South Central Texas Regional Water Planning Area

Regional Water Plan

Volume I — Executive Summary and Regional Water Plan

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South Central Texas Regional Water Planning Group

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Water Utilities Representative

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As adopted by the South Central Texas
Regional Water Planning Group
on this date ________________________

South Central Texas Regional Water Planning Area
Regional Water Plan

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South Central Texas Regional Water Plan

Executive Summary

Background

Since 1957, the Texas Water Development Board (TWDB) has been charged with preparing a comprehensive and flexible long-term plan for the development, conservation, and management of the state's water resources. The last water plan developed at the state level, *Water for Texas, August 1997*, was produced by the TWDB in cooperation with the Texas Parks and Wildlife Department (TPWD), Texas Natural Resource Conservation Commission (TNRCC), and a number of stakeholder groups. Future State Water Plans, including the one due January 5, 2002, will be based on approved regional water plans pursuant to requirements of Senate Bill 1 (SB1), enacted in 1997 by the 75^{th} Legislature. As stated in SB1, the purpose of the regional planning effort is to:

> "Provide for the orderly development, management, and conservation of water resources and preparation for and response to drought conditions in order that sufficient water will be available at a reasonable cost to ensure public health, safety, and welfare; further economic development; and protect the agricultural and natural resources of that particular region."

SB1 also provides that future regulatory and financing decisions of the TNRCC and the TWDB be consistent with approved regional plans.

The TWDB divided the state into 16 planning regions and appointed members to the regional planning groups. The South Central Texas Regional Water Planning Group (SCTRWPG) has 20 members appointed by the TWDB and one member added by the SCTRWPG. The members represent 11 interests or stakeholders (Public, Counties, Municipalities, Industries, Agricultural, Environmental, Small Businesses, Electric Generating Utilities, River Authorities, Water Districts, and Water Utilities), serve without pay, and are responsible for the development of the South Central Texas Regional Water Plan (Table ES-1).

Table ES-1.
South Central Texas Regional Water Planning Group Members

Name	***Interest***	***Entity***	***County of Location***
Evelyn Bonavita	Public	League of Women Voters	Bexar plus 3 others
Charles Johnson, Judge	Counties	Dimmit County	Dimmit
John Kight, Commissioner	Counties	Kendall County	Kendall
Mike Thuss, President	Municipalities	San Antonio Water System	Bexar
Gary Middleton, Mayor	Municipalities	City of Victoria	Victoria
Pedro Nieto	Municipalities	City of Uvalde	Uvalde
Hugh Charlton	Industry	Du Pont	Victoria
Richard Eppright	Agriculture	Graham Land & Cattle Co.	Gonzales & Atascosa
Bruce T. Foster	Agriculture	Texas Farm Bureau	Medina
Susan Hughes	Environment	Audubon Society	Bexar
Douglas R. Miller	Small Business	Wittig & Miller	Comal & Guadalupe
Gloria Rivera	Small Business	Electrical Engineer	Guadalupe
Darrell Brownlow	Small Business	Environmental Consultant	Wilson
Mike Fields	Elec.Gen.Utilities	CP&L Coleto Plant	Goliad
Bill West	River Authorities	Guadalupe-Blanco RA	Guadalupe plus 9 others
Fred Pfeiffer	River Authorities	San Antonio RA	Bexar plus 3 others
Greg Ellis	Water Districts	Edwards Aquifer Authority	Bexar plus 6 others
Mike Mahoney	Water Districts	Evergreen UWCD	Atascosa plus 3 others
Tom Moreno	Water Districts	Bexar Metropolitan WD	Bexar
Ron Naumann	Water Utilities	Springs Hill WSC	Guadalupe
Con Mims	Added by RWPG	Nueces River Authority	Nueces River Basin

The SCTRWPG adopted bylaws to govern its operations and, in accordance with its bylaws, selected the San Antonio River Authority (SARA) to serve as its administrative agency (Qualified Political Subdivision) to: 1) Develop a scope of work; 2) Apply for a TWDB planning grant; 3) Contract with the TWDB for the grant; and 4) Manage the development of the Regional Water Plan, including supervision of consultants. Members of the SCTRWPG and key staff of several participants serve as an ad hoc staff workgroup to review and guide SARA and its consultants' work.

Pursuant to TWDB Rules for Regional Water Planning Grants, Regional Water Planning Guidelines, and State Water Planning Guidelines (31 Texas Administrative Code, Chapters 357.7 and 357.9), the SCTRWPG developed a scope of work, schedule, and budget to prepare a water plan for the South Central Texas Region, which includes the counties shown in Figure ES-1.

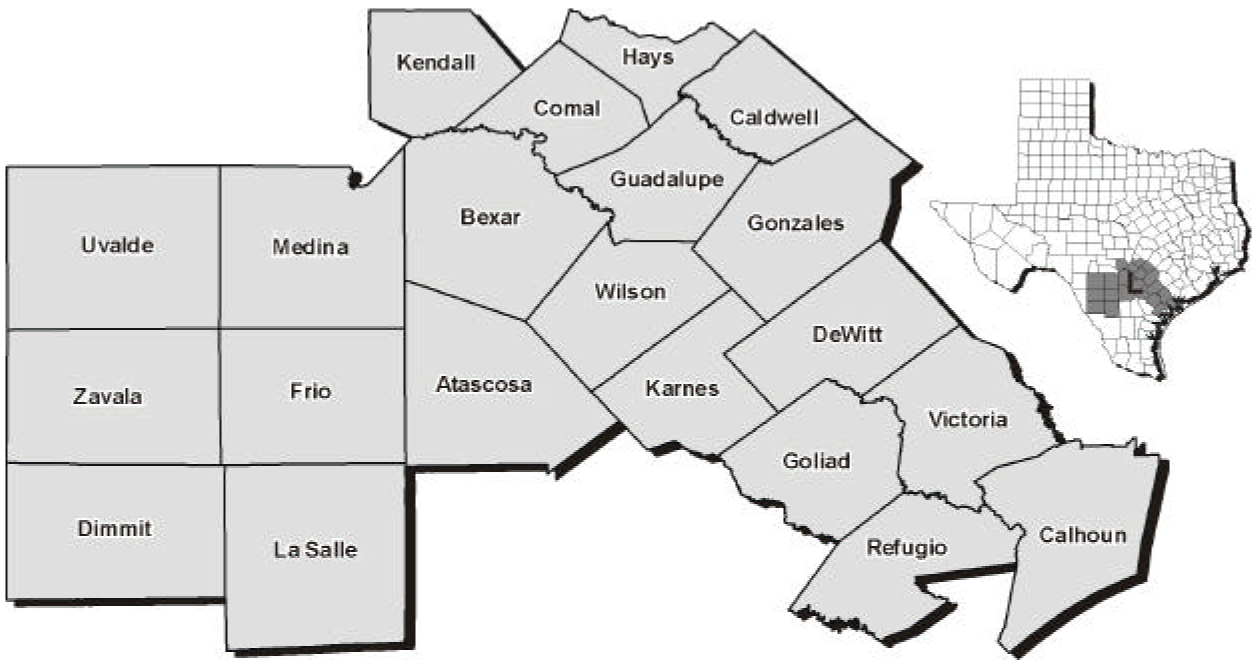

Figure ES-1. South Central Texas Planning Region (Region L)

The development of the Regional Water Plan was organized into three phases. Phase 1 included preparation of a description of the planning region, population and water demand projections, quantification of current supplies, comparison of water demands and supplies to determine water needs (shortages) and surpluses, and identification of feasible water supply options or management strategies. Phase 2 included formulation and evaluation of alternative regional water plans. Phase 3 involved preparation of the Regional Water Plan, consideration of identification of unique ecological stream segments and reservoir sites, and regulatory, administrative, and legislative recommendations. The South Central Texas Regional Water Plan is presented in three volumes, with structure and contents as shown in Figure ES-2.

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Figure ES-2. Plan Structure

Description of South Central Texas Region

The South Central Texas Region includes counties that are located in whole or in part in the Rio Grande, Nueces, San Antonio, Guadalupe, Colorado, and Lavaca River Basins, and the Colorado-Lavaca, Lavaca-Guadalupe, and San Antonio-Nueces Coastal Basins. The physical terrain of the region ranges from the Hill Country of the Edwards Plateau to the Coastal Plains. A general description of the region, including climate, land, water, vegetation, wildlife, population, economy, and water agencies is presented below.

Climate: The South Central Texas Region lies in three climatic divisions in Texas: the Edwards Plateau division, the South Central division, and the Upper Coast division. Mean annual temperature ranges from about 70 degrees Fahrenheit in the east to about 80 degrees in the central parts of the region. Summers are usually hot (above 90 degrees F) and humid, while winters are often mild and dry. There is little variation in the day-to-day summer weather except for the occasional thunderstorm, which produces much of the annual precipitation within the region. The cool season begins about the first of November and extends through March. Winters are ordinarily short and mild, with most of the precipitation falling as drizzle or light rain.

Mean annual precipitation in the region ranges from a high of 38 inches per year in DeWitt County, in the eastern part of the region, to a low of 23 inches per year in the Nueces River Basin, in the west. The South Central Texas Region is subject to the threat of hurricanes each year from mid-June through the end of October. Records dating back to 1871 show that, on average, a tropical storm or hurricane has affected the region once every 3 years.

Land: The majority of the South Central Texas Region is underlain by Cretaceous Age limestone, which forms the Edwards Plateau. East and south of the Plateau are Upper Cretaceous chalk, limestone, dolomite, and clay. The Balcones Fault Zone System forms the boundary between the Edwards Plateau and the Gulf Coastal Region. A Tertiary Age sequence of southeasterly dipping sand, silts, clay, glauconite, volcanic ash, and lignite overlie the Cretaceous Age strata. A sequence of clay, sand, caliche, and conglomerate of the Pliocene Age Goliad Formation underlie the coastal areas of the region. Overlying the Goliad Formation is the Quaternary Age Lissie Formation. The Beaumont Formation overlies the Lissie Formation, and throughout the region, alluvial sediments occur along streams and coastal areas.

Of the 12.82 million acres of land area in the planning region, over 10.35 million acres (81 percent) are farmland and ranchland, with 2.68 million acres classified as cropland, of which about 1.15 million acres were harvested in 1997. Approximately one-tenth (252,616 acres) of cropland in the region was irrigated in 1997. The leading irrigation counties are Uvalde, Frio, Medina, Atascosa, and Zavala. In 1997, there were 20,098 farms and ranches in the region with an average size of 866 acres.

Water: The South Central Texas Region includes parts of six major river basins (Rio Grande, Nueces, San Antonio, Guadalupe, Lavaca, and Lower Colorado) and overlies the Edwards and Gulf Coast Aquifers and southern parts of the Trinity, Carrizo, and Edwards-Trinity (Plateau) Aquifers. In addition to these water resources, the area also overlies two minor aquifers (Queen City and Sparta).

Comal and San Marcos Springs are significant water resources in the region. San Marcos Springs has the greatest flow dependability and environmental stability of any spring system in the southwestern United States. Comal Springs, located in New Braunfels, serves as the source for the Comal River, a tributary of the Guadalupe River. Unlike San Marcos Springs, Comal Springs is more responsive to drought conditions and ceased flowing in June of 1956 as a result of severe drought.

Vegetation: The South Central Texas Region contains a vegetation transition from the lowland forests of the southeastern United States to the arid grasslands of the western uplands and tropical thorn scrub to the south. The vegetation consists of dendritic networks of wooded stream corridors of eastern species that dissect upland grasslands and savannahs that harbor western species. The vegetational areas of the Region are the Edwards Plateau, South Texas Plains, Blackland Prairies, Gulf Prairies and Marshes, and the Post Oak Savannah.

The Edwards Plateau area includes all of Kendall County; the northern portions of Uvalde, Medina, Bexar, and Comal Counties; and that portion of Hays County located within the planning area. This area is characterized by springfed, perennially flowing streams that originate in its interior and flow across the Balcones Escarpment. This area is predominantly rangeland, with cultivation confined to the deeper soils.

The South Texas Plains area lies south of San Antonio and includes all or parts of Uvalde, Zavala, Dimmit, Medina, Frio, LaSalle, Bexar, Atascosa, Wilson, Karnes, DeWitt, and Goliad Counties. This vegetational area is characterized by subtropical dryland vegetation consisting of small trees, shrubs, cactus, weeds, and grasses. Principal plants are honey mesquite, live oak, post oak, several members of the cactus family, blackbrush acacia, guajillo, huisache, and others that often grow very densely. Long-continued grazing has contributed to the dense cover of brush. Most of the desirable grasses have persisted under the protection of brush and cacti.

The Blackland Prairies area includes parts of Bexar, Comal, Guadalupe, Hays, Caldwell, Gonzales, and DeWitt Counties. The area has timber along the streams, including a variety of oaks, pecan, cedar elm, and mesquite. In its native state, it was largely a grassy plain, but most of this fertile area has been cultivated, and only small acreages of meadowland remain in original vegetation.

The Gulf Prairies and Marshes vegetational area includes all or parts of Victoria, Goliad, Refugio, and Calhoun Counties. There are two subunits: (1) the marsh and salt grasses immediately at tidewater and (2) a little farther inland, a strip of bluestems and tall grasses, with some gramas in the western part. Many of these grasses make excellent grazing. Oaks, elm, and other hardwoods grow to some extent, especially along streams, and the area has some post oak and brushy extensions along its borders. Much of the Gulf Prairies is fertile farmland.

The Post Oak Savannah is a secondary forest region and includes all or parts of Guadalupe, Caldwell, Wilson, Gonzales, DeWitt, Goliad, and Victoria Counties. It is immediately west of the primary forest region, with less annual rainfall and a little higher elevation. Principal trees are post oak, blackjack oak, and cedar elm. Pecans, walnuts, and other kinds of water-demanding trees grow along streams. The southwestern extension of this belt is often poorly defined, with large areas of prairie.

Wildlife: Wildlife of the area include white-tailed deer, raccoons, ringtails, gray foxes, coyotes, beaver, bobcats, and several species of skunks. Wintering songbirds such as robins and cedar waxwings may also be found. Virtually all wildlife habitat in the South Central Texas Region is on privately-owned land.

There are approximately 123 species observed within the planning region that are listed by the U.S. Fish and Wildlife Service (USFWS) or TPWD as threatened or endangered. These species are listed by county in Appendix D (Volume III) with notations concerning their habitat preferences and protected status if any. Vertebrates and macroinvertebrates have been found at depths ranging from 190 to 2,000 feet in the artesian parts of the Edwards Aquifer, and Edwards springs support several endangered species.

Population: The South Central Texas Region population has increased from 806,770 in 1950 to approximately 1,954,100 in 1998, an increase of 1,147,300, or 2.4 times. Between 1950 and 1998, 16 counties had a positive growth rate, while five counties (DeWitt, Gonzales, Karnes, LaSalle, and Refugio) lost population. Based on annual growth rates from 1950 through 1998, the fastest growing counties in the region have been Hays (3.34 percent), Comal (3.15 percent), Kendall (2.83 percent), and Guadalupe (2.31 percent). There are 81 cities in the region for which the TWDB has made population and water demand projections. Of the 81 cities, 22 have a population greater than 5,000. Bexar County contains six cities having a population of 5,000 or more, including San Antonio. Four counties, Goliad, Karnes, Kendall, and Refugio, do not have a city of 5,000 or greater.

In 1990, 82 percent of the region's population resided in urban areas. Age distribution across the region is characterized by a relatively young population. The two age groups that include the highest percentage of the population are under 18 years of age (29 percent) and from 25 to 39 years of age (25 percent). The age groups with the lowest percentage of the population are ages 18 to 24 (11 percent) and ages 65 and older (11 percent).

With respect to education, of those residents in the region who are 25 years of age are older, 60.7 percent have at least a high school diploma. The two largest groups ranked by educational achievement are those who have an 8th grade education or lower (24.7 percent) and those who have completed high school, but have not gone to college (27.3 percent). Only 4 percent of the population who are 25 years or older have a graduate degree.

Economy: The South Central Texas Region economy is based upon crop production, livestock production, mining, manufacturing, and trades and services. All sectors of the economy have experienced solid growth in recent years, with the exception of the mining sector. Employment in the regional economy is heavily supported by a strong trades and services sector, which accounts for approximately 76 percent of the region's value of output, and a thriving tourism industry in the Hill Country and San Antonio. Fabricated metal products, industrial machinery, and food processing form the core of the region's manufacturing sector, which accounts for approximately 21 percent of the value of output of the region.

Beef cattle, corn, and grain sorghum are the dominant agricultural enterprises, although vegetables produced in the Winter Garden area add diversity to the region's agricultural sector. According to the 1997 Census of Agriculture, all crops grown in the South Central Texas Region had a market value of over $290 million in 1997. The leading agricultural producing counties in the region are Bexar, Frio, Uvalde, Medina, and Atascosa.

Livestock marketed in the South Central Texas Region had a market value in 1997 of over $645 million, or about 2.2 times the value of crop production. Major types of livestock are cattle and calves, beef cattle, and sheep and lambs. Layers, pullets, and broilers also contribute significantly to the region's livestock production, with Gonzales County producing over 98.7 percent of these types of livestock. In 1997, the region's leading livestock producing counties by market value were Gonzales, Uvalde, Medina, and Wilson.

Mining includes sand and gravel quarries and petroleum products, including oil, natural gas, and lignite. Much of the stone quarried is used in the production of cement in Bexar and Hays Counties. In 1992, these products had a market value of over $42 million.

All but two counties (Comal and Hays) had oil and gas production in 1998. The leading oil and gas producing counties in the region are Refugio, Goliad, Victoria, Atascosa, and DeWitt. In 1998, oil and gas production generated over $290 million in value of products.

The leading types of manufacturing plants in the region are printing and publishing; food and kindred products; petrochemicals; industrial machinery and equipment; and stone, clay, and glass products. In 1992, manufacturing contributed over $9 billion in sales and provided 56,460 jobs in the region, with sales of manufactured goods accounting for 21.3 percent of the total market value of all products produced in the region. The leading manufacturing counties are Bexar, Calhoun, Victoria, and Guadalupe.

In 1992, wholesale trade, retail trade, and services contributed over $32 billion in sales and provided 285,293 jobs in the South Central Texas Region, with trades and services sales accounting for 76 percent of the total market value of all products produced in the region. Wholesale trade accounted for 42.5 percent of the total sales or receipts and provided 11.2 percent of the jobs within the trades and services classification in 1992. The leading counties in wholesale trade were Bexar, Victoria, Guadalupe, and Comal.

Retail trade accounted for 37.1 percent of the total sales and provided 43.1 percent of the jobs within the trades and services classification in 1992. The leading counties in retail trade were Bexar, Victoria, Comal, and Hays.

Services accounted for 20.4 percent of the total sales and provided 45.7 percent of the jobs within the trades and services classification in 1992. The leading types of services within the South Central Texas Region are health services, business services, engineering and management services, and membership organizations.

Water Agencies and Programs: State agencies and programs affecting the South Central Texas Planning Region include the TWDB's planning, financing, and water information programs; the TNRCC's water rights administration, waste discharge regulatory functions, dam safety, safe drinking water regulations, weather modification program, and air quality protection programs; the TPWD's fish and wildlife regulatory and habitat protection programs; and the Texas State Soil and Water Conservation Board's soil and water conservation efforts, brush control, farm and ranch conservation planning, and cooperative small watershed flood protection programs. Other state agencies, including the Texas A&M University research, education, and extension programs and the Texas Department of Agriculture's outreach and financing programs, are also relevant to water planning for the region.

Federal programs and agencies that contribute to water supply and water quality protection through both regulation and resources include the U.S. Environmental Protection Agency, U.S. Army Corps of Engineers, U.S. Bureau of Reclamation, USFWS, and U.S. Natural Resource Conservation Service.

In addition to state and federal agencies mentioned above, there are three river authorities and five groundwater conservation districts within the region that have one or more of the following functions: water supply, flood protection, water quality protection, and water management and regulation.

Local Water Plans: In January 1999, the SCTRWPG requested that representatives of each city and water conservation district of the region forward a copy of any available water plans or water management documents. Entities were asked to indicate where they are planning to obtain their water for the next 50 years, including whether or not they had a supply of water for the next 50 years. Approximately 93 responses were received. These responses included copies of plans, as well as summaries of local and regional water plans and planning studies. Of the total number of responses received, 12 were water supply plans for various lengths of time into the future, but none were to 2050, six were Water Conservation District Management Plans, 30 were Emergency Demand Management and Drought Contingency Plans, and the remaining 45 were letters explaining that no specific planning document or report exists, but that the entity has adequate supplies for the future or is in the process of considering its situation.

Population and Water Demand Projections

Population Projections: In order to develop water plans to meet future water needs, it is necessary to make projections of future water demands for the region. TWDB population and water demand projections of the 1996 State Water Plan for cities, rural areas, and water user groups for each of the 21 counties of the region were forwarded to local officials for review. In response to requests by these reviewers, the projections were modified for five counties (Atascosa, Caldwell, Hays, Kendall, and Wilson) and 10 cities (Boerne, Fair Oaks Ranch, Garden Ridge, Lockhart, Luling, Pleasanton, San Marcos, Schertz, Seguin, and Yoakum).

The 1996 estimates published by the U.S. Bureau of the Census indicate that Texas currently ranks as the second most populated state in the nation, with a population of more than 18.3 million. The population of the South Central Texas Region was estimated at 2.0 million in 1996 and is projected to grow at a 1.5 percent compound annual growth rate to 4.5 million in 2050. Of this total, three-fourths are projected to reside in the San Antonio River Basin. Water needs assessments were made for each of the 83 individual cities and 48 rural areas of each county and part of county of each river basin area of the region.

Water Demand Projections: For purposes of water planning, the SCTRWPG adopted advanced conservation water demand projections provided by the TWDB from the 1996 State Water Plan, as specified by SB1. The South Central Texas Region is the only planning region in the state to adopt the advanced conservation projections. Projections were included for each water user group—municipal, industrial, steam-electric power generation, irrigation, mining, and livestock. The projections were at the level of detail of each city, rural area, and county or part of county of each river basin. Projections were also provided at the county and river basin area level of detail for industry, steam-electric power generation, irrigation, mining, and livestock. The projections are summarized below.

Municipal water is fresh water used for drinking, sanitation, and other purposes in homes and commercial establishments of both cities and rural areas. Total municipal water use in the South Central Texas Region in 1990 was 318,495 acft/yr and is projected to increase to 769,523 acft/yr by 2050 (Figure ES-3). *Industrial* water is fresh water used in the manufacture of industrial products. All industries in the region used 67,016 acft of water in 1990 and are projected to have a demand of 202,379 acft/yr in 2050 (Figure ES-3).

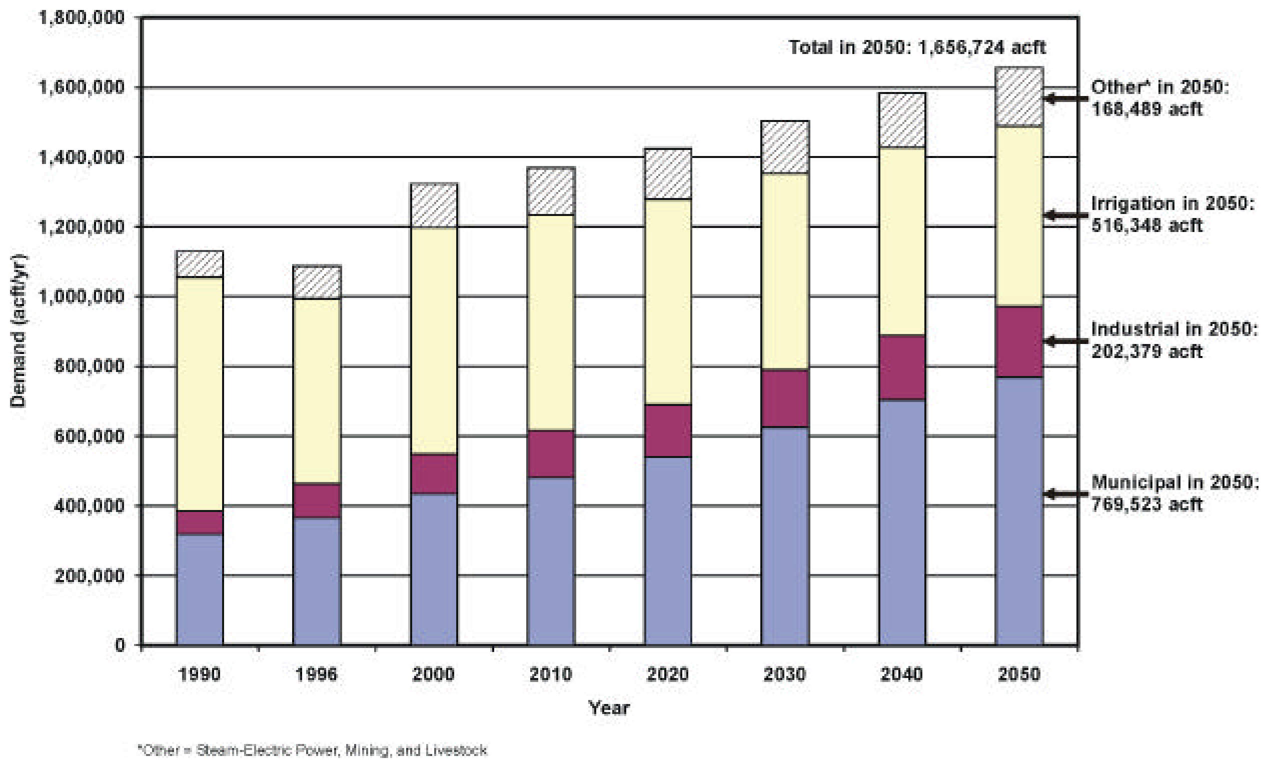

Figure ES-3. Projected Water Demands

Eight counties (Atascosa, Bexar, Calhoun, Frio, Goliad, Guadalupe, Hays, and Victoria) of the region use cooling and boiler feed water in *steam-electric power production*. In 1990, 43,451 acft of water were used, and it is estimated that by the year 2050, 125,660 acft/yr of water will be needed for the production of steam-electric power (Figure ES-3). In the South Central Texas Region, the principal uses of water for *mining* are for the extraction of stone, clay, and petroleum and for sand and gravel washing. In the region, total mining water use was 7,799 acft in 1990 and is projected to increase to 14,308 acft/yr in 2050, an increase of over 80 percent (Figure ES-3).

The TWDB *irrigation* water use data show annual use for irrigation to grow cotton, grain, vegetables, and tree crops in the South Central Texas Region in 1990 of 669,440 acft/yr, or 6.7 percent of the total irrigation water used in Texas in 1990. Projected irrigation water demands in the Region in 2050 are 516,348 acft/yr, or 22.9 percent less than in 1990 (Figure ES-3). The projected decline is based upon increased irrigation efficiency, economic factors, and reduced government programs affecting the profitability of irrigated agriculture. In

1990, water use in the region for livestock purposes was estimated at 24,400 acft/yr. The TWDB projections for livestock use in the region in the year 2020 through 2050 are 28,521 acft/yr.

Projected total water demand for the South Central Texas Region is the sum of water demand projections for municipal, industrial, steam-electric power generation, mining, irrigation, and livestock uses. Projected percentage changes in the composition of total water demand by use category from 1990 to 2050 are shown in Figure ES-4.

Major Water Providers: The SCTRWPG identified six Major Water Providers in the South Central Texas Region. These Major Providers are listed in Table ES-2, along with a general description of their service areas. TWDB guidance defines a Major Provider as a provider such as a river authority, water supply corporation, or city that provides a major amount of water to other cities. A plan for each Major Provider is included in the Regional Water Plan.

South Central Texas Region Water Supply: There are five major and two minor aquifers supplying water to the region. The five major aquifers are the Edwards-Balcones Fault Zone, Carrizo-Wilcox, Trinity, Gulf Coast, and Edwards-Trinity (Plateau) Aquifers. The two minor aquifers are the Sparta and Queen City Aquifers. The Region is located in parts of the Rio Grande, Nueces, San Antonio, Guadalupe, Colorado, and Lavaca River Basins and parts of the Colorado-Lavaca, Lavaca-Guadalupe, and San Antonio-Nueces Coastal Basins. The existing surface water supplies of the region include storage reservoirs and run-of-river water rights.

The total quantity of water obtained from aquifers of the region and used within the region in 1990 was 967,327 acft. Of this total, 53.7 percent was from the Edwards Aquifer, 28.8 percent was from the Carrizo, 9.3 percent was from the Gulf Coast, 4.8 percent was from the Sparta, and the remaining 3.4 percent was from the Queen City, Trinity, and Edwards-Trinity (Plateau) Aquifers.

Projected future groundwater supplies available in the South Central Texas Region during the drought of record are 812,868 acft/yr in 2000, 812,868 acft/yr in 2020, and 675,187 acft/yr in 2050. Supplies available from the Sparta, Queen City, Trinity, Gulf Coast, and Edwards-Trinity (Plateau) Aquifers are projected to hold steady on an annual basis throughout the 2000 through 2050 projections period. However, these aquifers are projected to supply only about 25 percent of the total groundwater available to the region in 2050. The supply available from the Carrizo Aquifer is projected to decline from 304,484 acft/yr for the

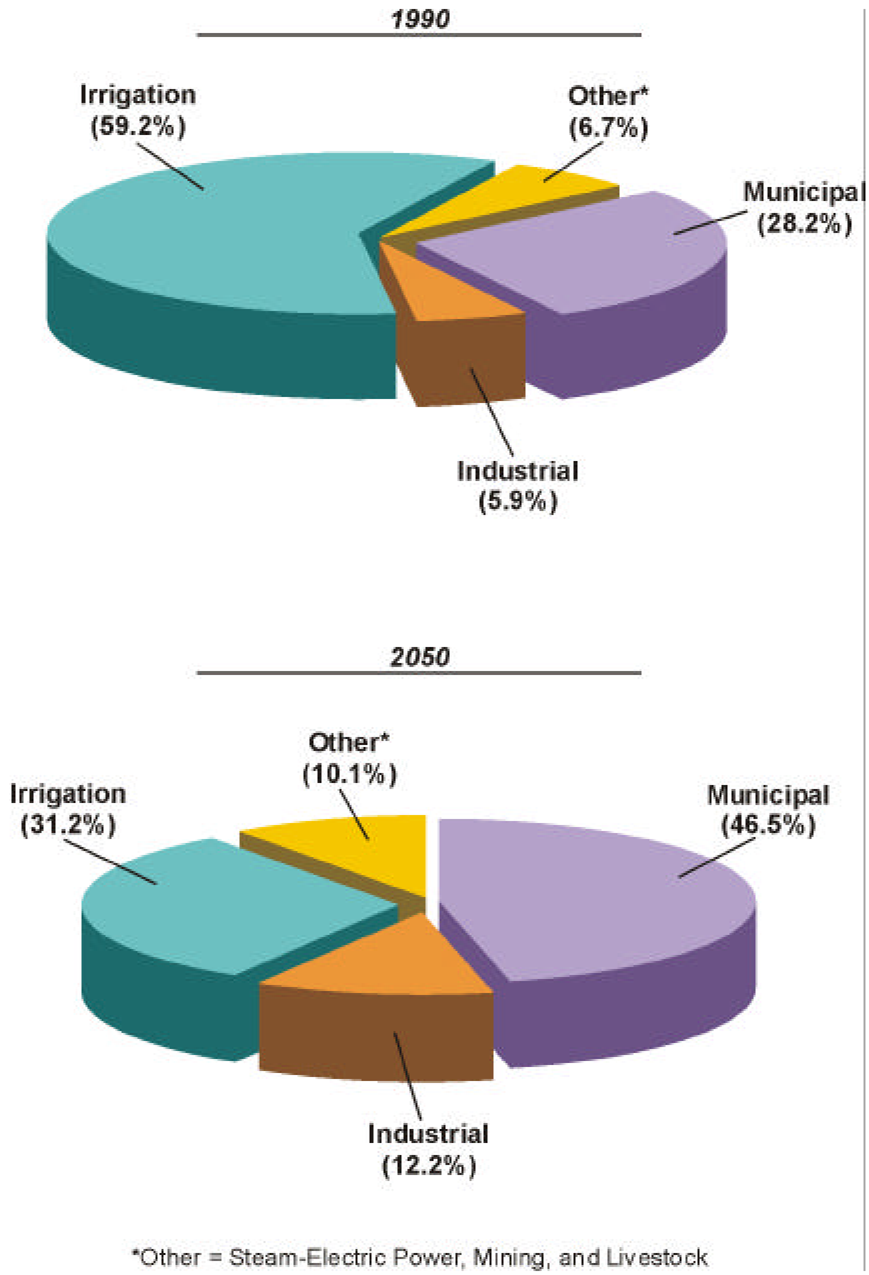

Figure ES-4. Distribution of Total Demand Among Users

Table ES-2.
Major Water Providers and Service Areas

Major Water Provider	Service Areas
San Antonio Water System (SAWS)	City of San Antonio and Bexar County
Bexar Metropolitan Water District (BMWD)	Bexar, Atascosa, Comal, and Guadalupe Counties
Canyon Regional Water Authority (CRWA)	Bexar, Caldwell, Comal, Guadalupe, and Hays Counties
Guadalupe-Blanco River Authority (GBRA)	Kendall, Comal, Hays, Caldwell, Guadalupe, Gonzales, DeWitt, Victoria, Refugio, and Calhoun Counties
New Braunfels Utilities (NBU)	City of New Braunfels, Comal, and Guadalupe Counties
City of San Marcos	City of San Marcos, Hays, and Caldwell Counties

2000 through 2020 period to 168,159 acft/yr for the period after 2020[1]. In the case of the Edwards Aquifer, SB 1477 limits pumpage withdrawals to 450,000 acft/yr until December 31, 2007, and to 400,000 acft/yr beginning in 2008.[2] In addition, SB 1477 states in Section 1.14(h): "… the authority, through a program, shall implement and enforce water management practices, procedures, and methods to ensure that, not later than December 31, 2012, the continuous minimum springflows of the Comal Springs and the San Marcos Springs are maintained to protect endangered and threatened species to the extent required by federal law. The authority from time to time as appropriate may revise the practices, procedures, and methods. To meet this requirement, the authority shall require: (1) phased reductions in the amount of water that may be used or withdrawn by existing users or categories of other users; or (2) implementation of alternative management practices, procedures, and methods." Thus, supplies from the Edwards Aquifer may be less than the pumpage limits specified in SB 1477. For purposes of this analysis, the supply from the Edwards Aquifer is included at 340,000 acft/yr.

[1] Actual avaiability is subject to regulations of underground water conservation districts, where such districts exist. For planning purposes, for Gonzales and Wilson Counties, the SCTRWPG used the quantities specified by the Gonzales County and Evergreen Underground Water Conservation Districts, respectively.

[2] For planning purposes, an estimate of 340,000 acft/yr of available supply during a drought of record from the Edwards Aquifer was agreed upon by the South Central Texas Regional Water Planning Group and the staff of the Texas Water Development Board. This quantity was adopted as a placeholder number until the EAA completes and acquires approval from the U.S. Fish and Wildlife Service for a Habitat Conservation Plan (HCP). TWDB staff, in a letter to Greg Ellis, dated November 16, 1999, agreed to accept water availability from the Edwards Aquifer as 340,000 acft/yr after 2012 in the Regional Water Plan, if it includes actions to be taken to ensure that the required level of protection of the endangered species at San Marcos and Comal Springs will be maintained during a drought of record.

Development of surface water resources has been limited in the South Central Texas Region because of the presence of significant quantities of groundwater. The largest run-of-river water rights are concentrated in the lower Guadalupe-San Antonio River Basin and are held by the Guadalupe-Blanco River Authority, Union Carbide Corporation, DuPont, and the City of Victoria. These diversion rights total about 225,000 acft/yr. Significant water rights associated with existing reservoirs are held by the Guadalupe-Blanco River Authority (Canyon Reservoir), Bexar-Medina-Atascosa Counties WCID #1 (Medina Lake System), San Antonio City Public Service (Calaveras and Braunig Lakes), and Central Power & Light (Coleto Creek Reservoir). Diversion rights associated with these reservoirs total about 177,000 acft/yr.

Water Demand and Water Supply Comparisons

The South Central Texas Region water supply and demand data are shown graphically, by decade, for the years 2000 to 2050. The amount by which drought demand exceeds current supply is defined, for regional planning purposes, as the needs. In year 2000, needs (shortages) are 494,874 acft/yr, in 2030 the projected need is 670,948 acft/yr, and in 2050 the projected need for drought of record conditions is 785,725 acft/yr (Figure ES-5).

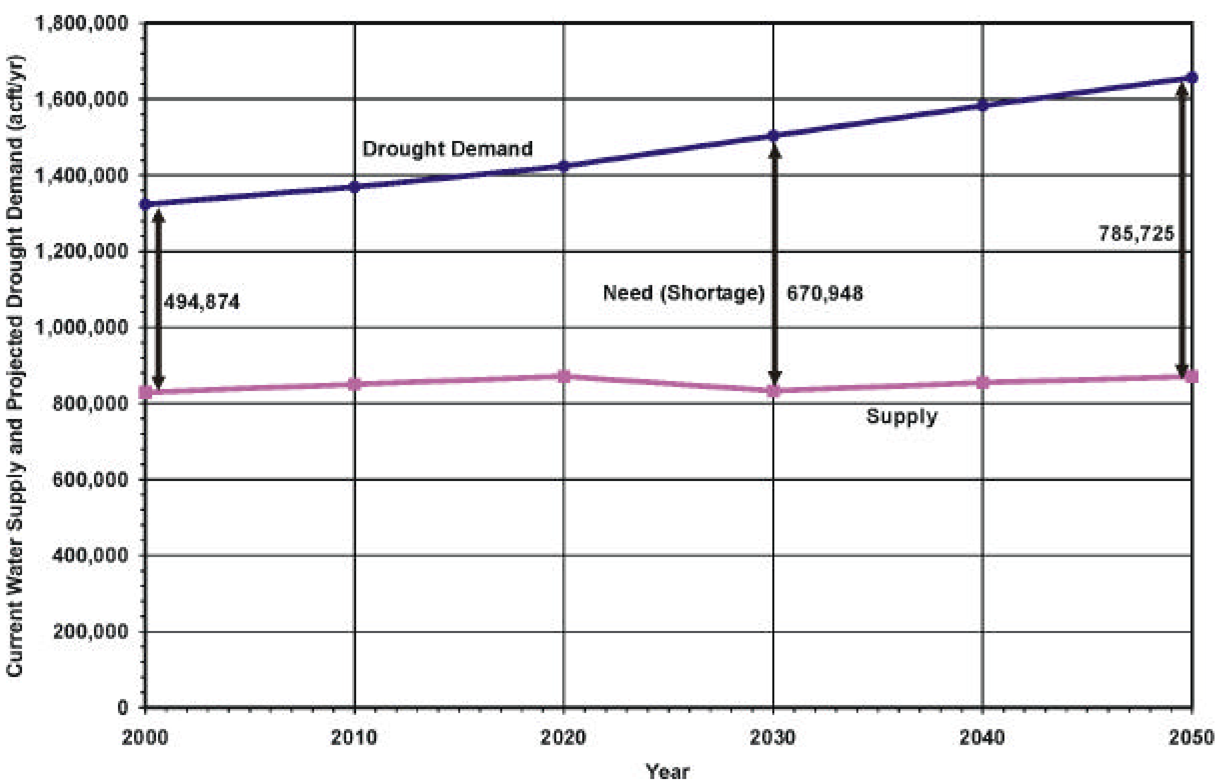

Figure ES-5. Supply, Demand, and Need (Shortage)

Figure ES-6 shows the projected water needs for the region at each decade. In 2010, the projected need (shortage) for municipal, industrial, steam-electric, and mining is approximately 210,000 acft/yr, and the need for irrigation is about 310,000 acft/yr. The projected needs in 2050 are about 505,000 acft/yr for municipal, industrial, steam-electric, and mining, and about

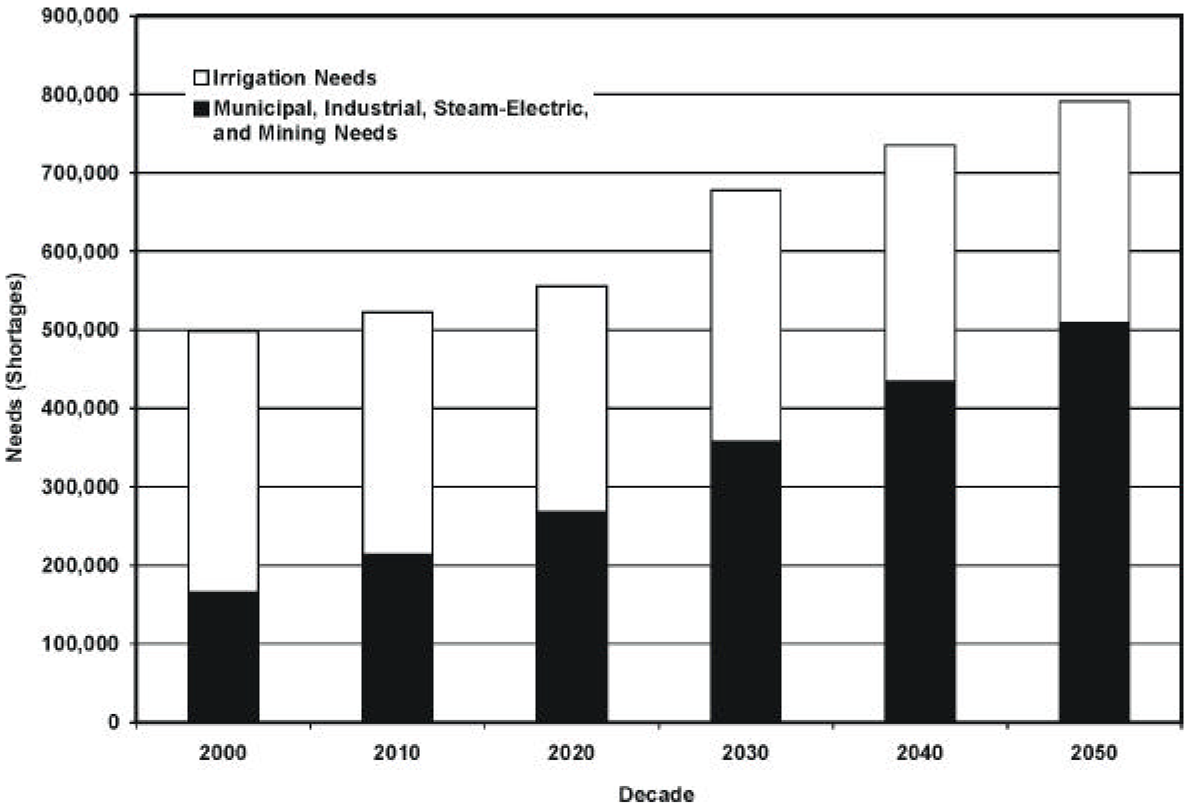

Figure ES-6. Projected Water Needs (Shortages)

280,000 acft/yr for irrigation. Twelve of the counties in the region have municipal water user groups for which there are projected shortages (Figure ES-7). Figure ES-8 shows the names and locations of the 40 municipal water user groups that have projected needs during the projection period. There are four counties with projected industrial water needs (shortages) (Figure ES-9), two counties with projected steam-electric power generation water needs (Figure ES-10), ten counties with projected irrigation water needs (Figure ES-11), and six counties with projected mining water needs (shortages) (Figure ES-12). Needs (shortages) are not indicated in Figures ES-7 through ES-12 for water user groups capable of meeting their needs by renewal of a current water supply contract.

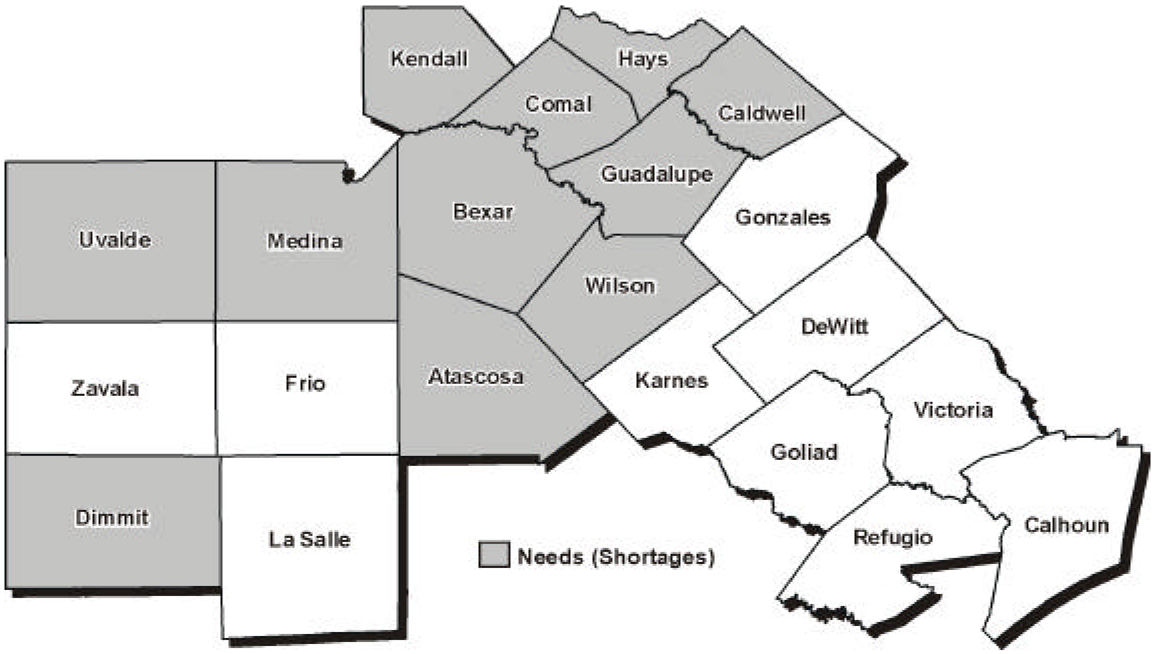

Figure ES-7. Counties with Projected Municipal Needs (Shortages)

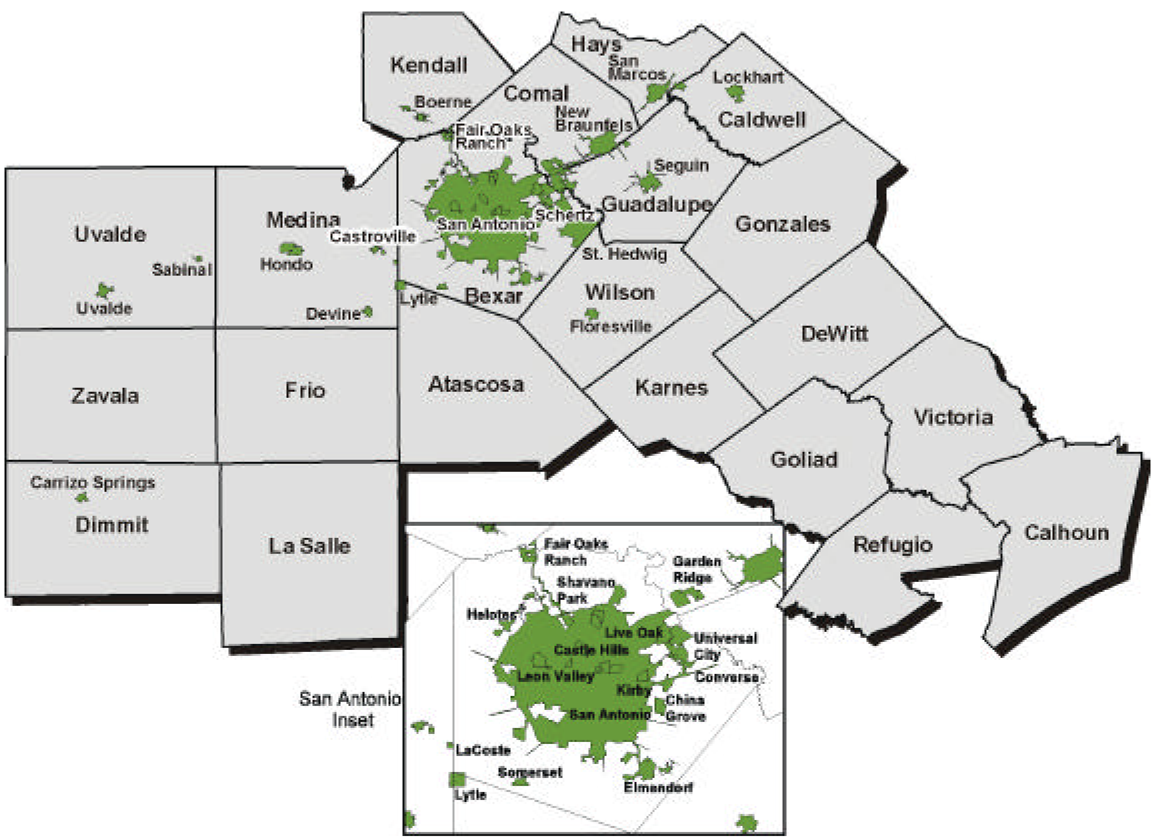

Figure ES-8. Cities with Projected Needs (Shortages)

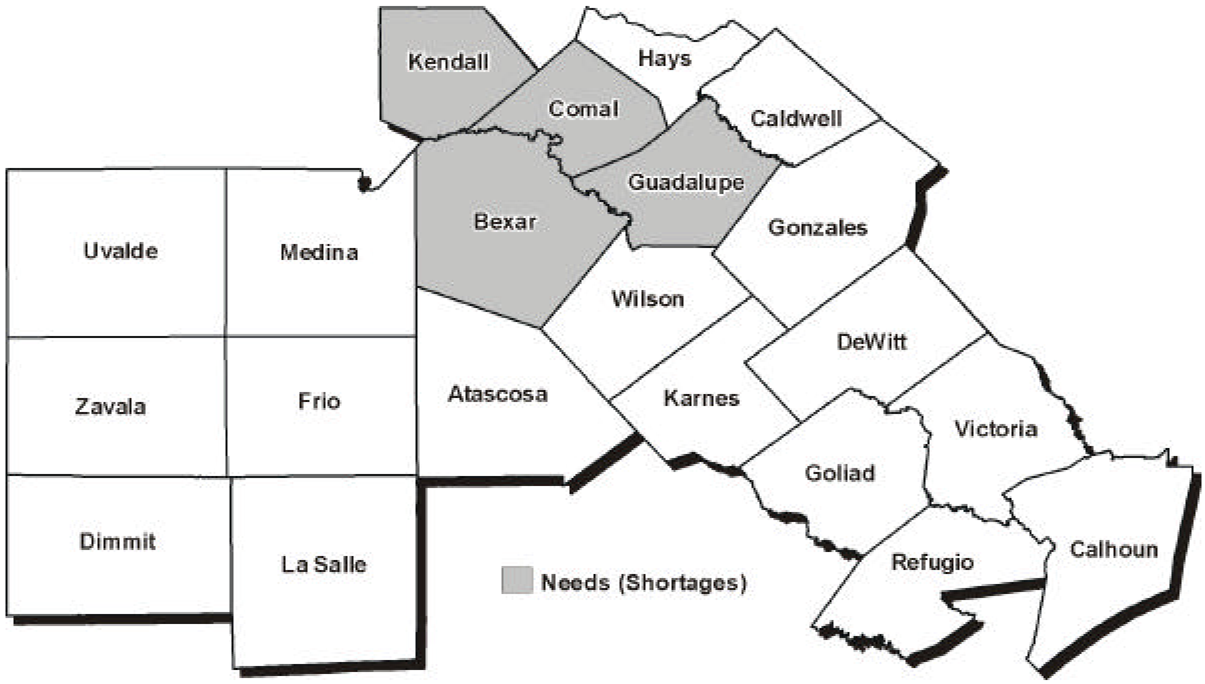

Figure ES-9. Counties with Projected Industrial Needs (Shortages)

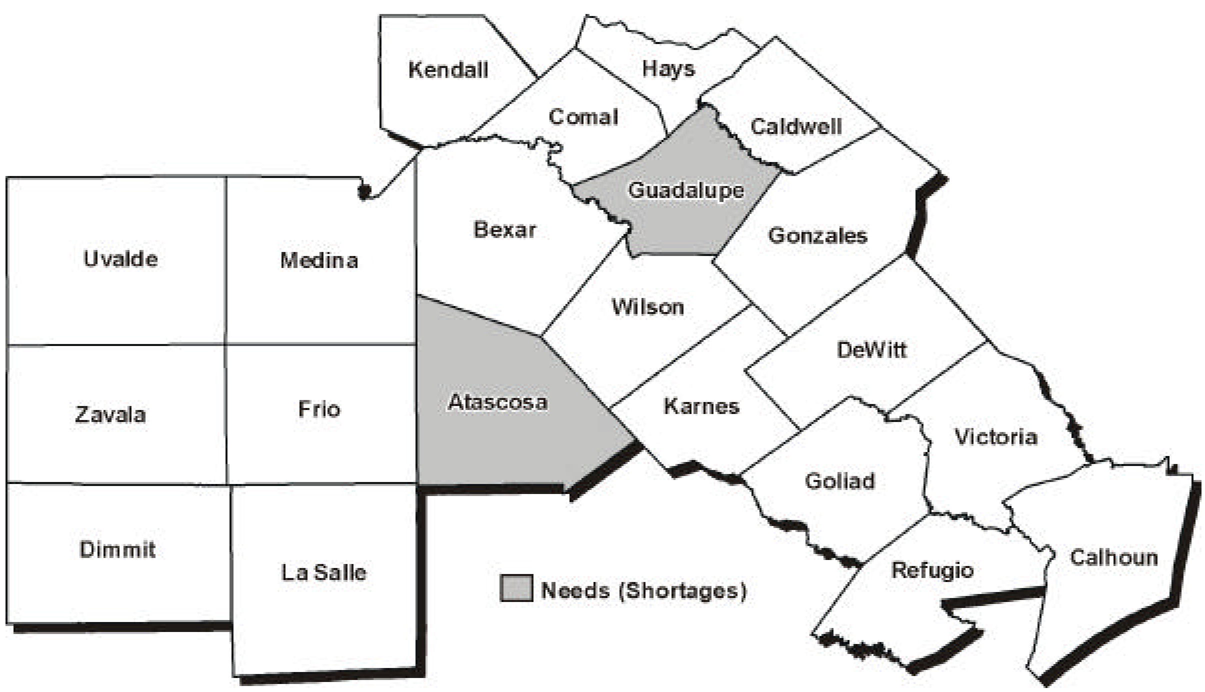

Figure ES-10. Counties with Projected Steam-Electric Needs (Shortages)

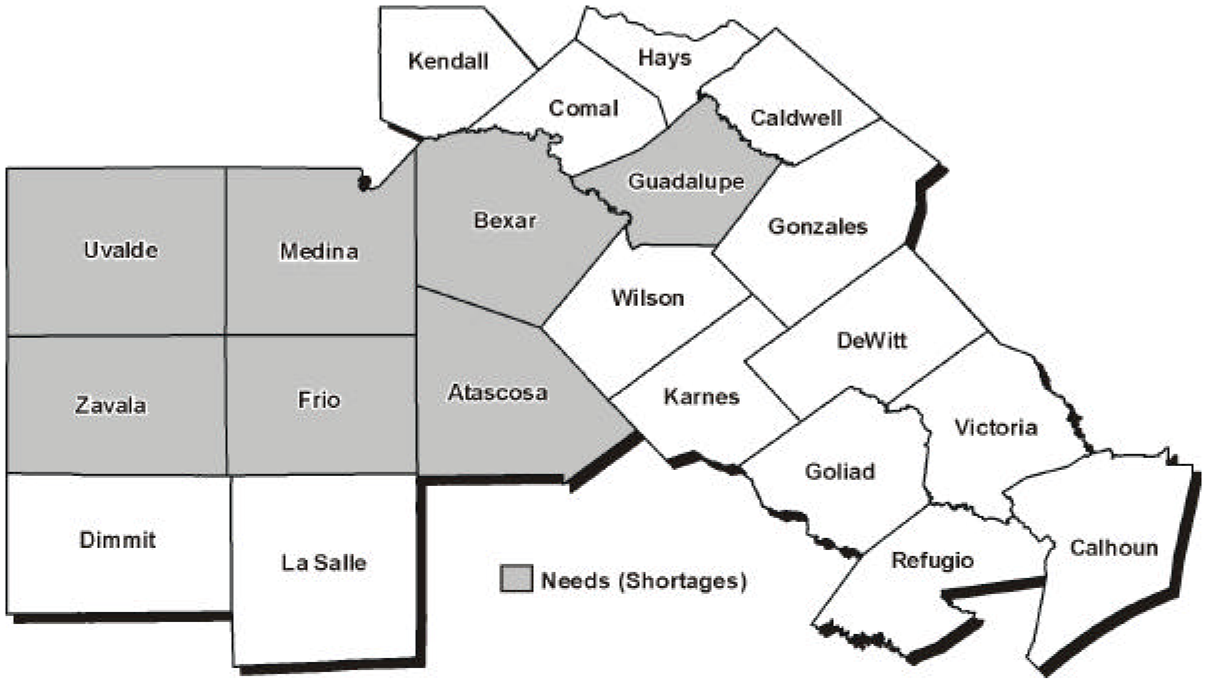

Figure ES-11. Counties with Projected Irrigation Needs (Shortages)

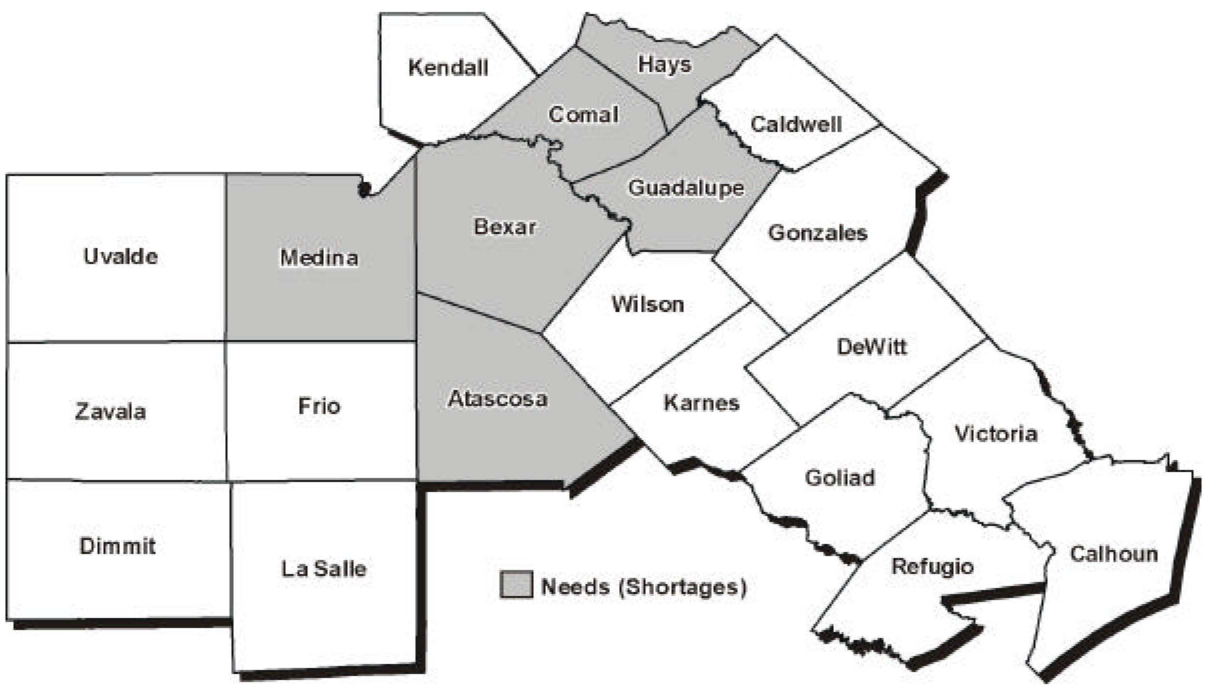

Figure ES-12. Counties with Projected Mining Needs (Shortages)

Social and Economic Impacts of Not Meeting Projected Water Needs

The SCTRWPG identified 66 individual water user groups that showed an unmet need during drought-of-record supply conditions for each decade from 2000 to 2050. Of the 21 counties of the South Central Texas Region, 14 have water user groups with projected water needs (shortages). Compared to the baseline projected growth in population, the region could expect 807,923 fewer people in 2010, 1.3 million fewer in 2030, and 2.0 million fewer in 2050 if the projected water needs are not met. The expected 2050 population under the unmet water need (shortage) condition would be 44 percent lower than in the region's most likely growth projection. School enrollment estimates for the region are 206,369 less in 2010, 328,528 less in 2030, and 500,891 less in 2050 than if the projected water needs are met.

The estimated effect of projected water shortages upon gross value of business, which includes the direct and indirect effects, are $31.9 billion per year in 2010, $52.4 billion per year in 2030, and $78.8 billion per year in 2050. If the water needs are left entirely unmet, the level of shortage in 2010 results in 461,698 fewer jobs than would be expected if the water needs of 2010 are fully met. The gap in job growth due to water shortages grows to 748,081 by 2030 and to 1.1 million by 2050. The estimated effects of the projected water shortages upon personal income in 2030 are $21.02 billion annually (1999 dollars), and in 2050 are $31.14 billion annually (1999 dollars).

Water Management Strategies to Meet Projected Water Needs

The regional water planning process included making projections of water needs of each water user group; identifying water management options and strategies through public input; and evaluation of each strategy in accordance with TWDB Rules, including calculation of potential quantity of water during drought conditions, reliability of supplies, cost of water delivered to the water users' distribution systems in a form ready to be distributed for end use, environmental and implementation issues, effects upon other water resources of the state, threats to agricultural and natural resources, consistency comparisons among options and strategies, recreational effects, third party social and economic impacts of voluntary transfers, efficient use of existing supplies, and effects upon navigation. The planning process for the South Central Texas Region is summarized in Figure ES-13.

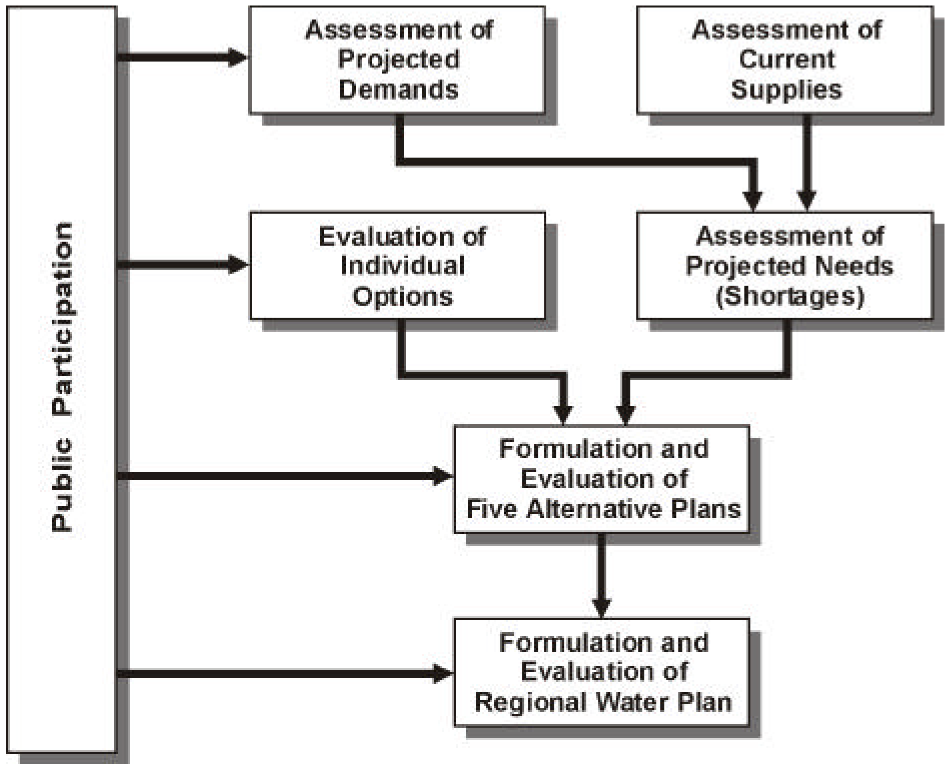

Figure ES-13. Regional Planning Process

South Central Texas Regional Water Plan

Water Plan Summary: The South Central Texas Regional Water Plan includes water management strategies which emphasize water conservation and reuse; maximize utilization of available resources, water rights, and reservoirs; avoid development of large new reservoirs; and minimize depletion of storage in aquifers. The Plan recognizes and includes several projects that are in various stages of implementation at this time, but are not yet complete. Additional strategies have significant support within the region, yet require further study regarding quantity of dependable water supply made available during severe drought, feasibility, and/or cost of implementation, are also included in the Plan. The water management strategies included in the South Central Texas Regional Water Plan could produce new supplies totaling 744,053 acft/yr in 2050 and may be categorized by source, as shown in Figure ES-14.

Specific water management strategies in the Plan are summarized by source category below and by phased implementation in Figure ES-15. Water management strategies

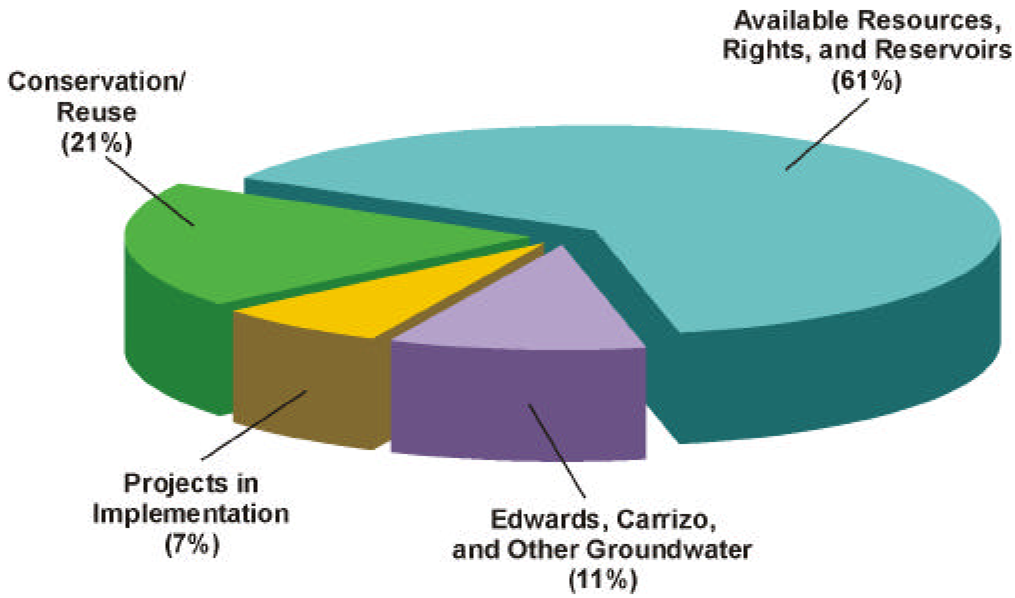

Figure ES-14. Sources of New Supply

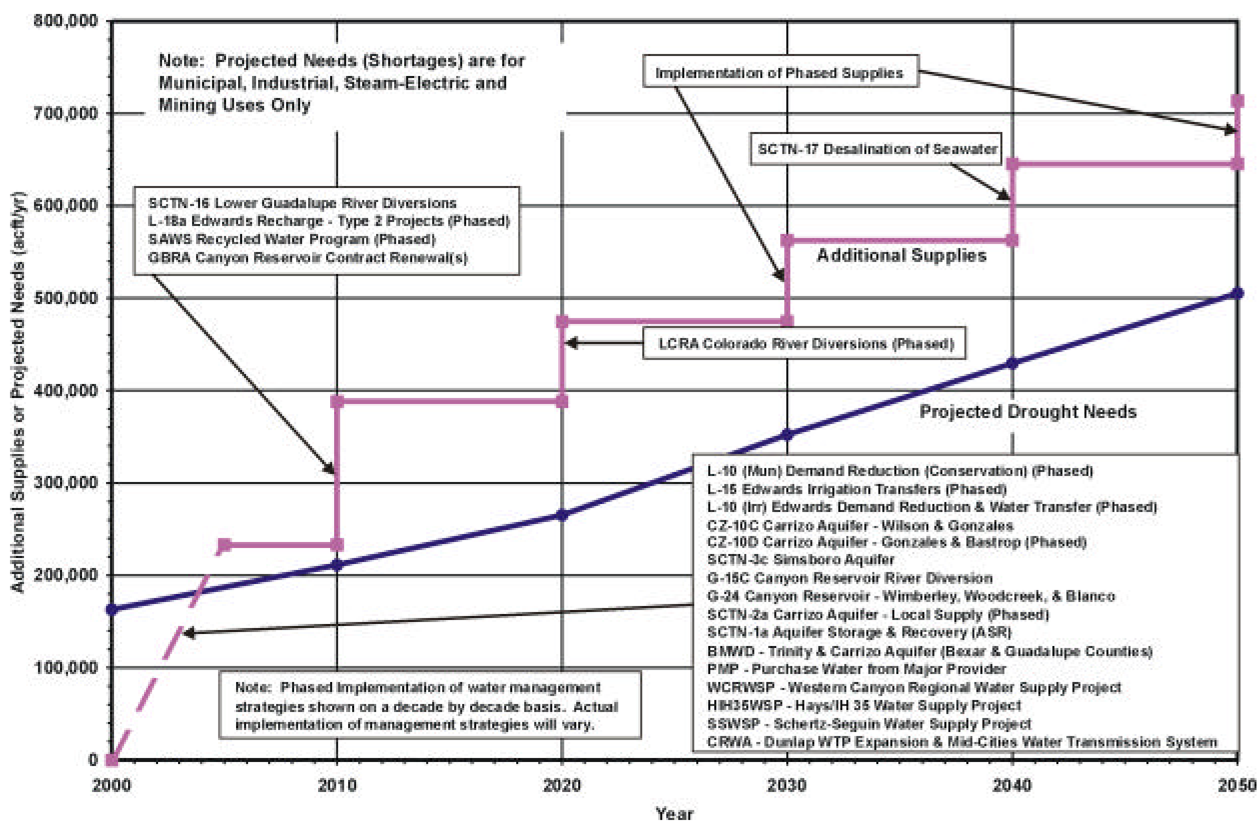

Figure ES-15. Phased Implementation of Water Management Strategies emphasizing conservation and reuse are expected to provide about 21 percent of new supplies available in the year 2050 and include:

- Municipal Demand Reduction (Conservation) (L-10 Mun.);
- Irrigation Demand Reduction (Conservation) with Transfer (L-10 Irr.);
- SAWS Recycled Water Program;
- Aquifer Storage & Recovery (ASR) (SCTN-1a); and
- Irrigation Demand Reduction (Conservation) (L-10 Irr.).

Water management strategies maximizing use of available resources, water rights, and reservoirs are expected to provide about 61 percent of new supplies available in the year 2050 and include:

- Edwards Irrigation Transfers (L-15);
- Canyon Reservoir – River Diversion (G-15C);
- Canyon Reservoir – Wimberley, Woodcreek, & Blanco (G-24);
- Lower Guadalupe River Diversions (SCTN-16);
- Colorado River Diversion (LCRA)[3];
- Simsboro Aquifer (SCTN-3c);
- Purchase Water from Major Provider (PMP); and
- Desalination of Seawater (SCTN-17).

Water management strategies that simultaneously develop groundwater supplies and minimize depletion of storage in regional aquifers are expected to provide about 11 percent of new supplies available in the year 2050 and include:

- Edwards Recharge – Type 2 Projects (L-18a);
- Carrizo Aquifer – Wilson & Gonzales (CZ-10C);
- Carrizo Aquifer – Gonzales & Bastrop (CZ-10D); and
- Carrizo Aquifer – Local Supply (SCTN-2a).

[3] On December 14, 2000, late in the planning cycle, additional analysis by Region K of the Colorado River Diversion option with the full application of consensus environmental flow criteria indicated the yield of the project could be reduced by 19,000 acft/yr, resulting in an estimated 131,000 acft/yr of water available for transfer to Region L (Bexar and Hays Counties). The SCTRWPG acknowledges the different yield amounts for this project contained in the Regional Water Plans for Region L and Region K, and acknowledges that the yield of this project may be reduced to 131,000 acft/yr, and that the unit cost could be increased somewhat. This change could affect supplies to Hays County and Bexar County and may necessitate supplying Hays County needs from other sources. However, due to this information being discovered late in the planning cycle, the SCTRWPG decided to retain the project in the Region L Plan with a yield of 150,000 acft/yr, however, this discrepancy between the two regional plans will be addressed early in the next planning cycle. There are adequate "contingency" supplies available within the Region L plan to compensate for the proposed reduction in yield of the project.

Projects recognized in the Plan that are presently being implemented are expected to provide about 7 percent of new supplies available in the year 2050 and include:

- Schertz-Seguin Water Supply Project (SSWSP);
- Western Canyon Regional Water Supply Project (WCRWSP);
- Hays / IH-35 Water Supply Project (HIH35WSP);
- Lake Dunlap WTP Expansion and Mid-Cities Water Transmission System (CRWA);
- Carrizo Aquifer – Bexar & Guadalupe (BMWD);
- Trinity Aquifer – Bexar (BMWD); and
- Canyon Reservoir Contract Renewal (GBRA).

The Regional Water Plan includes several water management strategies that require further study and funding prior to implementation. Several of these strategies employ technologies that have been used previously, but further research is necessary to determine the cost of implementation, optimal scale and location, and quantity of dependable water supply that would be available in severe drought. These strategies are:

- Brush Management (SCTN-4);
- Weather Modification (SCTN-5);
- Rainwater Harvesting (SCTN-9);
- Additional Municipal Recycling (Reuse) Programs;
- Small Aquifer Recharge Dams;
- Cooperation with Corpus Christi for New Water Sources; and
- Additional Storage (ASR and/or Surface).

Although specific quantities of new supply dependable in drought have not been determined for these strategies, it is understood that their implementation will contribute positively to storage and system management of many diverse strategies in the Regional Water Plan. The SCTRWPG recommends that State funding be made available to cooperatively support the refinement and implementation of these strategies.

The Regional Water Plan also includes the Edwards Aquifer Recharge and Recirculation Systems (R&R). The SCTRWPG recommends State and local funding for research at a level that would ensure consideration of this strategy in the next 5-year planning cycle. However, this management strategy may not be implemented unless the Plan is specifically amended to allow implementation.

Following publication of the Initially Prepared Plan (IPP) on August 17, 2000, the Regional Water Planning Group carefully reconsidered the R&R strategy in light of its fundamental importance to many interests. The IPP included a footnote (IPP at pages ES-25 and 5-8) that indicated the strategy was included for research but not for implementation "unless the Plan is specifically amended to allow implementation." In place of that footnote, the final Regional Water Plan includes a fuller discussion of the issue in Section 5.

The SCTRWPG members agree that the Recharge and Recirculation strategy may hold great promise and that optimizing use of the Edwards Aquifer is a cornerstone of water policy for the Water User Groups dependent on this underground source. They support inclusion of this strategy in the Regional Water Plan for purposes of assuring continued research, which is needed to show that this strategy will not adversely affect flows at Comal Springs. The SCTRWPG members agree that implementation of the strategy will require an amendment of the Regional Plan. The amendment process can occur at any time after formal approval of the Regional Water Plan and requires a public hearing after a 30-day notice period.

The members of the South Central Texas Regional Water Planning Group have further agreed that the Recharge and Recirculation strategy must move as expeditiously as possible through the necessary phases of research to resolve uncertainties about how it could work in practice. To this end, the Planning Group members agree to support the accelerated research effort in the manner appropriate to each, whether by providing funding, reviewing research findings, offering in-kind services, or other means. The goal of this effort will be to conclude the research as soon as practicable, possibly within a three-year period and in any case in time for reviewing results for possible inclusion of this strategy in the next planning cycle. In this way, the Regional Water Planning Group intends to maintain its consensus approach to planning with careful regard for all interests it represents across the South Central Texas Region.

The Lockhart Reservoir is recommended as a potential reservoir site. Although the Regional Plan recommends other means of meeting projected water needs in Caldwell County, the SCTRWPG recognizes the strong interest of local government to shift from low-quality groundwater sources to a surface water supply system. The reservoir is considered by the City of Lockhart and Caldwell County leaders to be an important economic development project to create new growth opportunities for the area. There are questions about economic feasibility at present, but the SCTRWPG recognizes the efforts in Caldwell County and by the Guadalupe Blanco River Authority to find a viable strategy to move the project forward. When that strategy is ready, the SCTRWPG will review the Lockhart Reservoir water supply option as a possible amendment to the Regional Water Plan.

There are significant quantities of projected water supply needs or shortages in the region for municipal, industrial, steam-electric, and mining uses. As indicated in Figure ES-15, implementation of a number of water management strategies on an expedited basis will be necessary to avoid significant hardship, water rationing, and/or cessation of discharge from Comal Springs in the event of severe drought during the next decade. Substantial water supply needs or shortages are also projected for irrigation use in the South Central Texas Region. However, based upon present economic conditions for agriculture and the fact that there are no really low-cost water supplies to be developed, the SCTRWPG has determined that it is not economically feasible to meet projected irrigation needs at this time, since the net farm income to pay for water is less than the costs of water at the potential sources. However, installation of Low Energy Precision Application (LEPA) equipment in six counties is recommended as part of the Irrigation Demand Reduction (Conservation) (L-10 Irr.) water supply strategy included in the Plan. During the next planning cycle, the RWPG intends to examine agricultural needs throughout the region and to undertake additional socio-economic studies of Regional Water Plan impacts on agricultural resources. It will also review water management strategies that may meet irrigation needs during the planning period of 2005–2055.

Implementation of the South Central Texas Regional Water Plan could result in the development of almost 750,000 acft/yr of new water supplies that will be reliable in the event of a repeat of the most severe drought on record. Costs associated with the implementation and long-term operations and maintenance of water management strategies have been estimated in accordance with TWDB rules and general guidelines and reflect regional water treatment capacity and balancing storage facilities sufficient to meet peak daily and seasonal water demands in the larger urban areas. Projected annual and unit costs for the South Central Texas Regional Water Plan are summarized by decade.

