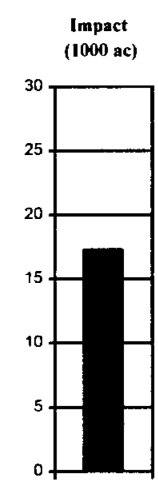
ENVIRONMENTAL ISSUES: Inundation of 18 miles of stream channel, much of which is lined with bottomland hardwoods, and riparian communities. Habitat mitigation has been estimated at 28,958 acres.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Quantity of instream flow and bay and estuary requirements, habitat mitigation, and quantity of unappropriated flows of the Guadalupe River.

ADDITIONAL FACTORS: Ability to obtain permits to move water from the Guadalupe River Basin to the San Antonio area.







OPTION NUMBER: S-15Dc

OPTION NAME: Cibolo Reservoir with Imported Water from the San Antonio River near Floresville, the Guadalupe River at Cuero and the Colorado River near Columbus

OPTION DESCRIPTION: *The firm yield of Cibolo Reservoir located in Wilson County would be supplemented with water diverted from the San Antonio River near Floresville via a 72-inch diameter pipeline, from the Guadalupe River at Cuero via an 84-inch diameter pipeline, and from the Colorado River near Columbus via a 96-inch diameter pipeline, and then diverted to the south water treatment plant and then to the municipal distribution system.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$723	per acft[1]
QUANTITY OF WATER:	162,900	acft/yr[2]
LAND IMPACTED:	17,272	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	53	of	106	(1=lowest unit)
QUANTITY OF WATER:	12	of	106	(1=highest volume)
LAND IMPACTED:	96	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Dam and reservoir, intakes and pump stations at the reservoir, San Antonio, Guadalupe, and Colorado Rivers intakes and pump stations, raw and treated water pipelines, treatment plant and treatment costs, and mitigation.

[2]**QUANTITY OF WATER:** Water availability from the San Antonio, Guadalupe and Colorado Rivers and diversion pipeline sizes; instream flow requirements, Edwards Aquifer pumpage levels, and quantities of return flows in the San Antonio, Guadalupe and Colorado Rivers to meet downstream water rights.

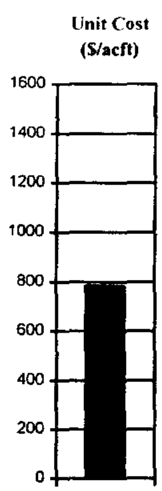
[3]**LAND IMPACTED:** Reservoir site size, and sites for pipelines, pump stations, and water treatment plant.

ENVIRONMENTAL ISSUES: Inundation of 18 miles of stream channel, much of which is lined with bottomland hardwoods and riparian communities. Habitat mitigation has been estimated at 28,958 acres.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Quantity of instream flow requirements, habitat mitigation, and technical factors (e.g. water quality) affecting use of San Antonio River water via storage in Cibolo Reservoir.

ADDITIONAL FACTORS: Ability to obtain permits to move water from the Guadalupe Basin to the San Antonio area.

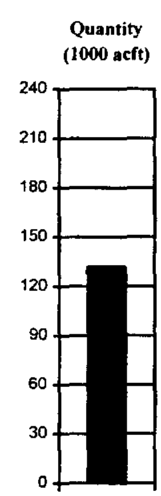
WEST CENTRAL TRANS-TEXAS WATER SUPPLY OPTIONS
OPTION DATA SHEET



OPTION NUMBER: S-15Eb
OPTION NAME: Cibolo Reservoir with Imported Water from the Guadalupe River at the Salt Water Barrier and the Colorado River below Garwood

OPTION DESCRIPTION: *The firm yield of Cibolo Reservoir located in Wilson County would be supplemented with unappropriated water from the Guadalupe River at the Saltwater Barrier via a 60-inch diameter pipeline and then diverted to the south water treatment plant and then to the municipal distribution system.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.



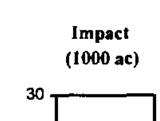
COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$786	per acft[1]
QUANTITY OF WATER:	132,000	acft/yr[2]
LAND IMPACTED:	17,366	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	66	of	106	(1=lowest unit)
QUANTITY OF WATER:	15	of	106	(1=highest volume)
LAND IMPACTED:	97	of	106	(1=least acreage)

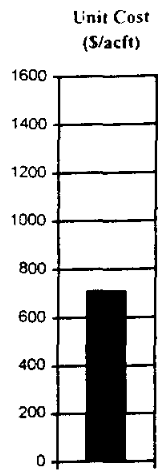
FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

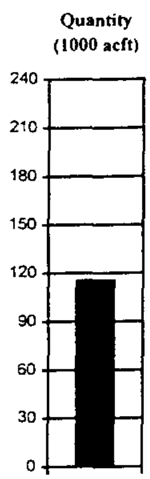
[1]**COST:** Dam and reservoir, intakes and pump stations, raw water pipelines, Guadalupe and Colorado Rivers intakes and pump stations, water treatment plant, treatment costs and mitigation.

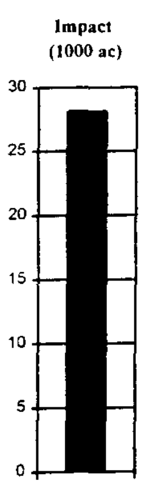
[2]**QUANTITY OF WATER:** Water availability in the San Antonio, Guadalupe and Colorado Rivers, including quantity of unappropriated water in the Guadalupe and Colorado Rivers.



[3]**LAND IMPACTED:** Reservoir site size and sites for pipelines and pump stations.







OPTION NUMBER: S-16A
OPTION NAME: Goliad Reservoir--Divert and Inject to Edwards Aquifer

OPTION DESCRIPTION: *Reservoir located on the San Antonio River eight miles west of Goliad, with firm yield diverted to a water treatment plant and then to Edwards Aquifer injection wells in eastern Medina County.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☐ 5-15 yrs. ☒ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$709	per acft[1]
QUANTITY OF WATER:	115,500	acft/yr[2]
LAND IMPACTED:	28,147	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	49	of	106	(1=lowest unit)
QUANTITY OF WATER:	18	of	106	(1=highest volume)
LAND IMPACTED:	102	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Dam and reservoir, intake, pump station, raw water pipeline, booster pump station and pumps, water treatment plant, finished water pump station, transmission line to well field, injection well field, and mitigation.

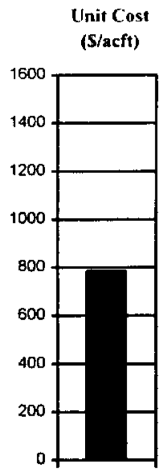
[2]**QUANTITY OF WATER:** Edwards Aquifer pumpage level, instream flow needs, quantities of wastewater return flows, and bay and estuary freshwater requirements. Project was originally evaluated using the Trans-Texas environmental criteria which has recently been revised. Latest criteria would result in increase in firm yield of Goliad Reservoir and reduction in unit costs.

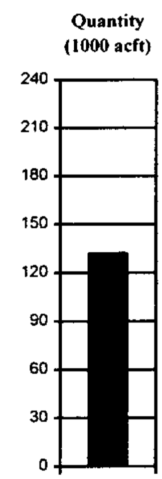
[3]**LAND IMPACTED:** Size of reservoir site, sites for pipelines, pump stations, water treatment plant, injection well fields, and habitat mitigation requirements.

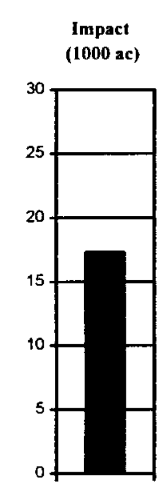
ENVIRONMENTAL ISSUES: Instream flows, elevated nutrient levels of reservoir yield, inundation of 43 miles of stream channel, and more than 28,000 acres of land.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Public perceptions and support for injection of treated Goliad water into the Edwards Aquifer.

ADDITIONAL FACTORS: A portion of the site has been placed on the National Register of Historic Places.







OPTION NUMBER: S-15Eb

OPTION NAME: Cibolo Reservoir with Imported Water from the Guadalupe River at the Salt Water Barrier and the Colorado River below Garwood

OPTION DESCRIPTION: *The firm yield of Cibolo Reservoir located in Wilson County would be supplemented with unappropriated water from the Guadalupe River at the Saltwater Barrier via a 60-inch diameter pipeline and then diverted to the south water treatment plant and then to the municipal distribution system.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	**$786**	**per acft**[1]
QUANTITY OF WATER:	**132,000**	**acft/yr**[2]
LAND IMPACTED:	**17,366**	**acres**[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	**66**	**of**	**106**	(1=lowest unit)
QUANTITY OF WATER:	**15**	**of**	**106**	(1=highest volume)
LAND IMPACTED:	**97**	**of**	**106**	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Dam and reservoir, intakes and pump stations, raw water pipelines, Guadalupe and Colorado Rivers intakes and pump stations, water treatment plant, treatment costs and mitigation.

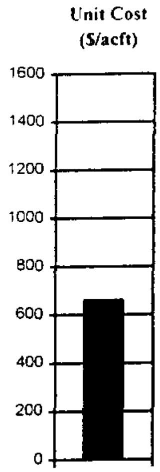
[2]**QUANTITY OF WATER:** Water availability in the San Antonio, Guadalupe and Colorado Rivers, including quantity of unappropriated water in the Guadalupe and Colorado Rivers.

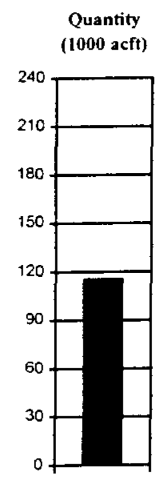
[3]**LAND IMPACTED:** Reservoir site size and sites for pipelines and pump stations.

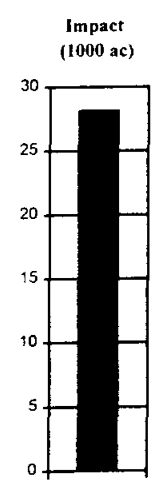
ENVIRONMENTAL ISSUES: Inundation of 18 miles of stream channel, much of which is lined with bottomland hardwoods, and riparian communities. Habitat mitigation has been estimated at 28,958 acres.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Quantity of instream flow and bay and estuary requirements, habitat mitigation, and quantity of unappropriated flows of the Guadalupe and Colorado Rivers.

ADDITIONAL FACTORS: Ability to obtain permits to move water from the Guadalupe and Colorado River Basins to the San Antonio area.







OPTION NUMBER: S-16C
OPTION NAME: Goliad Reservoir--Divert to Water Treatment Plant and then to Municipal Distribution System

OPTION DESCRIPTION: *Reservoir located on the San Antonio River eight miles west of Goliad, with firm yield diverted to the south water treatment plant, and then to the municipal distribution system.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☐ 5-15 yrs. ☒ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$662	per acft[1]
QUANTITY OF WATER:	115,500	acft/yr[2]
LAND IMPACTED:	28,147	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	43	of	106	(1=lowest unit)
QUANTITY OF WATER:	20	of	106	(1=highest volume)
LAND IMPACTED:	101	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Dam and reservoir, intake and pump station, raw water pipeline, booster pump station and pumps, water treatment plant, finished water line to distribution system, and mitigation.

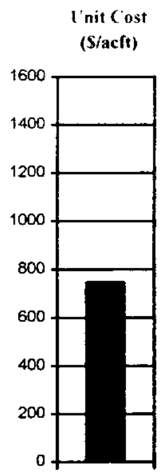
[2]**QUANTITY OF WATER:** Edwards Aquifer pumpage level, instream flow needs, quantities of wastewater return flows, and bay and estuary freshwater requirements. Project was originally evaluated using the Trans-Texas environmental criteria which has recently been revised. Latest criteria would result in increase in firm yield of Goliad Reservoir and reduction in unit costs.

[3]**LAND IMPACTED:** Size of reservoir site, sites for pipelines, pump stations, water treatment plant, size of recharge sites, and habitat mitigation.

ENVIRONMENTAL ISSUES: Instream flows, elevated nutrient levels of reservoir yield, inundation of 43 miles of stream channel, and more then 28,000 acres of land.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Public perceptions and support for use of treated water from Goliad Reservoir.

ADDITIONAL FACTORS: A portion of the site has been placed on the National Register of Historic Places.



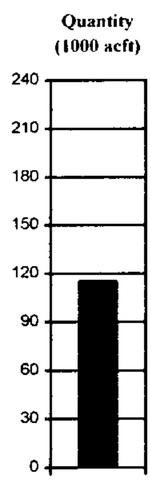
OPTION NUMBER: S-16B

OPTION NAME: Goliad Reservoir--Divert to Edwards Aquifer Recharge Zone

OPTION DESCRIPTION: *Reservoir located on the San Antonio River eight miles west of Goliad with firm yield diverted to a water treatment plant and then to Edwards Aquifer recharge structures located in northern Bexar County.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☐ 5-15 yrs. ☒ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$748	per acft[1]
QUANTITY OF WATER:	115,500	acft/yr[2]
LAND IMPACTED:	28,147	acres[3]

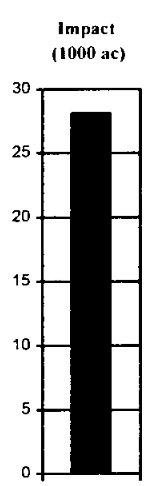


POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	57	of	106	(1=lowest unit)
QUANTITY OF WATER:	19	of	106	(1=highest volume)
LAND IMPACTED:	103	of	106	(1=least acreage)

<u>FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED</u>

[1]**COST:** Dam and reservoir, intake, pump station, raw water pipeline, booster pump station and pumps, water treatment plant, finished water line to recharge structures, and mitigation.

[2]**QUANTITY OF WATER:** Edwards Aquifer pumpage level, instream flow needs, quantities of wastewater return flows, and bay and estuary freshwater requirements. Project was originally evaluated using the Trans-Texas environmental criteria which has recently been revised. Latest criteria would result in increase in firm yield of Goliad Reservoir and reduction in unit costs.

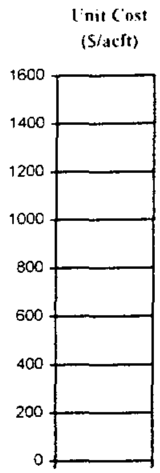


[3]**LAND IMPACTED:** Size of reservoir site, sites for pipelines, pump stations, water treatment plant, size of recharge sites, and habitat mitigation.

ENVIRONMENTAL ISSUES: Instream flows, elevated nutrient levels of reservoir yield, inundation of 43 miles of stream channel, and more then 28,000 acres of land.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Public perceptions and support for recharging the Edwards Aquifer with treated water from Goliad Reservoir.

ADDITIONAL FACTORS: A portion of the site has been placed on the National Register of Historic Places.



OPTION NUMBER: G-10

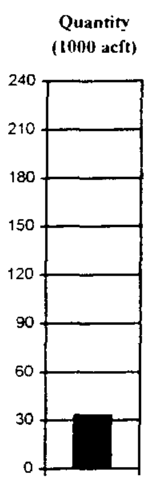
OPTION NAME: Guadalupe River Unappropriated Streamflow near Gonzales

OPTION DESCRIPTION: *Calculations of unappropriated streamflow under a range of drought conditions. Availability calculated under a range of Edwards pumping & hydropower subordination alternatives.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	N/A	per acft[1]
QUANTITY OF WATER:	33,200	acft/yr[2]
LAND IMPACTED:	N/A	acres[3]

POSITION RELATIVE TO ALL OPTIONS			
UNIT COST OF WATER:	N/A	of	(1=lowest unit)
QUANTITY OF WATER:	N/A	of	(1=highest volume)
LAND IMPACTED:	N/A	of	(1=least acreage)



<u>FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED</u>

[1]**COST:** Not computed.

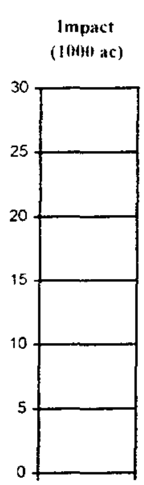
[2]**QUANTITY OF WATER:** With diversion rate of 1,000 cfs, Edwards Aquifer pumpage of 400,000 acft/yr and hydropower subordinated to 0 cfs at Lake Dunlap, unappropriated water for drought conditions would be 33,200 acft/yr, for average conditions would be 159,600 acft/yr, and would be 0 acft/yr for the minimum year.

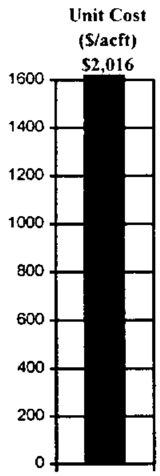
[3]**LAND IMPACTED:** Not Applicable.

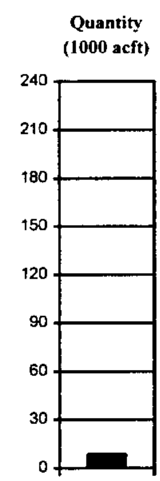
ENVIRONMENTAL ISSUES: Not Applicable.

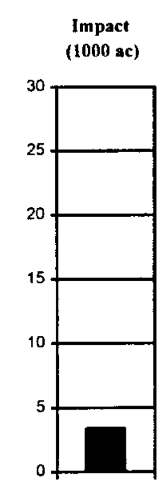
SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Not Applicable.

ADDITIONAL FACTORS: Not Applicable.









OPTION NUMBER: S-17

OPTION NAME: Upper Cibolo Creek Reservoir--Cost Analysis--Firm Yield

OPTION DESCRIPTION: *The Upper Cibolo Creek Reservoir near Bracken, Texas would be lined to hold water and used to store runoff from its own watershed, with water released to the Edwards Aquifer for natural recharge.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$2,016	per acft[1]
QUANTITY OF WATER:	8,700	acft/yr[2]
LAND IMPACTED:	3,400	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	102	of	106	(1=lowest unit)
QUANTITY OF WATER:	89	of	106	(1=highest volume)
LAND IMPACTED:	78	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Dam and reservoir, spillway, outlet works, sealing of the lake bed, environmental studies, mitigation, and relocations.

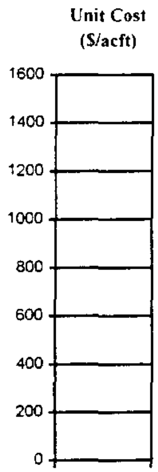
[2]**QUANTITY OF WATER:** Potential ability to help maintain Comal Spring flow so that Edwards Aquifer pumpage could be greater than would otherwise be possible. Possible to store water available from Canyon Lake and other sources.

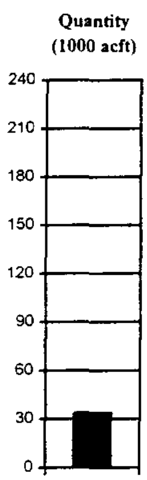
[3]**LAND IMPACTED:** Reservoir site size and habitat mitigation requirement.

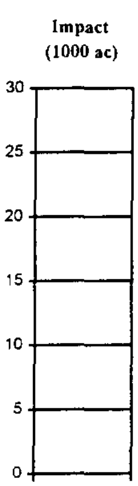
ENVIRONMENTAL ISSUES: Bracken Bat Cave and Natural Bridge Caverns are located nearby and might be affected. Some hardwoods in the project site, the potential to effect known and potentially additional caves.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of sealing the site to be able to hold water for controlled release to the Edwards Aquifer.

ADDITIONAL FACTORS: Being able to demonstrate technical operation possibilities, availability of unappropriated flows to be impounded, and availability of water form Canyon Lake and other sources.







OPTION NUMBER: G-12
OPTION NAME: Guadalupe River Unappropriated Streamflow at Salt Water Barrier

OPTION DESCRIPTION: *Calculations of unappropriated Guadalupe River streamflow at the Saltwater Barrier. Computations for a range of Edwards Aquifer pumpage levels and drought conditions.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	N/A	per acft[1]
QUANTITY OF WATER:	33,800	acft/yr[2]
LAND IMPACTED:	N/A	acres[3]

POSITION RELATIVE TO ALL OPTIONS			
UNIT COST OF WATER:	N/A	of	(1=lowest unit)
QUANTITY OF WATER:	N/A	of	(1=highest volume)
LAND IMPACTED:	N/A	of	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Not computed.

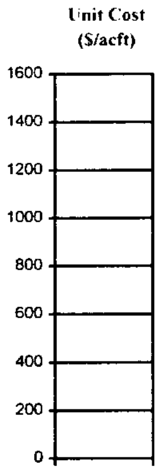
[2]**QUANTITY OF WATER:** With diversion rate of 1,000 cfs, Edwards Aquifer pumpage of 400,000 acft/yr, and hydropower subordinated to 0 cfs, unappropriated water for drought conditions would be 33,800 acft/yr, for average conditions would be 182,200 acft/yr, and for minimum year conditions would be 0 acft/yr.

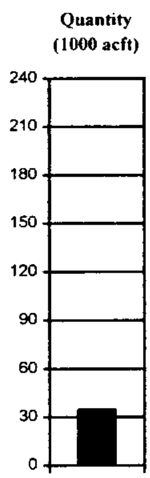
[3]**LAND IMPACTED:** Not Applicable.

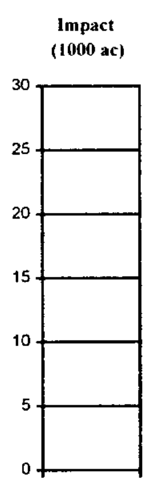
ENVIRONMENTAL ISSUES: Not Applicable.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Not Applicable.

ADDITIONAL FACTORS: Not Applicable.







OPTION NUMBER: G-11

OPTION NAME: Guadalupe River Unappropriated Streamflow near Cuero

OPTION DESCRIPTION: *Calculations of unappropriated Guadalupe River streamflow at location near Cuero. Computations for a range of Edwards Aquifer pumpage levels and drought conditions.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	**N/A**	**per acft**[1]
QUANTITY OF WATER:	**34,900**	**acft/yr**[2]
LAND IMPACTED:	**N/A**	**acres**[3]

POSITION RELATIVE TO ALL OPTIONS			
UNIT COST OF WATER:	**N/A**	**of**	(1=lowest unit)
QUANTITY OF WATER:	**N/A**	**of**	(1=highest volume)
LAND IMPACTED:	**N/A**	**of**	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Not computed.

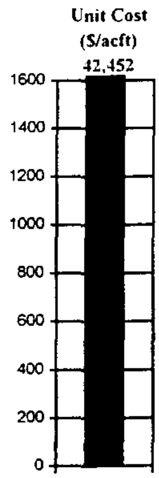
[2]**QUANTITY OF WATER:** With diversion rate of 1,000 cfs, Edwards Aquifer pumpage of 400,000 acft/yr, and hydropower subordinated to 0 cfs, unappropriated water for drought conditions would be 34,900 acft/yr, for average conditions would be 175,000 acft/yr, and would be 0 acft/yr for the minimum year.

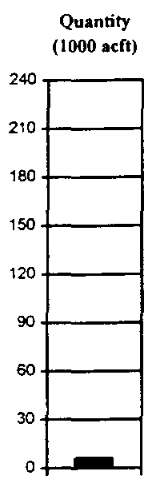
[3]**LAND IMPACTED:** Not Applicable.

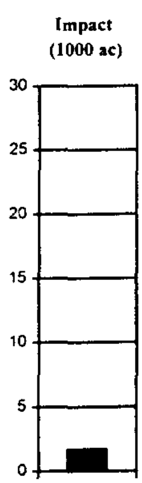
ENVIRONMENTAL ISSUES: Not Applicable.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Not Applicable.

ADDITIONAL FACTORS: Not Applicable.







OPTION NUMBER: G-13B

OPTION NAME: San Marcos River Diversion-- Unappropriated Flow below Blanco Confluence to Edwards Aquifer Recharge Zone

OPTION DESCRIPTION: *Divert unappropriated San Marcos River streamflow below the confluence with Blanco River to off-channel reservoir at a non-uniform rate and then to small recharge structures in northwestern Bexar County.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$2,452	per acft[1]
QUANTITY OF WATER:	6,600	acft/yr[2]
LAND IMPACTED:	1,702	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	103	of	106	(1=lowest unit)
QUANTITY OF WATER:	95	of	106	(1=highest volume)
LAND IMPACTED:	55	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Diversion intake, off-channel reservoir, raw water pipelines and pump stations, and aquifer recharge structures.

[2]**QUANTITY OF WATER:** Drought average for 1947-56. Edwards Aquifer pumpage, size of off-channel reservoir, diversion capacity, instream flow requirements, and downstream water rights. For average conditions, the quantity is 23,500 acft/yr.

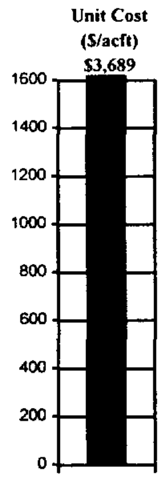
[3]**LAND IMPACTED:** Size of off-channel reservoir site, pipeline rights-of-way, and size of recharge sites.

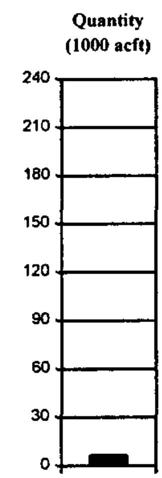
ENVIRONMENTAL ISSUES: All facilities could be located outside the areas of critical habitat for endangered species. Archeological surveys should be used to guide route selection for pipelines.

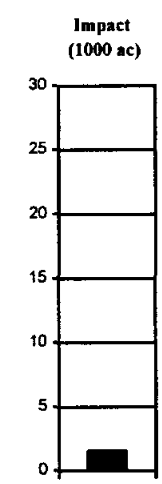
SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, water quality of the San Marcos River, and public acceptance of recharging the Edwards Aquifer with surface water.

ADDITIONAL FACTORS: Ability to obtain permits to divert San Marcos River unappropriated flows for purpose of Edwards Aquifer recharge.

WEST CENTRAL TRANS-TEXAS WATER SUPPLY OPTIONS
OPTION DATA SHEET







OPTION NUMBER: G-13A

OPTION NAME: San Marcos River Diversion--Unappropriated Flow below Blanco Confluence

OPTION DESCRIPTION: *Divert unappropriated San Marcos River streamflow below the confluence with Blanco River and pump at a non-uniform rate to off-channel reservoir and then to a water treatment plant and then to injection well field in eastern Medina County.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$3,689	per acft[1]
QUANTITY OF WATER:	6,600	acft/yr[2]
LAND IMPACTED:	1,579	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	105	of	106	(1=lowest unit)
QUANTITY OF WATER:	94	of	106	(1=highest volume)
LAND IMPACTED:	41	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Diversion intake, off-channel reservoir, raw water pipelines and pump stations, water treatment plant, treated water conveyance system, and injection wells.

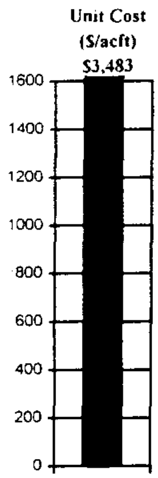
[2]**QUANTITY OF WATER:** Drought average for 1947-56. Edwards Aquifer pumpage, size of off-channel reservoir, diversion capacity, instream flow requirements, and downstream water rights. For average conditions, the quantity available is 23,500 acft/yr.

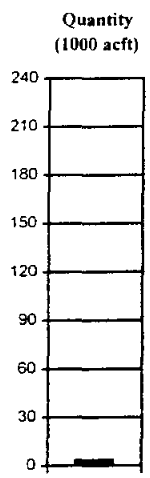
[3]**LAND IMPACTED:** Size of off-channel reservoir site, water treatment plant site, pipeline rights-of-way, and injection well field size.

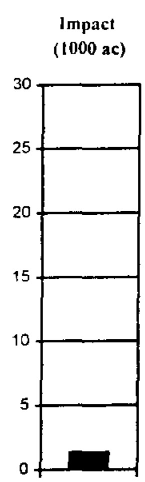
ENVIRONMENTAL ISSUES: All facilities could be located outside the areas of critical habitat for endangered species. Archeological surveys should be used to guide route selection for pipelines.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, water quality of the San Marcos River, and public acceptance of recharging the Edwards Aquifer with treated surface water.

ADDITIONAL FACTORS: Ability to obtain permits to divert San Marcos River unappropriated flows for purpose of Edwards Aquifer recharge.







OPTION NUMBER: G-14B

OPTION NAME: Guadalupe River Diversion--Unappropriated Flow at Lake Dunlap to Edwards Aquifer Recharge Zone

OPTION DESCRIPTION: *Divert unappropriated Guadalupe River streamflow at Lake Dunlap to an off-channel reservoir, and then to small recharge structures in northwester Bexar County.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$3,483	per acft[1]
QUANTITY OF WATER:	3,500	acft/yr[2]
LAND IMPACTED:	1,351	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	104	of	106	(1=lowest unit)
QUANTITY OF WATER:	101	of	106	(1=highest volume)
LAND IMPACTED:	48	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** River intake and pump station, raw water pipelines, off-channel reservoir, reservoir intake and pump station, transmission line to recharge site, and aquifer recharge sites.

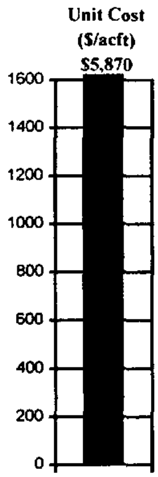
[2]**QUANTITY OF WATER:** Quantity is drought average for 1947-56. Level of Edwards Aquifer pumpage, hydropower requirements, instream flow requirements, and downstream water rights. For average conditions, the quantity is 12,300 acft/yr at a cost of $1,268 per acft. .

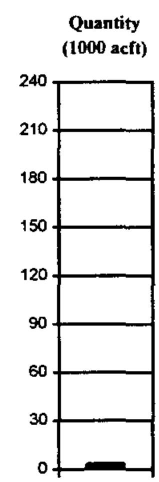
[3]**LAND IMPACTED:** Size of off-channel reservoir site, pipeline and water treatment plant site sizes, and size of injection well fields.

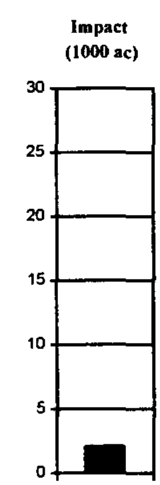
ENVIRONMENTAL ISSUES: All facilities could be located outside the areas of critical habitat for endangered species. Archeological surveys should be used to guide route selections.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, water quality of the Guadalupe River, and public acceptance of recharging the Edwards Aquifer with surface water.

ADDITIONAL FACTORS: Ability to obtain permits to divert unappropriated Guadalupe River water for purpose of Edwards Aquifer recharge.







OPTION NUMBER: G-14A

OPTION NAME: Guadalupe River Diversion-- Unappropriated Flow at Lake Dunlap; Inject to Edwards Aquifer

OPTION DESCRIPTION: *Divert unappropriated Guadalupe River streamflow at Lake Dunlap to an off-channel reservoir, then to a water treatment plant, and then to injection well field in eastern Medina County.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$5,870	per acft[1]
QUANTITY OF WATER:	3,500	acft/yr[2]
LAND IMPACTED:	2,102	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	106	of	106	(1=lowest unit)
QUANTITY OF WATER:	100	of	106	(1=highest volume)
LAND IMPACTED:	33	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** River intake and pump station, raw water pipelines, off-channel reservoir, reservoir intake and pump station, water treatment plant, finished water pump stations, transmission line to injection site, aquifer injection well field.

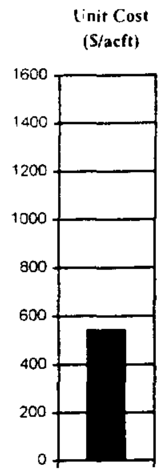
[2]**QUANTITY OF WATER:** Drought average for 1947-56. Level of Edwards Aquifer pumpage, hydropower requirements, instream flow requirements, and downstream water rights. For average conditions, the quantity is 12,300 acft/yr at a cost of $1,933 per acft.

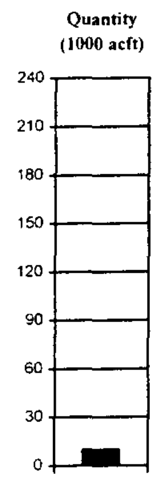
[3]**LAND IMPACTED:** Size of off-channel reservoir site, pipeline and water treatment plant site sizes, and size of injection well fields.

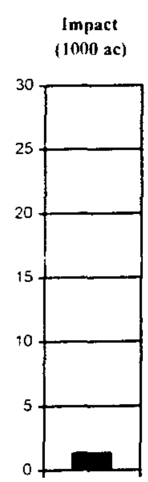
ENVIRONMENTAL ISSUES: All facilities could be located outside the areas of critical habitat for endangered species. Archeological surveys should be used to guide route selections for pipelines.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, water quality of the Guadalupe River, and public acceptance of recharging the Edwards Aquifer with treated surface water.

ADDITIONAL FACTORS: Ability to obtain permits to divert unappropriated Guadalupe River water for purpose of Edwards Aquifer recharge.







OPTION NUMBER: G-15B

OPTION NAME: Canyon Lake Water Released to Lake Dunlap--Divert to Aquifer Recharge Zone

OPTION DESCRIPTION: *Purchase 10,000 acft/yr uncommitted stored water from Canyon Lake and release to Lake Dunlap. Pump at a uniform rate from Lake Dunlap to recharge structures in northwestern Bexar County.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$543	per acft[1]
QUANTITY OF WATER:	10,000	acft/yr[2]
LAND IMPACTED:	1,351	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	32	of	106	(1=lowest unit)
QUANTITY OF WATER:	86	of	106	(1=highest volume)
LAND IMPACTED:	47	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Reservoir intake and pump station, raw water pipeline and pump station, pump station to recharge structures, and recharge structures.

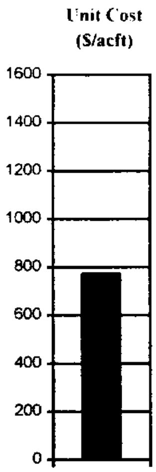
[2]**QUANTITY OF WATER:** Quantity of uncommitted Canyon Lake water available for sale.

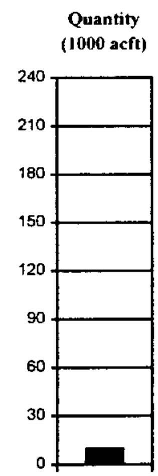
[3]**LAND IMPACTED:** Pipeline right-of-way, and size of recharge structures.

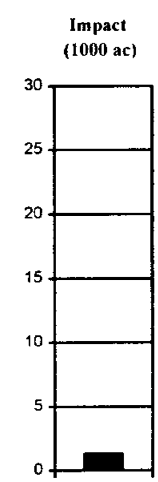
ENVIRONMENTAL ISSUES: Selection of pipeline routes to avoid habitats for endangered species, and cultural resources.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, and public acceptance of recharging the Edwards Aquifer with surface water.

ADDITIONAL FACTORS: Ability to obtain permits to use Canyon Lake water to recharge the Edwards Aquifer.







OPTION NUMBER: G-15A

OPTION NAME: Canyon Lake Water Released to Lake Dunlap--Divert and Inject to Aquifer

OPTION DESCRIPTION: *Purchase 10,000 acft/yr uncommitted stored water from Canyon Lake and release to Lake Dunlap. This would then be pumped at a uniform rate in a transmission line to a water treatment plant, and then to an injection well field in eastern Medina County. Prior to injection, water would be treated in a direct filtration water treatment plant.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$775	per acft[1]
QUANTITY OF WATER:	10,000	acft/yr[2]
LAND IMPACTED:	1,334	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	64	of	106	(1=lowest unit)
QUANTITY OF WATER:	85	of	106	(1=highest volume)
LAND IMPACTED:	32	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Reservoir intake and pump station, raw water pipeline and pump station, water treatment plant, finished water pipeline and pump station to injection well field, and aquifer injection well field.

[2]**QUANTITY OF WATER:** Quantity of uncommitted Canyon Lake water available for sale.

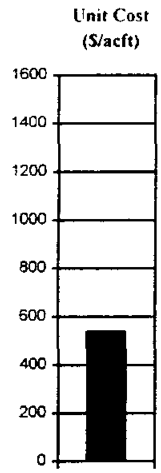
[3]**LAND IMPACTED:** Treatment plant site size, pipeline right-of-way, and size of area required for recharge structures.

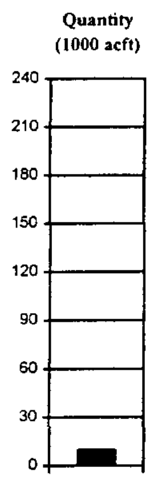
ENVIRONMENTAL ISSUES: Selection of pipeline routes to avoid habitats for endangered species, and cultural resources.

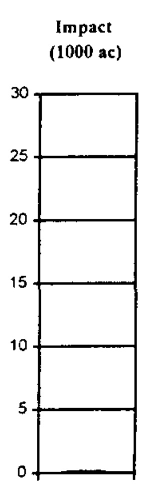
SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, and public acceptance of recharging the Edwards Aquifer with treated surface water.

ADDITIONAL FACTORS: Ability to obtain permits to use Canyon Lake water to recharge the Edwards Aquifer.

WEST CENTRAL TRANS-TEXAS WATER SUPPLY OPTIONS
OPTION DATA SHEET







OPTION NUMBER: G-15D
OPTION NAME: Canyon Lake Water Released to Lake Dunlap--Divert to Water Treatment Plant and then to Municipal Distribution System

OPTION DESCRIPTION: *Purchase 10,000 acft/yr uncommitted stored water from Canyon Lake and release to Lake Dunlap. Pump at a uniform rate from Lake Dunlap to north water treatment plant, and then to municipal distribution system.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$540	per acft[1]
QUANTITY OF WATER:	10,000	acft/yr[2]
LAND IMPACTED:	131	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	31	of	106	(1=lowest unit)
QUANTITY OF WATER:	87	of	106	(1=highest volume)
LAND IMPACTED:	23	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Reservoir intake and pump station, raw water pipeline and pump station, water treatment plant, finished water pipeline, pump station, and distribution system improvements.

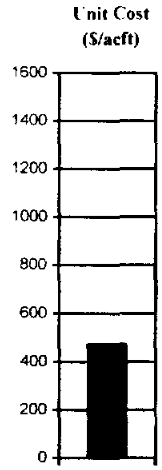
[2]**QUANTITY OF WATER:** Quantity of uncommitted Canyon Lake water available for sale.

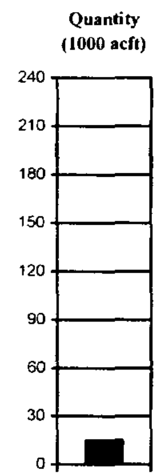
[3]**LAND IMPACTED:** Treatment plant site size, and pipeline right-of-way.

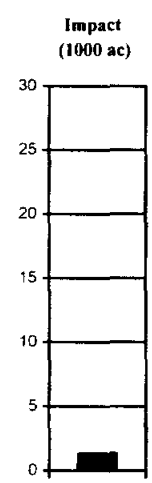
ENVIRONMENTAL ISSUES: Selection of pipeline routes to avoid habitats for endangered species and cultural resources.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water.

ADDITIONAL FACTORS: Ability to obtain permits to move Canyon Lake water to the San Antonio area.







OPTION NUMBER: G-15C

OPTION NAME: Canyon Lake Water Released to Lake Dunlap--Divert to Aquifer Recharge Zone

OPTION DESCRIPTION: *Purchase 15,000 acft/yr uncommitted stored water from Canyon Lake and release to Lake Dunlap. Pump at a uniform rate to small recharge structures in northwestern Bexar County.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	**$473**	**per acft**[1]
QUANTITY OF WATER:	**15,000**	**acft/yr**[2]
LAND IMPACTED:	**1,351**	**acres**[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	**23**	**of**	**106**	(1=lowest unit)
QUANTITY OF WATER:	**76**	**of**	**106**	(1=highest volume)
LAND IMPACTED:	**46**	**of**	**106**	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Reservoir intake and pump station, raw water pipeline and pump station, pipeline and pump station to recharge structures, and recharge structures.

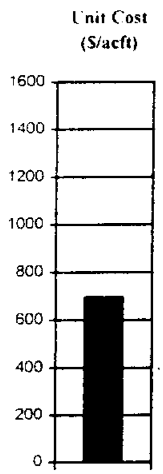
[2]**QUANTITY OF WATER:** Quantity of uncommitted Canyon Lake water available for sale.

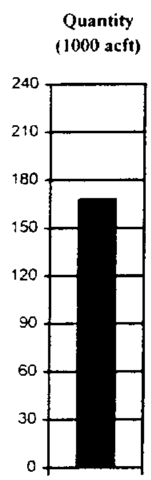
[3]**LAND IMPACTED:** Pipeline right-of-way, and size of recharge structures.

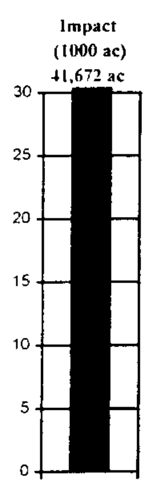
ENVIRONMENTAL ISSUES: Selection of pipeline routes to avoid habitats for endangered species, and cultural resources.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, and public acceptance of recharging the Edwards Aquifer with surface water.

ADDITIONAL FACTORS: Ability to obtain permits to use Canyon Lake water to recharge the Edwards Aquifer.







OPTION NUMBER: G-16A
OPTION NAME: Cuero Reservoir--Divert and Inject to Aquifer*

OPTION DESCRIPTION: *Firm yield of proposed Cuero Reservoir on Guadalupe River four miles north of Cuero, TX would be diverted and pumped at a uniform rate through transmission pipeline to a treatment plant and then to an injection well field in eastern Medina County. *Evaluated in 1994 using Trans-Texas Phase 1 environmental criteria, thus results are comparable to option G-16B, but not to G-16C1.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☐ 5-15 yrs. ☒ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$697	per acft[1]
QUANTITY OF WATER:	168,000	acft/yr[2]
LAND IMPACTED:	41,672	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	47	of	106	(1=lowest unit)
QUANTITY OF WATER:	10	of	106	(1=highest volume)
LAND IMPACTED:	105	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Dam and reservoir, intake and pump station, raw water pipeline and pump station, water treatment plant, finished water pipeline and pump station, injection well field, and mitigation

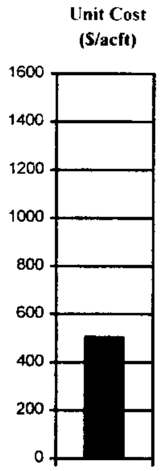
[2]**QUANTITY OF WATER:** . Level of Edwards Aquifer pumpage, instream flow requirements, and level of hydropower subordination.

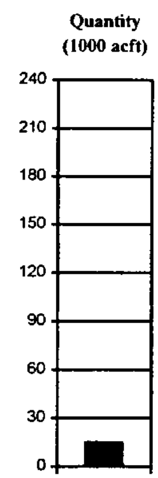
[3]**LAND IMPACTED:** Size of reservoir site, pipeline right-of-way, water treatment plant, injection well field, and mitigation.

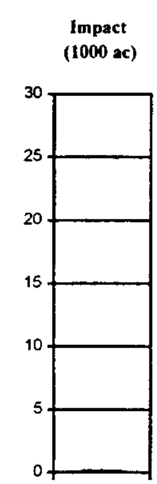
ENVIRONMENTAL ISSUES: Inundation of about 50 miles of Guadalupe River streambed, about 11,000 acres of wooded bottomland, 7,000 acres of brushland in the upland portion of the reservoir site, 6,700 acres of cropland, 2,400 acres of wetlands, and 14,000 acres of pastureland. Habitat for candidate species for protection, location of 82 possible significant historic resources and 357 archeological sites, and 7 cemeteries; streamflow below the dam would be modified, but sufficient flow to maintain bay and estuary sustenance would remain. In 1974, a large part of the site was nominated to the National Register of Historic Places and was accepted for review.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, environmental mitigation, and local reservoir area, economic and social impacts.

ADDITIONAL FACTORS: Ability to obtain permits to use surface water from the Cuero Reservoir to recharge the Edwards Aquifer.







OPTION NUMBER: G-15E

OPTION NAME: Canyon Lake Water Released to Lake Dunlap--Divert to Water Treatment Plant and then to Municipal Distribution System

OPTION DESCRIPTION: *Purchase 15,000 acft/yr uncommitted stored water from Canyon Lake and release to Lake Dunlap. Pump at a uniform rate from Lake Dunlap to north water treatment plant, and then to municipal distribution system.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$504	per acft[1]
QUANTITY OF WATER:	15,000	acft/yr[2]
LAND IMPACTED:	131	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	28	of	106	(1=lowest unit)
QUANTITY OF WATER:	77	of	106	(1=highest volume)
LAND IMPACTED:	22	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Reservoir intake and pump station, raw water pipeline and pump station, water treatment plant, finished water pipeline, pump station, and distribution system improvements.

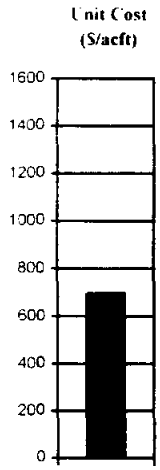
[2]**QUANTITY OF WATER:** Quantity of uncommitted Canyon Lake water available for sale.

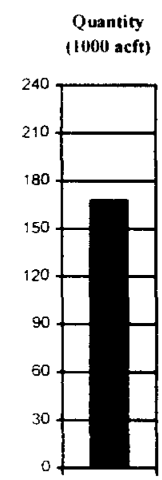
[3]**LAND IMPACTED:** Treatment plant site size, and pipeline right-of-way.

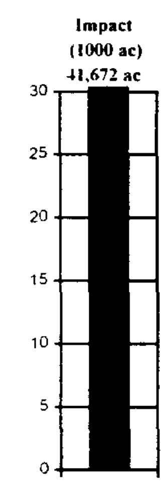
ENVIRONMENTAL ISSUES: Selection of pipeline routes to avoid habitats for endangered species and cultural resources.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water.

ADDITIONAL FACTORS: Ability to obtain permits to move Canyon Lake water to the San Antonio area.







OPTION NUMBER: G-16A

OPTION NAME: Cuero Reservoir--Divert and Inject to Aquifer*

OPTION DESCRIPTION: *Firm yield of proposed Cuero Reservoir on Guadalupe River four miles north of Cuero, TX would be diverted and pumped at a uniform rate through transmission pipeline to a treatment plant and then to an injection well field in eastern Medina County. *Evaluated in 1994 using Trans-Texas Phase 1 environmental criteria, thus results are comparable to option G-16B, but not to G-16C1.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☐ 5-15 yrs. ☒ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$697	per acft[1]
QUANTITY OF WATER:	168,000	acft/yr[2]
LAND IMPACTED:	41,672	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	47	of	106	(1=lowest unit)
QUANTITY OF WATER:	10	of	106	(1=highest volume)
LAND IMPACTED:	105	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Dam and reservoir, intake and pump station, raw water pipeline and pump station, water treatment plant, finished water pipeline and pump station, injection well field, and mitigation

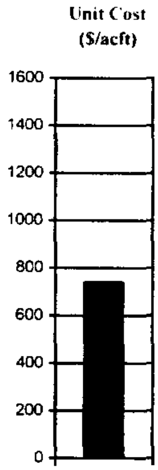
[2]**QUANTITY OF WATER:** . Level of Edwards Aquifer pumpage, instream flow requirements, and level of hydropower subordination.

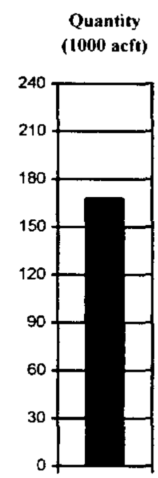
[3]**LAND IMPACTED:** Size of reservoir site, pipeline right-of-way, water treatment plant, injection well field, and mitigation.

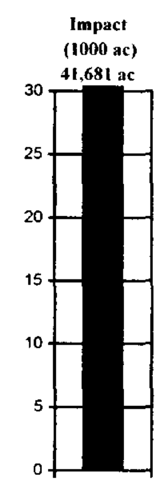
ENVIRONMENTAL ISSUES: Inundation of about 50 miles of Guadalupe River streambed, about 11,000 acres of wooded bottomland, 7,000 acres of brushland in the upland portion of the reservoir site, 6,700 acres of cropland, 2,400 acres of wetlands, and 14,000 acres of pastureland. Habitat for candidate species for protection, location of 82 possible significant historic resources and 357 archeological sites, and 7 cemeteries; streamflow below the dam would be modified, but sufficient flow to maintain bay and estuary sustenance would remain. In 1974, a large part of the site was nominated to the National Register of Historic Places and was accepted for review.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, environmental mitigation, and local reservoir area, economic and social impacts.

ADDITIONAL FACTORS: Ability to obtain permits to use surface water from the Cuero Reservoir to recharge the Edwards Aquifer.







OPTION NUMBER: G-16B

OPTION NAME: Cuero Reservoir--Divert to Edwards Aquifer Recharge Zone*

OPTION DESCRIPTION: *Firm yield of proposed Cuero Reservoir on Guadalupe River four miles north of Cuero, TX would be diverted and pumped at a uniform rate through transmission pipeline to a treatment plant and then to recharge structures in northwestern Bexar County. *Evaluated in 1994 using Trans-Texas Phase 1 environmental criteria, thus results are comparable to option G-16A, but not to G-16C1.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☐ 5-15 yrs. ☒ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$740	per acft[1]
QUANTITY OF WATER:	168,000	acft/yr[2]
LAND IMPACTED:	41,681	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	56	of	106	(1=lowest unit)
QUANTITY OF WATER:	11	of	106	(1=highest volume)
LAND IMPACTED:	106	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Dam and reservoir, intake and pump station, raw water pipeline and pump station, water treatment plant, finished water pipeline and pump station, injection well field, and mitigation

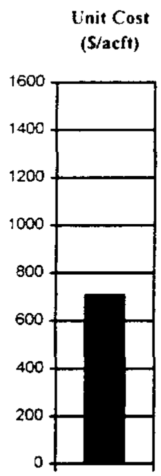
[2]**QUANTITY OF WATER:** Level of Edwards Aquifer pumpage, instream flow requirements, and level of hydropower subordination.

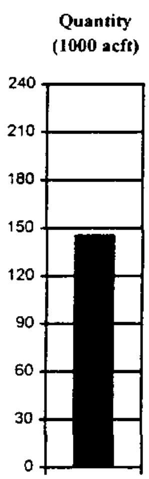
[3]**LAND IMPACTED:** Size of reservoir site, pipeline right-of-way, water treatment plant, recharge sites, and mitigation.

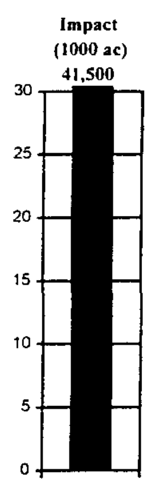
ENVIRONMENTAL ISSUES: Inundation of about 50 miles of Guadalupe River streambed, about 11,000 acres of wooded bottomland, 7,000 acres of brushland in the upland portion of the reservoir site, 6,700 acres of cropland, 2,400 acres of wetlands, and 14,000 acres of pastureland. Habitat for candidate species for protection, location of 82 possible significant historic resources and 357 archeological sites, and 7 cemeteries; streamflow below the dam would be modified, but sufficient flow to maintain bay and estuary sustenance would remain. In 1974, a large part of the site was nominated to the National Register of Historic Places and was accepted for review.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, environmental mitigation, and local reservoir area, economic and social impacts.

ADDITIONAL FACTORS: Ability to obtain permits to use surface water from the Cuero Reservoir to recharge the Edwards Aquifer.







OPTION NUMBER: G-16C1
OPTION NAME: Cuero Reservoir--Divert to Water Treatment Plant *

OPTION DESCRIPTION: *Firm yield of proposed Cuero Reservoir on Guadalupe River four miles north of Cuero, TX would be diverted and pumped through transmission pipeline to water treatment plant and pumped to the municipal distribution system. *Original option re-evaluated in 1998 using TWDB/TNRCC/TPWD consensus environmental criteria, thus results are not comparable to options G-16A and G-16B.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☐ 5-15 yrs. ☒ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$775	per acft[1]
QUANTITY OF WATER:	145,448	acft/yr[2]
LAND IMPACTED:	41,500	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	63	of	106	(1=lowest unit)
QUANTITY OF WATER:	14	of	106	(1=highest volume)
LAND IMPACTED:	104	of	106	(1=least acreage)

__FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED__

[1]**COST:** Dam and reservoir, intake and pump station, raw water pipeline and pump station, water treatment plant, finished water pipeline and pump station, and mitigation. Unit cost for raw water at the reservoir is $371/acft.

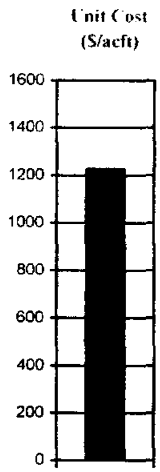
[2]**QUANTITY OF WATER:** Level of Edwards Aquifer pumpage, instream flow requirements, and level of hydropower subordination.

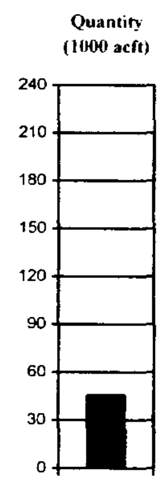
[3]**LAND IMPACTED:** Size of reservoir site, pipeline right-of-way, water treatment plant, and mitigation.

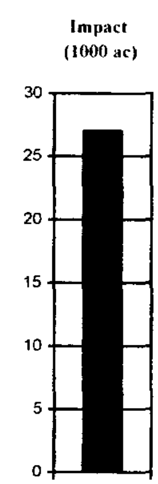
ENVIRONMENTAL ISSUES: Inundation of about 50 miles of Guadalupe River streambed, about 11,000 acres of wooded bottomland, 7,000 acres of brushland in the upland portion of the reservoir site, 6,700 acres of cropland, 2,400 acres of wetlands, and 14,000 acres of pastureland. Habitat for candidate species for protection, location of 82 possible significant historic resources and 357 archeological sites, and 7 cemeteries; streamflow below the dam would be modified, but sufficient flow to maintain bay and estuary sustenance would remain. In 1974, a large part of the site was nominated to the National Register of Historic Places and was accepted for review.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, environmental mitigation, and local reservoir area, economic and social impacts.

ADDITIONAL FACTORS: Ability to obtain permits to use surface water from the Cuero Reservoir.







OPTION NUMBER: G-17A

OPTION NAME: Sandies Reservoir--Divert and Inject to Aquifer*

OPTION DESCRIPTION: *Firm yield of proposed Sandies Reservoir on Sandies Creek, a tributary of the Guadalupe River in DeWitt and Gonzales Counties, would be diverted and pumped at a uniform rate through transmission pipeline to a treatment plant, and then to an injection well field in eastern Medina County. *Evaluated in 1994 using Trans-Texas Phase 1 environmental criteria, thus results are comparable to option G-17B, but not to G-17C1.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☐ 5-15 yrs. ☒ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	**$1,227**	**per acft[1]**
QUANTITY OF WATER:	**45,800**	**acft/yr[2]**
LAND IMPACTED:	**27,047**	**acres[3]**

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	**94**	**of**	**106**	(1=lowest unit)
QUANTITY OF WATER:	**52**	**of**	**106**	(1=highest volume)
LAND IMPACTED:	**99**	**of**	**106**	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Dam and reservoir, Guadalupe River diversion, pump station and pipeline, intake and pump station, raw water pipeline and pump station, water treatment plant, finished water pipeline and pump station, injection well field, and mitigation.

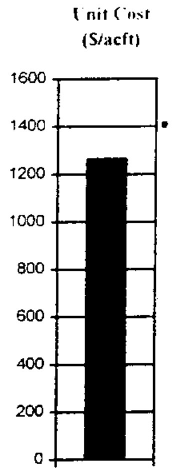
[2]**QUANTITY OF WATER:** Level of Edwards Aquifer pumpage, instream flow requirements, and level of hydropower subordination.

[3]**LAND IMPACTED:** Size of reservoir site, pipeline right-of-way, water treatment plant, injection well field, and mitigation.

ENVIRONMENTAL ISSUES: Inundation of about 30 miles of Sandies Creek streambed, about 5,383 acres of wooded bottomland, 8,409 acres of brushland in the upland portion of the reservoir site, 904 acres of cropland, 2,600 acres of wetlands, and 9,390 acres of pastureland. Habitat for candidate species for protection, and 3 cemeteries. Archeological and cultural resource surveys have not been conducted. Streamflow below the dam would be modified, but sufficient flow to maintain bay and estuary sustenance would remain.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, environmental mitigation, and local reservoir area, economic and social impacts.

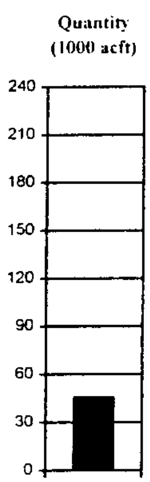
ADDITIONAL FACTORS: Ability to obtain permits to use surface water from Sandies Reservoir to recharge the Edwards Aquifer.



OPTION NUMBER: G-17B
OPTION NAME: Sandies Reservoir--Divert to Edwards Aquifer Recharge Zone*

OPTION DESCRIPTION: *Firm yield of proposed Sandies Reservoir on Sandies Creek, a tributary of the Guadalupe River in DeWitt and Gonzales Counties, would be diverted and pumped at a uniform rate through transmission pipeline to a treatment plant, and then to small recharge structures in northwestern Bexar County. *Evaluated in 1994 using Trans-Texas Phase 1 environmental criteria, thus results are comparable to option G-17A, but not to G-17C1.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☐ 5-15 yrs. ☒ > 15 yrs.



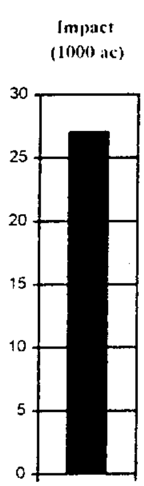
COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$1,266	per acft[1]
QUANTITY OF WATER:	45,800	acft/yr[2]
LAND IMPACTED:	27,056	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	96	of	106	(1=lowest unit)
QUANTITY OF WATER:	53	of	106	(1=highest volume)
LAND IMPACTED:	100	of	106	(1=least acreage)

<u>FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED</u>

[1]**COST:** Dam and reservoir, Guadalupe River diversion, pump station and pipeline, intake and pump station, raw water pipeline and pump station, water treatment plant, finished water pipeline and pump station to recharge zone, recharge structures, and mitigation.

[2]**QUANTITY OF WATER:** Level of Edwards Aquifer pumpage, instream flow requirements, and level of hydropower subordination.

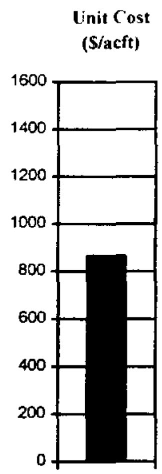


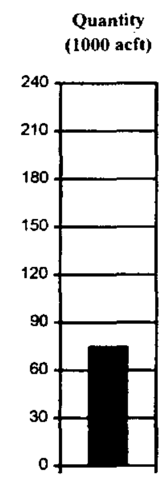
[3]**LAND IMPACTED:** Size of reservoir site, pipeline right-of-way, water treatment plant, and recharge structures, and mitigation.

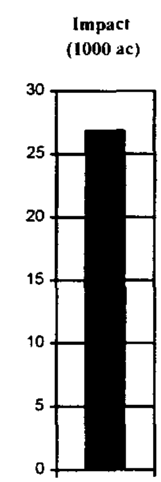
ENVIRONMENTAL ISSUES: Inundation of about 30 miles of Sandies Creek streambed, about 5,383 acres of wooded bottomland, 8,409 acres of brushland in the upland portion of the reservoir site, 904 acres of cropland, 2,600 acres of wetlands, and 9,390 acres of pastureland. Habitat for candidate species for protection, and 3 cemeteries. Archeological and cultural resource surveys have not been conducted. Streamflow below the dam would be modified, but sufficient flow to maintain bay and estuary sustenance would remain.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, environmental mitigation, and local reservoir area, economic and social impacts.

ADDITIONAL FACTORS: Ability to obtain permits to use surface water from Sandies Reservoir to recharge the Edwards Aquifer.







OPTION NUMBER: G-17C1

OPTION NAME: Sandies Reservoir--Divert to Water Treatment Plant and then to Municipal Distribution System*

OPTION DESCRIPTION: *Firm yield of proposed Sandies Reservoir on Sandies Creek, a tributary of the Guadalupe River in DeWitt and Gonzales Counties, would be diverted and pumped at a uniform rate through transmission pipeline to a treatment plant, and then to the municipal distribution system. *Original option re-evaluated in 1998 using TWDB/TNRCC/TPWD consensus environmental criteria, thus results are not comparable to options G-17A and G-17B.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☐ 5-15 yrs. ☒ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$827	per acft[1]
QUANTITY OF WATER:	74,741	acft/yr[2]
LAND IMPACTED:	26,875	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	70	of	106	(1=lowest unit)
QUANTITY OF WATER:	34	of	106	(1=highest volume)
LAND IMPACTED:	98	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Dam and reservoir, Guadalupe River diversion, pump station and pipeline, reservoir intake and pump station, raw water pipeline and pump station, water treatment plant, finished water pipeline and pump station to municipal distribution system, and mitigation. Unit cost for raw water at the reservioir is $366 per acft.