Annual costs for the development of new supplies in the South Central Texas Regional Water Plan (in 1999 dollars) are estimated to range from a low of about $120 million in the immediate future, as some of the least costly water management strategies are developed, to a high of about $420 million in 2040, at which time Desalination of Seawater (SCTN-17) is projected to be implemented (Figure ES-16). Estimated unit costs for the development of new

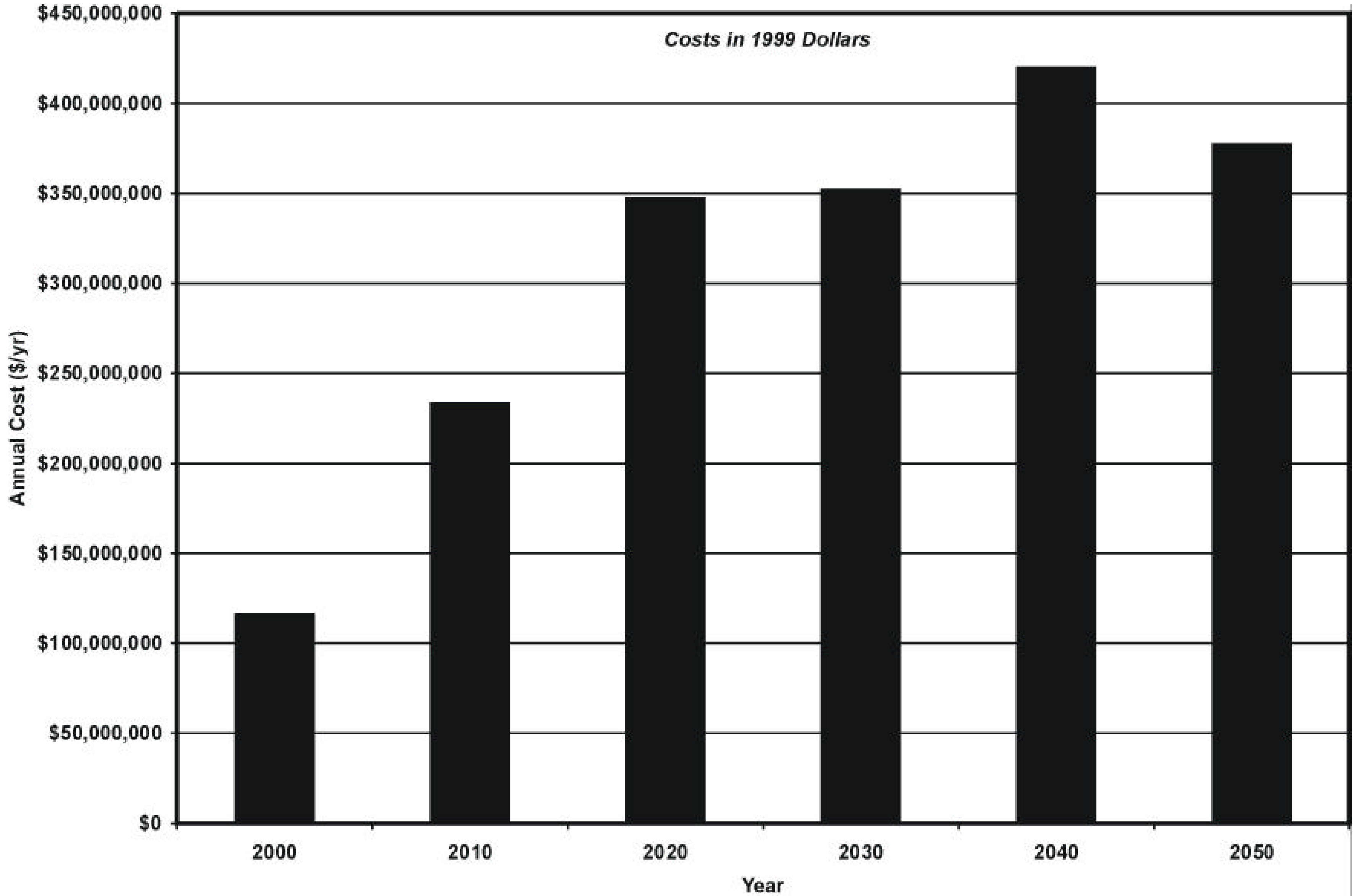

Figure ES-16. Regional Water Plan — Annual Cost of Cumulative Additional Water Supply

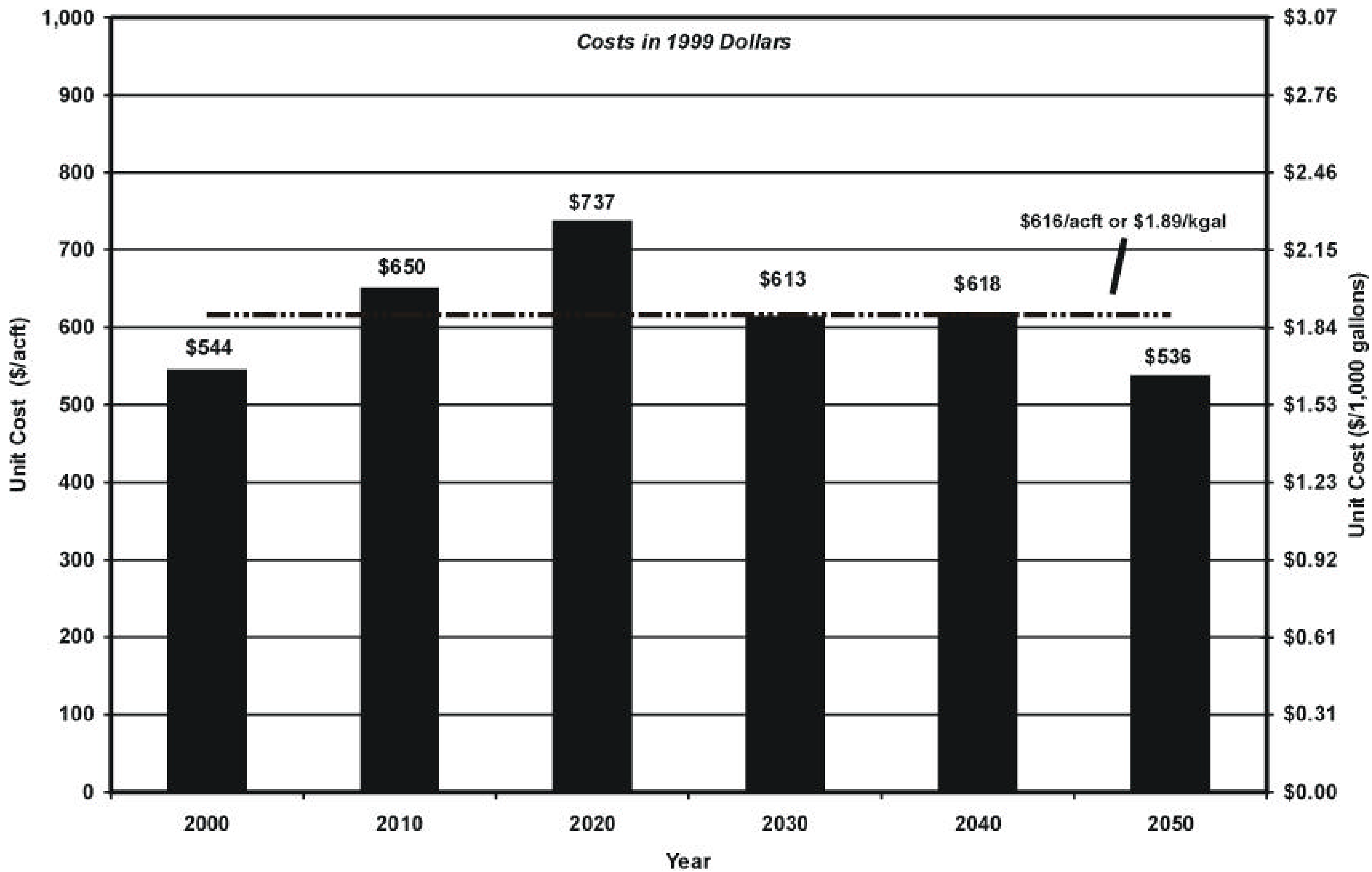

Figure ES-17. Regional Water Plan — Unit Cost of Cumulative Additional Water Supply supplies range from a low of $530 per acft to a high of $737 per acft, and average $617 per acft or $1.89 per 1,000 gallons over the 50-year planning horizon (Figure ES-17). Unit costs tend to decrease beyond 2030 as the 30-year debt service period is completed for the many strategies to be implemented on an expedited basis. No costs have been included for projects that are presently being implemented and management strategies requiring further study.

The South Central Texas Regional Water Planning Group has identified the following environmental benefits and concerns associated with the implementation of the Regional Water Plan.

Environmental Benefits

- Substantial commitment to water conservation through adoption of Texas Water Development Board (TWDB) advanced conservation water demand projections results in fewer water management strategies necessary to meet projected water needs. The South Central Texas Region is the only planning region in the state to adopt the advanced conservation water demand projections.
- Additional commitment to accelerated conservation (above and beyond that in the TWDB's advanced conservation water demand projections) through Demand Reduction (L-10) results in fewer water management strategies necessary to meet projected water needs. Demand Reduction (L-10) accounts for more than 22 percent of the total new water supplies for municipal, industrial, steam-electric, and mining uses in 2010. Even in 2050, Demand Reduction (L-10) accounts for more than 10 percent of the total new water supplies for the referenced uses.
- Development of new water supply sources for Bexar, Comal, and Hays Counties reduces reliance on the Edwards Aquifer during drought thereby contributing to maintenance of springflow and protection of endangered species. The Regional Water Plan recognizes the on-going initiatives of the Edwards Aquifer Authority (EAA) to develop a Habitat Conservation Plan and implement Critical Period Management rules which will help to define the requirements for maintenance of springflow and protection of endangered species.
- Phased implementation of the Regional Water Plan (including timely utilization of Management Supplies) results in increased instream flows in the Guadalupe and San Antonio Rivers and increased freshwater inflows to the Guadalupe Estuary, particularly during the drier months and more extended drought periods.
- Edwards Aquifer Recharge Enhancement through the construction of Type 2 recharge dams (L-18a) contributes not only to municipal water supply, but also to maintenance of springflow, protection of endangered species, increased instream flows, and increased freshwater inflows to the Guadalupe Estuary.

- The Regional Water Plan makes greatest beneficial use of existing surface water rights and major storage facilities (Canyon Reservoir, Highland Lakes System) thereby minimizing the development of new water supply sources and associated environmental impacts. Examples include reliance on presently under-utilized water rights held by the Guadalupe-Blanco River Authority (GBRA) and Union Carbide Corporation (UCC) below the confluence of the Guadalupe and San Antonio Rivers (SCTN-16) and by the Lower Colorado River Authority (LCRA) on the Lower Colorado River. Enhanced use of existing surface water rights and major storage facilities accounts for more than one-third of the total new water supplies for municipal, industrial, steam-electric, and mining uses by 2050.
- The Regional Water Plan avoids large-scale development of new reservoirs having associated terrestrial and aquatic habitat and cultural resources impacts and focuses on smaller, off-channel balancing reservoirs essential for efficient operations and meeting peak seasonal water needs.
- Inclusion of Edwards Aquifer transfers from irrigation use to municipal use through lease/purchase of pumpage rights (L-15) and development of conserved water through installation of LEPA irrigation systems (L-10 Irr.) results in substantial increases in municipal water supply without construction of additional transmission and storage facilities having associated environmental effects.
- The San Antonio Water System (SAWS) goal of meeting 20 percent of projected water demand through its Recycled Water Program makes greatest use of developed water resulting in fewer water management strategies necessary to meet projected water needs.
- Inclusion of modest Carrizo Aquifer groundwater development (CZ-10C, CZ-10D, and SCTN-2a) has minimal associated environmental effects as compared to those typically associated with development of new surface water supplies.
- Inclusion of Desalination of Seawater (SCTN-17) is perceived to have fewer associated environmental effects, as compared to those typically associated with development of new (fresh) surface water supplies.

Environmental Concerns

- Potential reductions in freshwater inflows to bays and estuaries, including associated effects on wetland and marsh habitats and marine species, are identified as matters of concern. Primary concerns focus upon the potential effects of the New Colorado River Diversion Option (LCRA) on freshwater inflows to Matagorda Bay. Secondary concerns are identified for the Nueces Estuary as a result of implementation of Edwards Recharge – Type 2 Projects (L-18a).
- Concentration of Edwards Aquifer pumpage closer to Comal Springs as a result of implementation of Edwards Irrigation Transfers (L-15) and additional transfers of conserved water developed by installation of LEPA irrigation systems (L-10 Irr.) tends to reduce discharge from Comal Springs.
- Potential conflicts with stream segments identified by TPWD as ecologically significant are associated with the New Lower Colorado River Diversion Option (LCRA), Lower Guadalupe River Diversions (SCTN-16), and Edwards Recharge – Type 2 Projects (L-18a).

- Potential effects on small springs may be associated with the development of groundwater supplies from the Carrizo Aquifer (CZ-10C, CZ-10D, and SCTN-2a) and from the Simsboro Aquifer (SCTN-3c).
- Intake siting, brine discharge location(s), and potential effects on marine habitat and species are environmental concerns associated with Desalination of Seawater (SCTN-17).

Regional Water Plan Summary

Management strategies recommended to meet the projected needs of each city or water user group in the South Central Texas Region are summarized by county in Table ES-3.

Table ES-3: Regional Water Supply Plan Summary

County/ Water User Group	Demand 2000 (acft)	Demand 2030 (acft)	Demand 2050 (acft)	Need (Shortage) 2000 (acft)	Need (Shortage) 2030 (acft)	Need (Shortage) 2050 (acft)	Recommended Management Strategies to Meet Need (Shortage)
Atascosa County	Section 2.9			Table 4-1			Section 5.3.1
CHARLOTTE	409	510	568	none	none	none	Municipal Demand Reduction (Conservation) (L-10 Mun.)
JOURDANTON	815	988	1,124	none	none	none	Municipal Demand Reduction (Conservation) (L-10 Mun.)
LYTLE (PART)	559	701	811	325	467	577	Municipal Demand Reduction (Conservation) (L-10 Mun.) Edwards Irrigation Transfers (L-15)
PLEASANTON	2,486	3,074	3,523	none	none	none	Municipal Demand Reduction (Conservation) (L-10 Mun.)
POTEET	1,285	1,479	1,629	none	none	none	Municipal Demand Reduction (Conservation) (L-10 Mun.)
RURAL AREAS	2,240	3,458	4,232	none	1	10	Carrizo Aquifer - Local Supply (SCTN-2a)
INDUSTRIAL	-	-	-				
STEAM-ELECTRIC POWER	12,000	12,000	22,000	none	none	8,504	Carrizo Aquifer - Local Supply (SCTN-2a)
MINING	1,558	1,804	2,048	none	995	1,239	Carrizo Aquifer - Local Supply (SCTN-2a)
IRRIGATION	51,015	46,036	43,023	38,418	43,726	40,713	Demand Reduction (Conservation) (L-10 Irr.)
LIVESTOCK	1,808	1,808	1,808	none	none	none	
Bexar County	Section 2.9			Table 4-2			Section 5.3.2
ALAMO HEIGHTS	2,799	2,706	2,742	1,299	1,206	1,242	Municipal Demand Reduction (Conservation) (L-10 Mun.) Purchase/Participate with Regional Water Provider
BALCONES HEIGHTS	731	798	885	419	486	573	Municipal Demand Reduction (Conservation) (L-10 Mun.) Purchase/Participate with Regional Water Provider
CHINA GROVE	259	344	416	155	240	312	Municipal Demand Reduction (Conservation) (L-10 Mun.) Purchase/Participate with Regional Water Provider
CONVERSE	2,127	4,498	6,456	1,560	3,931	5,889	Municipal Demand Reduction (Conservation) (L-10 Mun.) Purchase/Participate with Regional Water Provider
ELMENDORF	64	75	94	33	44	63	Municipal Demand Reduction (Conservation) (L-10 Mun.) Purchase/Participate with Regional Water Provider
FAIR OAKS RANCH (PART)	1,365	1,209	1,213	1,309	1,153	1,157	Municipal Demand Reduction (Conservation) (L-10 Mun.) Western Canyon Regional Water Supply Project Purchase/Participate with Regional Water Provider
HELOTES	360	494	577	152	286	369	Municipal Demand Reduction (Conservation) (L-10 Mun.) Purchase/Participate with Regional Water Provider
KIRBY	1,586	2,099	2,614	963	1,476	1,991	Municipal Demand Reduction (Conservation) (L-10 Mun.) Purchase/Participate with Regional Water Provider
LEON VALLEY	2,288	1,956	2,040	570	238	322	Municipal Demand Reduction (Conservation) (L-10 Mun.) Purchase/Participate with Regional Water Provider
LIVE OAK WATER PUBLIC UTILITY	1,101	1,389	1,738	none	255	604	Municipal Demand Reduction (Conservation) (L-10 Mun.) Purchase/Participate with Regional Water Provider
LYTLE	1	1	1	none	none	none	Municipal Demand Reduction (Conservation) (L-10 Mun.) Edwards Irrigation Transfers (L-15)
OLMOS PARK	519	553	603	311	345	395	Municipal Demand Reduction (Conservation) (L-10 Mun.) Purchase/Participate with Regional Water Provider

Table ES-3: Regional Water Supply Plan Summary

ounty/ 'ater User Group	Demand 2000 (acft)	Demand 2030 (acft)	Demand 2050 (acft)	Need (Shortage) 2000 (acft)	Need (Shortage) 2030 (acft)	Need (Shortage) 2050 (acft)	Recommended Management Strategies to Meet Need (Shortage)
SAN ANTONIO (SAWS)	220,405	312,695	391,640	102,394	194,684	273,629	Municipal Demand Reduction (Conservation) (L-10 Mun.) Western Canyon Regional Water Supply Project Simsboro Aquifer (SCTN-3c) SAWS Recycled Water Program Aquifer Storage & Recovery - Regional (SCTN-1a) Regional Water Provider(s) (SAWS)* ***Water Management Strategies to be Developed by the Regional Water Provider(s) for Bexar County*** Edwards Irrigation Transfers (L-15) Irrigation Demand Reduction (Conservation) with Transfers (L-10 Irr.) Carrizo Aquifer - Wilson & Gonzales (CZ-10C) Lower Guadalupe River Diversion (SCTN-16) Edwards Recharge - Type 2 Projects (L-18a) New Colorado River Diversion Option Desalination of Seawater - 75 MGD (SCTN-17) Brush Management Weather Modification Rainwater Harvesting Additional Municipal Recycling (Reuse) Programs Small Aquifer Recharge Dams Edwards Aquifer Recharge & Recirculation Systems Cooperation w/ Corpus Christi for New Water Sources Additional Storage (ASR and/or Surface)
SCHERTZ (OUTSIDE CITY)	819	1,455	1,880	674	1,310	1,735	Municipal Demand Reduction (Conservation) (L-10 Mun.) Schertz-Seguin Water Supply Project (Carrizo)
SCHERTZ (PART)	251	997	1,192	207	953	1,148	Municipal Demand Reduction (Conservation) (L-10 Mun.) Schertz-Seguin Water Supply Project (Carrizo)
SHAVANO PARK	1,088	1,232	1,342	675	819	929	Municipal Demand Reduction (Conservation) (L-10 Mun.) Purchase/Participate with Regional Water Provider
ST. HEDWIG	200	275	367	none	none	none	Municipal Demand Reduction (Conservation) (L-10 Mun.)
TERRELL HILLS	1,090	1,070	1,050	540	520	500	Municipal Demand Reduction (Conservation) (L-10 Mun.) Purchase/Participate with Regional Water Provider
UNIVERSAL CITY	3,386	4,864	6,200	2,012	3,490	4,826	Municipal Demand Reduction (Conservation) (L-10 Mun.) Purchase/Participate with Regional Water Provider
WINDCREST (WC&ID NO. 10)	1,675	1,687	1,731	none	none	none	Municipal Demand Reduction (Conservation) (L-10 Mun.)

Table ES-3: Regional Water Supply Plan Summary

ounty/ ater User Group	Demand 2000 (acft)	Demand 2030 (acft)	Demand 2050 (acft)	Need (Shortage) 2000 (acft)	Need (Shortage) 2030 (acft)	Need (Shortage) 2050 (acft)	Recommended Management Strategies to Meet Need (Shortage)
BMWD (CASTLE HILLS)	1,714	1,786	1,751	1,209	1,281	1,246	Municipal Demand Reduction (Conservation) (L-10 Mun.) Regional Water Provider(s) (BMWD)*
							Water Management Strategies to be Developed by the Regional Water Provider(s) for Bexar County
							Edwards Irrigation Transfers (L-15) Irrigation Demand Reduction (Conservation) with Transfers (L-10 Irr.) Carrizo Aquifer - Wilson & Gonzales (CZ-10C) Lower Guadalupe River Diversion (SCTN-16) Edwards Recharge - Type 2 Projects (L-18a) New Colorado River Diversion Option Desalination of Seawater - 75 MGD (SCTN-17) Brush Management Weather Modification Rainwater Harvesting Additional Municipal Recycling (Reuse) Programs Small Aquifer Recharge Dams Edwards Aquifer Recharge & Recirculation Systems Cooperation w/ Corpus Christi for New Water Sources Additional Storage (ASR and/or Surface)
BMWD (SOMERSET)	191	161	149	121	91	79	Municipal Demand Reduction (Conservation) (L-10 Mun.) Carrizo Aquifer - Bexar & Guadalupe (BMWD)
BMWD (HILL CTRY/HOLLYWPARK)	2,395	3,307	4,079	1,694	2,606	3,378	Municipal Demand Reduction (Conservation) (L-10 Mun.) Trinity Aquifer - Bexar (BMWD) Regional Water Provider(s) (BMWD)*
							Water Management Strategies to be Developed by the Regional Water Provider(s) for Bexar County
							Edwards Irrigation Transfers (L-15) Irrigation Demand Reduction (Conservation) with Transfers (L-10 Irr.) Carrizo Aquifer - Wilson & Gonzales (CZ-10C) Lower Guadalupe River Diversion (SCTN-16) Edwards Recharge - Type 2 Projects (L-18a) New Colorado River Diversion Option Desalination of Seawater - 75 MGD (SCTN-17) Brush Management Weather Modification Rainwater Harvesting Additional Municipal Recycling (Reuse) Programs Small Aquifer Recharge Dams Edwards Aquifer Recharge & Recirculation Systems Cooperation w/ Corpus Christi for New Water Sources Additional Storage (ASR and/or Surface)

Table ES-3: Regional Water Supply Plan Summary

ounty/ Water User Group	Demand 2000 (acft)	Demand 2030 (acft)	Demand 2050 (acft)	Need (Shortage) 2000 (acft)	Need (Shortage) 2030 (acft)	Need (Shortage) 2050 (acft)	Recommended Management Strategies to Meet Need (Shortage)
BMWD (OTHER SUBDNS)	27,999	46,235	56,821	9,795	28,031	38,617	Municipal Demand Reduction (Conservation) (L-10 Mun.) Carrizo Aquifer - Bexar & Guadalupe (BMWD) Western Canyon Regional Water Supply Project Regional Water Provider(s) (BMWD)* Lake Dunlap WTP Expansion & Mid-Cities Water Transmission System (CRWA)
							Water Management Strategies to be Developed by the Regional Water Provider(s) for Bexar County
							Edwards Irrigation Transfers (L-15) Irrigation Demand Reduction (Conservation) with Transfers (L-10 Irr.) Carrizo Aquifer - Wilson & Gonzales (CZ-10C) Lower Guadalupe River Diversion (SCTN-16) Edwards Recharge - Type 2 Projects (L-18a) New Colorado River Diversion Option Desalination of Seawater - 75 MGD (SCTN-17) Brush Management Weather Modification Rainwater Harvesting Additional Municipal Recycling (Reuse) Programs Small Aquifer Recharge Dams Edwards Aquifer Recharge & Recirculation Systems Cooperation w/ Corpus Christi for New Water Sources Additional Storage (ASR and/or Surface)
FORT SAM HOUSTON	4,073	3,549	3,508	1,453	929	888	Municipal Demand Reduction (Conservation) (L-10 Mun.) Purchase/Participate with Regional Water Provider
LACKLAND AFB	3,960	3,467	3,436	1,222	729	698	Municipal Demand Reduction (Conservation) (L-10 Mun.) Purchase/Participate with Regional Water Provider
RANDOLPH AFB	1,877	1,649	1,635	906	678	664	Municipal Demand Reduction (Conservation) (L-10 Mun.) Purchase/Participate with Regional Water Provider
RURAL AREAS	21,741	39,202	35,590	2,211	26,686	23,074	Western Canyon Regional Water Supply Project Purchase/Participate with Regional Water Provider Lake Dunlap WTP Expansion & Mid-Cities Water Transmission System (CRWA)
INDUSTRIAL	16,805	24,935	31,697	none	1,428	8,190	Purchase/Participate with Regional Water Provider
STEAM-ELECTRIC POWER	36,000	45,000	56,000	none	none	none	
MINING	4,963	5,406	5,962	4,963	5,406	5,962	Purchase/Participate with Regional Water Provider
IRRIGATION	40,003	33,827	31,026	14,059	7,883	5,082	Demand Reduction (Conservation) (L-10 Irr.)
LIVESTOCK	1,487	1,487	1,487	none	none	none	

Table ES-3: Regional Water Supply Plan Summary

ounty/ ater User Group	Demand 2000 (acft)	Demand 2030 (acft)	Demand 2050 (acft)	Need (Shortage) 2000 (acft)	Need (Shortage) 2030 (acft)	Need (Shortage) 2050 (acft)	Recommended Management Strategies to Meet Need (Shortage)
Caldwell County	*Section 2.9*			*Table 4-3*			*Section 5.3.3*
LOCKHART	2,279	2,978	3,047	none	668	737	Municipal Demand Reduction (Conservation) (L-10 Mun.) Carrizo Aquifer - Local Supply (SCTN-2a)
LULING	1,532	2,244	2,819	none	none	none	Municipal Demand Reduction (Conservation) (L-10 Mun.)
MARTINDALE	109	99	113	none	none	none	Municipal Demand Reduction (Conservation) (L-10 Mun.)
RURAL AREAS	3,121	3,373	2,759	none	none	none	
INDUSTRIAL	62	77	87	none	none	none	
STEAM-ELECTRIC POWER	-	-	-				
MINING	21	4	-	none	none		
IRRIGATION	1,222	857	677	none	none	none	
LIVESTOCK	835	835	835	none	none	none	
Calhoun County	*Section 2.9*			*Table 4-4*			*Section 5.3.4*
POINT COMFORT	171	160	176	none	none	none	Municipal Demand Reduction (Conservation) (L-10 Mun.)
PORT LAVACA	1,769	1,792	2,033	none	852	1,093	Municipal Demand Reduction (Conservation) (L-10 Mun.) GBRA Canyon Reservoir Contract Renewal
SEADRIFT	196	238	280	none	none	none	Municipal Demand Reduction (Conservation) (L-10 Mun.)
RURAL AREAS	2,275	2,706	3,258	none	none	none	
INDUSTRIAL	63,026	95,240	115,958	none	none	none	
STEAM-ELECTRIC POWER	100	100	100	none	none	none	
MINING	28	6	3	none	none	none	
IRRIGATION	26,822	17,673	15,028	none	none	none	
LIVESTOCK	304	304	304	none	none	none	
Comal County	*Section 2.9*			*Table 4-5*			*Section 5.3.5*
FAIR OAKS RANCH (PART)	58	57	64	43	42	49	Municipal Demand Reduction (Conservation) (L-10 Mun.) Western Canyon Regional Water Supply Project Purchase/Participate with Regional Water Provider
GARDEN RIDGE	616	856	911	322	562	617	Municipal Demand Reduction (Conservation) (L-10 Mun.) Canyon Reservoir - River Diversion (G-15C)
NEW BRAUNFELS (PART)	10,335	19,499	25,717	none	14,697	20,915	Municipal Demand Reduction (Conservation) (L-10 Mun.) Canyon Reservoir - River Diversion (G-15C) GBRA Canyon Reservoir Contract Renewal Carrizo Aquifer - Gonzales & Bastrop (CZ-10D) Additional Storage (ASR and/or Surface)
SCHERTZ (PART)	150	997	1,192	123	970	1,165	Municipal Demand Reduction (Conservation) (L-10 Mun.) Schertz-Seguin Water Supply Project (Carrizo)
RURAL AREAS	7,428	15,160	23,343	3,362	11,094	19,601	Western Canyon Regional Water Supply Project Canyon Reservoir - River Diversion (G-15C) Carrizo Aquifer - Gonzales & Bastrop (CZ-10D)
INDUSTRIAL	3,450	3,799	4,351	none	none	551	Carrizo Aquifer - Gonzales & Bastrop (CZ-10D)
STEAM-ELECTRIC POWER	-	-	-				
MINING	5,570	5,796	2,224	5,570	5,796	2,224	Canyon Reservoir - River Diversion (G-15C) Carrizo Aquifer - Gonzales & Bastrop (CZ-10D)
IRRIGATION	459	405	371	none	none	none	
LIVESTOCK	356	356	356	none	none	none	

Table ES-3: Regional Water Supply Plan Summary

ounty/ Water User Group	Demand 2000 (acft)	Demand 2030 (acft)	Demand 2050 (acft)	Need (Shortage) 2000 (acft)	Need (Shortage) 2030 (acft)	Need (Shortage) 2050 (acft)	Recommended Management Strategies to Meet Need (Shortage)
eWitt County	***Section 2.9***			***Table 4-6***			***Section 5.3.6***
CUERO	1,767	1,749	1,891	none	none	none	Municipal Demand Reduction (Conservation) (L-10 Mun.)
YOAKUM	478	576	718	none	none	none	Municipal Demand Reduction (Conservation) (L-10 Mun.)
YORKTOWN	438	451	510	none	none	none	Municipal Demand Reduction (Conservation) (L-10 Mun.)
RURAL AREAS	931	759	722	none	none	none	
INDUSTRIAL	108	170	223	none	none	none	
STEAM-ELECTRIC POWER	-	-	-				
MINING	161	50	44	none	none	none	
IRRIGATION	250	169	130	none	none	none	
LIVESTOCK	1,896	1,896	1,896	none	none	none	
immit County	***Section 2.9***			***Table 4-7***			***Section 5.3.7***
ASHERTON	211	224	267	none	none	none	
BIG WELLS	165	146	149	none	none	none	Municipal Demand Reduction (Conservation) (L-10 Mun.)
CARRIZO SPRINGS	2,316	3,232	4,137	138	1,054	1,959	Municipal Demand Reduction (Conservation) Carrizo Aquifer - Local Supply (SCTN-2a)
RURAL AREAS	244	237	287	none	none	none	
INDUSTRIAL	11	13	15	none	none	none	
STEAM-ELECTRIC POWER	-	-	-				
MINING	1,003	916	950	none	none	none	
IRRIGATION	10,551	9,828	9,026	none	none	none	
LIVESTOCK	771	771	771	none	none	none	
rio County	***Section 2.9***			***Table 4-8***			***Section 5.3.8***
DILLEY	824	906	962	none	none	none	Municipal Demand Reduction (Conservation) (L-10 Mun.)
PEARSALL	1,955	2,146	2,263	none	none	none	Municipal Demand Reduction (Conservation) (L-10 Mun.)
RURAL AREAS	731	761	799	none	none	none	
INDUSTRIAL	-	-	-				
STEAM-ELECTRIC POWER	400	400	400	none	none	none	
MINING	150	16	3	none	none	none	
IRRIGATION	94,688	84,933	79,103	71,125	76,506	70,663	Demand Reduction (Conservation) (L-10 Irr.)
LIVESTOCK	1,192	1,192	1,192	none	none	none	
oliad County	***Section 2.9***			***Table 4-9***			***Section 5.3.9***
GOLIAD	429	407	440	none	none	none	Municipal Demand Reduction (Conservation) (L-10 Mun.)
RURAL AREAS	499	449	477	none	none	none	
INDUSTRIAL	-	-	-				
STEAM-ELECTRIC POWER	15,000	20,000	20,000	none	none	none	
MINING	17	3	0	none	none	none	
IRRIGATION	592	382	285	none	none	none	
LIVESTOCK	1,208	1,208	1,208	none	none	none	

Table ES-3: Regional Water Supply Plan Summary

ounty/ ater User Group	Demand 2000 (acft)	Demand 2030 (acft)	Demand 2050 (acft)	Need (Shortage) 2000 (acft)	Need (Shortage) 2030 (acft)	Need (Shortage) 2050 (acft)	Recommended Management Strategies to Meet Need (Shortage)
onzales County	***Section 2.9***			***Table 4-10***			***Section 5.3.10***
GONZALES	1,648	1,564	1,623	none	none	none	Municipal Demand Reduction (Conservation) (L-10 Mun.)
NIXON	384	351	363	none	none	none	Municipal Demand Reduction (Conservation) (L-10 Mun.)
WAELDER	157	142	140	none	none	none	Municipal Demand Reduction (Conservation) (L-10 Mun.)
RURAL AREAS	1,690	1,532	1,558	none	none	none	
INDUSTRIAL	929	1,083	1,231	none	none	none	
STEAM-ELECTRIC POWER	-	-	-				
MINING	41	29	30	none	none	none	
IRRIGATION	3,052	1,957	1,455	none	none	none	
LIVESTOCK	5,999	6,334	6,334	none	none	none	
uadalupe County	***Section 2.9***			***Table 4-11***			***Section 5.3.11***
CIBOLO	441	519	632	none	none	none	Municipal Demand Reduction (Conservation) (L-10 Mun.)
MARION	131	113	114	none	none	none	Municipal Demand Reduction (Conservation) (L-10 Mun.)
MCQUEENEY	251	254	277	none	none	none	Municipal Demand Reduction (Conservation) (L-10 Mun.)
NEW BRAUNFELS (PART)	75	139	171	none	104	136	Municipal Demand Reduction (Conservation) (L-10 Mun.) Canyon Reservoir - River Diversion (G-15C) GBRA Canyon Reservoir Contract Renewal Carrizo Aquifer - Gonzales & Bastrop (CZ-10D) Additional Storage (ASR and/or Surface)
SCHERTZ (PART)	4,612	4,654	5,563	3,795	3,837	4,746	Municipal Demand Reduction (Conservation) (L-10 Mun.) Schertz-Seguin Water Supply Project (Carrizo)
SEGUIN	4,566	6,800	9,538	none	7	2,745	Municipal Demand Reduction (Conservation) (L-10 Mun.) Schertz-Seguin Water Supply Project (Carrizo)
RURAL AREAS	5,404	13,474	18,001	none	922	4,505	Carrizo Aquifer - Gonzales & Bastrop (CZ-10D) Schertz-Seguin Water Supply Project (Carrizo)
INDUSTRIAL	1,883	2,385	2,797	979	1,481	1,893	Carrizo Aquifer - Gonzales & Bastrop (CZ-10D) Schertz-Seguin Water Supply Project (Carrizo)
STEAM-ELECTRIC POWER	10,760	10,760	10,760	920	920	920	Schertz-Seguin Water Supply Project (Carrizo)
MINING	196	202	213	196	202	213	Carrizo Aquifer - Gonzales & Bastrop (CZ-10D)
IRRIGATION	2,520	2,175	1,972	883	582	406	
LIVESTOCK	1,132	1,132	1,132	none	none	none	

Table ES-3: Regional Water Supply Plan Summary

ounty/ Water User Group	Demand 2000 (acft)	Demand 2030 (acft)	Demand 2050 (acft)	Need (Shortage) 2000 (acft)	Need (Shortage) 2030 (acft)	Need (Shortage) 2050 (acft)	Recommended Management Strategies to Meet Need (Shortage)
ays County (part)	***Section 2.9***			***Table 4-12***			***Section 5.3.12***
KYLE	353	376	504	none	none	225	Hays/IH 35 Water Supply Contract GBRA Canyon Reservoir Contract Renewal
SAN MARCOS	9,393	18,671	31,049	641	9,919	27,297	Municipal Demand Reduction (Conservation) (L-10 Mun.) Purchase Water from Major Provider New Colorado River Diversion Option GBRA Canyon Reservoir Contract Renewal Additional Storage (ASR and/or Surface)
WIMBERLEY	615	898	1,128	none	none	322	Municipal Demand Reduction (Conservation) (L-10 Mun.) Canyon Reservoir (G-24)
WOODCREEK	171	150	157	none	none	none	Municipal Demand Reduction (Conservation) (L-10 Mun.)
RURAL AREAS	5,569	8,315	8,325	3,604	6,350	6,360	Hays/IH35 Water Supply Project Canyon Reservoir (G-24) New Colorado River Diversion Option
INDUSTRIAL	93	129	154	none	none	none	
STEAM-ELECTRIC POWER	-	6,400	6,400		none	none	
MINING	84	55	28	84	55	28	Hays/IH35 Water Supply Project
IRRIGATION	294	287	281	none	none	none	
LIVESTOCK	271	271	271	none	none	none	
arnes County	***Section 2.9***			***Table 4-13***			***Section 5.3.13***
KARNES CITY	468	468	515	none	none	none	Municipal Demand Reduction (Conservation) (L-10 Mun.)
KENEDY	828	847	931	none	none	none	Municipal Demand Reduction (Conservation) (L-10 Mun.)
RUNGE	199	196	213	none	none	none	Municipal Demand Reduction (Conservation) (L-10 Mun.)
RURAL AREAS	1,091	1,053	1,117	none	none	none	
INDUSTRIAL	296	340	383	none	none	none	
STEAM-ELECTRIC POWER	-	-	-				
MINING	166	19	4	none	none	none	
IRRIGATION	1,840	1,362	1,114	none	none	none	
LIVESTOCK	1,339	1,339	1,339	none	none	none	
endall County	***Section 2.3***			***Table 4-14***			***Section 5.3.14***
BOERNE	1,259	2,199	3,598	34	974	2,528	Municipal Demand Reduction (Conservation) (L-10 Mun.) Western Canyon Regional Water Supply Project Purchase/Participate with Regional Water Provider
COMFORT	265	254	285	none	none	none	Municipal Demand Reduction (Conservation) (L-10 Mun.)
FAIR OAKS RANCH (PART)	232	331	342	90	189	200	Municipal Demand Reduction (Conservation) (L-10 Mun.) Western Canyon Regional Water Supply Project Purchase/Participate with Regional Water Provider
RURAL AREAS	1,778	5,500	8,536	1,070	4,099	6,847	Purchase Water from Major Provider
INDUSTRIAL	2	4	6	2	4	6	Purchase Water from Major Provider
STEAM-ELECTRIC POWER	-	-	-				
MINING	13	1	-	none	none		
IRRIGATION	364	320	293	none	none	none	
LIVESTOCK	512	512	512	none	none	none	

Table ES-3: Regional Water Supply Plan Summary

ounty/ ater User Group	*Demand 2000 (acft)*	*Demand 2030 (acft)*	*Demand 2050 (acft)*	*Need (Shortage) 2000 (acft)*	*Need (Shortage) 2030 (acft)*	*Need (Shortage) 2050 (acft)*	*Recommended Management Strategies to Meet Need (Shortage)*
aSalle County	***Section 2.9***			***Table 4-15***			***Section 5.3.15***
COTULLA	908	970	1,040	none	none	none	Municipal Demand Reduction (Conservation) (L-10 Mun.)
ENCINAL	93	55	48	none	none	none	Municipal Demand Reduction (Conservation) (L-10 Mun.)
RURAL AREAS	371	397	398	none	none	none	
INDUSTRIAL	-	-	-				
STEAM-ELECTRIC POWER	-	-	-				
MINING	-	-	-				
IRRIGATION	7,067	6,433	6,042	none	none	none	
LIVESTOCK	1,077	1,077	1,077	none	none	none	
edina County	***Section 2.9***			***Table 4-16***			***Section 5.3.16***
CASTROVILLE	958	1,061	1,123	228	331	393	Municipal Demand Reduction (Conservation) (L-10 Mun.) Edwards Irrigation Transfers (L-15)
DEVINE	953	964	1,005	666	677	718	Municipal Demand Reduction (Conservation) (L-10 Mun.) Edwards Irrigation Transfers (L-15)
HONDO	2,032	2,263	2,393	923	1,154	1,284	Municipal Demand Reduction (Conservation) (L-10 Mun.) Edwards Irrigation Transfers (L-15)
LACOSTE	278	326	365	147	195	234	Municipal Demand Reduction (Conservation) (L-10 Mun.) Edwards Irrigation Transfers (L-15)
LYTLE (PART)	92	88	92	51	47	51	Municipal Demand Reduction (Conservation) (L-10 Mun.) Edwards Irrigation Transfers (L-15)
NATALIA	397	440	464	none	none	none	Municipal Demand Reduction (Conservation) (L-10 Mun.)
RURAL AREAS	2,402	2,690	2,956	none	23	70	Edwards Irrigation Transfers (L-15)
INDUSTRIAL	302	361	411	none	none	none	
STEAM-ELECTRIC POWER	-	-	-				
MINING	143	129	136	68	72	76	Edwards Irrigation Transfers (L-15)
IRRIGATION	144,413	127,270	116,891	78,206	65,382	55,006	Demand Reduction (Conservation) (L-10 Irr.)
LIVESTOCK	1,914	1,914	1,914	none	none	none	
efugio County	***Section 2.9***			***Table 4-17***			***Section 5.3.17***
REFUGIO	638	604	589	none	none	none	Municipal Demand Reduction (Conservation) (L-10 Mun.)
WOODSBORO	328	298	288	none	none	none	Municipal Demand Reduction (Conservation) (L-10 Mun.)
RURAL AREAS	362	296	273	none	none	none	
INDUSTRIAL	-	-	-				
STEAM-ELECTRIC POWER	-	-	-				
MINING	44	11	4	none	none	none	
IRRIGATION	-	-	-				
LIVESTOCK	407	407	407	none	none	none	

Table ES-3: Regional Water Supply Plan Summary

ounty/ Water User Group	Demand 2000 (acft)	Demand 2030 (acft)	Demand 2050 (acft)	Need (Shortage) 2000 (acft)	Need (Shortage) 2030 (acft)	Need (Shortage) 2050 (acft)	Recommended Management Strategies to Meet Need (Shortage)
valde County	***Section 2.9***			***Table 4-18***			***Section 5.3.18***
SABINAL	510	632	739	247	369	476	Municipal Demand Reduction (Conservation) (L-10 Mun.) Edwards Irrigation Transfers (L-15)
UVALDE	5,173	6,610	7,871	2,435	3,872	5,133	Municipal Demand Reduction (Conservation) (L-10 Mun.) Edwards Irrigation Transfers (L-15)
RURAL AREAS	1,027	777	661	none	none	none	
INDUSTRIAL	600	700	817	none	none	none	
STEAM-ELECTRIC POWER	-	-	-				
MINING	444	576	777	none	none	none	
IRRIGATION	135,168	119,924	110,728	48,551	36,274	273,873	Demand Reduction (Conservation) (L-10 Irr.)
LIVESTOCK	1,494	1,494	1,494	none	none	none	
ictoria County	***Section 2.9***			***Table 4-19***			***Section 5.3.19***
BLOOMINGTON	269	316	373	none	none	none	Municipal Demand Reduction (Conservation) (L-10 Mun.)
VICTORIA	10,506	11,714	13,333	none	none	none	Municipal Demand Reduction (Conservation) (L-10 Mun.) Purchase Water from Major Provider
RURAL AREAS	2,238	2,148	2,410	none	none	none	
INDUSTRIAL	24,115	33,670	42,201	none	none	none	
STEAM-ELECTRIC POWER	8,000	10,000	10,000	none	none	none	
MINING	2,578	1,714	1,862	none	none	none	
IRRIGATION	11,824	7,602	5,663	none	none	none	
LIVESTOCK	1,398	1,398	1,398	none	none	none	
ilson County	***Section 2.9***			***Table 4-20***			***Section 5.3.20***
FLORESVILLE	1,290	1,453	1,613	none	none	145	Municipal Demand Reduction (Conservation) (L-10 Mun.) Carrizo Aquifer - Local Supply (SCTN-2a)
LAVERNIA	225	254	286	none	none	none	Municipal Demand Reduction (Conservation) (L-10 Mun.)
POTH	449	522	600	none	none	none	Municipal Demand Reduction (Conservation) (L-10 Mun.)
STOCKDALE	334	392	448	none	none	none	Municipal Demand Reduction (Conservation) (L-10 Mun.)
RURAL AREAS	3,678	6,740	9,584	none	none	none	
INDUSTRIAL	61	99	134	none	none	none	
STEAM-ELECTRIC POWER	-	-	-				
MINING	193	39	20	none	none	none	
IRRIGATION	14,519	10,713	8,869	none	none	none	
LIVESTOCK	1,905	1,905	1,905	none	none	none	

Table ES-3: Regional Water Supply Plan Summary

ounty/ ater User Group	Demand 2000 (acft)	Demand 2030 (acft)	Demand 2050 (acft)	Need (Shortage) 2000 (acft)	Need (Shortage) 2030 (acft)	Need (Shortage) 2050 (acft)	Recommended Management Strategies to Meet Need (Shortage)
avala County	***Section 2.9***			***Table 4-21***			***Section 5.3.21***
BATESVILLE	212	204	209	none	none	none	Municipal Demand Reduction (Conservation) (L-10 Mun.)
CRYSTAL CITY	2,034	1,908	1,908	none	none	none	Municipal Demand Reduction (Conservation) (L-10 Mun.)
LAPRYOR	238	157	145	none	none	none	Municipal Demand Reduction (Conservation) (L-10 Mun.)
RURAL AREAS	290	383	658	none	none	none	
INDUSTRIAL	1,407	1,642	1,914	none	none	none	
STEAM-ELECTRIC POWER	-	-	-				
MINING	97	8	-	none	none		
IRRIGATION	103,213	91,456	84,371	80,722	88,293	81,200	Demand Reduction (Conservation) (L-10 Irr.)
LIVESTOCK	881	881	881	none	none	none	
ajor Water Providers	***Section 2.10***			***Table 4-23***			***Section 5.4***
REGIONAL WATER PROVIDER(S) FOR BEXAR COUNTY							Edwards Irrigation Transfers (L-15) Irrigation Demand Reduction (Conservation) with Transfers (L-10 Irr.) Carrizo Aquifer - Wilson & Gonzales (CZ-10C) Lower Guadalupe River Diversions (SCTN-16) Edwards Recharge - Type 2 Projects (L-18a) New Colorado River Diversion Option Desalination of Seawater - 75 MGD (SCTN-17) Brush Management Weather Modification Rainwater Harvesting Small Aquifer Recharge Dams Edwards Aquifer Recharge & Recirculation Systems Cooperation w/ Corpus Christi for New Water Sources Additional Storage (ASR and/or Surface)
SAN ANTONIO WATER SYSTEM	228,728	322,846	403,397	106,550	200,668	281,219	Municipal Demand Reduction (Conservation) (L-10 Mun.) Western Canyon Regional Water Supply Project Simsboro Aquifer (SCTN-3c) SAWS Recycled Water Program Regional Water Provider(s) (SAWS)* Aquifer Storage & Recovery - Regional (SCTN-1a)
							****Water Management Strategies to be Developed by the Regional Water Provider(s) for Bexar County***
							Edwards Irrigation Transfers (L-15) Irrigation Demand Reduction (Conservation) with Transfers (L-10 Irr.) Carrizo Aquifer - Wilson & Gonzales (CZ-10C) Lower Guadalupe River Diversion (SCTN-16) Edwards Recharge - Type 2 Projects (L-18a) New Colorado River Diversion Option Desalination of Seawater - 75 MGD (SCTN-17) Brush Management Weather Modification Rainwater Harvesting Additional Municipal Recycling (Reuse) Programs Small Aquifer Recharge Dams Edwards Aquifer Recharge & Recirculation Systems Cooperation w/ Corpus Christi for New Water Sources Additional Storage (ASR and/or Surface)

Table ES-3: Regional Water Supply Plan Summary

ounty/ ater User Group	Demand 2000 (acft)	Demand 2030 (acft)	Demand 2050 (acft)	Need (Shortage) 2000 (acft)	Need (Shortage) 2030 (acft)	Need (Shortage) 2050 (acft)	Recommended Management Strategies to Meet Need (Shortage)
BEXAR MET WATER DISTRICT	32,513	51,914	63,490	13,033	32,424	44,010	Municipal Demand Reduction (Conservation) (L-10 Mun.) Carrizo Aquifer - Bexar & Guadalupe (BMWD) Trinity Aquifer - Bexar (BMWD) Western Canyon Regional Water Supply System Regional Water Provider(s) (BMWD)*
							***Water Management Strategies to be Developed by the Regional Water Provider(s) for Bexar County**
							Edwards Irrigation Transfers (L-15) Irrigation Demand Reduction (Conservation) with Transfers (L-10 Irr.) Carrizo Aquifer - Wilson & Gonzales (CZ-10C) Lower Guadalupe River Diversion (SCTN-16) Edwards Recharge - Type 2 Projects (L-18a) New Colorado River Diversion Option Desalination of Seawater - 75 MGD (SCTN-17) Brush Management Weather Modification Rainwater Harvesting Additional Municipal Recycling (Reuse) Programs Small Aquifer Recharge Dams Edwards Aquifer Recharge & Recirculation Systems Cooperation w/ Corpus Christi for New Water Sources Additional Storage (ASR and/or Surface)
CANYON REGIONAL WATER AUTHORITY	2,536	6,675	9,557	none	3,449	6,331	Lake Dunlap WTP Expansion & Mid-Cities Water Transmission System Carrizo Aquifer - Gonzales & Bastrop (CZ-10D)
GUADALUPE-BLANCO RIVER AUTHORITY	74,452	68,015	65,945	none	none	none	Additional Canyon Reservoir Diversions (Amend CA#18-2074) Major Provider of Additional Supplies Canyon Reservior - River Diversion (G-15C) Canyon Reservoir - Wimberley, Woodcreek, & Blanco (G-24) Western Canyon Regional Water Supply Project (WCRWSP) Hays/IH35 Water Supply Project (HIH35WSP) Lake Dunlap WTP Expansion & Mid-Cities Project (CRWA)
NEW BRAUNFELS UTILITIES	4,280	14,972	22,202	none	10,135	17,365	Municipal Demand Reduction (Conservation) (L-10 Mun) Canyon Reservoir - River Diversion (G-15C) Carrizo Aquifer - Gonzales & Bastrop (CZ-10D) Additional Storage (ASR and/or Surface)
CITY OF SAN MARCOS	5,391	14,844	27,358	1,639	11,092	23,606	Municipal Demand Reduction (Conservation) (L-10 Mun.) Purchase Water from Major Provider New Colorado River Diversion Option Additional Storage (ASR and/or Surface)

South Central Texas Regional Water Planning Area

Regional Water Plan

Volume I — Executive Summary and Regional Water Plan

Prepared by:

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January 2001

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River Authorities Representative

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Mr. Greg Ellis
Water Districts Representative

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Mr. Tom Moreno
Water Districts Representative

____

Mr. Ron Naumann
Water Utilities Representative

____

As adopted by the South Central Texas
Regional Water Planning Group
on this date ____________________

South Central Texas Regional Water Planning Area

Regional Water Plan

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Section 1
Description of the
South Central Texas Region

1.1 Background

Water supplies of the South Central Texas Region are obtained from the Edwards-Balcones Fault Zone, Carrizo-Wilcox, Trinity, and Gulf Coast Aquifers; from two minor aquifers (Queen City and Sparta); and from the rivers, streams, and reservoirs within the region. The water supply picture of the region is very complex, involving intricate relationships between surface water and groundwater. The Edwards-Balcones Fault Zone Aquifer (hereinafter referred to as the Edwards Aquifer) supplied approximately 46 percent of the total water used in the South Central Texas Region in 1990. Water demands for the area that is now being supplied from the Edwards Aquifer are growing at a rate of approximately 1.7 percent per year. However, not even the present level of use can be sustained while maintaining levels of flows at Comal and San Marcos Springs adequate to support habitats of threatened and endangered species and also meet downstream water rights. Demands on the other aquifers of the South Central Texas Region exceed recharge, such that continued withdrawals at present rates could ultimately result in water supply failures, particularly in some areas that now depend upon the Trinity, Carrizo-Wilcox (hereinafter referred to as the Carrizo Aquifer), and Gulf Coast Aquifers.

Operations of the largest existing surface water supply sources in the region are also directly linked to the Edwards Aquifer. Dependable supplies from Canyon Reservoir for municipal and industrial customers are a function of springflows from the Edwards Aquifer, since releases from Canyon are necessary to meet downstream water rights when springflows drop below certain levels. Storage in the Medina Lake System contributes significantly to recharge of the Edwards Aquifer, and reservoirs used for power generation (Coleto Creek, Calaveras, and Braunig) are dependent upon springflows and/or treated municipal effluent that originate from the Edwards Aquifer. Surface water supplies available to the region are also a function of recharge to and withdrawal from the aquifers, as are the quantities of streamflows permitted for use in counties of the Nueces, San Antonio, and Guadalupe River Basins outside of the South Central Texas Region. In water planning for the South Central Texas Region, these factors, together with the numerous potential water management strategies and options of the South Central Texas Region, will have to be taken into account.

1.2 Physical Description of the South Central Texas Region

The South Central Texas Region includes counties that are located in whole or in part in the Rio Grande, Nueces, San Antonio, Guadalupe, Colorado, and Lavaca River Basins, and the Colorado-Lavaca, Lavaca-Guadalupe, and San Antonio-Nueces Coastal Basins (Table 1-1). The physical terrain of the region ranges from the Hill Country of the Edwards Plateau to the Coastal Plains. A general description of the region, including geology, climate, water resources, vegetational areas, and major water demand centers, is presented in the following sections.

1.2.1 Climate[1]

The South Central Texas Region lies in three climatic divisions in Texas: the Edwards Plateau division, the South Central division, and the Upper Coast division. The climate of the region is classified as humid subtropical. Summers are usually hot and humid, while winters are often mild and dry. The hot weather is rather persistent from late May through September, accompanied by prevailing southeasterly winds. There is little change in the day-to-day summer weather, except for the occasional thunderstorm, which produces much of the annual precipitation within the region. The cool season, beginning about the first of November and extending through March, is also typically the driest season of the year. Winters are ordinarily short and mild, with most of the precipitation falling as drizzle or light rain. Any accumulation of snow is a rare occurrence. Polar air masses, which penetrate the region in winter, bring northerly winds and sharp drops in temperature for short periods of time.

In the coastal region, the climate is dominated by proximity to the Gulf of Mexico and characterized by prevailing southeasterly winds. During the long humid summers, high daytime temperatures, which are common in inland areas, are moderated in coastal areas by the Gulf breeze.

Mean annual precipitation in the region ranges from a high of 38 inches per year in DeWitt County, in the eastern part of the region, to a low of 23 inches per year in the Nueces River Basin, in the west (Table 1-2). There is a general trend of decreasing precipitation from the eastern portions of the region to western portions. There is also a general trend of increasing precipitation from inland areas to coastal areas.

[1] Texas Water Development Board (TWDB) "Continuing Water Resources Planning and Development for Texas," May 1977.

Table 1-1.
South Central Texas Region – List of Counties
Location by River Basin and Edwards Aquifer Area

County	Edwards Aquifer Area	Nueces Basin	San Antonio Basin	Guadalupe Basin	Lower Colorado Basin	Colorado-Lavaca Coastal Basin	Lavaca Basin	Lavaca-Guadalupe Coastal Basin	San Antonio-Nueces Coastal Basin	Rio Grande
Atascosa	X	X	X							
Bexar	X	X	X							
Caldwell	X			X	X					
Calhoun				X		X		X	X	
Comal	X		X	X						
DeWitt			X	X			X	X		
Dimmit		X								X
Frio		X								
Goliad			X	X					X	
Gonzales				X			X			
Guadalupe	X		X	X						
Hays (Part)	X			X						
Karnes		X	X	X					X	
Kendall			X	X	X					
LaSalle		X								
Medina	X	X	X							
Refugio			X						X	
Uvalde	X	X								
Victoria			X	X			X	X		
Wilson		X	X	X						
Zavala		X								
An X in the column indicates that all or part of the county is located in the River or Coastal Basin named in the column heading.										

Table 1-2.
Climatological Data for the
South Central Texas Region

River Basin	Precipitation: Mean Annual (inches)	Precipitation: Wettest Month(s)	Precipitation: Driest Month(s)	Temperature: Mean Annual (°F)	Temperature: Mean Daily Minimum: January (°F)	Temperature: Mean Daily Minimum: July (°F)	Temperature: Mean Daily Maximum: January (°F)	Temperature: Mean Daily Maximum: July (°F)	Annual Net Lake Surface Evaporation (inches)
Rio Grande	25	Sept.	Mar.	74	48	74	71	96	65
Nueces	23	May, Sept.	Mar.	71	40	72	65	98	45
San Antonio	30	Sept.	Mar., Dec.	70	41	74	64	96	31
Guadalupe	32	May, Sept.	Mar.	79	37	71	60	95	37
Colorado	34	May, Sept.	Jan.	68	39	74	60	96	35
Lavaca	38	May, Sept.	Mar., July	70	41	72	65	98	24
Lavaca-Guadalupe	37	Sept.	Mar., July	70	44	76	64	94	25
San Antonio-Nueces	33	Sept.	Mar.	71	43	73	65	96	30
Colorado-Lavaca	41	Sept.	Mar., July	70	43	78	64	91	20

Source: TWDB, "Continuing Water Resources Planning and Development for Texas," May 1977.

Although mean annual temperatures are basically uniform throughout the region, there are some marked seasonal variations, which lead to widely varied values for annual net lake surface evaporation. The values for annual net lake surface evaporation range from a high of 65 inches per year, for the portion of Dimmit County located in the Rio Grande River Basin, to a low of 24 inches per year, for the portion of DeWitt County that lies in the Lavaca River Basin (Table 1-2).

The South Central Texas Region is subject to the threat of hurricanes each year from mid-June through the end of October, and in those parts of the region along and near the coastline, the hazard of hurricane tides is prevalent. Although hurricane winds and tornadoes spawned by hurricanes cause extensive damage and occasional loss of life, surveys of hurricanes reaching the Texas Coast indicate that storm tides cause by far the greatest destruction and largest number of deaths. Elsewhere in the inland areas of the region, the greatest concern with regard to hurricanes is the damage that results from winds and flooding. Records dating back to 1871 show that, on average, a tropical storm or hurricane has affected the region once every 3 years.

1.2.2 General Geology[2]

The Hill Country area of the South Central Texas Region is underlain by Cretaceous Age limestone, which forms the Edwards Plateau. East and south of the Plateau are upper Cretaceous chalk, limestone, dolomite, and clay, with the extensive Balcones Fault Zone System marking the boundary between the Edwards Plateau and the Gulf Coastal Region. The entire sequence dips gently toward the southeast.

A Tertiary Age sequence of southeasterly dipping sand, silts, clay, glauconite, volcanic ash, and lignite overlie the Cretaceous Age strata. The primary water-bearing unit of this sequence is the Carrizo Aquifer. A sequence of clay, sand, caliche, and conglomerate of the Pliocene Age Goliad Formation underlie the coastal areas of the region.

Overlying the Goliad Formation is the Quaternary Age Lissie Formation, which consists of sand, silt, clay and minor amounts of gravel. Clay, silt, and fine-grained sand of the Beaumont Formation overlie the Lissie Formation. Throughout the region, alluvial sediments of Recent Age occur along streams and coastal areas.

1.2.3 Vegetational Areas[3]

Biologically, the South Central Texas Regional Planning Area is a region of transition from the lowland forests of the southeastern United States to the arid grasslands of the western uplands and tropical thorn scrub to the south. The essence of this landscape consists of dendritic networks of wooded stream corridors populated by typically eastern species that dissect upland grasslands, and savannahs that harbor western species. The vegetational areas containing portions of the South Central Texas Regional Planning Area are the Edwards Plateau, South Texas Plains, Blackland Prairies, Gulf Prairies and Marshes, and the Post Oak Savannah (Figure 1-1). Each area is described below.

1.2.3.1 Edwards Plateau

In the South Central Texas Region, the Edwards Plateau vegetational area includes all of Kendall County, the northern portions of Uvalde, Medina, Bexar, and Comal Counties, and that portion of Hays County located within the planning area. This limestone-based area is

[2] TWDB, Op. Cit., May 1977.
[3] HDR Engineering, Inc. (HDR), et al., "Trans-Texas Water Program, West Central Study Area, Phase I Interim Report," Volume 2, San Antonio River Authority, et al., May 1994.

characterized by springfed, perennially flowing streams that originate in its interior and flow across the Balcones Escarpment, which bounds it on the south and east. This area is also characterized by the occurrence of numerous ephemeral streams that are important conduits of storm runoff, which contributes to the recharge of the Edwards Aquifer. The soils are shallow, ranging from sands to clays, and are calcareous in reaction. This area is predominantly rangeland, with cultivation confined to the deeper soils.

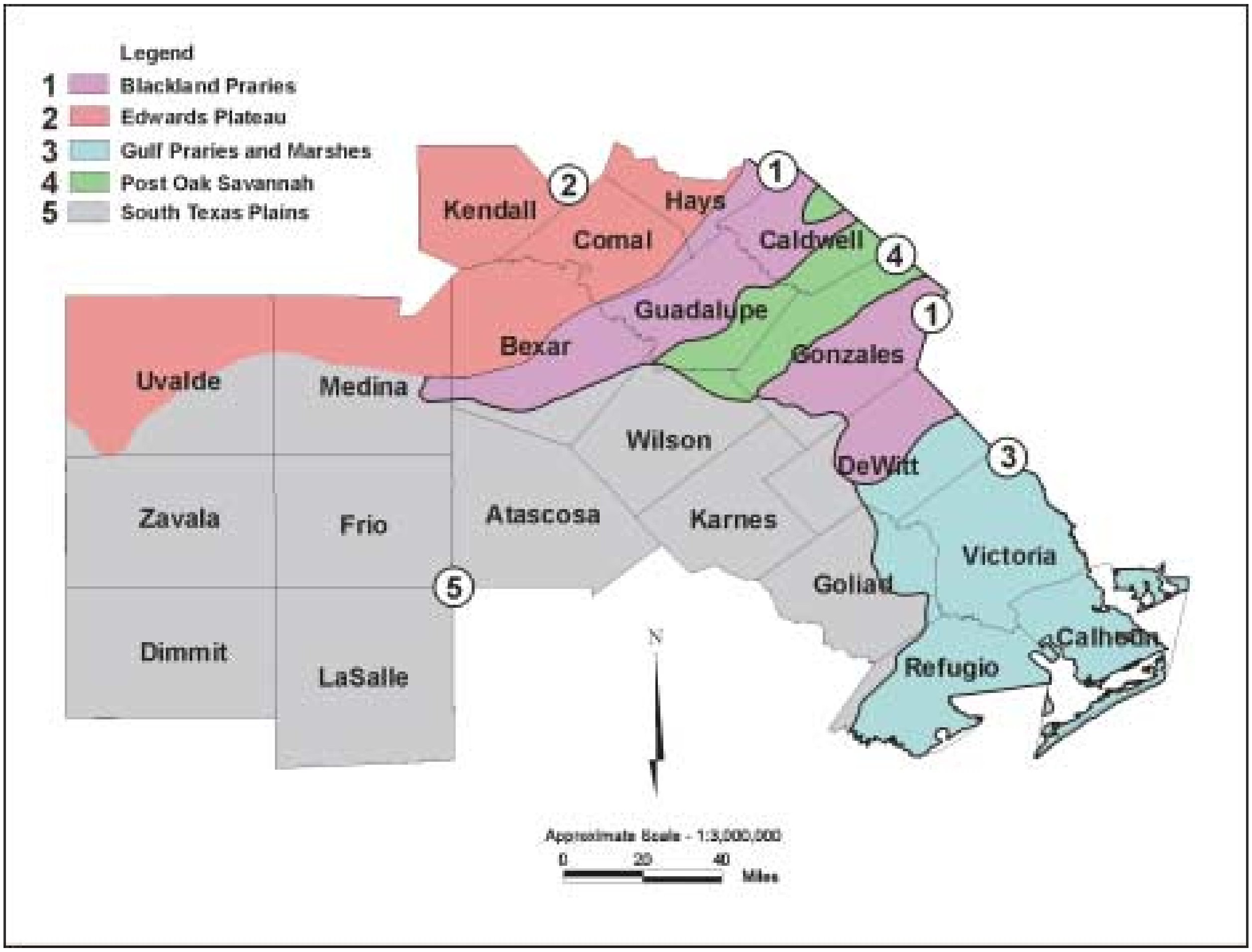

Figure 1-1. Eco-Regions — South Central Texas Region

Noteworthy is the growth of Bald cypress (*Taxodium distichum*) along the perennially flowing streams. Separated by many miles from cypress growth of the moist Southern Forest Belt, they constitute one of Texas' several "islands" of vegetation.

The principal grasses of the clay soils are several species of bluestem (*Schizachyrium* and *Andropogon* spp.), gramas (*Bouteloua* spp.), Indiangrass (*Sorghastrum nutans*), common curlymesquite (*Hiaria belangeri*), buffalograss (*Buchloe dactyloides),* and Canadian wild rye (*Elymus canadensis*).

The rocky areas support tall or mid-grasses with an overstory of live oak (*Quercus virginiana*) and other oaks (*Q. fusiformis, Q. buckleyi, Q. sinuata* var. *breviloba*), cedar elm (*Ulmus crassifolia*) and mesquite (*Prosopis glandulosa*). The heavy clay soils have a mixture of buffalograss (*Buchloe dactyloides*), sideoats grama (*Bouteloua curtipendula*), and mesquite (*Prosopis glandulosa*).

1.2.3.2 South Texas Plains

South of San Antonio, including all or parts of Uvalde, Zavala, Dimmit, Medina, Frio, LaSalle, Bexar, Atascosa, Wilson, Karnes, DeWitt, Goliad, and Refugio Counties, lies the South Texas Plains vegetational area, which is characterized by subtropical dryland vegetation consisting of small trees, shrubs, cactus, weeds and grasses. Principal plants are honey mesquite (*Prosopis glandulosa*), live oak (*Quercus virginiana*), post oak, several members of the cactus family (Cactaceae), blackbrush acacia (*Acacia rigidula*), guajillo (*Acacia berlandieri*), huisache (*Acacia smallii*) and others that often grow very densely. The original vegetation was mainly perennial warm-season bunchgrass in post oak, live oak, and mesquite savannahs. Other brush species form dense thickets on the ridges and along streams. Long-continued grazing as well as the control of wild fires has contributed to the dense cover of brush. Most of the desirable grasses have persisted under the protection of brush and cacti.

There are distinct differences in the original plant communities on various soils. Dominant grasses on the sandy loam soils are seacoast bluestem (*Schizachyrium scoparium* var. *litoralis*), bristlegrasses (*Setaria* spp.), and silver bluestem (*Bothriochloa saccharoides*). Dominant grasses on the clay and clay loams are silver bluestem, Arizona cottontop (*Trichachne californica*), buffalograss (*Buchloe dactyloides*), common curlymesquite (*Hilaria belangeri*), bristlegrasses (*Setaria* spp.), gramas (*Bouteloua* spp.), and Texas wintergrass (*Stipa leucotricha*). Gulf cordgrass (*Spartina* spp.) and seashore saltgrass (*Distichlis spicata*) characterize low saline areas. In the post oak and live oak savannahs, the grasses are mainly seacoast bluestem (*S. scoparium* var. *litoralis*), Indiangrass (*Sorghastrum nutans*), and switchgrass (*Panicum virgatum*).

1.2.3.3 Blackland Prairies

This area, including parts of Bexar, Comal, Guadalupe, Hays, Caldwell, Gonzales, and DeWitt Counties, while called a "prairie," has timber along the streams, including a variety of oaks (*Quercus* spp.), pecan (*Carya illinoiensis*), cedar elm (*Ulmus crassifolia*) and mesquite (*Prosopis glandulosa*). In its native state it was largely a grassy plain.

Most of this fertile area has been cultivated, and only small acreages of meadowland remain in original vegetation. In heavily grazed pastures, buffalograss (*Buchloe dactyloides*), Texas grama (*Bouteloua rigidiseta*) and other less productive grasses have replaced the tall bunchgrass. Mesquite and other woody plants have invaded the grasslands.

The original grass vegetation included big bluestem (*Andropogon gerardi*) and little bluestem (*Schizachyrium scoparium*), Indiangrass (*Sorghastrum nutans*), switchgrass (*Panicum virgatum),* sideoats grama (*Bouteloua curtipendula*), hairy grama (*Bouteloua hirsuta*), tall dropseed (*Sporobolus asper*), Texas wintergrass (*Stipa leucotricha*) and buffalograss. Non-grass vegetation is largely legumes and composites.

1.2.3.4 Gulf Prairies and Marshes

The Gulf Prairies and Marshes vegetational area includes all or parts of Victoria, DeWitt, Goliad, Refugio, and Calhoun Counties. There are two subunits: (1) the marsh and salt grasses immediately at tidewater and (2) a little farther inland, a strip of bluestems and tall grasses, with some gramas in the western part. Many of these grasses make excellent grazing. Oaks (*Quercus* spp.), elm, and other hardwoods grow to some extent, especially along streams, and the area has some post oak and brushy extensions along its borders. Much of the Gulf Prairies is fertile farmland.

Principal grasses of the Gulf Prairies are tall bunchgrasses, including big bluestem (*Andropogon gerardi*), little bluestem (*Schizachyrium scoparium*), seacoast bluestem (*S. scoparium* var. *litoralis*), Indiangrass (*Sorghastrum nutans*), eastern gamagrass (*Tripsacum dactyloides*), Texas wintergrass (*Stipa leucotricha*), switchgrass (*Panicum virgatum*) and gulf cordgrass (*Spartina* spp.). Seashore saltgrass (*Distichlis spicata*) occurs on most saline sites. Heavy grazing has changed the range vegetation in many cases so that the predominant grasses are less desirable broomsedge (*Andropogon virginicus*), smutgrass (*Sporobolus indicus*), threeawns (*Aristida* spp.) and many other inferior grasses. The other plants that have invaded the productive grasslands include oak underbrush, huisache (*Acacia smallii*), mesquite (*Prosopis* *glandulosa*), pricklypear (*Opuntia* spp.), ragweed (*Ambrosia psilostachya*), broomweed (*Xanthocephalum* spp.), and others.

1.2.3.5 Post Oak Savannah

This secondary forest region, also called the Post Oak Belt, includes all or parts of Guadalupe, Caldwell, Wilson, and Gonzales Counties. It is immediately west of the primary forest region, with less annual rainfall and a little higher elevation. Principal trees are post oak (*Quercus stellata*), blackjack oak (*Quercus marilandica*) and cedar elm (Ulmus *crassifolia*). Pecans (*Carya illinoiensis*), walnuts (*Juglans* spp.) and other kinds of water-demanding trees grow along streams. The southwestern extension of this belt is often poorly defined, with large areas of prairie.

The original vegetation consisted mainly of little bluestem (*Schizachyrium scoparium*), big bluestem (*Andropogon gerardi*), Indiangrass (*Sorghastrum nutans*), switchgrass (*Panicum virgatum*), silver bluestem (*Bothriochloa saccharoides*), Texas wintergrass (*Stipa leucotricha*), post oak and blackjack oak. The area is still largely native or improved grasslands, with farms located throughout. Intensive grazing has contributed to dense stands of a woody understory of yaupon (*Ilex vomitoria*) and oak brush and mesquite has become a serious problem. In addition, the control of wild fires has affected the encroachment of brush species on Savannah range lands. Such plants as broomsedge (*Andropogon virginicus*), broomweed (*Xanthocephalum* spp.) and ragweed (*Ambrosia psilostachya*) have replaced good forage plants.

1.2.4 Natural Resources

1.2.4.1 Water Resources

The South Central Texas Region includes parts of six major river basins (Rio Grande, Nueces, San Antonio, Guadalupe, Lavaca, and Lower Colorado) and overlies the Edwards and Gulf Coast Aquifers, and southern parts of the Trinity, Carrizo, and Edwards-Trinity (Plateau) Aquifers. In addition to these water resources, the area also overlies two minor aquifers (Queen City and Sparta Aquifers). Details about these water resources are presented in Section 1.7.

Springs also serve as a significant water resource in the South Central Texas Region. The two most noteworthy springs are the Comal and San Marcos Springs, which both contribute to flow in the Guadalupe River. The San Marcos Springs have the greatest flow dependability and environmental stability of any spring system in the southwestern United States. Constancy of its

spring flow is apparently key to the unique ecosystem found in the uppermost San Marcos River. Comal Springs, located in New Braunfels, serve as the source for the Comal River, which is a tributary of the Guadalupe River. Unlike the San Marcos Springs, Comal Springs is more responsive to drought conditions and ceased flowing in June of 1956 in response to severe drought conditions.

1.2.4.2 Wildlife Resources

An overview of the environmental and cultural resources setting of Region L is presented in Volume I, Section 5.2.5, and more specific discussions of resources and impacts are presented in the previously completed Phase I work (Technical Evaluations of South Central Texas Region Water Supply Options, October 1999), and in Volume III of this series. Common types of wildlife found in the area include white-tailed deer, raccoons, ringtails, gray foxes, coyotes, beaver, bobcats, and several species of skunks. Wintering songbirds such as robins and cedar waxwings may also be found.

A key concern in the South Central Texas Region is that of threatened and endangered species. There are approximately 123 species listed in the planning region by the U.S. Fish and Wildlife Service or the Texas Parks and Wildlife Department as threatened or endangered. These species are listed by county in Appendix D (Volume III) with notations concerning concerning their habitat preferences and protected status, if any.

The subterranean aquatic habitats associated with the Edwards Aquifer support a diverse ecosystem. Vertebrates and macroinvertebrates have been found at depths ranging from 190 to 2,000 feet in the artesian parts of the aquifer. The Edwards Aquifer is the only important aquifer habitat in Texas in which vertebrate species live. Volume III, Appendix E includes a listing of threatened or endangered species found in the Edwards Aquifer and related springs.

1.2.4.3 Agricultural Resources

Of the 12.82 million acres of land area in the planning region, over 10.35 million acres (81 percent) are classified as farmland and ranchland (Table 1-3). In 1997, there were 20,098 farms and ranches in the region with an average size of 866 acres (Table 1-3). Of the 10.35 million acres of farmland, over 2.68 million acres were classified as cropland, of which about 1.15 million acres were harvested in 1997 (Table 1-3). Approximately one-tenth (about

252,616 acres) of the total cropland in the region was irrigated in 1997 (Table 1-3).[4] The leading irrigation counties are located in the western part of the region and include Uvalde, Frio, Medina, Atascosa, and Zavala. Major irrigated crops are corn, cotton, grain sorghum, wheat, rice, soybeans, and vegetables. Cow-calf operations are the most predominant type of livestock industry, although beef cattle, hogs and pigs, sheep and lambs, and poultry are also produced. (Agricultural production and livestock production are discussed in greater detail in Sections 1.3.2 and 1.3.3, respectively.)

1.2.5 Major Water Demand Centers

In the South Central Texas Region there are four major water demand centers. These centers are the Interstate Highway 35 (IH-35) corridor from San Antonio to San Marcos, the Edwards Aquifer region west of the City of San Antonio, the Winter Garden area south of the Edwards Aquifer area, and the Coastal area. The San Antonio, New Braunfels, and San Marcos corridor along IH-35 is one of the fastest growing areas in Texas. In the next 50 years, its water use will follow the same trend as population growth, with most of the demand being for municipal use.

The Edwards Aquifer region west of San Antonio, including Uvalde and Medina Counties, is a major demand center for water to be used for irrigated agriculture. The Winter Garden area, including Zavala, Dimmit, and Atascosa Counties, is also a major demand center for water for irrigated agriculture. The Coastal area, including the cities of Victoria and Port Lavaca, are major demand centers for water for industrial purposes, with significant demand for irrigation in Calhoun County.

Table 1-3.
Agricultural Resources — 1997
South Central Texas Region

County	Total Land Area (acres)	Farms and Ranches (number)	Land in Farms and Ranches (acres)	Average Size (acres)	Total Cropland (acres)	Harvested Cropland (acres)	Irrigated Land (acres)
Atascosa	788,480	1,322	708,067	536	215,047	72,372	29,422
Bexar	798,080	1,964	447,824	228	177,217	75,041	12,844
Caldwell	349,440	1,068	265,569	248	105,263	36,392	899

[4] 1997 Census of Agriculture, Volume 1 Geographic Area Series, “Table 1. County Summary Highlights: 1997.”

Calhoun	327,680	257	213,390	830	76,071	57,528	3,032
Comal	359,680	657	183,241	279	41,951	13,185	133
De Witt	581,760	1,502	560,093	373	150,072	41,346	539
Dimmit	851,840	218	517,641	2,375	43,771	9,686	6,312
Frio	725,120	485	662,124	1,365	148,717	58,900	46,919
Goliad	546,560	786	433,568	552	75,831	24,115	330
Gonzales	683,520	1,629	709,657	436	178,034	54,368	3,246
Guadalupe	455,040	1,841	347,763	189	164,504	82,748	1,217
Hays (part)[1]	239,360	805	294,613	366	72,896	25,423	539
Karnes	480,000	1,051	417,146	397	161,969	56,249	2,838
Kendall	424,320	730	325,412	446	49,167	12,881	467
LaSalle	952,960	280	526,978	1,882	71,537	16,695	3,643
Medina	849,920	1,570	749,653	477	225,616	120,394	44,330
Refugio	492,800	230	550,165	2,392	110,723	79,344	0
Uvalde	996,480	593	942,604	1,590	159,477	85,477	52,933
Victoria	565,120	1,084	458,111	423	155,242	95,644	3,520
Wilson	516,480	1,794	445,798	248	216,935	91,457	19,087
Zavala	831,360	232	590,746	2,546	78,231	39,716	20,366
Total	**12,816,000**	**20,098**	**10,350,163**	**866**	**2,678,271**	**1,148,961**	**252,616**

[1] Estimate for that portion of Hays County located in the planning region.

Source: 1997 Census of Agriculture, Vol. 1 Geographic Area Series, “Table 1: County Summary Highlights — 1997.”

1.3 Population and Demography

1.3.1 Historical and Recent Trends in Population

The South Central Texas Region population has increased from 806,770 in 1950 to approximately 1,954,100 in 1998, an increase of 1,147,300, or 2.4 times (Table 1-4). The largest percentage increase occurred between the years 1950 and 1960 (25.8 percent), while the smallest occurred between 1990 and 1998 (15.2 percent) (Table 1-4). Between the period 1950 to 1998, 16 counties had a positive annual growth rate, while five counties (DeWitt, Gonzales, Karnes, LaSalle, and Refugio) had a negative annual growth rate (Table 1-4). Historically, the fastest growing counties in the region are Hays (3.34 percent), Comal (3.15 percent), Kendall (2.83 percent), and Guadalupe (2.31 percent), while the slowest growing counties were Dimmit (0.04 percent), Zavala (0.10 percent), Goliad (0.12 percent), and Frio (0.87 percent) (Table 1-4). Section 2.1 summarizes population projections through the year 2050 for the South Central Texas Region.

There are 81 cities in the South Central Texas Region for which the TWDB has made population and water demand projections. Of the 81cities, 22 have a population greater than 5,000. These cities are relatively equally distributed among the 21 counties in the planning region and are located in three commonly used regional references (Coastal, Hill Country, and Winter Garden) (Table 1-5). Bexar County contains six cities having a population of 5,000 or more, including San Antonio and its surrounding suburbs. Four counties, Goliad, Karnes, Kendall, and Refugio, do not have a city of 5,000 or greater.

Table 1-4.
Population Growth – 1950 to 1998
South Central Texas Region

County	Year						Growth Rate[1] (%)
	1950	1960	1970	1980	1990	Estimated 1998	
Atascosa	20,048	18,828	18,696	25,055	30,533	35,089	1.17
Bexar	500,460	687,151	830,460	988,800	1,185,394	1,342,934	2.08
Caldwell	19,350	17,222	21,178	23,637	26,392	31,306	1.01
Calhoun	9,222	16,592	17,831	19,574	19,053	20,895	1.72
Comal	16,357	19,844	24,165	36,446	51,832	72,354	3.15
DeWitt	22,973	20,683	18,660	18,903	18,840	20,601	-0.23
Dimmit	10,654	10,095	9,039	11,367	10,433	10,875	0.04
Frio	10,357	10,112	11,159	13,785	13,472	15,719	0.87
Goliad	6,219	5,429	4,869	5,193	5,980	6,578	0.12
Gonzales	21,164	17,845	16,375	16,883	17,205	17,971	-0.34
Guadalupe	25,392	29,017	33,554	46,708	64,873	75,906	2.31
Hays (part)[2]	14,272	15,947	22,114	32,475	52,491	69,180	3.34
Karnes	17,139	14,995	13,462	13,593	12,455	14,392	-0.36
Kendall	5,423	5,889	6,964	10,635	14,589	20,659	2.83
LaSalle	7,485	5,972	5,014	5,514	5,254	6,120	-0.42
Medina	17,013	18,904	20,249	23,164	27,312	35,894	1.57
Refugio	10,113	10,975	9,494	9,289	7,976	8,045	-0.48
Uvalde	16,015	16,814	17,348	22,441	23,340	25,071	0.94
Victoria	31,241	46,475	53,766	68,807	74,361	83,362	2.07
Wilson	14,672	13,267	13,041	16,756	22,650	29,378	1.46
Zavala	11,201	12,696	11,370	11,666	12,162	11,771	0.10
Total	806,770	1,014,752	1,178,808	1,420,691	1,696,597	1,954,100	1.86

1 Compound annual growth rate.
2 Estimate that 80 percent of the total county population resides within the planning area.

Source: Bureau of the Census, Decadal Censuses of 1950, 1960, 1970, 1980, and 1990, with estimates for 1998, U.S. Department of Commerce.

Table 1-5.
Major Cities in the
South Central Texas Region*

City Name	County Name	Regional Classification
Alamo Heights	Bexar	Hill Country
Carrizo Springs	Dimmit	Winter Garden
Converse	Bexar	Hill Country
Crystal City	Zavala	Winter Garden
Cuero	DeWitt	Coastal
Floresville	Wilson	Winter Garden
Gonzales	Gonzales	Coastal
Hondo	Medina	Hill Country
Kirby	Bexar	Hill Country
Live Oak	Bexar	Hill Country
Lockhart	Caldwell	Hill Country

City Name	County Name	Regional Classification
New Braunfels	Comal	Hill Country
Pearsall	Frio	Winter Garden
Pleasanton	Atascosa	Winter Garden
Port Lavaca	Calhoun	Coastal
San Antonio	Bexar	Hill Country
San Marcos	Hays	Hill Country
Schertz	Comal	Hill Country
Seguin	Guadalupe	Hill Country
Universal City	Bexar	Hill Country
Uvalde	Uvalde	Hill Country
Victoria	Victoria	Coastal

* Cities with population of 5,000 or more in 1998.

1.3.2 Demographic Characteristics

In 1990, 82 percent of the South Central Texas Region's population resided in urban areas, while only 18 percent resided in rural areas (Figure 1-2). LaSalle County had the lowest population in 1998, with 6,120 residents (averaging 4.1 persons per square mile), while Bexar County had the highest population in the region with 1,342,934 residents (averaging 1,077 persons per square mile) (Table 1-6).

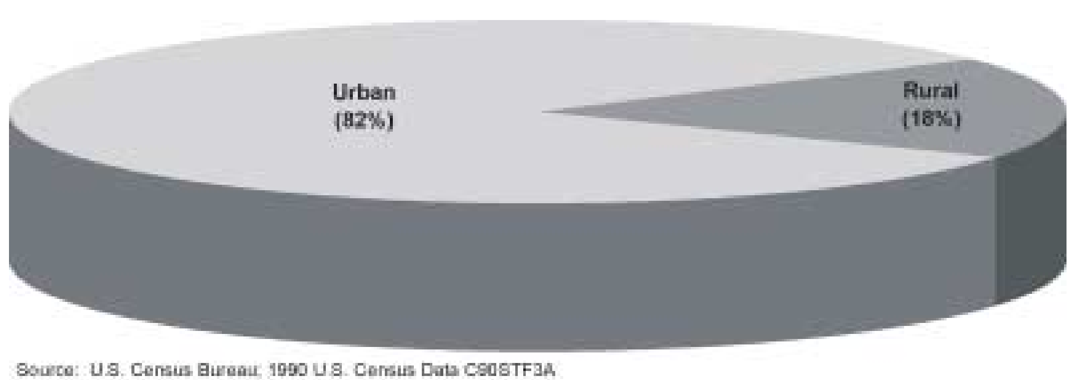

Figure 1-2. Percentages of Population Residing in Urban and Rural Areas (1990) South Central Texas Region

Age distribution across the region is characterized by a relatively young population. The two age groups that include the highest percentage of the population are under 18 years of age (29 percent) and from 25 to 39 years of age (25 percent) (Figure 1-3). The age groups with the lowest percentage of the population are ages 18 to 24 (11 percent) and ages 65 and older (11 percent) (Figure 1-3).

The regional population can also be characterized by its level of education. Of those residents in the South Central Texas Region who are 25 years of age are older, 60.7 percent have at least a high school diploma, while 39.3 percent do not. The two largest groups rated according to educational achievement are those who have an 8th grade education or lower (24.7 percent) and those who have completed high school, but have not gone to college (27.3 percent). Only 4 percent of the population who are 25 years or older have a graduate degree (Figure 1-4).

Table 1-6.
County Population and Area
South Central Texas Region

County	Population (1998)	Area (sq. mi.)	County	Population (1998)	Area (sq. mi.)
Atascosa	35,089	1,232	Hays (part)	69,180	374
Bexar	1,342,934	1,247	Karnes	14,392	750
Caldwell	31,306	546	Kendall	20,659	663
Calhoun	20,895	512	LaSalle	6,120	1,489
Comal	72,354	562	Medina	35,894	1,328
DeWitt	20,601	909	Refugio	8,045	770
Dimmit	10,875	1,331	Uvalde	25,071	1,557
Frio	15,719	1,133	Victoria	83,362	883
Goliad	6,578	854	Wilson	29,378	807
Gonzales	17,971	1,068	Zavala	11,771	1,299
Guadalupe	75,906	711	Total	1,954,100	20,025

Source: U.S. Census Bureau, U.S. Department of Commerce.

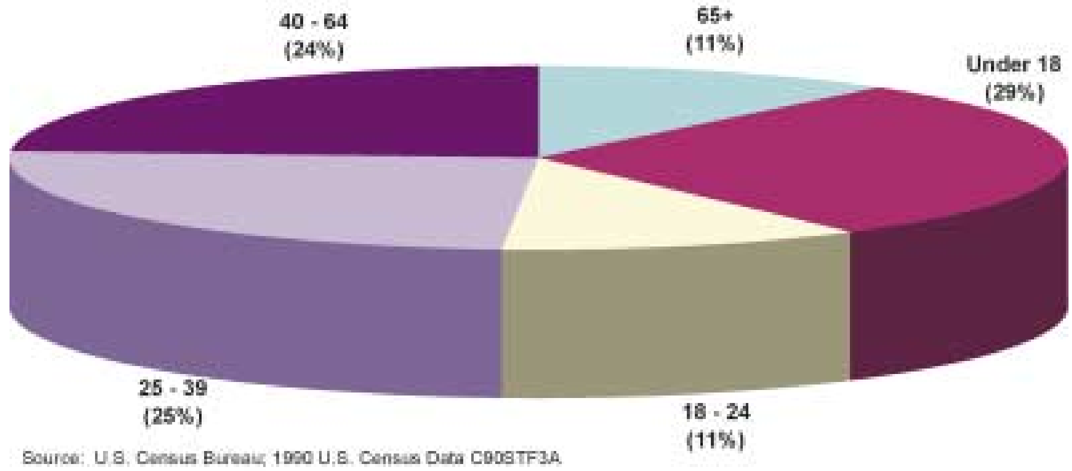

Figure 1-3. Age Distribution of the Population (1990)
South Central Texas Region

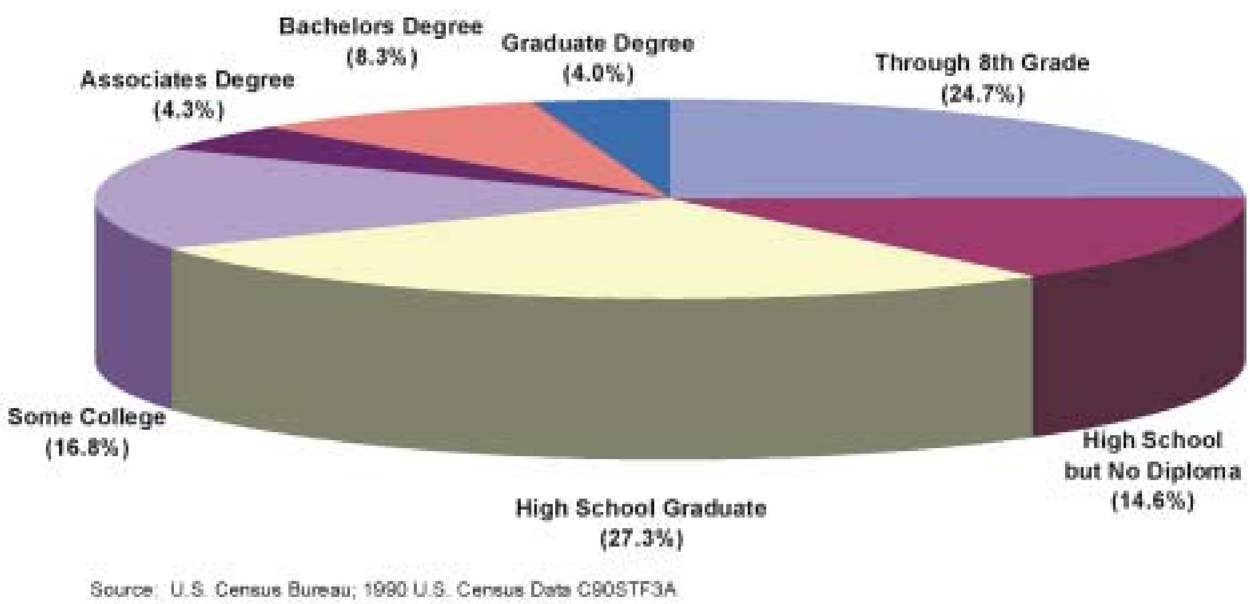

Figure 1-4. Level of Educational Achievement (1990)
South Central Texas Region

1.4 Economy — Major Sectors and Industries

1.4.1 Summary of the South Central Texas Regional Economy[5]

The South Central Texas Region has an economic base centered on agricultural production, livestock production, mining, manufacturing, and trades and services. The region has experienced economic ups and downs throughout the past decade, but all sectors of the economy, with the exception of the mining sector, have experienced solid growth in recent years. Paralleling economic growth, employment in the diversified regional economy is supported by a strong trades and services sector, which accounts for approximately 76 percent of the region's value of output and a thriving tourism industry in San Antonio. Fabricated metal products, industrial machinery, petrochemicals, and food processing form the core of the region's manufacturing sector, which accounts for approximately 21 percent of the value of output in the South Central Texas Region. Beef cattle, corn, and grain sorghum are the dominant agricultural enterprises, although vegetables produced in the Winter Garden area add diversity to the region's agricultural sector. A more detailed summary of the agricultural, livestock, mining, manufacturing, and trades and services sectors is presented below.

1.4.2 Agricultural Production

It was estimated in 1997 that over 2.6 million acres in the South Central Texas Region were used in crop production. Of this total, only 252,616 acres (9.4 percent) were irrigated while the remaining 90.6 percent of the total cropland was farmed using dryland techniques. The leading irrigation counties are found primarily in the western part of the region and include Uvalde, Frio, Medina, Atascosa, and Zavala.

According to the 1997 Census of Agriculture, all crops grown in the South Central Texas Region had a market value of over $290 million in 1997. The leading agricultural producing counties in the region, by market value of products, are Bexar, Frio, Uvalde, Medina, and Atascosa. The major crops grown in the region include corn, grain sorghum, wheat, soybeans and cotton (Table 1-7).

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[5] Information summarized from reports by the Texas Comptroller's Office.

Table 1-7.
Summary of Farm Production Data – 1997
South Central Texas Region

County	Cropland: Total Cropland (acres)	Cropland: Irrigated Land (acres)	Cropland: Non-Irrigated Land (acres)	Market Value of all Crops ($1,000)	Selected Crops Harvested: Corn (bushels)	Grain Sorghum (bushels)	Wheat (bushels)	Rice (100 lbs)	Cotton (bales)	Soybeans (bushels)	Hay, Alfalfa, Other (tons)
Atascosa	215,047	29,422	185,625	22,586	254,927	636,748	31,570	0	149	0	84,281
Bexar	177,217	12,844	164,373	45,994	940,904	964,935	255,170	0	0	(D)	80,199
Caldwell	105,263	899	104,364	4,688	245,360	483,467	20,261	0	2,927	0	46,396
Calhoun	76,071	3,032	73,039	15,455	1,499,432	891,360	(D)	138,807	20,385	198,863	7,821
Comal	41,951	133	41,818	1,673	132,023	113,636	31,523	0	0	(D)	22,039
DeWitt	150,072	539	149,533	2,197	545,142	121,446	31,017	0	360	2,085	69,437
Dimmit	43,771	6,312	37,459	2,609	(D)	55,340	0	0	0	(D)	6,816
Frio	148,717	46,919	101,798	39,692	697,511	528,584	231,725	0	990	(D)	19,886
Goliad	75,831	330	75,501	1,940	307,224	168,883	(D)	0	(D)	0	34,747
Gonzales	178,034	3,246	174,788	13,872	537,875	155,700	11,669	0	(D)	0	90,893
Guadalupe	164,504	1,217	163,287	13,931	978,191	1,629,179	356,835	0	442	0	70,889
Hays (part)[1]	72,896	539	72,357	4,378	409,691	244,740	107,845	0	102	0	20,339
Karnes	161,969	2,838	159,131	3,758	706,386	355,763	107,538	0	(D)	2,039	70,070
Kendall	49,167	467	48,700	923	16,151	6,757	17,402	0	0	0	22,967
LaSalle	71,537	3,643	67,894	4,123	104,190	167,333	25,239	0	(D)	0	8,057
Medina	225,616	44,330	181,286	26,164	2,912,586	2,616,571	705,138	0	5,861	0	45,047
Refugio	110,723	(D)	110,723-(D)	16,326	868,192	2,486,869	(D)	0	23,130	41,757	5,254
Uvalde	159,477	52,933	105,544	27,985	2,955,715	1,231,028	631,632	0	12,614	0	19,842
Victoria	155,242	3,520	151,722	17,139	1,702,796	2,336,470	1,361	166,876	8,871	355,441	28,691
Wilson	216,935	19,087	197,848	13,919	693,916	1,393,948	112,320	0	1,942	(D)	93,132
Zavala	78,231	20,366	57,865	18,137	558,991	489,285	285,937	0	3,880	(D)	7,902
Total	**2,678,271**	**252,616+(D)**	**2,313,932**	**297,489**	**17,067,203+(D)**	**17,078,042**	**2,964,182+(D)**	**305,683**	**81,653+(D)**	**600,185+(D)**	**854,705**

[1] Estimate for that portion of Hays County located in the planning region.
(D) – Withheld to avoid disclosing data for individual producers.

Source: 1997 Census of Agriculture, Volume 1 Geographic Area Series, “Table 1. County Summary Highlights: 1997.”

Corn and grain sorghum have historically been the leading crops in the region. In 1997, it was estimated that over 17 million bushels of corn were harvested in the South Central Texas Region, having a market value of $48.5 million. The leading corn producing counties in the region are Uvalde, Medina, Victoria, and Calhoun (Table 1-7).

Grain sorghum also contributes significantly to the region's agricultural sector. In 1997, it was estimated that over 17 million bushels of grain sorghum were harvested in the region, having had a market value of $42.5 million. The leading grain sorghum producing counties in the region are Medina, Refugio, Victoria, Guadalupe, Wilson, and Uvalde (Table 1-7).

Although wheat production is not as widespread as corn and grain sorghum production, it is still an important part of the region's agricultural production with almost 3 million bushels of wheat harvested in 1997, which had a market value of close to $10 million. The leading wheat producing counties in the region are Medina, Uvalde, and Guadalupe Counties (Table 1-7).

Because of favorable climatic and soil conditions, the coastal counties of Calhoun and Victoria are able to produce rice. In 1997, these two counties combined produced 305,683 hundredweight (cwt) of rice which had a market value of over $2 million (Table 1-7).

Cotton production is widespread throughout the region and is the third highest valued crop produced in the region. In 1997, the 17 counties in which cotton is produced combined to harvest over 80,000 bales with a market value of over $24 million (Table 1-7).

The majority of soybean production in the region occurs in the area extending from the Gulf Coast to DeWitt and Karnes Counties. The two leading soybean producing counties are Calhoun and Victoria, while all counties engaged in soybean production combined to harvest over 600,000 bushels of soybeans with a market value of approximately $3.7 million in 1997 (Table 1-7).

1.4.3 Livestock Production

According to the 1997 Census of Agriculture, livestock marketed in the South Central Texas region had a market value of over $645 million, or about 2.2 times the value of crop production. Major types of livestock produced in the area include cattle and calves, beef cattle, and sheep and lambs. Layers, pullets, and broilers also contribute significantly to the region's livestock production, with Gonzales County producing over 98.7 percent of these types of livestock. In 1997, the region's leading livestock producing counties by market value were Gonzales, Uvalde, Medina, and Wilson Counties (Table 1-8).

Table 1-8.
Summary of Livestock Production Data – 1997
South Central Texas Region

County	Market Value of Livestock ($1,000)	Livestock and Poultry						
		Cattle & Calves (Number)	Beef Cows (Number)	Milk Cows (Number)	Hogs & Pigs (Number)	Sheep & Lambs (Number)	Layers & Pullets (Number)	Broilers (Number)
Atascosa	23,583	82,857	36,969	1,148	1,605	354	1,167	(D)
Bexar	22,288	58,699	24,032	929	3,400	2,088	4,561	267
Caldwell	27,696	48,442	25,785	108	804	939	648,418	(D)
Calhoun	5,047	18,421	(D)	(D)	(D)	165	(D)	0
Comal	3,492	13,584	7,624	37	352	2,795	1,125	(D)
DeWitt	21,043	98,281	56,397	895	1,678	627	(D)	(D)
Dimmit	17,293	28,717	11,211	13	58	87	(D)	0
Frio	28,391	72,220	19,769	1,081	518	(D)	(D)	0
Goliad	10,412	53,095	31,292	17	207	230	310	0
Gonzales	280,530	159,312	74,224	771	4,368	276	4,318,566	53,922,823
Guadalupe	17,430	53,256	26,700	1,121	2,196	1,717	111,551	(D)
Hays (part)[1]	3,162	13,771	5,392	18	220	1,150	514	(D)
Karnes	12,132	67,354	38,536	401	1,876	549	(D)	0
Kendall	5,566	17,836	9,938	293	2,510	14,210	1,148	620
LaSalle	14,566	34,207	(D)	(D)	68	(D)	48	0
Medina	33,773	70,175	29,268	412	1,151	1,644	1,034	(D)
Refugio	7,507	38,600	24,375	10	136	(D)	61	0
Uvalde	40,500	67,064	16,141	89	853	32,796	(D)	0
Victoria	11,499	60,343	38,263	224	356	423	750	(D)
Wilson	32,128	87,466	40,322	4,951	4,482	405	(D)	(D)
Zavala	27,248	40,139	10,311	8	(D)	(D)	(D)	0
Total	645,286	1,183,839	526,549+(D)	12,526+(D)	26,838+(D)	59,915+(D)	5,089,253+(D)	53,923,710+(D)

[1] Estimates that 50 percent of all livestock production in Hays County occurs in the planning region.
(D) – Withheld to avoid disclosing data for individual producers.

Source: 1997 Census of Agriculture, Volume 1 Geographic Area Series, "Table 1. County Summary Highlights: 1997."

1.4.4 Mining

The South Central Texas Region contains many sand and gravel quarries and is also rich in petroleum products including oil, natural gas, and lignite. Much of the stone quarried is used in the production of cement. The leading cement producing areas in the region are located in Bexar and Hays Counties. According to the 1992 Economic Census, approximately 1,000 people were employed in the mining of stone, sand, and gravel, with these products having a market value of over $42 million in 1992.[6] Most of the region's stone, gravel, and sand mining activities are located in Bexar, Comal, Gonzales, and Victoria Counties.

The region also derives a significant portion of its mining income from oil and gas activities. All but two counties (Comal and Hays) derived some of their revenues from oil and gas production in 1998. Oil and gas production in the remaining 19 counties generated over $290 million in 1998 and provided approximately 3,500 jobs in the region. The leading oil and gas producing counties in the region are Refugio, Goliad, Victoria, Atascosa, and DeWitt.

1.4.5 Manufacturing[7]

In 1992, manufacturing facilities contributed over $9 billion in sales and provided 56,460 jobs in the South Central Texas Region.[8] Sales of manufactured goods accounted for 21.3 percent of the total market value of all products produced in the region in 1992, including farming and livestock (Table 1-9). The leading manufacturing counties, by value of shipments, in the region are Bexar, Calhoun, Victoria, and Guadalupe. The leading types of manufacturing plants in the region (in 1992) were printing and publishing; food and kindred products; industrial machinery and equipment; and stone, clay, and glass products.

[6] Data for 1992 are the most recent data available.
[7] Source: 1992 Census of Manufacturing, U.S. Department of Commerce.
[8] Data for 1992 are the most recent data available.

Table 1-9.
Summary of Manufacturing Activity – 1992
South Central Texas Region

County	*Total Number of Establishments*	*Total Number of Employees*	*Value of Shipments (million dollars)*
Atascosa	11	100	8
Bexar	1,094	37,600	4,302
Caldwell	16	500	39
Calhoun	22	3,200	1,826
Comal	75	3,200	324
DeWitt	18	500	55
Dimmit	5	(D)	(D)
Frio	5	(D)	3
Goliad	3	(D)	(D)
Gonzales	23	700	98
Guadalupe	72	4,100	821
Hays (part)[1]	65	2,160	253
Karnes	11	200	37
Kendall	21	300	16
LaSalle	1	(D)	(D)
Medina	17	500	42
Refugio	5	(D)	1
Uvalde	21	600	36
Victoria	64	2,700	1,176
Wilson	13	100	7
Zavala	6	(D)	(D)
Region Total	1,568	56,460+(D)	9,044+(D)

[1] Estimated that 90 percent of Hays County's total manufacturing industry is located within the planning region.

(D) - Withheld to avoid disclosing data for individual firms.

Source: 1992 Economic Census, U.S. Department of Commerce.

1.4.6 Trades and Services[9]

In 1992, wholesale trade, retail trade, and services contributed over $32 billion in sales or receipts and provided 285,293 jobs in the South Central Texas Region, with trades and services sales accounting for 76 percent of the total market value of all products produced in the region, including farm and livestock products (Table 1-10).[10] Wholesale trade accounted for 42.5 percent of the total sales or receipts and provided 11.2 percent of the jobs within the trades and services classification in 1992. The leading type of wholesale trade within the South Central Texas Region is durable goods, which includes automobile parts and supplies; lumber and construction materials, and machinery, equipment, and supplies. In 1992, the leading counties in wholesale trade were Bexar, Victoria, Guadalupe, and Comal.

Retail trade accounted for 37.1 percent of the total sales or receipts and provided 43.1 percent of the jobs within the trades and services classification in 1992. The leading types of retail trade within the South Central Texas Region are restaurants, automotive dealers and service stations, food stores, and apparel and accessory stores. In 1992, the leading counties in retail trade were Bexar, Victoria, Comal, and Hays.

Services accounted for 20.4 percent of the total sales or receipts and provided 45.7 percent of the jobs within the trades and services classification in 1992. The leading types of services within the South Central Texas Region are health services, business services, engineering and management services, and membership organizations.

1.5 Water Uses[11]

Water use in 1990 within the South Central Texas Region is summarized for each of the river and coastal basin areas of the region in the following paragraphs.

In 1990, total water use in that part of the Rio Grande Basin located in the South Central Texas Region (part of Dimmit County) was approximately 198 acre-feet (acft) of which 6 acft (3 percent) was used for municipal-type (household) purposes, while the remaining 192 acft was for livestock watering.

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[9] Source: 1992 Economic Census, U.S. Department of Commerce.
[10] Data for 1992 are the most recent data available.
[11] TWDB, "Water For Texas: A Consensus-Based Update to the State Water Plan," Austin, Texas, August 1997.

Table 1-10.
Trades and Services Industry – 1992
South Central Texas Region

County	Total Number of Establishments	Total Number of Employees	Value of Shipments (million dollars)
Atascosa	305	2,533	319
Bexar	17,521	229,342	25,608
Caldwell	250	1,813	188
Calhoun	281	2,048	197
Comal	891	7,429	849
DeWitt	210	1,472	258
Dimmit	93	604	60
Frio	159	1,333	242
Goliad	67	344	20
Gonzales	261	1,753	225
Guadalupe	632	6,065	730
Hays (part)[1]	545	5,586	444
Karnes	165	1,064	173
Kendall	235	1,976	232
LaSalle	42	269	25
Medina	281	1,370	235
Refugio	101	640	68
Uvalde	328	2,770	406
Victoria	1,293	13,004	1,675
Wilson	186	1,225	122
Zavala	60	259	80
Region Total	23,906	282,899	32,156

[1] Estimated that 70 percent of Hays County's trades and services industry is located within the planning region.

Source: 1992 Economic Census, U.S. Department of Commerce.

In the Nueces River Basin, groundwater resources supply about 76 percent of the water used for all purposes in the basin, with surface water resources supplying the remaining 24 percent. In 1990, total water use in the basin was 615,752 acft, of which 582,121 acft (94.5 percent) occurred in the South Central Texas Region. Irrigated agriculture accounts for nearly 93 percent of all the water used in that portion of the Nueces River Basin located in the planning region, while municipal water use accounts for only about 4.1 percent.

In the San Antonio River Basin, groundwater resources supply about 88 percent of the water used for all purposes, with surface water resources supplying the remaining 12 percent. In 1990, water use for municipal, industrial, and agricultural purposes within the South Central Texas Region totaled 327,633 acft. Municipal water use accounts for about 67 percent of all water use in that portion of the basin located in the planning region, with water used for irrigated agriculture accounting for about 20 percent. Groundwater resources supply about 99 percent of the water for municipal use in the basin and about 80 percent of the water used for irrigated agriculture.

In the Guadalupe River Basin, groundwater resources supply about 48 percent of the water used for all purposes, with surface water resources supplying the remaining 52 percent. Total basin water use in 1990 was 116,519 acft, of which 108,159 acft (92.8 percent) was used in the South Central Texas Region. Municipal is the largest water use category in that part of the basin located within the planning region, accounting for more than 40 percent of the total water use, followed by manufacturing, which accounts for about 24 percent.

In 1990, total water use in that part of the Lower Colorado River Basin located in the South Central Texas Region (parts of Caldwell and Kendall Counties) was approximately 403 acft. Of this total, 236 acft (58.6 percent) was used for municipal purposes, 20 acft (5 percent) for irrigation purposes, and the remaining 147 acft for livestock purposes.

Total basin water use in 1990 for the Lavaca River Basin was 277,458 acft, of which only 1,003 acft was used inside the South Central Texas Region. Municipal water use accounts for about 58.8 percent of all water use in that portion of the basin located in the planning region, followed by livestock use, which accounts for 30.4 percent.

In 1990, water use for municipal, industrial, and livestock purposes in that portion of the Colorado-Lavaca Coastal Basin located in the South Central Texas Region totaled 6,573 acft. Industrial water use is the largest in that part of the basin located within the planning area, accounting for nearly 96 percent of all water used.

In the Lavaca-Guadalupe Coastal Basin, annual water use totaled 87,489 acft in 1990, of which 72,694 acft was used within the South Central Texas Region. The largest water-using category in that part of the basin located within the planning region is irrigated agriculture, which accounts for about 65 percent of all water used.

In the San Antonio-Nueces Coastal Basin, annual water use totaled about 29,000 acft in 1990, of which 2,375 acft was used within the South Central Texas Region. The largest water use category in that part of the basin located within the planning region is municipal, which accounts for about 56 percent of all water used.

1.6 Major Municipal and Manufacturing Water Providers[12]

The TWDB has defined a major water provider as follows: "A major water provider is an entity which delivers and sells a significant amount of raw or treated water for municipal and/or manufacturing use on a wholesale and/or retail basis." The SCTRWPG decided that a major water provider is an entity that has commitments to provide 500 acft or more of raw or treated water for municipal and/or manufacturing use, on a wholesale or retail basis, to water users other than its own direct customers. The SCTRWPG has identified six major municipal and manufacturing water providers in the South Central Texas Region, as follows: the San Antonio Water System, Bexar Metropolitan Water District, Canyon Regional Water Authority, Guadalupe-Blanco River Authority, New Braunfels Utilities, and the City of San Marcos. Each major water provider is briefly described below. Detailed water demand projections for each major water provider are presented in Section 2.10.

1.6.1 San Antonio Water System

The San Antonio Water System (SAWS) is a public utility owned by the City of San Antonio, and its sole water supply source is the Edwards Aquifer. SAWS has 260,000 separate customers, and serves approximately 1 million people in the urbanized portion of Bexar County. The water supply service area includes most, but not all, of the City of San Antonio, several suburban municipalities, and adjacent areas of Bexar County. In addition to serving its own retail customers, SAWS also provides wholesale water supplies to several utility systems within Bexar County (Section 2.10). SAWS is in the process of developing supplies from other sources, including surface water from both the San Antonio and Guadalupe River Basins and from the Simsboro formation within the Carrizo Aquifer.

1.6.2 Bexar Metropolitan Water District

Created in 1945 by the Texas State Legislature, Bexar Metropolitan Water District (BMWD) serves a population of more than 250,000 in the west and northwest portions of Bexar County, some portions of the City of San Antonio, and areas in Atascosa and Medina Counties. It is the second-largest water supplier in Bexar County and, at present, obtains most of its water from the Edwards Aquifer. However, BMWD is in the process of developing supplies from other sources including surface water from both the San Antonio and Guadalupe River Basins.

1.6.3 Canyon Regional Water Authority

Canyon Regional Water Authority (CRWA) is a subdivision of the State of Texas created by the Texas Legislature in 1989. CRWA is the water planning and development agency for water purveyors that serve large areas of Guadalupe County and portions of Bexar, Hays, Wilson, and Comal Counties. It works as a partnership of 11 water supply corporations, cities and districts responsible for acquiring, treating, and transporting potable water (Section 2.10). CRWA owns and operates a treatment plant at Lake Dunlap on the Guadalupe River for surface water purchased from the GBRA. CRWA's sources of supply also include groundwater pumped from the Edwards Aquifer, however, CRWA is encouraging development of alternative sources for users not located directly over the aquifer.

1.6.4 Guadalupe-Blanco River Authority

The Guadalupe-Blanco River Authority (GBRA) was created by the Texas Legislature in 1933 for the purpose of controlling, storing, preserving, and distributing the waters of the Guadalupe River Basin for all useful purposes. GBRA is a regional entity serving Hays, Comal, Guadalupe, Caldwell, Gonzales, DeWitt, Victoria, Kendall, Refugio, and Calhoun Counties. GBRA's activities include supplying hydroelectric power through operations of six hydroelectric dams located on the Guadalupe River in Guadalupe and Gonzales Counties, supplying potable water, treatment of wastewater, and supplying raw water through management of substantial run-of-river rights and storage rights in Canyon Reservoir. As of July 1999, the Authority has contracts to provide water to 28 public and private entities (Section 2.10).

[12] The following section contains information provided by the major municipal and manufacturing water providers.

1.6.5 New Braunfels Utilities

New Braunfels Utilities provides water to the City of New Braunfels and three utilities that serve neighboring areas (Section 2.10). The utility obtains its water from run-of-river rights, purchased water from Canyon Reservoir (GBRA), and Edwards Aquifer pumping rights. If future water supplies are needed in its service area, the utility plans to purchase additional water from Canyon Reservoir to feed an expansion of New Braunfels Utilities' water treatment plant.

1.6.6 City of San Marcos

The City of San Marcos has historically obtained its water supply from the Edwards Aquifer. In order to reduce pumpage from the aquifer and increase its water supply, the City purchased 5,000 acft/yr of surface water from Canyon Reservoir (GBRA). In addition to supplying water to the permanent residents of San Marcos, the City supplies water to Southwest Texas State University, and the Texas Education Foundation (Section 2.10).

1.7 Water Supplies

1.7.1 Groundwater[13]

There are five major and two minor aquifers supplying water to the region. The five major aquifers are the Edwards, Carrizo, Trinity, Gulf Coast, and Edwards-Trinity (Plateau) Aquifers (Figure 1-5). The two minor aquifers are the Sparta and Queen City Aquifers. Each aquifer is described below, and a summary of water availability is presented in Section 1.7.1.8.

1.7.1.1 Edwards-Balcones Fault Zone Aquifer (Edwards Aquifer)

The Edwards Aquifer underlies parts of five counties (Uvalde, Medina, Bexar, Comal, and Hays) in the South Central Texas Region. The aquifer forms a narrow belt extending from a groundwater divide in Kinney County through the San Antonio area northeastward to the Leon River in Bell County. A groundwater divide near Kyle in Hays County hydrologically separates the aquifer into the San Antonio and the Austin regions. The name Edwards-BFZ distinguishes this aquifer from the Edwards-Trinity (Plateau) and the Edwards-Trinity (High Plains) Aquifers, however, in this study, it will be referred to as the Edwards Aquifer (Figure 1-5).

[13] "Ground-water Availability in Texas," Texas Department of Water Resources, Austin, Texas, September 1979.

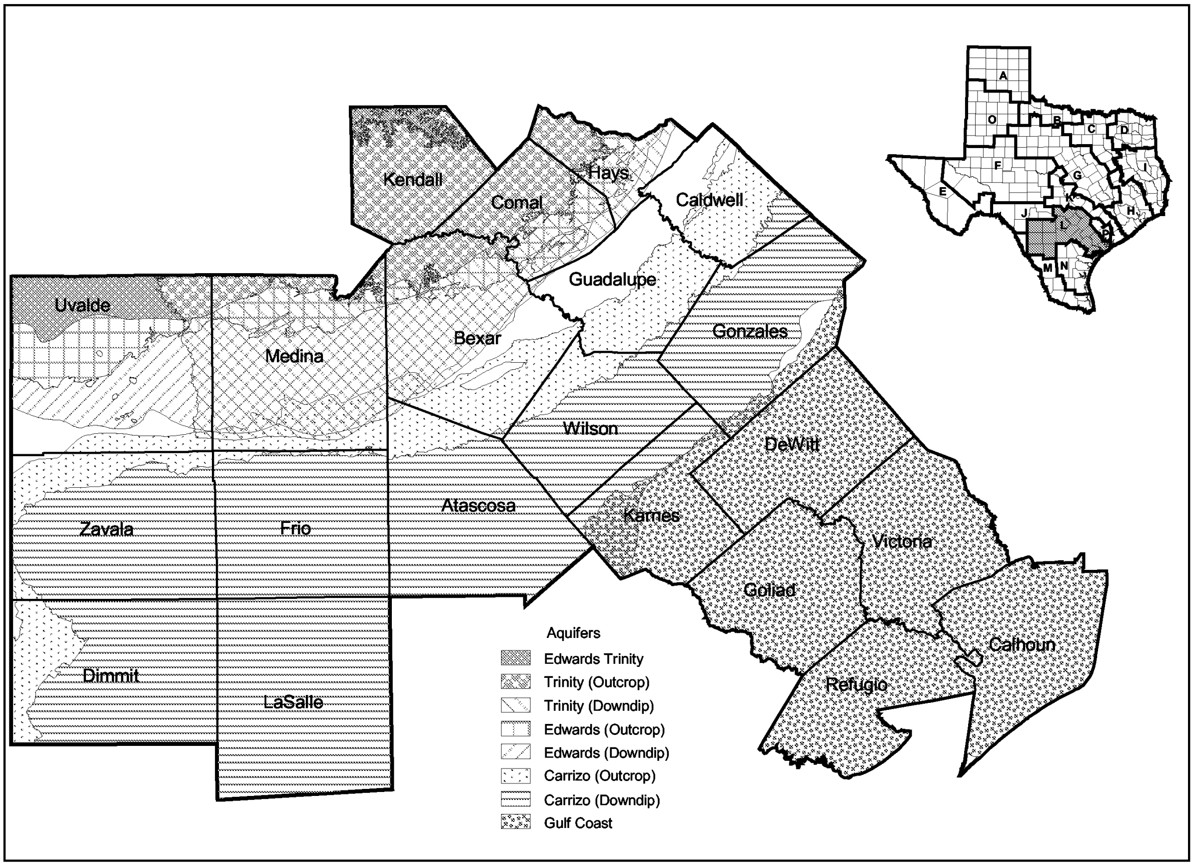

Figure 1-5. Major Aquifers — South Central Texas Region

A "bad water" line generally runs west-east through southern Uvalde and Medina Counties, the northern tip of Atascosa County, Southeastern Bexar, Comal, and Hays Counties, and the western tip of Guadalupe County.[14] South and southeast of the "bad water" line the aquifer contains water having more than 1,000 milligrams per liter of dissolved solids. The potential for movement of this poor quality water into the fresh water zone, as fresh water levels are lowered during periods of low recharge and high pumpage, is considered a threat to the quality of water in the fresh water zone of the aquifer, and consequently may be a threat to the water supplies of these who depend upon the aquifer.

The Edwards Aquifer supplied approximately 46 percent of the total water used in the South Central Texas Region in 1990. Water demands of the area that is now being supplied from

[14] "Groundwater Resources, and Model Applications for the Edwards (Balcones Fault Zone) Aquifer in the San Antonio Region, Texas," Texas Department of Water Resources, Ulent, William B., Tommy R. Knowles, Glenward R. Elder, and Thomas W. Sieb, Report 239, Austin, Texas, October 1979.

the Edwards Aquifer are growing at a rate of approximately 1.7 percent per year. However, not even the present level of use can be sustained while maintaining adequate levels of flows at Comal and San Marcos Springs to support habitats of endangered species and also to meet downstream water rights.

Water from the aquifer is primarily used for municipal, irrigation, and recreational purposes. Historically, approximately 54 percent of the total water pumped from the aquifer in the region has been used for municipal supply, with 39 percent used for irrigation purposes. San Antonio, which presently obtains the vast majority of its municipal water supply from the aquifer, is the largest city in the United States and one of the largest in the world that relies on a single groundwater source. The Edwards Aquifer also supplies water to industries in the San Antonio area and is the source of flow of Comal, San Marcos, Leona, San Antonio, and San Pedro Springs. Both the Guadalupe and San Antonio Rivers are supplied with base flows from springs, which, in turn, are used downstream for municipal, industrial, and agricultural purposes.

The aquifer, composed predominantly of limestone formed during the early Cretaceous Period, exists under water-table conditions in the outcrop and under artesian conditions where it is confined below the overlying Del Rio Clay. The Aquifer consists of the Georgetown Limestone, formations of the Edwards Group (the primary water-bearing unit) and their equivalents, and the Comanche Peak Limestone where it exists. Saturated thickness ranges from 200 to 600 feet.

Recharge to the aquifer occurs primarily by the downward percolation of surface water from streams draining off the Edwards Plateau to the north and west and by direct infiltration of precipitation on the outcrop. This recharge reaches the aquifer through crevices, faults, and sinkholes in the unsaturated zone. Unknown amounts of groundwater enter the aquifer as lateral underflow from the Glen Rose Formation. Water in the aquifer generally moves from the recharge zone toward natural discharge points such as Comal and San Marcos Springs. Water is withdrawn through hundreds of wells, particularly municipal and industrial wells in Bexar, Comal, and Hays Counties, and irrigation wells in Bexar, Medina, and Uvalde Counties.

In the updip portion, groundwater moving through the aquifer system has dissolved large volumes of rock to create highly permeable solution zones and channels that facilitate rapid flow and relatively high storage capacity within the aquifer. Highly fractured strata in fault zones have also been preferentially dissolved to form conduits capable of transmitting large amounts of water. Due to its extensive honeycombed and cavernous character, the aquifer yields moderate to large quantities of water to wells, with some wells yielding in excess of 16,000 gallons per minute (gpm) (35.6 cfs, 25,810 acft/yr). One well drilled in Bexar County flowed 24,000 gpm (53.5 cfs, 38,720 acft/yr) from a 30-inch diameter pipe. The aquifer is significantly less permeable farther downdip where the concentration of dissolved solids in the water exceeds 1,000 mg/L.

Due to its highly permeable nature in the fresh-water zone, the Edwards Aquifer responds quickly to changes and extremes of stress placed on the system. This is indicated by rapid water-level fluctuations during relatively short periods of time. During times of high rainfall and recharge, the Edwards Aquifer is able to supply significant quantities of water for municipal, industrial, and irrigation uses, as well as sustain spring flows. However, under conditions of below-average rainfall or drought, when discharge and withdrawals exceed recharge, springflows may decline to levels that are unacceptable to both environmental and downstream water rights concerns (See Section 1.10.3.1).

Operations of the largest existing surface water supply sources in the South Central Texas Region are linked to the Edwards Aquifer. Dependable supplies from Canyon Reservoir for municipal and industrial customers are a function of springflows from the Edwards Aquifer, since releases from Canyon Reservoir are necessary to meet downstream water rights when springflows drop below certain levels. Storage in the Medina Lake System contributes significantly to recharge of the Edwards Aquifer, and reservoirs used for power generation (Coleto Creek, Calaveras, and Braunig) are dependent upon springflows and/or treated municipal effluent, which originated from the Edwards Aquifer. Surface water supplies available to the region are also a function of recharge to and withdrawal from the Edwards and other aquifers, and the quantities of streamflows permitted for use in counties of the Nueces, San Antonio, and Guadalupe River Basins outside the South Central Texas Region.

An important management issue for the Edwards Aquifer includes establishing a level of groundwater withdrawals to ensure adequate water levels and at least minimum springflows. In the three river basin area where the Edwards Aquifer is located, growing demands are increasing the competition for scarce water resources. Aquifer recharge and pumpage affect streamflows and springflows, which in turn affect endangered species, stream flows for downstream water rights holders, and instream supplies for fish and wildlife.

In 1959, after the severe drought from 1950 to 1957 that lowered water levels in the aquifer to record lows and caused Comal Springs in Comal County to go dry for several months, the Texas Legislature created the Edwards Underground Water District. The district included Bexar, Comal, Hays, Medina, and Uvalde Counties and was charged with conserving, protecting, and recharging the underground water-bearing formations within the district and preventing waste and pollution of such underground water. In 1989, Medina and Uvalde Counties withdrew from the district and each formed a countywide district. In 1993, while under threat of federal intervention for alleged failure to protect federally protected species that rely on springflows from the Edwards Aquifer, the Texas Legislature enacted Senate Bill 1477.

Senate Bill 1477 abolished the Edwards Underground Water District and created a new entity, the Edwards Aquifer Authority. SB1477 directs the Authority to implement a comprehensive management plan for the aquifer that regulates pumpage, while taking into consideration the interests and needs of all the individuals and entities that rely on the aquifer as a water source, and maintains the delicate relationship between springflows and the environment.

1.7.1.2 Carrizo-Wilcox Aquifer (Carrizo Aquifer)

The Wilcox Group, including the Calvert Bluff, Simsboro, and Hooper Formations, and the overlying Carrizo Formation of the Claiborne Group, form a hydrologically connected system known as the Carrizo-Wilcox Aquifer, which is referred to in this study as the Carrizo Aquifer. This aquifer extends from the Rio Grande in South Texas northeastward into Arkansas and Louisiana, providing water to all or parts of 60 counties in Texas, 13 of which are located in the South Central Texas Region. The Carrizo Sand and Wilcox Group outcrop along a narrow band that is located about 130 miles inland from the Gulf of Mexico at the eastern edge of the South Central Texas Region and about 200 miles inland at the western edge. The aquifer dips beneath the land surface toward the coast.

The Carrizo Aquifer is predominantly composed of sand locally interbedded with gravel, silt, clay, and lignite deposited during the Tertiary Period. Water-bearing thickness of the aquifer ranges from 200 feet in Dimmit County to more than 1,500 feet in the downdip artesian portion in Atascosa County. In the outcrop area, Carrizo water is hard, but low in total dissolved solids. Downdip water is softer, higher in temperature, higher in dissolved solids, locally is high in iron, and locally may contain hydrogen surfide and methane gas.[15] Where it is found at the

[15] Ibid.

surface, the aquifer exists under water-table conditions and, in the subsurface, is under artesian conditions. Yields of wells are commonly 500 gpm (1.1 cfs, 810 acft/yr), and some may reach 3,000 gpm (6.7 cfs, 4,840 acft/yr) downdip where the aquifer is under artesian conditions. Some of the greatest yields are produced from the Carrizo Sand in the southern, or Winter Garden, area of the aquifer.

Historically, municipal and irrigation pumpage account for about 35 percent and 51 percent, respectively, of total pumpage from the Carrizo Aquifer within the region, with irrigation being the predominant use in the Winter Garden region (Sections 1.10.3.2 and 1.10.3.3). Significant water-level declines have occurred in the semiarid Winter Garden portion of the Carrizo Aquifer, as the region is heavily dependent on groundwater for irrigation. Since 1920, water levels have declined 100 feet in much of the area and more than 250 feet in the Crystal City area of Zavala County.

1.7.1.3 Trinity Aquifer

The Trinity Aquifer provides water to all or parts of 55 counties in Texas, including five counties (Hays, Comal, Kendall, Bexar, and Medina) in the South Central Texas Region. The Trinity Aquifer consists of early Cretaceous Age formations of the Trinity Group that are organized into the lower Trinity Aquifer (Hosston Sand and Sligo Limestone), the middle Trinity Aquifer (lower Glen Rose Limestone, the Hensell Sand, and Cow Creek Limestone), and the upper Trinity Aquifer (upper Glen Rose Limestone).[16] Because of its depth and poor quality, the lower Trinity has not been extensively developed. The middle Trinity is the most widely used part of the aquifer in the South Central Texas Region. The upper Trinity yields are low due to low porosity and permeability, and water quality is poor due to the presence of evaporate beds.

Trinity well yields are rarely more than 100 gpm (0.22 cfs, 160 acft/yr) in the South Central Texas Region. At the present time the aquifer is being stressed due to rapid growth in the number of wells being drilled to supply new homes and commercial establishments. Due to the heavy demands being placed upon the aquifer in relation to supplies available, much of the area underlain by the Trinity Aquifer in the Hill Country has been included in a Priority Groundwater Management Area.

[16] "Groundwater Availability of the Lower Cretaceous Formations in the Hill Country of South-Central Texas," Texas Department of Water Resources, Austin, Texas, 1983.

1.7.1.4 Gulf Coast Aquifer

The Gulf Coast Aquifer forms a wide belt along the Gulf of Mexico from Florida to Mexico. In Texas, the aquifer provides water to all or parts of 54 counties, including all or parts of seven coastal counties (Karnes, Gonzales, DeWitt, Goliad, Victoria, Refugio, and Calhoun) in the South Central Texas Region. Municipal and irrigation uses have historically accounted for 90 percent of the total pumpage for the aquifer in the planning region.

The aquifer consists of complex interbedded clays, silts, sands, and gravels of the Cenozoic Age, which are hydrologically connected to form a large, leaky artesian aquifer system. This system comprises four major components consisting of the following generally recognized water-producing formations. The deepest is the Catahoula, which contains groundwater near the outcrop in relatively restricted sand layers. Above the Catahoula is the Jasper Aquifer, primarily contained within the Oakville Sandstone. The Burkeville confining layer separates the Jasper from the overlying Evangeline Aquifer, which is contained within the Fleming and Goliad Sands. The Chicot Aquifer, or upper component of the Gulf Coast Aquifer system, consists of the Lissie, Willis, Bentley, Montgomery, and Beaumont Formations, and overlying alluvial deposits. Not all formations are present throughout the system, and nomenclature often differs from one end of the system to the other. In the South Central Texas Region, saturated thickness ranges from 500 feet in Karnes County to about 1,500 feet in Victoria County. Average well yields are about 1,600 gallons per minute. Water quality tends to deteriorate from about 500 mg/L of dissolved solids in Karnes County to over 1,000 mg/L near the coast. Water levels have declined in areas where withdrawals have been made for municipal, industrial, and irrigation purposes. As water levels decline, the threats of land subsidence and salt-water intrusion increase.

1.7.1.5 Edwards-Trinity (Plateau) Aquifer

The Edwards-Trinity (Plateau) Aquifer provides water to the northern portions of Uvalde and Kendall Counties in the South Central Texas Region. The aquifer consists of saturated sediments of lower Cretaceous Age Trinity Group, including the Fredericksburg Group and Washita Group.[17] The Glen Rose Limestone is the primary unit in the Edwards-Trinity (Plateau)

[17] Barker, Rene A., and Ann F. Ardis, Hydrogeologic Framework of the Edwards-Trinity Aquifer System, West Central Texas, USGS Professional Paper 1421-B, 1996.

Aquifer in the southern areas of its extent. This unit is estimated to have a thickness of up to 300 feet in these southern areas of its extent.

The aquifer generally exists under water-table conditions, however, where the Trinity (Plateau) Aquifer is fully saturated and a zone of low permeability occurs near the base of the overlying Edwards, artesian conditions may exist. Reported well yields commonly range from less than 50 gpm where saturated thickness is thin to more than 1,000 gpm where wells are completed in jointed and cavernous limestone. Water quality ranges from fresh to slightly saline. The water is generally hard and varies in concentrations of calcium, magnesium, and bicarbonate.

1.7.1.6 Sparta Aquifer

The Sparta Aquifer extends in a narrow band from the Frio River in South Texas northeastward to the Louisiana border, and underlies parts of five counties (Frio, LaSalle, Atascosa, Wilson, and Gonzales) in the South Central Texas Region. The southwestern boundary is placed at the Frio River because of a facies change in the formation, which makes it difficult to delineate the boundaries of the Sparta and contiguous formations southwestward. The facies change results in reduced amounts of water and poorer quality water being produced from the interval. The Sparta provides water for domestic and livestock supply throughout its extent in the region.

The Sparta Formation, part of the Claiborne Group deposited during the Tertiary, consists of sand and interbedded clay with massive sand beds in the basal section. These beds gently dip to the south and southeast toward the Gulf Coast and reach a total thickness of up to 300 feet. Usable quality water is commonly found within the outcrop and for a few miles downdip and in some areas may occur down to depths approaching 2,000 feet. Yields of individual wells are generally less than 100 gpm, although some wells average 400 to 500 gpm, and a few wells produce as much as 1,200 gpm. Water occurs under water-table conditions in the outcrop and under artesian conditions downdip where the Sparta is covered by younger, non water-bearing rocks. Water from the aquifer is low in dissolved solids, however, in some areas is high in iron.

1.7.1.7 Queen City Aquifer

The Queen City Aquifer extends across Texas from the Frio River in South Texas northeastward into Louisiana and underlies five counties (Medina, Frio, Atascosa, Wilson, and Gonzales) in the South Central Texas Region. The southwestern boundary is placed at the Frio

River because of a facies change in the formation. This facies change results in reduced amounts of poorer quality water produced from this interval southwest of the Frio River. The aquifer provides water for domestic and livestock purposes throughout most of its extent and water for irrigation in Wilson County.

Sand, loosely cemented sandstone, and interbedded clay units of the Queen City Formation of the Tertiary Claiborne Group make up the aquifer. These rocks dip gently to the south and southeast toward the Gulf Coast. Total aquifer thickness is usually less than 500 feet. In the outcrop area, water occurs under water-table conditions, while in the downdip subsurface, where the Queen City is covered by younger, non water-bearing rocks, the water is under artesian conditions. Yields of individual wells are commonly low, but a few exceed 400 gpm. Concentrations of dissolved solids are usually less than 3,000 mg/L, however, locally the water has a low pH and is high in iron.

1.7.1.8 Groundwater Availability in the South Central Texas Region

According to TWDB data, the total quantity of water obtained from aquifers of the South Central Texas Region and used within the Region in 1990 was 967,327 acft (Table 1-11). Of this total, 53.7 percent was from the Edwards Aquifer, 28.9 percent was from the Carrizo, 9.3 percent was from the Gulf Coast, 4.9 percent was from the Sparta, and the remaining 3.2 percent was from the Queen City, Trinity, and Edwards-Trinity (Plateau) Aquifers (Table 1-11).

Projected future groundwater supplies available in the South Central Texas Region are 812,868 acft/yr in 2000, 812,868 acft/yr in 2020, and 675,187 acft/yr in 2050 (Table 1-11).[18] Supplies available from the Sparta, Queen City, Trinity, Gulf Coast, and Edwards-Trinity (Plateau) Aquifers are projected to hold steady on an annual basis throughout the 2000 through 2050 projection period (Table 1-11). However, these aquifers are projected to supply only about 25 percent of the total groundwater available to the region in 2050 (Table 1-11). The supply available from the Carrizo Aquifer is projected to decline from 304,484 acft/yr for the 2000 through 2020 period to 168,159 acft/yr for the period after 2020 (Table 1-11). The supply for the period 2000 through 2020 includes withdrawals from storage plus estimated annual recharge, whereas the supply after 2020 is only estimated annual recharge. The quantities available for use are subject to regulations of groundwater districts in counties where such districts exist.

[18] Note: The quantities available in each county are shown in Section 4.

Table 1-11.
Groundwater Availability by Aquifer
South Central Texas Region

Aquifer Name and TWDB Aquifer No.[1]	1990 Use (acft)	Annual Quantity Available 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Edwards (11)	519,459	340,000	340,000	340,000	340,000	340,000	340,000
Carrizo (10)	279,484	304,484	304,484	304,484	168,159	168,159	168,159
Sparta (27)	47,060	47,060	47,060	47,060	47,060	47,060	47,060
Queen City (24)	18,003	18,003	18,003	18,003	18,003	18,003	18,003
Trinity (28)	9,563	9,563	9,563	9,563	9,563	9,563	8,207
Gulf Coast (15)	89,668	89,668	89,668	89,668	89,668	89,668	89,668
Edwards-Trinity (Plateau)[2] (13)	4,090	4,090	4,090	4,090	4,090	4,090	4,090
Total	967,327	812,868	812,868	812,868	676,543	676,543	675,187
	Percent of Total						
Edwards (11)	53.70%	41.83%	41.83%	41.83%	50.26%	50.26%	50.36%
Carrizo (10)	28.89%	37.46%	37.46%	37.46%	24.86%	24.86%	24.91%
Sparta (27)	4.86%	5.79%	5.79%	5.79%	6.96%	6.96%	6.97%
Queen City (24)	1.86%	2.21%	2.21%	2.21%	2.66%	2.66%	2.67%
Trinity (28)	0.99%	1.18%	1.18%	1.18%	1.41%	1.41%	1.22%
Gulf Coast (15)	9.27%	11.03%	11.03%	11.03%	13.25%	13.25%	13.28%
Edwards-Trinity (Plateau)[2] (13)	0.42%	0.50%	0.50%	0.50%	0.60%	0.60%	0.61%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

[1] TWDB aquifer identification number is shown in parentheses in column number 1.
[2] Edwards-Trinity (Plateau Aquifer).

Source: File 12—Groundwater Supplies, Ixxxx–17.xxx, *sic*, Texas Water Development Board, January 1998.

1.7.2 Surface Water

The South Central Texas Region includes parts of the Rio Grande, Nueces, San Antonio, Guadalupe, Colorado, and Lavaca River Basins and parts of the Colorado-Lavaca, Lavaca-Guadalupe, and San Antonio-Nueces Coastal Basins (Figure 1-6). The existing surface water supplies of the region include storage reservoirs and run-of-river water rights. The geographical relationship between the river basins and the South Central Texas Region is described below, followed by a description of the existing surface water supplies.

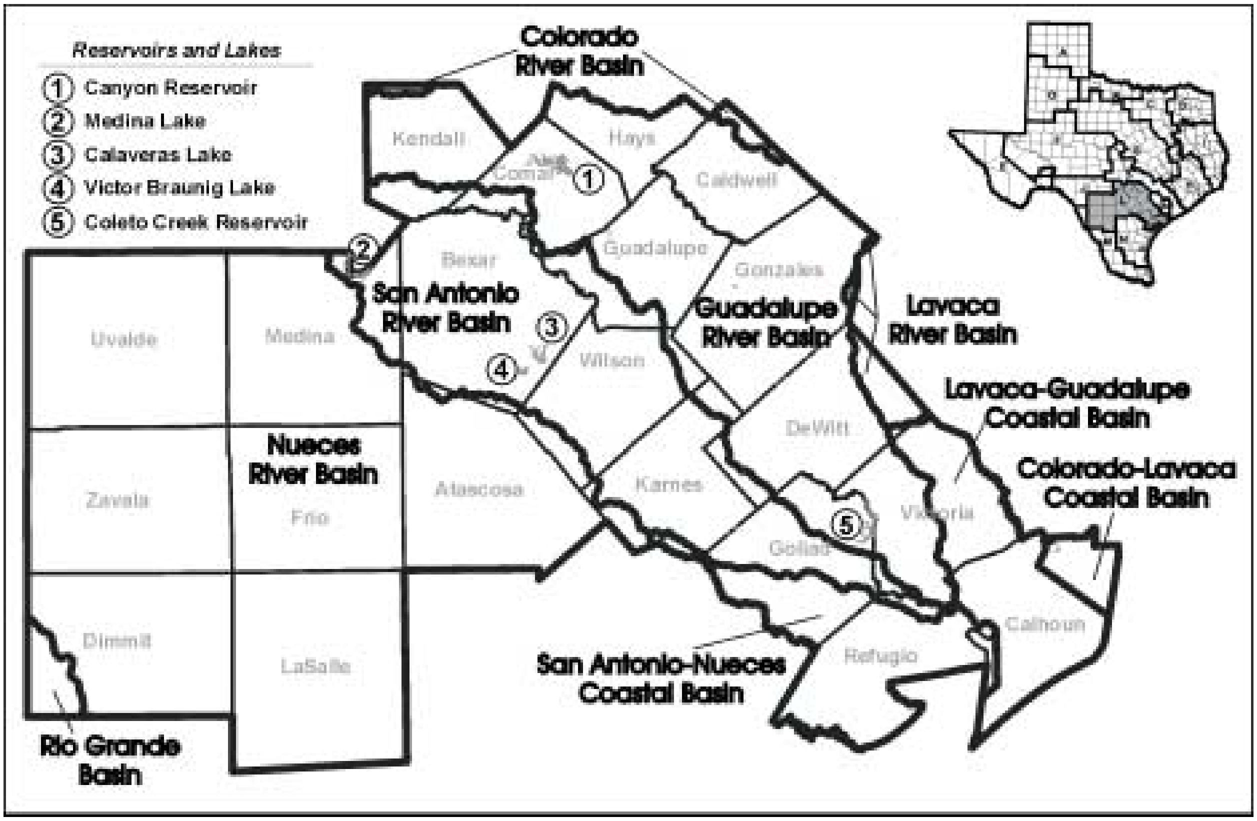

Figure 1-6. River Basins, Coastal Basins, Reservoirs, and Lakes South Central Texas Region

1.7.2.1 Rio Grande Basin

The southwestern corner of Dimmit County, an area of approximately 164 square miles, is located in the Rio Grande Basin and in the South Central Texas Region. The only surface water presently available to this area is that which can be captured in stock tanks.

1.7.2.2 Nueces River Basin

The Nueces River Basin is bounded on the north and east by the Colorado, San Antonio, and Guadalupe River Basins and the San Antonio-Nueces Coastal Basin, and on the west and south by the Rio Grande Basin and the Nueces-Rio Grande Coastal Basin. Total drainage area of the basin is about 16,950 square miles, of which 8,973 square miles are located in the planning region. The Nueces River rises in Edwards County and flows 315 miles to Nueces Bay on the Gulf of Mexico near Corpus Christi. Principal tributaries of the Nueces River are the Frio and Atascosa Rivers. Major population centers located in the basin include the cities of Uvalde

(Uvalde County), Crystal City (Zavala County), Pearsall (Frio County), Pleasanton (Atascosa County), Hondo (Medina County), and Carrizo Springs (Dimmit County).

1.7.2.3 San Antonio River Basin

The San Antonio River Basin is bounded on the north and east by the Guadalupe River Basin and on the west and south by the Nueces River Basin and the San Antonio-Nueces Coastal Basin. Total drainage area of the basin is about 4,180 square miles, of which 3,506 square miles are located in the planning region. The San Antonio River has its source in large springs within and near the city limits of San Antonio. The river flows more than 230 river miles across the Coastal Plain to a junction with the Guadalupe River near the Gulf of Mexico. Its principal tributaries are the Medina River and Cibolo Creek, both spring-fed streams. Major population centers located in the basin include the cities of San Antonio (Bexar County), Universal City (Bexar County), Schertz (Bexar County), Live Oak (Bexar County), Leon Valley (Bexar County), Converse (Bexar County), Kirby (Bexar County), Alamo Heights (Bexar County), and Floresville (Wilson County).

1.7.2.4 Guadalupe River Basin

The Guadalupe River Basin is bounded on the north by the Colorado River Basin, on the east by the Lavaca River Basin and the Lavaca-Guadalupe Coastal Basin, and on the west and south by the Nueces and San Antonio River Basins. The Guadalupe River rises in the west-central part of Kerr County. A spring-fed stream, it flows eastward through the Hill Country until it issues from the Balcones Escarpment near New Braunfels. It then crosses the Coastal Plain to San Antonio Bay. Its total length is more than 430 river miles, and its drainage area is approximately 6,700 square miles, of which 4,728 square miles are located within the South Central Texas Region. Its principal tributaries are the San Marcos River, another spring fed stream, which joins the Guadalupe River in Gonzales County; the San Antonio River, which joins it just above its mouth on San Antonio Bay; and the Comal River, which joins it at New Braunfels. Comal Springs are the source of the Comal River, which flows about 2.5 miles before joining the Guadalupe River. Major population centers located in the basin include the cities of Victoria (Victoria County), San Marcos (Hays County), New Braunfels (Comal County), Seguin (Guadalupe County), Lockhart (Caldwell County), Cuero (DeWitt County), Gonzales (Gonzales County), and Luling (Caldwell County).

1.7.2.5 Lower Colorado River Basin

Only a small portion of Kendall and Caldwell Counties is located in that part of the Lower Colorado River Basin located inside the planning region. The total drainage area of the Colorado River Basin is 41,763 square miles, of which only 76 square miles are located in the planning region. The only surface water presently available to these two areas of the South Central Texas Region is from local stock tanks.

1.7.2.6 Lavaca River Basin

Small portions of DeWitt, Gonzales, and Victoria Counties are located in that part of the Lavaca River Basin inside the planning region. The total drainage area of the Lavaca River Basin is 2,309 square miles, of which 156 square miles are located in the planning region. The Lavaca-Navidad River Authority along with the TWDB owns and operates Lake Texana and has contracts to provide 32,000 acft/yr of water to customers in the Colorado-Lavaca Coastal Basin, 41,840 acft/yr to Corpus Christi in the Nueces-Rio Grande Coastal Basin, and 594 acft/yr for use in the Lavaca-Guadalupe Coastal Basin.

1.7.2.7 Coastal Basins

Parts of the Colorado-Lavaca, Lavaca-Guadalupe, and San Antonio-Nueces Coastal Basins are located within the South Central Texas Region. None of these coastal basins has large surface water projects. Because of potential subsidence problems and salt-water intrusion, groundwater usage is limited; thus, these basins generally rely on adjoining river basins to provide surface water to meet their needs. The Colorado-Lavaca Coastal Basin obtains 32,000 acft/yr of surface water from Lake Texana in the Lavaca River Basin. The Lavaca-Guadalupe Coastal Basin obtains approximately 69,000 acft/yr of imported surface water, the majority of which is supplied from the Guadalupe River. The San Antonio-Nueces Coastal Basin obtains approximately 26,000 acft/yr of imported surface water supplied from the Nueces River Basin.

1.7.3 Existing Surface Water Resources, Including Major Springs

Development of surface water resources has been limited in the South Central Texas Region because of both the presence of significant quantities of groundwater and a comparatively low quantity of developable surface water in the western part of the region.

Existing reservoirs (Figure 1-6) and run-of-river water rights within the region are described below.

1.7.3.1 Lakes and Reservoirs

Medina Lake is located on the Medina River, of the San Antonio River Basin, at the boundaries of Medina and Bandera Counties, with Diversion Lake on the Medina River downstream of Medina Lake. These lakes are owned by the Bexar-Medina-Atascosa Counties Water Control and Improvement District No. 1 (BMA) and historically have been used to supply irrigation water to farms along the Medina Canal System (Table 1-12). In addition to supplying irrigation water, seepage through the lakes and riverbeds recharges the Edwards Aquifer.

Braunig and Calaveras Lakes are located in the San Antonio River Basin in Bexar County to the southeast of San Antonio and are used for electric power plant cooling water (Table 1-12). 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 Reservoir in the Guadalupe Basin is located in Comal County on the mainstem of the Guadalupe River. Uses of the reservoir include water supply for municipal, industrial, steam-electric power generation, irrigation, hydroelectric power generation, flood protection, and recreation (Table 1-12). The annual authorized diversion from Canyon Reservoir is an average of 50,000 acft/yr. GBRA has applied to TNRCC for an amendment to the Canyon Reservoir Certificate of Adjudication (#18-2074) to increase authorized diversions to approximately 90,000 acft/yr. Stored water is made available by GBRA to water users within their district and the South Central Texas Region.

Lakes Dunlap, McQueeny, Placid, Nolte, H-4, and Wood, on the Guadalupe River, form hydroelectric power generation pools and are the sites of hydroelectric power plants on the Guadalupe River in the reach from New Braunfels to about eight miles west of Gonzales. The lakes and the water rights are owned by GBRA, and since hydroelectric power generation is a non-consumptive use of water, water availability to these rights is not included in the tabulation of water rights for the Guadalupe Basin.

Table 1-12.
List of Major Reservoirs[1]
South Central Texas Region

Reservoir	*Water Right Owner*	*Certificate of Adjudication Number*	*Authorized Diversion (acft/yr)*	*Firm Yield (acft/yr)*	*Purposes*
San Antonio Basin					
Medina Lake System	Bexar-Medina-Atascosa Counties WCID #1	19-2130	66,750	0[6]	Irrigation, municipal, domestic, livestock
Victor Braunig Lake	City Public Service Board of San Antonio	19-2161	12,000[2]	>12,000[7]	Steam-electric power generation
Calaveras Lake	City Public Service Board of San Antonio	19-2162	37,000[3]	>37,000[7]	Steam-electric power generation
Guadalupe Basin					
Canyon Reservoir	Guadalupe-Blanco River Authority	18-2074	50,000[4]	~90,000[8]	Municipal, industrial, steam-electric & hydropower, irrigation, flood protection
Coleto Creek Reservoir	Central Power and Light Company	18-5486	12,500[5]	>12,500[7]	Steam-electric power generation

[1] See Table 1-13 for a summary of run-of-river permits.
[2] Includes 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.
[3] Includes rights to divert up to 60,000 acft/yr of reclaimed wastewater from the San Antonio River to Calaveras Lake and to consume up to 37,000 acft/yr.
[4] GBRA has applied to TNRCC to increase Canyon Reservoir authorized diversions to approximately 90,000 acft/yr.
[5] Includes rights to divert up to 20,000 acft/yr from the Guadalupe River to Coleto Creek Reservoir and to consume up to 12,500 acft/yr.
[6] Based on operation of the Medina Lake System in accordance with CA #19-2130C.
[7] The reservoir and supplemental authorized diversions from the adjacent river could support a firm yield in excess of the authorized consumptive use, however, operations of steam-electric power generation facilities could be impaired.
[8] TNRCC, GBRA Application #18-2074D to amend CA #18-2074, as amended, 1999.

Coleto Creek Reservoir, owned by Central Power and Light Company, is located at the border of Victoria and Goliad Counties in the lower Guadalupe River 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 Reservoir, when needed. The reservoir supplies water for steam-electric power generation at a power plant located in Goliad County (12,165 acft in 1990).

1.7.3.2 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 from flowing streams of the South Central Texas Region. Each right bears a priority date, diversion location, maximum diversion rate, and annual quantity of diversion. Some rights may include off-channel storage authorization, instream flow requirements, and various special conditions. The principle of prior appropriation or "first-in-time-first-in-right" is applied, which means that the senior or oldest right (earliest priority date) has first call on flows, with the second, third, and more recent rights having second, third, and later standings for diversions. This procedure gives senior right holders priority when stream flows are low, as in periods of drought, and renders junior rights less reliable during droughts (i.e., the most junior right holders may not be able to divert any water during severe droughts).

It is important to note that many run-of-river rights are for irrigation purposes, where chances are taken at planting time upon whether or not water will be available for crop production during the growing season. In fact, TNRCC staff has historically considered whether 75 percent of the proposed diversion would be available in 75 percent of the years when reviewing applications for irrigation rights. Most of the municipal, industrial, and steam-electric power demands, however, are for more reliable supplies than are available from run-of-river flows. Thus, reservoirs having firm yields have been permitted by TNRCC and constructed by water suppliers.

Run-of-river permits have been summarized for the streams of the South Central Texas Region (Table 1-13). For the Nueces River Basin part of the Regional Planning Area, run-of-river water rights total 120,097 acft, most of which are for irrigation purposes (Table 1-13).

In the San Antonio River Basin on the Medina River, downstream of the Medina Lake System to San Antonio, there are 31,794 acft of run-of-river rights (Table 1-13). On the San Antonio River from San Antonio to the confluence with the Guadalupe River, 28,866 acft of run-of-river rights have been awarded (Table 1-13). Most of the rights are for irrigation and livestock water with some limited municipal and industrial use and can be viewed as supply available to meet those needs in areas along the Medina and San Antonio Rivers.

Consumptive run-of-river rights in the South Central Texas Region in the Guadalupe River Basin upstream of Canyon Reservoir total 4,674 acft/yr, and downstream of Canyon to Victoria total 46,468 acft/yr. These rights are primarily for irrigation, municipal, and industrial purposes.

Table 1-13.
Summary of Run-of-River Water Rights
South Central Texas Region

River Basin and Segment	*Sum of Permits[1] (acft)*
Nueces River Basin Part of the Regional Planning Area	
Subtotal	120,097
San Antonio River Basin Part of the Regional Planning Area	
Medina Lake to San Antonio[2]	31,794
San Antonio to Confluence with Guadalupe River	28,866
Subtotal	60,660
Guadalupe River Basin Part of the Regional Planning Area	
Upstream of Canyon Reservoir	4,674
Canyon Reservoir to Victoria	46,468
Downstream of Victoria	223,884
Subtotal	275,026
Total for Study Area	**455,783**

[1] Totals shown include only consumptive portions of rights for municipal, industrial, irrigation, mining, recreation, etc. as of January 7, 1999.
[2] Totals include rights upstream of USGS gage Medina River at San Antonio (#08181500).

Source: Data from Water Rights Records of the TNRCC.

In the Guadalupe River Basin downstream of Victoria, total run-of-river rights are 223,884 acft/yr considering only consumptive rights for municipal, irrigation and industrial process water (Table 1-13).

In the South Central Texas Region, the sum of the major consumptive run-of-river permitted water rights is 455,783 acft/yr (Table 1-13). New computer models for estimating the quantity of dependable supply from run-of-river rights and reservoirs has been developed by the TNRCC through its Water Availability Modeling effort. Results from the application of these new models subject to assumptions adopted by the SCTRWPG are included in Section 4.

1.7.3.3 Major Springs

According to selected references,[19,20] there are six major springs located within the planning area (Comal, San Marcos, Hueco, Leona, San Antonio, and San Pedro Springs).

Comal Springs: Comal Springs is located in Landa Park, New Braunfels in Comal County. Comal Springs discharges water from the Edwards and associated limestones of the Edwards Aquifer and issues through the Comal Springs Fault. SB1477, Section 1.14, limits the quantity of water that can be withdrawn from the Edwards Aquifer in each calendar year for the period ending December 31, 2007 to no more than 450,000 acft, and for the period beginning January 1, 2008 to no more than 400,000 acft. Section 1.14, Subsection h, specifies that the Edwards Aquifer Authority shall implement and enforce water management practices, procedures, and methods to ensure that not later than December 31, 2012, the continuous minimum spring flows of Comal and San Marcos Springs are maintained to protect endangered and threatened species to the extent required by federal law. Section 1.15 of SB1477 provides that the Edwards Aquifer Authority (Authority) shall manage withdrawals and points of withdrawal from the aquifer by granting permits. Long-term average discharge from Comal Springs is about 280 cfs.

San Marcos Springs: San Marcos Springs is located 2 miles northeast of San Marcos, in Hays County. San Marcos Springs discharges water from the Edwards and associated limestones of the Edwards Aquifer and issues through the San Marcos Springs Fault. SB1477, as described in the Comal Springs text above, also applies to San Marcos Springs. Long-term average discharge from San Marcos Springs is about 150 cfs.

Hueco Springs: Hueco Springs is located about 3 miles north of New Braunfels near the confluence of Elm Creek and the Guadalupe River in Comal County. There are two main springs issuing from a fault in the Edwards limestone at this location. Sources of water for these springs include the Edwards Aquifer and,

[19] Texas Water Development Board (TWDB), "Major and Historical Springs of Texas (Report #189)," March 1975.
[20] Brune, Gunnar, "Springs of Texas," Volume I, Branch-Smith, Inc., Fort Worth, Texas, 1981.

possibly, underflow from the Guadalupe River. Long-term average discharge from Hueco Springs is about 40 cfs.

Leona Springs: Leona Springs consists of three groups of springs located from 1 to 6 miles southeast of Uvalde, in Uvalde County. These springs discharge water from the Edwards Aquifer. Long-term average discharge from Leona Springs is about 25 cfs.

San Antonio Springs: San Antonio Springs is located just above East Hildebrand Street in San Antonio, in Bexar County. San Antonio Springs discharge water from the Edwards Aquifer. Long-term average discharge from San Antonio Springs is about 20 cfs.

San Pedro Springs: San Pedro Springs is located in San Pedro Park, San Antonio in Bexar County. San Pedro Springs discharges water from the Edwards Aquifer. Long-term average discharge from San Pedro Springs is about 5 cfs.

Since present levels of withdrawals from the Edwards Aquifer are greater than the withdrawal rates specified in SB1477, it will be necessary to either limit future withdrawals to those specified in SB1477, or to increase recharge to the Aquifer in sufficient quantities to meet the future needs of those who depend upon it for their water supplies. Therefore, actions specified by SB1477 to limit withdrawals from the Edwards Aquifer and/or to supplement supplies from the aquifer directly affect water supplies of the South Central Region. To the extent that pumping limits are imposed to limit withdrawals to those specified by SB1477 in order to maintain flows at Comal and San Marcos Springs at levels sufficient to protect endangered and threatened species to the extent required by federal law, then the SCTRWPG will be required to obtain water from other sources to meet a part of the present needs, and for growth of needs of users that now obtain water from the Edwards Aquifer. In any event, protection of flows at Comal and San Marcos Springs, as specified in SB1477, limits the supply of water available to the SCTRWPG to meet needs within the region, and thereby necessitates that supplies for parts of the region be obtained from other sources.

1.8 Water Quality

1.8.1 Groundwater Quality[21]

1.8.1.1 Edwards Aquifer Water Quality

The chemical quality of water in the Edwards Aquifer is typically fresh, although hard, with dissolved solids concentrations averaging less than 500 mg/L. The downdip interface

[21] TWDB, "Water for Texas: A Consensus-Based Update to the State Water Plan," Austin, Texas, August 1997.

between fresh and slightly saline water represents the extent of water containing less than 1,000 mg/L. Within a short distance down gradient of this "bad water line," the groundwater becomes increasingly mineralized.

1.8.1.2 Carrizo Aquifer Water Quality

In the South Central Texas Region, water from the Carrizo Aquifer is fresh to slightly saline. In the outcrop, the water is hard yet usually low in dissolved solids. Downdip, the water is softer, has a higher temperature, and contains more dissolved solids. A downdip "bad water" line generally runs northeast-southwest through the southeast portion of La Salle and McMullen Counties, the northeast portion of Live Oak and Karnes Counties, and southeast Gonzales County. Southeast of the "bad water" line the groundwater has more than 1,000 mg/L of total dissolved solids. Localized contamination of the aquifer in the Winter Garden region is attributed to direct infiltration of oil field brines on the surface and to downward leakage of saline water from the overlying Bigford Formation. Some recently sampled wells in Dimmit and Zavala Counties were found to contain high concentrations of dissolved solids, chloride, and/or sulfate. Downward leakage of more highly-mineralized water from overlying strata through the uncemented annular space between the well casings and boreholes of such wells is considered to be the most likely cause. Caldwell and Gonzales Counties have areas where water from the aquifer is high in iron and manganese. The Calvert Bluff, Simsboro, and Hooper formations of the Wilcox group all contain mean iron concentrations greater than the secondary drinking water standard of 0.3 mg/L. Water from all three formations is hard to very hard. Mean concentrations of sulfate and chloride are below regulatory standards in all three formations.