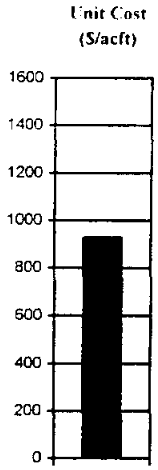
[2]**QUANTITY OF WATER:** Level of Edwards Aquifer pumpage, instream flow requirements, and level of hydropower subordination.

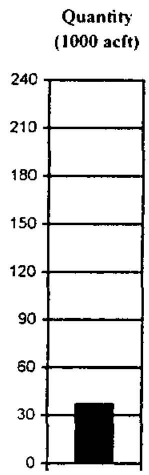
[3]**LAND IMPACTED:** Size of reservoir site, pipeline right-of-way, water treatment plant, distribution system improvements, and mitigation.

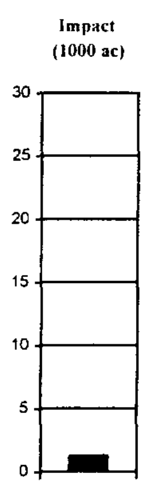
ENVIRONMENTAL ISSUES: Inundation of about 30 miles of Sandies Creek streambed, about 5,383 acres of wooded bottomland, 8,409 acres of brushland in the upland portion of the reservoir site, 904 acres of cropland, 2,600 acres of wetlands, and 9,390 acres of pastureland. Habitat for candidate species for protection, and 3 cemeteries. Archeological and cultural resource surveys have not been conducted. Streamflow below the dam would be modified, but sufficient flow to maintain bay and estuary sustenance would remain.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, environmental mitigation, and local reservoir area, economic and social impacts.

ADDITIONAL FACTORS: Ability to obtain permits to use surface water from Sandies Reservoir.







OPTION NUMBER: G-18A
OPTION NAME: McFaddin Reservoir - Buy Water Rights in Calhoun County and Divert and Inject to Edwards Aquifer

OPTION DESCRIPTION: *Firm yield of proposed McFaddin Reservoir (on Kuy and Dry Kuy Creeks, both of which are located within the San Antonio River Basin upstream of the San Antonio/Guadalupe confluence) supplemented with water from a small pool located near the salt water barrier under rights held by GBRA), would be diverted and pumped at a uniform rate through transmission pipeline to a treatment plant and then to injection well field in eastern Medina County.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$929	per acft[1]
QUANTITY OF WATER:	37,000	acft/yr[2]
LAND IMPACTED:	1,264	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	77	of	106	(1=lowest unit)
QUANTITY OF WATER:	60	of	106	(1=highest volume)
LAND IMPACTED:	69	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Salt Water Barrier diversion, intake and pump station, pipeline from river to reservoir, dam and reservoir, reservoir intake, and pump station, raw water pipeline and 3 pump stations to water treatment plant, water treatment plant, finished water pipeline and pump stations to aquifer injection well field, injection wells, and mitigation.

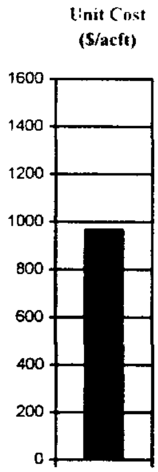
[2]**QUANTITY OF WATER:** Level of pumpage of Edwards Aquifer, instream flow requirements, and quantity of water available for sale.

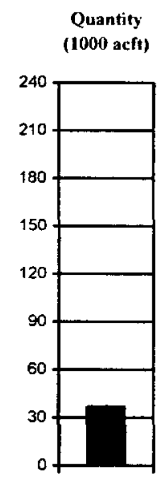
[3]**LAND IMPACTED:** Size of reservoir site, sites for water treatment plant and injection well field, and pipeline right-of-way.

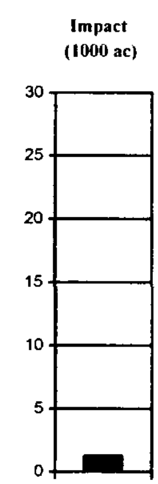
ENVIRONMENTAL ISSUES: Inundation of about 730 acres of pastureland, 340 acres of wetlands, and 165 acres of woodlands; the potential for habitat for threatened species to be affected, and potential for minor effects upon flows to the estuary.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, public acceptance of use of treated surface water from the reservoir to recharge the Edwards Aquifer, and mitigation requirements.

ADDITIONAL FACTORS: Ability to obtain permits to use water from the Salt Water Barrier for recharge of the Edwards Aquifer.







OPTION NUMBER: G-18B
OPTION NAME: McFaddin Reservoir -- Buy Water Rights in Calhoun County and Divert to Aquifer Recharge Zone

OPTION DESCRIPTION: *Firm yield of proposed McFaddin Reservoir (on Kuy and Dry Kuy Creeks, both off which are located within the San Antonio River Basin upstream of the San Antonio/Guadalupe confluence), supplemented with water diverted from a small pool located near the salt water barrier under rights held by GBRA), would be diverted at a uniform rate through transmission pipeline to a treatment plant and then to small recharge structures in northwestern Bexar County located over the recharge zone*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$968	per acft[1]
QUANTITY OF WATER:	37,000	acft/yr[2]
LAND IMPACTED:	1,264	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	83	of	106	(1=lowest unit)
QUANTITY OF WATER:	61	of	106	(1=highest volume)
LAND IMPACTED:	71	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Salt Water Barrier diversion, intake and pump station, pipeline from river to reservoir, dam and reservoir, reservoir intake, and pump station, raw water pipeline and 3 pump stations to water treatment plant, water treatment plant, finished water pipeline and pump stations to aquifer recharge structures, and mitigation.

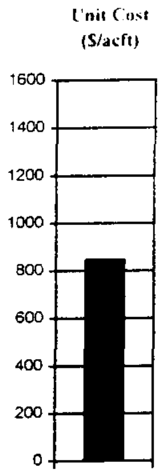
[2]**QUANTITY OF WATER:** Level of pumpage of Edwards Aquifer, instream flow requirements, and quantity of water available for sale.

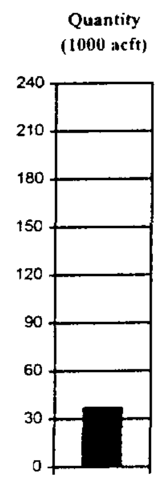
[3]**LAND IMPACTED:** Size of reservoir site, sites for water treatment plant and recharge site size, and pipeline right-of-way.

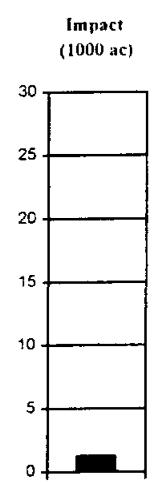
ENVIRONMENTAL ISSUES: Inundation of about 730 acres of pastureland, 340 acres of wetlands, and 165 acres of woodlands; the potential for habitat for threatened species to be affected, and potential for minor effects upon flows to the estuary.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, public acceptance of use of treated surface water from the reservoir to recharge the Edwards Aquifer, and mitigation requirements.

ADDITIONAL FACTORS: Ability to obtain permits to use water from the Salt Water Barrier for recharge of the Edwards Aquifer.







OPTION NUMBER: G-18C

OPTION NAME: McFaddin Reservoir -- Buy Water Rights in Calhoun County and Divert to Water Treatment Plant and then to SAWS Municipal Distribution System

OPTION DESCRIPTION: *Firm yield of proposed McFaddin Reservoir (on Kuy and Dry Kuy Creeks, both off which are located within the San Antonio River Basin upstream of the San Antonio/Guadalupe confluence) supplemented with water diverted from a small pool located near the salt water barrier under rights held by GBRA, would be diverted and pumped to a water treatment plant and then to municipal distribution system.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$847	per acft[1]
QUANTITY OF WATER:	37,000	acft/yr[2]
LAND IMPACTED:	1,264	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	73	of	106	(1=lowest unit)
QUANTITY OF WATER:	62	of	106	(1=highest volume)
LAND IMPACTED:	66	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Salt Water Barrier diversion, intake and pump station, pipeline from river to reservoir, dam and reservoir, reservoir intake, and pump station, raw water pipeline and 3 pump stations to water treatment plant, water treatment plant, finished water pipeline and pump stations to municipal distribution system, and mitigation.

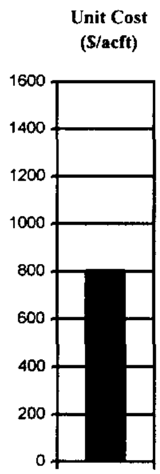
[2]**QUANTITY OF WATER:** Level of pumpage of Edwards Aquifer, instream flow requirements, and quantity of water available for sale.

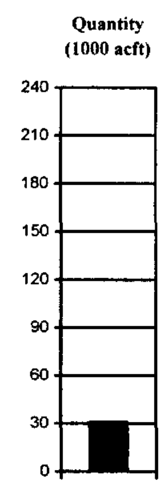
[3]**LAND IMPACTED:** Size of reservoir site, sites for water treatment plant, and pipeline right-of-way.

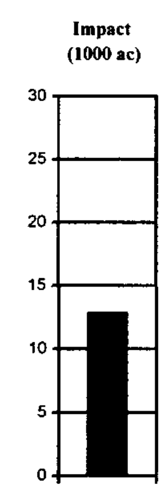
ENVIRONMENTAL ISSUES: Inundation of about 730 acres of pastureland, 340 acres of wetlands, and 165 acres of woodlands; the potential for habitat for threatened species to be affected, and potential for minor effects upon flows to the estuary.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, and mitigation requirements.

ADDITIONAL FACTORS: Ability to obtain permits to obtain water from the Salt Water Barrier.







OPTION NUMBER: G-19
OPTION NAME: Guadalupe River Dam 7--Raw Water at the Reservoir

OPTION DESCRIPTION: *Guadalupe River Dam 7 site is located near the center of Kendall County on the Guadalupe River upstream of Canyon Lake. The conservation storage capacity at elevation 1,242 ft-msl is 600,000 acft. Firm yield was computed using the TWDB/TNRCC/TPWD consensus environmental criteria, Edwards Aquifer pumpage of 400,000 acft/yr, full use of all water rights of the basin, full subordination of hydropower rights at Lake Dunlap, and a Canyon Lake firm yield of 78,600 acft/yr.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☐ 5-15 yrs. ☒ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED			
UNIT COST OF WATER:	$804	per acft[1]	(raw water at lake)
QUANTITY OF WATER:	30,927	acft/yr[2]	
LAND IMPACTED:	12,830	acres[3]	

POSITION RELATIVE TO ALL OPTIONS			
UNIT COST OF WATER:	N/A	of	(1=lowest unit)
QUANTITY OF WATER:	N/A	of	(1=highest volume)
LAND IMPACTED:	N/A	of	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Embankment and spillway, outlet works, land, relocations, reservoir clearing, diversion and care of water, grout curtain, environmental studies and mitigation, and engineering and legal services.

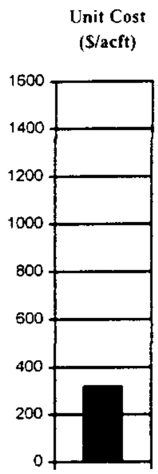
[2]**QUANTITY OF WATER:** Downstream water rights, including hydropower rights at Lake Dunlap, instream flow requirements, and Edwards Aquifer pumpage.

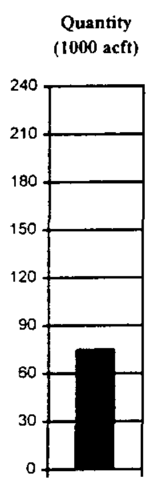
[3]**LAND IMPACTED:** Size of the reservoir site, and mitigation requirements.

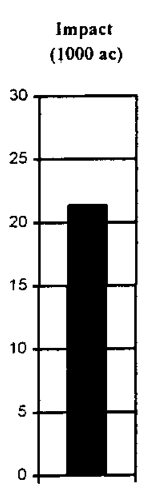
ENVIRONMENTAL ISSUES: Inundation of approximately 12,830 acres of land, including a 31-mile stretch of the Guadalupe River, and instream flow requirements. The land involved is 41 percent wooded and 43 percent brush and scrublands. The analyses were based upon consensus environmental criteria, which specifies conditions for storage and passthrough of flows to meet instream and bay and estuary needs.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, environmental mitigation, and local reservoir area, economic and social impacts.

ADDITIONAL FACTORS: Ability to obtain permits to develop the Reservoir.







OPTION NUMBER: G-20

OPTION NAME: Gonzales Reservoir--Raw Water at the Reservoir

OPTION DESCRIPTION: *The Gonzales Reservoir site is located on the San Marcos River in Gonzales County, about 5 miles upstream of the San Marcos/Guadalupe confluence. The drainage area is 1,344 square miles and the reservoir conservation storage capacity would be 560,000 acre-feet. Firm yield was computed using the TWDB/TNRCC/TPWD consensus environmental criteria, Edwards Aquifer pumpage of 400,000 acft/yr, full use of all water rights of the basin, full subordination of hydropower rights at Lake Dunlap, and a Canyon Lake firm yield of 78,600 acft/yr.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☐ 5-15 yrs. ☒ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$320	per acft[1]
QUANTITY OF WATER:	75,093	acft/yr[2]
LAND IMPACTED:	21,370	acres[3]

POSITION RELATIVE TO ALL OPTIONS			
UNIT COST OF WATER:	N/A	of	(1=lowest unit)
QUANTITY OF WATER:	N/A	of	(1=highest volume)
LAND IMPACTED:	N/A	of	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Embankment and spillway, outlet works, land, relocations, reservoir clearing, diversion and care of water, grout curtain, environmental studies and mitigation, and engineering and legal services.

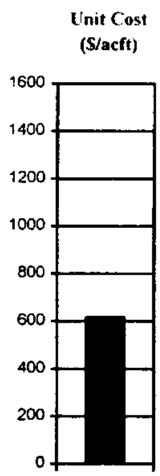
[2]**QUANTITY OF WATER:** Downstream water rights, including hydropower rights at Lake Dunlap, instream flow requirements, and Edwards Aquifer pumpage.

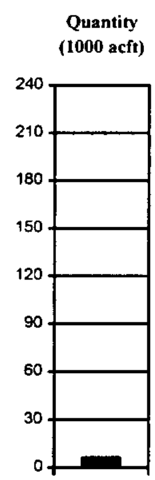
[3]**LAND IMPACTED:** Size of the reservoir site, and mitigation requirements.

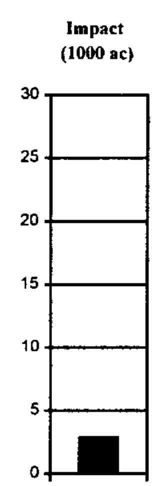
ENVIRONMENTAL ISSUES: Inundation of approximately 21,370 acres of land, including a 31-mile stretch of the San Marcos River, and instream flow requirements. The land involved is 9 percent wooded, 33 percent brush and scrublands, 54 percent cropland and grassland, and 3 percent wetlands. The analyses were based upon consensus environmental criteria, which specifies conditions for storage and passthrough of flows to meet instream and bay and estuary needs.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, environmental mitigation, and local reservoir area, economic and social impacts.

ADDITIONAL FACTORS: Ability to obtain permits to develop the reservoir.







OPTION NUMBER: G-21

OPTION NAME: Lockhart Reservoir--Raw Water at the Reservoir

OPTION DESCRIPTION: *Lockhart Reservoir site is located on Plum Creek, a tributary to the San Marcos River, north of Lockhart in Caldwell County. The site has a drainage area of 118 square miles; the proposed reservoir would have a conservation storage capacity of 50,000 acre-feet. Firm yield was computed using the TWDB/TNRCC/TPWD consensus environmental criteria, Edwards Aquifer pumpage of 400,000 acft/yr, full use of all water rights of the basin, full subordination of hydropower rights at Lake Dunlap, and a Canyon Lake firm yield of 78,600 acft/yr.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$618	per acft[1]
QUANTITY OF WATER:	6,339	acft/yr[2]
LAND IMPACTED:	2,910	acres[3]

POSITION RELATIVE TO ALL OPTIONS			
UNIT COST OF WATER:	N/A	of	(1=lowest unit)
QUANTITY OF WATER:	N/A	of	(1=highest volume)
LAND IMPACTED:	N/A	of	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Embankment and spillway, outlet works, land, relocations, reservoir clearing, diversion and care of water, grout curtain, environmental studies and mitigation, and engineering and legal services.

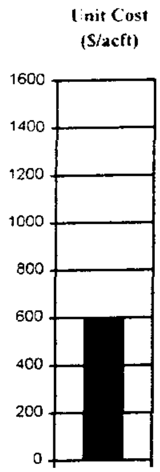
[2]**QUANTITY OF WATER:** Downstream water rights, including hydropower rights at Lake Dunlap, instream flow requirements, and Edwards Aquifer pumpage.

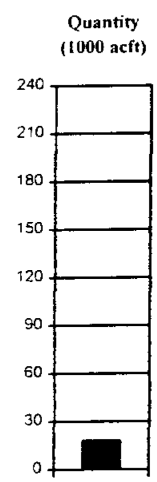
[3]**LAND IMPACTED:** Size of the reservoir site, and mitigation requirements.

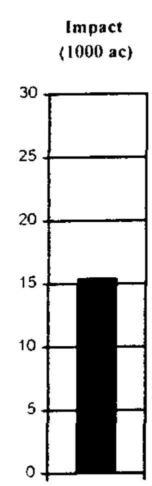
ENVIRONMENTAL ISSUES: Inundation of approximately 2,910 acres of land, including a 5-mile stretch of the Plum Creek, and instream flow requirements. The land involved is 4 percent wooded, 38 percent brush and scrubland, 30 percent cropland, and 25 percent grasses. The analyses were based upon consensus environmental criteria, which specifies conditions for storage and passthrough of flows to meet instream and bay and estuary needs.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, environmental mitigation, and local reservoir area, economic and social impacts.

ADDITIONAL FACTORS: Ability to obtain permits to develop the Reservoir.







OPTION NUMBER: G-22
OPTION NAME: Dilworth Reservoir--Raw Water at the Reservoir

OPTION DESCRIPTION: *Dilworth Reservoir site is located on Peach Creek, a tributary of the Guadalupe River, approximately 6 miles east of Gonzales in Gonzales County. The drainage area is 438 square miles; the reservoir conservation storage capacity would be 275,000 acre-feet. Firm yield was computed using the TWDB/TNRCC/TPWD consensus environmental criteria, Edwards Aquifer pumpage of 400,000 acft/yr, full use of all water rights of the basin, full subordination of hydropower rights at Lake Dunlap, and a Canyon Lake firm yield of 78,600 acft/yr.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☐ 5-15 yrs. ☒ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$590	per acft[1]
QUANTITY OF WATER:	18,195	acft/yr[2]
LAND IMPACTED:	15,400	acres[3]

POSITION RELATIVE TO ALL OPTIONS			
UNIT COST OF WATER:	N/A	of	(1=lowest unit)
QUANTITY OF WATER:	N/A	of	(1=highest volume)
LAND IMPACTED:	N/A	of	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Embankment and spillway, outlet works, land, relocations, reservoir clearing, diversion and care of water, grout curtain, environmental studies and mitigation, and engineering and legal services.

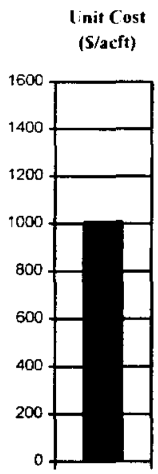
[2]**QUANTITY OF WATER:** Downstream water rights, including hydropower rights at Lake Dunlap, instream flow requirements, and Edwards Aquifer pumpage.

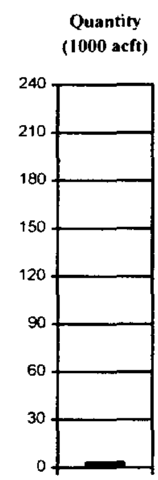
[3]**LAND IMPACTED:** Size of the reservoir site, and mitigation requirements.

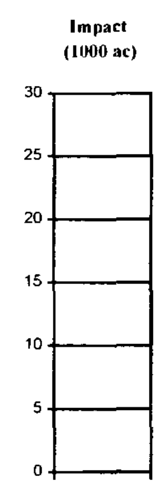
ENVIRONMENTAL ISSUES: Inundation of approximately 15,400 acres of land, including a 13-mile stretch of Peach Creek, a tributary to the Guadalupe River, and instream flow requirements. The land involved is 39 percent grass and cropland, 18 percent woodlands, 9 percent wetlands, and 32 percent brush and scrublands. The analyses were based upon consensus environmental criteria, which specifies conditions for storage and passthrough of flows to meet instream and bay and estuary needs.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, environmental mitigation, and local reservoir area, economic and social impacts.

ADDITIONAL FACTORS: Ability to obtain permits to develop the reservoir.







OPTION NUMBER: G-23A
OPTION NAME: Canyon Lake Area Water Supply--Areas Adjacent to Canyon Lake; 2020 Demands

OPTION DESCRIPTION: *A water treatment plant and treated water storage facilities located at Canyon Lake, with pipelines to convey treated water on a wholesale basis to the existing water supply systems around Canyon Lake.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$1,008	per acft[1]
QUANTITY OF WATER:	3,470	acft/yr[2]
LAND IMPACTED:	46	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	86	of	106	(1=lowest unit)
QUANTITY OF WATER:	102	of	106	(1=highest volume)
LAND IMPACTED:	10	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Reservoir intake and pump station, raw water pipeline to treatment plant, water treatment plant, elevated storage tank, finished water pipeline around the lake, finished water pump station, and interconnects to retail water utilities. Unit costs would be reduced to $963 per acft if constructed in conjunction with Option G-24.

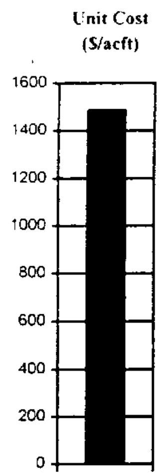
[2]**QUANTITY OF WATER:** Adequate quantities of firm yield are available in the lake to meet the projected quantities of this option.

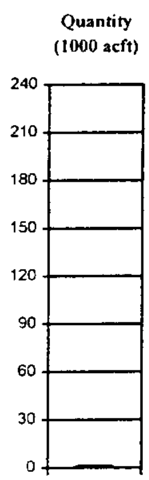
[3]**LAND IMPACTED:** Site for water treatment plant, storage tanks, and pipeline and pump station rights-of-way.

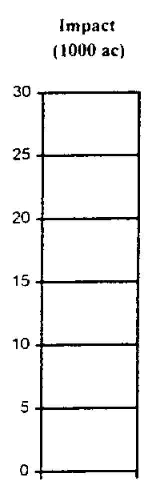
ENVIRONMENTAL ISSUES: Any resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes. Construction can be scheduled to avoid nesting schedules of any threatened or endangered species.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Local experience with declining yields of wells in the underlying Trinity Group of Aquifers is driving local residents to consider this option. Cost of water.

ADDITIONAL FACTORS: Recognition by Canyon Lake residents of the need to act in a timely manner.







OPTION NUMBER: G-23B
OPTION NAME: Canyon Lake Area Water Supply--Smithson Valley, Bulverde, and Oak Village North; 2020 Demands

OPTION DESCRIPTION: *A surface water intake would be constructed on the south side of Canyon Lake, and raw water would be pumped to a water treatment plant to be located within two miles of the lake. A treated water pipeline would be constructed along FM 3159 and FM 1863 to supply treated water on a wholesale basis to existing distribution systems of each community which are now supplied from wells drilled into the Trinity Group of Aquifers.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$1,487	per acft[1]
QUANTITY OF WATER:	1,280	acft/yr[2]
LAND IMPACTED:	16	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	99	of	106	(1=lowest unit)
QUANTITY OF WATER:	105	of	106	(1=highest volume)
LAND IMPACTED:	5	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Reservoir intake and pump station, raw water pipeline to treatment plant. water treatment plant, elevated storage tank, finished water pipeline to Smithson Valley, Bulverde, and Oak Village North, finished water pump station, and interconnects to retail water utilities.

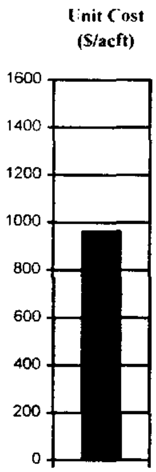
[2]**QUANTITY OF WATER:** Adequate quantities of firm yield are available in the lake to meet the projected quantities of this option.

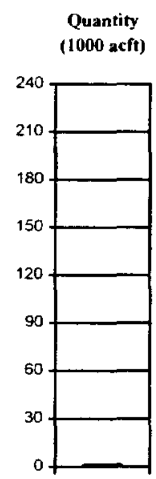
[3]**LAND IMPACTED:** Site for water treatment plant, storage tanks, and pipeline and pump station rights-of-way.

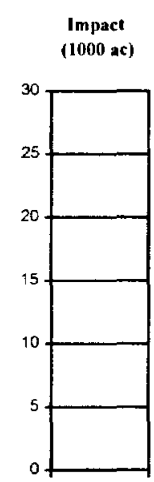
ENVIRONMENTAL ISSUES: Any resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes. Construction can be scheduled to avoid nesting schedules of any threatened or endangered species.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Local experience with declining yields of wells in the underlying Trinity Group of Aquifers is driving local residents to consider this option. Cost of water.

ADDITIONAL FACTORS: Recognition by Smithson Valley, Bulverde, and Oak Village North residents of the need to act in a timely manner.







OPTION NUMBER: G-24

OPTION NAME: Wimberley and Wood Creek Water Supply from Canyon Lake, Combined with Option G-23; 2020 Demands

OPTION DESCRIPTION: *The water treatment plant for option G-23 would be upsized to supply Smithson Valley, Bulverde, Oak Village North, Wimberley and Wood Creek at the projected 2020 demands, and a treated water pipeline would be constructed from the treatment plant a distance of approximately 12 miles north to the Wimberley and Wood Creek communities.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	**$963**	**per acft[1]**
QUANTITY OF WATER:	**1,424**	**acft/yr[2]**
LAND IMPACTED:	**40**	**acres[3]**

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	**80**	**of**	**106**	(1=lowest unit)
QUANTITY OF WATER:	**104**	**of**	**106**	(1=highest volume)
LAND IMPACTED:	**9**	**of**	**106**	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Reservoir intake and pump station, raw water pipeline to treatment plant, water treatment plant, elevated storage tank (shared with Smithson Valley, Bulverde, and Oak Village North, as appropriate), finished water pipeline to Wimberley and Wood Creek, finished water pump station, and interconnects to retail water utilities.

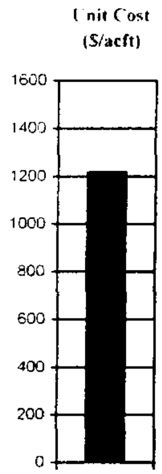
[2]**QUANTITY OF WATER:** Adequate quantities of firm yield are available in the lake to meet the projected quantities of this option.

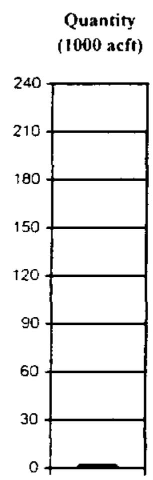
[3]**LAND IMPACTED:** Site for water treatment plant, storage tanks, and pipeline rights-of-way.

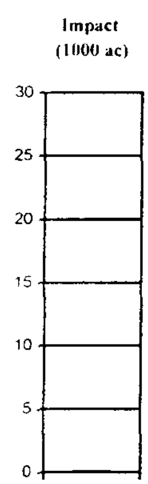
ENVIRONMENTAL ISSUES: Any resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes. Construction can be scheduled to avoid nesting schedules of any threatened or endangered species.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Local experience with declining yields of wells in the underlying Trinity Group of Aquifers is driving local residents to consider development of additional water supplies. Cost of water.

ADDITIONAL FACTORS: Recognition by Wimberley and Wood Creek residents of the need to act in a timely manner.







OPTION NUMBER: G-25

OPTION NAME: Northeast Hays and Northwest Caldwell Counties Water Supply from Near Lake Dunlap; 2020 Demands

OPTION DESCRIPTION: *A surface water treatment plant would be constructed alongside the Guadalupe River near Lake Dunlap and a treated water line would be constructed from the plant to northeast Hays and northwest Caldwell Counties, with wholesale delivery of treated water to 8 public water systems of the area, which presently depend wholly upon the Edwards Aquifer. The plant would be sized to meet projected 2020 demands that could not be met from the Edwards Aquifer. The source of water would be purchases of Canyon Lake water, which would be released into the Guadalupe River, and subsequently diverted at Lake Dunlap.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$1,220	per acft[1]
QUANTITY OF WATER:	1,920	acft/yr[2]
LAND IMPACTED:	52	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	93	of	106	(1=lowest unit)
QUANTITY OF WATER:	103	of	106	(1=highest volume)
LAND IMPACTED:	11	of	106	(1=least acreage)

__FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED__

[1]**COST:** Surface water intake and pump station, raw water pipeline to treatment plant, water treatment plant, finished water line and pump station, interconnects to retail water utilities, and treated water storage tank(s).

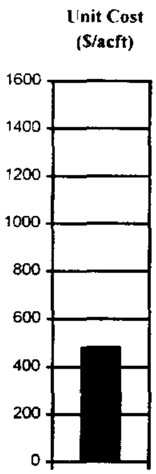
[2]**QUANTITY OF WATER:** Adequate quantities of firm yield are available in the lake to meet the projected quantities of this option.

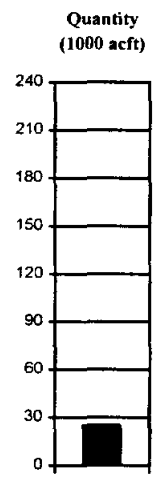
[3]**LAND IMPACTED:** Site for water treatment plant, storage tanks, and pipeline and pump station rights-of-way.

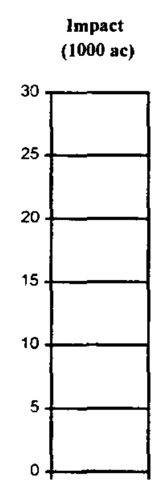
ENVIRONMENTAL ISSUES: Any resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes. Construction can be scheduled to avoid nesting schedules of any threatened or endangered species.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY : Cost of water, and the fact that Edwards Aquifer pumpage must be limited to levels which are less than present usage is driving all Edwards Aquifer users to implement water conservation programs, and/or develop supplemental supplies.

ADDITIONAL FACTORS: Recognition by entities to act in timely manner.