1.8.1.3 Trinity Aquifer Water Quality

Water quality from the Trinity Aquifer is acceptable for most municipal and industrial purposes; however, excess concentrations of certain constituents in many places exceed drinking water standards for municipal supplies. In the southern Hill Country region, the primary contribution to poor quality in wells that have not been adequately cased through the evaporite beds in the upper part of the Glen Rose. Water quality naturally deteriorates in the downdip direction of all the Trinity water-bearing units. A downdip "bad water" line for the Trinity Aquifer generally trends east-west through southern Uvalde and Medina Counties, then trends southeast-northwest through central Bexar County and the southeast edge of Comal and Hays Counties. South and southeast of this "bad water" line, the groundwater contains greater than

1,000 mg/L of total dissolved solids. Average concentrations of nitrates, fluorides, chlorides, and sulfates are below regulatory standards. However, localized areas of nitrate pollution due to human or animal waste, and ranching and farming activities has been identified in parts of Kendall and Hays Counties.

1.8.1.4 Gulf Coast Aquifer Water Quality

In the Gulf Coast Aquifer, water quality is generally good in the shallower portion of the aquifer. Groundwater containing less than 500 mg/L dissolved solids is usually encountered to a maximum depth of 3,200 feet in the aquifer from the San Antonio River basin northeastward to Louisiana. From the San Antonio River Basin southwestward to Mexico, quality deterioration is evident in the form of increased chloride concentration and salt-water encroachment along the coast. Little of this groundwater is suitable for prolonged irrigation use due to either high salinity, or alkalinity, or both. The downdip extent of fresh water in the Gulf Coast Aquifer is approximately equal to the coast line of the Gulf of Mexico.

1.8.1.5 Edwards-Trinity (Plateau) Aquifer Water Quality

Natural chemical quality of Edwards-Trinity (Plateau) water ranges from fresh to slightly saline. The water is typically hard and may vary widely in concentrations of dissolved solids made up mostly of calcium and bicarbonate. The lower formations of the Edwards-Trinity Plateau Aquifer are transitionally contiguous with the formations of the Trinity Aquifer, which crops out to the east. The extent of fresh water in the Trinity Aquifer was discussed in subsection 1.8.1.3. Average concentrations of nitrate, fluoride, chloride, and sulfates are below regulatory drinking water standards.

1.8.1.6 Sparta Aquifer Water Quality

The Sparta Aquifer produces water of excellent quality throughout most of its extent in the South Central Texas Region; however, water quality deteriorates with depth due to high chlorides and dissolved solids in the downdip direction. The extent of downdip fresh water in the Sparta Aquifer generally runs along a line trending southwest-northeast from northern La Salle and McMullen Counties through southeast Atascosa and Wilson Counties to central Gonzales County. In some locations, water within the aquifer may contain iron concentrations in excess of secondary drinking water standards.

1.8.1.7 Queen City Aquifer Water Quality

Water of excellent quality is generally found within the outcrop and for a few miles downdip, but water quality deteriorates with depth in the downdip direction due to high chlorides and dissolved solids. The extent of downdip fresh water in the Queen City Aquifer is approximately the same as the Sparta Aquifer in the previous subsection. Queen City Aquifer groundwater contains relatively high iron concentrations in some locations.

1.8.2 Surface Water Quality[22]

1.8.2.1 Nueces River Basin Water Quality

Water quality in the upper portion of the Nueces River Basin in the less-inhabited reaches is good, except for relatively high nitrate-nitrogen levels occurring naturally in the spring-fed streams. A substantial part of the flow of the upper Nueces River and its tributaries upstream of the Edwards Aquifer recharge zone enters the fractured and cavernous limestone formation of the Edwards Aquifer. As a result, stream flows in the Nueces River Basin downstream from the recharge zone consist almost entirely of stormwater. During low-flow conditions, chloride, sulfate, and total dissolved solids levels increase due to natural and man-made activities. The Atascosa River has experienced elevated fecal coliform bacteria, inorganic nitrogen, and phosphorus levels downstream of the City of Pleasanton.

1.8.2.2 San Antonio River Basin Water Quality

In the past, water quality in the San Antonio Basin varied from very good in the upper basin to relatively poor in the lower basin, particularly during periods of low flow. Since 1987, advanced water treatment has been instituted at the three major San Antonio area water recycling plants, Dos Rios, Leon Creek, and Salado Creek. As a result dissolved oxygen concentrations in the San Antonio River have been maintained well above the State stream standard of 5.0 mg/L and aquatic life has been significantly enhanced. However, certain water quality concerns remain in the basin. Nutrient concentrations are elevated in nine segments, all of which occur within the planning region. The nutrients occur in natural groundwater discharges, but concentrations become elevated with contributions from municipal wastewater discharges and non-point sources. Elevated fecal coliform bacteria levels occur in five segments preventing

[22] "Texas Water Quality, A Summary of River Basin Assessments," Texas Clean Rivers Program, TNRCC, Austin, TX, 1996.

attainment of contact recreation use. The elevated bacteria levels are primarily attributed to both urban and rural non-point pollution sources. Although toxic chemicals have been detected in three segments, aquatic life use is only partially supported due to the lack of habitat. There is only one industrial discharge located in the basin, the primary origin of toxic chemicals are non-point sources introduced by urban stormwater runoff.

1.8.2.3 Guadalupe River Basin Water Quality

The Guadalupe River Basin is characterized by generally high quality throughout. Low dissolved oxygen concentrations are found sometimes in Plum Creek, possibly associated with rainfall runoff. Elevated levels of fecal coliform bacteria associated with rainfall runoff occur in several segments, but only Plum Creek does not support contact recreation use. Elevated levels of nutrients occur in several segments. Elevated levels of phosphates in the 1.0 to 2.5 mg/L range associated with fairly constant spring flows in the San Marcos and Comal Rivers likely contribute to abundant growths of lush aquatic vegetation in these streams.

1.8.2.4 Lavaca-Guadalupe Coastal Basin Water Quality

The TNRCC routinely monitors the Victoria Barge Canal segment in the Lavaca-Guadalupe Coastal Basin, which has no known water quality problems. All water quality standards and uses are supported, although phosphorus and chlorophyll-a levels are occasionally elevated. At certain times during the year, the canal is very biologically productive, but other parameters do not indicate water quality instability.

1.8.2.5 San Antonio-Nueces Coastal Basin Water Quality

According to the TNRCC, water quality in the Mission River, located in the San Antonio-Nueces Coastal Basin, is impaired by elevated levels of fecal coliform, but the river otherwise has good water quality. The Aransas River exhibits good water quality in the tidal stretch, but elevated levels of fecal coliform, chloride, sulfate, and total dissolved solids are common above tidal levels.

1.9 Threats to Agricultural and Natural Resources

Water shortages and declining water quality are threats to agricultural and natural resources in the South Central Texas Water Planning Region. As this region is projected to experience significant population growth through the year 2050, additional stress will be placed on water supply sources, which are already stressed in some areas. The Winter Garden and Edwards Aquifer areas are productive farming areas of the State. The Winter Garden area relies extensively upon groundwater from the Carrizo Aquifer for irrigation purposes, while irrigation farmers in Uvalde, Medina, and Bexar Counties rely upon groundwater from the Edwards Aquifer for irrigation. A loss of productivity in these areas would adversely affect the people and economy of the Region.

There are several threatened or endangered species in the area whose habitat relies upon a constant source of clean water. Many of these species are associated with the Edwards Aquifer and springs emanating therefrom. A reduction in either water quality or quantity could have adverse impacts on these fragile ecosystems. Therefore, major objectives of the water planning for the South Central Texas Water Planning Region are to improve efficiency of use of water so that the people and economy can function satisfactorily with smaller quantities per unit of activity, and to increase the supply of water at reasonable costs in order to have adequate quantities for all water user groups, thereby reducing the competition among user groups for the region’s presently available supply.

The South Central Texas Regional Water Planning Group (SCTRWPG) has given due consideration to potential or perceived threats to agricultural and natural resources, such as those identified above, in the course of developing this Regional Water Plan. Thoughts, concerns, or observations of the SCTRWPG regarding threats to agricultural and natural resources are expressed in the following locations throughout the Regional Water Plan:

- Volume I, Section 5.2.6.1 with regard to the overall Regional Water Plan;
- Volume I, Table 5.2-25 with regard to each of the water management strategies in the Regional Water Plan; and
- Volume II, Section 2 through Section 6 with regard to each alternative regional water plan and each of the associated water management strategies.

1.10 Summary of Existing Plans and Programs

In January 1999, the SCTRWPG requested that representatives of each city and water conservation district of the region forward a copy of any available water plans, or water management documents. Entities with or without water planning documents were asked to indicate where they are planning to obtain their water for the next 50 years. Entities were also asked to respond if they already had a supply of water for the next 50 years. Approximately 70 responses were received. These responses included copies of plans, as well as summaries of local and regional water plans and studies conducted in the planning area (Table 1-14). If an entity did not have a water plan, its current and future water source or sources are summarized in the table. A narrative description of each plan or study is presented in the following sections.

1.10.1 State and Federal Plans/Programs

1.10.1.1 State Water Plan[23]

In Section 26.051 of the Texas Water Code, the Executive Administrator of the TWDB is charged with producing a State Water Plan that addresses the broad public interest of the State. As currently specified in Sections 16.055 and 16.056, the Plan is to be periodically reviewed and updated and serve as a flexible guide to state policy for the development of its water resources. The TNRCC shall consider the State Water Plan in its water regulatory actions, although its actions are not bound by the Plan.

The 1997 Texas Water Plan provides a statewide perspective that places local and regional needs within the state context. Available individual and county-level studies were built into the overall findings, and in formulating water supply solutions, the Plan focused on economic viability while taking environmental sensitivity into consideration. New legislation, passed in the 75th Legislature, specifies a 5-year update period for the Plan, that is based on regional planning studies, and provides that related financial assistance applications must be consistent with the regional and State plans for regulatory approval by State agencies.

The ultimate goal of the State Water Plan is to identify those policies and actions that may be needed to meet Texas' near- and long-term water needs, based on a reasonable projected use of water, affordable water supply availability, and the goal of conservation of the State's natural resources.

1.10.1.2 Summary of Recommendations in the 1997 Water for Update to the State Water Plan[24]

1.10.1.2.1Nueces River Basin

Portions of the Nueces River Basin within the South Central Texas Region will need to continue to depend heavily upon the Edwards and the Carrizo Aquifers to meet the basin's future water needs.

[23] TWDB, Op. Cit., August 1997.

Table 1-14.
Summary of Plans/Studies Submitted to the SCTRWPG

Type of Plan/Study	*Entity*	*Name of Plan/Study*	*Responded by Submitting Plan/Letter*[1]	*Page Number of Plan/Study Description*	*Planning Horizon*	*Year Shortage Develops*	*Significant Problems Identified*	*Future Actions Being Considered*
Statewide	Federal Clean Water Act Program		P	1-62				
	Texas Clean Rivers Program		P	1-61				
	Texas Water Development Board	Water For Texas (1997)	P	1-53		Varies depending on location	Shortages expected in the San Antonio and Guadalupe River Basins and the San Antonio-Nueces Coastal Basin	Construction of Cibolo and Sandies Creek Reservoirs, converting Medina Lake to both a municipal and irrigation water source, and the subordination of hydropower permits downstream
Regional	Bexar-Medina-Atascosa Counties WCID #1		L	1-63				Development of Small Watershed Project including the expansion of Pearson Lake
	Canyon Lake WSC	Canyon Lake Water Supply Corporation Regional Water Plan	P	1-64			5,000 acft/yr needed for future growth	Construction of a 4.0 mgd surface water treatment plant on Canyon Lake
	Canyon Regional Water Authority		L	1-64				Work with GBRA to provide additional supplies from Canyon Reservoir and the Guadalupe River
	Canyon Regional Water Authority	Water Conservation and Drought Management Plan	P	1-91				Outlines water conservation procedures and drought management procedures.
	City and County of Victoria	Regional Water Supply Plan for the City and County of Victoria	P	1-65				Obtain additional water from the Guadalupe River and protect existing groundwater supplies
	Green Valley SUD		L	1-66		Possibly in 2000		Intend to purchase or lease water rights from those on the market
	Green Valley SUD	Drought Contingency Plan	P	1-98				Mandatory water use restrictions under drought conditions
	Guadalupe-Blanco River Authority		L	1-66				Conjunctive use of surface water and groundwater
	Guadalupe-Blanco River Authority	Drought Contingency Plan	P	1-98				Outlines drought management procedures.
	Bexar-Medina-Atascosa Counties WCID #1	Medina County Regional Water Management Plan	p	1-67				Evaluate the long-term alternatives to the use of groundwater.
	Portions of Comal, Kendall and Bexar Counties	Regional Water Supply Project for Portions of Comal, Kendall and Bexar Counties	P	1-67				Diversion of water from Canyon Reservoir, facilities to convey treated water for use in portions of included counties
	San Marcos Area	Regional Water Supply Study for the San Marcos Area	P	1-68	2020			Develop a regional water supply facility serving all of the study participants
	Zavala-Dimmit Counties WID #1		L	1-68	2050			Continue to obtain water from the Nueces River Basin
	Zavala-Dimmit Counties WID #1	Water Conservation and Drought Contingency Plan	P	1-102				Outlines water conservation procedures.
Underground Water Conservation Districts	Edwards Aquifer Authority	Edwards Aquifer Authority Groundwater Management Plan	P	1-69	2050	Current shortage exists		Institute pumping limits on the Edwards Aquifer

Table 1-14 (continued)

Type of Plan/Study	Entity	Name of Plan/Study	Responded by Submitting Plan/Letter[1]	Page Number of Plan/Study Description	Planning Horizon	Year Shortage Develops	Significant Problems Identified	Future Actions Being Considered
	Evergreen UWCD	Management Plan of the Evergreen Underground Water Conservation District	P	1-70				Control groundwater withdrawals to reduce aquifer mining in the District
	Gonzales County UWCD	Management Plan and Rules	P	1-71				Continue to rely on wells in the Sparta, Queen City, and Carrizo-Wilcox Aquifers
	Medina County Groundwater Conservation District	Groundwater Management Plan	P	1-72	2008			
	Uvalde County Underground Water Conservation District	Uvalde County UWCD Drought Management Plan	P	1-73				Water use restrictions during times of drought
	Wintergarden Groundwater Conservation District	Management Plan	P	1-73				Sets goals to reduce water use within the District.
Local	AquaSource Incorporated		L	1-74				Development of surface supplies
	Aqua WSC	Drought Contingency Plan	P	1-90				Water use restrictions during times of drought.
	Atascosa Rural Water Supply Corporation		L	1-74				Purchase water rights from local farmers
	Atascosa Rural Water Supply Corporation	Drought Contingency Plan	P	1-90				Water use restrictions during times of drought
	Baptist Children's Home Ministries		L	1-74	2050			Obtain water from the San Antonio Water System
	Bexar Metropolitan Water District	Groundwater Management Plan	P	1-74	2020		None identified through 2020	Continued development of surface supplies, requiring and promoting effective water conservation measures, construction of Water Production Facility
	Bexar Metropolitan Water District	Retail Supplier Water Conservation Plan	P	1-90				Reduce per capita demand in BMWD's service area
	Bexar Metropolitan Water District	Wholesale Supplier Water Conservation Plan	P	1-91				Reduce water demand from wholesale customers within BMWD' service area
	Bloomington Independent School District		L	1-75	2050			Rely on current wells for future water supply needs
	Canyon Lake Estates WSC		L	1-76				Rely on current well for future water supply needs
	Canyon Lake Recreational Area		L	1-76	2050			Rely on current well
	Canyon Springs Water Company	Canyon Springs Water Company Drought Contingency Plan	P	1-92				Water use restrictions during times of drought
	Cattleman's Crossing WS	Drought Contingency Plan	P	1-92				Water use restrictions during times of drought
	City of Alamo Heights		L	1-76	2050			Continue to rely on Edwards Aquifer
	City of Boerne		L	1-76	2030	2030	Tremendous growth projected over next few decades	Contract with GBRA for 2,000 acft/yr
	City of Carrizo Springs		L	1-77				Continue to obtain water from the Carrizo-Wilcox Aquifer
	City of Cibolo		L	1-77				Obtain permission to pump from City's well located in the Edwards Aquifer, Lake Dunlap expansion

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Table 1-14 (continued)

Type of Plan/Study	Entity	Name of Plan/Study	Responded by Submitting Plan/Letter[1]	Page Number of Plan/Study Description	Planning Horizon	Year Shortage Develops	Significant Problems Identified	Future Actions Being Considered
	City of Converse	Water Conservation Plan	P	1-92				Use non-potable water for industrial and non-discretionary use
	City of Fair Oaks Ranch		L	1-77				Obtain water from the Regional Water Supply Project for Portions of Comal, Kendall and Bexar Counties
	City of Fair Oaks Ranch	Drought Contingency Plan	P	1-93				Mandatory water conservation under drought conditions
	City of Garden Ridge	Drought Management Plan	P	1-93				Mandatory water conservation under drought conditions
	City of Goliad	Drought Contingency Plan	P	1-93				Institutes water use restrictions during times of drought
	City of Gonzales		L	1-77	2050			Drill more wells into the Carrizo Aquifer as needed
	City of Gonzales	Water Conservation Plan	P	1-94				Reduce per capita water consumption in the City's service area
	City of Karnes City		L	1-78				Drill more wells into the Carrizo Aquifer as needed
	City of La Coste	Conservation Ordinance	P	1-78				Acquire more water from the San Antonio Water System and the Bexar Metropolitan Water District
	City of La Vernia		L	1-78				Has contract with CRWA to supply additional needs for the next few decades
	City of Lockhart		L	1-78				Continue to rely on the Carrizo-Wilcox Aquifer
	City of Luling		L	1-79				Continue to utilize San Marcos River water
	City of Lytle		L	1-79				
	City of New Braunfels		L	1-79	2050	Uncertain		Purchase additional water from Canyon Lake
	City of New Braunfels	Drought Contingency Plan and Water Conservation Plan	P	1-94				Mandatory water conservation under drought conditions and sets goals for water use reduction
	City of Port Lavaca	Utilities Master Plan	P	1-80				Improve distribution system and increase their water storage capacity
	City of Poth		L	1-80				Drill more wells into the Carrizo Aquifer as needed
	City of San Marcos	Surface Water Supply Study	P	1-80	2045			Purchase additional water from Canyon Lake, purchase senior San Marcos River water rights
	City of Schertz	Drought Contingency Plan	P	1-95				Mandatory water conservation under drought conditions
	City of Selma		L	1-81				Purchase of additional water where available
	City of Seguin	Water Conservation Plan	P	1-96				Mandatory water conservation under drought conditions
	City of Stockdale	Drought Contingency Plan	P	1-96				Mandatory water conservation under drought conditions

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Table 1-14 (continued)

Type of Plan/Study	Entity	Name of Plan/Study	Responded by Submitting Plan/Letter[1]	Page Number of Plan/Study Description	Planning Horizon	Year Shortage Develops	Significant Problems Identified	Future Actions Being Considered
	City of Uvalde		L	1-81				Purchase of water rights in surrounding properties
	City of Victoria		L	1-81	2040		Water quality	Obtain surface water from the Guadalupe River
	City of Victoria	Drought Contingency Plan	P	1-96				Mandatory water conservation under drought conditions
	City of Yoakum		L	1-82	2050			Continue to rely on wells in the Gulf Coast Aquifer
	Clearwater Estates Water System		L	1-82	2050			Continue to rely on wells in the Rose Aquifer
	Cotulla Independent School District		L	1-82				Continue to purchase water from the City of Cotulla
	County Line WSC		L	1-82	2020	Possibly after 2020		Purchase water from GBRA
	Creekwood Ranches WSC		L	1-82				Continue to rely on wells in the Edwards Aquifer
	Crystal Clear WSC		L	1-83				Supplement groundwater with additional surface water
	Crystal Clear WSC	Water Conservation & Drought Contingency Plan	P	1-97				Mandatory water conservation under drought conditions and sets goals for water use reduction
	Cypress Bend Water System		L	1-83				Drill additional well and water purchase agreement
	Cypress Cove Water System		L	1-83				Drill two additional wells in the Trinity Aquifer
	E.I. du Pont de Nemours and Company, Inc., Victoria Plant	Water Conservation Plan and Data Survey	P	1-97				Reduce the amount of water needed to manufacture a pound of product
	East Central WSC	Water Supply Program	P	1-83	2050	Before 2050	Demands are expected to increase 134% before 2050	Obtain water from other groundwater sources or various surface water projects
	El Oso WSC	Water Conservation & Drought Management Plan	P	1-98				Mandatory water conservation under drought conditions and sets goals for water use reduction
	Fashing-Peggy WSC		L	1-84	2050	None expected over the next 50 years		Continue to rely on wells in the Carrizo Aquifer
	Gusville Mobile Home and RV Park		L	1-84				Continue to rely on wells in the Carrizo Aquifer
	Kendall County WCID #1		L	1-84				Continue to rely on wells in the Trinity Aquifer
	Kendall County WCID #1	Kendall County Water Control & Improvement District No. 1, Drought Contingency and Water Rationing Plan	P	1-99				Institutes water use restrictions during times of drought
	Martindale WSC	Water Plan	P	1-84				Obtain water from the GBRA's Lake Dunlap project

Table 1-14 (continued)

Type of Plan/Study	Entity	Name of Plan/Study	Responded by Submitting Plan/Letter[1]	Page Number of Plan/Study Description	Planning Horizon	Year Shortage Develops	Significant Problems Identified	Future Actions Being Considered
	Martindale WSC	Water Conservation and Emergency Demand Plan	P	1-99				Mandatory water conservation under drought conditions and sets goals for water use reduction
	Maxwell WSC		L	1-85	2050			
	Oak Hills WSC	Water Conservation Plan and Drought Contingency Plan	P	1-99				Mandatory water conservation under drought conditions and sets goals for water use reduction
	Plum Creek Conservation District		L	1-86				
	San Antonio Country Club		L	1-86				Supplement water use with recycled water
	San Antonio Water System	San Antonio Water System Water Resource Plan	P	1-86	2050			Obtain water from other groundwater sources or various surface water projects
	San Antonio Water System	Water Conservation and Reuse Plan	P	1-100				Sets goals for water use reduction
	Schertz-Seguin Local Government Corporation		L	1-87	2050			Development of a well field in the Carrizo Aquifer
	Southwest Texas State University	Water Supply Study	P	1-88				Contract with GBRA for Canyon Lake water
	Springs Hill WSC	Water Supply Program 2000-2050	P	1-89	2050			Obtain additional water from the Guadalupe River and the Carrizo Aquifer
	Sutherland Springs WSC		L	1-88				Possibly obtain some water from the Cibolo Creek Reservoir Project
	Sutherland Springs WSC	Water Conservation Plan & Drought Contingency Plan	P	1-101				Mandatory water conservation under drought conditions and sets goals for water use reduction
	Texas Parks and Wildlife Department		L	1-88				
	The Oaks WSC		L	1-89				Continue to rely on current wells
	3-G W. C., Inc.	Drought Contingency Plan	P	1-102				Institutes water use restrictions during times of drought
	Western Trails Village		L	1-89	2050			Obtain water from an additional well or from the City of San Antonio

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1.10.1.2.2San Antonio River Basin

With the Edwards Aquifer withdrawal limits imposed by SB1477, additional water supplies in the San Antonio and Guadalupe River Basins will need to be developed for use in the San Antonio area, even with the TWDB's advanced water conservation savings projections. Long-term water needs in the area will be difficult to meet unless several options are successfully pursued. In order to meet the needs in the San Antonio area, the Board recommends that the Cibolo Reservoir project be developed before 2010. However, final decisions on actual projects and timing are to be made locally.

Cibolo Reservoir. This project would be located near the City of Stockdale in Wilson County, and would consist of a reservoir on Cibolo Creek, with diversion facilities on the San Antonio River. The diversion facilities, located near Floresville, would divert flows from the San Antonio River including treated effluent from the San Antonio area into the main reservoir. The TWDB estimated that over 122,000 acft/yr of water supply could be developed by this project, which includes the supplies that could be developed from the Cibolo watershed at the site, plus diversions of wastewater return flows from the San Antonio area and river flows from the San Antonio River. The project would pass flows averaging about 25,000 acft/yr to meet environmental needs under the consensus environmental planning criteria. The project would inundate 9,896 acres, including 1,615 acres of mixed riparian forest.

Medina Lake. The Medina Lake System is recommended to be converted from a purely irrigation supply source to an irrigation and municipal water supply source capable of satisfying a portion of the municipal needs in western Bexar County. The TNRCC has authorized diversion of up to 19,974 acft/yr from Diversion Lake for municipal purposes. Water supply contracts between BMA and BMWD exist today.

1.10.1.2.3Guadalupe River Basin

In order to ensure that the springs at San Marcos and New Braunfels continue to flow, alternative water supplies must be developed to meet part of the needs now being met from the Edwards Aquifer. One reservoir, Sandies Creek, is recommended for development in the basin before 2030. Supplies from this project could be used to meet part of the needs in the Edwards Aquifer area, as well as some of the needs in the lower part of the basin which are presently supplied by Canyon Reservoir, thereby freeing supplies from Canyon Reservoir to be used in the

New Braunfels – San Marcos area. The following is recommended to increase the supplies in the basin:

Hydropower Subordination. The TWDB recommended that the hydropower permits below Canyon Reservoir be subordinated to Canyon Reservoir. This subordination is expected to increase the dependable supplies available from Canyon by about 35,000 acft/yr. The TWDB recommends that hydropower subordination be implemented before 2010. Both the GBRA and the City of Seguin have already subordinated their hydropower rights to Canyon Reservoir.

Sandies Reservoir. This project would consist of an off-channel storage reservoir located on Sandies Creek, with facilities to divert water from the Guadalupe River into the reservoir during high river flow. The reservoir would be located in DeWitt and Gonzales Counties northwest of the City of Cuero. The diversion facilities could be located in Gonzales County near the City of Gonzales or further downstream above Cuero. The TWDB estimates that a supply of more than 97,600 acft/yr could be developed by operating this project so as to pass through only the amount of water actually projected to be used by downstream water rights holders. If full downstream water rights are considered and a corresponding volume of water is passed to meet them, then the TWDB estimates the supply available from the project would be 80,000 acft/yr. The amount of flows estimated to be passed through this reservoir for environmental maintenance in 3,175 acft/yr. This project would inundate 29,322 acres, including an estimated 2,388 acres of mixed riparian forest.

1.10.1.2.4Lavaca-Guadalupe Coastal Basin

The Lavaca-Guadalupe Coastal Basin will continue to be supplied by imports from the Guadalupe River, with 20 percent of the needs being met from locally available groundwater.

1.10.1.2.5San Antonio-Nueces Coastal Basin

The San-Antonio-Nueces Coastal Basin will continue to rely on imports from the Nueces River Basin to provide most of its needed supplies. However, additional contractual commitments for future water supplies will need to secured from the City of Corpus Christi, which is the major regional supplier in the area.

1.10.1.3 Texas Clean Rivers Program and Goals[25]

The Clean Rivers Program was established by the Texas Clean Rivers Act in 1991. In accordance with the statute, the TNRCC adopted rules guiding comprehensive regional assessments of water quality focusing on river basins or watersheds.

The goal of the Clean Rivers Program is to maintain and improve the quality of water resources within each river basin in Texas through an ongoing partnership involving the TNRCC, other agencies, river authorities, regional entities, local governments, industry and citizens. The program uses a watershed management approach to identify and evaluate water quality issues, establish priorities for corrective action, and work to implement those actions. Specifically, the Cleans Rivers Program has nine goals. These are:

- Enhance public participation and education;
- Encourage comprehensive watershed planning;
- Identify pollutant sources;
- Provide a scientific approach to water quality issues;
- Focus on priority issues;
- Prevent and reduce pollution at the source;
- Ensure better use of public funds;
- Promote water conservation; and
- Provide assistance for local initiatives.

In the South Central Texas Region, the Guadalupe-Blanco, San Antonio, and Nueces River Authorities, in partnership with the Texas Natural Resource Conservation Commission, administer and operate the Clean Rivers Program. The program is funded from fees assessed to wastewater discharge and water rights permit holders, and is focused upon water quality monitoring to determine water quality trends. Data are collected and analyzed for important water quality parameters, including dissolved oxygen, conductivity, pH, temperature, total dissolved solids, chloride, sulfate, nitrate nitrogen, nitrite nitrogen, ammonia nitrogen, total phospherus, and ortho-phosphorus. Bacterial data such as fecal coliform, Escherichia coli, and fecal streptococcus are collected, and biological sampling of fish is done.

[25] TNRCC, "The Clean Rivers Program Goals," April 28, 1997.

Data collection and water quality monitoring provides information to support a wide range of analyses, including:

- Temporal and spatial analysis of water quality and standards compliance;
- Knowledge of water quality and flow for unclassified streams;
- Evaluation and development of state-wide, regional, and site-specific standards;
- Permit criteria related to the perennial or intermitten nature of receiving streams;
- Receiving water assessments;
- 305(b) assessment and 303(d) priority monitoring;
- Use attainability assessments;
- Waste load evaluations (WLE) or total maximum daily load (TMDL) development; and
- Special studies.

The information developed and maintained through the CRP is extremely important to both natural resource protection and to water planning, in that the information is essential to the management of waste disposal and the production of safe drinking water for public purposes.

1.10.1.4 Federal Clean Water Act Program and Goals

In 1972, Congress enacted the Federal Clean Water Act. This Act is the primary federal law that protects the nation's waters, including lakes, rivers, aquifers and coastal areas. The Clean Water Act's primary objective is to restore and maintain the integrity of the nation's waters. This objective translates into two fundamental national goals:

- Eliminate the discharge of pollutants into the nation's waters; and
- Achieve water quality levels that are fishable and support contact recreational use.

More specifically, the Clean Water Act:

- Requires major industries to meet performance standards to ensure pollution control;
- Charges states and tribes with setting specific water quality criteria appropriate for their waters and developing pollution control programs to meet them;
- Provides funding to states and communities to help them meet their clean water infrastructure needs; and
- Requires a permitting process to ensure that development and other activities are conducted in an environmentally sound manner.

1.10.2 Regional Water Plans

1.10.2.1 Bexar-Medina-Atascosa Counties Water Control and Improvement District No. 1[26]

BMA owns and operates Medina Lake and Diversion Lake approximately 25 miles northwest of San Antonio and currently operates primarily as an irrigation district, although it has contracted to sell surplus irrigation water for municipal use. BMA is authorized to store more than 237,000 acft of water in Medina Lake with an annual diversion right of 66,000 acft/yr. Of its total diversion right, BMA has been authorized to divert approximately 20,000 acft/yr for municipal purposes and the balance, approximately 46,000 acft/yr, for irrigation use. BMA currently has approximately 34,000 acres of irrigable land within the District eligible to receive irrigation waters. BMA is also authorized to maintain and operate Chacon Lake, located in the Nueces River Basin in Medina County, with an annual diversion right of approximately 2,000 acft/yr for irrigation purposes.

BMA has existing contracts for use of its authorized municipal diversion rights. Specifically, BMA has two contracts with the BMWD and a third contract (limited to approximately 5,000 acft/yr) with interest in Bandera County. BMA also has several smaller contracts with water utilities and/or irrigators around Medina Lake, which consume the balance of the present allocation of municipal water rights associated with the Medina Lake System.

BMA's current active water development project involves a Small Watershed Project pursued though the Natural Resource Conservation Service of the United States Department of Agriculture. The Project has been authorized by Congress for consideration by the Office of Management and Budget. The beneficial results from the Project are estimated by the National Resource Conservation Service in "water savings" of approximately 34,000 acft/yr through reduction of losses in the Medina Canal System and other conservation measures. The Project also includes expansion of a small regulating reservoir in the BMA canal system known as Pearson Lake.

1.10.2.2 Canyon Lake Water Supply Corporation[27]

In January 1996, Canyon Lake WSC and the TWDB entered into an agreement to jointly fund a Regional Water Study for western Comal County. This study was completed and

[26] Information transmitted in a letter received from the law offices of McGinnis, Lochridge & Kilgore, L.L.P. on behalf of the Bexar-Medina-Atascosa WCID No. 1 dated February 23, 1999.

[27] The Hogan Corporation, "Canyon Lake Water Supply Corporation Regional Water Plan," Canyon Lake Water Supply Corporation, December 1997.

approved in December 1997. This plan addresses the conjunctive use of Trinity Aquifer groundwater and surface water from Canyon Reservoir. Canyon Lake WSC currently has a 1.5-mgd surface water treatment plant in operation on the south shore of Canyon Reservoir.

Based upon priorities within Comal County, the Canyon Lake WSC Board of Directors has elected to limit the planned service area to the portion of western Comal County that lies north of State Highway 46. Funding is approved, and plans are being developed to construct a 4.0-mgd surface water treatment plant in the spring of 2000 on the north shore of Canyon Reservoir. The GBRA has indicated that the raw water will be made available when Canyon Lake WSC presents its request for additional raw water. A current contract with GBRA for 1,000 acft of raw water from Canyon Reservoir meets present needs, but an additional 5,000 acft will be needed for future growth.

1.10.2.3 Canyon Regional Water Authority[28]

Canyon Regional Water Authority (CRWA) is a subdivision of the State of Texas created by the Texas Legislature in 1989. CRWA is made up of member entities (Crystal Clear WSC, East Central WSC, BMWD, Green Valley SUD, Springs Hill WSC, City of Cibolo, City of Marion, City of La Vernia, Maxwell WSC, and County Line WSC) who are retail water suppliers in the South Central Texas Region. CRWA functions as a partnership of water supply corporations, cities, and districts responsible for acquiring, treating, and transporting potable water.

CRWA is currently operating under agreements with several member entities to develop additional resources within the Cibolo Creek sub-basin area. This entails development of Carrizo Aquifer water along with certain small water rights on Cibolo Creek.

CRWA's current ongoing projects include expansion of the Lake Dunlap Water Treatment Plant and the Mid-Cities Transmission System to serve the Cities of Marion, La Vernia, Cibolo, and BMWD. A water purchase contract between CRWA and GBRA has been negotiated to accommodate the requested increase of Springs Hill WSC, Green Valley SUD, Marion, Cibolo, East Central WSC, and BMWD. In order for CRWA to meet the requested needs of its member entities, a phased approach to accommodate the requested increase in treated water from the Lake Dunlap facility has been proposed. Phase I includes the requested increases of Crystal Clear WSC, Springs Hill WSC, and Green Valley SUD. Phase II

[28] Information transmitted in a letter received from the Canyon Regional Water Authority dated February 25, 1999.

includes the remainder of the requested increases for East Central WSC, the Cities of Marion and Cibolo, Green Valley SUD, BMWD's Northeast Service Area, and Springs Hill WSC.

CRWA is also currently involved in the Hays/Caldwell Water Regionalization Project. The overall project consists of a surface water treatment plant to be constructed along the San Marcos River east of the City of San Marcos and a transmission system to deliver treated water to Martindale WSC, Maxwell WSC, County Line WSC, and Crystal Clear WSC. Following treatment, finished water would be delivered to the four participating entities via a transmission system consisting of two components. One component delivers treated surface water to CCWSC and the second component delivers treated surface water to Martindale WSC, Maxwell WSC, and CLWSC.

1.10.2.4 City and County of Victoria[29]

In June 1992, a regional water supply plan was prepared for the City and County of Victoria. The plan showed that at least 16,000 acft/yr was available for appropriation in the Guadalupe River just downstream of the Central Power & Light power plant in Victoria. It was further recommended that by mixing treated surface water and groundwater at a rate of half surface water and half groundwater a good quality water could be produced and water production costs would be reduced. Finally, it was recommended that the groundwater resource be protected. This protection would take the form of the City or County of Victoria, or a newly created district, measuring water levels and testing water quality on at least a quarterly basis.

The City of Victoria subsequently applied for and obtained a water rights permit authorizing run-of-river diversion of up to 20,000 acft/yr and storage of up to 1,000 acft/yr in an off-channel storage facility.

1.10.2.5 Green Valley Special Utility District[30]

Green Valley SUD has three wells in the Edwards Aquifer from which they currently receive water. They also purchase water from New Braunfels Utilities. The proposed permit amount from the Edwards Aquifer Authority (EAA) for Green Valley SUD is set at 1,060 acft/yr and will be imposed in the year 2000. If this causes a shortage of water, they intend to purchase or lease water rights from those available on the market.

[29] Camp Dresser & McKee Inc. and Michael Sullivan & Associates, "Regional Water Supply Plan for the City and County of Victoria," June 1992.
[30] Information transmitted in a letter received from Green Valley SUD dated February 24, 1999.

Green Valley SUD has a contract with the Canyon Regional Water Authority for 725 acft/yr with an additional 300 acft/yr available for their use. Once the expansion of CRWA's water treatment plant on Lake Dunlap is completed and the transmission line is complete, Green Valley SUD is contracted to receive 1,400 acft/yr.

Green Valley feels that their water needs will be met over the next ten years by the combination of these and other options. They will investigate the reuse of water from any available source and will consider partnering with other municipalities to find a feasible method.

1.10.2.6 Guadalupe-Blanco River Authority[31]

The GBRA was established to develop, conserve, and protect the water resources of the Guadalupe River Basin and make them available for beneficial use. GBRA is a regional entity serving Hays, Comal, Guadalupe, Caldwell, Gonzales, DeWitt, Victoria, Kendall, Refugio, and Calhoun Counties.

GBRA's internal planning process reflects short-term local projects, but GBRA recognizes that any long-term projects must be regional. GBRA has several water supply projects that are underway, under construction, or are in the design phase with construction to follow, including the Western Canyon Regional Water Supply Project and the CRWA/BMWD Water Supply Agreement. The Western Canyon Regional Project will include the construction of a water treatment plant west of Canyon Reservoir, and a water transmission pipeline system to deliver treated water to the project participants' ground storage tanks or other selected delivery points. Depending on the final size of the plant, it will be able to treat approximately 9.3 million gallons of water daily. Potential in-district participants include the Bulverde Utility Company, Apex Water Services, Comal Independent School District, the City of Boerne, and the City of Fair Oaks Ranch. As a part of this project, limited quantities of water will be provided to out-of-district customers, including the San Antonio Water System, Bexar Metropolitan Water District, and the San Antonio River Authority.

GBRA has submitted an application to the TNRCC to increase the amount of Canyon Reservoir stored water for municipal, industrial, and other purposes. GBRA has also approved a short-term, temporary out-of-district allocation to the BMWD, as well as the East Central WSC, and the Green Valley SUD, and has entered into an agreement with the San Antonio Water System (SAWS) and the San Antonio River Authority to set guidelines for regional water supply

[31] Information transmitted in a letter received from GBRA dated February 26, 1999.

development. This will initiate a process of identifying available sources of supply, studying alternative methods of developing these supplies, conducting the regional planning necessary to utilize these supplies, and developing the appropriate contracts.

1.10.2.7 Medina County Regional Water Management Plan[32]

The Medina County Regional Water Management Plan was developed in order to evalute the long-term alternatives to the use of groundwater and perform a cost analysis on the effectiveness of such alternatives and is being lead by the Bexar-Medina-Atascosa Water Control and Improvement District No. 1.

The specific objectives of the plan included the following:

1. To establish county-wide population and water demand projections for Medina County;
2. To describe the quantity and quality of water resources that are available to meet the future demands within the study area and to quantify any limits to development of these resources;
3. To evaluate conjunctive management and use of groundwater and surface water resources within Medina County and provide a basis for management strategies that may be used to fulfill the regional water demands; and
4. To formulate the basic elements of alternative plans that may be used to reconcile water demands with the resources available.

1.10.2.8 Portions of Comal, Kendall and Bexar Counties[33]

A potential regional water supply project is based upon a contract between the GBRA, and three entities in Bexar County (SAWS, BMWD, and the San Antonio River Authority) to provide 4,000 acft/yr to Bexar County. The project will consist of facilities for the diversion of raw water from Canyon Reservoir, a water treatment plant and facilities to convey the raw water from Canyon Reservoir to the water treatment plant. Facilities to convey treated water from the water treatment plant for use in areas within portions of Comal, Kendall, and Bexar Counties are also included in this plan.

[32] Bexar-Medina-Atascosa WCID #1, "Medina County Regional Water Management Plan," September 1999.
[33] Draft agreement between the San Antonio Water System and the Guadalupe-Blanco River Authority, "Regional Water Supply Project for Portions of Comal, Kendall, and Bexar Counties," March 16, 1998.

1.10.2.9 San Marcos Area[34]

In December of 1995, a study evaluated two alternatives for development of a regional water supply system to meet the present and future needs (year 2020) of each of the study participants (City of Kyle, City of Lockhart, Crystal Clear WSC, Elim WSC, Martindale WSC, Maxwell WSC, County Line WSC, Goforth WSC, Plum Creek WSC, and Creedmore-Maha WSC). The first alternative evaluates the feasibility of enlarging the City of San Marcos' proposed water treatment plant to serve both the City of San Marcos and the ten water supply entities outside of the City's service area. Alternative 2 assumes that the city of San Marcos develops its own individual water supply system and the other ten study participants develop a separate regional system to serve their needs.

Groundwater availability for the study area is limited by legislative and court actions regarding the Edwards Aquifer. The study showed the development of a regional water supply facility serving all of the study participants (Alternative 1) would result in the least cost to the existing customers and would provide the more economical long-term water supply for the region. At present, the early phases of this plan, including a regional water treatment plant near the City of San Marcos and a pipeline connecting the plant to Lake Dunlap, have been completed. Planning is underway to construct a potable water pipeline from the San Marcos Water Treatment Plant extending to the City of Kyle, Creedmoor-Maha, the City of Buda, and other county entities.

1.10.2.10 Zavala-Dimmit Counties Water Improvement District No. 1[35]

Water for the Zavala-Dimmit Counties Water Improvement District No. 1 is from the Nueces River and Turkey Creek watersheds. The District has a permit to divert 28,000 acft/yr from the Nueces River from several diversion points near Crystal City and Carrizo Springs in Zavala and Dimmit Counties. An unofficial water conservation program is always in effect and the TNRCC Watermaster enforces a drought plan when water becomes short. The District anticipates that it will continue to obtain its water from the Nueces River for the next fifty years pending unforeseen developments.

[34] HDR Engineering, Inc., "Regional Water Supply Study for the San Marcos Area," prepared for GBRA and TWDB, December 1995.
[35] Information transmitted in a letter received from Zavala-Dimmit Counties Water Improvement District No. 1 dated February 17, 1999.

1.10.3 Certified Groundwater Conservation District Management Plans

1.10.3.1 Edwards Aquifer Authority[36]

The EAA was created by the 73rd Texas Legislature in 1993 to supplant the Edwards Underground Water District, and in part, to enforce reductions in withdrawals from the Edwards Aquifer mandated in SB1477.

The EAA began operations on June 28, 1996 as a "conservation and reclamation district" to manage the southern portion of the Edwards Aquifer. The EAA's jurisdiction is limited to the Edwards Aquifer within an area that includes all of Bexar, Medina, and Uvalde Counties and parts of Atascosa, Comal, Caldwell, Hays and Guadalupe Counties.

Water use data for 1990 show that a total of 647,000 acft of water was used within the EAA's boundaries. Approximately 519,000 acft or 80 percent of this demand was supplied by water from the Edwards Aquifer. Other groundwater and surface water resources supplied the remaining 20 percent of water used in 1990.

In order to meet the current and continued water shortages experienced in the EAA's planning area, the EAA has derived nine basic management goals from its enabling statute, the EAA Act, as amended:

1. Develop, implement, and enforce comprehensive programs for managing withdrawals of water from the Edwards Aquifer in order to sustain domestic, municipal, agricultural and industrial water supplies. These programs will promote efficiency, control and prevent waste, and help protect natural resources;
2. Facilitate the marketing and transfer of Edwards Aquifer water rights between buyers and sellers in order to promote efficiency and to control and prevent waste;
3. Support and conduct research and, as appropriate, implement strategies to enhance the yield of the Edwards Aquifer and promote conjunctive management of groundwater and surface water supplies;
4. Implement technical and financial assistance programs to encourage the use of cost-effective measures to improve water use efficiency, minimize waste, and increase beneficial reuse and recycling of water by municipal, industrial, commercial, institutional and agricultural water users so that water supplies are conserved or made available for alternative or future uses;
5. Implement programs in cooperation with other local, state, and federal agencies to monitor and protect the quality of the Edwards Aquifer;
6. Implement and enforce water management practices, procedures, and methods to ensure, by the end of 2012, the continuous minimum springflow of Comal and San Marcos Springs in order to protect species, habitats, instream uses, and bays and estuaries that are dependent on discharge from the Edwards Aquifer;

[36] Edwards Aquifer Authority, "Groundwater Management Plan," August 1998.

7. Continue to develop, operate, and maintain the data collection and retrieval network for the Edwards Aquifer region in order to improve basic data required to better understand the geology and hydrology of the Edwards Aquifer and to better understand the meteorological conditions that affect the Edwards Aquifer;
8. Provide information to the public and interested parties on the mission, goals, and initiatives of the Authority and expand education programs on the geology, hydrology, use, conservation and management of the Edwards Aquifer; and
9. Ensure the efficient and cost-effective management and operation of the EAA, as well as its overall fiscal integrity.

The EAA's initial Groundwater Management Plan was developed without recommendations on specific water management strategies that could be implemented to meet future water needs in the Edwards Aquifer region. This approach was taken in order to minimize potential inconsistency with the soon to be prepared South Central Texas Region Water Management Plan. It is anticipated that subsequent versions of the EAA's Groundwater Management Plan will incorporate relevant portions of the regional water plan and will provide more definitive recommendations with regard to the implementation of regional water management strategies.

The South Central Texas Water Advisory Committee is a 20-member committee created by SB1477 to serve in an advisory role to the EAA Board of Directors, particularly with regard to downstream water uses, water rights holders, and issues. The governing body of designated counties and municipalities appoints members. The South Central Texas Water Advisory Committee is also charged with making a biennial report to the Board assessing the effectiveness of the EAA. The South Central Texas Water Advisory Committee by resolution may request that the EAA Board reconsider any action considered prejudicial to the Guadalupe River downstream water interests and may also request that TNRCC review EAA actions.

1.10.3.2 Evergreen Underground Water Conservation District[37]

The Evergreen Underground Water Conservation District (EUWCD) was created in 1965 and includes Atascosa, Frio, Wilson, and Karnes Counties. The total area within the EUWCD is 2,461,000 acres, or 3,845 square miles. The area's economy is heavily dependent upon agriculture and agriculture related business, as approximately 80 percent of the total groundwater pumpage in the EUWCD is used in agriculture.

[37] Evergreen Underground Water Conservation District, "Management Plan of the Evergreen Underground Water Conservation District," August 5, 1998.

The primary objective of this Management Plan is to control groundwater withdrawals to reduce aquifer mining within the EUWCD. The Plan outlines four main goals that the EUWCD will use as tools to accomplish its primary objective. These are:

1. Promoting the most efficient use of groundwater;
2. Implementing a management strategy to address controlling and preventing the waste of groundwater;
3. Implementing a management strategy to address the conjunctive use of surface and groundwater; and
4. Implementing a management strategy that will address natural resource issues which impact the use and availability of groundwater, and which are impacted by the use of groundwater.

The EUWCD's regulatory action plan contains guidelines on how to obtain a water well drilling and production permit as well as ways to obtain permits to transport water from the district. The EUWCD has also formulated a plan to take appropriate measures to discontinue activities that are either causing, or are a potential threat to cause groundwater contamination, and has limited permitted annual withdrawals to estimated annual recharge.

1.10.3.3 Gonzales County Underground Water Conservation District[38]

The Gonzales County Underground Water Conservation District (GCUWCD) was created in 1994 to conserve, preserve, protect and prevent waste of the groundwater resources of Gonzales County. The District was created on an order of the TNRCC and is specifically charged with managing the Sparta, Queen City, and the Carrizo Aquifers in Gonzales County. The District includes 576,000 acres within Gonzales County that lie over the usable portions of the aquifers. In 1997, the District reported groundwater pumpage of 12,651 acft for Gonzales County and the District expects that groundwater pumpage will increase to 20,256 acft in the next ten years. The District's economy is heavily dependent upon agriculture and agriculture related business.

The goals of the Gonzales County Underground Water Conservation District contained in the current Management Plan include:

- To establish and maintain an aquifer monitoring network;
- To investigate aquifers within the District and to improve the level of knowledge about those aquifers;

[38] Gonzales County Underground Water Conservation District, "Management Plan and Rules of the Gonzales County Underground Water Conservation District," adopted November 26, 1997 and amended February 10, 1998.

- To coordinate drought contingency planning and to reinforce surface water supply by using groundwater;
- To promote conservation and efficient use of aquifers within the District;
- To prevent and control waste of groundwater within the District;
- To inform the public on aquifer conditions and water conservation;
- To promote cooperation between water management entities and user groups within the District;
- To protect aquifers within the District from damage due to mineral exploration activities; and
- To provide for reasonable allocation of water resources to be transported out of the District and to monitor this activity.

Over the next 10 years, the county expects to shift its water use away from surface supplies and rely more heavily on available groundwater. The GCUWCD has limited permitted annual withdrawals to estimated annual recharge.

1.10.3.4 Medina County Groundwater Conservation District[39]

The Medina County Groundwater Conservation District was created in 1991. The District's jurisdiction is limited to the minor aquifers underlying Medina County, since the EAA has jurisdiction over the Edwards Aquifer. The District anticipates demand increases upon these aquifers, and therefore has an interest in aquifer storage and recovery projects to increase supplies. The current groundwater management plan lists four major goals as follows:

- Each year, the District will provide educational materials to the newspapers and to the general public on at least six occasions concerning waste which is prohibited under the District rules;
- Each year, the District will work with all interested parties and appropriate agencies to develop additional information on aquifer storage and recovery projects and will require permits for all aquifer storage and recovery projects;
- Each year, the District will provide automatic timer devices to the public in response to all requests in an effort to increase the efficiency of irrigating lawns; and
- Each year, the District will provide informative speakers to schools and civic groups to raise public awareness of practices that insure the efficient use of groundwater.

1.10.3.5 Uvalde County Underground Water Conservation District[40]

The Uvalde County Underground Water Conservation District's Drought Management Plan provides standards for determining that drought conditions exist, how long they continue,

[39] Medina County Groundwater Conservation District, "Groundwater Management Plan," July 22, 1998.

and when a drought has ended. These standards also define increasing stages of drought severity. Upon declaration of a drought, users will be required to initiate demand reduction measures to reduce pumping of the Edwards Aquifer. Two mechanisms define the type of reductions required. The first mechanism is the reduction goal established for each stage. The goals define percentage reductions in the base usage that are to be achieved. The second mechanism is the requirement that each user implement specific minimum demand reduction measures. Users will develop their own management plans that describe how each of the two mechanisms will be implemented within their respective service areas or operations.

1.10.3.6 Wintergarden Groundwater Conservation District[41]

The Wintergarden Groundwater Conservation District was created in 1997 and encompasses all of Dimmit, La Salle, and Zavala Counties. The total area within the District is 2,685,148 acres, or 4,195 square miles. The area's economy is heavily dependent upon agriculture and agriculture related business, as approximately 89 percent of the total groundwater pumpage within the District is used in agriculture.

The primary objective of this Management Plan is to control groundwater withdrawals to reduce aquifer mining within the District. The Plan outlines four main goals that the District will use as tools to accomplish its primary objective. These are:

1. Establishing an aquifer water level metering network with a minimum of five monitoring wells by December 31, 2001;
2. On at least two occasions each year provide public information on water conservation and waste prevention through public speaking appearances at public schools, civic organizations or newspaper articles;
3. Each year the District will confer at least on one occasion with the Nueces River Authority on cooperative opportunities for conjunctive resource management; and
4. Each year the District will insure that all new wells permitted for construction within the District comply with the District construction standards through monitoring of the State of Texas water well report required to be provided to the District by water well drillers.

The District's regulatory action plan contains guidelines on how to obtain a water well drilling and production permit as well as ways to obtain permits to transport water from the

[40] Uvalde County UWCD, "Uvalde County Underground Water Conservation District Drought Management Plan," November 28, 1994.
[41] Wintergarden Groundwater Conservation District, "Wintergarden Groundwater Conservation District Management Plan," June 15, 1999.

district. The District has also formulated a plan to take appropriate measures to discontinue activities that are either causing, or are a potential threat to cause, groundwater contamination.

1.10.4 Local Water Plans

1.10.4.1 AquaSource Incorporated[42]

AquaSource Incorporated currently serves the systems of Walnut Hill, Kendall Pointe, Ten West, Stonegate, Estates of Stonegate and Eagle Creek in Kendall, Bexar and Wilson Counties. Presently, production meets the demands of each system, but anticipated growth in some systems may force additional supplies to be developed. AquaSource would like to develop surface water supplies for a few of its systems.

1.10.4.2 Atascosa Rural Water Supply Corporation[43]

Atascosa Rural WSC was created in 1970 and serves parts of southwestern Bexar County. Atascosa Rural WSC plans to purchase water rights in the near future from farmers around the Atascosa Rural WSC area, to satisfy future consumption needs or requirements. The Atascosa Rural WSC is currently planning construction of an elevated water storage tank and additional pipelines to eliminate low water pressure problems in the area.

1.10.4.3 Baptist Children's Home Ministries[44]

The Baptist Children's Home Ministries currently has two water wells in the Edwards Aquifer, which they plan to continue to use. However, it is Baptist Children's Home Ministry's goal to start obtaining water from the SAWS. Baptist Children's Home Ministries plans to use recycled water to meet their irrigation needs. Baptist Children's Home Ministries expects water needs to increase in the future.

1.10.4.4 Bexar Metropolitan Water District[45]

BMWD is the second largest water purveyor in Bexar County and is a political subdivision of the State of Texas. Provision of water service for municipal, industrial, and other beneficial uses was the primary purpose for creation of the District by the 49th Texas Legislature in 1945. BMWD's existing water supply facilities consist of 88 wells with a total rated capacity

[42] Information transmitted in a letter received from Aqua Source Inc. dated February 26, 1999.
[43] Information transmitted in a letter received from Atascosa Rural WSC dated February 25, 1999.
[44] Information transmitted in a letter received from Baptist Children's Home Ministries dated February 25, 1999.
[45] Bexar Metropolitan Water District, "Groundwater Management Plan," March 1999.

of approximately 89,000 gpm, 68 ground storage facilities totaling approximately 25.9 million gallons capacity, and 15 elevated storage facilities totaling approximately 10 million gallons capacity. BMWD's principal source of water is the Edwards Aquifer. Hence, many of BMWD's actions in recent years have been driven by the designation of threatened and endangered species in the Comal Springs and San Marcos Springs ecosystems and the declining flows from these springs as withdrawals from the Edwards Aquifer have increased.

BMWD has acquired alternative sources of water for each of its Service Areas comprising portions of three watersheds. BMWD will also implement its revised Critical Period Management Plan with trigger levels based on actual springflow rather than measurements of water levels in index wells. Other water conservation measures initiated by BMWD include:

- Planning, design, and construction of water storage and conveyance facilities in each of its regional Service Areas to interconnect water sources, for off-river storage capacity, and to complete the 9.0 million gallons per day (mgd) Water Production Facility; and
- Co-sponsor engineered system management plans and facility improvements at Medina Lake, Diversion Dam, the 512-mile canal system, and auxiliary off-canal storage capacity.

BMWD proposes to reduce its dependence upon the Edwards Aquifer by implementing a multi-faceted plan to develop and provide alternative surface water supplies within each of the watersheds comprising its service areas and expanding its use of non-Edwards groundwater. The District will also reduce demand on the aquifer by requiring and promoting effective water conservation measures throughout its jurisdiction. A 9.0-mgd surface water production facility near Von Ormy was completed in early 2000. Other proposed measures are underway, such as transport of potable water from Canyon Reservoir to BMWD's central valley service area and conveyance of potable water to the Cibolo service area from Lake Dunlap, are contracted and in planning and design stages.

1.10.4.5 Bloomington Independent School District[46]

Bloomington High School and Middle School, located in the southern part of Victoria County, have their own independent water supply that is checked on a regular basis. Water is produced from on-site wells and it is the school district's intent to continue this practice over the next 50 years. Bloomington Elementary and Placedo Elementary are on city water and the

[46] Information transmitted in a letter received from the Bloomington ISD dated February 8, 1999.

school district intends to continue this practice into the future. They feel that this plan will adequately serve their needs for the next 50 years.

1.10.4.6 Canyon Lake Estates Water Supply Corporation[47]

The Canyon Lake Estates WSC, located in Comal County, currently operates one well to supply five water users. They will rely on their current well for future water supply needs.

1.10.4.7 Canyon Lake Recreational Area[48]

Fort Sam Houston is responsible for the management of the Canyon Lake Recreational Area, which is located at the east end of Canyon Reservoir in Comal County. The Canyon Lake Recreational Area currently obtains is potable water supply from a well installed and owned by the U.S. Army, which produces approximately 0.01 mgd. The Army anticipates that this well will meet Canyon Lake Recreational Area's 50-year water needs.

1.10.4.8 City of Alamo Heights[49]

The City of Alamo Heights has its own water wells, obtains water only from the Edwards Aquifer, and plans to do so for the next 50-year timeframe. The City of Alamo Heights is not anticipating any expansion of the city at this time.

1.10.4.9 City of Boerne[50]

The City of Boerne is negotiating a contract with GBRA for water from the Western Canyon Regional Project. If a contract for about 2,000 acft of water can be reserved for Boerne, the City estimates this supply will be adequate to meet projected needs until about the year 2030. Other sources of water will need to be obtained to meet needs beyond 2030. Current population projections show tremendous growth in Boerne over the next few decades.

1.10.4.10 City of Carrizo Springs[51]

The City of Carrizo Springs plans to obtain its water from the Carrizo Aquifer through the next 50 years.

[47] Information transmitted in a letter received from Canyon Lake Estates WSC dated February 2, 1999.
[48] Information transmitted in a letter received from the Department of the Army dated February 4, 1999.
[49] Information transmitted in a letter received from the City of Alamo Heights dated February 3, 1999.
[50] Information transmitted in a letter received from HDR/Simpson on behalf of the City of Boerne dated February 8, 1999.
[51] Information transmitted in a letter received from the City of Carrizo Springs dated March 19, 1999.

1.10.4.11 City of Cibolo[52]

Currently, the City of Cibolo is totally dependent on the Edwards Aquifer for all of its water resources. The City obtains water through Green Valley SUD.[53] The City is also an active member of the Canyon Regional Water Authority (CRWA). The CRWA has a 2-mgd surface treatment plant located on Lake Dunlap and is in the first phase of constructing an additional water transmission line to serve the City. Construction of the transmission line is projected to be completed in 3 to 5 years. Completion of this line will initiate a three phase program to use CRWA water to meet most, if not all, of the City's demand.

1.10.4.12 City of Fairoaks Ranch[54]

Fairoaks Ranch Utilities is currently negotiating with GBRA to provide a long-term surface water supply to the City of Fairoaks Ranch, located near San Antonio in Bexar County. The project is known as the Regional Water Supply Project for Portions of Comal, Kendall and Bexar Counties. The current plan assumes this project will supply Fairoaks Ranch with 1,500 acft/yr of Canyon Reservoir treated water after 2010 for 60 to 80 years.

1.10.4.13 City of Gonzales[55]

The City has a Certificate of Adjudication for 2,240 acft of water per year from the Guadalupe River, which it plans to use as one source of water for the next 50 years. The City has also drilled one well in the Carrizo Aquifer that will provide 1.4 mgd, and has plans to drill more wells in the Carrizo Aquifer north and east of the City as they are needed.

1.10.4.14 City of Karnes City[56]

The City of Karnes City's immediate drinking water source plans include pursuing several currently available options, including drilling wells into the Carrizo Aquifer and treating water from existing wells in the Catahoula Aquifer to meet drinking water standards.

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[52] Information transmitted in a letter received from the City of Cibolo dated February 9, 1999.

[53] The City has one water well, but the Edwards Aquifer Authority has prohibited the City from pumping it. However, the city is exploring avenues to obtain permission to use this well to supplement their water supply.

[54] Information transmitted in a letter received from Fair Oaks Ranch Utilities dated February 15, 1999.

[55] Information transmitted in a letter received from the City of Gonzales dated February 3, 1999.

[56] Information transmitted in a letter received from the City of Karnes City dated February 23, 1999.

1.10.4.15 City of La Coste[57]

The City of La Coste obtains its water from its wells in the Edwards Aquifer, and has adopted an ordinance governing the use of water drawn from the aquifer during times of "stage one" water conservation measures. This ordinance imposes restrictions on water use during times of low water levels in the Edwards Aquifer.

The City is actively pursuing alternative sources of water. These include obtaining water from the SAWS and the BMWD.

1.10.4.16 City of La Vernia[58]

The City of La Vernia relies on water wells in the Wilcox Aquifer to meet a large percentage of its water needs. The City is also a member of Canyon Regional Water Authority (CRWA) and has contracted with the CRWA for additional water to meet its needs for the next few decades.

1.10.4.17 City of Lockhart[59]

The City of Lockhart currently uses water from the Carrizo Aquifer. The city staff is currently writing a comprehensive water development plan. This plan includes the continued development of underground water for municipal use. This plan may also include the development of surface water storage in the local area.

1.10.4.18 City of Luling[60]

The City of Luling currently obtains water from the San Marcos River, and has capability to obtain water from the Carrizo Aquifer during emergencies. The city water plan includes a water-rationing plan based upon levels of the Edwards Aquifer index well in San Antonio (J-17).

1.10.4.19 City of Lytle[61]

Currently, the City of Lytle obtains all of its water supply from the Edwards Aquifer. At this time the City has no formal water plan.

[57] City of La Coste, "City of La Coste Conservation Ordinance," June 17, 1998.
[58] Information transmitted in a letter received from the City of La Vernia dated February 10, 1999.
[59] Information transmitted in a letter received from the Caldwell County Courthouse on behalf of the City of Lockhart dated March 8, 1999.
[60] Information transmitted in a letter received from the Caldwell County Courthouse on behalf of the City of Luling dated March 8, 1999.
[61] Information transmitted in a letter received from the City of Lytle dated February 3, 1999.

1.10.4.20 City of New Braunfels[62]

In 1995, New Braunfels Utilities engaged the firm of CH2MHill to study the water needs of the City of New Braunfels through 2050. This study analyzed population projections from the TWDB and per capita water use data to determine future needs. The total projected water demand for New Braunfels and adjacent areas for the year 2050 was 17,668 acft/yr. The firm supply as shown in the study is 14,249 acft/yr. This supply is made up of run-of-river rights, purchased water from Canyon Reservoir and Edwards Aquifer pumping rights. The Edwards Aquifer portion of the firm supply is still contingent on the final rules and permits issued by the EAA. Until final permits are issued, the amount of Edwards Aquifer water included in the firm supply is considered a conservative estimate. The projected demand and the estimated firm supply presented indicate a shortage of firm supply for New Braunfels Utilities by the year 2050 of 3,419 acft/yr.

In order to meet the projected demand for water and alleviate the projected shortfall, New Braunfels Utilities' plans include aggressive conservation education programs, drought management by ordinance, and development of additional supply using purchased water out of Canyon Reservoir to feed an expansion of New Braunfels Utilities' water treatment plant. The projected shortfall does not include any unforeseen contracts for wholesale water sales outside the projected service area. Any contract of this nature would increase the shortfall and expedite the need to purchase water from Canyon Reservoir and expand the treatment plant.

1.10.4.21 City of Port Lavaca[63]

The City of Port Lavaca purchases its potable water from the GBRA treatment plant located approximately seven miles outside of the City. The City of Port Lavaca has no immediate plans to increase water demands; however, the City is seeking to improve its distribution system and their water storage capacity.

1.10.4.22 City of Poth[64]

The City of Poth intends to supply all future water needs by drilling additional wells in the Carrizo Aquifer.

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[62] Information transmitted in a letter received from New Braunfels Utilities dated February 12, 1999.
[63] City of Port Lavaca, "Utilities Master Plan, Section II."
[64] Information transmitted in a letter received from the City of Poth dated February 2, 1999.

1.10.4.23 City of San Marcos[65]

A 1994 study developed a plan to implement the use of 4.5 mgd of Canyon Reservoir water that the City had contracted to purchase from the GBRA. The City's long-range plan is to expand its supply to meet the projected year 2045 demand.

Assuming that a 4.5 mgd water supply from Canyon Reservoir would be developed in the near term, the 1994 study showed that the water supply available to the City could be increased by: (1) obtaining credit for the amount of groundwater that is discharged to the San Marcos River as treated wastewater; (2) purchasing additional Canyon Reservoir water; (3) purchasing senior San Marcos River water rights; and (4) if a management plan for the Edwards Aquifer is developed that allows credit for recharge enhancement, implementation of a recharge enhancement project.

The City has submitted two applications to TNRCC, one for reuse of the City's Edwards Aquifer-based wastewater from the San Marcos River, and the other for a permit to divert from the San Marcos River. The City has executed a contract with the GBRA for the development of a regional surface water supply project, including the construction by the City of San Marcos of a water treatment plant, and the construction by GBRA of a raw water transmission pipeline to the plant from the Guadalupe River. Construction of these facilities in underway and is expected to be completed in November 1999.

1.10.4.24 City of Selma[66]

The City of Selma has joined the Regional Water Resources Development Group. Through this group, the City will purchase water, if available, to meet current and future needs. The City is also looking to participate with the Cities of Schertz and Seguin to obtain water from the Carrizo Aquifer. The development of additional supplies of water from the Carrizo Aquifer would assist in meeting demands when Edwards Aquifer pumpage is reduced during drought periods. In addition, three of the City's major businesses are participating in a water reuse line that will reduce the demand on groundwater resources. To meet future water needs, the City will continue to pressure water conservation and other water supply alternatives such as obtaining surface water, but no specific surface water plan is in place.

[65] HDR Engineering, Inc., "Surface Water Supply Study," prepared for the City of San Marcos, October 1994.
[66] Information transmitted in a letter received from the City of Selma dated March 16, 1999.

1.10.4.25 City of Uvalde[67]

The City of Uvalde has no formal water plan, however the City has been working with a local water advisory committee and citizen interest groups to develop alternative supplies. The outcome of these planning sessions has centered on the purchase of property in and around the City of Uvalde, including farmland having Edwards Aquifer withdrawal permits that could supplement the City's water supply. In addition to the purchase of land, another source or alternative measure considered by the City is the potential to explore other formations for water. The City has received several offers from local landowners that are willing to donate some of their permitted Edwards Aquifer pumping rights to the City during emergencies.

1.10.4.26 City of Victoria[68]

The City of Victoria has historically obtained all of its potable water from 15 wells drilled into the Gulf Coast Aquifer. These wells have a combined capacity of 33 mgd, however, this supply contains objectionable constituents such as iron, manganese and hydrogen sulfide in sufficient quantities to cause color, taste and odor problems. In order to address water needs through the year 2040 and to improve water quality, the City of Victoria plans to convert from its current groundwater supply to a surface water supply from the Guadalupe River, which flows through the City. In January 1996, the City obtained a water rights permit to withdraw 20,000 acft/yr of surface water from the Guadalupe River. Construction of the surface water treatment facility has begun and is expected to be substantially completed by November 2000. However, the City intends to maintain its groundwater facilities for use during peak periods and emergencies. As growth develops and the City approaches the year 2040, the City plans to either increase the conjunctive use of its surface water and groundwater supplies or purchase additional surface water rights.

1.10.4.27 City of Yoakum[69]

The City of Yoakum presently obtains its water from wells in the Oakville sandstone formations of the Gulf Coast Aquifer. The City plans to continue to obtain water from this source for the next 50 years.

[67] Information transmitted in a letter received from the City of Uvalde dated February 25, 1999.
[68] Information transmitted in a letter received from the City of Victoria dated February 3, 1999.
[69] Information transmitted in a letter received from the City of Yoakum dated February 24, 1999.

1.10.4.28 Clearwater Estates Water System[70]

Clearwater Estates, located in the City of Canyon Lake, currently plans to use water pumped from the Glen Rose Aquifer to supply their anticipated fifty-year demand.

1.10.4.29 Cotulla Independent School District[71]

The Cotulla Independent School District, located in LaSalle County, plans to continue to purchase its water from the City of Cotulla.

1.10.4.30 County Line Water Supply Corporation[72]

County Line WSC, located in Hays and Caldwell Counties, is making plans to purchase surface water from GBRA, in cooperation with CRWA. At present, these plans address the needs through about 2020. Other sources may be needed after that time.

1.10.4.31 Creekwood Ranches Water Supply Corporation[73]

Creekwood Ranches WSC, located near Hondo in Medina County, currently relies on a well drilled into the Edwards Aquifer for its water supply. The WSC currently supplies water to 140 metered customers, with a maximum potential to supply 180 metered customers. Their plan is to continue to rely on water from the Edwards Aquifer.

1.10.4.32 Crystal Clear Water Supply Corporation[74]

Crystal Clear WSC, located in Comal, Hays, and Guadalupe Counties, has supplemented its Edwards Aquifer supply with additional surface water resources from New Braunfels Utilities, Canyon Regional Water Authority, and Springs Hill WSC.

1.10.4.33 Cypress Bend Water System[75]

The Cypress Bend Water System currently serves the Cypress Bend and Comanche Crossing Subdivisions located in the City of Concan in northern Uvalde County. During the summer of 1996 this area experienced some water shortages. Future plans to increase the water

[70] Information transmitted in a letter received from Clearwater Estates Water System dated February 17, 1999.
[71] Information transmitted in a letter received from Cotulla ISD dated February 3, 1999.
[72] Information transmitted in a letter received from County Line Water Supply Corp. dated February 2, 1999.
[73] Information transmitted in a letter received from Creekwood Ranches WSC dated February 5, 1999.
[74] Information transmitted in a letter received from the law offices of Louis T. Rosenberg, P.C. on behalf of Crystal Clear WSC dated February 28, 1999.
[75] Information transmitted in a letter received from the Concan WSC, dated February 23, 19999.

supply to the area include drilling an additional well in Cypress Bend and developing a water purchase agreement with Frio County Cabins and Campgrounds.

1.10.4.34 Cypress Cove Water System[76]

Cypress Cove is an independently owned water system serving the Cypress Cove area of Spring Branch, located in Comal County. Currently, the system has 194 water meter connections. The water supply system includes four wells, with an average rate of production of approximately 1.2 million gallons per month, and three 60,000-gallon storage tanks. The wells are producing from the Glen Rose and/or Trinity Aquifers. Future water supply plans include the addition of two more wells to meet future needs.

1.10.4.35 East Central Water Supply Corporation[77]

East Central WSC, located in Bexar, Guadalupe, and Wilson Counties, currently obtains 2 mgd of water from SAWS and 0.325 mgd from CRWA, in addition to their supply from the Edwards Aquifer. East Central WSC is working with other water suppliers in Guadalupe, Wilson, and Bexar Counties to develop alternate water sources. Some of these alternative water sources include Lake Dunlap, the Carrizo Aquifer through Springs Hill WSC, Cibolo Creek, Medina Lake/Medina River, extending their current contract with SAWS, and rainwater harvesting.

1.10.4.36 Fashing-Peggy Water Supply Corporation[78]

The Fashing-Peggy WSC operates two wells both completed in the Carrizo Aquifer, and supplies this water to the communities of Fashing and Peggy, both located in Atascosa County. The current system has 140 metered connections, and does not anticipate any water supply problems over the next 50 years.

1.10.4.37 Gusville Mobile Home and RV Park[79]

The Gusville Mobile Home and RV Park, located in the City of Devine, currently obtains its water from wells completed in the Carrizo Aquifer. Although the population served by this system fluctuates, at peak periods, it serves approximately 250 people. In 1998, the system

[76] Information transmitted in a letter received from the Cypress Cove Maintenance Association on behalf of the Cypress Cove Water System, dated February 10, 1999.
[77] East Central WSC, "Water Supply Program," January 31, 2000.
[78] Information transmitted in a letter received from the Fashing-Peggy WSC.

metered 3,758,201 gallons of water. As the Park's population grows, the additional need will be met with new wells.

1.10.4.38 Kendall County Water Control & Improvement District No. 1[80]

Kendall County Water Control and Improvement District No. 1 is a small water district that provides water and wastewater service to the unincorporated town of Comfort. The District currently has about 780 water and sewer connections and serves approximately 2,000 residents with its six Trinity Aquifer wells. The District's boundary contains approximately 1.5 square miles. Kendall County WCID No. 1 has no formal water plan for the next 50 years, although the District recently adopted a wastewater plan for the next 20 years to meet a critical need.

The District estimates its has enough groundwater capacity for the existing service area and an additional 100 water connections. In order to meet future needs, the District requested that the last developer seeking annexations to the District dedicate two new well sites, which the District will use to drill new middle Trinity wells in the near future. The District plans to continue to make dedication of well sites a condition of annexation into the District.

1.10.4.39 Martindale Water Supply Corporation[81]

The Martindale WSC, created in 1965, currently serves approximately 640 metered customers in a geographical area downstream from the San Marcos Springs. The supply system serves an area of approximately 8.6 square miles which includes the City of Martindale and rural areas primarily in western Caldwell County, but extending into an adjacent portion of Guadalupe County immediately across the San Marcos River to the southwest.

Martindale WSC has made a loan application to the United States Department of Agriculture to obtain sufficient funds to build an improved water treatment plant for the water from its two wells in Martindale which are completed in the Recent Alluvium Aquifer. This new facility will treat the well water to meet all current and anticipated water quality standards for drinking water, but will not be able to supply the area's needs over the fifty year planning period.

To obtain a sufficient supply of water for the future, the WSC has also entered into contracts with Maxwell WSC, County Line WSC, Crystal Clear WSC, and the Canyon Regional Water Authority to build a network of pipelines that will interconnect these contiguous systems and to build a small regional water treatment plant. The plan for this new regional plant, the

[79] Information transmitted in a letter received from Gusville Mobile Home and RV Park dated February 15, 1999.
[80] Information transmitted in a letter received from the Kendall County WCID No. 1 dated February 22, 1999.

Hays/Caldwell Water Treatment Plant, includes capability to treat water taken directly from the San Marcos River and water delivered through the GBRA raw water pipeline from Lake Dunlap to San Marcos now under construction.

Martindale WSC has also entered into a long-term lease of one of the oldest water rights on the San Marcos River for 396 acft/yr of additional supply. Its current plan is to treat the water from the San Marcos River in the Hays/Caldwell Water Treatment Plant.

1.10.4.40 Maxwell Water Supply Corporation[82]

Maxwell WSC is located in Hays and Caldwell Counties, generally west and northeast of San Marcos and west of Lockhart, and includes the community of Maxwell. The existing waterworks system is comprised of three Edwards Aquifer wells with a combined capacity of 1,850 gpm. In addition, Maxwell WSC has entered into a long-term water supply contract with the GBRA for 500 acft/yr of raw water from Canyon Reservoir, and has an agreement with the family estate of Ernest Cummings, et al, for run-of-river water rights from the San Marcos River totaling 188 acft/yr. Maxwell WSC is a participant in the Canyon Regional Water Authority's Hays/Caldwell Counties Water Regionalization Project. The present and planned systems are thought to be adequate to meet projected demands to about 2020, at which time additional supplies will be needed.

1.10.4.41 Plum Creek Conservation District[83]

Plum Creek Conservation District is a legislatively created conservation and reclamation district. Currently, the District maintains Soil Conservation Service flood control structures built by the Department of Agriculture. It does not furnish either wholesale or retail water and holds no water rights. In 1989, the Texas Legislature amended Plum Creek's statute to allow the District to exercise the powers of an underground water conservation district for all areas within its boundaries (parts of Caldwell and Hays Counties) except those portions of the Edwards Aquifer which are controlled by other entities.

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[81] Martindale WSC, "Water Plan," February 25, 1999.

[82] Information transmitted in a letter received from Taylor and Mullins, Inc. on behalf of Maxwell WSC dated February 27, 1999.

[83] Information transmitted in a letter received from the Caldwell County Courthouse on behalf of the Plum Creek Conservation District dated March 8, 1999.

1.10.4.42 San Antonio Country Club[84]

The San Antonio Country Club, located in Bexar County within the City of San Antonio, has an interim authorization from the EAA to pump approximately 266 acft/yr. The Club anticipates a future demand of 300 to 350 acft/yr, which they hope to supply using recycled water.

1.10.4.43 San Antonio Water System[85]

The San Antonio Water System (SAWS) has developed a Water Resource Plan which describes the actions that SAWS will take to meet its water needs through the year 2050. It describes the current and future water demands for the area and the potential sources of supply to meet those demands. It also discusses the policies, planning activities, and decision-making process that will guide the selection and development of water supply solutions.

Currently SAWS primary source of water is the Edwards Aquifer, with current usage at approximately 178,000 acft/yr. SAWS expects its Edwards Aquifer pumping permit to be issued for a minimum withdrawal of between 148,000 and 170,000 acft/yr.

There are two opportunities for increasing the supply available to SAWS from the Edwards Aquifer, as follows: (1) purchase or lease of other Edwards Aquifer pumping rights through water market transactions as allowed by SB1477; and (2) to increase the total supply available from the Edwards Aquifer through optimization and recharge enhancement. To date, SAWS has acquired approximately 12,000 acft/yr of Edwards Aquifer groundwater rights from other permit holders.

SAWS is implementing aggressive water conservation to reduce overall water demand, and is pursuing other water supply options including a contract with the Aluminum Company of America (ALCOA), water recycling, and the Western Canyon Regional Water Supply Project. SAWS signed a contract in December 1998 with ALCOA, in which ALCOA agreed to supply SAWS between 40,000 and 60,000 acft of water per year. See Section 1.10.7.3 for additional information on the contract. In 1996, the SAWS Board of Trustees authorized design and construction of the Recycled Water Project to recycle approximately 35,000 acft/yr of effluent from SAWS' wastewater treatment plants to water users now served from the Edwards Aquifer for non-potable purposes. These uses are principally irrigation of public parks and golf courses

[84] Information transmitted in a letter received from the San Antonio County Club dated February 23, 1999.
[85] San Antonio Water System (SAWS), "Water Resource Plan," September 29, 1998.

and industrial processing and cooling uses. SAWS will also obtain about 2,000 acft/yr of surface water from the Western Canyon Regional Water Supply project, which is currently in the permitting and design phase and is expected to be completed by GBRA in 2002.

Recommendations in the plan for future water supplies include:

- Completing feasibility studies of other groundwater sources available, such as minor aquifers in the area;
- Pursuing the developing opportunity with GBRA to asses the Guadalupe River Basin for available supplies; and
- Planning now for one or more new surface water storage projects.

1.10.4.44 Schertz-Seguin Local Government Corporation[86]

The Cities of Schertz, located partially in Guadalupe County and partially in Bexar County, and Seguin, located in Guadalupe County, have joined to create the Schertz-Seguin Local Government Corporation. This Corporation will be responsible for creating and operating a wholesale water supply system to serve the long-term needs of these two communities. The project will utilize the Carrizo Aquifer with the development of a well field primarily in Gonzales County with limited development in Guadalupe and Wilson Counties likely. It is anticipated that the system will be placed into operation in January 2002, and will meet the projected 50-year needs of these two entities.