OPTION NUMBER: G-26
OPTION NAME: Mid-Cities (IH-35 and Highway 78 areas) Water Supply from near Lake Dunlap; 2020 Demands

OPTION DESCRIPTION: *A surface water treatment plant would be constructed alongside the Guadalupe River near Lake Dunlap and a treated water line would be constructed from the plant to the Mid-Cities area (Western Guadalupe and Eastern Bexar Counties), with wholesale delivery of treated water to benefit 14 or more public water systems of the area, most of which presently depend wholly upon the Edwards Aquifer. The plant would be sized to meet projected 2020 demands that could not be met from the Edwards Aquifer. The source of water would be purchases of Canyon Lake water, which would be released into the Guadalupe River, and subsequently diverted at Lake Dunlap.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	**$483**	**per acft[1]**
QUANTITY OF WATER:	**25,166**	**acft/yr[2]**
LAND IMPACTED:	**36**	**acres[3]**

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	**27**	**of**	**106**	(1=lowest unit)
QUANTITY OF WATER:	**72**	**of**	**106**	(1=highest volume)
LAND IMPACTED:	**7**	**of**	**106**	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Surface water intake and pump station, raw water pipeline to treatment plant, water treatment plant, finished water line and pump station, interconnects to retail water utilities, and treated water storage tank(s).

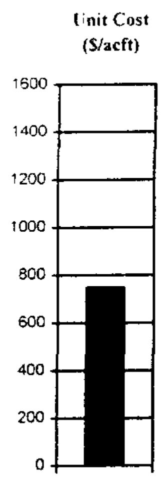
[2]**QUANTITY OF WATER:** Adequate quantities of firm yield are available in the lake to meet the projected quantities of this option.

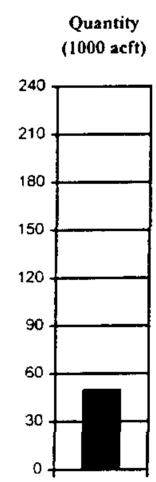
[3]**LAND IMPACTED:** Site for water treatment plant, storage tanks, and pipeline rights-of-way.

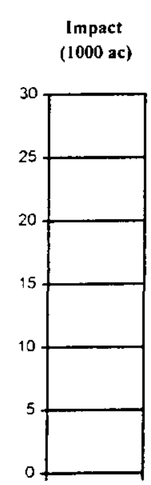
ENVIRONMENTAL ISSUES: Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes. Construction can be scheduled to avoid nesting schedules of any threatened or endangered species.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water.

ADDITIONAL FACTORS: Edwards Aquifer pumpage must be limited to levels which are less than present usage, therefore, all Edwards Aquifer users are being forced to implement water conservation programs, and/or develop supplemental supplies.







OPTION NUMBER: G-27

OPTION NAME: Guadalupe River Diversion Near Lake Dunlap to North WTP, with Transfer of Downstream Water Rights

OPTION DESCRIPTION: *Raw water would be diverted from the Guadalupe River near Lake Dunlap and piped to a water treatment plant located in the northern parts of the San Antonio Metropolitan area. The source of water would include stored water from Canyon Lake and downstream water rights whose point of diversion would be relocated to Lake Dunlap. Treated water would be put into the municipal distribution system, with transfers of Edwards pumping rights to project participants, as appropriate.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$749	per acft[1]
QUANTITY OF WATER:	49,785	acft/yr[2]
LAND IMPACTED:	34	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	58	of	106	(1=lowest unit)
QUANTITY OF WATER:	51	of	106	(1=highest volume)
LAND IMPACTED:	8	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Reservoir intake and pump station, raw pipeline and pump stations to water treatment plant, water treatment plant, finished water pump station and pipelines, and distribution system improvements. (Note: Unit costs are reduced to $588/acft and quantity of water increased to 78,600 acft/yr if Trans-Texas Flow Criteria are not applied to transferred rights.)

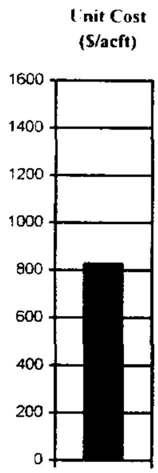
[2]**QUANTITY OF WATER:** Quantity of Canyon Lake yield remaining uncommitted to others, level of Edwards Aquifer pumpage, instream flow requirements, level of hydropower subordination, and quantity of downstream rights available for transfer.

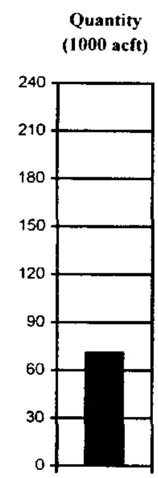
[3]**LAND IMPACTED:** Sizes of sites for water treatment plant and pipeline routes.

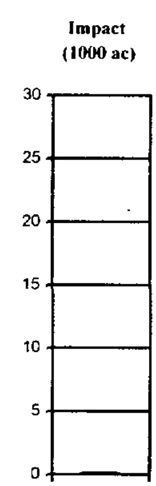
ENVIRONMENTAL ISSUES: Instream flow requirements and terrestrial habitat effects of pipeline and water treatment plant location. Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes. Construction can be scheduled to avoid nesting schedules of any threatened or endangered species.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, and agreements among potential participants to develop a cooperative approach in which one or more participants use treated surface water in exchange for Edwards Aquifer pumping rights in lieu of direct delivery of participants' share of imported surface water.

ADDITIONAL FACTORS: Ability to obtain permits to transfer Guadalupe Basin water to the San Antonio area.







OPTION NUMBER: G-28
OPTION NAME: Guadalupe River Diversion Near Gonzales to North WTP, with Transfer of Downstream Water Rights

OPTION DESCRIPTION: *Raw water would be diverted from the Guadalupe River near Gonzales and piped to a water treatment plant located in the northern part of the San Antonio Metropolitan area. The source of water would include stored water from Canyon Lake and downstream water rights whose point of diversion would be relocated to Gonzales. Treated water would be put into the municipal distribution system, with transfers of Edwards pumping rights to project participants, as appropriate. Env.Criteria not applied.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$828	per acft[1]
QUANTITY OF WATER:	71,260	acft/yr[2]
LAND IMPACTED:	102	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	71	of	106	(1=lowest unit)
QUANTITY OF WATER:	35	of	106	(1=highest volume)
LAND IMPACTED:	12	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Reservoir intake and pump station, raw pipeline and pump stations to water treatment plant, water treatment plant, finished water pump station and pipelines, and distribution system improvements.

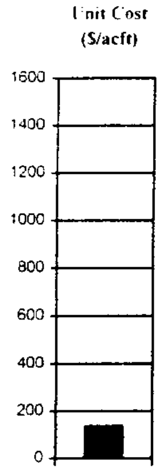
[2]**QUANTITY OF WATER:** Quantity of Canyon Lake yield remaining uncommitted to others, level of Edwards Aquifer pumpage, instream flow requirements, level of hydropower subordination, and quantity of downstream rights available for transfer.

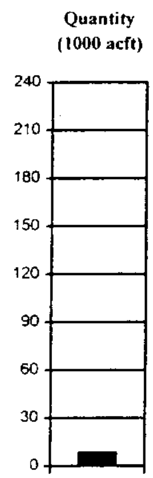
[3]**LAND IMPACTED:** Sizes of sites for water treatment plant and pipeline routes.

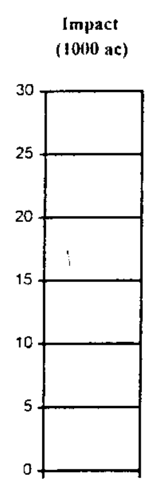
ENVIRONMENTAL ISSUES: Instream flow requirements and terrestrial habitat effects of pipeline and water treatment plant location. Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes. Construction can be scheduled to avoid nesting schedules of any threatened or endangered species.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, and agreements among potential participants to develop a cooperative approach in which one or more participants use treated surface water in exchange for Edwards Aquifer pumping rights in lieu of direct delivery of participants' share of imported surface water.

ADDITIONAL FACTORS: Ability to obtain permits to transfer Guadalupe Basin water to the San Antonio area.







OPTION NUMBER: L-20

OPTION NAME: Transfer of SAWS Reclaimed Water to Coleto Creek Reservoir in Exchange for CP&L Rights being Relocated Upstream for Use in Options G-27 & G-28

OPTION DESCRIPTION: *A part of SAWS return flows would be diverted from the San Antonio River near Goliad to Coleto Creek Reservoir for use as steam-electric power cooling water, in exchange for transferring Guadalupe River water rights now being used for these purposes to upstream points to be diverted, treated and used for San Antonio area municipal and industrial purposes.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$138	per acft[1]
QUANTITY OF WATER:	8,400	acft/yr[2]
LAND IMPACTED:	23	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	2	of	106	(1=lowest unit)
QUANTITY OF WATER:	90	of	106	(1=highest volume)
LAND IMPACTED:	6	of	106	(1=least acreage)

__FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED__

[1]**COST:** Diversion and surface water intake structures on the San Antonio River, pump station, pipeline to Coleto Creek watershed divide, and discharge structure in the Coleto Creek Reservoir.

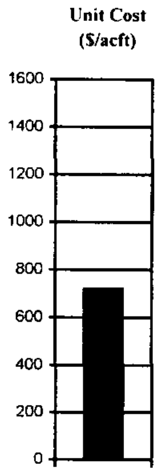
[2]**QUANTITY OF WATER:** The quantity of cooling water needed for the power plant, the present quantities of permits for these purposes, and instream flow requirements associated with movement of the points of diversion from their present location to upstream alternative diversion points (See Options G-27 & G-28).

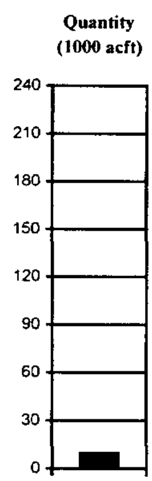
[3]**LAND IMPACTED:** Pipeline right of way for raw water diversion, with treatment plant and pipeline routes from upstream diversion point to San Antonio area for complete project.

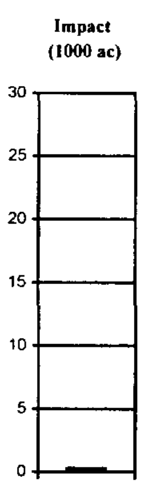
ENVIRONMENTAL ISSUES: Effects of San Antonio River water upon quality of Coleto Creek Reservoir, effects of pipeline and treatment plant locations upon terrestrial habitats, and instream flow effects from relocating diversion point upstream in the Guadalupe Basin.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Water quality effects upon Coleto Creek Reservoir.

ADDITIONAL FACTORS: Ability to obtain permits for the project.







OPTION NUMBER: G-30
OPTION NAME: Guadalupe River Diversion Near Comfort to Recharge Zone via Medina Lake--Drought Average

OPTION DESCRIPTION: *Water would be diverted from the Guadalupe River in the reach between Comfort and Center Point and pumped to the watershed divide where it would flow via Mason Creek and the Medina River to Medina Lake/Diversion Lake, and then pumped to the Edwards Aquifer recharge zone in northeastern Medina and northern Bexar Counties to increase the quantity of Edwards Aquifer water available for pumpage.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$720	per acft[1]
QUANTITY OF WATER:	9,900	acft/yr[2]
LAND IMPACTED:	300	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	52	of	106	(1=lowest unit)
QUANTITY OF WATER:	88	of	106	(1=highest volume)
LAND IMPACTED:	36	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Guadalupe River intake and pump station, raw water pipeline to Medina River tributary, booster pump stations, reservoir intake and pump stations, raw water pipeline to recharge zone, and recharge structures.

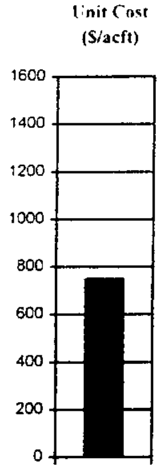
[2]**QUANTITY OF WATER:** Downstream water rights, instream flow requirements, level of Edwards Aquifer pumpage affecting downstream supplies to meet downstream needs, and instream flow requirements. With 72-inch diameter diversion pipeline, average available would be 42,000 acft/yr, at $241 per acft, with 11,000 acft/yr available during 1947-56 drought. The quantity to the Edwards Aquifer is net of channel losses during transfer. Also, this diversion would reduce firm yield of Canyon Lake by about 5,000 acft/yr; the cost of this yield is included in the cost of water for this option.

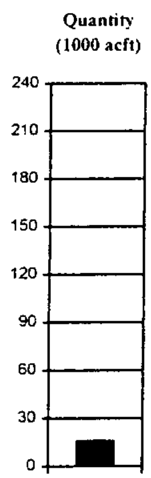
[3]**LAND IMPACTED:** Pipeline and recharge structures right-of-way and sites.

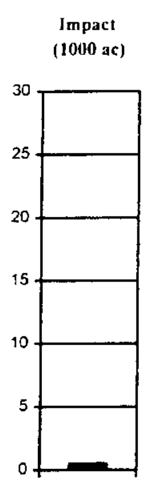
ENVIRONMENTAL ISSUES: Instream flows of the Guadalupe River and effects of pipeline routes and recharge structures upon terrestrial habitat. Resource conflicts can be avoided by careful selection of pipeline routes. Construction can be scheduled to avoid nesting schedules of any threatened or endangered species.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water and ability of sponsors to obtain credits for recharge that can be expressed in quantities of additional Edwards Aquifer pumping rights.

ADDITIONAL FACTORS: Ability to obtain permits and Canyon Lake water for this purpose.







OPTION NUMBER: G-32
OPTION NAME: Diversion of Canyon Lake Flood Storage to Recharge Zone via Cibolo Creek--Long-Term Average

OPTION DESCRIPTION: *Canyon Lake is located on the Guadalupe River 12 miles northwest of New Braunfels, and has a flood control capacity of 355,000 acre feet. Water would be diverted from the flood control pool when available, and delivered to the Edwards Aquifer recharge zone via Cibolo Creek to increase the quantity of Edwards Aquifer water available for pumpage.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$750	per acft[1]
QUANTITY OF WATER:	16,100	acft/yr[2]
LAND IMPACTED:	537	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	59	of	106	(1=lowest unit)
QUANTITY OF WATER:	75	of	106	(1=highest volume)
LAND IMPACTED:	58	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Canyon Lake intake and pump station, raw water pipelines (two 108-inch diameter lines), booster station, and a 10,000 acre foot storage capacity recharge structure on Cibolo Creek.

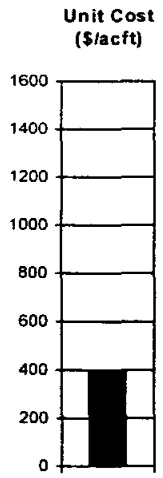
[2]**QUANTITY OF WATER:** The 16,100 acft/yr is not firm water but is the long-term average based on volume of flood water in storage, rate at which flood water has to be evacuated in order to fulfill flood protection purposes of Canyon Lake, and rate at which Edwards Aquifer can accept recharge via this methods.

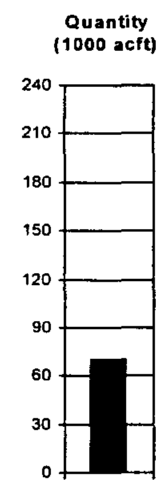
[3]**LAND IMPACTED:** Pipeline right-of-way, and size of recharge structures(s).

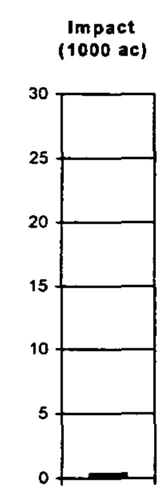
ENVIRONMENTAL ISSUES: Effects of pipeline right of way on terrestrial habitat, and instream flow effects downstream. Resource conflicts can be avoided by careful selection of pipeline routes. Construction can be scheduled to avoid nesting schedules of any threatened or endangered species. Since diversion would only be done when flood water is available and being released, there should not be any adverse effects upon instream flow supplies.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water and ability of sponsors to obtain credits for recharge that can be expressed in quantities of additional Edwards Aquifer pumping rights.

ADDITIONAL FACTORS: Ability to obtain permits and Canyon Lake water for this purpose.







OPTION NUMBER: G-33

OPTION NAME: Guadalupe River Diversions Near Lake Dunlap to Recharge Zone, Using Enhanced Spring Flow, Water Rights Transfers, and Unappropriated Streamflow--1947-56 Drought Average

OPTION DESCRIPTION: *Water would be diverted from the Guadalupe River near Lake Dunlap, below Comal Springs, to the Edwards Aquifer recharge zone in northeastern Medina and northwestern Bexar Counties. The sources of water would be enhanced spring flows resulting from reduced Edwards Aquifer pumpage, underutilized downstream water rights, and unappropriated flows of the Guadalupe River, in order to increase the quantities of Edwards Aquifer water available for pumpage.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$394	per acft[1]
QUANTITY OF WATER:	70,300	acft/yr[2]
LAND IMPACTED:	414	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	11	of	106	(1=lowest unit)
QUANTITY OF WATER:	36	of	106	(1=highest volume)
LAND IMPACTED:	54	of	106	(1=least acreage)

__FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED__

[1]**COST:** Reservoir intake and pump station, large diameter (84-inch) raw water pipeline to recharge zone, booster pump stations, recharge structures, and mitigation.

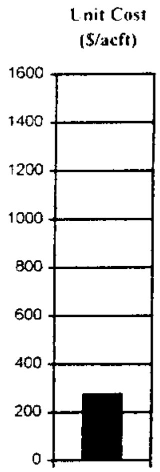
[2]**QUANTITY OF WATER:** Level of Edwards Aquifer pumpage, instream flow requirements, quantity of underused downstream water rights available, and quantity of unappropriated flows during the 1947-56 drought period. Long-term average is 123,200 acft/yr at $267 per acft.

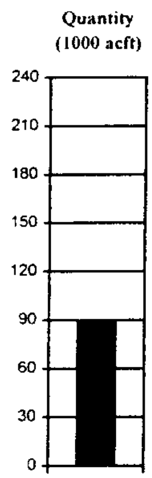
[3]**LAND IMPACTED:** Pipeline right-of-way, and size of recharge structures(s).

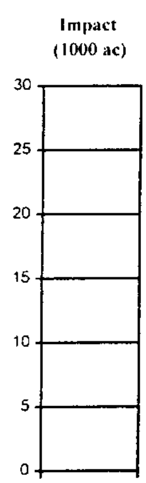
ENVIRONMENTAL ISSUES: Effects of pipeline right-of-way on terrestrial habitat, and instream flow effects downstream. Resource conflicts can be avoided by careful selection of pipeline routes. Construction can be scheduled to avoid nesting schedules of any threatened or endangered species.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water and ability of sponsors to obtain credits for recharge that can be expressed in quantities of additional Edwards Aquifer pumping rights.

ADDITIONAL FACTORS: Ability to obtain quantities of water and the necessary permits for this purpose.







OPTION NUMBER: G-34A

OPTION NAME: Canyon Lake Water to Canyon Lake WSC, Bulverde, & North Bexar County--Uniform Delivery

OPTION DESCRIPTION: *A surface water treatment plant would be constructed on the south side of Canyon Lake, and treated water would be delivered wholesale to Canyon Lake WSC, Bulverde, and the SAWS municipal delivery system in north Bexar County.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$605	per acft[1]
QUANTITY OF WATER:	5,000	acft/yr[2]
LAND IMPACTED:	130	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	39	of	106	(1=lowest unit)
QUANTITY OF WATER:	96	of	106	(1=highest volume)
LAND IMPACTED:	17	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Reservoir intake and pump station, raw pipeline and pump stations to water treatment plant, water treatment plant, finished water pump station and pipelines, interconnects at CLWSC, Bulverde, and SAWS, ground storage tanks, and distribution system improvements.

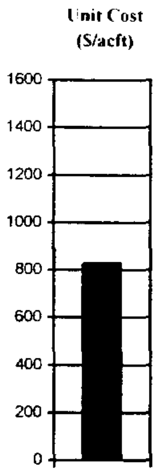
[2]**QUANTITY OF WATER:** Quantity of Canyon Lake yield remaining uncommitted to others.

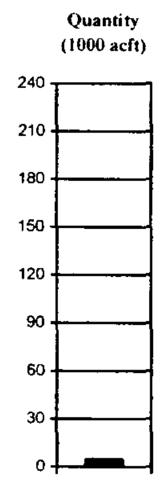
[3]**LAND IMPACTED:** Sizes of sites for water treatment plant and pipeline routes.

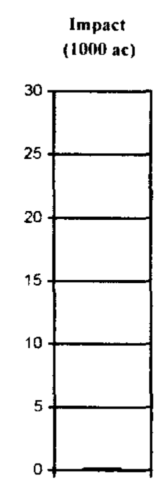
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of pipeline and water treatment plant location. Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes. Construction can be scheduled to avoid nesting schedules of any threatened or endangered species.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, and ability of the three entities to develop a regional plan which realizes economies of size that benefits all of the participants.

ADDITIONAL FACTORS: Ability to obtain permits to transfer Guadalupe Basin water to the San Antonio area. Also, the need for Edwards Aquifer users to develop supplemental supplies in response to mandated reductions in Edwards pumpage.







OPTION NUMBER: G-34B

OPTION NAME: Canyon Lake Water to Canyon Lake WSC, Bulverde, & North Bexar County--Summer Peak Delivery

OPTION DESCRIPTION: *A surface water treatment plant would be constructed on the south side of Canyon Lake, and treated water would be delivered wholesale to Canyon Lake WSC, Bulverde, and the SAWS municipal delivery system in north Bexar County.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$829	per acft[1]
QUANTITY OF WATER:	5,000	acft/yr[2]
LAND IMPACTED:	130	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	72	of	106	(1=lowest unit)
QUANTITY OF WATER:	97	of	106	(1=highest volume)
LAND IMPACTED:	19	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Reservoir intake and pump station, raw pipeline and pump stations to water treatment plant, water treatment plant, finished water pump station and pipelines, interconnects at CLWSC, Bulverde, and SAWS, ground storage tanks, and distribution system improvements. Facilities sized larger than for Option G-34A to accommodate summer peak needs.

[2]**QUANTITY OF WATER:** Quantity of Canyon Lake yield remaining uncommitted to others.

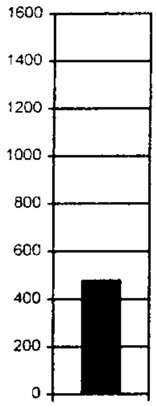
[3]**LAND IMPACTED:** Sizes of sites for water treatment plant and pipeline routes.

ENVIRONMENTAL ISSUES: Terrestrial habitat effects of pipeline and water treatment plant location. Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes. Construction can be scheduled to avoid nesting schedules of any threatened or endangered species.

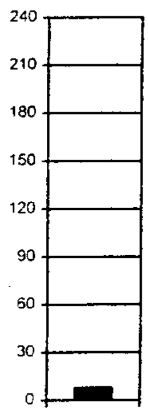
SIGNIFICANT ISSUES AFFECTING FEASIBILITY : Cost of water, and ability of the three entities to develop a regional plan which realizes economies of size that benefits all of the participants.

ADDITIONAL FACTORS: Ability to obtain permits to transfer Guadalupe Basin water to the San Antonio area. Also, the need for Edwards Aquifer users to develop supplemental supplies in response to mandated reductions in Edwards pumpage.

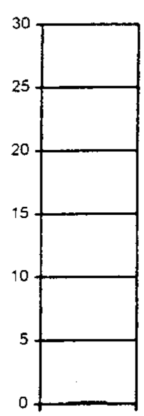
Unit Cost ($/acft)



Quantity (1000 acft)



Impact (1000 ac)



OPTION NUMBER: G-34C

OPTION NAME: Canyon Lake Water to Canyon Lake WSC, Bulverde, & North Bexar County--Uniform Delivery

OPTION DESCRIPTION: *A surface water treatment plant would be constructed on the south side of Canyon Lake, and treated water would be delivered wholesale to Canyon Lake WSC, Bulverde, and the SAWS municipal delivery system in north Bexar County.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$479	per acft[1]
QUANTITY OF WATER:	8,000	acft/yr[2]
LAND IMPACTED:	130	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	25	of	106	(1=lowest unit)
QUANTITY OF WATER:	91	of	106	(1=highest volume)
LAND IMPACTED:	16	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Reservoir intake and pump station, raw pipeline and pump stations to water treatment plant, water treatment plant, finished water pump station and pipelines, interconnects at CLWSC, Bulverde, and SAWS, ground storage tanks, and distribution system improvements.

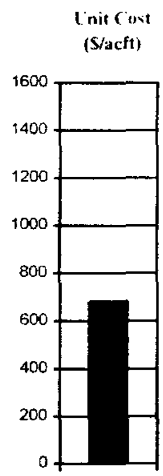
[2]**QUANTITY OF WATER:** Quantity of Canyon Lake yield remaining uncommitted to others.

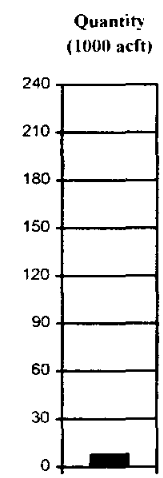
[3]**LAND IMPACTED:** Sizes of sites for water treatment plant and pipeline routes.

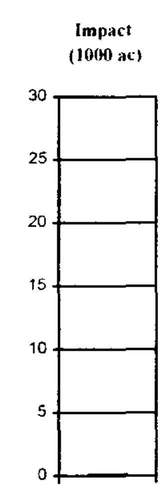
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of pipeline and water treatment plant location. Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes. Construction can be scheduled to avoid nesting schedules of any threatened or endangered species.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, and ability of the three entities to develop a regional plan which realizes economies of size that benefits all of the participants.

ADDITIONAL FACTORS: Ability to obtain permits to transfer Guadalupe Basin water to the San Antonio area. Also, the need for Edwards Aquifer users to develop supplemental supplies in response to mandated reductions in Edwards pumpage.







OPTION NUMBER: G-34D

OPTION NAME: Canyon Lake Water to Canyon Lake WSC, Bulverde, & North Bexar County--Summer Peak Delivery

OPTION DESCRIPTION: *A surface water treatment plant would be constructed on the south side of Canyon Lake, and treated water would be delivered wholesale to Canyon Lake WSC, Bulverde, and the SAWS municipal delivery system in north Bexar County.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$683	per acft[1]
QUANTITY OF WATER:	8,000	acft/yr[2]
LAND IMPACTED:	130	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	45	of	106	(1=lowest unit)
QUANTITY OF WATER:	92	of	106	(1=highest volume)
LAND IMPACTED:	18	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Reservoir intake and pump station, raw water pipeline and pump stations to water treatment plant, water treatment plant, finished water pump station and pipelines, interconnects at CLWSC, Bulverde, and SAWS, ground storage tanks, and distribution system improvements. Facilities sized larger than Option G-34C to meet peak summer demands.

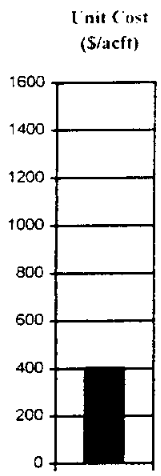
[2]**QUANTITY OF WATER:** Quantity of Canyon Lake yield remaining uncommitted to others.

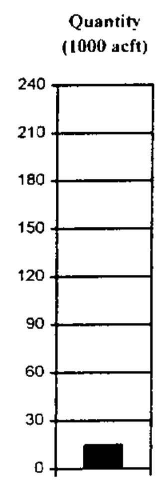
[3]**LAND IMPACTED:** Sizes of sites for water treatment plant and pipeline routes.

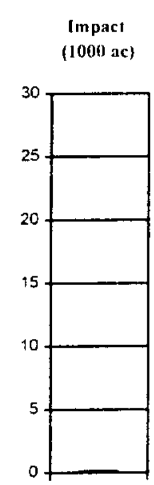
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of pipeline and water treatment plant location. Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes. Construction can be scheduled to avoid nesting schedules of any threatened or endangered species.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, and ability of the three entities to develop a regional plan which realizes economies of size that benefits all of the participants.

ADDITIONAL FACTORS: Ability to obtain permits to transfer Guadalupe Basin water to the San Antonio area. Also, the need for Edwards Aquifer users to develop supplemental supplies in response to mandated reductions in Edwards pumpage.







OPTION NUMBER: G-35A

OPTION NAME: Guadalupe River Diversion at New Braunfels to Mid-Cities and Bexar County, with Expanded New Braunfels Water Treatment Plant--Uniform Delivery

OPTION DESCRIPTION: *15,000 acft/yr of Canyon Lake uncommitted yield would be purchased for release to New Braunfels, the New Braunfels water treatment plant would be expanded, and treated water would be delivered via treated water pipelines to the Mid-Cities areas of western Guadalupe and eastern Bexar Counties; system would be sized for uniform delivery.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$405	per acft[1]
QUANTITY OF WATER:	15,000	acft/yr[2]
LAND IMPACTED:	119	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	14	of	106	(1=lowest unit)
QUANTITY OF WATER:	78	of	106	(1=highest volume)
LAND IMPACTED:	13	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** River intake and pump station, raw water pipeline and pump stations to water treatment plant, water treatment plant expansion, finished water pump station and pipelines, interconnections at Marion, Cibolo, Schertz, Garden Ridge, and SAWS Stahl pump station, ground storage tanks, and distribution system improvements.

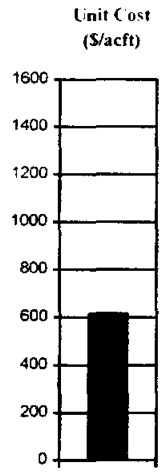
[2]**QUANTITY OF WATER:** Quantity of Canyon Lake yield remaining uncommitted to others.

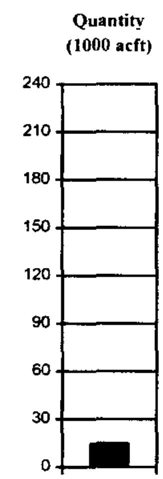
[3]**LAND IMPACTED:** Sizes of sites for water treatment plant and pipeline routes.

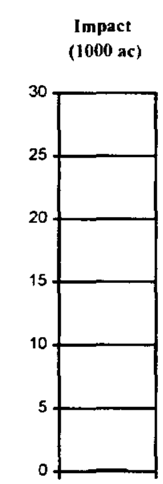
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of pipeline and water treatment plant location. Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, and ability of the entities to develop a regional plan which realizes economies of size that benefits all of the participants.

ADDITIONAL FACTORS: Ability to obtain permits to transfer Guadalupe Basin water to the San Antonio area. Also, the need for Edwards Aquifer users to develop supplemental supplies in response to mandated reductions in Edwards pumpage.