1.10.4.45 Southwest Texas State University[87]

Southwest Texas State University is located along the banks of the San Marcos River within the corporate limits of the City of San Marcos in Hays County. Historically, Southwest Texas State University has relied on the Edwards Aquifer to meet its water supply needs. However, impending regulation of withdrawals from the Edwards Aquifer will require Southwest Texas State University to utilize alternative sources to meet present and future water needs. In recognition of future restrictions on Edwards Aquifer pumpage, Southwest Texas State University secured water from Canyon Reservoir in 1989 by contracting with GBRA for 500 acft/yr of stored water from the reservoir. An October 1998 study concerning Southwest

[86] Information transmitted in a letter received from the Schertz-Seguin Local Government Corporation dated February 24, 1999.

[87] HDR, "Southwest Texas State University Water Supply Study," prepared for SWTSU, October 1998.

Texas State University's current and future water supply needs identified the following options for meeting future needs:

- Maximize the use of water from the Edwards Aquifer, as it is the lowest cost supply source for Southwest Texas State University;
- Consider the development of a project to utilize existing water rights from the San Marcos River for irrigation of athletic facilities that are presently supplied through the purchase of treated water from the City of San Marcos; and
- Begin negotiations with GBRA and the City of San Marcos to obtain treated surface water from Canyon Reservoir under Southwest Texas State University's existing contract for stored water via the raw water delivery system, surface water treatment plant, and transmission system currently being implemented by GBRA and the City.

1.10.4.46 Sutherland Springs Water Supply Corporation[88]

The Sutherland Spring WSC, located in northern Wilson County, relies on the Carrizo Aquifer as a sole source of water. Currently, their future plans are to continue to use this source as the sole water supply. The proposed Cibolo Reservoir Project would be partially in their service area and could afford the means to convert some of their demand to surface water.

1.10.4.47 Texas Parks and Wildlife Department[89]

The Texas Parks & Wildlife Department (TPWD) has many facilities in the planning region, however, in a letter from TPWD, only two facilities were described: Garner State Park, in Uvalde County, and Hill Country State Natural Area, in Bandera and Medina Counties.

[88] Information transmitted in a letter received from Sutherland Springs WSC dated February 1, 1999.
[89] Information transmitted in a letter received from the TPWD dated February 26, 1999.

Garner State Park has a well extending 1,080 feet below the ground surface into the Trinity Aquifer. The well currently produces 38,000 gallons per day on an annual average. At this time, no plans for future development are expected to cause park visitation or water usage to rise significantly above current levels.

Hill County State Natural Area currently has no potable water system, however a plan has been established to drill and develop a well in the near future.

1.10.4.48 The Oaks Water Supply Corporation[90]

The Oaks WSC is a non-profit cooperative supplying water to the subdivisions of Scenic Oaks and Country Estates, located near Leon Springs in Bexar County. The Oaks WSC currently has six operating wells that supply all of their water from the Cow Creek and Sligo Hosston Aquifers. The Oaks WSC has no plans to add more wells, but does have an active project to increase their storage capability, increase efficiency/effectiveness of their distribution system, and upgrade some wells.

1.10.4.49 Western Trails Village[91]

Currently, Western Trails Village, located near San Antonio in Bexar County, obtains all of their potable water from a single well. The Board of Trustees of Western Trails Village has put forth two options should their current well not last over the next 50 years. These two options are to drill an additional well or to obtain water from the City of San Antonio. Western Trails Village is a limited-space park, and therefore does not anticipate any future increases in its population. They also currently maintain a fund to keep the current well maintained.

1.10.4.50 Springs Hill Water Supply Corporation[92]

Springs Hill Water Supply Corporation (WSC) is a retail and wholesale water supplier serving customers located primarily in Guadalupe County. The projected year 2050 water demands of Springs Hill WSC are 6,070 acft/yr. Springs Hill's plan to meet these needs is to obtain approximately 2,950 acft/yr from the Guadalupe River, and approximately 3,020 acft/yr from the Carrizo Aquifer in Guadalupe County.

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[90] Information transmitted in a letter received from the Oaks WSC dated February 1, 1999.
[91] Information transmitted in a letter received from Western Trails Village dated February 9, 1999.
[92] Springs Hill WSC, "Water Supply Program—2000-2050," February 28, 2000.

1.10.5 Water Conservation and Drought Contingency Plans

1.10.5.1 Aqua Water Supply Corporation[93]

This drought contingency plan was adopted by the Aqua WSC Board of Directors on September 13, 1999. Although the majority of the Aqua WSC service area lies within the Lower Colorado Water Planning Area, a small portion lies within the South Central Texas Region. The Corporation's Drought Contingency Plan outlines the Corporation's drought and emergency contingency procedures and identifies the triggering criteria for initiation and termination of drought response stages as well as the water use restrictions in effect during times of water shortages. It is the goal of this plan to achieve a voluntary reduction in daily water demand sufficient to stabilize water levels in key water storage tanks at safe operating levels during "mild water shortage conditions" and to achieve a reduction in daily water demand sufficient to meet basic water needs for public health and safety during "emergency water shortage conditions." To achieve these goals, the plan contains restrictions on water use to be in effect during water shortages that include irrigation of landscaped areas, use of water to wash any motor vehicle, operation of any ornamental fountain or pond, and other restrictions on outdoor water use.

1.10.5.2 Atascosa Rural Water Suppy Corporation[94]

The Atascosa Rural WSC's Drought Contingency Plan contains a voluntary water conservation plan and an emergency drought management plan. The voluntary water conservation plan is always in effect and urges residents to check for leaks and from May 1 to September 30 to only water lawns during the early morning or late evening. In emergency drought conditions, the emergency drought management plan will take the place of the voluntary plan. The triggering criteria for the emergency drought management plan is based on the Edwards Aquifer Authority rules and regulations and contains restrictions on lawn watering, filling swimming pools, and using water in an ornamental fountain.

1.10.5.3 Bexar Metropolitan Water District[95]

BMWD's Retail Supplier Drought Contingency Plan outlines drought and emergency contingency procedures and identifies the triggering criteria for initiation and termination of

[93] Aqua Water Supply Corporation, "Drought Contingency Plan," September 13, 1999.
[94] Atascosa Rural WSC, "Drought Contingency Plan," May 10, 2000.
[95] Bexar Metropolitan Water District, "Retail Supplier Water Conservation Plan," and "Wholesale Supplier Water Conservation Plan," August 30, 1999.

drought response stages as well as the water use restrictions in effect during times of water shortages. It is the goal of this plan to reduce total water use by 5 percent during “mild water shortage conditions” and 15 percent during “severe water shortage conditions.” To achieve these goals, the plan contains restrictions on water use to be in effect during water shortages that include irrigation of landscaped areas, operation of any ornamental fountain or pond, and other restrictions on outdoor water use.

BMWD’s Wholesale Supplier Drought Contingency Plan contains regulations and restrictions on the delivery and consumption of water by the wholesale customers of BMWD during times of water shortages. It is the goal of this plan to reduce total water use by 5 percent during “mild water shortage conditions” and 20 percent during “critical water shortage conditions.”

1.10.5.4 Canyon Regional Water Authority[96]

The purpose of Canyon Regional Water Authority’s (CRWA) water conservation plan is to increase water use efficiency and reduce water waste. In order to increase water use efficiency and reduce water waste, CRWA has set the following goals:

- Encourage the development of water conservation plans and drought management plans for each member entity;
- Achieve an overall average CRWA member entities per capita water use of 120 gpcd by planning year 2020 and 114 gpcd by planning year 2050;
- Utilize the “averaging concept” in the commitment of treated water in order to stretch the supply of treated water;
- Encourage member entities seeking additional water supplies to develop these water supplies based on a firm yield;
- Encourage the development of criteria for use of treated wastewater for irrigation of golf courses and athletic fields;
- Establish criteria for increased metering to track and manage water supplies; and
- Develop and implement an Annual Water Use Report for all systems which purchase treated water from CRWA.

CRWA’s Drought Contingency Plan defines trigger conditions and drought contingency measures for each of the three water supply types utilized by CRWA’s member entities (surface water systems, Edwards and related aquifers, and the Carrizo and Leona Gravel Aquifers). For

[96] Taylor and Mullins, Inc., “Water Conservation and Drought Management Plan,” Canyon Regional Water Authority, July 1999.

each type of water supply the plan defines three trigger stages and the associated contingency measures that will be taken during each of the drought stages.

1.10.5.5 Canyon Springs Water Company[97]

The Drought Contingency Plan for Canyon Springs Water Company, located near Canyon Reservoir in Comal County, provides the framework to identify those periods in which water shortages exist, and to take actions to curtail water usage during periods of drought and other water shortages. The plan contains five stages of water use curtailment ranging from a mild water shortage condition to an emergency water shortage condition. The stages are triggered by fluctuations of the Bexar County monitoring well (J-17) maintained by the EAA. Under this plan, increasingly stringent water use restrictions will accompany each declared stage during a water shortage.

1.10.5.6 Cattleman's Crossing Water System[98]

The Cattleman's Crossing Water System's Drought Contingency Plan defines trigger conditions for the plan to take effect and sets goals to reduce water use during times of drought or other water shortages. Three different conditions have been defined based upon the level of the Medina Well #TD-69-47-306. The water reduction goals in the plan range from five percent during a stage I shortage to 25 percent for a stage III water shortage. This plan also initiates an increase in the System's water rates in periods of drought when stage II or stage III are declared.

1.10.5.7 City of Converse[99]

The City of Converse Water Conservation Plan formalizes the concept for reducing the City's dependence on Edwards Aquifer groundwater to meet current and projected water demands. The plan is based on two precepts. The first is to reduce demand by initiating conservation practices within current production capacity. The second is to substitute untreated surface water from a local source for Edwards Aquifer water used in industrial processing, general irrigation, and outdoor discretionary uses. The savings in Edwards Aquifer water can be reserved to support projected growth and reduce the demands on future groundwater production.

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[97] Canyon Springs Water Company, "Drought Contingency Plan for Canyon Springs Water Company," May 15, 1999.
[98] Cattleman's Crossing Water System, "Drought Contingency Plan."
[99] City of Converse, "City of Converse Water Conservation Plan," January 4, 1999.

After a test program was completed in the summer of 1998, the City reported that the program demonstrated that significant conservation of Edwards Aquifer groundwater could be achieved by substituting non-potable surface waters. The City plans to accomplish this task through a four-phase program that will involve installation of pumps to divert water from Saltrillo Creek into a distribution network to supply the City with non-potable surface water. By using surface water to replace industrial and discretionary use of Edwards Aquifer water, the City expects to conserve 797 acft/yr of Edwards Aquifer water when all four phases are complete.

1.10.5.8 City of Fair Oaks Ranch[100]

The City of Fair Oaks Ranch's Drought Contingency Plan provides specific criteria for the initiation and termination of drought response stages. Static water levels in the Fair Oaks Ranch Utilities Well #20 as well as average daily production values are the trigger mechanisms for the various stages of the drought plan. During the various stages of the drought plan, the City may impose surcharges on water use above a specified amount as well as implementing other measures designed to lower water use.

1.10.5.9 City of Garden Ridge[101]

The City of Garden Ridge's Drought Contingency Plan provides specific criteria for the initiation and termination of demand reduction measures and a full description of the measures required in each stage in order to comply. The plan has procedures for granting variances and procedures for the enforcement of any mandatory use restrictions. Specific levels of the Edwards Aquifer, measured by the J-17 well, are the trigger mechanisms for the various stages of the drought plan. During the various stages of the drought plan, the City may restrict or prohibit the use of water for landscape watering, ornamental outdoor fountains, vehicle washing, and the filling of swimming pools.

1.10.5.10 City of Goliad[102]

The City of Goliad Drought Contingency Plan defines trigger conditions for the plan to take effect. Six different conditions have been defined based upon storage in the City's off

[100] City of Fair Oaks Ranch, "Drought Contingency Plan for the City of Fair Oaks Ranch," September 1, 2000.
[101] City of Garden Ridge, "Municipal Ordinance Number 61, Drought Management Plan," July 1, 1998.
[102] City of Goliad, "Drought Contingency Plan," July 19, 2000.

channel reservoirs. These conditions are a mild water shortage condition, moderate water shortage condition, severe water shortage condition, critical water shortage condition, emergency water shortage condition, and water allocation condition. Under mild water shortage conditions, water conservation measures will be voluntary. Under moderate water shortage conditions, water conservation measures will be mandatory and will include the reduction of certain outdoor water uses. Under severe water shortage conditions, water conservation will be mandatory and the City will require curtailment of outdoor water uses. Lawn watering will be reduced through a mandatory odd/even house address schedule. During a critical water shortage water use for car washing and for filling or refilling pools is prohibited. During an emergency water shortage condition, the goal of the plan is to achieve a 40 percent reduction in daily water use. In the event that water shortage conditions threaten public health, safety, or welfare, the Mayor may allocate water supplies based upon guidelines contained in the plan.

1.10.5.11 City of Gonzales[103]

The City of Gonzales currently has strategies for reducing water consumption which include a rate structure discouraging the excess use of water, metering devices with an accuracy of plus or minus five percent, radio advertisements highlighting water conservation tips, and others. Gonzales intends to reduce water consumption in its service area by 9.5 percent, from 301 gpcd to 272 gpcd by the year 2040. In order to achieve this goal, the city will periodically distribute water conservation literature to the citizens of Gonzales, continue radio announcements giving water conservation tips, continue to replace old meters, test all meters periodically, continue regular inspection of water lines, continue unaccounted for losses of less than 15 percent, continue a water rate structure discouraging excess water consumption, research developing a water recycling and reuse program, and research adopting water saving amendments to the Plumbing Code.

1.10.5.12 City of New Braunfels[104]

The City of New Braunfels' Drought Contingency Plan provides specific criteria for the initiation and termination of drought response stages and a full description of the measures required in each stage in order to comply. The plan has procedures for granting variances,

[103] Hunter Associates Texas, Ltd., "Water Conservation Plan," City of Gonzales, August 1999.
[104] New Braunfels Utilities, "Drought Contingency Plan for Municipal Users by Public Water Suppliers," and "Water Conservation Plan for Municipal Users by Public Water Suppliers," August 1999.

procedures for notification of the public of the initiation or termination of the drought response stages, and procedures for the enforcement of any mandatory use restrictions. Specific spring flows of the Comal River and specific levels of the Edwards Aquifer are the trigger mechanisms for the various stages of the drought plan. During the various stages of the drought plan, the City may restrict or prohibit the use of water for landscape watering, ornamental outdoor fountains, vehicle washing, and the filling of swimming pools.

The goal of the City's water conservation plan is to educate the public on how and why they need to conserve water, create incentives to conserve through the water rate structure, and provide meaningful year-round conservation rules. In order to realize the City's water conservation goal, the City is undertaking several programs to conserve water which include:

- Installing metering devices which have an accuracy of plus or minus five percent to measure and account for the amount of water diverted from the source supply;
- A program for universal metering of both customer and public uses of water;
- A program for water meter testing, repair, and periodic replacement;
- Measures to determine and control unaccounted-for uses of water including visual inspection along distribution lines, determining illegal connections, and abandoned services;
- Continuing public education and information regarding water conservation; and
- Water rate structures that are cost-based and which do not encourage the excessive use of water.

1.10.5.13 City of Schertz[105]

The City of Schertz's Drought Contingency Plan provides specific criteria for the initiation and termination of demand reduction measures and a full description of the measures required in each stage in order to comply. The plan has procedures for granting variances and procedures for the enforcement of any mandatory use restrictions. Specific levels of the Edwards Aquifer, measured by Bexar County Observation J-17 Well, are the trigger mechanisms for the various stages of the drought plan. During the various stages of the drought plan, the City may restrict or prohibit the use of water for landscape watering, ornamental outdoor fountains, vehicle washing, and the filling of swimming pools.

[105] City of Schertz, "Drought Contingency Plan for the City of Schertz."

1.10.5.14 City of Seguin[106]

It is the goal of the City of Seguin's Water Conservation Plan to reduce water consumption by all customers. To reduce consumption of water by all customers, the City of Seguin promotes water conservation through Education and Information, Water Conserving Landscaping, Leak Detection and Repair, Universal Metering, Rate Structure, Recycling and Reuse, Retrofit Programs, Plumbing Codes, and Implementation and Enforcement.

The objective of the City's emergency water demand management plan provides procedures for voluntary and mandatory actions to be placed into effect to temporarily reduce the demand placed upon the City of Seguin's water supply system during a water shortage emergency. Emergency demand procedures include conservation, but also includes prohibition of certain uses. The City of Seguin has established a set of trigger or threshold conditions that indicated when contingency measures need to be put into effect.

1.10.5.15 City of Stockdale[107]

The City of Stockdale Drought Contingency Plan defines trigger conditions for the plan to take effect based upon the level of wells and surface water supplies and the capability of the system to deliver the required quantities of water. The plan describes what combination of trigger conditions are necessary to initiate each of the three water shortage conditions outlined in the plan. Under mild water shortage conditions, the goal of the plan is to achieve a 10 percent reduction in daily water demand through voluntary measures. Under moderate water shortage conditions, water conservation measures will be mandatory and will include the reduction of certain outdoor water uses. Under severe water shortage conditions, water conservation will be mandatory and the City will require that the irrigation of landscaped areas be terminated.

1.10.5.16 City of Victoria[108]

The City of Victoria Drought Contingency Plan defines trigger conditions for the plan to take effect. Four different conditions have been defined based upon storage in the City's off channel reservoirs. These conditions are a mild water shortage condition, moderate water shortage condition, severe water shortage condition, and critical water shortage condition. Under

[106] City of Seguin, "Water Conservation Plan," March 1996.
[107] City of Stockdale, "Drought Contingency Plan for the City of Stockdale," April 3, 2000.
[108] City of Victoria, "Drought Contingency Plan," August 27, 1999.

mild water shortage conditions, water conservation measures will be voluntary. Under moderate water shortage conditions, water conservation measures will be mandatory and will include the reduction of certain outdoor water uses. Under severe water shortage conditions, water conservation will be mandatory and the City will require curtailment of outdoor water uses. Lawn watering will be reduced through a mandatory odd/even house address schedule. During a critical water shortage water use for car washing and for filling or refilling pools is prohibited.

1.10.5.17 Crystal Clear Water Supply Corporation

Crystal Clear WSC's Drought Contingency Plan[109] outlines the Corporation's drought and emergency contingency procedures and identifies the triggering criteria for initiation and termination of drought response stages as well as the water use restrictions in effect during times of water shortages. It is the goal of this plan to reduce total water use by 5 percent during "mild water shortage conditions" and 15 percent during "severe water shortage conditions." To achieve these goals, the plan contains restrictions on water use to be in effect during water shortages that include irrigation of landscaped areas, operation of any ornamental fountain or pond, and other restrictions on outdoor water use.

Crystal Clear WSC's Water Conservation Plan[110] includes five goals for the conservation of water by all of its customers and includes promoting water conservation and public education. The Corporation's water conservation objectives are to:

- Derive the highest beneficial use from water diverted or produced;
- Achieve efficient water-use in its production, storage and distribution systems;
- Promote efficient water-use among its customers;
- Provide adequate water of consistent and good quality at affordable costs;
- Reduce peak demands for water among its customers; and
- Prevent water losses through an aggressive, system-wide program of inspection and maintenance.

1.10.5.18 E.I. du Pont de Nemours and Company, Inc., Victoria Plant[111]

The du Pont Victoria petrochemical plant utilizes water in many ways to manufacture nylon intermediate chemicals, organic and inorganic chemicals, and polyethylene. The Victoria

[109] C. Thomas Koch, Inc., "Drought Contingency Plan," Crystal Clear WSC, August 19, 1999.
[110] Southwest Engineers, Inc., "Water Conservation Plan" and "Water Supply Program," Crystal Clear WSC, July 20, 2000.
[111] Manning Engineering Group, "Water Conservation Plan and Data Survey," E.I. du Pont de Nemours and Company, Inc., Victoria Plant, August 1999.

plant obtains water from the Guadalupe River, groundwater, and rainfall, which it then uses for cooling, process manufacturing, fire fighting, and personnel needs. The du Pont Company has made changes in the raw water cooling system to improve the recirculation rate. This improvement is expected to decrease the amount of diverted surface water by as much as 20 percent at the end of the year 2000.

1.10.5.19 El Oso Water Supply Corporation[112]

This plan has two components, the Water Conservation Plan and the Drought Contingency Plan. The El Oso Water Supply Corporation's long term water conservation plan is to enact policies that with the cooperation of all members will achieve the maximum amount of water conservation. The goals of the drought contingency plans are to establish a set of procedures initiated by certain conditions to prevent the loss of water supply to any customer during periods of high demand or low supply.

1.10.5.20 Green Valley Special Utility District[113]

Green Valley SUD's Drought Contingency Plan outlines the District's drought and emergency contingency procedures and identifies the triggering criteria for initiation and termination of drought response stages as well as the water use restriction in effect during times of water shortage. It is the goal of this plan to reduce total water use by 10 percent during "mild water shortage conditions" and 20 percent during "severe water shortage conditions." To achieve these goals, the plan contains restrictions on water use to be in effect during water shortages that include irrigation of landscaped areas, operation of any ornamental fountain or pond, and other restriction on outdoor water use.

1.10.5.21 Guadalupe-Blanco River Authority[114]

The Guadalupe-Blanco River Authority's Drought Contingency Plan defines trigger conditions for the plan to take effect and sets goals to reduce water use during times of drought or other water shortages. Four different conditions have been defined based upon the level of storage in Canyon Reservoir or other water supply emergencies such as system failure or contamination of the water supply source. These conditions are a mild water shortage condition,

[112] El Oso Water Supply Corporation, "Water Conservation and Drought Management Plan," March 14, 2000.
[113] C. Thomas Koch, Inc., "Drought Contingency Plan," Green Valley SUD, August 19, 1999.
[114] Guadalupe-Blanco River Authority, "Drought Contingency Plan," August 5, 1999.

moderate water shortage condition, severe water shortage condition and emergency water shortage condition. GBRA's water reduction goals range from five percent during a mild water shortage to 15 percent for a severe water shortage. During each water shortage condition GBRA will calibrate and review the operation of all available stream gauges and implement water delivery procedures to improve efficiency of the delivery of water from storage.

1.10.5.22 Kendall County Water Control & Improvement District No. 1[115]

The Kendall County WCID No. 1 Drought Contingency and Water Rationing Plan is designed to conserve groundwater supplies obtained from the Cow Creek formation during dry weather and high water usage periods. The level of the Cow Creek formation is measured in a monitoring well, which is owned by the District, but is not used for water production. When the monitoring well reaches 100 feet from the surface, the Manager will issue public notice advising the customers that the groundwater level is falling. Customers will be asked not to water lawns and gardens between the hours of 10:00 a.m. and 7:00 p.m. and to survey their property to check for leaks, drips, and faulty commode valves. If the water level continues to decline, other measures are instituted, such as restrictions on washing cars, and certain methods for watering lawns.

1.10.5.23 Martindale Water Supply Corporation[116]

The Martindale WSC's Water Conservation and Emergency Demand Plan has two components – the long term Water Conservation Plan and the Emergency Water Demand Management Plan. The goals of the Water Conservation Plan include reducing water usage to no more than 10,000 gallons per connection per month, limiting peak water use during the month of May through September, and reducing unaccounted for water to less than ten percent of that supplied. The goal of the Emergency Water Demand Management Plan is to cause a reduction in water use in response to emergency conditions. This plan contains trigger conditions and their accompanying water use restrictions.

[115] Kendall County WCID No. 1, "Drought Contingency & Water Rationing Plan," August 12, 1993.
[116] Martindale WSC, "Water Conservation and Emergency Demand Plan."

1.10.5.24 Oak Hills Water Supply Corporation[117]

The Oak Hills WSC's Water Conservation Plan includes three goals for the conservation of water by all of its customers and includes promoting water conservation and public education. These three goals include replacing old water lines, testing and replacing faulty water meters, reducing per capita consumption to near 100 gpcd, and periodic mail outs with conservation tips.

The Corporation's Drought Contingency Plan provides specific criteria for the initiation and termination of demand reduction measures and a full description of the measures required in each stage in order to comply. The plan has procedures for granting variances and procedures for the enforcement of any mandatory use restrictions. During the various stages of the drought contingency plan, the Corporation may restrict or prohibit the use of water for landscape watering, ornamental outdoor fountains, vehicle washing, and the filling of swimming pools.

1.10.5.25 San Antonio Water System[118]

The San Antonio Water System's Water Conservation and Reuse Plan serves as a guide to long-range decision making and day-to-day operations through explicit statements of policy and the identification of specific strategies of policy implementation. The SAWS conservation goal states, "Conservation is to be treated as a source a water, with a goal of reducing total regional water demand by the year 2007." In order to accomplish these conservation savings, SAWS has set a short term goal of reducing per capita water use to 140 gpcd by the year 2008 along with the following long-term goals listed below:

- Increase the public's awareness of water-saving methods, in order to encourage customers to voluntarily conserve water, thus reducing Edwards Aquifer use;
- Reduce existing customers' water usage by encouraging landscape improvements and replacement of inefficient plumbing fixtures;
- Decrease water consumption among new customers by requiring water efficient plumbing fixtures and xeriscaping in new construction;
- Maximum use of recycled wastewater for non-potable needs;
- Utilize conservation rates and incentives to modify the long-term water use patterns of SAWS' customers and to encourage on-site industrial reuse;
- Maintain unaccounted-for water totals at rates lower than the national average; and
- Reduce the peaks in per capita usage during drought periods.

[117] Southwest Engineers, Inc., "Water Conservation Plan" and "Drought Contingency Plan," Oak Hills WSC, July 11, 2000.
[118] San Antonio Water System, "Water Conservation and Reuse Plan," November 1998.

Reuse of treated municipal wastewater for irrigation is also a part of the SAWS Conservation and Reuse Plan designed to reduce the use of potable groundwater for non-potable applications. A major goal of this part of the plan is to virtually eliminate the use of groundwater for irrigation and stream augmentation while preserving the integrity of the Edwards Aquifer.

SAWS current and anticipated water conservation programs are divided into seven program areas. Residential programs, which serve 91 percent of SAWS customers, are further subdivided into Indoor and Outdoor Programs. Commercial/Institutional/Industrial Programs serve the other nine percent of customers. All three of these program areas provide financial incentives for equipment retrofits as wells as education programs. In addition, two program areas provide educational efforts targeted for those of school age and for education and outreach to adults. SAWS also has a metering and monitoring program for assisting with efficiency throughout the system, while the Agricultural Program provides incentives and research funds to assist in reducing demand regionally on the Edwards Aquifer.

1.10.5.26 Sutherland Springs Water Supply Corporation[119]

The S.S. WSC's water conservation plan includes nine goals for the conservation of water by all of its customers and includes promoting water conservation and public education. The Corporation's water conservation objectives are to:

- Derive the highest beneficial use from water diverted or produced;
- Achieve efficient water-use in its production, storage and distribution systems;
- Promote efficient water-use among its customers;
- Provide adequate water of consistent and good quality at affordable costs;
- Reduce peak demands for water among its customers; and
- Prevent water losses through an aggressive, system-wide program of inspection and maintenance.

The Corporation's Drought Contingency Plan provides specific criteria for the initiation and termination of demand reduction measures and a full description of the measures required in each stage in order to comply. The plan has procedures for granting variances and procedures for the enforcement of any mandatory use restrictions. During the various stages of the drought contingency plan, the Corporation may restrict or prohibit the use of water for landscape watering, ornamental outdoor fountains, vehicle washing, and the filling of swimming pools.

[119] Southwest Engineers, Inc., "Water Conservation Plan" and "Drought Contingency Plan," Sutherland Springs Water Supply Corporation, June 12, 2000.

1.10.5.27 3-G Water Company, Inc.[120]

The 3-G Water Company, Inc. Drought Contingency Plan defines trigger conditions for the plan to take effect and sets goals to reduce water use during times of drought or other water shortages. Three different conditions have been defined based upon the level of the J-17 index well or flow in the Comal River. These conditions are a mild water shortage condition, moderate water shortage condition, and severe water shortage condition. 3-G Water Company's water reduction goals range from five percent during a mild water shortage to 15 percent for a severe water shortage.

1.10.5.28 Zavala-Dimmit Counties Water Improvement District No. 1[121]

The Zavala-Dimmit Counties Water Improvement District No. 1 is a Chapter 58 Irrigation District with 28,000 acft of water appropriated by the State of Texas. The District's water conservation plan outlines measures that irrigators operating within the can take to reduce water usage. These measures include maintaining diversion points and conveyance systems in a leak free condition and reducing tail water loss by construction tail water pits to capture excess water for recycling. The District's drought contingency plan outlines the procedures the District will follow during times of drought to allocate water to its customers.

1.10.6 Water Quality Programs

1.10.6.1 Seco Creek Water Quality Demonstration Project[122]

The Seco Creek Water Quality Demonstration Project is located in the Nueces River Basin, where Seco Creek flows across the recharge zone of the Edwards Aquifer. The project area is includes portions of Medina and Uvalde Counties inside of the planning region. This project is led by the Texas Agricultural Extension Service, Natural Resource Conservation Service, and the Farm Service Agency. Project personnel work to develop and demonstrate practices that reduce or prevent pollution and improve water quality, while water conservation and efforts to increase water yields are encouraged through educational programs and demonstrations.

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[120] 3-G Water Company, Inc., "Drought Contingency Plan for the Investor Owned Utility 3-G W.C., Inc.," June 30, 2000

[121] Zavala-Dimmit Counties WID No. 1, "Water Conservation Plan" and "Drought Contingency Plan," August 2, 1999.

Projects to increase water yields include a catchment and recharge structure designed to hold an inch of runoff from a 40-acre rangeland watershed allowing more water to be recharged into the Edwards Aquifer. Another source of increasing water availability has been investigated through studies that evaluated the effects of removing ashe juniper on the soil-water balance on rangelands in the study area.

Educational material and programs have also been developed for public school students. More than 2,000 students from the surrounding school districts have been exposed to the program. Project personnel also conducted 260 tours for more than 50,000 people from the United States and many foreign countries since the beginning of the project.

1.10.6.2 Seco Creek-Edwards Regional Water Partnership[123]

Out of this original project has grown an expanded project, the Seco Creek-Edwards Regional Water Partnership. This project will expand the Seco Creek Water Quality Demonstration Project's boundaries through the use of "satellite" locations in the 13 counties of the Edwards region (Bandera, Bexar, Blanco, Comal, Edwards, Gillespie, Hays, Kendall, Kerr, Kinney, Medina, Real, and Uvalde). This project will be a collaborative, multi-disciplinary and multi-agency effort addressing regional resource management and land use concerns, with water being the unifying issue. The new project will seek to accomplish four goals:

- Utilize grassroots inputs to coordinate and focus agency educational and technical assistance efforts on regional water quality and related resource management issues;
- Demonstrate resource management practices that improve water quality and availability while sustaining other resources and meeting the economic needs of individuals and communities;
- Establish and maintain a clearinghouse for educational, research, and management information to help land managers and policy makers make informed decisions; and
- Provide an educational forum to help other resource management personnel from state and federal agencies gain hands-on experience to learn how to effectively implement collaborative programs that address resource management issues among diverse audiences on a watershed scale.

[122] Texas Agricultural Extension Service, National Resource Conservation Service, and FSA, in cooperation with the Texas State Soil and Water Conservation Board and local soil and water conservation districts, "Seco Creek Water Quality Demonstration Project," January 1998.
[123] Ibid.

1.10.7 Summary of Other Information Available from Existing Local/Regional Planning

1.10.7.1 Comal County[124]

Comal County, as a governmental entity, does not operate a water delivery system. However, Comal County is taking steps to secure a dependable water supply and to protect the quantity and quality of existing water resources within the county. Comal County supports the creation of a multi-county groundwater conservation district for those portions of the Trinity Aquifer underlying Comal, Kendall, Blanco, Bexar, Hays, and Travis Counties. However, because of a lack of support for the multi-county concept in surrounding counties, Comal County sent a bill to the 76th Legislature for the creation of a Comal County Groundwater Conservation District, which was not approved by the Legislature.

1.10.7.2 Wastewater Contract Between the City Public Service Board of San Antonio and the Alamo Conservation and Reuse District[125]

The Alamo Conservation and Reuse District is empowered to convey wastewater to any public or private entity within its boundaries for the purpose of reuse of wastewater in order to augment the supply of water from the Edwards Aquifer. Under this contact the Alamo Conservation and Reuse District has agreed to convey and deliver 40,000 acft/yr of treated wastewater to the City of San Antonio's City Public Service Board (CPSB). This water is being used by CPS in the generation of electric power. Under this agreement, CPS is not permitted to resell any of the wastewater acquired, except to the extent of pre-existing commitments under its contract with Golden Aluminum and the additional resale of 2,000 acft/yr to users located within one-half mile of Calaveras and Braunig Lakes.

1.10.7.3 Water Supply Contract between the Aluminum Company of America (ALCOA) and the San Antonio Water System[126]

A water supply contract between ALCOA and SAWS will provide SAWS an amount of water not to exceed 60,000 acft/yr. ALCOA will obtain this water from wells located in the Carrizo Aquifer in Bastrop and Lee Counties. SAWS may use the water obtained under this contract in any manner it chooses. This contract will be in effect until December 31, 2040,

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[124] Information transmitted in a letter from the Comal County District Attorney's Office dated February 25, 1999.
[125] "Wastewater Contract Between the City Public Service Board and Alamo Conservation and Reuse District," September 1990.
[126] "Water Supply Contract Between Aluminum Company of American and San Antonio Water System," December 31, 1998.

unless the date is extended at that time. See Section 1.10.4.43 for a description of SAWS' Water Resource Plan.

1.11 Water Availability Requirements Promulgated by a County Commissioners Court

Due to the limited groundwater availability from the Trinity Aquifer in the Hill Country area of Texas, the TNRCC has declared a portion of the Texas Hill Country that overlies the Trinity Aquifer, including Kendall County, as the Hill Country Priority Groundwater Management Area (HCPGMA). In response to this designation, the County Commissioners Court of Kendall County has enacted Ordinance Number 203.860 which requires that the "developer of a proposed platted area shall provide evidence that an adequate supply of water of sufficient quantity and quality is available to supply the number of equivalent units proposed for the platted area in accordance with 'Exhibit A' of the Cow Creek Groundwater Conservation District rules."

Exhibit A of the Cow Creek Groundwater Conservation District's (CCGCD) rules provides developers in Kendall County with guidelines for developing land that will correlate the proposed lot size and development density with the anticipated groundwater availability. When a development is proposed within an area of the CCGCD where there is limited data on the availability of groundwater resources, developers must develop sufficient additional data in order to determine that an adequate supply of water would exist when the proposed development is fully built-out. In most instances the District requires a Water Availability Report to be completed for the proposed development. The Water Availability Report must show the formations to be considered as a water supply, estimates of the quantity of water a typical domestic well within the development would produce, and a statement of water quality to be expected based on existing well data. In addition to this requirement, in some instances, the District requires test and monitor wells to be drilled and pump tested to determine the water availability for the proposed development.

1.12 Current Preparations for Drought

Under requirements of SB1, 1997 Texas Legislature, drought contingency plans are required by the TNRCC for wholesale water suppliers, irrigation districts, and retail water suppliers. In January 1999, the SCTRWPG requested that representatives of each city and water conservation district of the region forward a copy of any available water plans or water management documents. Approximately 70 responses were received, of which 21 were groundwater management plans or drought contingency plans (See Sections 1.10.3 and 1.10.5). SB1 also requires that TNRCC require surface water right holders that supply 1,000 acre-feet or more of water for non-irrigation use and 10,000 acre-feet per year for irrigation use prepare a water conservation plan. In addition, conservation plans are commonly included in the management plans of underground water conservation districts.

All drought contingency plans are required to set triggering criteria for initiation and termination of drought response stages and contain supply and demand management measures to be implemented during each stage. The retail and wholesale water suppliers' plans contain measures to limit or restrict the use of water for purposes such as the irrigation of landscaped areas, to wash any motor vehicle, to fill or add water to any indoor or outdoor swimming pool, operation of any ornamental fountain, and the irrigation of golf course greens, tees, and fairways.

The underground water conservation district management plans also contain conservation plans that set goals and objectives for conserving groundwater within the district. The districts use methods such as requiring wells in areas that are in danger of over producing groundwater and damaging the aquifers to restrict production by means of production permits, metering the amount of water produced, and by working with water utilities, agricultural, and industrial users within the district to promote the efficient use of water.

The San Antonio Water System's Water Conservation and Reuse Plan aims to reduce the impacts of drought in the San Antonio area of the South Central Texas Region by water conservation programs for its customers (See Section 1.10.5.8). One of the goals of this plan is to increase the public's awareness of water-saving methods, in order to encourage customers to voluntarily conserve water, thus reducing Edwards Aquifer use. Reuse of treated municipal wastewater for irrigation is also a part of the SAWS Conservation and Reuse Plan designed to reduce the use of potable groundwater for non-potable applications. A major goal of this part of the plan is to virtually eliminate the use of groundwater for irrigation and stream augmentation while preserving the integrity of the Edwards Aquifer.

In response to the passage of SB1477 by the 73rd Texas Legislature, the Edwards Aquifer Authority is in the process of developing a Critical Period Management Plan to address aquifer usage during times of drought. This plan, when adopted, will apply to all applicants or holders of regular permits, the customers of all permittees who are retail water utilities, and owners of exempt wells. Under the plan, during times of drought, water use restrictions will be placed into effect, as appropriate and necessary.

The South Central Texas Regional Water Plan relies upon local water management agencies and water utilities drought contingency plans to identify factors specific to each source of water supply to be considered in determining whether to initiate a drought response, and actions to be taken as part of the response.

Section 2
Population and Water Demand Projections

In order to develop water plans to meet future water needs, it is necessary to make projections of future population and water demands for the region. For purposes of the South Central Texas Region, the Texas Water Development Board (TWDB) has made both population and water demand projections for cities, rural areas, and water using purposes for each of the 21 counties of the region. These counties are located in six major river basins (Nueces, San Antonio, Guadalupe, Lower Colorado, Lavaca, and Rio Grande) and three coastal basins (Colorado-Lavaca, Lavaca-Guadalupe, and San Antonio-Nueces) (Table 2-1). In accordance with TWDB Rules, Section 357.5(d), which states, "In developing regional water plans, regional water planning groups shall use: (1) state population and water demand projections contained in the state water plan or adopted by the board after consultation with the Texas Natural Resource Conservation Commission and Texas Parks and Wildlife Department in preparation for revision of the state water plan; or (2) in lieu of paragraph (1) of this subsection, population or water demand projection revisions that have been adopted by the board, after coordination with Texas Natural Resource Conservation Commission and Texas Parks and Wildlife Department, based on changed conditions and availability of new information. Within 45 days of receipt of a request from a regional water planning group for revision of population or water demand projections, the executive administrator shall consult with the requesting regional water planning group and respond to their request." The TWDB-approved projections are presented below.

2.1 Population Projections

The 1996 estimates published by the U.S. Bureau of the Census indicate that Texas currently ranks as the second most populated state in the nation, with a population of more than 18.3 million. The population of the South Central Texas Region was estimated at 2.0 million in 1996 and is projected to be 4.5 million in 2050 (Table 2-2 and Figure 2-1). Approximately 75 percent of the population of the region is projected to reside in the San Antonio River Basin. The TWDB's population projections for 83 individual cities and 48 rural areas of each county and part of county of each river basin area of the South Central Texas Region are shown in Table 2-3.

Table 2-1.
South Central Texas Region – List of Counties
Location by River or Coastal Basin and Edwards Aquifer Area

County	Edwards Aquifer Area	River and Coastal Basin								
		Nueces Basin	San Antonio Basin	Guadalupe Basin	Lower Colorado Basin	Colorado/ Lavaca Coastal Basin	Lavaca Basin	Lavaca/ Guadalupe Coastal Basin	San Antonio/ Nueces Coastal Basin	Rio Grande
Atascosa	X	X	X							
Bexar	X	X	X							
Caldwell	X			X	X					
Calhoun				X		X		X	X	
Comal	X		X	X						
DeWitt			X	X			X	X		
Dimmit		X								X
Frio		X								
Goliad			X	X					X	
Gonzales				X			X			
Guadalupe	X		X	X						
Hays (Part)	X			X						
Karnes		X	X	X					X	
Kendall			X	X	X					
LaSalle		X								
Medina	X	X	X							
Refugio			X						X	
Uvalde	X	X								
Victoria			X	X			X	X		
Wilson		X	X	X						
Zavala		X								

* An X in the column indicates that all or part of the county is located in the River or Coastal Basin named in the column heading.

Table 2-2.
Population Projections[1]
South Central Texas Region
Individual Counties with River Basin Summaries

	Total in 1990	Total in 1996	Projections 2000	2010	2020	2030	2040	2050
Counties								
Atascosa	30,533	34,152	38,609	45,815	54,023	61,342	68,182	71,988
Bexar	1,185,394	1,431,635	1,474,512	1,776,965	2,130,820	2,491,291	2,817,681	3,081,381
Caldwell	26,392	28,483	39,023	46,976	54,590	60,314	61,505	62,244
Calhoun	19,053	20,505	21,941	23,864	26,027	28,245	30,576	33,334
Comal	51,832	68,525	79,378	106,558	144,869	187,464	226,133	267,843
DeWitt	18,840	20,545	20,242	21,206	22,367	23,579	24,803	26,061
Dimmit	10,433	10,681	12,072	13,925	15,791	17,902	20,112	22,546
Frio	13,472	15,841	15,421	17,356	18,993	19,918	20,733	21,343
Goliad	5,980	6,569	6,408	6,784	7,089	7,161	7,368	7,892
Gonzales	17,205	17,754	17,817	18,647	19,305	19,405	19,843	20,292
Guadalupe	64,873	73,679	86,668	111,437	140,370	176,873	203,201	235,139
Hays(part)[2]	51,478	63,901	80,474	106,378	132,110	163,586	199,215	226,816
Karnes	12,455	15,259	14,578	14,835	16,322	17,460	18,457	19,353
Kendall	14,589	19,834	23,542	34,846	49,155	66,058	84,560	103,078
LaSalle	5,254	5,911	6,092	6,748	7,285	7,562	7,854	8,034
Medina	27,312	33,471	33,349	38,069	42,299	44,945	46,969	49,556
Refugio	7,976	8,198	8,421	8,844	9,110	9,081	9,020	8,896
Uvalde	23,340	25,012	26,466	29,756	32,788	35,595	38,087	40,565
Victoria	74,361	81,023	81,909	89,539	96,977	104,205	111,710	120,836
Wilson	22,650	26,989	31,648	42,238	49,442	60,220	70,987	81,961
Zavala	12,162	12,000	13,619	14,584	15,117	15,789	16,770	18,203
Total	1,695,584	2,019,967	2,132,189	2,575,370	3,084,849	3,617,995	4,103,766	4,527,361
River and Coastal Basins Summary[3]								
Rio Grande	48	51	49	51	53	58	63	68
Nueces	120,265	132,528	143,374	164,315	184,507	202,091	218,499	231,081
San Antonio	1,261,182	1,526,820	1,583,356	1,917,232	2,307,528	2,712,200	3,086,653	3,403,623
Guadalupe	261,039	303,689	346,040	429,354	523,094	628,993	718,863	806,769
Lower Colorado	856	1,022	1,066	1,280	1,489	1,642	1,685	1,731
Lavaca	3,523	3,887	4,051	4,436	4,901	5,402	5,964	6,598
Colorado-Lavaca	1,596	1,741	1,861	1,982	2,125	2,283	2,454	2,664
Lavaca-Guadalupe	38,465	41,368	43,277	47,149	51,267	55,441	59,722	65,030
San Antonio-Nueces	8,610	8,861	9,115	9,571	9,885	9,885	9,863	9,797
Total	1,695,584	2,019,967	2,132,189	2,575,370	3,084,849	3,617,995	4,103,766	4,527,361

[1] As specified in Texas Water Development Board Rules, 31 Texas Administrative Code, Regional Water Planning Areas, March 11, 1998.

[2] That part of Hays County located in the Guadalupe River Basin.

[3] See Table 2-12 for River and Coastal Basins tabulation of counties, cities, and rural areas.

Note: Texas population in 1990 was 16,986,510. TWDB projections of Texas population in year 2000 are 20,220,182, and in 2050 are 36,587,631 (1.287% compound annual growth rate).

Source: Texas Water Development Board, 1997 Consensus Water Plan, Most Likely Case, revised January 21, 1999.

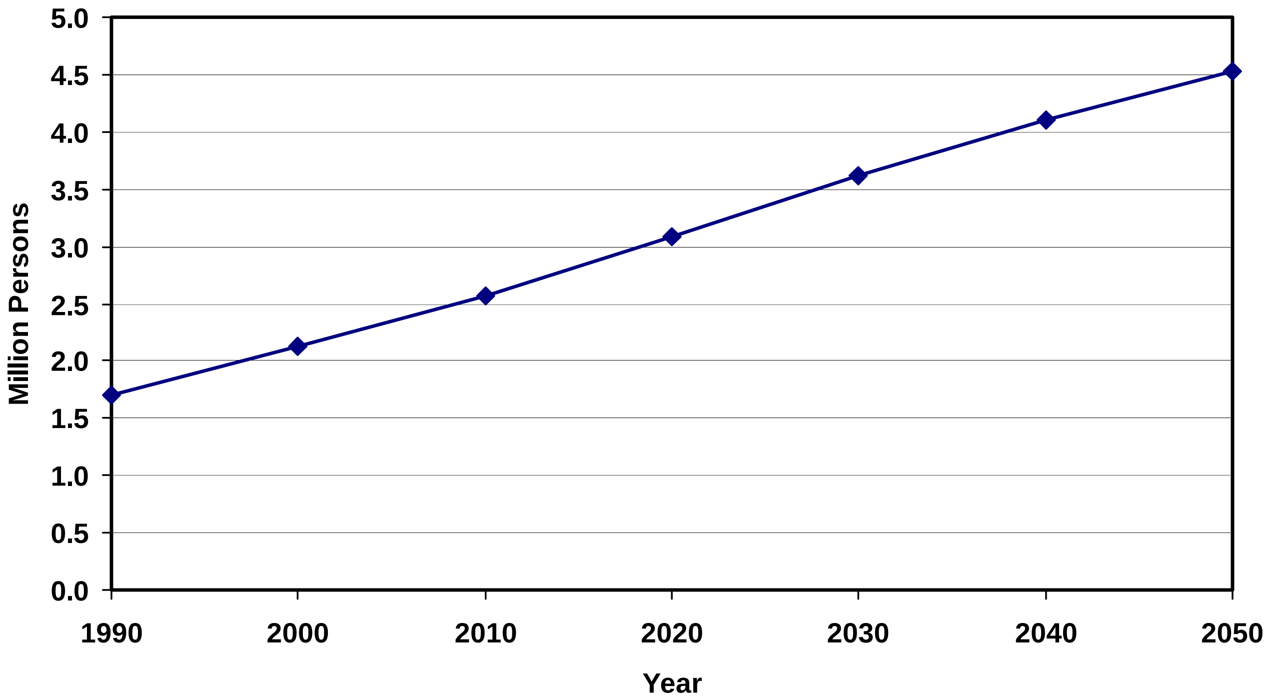

Figure 2-1. Summary of South Central Texas Region's Projected Population

Table 2-3
Population Projections
South Central Texas Region
River Basins, Counties, and Cities*

Basin/County/City/Rural	Total in 1990	Total in 1996	Projections 2000	2010	2020	2030	2040	2050
Rio Grande Basin (part)								
Dimmit (part) - Rio Grande								
Rural	48	51	49	51	53	58	63	68
Total	48	51	49	51	53	58	63	68
Rio Grande Basin Total	48	51	49	51	53	58	63	68
Nueces Basin (part)								
Atascosa (part) - Nueces								
Charlotte	1,475	1,604	1,797	2,093	2,383	2,649	2,856	2,982
Jourdanton	3,220	3,597	3,770	4,377	4,952	5,477	5,880	6,313
Lytle	1,911	2,113	2,312	2,718	3,113	3,477	3,762	4,070
Pleasanton	7,678	8,611	10,084	11,704	13,292	14,752	15,879	17,092
Poteet	3,206	3,663	3,968	4,413	4,870	5,283	5,577	5,887
Rural	12,367	13,809	15,900	19,592	24,358	28,522	32,946	34,349
Total	29,857	33,397	37,831	44,897	52,968	60,160	66,900	70,693
Bexar (part) - Nueces								
Lytle	4	5	4	4	4	4	4	4
Rural	2,747	1,834	4,052	5,485	6,599	8,094	9,321	8,816
Total	2,751	1,839	4,056	5,489	6,603	8,098	9,325	8,820
Dimmit (part) - Nueces								
Asherton	1,608	1,630	1,747	1,927	2,113	2,355	2,617	2,908
Big Wells	834	816	861	884	891	926	945	964
Carrizo Springs	5,745	5,771	7,203	8,736	10,259	11,827	13,435	15,262
Rural	2,198	2,413	2,212	2,327	2,475	2,736	3,052	3,344
Total	10,385	10,630	12,023	13,874	15,738	17,844	20,049	22,478
Frio (all) - Nueces								
Dilley	2,632	2,952	3,041	3,423	3,746	3,928	4,089	4,209
Pearsall	6,924	7,821	7,933	8,928	9,770	10,246	10,665	10,979
Rural	3,916	5,068	4,447	5,005	5,477	5,744	5,979	6,155
Total	13,472	15,841	15,421	17,356	18,993	19,918	20,733	21,343
Karnes (part) - Nueces								
Rural	314	309	357	356	388	411	432	444
Total	314	309	357	356	388	411	432	444
LaSalle (all) - Nueces								
Cotulla	3,694	4,272	4,178	4,684	5,096	5,315	5,537	5,768
Encinal	608	636	568	506	453	412	392	373
Rural	952	1,003	1,346	1,558	1,736	1,835	1,925	1,893
Total	5,254	5,911	6,092	6,748	7,285	7,562	7,854	8,034

Continued Next Page

Basin/County/City/Rural	Total in 1990	Total in 1996	Projections 2000	2010	2020	2030	2040	2050
Medina (part) - Nueces								
Devine	3,928	4,766	4,524	4,921	5,310	5,515	5,686	5,862
Hondo	6,018	6,907	7,032	7,880	8,782	9,268	9,574	9,890
Lytle	340	442	382	402	425	435	448	461
Natalia	1,216	1,366	1,703	1,909	2,126	2,244	2,318	2,394
Rural	10,379	13,102	12,861	14,972	16,662	17,839	18,817	20,231
Total	21,881	26,583	26,502	30,084	33,305	35,301	36,843	38,838
Uvalde (all) - Nueces								
Sabinal	1,584	1,692	1,880	2,184	2,460	2,737	2,976	3,236
Uvalde	14,729	16,028	17,296	20,398	23,185	25,997	28,558	31,371
Rural	7,027	7,292	7,290	7,174	7,143	6,861	6,553	5,958
Total	23,340	25,012	26,466	29,756	32,788	35,595	38,087	40,565
Wilson (part) - Nueces								
Rural	849	1,006	1,007	1,171	1,322	1,413	1,506	1,663
Total	849	1,006	1,007	1,171	1,322	1,413	1,506	1,663
Zavala (all) - Nueces								
Batesville	1,272	1,303	1,330	1,395	1,497	1,581	1,660	1,669
Crystal City	8,263	8,227	8,900	9,301	9,547	9,959	10,049	10,140
LaPryor	1,280	1,269	1,250	1,168	1,068	993	963	938
Rural	1,347	1,201	2,139	2,720	3,005	3,256	4,098	5,456
Total	12,162	12,000	13,619	14,584	15,117	15,789	16,770	18,203
Nueces Basin Total	120,265	132,528	143,374	164,315	184,507	202,091	218,499	231,081
San Antonio Basin (part)								
Atascosa (part) - San Antonio								
Rural	676	755	778	918	1,055	1,182	1,282	1,295
Total	676	755	778	918	1,055	1,182	1,282	1,295
Bexar (part) - San Antonio								
Alamo Heights	6,502	7,201	7,039	7,391	7,759	7,868	7,959	8,051
Balcones Heights	3,022	3,267	3,437	3,791	4,182	4,455	4,734	5,030
China Grove	1,031	1,183	1,231	1,426	1,624	1,930	2,235	2,378
Converse	8,887	10,594	13,658	20,424	27,634	35,537	42,763	51,458
Elmendorf	645	1,021	785	923	1,043	1,234	1,465	1,648
Fair Oaks Ranch	1,640	3,101	4,090	4,699	4,739	4,779	4,819	4,833
Helotes	1,535	1,929	2,045	2,600	3,251	3,937	4,295	4,686
Kirby	8,326	9,101	10,039	11,992	14,276	16,584	18,672	21,023
Leon Valley	9,581	10,296	12,455	12,704	12,577	12,748	12,919	13,694
Live Oak Water Public Utility	10,023	10,868	12,439	15,199	18,430	21,756	24,774	28,211
Olmos Park	2,161	2,294	2,438	2,669	2,920	3,086	3,253	3,429
San Antonio	935,933	1,098,642	1,137,369	1,360,669	1,621,857	1,886,190	2,125,314	2,394,753
Schertz (Outside City) Estimated	3,165	3,638	3,222	4,612	5,657	6,662	7,678	8,688
Schertz (Part)	414	584	1,309	3,167	5,700	6,269	6,911	7,603
Shavano Park	1,708	2,046	2,097	2,425	2,687	2,784	2,917	3,056
St. Hedwig	1,443	1,808	1,843	2,425	3,107	3,837	4,503	5,285
Terrell Hills	4,592	5,069	5,120	5,417	5,810	5,970	5,969	5,968
Universal City	13,057	14,636	15,992	19,452	23,502	27,658	31,426	35,707
Windcrest (WC&ID No. 10)	5,331	5,793	5,818	6,160	6,520	6,665	6,796	6,930
BMWD(Castle Hills)	4,198	4,356	4,967	5,328	5,667	5,778	5,742	5,706
BMWD(Somerset)	1,144	1,438	1,251	1,314	1,361	1,321	1,280	1,240
Continued Next Page								

Basin/County/City/Rural	Total in 1990	Total in 1996	Projections					
			2000	2010	2020	2030	2040	2050
Bexar - Continued From Previous Page								
BMWD(Hill Country/HollywPark)	3,879	4,355	4,956	5,887	6,988	8,003	8,947	10,009
BMWD(Other Subdvns)Est.	108,988	109,566	110,144	152,208	181,324	211,702	243,692	262,588
Fort Sam Houston	12,000	14,000	12,000	12,000	12,000	12,000	12,000	12,000
Lackland AFB	9,352	10,568	9,352	9,352	9,352	9,352	9,353	9,352
Randolph AFB	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000
Remainder of County	20,086	88,442	81,360	93,242	130,250	171,088	203,940	155,235
Total	1,182,643	1,429,796	1,470,456	1,771,476	2,124,217	2,483,193	2,808,356	3,072,561
Comal (part) - San Antonio								
Fair Oaks Ranch	51	79	174	200	214	227	240	254
Schertz (Part)	129	451	785	2,533	5,700	6,270	6,912	7,602
Rural	6,134	8,504	9,598	11,805	14,615	20,384	26,577	32,988
Total	6,314	9,034	10,557	14,538	20,529	26,881	33,729	40,844
DeWitt (part) - San Antonio								
Rural	890	1,019	930	968	1,013	1,059	1,105	1,150
Total	890	1,019	930	968	1,013	1,059	1,105	1,150
Goliad (part) - San Antonio								
Goliad	1,946	2,221	2,140	2,266	2,368	2,392	2,461	2,636
Rural	2,119	2,284	2,242	2,373	2,480	2,505	2,578	2,761
Total	4,065	4,505	4,382	4,639	4,848	4,897	5,039	5,397
Guadalupe (part) - San Antonio								
Cibolo	1,757	1,945	3,940	4,640	5,830	6,710	7,780	8,420
Marion	1,027	1,059	1,051	1,078	1,104	1,130	1,158	1,187
Schertz (Part)	14,891	12,549	24,079	25,968	26,599	29,258	32,254	35,478
Rural	1,385	7,024	652	6,086	14,810	24,456	33,753	46,348
Total	19,060	22,577	29,722	37,772	48,343	61,554	74,945	91,433
Karnes (part) - San Antonio								
Karnes City	2,916	3,039	3,453	3,564	3,949	4,259	4,518	4,793
Kenedy	3,763	6,463	4,478	4,604	5,092	5,479	5,807	6,155
Runge	1,139	1,197	1,379	1,403	1,544	1,652	1,746	1,845
Rural	3,977	3,911	4,518	4,515	4,921	5,206	5,477	5,627
Total	11,795	14,610	13,828	14,086	15,506	16,596	17,548	18,420
Kendall (part) - San Antonio								
Boerne	4,274	5,754	6,459	9,607	10,438	13,444	17,315	22,302
Fair Oaks Ranch	169	235	694	1,234	1,282	1,308	1,335	1,362
Rural	4,260	5,954	8,345	13,313	23,631	34,130	46,931	58,449
Total	8,703	11,943	15,498	24,154	35,351	48,882	65,581	82,113
Medina (part) - San Antonio								
Castroville	2,159	2,688	2,632	2,950	3,289	3,469	3,583	3,701
Lacoste	1,021	1,359	1,426	1,789	2,092	2,307	2,463	2,630
Rural	2,251	2,841	2,789	3,246	3,613	3,868	4,080	4,387
Total	5,431	6,888	6,847	7,985	8,994	9,644	10,126	10,718
Refugio (part) - San Antonio								
Rural	86	89	91	94	96	94	93	90
Total	86	89	91	94	96	94	93	90
Continued Next Page								

Basin/County/City/Rural	Total in 1990	Total in 1996	Projections 2000	2010	2020	2030	2040	2050
Victoria (part) - San Antonio								
Rural	273	279	284	301	319	335	353	390
Total	273	279	284	301	319	335	353	390
Wilson (part) - San Antonio								
Floresville	5,247	6,309	5,998	6,834	7,631	8,109	8,596	9,112
LaVernia	757	860	850	947	1,036	1,133	1,243	1,297
Poth	1,642	1,970	1,926	2,229	2,507	2,678	2,850	3,114
Stockdale	1,268	1,426	1,471	1,702	1,915	2,045	2,177	2,378
Rural	12,332	14,760	19,738	28,589	34,168	43,918	53,630	63,311
Total	21,246	25,325	29,983	40,301	47,257	57,883	68,496	79,212
San Antonio Basin Total	1,261,182	1,526,820	1,583,356	1,917,232	2,307,528	2,712,200	3,086,653	3,403,623
Guadalupe Basin (part)								
Caldwell (part) - Guadalupe								
Lockhart	9,205	9,769	12,639	15,274	17,872	19,841	20,294	20,605
Luling	4,661	5,381	5,894	7,269	8,645	10,021	11,397	12,772
Martindale	1,028	1,075	1,108	1,182	1,238	1,297	1,410	1,547
Rural	10,804	11,462	18,494	22,169	25,566	27,753	26,984	25,882
Total	25,698	27,687	38,135	45,894	53,321	58,912	60,085	60,806
Calhoun (part) - Guadalupe								
Rural	23	23	28	31	35	38	41	46
Total	23	23	28	31	35	38	41	46
Comal (part) - Guadalupe								
Garden Ridge	1,450	2,092	2,513	3,238	3,963	4,688	5,050	5,050
New Braunfels	27,091	33,862	38,126	49,873	65,003	82,894	95,424	109,848
Rural	16,977	23,537	28,182	38,909	55,374	73,001	91,930	112,101
Total	45,518	59,491	68,821	92,020	124,340	160,583	192,404	226,999
DeWitt (part) - Guadalupe								
Cuero	6,700	6,932	7,170	7,485	7,869	8,261	8,658	9,074
Yorktown	2,207	2,334	2,430	2,596	2,786	3,002	3,218	3,450
Rural	5,736	6,594	5,883	5,955	6,044	6,109	6,124	6,079
Total	14,643	15,860	15,483	16,036	16,699	17,372	18,000	18,603
Goliad (part) - Guadalupe								
Rural	1,465	1,579	1,550	1,640	1,714	1,732	1,782	1,908
Total	1,465	1,579	1,550	1,640	1,714	1,732	1,782	1,908
Gonzales (part) - Guadalupe								
Gonzales	6,527	6,417	7,039	7,432	7,725	7,798	8,012	8,232
Nixon	1,995	2,056	2,142	2,263	2,353	2,377	2,443	2,511
Waelder	744	803	758	768	794	811	814	815
Rural	7,873	8,408	7,812	8,116	8,363	8,349	8,503	8,661
Total	17,139	17,684	17,751	18,579	19,235	19,335	19,772	20,219
Guadalupe (part) - Guadalupe								
McQueeney	1,975	2,252	2,130	2,294	2,432	2,735	2,957	3,095
New Braunfels	243	378	278	334	414	592	657	729
Seguin	18,853	21,013	23,031	28,069	34,216	41,302	49,368	58,720
Rural	24,742	27,459	31,507	42,968	54,965	70,690	75,274	81,162
Total	45,813	51,102	56,946	73,665	92,027	115,319	128,256	143,706

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Basin/County/City/Rural	Total in 1990	Total in 1996	Projections					
			2000	2010	2020	2030	2040	2050
Hays (part) - Guadalupe**								
Kyle	2,225	2,658	2,427	2,574	2,803	3,167	3,702	4,327
San Marcos	28,743	35,256	37,604	49,787	65,172	85,476	110,797	143,619
Wimberley	2,520	2,735	3,325	4,301	5,001	5,728	6,494	7,402
Woodcreek	978	1,199	1,000	1,021	1,022	1,044	1,082	1,120
Rural	17,012	22,053	36,118	48,695	58,112	68,171	77,140	70,348
Total	51,478	63,901	80,474	106,378	132,110	163,586	199,215	226,816
Karnes (part) - Guadalupe								
Rural	116	114	132	132	143	152	160	164
Total	116	114	132	132	143	152	160	164
Kendall (part) - Guadalupe								
Comfort	1,678	1,729	1,755	1,861	1,936	2,043	2,201	2,359
Rural	4,046	5,936	6,111	8,633	11,648	14,893	16,513	18,313
Total	5,724	7,665	7,866	10,494	13,584	16,936	18,714	20,672
Victoria (part) - Guadalupe								
Victoria	43,747	48,611	48,695	53,645	58,378	62,926	67,649	72,726
Rural	9,120	9,314	9,501	10,074	10,645	11,178	11,800	13,018
Total	52,867	57,925	58,196	63,719	69,023	74,104	79,449	85,744
Wilson (part) - Guadalupe								
Rural	555	658	658	766	863	924	985	1,086
Total	555	658	658	766	863	924	985	1,086
Guadalupe Basin Total	261,039	303,689	346,040	429,354	523,094	628,993	718,863	806,769
Lower Colorado Basin (part)								
Caldwell (part) - Lower Colorado								
Rural	694	796	888	1,082	1,269	1,402	1,420	1,438
Total	694	796	888	1,082	1,269	1,402	1,420	1,438
Kendall (part) - Lower Colorado								
Rural	162	226	178	198	220	240	265	293
Total	162	226	178	198	220	240	265	293
Lower Colorado Basin Total	856	1,022	1,066	1,280	1,489	1,642	1,685	1,731
Lavaca Basin (part)								
DeWitt (part) - Lavaca								
Yoakum	2,154	2,374	2,649	2,976	3,370	3,805	4,296	4,850
Rural	1,129	1,265	1,155	1,200	1,258	1,314	1,372	1,427
Total	3,283	3,639	3,804	4,176	4,628	5,119	5,668	6,277
Gonzales (part) - Lavaca								
Rural	66	70	66	68	70	70	71	73
Total	66	70	66	68	70	70	71	73
Continued Next Page								

Basin/County/City/Rural	Total in 1990	Total in 1996	Projections 2000	2010	2020	2030	2040	2050
Victoria (part) - Lavaca								
Rural	174	178	181	192	203	213	225	248
Total	174	178	181	192	203	213	225	248
Lavaca Basin Total	3,523	3,887	4,051	4,436	4,901	5,402	5,964	6,598
Colorado-Lavaca Coastal Basin								
Calhoun (part) - Colorado-Lavaca CB								
Point Comfort	956	1,093	1,090	1,116	1,169	1,233	1,309	1,390
Rural	640	648	771	866	956	1,050	1,145	1,274
Total	1,596	1,741	1,861	1,982	2,125	2,283	2,454	2,664
Colo-Lavaca Coastal Basin Total	1,596	1,741	1,861	1,982	2,125	2,283	2,454	2,664
Lavaca-Guadalupe Coastal Basin								
Calhoun (part) - Lavaca-Guadalupe CB								
Port Lavaca	10,886	11,887	12,054	12,822	13,784	14,810	15,924	17,122
Seadrift	1,277	1,516	1,649	1,896	2,212	2,474	2,730	3,012
Rural	5,231	5,297	6,301	7,078	7,812	8,575	9,355	10,411
Total	17,394	18,700	20,004	21,796	23,808	25,859	28,009	30,545
DeWitt (part) - Lavaca-Guadalupe CB								
Rural	24	27	25	26	27	29	30	31
Total	24	27	25	26	27	29	30	31
Victoria (part) - Lavaca-Guadalupe CB								
Bloomington	1,888	2,055	2,480	2,785	3,174	3,660	4,032	4,442
Victoria	11,329	12,589	12,610	13,892	15,118	16,296	17,519	18,834
Rural	7,830	7,997	8,158	8,650	9,140	9,597	10,132	11,178
Total	21,047	22,641	23,248	25,327	27,432	29,553	31,683	34,454
Lavaca-Guad Coastal Basin Total	38,465	41,368	43,277	47,149	51,267	55,441	59,722	65,030
San Antonio-Nueces Coastal Basin								
Calhoun (part) - San Antonio-Nueces CB								
Rural	40	41	48	55	59	65	72	79
Total	40	41	48	55	59	65	72	79
Goliad (part) - San Antonio-Nueces CB								
Rural	450	485	476	505	527	532	547	587
Total	450	485	476	505	527	532	547	587
Karnes (part) - San Antonio-Nueces CB								
Rural	230	226	261	261	285	301	317	325
Total	230	226	261	261	285	301	317	325

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Basin/County/City/Rural	Total in 1990	Total in 1996	Projections					
			2000	2010	2020	2030	2040	2050
Refugio (part) - San Antonio-Nueces CB								
Refugio	3,158	3,153	3,330	3,562	3,717	3,742	3,737	3,732
Woodsboro	1,731	1,857	1,828	1,913	1,964	1,954	1,938	1,922
Rural	3,001	3,099	3,172	3,275	3,333	3,291	3,252	3,152
Total	7,890	8,109	8,330	8,750	9,014	8,987	8,927	8,806
San Ant-Nuec Coastal Basin Total	8,610	8,861	9,115	9,571	9,885	9,885	9,863	9,797
South Central Texas Region Total	1,695,584	2,019,967	2,132,189	2,575,370	3,084,849	3,617,995	4,103,766	4,527,361
RIVER AND COASTAL BASINS SUMMARY								
Rio Grande	48	51	49	51	53	58	63	68
Nueces	120,265	132,528	143,374	164,315	184,507	202,091	218,499	231,081
San Antonio	1,261,182	1,526,820	1,583,356	1,917,232	2,307,528	2,712,200	3,086,653	3,403,623
Guadalupe	261,039	303,689	346,040	429,354	523,094	628,993	718,863	806,769
Lower Colorado	856	1,022	1,066	1,280	1,489	1,642	1,685	1,731
Lavaca	3,523	3,887	4,051	4,436	4,901	5,402	5,964	6,598
Colorado-Lavaca	1,596	1,741	1,861	1,982	2,125	2,283	2,454	2,664
Lavaca-Guadalupe	38,465	41,368	43,277	47,149	51,267	55,441	59,722	65,030
San Antonio-Nueces	8,610	8,861	9,115	9,571	9,885	9,885	9,863	9,797
South Central Texas Region Total	1,695,584	2,019,967	2,132,206	2,575,370	3,084,849	3,617,995	4,103,766	4,527,361

Source: Texas Water Development Board; 1997 Consensus Water Plan, Most Likely Case, as revised, January 21, 1999.
* Parts of Rio Grande, Nueces, San Antonio, Guadalupe, Lower Colorado, and Lavaca River Basins, and Colorado-Lavaca, Lavaca-Guadalupe, and San Antonio-Nueces Coastal Basins.
** That part of Hays County located in the Guadalupe River Basin.

2.2 Municipal Water Demand Projections

The projected quantity of water needed for municipal purposes depends upon population growth, climatic conditions, and water conservation measures. For planning purposes, municipal water demand includes residential and commercial water uses. Commercial water use includes business establishments, and public offices and institutions. Residential and commercial uses are categorized together because they are similar types of uses (i.e., they both use water primarily for drinking, cleaning, sanitation, air condition, and landscape watering).

Although per capita water use, in gallons per person per day, is projected to decline over the planning period, this will be more than offset by the projected increase in population, which is expected to cause municipal water demand in the South Central Texas Region to increase by almost 1.5 times the 1990 reported use (Table 2-4 and Figure 2-2). For example, total municipal water use in the South Central Texas Region in 1990 was 318,495 acft/yr and is projected to increase to 769,523 acft/yr by 2050 (Table 2-4). The projected municipal water demand for individual counties in the region is shown in Table 2-4. Since Bexar County has the highest population, it also has the largest projected water demand, with almost 70 percent of the projected total water demand for the region by the year 2050 (Table 2-4 and Figure 2-2).

Table 2-4.
Municipal Water Demand Projections[1]
South Central Texas Region
Individual Counties with River Basin Summaries

	Use in 1990 (acft)	Use in 1996 (acft)	Projections					
			2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Counties								
Atascosa	5,670	5,994	7,794	8,374	9,087	10,210	11,211	11,887
Bexar	225,626	257,999	306,064	338,626	381,015	439,753	493,649	531,750
Caldwell	4,931	5,186	7,041	7,574	8,058	8,694	8,739	8,738
Calhoun	3,916	2,665	4,411	4,455	4,554	4,896	5,274	5,747
Comal	10,415	13,878	18,587	22,780	28,687	36,569	43,590	51,227
DeWitt	3,556	3,541	3,614	3,470	3,400	3,535	3,688	3,841
Dimmit	2,208	2,815	2,936	3,168	3,393	3,839	4,313	4,840
Frio	3,045	3,063	3,510	3,615	3,670	3,813	3,933	4,024
Goliad	916	957	928	891	858	856	868	917
Gonzales	3,832	4,151	3,879	3,729	3,613	3,589	3,628	3,684
Guadalupe	9,627	12,016	15,480	17,932	20,847	25,953	29,648	34,296
Hays(part)[2]	9,805	11,129	16,101	19,475	22,895	28,410	34,925	41,163
Karnes	2,187	2,579	2,586	2,401	2,436	2,564	2,682	2,776
Kendall	2,130	3,239	3,534	4,758	6,213	8,284	10,533	12,761
LaSalle	1,233	1,386	1,372	1,391	1,392	1,422	1,459	1,486
Medina	5,254	6,414	7,112	7,312	7,467	7,832	8,074	8,398
Refugio	1,227	1,246	1,328	1,275	1,220	1,198	1,177	1,150
Uvalde	5,278	6,137	6,710	7,074	7,317	8,019	8,618	9,271
Victoria	11,545	13,764	13,013	13,146	13,382	14,178	15,056	16,116
Wilson	3,745	4,491	5,976	7,219	7,796	9,361	10,948	12,531
Zavala	2,349	2,690	2,774	2,694	2,574	2,652	2,753	2,920
Total	318,495	365,340	434,750	481,359	539,874	625,627	704,811	769,523
River and Coastal Basins Summary[3]								
Rio Grande	6	8	6	6	6	6	6	7
Nueces	24,157	27,760	31,702	33,357	34,711	37,811	40,607	42,873
San Antonio	239,648	273,481	326,748	361,978	407,215	471,381	530,877	575,125
Guadalupe	45,608	55,704	66,249	75,973	87,784	105,664	121,908	139,281
Lower Colorado	236	148	143	154	167	180	182	186
Lavaca	590	604	650	654	674	736	804	887
Colorado-Lavaca	217	257	417	419	425	454	488	529
Lavaca-Guadalupe	6,696	6,005	7,389	7,431	7,561	8,083	8,642	9,360
San Antonio-Nueces	1,337	1,373	1,446	1,387	1,331	1,312	1,297	1,275
Total	318,495	365,340	434,750	481,359	539,874	625,627	704,811	769,523

[1] As specified in Texas Water Development Board Rules, 31 Texas Administrative Code, Regional Water Planning Areas, March 11, 1998.

[2] That part of Hays County located in the Guadalupe River Basin.

[3] See Table 2-12 for River and Coastal Basins tabulation of counties, cities, and rural areas.

Source: Texas Water Development Board; 1997 Consensus Water Plan, Most Likely Case, below normal rainfall and advanced water conservation, as revised January 21, 1999.

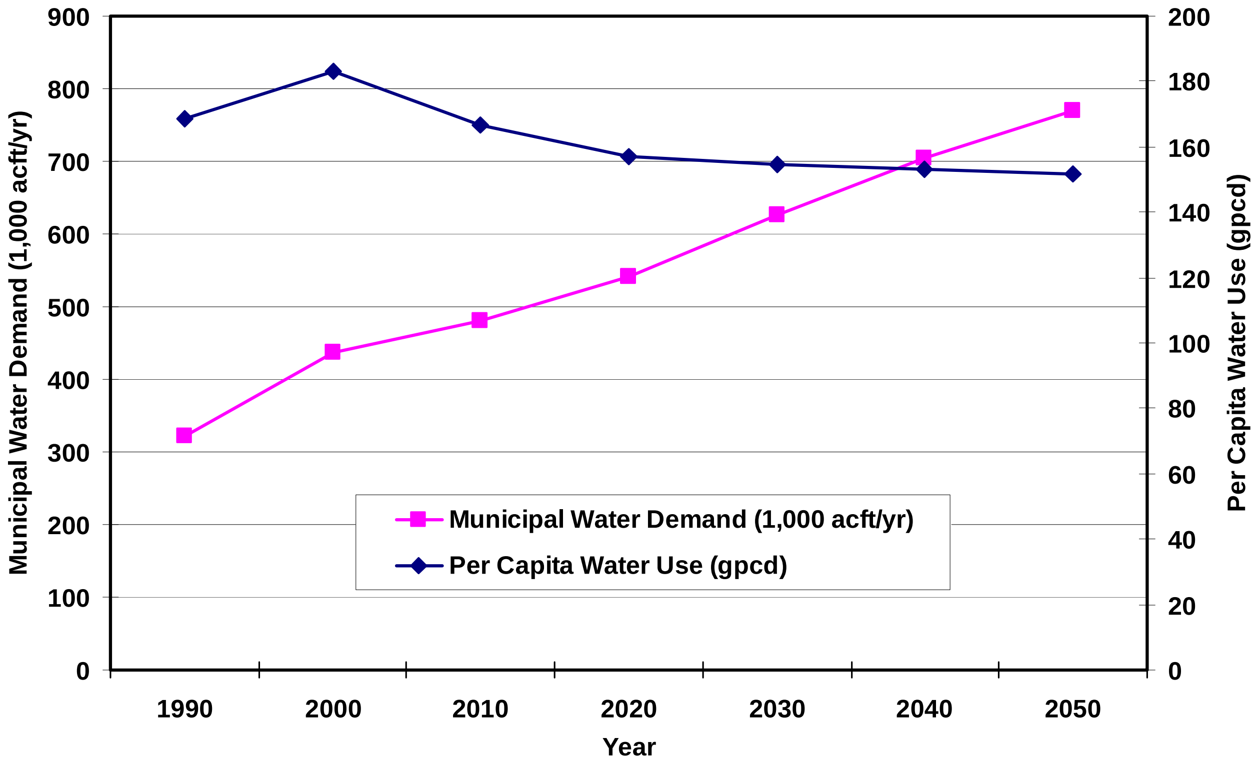

Figure 2-2. Projected Per Capita Water Use and Municipal Water Demand South Central Texas Region – 1990 to 2050

2.3 Industrial Water Demand Projections

The use of water for the production of goods for domestic and foreign markets varies widely among manufacturing industries in Texas. Manufactured products in Texas range from food and clothing to refined chemical and petroleum products to computers and automobiles. Some processes require direct consumption of water as part of the products being manufactured, while others require very little water consumption, but large volumes of water for cooling or cleaning purposes. Five manufacturing industries account for approximately 90 percent of water used by all manufacturing industries in Texas. These five water-intensive industries are chemical products, petroleum refining, pulp and paper, food and kindred products, and primary metals. The chemical and petroleum refining industries account for nearly 60 percent of the State's annual manufacturing water use.

The South Central Texas Region's major water using manufacturing sectors are fabricated metal products, industrial machinery, and food processing. All industries in the region used 67,016 acft of water in 1990 and are projected to have a demand of 202,379 acft/yr in 2050 (Table 2-5 and Figure 2-3). As can be seen in Figure 2-3, industrial water demand is projected to increase throughout the planning period.

2.4 Steam-Electric Power Water Demand Projections

Although Texas is the second most-populated state in the United States, it is the largest generator and consumer of electricity. It is also the largest user of coal-generated power. Power production in Texas is concentrated primarily in ten privately owned utilities, which account for 85 percent of production. Nine percent of power production is from facilities that are both publicly and privately held, while only 6 percent is from publicly owned utilities. The industry has faced and will continue to face significant changes in the structure of power generation. These changes range from new generation technology to government regulations on the marketing of electricity. These changes will not only have an impact on how and where power will be generated, but also on how water will be used in the process.

Only eight counties (Atascosa, Bexar, Calhoun, Frio, Goliad, Guadalupe, Hays, and Victoria) of the South Central Texas Region use water in steam-electric power production. In 1990, 43,451 acft of water was used for steam-electric power generation, and by the year 2050, it is estimated that 125,660 acft/yr of water will be needed for the production of steam-electric power (Table 2-6 and Figure 2-3).

2.5 Mining Water Demand Projections

Although the Texas mineral industry is foremost in the production of crude petroleum and natural gas in the United States, it also produces a wide variety of important non-fuel minerals. Texas is the only state to produce native asphalt and is the leading producer nationally of Frasch-mined sulfur. It is also one of the leading states in the production of clay, gypsum, lime, salt, stone, and aggregate. In the South Central Texas Region, the principal uses of water for mining are for the extraction of stone, clay, and petroleum and for sand and gravel washing.

In the region, total mining water demand was 7,799 acft in 1990 and is expected to increase to 14,308 acft/yr in 2050, an increase of over 80 percent (Table 2-7 and Figure 2-3).