OPTION NUMBER: G-35B

OPTION NAME: Guadalupe River Diversion at New Braunfels to Mid-Cities and Bexar County, with Expanded New Braunfels Water Treatment Plant--Summer Peaking Delivery

OPTION DESCRIPTION: *15,000 acft/yr of Canyon Lake uncommitted yield would be purchased for release to New Braunfels, the New Braunfels water treatment plant would be expanded, and treated water would be delivered via treated water pipelines to the Mid-Cities areas of western Guadalupe and eastern Bexar Counties; system would be sized for summer peaking delivery.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	**$617**	**per acft[1]**
QUANTITY OF WATER:	**15,000**	**acft/yr[2]**
LAND IMPACTED:	**119**	**acres[3]**

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	**41**	**of**	**106**	(1=lowest unit)
QUANTITY OF WATER:	**79**	**of**	**106**	(1=highest volume)
LAND IMPACTED:	**14**	**of**	**106**	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** River intake and pump station, raw water pipeline and pump stations to water treatment plant, water treatment plant expansion, finished water pump station and pipelines, interconnections at Marion, Cibolo, Schertz, Garden Ridge, and SAWS Stahl pump station, ground storage tanks, and distribution system improvements. Facilities sized larger than Option G-35A to meet summer peak demands.

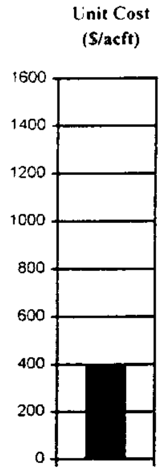
[2]**QUANTITY OF WATER:** Quantity of Canyon Lake yield remaining uncommitted to others.

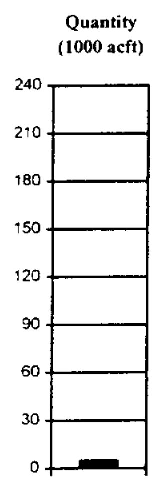
[3]**LAND IMPACTED:** Sizes of sites for water treatment plant and pipeline routes.

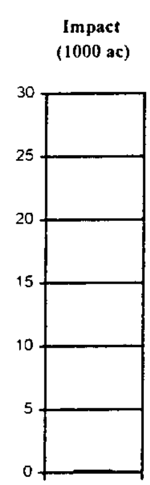
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of pipeline and water treatment plant location. Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, and ability of the entities to develop a regional plan which realizes economies of size that benefits all of the participants.

ADDITIONAL FACTORS: Ability to obtain permits to transfer Guadalupe Basin water to the San Antonio area. Also, the need for Edwards Aquifer users to develop supplemental supplies in response to mandated reductions in Edwards pumpage.







OPTION NUMBER: G-36A

OPTION NAME: Guadalupe River Diversion at Lake Dunlap to CRWA/Mid-Cities/Bexar County, with Expanded CRWA Water Treatment Plant--Uniform Delivery

OPTION DESCRIPTION: *5,000 acft/yr of Canyon Lake uncommitted yield would be purchased for release to Lake Dunlap, the CRWA Lake Dunlap water treatment plant would be expanded, and treated water would be delivered via treated water pipelines to CRWA members and the Mid-Cities areas of western Guadalupe and eastern Bexar Counties.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$399	per acft[1]
QUANTITY OF WATER:	5,000	acft/yr[2]
LAND IMPACTED:	131	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	12	of	106	(1=lowest unit)
QUANTITY OF WATER:	98	of	106	(1=highest volume)
LAND IMPACTED:	20	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Reservoir intake and pump station, raw water pipeline and pump station to water treatment plant, water treatment plant expansion, finished water pump station and pipelines, interconnections at Marion, Cibolo, Schertz, Green Valley WSC, and SAWS Stahl pump station, ground storage tanks, and distribution system improvements. System would be sized for uniform delivery.

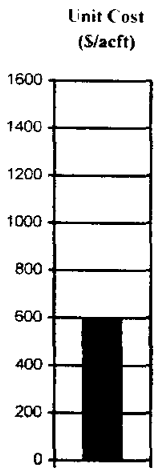
[2]**QUANTITY OF WATER:** Quantity of Canyon Lake yield remaining uncommitted to others.

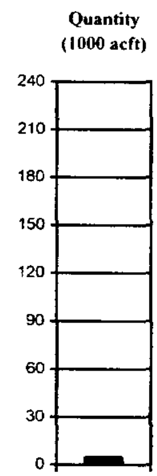
[3]**LAND IMPACTED:** Sizes of sites for water treatment plant and pipeline routes.

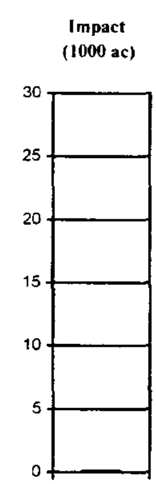
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of pipeline and water treatment plant location. Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, and ability of the entities to develop a regional plan which realizes economies of size that benefits all of the participants.

ADDITIONAL FACTORS: Ability to obtain permits to transfer Guadalupe Basin water to the San Antonio area. Also, the need for Edwards Aquifer users to develop supplemental supplies in response to mandated reductions in Edwards pumpage.







OPTION NUMBER: G-36B

OPTION NAME: Guadalupe River Diversion at Lake Dunlap to CRWA/Mid-Cities/Bexar County, with Expanded CRWA Water Treatment Plant--Summer Peaking Delivery

OPTION DESCRIPTION: *5,000 acft/yr of Canyon Lake uncommitted yield would be purchased for release to Lake Dunlap, the CRWA Lake Dunlap water treatment plant would be expanded, and treated water would be delivered via treated water pipelines to CRWA members, and the Mid-Cities areas of western Guadalupe and eastern Bexar Counties.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$599	per acft[1]
QUANTITY OF WATER:	5,000	acft/yr[2]
LAND IMPACTED:	131	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	38	of	106	(1=lowest unit)
QUANTITY OF WATER:	99	of	106	(1=highest volume)
LAND IMPACTED:	25	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Reservoir intake and pump station, raw water pipeline and pump station to water treatment plant, water treatment plant expansion, finished water pump station and pipelines, interconnections at Marion, Cibolo, Schertz, Green Valley WSC, and SAWS Stahl pump station, ground storage tanks, and distribution system improvements. System would be sized for summer peak delivery.

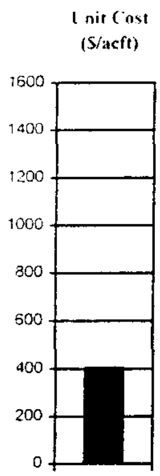
[2]**QUANTITY OF WATER:** Quantity of Canyon Lake yield remaining uncommitted to others.

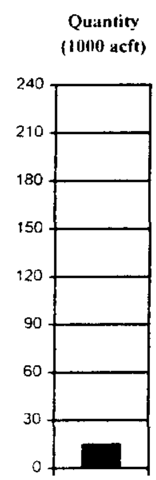
[3]**LAND IMPACTED:** Sizes of sites for water treatment plant and pipeline routes.

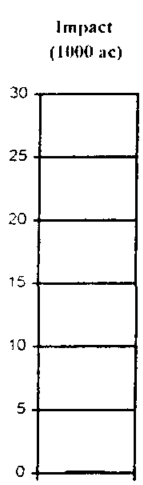
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of pipeline and water treatment plant location. Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, and ability of the entities to develop a regional plan which realizes economies of size that benefits all of the participants.

ADDITIONAL FACTORS: Ability to obtain permits to transfer Guadalupe Basin water to the San Antonio area. Also, the need for Edwards Aquifer users to develop supplemental supplies in response to mandated reductions in Edwards pumpage.







OPTION NUMBER: G-36C

OPTION NAME: Guadalupe River Diversion at Lake Dunlap to CRWA/Mid-Cities/Bexar County, with Expanded CRWA Water Treatment Plant--Uniform Delivery

OPTION DESCRIPTION: *15,000 acft/yr of Canyon Lake uncommitted yield would be purchased for release to Lake Dunlap, the CRWA Lake Dunlap water treatment plant would be expanded, and treated water would be delivered via treated water pipelines to CRWA members, and the Mid-Cities areas of western Guadalupe and eastern Bexar Counties.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$405	per acft[1]
QUANTITY OF WATER:	15,000	acft/yr[2]
LAND IMPACTED:	131	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	15	of	106	(1=lowest unit)
QUANTITY OF WATER:	80	of	106	(1=highest volume)
LAND IMPACTED:	21	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Reservoir intake and pump station, raw water pipeline and pump station to water treatment plant, water treatment plant expansion, finished water pump station and pipelines, interconnections at Marion, Cibolo, Schertz, Green Valley WSC, and SAWS Stahl pump station, ground storage tanks, and distribution system improvements. System would be sized for uniform delivery.

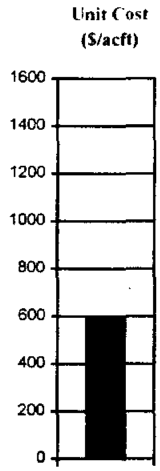
[2]**QUANTITY OF WATER:** Quantity of Canyon Lake yield remaining uncommitted to others.

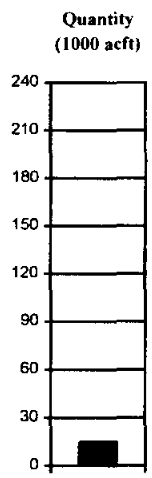
[3]**LAND IMPACTED:** Sizes of sites for water treatment plant and pipeline routes.

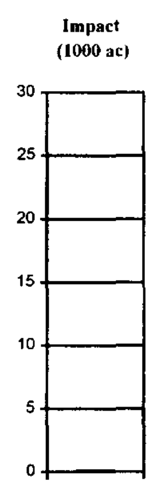
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of pipeline and water treatment plant location. Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, and ability of the entities to develop a regional plan which realizes economies of size that benefits all of the participants.

ADDITIONAL FACTORS: Ability to obtain permits to transfer Guadalupe Basin water to the San Antonio area. Also, the need for Edwards Aquifer users to develop supplemental supplies in response to mandated reductions in Edwards pumpage.







OPTION NUMBER: G-36D

OPTION NAME: Guadalupe River Diversion at Lake Dunlap to CRWA/Mid-Cities/Bexar County, with Expanded CRWA Water Treatment Plant--Summer Peaking Delivery

OPTION DESCRIPTION: *15,000 acft/yr of Canyon Lake uncommitted yield would be purchased for release to Lake Dunlap, the CRWA Lake Dunlap water treatment plant would be expanded, and treated water would be delivered via treated water pipelines to CRWA members, and the Mid-Cities areas of western Guadalupe and eastern Bexar Counties.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$594	per acft[1]
QUANTITY OF WATER:	15,000	acft/yr[2]
LAND IMPACTED:	131	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	37	of	106	(1=lowest unit)
QUANTITY OF WATER:	81	of	106	(1=highest volume)
LAND IMPACTED:	24	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Reservoir intake and pump station, raw water pipeline and pump station to water treatment plant, water treatment plant expansion, finished water pump station and pipelines, interconnections at Marion, Cibolo, Schertz, Green Valley WSC, and SAWS Stahl pump station, ground storage tanks, and distribution system improvements. System would be sized for summer peaking delivery.

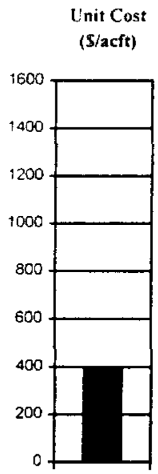
[2]**QUANTITY OF WATER:** Quantity of Canyon Lake yield remaining uncommitted to others.

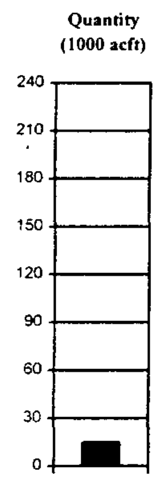
[3]**LAND IMPACTED:** Sizes of sites for water treatment plant and pipeline routes.

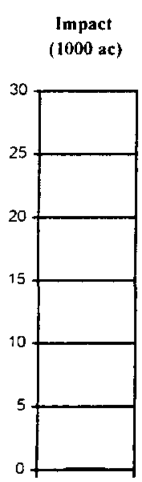
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of pipeline and water treatment plant location. Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, and ability of the entities to develop a regional plan which realizes economies of size that benefits all of the participants.

ADDITIONAL FACTORS: Ability to obtain permits to transfer Guadalupe Basin water to the San Antonio area. Also, the need for Edwards Aquifer users to develop supplemental supplies in response to mandated reductions in Edwards pumpage.







OPTION NUMBER: G-37A

OPTION NAME: Guadalupe River Diversion at Lake Dunlap to Mid-Cities/CRWA/Bexar County, with Regional Water Treatment Plant--Uniform Delivery

OPTION DESCRIPTION: *15,000 acft/yr of Canyon Lake uncommitted yield would be purchased for release to Lake Dunlap, a regional water treatment plant would be constructed, and treated water would be delivered via treated water pipelines to the Mid-Cities, CRWA members of Guadalupe County, and SAWS Stahl Pump Station.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$394	per acft[1]
QUANTITY OF WATER:	15,000	acft/yr[2]
LAND IMPACTED:	136	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	10	of	106	(1=lowest unit)
QUANTITY OF WATER:	82	of	106	(1=highest volume)
LAND IMPACTED:	27	of	106	(1=least acreage)

__FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED__

[1]**COST:** Reservoir intake and pump station, raw water pipeline and pump station to water treatment plant, water treatment plant, finished water pump station and pipelines, interconnections at Marion, Cibolo, Schertz, Green Valley WSC, and SAWS Stahl pump station, ground storage tanks, and distribution system improvements. System would be sized for uniform delivery.

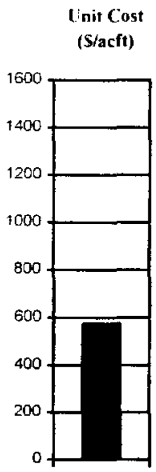
[2]**QUANTITY OF WATER:** Quantity of Canyon Lake yield remaining uncommitted to others.

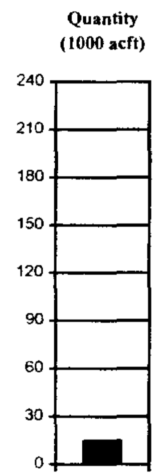
[3]**LAND IMPACTED:** Sizes of sites for water treatment plant and pipeline routes.

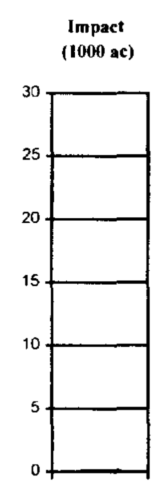
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of pipeline and water treatment plant location. Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, and ability of the entities to develop a regional plan which realizes economies of size that benefits all of the participants.

ADDITIONAL FACTORS: Ability to obtain permits to transfer Guadalupe Basin water to the San Antonio area. Also, the need for Edwards Aquifer users to develop supplemental supplies in response to mandated reductions in Edwards pumpage.







OPTION NUMBER: G-37B

OPTION NAME: Guadalupe River Diversion at Lake Dunlap to Mid-Cities/CRWA/Bexar County, with Regional Water Treatment Plant--Summer Peaking Delivery

OPTION DESCRIPTION: *15,000 acft/yr of Canyon Lake uncommitted yield would be purchased for release to Lake Dunlap, a regional water treatment plant would be constructed, and treated water would be delivered via treated water pipelines to the Mid-Cities, CRWA members of Guadalupe County, and SAWS Stahl Pump Station.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$576	per acft[1]
QUANTITY OF WATER:	15,000	acft/yr[2]
LAND IMPACTED:	136	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	34	of	106	(1=lowest unit)
QUANTITY OF WATER:	83	of	106	(1=highest volume)
LAND IMPACTED:	29	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Reservoir intake and pump station, raw water pipeline and pump station to water treatment plant, water treatment plant, finished water pump station and pipelines, interconnections at Marion, Cibolo, Schertz, Green Valley WSC, and SAWS Stahl pump station, ground storage tanks, and distribution system improvements. System would be sized for summer peaking delivery.

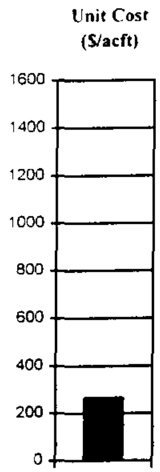
[2]**QUANTITY OF WATER:** Quantity of Canyon Lake yield remaining uncommitted to others.

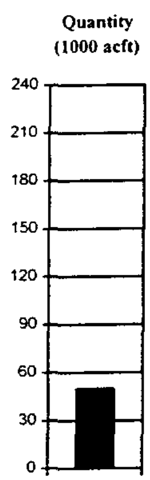
[3]**LAND IMPACTED:** Sizes of sites for water treatment plant and pipeline routes.

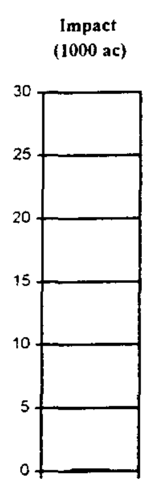
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of pipeline and water treatment plant location. Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, and ability of the entities to develop a regional plan which realizes economies of size that benefits all of the participants.

ADDITIONAL FACTORS: Ability to obtain permits to transfer Guadalupe Basin water to the San Antonio area. Also, the need for Edwards Aquifer users to develop supplemental supplies in response to mandated reductions in Edwards pumpage.







OPTION NUMBER: G-37C
OPTION NAME: Guadalupe River Diversion at Lake Dunlap to Mid-Cities/CRWA/Bexar County, with Regional Water Treatment Plant--Uniform Delivery

OPTION DESCRIPTION: *50,000 acft/yr of Canyon Lake uncommitted yield would be purchased for release to Lake Dunlap, a regional water treatment plant would be constructed, and treated water would be delivered via treated water pipelines to the Mid-Cities, CRWA members of Guadalupe County, and SAWS Stahl Pump Station.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$266	per acft[1]
QUANTITY OF WATER:	50,000	acft/yr[2]
LAND IMPACTED:	136	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	4	of	106	(1=lowest unit)
QUANTITY OF WATER:	45	of	106	(1=highest volume)
LAND IMPACTED:	26	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Reservoir intake and pump station, raw water pipeline and pump station to water treatment plant, water treatment plant, finished water pump station and pipelines, interconnections at Marion, Cibolo, Schertz, Green Valley WSC, and SAWS Stahl pump station, ground storage tanks, and distribution system improvements. System would be sized for uniform delivery.

[2]**QUANTITY OF WATER:** Quantity of Canyon Lake yield remaining uncommitted to others, level of Edwards Aquifer pumpage, instream flow requirements, level of hydropower subordination, which affects downstream water supplies, and thus Canyon Lake yield.

[3]**LAND IMPACTED:** Sizes of sites for water treatment plant and pipeline routes.

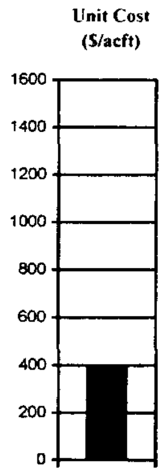
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of pipeline and water treatment plant location. Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes.

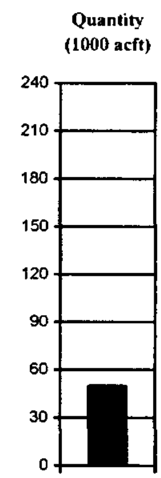
SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, and ability of the entities to develop a regional plan which realizes economies of size that benefits all of the participants.

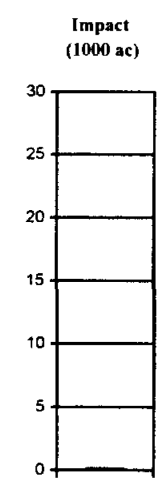
ADDITIONAL FACTORS: Ability to obtain permits to transfer Guadalupe Basin water to the San Antonio area. Also, the need for Edwards Aquifer users to develop supplemental supplies in response to mandated reductions in Edwards pumpage.

WEST CENTRAL TRANS-TEXAS WATER SUPPLY OPTIONS

OPTION DATA SHEET







OPTION NUMBER: G-37D

OPTION NAME: Guadalupe River Diversion at Lake Dunlap to Mid-Cities/CRWA/Bexar County, with Regional Water Treatment Plant--Summer Peaking Delivery

OPTION DESCRIPTION: *50,000 acft/yr of Canyon Lake uncommitted yield would be purchased for release to Lake Dunlap, a regional water treatment plant would be constructed, and treated water would be delivered via treated water pipelines to the Mid-Cities, CRWA members of Guadalupe County, and SAWS Stahl Pump Station.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	**$400**	**per acft[1]**
QUANTITY OF WATER:	**50,000**	**acft/yr[2]**
LAND IMPACTED:	**136**	**acres[3]**

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	**13**	**of**	**106**	(1=lowest unit)
QUANTITY OF WATER:	**46**	**of**	**106**	(1=highest volume)
LAND IMPACTED:	**28**	**of**	**106**	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Reservoir intake and pump station, raw water pipeline and pump station to water treatment plant, water treatment plant, finished water pump station and pipelines, interconnections at Marion, Cibolo, Schertz, Green Valley WSC, and SAWS Stahl pump station, ground storage tanks, and distribution system improvements. System would be sized for summer peaking delivery.

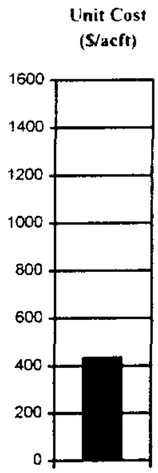
[2]**QUANTITY OF WATER:** Quantity of uncommitted Canyon Lake yield, level of Edwards Aquifer pumpage, instream flow requirements, level of hydropower subordination, which affects downstream water supplies, and thus Canyon Lake yield.

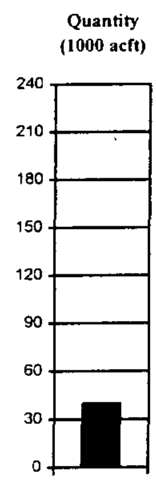
[3]**LAND IMPACTED:** Sizes of sites for water treatment plant and pipeline routes.

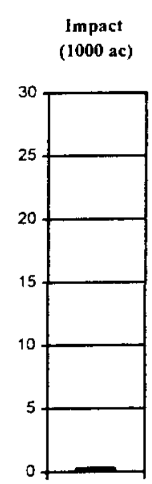
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of pipeline and water treatment plant location. Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, and ability of the entities to develop a regional plan which realizes economies of size that benefits all of the participants.

ADDITIONAL FACTORS: Ability to obtain permits to transfer Guadalupe Basin water to the San Antonio area. Also, the need for Edwards Aquifer users to develop supplemental supplies in response to mandated reductions in Edwards pumpage.







OPTION NUMBER: G-38A

OPTION NAME: Guadalupe River Diversion at Gonzales to Mid-Cities/CRWA/Bexar County, with Regional Water Treatment Plant--Uniform Delivery

OPTION DESCRIPTION: *Diversion at Gonzales, of enhanced spring flow resulting from reduced Edwards pumpage, underutilized downstream water rights, unappropriated stream flows, and uncommitted Canyon Lake yield, to a regional water treatment plant, with treated water delivered via treated water pipelines to the Mid-Cities, CRWA members of Guadalupe County, and SAWS Stahl Pump Station.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$435	per acft[1]
QUANTITY OF WATER:	40,000	acft/yr[2]
LAND IMPACTED:	316	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	17	of	106	(1=lowest unit)
QUANTITY OF WATER:	54	of	106	(1=highest volume)
LAND IMPACTED:	38	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Reservoir intake and pump station, raw water pipeline and pump station to water treatment plant, water treatment plant, off-channel reservoir at water treatment plant, finished water pump station and pipelines, interconnections at Marion, Cibolo, Schertz, Green Valley WSC, and SAWS Stahl pump station, ground storage tanks, and distribution system improvements. System would be sized for uniform delivery.

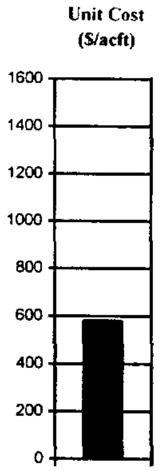
[2]**QUANTITY OF WATER:** Quantities of enhanced spring flows, underutilized downstream water rights, and uncommitted Canyon Lake yield, level of Edwards Aquifer pumpage, instream flow requirements, and level of hydropower subordination.

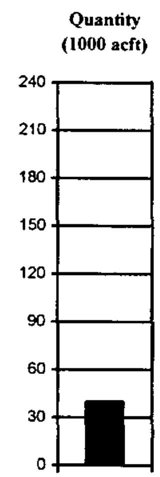
[3]**LAND IMPACTED:** Sizes of sites for water treatment plant and pipeline routes.

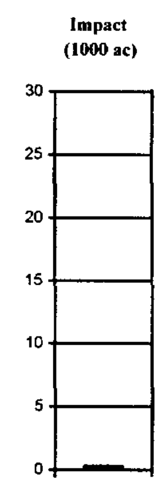
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of pipeline and water treatment plant location. Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, and ability of the entities to develop a regional plan which realizes economies of size that benefits all of the participants.

ADDITIONAL FACTORS: Ability to obtain permits to transfer Guadalupe Basin water to the San Antonio area. Also, the need for Edwards Aquifer users to develop supplemental supplies in response to mandated reductions in Edwards pumpage.







OPTION NUMBER: G-38B

OPTION NAME: Guadalupe River Diversion at Gonzales to Mid-Cities/CRWA/Bexar County, with Regional Water Treatment Plant--Summer Peaking Delivery

OPTION DESCRIPTION: *Diversion at Gonzales, of enhanced spring flow resulting from reduced Edwards pumpage, underutilized downstream water rights, unappropriated stream flows, and uncommitted Canyon Lake yield, to a regional water treatment plant, with treated water delivered via treated water pipelines to the Mid-Cities, CRWA members of Guadalupe County, and SAWS Stahl Pump Station.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$581	per acft[1]
QUANTITY OF WATER:	40,000	acft/yr[2]
LAND IMPACTED:	316	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	36	of	106	(1=lowest unit)
QUANTITY OF WATER:	55	of	106	(1=highest volume)
LAND IMPACTED:	40	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Reservoir intake and pump station, raw water pipeline and pump station to water treatment plant, water treatment plant, off-channel reservoir at water treatment plant, finished water pump station and pipelines, interconnections at Marion, Cibolo, Schertz, Green Valley WSC, and SAWS Stahl pump station, ground storage tanks, and distribution system improvements. System would be sized for summer peak delivery.

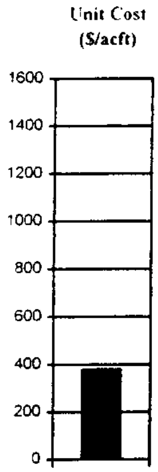
[2]**QUANTITY OF WATER:** Quantities of enhanced spring flows, underutilized downstream water rights, and uncommitted Canyon Lake yield, level of Edwards Aquifer pumpage, instream flow requirements, and level of hydropower subordination.

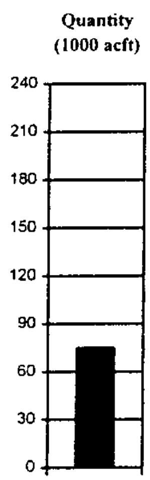
[3]**LAND IMPACTED:** Sizes of sites for water treatment plant and pipeline routes.

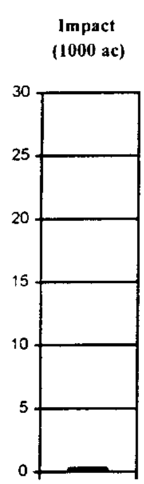
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of pipeline and water treatment plant location. Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, and ability of the entities to develop a regional plan which realizes economies of size that benefits all of the participants.

ADDITIONAL FACTORS: Ability to obtain permits to transfer Guadalupe Basin water to the San Antonio area. Also, the need for Edwards Aquifer users to develop supplemental supplies in response to mandated reductions in Edwards pumpage.







OPTION NUMBER: G-38C

OPTION NAME: Guadalupe River Diversion at Gonzales to Mid-Cities/CRWA/Bexar County, with Regional Water Treatment Plant--Uniform Delivery

OPTION DESCRIPTION: *Diversion at Gonzales, of enhanced spring flow resulting from reduced Edwards pumpage, underutilized downstream water rights, unappropriated stream flows, and uncommitted Canyon Lake yield, to a regional water treatment plant, with treated water delivered via treated water pipelines to the Mid-Cities, CRWA members of Guadalupe County, and SAWS Stahl Pump Station.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$381	per acft[1]
QUANTITY OF WATER:	75,000	acft/yr[2]
LAND IMPACTED:	316	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	9	of	106	(1=lowest unit)
QUANTITY OF WATER:	30	of	106	(1=highest volume)
LAND IMPACTED:	37	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Reservoir intake and pump station, raw water pipeline and pump station to water treatment plant, water treatment plant, off-channel reservoir at water treatment plant, finished water pump station and pipelines, interconnections at Marion, Cibolo, Schertz, Green Valley WSC, and SAWS Stahl pump station, ground storage tanks, and distribution system improvements. System would be sized for uniform delivery.

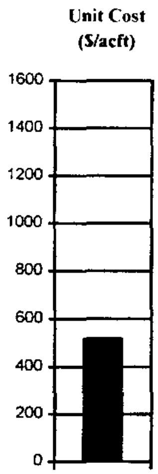
[2]**QUANTITY OF WATER:** Quantities of enhanced spring flows, underutilized downstream water rights, and uncommitted Canyon Lake yield, level of Edwards Aquifer pumpage, instream flow requirements, and level of hydropower subordination.

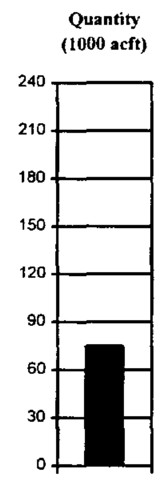
[3]**LAND IMPACTED:** Sizes of sites for water treatment plant and pipeline routes.

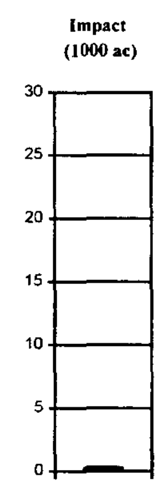
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of pipeline and water treatment plant location. Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, and ability of the entities to develop a regional plan which realizes economies of size that benefits all of the participants.

ADDITIONAL FACTORS: Ability to obtain permits to transfer Guadalupe Basin water to the San Antonio area. Also, the need for Edwards Aquifer users to develop supplemental supplies in response to mandated reductions in Edwards pumpage.







OPTION NUMBER: G-38D

OPTION NAME: Guadalupe River Diversion at Gonzales to Mid-Cities/CRWA/Bexar County, with Regional Water Treatment Plant-- Summer Peaking Delivery

OPTION DESCRIPTION: *Diversion at Gonzales, of enhanced spring flow resulting from reduced Edwards pumpage, underutilized downstream water rights, unappropriated stream flows, and uncommitted Canyon Lake yield, to a regional water treatment plant, with treated water delivered via treated water pipelines to the Mid-Cities, CRWA members of Guadalupe County, and SAWS Stahl Pump Station.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	**$518**	**per acft**[1]
QUANTITY OF WATER:	**75,000**	**acft/yr**[2]
LAND IMPACTED:	**316**	**acres**[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	**30**	**of**	**106**	(1=lowest unit)
QUANTITY OF WATER:	**31**	**of**	**106**	(1=highest volume)
LAND IMPACTED:	**39**	**of**	**106**	(1=least acreage)

<u>FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED</u>

[1]**COST:** Reservoir intake and pump station, raw water pipeline and pump station to water treatment plant, water treatment plant, off-channel reservoir at water treatment plant, finished water pump station and pipelines, interconnections at Marion, Cibolo, Schertz, Green Valley WSC, and SAWS Stahl pump station, ground storage tanks, and distribution system improvements. System would be sized for summer peak delivery.

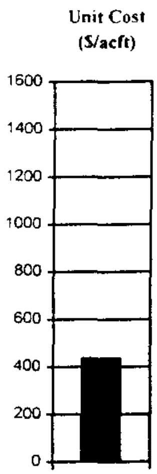
[2]**QUANTITY OF WATER:** Quantities of enhanced spring flows, underutilized downstream water rights, and uncommitted Canyon Lake yield, level of Edwards Aquifer pumpage, instream flow requirements, and level of hydropower subordination.

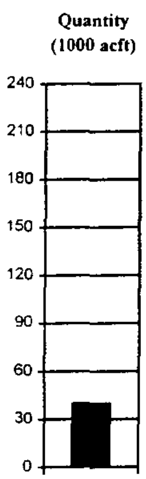
[3]**LAND IMPACTED:** Sizes of sites for water treatment plant and pipeline routes.

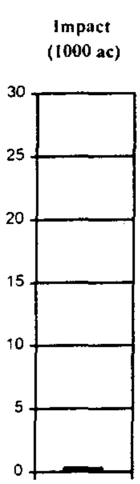
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of pipeline and water treatment plant location. Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, and ability of the entities to develop a regional plan which realizes economies of size that benefits all of the participants.

ADDITIONAL FACTORS: Ability to obtain permits to transfer Guadalupe Basin water to the San Antonio area. Also, the need for Edwards Aquifer users to develop supplemental supplies in response to mandated reductions in Edwards pumpage.







OPTION NUMBER: G-39A

OPTION NAME: Guadalupe River Diversion at Lake Dunlap and Near Gonzales to Mid-Cities/CRWA/Bexar County, with Regional Water Treatment Plant--Uniform Delivery

OPTION DESCRIPTION: *Diversion at Lake Dunlap of 5,000 acft/yr of Canyon Lake Water, and at Gonzales of 35,000 acft/yr of enhanced spring flow resulting from reduced Edwards pumpage, underutilized downstream water rights, unappropriated stream flows, and Canyon Lake yield, to a regional water treatment plant, with treated water delivered via treated water pipelines to the Mid-Cities, CRWA members of Guadalupe County, and SAWS Stahl Pump Station.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$436	per acft[1]
QUANTITY OF WATER:	40,000	acft/yr[2]
LAND IMPACTED:	342	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	18	of	106	(1=lowest unit)
QUANTITY OF WATER:	56	of	106	(1=highest volume)
LAND IMPACTED:	43	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Reservoir intake and pump station, river intake and pump station, raw water pipelines and pump stations to water treatment plant, water treatment plant, off-channel reservoir at water treatment plant, finished water pump station and pipelines, interconnections at Marion, Cibolo, Schertz, Green Valley WSC, and SAWS Stahl pump station, ground storage tanks, and distribution system improvements. System would be sized for uniform delivery.

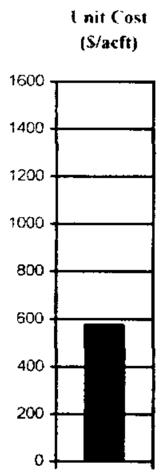
[2]**QUANTITY OF WATER:** Quantities of enhanced spring flows, underutilized downstream water rights, and uncommitted Canyon Lake yield, level of Edwards Aquifer pumpage, instream flow requirements, and level of hydropower subordination.

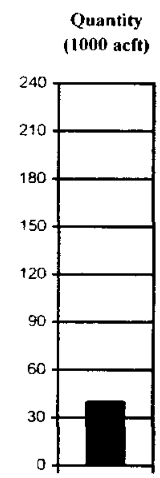
[3]**LAND IMPACTED:** Sizes of sites for water treatment plant and pipeline routes.

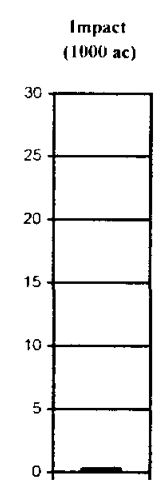
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of pipeline and water treatment plant location. Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, and ability of the entities to develop a regional plan which realizes economies of size that benefits all of the participants.

ADDITIONAL FACTORS: See Option G-38D for additional factors.







OPTION NUMBER: G-39B

OPTION NAME: Guadalupe River Diversion at Lake Dunlap and Near Gonzales to Mid-Cities/CRWA/Bexar County, with Regional Water Treatment Plant--Summer Peaking Delivery

OPTION DESCRIPTION: *Diversion at Lake Dunlap of 5,000 acft/yr of Canyon Lake Water, and at Gonzales of 35,000 acft/yr of enhanced spring flow resulting from reduced Edwards pumpage, underutilized downstream water rights, unappropriated stream flows, and Canyon Lake yield, to a regional water treatment plant, with treated water delivered via treated water pipelines to the Mid-Cities, CRWA members of Guadalupe County, and SAWS Stahl Pump Station.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$578	per acft[1]
QUANTITY OF WATER:	40,000	acft/yr[2]
LAND IMPACTED:	342	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	35	of	106	(1=lowest unit)
QUANTITY OF WATER:	57	of	106	(1=highest volume)
LAND IMPACTED:	45	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Reservoir intake and pump station, river intake and pump station, raw water pipelines and pump stations to water treatment plant, water treatment plant, off-channel reservoir at water treatment plant, finished water pump station and pipelines, interconnections at Marion, Cibolo, Schertz, Green Valley WSC, and SAWS Stahl pump station, ground storage tanks, and distribution system improvements. System would be sized for summer peaking delivery.

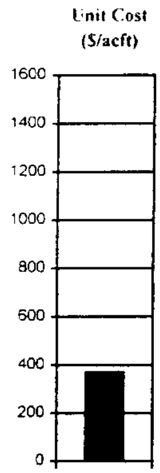
[2]**QUANTITY OF WATER:** Quantities of enhanced spring flows, underutilized downstream water rights, and uncommitted Canyon Lake yield, level of Edwards Aquifer pumpage, instream flow requirements, and level of hydropower subordination.

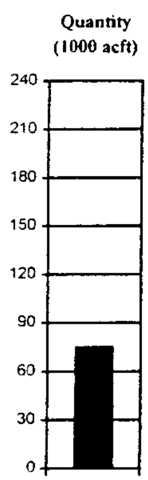
[3]**LAND IMPACTED:** Sizes of sites for water treatment plant and pipeline routes.

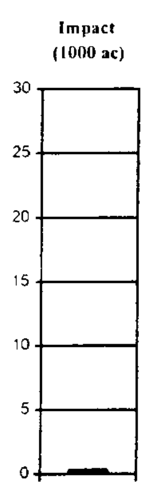
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of pipeline and water treatment plant location. Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, and ability of the entities to develop a regional plan which realizes economies of size that benefits all of the participants.

ADDITIONAL FACTORS: See Option G-38D for additional factors.







OPTION NUMBER: G-39C

OPTION NAME: Guadalupe River Diversion at Lake Dunlap and Near Gonzales to Mid-Cities/CRWA/Bexar County, with Regional Water Treatment Plant--Uniform Delivery

OPTION DESCRIPTION: *Diversion at Lake Dunlap of 15,000 acft/yr of Canyon Lake Water, and at Gonzales of 60,000 acft/yr of enhanced spring flow resulting from reduced Edwards pumpage, underutilized downstream water rights, unappropriated stream flows, and Canyon Lake yield, to a regional water treatment plant, with treated water delivered via treated water pipelines to the Mid-Cities, CRWA members of Guadalupe County, and SAWS Stahl Pump Station.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$371	per acft[1]
QUANTITY OF WATER:	75,000	acft/yr[2]
LAND IMPACTED:	342	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	7	of	106	(1=lowest unit)
QUANTITY OF WATER:	32	of	106	(1=highest volume)
LAND IMPACTED:	42	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Reservoir intake and pump station, river intake and pump station, raw water pipelines and pump stations to water treatment plant, water treatment plant, off-channel reservoir at water treatment plant, finished water pump station and pipelines, interconnections at Marion, Cibolo, Schertz, Green Valley WSC, and SAWS Stahl pump station, ground storage tanks, and distribution system improvements. System would be sized for uniform delivery.

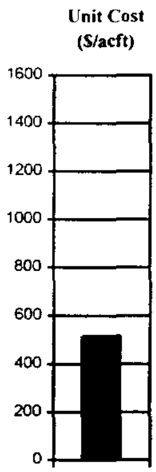
[2]**QUANTITY OF WATER:** Quantities of enhanced spring flows, underutilized downstream water rights, and uncommitted Canyon Lake yield, level of Edwards Aquifer pumpage, instream flow requirements, and level of hydropower subordination.

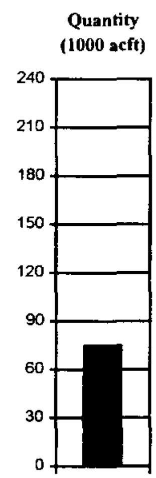
[3]**LAND IMPACTED:** Sizes of sites for water treatment plant and pipeline routes.

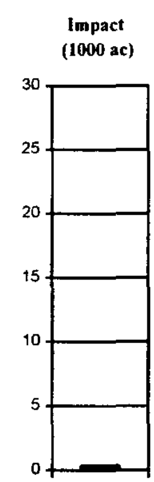
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of pipeline and water treatment plant location. Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, and ability of the entities to develop a regional plan which realizes economies of size that benefits all of the participants.

ADDITIONAL FACTORS: See Option G-38D for additional factors.







OPTION NUMBER: G-39D

OPTION NAME: Guadalupe River Diversion at Lake Dunlap and Near Gonzales to Mid-Cities/CRWA/Bexar County, with Regional Water Treatment Plant--Summer Peaking Delivery

OPTION DESCRIPTION: *Diversion at Lake Dunlap of 15,000 acft/yr of Canyon Lake Water, and at Gonzales of 60,000 acft/yr of enhanced spring flow resulting from reduced Edwards pumpage, underutilized downstream water rights, unappropriated stream flows, and Canyon Lake yield, to a regional water treatment plant, with treated water delivered via treated water pipelines to the Mid-Cities, CRWA members of Guadalupe County, and SAWS Stahl Pump Station.*

TIME NEEDED TO IMPLEMENT: ☒ 1-5 yrs. ☐ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$516	per acft[1]
QUANTITY OF WATER:	75,000	acft/yr[2]
LAND IMPACTED:	342	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	29	of	106	(1=lowest unit)
QUANTITY OF WATER:	33	of	106	(1=highest volume)
LAND IMPACTED:	44	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Reservoir intake and pump station, river intake and pump station, raw water pipelines and pump stations to water treatment plant, water treatment plant, off-channel reservoir at water treatment plant, finished water pump station and pipelines, interconnections at Marion, Cibolo, Schertz, Green Valley WSC, and SAWS Stahl pump station, ground storage tanks, and distribution system improvements. System would be sized for summer peaking delivery.

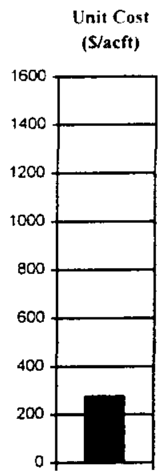
[2]**QUANTITY OF WATER:** Quantities of enhanced spring flows, underutilized downstream water rights, and uncommitted Canyon Lake yield, level of Edwards Aquifer pumpage, instream flow requirements, and level of hydropower subordination.

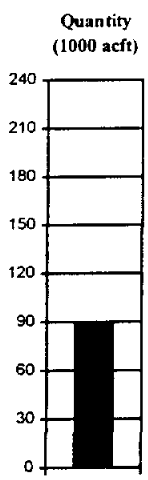
[3]**LAND IMPACTED:** Sizes of sites for water treatment plant and pipeline routes.

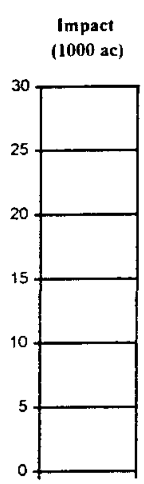
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of pipeline and water treatment plant location. Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, and ability of the entities to develop a regional plan which realizes economies of size that benefits all of the participants.

ADDITIONAL FACTORS: See Option G-38D for additional factors.







OPTION NUMBER: G-40

OPTION NAME: Cloptin Crossing--Raw Water at the Reservoir.

OPTION DESCRIPTION: *The Cloptin Crossing Reservoir site is located in Hays and Comal Counties, on the Blanco River, about 2 miles southwest of Wimberley. At elevation 980.5, the conservation pool capacity would be 275,000 acre-feet. Firm yield was computed using the TWDB/TNRCC/TPWD consensus environmental criteria, Edwards Aquifer pumpage of 400,000 acft/yr, full use of all water rights of the basin, full subordination of hydropower rights at Lake Dunlap, and a Canyon Lake firm yield of 78,600 acft/yr.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☐ 5-15 yrs. ☒ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$476	per acft[1]
QUANTITY OF WATER:	33,163	acft/yr[2]
LAND IMPACTED:	6,060	acres[3]

POSITION RELATIVE TO ALL OPTIONS			
UNIT COST OF WATER:	N/A	of	(1=lowest unit)
QUANTITY OF WATER:	N/A	of	(1=highest volume)
LAND IMPACTED:	N/A	of	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]COST: Embankment and spillway, outlet works, land, relocations, reservoir clearing, diversion and care of water, grout curtain, environmental studies and mitigation, and engineering and legal services.

[2]**QUANTITY OF WATER:** Downstream water rights, including hydropower rights at Lake Dunlap, instream flow requirements, and Edwards Aquifer pumpage.

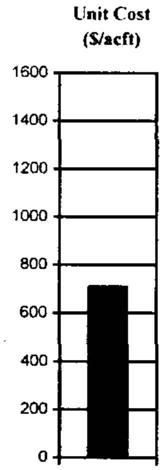
[3]**LAND IMPACTED:** Size of the reservoir site, and mitigation requirements.

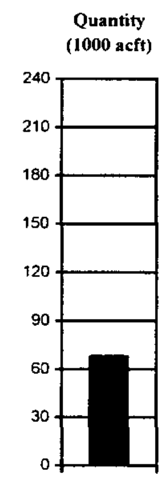
ENVIRONMENTAL ISSUES: Inundation of approximately 6,060 acres of land, including a 13-mile reach of the Blanco River, and instream flow requirements. The land involved is 24 percent grassland, 14 percent brushland, 20 percent woodland, 1 percent wetlands, and 3 percent riverine habitat. The analyses were based upon consensus environmental criteria, which specifies conditions for storage and passthrough of flows to meet instream and bay and estuary needs.

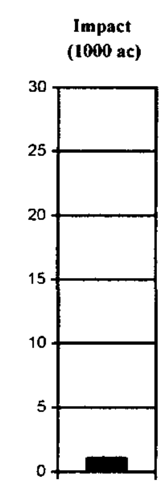
SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, environmental mitigation, and local reservoir area, economic and social impacts.

ADDITIONAL FACTORS: Ability to obtain permits to develop the Reservoir.

WEST CENTRAL TRANS-TEXAS WATER SUPPLY OPTIONS
OPTION DATA SHEET







OPTION NUMBER: **C-13A**

OPTION NAME: **Purchase Lake Travis Water and Run-of-River Water Rights/Divert at Lake Austin to Water Treatment Plant and then to Injection Wells**

OPTION DESCRIPTION: *Purchase 50,000 acft/yr of Lake Travis water from LCRA, and 288,500 acft/yr of senior run-of-river water rights; divert from Lake Austin to a water treatment plant and then to an injection well field in eastern Medina County.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$710	per acft[1]
QUANTITY OF WATER:	68,000	acft/yr[2]
LAND IMPACTED:	1,075	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	50	of	106	(1=lowest unit)
QUANTITY OF WATER:	38	of	106	(1=highest volume)
LAND IMPACTED:	56	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Reservoir intake and pump station, raw water pipeline and pump stations to water treatment plant, water treatment plant, finished water pump station and pipeline to injection well field, and injection well field.

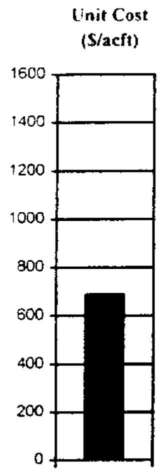
[2]**QUANTITY OF WATER:** Quantities of uncommitted Lake Travis and run-of-river water rights available, and instream flow requirements.

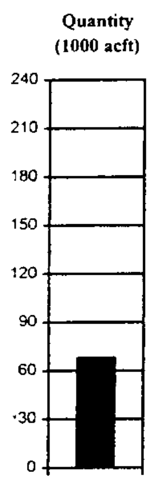
[3]**LAND IMPACTED:** Sizes of sites of water treatment plant, pipeline rights-of-way, and aquifer injection well field.

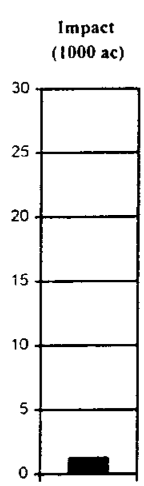
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of pipeline and water treatment plant location. Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, and ability of the entities to develop a regional plan which realizes economies of size that benefits all of the participants.

ADDITIONAL FACTORS: Ability to obtain permits to transfer Colorado River Basin water to the San Antonio area.







OPTION NUMBER: C-13B

OPTION NAME: Purchase Lake Travis Water and Run-of-River Water Rights/Diverted at Lake Austin/Divert to Edwards Aquifer Recharge Zone

OPTION DESCRIPTION: *Purchase 50,000 acft/yr of Lake Travis water from LCRA, and 288,500 acft/yr of senior run-of-river water rights: divert from Lake Austin to a water treatment plant and then to aquifer recharge structures in northwestern Bexar County.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$690	per acft[1]
QUANTITY OF WATER:	68,000	acft/yr[2]
LAND IMPACTED:	1,253	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	46	of	106	(1=lowest unit)
QUANTITY OF WATER:	39	of	106	(1=highest volume)
LAND IMPACTED:	59	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Reservoir intake and pump station, raw water pipeline and pump stations to water treatment plant, water treatment plant, finished water pump station and pipeline to recharge structures in northwestern Bexar County, and recharge structures. (Note: If water does not need to be treated, unit cost would be reduced to $595/acft.)

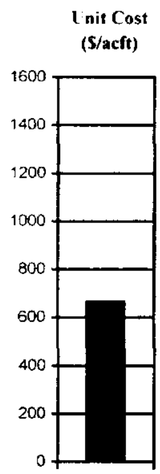
[2]**QUANTITY OF WATER:** Quantities of uncommitted Lake Travis and run-of-river water rights available, and instream flow requirements.

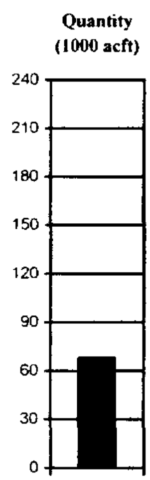
[3]**LAND IMPACTED:** Sizes of sites of water treatment plant, pipeline rights-of-way, and recharge structures.

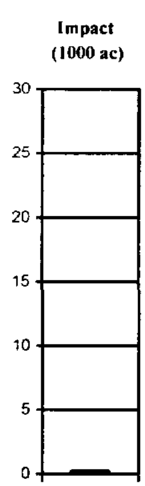
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of pipeline and water treatment plant location. Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, and ability of the entities to develop a regional plan which realizes economies of size that benefits all of the participants.

ADDITIONAL FACTORS: Ability to obtain permits to transfer Colorado River Basin water to the San Antonio area.







WEST CENTRAL TRANS-TEXAS WATER SUPPLY OPTIONS

OPTION DATA SHEET

OPTION NUMBER: C-13C

OPTION NAME: Purchase Lake Travis Water and Run-of-River Water Rights/Diverted at Lake Austin/Divert to Water Treatment Plant/Municipal Distribution System

OPTION DESCRIPTION: *Purchase 50,000 acft/yr of Lake Travis water from LCRA, and 288,500 acft/yr of senior run-of-river water rights; divert from Lake Austin to a water treatment plant and then to SAWS municipal distribution system.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$667	per acft[1]
QUANTITY OF WATER:	68,000	acft/yr[2]
LAND IMPACTED:	249	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	44	of	106	(1=lowest unit)
QUANTITY OF WATER:	40	of	106	(1=highest volume)
LAND IMPACTED:	49	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Reservoir intake and pump station, raw water pipeline and pump stations to water treatment plant, water treatment plant, finished water pump station and pipeline to SAWS municipal distribution system.

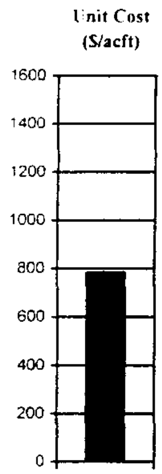
[2]**QUANTITY OF WATER:** Quantities of uncommitted Lake Travis and run-of-river water rights available, and instream flow requirements.

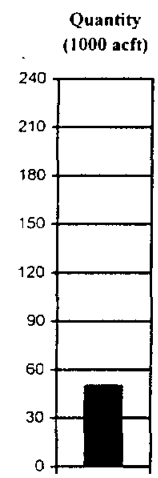
[3]**LAND IMPACTED:** Sizes of sites of water treatment plant, pipeline rights-of-way.

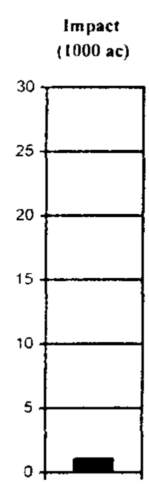
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of pipeline and water treatment plant location. Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, and ability of the entities to develop a regional plan which realizes economies of size that benefits all of the participants.

ADDITIONAL FACTORS: Ability to obtain permits to transfer Colorado River Basin water to the San Antonio area.







OPTION NUMBER: C-13D

OPTION NAME: Purchase Lake Travis Water /Diverted at Lake Austin/Divert/Inject to Edwards Aquifer

OPTION DESCRIPTION: *Purchase 50,000 acft/yr of Lake Travis water from LCRA, divert from Lake Austin to water treatment plant and then to aquifer well field in eastern Medina County*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$785	per acft[1]
QUANTITY OF WATER:	50,000	acft/yr[2]
LAND IMPACTED:	1,075	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	65	of	106	(1=lowest unit)
QUANTITY OF WATER:	47	of	106	(1=highest volume)
LAND IMPACTED:	57	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Reservoir intake and pump station, raw water pipeline and pump stations to water treatment plant, water treatment plant, finished water pump station and pipeline to injection well field in eastern Medina County, and injection well field.

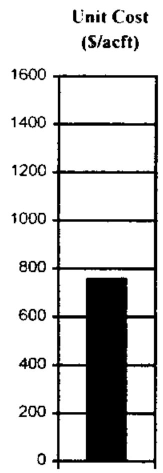
[2]**QUANTITY OF WATER:** Quantity of uncommitted Lake Travis water available.

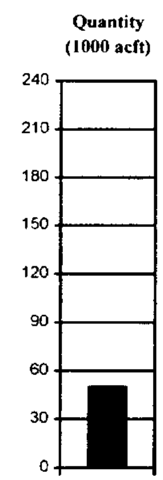
[3]**LAND IMPACTED:** Sizes of sites of water treatment plant, pipeline rights-of-way, and injection well field.

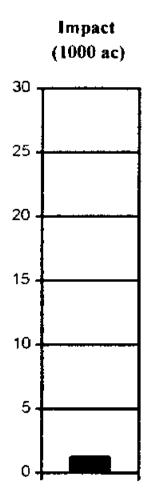
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of pipeline and water treatment plant location. Resource conflicts can be avoided by careful selection of water treatment plant, and pipeline routes.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, and ability of the entities to develop a regional plan which realizes economies of size that benefits all of the participants.

ADDITIONAL FACTORS: Ability to obtain permits to transfer Colorado River Basin water to the San Antonio area.







OPTION NUMBER: C-13E

OPTION NAME: Purchase Lake Travis Water /Diverted at Lake Austin/Divert to Edwards Aquifer Recharge Zone

OPTION DESCRIPTION: *Purchase 50,000 acft/yr of Lake Travis water from LCRA, divert from Lake Austin to water treatment plant and then to aquifer recharge zone in northwestern Bexar County*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$759	per acft[1]
QUANTITY OF WATER:	50,000	acft/yr[2]
LAND IMPACTED:	1,253	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	60	of	106	(1=lowest unit)
QUANTITY OF WATER:	48	of	106	(1=highest volume)
LAND IMPACTED:	60	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Reservoir intake and pump station, raw water pipeline and pump stations to water treatment plant, water treatment plant, finished water pump station and pipeline to recharge zone in northwestern Bexar County, and recharge structures.

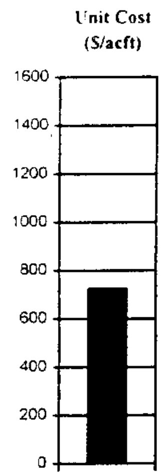
[2]**QUANTITY OF WATER:** Quantity of uncommitted Lake Travis water available.

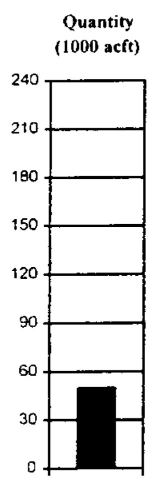
[3]**LAND IMPACTED:** Sizes of sites of water treatment plant, pipeline rights-of-way, and recharge structures.

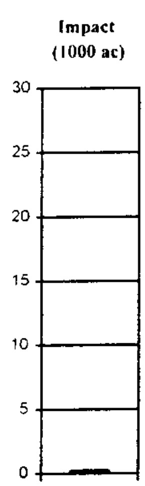
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of pipeline and water treatment plant location. Resource conflicts can be avoided by careful selection of water treatment plant, and pipeline routes.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, and ability of the entities to develop a regional plan which realizes economies of size that benefits all of the participants.

ADDITIONAL FACTORS: Ability to obtain permits to transfer Colorado River Basin water to the San Antonio area.







OPTION NUMBER: C-13F

OPTION NAME: Purchase Lake Travis Water /Diverted at Lake Austin/Divert to Water Treatment Plant/Municipal System

OPTION DESCRIPTION: *Purchase 50,000 acft/yr of Lake Travis water from LCRA, divert from Lake Austin to water treatment plant and then to SAWS municipal distribution system.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$725	per acft[1]
QUANTITY OF WATER:	50,000	acft/yr[2]
LAND IMPACTED:	249	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	54	of	106	(1=lowest unit)
QUANTITY OF WATER:	49	of	106	(1=highest volume)
LAND IMPACTED:	50	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Reservoir intake and pump station, raw water pipeline and pump stations to water treatment plant, water treatment plant, finished water pump station and pipeline to municipal distribution system.

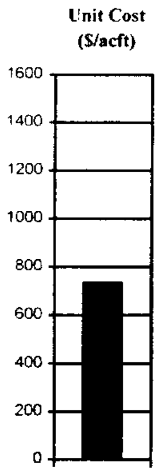
[2]**QUANTITY OF WATER:** Quantity of uncommitted Lake Travis water available.

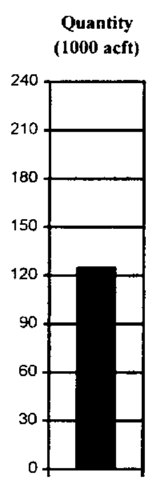
[3]**LAND IMPACTED:** Sizes of sites of water treatment plant, pipeline rights-of-way, and recharge structures.

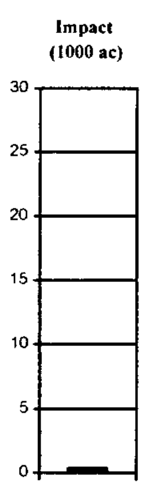
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of pipeline and water treatment plant location. Resource conflicts can be avoided by careful selection of water treatment plant, and pipeline routes.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, and ability of the entities to develop a regional plan which realizes economies of size that benefits all of the participants.

ADDITIONAL FACTORS: Ability to obtain permits to transfer Colorado River Basin water to the San Antonio area.







OPTION NUMBER: C-17A

OPTION NAME: Purchase Lake Travis Water and Run-of-River Water Rights/Divert at Columbus to Water Treatment Plant and then to SAWS Municipal System

OPTION DESCRIPTION: *Purchase 50,000 acft/yr of Lake Travis water from LCRA, 75,000 acft/yr of unutilized run-of-river rights, and 213,500 acft/yr of second crop run-of-river water rights; divert from Colorado River at Columbus to an off-channel reservoir, then to a water treatment plant and to SAWS municipal distribution system.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	**$736**	**per acft**[1]
QUANTITY OF WATER:	**125000**	**acft/yr**[2]
LAND IMPACTED:	**403**	**acres**[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	**55**	**of**	**106**	(1=lowest unit)
QUANTITY OF WATER:	**16**	**of**	**106**	(1=highest volume)
LAND IMPACTED:	**51**	**of**	**106**	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Small channel dam, river intake, pump station, off-channel reservoir, raw water pipeline to off-channel reservoir, reservoir intake and pump station, raw water pipeline and 3 pump stations to water treatment plant, water treatment plant, and distribution system improvements.

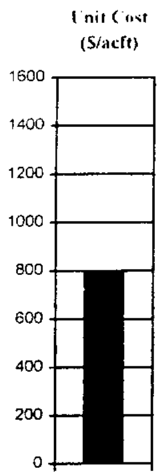
[2]**QUANTITY OF WATER:** Quantities of water available from Lake Travis, unutilized run-of-river and second crop run-of-river water rights, and instream flow requirements.

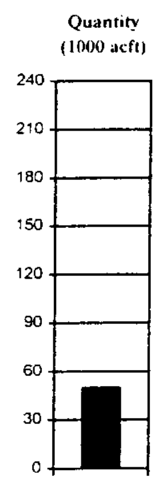
[3]**LAND IMPACTED:** Sizes of off-channel reservoir, water treatment plant site and pipeline rights-of-way.

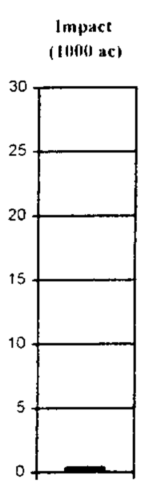
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of off-channel reservoir, pipeline and water treatment plant locations. Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, mitigation requirements, and ability of the entities to develop a regional plan which realizes economies of size that benefits all of the participants.

ADDITIONAL FACTORS: Ability to obtain permits to transfer Colorado River Basin water to the San Antonio area.