Table 2-5.
Industrial Water Demand Projections[1]
South Central Texas Region
Individual Counties with River Basin Summaries

	Use in 1990 (acft)	Use in 1996 (acft)	Projections					
			2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Counties								
Atascosa	0	0	0	0	0	0	0	0
Bexar	14,049	20,627	16,805	19,682	22,359	24,935	28,264	31,697
Caldwell	0	12	62	67	71	77	82	87
Calhoun	24,539	40,026	63,026	77,588	85,949	95,240	105,236	115,958
Comal	3,248	11,964	3,450	3,487	3,548	3,799	4,071	4,351
DeWitt	91	47	108	126	146	170	195	223
Dimmit	3	4	11	11	12	13	14	15
Frio	0	0	0	0	0	0	0	0
Goliad	0	0	0	0	0	0	0	0
Gonzales	865	1,091	929	992	1,043	1,083	1,160	1,231
Guadalupe	1,661	2,895	1,883	2,102	2,248	2,385	2,590	2,797
Hays(part)[2]	57	96	93	105	118	129	142	154
Karnes	270	80	296	320	331	340	356	383
Kendall	2	7	2	3	4	4	5	6
LaSalle	0	0	0	0	0	0	0	0
Medina	286	47	302	319	339	361	384	411
Refugio	0	0	0	0	0	0	0	0
Uvalde	557	337	600	643	675	700	759	817
Victoria	20,032	19,587	24,115	28,446	31,157	33,670	37,900	42,201
Wilson	50	1	61	72	85	99	115	134
Zavala	1,306	721	1,407	1,507	1,582	1,642	1,780	1,914
Total	67,016	97,542	113,150	135,470	149,667	164,647	183,053	202,379
River and Coastal Basins Summary[3]								
Rio Grande	0	0	0	0	0	0	0	0
Nueces	2,152	1,109	2,320	2,480	2,608	2,716	2,937	3,157
San Antonio	14,323	20,980	17,105	20,008	22,698	25,283	28,630	32,092
Guadalupe	26,235	35,515	31,118	35,887	38,958	42,009	46,912	51,898
Lower Colorado	0	0	0	0	0	0	0	0
Lavaca	0	5	0	0	0	0	0	0
Colorado-Lavaca	6,343	19,824	16,538	20,391	22,590	25,036	27,669	30,494
Lavaca-Guadalupe	17,963	20,109	46,069	56,704	62,813	69,603	76,905	84,738
San Antonio-Nueces	0	0	0	0	0	0	0	0
Total	67,016	97,542	113,150	135,470	149,667	164,647	183,053	202,379

[1] As specified in Texas Water Development Board Rules, 31 Texas Administrative Code, Regional Water Planning Areas, March 11, 1998.

[2] That part of Hays County located in the Guadalupe River Basin.

[3] See Table 2-12 for River and Coastal Basins tabulation of counties, cities, and rural areas.

Source: Texas Water Development Board; 1997 Consensus Water Plan, Most Likely Case, below normal rainfall and advanced water conservation, as revised January 21, 1999.

Table 2-6.
Steam-Electric Power Water Demand Projections[1]
South Central Texas Region
Individual Counties with River Basin Summaries

	Use in 1990 (acft)	Use in 1996 (acft)	Projections					
			2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Counties								
Atascosa	6,036	5,848	12,000	12,000	12,000	12,000	15,000	22,000
Bexar	24,263	25,714	36,000	36,000	40,000	45,000	50,000	56,000
Caldwell	0	0	0	0	0	0	0	0
Calhoun	62	29	100	100	100	100	100	100
Comal	0	0	0	0	0	0	0	0
DeWitt	0	0	0	0	0	0	0	0
Dimmit	0	0	0	0	0	0	0	0
Frio	38	227	400	400	400	400	400	400
Goliad	12,165	11,037	15,000	15,000	20,000	20,000	20,000	20,000
Gonzales	0	0	0	0	0	0	0	0
Guadalupe	0	0	10,760	10,760	10,760	10,760	10,760	10,760
Hays(part)[2]	0	0	0	6,400	6,400	6,400	6,400	6,400
Karnes	0	0	0	0	0	0	0	0
Kendall	0	0	0	0	0	0	0	0
LaSalle	0	0	0	0	0	0	0	0
Medina	0	0	0	0	0	0	0	0
Refugio	0	0	0	0	0	0	0	0
Uvalde	0	0	0	0	0	0	0	0
Victoria	887	1,893	8,000	10,000	10,000	10,000	10,000	10,000
Wilson	0	0	0	0	0	0	0	0
Zavala	0	0	0	0	0	0	0	0
Total	43,451	44,748	82,260	90,660	99,660	104,660	112,660	125,660
River and Coastal Basins Summary[3]								
Rio Grande	0	0	0	0	0	0	0	0
Nueces	6,074	6,075	12,400	12,400	12,400	12,400	15,400	22,400
San Antonio	24,263	25,714	36,000	36,000	40,000	45,000	50,000	56,000
Guadalupe	13,052	12,930	33,760	42,160	47,160	47,160	47,160	47,160
Lower Colorado	0	0	0	0	0	0	0	0
Lavaca	0	0	0	0	0	0	0	0
Colorado-Lavaca	62	29	100	100	100	100	100	100
Lavaca-Guadalupe	0	0	0	0	0	0	0	0
San Antonio-Nueces	0	0	0	0	0	0	0	0
Total	43,451	44,748	82,260	90,660	99,660	104,660	112,660	125,660

1 As specified in Texas Water Development Board Rules, 31 Texas Administrative Code, Regional Water Planning Areas, March 11, 1998.
2 That part of Hays County located in the Guadalupe River Basin.
3 See Table 2-12 for River and Coastal Basins tabulation of counties, cities, and rural areas.

Source: Texas Water Development Board; 1997 Consensus Water Plan, Most Likely Case, below normal rainfall and advanced water conservation, as revised January 21, 1999.

Table 2-7.
Mining Water Demand Projections[1]
South Central Texas Region
Individual Counties with River Basin Summaries

	Use in 1990 (acft)	Use in 1996 (acft)	Projections					
			2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Counties								
Atascosa	664	1,377	1,558	1,583	1,693	1,804	1,918	2,048
Bexar	1,591	6,597	4,963	4,936	5,201	5,406	5,645	5,962
Caldwell	27	12	21	16	10	4	0	0
Calhoun	5	15	28	21	13	6	3	3
Comal	946	8,909	5,570	5,464	5,628	5,796	3,590	2,224
DeWitt	129	121	161	106	70	50	44	44
Dimmit	506	919	1,003	817	906	916	926	950
Frio	313	139	150	63	32	16	7	3
Goliad	0	13	17	12	6	3	0	0
Gonzales	21	33	41	37	33	29	29	30
Guadalupe	8	270	196	198	200	202	207	213
Hays(part)[2]	0	153	84	82	68	55	37	28
Karnes	187	137	166	73	31	19	10	4
Kendall	0	6	13	9	5	1	0	0
LaSalle	0	0	0	0	0	0	0	0
Medina	120	118	143	128	128	129	132	136
Refugio	77	112	44	26	19	11	4	4
Uvalde	399	521	444	428	499	576	666	777
Victoria	2,409	3,015	2,578	2,028	1,732	1,714	1,720	1,862
Wilson	281	277	193	105	62	39	30	20
Zavala	116	114	97	42	25	8	2	0
Total	7,799	22,858	17,470	16,174	16,361	16,784	14,970	14,308
River and Coastal Basins Summary[3]								
Rio Grande	0	0	0	0	0	0	0	0
Nueces	2,212	3,300	3,509	3,171	3,396	3,566	3,771	4,037
San Antonio	1,973	6,892	5,188	4,992	5,179	5,352	5,573	5,873
Guadalupe	3,413	12,002	7,894	7,135	6,870	6,889	4,555	3,201
Lower Colorado	0	12	26	18	10	3	0	0
Lavaca	108	80	98	55	27	18	16	16
Colorado-Lavaca	0	1	1	1	1	0	0	0
Lavaca-Guadalupe	12	444	689	761	851	940	1,048	1,176
San Antonio-Nueces	81	127	65	41	27	16	7	5
Total	7,799	22,858	17,470	16,174	16,361	16,784	14,970	14,308

[1] As specified in Texas Water Development Board Rules, 31 Texas Administrative Code, Regional Water Planning Areas, March 11, 1998.
[2] That part of Hays County located in the Guadalupe River Basin.
[3] See Table 2-12 for River and Coastal Basins tabulation of counties, cities, and rural areas.

Source: Texas Water Development Board; 1997 Consensus Water Plan, Most Likely Case, below normal rainfall and advanced water conservation, as revised January 21, 1999.

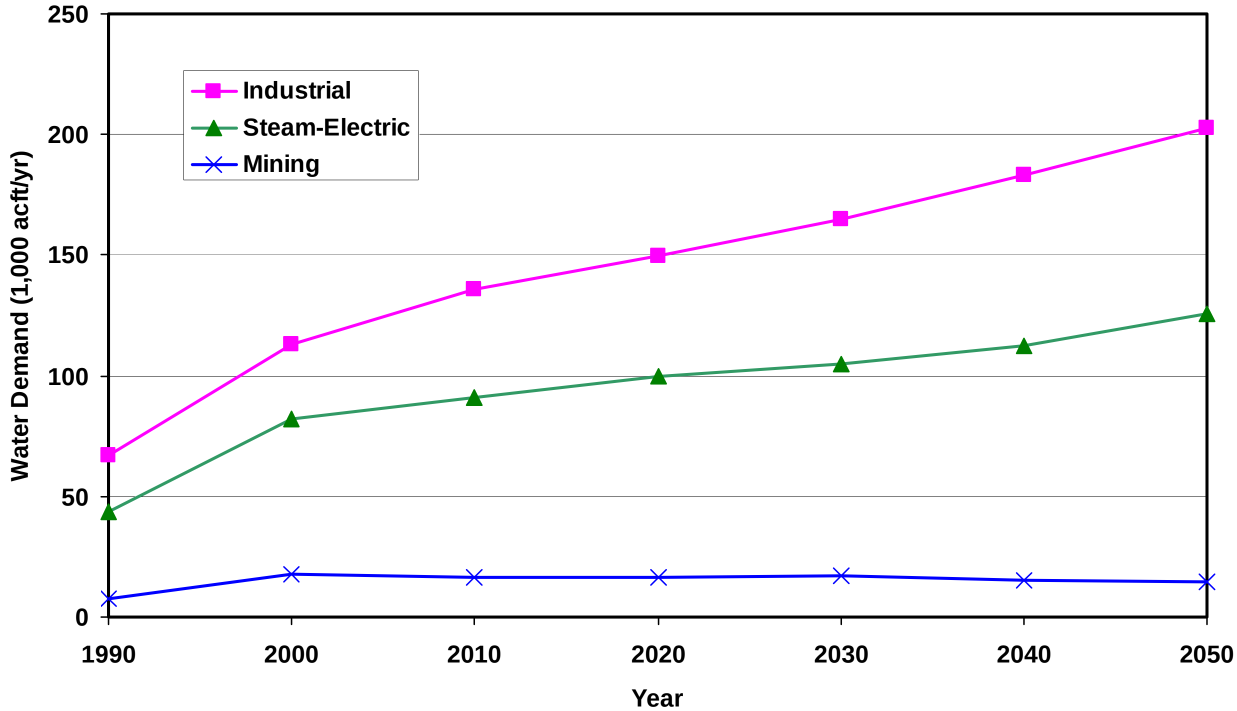

Figure 2-3. Projections of Industrial, Steam-Electric, and Mining Water Demands South Central Texas Region – 1990 to 2050

2.6 Irrigation Water Demand Projections

Irrigated agriculture accounts for almost 65 percent of the total water used in the state. Currently, in Texas, approximately 10 million acre-feet (acft) of water is used to grow a variety of crops ranging from food and feed grains to fruits, vegetables, and cotton. Of this 10 million acft of water used for irrigation in Texas, groundwater is approximately 70 percent, and surface is 30 percent. The TWDB irrigation water use data show annual use for irrigation in the South Central Texas Region in 1990 of 669,440 acft/yr, or 6.7 percent of the total irrigation water used in Texas in 1990 (Table 2-8 and Figure 2-4). Projected irrigation water demands in the region in 2050 are 516,348 acft/yr, or 22.9 percent less than in 1990 (Table 2-8 and Figure 2-4)[1]. The projected decline is based upon increased irrigation efficiency, economic factors, and reduced government programs affecting the profitability of irrigated agriculture.

[1] See Appendix A for the methods used by TWDB for projecting irrigation water demands.

Table 2-8.
Irrigation Water Demand Projections[1]
South Central Texas Region
Individual Counties with River Basin Summaries

	Use in 1990 (acft)	Use in 1996 (acft)	Projections					
			2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Counties								
Atascosa	47,208	48,827	51,015	49,291	47,632	46,036	44,500	43,023
Bexar	37,012	41,472	40,003	36,879	35,320	33,827	32,397	31,026
Caldwell	1,375	1,742	1,222	1,086	965	857	762	677
Calhoun	35,421	48,082	26,822	22,747	19,950	17,673	16,132	15,028
Comal	479	35	459	440	422	405	388	371
DeWitt	285	88	250	220	193	169	148	130
Dimmit	11,185	10,946	10,551	10,199	9,932	9,828	9,432	9,026
Frio	83,233	93,421	94,688	91,294	88,045	84,933	81,955	79,103
Goliad	685	189	592	511	442	382	330	285
Gonzales	3,540	1,379	3,052	2,632	2,269	1,957	1,687	1,455
Guadalupe	2,646	373	2,520	2,399	2,284	2,175	2,071	1,972
Hays(part)[2]	298	137	294	292	289	287	284	281
Karnes	2,034	2,157	1,840	1,664	1,505	1,362	1,232	1,114
Kendall	380	1,224	364	349	334	320	306	293
LaSalle	7,292	7,209	7,067	6,849	6,638	6,433	6,234	6,042
Medina[3]	157,380	86,356	144,413	138,582	132,804	127,270	121,969	116,891
Refugio	0	0	0	0	0	0	0	0
Uvalde	140,669	84,588	135,168	129,883	124,804	119,924	115,234	110,728
Victoria	13,699	12,289	11,824	10,205	8,808	7,602	6,561	5,663
Wilson	13,697	16,066	14,519	13,088	11,826	10,713	9,732	8,869
Zavala	110,922	74,669	103,213	99,135	95,218	91,456	87,842	84,371
Total	669,440	531,249	649,876	617,745	589,680	563,609	539,196	516,348
River and Coastal Basins Summary[4]								
Rio Grande	0	0	0	0	0	0	0	0
Nueces	539,759	396,701	527,710	507,105	487,545	468,496	450,261	432,753
San Antonio	72,216	69,515	75,669	70,571	66,913	63,951	60,869	57,988
Guadalupe	10,320	6,257	9,556	8,588	7,734	6,982	6,318	5,731
Lower Colorado	20	14	18	16	14	13	11	10
Lavaca	0	57	0	0	0	0	0	0
Colorado-Lavaca	0	0	0	0	0	0	0	0
Lavaca-Guadalupe	47,125	58,699	36,923	31,465	27,474	24,167	21,737	19,866
San Antonio-Nueces	0	6	0	0	0	0	0	0
Total	669,440	531,249	649,876	617,745	589,680	563,609	539,196	516,348

[1] As specified in Texas Water Development Board Rules, 31 Texas Administrative Code, Regional Water Planning Areas, March 11, 1998.
[2] That part of Hays County located in the Guadalupe River Basin.
[3] The projected irrigation demand for Medina County does not include conveyance losses of surface water from the BMA Canal System between the diversion points and the irrigated farms.
[4] See Table 2-12 for River and Coastal Basins tabulation of counties, cities, and rural areas.

Source: Texas Water Development Board; 1997 Consensus Water Plan, Most Likely Case, below normal rainfall, aggressive adoption of irrigation technology, and reduction in federal farm programs by one-half, as revised January 21, 1999.

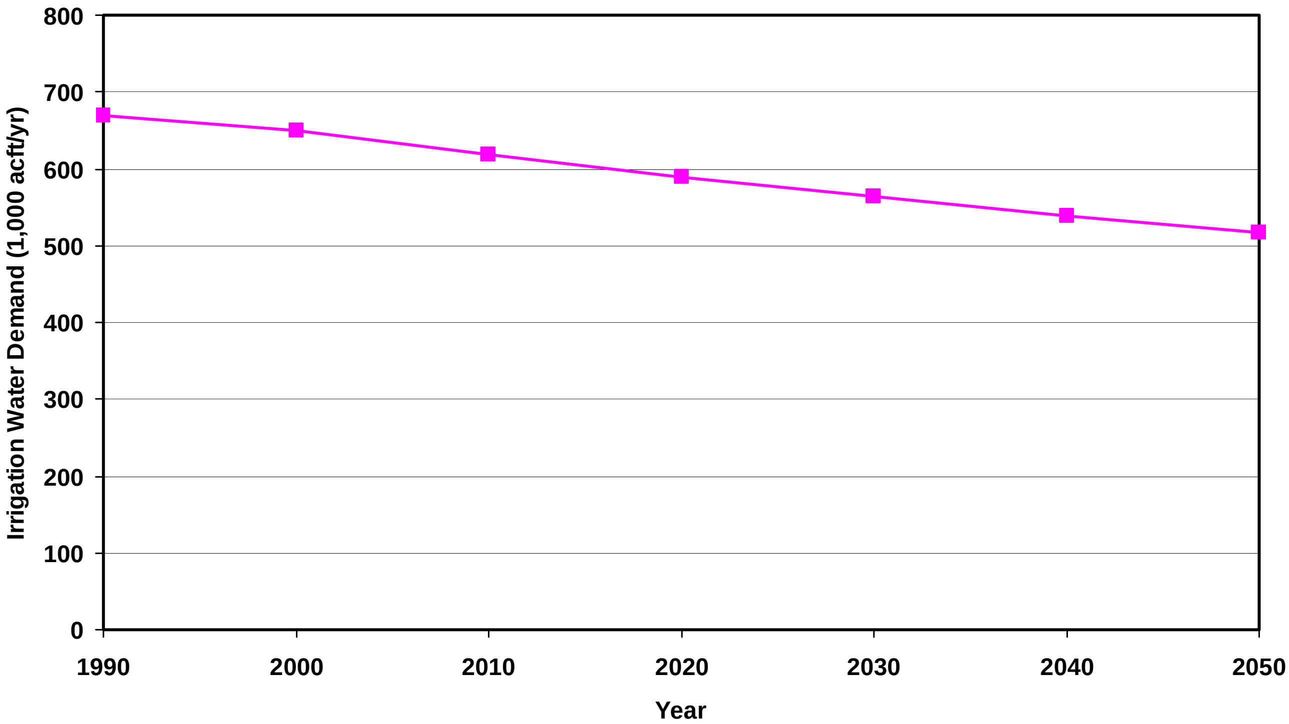

Figure 2-4. Projections of Irrigation Water Demands South Central Texas Region – 1990 to 2050

2.7 Livestock Water Demand Projections

Texas is the nation's leading livestock producer, accounting for approximately 11 percent of the total United States production. Livestock production was valued at approximately $8 billion in 1993 and represented more than half of the total value derived from all agricultural operations in Texas. Cattle and calf operations dominate Texas livestock production, making up more than 75 percent of the livestock value. In 1993, there were approximately 14 million head of cattle and calves, 20 million chickens, 1.7 million head of sheep and lambs, and 0.5 million hogs and pigs. Although livestock production is an important component of the Texas economy, the industry consumes a relatively small amount of water. In 1990, total livestock production consumed approximately 274,000 acre-feet of water in Texas, representing less than two percent of the total water use.

In 1990, water use in the South Central Texas Region for livestock purposes was estimated at 24,400 acft/yr (Table 2-9 and Figure 2-5). The TWDB projections for livestock use in the region estimate that in the year 2000 livestock demand will be 28,186 acft/yr and in the year 2010 livestock demand will be 28,521 acft/yr. After the year 2010, it is projected that livestock demand will remain level throughout the planning period (Table 2-9 and Figure 2-5).

Table 2-9.
Livestock Water Demand Projections[1]
South Central Texas Region
Individual Counties with River Basin Summaries

	Use in 1990 (acft)	Use in 1996 (acft)	Projections					
			2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Counties								
Atascosa	1,613	1,830	1,808	1,808	1,808	1,808	1,808	1,808
Bexar	1,376	1,822	1,487	1,487	1,487	1,487	1,487	1,487
Caldwell	816	801	835	835	835	835	835	835
Calhoun	291	318	304	304	304	304	304	304
Comal	316	305	356	356	356	356	356	356
DeWitt	1,840	1,791	1,896	1,896	1,896	1,896	1,896	1,896
Dimmit	987	852	771	771	771	771	771	771
Frio	1,097	906	1,192	1,192	1,192	1,192	1,192	1,192
Goliad	884	863	1,208	1,208	1,208	1,208	1,208	1,208
Gonzales	4,108	3,420	5,999	6,334	6,334	6,334	6,334	6,334
Guadalupe	1,031	1,832	1,132	1,132	1,132	1,132	1,132	1,132
Hays(part)[2]	378	281	271	271	271	271	271	271
Karnes	1,371	1,735	1,339	1,339	1,339	1,339	1,339	1,339
Kendall	389	380	512	512	512	512	512	512
LaSalle	988	574	1,077	1,077	1,077	1,077	1,077	1,077
Medina	1,560	1,925	1,914	1,914	1,914	1,914	1,914	1,914
Refugio	563	495	407	407	407	407	407	407
Uvalde	994	1,864	1,494	1,494	1,494	1,494	1,494	1,494
Victoria	1,271	1,740	1,398	1,398	1,398	1,398	1,398	1,398
Wilson	1,813	2,034	1,905	1,905	1,905	1,905	1,905	1,905
Zavala	714	809	881	881	881	881	881	881
Total	24,400	26,577	28,186	28,521	28,521	28,521	28,521	28,521
River and Coastal Basins Summary[3]								
Rio Grande	192	166	150	150	150	150	150	150
Nueces	7,767	8,597	8,942	8,942	8,942	8,942	8,942	8,942
San Antonio	5,285	6,480	5,693	5,693	5,693	5,693	5,693	5,693
Guadalupe	8,836	8,803	10,967	11,299	11,299	11,299	11,299	11,299
Lower Colorado	147	146	156	156	156	156	156	156
Lavaca	305	295	332	335	335	335	335	335
Colorado-Lavaca	13	16	15	15	15	15	15	15
Lavaca-Guadalupe	898	1,172	1,000	1,000	1,000	1,000	1,000	1,000
San Antonio-Nueces	957	902	931	931	931	931	931	931
Total	24,400	26,577	28,186	28,521	28,521	28,521	28,521	28,521

[1] As specified in Texas Water Development Board Rules, 31 Texas Administrative Code, Regional Water Planning Areas, March 11, 1998.
[2] That part of Hays County located in the Guadalupe River Basin.
[3] See Table 2-12 for River and Coastal Basins tabulation of counties, cities, and rural areas.

Source: Texas Water Development Board; 1997 Consensus Water Plan, Most Likely Case, below normal rainfall and advanced water conservation, as revised January 21, 1999.

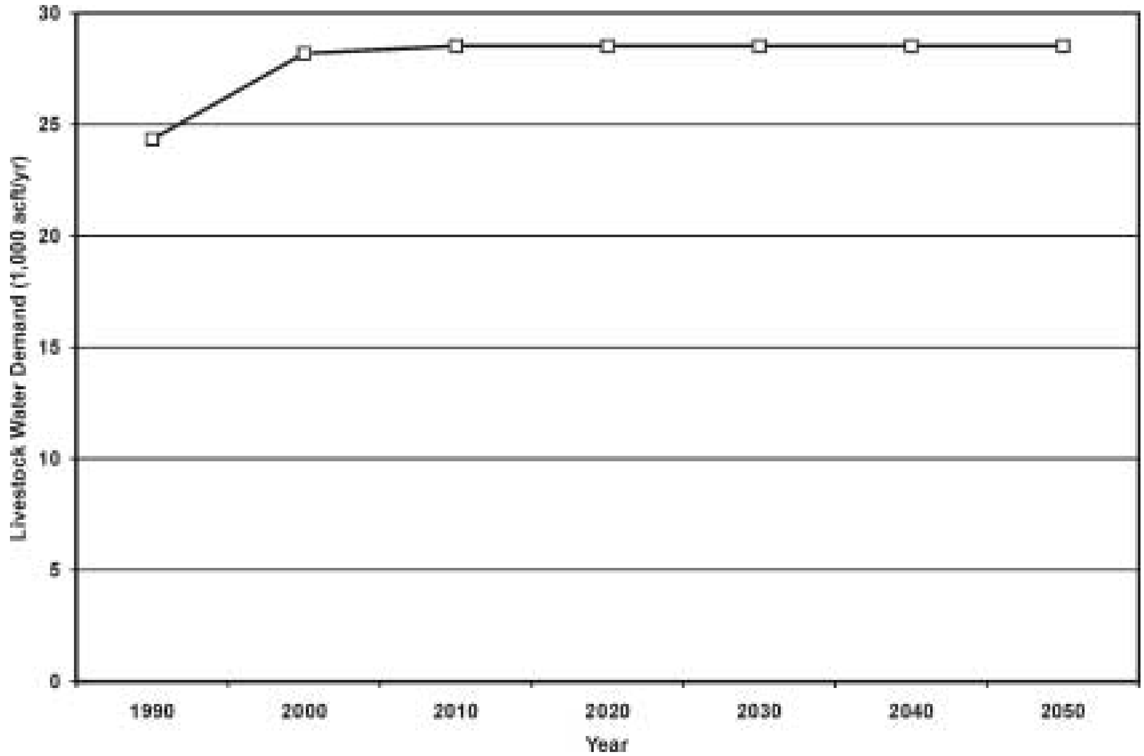

Figure 2-5. Projections of Livestock Water Demands South Central Texas Region – 1990 to 2050

2.8 Total Water Demand Projections

Total water demand projections for the South Central Texas Region are the sum of water demand projections for municipal, industrial, steam-electric power generation, mining, irrigation, and livestock water demand projections (Tables 2-4, 2-5, 2-6, 2-7, 2-8, and 2-9), and are shown in Table 2-10 and Figure 2-6. Total water use in 1990 was 1,130,601 acft/yr (Table 2-10). Projected total water demand for the region is 1,503,848 acft/yr in 2030 and 1,656,739 acft/yr in 2050 (Table 2-10 and Figure 2-6). Projections of future water demands for municipal, industrial, steam-electric power, mining, and livestock increase while projections for irrigation decrease. The reasons for the decline in the projections of demand in future years for irrigation are predictions of increased efficiency in irrigation, economic factors adversely affecting the profitability of irrigation in future years, and expectations of decreased government programs supporting agricultural incomes.

Projections of future water demands for the South Central Texas Region show irrigation demand at 37.5 percent of total demand in 2030 and 31.2 percent in 2050 (Table 2-11). Municipal demand, as a percent of total demand, is projected to increase from 28.2 percent in 1990 to 41.6 percent in 2030 to 46.5 percent in 2050 (Table 2-11), with livestock demand as a percent of total demand decreasing from 2.2 percent in 1990 to 1.9 percent in 2030, and to 1.7 percent in 2050 (Table 2-11). Industrial water demand was 5.9 percent of total demand in 1990, and is projected to be 11.0 percent in 2030, and 12.2 percent in 2050 (Table 2-11). Steam-electric power demand increases from 3.8 percent of total demand in 1990 to 7.0 percent in 2030, and 7.6 percent in 2050 (Table 2-11).

Table 2-10.
Total Water Demand Projections[1]
South Central Texas Region
Individual Counties with River Basin Summaries

	Use in 1990 (acft)	Use in 1996 (acft)	Projections					
			2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Counties								
Atascosa	61,191	63,876	74,175	73,056	72,220	71,858	74,437	80,766
Bexar	303,917	354,231	405,322	437,610	485,382	550,408	611,487	657,922
Caldwell	7,149	7,753	9,181	9,578	9,939	10,467	10,418	10,337
Calhoun	64,234	91,135	94,691	105,215	110,870	118,219	127,049	137,140
Comal	15,404	35,091	28,422	32,527	38,641	46,925	51,995	58,529
DeWitt	5,901	5,588	6,029	5,818	5,705	5,820	5,971	6,134
Dimmit	14,889	15,536	15,272	14,966	15,104	15,367	15,456	15,602
Frio	87,726	97,756	99,940	96,564	93,339	90,354	87,487	84,722
Goliad	14,650	13,059	17,745	17,622	22,514	22,449	22,406	22,410
Gonzales	12,366	10,074	13,900	13,724	13,292	12,992	12,838	12,734
Guadalupe	14,973	17,386	31,971	34,523	37,471	42,607	46,408	51,170
Hays(part)[2]	10,538	11,796	16,843	26,625	30,041	35,552	42,059	48,297
Karnes	6,049	6,688	6,227	5,797	5,642	5,624	5,619	5,616
Kendall	2,901	4,856	4,425	5,631	7,068	9,121	11,356	13,572
LaSalle	9,513	9,169	9,516	9,317	9,107	8,932	8,770	8,605
Medina	164,600	94,860	153,884	148,255	142,652	137,506	132,473	127,750
Refugio	1,867	1,853	1,779	1,708	1,646	1,616	1,588	1,561
Uvalde	147,897	93,447	144,416	139,522	134,789	130,713	126,771	123,087
Victoria	49,843	52,288	60,928	65,223	66,477	68,562	72,635	77,240
Wilson	19,586	22,869	22,654	22,389	21,674	22,117	22,730	23,459
Zavala	115,407	79,003	108,372	104,259	100,280	96,639	93,258	90,086
Total	1,130,601	1,088,314	1,325,692	1,369,929	1,423,763	1,503,848	1,583,211	1,656,739
River and Coastal Basins Summary[3]								
Rio Grande	198	174	156	156	156	156	156	157
Nueces	582,121	443,542	586,583	567,455	549,602	533,931	521,918	514,162
San Antonio	357,708	403,062	466,403	499,242	547,698	616,660	681,642	732,771
Guadalupe	107,464	131,211	159,544	181,042	199,805	220,003	238,152	258,570
Lower Colorado	403	320	343	344	347	352	349	352
Lavaca	1,003	1,041	1,080	1,044	1,036	1,089	1,155	1,238
Colorado-Lavaca	6,635	20,127	17,071	20,926	23,131	25,605	28,272	31,138
Lavaca-Guadalupe	72,694	86,429	92,070	97,361	99,699	103,793	109,332	116,140
San Antonio-Nueces	2,375	2,408	2,442	2,359	2,289	2,259	2,235	2,211
Total	1,130,601	1,088,314	1,325,692	1,369,929	1,423,763	1,503,848	1,583,211	1,656,739

1 As specified in Texas Water Development Board Rules, 31 Texas Administrative Code, Regional Water Planning Areas, March 11, 1998.

2 That part of Hays County located in the Guadalupe River Basin.

3 See Table 2-12 for River and Coastal Basins tabulation of counties, cities, and rural areas.

Source: Texas Water Development Board; 1997 Consensus Water Plan, Most Likely Case, below normal rainfall and advanced water conservation, as revised January 21, 1999.

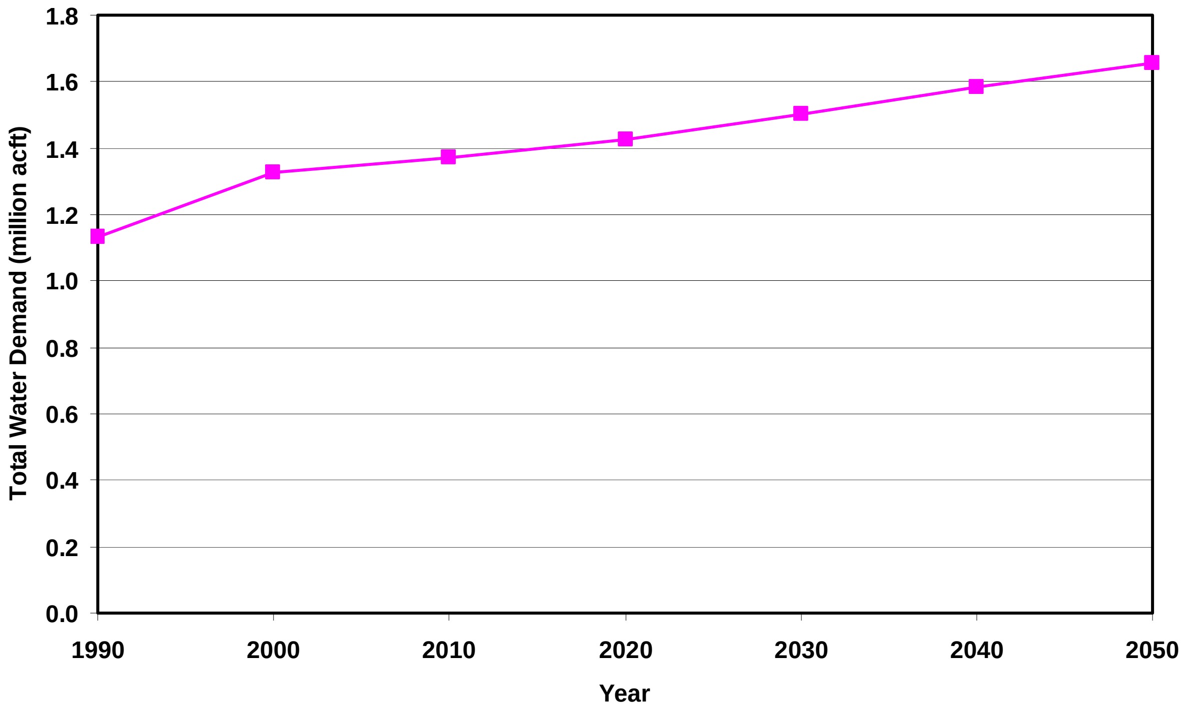

Figure 2-6. Total Water Demand Projections
South Central Texas Region – 1990 to 2050

Table 2-11.
Composition of Total Water Use
South Central Texas Region
1990, 2030, and 2050

	1990		*2030*		*2050*	
Purpose of Use	***acre-feet***	***% of Total***	***acre-feet***	***% of Total***	***acre-feet***	***% of Total***
Municipal	318,495	28.17%	625,627	41.60%	769,523	46.45%
Industrial	67,016	5.93%	164,647	10.95%	202,379	12.22%
Steam-Electric Power	43,451	3.84%	104,660	6.96%	125,660	7.59%
Mining	7,799	0.69%	16,784	1.12%	14,308	0.86%
Irrigation	669,440	59.21%	563,609	37.48%	516,348	31.17%
Livestock	24,400	2.16%	28,521	1.90%	28,521	1.72%
Total	1,130,601	100.00%	1,503,848	100.00%	1,656,739	100.00%

2.9 Water Demand Projections for Counties and Parts of Counties of River and Coastal Basins of the South Central Texas Region

For purposes of this regional planning project, and in accordance with TWDB Rules, Section 357.7(a)(2), water demand projections are tabulated by river and coastal basin, county or part of county located within the river or coastal basin, and city and rural areas of each county or part of county for the South Central Texas Region (Table 2-12).[2] An illustration of how to read Table 2-12 is given below; however, the entire table will not be verbalized here. For example, a part of the rural area of Dimmit County is located in the Rio Grande River Basin. The projected 6 acft/yr of water demand for the people who live in this rural area is shown as municipal water demand (Table 2-12). There is no industry, steam-electric power, irrigation, or mining demand projected for that part of Dimmit County located in the Rio Grande River Basin. However, there is a livestock demand of 150 acft/yr (Table 2-12).

A part of Atascosa County is located in the Nueces River Basin, and a part is located in the San Antonio River Basin. That part located in the Nueces River Basin contains the cities of Charlotte, Jourdanton, Lytle, Pleasanton, and Poteet. In addition, rural areas of Atascosa County are located in the Nueces River Basin. The municipal water use by Charlotte in 1990 was 247 acft/yr, and projected municipal water demand in 2050 is 568 acft/yr (Table 2-12).

Likewise, water use in 1990 by Jourdanton was 670 acft/yr, with projected 2050 demands of 1,124 acft/yr (Table 2-12). Rural areas of Atascosa County located in the Nueces River Basin used 1,633 acft/yr for household purposes (municipal type of water use), with projections in 2050 of 4,100 acft/yr (Table 2-12).

There is no industrial demand in Atascosa County in the Nueces River Basin. However, there was an estimated 6,036 acft/yr of water used for steam-electric power in 1990, with projected steam-electric power water demand in 2050 of 22,000 acft/yr (Table 2-12). Irrigation water demand in Atascosa County in the Nueces River Basin is projected to decrease from 45,792 acft/yr in 1990 to 41,900 acft/yr in 2050 (Table 2-12).

Total water use in Atascosa County in the Nueces River Basin in 1990 was 59,619 acft/yr, with projected total water demand for this same area at 79,445 acft/yr in 2050 (Table 2-12).

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[2] 31 Texas Administrative Code, Chapter 357, Regional Water Planning Guideline Rules, Texas Water Development Board, Austin, Texas, March 11, 1998.

The reader can see the projections for each county or part of county of each respective river or coastal basin of the region in Table 2-12. Total projections for counties and parts of counties of each river and coastal basin area located in the South Central Texas Region are shown at the end of the listing of individual counties and parts of counties of each river or coastal basin. In addition, the basin totals are listed at the end of Table 2-12. For example, total water use in 1990 in the Nueces River Basin part of the South Central Texas Planning Region was 582,121 acft/yr, of which 24,157 acft/yr was for municipal purposes, 2,152 acft/yr was for industrial purposes, 6,074 acft/yr was for steam-electric power purposes, 539,759 acft/yr was for irrigation, 2,212 acft/yr was for mining, and 7,767 acft/yr was for livestock (Page 2-35). Projected water demand for the Nueces River Basin part of the planning region in 2050 is 514,162 acft/yr, with 42,873 acft/yr being for municipal demand, 3,157 acft/yr being for industry, 22,400 acft/yr being for steam-electric power, 432,753 acft/yr being for irrigation, 4,037 acft/yr being for mining, and 8,942 acft/yr being for livestock (Page 2-35). The reader can readily see the projections, by type of demand, for the Rio Grande, Nueces, San Antonio, Guadalupe, Lower Colorado, and Lavaca River Basins as well as for the Colorado-Lavaca, Lavaca-Guadalupe, and San Antonio-Nueces Coastal Basin areas of the South Central Planning Region in Table 2-12, Page 2-45.

Total water use in the South Central Texas Region was 1,130,601 acft/yr in 1990, with projected 2050 water demands of 1,656,739 acft/yr (Page 2-46). The quantity of projected water demands in 2050 are 157 acft/yr for the Rio Grande River Basin, 514,162 acft/yr for the Nueces River Basin, 732,771 acft/yr for the San Antonio River Basin, 258,570 acft/yr for the Guadalupe River Basin, 352 acft/yr for the Lower Colorado River Basin, 1,238 acft/yr for the Lavaca River Basin, 31,138 acft/yr for the Colorado-Lavaca Coastal Basin, 116,140 acft/yr for the Lavaca-Guadalupe Coastal Basin, and 2,211 acft/yr for the San Antonio-Nueces Coastal Basin (Page 2-47).

Table 2-12 Water Demand Projections South Central Texas Region River Basins, Counties, and Cities*										
			Total in	Total in	Projections					
Basin/County/City/Rural			1990	1996	2000	2010	2020	2030	2040	2050
			acft	acft	acft	acft	acft	acft	acft	acft
Rio Grande Basin (part)										
Dimmit (part) - Rio Grande										
Rural		Municipal	6	8	6	6	6	6	6	7
Total Municipal Demand			6	8	6	6	6	6	6	7
Industrial Demand			0	0	0	0	0	0	0	0
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			0	0	0	0	0	0	0	0
Mining Demand			0	0	0	0	0	0	0	0
Livestock Demand			192	166	150	150	150	150	150	150
	Total Demand		198	174	156	156	156	156	156	157
Rio Grande Basin Total			198	174	156	156	156	156	156	157
Nueces Basin (part)										
Atascosa (part) - Nueces										
Charlotte		Municipal	247	319	409	436	464	510	547	568
Jourdanton		Municipal	670	559	815	863	899	988	1,047	1,124
Lytle		Municipal	410	431	559	600	635	701	754	811
Pleasanton		Municipal	1,556	1,915	2,486	2,649	2,784	3,074	3,273	3,523
Poteet		Municipal	1,055	742	1,285	1,325	1,369	1,479	1,549	1,629
Rural		Municipal	1,633	1,923	2,139	2,395	2,825	3,335	3,909	4,100
Total Municipal Demand			5,571	5,889	7,693	8,268	8,976	10,087	11,079	11,755
Industrial Demand			0	0	0	0	0	0	0	0
Steam-Electric Power Demand			6,036	5,848	12,000	12,000	12,000	12,000	15,000	22,000
Irrigation Demand			45,792	48,339	49,652	47,980	46,371	44,822	43,333	41,900
Mining Demand			664	1,377	1,558	1,583	1,693	1,804	1,918	2,048
Livestock Demand			1,556	1,764	1,742	1,742	1,742	1,742	1,742	1,742
	Total Demand		59,619	63,217	72,645	71,573	70,782	70,455	73,072	79,445
Bexar (part) - Nueces										
Lytle		Municipal	1	1	1	1	1	1	1	1
Rural		Municipal	330	473	1,030	1,333	1,450	1,763	2,045	1,908
Total Municipal Demand			331	474	1,031	1,334	1,451	1,764	2,046	1,909
Industrial Demand			0	0	0	0	0	0	0	0
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			3,374	2,743	3,380	3,274	3,282	2,830	2,713	2,592
Mining Demand			147	168	182	178	183	189	194	199
Livestock Demand			23	31	26	26	26	26	26	26
	Total Demand		3,875	3,416	4,619	4,812	4,942	4,809	4,979	4,726
Continued Next Page										

			Total in	Total in	Projections					
Basin/County/City/Rural			**1990**	**1996**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
			acft	**acft**	**acft**	**acft**	**acft**	**acft**	**acft**	**acft**
Dimmit (part) - Nueces										
Asherton		Municipal	215	302	211	205	206	224	243	267
Big Wells		Municipal	178	186	165	153	143	146	147	149
Carrizo Springs		Municipal	1,592	1,946	2,316	2,583	2,827	3,232	3,657	4,137
Rural		Municipal	217	373	238	221	211	231	260	280
Total Municipal Demand			2,202	2,807	2,930	3,162	3,387	3,833	4,307	4,833
Industrial Demand			3	4	11	11	12	13	14	15
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			11,185	10,946	10,551	10,199	9,932	9,828	9,432	9,026
Mining Demand			506	919	1,003	817	906	916	926	950
Livestock Demand			795	686	621	621	621	621	621	621
	Total Demand		14,691	15,362	15,116	14,810	14,858	15,211	15,300	15,445
Frio (all) - Nueces										
Dilley		Municipal	771	720	824	855	873	906	939	962
Pearsall		Municipal	1,602	1,446	1,955	2,020	2,057	2,146	2,210	2,263
Rural		Municipal	672	897	731	740	740	761	784	799
Total Municipal Demand			3,045	3,063	3,510	3,615	3,670	3,813	3,933	4,024
Industrial Demand			0	0	0	0	0	0	0	0
Steam-Electric Power Demand			38	227	400	400	400	400	400	400
Irrigation Demand			83,233	93,421	94,688	91,294	88,045	84,933	81,955	79,103
Mining Demand			313	139	150	63	32	16	7	3
Livestock Demand			1,097	906	1,192	1,192	1,192	1,192	1,192	1,192
	Total Demand		87,726	97,756	99,940	96,564	93,339	90,354	87,487	84,722
Karnes (part) - Nueces										
Rural		Municipal	39	98	74	68	68	71	75	76
Total Municipal Demand			39	98	74	68	68	71	75	76
Industrial Demand			0	0	0	0	0	0	0	0
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			0	0	0	0	0	0	0	0
Mining Demand			0	0	0	0	0	0	0	0
Livestock Demand			118	151	117	117	117	117	117	117
	Total Demand		157	249	191	185	185	188	192	193
LaSalle (all) - Nueces										
Cotulla		Municipal	795	1,057	908	934	942	970	1,005	1,040
Encinal		Municipal	98	98	93	75	61	55	51	48
Rural		Municipal	340	231	371	382	389	397	403	398
Total Municipal Demand			1,233	1,386	1,372	1,391	1,392	1,422	1,459	1,486
Industrial Demand			0	0	0	0	0	0	0	0
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			7,292	7,209	7,067	6,849	6,638	6,433	6,234	6,042
Mining Demand			0	0	0	0	0	0	0	0
Livestock Demand			988	574	1,077	1,077	1,077	1,077	1,077	1,077
	Total Demand		9,513	9,169	9,516	9,317	9,107	8,932	8,770	8,605
Continued Next Page										

			Total in	Total in	Projections					
Basin/County/City/Rural			1990	1996	2000	2010	2020	2030	2040	2050
			acft	acft	acft	acft	acft	acft	acft	acft
Medina (part) - Nueces										
Devine		Municipal	630	755	953	943	940	964	987	1,005
Hondo		Municipal	1,456	1,777	2,032	2,092	2,164	2,263	2,327	2,393
Lytle		Municipal	73	90	92	89	87	88	90	92
Natalia		Municipal	294	283	397	408	422	440	452	464
Rural		Municipal	1,535	2,158	1,961	2,038	2,075	2,197	2,272	2,416
Total Municipal Demand			3,988	5,063	5,435	5,570	5,688	5,952	6,128	6,370
Industrial Demand			286	47	302	319	339	361	384	411
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			133,196	69,573	120,332	115,260	110,402	105,749	101,291	97,022
Mining Demand			67	62	75	60	58	57	58	60
Livestock Demand			1,336	1,648	1,638	1,638	1,638	1,638	1,638	1,638
	Total Demand		138,873	76,393	127,782	122,847	118,125	113,757	109,499	105,501
Uvalde (all) - Nueces										
Sabinal		Municipal	381	454	510	546	573	632	683	739
Uvalde		Municipal	3,915	4,435	5,173	5,621	5,921	6,610	7,198	7,871
Rural		Municipal	982	1,248	1,027	907	823	777	737	661
Total Municipal Demand			5,278	6,137	6,710	7,074	7,317	8,019	8,618	9,271
Industrial Demand			557	337	600	643	675	700	759	817
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			140,669	84,588	135,168	129,883	124,804	119,924	115,234	110,728
Mining Demand			399	521	444	428	499	576	666	777
Livestock Demand			994	1,864	1,494	1,494	1,494	1,494	1,494	1,494
	Total Demand		147,897	93,447	144,416	139,522	134,789	130,713	126,771	123,087
Wilson (part) - Nueces										
Rural		Municipal	121	153	173	181	188	198	209	229
Total Municipal Demand			121	153	173	181	188	198	209	229
Industrial Demand			0	0	0	0	0	0	0	0
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			4,096	5,213	3,659	3,231	2,853	2,521	2,227	1,969
Mining Demand			0	0	0	0	0	0	0	0
Livestock Demand			146	164	154	154	154	154	154	154
	Total Demand		4,363	5,530	3,986	3,566	3,195	2,873	2,590	2,352
Zavala (all) - Nueces										
Batesville		Municipal	208	234	212	200	196	204	212	209
Crystal City		Municipal	1,692	1,891	2,034	1,948	1,850	1,908	1,902	1,908
LaPryor		Municipal	278	336	238	203	171	157	150	145
Rural		Municipal	171	229	290	343	357	383	489	658
Total Municipal Demand			2,349	2,690	2,774	2,694	2,574	2,652	2,753	2,920
Industrial Demand			1,306	721	1,407	1,507	1,582	1,642	1,780	1,914
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			110,922	74,669	103,213	99,135	95,218	91,456	87,842	84,371
Mining Demand			116	114	97	42	25	8	2	0
Livestock Demand			714	809	881	881	881	881	881	881
	Total Demand		115,407	79,003	108,372	104,259	100,280	96,639	93,258	90,086
Continued Next Page										

			Total in	Total in	Projections					
Basin/County/City/Rural			**1990**	**1996**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
			acft	**acft**	**acft**	**acft**	**acft**	**acft**	**acft**	**acft**
Nueces Basin Total										
Total Municipal Demand			24,157	27,760	31,702	33,357	34,711	37,811	40,607	42,873
Industrial Demand			2,152	1,109	2,320	2,480	2,608	2,716	2,937	3,157
Steam-Electric Power Demand			6,074	6,075	12,400	12,400	12,400	12,400	15,400	22,400
Irrigation Demand			539,759	396,701	527,710	507,105	487,545	468,496	450,261	432,753
Mining Demand			2,212	3,300	3,509	3,171	3,396	3,566	3,771	4,037
Livestock Demand			7,767	8,597	8,942	8,942	8,942	8,942	8,942	8,942
	Total Demand		582,121	443,542	586,583	567,455	549,602	533,931	521,918	514,162
San Antonio Basin (part)										
Atascosa (part) - San Antonio										
Rural		Municipal	99	105	101	106	111	123	132	132
Total Municipal Demand			99	105	101	106	111	123	132	132
Industrial Demand			0	0	0	0	0	0	0	0
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			1,416	488	1,363	1,311	1,261	1,214	1,167	1,123
Mining Demand			0	0	0	0	0	0	0	0
Livestock Demand			57	66	66	66	66	66	66	66
	Total Demand		1,572	659	1,530	1,483	1,438	1,403	1,365	1,321
Bexar (part) - San Antonio										
Alamo Heights		Municipal	2,210	2,184	2,799	2,732	2,686	2,706	2,728	2,742
Balcones Heights		Municipal	538	538	731	739	759	798	843	885
China Grove		Municipal	217	273	259	276	293	344	393	416
Converse		Municipal	1,213	1,349	2,127	2,837	3,529	4,498	5,365	6,456
Elmendorf		Municipal	52	70	64	65	65	75	85	94
Fair Oaks Ranch		Municipal	617	1,071	1,365	1,368	1,205	1,209	1,214	1,213
Helotes		Municipal	310	381	360	387	415	494	534	577
Kirby		Municipal	1,080	1,149	1,586	1,693	1,839	2,099	2,343	2,614
Leon Valley		Municipal	1,715	1,949	2,288	2,135	1,958	1,956	1,954	2,040
Live Oak Water PublicUtility Mun		Municipal	1,221	1,545	1,101	1,141	1,218	1,389	1,554	1,738
Olmos Park		Municipal	385	378	519	520	530	553	579	603
San Antonio		Municipal	166,616	180,999	220,405	242,339	272,507	312,695	349,957	391,640
Schertz (Outside City) Estimated		Municipal	607	713	819	1,115	1,243	1,455	1,667	1,880
Schertz (Part)		Municipal	60	84	251	550	913	997	1,092	1,192
Shavano Park		Municipal	840	827	1,088	1,163	1,192	1,232	1,284	1,342
St. Hedwig		Municipal	187	290	200	215	230	275	318	367
Terrell Hills		Municipal	817	835	1,090	1,056	1,054	1,070	1,063	1,050
Universal City		Municipal	2,323	2,612	3,386	3,748	4,186	4,864	5,491	6,200
Windcrest (WC&ID No. 10) Mun		Municipal	1,329	1,372	1,675	1,663	1,665	1,687	1,713	1,731
BMWD (Castle Hills)		Municipal	1,311	1,165	1,714	1,743	1,765	1,786	1,769	1,751
BMWD (Somerset)		Municipal	215	282	191	180	171	161	153	149
BMWD(Hill Ctry/HollywPk)Mun		Municipal	2,174	1,882	2,395	2,633	2,901	3,307	3,664	4,079
BMWD(Other Subdns) Est. Mun		Municipal	20,741	24,370	27,999	34,024	39,841	46,235	52,910	56,821
Fort Sam Houston		Municipal	4,342	3,413	4,073	3,804	3,575	3,549	3,522	3,508
Lackland AFB		Municipal	4,212	3,777	3,960	3,708	3,488	3,467	3,446	3,436
Randolph AFB		Municipal	1,993	1,207	1,877	1,761	1,658	1,649	1,644	1,635
Remainder of County		Municipal	7,970	22,810	20,711	23,697	28,678	37,439	44,363	33,682
Total Municipal Demand			225,295	257,525	305,033	337,292	379,564	437,989	491,648	529,841
Continued Next Page										

			Total in	Total in	Projections					
Basin/County/City/Rural			**1990**	**1996**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
			acft	**acft**	**acft**	**acft**	**acft**	**acft**	**acft**	**acft**
Bexar - Continued from Previous Page										
Industrial Demand			14,049	20,627	16,805	19,682	22,359	24,935	28,264	31,697
Steam-Electric Power Demand			24,263	25,714	36,000	36,000	40,000	45,000	50,000	56,000
Irrigation Demand			33,638	38,729	36,623	33,605	32,038	30,997	29,684	28,434
Mining Demand			1,444	6,429	4,781	4,758	5,018	5,217	5,451	5,763
Livestock Demand			1,353	1,791	1,461	1,461	1,461	1,461	1,461	1,461
	Total Demand		300,042	350,815	400,703	432,798	480,440	545,599	606,508	653,196
Comal (part) - San Antonio										
Fair Oaks Ranch		Municipal	19	27	58	58	54	57	60	64
Schertz (Part)		Municipal	19	65	150	440	913	997	1,092	1,192
Rural		Municipal	1,718	1,619	1,897	2,115	2,442	3,333	4,298	5,330
Total Municipal Demand			1,756	1,711	2,105	2,613	3,409	4,387	5,450	6,586
Industrial Demand			0	264	0	0	0	0	0	0
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			409	18	66	63	61	58	56	53
Mining Demand			0	0	0	0	0	0	0	0
Livestock Demand			45	44	50	50	50	50	50	50
	Total Demand		2,210	2,037	2,221	2,726	3,520	4,495	5,556	6,689
DeWitt (part) - San Antonio										
Rural		Municipal	109	148	109	102	98	100	103	106
Total Municipal Demand			109	148	109	102	98	100	103	106
Industrial Demand			0	0	0	0	0	0	0	0
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			22	0	19	17	15	13	11	10
Mining Demand			0	0	0	0	0	0	0	0
Livestock Demand			148	146	153	153	153	153	153	153
	Total Demand		279	294	281	272	266	266	267	269
Goliad (part) - San Antonio										
Goliad		Municipal	412	414	429	419	408	407	416	440
Rural		Municipal	261	285	259	245	233	233	234	247
Total Municipal Demand			673	699	688	664	641	640	650	687
Industrial Demand			0	0	0	0	0	0	0	0
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			685	157	592	511	442	382	330	285
Mining Demand			0	0	0	0	0	0	0	0
Livestock Demand			345	337	471	471	471	471	471	471
	Total Demand		1,703	1,193	1,751	1,646	1,554	1,493	1,451	1,443
Guadalupe (part) - San Antonio										
Cibolo		Municipal	178	316	441	437	464	519	593	632
Marion		Municipal	111	157	131	120	113	113	113	114
Schertz	(Part)	Municipal	1,454	1,811	4,612	4,508	4,261	4,654	5,094	5,563
Rural		Municipal	1,666	978	1,125	1,565	2,104	2,857	3,254	3,835
Total Municipal Demand			3,409	3,262	6,309	6,630	6,942	8,143	9,054	10,144
Industrial Demand			0	2	0	0	0	0	0	0
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			343	0	326	311	296	282	268	255
Mining Demand			8	9	10	10	10	10	10	10
Livestock Demand			258	460	284	284	284	284	284	284
	Total Demand		4,018	3,733	6,929	7,235	7,532	8,719	9,616	10,693
Continued Next Page										

			Total in	Total in	Projections					
Basin/County/City/Rural			**1990**	**1996**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
			acft	**acft**	**acft**	**acft**	**acft**	**acft**	**acft**	**acft**
Karnes (part) - San Antonio										
Karnes City		Municipal	410	393	468	435	442	468	491	515
Kenedy		Municipal	682	587	828	779	799	847	885	931
Runge		Municipal	164	153	199	184	187	196	203	213
Rural		Municipal	820	1,240	936	860	865	904	945	958
Total Municipal Demand			2,076	2,373	2,431	2,258	2,293	2,415	2,524	2,617
Industrial Demand			270	80	296	320	331	340	356	383
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			2,034	2,157	1,840	1,664	1,505	1,362	1,232	1,114
Mining Demand			187	127	147	59	23	15	8	4
Livestock Demand			1,088	1,374	1,060	1,060	1,060	1,060	1,060	1,060
	Total Demand		5,655	6,111	5,774	5,361	5,212	5,192	5,180	5,178
Kendall (part) - San Antonio										
Boerne		Municipal	785	1,083	1,259	1,711	1,718	2,199	2,812	3,598
Fair Oaks Ranch		Municipal	64	81	232	359	326	331	336	342
Rural		Municipal	515	876	1,070	1,539	2,808	4,099	5,578	6,847
Total Municipal Demand			1,364	2,040	2,561	3,609	4,852	6,629	8,726	10,787
Industrial Demand			2	6	2	3	4	4	5	6
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			0	330	0	0	0	0	0	0
Mining Demand			0	0	0	0	0	0	0	0
Livestock Demand			70	68	91	91	91	91	91	91
	Total Demand		1,436	2,444	2,654	3,703	4,947	6,724	8,822	10,884
Medina (part) - San Antonio										
Castroville		Municipal	779	670	958	985	1,013	1,061	1,092	1,123
LaCoste		Municipal	229	213	278	299	300	326	345	365
Rural		Municipal	258	468	441	458	466	493	509	540
Total Municipal Demand			1,266	1,351	1,677	1,742	1,779	1,880	1,946	2,028
Industrial Demand			0	0	0	0	0	0	0	0
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			24,184	16,783	24,081	23,322	22,402	21,521	20,678	19,869
Mining Demand			53	56	68	68	70	72	74	76
Livestock Demand			224	277	276	276	276	276	276	276
	Total Demand		25,727	18,467	26,102	25,408	24,527	23,749	22,974	22,249
Refugio (part) - San Antonio										
Rural		Municipal	11	10	10	9	9	8	8	8
Total Municipal Demand			11	10	10	9	9	8	8	8
Industrial Demand			0	0	0	0	0	0	0	0
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			0	0	0	0	0	0	0	0
Mining Demand			0	0	0	0	0	0	0	0
Livestock Demand			21	19	16	16	16	16	16	16
	Total Demand		32	29	26	25	25	24	24	24
Victoria (part) - San Antonio										
Rural		Municipal	34	19	34	33	32	33	34	37
Total Municipal Demand			34	19	34	33	32	33	34	37
Industrial Demand			0	0	0	0	0	0	0	0
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			0	0	0	0	0	0	0	0
Mining Demand			0	0	0	0	0	0	0	0
Livestock Demand			70	97	78	78	78	78	78	78
	Total Demand		104	116	112	111	110	111	112	115
Continued Next Page										

Basin/County/City/Rural			Total in 1990 acft	Total in 1996 acft	Projections 2000 acft	2010 acft	2020 acft	2030 acft	2040 acft	2050 acft
Wilson (part) - San Antonio										
Floresville		Municipal	1,044	1,146	1,290	1,340	1,385	1,453	1,531	1,613
LaVernia		Municipal	218	203	225	230	234	254	276	286
Poth		Municipal	361	325	449	474	494	522	552	600
Stockdale		Municipal	273	317	334	353	369	392	412	448
Rural		Municipal	1,660	2,247	3,392	4,523	5,003	6,413	7,831	9,205
Total Municipal Demand			3,556	4,238	5,690	6,920	7,485	9,034	10,602	12,152
Industrial Demand			2	1	2	3	4	4	5	6
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			9,485	10,853	10,759	9,767	8,893	8,122	7,443	6,845
Mining Demand			281	271	182	97	58	38	30	20
Livestock Demand			1,606	1,801	1,687	1,687	1,687	1,687	1,687	1,687
	Total Demand		14,930	17,164	18,320	18,474	18,127	18,885	19,767	20,710
San Antonio Basin Total										
Total Municipal Demand			239,648	273,481	326,748	361,978	407,215	471,381	530,877	575,125
Industrial Demand			14,323	20,980	17,105	20,008	22,698	25,283	28,630	32,092
Steam-Electric Power Demand			24,263	25,714	36,000	36,000	40,000	45,000	50,000	56,000
Irrigation Demand			72,216	69,515	75,669	70,571	66,913	63,951	60,869	57,988
Mining Demand			1,973	6,892	5,188	4,992	5,179	5,352	5,573	5,873
Livestock Demand			5,285	6,480	5,693	5,693	5,693	5,693	5,693	5,693
	Total Demand		357,708	403,062	466,403	499,242	547,698	616,660	681,642	732,771
Guadalupe Basin (part)										
Caldwell (part) - Guadalupe										
Lockhart		Municipal	1,816	2,033	2,279	2,498	2,703	2,978	3,024	3,047
Luling		Municipal	1,207	1,145	1,532	1,750	1,955	2,244	2,516	2,819
Martindale		Municipal	101	88	109	103	97	99	106	113
Rural		Municipal	1,591	1,805	3,000	3,090	3,158	3,216	2,936	2,601
Total Municipal Demand			4,715	5,071	6,920	7,441	7,913	8,537	8,582	8,580
Industrial Demand			0	12	62	67	71	77	82	87
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			1,355	1,728	1,204	1,070	951	844	751	667
Mining Demand			27	6	8	7	5	2	0	0
Livestock Demand			681	668	696	696	696	696	696	696
	Total Demand		6,778	7,485	8,890	9,281	9,636	10,156	10,111	10,030
Calhoun (part) - Guadalupe										
Rural		Municipal	3	2	9	9	10	11	11	13
Total Municipal Demand			3	2	9	9	10	11	11	13
Industrial Demand			233	93	419	493	546	601	662	726
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			0	0	0	0	0	0	0	0
Mining Demand			0	6	13	9	5	2	0	0
Livestock Demand			0	2	2	2	2	2	2	2
	Total Demand		236	103	443	513	563	616	675	741
Continued Next Page										

Basin/County/City/Rural			Total in 1990 acft	Total in 1996 acft	Projections 2000 acft	2010 acft	2020 acft	2030 acft	2040 acft	2050 acft
Comal (part) - Guadalupe										
Garden Ridge		Municipal	361	401	616	689	728	856	917	911
New Braunfels		Municipal	6,199	7,284	10,335	12,570	15,436	19,499	22,447	25,717
Rural		Municipal	2,099	4,482	5,531	6,908	9,114	11,827	14,776	18,013
Total Municipal Demand			8,659	12,167	16,482	20,167	25,278	32,182	38,140	44,641
Industrial Demand			3,248	11,700	3,450	3,487	3,548	3,799	4,071	4,351
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			70	17	393	377	361	347	332	318
Mining Demand			946	8,909	5,570	5,464	5,628	5,796	3,590	2,224
Livestock Demand			271	261	306	306	306	306	306	306
	Total Demand		13,194	33,054	26,201	29,801	35,121	42,430	46,439	51,840
DeWitt (part) - Guadalupe										
Cuero		Municipal	1,716	1,462	1,767	1,710	1,684	1,749	1,823	1,891
Yorktown		Municipal	405	407	438	427	424	451	479	510
Rural		Municipal	762	955	683	609	553	532	512	482
Total Municipal Demand			2,883	2,824	2,888	2,746	2,661	2,732	2,814	2,883
Industrial Demand			91	42	108	126	146	170	195	223
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			263	31	231	203	178	156	137	120
Mining Demand			21	22	24	24	25	26	27	28
Livestock Demand			1,378	1,339	1,419	1,419	1,419	1,419	1,419	1,419
	Total Demand		4,636	4,258	4,670	4,518	4,429	4,503	4,592	4,673
Goliad (part) - Guadalupe										
Rural		Municipal	184	197	182	172	164	164	165	174
Total Municipal Demand			184	197	182	172	164	164	165	174
Industrial Demand			0	0	0	0	0	0	0	0
Steam-Electric Power Demand			12,165	11,037	15,000	15,000	20,000	20,000	20,000	20,000
Irrigation Demand			0	26	0	0	0	0	0	0
Mining Demand			0	6	12	9	5	2	0	0
Livestock Demand			195	190	267	267	267	267	267	267
	Total Demand		12,544	11,456	15,461	15,448	20,436	20,433	20,432	20,441
Gonzales (part) - Guadalupe										
Gonzales		Municipal	1,646	1,693	1,648	1,607	1,566	1,564	1,589	1,623
Nixon		Municipal	373	406	384	368	353	351	358	363
Waelder		Municipal	169	138	157	146	141	142	140	140
Rural		Municipal	1,636	1,898	1,676	1,595	1,540	1,519	1,528	1,545
Total Municipal Demand			3,824	4,135	3,865	3,716	3,600	3,576	3,615	3,671
Industrial Demand			865	1,091	929	992	1,043	1,083	1,160	1,231
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			3,540	1,379	3,052	2,632	2,269	1,957	1,687	1,455
Mining Demand			21	31	37	34	32	29	29	30
Livestock Demand			4,072	3,389	5,945	6,277	6,277	6,277	6,277	6,277
	Total Demand		12,322	10,025	13,828	13,651	13,221	12,922	12,768	12,664
Continued Next Page										

			Total in	Total in	Projections					
Basin/County/City/Rural			1990	1996	2000	2010	2020	2030	2040	2050
			acft	acft	acft	acft	acft	acft	acft	acft
Guadalupe (part) - Guadalupe										
McQueeney		Municipal	250	318	251	242	232	254	272	277
New Braunfels		Municipal	55	81	75	84	98	139	155	171
Seguin		Municipal	3,604	4,530	4,566	5,093	5,711	6,800	8,073	9,538
Rural		Municipal	2,309	3,825	4,279	5,883	7,864	10,617	12,094	14,166
Total Municipal Demand			6,218	8,754	9,171	11,302	13,905	17,810	20,594	24,152
Industrial Demand			1,661	2,893	1,883	2,102	2,248	2,385	2,590	2,797
Steam-Electric Power Demand			0	0	10,760	10,760	10,760	10,760	10,760	10,760
Irrigation Demand			2,303	373	2,194	2,088	1,988	1,893	1,803	1,717
Mining Demand			0	261	186	188	190	192	197	203
Livestock Demand			773	1,372	848	848	848	848	848	848
	Total Demand		10,955	13,653	25,042	27,288	29,939	33,888	36,792	40,477
Hays (part) - Guadalupe**										
Kyle		Municipal	326	307	353	337	339	376	435	504
San Marcos		Municipal	6,321	6,404	9,393	11,600	14,381	18,671	24,078	31,049
Wimberley		Municipal	732	576	615	732	790	898	1,004	1,128
Woodcreek		Municipal	182	208	171	160	149	150	153	157
Rural		Municipal	2,244	3,634	5,569	6,646	7,236	8,315	9,255	8,325
Total Municipal Demand			9,805	11,129	16,101	19,475	22,895	28,410	34,925	41,163
Industrial Demand			57	96	93	105	118	129	142	154
Steam-Electric Power Demand			0	0	0	6,400	6,400	6,400	6,400	6,400
Irrigation Demand			298	137	294	292	289	287	284	281
Mining Demand			0	153	84	82	68	55	37	28
Livestock Demand			378	281	271	271	271	271	271	271
	Total Demand		10,538	11,796	16,843	26,625	30,041	35,552	42,059	48,297
Karnes (part) - Guadalupe										
Rural		Municipal	14	36	27	25	25	26	28	28
Total Municipal Demand			14	36	27	25	25	26	28	28
Industrial Demand			0	0	0	0	0	0	0	0
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			0	0	0	0	0	0	0	0
Mining Demand			0	6	11	8	4	1	0	0
Livestock Demand			94	120	92	92	92	92	92	92
	Total Demand		108	162	130	125	121	119	120	120
Kendall (part) - Guadalupe										
Comfort		Municipal	278	293	265	254	245	254	269	285
Rural		Municipal	468	873	686	874	1,094	1,378	1,513	1,661
Total Municipal Demand			746	1,166	951	1,128	1,339	1,632	1,782	1,946
Industrial Demand			0	1	0	0	0	0	0	0
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			380	894	364	349	334	320	306	293
Mining Demand			0	0	0	0	0	0	0	0
Livestock Demand			307	299	404	404	404	404	404	404
	Total Demand		1,433	2,360	1,719	1,881	2,077	2,356	2,492	2,643
Continued Next Page										

			Total in	Total in	Projections					
Basin/County/City/Rural			1990	1996	2000	2010	2020	2030	2040	2050
			acft	acft	acft	acft	acft	acft	acft	acft
Victoria (part) - Guadalupe										
Victoria		Municipal	7,269	8,922	8,345	8,533	8,762	9,304	9,927	10,590
Rural		Municipal	1,220	1,201	1,195	1,141	1,109	1,151	1,188	1,290
Total Municipal Demand			8,489	10,123	9,540	9,674	9,871	10,455	11,115	11,880
Industrial Demand			20,032	19,587	24,115	28,446	31,157	33,670	37,900	42,201
Steam-Electric Power Demand			887	1,893	8,000	10,000	10,000	10,000	10,000	10,000
Irrigation Demand			1,995	1,672	1,723	1,487	1,284	1,108	956	825
Mining Demand			2,398	2,596	1,938	1,302	904	783	675	688
Livestock Demand			626	813	653	653	653	653	653	653
	Total Demand		34,427	36,684	45,969	51,562	53,869	56,669	61,299	66,247
Wilson (part) - Guadalupe										
Rural		Municipal	68	100	113	118	123	129	137	150
Total Municipal Demand			68	100	113	118	123	129	137	150
Industrial Demand			48	0	59	69	81	95	110	128
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			116	0	101	90	80	70	62	55
Mining Demand			0	6	11	8	4	1	0	0
Livestock Demand			61	69	64	64	64	64	64	64
	Total Demand		293	175	348	349	352	359	373	397
Guadalupe Basin Total										
Total Municipal Demand			45,608	55,704	66,249	75,973	87,784	105,664	121,908	139,281
Industrial Demand			26,235	35,515	31,118	35,887	38,958	42,009	46,912	51,898
Steam-Electric Power Demand			13,052	12,930	33,760	42,160	47,160	47,160	47,160	47,160
Irrigation Demand			10,320	6,257	9,556	8,588	7,734	6,982	6,318	5,731
Mining Demand			3,413	12,002	7,894	7,135	6,870	6,889	4,555	3,201
Livestock Demand			8,836	8,803	10,967	11,299	11,299	11,299	11,299	11,299
	Total Demand		107,464	131,211	159,544	181,042	199,805	220,003	238,152	258,570
Lower Colorado Basin (part)										
Caldwell (part) - Lower Colorado										
Rural		Municipal	216	115	121	133	145	157	157	158
Total Municipal Demand			216	115	121	133	145	157	157	158
Industrial Demand			0	0	0	0	0	0	0	0
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			20	14	18	16	14	13	11	10
Mining Demand			0	6	13	9	5	2	0	0
Livestock Demand			135	133	139	139	139	139	139	139
	Total Demand		371	268	291	297	303	311	307	307
Kendall (part) - Lower Colorado										
Rural		Municipal	20	33	22	21	22	23	25	28
Total Municipal Demand			20	33	22	21	22	23	25	28
Industrial Demand			0	0	0	0	0	0	0	0
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			0	0	0	0	0	0	0	0
Mining Demand			0	6	13	9	5	1	0	0
Livestock Demand			12	13	17	17	17	17	17	17
	Total Demand		32	52	52	47	44	41	42	45
Continued Next Page										

Basin/County/City/Rural			Total in 1990 acft	Total in 1996 acft	Projections 2000 acft	2010 acft	2020 acft	2030 acft	2040 acft	2050 acft
Lower Colorado Basin Total										
Total Municipal Demand			236	148	143	154	167	180	182	186
Industrial Demand			0	0	0	0	0	0	0	0
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			20	14	18	16	14	13	11	10
Mining Demand			0	12	26	18	10	3	0	0
Livestock Demand			147	146	156	156	156	156	156	156
	Total Demand		403	320	343	344	347	352	349	352
Lavaca Basin (part)										
DeWitt (part) - Lavaca										
Yoakum		Municipal	425	382	478	493	517	576	640	718
Rural		Municipal	136	183	136	126	121	124	128	131
Total Municipal Demand			561	565	614	619	638	700	768	849
Industrial Demand			0	5	0	0	0	0	0	0
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			0	57	0	0	0	0	0	0
Mining Demand			108	78	94	52	26	18	16	16
Livestock Demand			263	256	271	271	271	271	271	271
	Total Demand		932	961	979	942	935	989	1,055	1,136
Gonzales (part) - Lavaca										
Rural		Municipal	8	16	14	13	13	13	13	13
Total Municipal Demand			8	16	14	13	13	13	13	13
Industrial Demand			0	0	0	0	0	0	0	0
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			0	0	0	0	0	0	0	0
Mining Demand			0	2	4	3	1	0	0	0
Livestock Demand			36	31	54	57	57	57	57	57
	Total Demand		44	49	72	73	71	70	70	70
Victoria (part) - Lavaca										
Rural		Municipal	21	23	22	22	23	23	23	25
Total Municipal Demand			21	23	22	22	23	23	23	25
Industrial Demand			0	0	0	0	0	0	0	0
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			0	0	0	0	0	0	0	0
Mining Demand			0	0	0	0	0	0	0	0
Livestock Demand			6	8	7	7	7	7	7	7
	Total Demand		27	31	29	29	30	30	30	32
Lavaca Basin Total										
Total Municipal Demand			590	604	650	654	674	736	804	887
Industrial Demand			0	5	0	0	0	0	0	0
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			0	57	0	0	0	0	0	0
Mining Demand			108	80	98	55	27	18	16	16
Livestock Demand			305	295	332	335	335	335	335	335
	Total Demand		1,003	1,041	1,080	1,044	1,036	1,089	1,155	1,238
Continued Next Page										

Basin/County/City/Rural			Total in 1990 acft	Total in 1996 acft	Projections 2000 acft	2010 acft	2020 acft	2030 acft	2040 acft	2050 acft
Colorado-Lavaca Coastal Basin										
Calhoun (part) - Colorado-Lavaca										
Point Comfort		Municipal	137	191	171	160	155	160	169	176
Rural		Municipal	80	66	246	259	270	294	319	353
Total Municipal Demand			217	257	417	419	425	454	488	529
Industrial Demand			6,343	19,824	16,538	20,391	22,590	25,036	27,669	30,494
Steam-Electric Power Demand			62	29	100	100	100	100	100	100
Irrigation Demand			0	0	0	0	0	0	0	0
Mining Demand			0	1	1	1	1	0	0	0
Livestock Demand			13	16	15	15	15	15	15	15
	Total Demand		6,635	20,127	17,071	20,926	23,131	25,605	28,272	31,138
Colo-Lavaca Coastal Basin Total			6,635	20,127	17,071	20,926	23,131	25,605	28,272	31,138
Lavaca-Guadalupe Coastal Basin										
Calhoun (part) - Lavaca-Guadalupe										
Port Lavaca		Municipal	1,507	1,672	1,769	1,709	1,698	1,792	1,909	2,033
Seadrift		Municipal	169	191	196	202	216	238	257	280
Rural		Municipal	2,016	539	2,004	2,100	2,188	2,383	2,589	2,870
Total Municipal Demand			3,692	2,402	3,969	4,011	4,102	4,413	4,755	5,183
Industrial Demand			17,963	20,109	46,069	56,704	62,813	69,603	76,905	84,738
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			35,421	48,082	26,822	22,747	19,950	17,673	16,132	15,028
Mining Demand			1	4	6	5	4	3	2	2
Livestock Demand			278	300	287	287	287	287	287	287
	Total Demand		57,355	70,897	77,153	83,754	87,156	91,979	98,081	105,238
DeWitt (part) - Lavaca-Guadalupe										
Rural		Municipal	3	4	3	3	3	3	3	3
Total Municipal Demand			3	4	3	3	3	3	3	3
Industrial Demand			0	0	0	0	0	0	0	0
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			0	0	0	0	0	0	0	0
Mining Demand			0	21	43	30	19	6	1	0
Livestock Demand			51	50	53	53	53	53	53	53
	Total Demand		54	75	99	86	75	62	57	56
Victoria (part) - Lavaca-Guadalupe										
Bloomington		Municipal	181	258	269	268	281	316	343	373
Victoria		Municipal	1,883	2,310	2,161	2,210	2,269	2,410	2,571	2,743
Rural		Municipal	937	1,031	987	939	906	941	970	1,058
Total Municipal Demand			3,001	3,599	3,417	3,417	3,456	3,667	3,884	4,174
Industrial Demand			0	0	0	0	0	0	0	0
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			11,704	10,617	10,101	8,718	7,524	6,494	5,605	4,838
Mining Demand			11	419	640	726	828	931	1,045	1,174
Livestock Demand			569	822	660	660	660	660	660	660
	Total Demand		15,285	15,457	14,818	13,521	12,468	11,752	11,194	10,846
Continued Next Page										

Basin/County/City/Rural			Total in 1990 acft	Total in 1996 acft	Projections 2000 acft	2010 acft	2020 acft	2030 acft	2040 acft	2050 acft
Lavaca-Guad Coastal Basin Total										
Total Municipal Demand			6,696	6,005	7,389	7,431	7,561	8,083	8,642	9,360
Industrial Demand			17,963	20,109	46,069	56,704	62,813	69,603	76,905	84,738
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			47,125	58,699	36,923	31,465	27,474	24,167	21,737	19,866
Mining Demand			12	444	689	761	851	940	1,048	1,176
Livestock Demand			898	1,172	1,000	1,000	1,000	1,000	1,000	1,000
	Total Demand		72,694	86,429	92,070	97,361	99,699	103,793	109,332	116,140
San Antonio-Nueces Coastal Basin										
Calhoun (part) - San Antonio-Nueces										
Rural		Municipal	4	4	16	16	17	18	20	22
Total Municipal Demand			4	4	16	16	17	18	20	22
Industrial Demand			0	0	0	0	0	0	0	0
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			0	0	0	0	0	0	0	0
Mining Demand			4	4	8	6	3	1	1	1
Livestock Demand			0	0	0	0	0	0	0	0
	Total Demand		8	8	24	22	20	19	21	23
Goliad (part) - San Antonio-Nueces										
Rural		Municipal	59	61	58	55	53	52	53	56
Total Municipal Demand			59	61	58	55	53	52	53	56
Industrial Demand			0	0	0	0	0	0	0	0
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			0	6	0	0	0	0	0	0
Mining Demand			0	7	5	3	1	1	0	0
Livestock Demand			344	336	470	470	470	470	470	470
	Total Demand		403	410	533	528	524	523	523	526
Karnes (part) - San Antonio-Nueces										
Rural		Municipal	58	72	54	50	50	52	55	55
Total Municipal Demand			58	72	54	50	50	52	55	55
Industrial Demand			0	0	0	0	0	0	0	0
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			0	0	0	0	0	0	0	0
Mining Demand			0	4	8	6	4	3	2	0
Livestock Demand			71	90	70	70	70	70	70	70
	Total Demand		129	166	132	126	124	125	127	125
Refugio (part) - San Antonio-Nueces										
Refugio		Municipal	569	616	638	626	608	604	599	589
Woodsboro		Municipal	309	261	328	317	304	298	293	288
Rural		Municipal	338	359	352	323	299	288	277	265
Total Municipal Demand			1,216	1,236	1,318	1,266	1,211	1,190	1,169	1,142
Industrial Demand			0	0	0	0	0	0	0	0
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			0	0	0	0	0	0	0	0
Mining Demand			77	112	44	26	19	11	4	4
Livestock Demand			542	476	391	391	391	391	391	391
	Total Demand		1,835	1,824	1,753	1,683	1,621	1,592	1,564	1,537
Continued Next Page										

Basin/County/City/Rural		Total in 1990 acft	Total in 1996 acft	Projections 2000 acft	2010 acft	2020 acft	2030 acft	2040 acft	2050 acft
San Ant-Nuec Coastal Basin Total									
Total Municipal Demand		1,337	1,373	1,446	1,387	1,331	1,312	1,297	1,275
Industrial Demand		0	0	0	0	0	0	0	0
Steam-Electric Power Demand		0	0	0	0	0	0	0	0
Irrigation Demand		0	6	0	0	0	0	0	0
Mining Demand		81	127	65	41	27	16	7	5
Livestock Demand		957	902	931	931	931	931	931	931
	Total Demand	2,375	2,408	2,442	2,359	2,289	2,259	2,235	2,211
South Central Texas Region									
River and Coastal Basin Totals									
Rio Grande Basin (part)									
Total Municipal Demand		6	8	6	6	6	6	6	7
Industrial Demand		0	0	0	0	0	0	0	0
Steam-Electric Power Demand		0	0	0	0	0	0	0	0
Irrigation Demand		0	0	0	0	0	0	0	0
Mining Demand		0	0	0	0	0	0	0	0
Livestock Demand		192	166	150	150	150	150	150	150
	Total Demand	198	174	156	156	156	156	156	157
Nueces Basin (part)									
Total Municipal Demand		24,157	27,760	31,702	33,357	34,711	37,811	40,607	42,873
Industrial Demand		2,152	1,109	2,320	2,480	2,608	2,716	2,937	3,157
Steam-Electric Power Demand		6,074	6,075	12,400	12,400	12,400	12,400	15,400	22,400
Irrigation Demand		539,759	396,701	527,710	507,105	487,545	468,496	450,261	432,753
Mining Demand		2,212	3,300	3,509	3,171	3,396	3,566	3,771	4,037
Livestock Demand		7,767	8,597	8,942	8,942	8,942	8,942	8,942	8,942
	Total Demand	582,121	443,542	586,583	567,455	549,602	533,931	521,918	514,162
San Antonio Basin (part)									
Total Municipal Demand		239,648	273,481	326,748	361,978	407,215	471,381	530,877	575,125
Industrial Demand		14,323	20,980	17,105	20,008	22,698	25,283	28,630	32,092
Steam-Electric Power Demand		24,263	25,714	36,000	36,000	40,000	45,000	50,000	56,000
Irrigation Demand		72,216	69,515	75,669	70,571	66,913	63,951	60,869	57,988
Mining Demand		1,973	6,892	5,188	4,992	5,179	5,352	5,573	5,873
Livestock Demand		5,285	6,480	5,693	5,693	5,693	5,693	5,693	5,693
	Total Demand	357,708	403,062	466,403	499,242	547,698	616,660	681,642	732,771
Guadalupe Basin (part)									
Total Municipal Demand		45,608	55,704	66,249	75,973	87,784	105,664	121,908	139,281
Industrial Demand		26,235	35,515	31,118	35,887	38,958	42,009	46,912	51,898
Steam-Electric Power Demand		13,052	12,930	33,760	42,160	47,160	47,160	47,160	47,160
Irrigation Demand		10,320	6,257	9,556	8,588	7,734	6,982	6,318	5,731
Mining Demand		3,413	12,002	7,894	7,135	6,870	6,889	4,555	3,201
Livestock Demand		8,836	8,803	10,967	11,299	11,299	11,299	11,299	11,299
	Total Demand	107,464	131,211	159,544	181,042	199,805	220,003	238,152	258,570
Continued Next Page									

			Total in	Total in	Projections					
Basin/County/City/Rural			1990	1996	2000	2010	2020	2030	2040	2050
			acft	acft	acft	acft	acft	acft	acft	acft
Lower Colorado Basin (part)										
Total Municipal Demand			236	148	143	154	167	180	182	186
Industrial Demand			0	0	0	0	0	0	0	0
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			20	14	18	16	14	13	11	10
Mining Demand			0	12	26	18	10	3	0	0
Livestock Demand			147	146	156	156	156	156	156	156
	Total Demand		403	320	343	344	347	352	349	352
Lavaca Basin (part)										
Total Municipal Demand			590	604	650	654	674	736	804	887
Industrial Demand			0	5	0	0	0	0	0	0
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			0	57	0	0	0	0	0	0
Mining Demand			108	80	98	55	27	18	16	16
Livestock Demand			305	295	332	335	335	335	335	335
	Total Demand		1,003	1,041	1,080	1,044	1,036	1,089	1,155	1,238
Colorado-Lavaca Basin										
Total Municipal Demand			217	257	417	419	425	454	488	529
Industrial Demand			6,343	19,824	16,538	20,391	22,590	25,036	27,669	30,494
Steam-Electric Power Demand			62	29	100	100	100	100	100	100
Irrigation Demand			0	0	0	0	0	0	0	0
Mining Demand			0	1	1	1	1	0	0	0
Livestock Demand			13	16	15	15	15	15	15	15
	Total Demand		6,635	20,127	17,071	20,926	23,131	25,605	28,272	31,138
Lavaca-Guadalupe Basin										
Total Municipal Demand			6,696	6,005	7,389	7,431	7,561	8,083	8,642	9,360
Industrial Demand			17,963	20,109	46,069	56,704	62,813	69,603	76,905	84,738
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			47,125	58,699	36,923	31,465	27,474	24,167	21,737	19,866
Mining Demand			12	444	689	761	851	940	1,048	1,176
Livestock Demand			898	1,172	1,000	1,000	1,000	1,000	1,000	1,000
	Total Demand		72,694	86,429	92,070	97,361	99,699	103,793	109,332	116,140
San Antonio-Nueces Basin										
Total Municipal Demand			1,337	1,373	1,446	1,387	1,331	1,312	1,297	1,275
Industrial Demand			0	0	0	0	0	0	0	0
Steam-Electric Power Demand			0	0	0	0	0	0	0	0
Irrigation Demand			0	6	0	0	0	0	0	0
Mining Demand			81	127	65	41	27	16	7	5
Livestock Demand			957	902	931	931	931	931	931	931
	Total Demand		2,375	2,408	2,442	2,359	2,289	2,259	2,235	2,211
South Central Texas Region Total										
Total Municipal Demand			318,495	365,340	434,750	481,359	539,874	625,627	704,811	769,523
Industrial Demand			67,016	97,542	113,150	135,470	149,667	164,647	183,053	202,379
Steam-Electric Power Demand			43,451	44,748	82,260	90,660	99,660	104,660	112,660	125,660
Irrigation Demand			669,440	531,249	649,876	617,745	589,680	563,609	539,196	516,348
Mining Demand			7,799	22,858	17,470	16,174	16,361	16,784	14,970	14,308
Livestock Demand			24,400	26,577	28,186	28,521	28,521	28,521	28,521	28,521
	Total Demand		1,130,601	1,088,314	1,325,692	1,369,929	1,423,763	1,503,848	1,583,211	1,656,739
Continued Next Page										

			Total in	Total in	Projections					
Basin/County/City/Rural			1990	1996	2000	2010	2020	2030	2040	2050
			acft	acft	acft	acft	acft	acft	acft	acft
RIVER AND COASTAL BASINS SUMMARY										
Rio Grande			198	174	156	156	156	156	156	157
Nueces			582,121	443,542	586,583	567,455	549,602	533,931	521,918	514,162
San Antonio			357,708	403,062	466,403	499,242	547,698	616,660	681,642	732,771
Guadalupe			107,464	131,211	159,544	181,042	199,805	220,003	238,152	258,570
Lower Colorado			403	320	343	344	347	352	349	352
Lavaca			1,003	1,041	1,080	1,044	1,036	1,089	1,155	1,238
Colorado-Lavaca			6,635	20,127	17,071	20,926	23,131	25,605	28,272	31,138
Lavaca-Guadalupe			72,694	86,429	92,070	97,361	99,699	103,793	109,332	116,140
San Antonio-Nueces			2,375	2,408	2,442	2,359	2,289	2,259	2,235	2,211
South Central Texas Region Total			1,130,601	1,088,314	1,325,692	1,369,929	1,423,763	1,503,848	1,583,211	1,656,739

Source: Texas Water Development Board; 1997 Consensus Water Plan, Most Likely Case, as revised, January 21, 1999.