OPTION NUMBER: C-17B

OPTION NAME: Purchase Lake Travis Water and Divert at Columbus to Water Treatment Plant and then to SAWS Municipal System

OPTION DESCRIPTION: *Purchase 50,000 acft/yr of Lake Travis water from LCRA; divert from Colorado River at Columbus to an off-channel reservoir, and then to a water treatment plant and to SAWS municipal distribution system.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$793	per acft[1]
QUANTITY OF WATER:	50,000	acft/yr[2]
LAND IMPACTED:	403	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	67	of	106	(1=lowest unit)
QUANTITY OF WATER:	50	of	106	(1=highest volume)
LAND IMPACTED:	52	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Small channel dam, river intake, pump station, raw water pipeline and 3 pump stations to water treatment plant, water treatment plant, and distribution system improvements.

[2]**QUANTITY OF WATER:** Quantities of water available from Lake Travis.

[3]**LAND IMPACTED:** Water treatment plant site and pipeline rights-of-way.

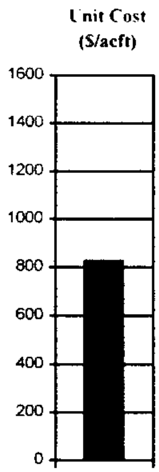
ENVIRONMENTAL ISSUES: Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes.

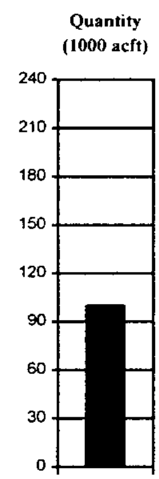
SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, and ability of the entities to develop a regional plan which realizes economies of size that benefits all of the participants.

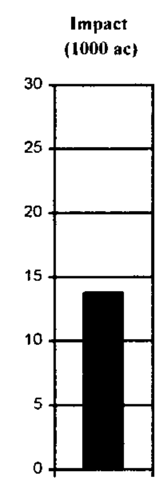
ADDITIONAL FACTORS: Ability to obtain permits to transfer Colorado River Basin water to the San Antonio area.

WEST CENTRAL TRANS-TEXAS WATER SUPPLY OPTIONS

OPTION DATA SHEET







OPTION NUMBER: C-18

OPTION NAME: Shaws Bend Reservoir/Divert to Water Treatment Plant/Municipal System

OPTION DESCRIPTION: *Firm yield of proposed Shaws Bend Reservoir located 4 miles southeast of City of LaGrange, TX would be diverted through intake and pumped at a uniform rate through transmission pipeline to water treatment plant and then to SAWS municipal distribution system.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☐ 5-15 yrs. ☒ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	**$827**	**per acft**[1]
QUANTITY OF WATER:	**100000**	**acft/yr**[2]
LAND IMPACTED:	**13,803**	**acres**[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	**69**	**of**	**106**	(1=lowest unit)
QUANTITY OF WATER:	**21**	**of**	**106**	(1=highest volume)
LAND IMPACTED:	**89**	**of**	**106**	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Dam and reservoir, reservoir intake, and pump station, raw water pipeline and 3 booster pump stations, water treatment plant, finished water pipeline to SAWS municipal distribution system, and mitigation.

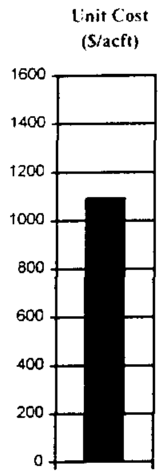
[2]**QUANTITY OF WATER:** Quantity of unappropriated water, instream flow requirements, quantity of any downstream run-of-river water rights that might be available for purchase.

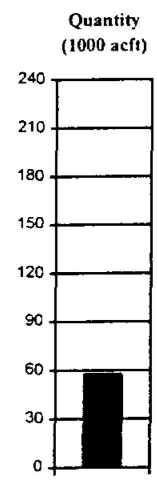
[3]**LAND IMPACTED:** Sizes of reservoir and water treatment plant sites and pipeline rights of way.

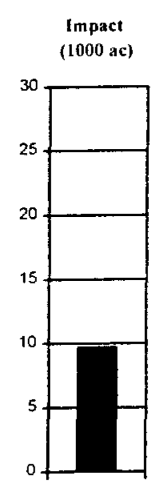
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of reservoir, pipeline and water treatment plant locations. Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes. Mitigation of the Shaws Bend site would be required.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, mitigation requirements, and ability of the entities to develop a regional plan which realizes economies of size that benefits all of the participants.

ADDITIONAL FACTORS:







OPTION NUMBER: B-10A
OPTION NAME: Allens Creek Reservoir--Divert Firm Yield and Inject to Edwards Aquifer

OPTION DESCRIPTION: *Firm yield of proposed Allens Creek reservoir on Allens Creek, a tributary of the Brazos River in Austin County, would be diverted and pumped at a uniform rate through transmission pipeline to a water treatment plant and then to injection well field in eastern Medina County. Reservoir intake and pump station sized to deliver 4,900 acft/month.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$1,093	per acft[1]
QUANTITY OF WATER:	57,800	acft/yr[2]
LAND IMPACTED:	9,715	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	90	of	106	(1=lowest unit)
QUANTITY OF WATER:	42	of	106	(1=highest volume)
LAND IMPACTED:	83	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Allens Creek dam and reservoir, reservoir intake and pump station, river diversion, intake and pump station, raw water pipeline to Allens Creek Reservoir, raw water pipeline to water treatment plant, and 4 booster pump stations, water treatment plant, finished water pipeline to injection well field in eastern Medina County, injection well field, and mitigation.

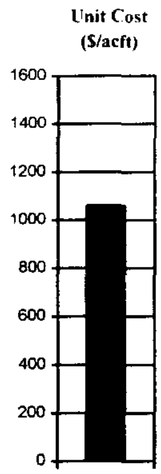
[2]**QUANTITY OF WATER:** Unappropriated runoff from the 58.3 square mile Allens Creek watershed, diversions of unappropriated flood flows of the Brazos River, and perhaps stored water from the Brazos River Authority's upstream reservoirs that could be released and diverted into Allens Creek Reservoir. Instream flow requirements could affect quantities available from Allens Creek and the Brazos River.

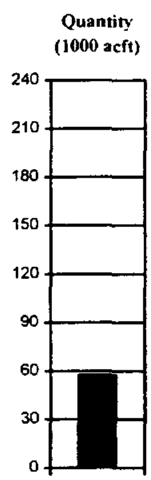
[3]**LAND IMPACTED:** Sizes of reservoir and water treatment plant sites and pipeline rights-of-way.

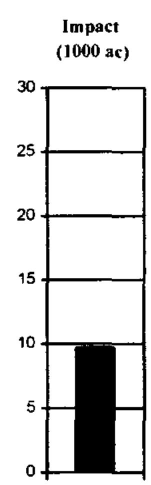
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of reservoir, pipeline and water treatment plant locations. Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes. Mitigation of the Allens Creek Reservoir site would be required.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, mitigation requirements, and ability of the entities to develop a regional plan which realizes economies of size that benefits all of the participants.

ADDITIONAL FACTORS: Ability to obtain permits to transfer Brazos Basin water to the San Antonio area.







OPTION NUMBER: B-10B
OPTION NAME: Allens Creek Reservoir--Divert Firm Yield to Edwards Aquifer Recharge Zone

OPTION DESCRIPTION: *Firm yield of proposed Allens Creek reservoir on Allens Creek, a tributary of the Brazos River in Austin County, would be diverted and pumped at a uniform rate through transmission pipeline to a water treatment plant and then to recharge zone in northwestern Bexar County. Reservoir intake and pump station sized to deliver 4,900 acft/month.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☐ 5-15 yrs. ☒ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$1,061	per acft[1]
QUANTITY OF WATER:	57,800	acft/yr[2]
LAND IMPACTED:	9,732	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	89	of	106	(1=lowest unit)
QUANTITY OF WATER:	43	of	106	(1=highest volume)
LAND IMPACTED:	84	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Allens Creek dam and reservoir, reservoir intake and pump station, river diversion, intake and pump station, raw water pipeline to Allens Creek Reservoir, raw water pipeline to water treatment plant, and 4 booster pump stations, water treatment plant, finished water pipeline to Edwards Aquifer recharge zone in northwestern Bexar County, recharge structures, and mitigation.

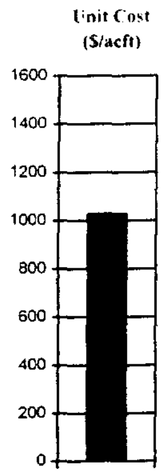
[2]**QUANTITY OF WATER:** Unappropriated runoff from the 58.3 square mile Allens Creek watershed, diversions of unappropriated flood flows of the Brazos River, and perhaps stored water from the Brazos River Authority's upstream reservoirs that could be released and diverted into Allens Creek Reservoir. Instream flow requirements could affect quantities available from Allens Creek and the Brazos River.

[3]**LAND IMPACTED:** Sizes of reservoir and water treatment plant sites and pipeline rights-of-way.

ENVIRONMENTAL ISSUES: Terrestrial habitat effects of reservoir, pipeline and water treatment plant locations. Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes. Mitigation of the Allens Creek Reservoir site would be required.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, mitigation requirements, and ability of the entities to develop a regional plan which realizes economies of size that benefits all of the participants.

ADDITIONAL FACTORS: Ability to obtain permits to transfer Brazos Basin water to the San Antonio area.

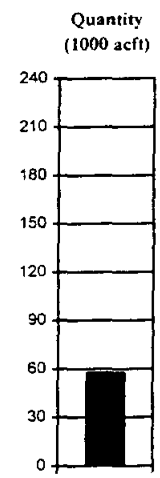


OPTION NUMBER: B-10C

OPTION NAME: Allens Creek Reservoir--Divert Firm Yield to Water Treatment Plant and then to Municipal Distribution System

OPTION DESCRIPTION: *Firm yield of proposed Allens Creek reservoir on Allens Creek, a tributary of the Brazos River in Austin County, would be diverted and pumped at a uniform rate through transmission pipeline to a water treatment plant and then to SAWS municipal distribution system. Reservoir intake and pump station sized to deliver 4,900 acft/month.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.



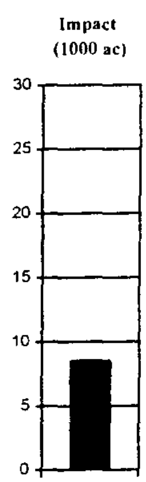
COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$1,029	per acft[1]
QUANTITY OF WATER:	57,800	acft/yr[2]
LAND IMPACTED:	8,562	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	87	of	106	(1=lowest unit)
QUANTITY OF WATER:	44	of	106	(1=highest volume)
LAND IMPACTED:	82	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Allens Creek dam and reservoir, reservoir intake and pump station, river diversion, intake and pump station, raw water pipeline to Allens Creek Reservoir, raw water pipeline to water treatment plant, and 4 booster pump stations, water treatment plant, finished water pipeline to SAWS municipal distribution system, and mitigation.

[2]**QUANTITY OF WATER:** Unappropriated runoff from the 58.3 square mile Allens Creek watershed, diversions of unappropriated flood flows of the Brazos River, and perhaps stored water from the Brazos River Authority's upstream reservoirs that could be released and diverted into Allens Creek Reservoir. Instream flow requirements could affect quantities available from Allens Creek and the Brazos River.

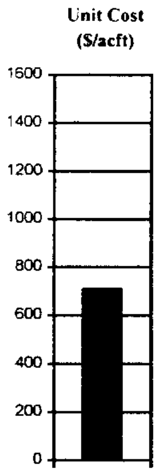


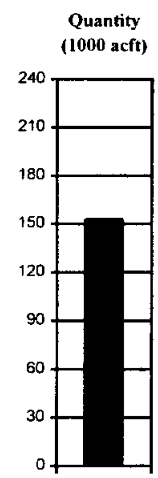
[3]**LAND IMPACTED:** Sizes of reservoir and water treatment plant sites and pipeline rights-of-way.

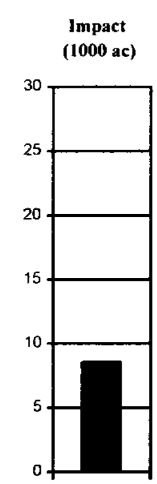
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of reservoir, pipeline and water treatment plant locations. Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes. Mitigation of the Allens Creek Reservoir site would be required.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, mitigation requirements, and ability of the entities to develop a regional plan which realizes economies of size that benefits all of the participants.

ADDITIONAL FACTORS: Ability to obtain permits to transfer Brazos Basin water to the San Antonio area.







OPTION NUMBER: B-10D
OPTION NAME: Allens Creek Reservoir--Divert Firm Yield to Water Treatment Plant and then to Municipal Distribution System

OPTION DESCRIPTION: *158,800 acft/yr of firm yield of proposed Allens Creek reservoir on Allens Creek, a tributary of the Brazos River in Austin County, would be diverted and pumped at a uniform rate through transmission pipeline to a water treatment plant and then to SAWS municipal distribution system. Reservoir intake and pump station sized to deliver 12,750 acft/month.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☐ 5-15 yrs. ☒ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$709	per acft[1]
QUANTITY OF WATER:	152,800	acft/yr[2]
LAND IMPACTED:	8,562	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	48	of	106	(1=lowest unit)
QUANTITY OF WATER:	13	of	106	(1=highest volume)
LAND IMPACTED:	81	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Allens Creek dam and reservoir, reservoir intake and pump station, river diversion, intake and pump station, raw water pipeline to Allens Creek Reservoir, raw water pipeline to water treatment plant, and 4 booster pump stations, water treatment plant, finished water pipeline to SAWS municipal distribution system, and mitigation.

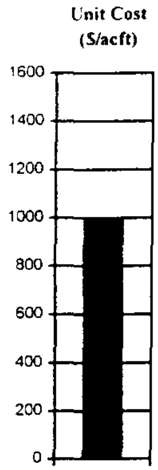
[2]**QUANTITY OF WATER:** Unappropriated runoff from the 58.3 square mile Allens Creek watershed, diversions of unappropriated flood flows of the Brazos River, and perhaps stored water from the Brazos River Authority's upstream reservoirs that could be released and diverted into Allens Creek Reservoir. Instream flow requirements could affect quantities available from Allens Creek and the Brazos River.

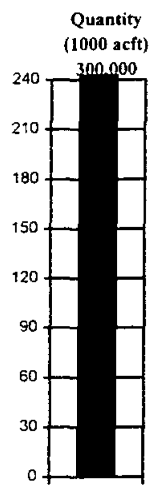
[3]**LAND IMPACTED:** Sizes of reservoir and water treatment plant sites and pipeline rights-of-way.

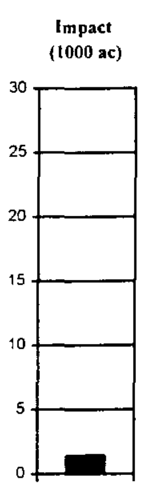
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of reservoir, pipeline and water treatment plant locations. Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes. Mitigation of the Allens Creek Reservoir site would be required.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, mitigation requirements, and ability of the entities to develop a regional plan which realizes economies of size that benefits all of the participants.

ADDITIONAL FACTORS: Ability to obtain permits to transfer Brazos Basin water to the San Antonio area.







OPTION NUMBER: SB-10A
OPTION NAME: Toledo Bend Reservoir--Divert and Inject to Edwards Aquifer

OPTION DESCRIPTION: *Purchase water from Toledo Bend Reservoir located on the Sabine River, convey via raw water pipeline to a water treatment plant, and then to Edwards Aquifer injection well field in eastern Medina County. Intake and pump stations designed to deliver 25,000 acft/month.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$990	per acft[1]
QUANTITY OF WATER:	300,000	acft/yr[2]
LAND IMPACTED:	1,465	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	85	of	106	(1=lowest unit)
QUANTITY OF WATER:	6	of	106	(1=highest volume)
LAND IMPACTED:	67	of	106	(1=least acreage)

<u>FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED</u>

[1]**COST:** Cost of Toledo Bend water, Toledo Bend reservoir intake and pump station, raw water pipeline to water treatment plant and 5 booster pump stations, water treatment plant, finished water pipeline and pump station to injection well field, injection well field, and mitigation.

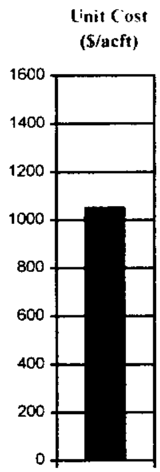
[2]**QUANTITY OF WATER:** Quantity of uncommitted water available from Toledo Bend Reservoir. Ability of Edwards Aquifer to receive 300,000 acft/yr.

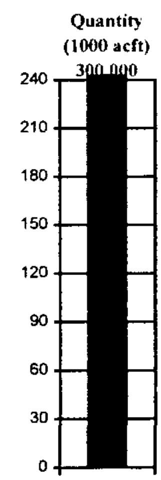
[3]**LAND IMPACTED:** Sizes of water treatment plant site, pipeline routes, and injection well field.

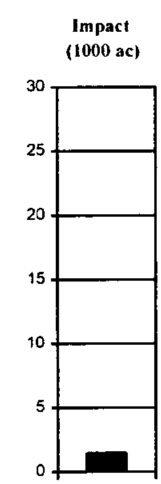
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of pipeline and water treatment plant locations. Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, mitigation requirements, and ability of the entities to develop a regional plan which realizes economies of size that benefits all of the participants.

ADDITIONAL FACTORS: Ability to obtain permits to transfer Sabine Basin water to the San Antonio area.







OPTION NUMBER: SB-10B

OPTION NAME: Toledo Bend Reservoir--Divert to Edwards Aquifer Recharge Zone

OPTION DESCRIPTION: *Purchase water from Toledo Bend Reservoir located on the Sabine River, convey via raw water pipeline to a water treatment plant, and then to Edwards Aquifer recharge zone in northwestern Bexar County. Intake and pump stations designed to deliver 25,000 acft/month.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$1,051	per acft[1]
QUANTITY OF WATER:	300,000	acft/yr[2]
LAND IMPACTED:	1,482	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	88	of	106	(1=lowest unit)
QUANTITY OF WATER:	7	of	106	(1=highest volume)
LAND IMPACTED:	70	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Cost of Toledo Bend water, Toledo Bend reservoir intake and pump station, raw water pipeline to water treatment plant and 5 booster pump stations, water treatment plant, finished water pipeline and pump station to aquifer recharge zone, recharge structures, and mitigation.

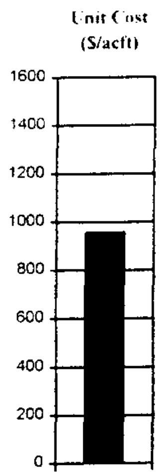
[2]**QUANTITY OF WATER:** Quantity of uncommitted water available from Toledo Bend Reservoir. Ability of Edwards Aquifer to receive 300,000 acft/yr.

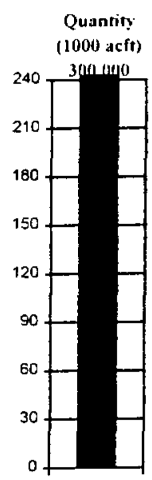
[3]**LAND IMPACTED:** Sizes of water treatment plant site, pipeline routes, and recharge reservoirs.

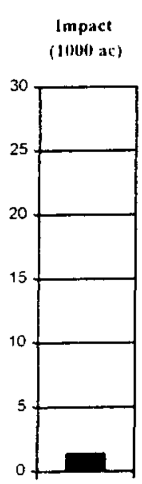
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of pipeline and water treatment plant locations. Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, mitigation requirements, and ability of the entities to develop a regional plan which realizes economies of size that benefits all of the participants.

ADDITIONAL FACTORS: Ability to obtain permits to transfer Sabine Basin water to the San Antonio area.







OPTION NUMBER: SB-10C
OPTION NAME: Toledo Bend Reservoir--Divert to Water Treatment Plant and then to SAWS Municipal Distribution System

OPTION DESCRIPTION: *Purchase water from Toledo Bend Reservoir located on the Sabine River, convey via raw water pipeline to a water treatment plant and then to SAWS municipal distribution system. Intake and pump stations designed to deliver 25,000 acft/month.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$957	per acft[1]
QUANTITY OF WATER:	300,000	acft/yr[2]
LAND IMPACTED:	1,400	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	79	of	106	(1=lowest unit)
QUANTITY OF WATER:	8	of	106	(1=highest volume)
LAND IMPACTED:	64	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Cost of Toledo Bend water, Toledo Bend reservoir intake and pump station, raw water pipeline to water treatment plant and 5 booster pump stations, water treatment plant, finished water pipeline and pump station to SAWS municipal distribution system, and mitigation.

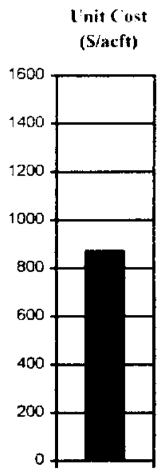
[2]**QUANTITY OF WATER:** Quantity of uncommitted water available from Toledo Bend Reservoir.

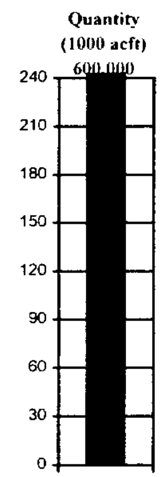
[3]**LAND IMPACTED:** Sizes of water treatment plant site, and pipeline routes.

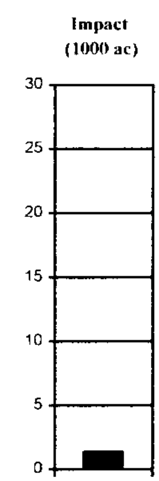
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of pipeline and water treatment plant locations. Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, and ability of the entities to develop a regional plan which realizes economies of size that benefits all of the participants.

ADDITIONAL FACTORS: Ability to obtain permits to transfer Sabine Basin water to the San Antonio area.







OPTION NUMBER: SB-10D
OPTION NAME: Toledo Bend Reservoir--Divert to Water Treatment Plant and then to SAWS Municipal Distribution System

OPTION DESCRIPTION: *Purchase water from Toledo Bend Reservoir located on the Sabine River, convey via raw water pipeline to a water treatment plant and then to SAWS municipal distribution system. Intake and pump stations designed to deliver 50,000 acft/month.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$872	per acft[1]
QUANTITY OF WATER:	600,000	acft/yr[2]
LAND IMPACTED:	1,400	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	74	of	106	(1=lowest unit)
QUANTITY OF WATER:	1	of	106	(1=highest volume)
LAND IMPACTED:	63	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Cost of Toledo Bend water, Toledo Bend reservoir intake and pump station, raw water pipeline to water treatment plant and 5 booster pump stations, water treatment plant, finished water pipeline and pump station to SAWS municipal distribution system, and mitigation.

[2]**QUANTITY OF WATER:** Quantity of uncommitted water available from Toledo Bend Reservoir.

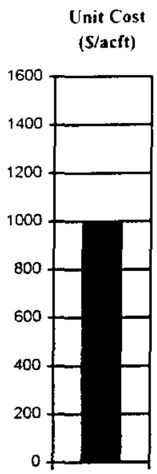
[3]**LAND IMPACTED:** Sizes of water treatment plant site, and pipeline routes.

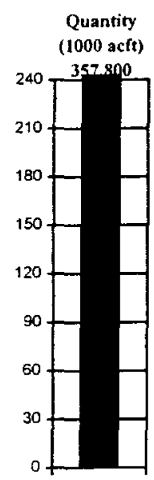
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of pipeline and water treatment plant locations. Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes.

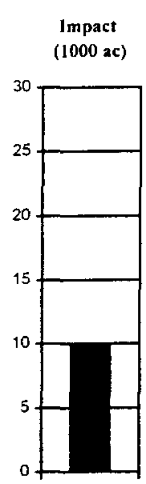
SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, and ability of the entities to develop a regional plan which realizes economies of size that benefits all of the participants.

ADDITIONAL FACTORS: Ability to obtain permits to transfer Sabine Basin water to the San Antonio area.

WEST CENTRAL TRANS-TEXAS WATER SUPPLY OPTIONS
OPTION DATA SHEET







OPTION NUMBER: **SBB-10A**

OPTION NAME: **Allens Creek and Toledo Bend Reservoirs--Divert Firm Yield and Inject to Edwards Aquifer**

OPTION DESCRIPTION: *57,800 acft/yr of firm yield from proposed Allens Creek reservoir on Allens Creek, a tributary of the Brazos River in Austin County, would be supplemented with 300,000 acft/yr of water from Toledo Bend Reservoir, diverted and pumped to a water treatment plant and then to injection well field in eastern Medina County. Allens Creek reservoir intake and pump station sized to deliver 30,000 acft/month.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	**$990**	**per acft**[1]
QUANTITY OF WATER:	**357,800**	**acft/yr**[2]
LAND IMPACTED:	**9,846**	**acres**[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	**84**	**of**	**106**	(1=lowest unit)
QUANTITY OF WATER:	**3**	**of**	**106**	(1=highest volume)
LAND IMPACTED:	**87**	**of**	**106**	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]COST: Allens Creek dam and reservoir, reservoir intake and pump station, river diversion, intake and pump station, raw water pipeline to Allens Creek Reservoir, cost of Toledo Bend water, Toledo Bend reservoir intake and pump station, raw water pipeline and pump stations from Toledo Bend to Allens Creek Reservoir, raw water pipeline to water treatment plant and 4 booster pump stations, water treatment plant, finished water pipeline to injection well field in eastern Medina County, injection well field, and mitigation.

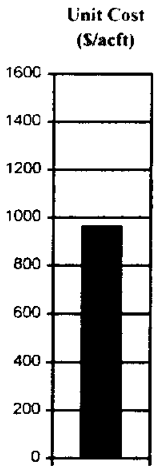
[2]**QUANTITY OF WATER:** Unappropriated runoff from the 58.3 square mile Allens Creek watershed, diversions of unappropriated flood flows of the Brazos River, and perhaps stored water from the Brazos River Authority's upstream reservoirs, quantity of uncommitted water available from Toledo Bend Reservoir. Instream flow needs. Ability of Edwards Aquifer to receive 357,800 acft/yr.

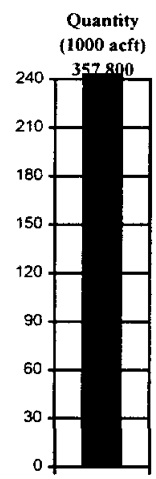
[3]**LAND IMPACTED:** Sizes of reservoir and water treatment plant sites and pipeline rights-of-way.

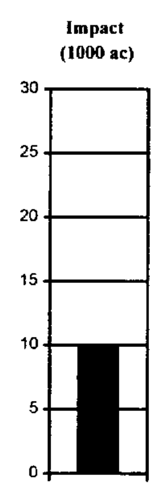
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of reservoir, pipeline and water treatment plant locations. Mitigation of the Allens Creek Reservoir site.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, mitigation requirements, and ability of the entities to develop a regional plan which realizes economies of size that benefits all of the participants.

ADDITIONAL FACTORS: Ability to obtain permits to transfer Brazos and Sabine water to San Antonio area.







OPTION NUMBER: SBB-10B

OPTION NAME: Allens Creek and Toledo Bend Reservoirs--Divert Firm Yield to Edwards Aquifer Recharge Zone

OPTION DESCRIPTION: *57,800 acft/yr of firm yield from proposed Allens Creek reservoir on Allens Creek, a tributary of the Brazos River in Austin County, would be supplemented with 300,000 acft/yr of water from Toledo Bend Reservoir, diverted and pumped to a water treatment plant and then to Edwards Aquifer recharge zone in northwestern Bexar County. Allens Creek reservoir intake and pump station sized to deliver 30,000 acft/month.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$963	per acft[1]
QUANTITY OF WATER:	357,800	acft/yr[2]
LAND IMPACTED:	9,863	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	81	of	106	(1=lowest unit)
QUANTITY OF WATER:	4	of	106	(1=highest volume)
LAND IMPACTED:	88	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Allens Creek dam and reservoir, reservoir intake and pump station, river diversion, intake and pump station, raw water pipeline to Allens Creek Reservoir, cost of Toledo Bend water, Toledo Bend reservoir intake and pump station, raw water pipeline and pump stations from Toledo Bend to Allens Creek Reservoir, raw water pipeline to water treatment plant and 4 booster pump stations, water treatment plant, finished water pipeline to Edwards Aquifer recharge zone in northwestern Bexar County, injection well field, and mitigation.

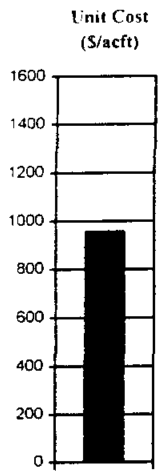
[2]**QUANTITY OF WATER:** Unappropriated runoff from the 58.3 square mile Allens Creek watershed, diversions of unappropriated flood flows of the Brazos River, and perhaps stored water from the Brazos River Authority's upstream reservoirs, quantity of uncommitted water available from Toledo Bend Reservoir. Instream flow needs. Ability of Edwards Aquifer to receive 357,800 acft/yr.

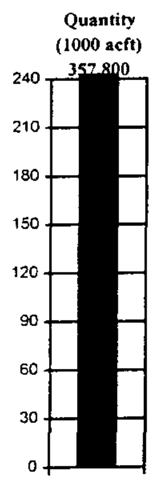
[3]**LAND IMPACTED:** Sizes of reservoir and water treatment plant sites and pipeline rights-of-way.

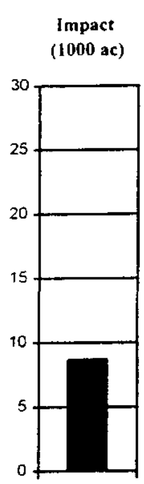
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of reservoir, pipeline and water treatment plant locations. Mitigation of the Allens Creek Reservoir site.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, mitigation requirements, and ability of the entities to develop a regional plan which realizes economies of size that benefits all of the participants.

ADDITIONAL FACTORS: Ability to obtain permits to transfer Brazos and Sabine water to San Antonio area.







OPTION NUMBER: **SBB-10C**

OPTION NAME: **Allens Creek and Toledo Bend Reservoirs--Divert Firm Yield to SAWS Water Treatment Plant and then to Municipal Distribution System**

OPTION DESCRIPTION: *57,800 acft/yr of firm yield from proposed Allens Creek reservoir on Allens Creek, a tributary of the Brazos River in Austin County, would be supplemented with 300,000 acft/yr of water from Toledo Bend Reservoir, diverted and pumped to a water treatment plant and then SAWS municipal distribution system. Allens Creek reservoir intake and pump station sized to deliver 30,000 acft/month.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$957	per acft[1]
QUANTITY OF WATER:	357,800	acft/yr[2]
LAND IMPACTED:	8,693	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	78	of	106	(1=lowest unit)
QUANTITY OF WATER:	5	of	106	(1=highest volume)
LAND IMPACTED:	86	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]COST: Allens Creek dam and reservoir, reservoir intake and pump station, river diversion, intake and pump station, raw water pipeline to Allens Creek Reservoir, cost of Toledo Bend water, Toledo Bend reservoir intake and pump station, raw water pipeline and pump stations from Toledo Bend to Allens Creek Reservoir, raw water pipeline to water treatment plant and 4 booster pump stations, water treatment plant, finished water pipeline to SAWS municipal distribution, and mitigation.