* Parts of Rio Grande, Nueces, San Antonio, Guadalupe, Lower Colorado, and Lavaca River Basins, and Colorado-Lavaca, Lavaca-Guadalupe, and San Antonio-Nueces Coastal Basins.

** That part of Hays County located in the Guadalupe River Basin

2.10 Water Demand Projections for Major Water Providers in the South Central Texas Region

The Texas Water Development Board's (TWDB) definition of a Major Water Provider (MWP) is as follows:

> "A MWP is an entity, which delivers and sells a significant amount of raw or treated water for municipal and/or manufacturing use on a wholesale and/or retail basis. The entity can be public or private (non-profit or for-profit). Examples include municipalities with wholesale customers, river authorities, and water districts."

It is the intent that the RWPG plan: "1) for each water user that contracts with a wholesale water supplier, and 2) for the wholesale supplier that is defined as a MWP." "31 TAC Chapter 357.7(a) requires: 1) the presentation of current and projected population and water demands, 2) evaluation of current water supplies available, and 3) water supply and demand analysis respectively be reported for the MWPs. 31 TAC Chapter 357.7(a)(1) requires that the regional water plans describe the MWPs and Appendix B to the contract between the TWDB and the San Antonio River Authority (political subdivision for the South Central Texas Region) states that the definition of a MWP will be determined by the RWPG based on the characteristics and needs of the region."

At its meeting on April 13, 1999 the SCTRWPG decided that a Major Water Provider (MWP) is an entity that has commitments to provide 500 acre-feet or more of raw or treated water for municipal and/or manufacturing use, on a wholesale or retail basis, to water users other than its own direct customers. Under this definition, the list of MWPs for the South Central Texas Region is as follows:

San Antonio Water System (SAWS)

Wholesale Accounts:

1) City of Elmendorf (2 taps)
2) Palm Park Water Co. (1 tap)
3) East Central Water Supply Co. (2 taps)

Cities Served by SAWS:

1) San Antonio
2) Balcones Heights
3) Terrell Hills
4) Olmos Park
5) Castle Hills (approximately 20 taps – rest served by Bexar Metropolitan Water Dist.)
6) China Grove

7) Live Oak (approximately 800 taps – rest served by City of Live Oak)
8) Hollywood Park (approximately 30 taps – rest served by Bexar Metropolitan W Dist.)
9) Leon Valley (approximately 30% of city – rest served by City of Leon Valley)
10) Helotes

Bexar Metropolitan Water District (BMWD)—(Retail)

Cities Served by BMWD

1) Bulverde Utility Company
2) Castle Hills
3) Hill Country Village (Stone Oak)
4) Hollywood Park
5) Somerset (with Southside subdivisions)

Subdivisions Served by BMWD

1) Southside
2) Northwest
3) Northeast
4) Texas Research Park
5) Cagnon Road
6) Chaparral
7) Hickory
8) Kingspoint
9) Palo Alto Park (Shalomar)
10) Silver Mountain
11) South Oaks
12) Twin Valley
13) Waterwood (1 and 2)
14) Windy's
15) Primrose
16) Oak South
17) Hidden Springs
18) Elm Valley
19) Timberwood Park
20) North San Antonio Hills

Wholesale Customers Served by BMWD

1) East Central Water Supply Corporation
2) Green Valley Special Utility District
3) Springs Hill Water Supply Corporation
4) City of LaCoste

Canyon Regional Water Authority

1) Crystal Clear Water Supply Corporation
2) Springs Hill Water Supply Corporation
3) Green Valley Special Utility District
4) East Central Water Supply Corporation
5) City of Marion

6) City of Cibolo
7) City of La Vernia
8) Maxwell Water Supply Corporation
9) Martindale Water Supply Corporation
10) County Line Water Supply Corporation
11) Bexar Metropolitan Water District

Guadalupe-Blanco River Authority

1) B. P. Chemical Company
2) Calhoun County Rural Water Supply System
3) Canyon Lake Water Supply Corporation
4) Canyon Regional Water Authority
5) Central Power and Light Company
6) City of Kyle
7) City of Luling
8) City of Port Lavaca
9) City of San Marcos
10) City of Seguin
11) Crystal Clear Water Supply Corporation
12) Gonzales County Water Supply Corporation
13) ISP Technologies
14) New Braunfels Utilities
15) Seadrift Coke, L.P.
16) Southwest Texas State University
17) Springs Hill Water Supply Corporation
18) Standard Gypsum
19) Structured Metals, Inc.
20) Rice Farmers
21) Union Carbide Corporation
22) Panda Guadalupe Power
23) City of San Antonio
24) San Antonio River Authority
25) Bexar Metropolitan Water District
26) Maxwell Water Supply Corporation
27) County Line Water Supply Corporation
28) Green Valley Special Utility District

New Braunfels Utilities

1) City of New Braunfels
2) Springs Hill Water Supply Corporation
3) Crystal Clear Water Supply Corporation
4) Green Valley Special Utility District

City of San Marcos

1) City of San Marcos
2) Southwest Texas State University
3) Texas Education Foundation

2.10.1 San Antonio Water System (SAWS)

The San Antonio Water System (SAWS) provides wholesale water supplies to three utility systems, retail water supplies to nine suburban municipalities, and retail water supplies for most, but not all, of the City of San Antonio. SAWS is the sole water provider for the Cities of Elmendorf, Balcones Heights, China Grove, Helotes, Olmos Park, Terrell Hills, and Palm Park Water Co., and provides part of the water supply for East Central WSC, Leon Valley, Live Oak, and San Antonio. In addition to these customers, Castle Hills and Hollywood Park are customers of SAWS, but have not historically obtained water from this source and are shown in Table 2-13 with a projected demand from SAWS of zero.

As noted in the preceding paragraph, several of SAWS' customers also obtain water from other Major Water Providers (MWP) or supply a portion of their own water. East Central WSC is a customer of BMWD and CRWA, although historically East Central WSC has not obtained water from BMWD. Leon Valley and Live Oak both obtain water from SAWS and also supply a portion of their own water (Table 2-13). The total amount of water supplied by SAWS in 1990 was 173,087 acft, all of which was for municipal purposes (Table 2-13). The total amount of water needed by SAWS to meet its customers' projected demands in 2030 is 322,846 acft/yr and in 2050 is 403,397 acft/yr (Table 2-13).

2.10.2 Bexar Metropolitan Water District (BMWD)

The Bexar Metropolitan Water District (BMWD) has wholesale water connections with four utility systems (City of LaCoste, East Central WSC, Green Valley SUD, and Springs Hill WSC), and has historically been the sole water supplier for the Bulverde Utility Company, the Cities of Castle Hills, Hill County Village/Hollywood Park, Somerset, and 20 subdivisions within Bexar County. BMWD is projected to supply a portion of the City of LaCoste's water demands in the future. In addition to these customers East Central WSC, Green Valley SUD, and Springs Hill WSC are customers of BMWD, but have not historically obtained water from this source and are shown in Table 2-13 with a projected demand from BMWD of zero. The total amount of water supplied by BMWD in 1990 was 24,536 acft, all of which was for municipal purposes (Table 2-13). The total amount of water needed by BMWD to meet its customers' projected demands in 2030 is 51,914 acft/yr and in 2050 is 63,490 acft/yr (Table 2-13).

Table 2-13
Water Demand Projections for Major Water Providers
South Central Texas Region

Major Water Providers	Total in 1990 acft	Total in 1996 acft	Projected Water Demand 2000 acft	2010 acft	2020 acft	2030 acft	2040 acft	2050 acft	Notes
San Antonio Water System (SAWS)									
Municipal	**173,087**	**188,353**	**228,728**	**251,024**	**281,693**	**322,846**	**360,936**	**403,397**	
Industrial	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
Wholesale Accounts:									
East Central WSC									
Municipal	1,129	1,292	1,827	2,281	2,777	3,319	3,793	4,217	That part of demand to be met by SAWS (see BMWD and CRWA).
Industrial	0	0	0	0	0	0	0	0	
Elmendorf									
Municipal	52	70	64	65	65	75	85	94	City of Elmendorf's total municipal water demand.
Industrial	0	0	0	0	0	0	0	0	
Palm Park Water Co.									
Municipal	87	93	84	85	117	153	181	137	Year 1990 & 1996 values from TWDB; projected using the rural growth rate of municipal water
Industrial	0	0	0	0	0	0	0	0	demand for that part of Bexar County located within the San Antonio River Basin.
Cities Served by SAWS									
Balcones Heights									
Municipal	538	538	731	739	759	798	843	885	City of Balcones Heights total municipal water demand.
Industrial	0	0	0	0	0	0	0	0	
Castle Hills									
Municipal	0	0	0	0	0	0	0	0	City of Castle Hills' total municipal water demand is included in BMWD's projections.
Industrial	0	0	0	0	0	0	0	0	
China Grove									
Municipal	217	273	259	276	293	344	393	416	City of China Grove's total municipal water demand.
Industrial	0	0	0	0	0	0	0	0	
Helotes									
Municipal	310	381	360	387	415	494	534	577	City of Helote's total municipal water demand.
Industrial	0	0	0	0	0	0	0	0	
Hollywood Park									
Municipal	0	0	0	0	0	0	0	0	The City of Hollywood Park's total municipal water demand is included in BMWD's projections.
Industrial	0	0	0	0	0	0	0	0	
Leon Valley									
Municipal	1,715	1,949	2,288	2,135	1,958	1,956	1,954	2,040	City of Leon Valley's total municipal water demand.
Industrial	0	0	0	0	0	0	0	0	
Live Oak									
Municipal	1,221	1,545	1,101	1,141	1,218	1,389	1,554	1,738	City of Live Oak's total municipal water demand.
Industrial	0	0	0	0	0	0	0	0	

Continued Next Page

Major Water Providers	Total in 1990 acft	Total in 1996 acft	Projected Water Demand 2000 acft	2010 acft	2020 acft	2030 acft	2040 acft	2050 acft	Notes
Olmos Park									
Municipal	385	378	519	520	530	553	579	603	City of Olmos Park's total municipal water demand.
Industrial	0	0	0	0	0	0	0	0	
San Antonio									
Municipal	166,616	180,999	220,405	242,339	272,507	312,695	349,957	391,640	City of San Antonio's total municipal water demand.
Industrial									
Terrel Hills									
Municipal	817	835	1,090	1,056	1,054	1,070	1,063	1,050	City of Terrell Hills' total municipal water demand.
Industrial	0	0	0	0	0	0	0	0	
Bexar Metropolitan Water District (BMWD)									
Municipal	**24,536**	**27,882**	**32,542**	**38,885**	**45,035**	**51,988**	**59,133**	**63,581**	
Industrial	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
Cities Served by BMWD									
Bulverde Utility Company									
Municipal	95	183	214	239	276	377	486	603	Year 1990 & 1996 values from TWDB; projected using the rural growth rate of municipal water
Industrial	0	0	0	0	0	0	0	0	demand for that part of Comal County located within the San Antonio River Basin.
Castle Hills									
Municipal	1,311	1,165	1,714	1,743	1,765	1,786	1,769	1,751	City of Castle Hills' total municipal water demand.
Industrial	0	0	0	0	0	0	0	0	
Hill Country Village/Hollywood Park									
Municipal	2,174	1,882	2,395	2,633	2,901	3,307	3,664	4,079	HCV/HP's total municipal water demand.
Industrial	0	0	0	0	0	0	0	0	
Somerset (with Southside subdivisions)									
Municipal	215	282	220	225	230	235	237	240	City of Somerset's total municipal water demand.
Industrial	0	0	0	0	0	0	0	0	
Subdivisions Served by BMWD									
Municipal	20,741	24,370	27,999	34,024	39,841	46,235	52,910	56,821	Total of all BMWD Subdivisions listed below.
Industrial	0	0	0	0	0	0	0	0	
Cagnon Road	—	—	—	—	—	—	—	—	Total is in BMWD Subdivisions
Chaparral	—	—	—	—	—	—	—	—	Total is in BMWD Subdivisions
Elm Valley	—	—	—	—	—	—	—	—	Total is in BMWD Subdivisions
Hickory	—	—	—	—	—	—	—	—	Total is in BMWD Subdivisions
Hidden Springs	—	—	—	—	—	—	—	—	Total is in BMWD Subdivisions
Kingspoint	—	—	—	—	—	—	—	—	Total is in BMWD Subdivisions
North San Antonio Hills	—	—	—	—	—	—	—	—	Total is in BMWD Subdivisions
Northeast	—	—	—	—	—	—	—	—	Total is in BMWD Subdivisions
Northwest	—	—	—	—	—	—	—	—	Total is in BMWD Subdivisions
Oak South	—	—	—	—	—	—	—	—	Total is in BMWD Subdivisions
Palo Alto Park (Shalomar)	—	—	—	—	—	—	—	—	Total is in BMWD Subdivisions
Continued Next Page									

Major Water Providers	Total in 1990 acft	Total in 1996 acft	Projected Water Demand 2000 acft	2010 acft	2020 acft	2030 acft	2040 acft	2050 acft	Notes
Subdivision Servied by BMWD (cont.)									
Primrose	—	—	—	—	—	—	—	—	Total is in BMWD Subdivisions
Silver Mountain	—	—	—	—	—	—	—	—	Total is in BMWD Subdivisions
South Oaks	—	—	—	—	—	—	—	—	Total is in BMWD Subdivisions
Southside	—	—	—	—	—	—	—	—	Total is in BMWD Subdivisions
Texas Research Park	—	—	—	—	—	—	—	—	Total is in BMWD Subdivisions
Timberwood Park	—	—	—	—	—	—	—	—	Total is in BMWD Subdivisions
Twin Valley	—	—	—	—	—	—	—	—	Total is in BMWD Subdivisions
Waterwood (1 and 2)	—	—	—	—	—	—	—	—	Total is in BMWD Subdivisions
Windy's	—	—	—	—	—	—	—	—	Total is in BMWD Subdivisions
Wholesale Customers Served by BMWD									
City of LaCoste									
Municipal	0	0	0	21	22	48	67	87	Self supplied at year 2000 level; however, the water demand growth after 2000 is projected to be
Industrial	0	0	0	0	0	0	0	0	met by BMWD.
East Central WSC									
Municipal	0	0	0	0	0	0	0	0	That part of demand to be met by BMWD (see SAWA and CRWA).
Industrial	0	0	0	0	0	0	0	0	
Green Valley SUD									
Municipal	0	0	0	0	0	0	0	0	That part of demand to be met by BMWD (see CRWA, GBRA, and New Braunfels Utilities).
Industrial	0	0	0	0	0	0	0	0	
Springs Hill WSC									
Municipal	0	0	0	0	0	0	0	0	That part of demand to be met by BMWD (see CRWA, GBRA, and New Braunfels Utilities).
Industrial	0	0	0	0	0	0	0	0	
Canyon Regional Water Authority (CRWA)									
Municipal	**291**	**2,246**	**2,529**	**3,708**	**4,985**	**6,662**	**8,029**	**9,542**	
Industrial	**0**	**4**	**7**	**8**	**11**	**13**	**14**	**15**	
Bexar Met NE									
Municipal	0	0	0	0	0	0	0	0	BMWD (Northeast Service Area) total municipal water demand is included in BMWD's
Industrial	0	0	0	0	0	0	0	0	projections.
City of Cibolo									
Municipal	198	316	441	437	464	519	593	632	City of Cibolo's total municipal water demand.
Industrial	0	0	0	0	0	0	0	0	
City of La Vernia									
Municipal	0	0	0	5	9	29	51	61	Self supplied at year 2000 level; however, the water demand growth after 2000 is projected
Industrial	0	0	0	0	0	0	0	0	to be met by CRWA.
City of Marion									
Municipal	0	0	0	0	0	0	0	0	Self supplied.
Industrial	0	0	0	0	0	0	0	0	

Continued Next Page

Major Water Providers	Total in 1990 acft	Total in 1996 acft	Projected Water Demand 2000 acft	2010 acft	2020 acft	2030 acft	2040 acft	2050 acft	Notes
County Line WSC									
Municipal	0	0	0	43	82	129	176	215	Self supplied at year 2000 level; however, the water demand growth after 2000 is projected to
Industrial	0	0	0	0	0	0	0	0	be met by CRWA.
Crystal Clear WSC									
Municipal	93	125	55	534	1,023	1,669	2,201	2,789	That part of demand to be met by CRWA (see GBRA and New Braunfels Utilities).
Industrial	0	0	0	0	0	0	0	0	

East Central WSC									
Municipal	0	176	249	310	377	452	515	572	That part of demand to be met by CRWA (see SAWS and BMWD).
Industrial	0	0	0	0	0	0	0	0	
Green Valley SUD									
Municipal	0	679	834	1,376	1,978	2,767	3,324	4,027	That part of demand to be met by CRWA (see BMWD, GBRA, and New Braunfels Utilities).
Industrial	0	3	6	7	9	11	12	13	
Martindale WSC									
Municipal	0	0	0	53	102	147	159	176	Self supplied at year 2000 level; however, the water demand growth after 2000 is projected to
Industrial	0	0	0	0	0	0	0	0	be met by CRWA.
Maxwell WSC									
Municipal	0	0	0	0	0	0	60	120	Self supplied at year 2000 level; however the water demand growth after 2000 is projected to
Industrial	0	0	0	0	0	0	0	0	be met by CRWA and GBRA (see GBRA).
Springs Hill WSC									
Municipal	0	950	950	950	950	950	950	950	Contract amount between Springs Hill WSC and CRWA (see BMWD, GBRA, and New
Industrial	0	1	1	1	2	2	2	2	Braunfels Utlities).
Guadalupe-Blanco River Authority									
Municipal	**17,683**	**19,446**	**31,531**	**31,749**	**31,954**	**32,243**	**32,515**	**32,818**	
Industrial	**1,885**	**1,885**	**7,259**	**7,259**	**7,259**	**7,259**	**7,259**	**7,259**	
Steam-Electric Power	**2,000**	**2,000**	**8,840**	**8,840**	**10,840**	**10,840**	**10,840**	**10,840**	
Irrigation	**35,421**	**48,082**	**26,822**	**22,747**	**19,950**	**17,673**	**16,132**	**15,028**	
B.P. Chemical Company									
Municipal	0	0	0	0	0	0	0	0	Contract amount between B.P. Chemical Company and GBRA.
Industrial	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100	
BMWD									
Municipal	0	0	0	0	0	0	0	0	BMWD historically has not obtained water from GBRA.
Industrial	0	0	0	0	0	0	0	0	
Calhoun County RWSC									
Municipal	312	347	560	560	560	560	560	560	Contract amount between Calhoun County RWSC and GBRA.
Industrial	0	0	0	0	0	0	0	0	
Canyon Lake WSC									
Municipal	178	379	1,000	1,000	1,000	1,000	1,000	1,000	Contract amount between Canyon Lake WSC and GBRA.
Industrial	0	0	0	0	0	0	0	0	
Canyon Regional Water Authority									
Municipal	7,550	7,550	7,550	7,550	7,550	7,550	7,550	7,550	Contract amount between CRWA and GBRA.
Industrial	0	0	0	0	0	0	0	0	
Central Power and Light Company									
Municipal	0	0	0	0	0	0	0	0	Contract amount between CP&L and GBRA.
Steam-Electric Power	2,000	2,000	2,000	2,000	4,000	4,000	4,000	4,000	
Continued Next Page									

Major Water Providers	Total in 1990 acft	Total in 1996 acft	Projected Water Demand 2000 acft	2010 acft	2020 acft	2030 acft	2040 acft	2050 acft	Notes
City of Kyle									
Municipal	0	0	589	589	589	589	589	589	Contract amount between City of Kyle and GBRA; contract is pending.
Industrial	0	0	0	0	0	0	0	0	
City of Luling									
Municipal	1,207	1,145	1,532	1,750	1,955	2,244	2,516	2,819	City of Luling's total municipal water demand.
Industrial	0	0	0	0	0	0	0	0	
City of Port Lavaca									
Municipal	1,507	1,672	1,500	1,500	1,500	1,500	1,500	1,500	Contract amount between City of Port Lavaca and GBRA.
Industrial	0	0	0	0	0	0	0	0	
City of San Antonio									

Municipal	—	—	—	—	—	—	—	—	The City of San Antonio historically hs not obtained water from GBRA; see SAWS and BMWD
Industrial	—	—	—	—	—	—	—	—	for San Antonio's municipal water demand projections.
City of San Marcos									
Municipal	0	0	5,000	5,000	5,000	5,000	5,000	5,000	Contract amount between the City of San Marcos and GBRA.
Industrial	0	0	0	0	0	0	0	0	
City of Seguin									
Municipal	0	0	3,000	3,000	3,000	3,000	3,000	3,000	Contract amount between the City of Seguin and GBRA. For steam-electric.
Industrial	0	0	0	0	0	0	0	0	
County Line WSC									
Municipal	0	0	30	30	30	30	30	30	Contract amount between County Line WSC and GBRA.
Industrial	0	0	0	0	0	0	0	0	
Crystal Clear WSC									
Municipal	52	69	800	800	800	800	800	800	Contract amount between Crystal Clear WSC and GBRA (see CRWA and New Braunfels
Industrial	0	0	0	0	0	0	0	0	Utilities).
Rice Farmers									
Irrigation	35,421	48,082	26,822	22,747	19,950	17,673	16,132	15,028	Calhoun County's total irrigation demand.
Gonzales County WSC									
Municipal	568	661	700	700	700	700	700	700	Contract amount between Gonzales County WSC and GBRA.
Industrial	0	0	0	0	0	0	0	0	
Green Valley SUD									
Municipal	0	0	200	200	200	200	200	200	Contract amount between Green Valley SUD and GBRA (see BMWD, CRWA, and New
Industrial	0	0	0	0	0	0	0	0	Braunfels Utilties).
ISP Technologies									
Municipal	0	0	0	0	0	0	0	0	Contract amount between ISP Technologies and GBRA.
Industrial	0	0	40	40	40	40	40	40	
Maxwell WSC									
Municipal	0	0	350	350	350	350	350	350	Contract amount between Maxwell WSC and GBRA (see CRWA).
Industrial	0	0	0	0	0	0	0	0	
New Braunfels Utilities									
Municipal	5,173	6,271	6,720	6,720	6,720	6,720	6,720	6,720	Contract amount between New Braunfels Utilities and GBRA (see New Braunfels Utilties).
Industrial	0	0	0	0	0	0	0	0	

Continued Next Page

	Total in	Total in	Projected Water Demand						
Major Water Providers	**1990**	**1996**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
	acft	**acft**	**acft**	**acft**	**acft**	**acft**	**acft**	**acft**	
Panda Guadalupe Power									
Municipal	0	0	0	0	0	0	0	0	Contract amount between Panda Guadalupe Power and GBRA.
Steam-Electric Power	0	0	6,840	6,840	6,840	6,840	6,840	6,840	
San Antonio River Authority									
Municipal	0	0	0	0	0	0	0	0	The San Antonio River Authority historically has not obtained water from GBRA.
Industrial	0	0	0	0	0	0	0	0	
Seadrift Coke, L.P.									
Municipal	0	0	0	0	0	0	0	0	Contract amount between Seadrift Coke, L.P. and GBRA.
Industrial	0	0	334	334	334	334	334	334	
Southwest Texas State University									
Municipal	500	500	500	500	500	500	500	500	Contract amount between Southwest Texas State University and GBRA.
Industrial	0	0	0	0	0	0	0	0	
Springs Hill WSC									
Municipal	636	852	1,500	1,500	1,500	1,500	1,500	1,500	Contract amount between Springs Hill WSC and GBRA (see BMWD, CRWA, and New
Industrial	0	0	0	0	0	0	0	0	Braunfels Utlities).
Standard Gypsum									
Municipal	0	0	0	0	0	0	0	0	Contract amount between Standard Gypsum and GBRA.
Industrial	185	185	185	185	185	185	185	185	

Structured Metals, Inc.									
Municipal	0	0	0	0	0	0	0	0	Contract amount between Structured Metals, Inc. and GBRA.
Industrial	600	600	600	600	600	600	600	600	
Union Carbide Corporation									
Municipal	0	0	0	0	0	0	0	0	Contract amount between Union Carbide Corporation and GBRA.
Industrial	0	0	5,000	5,000	5,000	5,000	5,000	5,000	
New Braunfels Utilities									
Municipal	**2,225**	**2,381**	**4,209**	**6,836**	**10,157**	**14,837**	**18,222**	**22,025**	
Industrial	**52**	**52**	**71**	**86**	**106**	**135**	**154**	**177**	
City of New Braunfels									
Municipal	1,081	1,094	3,690	5,934	8,814	12,918	15,882	19,168	That part of demand to be met by New Braunfels Utilities (see GBRA).
Industrial	49	49	68	82	101	128	147	169	
Springs Hill WSC									
Municipal	655	821	0	0	0	0	0	0	Springs Hill WSC utlitzies water from New Braunfels Utilities on an emergency basis only
Industrial	1	1	0	0	0	0	0	0	(see BMWD, CRWA, and GBRA)
Crystal Clear WSC									
Municipal	50	67	30	94	181	294	388	492	That part of demand to be met by New Braunfels Utilities (see CRWA and GBRA).
Industrial	0	0	0	0	0	0	0	0	
Green Valley SUD									
Municipal	439	399	489	808	1,162	1,625	1,952	2,365	That part of demand to be met by New Braunfels Utilities (see BMWD, CRWA, and GBRA).
Industrial	2	2	3	4	5	7	7	8	

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Major Water Providers	**Total in 1990 acft**	**Total in 1996 acft**	**Projected Water Demand 2000 acft**	**2010 acft**	**2020 acft**	**2030 acft**	**2040 acft**	**2050 acft**	**Notes**
City of San Marcos									
Municipal	**6,629**	**6,935**	**10,043**	**12,281**	**15,095**	**19,422**	**24,869**	**31,883**	
Industrial	**57**	**96**	**348**	**362**	**398**	**422**	**448**	**475**	
City of San Marcos									
Municipal	6,321	6,404	9,393	11,600	14,381	18,671	24,078	31,049	City of San Marcos' total municipal water demand.
Industrial	57	96	93	105	118	129	142	154	
Southwest Texas State University									
Municipal	26	246	365	396	429	466	506	549	Values are from a past study conducted by HDR Engineering Inc.
Industrial	—	—	255	257	280	293	306	321	
Texas Education Foundation									
Municipal	282	285	285	285	285	285	285	285	Year 1990 & 1996 values from TWDB; water use held constant at 1996 levels.
Industrial	0	0	0	0	0	0	0	0	

2.10.3 Canyon Regional Water Authority (CRWA)

Canyon Regional Water Authority (CRWA) is a water planning and development agency for water purveyors that serve large areas of Guadalupe County, and portions of Bexar, Hays, Wilson, and Comal Counties. In addition to serving as a planning and development agency for its 11 member entities, CRWA provides part of the water supply for Crystal Clear WSC, Springs Hill WSC, Green Valley SUD, and East Central WSC and provides water to meet all of the City of Cibolo's demands. The total amount of water supplied by CRWA for 1990 was 291 acft, all of which was for municipal purposes. The total amount of water needed by CRWA to meet its customers' projected demands in 2030 is 6,675 acft/yr, with 6,662 acft/yr being for municipal purposes, and 13 acft/yr being for industrial purposes, and 9,557 acft/yr in 2050, with 9,542 acft/yr being for municipal purposes, and 15 acft/yr being for industrial purposes (Table 2-13). CRWA is projected to supply a portion of the water demands for the City of La Vernia, County Line WSC, Martindale WSC, and Maxwell WSC in the future (Table 2-13). In addition to these customers, the City of Marion, and BMWD's Northeast Service Area are customers of CRWA, but have not historically obtained water from this source and are shown in Table 2-13 with a projected demand from CRWA of zero.

As noted in the preceding paragraph, several of CRWA's customers also obtain water from other sources. Crystal Clear WSC is a customer of GBRA and New Braunfels Utilities; Springs Hill WSC is a customer of BMWD, GBRA, and New Braunfels Utilities (Springs Hill historically has not obtained water from BMWD); Green Valley SUD is a customer of BMWD, GBRA, and New Braunfels Utilities (Green Valley historically has not obtained water from BMWD or GBRA); East Central WSC is a customer of SAWS and BMWD (East Central historically has not obtained water from BMWD) (Table 2-13). In addition, Crystal Clear WSC, Springs Hill, and Green Valley SUD supply a portion of their own water.

Two of CRWA's customers (Green Valley SUD and Springs Hill WSC) are projected to utilize water received from CRWA for industrial purposes over the planning period (Table 2-13).

2.10.4 Guadalupe-Blanco River Authority (GBRA)

The Guadalupe-Blanco River Authority (GBRA) supplies potable water and raw water for municipal, industrial, irrigation, and steam-electric purposes through management of substantial quantities of run-of-river rights and storage rights in Canyon Reservoir. As of July

1999, the Authority had contracts to provide water to 28 public and private entities, although historically GBRA in and of itself has only been called upon to meet the water demands, either in part or in whole, of Calhoun County RWSC, Canyon Lake WSC, CRWA, Central Power and Light, City of Luling, City of Port Lavaca, Crystal Clear WSC, rice farmers in Calhoun County, Gonzales County WSC, New Braunfels Utilities, Springs Hill WSC, Standard Gypsum, and Structured Metals, Inc. The total amount of water supplied by GBRA in 1990 was 56,989 acft, of which 17,683 acft was for municipal purposes, 1,885 acft was for industrial purposes, 2,000 acft was for steam-electric power purposes, and 35,421 acft was for irrigation purposes (Table 2-13). The total amount of water needed by GBRA to meet its customers' demands and current contract amounts in 2030 is 68,015 acft/yr, with 32,243 acft/yr being for municipal purposes, 7,259 acft/yr being for industrial purposes, 10,840 acft/yr being for steam-electric power purposes, and 17,673 acft/yr being for irrigation purposes (Table 2-13). The total amount of water needed by GBRA to meets its customers' projected demands and current contract amounts in 2050 is 65,945 acft/yr, with 32,818 acft/yr being for municipal purposes, 7,259 acft/yr being for industrial purposes, 10,840 acft/yr being for steam-electric power purposes, and 15,028 acft/yr being for irrigation purposes (Table 2-13).

In addition to those customers whom GBRA has historically supplied water, B.P. Chemical Company, BMWD, City of San Antonio, City of Seguin, County Line WSC, Green Valley SUD, ISP Technologies, Maxwell WSC, San Antonio River Authority, Seadrift Coke, L.P., and Union Carbide Corporation are customers of GBRA, but have not historically obtained water from this source; however, these entities do have contracts with GBRA and those contract amounts have been included in Table 2-13.

Several of GBRA's customers obtain water from other sources. Crystal Clear WSC is a customer of CRWA and New Braunfels Utilities, and Springs Hill WSC is a customer of BMWD, CRWA, and New Braunfels Utilities (Springs Hill historically has not obtained water from BMWD) (Table 2-13). In addition, Canyon Lake WSC, City of Luling, City of Port Lavaca, Crystal Clear WSC, Gonzales County WSC, New Braunfels Utilities, and Springs Hill WSC supply a portion of their own water.

Six of GBRA's customers (Calhoun County RWSC, City of Port Lavaca, New Braunfels Utilities, Springs Hill WSC, Standard Gypsum, and Structured Metals, Inc.) are projected to utilize water received from GBRA for industrial purposes over the planning period (Table 2-13).

In addition, three of GBRA's customers (American Electric Power (formerly Central Power & Light Company), Panda Guadalupe Power, and the City of Seguin) are projected to utilize water received from GBRA for steam-electric power purposes over the planning period (Table 2-13).

2.10.5 New Braunfels Utilities (NBU)

New Braunfels Utilities supplies water to the City of New Braunfels and two utilities (Crystal Clear WSC, and Green Valley SUD) that serve neighboring areas. The total amount of water supplied by NBU in 1990 was 2,277 acft, of which 2,225 acft was for municipal purposes, and 52 acft was for industrial purposes (Table 2-13). The total amount of water needed by NBU to meet its customers' projected demands in 2030 is 14,837 acft/yr, with 14,837 acft/yr being for municipal purposes and 135 acft/yr being for industrial purposes, and 22,202 acft/yr in 2050, with 22,025 acft/yr being for municipal purposes and 177 acft/yr being for industrial purposes (Table 2-13).

New Braunfels Utilities, Springs Hill WSC, Crystal Clear WSC, and Green Valley SUD also obtain water from other sources. Springs Hill WSC is a customer of BMWD, CRWA, and GBRA (Springs Hill historically has not obtained water from BMWD, and is projected to depend upon NBU as an emergency source of water only); Crystal Clear WSC is a customer of CRWA and GBRA; Green Valley SUD is a customer of BMWD, CRWA, and GBRA (Green Valley historically has not obtained water from BMWD or GBRA); and New Braunfels Utilities is a customer of GBRA (Table 2-13). In addition to these addition water supplies, all of these entities supply a portion of their own water.

Two of NBU's customers (City of New Braunfels and Green Valley SUD) are projected to utilize water obtained from NBU for industrial purposes over the planning period (Table 2-13).

2.10.6 City of San Marcos

In addition to supplying water to the permanent residents of San Marcos, the City supplies water to Southwest Texas State University (SWTSU) and the Texas Education Foundation. The total amount of water supplied by the City of San Marcos in 1990 was 6,686 acft, of which 6,629 acft was for municipal purposes, and 57 acft was for industrial purposes (Table 2-13). The total amount of water needed by the City to meet its customers' demands in 2030 is 14,844 acft/yr, with 14,422 acft/yr being for municipal purposes, and 422 acft/yr being for industrial purposes, and 27,358 acft/yr in 2050, with 26,883 acft/yr being for municipal purposes, and 475 acft/yr being for industrial purposes (Table 2-13). Both the City of San Marcos and SWTSU obtain water from GBRA as well as supply a portion of their own water (Table 2-13).

Only one of the City of San Marcos' customers (SWTSU) is projected to utilize water obtained from the City for industrial purposes over the planning period, however, the City is projected to supply water to industrial customers located within the City through its retail distribution system.

Section 3
Evaluation of Current Water Supplies

3.1 Groundwater

There are five major and two minor aquifers supplying water to the region. The five major aquifers are the Edwards-Balcones Fault Zone, Carrizo-Wilcox, Trinity, Gulf Coast, and Edwards-Trinity (Plateau) Aquifers (Figure 3-1). The two minor aquifers are the Sparta and Queen City Aquifers. Sections 1.7.1 and 1.8.1 contain further descriptions of the aquifers including water quality. The descriptions presented in this section provide water use information for the aquifers located within the region.

3.1.1 Edwards-Balcones Fault Zone Aquifer (Edwards Aquifer)

The Edwards Aquifer underlies parts of six counties (Uvalde, Medina, Bexar, Atascosa, Comal, and Hays) in the South Central Texas Region. The aquifer forms a narrow belt extending from a groundwater divide in Kinney County through the San Antonio area northeastward to the Leon River in Bell County. In the South Central Texas Planning Region, water from the aquifer is primarily used for municipal, irrigation, and recreational purposes. Historically, about 54 percent of the total water pumped from the aquifer in the region has been used for municipal supply, with 39 percent used for irrigation purposes. The Edwards Aquifer is projected to supply water for municipal, industrial, and irrigation uses in Atascosa, Bexar, Caldwell, Comal, Guadalupe, Hays, Medina, and Uvalde Counties.

3.1.2 Carrizo-Wilcox Aquifer (Carrizo Aquifer)

The Wilcox Group and the overlying Carrizo Formation of the Claiborne Group form a hydrologically-connected system known as the Carrizo-Wilcox Aquifer, which is referred to in this study as the Carrizo Aquifer. Historically, municipal and irrigation pumpage account for about 35 percent and 51 percent, respectively, of total pumpage from the Carrizo Aquifer within the region, with irrigation being the predominant use in the Winter Garden region. The Carrizo Aquifer is projected to supply water for municipal, industrial, steam-electric power, mining, and irrigation uses in Atascosa, Bexar, Caldwell, Comal, Dimmit, Frio, Gonzales, Guadalupe, Karnes, La Salle, Medina, Uvalde, Wilson, and Zavala Counties.

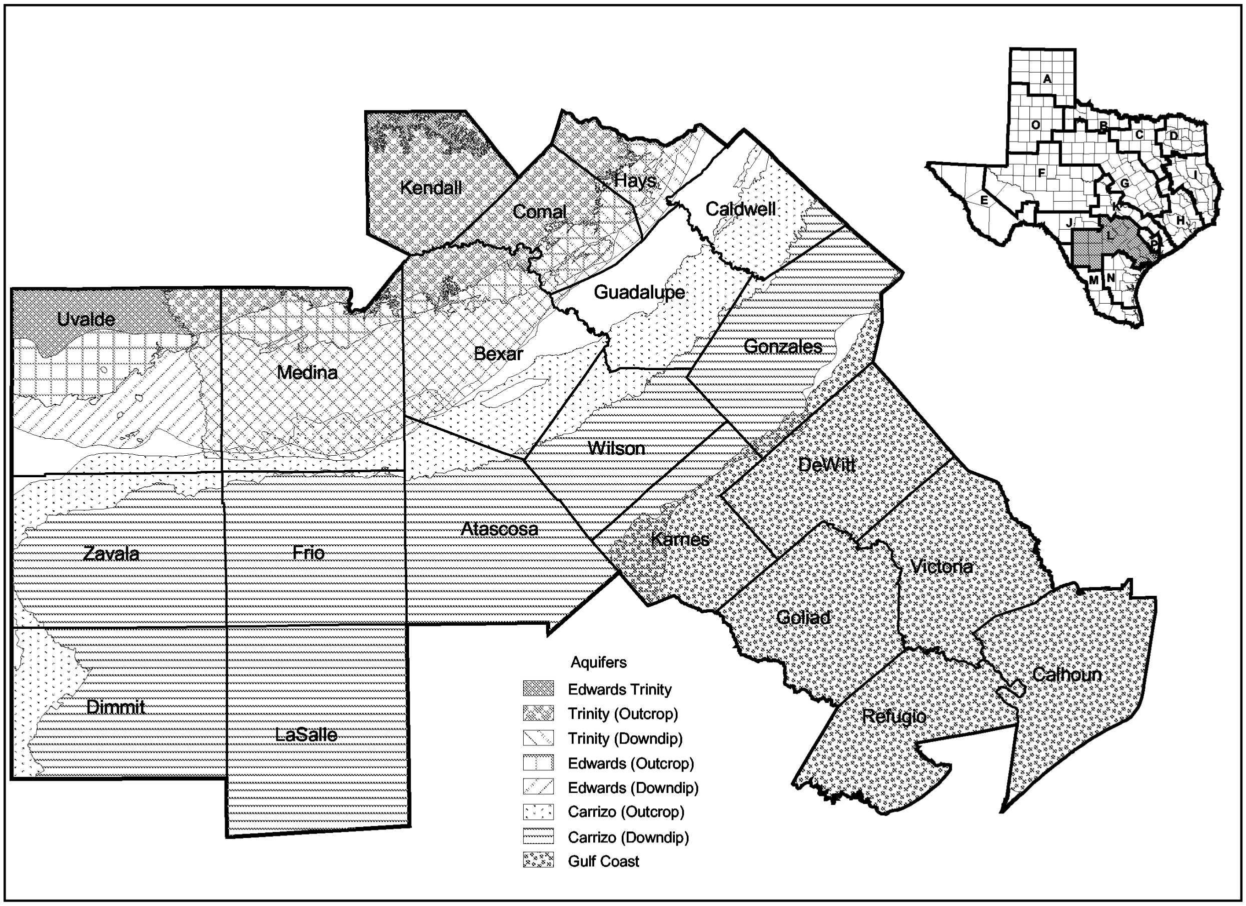

Figure 3-1. Major Aquifers — South Central Texas Region

3.1.3 Trinity Aquifer

The Trinity Aquifer consists of early Cretaceous age formations of the Trinity Group. Trinity Group deposits also occur in the Edwards Plateau region, where they are included as part of the Edwards-Trinity (Plateau) Aquifer. The Trinity Aquifer is projected to supply water for municipal, industrial, steam-electric power, mining, and irrigation uses in Bexar, Comal, Hays, Kendall, Medina, and Wilson Counties.

3.1.4 Gulf Coast Aquifer

The Gulf Coast Aquifer forms a wide belt along the Gulf of Mexico from Florida to Mexico, supplying water to all or parts of 54 counties in Texas. Municipal and irrigation uses have historically accounted for 90 percent of the total pumpage from the aquifer in the planning region. The Gulf Coast Aquifer is projected to supply water for municipal, industrial, steam-electric power, mining, and irrigation uses in Calhoun, DeWitt, Goliad, Gonzales, Karnes, Refugio, and Victoria Counties.

3.1.5 Edwards-Trinity (Plateau) Aquifer

The Edwards-Trinity (Plateau) Aquifer underlies the Edwards Plateau east of the Pecos River and provides water to all or parts of 38 counties in Texas. This aquifer underlies the northern portions of Uvalde and Kendall Counties in the South Central Texas Region. The aquifer consists of saturated sediments of lower Cretaceous age Trinity Group Formations and overlying limestones and dolomites of the Comanche Peak, Edwards, and the Georgetown Formations. The Glen Rose limestone is the primary water-bearing unit in the Trinity (Plateau) Aquifer in the southern areas of its extent. The Trinity (Plateau) Aquifer is projected to supply water for municipal, mining, and irrigation uses in Kendall and Uvalde Counties.

3.1.6 Sparta Aquifer

The Sparta Aquifer extends in a narrow band from the Frio River in South Texas northeastward to the Louisiana border, and underlies parts of five counties (Atascosa, Frio, Gonzales, La Salle, and Wilson) in the South Central Texas Region. The southwestern boundary is placed at the Frio River because of a facies change in the formation, which makes it difficult to delineate the boundaries of the Sparta Aquifer and contiguous formations southwestward. The facies change results in reduced amounts of water and poorer quality water produced from the interval. The Sparta Aquifer is projected to supply water for municipal, industrial, steam-electric power, mining, and irrigation uses in Atascosa, Frio, Gonzales, La Salle, and Wilson Counties.

3.1.7 Queen City Aquifer

The Queen City Aquifer extends across Texas from the Frio River in South Texas northeastward into Louisiana. The southwestern boundary is placed at the Frio River because of a facies change in the formation. This facies change results in reduced amounts of poorer quality water produced from this interval southwest of the Frio River. The Queen City Aquifer is projected to supply water for municipal, industrial, steam-electric power, mining, and irrigation uses in Atascosa, Caldwell, Frio, Gonzales, La Salle, and Wilson Counties.

3.1.8 Groundwater Availability in the South Central Texas Region

According to TWDB data, the total quantity of water obtained from aquifers of the South Central Texas Region and used within the Region in 1990 was 967,327 acft (Table 3-1). Of this total, 53.7 percent was from the Edwards Aquifer, 28.8 percent was from the Carrizo, 9.3 percent was from the Gulf Coast, 4.8 percent was from the Sparta, and the remaining 3.4 percent was from the Queen City, Trinity, and Edwards-Trinity (Plateau) Aquifers (Table 3-1).

Projected future groundwater supplies available in the South Central Texas Region during the drought of record are 812,868 acft/yr in 2000, 812,868 acft/yr in 2020, and 675,187 acft/yr in 2050 (Table 3-1). Supplies available from the Sparta, Queen City, Trinity, Gulf Coast, and Edwards-Trinity (Plateau) Aquifers are projected to hold steady on an annual basis throughout the 2000 through 2050 projections period (Table 3-1). However, these aquifers are projected to supply only about 25 percent of the total groundwater available to the region in 2050 (Table 3-1). The supply available from the Carrizo Aquifer is projected to decline from 304,484 acft/yr for the 2000 through 2020 period to 168,159 acft/yr for the period after 2020 (i.e., withdrawals are projected to exceed recharge). It is important to note that Underground Water Conservation Districts that have been organized within the Carrizo Aquifer area have developed regulatory policies that limit annual pumping to estimated annual recharge.

In the case of the Edwards Aquifer, SB 1477 limits pumpage withdrawals to 450,000 acft/yr until December 31, 2007, and to 400,000 acft/yr beginning in 2008 (Table 2-10). In addition, SB 1477 states in Section 1.14(h): "… the authority, through a program, shall implement and enforce water management practices, procedures, and methods to ensure that, not later than December 31, 2012, the continuous minimum springflows of the Comal Springs and the San Marcos Springs are maintained to protect endangered and threatened species to the extent required by federal law. The authority from time to time as appropriate may revise the practices, procedures, and methods. To meet this requirement, the authority shall require: (1) phased reductions in the amount of water that may be used or withdrawn by existing users or categories of other users; or (2) implementation of alternative management practices, procedures, and methods." Thus, supplies from the Edwards Aquifer may be less than the pumpage limits specified in SB 1477. For purposes of this analysis, the supply from the Edwards Aquifer is included at 340,000 acft/yr.[1]

Table 3-1.
Groundwater Availability by Aquifer
South Central Texas Region

Aquifer Name and TWDB Aquifer No.[1]	1990 Use (acft)	Annual Quantity Available 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Edwards (11)	519,459	340,000	340,000	340,000	340,000	340,000	340,000
Carrizo (10)[2]	279,484	304,484	304,484	304,484	168,159	168,159	168,159
Sparta (27)	47,060	47,060	47,060	47,060	47,060	47,060	47,060
Queen City (24)	18,003	18,003	18,003	18,003	18,003	18,003	18,003
Trinity (28)	9,563	9,563	9,563	9,563	9,563	9,563	8,207
Gulf Coast (15)	89,668	89,668	89,668	89,668	89,668	89,668	89,668
Edwards-Trinity (Plateau)[3] (13)	4,090	4,090	4,090	4,090	4,090	4,090	4,090
Total	967,327	812,868	812,868	812,868	676,543	676,543	675,187
Percent of Total							
Edwards (11)	53.70%	41.83%	41.83%	41.83%	50.26%	50.26%	50.36%
Carrizo (10)	28.89%	37.46%	37.46%	37.46%	24.86%	24.86%	24.91%
Sparta (27)	4.86%	5.79%	5.79%	5.79%	6.96%	6.96%	6.97%
Queen City (24)	1.86%	2.21%	2.21%	2.21%	2.66%	2.66%	2.67%
Trinity (28)	0.99%	1.18%	1.18%	1.18%	1.41%	1.41%	1.22%
Gulf Coast (15)	9.27%	11.03%	11.03%	11.03%	13.25%	13.25%	13.28%
Edwards-Trinity (Plateau)[2] (13)	0.42%	0.50%	0.50%	0.50%	0.60%	0.60%	0.61%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

[1] TWDB aquifer identification number is shown in parentheses in column number 1.
[2] Underground Water Conservation Districts in the Carrizo Aquifer Area have adopted policies to limit annual pumping to estimated annual recharge.
[3] Edwards-Trinity (Plateau) Aquifer.

Source: *File 12—Groundwater Supplies, Ixxxx-17.txt, Texas Water Development Board, January, 1998.

[1] For planning purposes, an estimate of 340,000 acft/yr of available supply during a drought of record from the Edwards Aquifer was agreed upon by the South Central Texas Regional Water Planning Group and the staff of the Texas Water Development Board. This quantity was adopted as a placeholder number until the EAA completes and acquires approval from the U.S. Fish and Wildlife Service for a Habitat Conservation Plan (HCP). TWDB staff, in a letter to Greg Ellis, dated November 16, 1999, agreed to accept water availability from the Edwards Aquifer as 340,000 acft/yr after 2012 in the Regional Water Plan, if it includes actions to be taken to ensure that the required level of protection of the endangered species at San Marcos and Comal Springs will be maintained during a drought of record.

3.2 Surface Water

The South Central Texas Region includes parts of the Rio Grande, Nueces, San Antonio, Guadalupe, Colorado, and Lavaca River Basins, and parts of the Colorado-Lavaca, Lavaca-Guadalupe, and San Antonio-Nueces Coastal Basins (Figure 3-2). The existing surface water supplies of the region include storage reservoirs and run-of-river water rights.

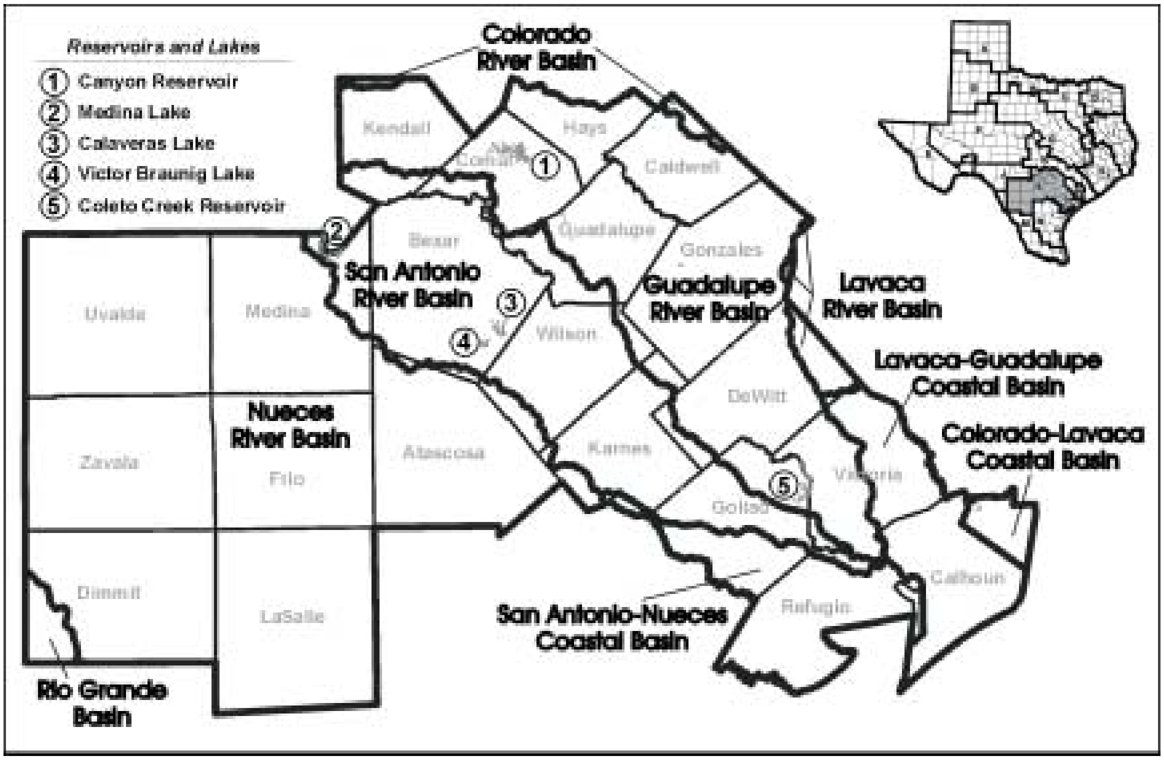

Figure 3-2. River Basins, Coastal Basins, Reservoirs, and Lakes South Central Texas Region

It has not been necessary to pursue aggressively the development of surface water resources in the South Central Texas Region because of the presence of significant quantities of groundwater. In addition, the comparatively low quantity of developable surface water in the western part of the region presents significant limitations upon surface water development potentials. Existing reservoirs (Figure 3-2) and run-of-river water rights within the region are described below.

3.2.1 Lakes and Reservoirs

Medina Lake is located on the Medina River, of the San Antonio River Basin, at the boundaries of Medina and Bandera Counties, with Diversion Lake on the Medina River downstream of Medina Lake. These lakes are owned by the Bexar-Medina-Atascosa Counties Water Control and Improvement District No. 1 and historically have been used to supply irrigation water to farms along the Medina Canal System (Table 3-2). In addition to supplying irrigation water, seepage through the lake and riverbeds recharges the Edwards Aquifer. The TWDB has designated Medina Lake as a special water resource located within Region L.

Braunig and Calaveras Lakes, owned by the City of San Antonio City Public Service, are located in the San Antonio River Basin in Bexar County to the southeast of San Antonio and are used for electric power plant cooling water (Table 3-2). Runoff from the watersheds above the lakes, diversion from the San Antonio River, and diversions from the San Antonio River of San Antonio reclaimed wastewater that has been discharged into the San Antonio River are used to maintain the necessary lake levels and meet the cooling water demands (24,263 acft in 1990).

Constructed by the U.S. Army Corps of Engineers, Canyon Reservoir in the Guadalupe River Basin is located in Comal County on the mainstem of the Guadalupe River. Uses of the reservoir include water supply for municipal, industrial, steam-electric power generation, irrigation, hydroelectric power generation, flood protection, and recreation (Table 3-2). Diversions from Canyon Reservoir are currently authorized up to an average of 50,000 acft/yr. GBRA, who holds the water rights, has applied to TNRCC for an amendment to the Canyon Reservoir Certificate of Adjudication (#18-2074) to increase authorized diversions to approximately 90,000 acft/yr. Stored water is made available by GBRA to water users within their district and the South Central Texas Region. The TWDB has designated Canyon Reservoir as a special water resource located within Region L.

Lakes Dunlap, McQueeny, Placid, Nolte, H-4, and Wood, on the Guadalupe River, form hydroelectric power generation pools and are the sites of hydroelectric power plants 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 non-consumptive use of water, water available to these rights is not included in the tabulation of water rights for the Guadalupe River Basin.

Table 3-2.
List of Major Reservoirs[1]
South Central Texas Region

Reservoir	***Water Right Owner***	***Certificate of Adjudication Number***	***Authorized Diversion (acft/yr)***	***Firm Yield (acft/yr)***	***Purposes***
San Antonio Basin					
Medina Lake System	Bexar-Medina-Atascosa Counties WCID #1	19-2130	66,750	0[6]	Irrigation, municipal, domestic, livestock
Victor Braunig Lake	City Public Service Board of San Antonio	19-2161	12,000[2]	>12,000[7]	Steam-electric power generation
Calaveras Lake	City Public Service Board of San Antonio	19-2162	37,000[3]	>37,000[7]	Steam-electric power generation
Guadalupe Basin					
Canyon Reservoir	Guadalupe-Blanco River Authority	18-2074	50,000[4]	~90,000[8]	Municipal, industrial, steam-electric & hydropower, irrigation, flood protection
Coleto Creek Reservoir	Central Power and Light Company	18-5486	12,500[5]	>12,500[7]	Steam-electric power generation

[1] See Table 3-3 for a summary of run-of-river permits.
[2] Includes 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.
[3] Includes rights to divert up to 60,000 acft/yr of reclaimed wastewater from the San Antonio River to Calaveras Lake and to consume up to 37,000 acft/yr.
[4] GBRA has applied to TNRCC to increase Canyon Reservoir authorized diversions to approximately 90,000 acft/yr.
[5] Includes rights to divert up to 20,000 acft/yr from the Guadalupe River to Coleto Creek Reservoir and to consume up to 12,500 acft/yr.
[6] Based on operation of the Medina Lake System in accordance with CA #19-2130C.
[7] The reservoir and supplemental authorized diversions from the adjacent river could support a firm yield in excess of the authorized consumptive use, however, operations of steam-electric power generation facilities could be impaired.
[8] TNRCC, GBRA Application #18-2074D to amend CA #18-2074, as amended, 1999.

Coleto Creek Reservoir, owned by American Electric Power (formerly Central Power & Light Company) and operated by GBRA, is located at the border of Victoria and Goliad Counties in the lower Guadalupe River 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 Reservoir, when needed. The reservoir supplies water for steam-electric power generation at a power plant located in Goliad County (12,165 acft in 1990).

3.2.2 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 from flowing streams of the South Central Texas Region. Each right bears a priority date, diversion location, maximum diversion rate, and annual quantity of diversion. Some rights may include off-channel storage authorization, instream flow requirements, and various special conditions. The principle of prior appropriation or "first-in-time-first-in-right" is applied, which means that the senior, or oldest, right (earliest priority date) has first call on flows, with the second, third, and more recent rights having second, third, and later standings for diversions. This procedure gives senior right holders priority when streamflows are low, as in periods of drought, and renders junior rights less reliable during droughts (i.e., the most junior right holders may not be able to divert any water during severe droughts).

It is important to note that many run-of-river rights are for irrigation purposes, where chances are taken at planting time upon whether or not water will be available for crop production during the growing season. In fact, when reviewing applications for irrigation rights, TNRCC staff has historically considered whether 75 percent of the proposed diversion would be available in 75 percent of the years. Most of the municipal, industrial, and steam-electric power demands, however, are for more reliable supplies than are available from run-of-river flows. Thus, reservoirs having firm yields have been permitted by TNRCC and constructed by water suppliers.

Run-of-river permits have been summarized for the streams of the South Central Texas Region (Table 3-3). For the Nueces River Basin part of the Regional Planning Area, run-of-river water rights total 120,097 acft, most of which are for irrigation purposes (Table 3-3).

In the San Antonio River Basin on the Medina River, downstream of the Medina Lake System to San Antonio, there are 31,794 acft of run-of-river rights (Table 3-3). On the San Antonio River from San Antonio to the confluence with the Guadalupe River, 28,866 acft of run-of-river rights have been awarded (Table 3-3). Most of the rights are for irrigation and livestock water with some limited municipal and industrial use, and can be viewed as supply available to meet those needs in areas along the Medina and San Antonio Rivers.

Table 3-3.
Summary of Run-of-River Water Rights
South Central Texas Region

River Basin and Segment	***Sum of Permits[1] (acft)***
Nueces River Basin Part of the Regional Planning Area	
Subtotal	120,097
San Antonio River Basin Part of the Regional Planning Area	
Medina Lake to San Antonio[2]	31,794
San Antonio to Confluence with Guadalupe River	28,866
Subtotal	60,666
Guadalupe River Basin Part of the Regional Planning Area	
Upstream of Canyon Reservoir	4,674
Canyon Reservoir to Victoria	46,468
Downstream of Victoria	223,884
Subtotal	275,026
Total for Study Area	**455,783**

[1] Totals shown include only consumptive portions of nights for municipal, industrial, irrigation, mining, recreation, etc. as of January 1, 1999.
[2] Totals include rights upstream of USGS gage Medina River at San Antonio (#08181500).

Source: Data from Water Rights Records of the TNRCC.

Consumptive run-of-river rights in the South Central Texas Region in the Guadalupe River Basin upstream of Canyon Reservoir total 4,674 acft/yr, and downstream of Canyon to Victoria total 46,468 acft/yr. These rights are primarily for irrigation, municipal, and industrial purposes.

In the Guadalupe River Basin downstream of Victoria, total run-of-river rights are 223,884 acft/yr considering only consumptive rights for municipal, irrigation and industrial process water (Table 3-3).

In the South Central Texas Region, the sum of the major consumptive run-of-river permitted water rights is 455,783 acft/yr (Table 3-3).

3.3 Drought Response

Texas Water Code Sections 16.053(e)(3)(A) and 31 TAC 357.5(e)(7) require that, for each source of water supply in the regional water planning area designated in accordance with 31 TAC 357.7(a)(1), the regional water plan shall identify: (A) factors specific to each source of water supply to be considered in determining whether to initiate a drought response; and (B) actions to be taken as part of the response. Table 3-4 summarizes the general recommendations of the South Central Texas Regional Water Planning Group (SCTRWPG) regarding identification and initiation of drought responses for current water supply sources in the South Central Texas Region. As the SCTRWPG is a planning body only, with no implementation authority, it is emphasized that these drought responses are recommendations only. Local public and private water suppliers and water districts have been required to adopt a Drought Contingency Plan (by TNRCC pursuant to SB1) that contains drought triggers and responses unique to each specific entity. Furthermore, these entities have the authority and responsibility to manage their particular water supply within the bounds created by applicable law. Therefore, the SCTRWPG encourages these entities to implement their respective plans with due consideration of the recommendations summarized in Table 3-4.

The Edwards Aquifer Authority (EAA) is presently in the process of developing Critical Period Management (CPM) rules that establish trigger conditions for recognition of drought and recommended reductions in withdrawals from the Edwards Aquifer when these trigger conditions are met. The draft CPM rules reflect staged reductions in permitted municipal withdrawals ranging from five to 15 percent during periods in which water levels in representative monitoring wells in Bexar, Medina, and Uvalde Counties have fallen below specified trigger levels. Table 3-5 summarizes the factors specific to the Edwards Aquifer in determining whether to initiate a drought response and the reductions in withdrawal expected as part of the response pursuant to draft CPM rules current as of March 22, 2000. It must be emphasized that rulemaking at the EAA is presently a dynamic process and that factors and responses identified in Table 3-5 may or may not be applicable in the future.

Table 3-4.
Identification and Initiation of Drought Responses

Source of Water Supply	*Factors to be Considered in Initiating Drought Response(s)*	*Potential Drought Responses*
Edwards Aquifer	• Local/regional well levels • Springflow maintenance • Water needs for health & safety • Availability of alternative sources	• Reductions in allowable withdrawals • Implementation of Drought Contingency Plans • Increase reliance on alternative sources
Carrizo & Other Aquifers	• Local/regional well levels • Water stored in formation vs. use • Acceptable long-term drawdown • Production facility constraints	• Implementation of Drought Contingency Plans • Groundwater district rules • Increase production facility capacity
Surface Water	• Streamflow/reservoir storage • Water right priority and special conditions • Dependable supply vs. use • Availability of alternative sources	• Implementation of Drought Contingency Plans • Coordination with TNRCC Watermaster • Increase reliance on alternative sources

The EAA is also in the process of developing a Habitat Conservation Plan (HCP) and Environmental Impact Statement (EIS) for submittal to the U.S. Fish & Wildlife Service. It is expected that the HCP and EIS will form the basis for identification of appropriate springflow levels for protection of threatened and endangered species. Until these springflow levels are identified and approved, appropriate timing for initiation of drought responses is uncertain. The SCTRWPG encourages the timely implementation of this Regional Water Plan as a pre-emptive drought response so that alternative sources of supply and/or enhanced supplies from the Edwards Aquifer will be available to satisfy regional water needs, maintain springflow, and protect endangered species to the extent required by State and Federal law.

Table 3-5.
Summary of Draft Edwards Aquifer Authority Critical Period Management Rules[1]

Reduction Stage	Well Levels Initiating Drought Response			Drought Response Maximum Allowable Withdrawal [5,6]
	J-17[2] (ft-msl)	TA69-47-306[3] (ft-msl)	J-27[4] (ft-msl)	
I	650	670	845	95 % of permitted (monthly) withdrawal
II	640	660	840	90 % of permitted (monthly) withdrawal
III[7]	630	655	835	85 % of permitted (monthly) withdrawal

[1] Information provided by EAA on March 22, 2000.
[2] Applicable to Bexar, Comal, and Hays Counties.
[3] Applicable to Medina County.
[4] Applicable to Uvalde County.
[5] Alternative responses related to base withdrawal multipliers and conservation plans available from EAA.
[6] Reductions in maximum allowable withdrawal applicable to permitted municipal use (including irrigation transfers) only.
[7] Emergency springflow protection measures may apply in Stage III.

Water supplies available from the Carrizo Aquifer and other aquifers in Region L are less subject to transient hydrologic drought conditions than the Edwards Aquifer and more dependent upon water stored in the formation and the acceptability of long-term depletion or drawdown. If depletion of storage in these aquifers is occurring at an unacceptable pace (typically measured over many years, rather than a few months), there is likely to be sufficient time to amend groundwater district rules and/or develop alternative sources of supply. As with any source of water supply, production facility constraints may necessitate expedited increases in production capacity or implementation of drought contingency measures during dry periods when peak water demands are greatest.

Supplies from surface water sources such as run-of-river water rights and reservoirs are determined on the basis of minimum year availability and firm yield, respectively. Hence, the current surface water supplies presented herein are, by TWDB definition, dependable during drought. Factors that are typically considered in initiating drought response for surface water sources are streamflow and reservoir storage as they may be conveniently measured and monitored. In contrast to groundwater sources, water right priority with respect to other rights and special permit conditions regarding minimum instream flows can also be important factors in determining whether to initiate drought responses for surface water sources. In the Guadalupe—San Antonio and Nueces River Basins, coordination with the TNRCC Watermaster is an essential drought response for all entities dependent upon surface water supply sources.

3.4 Methodology to Calculate the Water Supplies Available to the South Central Texas Region and Methodology for Calculating Water Supplies Available for Water User Groups

The water supplies available to the South Central Texas Region during the "drought of record" were calculated from the following data sources:

A. Groundwater availability by aquifer for the Carrizo, Sparta, Queen City, Trinity, Gulf Coast, and Edwards-Trinity (Plateau) Aquifers was obtained from the TWDB. The groundwater availability by county was further subdivided into river basin parts of each county according the amount of land area overlying each aquifer. Groundwater supplies for cities using water from the Carrizo, Gulf Coast, and Trinity Aquifers was based upon an analysis of saturated thickness of the aquifer in which their well fields are located respectively, and well capacities. The quantities available in Wilson and Gonzales Counties were obtained from the Evergreen and Gonzales County Underground Water Conservation Districts, respectively.

B. Groundwater availability from the Edwards Aquifer was set at a total of 340,000 acft/yr. Preliminary permit quantities by the Edwards Aquifer Authority were prorated down to achieve a total value of 340,000 acft/yr as the sum of all permits.

C. Surface water availability for permits within the Nueces Basin was obtained from the TNRCC Water Rights Availability Model (WAM).

D. Surface water availability for permits within the Guadalupe-San Antonio River Basin was obtained from the TNRCC Water Availability Model, but with a special run for Canyon Reservoir with hydroelectric rights subordinated. However, existing supplies from Canyon Reservoir for use in calculating water needs in Section 4 were limited to the TNRCC permitted diversions of 50,000 acft/yr.

E. Water availability from direct reuse was obtained from input to the TNRCC WAM for the San Antonio and Guadalupe River Basins. Three sources of supply from direct reuse are used in the supplies report. Two sources of supply are from the SAWS' current recycle program and are 18,193 acft/yr for the City of San Antonio in Bexar County and 6,748 acft/yr for industrial use in Bexar County. The third source of supply from direct reuse is 3,936 acft/yr for steam-electric use in Hays County.

F. Livestock water supply was allocated from local sources, and set at projected livestock water demands.

G. See Appendix B for assumptions that underlie water supply calculations.

The methods used to distribute each respective water supply to its appropriate use category are presented below.

1. Municipal Use from the Carrizo, Sparta, Queen City, Trinity, Gulf Coast, and Edwards-Trinity (Plateau) Aquifers

a. For cities using water from the Carrizo, Gulf Coast, and Trinity Aquifers their supply was based upon an analysis of saturated thickness of the aquifer in which their well fields are located, respectively, and well capacities.

b. For rural areas, it was assumed that the rural household (municipal type) demand would be met from aquifers underlying that river basin portion of the county. The rural supply was calculated from the maximum water demand over the planning horizon (usually in the year 2050), which was then proportioned among the available aquifers based on the area of the aquifer's extent below the appropriate river basin portion of each county.

2. Industrial Use from the Carrizo, Sparta, Queen City, Trinity, Gulf Coast, and Edwards-Trinity (Plateau) Aquifers

It was estimated that industrial demand would be met from aquifers underlying that river basin portion of the county. The industrial supply was calculated from the year 2050 projected demand. This demand was then proportioned among the available aquifers based on the area of the aquifer's extent below the appropriate river basin portion of each county.

3. Steam-Electric Use from the Carrizo, Sparta, Queen City, Trinity, Gulf Coast, and Edwards-Trinity (Plateau) Aquifers

It was estimated that steam-electric demand would be met from aquifers underlying that river basin portion of the county. The steam-electric supply was calculated from the year 2050 projected steam-electric demand. This demand was then proportioned among the available aquifers based on the area of the aquifer's extent below the appropriate river basin portion of each county.

4. Irrigation Use from the Carrizo, Sparta, Queen City, Trinity, Gulf Coast, and Edwards-Trinity (Plateau) Aquifers (For Edwards Aquifer See No. 6 Below)

It was estimated that irrigation demand would be met from aquifers underlying that river basin portion of the county. However, when projected total demand for all uses was greater than the estimated total groundwater supply for river basin portions of individual counties, the quantity available for irrigation was the total supply of the river basin portion of the county remaining after municipal, industrial, steam-electric power, and mining uses had been met.

5. **Mining Use from the Carrizo, Sparta, Queen City, Trinity, Gulf Coast, and Edwards-Trinity (Plateau) Aquifers**

   It was estimated that mining demand would be met from aquifers underlying that river basin portion of the county. The mining supply was set equal to the projected demand for each year within the planning horizon. This demand was then proportioned among the available aquifers based on the area of the aquifer's extent below the appropriate river basin portion of each county.

6. **Groundwater Supply from the Edwards Aquifer**

   To determine the groundwater availability from the Edwards Aquifer, the prorated permits were placed in the appropriate river basin portion of each county by the permit's use (municipal, industrial, and irrigation) category. All agricultural permits (not irrigation) were included in the industrial use classification; e.g.; permits for Lone Star Growers, Living Waters Artesian Springs, a feedyard, and 4 individuals whose type of business is not apparent. The total of these permits is 5,412 acft.

7. **Surface Water Availability Within the Nueces Basin**

   The WAM determined the minimum annual diversion during the drought of record for each permit within the Nueces River Basin. These permits were then placed in the appropriate river basin portion of each county by the permit's use category. (See Appendix C for a list of major water rights sorted by river basin, county, and type of use including the permit number and minimum annual supply).

8. **Surface Water Availability Within the Guadalupe and San Antonio River Basins**

   The WAM determined the minimum annual diversion during the drought of record for each permit within the San Antonio and Guadalupe River Basins. The quantities of supply for these permits were then placed in the appropriate river basin portion of each county by the permit's use category. (See Appendix C for a list of major water rights sorted by river basin, county, and type of use including the permit number and minimum annual supply). The key technical information and assumptions used in this application of the TWDB Edwards Aquifer Model (GWSIM4) are listed below.[2,3]

   - Edwards Aquifer pumpage of 400,000 acft/yr (plus domestic & livestock pumpage of 12,312 acft/yr) subject to Critical Period Management Rules under review on March 29, 2000 by an assessment team for the EAA. Pro-ration of proposed permits totaling about 484,000 acft/yr to simulated pumpage rates was accomplished by proportional reduction.
   - Breakdown of use type and geographical distribution was based on EAA proposed permits (without any voluntary transfers from irrigation to municipal use).