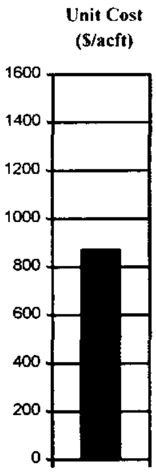
[2]**QUANTITY OF WATER:** Unappropriated runoff from the 58.3 square mile Allens Creek watershed, diversions of unappropriated flood flows of the Brazos River, and perhaps stored water from the Brazos River Authority's upstream reservoirs, quantity of uncommitted water available from Toledo Bend Reservoir. Instream flow needs.

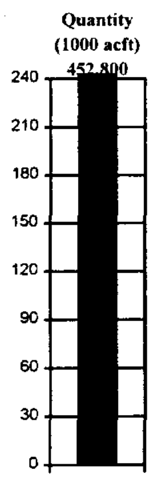
[3]**LAND IMPACTED:** Sizes of reservoir and water treatment plant sites and pipeline rights-of-way.

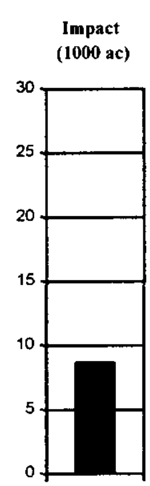
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of reservoir, pipeline and water treatment plant locations. Mitigation of the Allens Creek Reservoir site.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, mitigation requirements, and ability of the entities to develop a regional plan which realizes economies of size that benefits all of the participants..

ADDITIONAL FACTORS: Ability to obtain permits to transfer Brazos and Sabine water to San Antonio area.







OPTION NUMBER: SBB-10D

OPTION NAME: Allens Creek and Toledo Bend Reservoirs--Divert Firm Yield to SAWS Water Treatment Plant and then to Municipal Distribution System

OPTION DESCRIPTION: *157,800 acft/yr of firm yield from proposed Allens Creek reservoir on Allens Creek, a tributary of the Brazos River in Austin County, would be supplemented with 300,000 acft/yr of water from Toledo Bend Reservoir, diverted and pumped to a water treatment plant and then to SAWS municipal distribution system. Allens Creek reservoir intake and pump station sized to deliver 38,000 acft/month.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$872	per acft[1]
QUANTITY OF WATER:	452,800	acft/yr[2]
LAND IMPACTED:	8,693	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	75	of	106	(1=lowest unit)
QUANTITY OF WATER:	2	of	106	(1=highest volume)
LAND IMPACTED:	85	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Allens Creek dam and reservoir, reservoir intake and pump station, river diversion, intake and pump station, raw water pipeline to Allens Creek Reservoir, cost of Toledo Bend water, Toledo Bend reservoir intake and pump station, raw water pipeline and pump stations from Toledo Bend to Allens Creek Reservoir, raw water pipeline to water treatment plant and 4 booster pump stations, water treatment plant, finished water pipeline to SAWS municipal distribution, and mitigation.

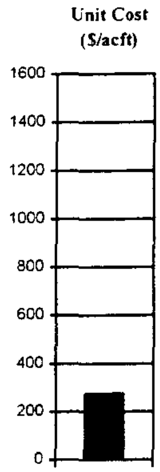
[2]**QUANTITY OF WATER:** Unappropriated runoff from the 58.3 square mile Allens Creek watershed, diversions of unappropriated flood flows of the Brazos River, and perhaps stored water from the Brazos River Authority's upstream reservoirs, quantity of uncommitted water available from Toledo Bend Reservoir. Instream flow needs.

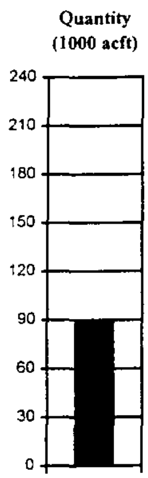
[3]**LAND IMPACTED:** Sizes of reservoir and water treatment plant sites and pipeline rights-of-way.

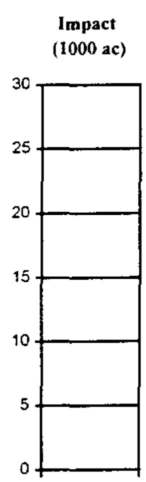
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of reservoir, pipeline and water treatment plant locations. Mitigation of the Allens Creek Reservoir site.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, mitigation requirements, and ability of the entities to develop a regional plan which realizes economies of size that benefits all of the participants..

ADDITIONAL FACTORS: Ability to obtain permits to transfer Brazos and Sabine water to San Antonio area.







OPTION NUMBER: CZ-10A
OPTION NAME: Carrizo Aquifer--Withdraw and Inject to Edwards Aquifer

OPTION DESCRIPTION: *A well field would be developed in Wilson and Atascosa Counties, and a yield of 90,000 acft/yr would be pumped to an Edwards Aquifer injection well field in eastern Medina County. The Edwards Aquifer would be used to convey water to existing users and the springs.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$545	per acft[1]
QUANTITY OF WATER:	90,000	acft/yr[2]
LAND IMPACTED:	1,567	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	33	of	106	(1=lowest unit)
QUANTITY OF WATER:	24	of	106	(1=highest volume)
LAND IMPACTED:	65	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Cost of Carrizo Aquifer water, Carrizo Aquifer well field and collection lines, raw water pipeline and pump station to water treatment plant, water treatment plant (Level 1), finished water pipeline and pump station to injection well field, injection well field, and mitigation.

[2]**QUANTITY OF WATER:** Quantity of water in storage in the Carrizo Aquifer, aquifer recharge, and aquifer capability to yield water to wells.

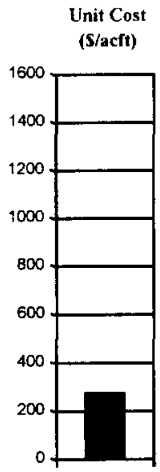
[3]**LAND IMPACTED:** Sizes of well fields, treatment plant site, and pipeline rights-of-way.

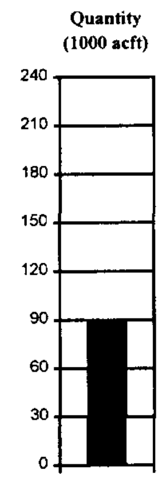
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of well fields, pipeline and water treatment plant locations. Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes.

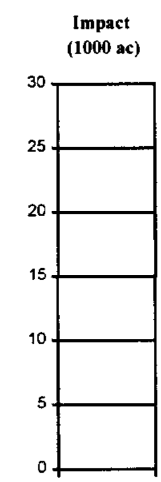
SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, and ability of participants to develop cooperative project in a timely manner.

ADDITIONAL FACTORS: Ability to obtain permits from Evergreen Underground Water District to develop Carrizo Aquifer well fields.

WEST CENTRAL TRANS-TEXAS WATER SUPPLY OPTIONS
OPTION DATA SHEET







OPTION NUMBER: **CZ-10B**

OPTION NAME: **Carrizo Aquifer--Withdraw and Divert to Edwards Aquifer Recharge Zone**

OPTION DESCRIPTION: *A well field would be developed in Wilson and Atascosa Counties, and a yield of 90,000 acft/yr would be pumped to Edwards Aquifer recharge zone in northwestern Bexar County. The Edwards Aquifer would be used to convey water to existing users and the springs.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$466	per acft[1]
QUANTITY OF WATER:	90,000	acft/yr[2]
LAND IMPACTED:	1,697	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	21	of	106	(1=lowest unit)
QUANTITY OF WATER:	25	of	106	(1=highest volume)
LAND IMPACTED:	68	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Cost of Carrizo Aquifer water, Carrizo Aquifer well field and collection lines, raw water pipeline and pump station to water treatment plant, water treatment plant (Level 1), finished water pipeline and pump station to recharge zone in northwestern Bexar County, and mitigation.

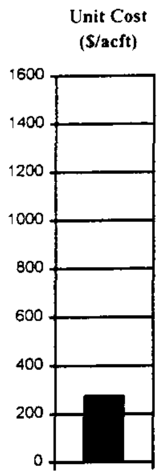
[2]**QUANTITY OF WATER:** Quantity of water in storage in the Carrizo Aquifer, aquifer recharge, and aquifer capability to yield water to wells.

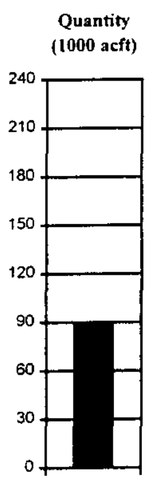
[3]**LAND IMPACTED:** Sizes of well fields, treatment plant site, recharge structures, and pipeline rights-of-way.

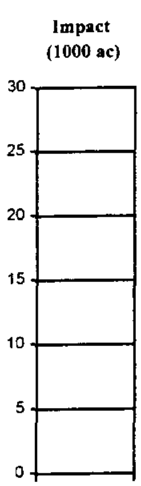
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of well fields, pipeline and water treatment plant locations. Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, and ability of participants to develop cooperative project in a timely manner.

ADDITIONAL FACTORS: Ability to obtain permits from Evergreen Underground Water District to develop Carrizo Aquifer well fields.







OPTION NUMBER: CZ-10C

OPTION NAME: Carrizo Aquifer--Withdraw and Divert to Water Treatment Plant and then to SAWS Municipal Distribution System

OPTION DESCRIPTION: *A well field would be developed in Wilson and Atascosa Counties, and a yield of 90,000 acft/yr would be pumped to SAWS municipal distribution system.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$419	per acft[1]
QUANTITY OF WATER:	90,000	acft/yr[2]
LAND IMPACTED:	1,466	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	16	of	106	(1=lowest unit)
QUANTITY OF WATER:	26	of	106	(1=highest volume)
LAND IMPACTED:	62	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Cost of Carrizo Aquifer water, Carrizo Aquifer well field and collection lines, raw water pipeline and pump station to water treatment plant, water treatment plant (Level 1), finished water pipeline and pump station to SAWS municipal distribution system, and mitigation.

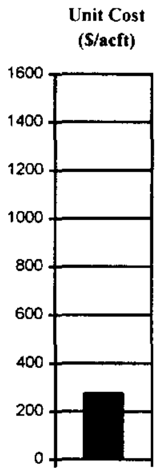
[2]**QUANTITY OF WATER:** Quantity of water in storage in the Carrizo Aquifer, aquifer recharge, and aquifer capability to yield water to wells.

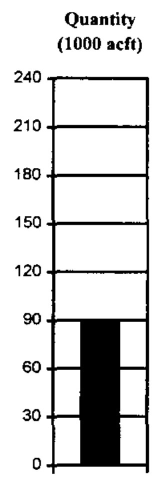
[3]**LAND IMPACTED:** Sizes of well fields, treatment plant site, and pipeline rights-of-way.

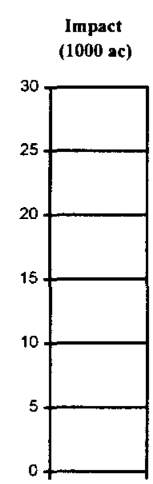
ENVIRONMENTAL ISSUES: Terrestrial habitat effects of well fields, pipeline and water treatment plant locations. Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, and ability of participants to develop cooperative project in a timely manner.

ADDITIONAL FACTORS: Ability to obtain permits from Evergreen Underground Water District to develop Carrizo Aquifer well fields.







OPTION NUMBER: CZ-10D

OPTION NAME: Carrizo Aquifer--Withdraw and Divert to Water Treatment Plant and then to SAWS Municipal Distribution System

OPTION DESCRIPTION: *A well field would be developed in Wilson, Atascosa, Gonzales, and Bastrop Counties, and a yield of 220,000 acft/yr would be pumped to SAWS municipal distribution system.*

TIME NEEDED TO IMPLEMENT: ☐ 1-5 yrs. ☒ 5-15 yrs. ☐ > 15 yrs.

COST, QUANTITY OF WATER, AND LAND IMPACTED		
UNIT COST OF WATER:	$480	per acft[1]
QUANTITY OF WATER:	220,000	acft/yr[2]
LAND IMPACTED:	3,075	acres[3]

POSITION RELATIVE TO ALL OPTIONS				
UNIT COST OF WATER:	26	of	106	(1=lowest unit)
QUANTITY OF WATER:	9	of	106	(1=highest volume)
LAND IMPACTED:	77	of	106	(1=least acreage)

FACTORS AFFECTING COST, QUANTITY, AND LAND IMPACTED

[1]**COST:** Cost of Carrizo Aquifer water, Carrizo Aquifer well field and collection lines, raw water pipeline and pump station to water treatment plant, water treatment plant (Level 1), finished water pipeline and pump station to SAWS municipal distribution system, and mitigation.

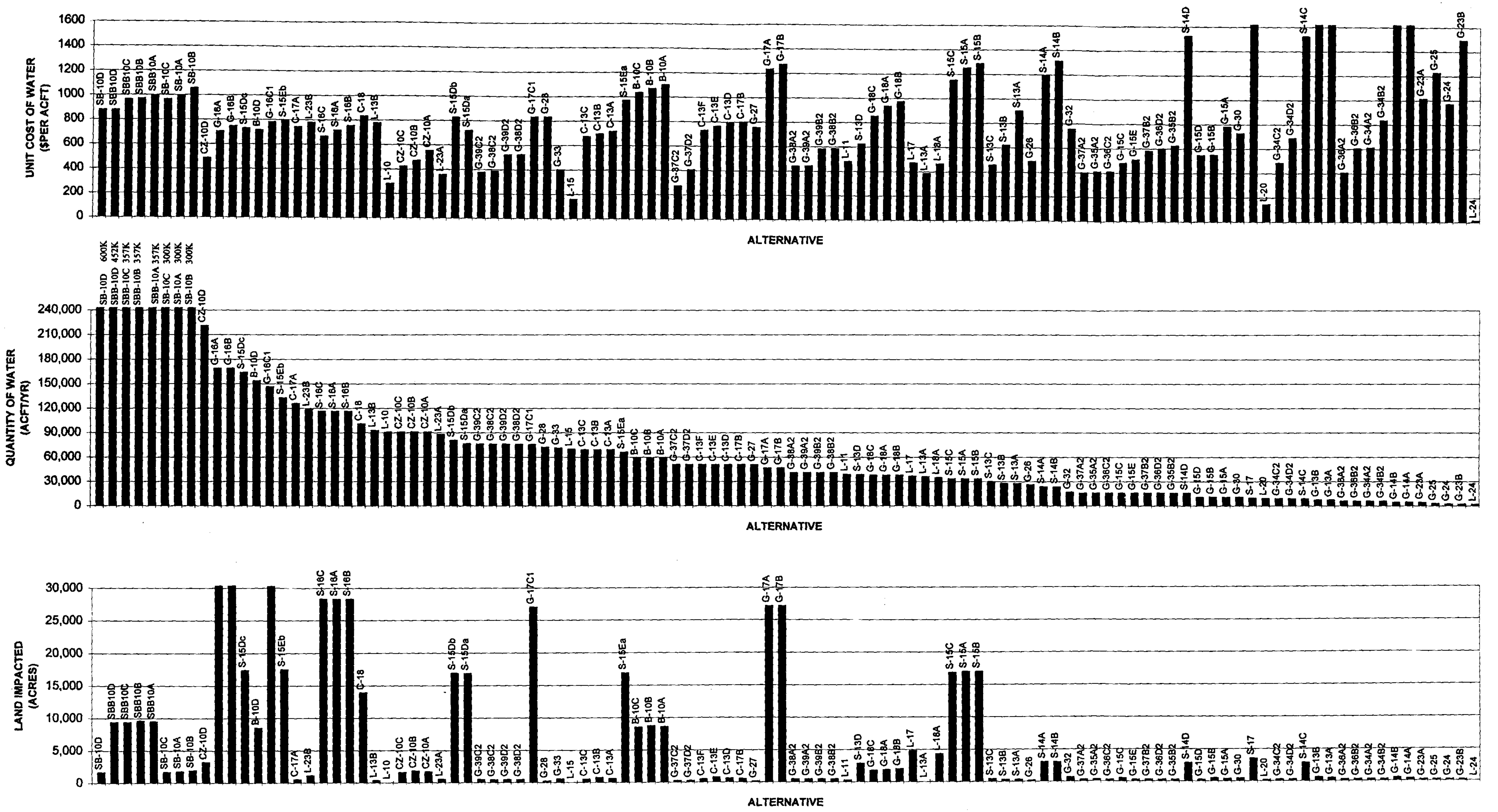
[2]**QUANTITY OF WATER:** Quantity of water in storage in the Carrizo Aquifer, aquifer recharge, and aquifer capability to yield water to wells.

[3]**LAND IMPACTED:** Sizes of well fields, treatment plant site, and pipeline rights-of-way.

ENVIRONMENTAL ISSUES: Terrestrial habitat effects of well fields, pipeline and water treatment plant locations. Resource conflicts can be avoided by careful selection of water treatment plant and storage tank sites, and pipeline routes.

SIGNIFICANT ISSUES AFFECTING FEASIBILITY: Cost of water, and ability of participants to develop cooperative project in a timely manner.

ADDITIONAL FACTORS: Ability to obtain permits from Evergreen Underground Water District to develop Carrizo Aquifer well fields.



NOTES:

FOR A DESCRIPTION OF EACH ALTERNATIVE AND FOOTNOTES, SEE TABLE 3-1 AND APPENDIX A;

WATER SUPPLY VALUES FOR EACH ALTERNATIVE ARE ON A STAND ALONE BASIS AND CANNOT, IN MOST CASES, BE ADDED TO OTHER ALTERNATIVES IN THEIR PRESENT FORM.

SUMMARY REPORT OF WATER SUPPLY ALTERNATIVES

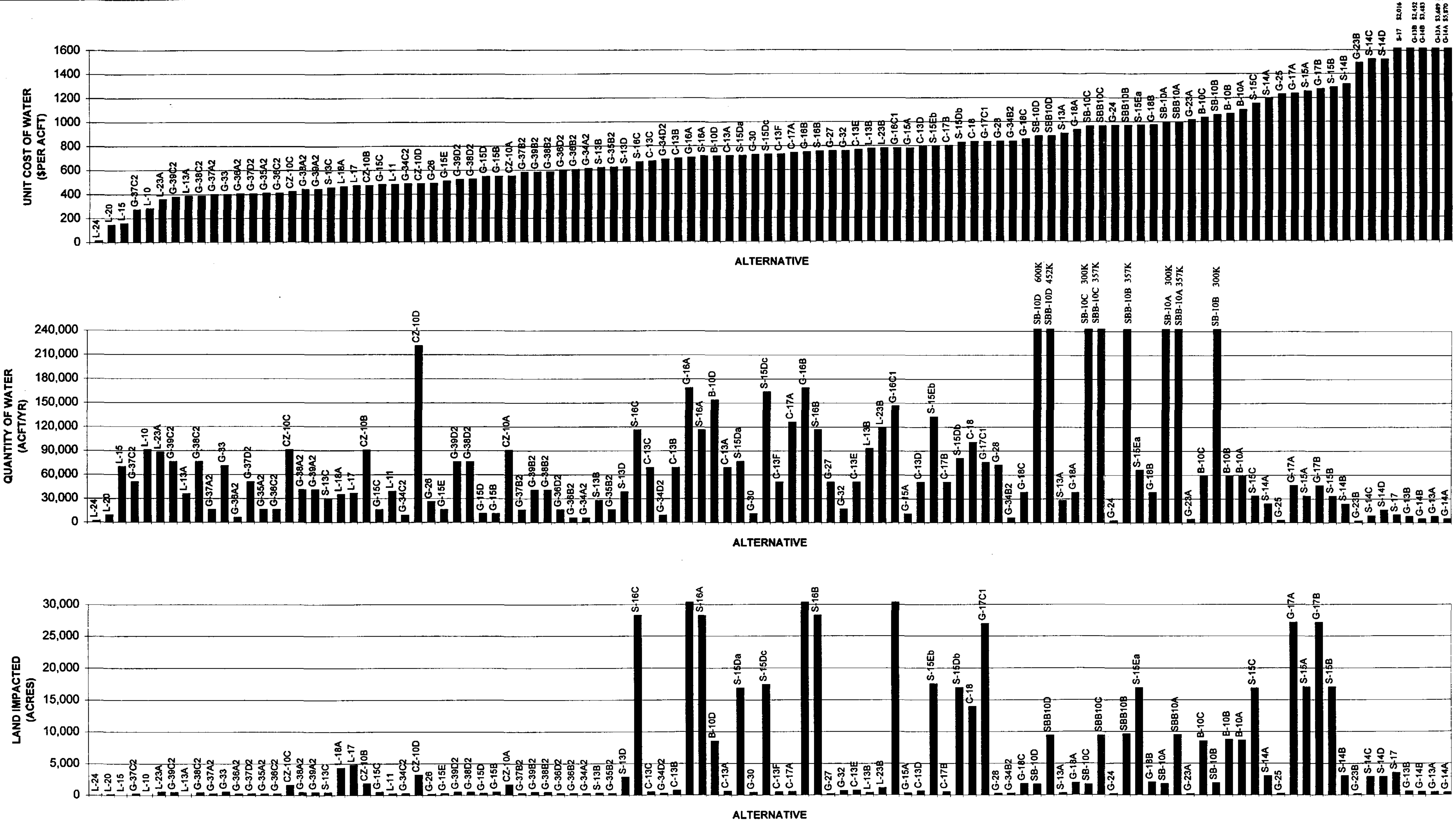
HDR

HDR Engineering, Inc.

TRANS TEXAS WATER PROGRAM / WEST CENTRAL STUDY AREA

WATER SUPPLY ALTERNATIVES ORDERED BY QUANTITY

FIGURE 3-3



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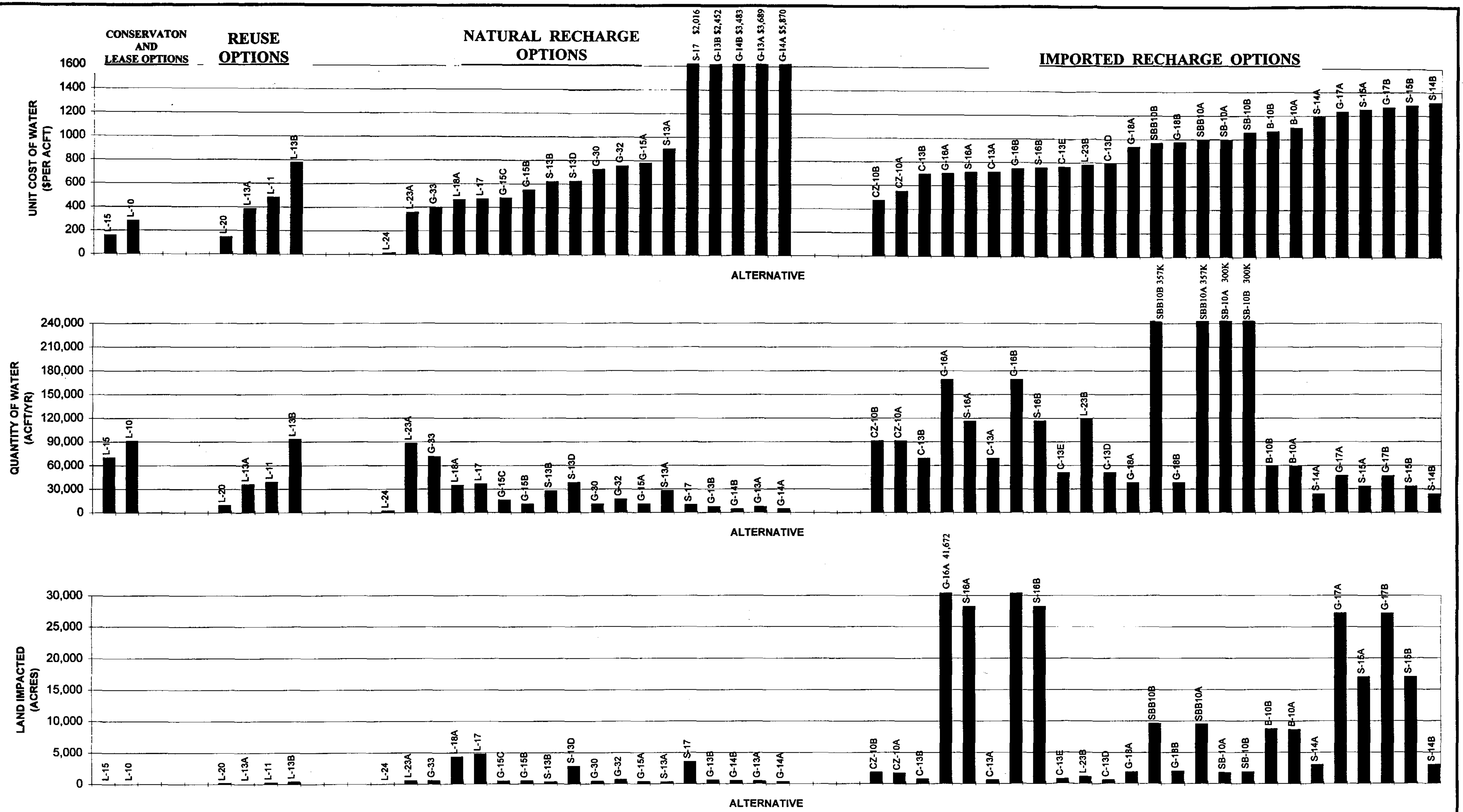
SUMMARY REPORT OF WATER SUPPLY ALTERNATIVES

HDR Engineering, Inc.

TRANS TEXAS WATER PROGRAM / WEST CENTRAL STUDY AREA

WATER SUPPLY ALTERNATIVES ORDERED BY UNIT COST

FIGURE 3-2



NOTES:

FOR A DESCRIPTION OF EACH ALTERNATIVE AND FOOTNOTES, SEE TABLE 3-1 AND APPENDIX A;

WATER SUPPLY VALUES FOR EACH ALTERNATIVE ARE ON A STAND ALONE BASIS AND CANNOT, IN MOST CASES, BE ADDED TO OTHER ALTERNATIVES IN THEIR PRESENT FORM.

SUMMARY REPORT OF WATER SUPPLY ALTERNATIVES

FIGURE 3-4

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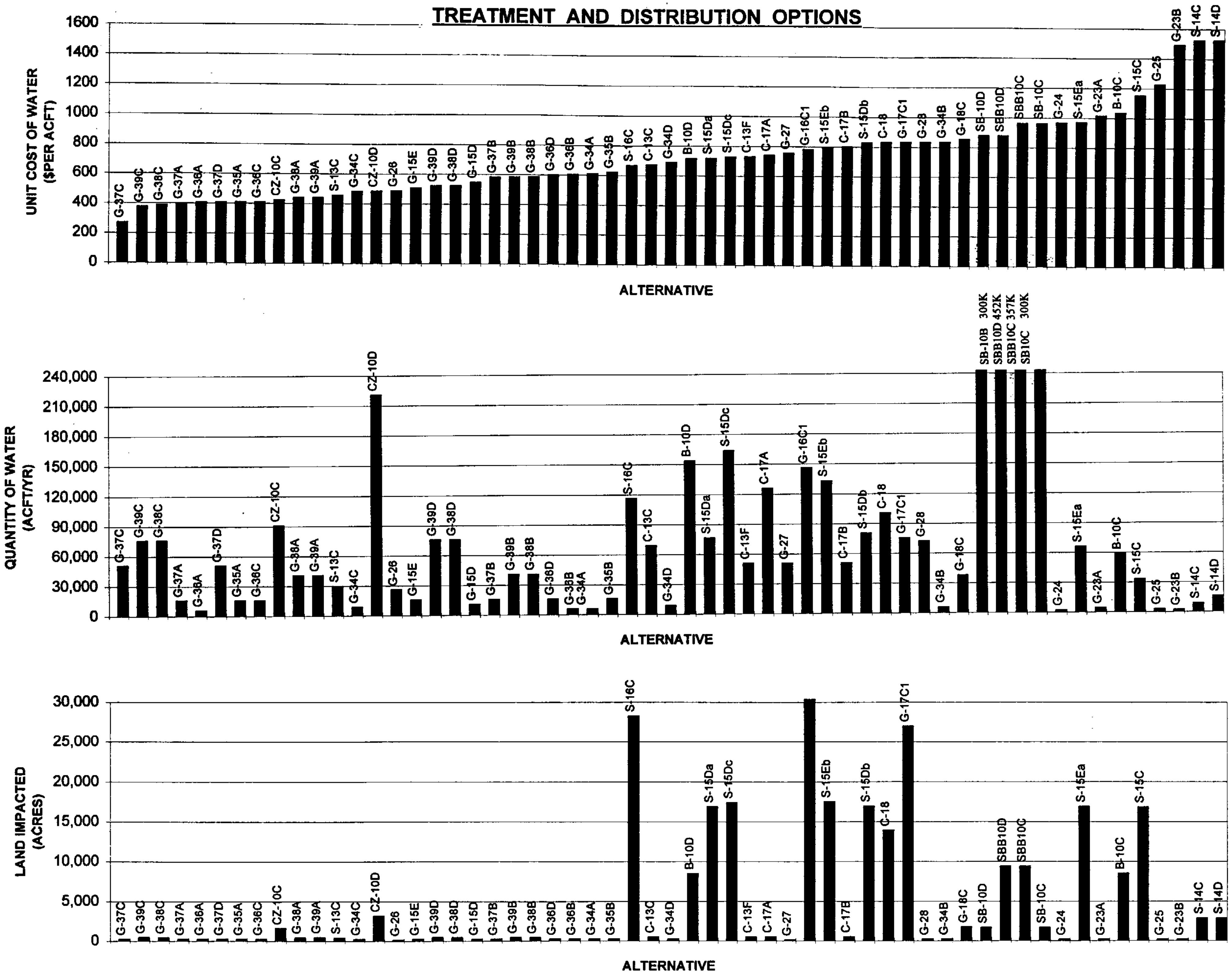
WATER SUPPLY ALTERNATIVES

Including, Conservation and Lease, Reuse, Natural Recharge, and Imported Recharge Options; Ordered by Unit Cost



NOTES:

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WATER SUPPLY VALUES FOR EACH ALTERNATIVE ARE ON A STAND ALONE BASIS AND CANNOT, IN MOST CASES, BE ADDED TO OTHER ALTERNATIVES IN THEIR PRESENT FORM.

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WATER SUPPLY ALTERNATIVES
Treatment and Distribution Options; Ordered by Unit Cost

FIGURE 3-5