[2] Klemt, W.B., Knowles, T.R., Elder, G.R., and Sieh, T.W., "Ground-water Resources and Model Applications for the Edwards (Balcones Fault Zone) Aquifer in the San Antonio Region, Texas," Texas Water Development Board Report 239, 1979.

[3] Thorkildsen, D. and McElhaney, P.D.., "Model Refinement and Applications for the Edwards (Balcones Fault Zone) Aquifer in the San Antonio Region, Texas," Texas Water Development Board Report 340, 1992.

- Simulations based upon draft Critical Period Management Rules which include staged curtailment of permitted municipal pumpage by up to 15 percent subject to specified levels in monitoring wells located in Bexar, Medina, and Uvalde Counties. Program code modifications were made by HDR to TWDB Edwards Aquifer Model (GWSIM4) to facilitate application of these rules.
- Starting heads and seasonal distributions of pumpage were developed by the TWDB and are consistent with previous applications of GWSIM4.
- Historical Edwards Aquifer recharge estimates developed by HDR which reflect current water rights and existing recharge enhancement facilities were used in the computations.[4,5]

The key technical information and assumptions underlying this application of the Guadalupe—San Antonio River Basin Water Availability Model (WAM) are listed below.[6]

- Full exercise of surface water rights.
- Subordination of all senior Guadalupe River hydropower rights to Canyon Reservoir. This assumption is based on previous actions of the GBRA to subordinate its own Guadalupe River hydropower rights and on an existing GBRA contractual agreement with the City of Seguin to subordinate its hydropower rights.
- Delivery of GBRA's full contractual obligations from Canyon Reservoir to point of diversion in all years. GBRA's obligations to American Electric Power (formerly Central Power & Light (CP&L)) for make-up water to Coleto Creek Reservoir, however, were supplied only on an as-needed basis. Contracts simulated total 48,152 acft/yr including an estimated average of 6,000 acft/yr for American Electric Power (CP&L) at Coleto Creek Reservoir.
- Effluent discharge/return flow in the Guadalupe—San Antonio and Nueces River Basins is that reported for calendar year 1988 and adjusted for SAWS direct reclaimed water use of 35,000 acft/yr (about 25,000 acft/yr of which is estimated to be consumptive).
- Operation of power plant reservoirs (Braunig, Calaveras, and Coleto Creek) subject to authorized consumptive uses at each reservoir, with makeup diversions as needed to maintain full conservation storage subject to senior water rights, instream flow constraints, and/or applicable contractual provisions.

It is important to note that the five alternative regional plans, as presented in Volume II, were based upon calculations of water available in the Guadalupe and San Antonio River Basins for the case of Canyon Reservoir Firm Yield (approximately

[4] HDR Engineering, Inc., "Guadalupe-San Antonio River Basin Recharge Enhancement Study," Edwards Underground Water District, September 1993.
[5] HDR Engineering, Inc., "Nueces River Basin Regional Water Supply Planning Study," Nueces River Authority, et al., May 1991.
[6] HDR Engineering, Inc., "Water Availability in the Guadalupe — San Antonio River Basin," Texas Natural Resource Conservation Commission, December 1999.

90,000 acft/yr) with downstream hydropower rights mentioned in D above having been subordinated to Canyon Reservoir. However, the Initially Prepared Regional Water Plan for the South Central Texas Region is based upon the TNRCC permitted diversion of 50,000 acft/yr from Canyon Reservoir. In the former case, a part of the difference of 40,000 acft/yr was allocated to meeting projected needs in the Guadalupe River Basin, thus reducing the quantity of new supply required to meet projected needs of the Basin. In the latter case, the quantity available to meet projected needs is less, thus the projected needs are greater by the difference in supply available from Canyon Reservoir. But, the quantity involved is included in the Initially Prepared Plan as water management strategies to meet the needs, which in the five alternative regional plans was included as firm water supply since GBRA had already subordinated hydropower rights. All that was done was to move the quantities from the situation of *"it's a done deal,"* to the situation of *"it's a water management strategy*" that will meet the same quantity of needs. The results are no different!!

9. Livestock Water Supply

For all areas within the planning region, livestock water demand was assumed to be met from local sources such as stock tanks, streams, and windmills. Livestock water supply was set equal to projected livestock demand.

10. Unallocated Supplies

In counties where projected demands are less than projected supplies, the difference (surplus supply) is listed in the county summary, by river basin, as "unallocated groundwater." However, this "unallocated supply" is not necessarily available to meet projected shortages of other parts of the region, since it may not be located in close proximity to demands. There are 12 counties (Caldwell, Calhoun, DeWitt, Dimmit, Goliad, Gonzales, Karnes, Kendall, La Salle, Refugio, Victoria, and Wilson) that have "unallocated groundwater" supplies.

3.5 Potential for Emergency Transfers of Surface Water

TWDB Rules, Section 357.5(i) direct that the RWPG include recommendations for the emergency transfer of surface water and further direct that a determination be made of the portion of each right for non-municipal use that may be transferred without causing unreasonable damage to the property of the non-municipal water right holder. SB1, Section 3.03 amends Texas Water Code Section 11.139 and allows the Executive Director of TNRCC, after notice to the Governor, to issue emergency permits or temporarily suspend or amend permit conditions without notice or hearing to address emergency conditions for a limited period of not more than 120 days if an imminent threat to public health and safety exists. A person desiring to obtain an emergency authorization is required to justify the request to TNRCC. If TNRCC determines the request is justified, it may issue an emergency authorization without notice and hearing, or with notice and hearing, if practicable. Applicants for emergency authorizations are required to pay fair market value for the water they are allowed to divert, as well as any damages caused by the transfer. In transferring the quantity of water pursuant to an emergency authorization request, the Executive Director, or the TNRCC, shall allocate the requested quantity among two or more water rights held for purposes other than domestic or municipal purposes.

Surface water availability models have been developed for the streams of the South Central Texas Region (Region L) in which the locations, quantities, and reliabilities of the surface water rights of the region have been determined (Appendix C). The Regional Water Plan incorporates Appendix C as a primary source of information to water user groups and the TNRCC for use in cases of emergencies that result in a threat to public health and safety. Water user groups who are located in proximity to one or more existing surface water diversion permits for non-municipal use can readily estimate quantities of water that might be available for emergency use applications, and TNRCC may also consider Appendix C in its administration of this provision of SB1. With regard to the determination of amounts "that may be transferred without causing unreasonable damage to the property of the non-municipal water rights holder," the SCTRWPG defers to the judgment of the TNRCC inasmuch as the TNRCC is charged with consideration of sworn applications for emergency transfer authorizations. The South Central Texas Regional Water Planning Group recommends that water user groups of the region develop emergency water supply plans to be activated in the event that public health and safety are threatened. Some water user groups will have access to surface water, but it is noted that many do not since they are remotely located, insofar as surface water is concerned, and rely upon groundwater.[7]

[7] Standards for public water supplies have been established by TNRCC and predecessor agencies to provide for public health and safety.

Section 4
Comparison of Supply and Demand to Determine Needs

4.1 Water Needs Projections by Water User Group

For purposes of this regional planning project, and in accordance with TWDB Rules, water supply projections and water needs (shortages) projections are tabulated by river and coastal basin, county or part of county located within the river or coastal basin, and city and rural areas of each county or part of county for the South Central Texas Region (Tables 4-1 through 4-22).[1] For each county, the water demands by river and coastal basin and water user group were brought forward from "South Central Texas Region Water Management Plan — Introduction, Description of the Planning Region (Task 1) and Population and Water Demand Projections (Task 2), Table 2-12; South Central Texas Regional Water Planning Group, HDR Engineering, Inc., San Antonio, TX, August 1999." These projected demands were compared to projected water supplies of Section 3, and if projected demands exceeded projected supplies for a water user group, the difference or shortage was identified as a water need for that water user group.

An illustration of how to read Tables 4-1 through 4-22 is given below; however, each table will not be verbalized here. For example, as shown in Table 4-1, a portion of Atascosa County is located in the Nueces River Basin, and a portion is located in the San Antonio River Basin. That part of Atascosa County located in the Nueces River Basin contains the cities of Charlotte, Jourdanton, Lytle, Pleasanton, and Poteet. In addition, rural areas of Atascosa County are located in the Nueces River Basin. The projected municipal water demand for Lytle is 559 acft in 2000 and 811 acft in 2050, while the projected municipal water supply for Lytle is 234 acft in 2000 and 234 acft in 2050 (Table 4-1). [Section 3.3 describes the methodology of computing water supplies for water user groups.] Comparing the projected demands with the projected supplies for Lytle in Atascosa County results in a shortage (need) of 325 acft in 2000 and 577 acft in 2050. Since the other cities of Atascosa County are projected to have more water supplies than demands, they have surpluses as opposed to needs.

Total projections for counties and parts of counties of each river and coastal basin area located in the South Central Texas Region are shown at the end of each county's supplies and

[1] 31 Texas Administrative Code, Chapter 357, Regional Water Planning Guideline Rules, Texas Water Development Board, Austin, Texas, March 11, 1998.

needs analysis table. The total projected water supplies available to Atascosa County in 2000 are 51,486 acft, of which 50,786 acft is located in the Nueces Basin and 700 acft is located in the San Antonio Basin. The counties projected water supplies are shown by river basin for each decade of the planning period (Table 4-1). This type of analysis is shown for each water user group for each county located within the South Central Texas Region.

The basin totals are listed in Table 4-22. For example, total water supply in the Nueces River Basin is projected to be 352,655 acft in 2000, of which 41,087 acft is for municipal purposes, 3,864 acft is for industrial purposes, 22,400 is for steam-electric power purposes, 218,245 acft is for irrigation purposes, 3,327 acft is for mining purposes, 8,942 acft is for livestock purposes, and 54,790 acft is unallocated groundwater supplies (Table 4-22). In 2000, the Nueces River Basin part of the South Central Texas Region is projected to have an irrigation water shortage of 309,465 acft and a mining shortage of 182 acft and in 2050 is projected to have a municipal water shortage of 2,366 acft, an irrigation shortage of 270,870 acft, and a mining shortage of 1,438 acft (Table 4-22). The reader can readily see the projections for water demand, water supply, and projected surplus/shortage, by type of demand, for the Nueces, San Antonio, Guadalupe, Colorado, Lavaca, and Rio Grande River Basin areas as well as the Colorado-Lavaca, Lavaca-Guadalupe, and the San Antonio-Nueces Coastal Basin areas of the South Central Texas Region (Table 4-22).

Total projected water supply in the South Central Texas Region in 2000 is 1,241,453 acft and in 2050 is 1,094,887 acft (Table 4-22). The projected water supply in 2050 is 319,379 acft for municipal use, 221,937 acft for industrial use, 123,279 acft for steam-electric use, 259,887 acft for irrigation use, 4,566 acft for mining use, 28,521 acft for livestock use, and 137,318 acft of unallocated groundwater. In 2050, the South Central Texas Region is projected to have a municipal water shortage of 450,144 acft, an industrial surplus of 19,558 acft, a steam-electric power shortage of 3,381 acft, an irrigation shortage of 256,461 acft, a mining shortage of 9,742 acft and a livestock surplus/shortage of 0 acft (Table 4-22). Of the 189 water user groups of the region with projected demand (104 municipalities and rural domestic users, 16 industry groups, 8 steam-electric users, 20 counties with irrigation use, 20 counties with mining water use, and 21 counties with livestock use), it has been calculated that 66 user groups will have a need sometime during the 50-year projection period. Of the estimated 66 user groups showing needs, 47 are municipalities or rural areas, four are industrial groups, two are steam-electric power groups, seven irrigation groups, and six mining groups.

Table 4-1
Projected Water Demands, Supplies, and Needs
Atascosa County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Municipal Demand										
Nueces Basin										
Charlotte			247	319	409	436	464	510	547	568
Jourdanton			670	559	815	863	899	988	1,047	1,124
Lytle			410	431	559	600	635	701	754	811
Pleasanton			1,556	1,915	2,486	2,649	2,784	3,074	3,273	3,523
Poteet			1,055	742	1,285	1,325	1,369	1,479	1,549	1,629
Rural			1,633	1,923	2,139	2,395	2,825	3,335	3,909	4,100
	Subtotal		5,571	5,889	7,693	8,268	8,976	10,087	11,079	11,755
San Antonio Basin										
Rural			99	105	101	106	111	123	132	132
	Subtotal		99	105	101	106	111	123	132	132
Total Municipal Demand			5,670	5,994	7,794	8,374	9,087	10,210	11,211	11,887
Municipal Existing Supply										
Nueces Basin										
Charlotte		Carrizo			1,468	1,468	1,468	1,468	1,468	1,468
Jourdanton		Carrizo			2,057	2,057	2,057	2,057	2,057	2,057
Lytle		Edwards			234	234	234	234	234	234
Pleasanton		Carrizo			3,524	3,524	3,524	3,524	3,524	3,524
Poteet		Carrizo			2,008	2,008	2,008	2,008	2,008	2,008
Rural		Carrizo			2,671	2,671	2,671	1,665	1,665	1,665
		Sparta			1,086	1,086	1,086	1,851	1,851	1,851
		Queen City			343	343	343	584	584	584
	Subtotal				13,391	13,391	13,391	13,391	13,391	13,391
San Antonio Basin										
Rural										
		Carrizo			132	132	132	122	122	122
	Subtotal				132	132	132	122	122	122
Total Existing Municipal Supply					13,523	13,523	13,523	13,513	13,513	13,513
Municipal Surplus/Shortage										
Nueces Basin										
Charlotte					1,059	1,032	1,004	958	921	900
Jourdanton					1,242	1,194	1,158	1,069	1,010	933
Lytle					-325	-366	-401	-467	-520	-577
Pleasanton					1,038	875	740	450	251	1
Poteet					723	683	639	529	459	379
Rural					1,961	1,705	1,275	765	191	0
	Subtotal				5,698	5,123	4,415	3,304	2,312	1,636
San Antonio Basin										
Rural					31	26	21	-1	-10	-10
	Subtotal				31	26	21	-1	-10	-10
Total Municipal Surplus/Shortage					5,729	5,149	4,436	3,303	2,302	1,626
Municipal New Supply Need										
Nueces Basin										
Charlotte					0	0	0	0	0	0
Jourdanton					0	0	0	0	0	0
Lytle					325	366	401	467	520	577
Pleasanton					0	0	0	0	0	0
Poteet					0	0	0	0	0	0
Rural					0	0	0	0	0	0
	Subtotal				325	366	401	467	520	577
San Antonio Basin										
Rural					0	0	0	1	10	10
	Subtotal				0	0	0	1	10	10
Total Municipal New Supply Need					325	366	401	468	530	587

Table 4-1
Projected Water Demands, Supplies, and Needs
Atascosa County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Industrial Demand										
Nueces Basin			0	0	0	0	0	0	0	0
San Antonio Basin			0	0	0	0	0	0	0	0
Total Industrial Demand			0	0	0	0	0	0	0	0
Industrial Existing Supply										
Nueces Basin					0	0	0	0	0	0
San Antonio Basin					0	0	0	0	0	0
Total Industrial Supply					0	0	0	0	0	0
Industrial Surplus/Shortage										
Nueces Basin					0	0	0	0	0	0
San Antonio Basin					0	0	0	0	0	0
Total Industrial Surplus/Shortage					0	0	0	0	0	0
Industrial New Supply Need										
Nueces Basin					0	0	0	0	0	0
San Antonio Basin					0	0	0	0	0	0
Total Industrial New Supply Need					0	0	0	0	0	0
Steam-Electric Demand										
Nueces Basin			6,036	5,848	12,000	12,000	12,000	12,000	15,000	22,000
San Antonio Basin			0	0	0	0	0	0	0	0
Total Steam-Electric Demand			6,036	5,848	12,000	12,000	12,000	12,000	15,000	22,000
Steam-Electric Existing Supply										
Nueces Basin										
		Carrizo			14,333	14,333	14,333	430	430	430
		Sparta			5,829	5,829	5,829	9,934	9,934	9,934
		Queen City			1,838	1,838	1,838	3,132	3,132	3,132
	Subtotal				22,000	22,000	22,000	13,496	13,496	13,496
San Antonio Basin					0	0	0	0	0	0
	Subtotal				0	0	0	0	0	0
Total Steam-Electric Existing Supply					22,000	22,000	22,000	13,496	13,496	13,496
Steam-Electric Surplus/Shortage										
Nueces Basin					10,000	10,000	10,000	1,496	-1,504	-8,504
San Antonio Basin					0	0	0	0	0	0
Total Steam-Electric Surplus/Shortage					10,000	10,000	10,000	1,496	-1,504	-8,504
Steam-Electric New Supply Need										
Nueces Basin					0	0	0	0	1504	8,504
San Antonio Basin					0	0	0	0	0	0
Total Steam-Electric New Supply Need					0	0	0	0	1,504	8,504
Irrigation Demand										
Nueces Basin			45,792	48,339	49,652	47,980	46,371	44,822	43,333	41,900
San Antonio Basin			1,416	488	1,363	1,311	1,261	1,214	1,167	1,123
Total Irrigation Demand			47,208	48,827	51,015	49,291	47,632	46,036	44,500	43,023
Irrigation Supply										
Nueces Basin		Edwards			2,009	2,009	2,009	2,009	2,009	2,009
		Run-of-River			1	1	1	1	1	1
		Carrizo			3,414	3,398	3,326	0	0	0
		Sparta			5,072	5,066	5,036	0	0	0
		Queen City			1,599	1,598	1,588	0	0	0
	Subtotal				12,095	12,071	11,960	2,010	2,010	2,010
San Antonio Basin		Edwards			300	300	300	300	300	300
		Carrizo			202	202	202	0	0	0
	Subtotal				502	502	502	300	300	300
Total Irrigation Supply					12,597	12,573	12,462	2,310	2,310	2,310

Table 4-1
Projected Water Demands, Supplies, and Needs
Atascosa County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Irrigation Surplus/Shortage										
Nueces Basin					-37,557	-35,909	-34,411	-42,812	-41,323	-39,890
San Antonio Basin					-861	-809	-759	-914	-867	-823
Total Irrigation Surplus/Shortage					-38,418	-36,718	-35,170	-43,726	-42,190	-40,713
Mining Demand										
Nueces Basin			664	1,377	1,558	1,583	1,693	1,804	1,918	2,048
San Antonio Basin			0	0	0	0	0	0	0	0
Total Mining Demand			664	1,377	1,558	1,583	1,693	1,804	1,918	2,048
Mining Supply										
Nueces Basin										
		Carrizo			1,015	1,031	1,103	0	0	0
		Sparta			413	419	449	616	615	615
		Queen City			130	132	141	194	194	195
	Subtotal				1,558	1,583	1,693	809	809	809
San Antonio Basin					0	0	0	0	0	0
	Subtotal				0	0	0	0	0	0
Total Mining Supply					1,558	1,583	1,693	809	809	809
Mining Surplus/Shortage										
Nueces Basin					0	0	0	-995	-1,109	-1,239
San Antonio Basin					0	0	0	0	0	0
Total Mining Surplus/Shortage					0	0	0	-995	-1,109	-1,239
Livestock Demand										
Nueces Basin			1,556	1,764	1,742	1,742	1,742	1,742	1,742	1,742
San Antonio Basin			57	66	66	66	66	66	66	66
Total Livestock Demand			1,613	1,830	1,808	1,808	1,808	1,808	1,808	1,808
Livestock Supplies										
Nueces Basin		Local	1,556	1,764	1,742	1,742	1,742	1,742	1,742	1,742
San Antonio Basin		Local	57	66	66	66	66	66	66	66
Total Livestock Supply			1,613	1,830	1,808	1,808	1,808	1,808	1,808	1,808
Livestock Surplus/Shortage										
Nueces Basin			0	0	0	0	0	0	0	0
San Antonio Basin			0	0	0	0	0	0	0	0
Total Livestock Surplus/Shortage			0	0	0	0	0	0	0	0
Total County Demand										
Municipal			5,670	5,994	7,794	8,374	9,087	10,210	11,211	11,887
Industrial			0	0	0	0	0	0	0	0
Steam-Electric			6,036	5,848	12,000	12,000	12,000	12,000	15,000	22,000
Irrigation			47,208	48,827	51,015	49,291	47,632	46,036	44,500	43,023
Mining			664	1,377	1,558	1,583	1,693	1,804	1,918	2,048
Livestock			1,613	1,830	1,808	1,808	1,808	1,808	1,808	1,808
Total County Demand			61,191	63,876	74,175	73,056	72,220	71,858	74,437	80,766
Total County Supply										
Municipal					13,523	13,523	13,523	13,513	13,513	13,513
Industrial					0	0	0	0	0	0
Steam-Electric					22,000	22,000	22,000	13,496	13,496	13,496
Irrigation					12,597	12,573	12,462	2,310	2,310	2,310
Mining					1,558	1,583	1,693	809	809	809
Livestock					1,808	1,808	1,808	1,808	1,808	1,808
Total County Supply					51,486	51,487	51,486	31,936	31,936	31,936

Table 4-1
Projected Water Demands, Supplies, and Needs
Atascosa County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Total County Surplus/Shortage									
Municipal				5,729	5,149	4,436	3,303	2,302	1,626
Industrial				0	0	0	0	0	0
Steam-Electric				10,000	10,000	10,000	1,496	-1,504	-8,504
Irrigation				-38,418	-36,718	-35,170	-43,726	-42,190	-40,713
Mining				0	0	0	-995	-1,109	-1,239
Livestock				0	0	0	0	0	0
Total County Surplus/Shortage				-22,689	-21,569	-20,734	-39,922	-42,501	-48,830
Total Basin Demand									
Nueces									
Municipal		5,571	5,889	7,693	8,268	8,976	10,087	11,079	11,755
Industrial		0	0	0	0	0	0	0	0
Steam-Electric		6,036	5,848	12,000	12,000	12,000	12,000	15,000	22,000
Irrigation		45,792	48,339	49,652	47,980	46,371	44,822	43,333	41,900
Mining		664	1377	1558	1583	1693	1804	1918	2048
Livestock		1,556	1,764	1,742	1,742	1,742	1,742	1,742	1,742
Total Nueces Basin Demand		59,619	63,217	72,645	71,573	70,782	70,455	73,072	79,445
San Antonio									
Municipal		99	105	101	106	111	123	132	132
Industrial		0	0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		1,416	488	1,363	1,311	1,261	1,214	1,167	1,123
Mining		0	0	0	0	0	0	0	0
Livestock		57	66	66	66	66	66	66	66
Total San Antonio Basin Demand		1,572	659	1,530	1,483	1,438	1,403	1,365	1,321
Total Basin Supply									
Nueces									
Municipal				13,391	13,391	13,391	13,391	13,391	13,391
Industrial				0	0	0	0	0	0
Steam-Electric				22,000	22,000	22,000	13,496	13,496	13,496
Irrigation				12,095	12,071	11,960	2,010	2,010	2,010
Mining				1,558	1,583	1,693	809	809	809
Livestock				1,742	1,742	1,742	1,742	1,742	1,742
Total Nueces Basin Supply				50,786	50,787	50,786	31,448	31,448	31,448
San Antonio									
Municipal				132	132	132	122	122	122
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				502	502	502	300	300	300
Mining				0	0	0	0	0	0
Livestock				66	66	66	66	66	66
Total San Antonio Basin Supply				700	700	700	488	488	488
Total Basin Surplus/Shortage									
Nueces									
Municipal				5,698	5,123	4,415	3,304	2,312	1,636
Industrial				0	0	0	0	0	0
Steam-Electric				10,000	10,000	10,000	1,496	-1,504	-8,504
Irrigation				-37,557	-35,909	-34,411	-42,812	-41,323	-39,890
Mining				0	0	0	-995	-1,109	-1,239
Livestock				0	0	0	0	0	0
Total Nueces Basin Supply				-21,859	-20,786	-19,996	-39,007	-41,624	-47,997
San Antonio									
Municipal				31	26	21	-1	-10	-10
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				-861	-809	-759	-914	-867	-823
Mining				0	0	0	0	0	0
Livestock				0	0	0	0	0	0
Total San Antonio Basin Supply				-830	-783	-738	-915	-877	-833

Table 4-1
Projected Water Demands, Supplies, and Needs
Atascosa County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Groundwater Supplies										
	Available									
	Nueces	Edwards			2,243	2,243	2,243	2,243	2,243	2,243
	San Antonio	Edwards			300	300	300	300	300	300
	Nueces	Carrizo			30,490	30,490	30,490	11,152	11,152	11,152
	San Antonio	Carrizo			334	334	334	122	122	122
	Nueces	Sparta			12,400	12,400	12,400	12,400	12,400	12,400
	Nueces	Queen City			3,910	3,910	3,910	3,910	3,910	3,910
	Total Available				49,677	49,677	49,677	30,127	30,127	30,127
	Allocated									
	Nueces	Edwards			2,243	2,243	2,243	2,243	2,243	2,243
	San Antonio	Edwards			300	300	300	300	300	300
	Nueces	Carrizo			30,490	30,490	30,490	11,152	11,152	11,152
	San Antonio	Carrizo			334	334	334	122	122	122
	Nueces	Sparta			12,400	12,400	12,400	12,400	12,400	12,400
	Nueces	Queen City			3,910	3,910	3,910	3,910	3,910	3,911
	Total Allocated				49,677	49,677	49,677	30,127	30,127	30,127
	Total Unallocated				0	0	0	0	0	0

Table 4-2
Projected Water Demands, Supplies, and Needs
Bexar County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Municipal Demand									
Nueces Basin									
Lytle		1	1	1	1	1	1	1	1
Rural		330	473	1,030	1,333	1,450	1,763	2,045	1,908
Subtotal		331	474	1,031	1,334	1,451	1,764	2,046	1,909
San Antonio Basin									
Alamo Heights		2,210	2,184	2,799	2,732	2,686	2,706	2,728	2,742
Balcones Heights		538	538	731	739	759	798	843	885
China Grove		217	273	259	276	293	344	393	416
Converse		1,213	1,349	2,127	2,837	3,529	4,498	5,365	6,456
Elmendorf		52	70	64	65	65	75	85	94
Fair Oaks Ranch		617	1,071	1,365	1,368	1,205	1,209	1,214	1,213
Helotes		310	381	360	387	415	494	534	577
Kirby		1,080	1,149	1,586	1,693	1,839	2,099	2,343	2,614
Leon Valley		1,715	1,949	2,288	2,135	1,958	1,956	1,954	2,040
Live Oak Water Public Utility		1,221	1,545	1,101	1,141	1,218	1,389	1,554	1,738
Olmos Park		385	378	519	520	530	553	579	603
San Antonio (SAWS)		166,616	180,999	220,405	242,339	272,507	312,695	349,957	391,640
Schertz (Outside City)		607	713	819	1,115	1,243	1,455	1,667	1,880
Schertz (Part)		60	84	251	550	913	997	1,092	1,192
Shavano Park		840	827	1,088	1,163	1,192	1,232	1,284	1,342
St. Hedwig		187	290	200	215	230	275	318	367
Terrell Hills		817	835	1,090	1,056	1,054	1,070	1,063	1,050
Universal City		2,323	2,612	3,386	3,748	4,186	4,864	5,491	6,200
Windcrest (WC&ID No. 10)		1,329	1,372	1,675	1,663	1,665	1,687	1,713	1,731
BMWD (Castle Hills)		1,311	1,165	1,714	1,743	1,765	1,786	1,769	1,751
BMWD (Somerset)		215	282	191	180	171	161	153	149
BMWD (Hill Ctry/HollywPk)		2,174	1,882	2,395	2,633	2,901	3,307	3,664	4,079
BMWD (Other Subdns)		20,741	24,370	27,999	34,024	39,841	46,235	52,910	56,821
Fort Sam Houston		4,342	3,413	4,073	3,804	3,575	3,549	3,522	3,508
Lackland AFB		4,212	3,777	3,960	3,708	3,488	3,467	3,446	3,436
Randolph AFB		1,993	1,207	1,877	1,761	1,658	1,649	1,644	1,635
Rural		7,970	22,810	20,711	23,697	28,678	37,439	44,363	33,682
Subtotal		225,295	257,525	305,033	337,292	379,564	437,989	491,648	529,841
Total Municipal Demand		225,626	257,999	306,064	338,626	381,015	439,753	493,694	531,750
Municipal Existing Supply									
Nueces Basin									
Lytle	Edwards			1	1	1	1	1	1
Rural	Carrizo			1,406	1,406	1,406	826	826	826
	Trinity			8	8	8	8	8	8
Subtotal				1,415	1,415	1,415	835	835	835
San Antonio Basin									
Alamo Heights	Edwards			1,500	1,500	1,500	1,500	1,500	1,500
Balcones Heights	Edwards			312	312	312	312	312	312
China Grove	Edwards			104	104	104	104	104	104
Converse	Edwards			567	567	567	567	567	567
Elmendorf	Edwards			31	31	31	31	31	31
Fair Oaks Ranch	Trinity (Comal County)			56	56	56	56	56	56
Helotes	Edwards			208	208	208	208	208	208
Kirby	Edwards			623	623	623	623	623	623
Leon Valley	Edwards			1,718	1,718	1,718	1,718	1,718	1,718
Live Oak Water Public Utility	Edwards			1,134	1,134	1,134	1,134	1,134	1,134
Olmos Park	Edwards			208	208	208	208	208	208
San Antonio (SAWS)	Edwards			99,818	99,818	99,818	99,818	99,818	99,818
	Direct Reuse (SAWS) [1]			18,193	18,193	18,193	18,193	18,193	18,193
San Antonio (SAWS) Subtotal				118,011	118,011	118,011	118,011	118,011	118,011

Table 4-2
Projected Water Demands, Supplies, and Needs
Bexar County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Schertz (Outside City)	Edwards			145	145	145	145	145	145
Schertz (Part)	Edwards			44	44	44	44	44	44
Shavano Park	Edwards			413	413	413	413	413	413
St. Hedwig Estimate	Edwards			404	404	404	404	404	404
Terrell Hills	Edwards			550	550	550	550	550	550
Universal City	Edwards			1,374	1,374	1,374	1,374	1,374	1,374
Windcrest (WC&ID No. 10) Estimate	Edwards			1,904	1,904	1,904	1,904	1,904	1,904
BMWD (Castle Hills)	Edwards			505	505	505	505	505	505
BMWD (Somerset)	Edwards			70	70	70	70	70	70
BMWD (Hill Ctry/HollywPk)	Edwards			701	701	701	701	701	701
BMWD (Other Subdns)	Edwards			12,572	12,572	12,572	12,572	12,572	12,572
	Trinity			583	583	583	583	583	583
	Carrizo			2,500	2,500	2,500	2,500	2,500	2,500
	Medina Lake			0	0	0	0	0	0
	Run-of-River (Medina)			2,649	2,649	2,649	2,649	2,649	2,649
BMWD (Other Subdns) Subtotal				18,304	18,304	18,304	18,304	18,304	18,304
Fort Sam Houston	Edwards			2,620	2,620	2,620	2,620	2,620	2,620
Lackland AFB	Edwards			2,738	2,738	2,738	2,738	2,738	2,738
Randolph AFB	Edwards			971	971	971	971	971	971
Rural	Edwards			4,017	4,017	4,017	4,017	4,017	4,017
	Carrizo			14,044	14,044	14,044	7,226	7,226	7,226
	Trinity			584	584	584	584	584	584
	Canyon (CRWA)			289	289	289	289	289	289
Rural Subtotal				18,934	18,934	18,934	12,116	12,116	12,116
Subtotal				174,149	174,149	174,149	167,331	167,331	167,331
Total Existing Municipal Supply				175,564	175,564	175,564	168,166	168,166	168,166
Municipal Surplus/Shortage									
Nueces Basin									
Lytle				0	0	0	0	0	0
Rural				384	81	-36	-929	-1,211	-1,074
Subtotal				384	81	-36	-929	-1,211	-1,074
San Antonio Basin									
Alamo Heights				-1,299	-1,232	-1,186	-1,206	-1,228	-1,242
Balcones Heights				-419	-427	-447	-486	-531	-573
China Grove				-155	-172	-189	-240	-289	-312
Converse				-1,560	-2,270	-2,962	-3,931	-4,798	-5,889
Elmendorf				-33	-34	-34	-44	-54	-63
Fair Oaks Ranch				-1,309	-1,312	-1,149	-1,153	-1,158	-1,157
Helotes				-152	-179	-207	-286	-326	-369
Kirby				-963	-1,070	-1,216	-1,476	-1,720	-1,991
Leon Valley				-570	-417	-240	-238	-236	-322
Live Oak Water Public Utility				33	-7	-84	-255	-420	-604
Olmos Park				-311	-312	-322	-345	-371	-395
San Antonio				-102,394	-124,328	-154,496	-194,684	-231,946	-273,629
Schertz (Outside City)				-674	-970	-1,098	-1,310	-1,522	-1,735
Schertz (Part)				-207	-506	-869	-953	-1,048	-1,148
Shavano Park				-675	-750	-779	-819	-871	-929
St. Hedwig				204	189	174	129	86	37
Terrell Hills				-540	-506	-504	-520	-513	-500
Universal City				-2,012	-2,374	-2,812	-3,490	-4,117	-4,826
Windcrest (WC&ID No. 10)				229	241	239	217	191	173
BMWD (Castle Hills)				-1,209	-1,238	-1,260	-1,281	-1,264	-1,246
BMWD (Somerset)				-121	-110	-101	-91	-83	-79
BMWD (Hill Ctry/HollywPk)				-1,694	-1,932	-2,200	-2,606	-2,963	-3,378
BMWD (Other Subdns)				-9,695	-15,720	-21,537	-27,931	-34,606	-38,517
Fort Sam Houston				-1,453	-1,184	-955	-929	-902	-888
Lackland AFB				-1,222	-970	-750	-729	-708	-698
Randolph AFB				-906	-790	-687	-678	-673	-664
Rural				-1,777	-4,763	-9,744	-25,323	-32,247	-21,566
Subtotal				-130,884	-163,143	-205,415	-270,658	-324,317	-362,510
Total Municipal Surplus/Shortage				-130,500	-163,062	-205,451	-271,587	-325,528	-363,584

Table 4-2
Projected Water Demands, Supplies, and Needs
Bexar County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Municipal New Supply Need									
Nueces Basin									
Lytle				0	0	0	0	0	0
Rural				0	0	36	929	1,211	1,074
Subtotal				0	0	36	929	1,211	1,074
San Antonio Basin									
Alamo Heights				1,299	1,232	1,186	1,206	1,228	1,242
Balcones Heights				419	427	447	486	531	573
China Grove				155	172	189	240	289	312
Converse				1,560	2,270	2,962	3,931	4,798	5,889
Elmendorf				33	34	34	44	54	63
Fair Oaks Ranch				1,309	1,312	1,149	1,153	1,158	1,157
Helotes				152	179	207	286	326	369
Kirby				963	1,070	1,216	1,476	1,720	1,991
Leon Valley				570	417	240	238	236	322
Live Oak Water Public Utility				0	7	84	255	420	604
Olmos Park				311	312	322	345	371	395
San Antonio				102,394	124,328	154,496	194,684	231,946	273,629
Schertz (Outside City)				674	970	1,098	1,310	1,522	1,735
Schertz (Part)				207	506	869	953	1,048	1,148
Shavano Park				675	750	779	819	871	929
St. Hedwig				0	0	0	0	0	0
Terrell Hills				540	506	504	520	513	500
Universal City				2,012	2,374	2,812	3,490	4,117	4,826
Windcrest (WC&ID No. 10)				0	0	0	0	0	0
BMWD (Castle Hills)				1,209	1,238	1,260	1,281	1,264	1,246
BMWD (Somerset)				121	110	101	91	83	79
BMWD (Hill Ctry/HollywPk)				1,694	1,932	2,200	2,606	2,963	3,378
BMWD (Other Subdns)				9,695	15,720	21,537	27,931	34,606	38,517
Fort Sam Houston				1,453	1,184	955	929	902	888
Lackland AFB				1,222	970	750	729	708	698
Randolph AFB				906	790	687	678	673	664
Rural				1,777	4,763	9,744	25,323	32,247	21,566
Subtotal				131,350	163,573	205,828	271,004	324,594	362,720
Total Municipal New Supply Need				131,350	163,573	205,864	271,933	325,805	363,794
Industrial Demand									
Nueces Basin		0	0	0	0	0	0	0	0
San Antonio Basin		14,049	20,627	16,805	19,682	22,359	24,935	28,264	31,697
Total Industrial Demand		14,049	20,627	16,805	19,682	22,359	24,935	28,264	31,697
Industrial Existing Supply									
Nueces Basin				0	0	0	0	0	0
Nueces Basin Subtotal				0	0	0	0	0	0
San Antonio Basin	Edwards			16,757	16,757	16,757	16,757	16,757	16,757
	Direct Reuse (SAWS)			6,748	6,748	6,748	6,748	6,748	6,748
San Antonio Basin Subtotal				23,505	23,505	23,505	23,505	23,505	23,505
Total Industrial Existing Supply				23,505	23,505	23,505	23,505	23,505	23,505
Industrial Surplus/Shortage									
Nueces Basin				0	0	0	0	0	0
San Antonio Basin				6,700	3,823	1,146	-1,430	-4,759	-8,192
Total Industrial Surplus/Shortage				6,700	3,823	1,146	-1,430	-4,759	-8,192
Industrial New Supply Need									
Nueces Basin				0	0	0	0	0	0
San Antonio Basin				0	0	0	1,430	4,759	8,192
Total Industrial New Supply Need				0	0	0	1,430	4,759	8,192

Table 4-2
Projected Water Demands, Supplies, and Needs
Bexar County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Steam-Electric Demand									
Nueces Basin		0	0	0	0	0	0	0	0
San Antonio Basin		24,263	25,714	36,000	36,000	40,000	45,000	50,000	56,000
Total Steam-Electric Demand		24,263	25,714	36,000	36,000	40,000	45,000	50,000	56,000
Steam-Electric Existing Supply									
Nueces Basin				0	0	0	0	0	0
San Antonio Basin	Victor Braunig Lake			12,064	12,064	12,064	12,064	12,064	12,064
	Calaveras Lake			47,364	47,364	47,364	47,364	47,364	47,364
San Antonio Basin Subtotal				59,428	59,428	59,428	59,428	59,428	59,428
Total Steam-Electric Existing Supply				59,428	59,428	59,428	59,428	59,428	59,428
Steam-Electric Surplus/Shortage									
Nueces Basin				0	0	0	0	0	0
San Antonio Basin				23,428	23,428	19,428	14,428	9,428	3,428
Total Steam-Electric Surplus/Shortage				23,428	23,428	19,428	14,428	9,428	3,428
Steam-Electric New Supply Need									
Nueces Basin				0	0	0	0	0	0
San Antonio Basin				0	0	0	0	0	0
Total Steam-Electric New Supply Need				0	0	0	0	0	0
Irrigation Demand									
Nueces Basin		3,374	2,743	3,380	3,274	3,282	2,830	2,713	2,592
San Antonio Basin		33,638	38,729	36,623	33,605	32,038	30,997	29,684	28,434
Total Irrigation Demand		37,012	41,472	40,003	36,879	35,320	33,827	32,397	31,026
Irrigation Supply									
Nueces Basin	Edwards			251	251	251	251	251	251
	Carrizo			0	0	0	0	0	0
	Trinity			0	0	0	0	0	0
Nueces Basin Subtotal				251	251	251	251	251	251
San Antonio Basin	Edwards			22,547	22,547	22,547	22,547	22,547	22,547
	Run-of-River			3,142	3,142	3,142	3,142	3,142	3,142
	Carrizo			0	0	0	0	0	0
	Trinity			0	0	0	0	0	0
San Antonio Basin Subtotal				25,689	25,689	25,689	25,689	25,689	25,689
Total Irrigation Supply				25,940	25,940	25,940	25,940	25,940	25,940
Irrigation Surplus/Shortage									
Nueces Basin				-3,129	-3,023	-3,031	-2,579	-2,462	-2,341
San Antonio Basin				-10,934	-7,916	-6,349	-5,308	-3,995	-2,745
Total Irrigation Surplus/Shortage				-14,063	-10,939	-9,380	-7,887	-6,457	-5,086
Mining Demand									
Nueces Basin		147	168	182	178	183	189	194	199
San Antonio Basin		1,444	6,429	4,781	4,758	5,018	5,217	5,451	5,763
Total Mining Demand		1,591	6,597	4,963	4,936	5,201	5,406	5,645	5,962
Mining Supply									
Nueces Basin	Carrizo			0	0	0	0	0	0
	Trinity			0	0	0	0	0	0
Nueces Basin Subtotal				0	0	0	0	0	0
San Antonio Basin	Carrizo			0	0	0	0	0	0
	Trinity			0	0	0	0	0	0
San Antonio Basin Subtotal				0	0	0	0	0	0
Total Mining Supply				0	0	0	0	0	0

Table 4-2
Projected Water Demands, Supplies, and Needs
Bexar County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Mining Surplus/Shortage									
Nueces Basin				-182	-178	-183	-189	-194	-199
San Antonio Basin				-4,781	-4,758	-5,018	-5,217	-5,451	-5,763
Total Mining Surplus/Shortage				-4,963	-4,936	-5,201	-5,406	-5,645	-5,962
Livestock Demand									
Nueces Basin		23	31	26	26	26	26	26	26
San Antonio Basin		1,353	1,791	1,461	1,461	1,461	1,461	1,461	1,461
Total Livestock Demand		1,376	1,822	1,487	1,487	1,487	1,487	1,487	1,487
Livestock Supply									
Nueces Basin	Local	23	31	26	26	26	26	26	26
San Antonio Basin	Local	1,353	1,791	1,461	1,461	1,461	1,461	1,461	1,461
Total Livestock Supply		1,376	1,822	1,487	1,487	1,487	1,487	1,487	1,487
Livestock Surplus/Shortage									
Nueces Basin		0	0	0	0	0	0	0	0
San Antonio Basin		0	0	0	0	0	0	0	0
Total Livestock Surplus/Shortage		0	0	0	0	0	0	0	0
Total Bexar County Demand									
Municipal		225,626	257,999	306,064	338,626	381,015	439,753	493,694	531,750
Industrial		14,049	20,627	16,805	19,682	22,359	24,935	28,264	31,697
Steam-Electric		24,263	25,714	36,000	36,000	40,000	45,000	50,000	56,000
Irrigation		37,012	41,472	40,003	36,879	35,320	33,827	32,397	31,026
Mining		1,591	6,597	4,963	4,936	5,201	5,406	5,645	5,962
Livestock		1,376	1,822	1,487	1,487	1,487	1,487	1,487	1,487
Total County Demand		303,917	354,231	405,322	437,610	485,382	550,408	611,487	657,922
7									
Total Bexar County Supply									
Municipal				175,564	175,564	175,564	168,166	168,166	168,166
Industrial				23,505	23,505	23,505	23,505	23,505	23,505
Steam-Electric				59,428	59,428	59,428	59,428	59,428	59,428
Irrigation				25,940	25,940	25,940	25,940	25,940	25,940
Mining				0	0	0	0	0	0
Livestock				1,487	1,487	1,487	1,487	1,487	1,487
Total County Supply				285,924	285,924	285,924	278,526	278,526	278,526
Total Bexar County Surplus/Shortage									
Municipal				-130,500	-163,062	-205,451	-271,587	-325,528	-363,584
Industrial				6,700	3,823	1,146	-1,430	-4,759	-8,192
Steam-Electric				23,428	23,428	19,428	14,428	9,428	3,428
Irrigation				-14,063	-10,939	-9,380	-7,887	-6,457	-5,086
Mining				-4,963	-4,936	-5,201	-5,406	-5,645	-5,962
Livestock				0	0	0	0	0	0
Total County Surplus/Shortage				-119,398	-151,686	-199,458	-271,882	-332,961	-379,396
Total Basin Demand									
Nueces									
Municipal		331	474	1,031	1,334	1,451	1,764	2,046	1,909
Industrial		0	0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		3,374	2,743	3,380	3,274	3,282	2,830	2,713	2,592
Mining		147	168	182	178	183	189	194	199
Livestock		23	31	26	26	26	26	26	26
Total Nueces Basin Demand		3,875	3,416	4,619	4,812	4,942	4,809	4,979	4,726
San Antonio									
Municipal		225,295	257,525	305,033	337,292	379,564	437,989	491,648	529,841
Industrial		14,049	20,627	16,805	19,682	22,359	24,935	28,264	31,697
Steam-Electric		24,263	25,714	36,000	36,000	40,000	45,000	50,000	56,000
Irrigation		33,638	38,729	36,623	33,605	32,038	30,997	29,684	28,434
Mining		1,444	6,429	4,781	4,758	5,018	5,217	5,451	5,763
Livestock		1,353	1,791	1,461	1,461	1,461	1,461	1,461	1,461
Total San Antonio Basin Demand		300,042	350,815	400,703	432,798	480,440	545,599	606,508	653,196

Table 4-2
Projected Water Demands, Supplies, and Needs
Bexar County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Total Basin Supply										
Nueces										
Municipal					1,415	1,415	1,415	835	835	835
Industrial					0	0	0	0	0	0
Steam-Electric					0	0	0	0	0	0
Irrigation					251	251	251	251	251	251
Mining					0	0	0	0	0	0
Livestock					26	26	26	26	26	26
Total Nueces Basin Supply					1,692	1,692	1,692	1,112	1,112	1,112
San Antonio										
Municipal					174,149	174,149	174,149	167,331	167,331	167,331
Industrial					23,505	23,505	23,505	23,505	23,505	23,505
Steam-Electric					59,428	59,428	59,428	59,428	59,428	59,428
Irrigation					25,689	25,689	25,689	25,689	25,689	25,689
Mining					0	0	0	0	0	0
Livestock					1,461	1,461	1,461	1,461	1,461	1,461
Total San Antonio Basin Supply					284,232	284,232	284,232	277,414	277,414	277,414
Total Basin Surplus/Shortage										
Nueces										
Municipal					384	81	-36	-929	-1,211	-1,074
Industrial					0	0	0	0	0	0
Steam-Electric					0	0	0	0	0	0
Irrigation					-3,129	-3,023	-3,031	-2,579	-2,462	-2,341
Mining					-182	-178	-183	-189	-194	-199
Livestock					0	0	0	0	0	0
Total Nueces Basin Surplus/Shortage					-2,927	-3,120	-3,250	-3,697	-3,867	-3,614
San Antonio										
Municipal					-130,884	-163,143	-205,415	-270,658	-324,317	-362,510
Industrial					6,700	3,823	1,146	-1,430	-4,759	-8,192
Steam-Electric					23,428	23,428	19,428	14,428	9,428	3,428
Irrigation					-10,934	-7,916	-6,349	-5,308	-3,995	-2,745
Mining					-4,781	-4,758	-5,018	-5,217	-5,451	-5,763
Livestock					0	0	0	0	0	0
Total San Antonio Basin Surplus/Shortage					-116,471	-148,566	-196,208	-268,185	-329,094	-375,782
Groundwater Supplies										
	Available									
	Nueces	Edwards			252	252	252	252	252	252
	San Antonio	Edwards			174,555	174,555	174,555	174,555	174,555	174,555
	Nueces	Carrizo			1,406	1,406	1,406	826	826	826
	San Antonio	Carrizo			16,544	16,544	16,544	9,726	9,726	9,726
	Nueces	Trinity			8	8	8	8	8	8
	San Antonio	Trinity			1,167	1,167	1,167	1,167	1,167	1,167
	Total Available				193,932	193,932	193,932	186,534	186,534	186,534
	Allocated									
	Nueces	Edwards			252	252	252	252	252	252
	San Antonio	Edwards			174,555	174,555	174,555	174,555	174,555	174,555
	Nueces	Carrizo			1,406	1,406	1,406	826	826	826
	Nueces	Trinity			8	8	8	8	8	8
	San Antonio	Carrizo			16,544	16,544	16,544	9,726	9,726	9,726
	San Antonio	Trinity			1,167	1,167	1,167	1,167	1,167	1,167
	Total Allocated				193,932	193,932	193,932	186,534	186,534	186,534
	Total Unallocated				0	0	0	0	0	0

Notes:
[1] Used for irrigation of golf courses and open spaces.

Table 4-3
Projected Water Demands, Supplies, and Needs
Caldwell County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Municipal Demand										
Guadalupe Basin										
Lockhart			1,816	2,033	2,279	2,498	2,703	2,978	3,024	3,047
Luling			1,207	1,145	1,532	1,750	1,955	2,244	2,516	2,819
Martindale			101	88	109	103	97	99	106	113
Rural			1,591	1,805	3,000	3,090	3,158	3,216	2,936	2,601
	Subtotal		4,715	5,071	6,920	7,441	7,913	8,537	8,582	8,580
Lower Colorado Basin										
Rural			216	115	121	133	145	157	157	158
	Subtotal		216	115	121	133	145	157	157	158
Total Municipal Demand			4,931	5,186	7,041	7,574	8,058	8,694	8,739	8,738
Municipal Existing Supply										
Guadalupe Basin										
Lockhart		Carrizo			2,310	2,310	2,310	2,310	2,310	2,310
Luling		Carrizo			2,730	2,730	2,730	2,730	2,730	2,730
		Run-of-River			99	99	99	99	99	99
Luling Subtotal					2,829	2,829	2,829	2,829	2,829	2,829
Martindale	Estimated	Carrizo			124	124	124	124	124	124
Rural		Edwards			161	161	161	161	161	161
		Carrizo			2,879	3,015	3,106	2,446	2,540	2,622
		Queen City			110	110	110	120	120	120
		Run-of-River			376	376	376	376	376	376
		Canyon (GBRA)			259	259	259	259	259	259
Rural Subtotal					3,785	3,921	4,012	3,362	3,456	3,538
	Subtotal				9,048	9,184	9,275	8,625	8,719	8,801
Lower Colorado Basin										
Rural										
		Carrizo			158	158	158	158	158	158
	Subtotal				158	158	158	158	158	158
Total Municipal Existing Supply					9,206	9,342	9,433	8,783	8,877	8,959
Municipal Surplus/Shortage										
Guadalupe Basin										
Lockhart					31	-188	-393	-668	-714	-737
Luling					1,297	1,079	874	585	313	10
Martindale					15	21	27	25	18	11
Rural					785	831	854	146	520	937
	Subtotal				2,128	1,743	1,362	88	137	221
Lower Colorado Basin										
Rural					37	25	13	1	1	0
	Subtotal				37	25	13	1	1	0
Total Municipal Surplus/Shortage					2,165	1,768	1,375	89	138	221
Municipal New Supply Need										
Guadalupe Basin										
Lockhart					0	188	393	668	714	737
Luling					0	0	0	0	0	0
Martindale					0	0	0	0	0	0
Rural					0	0	0	0	0	0
	Subtotal				0	188	393	668	714	737
Lower Colorado Basin										
Rural					0	0	0	0	0	0
	Subtotal				0	0	0	0	0	0
Total Municipal New Supply Need					0	188	393	668	714	737

Table 4-3
Projected Water Demands, Supplies, and Needs
Caldwell County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Industrial Demand									
Guadalupe Basin		0	12	62	67	71	77	82	87
Lower Colorado Basin		0	0	0	0	0	0	0	0
Total Industrial Demand		0	12	62	67	71	77	82	87
Industrial Existing Supply									
Guadalupe Basin									
	Carrizo			84	84	84	84	84	84
	Queen City			3	3	3	3	3	3
Guadalupe Basin Subtotal				87	87	87	87	87	87
Lower Colorado Basin				0	0	0	0	0	0
Total Industrial Existing Supply				87	87	87	87	87	87
Industrial Surplus/Shortage									
Guadalupe Basin				25	20	16	10	5	0
Lower Colorado Basin				0	0	0	0	0	0
Total Industrial Surplus/Shortage				25	20	16	10	5	0
Industrial New Supply Need									
Guadalupe Basin				0	0	0	0	0	0
Lower Colorado Basin				0	0	0	0	0	0
Total Industrial New Supply Need				0	0	0	0	0	0
Steam-Electric Demand									
Guadalupe Basin		0	0	0	0	0	0	0	0
Lower Colorado Basin		0	0	0	0	0	0	0	0
Total Steam-Electric Demand		0	0	0	0	0	0	0	0
Steam-Electric Existing Supply									
Guadalupe Basin				0	0	0	0	0	0
Lower Colorado Basin				0	0	0	0	0	0
Total Steam-Electric Existing Supply				0	0	0	0	0	0
Steam-Electric Surplus/Shortage									
Guadalupe Basin				0	0	0	0	0	0
Lower Colorado Basin				0	0	0	0	0	0
Total Steam-Electric Surplus/Shortage				0	0	0	0	0	0
Steam-Electric New Supply Need									
Guadalupe Basin				0	0	0	0	0	0
Lower Colorado Basin				0	0	0	0	0	0
Total Steam-Electric New Supply Need				0	0	0	0	0	0
Irrigation Demand									
Guadalupe Basin		1,355	1,728	1,204	1,070	951	844	751	667
Lower Colorado Basin		20	14	18	16	14	13	11	10
Total Irrigation Demand		1,375	1,742	1,222	1,086	965	857	762	677
Irrigation Supply									
Guadalupe Basin	Run-of-River			133	133	133	133	133	133
	Carrizo			1,156	1,021	902	796	703	621
	Queen City			41	36	32	28	25	22
Guadalupe Basin Subtotal				1,330	1,190	1,067	957	861	776
Lower Colorado Basin	Carrizo			18	16	14	13	11	10
Total Irrigation Supply				1,348	1,206	1,081	970	872	786

Table 4-3
Projected Water Demands, Supplies, and Needs
Caldwell County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Irrigation Surplus/Shortage									
Guadalupe Basin				126	120	116	113	110	109
Lower Colorado Basin				0	0	0	0	0	0
Total Irrigation Surplus/Shortage				126	120	116	113	110	109
Mining Demand									
Guadalupe Basin		27	6	8	7	5	2	0	0
Lower Colorado Basin		0	6	13	9	5	2	0	0
Total Mining Demand		27	12	21	16	10	4	0	0
Mining Supply									
Guadalupe Basin									
	Carrizo			8	7	5	2	0	0
	Queen City			0	0	0	0	0	0
Guadalupe Basin Subtotal				8	7	5	2	0	0
Lower Colorado Basin	Carrizo			13	9	5	2	0	0
Total Mining Supply				21	16	10	4	0	0
Mining Surplus/Shortage									
Guadalupe Basin				0	0	0	0	0	0
Lower Colorado Basin				0	0	0	0	0	0
Total Mining Surplus/Shortage				0	0	0	0	0	0
Livestock Demand									
Guadalupe Basin		681	668	696	696	696	696	696	696
Lower Colorado Basin		135	133	139	139	139	139	139	139
Total Livestock Demand		816	801	835	835	835	835	835	835
Livestock Supply									
Guadalupe Basin	Local	681	668	696	696	696	696	696	696
Lower Colorado Basin	Local	135	133	139	139	139	139	139	139
Total Livestock Supply		816	801	835	835	835	835	835	835
Livestock Surplus/Shortage									
Guadalupe Basin		0	0	0	0	0	0	0	0
Lower Colorado Basin		0	0	0	0	0	0	0	0
Total Livestock Surplus/Shortage		0	0	0	0	0	0	0	0
Total Caldwell County Demand									
Municipal		4,931	5,186	7,041	7,574	8,058	8,694	8,739	8,738
Industrial		0	12	62	67	71	77	82	87
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		1,375	1,742	1,222	1,086	965	857	762	677
Mining		27	12	21	16	10	4	0	0
Livestock		816	801	835	835	835	835	835	835
Total County Demand		7,149	7,753	9,181	9,578	9,939	10,467	10,418	10,337
Total Caldwell County Supply									
Municipal				9,206	9,342	9,433	8,783	8,877	8,959
Industrial				87	87	87	87	87	87
Steam-Electric				0	0	0	0	0	0
Irrigation				1,348	1,206	1,081	970	872	786
Mining				21	16	10	4	0	0
Livestock				835	835	835	835	835	835
Total County Supply				11,497	11,486	11,446	10,679	10,671	10,667
Total Caldwell County Surplus/Shortage									
Municipal				2,165	1,768	1,375	89	138	221
Industrial				25	20	16	10	5	0
Steam-Electric				0	0	0	0	0	0
Irrigation				126	120	116	113	110	109
Mining				0	0	0	0	0	0
Livestock				0	0	0	0	0	0
Total County Surplus/Shortage				2,316	1,908	1,507	212	253	330

Table 4-3
Projected Water Demands, Supplies, and Needs
Caldwell County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Total Basin Demand									
Guadalupe									
Municipal		4,715	5,071	6,920	7,441	7,913	8,537	8,582	8,580
Industrial		0	12	62	67	71	77	82	87
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		1,355	1,728	1,204	1,070	951	844	751	667
Mining		27	6	8	7	5	2	0	0
Livestock		681	668	696	696	696	696	696	696
Total Guadalupe Basin Demand		6,778	7,485	8,890	9,281	9,636	10,156	10,111	10,030
Colorado									
Municipal		216	115	121	133	145	157	157	158
Industrial		0	0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		20	14	18	16	14	13	11	10
Mining		0	6	13	9	5	2	0	0
Livestock		135	133	139	139	139	139	139	139
Total Colorado Basin Demand		371	268	291	297	303	311	307	307
Total Basin Supply									
Guadalupe									
Municipal				9,048	9,184	9,275	8,625	8,719	8,801
Industrial				87	87	87	87	87	87
Steam-Electric				0	0	0	0	0	0
Irrigation				1,330	1,190	1,067	957	861	776
Mining				8	7	5	2	0	0
Livestock				696	696	696	696	696	696
Unallocated Groundwater Supply				174	179	213	177	181	184
Total Guadalupe Basin Supply				11,343	11,343	11,343	10,544	10,544	10,544
Colorado									
Municipal				158	158	158	158	158	158
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				18	16	14	13	11	10
Mining				13	9	5	2	0	0
Livestock				139	139	139	139	139	139
Unallocated Groundwater Supply				575	581	587	525	529	530
Total Colorado Basin Supply				903	903	903	837	837	837
Total Basin Surplus/Shortage									
Guadalupe									
Municipal				2,128	1,743	1,362	88	137	221
Industrial				25	20	16	10	5	0
Steam-Electric				0	0	0	0	0	0
Irrigation				126	120	116	113	110	109
Mining				0	0	0	0	0	0
Livestock				0	0	0	0	0	0
Unallocated Groundwater Supply				174	179	213	177	181	184
Total Guadalupe Basin Surplus/Shortage				2,453	2,062	1,707	388	433	514
Colorado									
Municipal				37	25	13	1	1	0
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				0	0	0	0	0	0
Mining				0	0	0	0	0	0
Livestock				0	0	0	0	0	0
Unallocated Groundwater Supply				575	581	587	525	529	530
Total Colorado Basin Surplus/Shortage				612	606	600	526	530	530

Table 4-3
Projected Water Demands, Supplies, and Needs
Caldwell County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Groundwater Supplies										
	Available									
	Guadalupe	Edwards			161	161	161	161	161	161
	Guadalupe	Carrizo			9,291	9,291	9,291	8,492	8,492	8,492
	Colorado	Carrizo			764	764	764	698	698	698
	Guadalupe	Queen City			328	328	328	328	328	328
	Total Available				10,544	10,544	10,544	9,679	9,679	9,679
	Allocated									
	Guadalupe	Edwards			161	161	161	161	161	161
	Guadalupe	Carrizo			9,291	9,291	9,261	8,492	8,491	8,491
	Colorado	Carrizo			189	183	177	173	169	168
	Guadalupe	Queen City			154	149	145	151	147	144
	Total Allocated				9,795	9,784	9,744	8,977	8,969	8,965
	Total Unallocated				749	760	800	702	710	714

Table 4-4
Projected Water Demands, Supplies, and Needs
Calhoun County
South Central Texas Region

Basin		Source	Total in	Total in	Projections					
			1990	1996	2000	2010	2020	2030	2040	2050
			(acft)	(acft)	(acft)	(acft)	(acft)	(acft)	(acft)	(acft)
Municipal Demand										
Guadalupe Basin										
Rural			3	2	9	9	10	11	11	13
	Subtotal		3	2	9	9	10	11	11	13
Colorado-Lavaca Coastal Basin										
Point Comfort			137	191	171	160	155	160	169	176
Rural			80	66	246	259	270	294	318	353
	Subtotal		217	257	417	419	425	454	487	529
Lavaca-Guadalupe Coastal Basin										
Port Lavaca			1,507	1,672	1,769	1,709	1,698	1,792	1,909	2,033
Seadrift			169	191	196	202	216	238	257	280
Rural			2,016	539	2,004	2,100	2,188	2,383	2,589	2,870
	Subtotal		3,692	2,402	3,969	4,011	4,102	4,413	4,755	5,183
San Antonio-Nueces Coastal Basin										
Rural			4	4	16	16	17	18	20	22
	Subtotal		4	4	16	16	17	18	20	22
Total Municipal Demand			3,916	2,665	4,411	4,455	4,554	4,896	5,273	5,747
Municipal Existing Supply										
Guadalupe Basin										
Rural		Canyon (GBRA)			560	560	560	560	560	560
	Subtotal				560	560	560	560	560	560
Colorado-Lavaca Coastal Basin										
Point Comfort		Lake Texana (LNRA)			178	178	178	178	178	178
Rural		Gulf Coast			353	353	353	353	353	353
	Subtotal				531	531	531	531	531	531
Lavaca-Guadalupe Coastal Basin										
Port Lavaca		Canyon (GBRA)[1]			1,500	0	0	0	0	0
		Run-of-River (Guadalupe)			940	940	940	940	940	940
Port Lavaca Subtotal					2,440	940	940	940	940	940
Seadrift		Gulf Coast			407	407	407	407	407	407
Rural		Run-of-River (Guadalupe)			3,565	3,565	3,565	3,565	3,565	3,565
	Subtotal				6,412	4,912	4,912	4,912	4,912	4,912
San Antonio-Nueces Coastal Basin										
Rural		Gulf Coast			22	22	22	22	22	22
	Subtotal				22	22	22	22	22	22
Total Municipal Existing Supply					7,525	6,025	6,025	6,025	6,025	6,025
Municipal Surplus/Shortage										
Guadalupe Basin										
Rural					551	551	550	549	549	547
	Subtotal				551	551	550	549	549	547
Colorado-Lavaca Coastal Basin										
Point Comfort					7	18	23	18	9	2
Rural					107	94	83	59	35	0
	Subtotal				114	112	106	77	44	2
Lavaca-Guadalupe Coastal Basin										
Port Lavaca					671	-769	-758	-852	-969	-1,093
Seadrift					211	205	191	169	150	127
Rural					1,561	1,465	1,377	1,182	976	695
	Subtotal				2,443	901	810	499	157	-271
San Antonio-Nueces Coastal Basin										
Rural					6	6	5	4	2	0
	Subtotal				6	6	5	4	2	0
Total Municipal Surplus/Shortage					3,114	1,570	1,471	1,129	752	278

Table 4-4
Projected Water Demands, Supplies, and Needs
Calhoun County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Municipal New Supply Need									
Guadalupe Basin									
Rural				0	0	0	0	0	0
Subtotal				0	0	0	0	0	0
Colorado-Lavaca Coastal Basin									
Point Comfort				0	0	0	0	0	0
Rural				0	0	0	0	0	0
Subtotal				0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin									
Port Lavaca				0	769	758	852	969	1,093
Seadrift				0	0	0	0	0	0
Rural				0	0	0	0	0	0
Subtotal				0	769	758	852	969	1,093
San Antonio-Nueces Coastal Basin									
Rural				0	0	0	0	0	0
Subtotal				0	0	0	0	0	0
Total Municipal New Supply Need				0	769	758	852	969	1,093
Industrial Demand									
Guadalupe Basin		233	93	419	493	546	601	662	726
Colorado-Lavaca Coastal Basin		6,343	19,824	16,538	20,391	22,590	25,036	27,669	30,494
Lavaca-Guadalupe Coastal Basin		17,963	20,109	46,069	56,704	62,813	69,603	76,905	84,738
San Antonio-Nueces Basin		0	0	0	0	0	0	0	0
Total Industrial Demand		24,539	40,026	63,026	77,588	85,949	95,240	105,236	115,958
Industrial Existing Supply									
Guadalupe Basin	Run-of-River			12,754	12,754	12,754	12,754	12,754	12,754
	Canyon (GBRA)			6,474	6,474	6,474	6,474	6,474	6,474
Guadalupe Basin Subtotal				19,228	19,228	19,228	19,228	19,228	19,228
Colorado-Lavaca Coastal Basin	Lake Texana (LNRA)			32,426	32,426	32,426	32,426	32,426	32,426
Lavaca-Guadalupe Coastal Basin	Run-of-River (Guadalupe)			87,983	87,983	87,983	87,983	87,983	87,983
San Antonio-Nueces Basin				0	0	0	0	0	0
Total Industrial Existing Supply				139,637	139,637	139,637	139,637	139,637	139,637
Industrial Surplus/Shortage									
Guadalupe Basin				18,809	18,735	18,682	18,627	18,566	18,502
Colorado-Lavaca Coastal Basin				15,888	12,035	9,836	7,390	4,757	1,932
Lavaca-Guadalupe Coastal Basin				41,914	31,279	25,170	18,380	11,078	3,245
San Antonio-Nueces Basin				0	0	0	0	0	0
Total Industrial Surplus/Shortage				76,611	62,049	53,688	44,397	34,401	23,679
Industrial New Supply Need									
Guadalupe Basin				0	0	0	0	0	0
Colorado-Lavaca Coastal Basin				0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin				0	0	0	0	0	0
San Antonio-Nueces Basin				0	0	0	0	0	0
Total Industrial New Supply Need				0	0	0	0	0	0
Steam-Electric Demand									
Guadalupe Basin		0	0	0	0	0	0	0	0
Colorado-Lavaca Coastal Basin		62	29	100	100	100	100	100	100
Lavaca-Guadalupe Coastal Basin		0	0	0	0	0	0	0	0
San Antonio-Nueces Basin		0	0	0	0	0	0	0	0
Total Steam-Electric Demand		62	29	100	100	100	100	100	100
Steam-Electric Existing Supply									
Guadalupe Basin				0	0	0	0	0	0
Colorado-Lavaca Coastal Basin	Gulf Coast			100	100	100	100	100	100
Lavaca-Guadalupe Coastal Basin				0	0	0	0	0	0
San Antonio-Nueces Basin				0	0	0	0	0	0
Total Steam-Electric Existing Supply				100	100	100	100	100	100

Table 4-4 Projected Water Demands, Supplies, and Needs Calhoun County South Central Texas Region									
Basin	**Source**	**Total in 1990 (acft)**	**Total in 1996 (acft)**	**Projections 2000 (acft)**	**2010 (acft)**	**2020 (acft)**	**2030 (acft)**	**2040 (acft)**	**2050 (acft)**
Steam-Electric Surplus/Shortage									
Guadalupe Basin				0	0	0	0	0	0
Colorado-Lavaca Coastal Basin				0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin				0	0	0	0	0	0
San Antonio-Nueces Basin				0	0	0	0	0	0
Total Steam-Electric Surplus/Shortage				0	0	0	0	0	0
Steam-Electric New Supply Need									
Guadalupe Basin				0	0	0	0	0	0
Colorado-Lavaca Coastal Basin				0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin				0	0	0	0	0	0
San Antonio-Nueces Basin				0	0	0	0	0	0
Total Steam-Electric New Supply Need				0	0	0	0	0	0
Irrigation Demand									
Guadalupe Basin		0	0	0	0	0	0	0	0
Colorado-Lavaca Coastal Basin		0	0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin		35,421	48,082	26,822	22,747	19,950	17,673	16,132	15,028
San Antonio-Nueces Basin		0	0	0	0	0	0	0	0
Total Irrigation Demand		35,421	48,082	26,822	22,747	19,950	17,673	16,132	15,028
Irrigation Supply									
Guadalupe Basin				0	0	0	0	0	0
Colorado-Lavaca Coastal Basin				0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin	Run-of-River (Guadalupe)			28,631	28,631	28,631	28,631	28,631	28,631
San Antonio-Nueces Basin				0	0	0	0	0	0
Total Irrigation Supply				28,631	28,631	28,631	28,631	28,631	28,631
Irrigation Surplus/Shortage									
Guadalupe Basin				0	0	0	0	0	0
Colorado-Lavaca Coastal Basin				0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin				1,809	5,884	8,681	10,958	12,499	13,603
San Antonio-Nueces Basin				0	0	0	0	0	0
Total Irrigation Surplus/Shortage				1,809	5,884	8,681	10,958	12,499	13,603
Mining Demand									
Guadalupe Basin		0	6	13	9	5	2	0	0
Colorado-Lavaca Coastal Basin		0	1	1	1	1	0	0	0
Lavaca-Guadalupe Coastal Basin		1	4	6	5	4	3	2	2
San Antonio-Nueces Basin		4	4	8	6	3	1	1	1
Total Mining Demand		5	15	28	21	13	6	3	3
Mining Supply									
Guadalupe Basin	Gulf Coast			13	9	5	2	0	0
Colorado-Lavaca Coastal Basin	Gulf Coast			1	1	1	0	0	0
Lavaca-Guadalupe Coastal Basin	Gulf Coast			6	5	4	3	2	2
San Antonio-Nueces Basin	Gulf Coast			8	6	3	1	1	1
Total Mining Supply				28	21	13	6	3	3
Mining Surplus/Shortage									
Guadalupe Basin				0	0	0	0	0	0
Colorado-Lavaca Coastal Basin				0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin				0	0	0	0	0	0
San Antonio-Nueces Basin				0	0	0	0	0	0
Total Mining Surplus/Shortage				0	0	0	0	0	0
Livestock Demand									
Guadalupe Basin		0	2	2	2	2	2	2	2
Colorado-Lavaca Coastal Basin		13	16	15	15	15	15	15	15
Lavaca-Guadalupe Coastal Basin		278	300	287	287	287	287	287	287
San Antonio-Nueces Basin		0	0	0	0	0	0	0	0
Total Livestock Demand		291	318	304	304	304	304	304	304

Table 4-4
Projected Water Demands, Supplies, and Needs
Calhoun County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Livestock Supply									
Guadalupe Basin	Local	0	2	2	2	2	2	2	2
Colorado-Lavaca Coastal Basin	Local	13	16	15	15	15	15	15	15
Lavaca-Guadalupe Coastal Basin	Local	278	300	287	287	287	287	287	287
San Antonio-Nueces Basin	Local	0	0	0	0	0	0	0	0
Total Livestock Supply		291	318	304	304	304	304	304	304
Livestock Surplus/Shortage									
Guadalupe Basin		0	0	0	0	0	0	0	0
Colorado-Lavaca Coastal Basin		0	0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin		0	0	0	0	0	0	0	0
San Antonio-Nueces Basin		0	0	0	0	0	0	0	0
Total Livestock Surplus/Shortage		0	0	0	0	0	0	0	0
Total Calhoun County Demand									
Municipal		3,916	2,665	4,411	4,455	4,554	4,896	5,273	5,747
Industrial		24,539	40,026	63,026	77,588	85,949	95,240	105,236	115,958
Steam-Electric		62	29	100	100	100	100	100	100
Irrigation		35,421	48,082	26,822	22,747	19,950	17,673	16,132	15,028
Mining		5	15	28	21	13	6	3	3
Livestock		291	318	304	304	304	304	304	304
Total County Demand		64,234	91,135	94,691	105,215	110,870	118,219	127,048	137,140
Total Calhoun County Supply									
Municipal				7,525	6,025	6,025	6,025	6,025	6,025
Industrial				139,637	139,637	139,637	139,637	139,637	139,637
Steam-Electric				100	100	100	100	100	100
Irrigation				28,631	28,631	28,631	28,631	28,631	28,631
Mining				28	21	13	6	3	3
Livestock				304	304	304	304	304	304
Total County Supply				176,225	174,718	174,710	174,703	174,700	174,700
Total Calhoun County Surplus/Shortage									
Municipal				3,114	1,570	1,471	1,129	752	278
Industrial				76,611	62,049	53,688	44,397	34,401	23,679
Steam-Electric				0	0	0	0	0	0
Irrigation				1,809	5,884	8,681	10,958	12,499	13,603
Mining				0	0	0	0	0	0
Livestock				0	0	0	0	0	0
Total County Surplus/Shortage				81,534	69,503	63,840	56,484	47,652	37,560
Total Basin Demand									
Guadalupe									
Municipal		3	2	9	9	10	11	11	13
Industrial		233	93	419	493	546	601	662	726
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		0	0	0	0	0	0	0	0
Mining		0	6	13	9	5	2	0	0
Livestock		0	2	2	2	2	2	2	2
Total Guadalupe Basin Demand		236	103	443	513	563	616	675	741
Colorado-Lavaca									
Municipal		217	257	417	419	425	454	487	529
Industrial		6,343	19,824	16,538	20,391	22,590	25,036	27,669	30,494
Steam-Electric		62	29	100	100	100	100	100	100
Irrigation		0	0	0	0	0	0	0	0
Mining		0	1	1	1	1	0	0	0
Livestock		13	16	15	15	15	15	15	15
Total Colorado-Lavaca Basin Demand		6,635	20,127	17,071	20,926	23,131	25,605	28,271	31,138

Table 4-4
Projected Water Demands, Supplies, and Needs
Calhoun County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Lavaca-Guadalupe									
Municipal		3,692	2,402	3,969	4,011	4,102	4,413	4,755	5,183
Industrial		17,963	20,109	46,069	56,704	62,813	69,603	76,905	84,738
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		35,421	48,082	26,822	22,747	19,950	17,673	16,132	15,028
Mining		1	4	6	5	4	3	2	2
Livestock		278	300	287	287	287	287	287	287
Total Lavaca-Guadalupe Basin Demand		57,355	70,897	77,153	83,754	87,156	91,979	98,081	105,238
San Antonio-Nueces									
Municipal		4	4	16	16	17	18	20	22
Industrial		0	0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		0	0	0	0	0	0	0	0
Mining		4	4	8	6	3	1	1	1
Livestock		0	0	0	0	0	0	0	0
Total San Antonio-Nueces Basin Demand		8	8	24	22	20	19	21	23
Total Basin Supply									
Guadalupe									
Municipal				560	560	560	560	560	560
Industrial				19,228	19,228	19,228	19,228	19,228	19,228
Steam-Electric				0	0	0	0	0	0
Irrigation				0	0	0	0	0	0
Mining				13	9	5	2	0	0
Livestock				2	2	2	2	2	2
Unallocated Groundwater Supply				29	33	37	40	42	42
Total Guadalupe Basin Supply				19,832	19,832	19,832	19,832	19,832	19,832
Colorado-Lavaca									
Municipal				531	531	531	531	531	531
Industrial				32,426	32,426	32,426	32,426	32,426	32,426
Steam-Electric				100	100	100	100	100	100
Irrigation				0	0	0	0	0	0
Mining				1	1	1	0	0	0
Livestock				15	15	15	15	15	15
Unallocated Groundwater Supply				1,013	1,013	1,013	1,014	1,014	1,014
Total Colorado-Lavaca Basin Supply				34,086	34,086	34,086	34,086	34,086	34,086
Lavaca-Guadalupe									
Municipal				6,412	4,912	4,912	4,912	4,912	4,912
Industrial				87,983	87,983	87,983	87,983	87,983	87,983
Steam-Electric				0	0	0	0	0	0
Irrigation				28,631	28,631	28,631	28,631	28,631	28,631
Mining				6	5	4	3	2	2
Livestock				287	287	287	287	287	287
Unallocated Groundwater Supply				921	922	923	924	925	925
Total Lavaca-Guadalupe Basin Supply				124,240	122,740	122,740	122,740	122,740	122,740
San Antonio-Nueces									
Municipal				22	22	22	22	22	22
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				0	0	0	0	0	0
Mining				8	6	3	1	1	1
Livestock				0	0	0	0	0	0
Unallocated Groundwater Supply				67	69	72	74	74	74
Total San Antonio-Nueces Basin Supply				97	97	97	97	97	97

Table 4-4
Projected Water Demands, Supplies, and Needs
Calhoun County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Total Basin Surplus/Shortage										
Guadalupe										
Municipal					551	551	550	549	549	547
Industrial					18,809	18,735	18,682	18,627	18,566	18,502
Steam-Electric					0	0	0	0	0	0
Irrigation					0	0	0	0	0	0
Mining					0	0	0	0	0	0
Livestock					0	0	0	0	0	0
Unallocated Groundwater Supply					29	33	37	40	42	42
Total Guadalupe Basin Surplus/Shortage					19,389	19,319	19,269	19,216	19,157	19,091
Colorado-Lavaca										
Municipal					114	112	106	77	44	2
Industrial					15,888	12,035	9,836	7,390	4,757	1,932
Steam-Electric					0	0	0	0	0	0
Irrigation					0	0	0	0	0	0
Mining					0	0	0	0	0	0
Livestock					0	0	0	0	0	0
Unallocated Groundwater Supply					1,013	1,013	1,013	1,014	1,014	1,014
Total Colorado-Lavaca Basin Surplus/Shortage					17,015	13,160	10,955	8,481	5,815	2,948
Lavaca-Guadalupe										
Municipal					2,443	901	810	499	157	-271
Industrial					41,914	31,279	25,170	18,380	11,078	3,245
Steam-Electric					0	0	0	0	0	0
Irrigation					1,809	5,884	8,681	10,958	12,499	13,603
Mining					0	0	0	0	0	0
Livestock					0	0	0	0	0	0
Unallocated Groundwater Supply					921	922	923	924	925	925
Total Lavaca-Guadalupe Basin Surplus/Shortage					47,087	38,986	35,584	30,761	24,659	17,502
San Antonio-Nueces										
Municipal					6	6	5	4	2	0
Industrial					0	0	0	0	0	0
Steam-Electric					0	0	0	0	0	0
Irrigation					0	0	0	0	0	0
Mining					0	0	0	0	0	0
Livestock					0	0	0	0	0	0
Unallocated Groundwater Supply					67	69	72	74	74	74
Total San Antonio-Nueces Basin Surplus/Shortage					73	75	77	78	76	74
Groundwater Supplies										
	Available									
	Guadalupe	Gulf Coast			42	42	42	42	42	42
	Lavaca-Guadalupe	Gulf Coast			1,334	1,334	1,334	1,334	1,334	1,334
	Colorado-Lavaca	Gulf Coast			1,467	1,467	1,467	1,467	1,467	1,467
	San Antonio-Nueces	Gulf Coast			97	97	97	97	97	97
	Total Available				2,940	2,940	2,940	2,940	2,940	2,940
	Allocated									
	Guadalupe	Gulf Coast			13	9	5	2	0	0
	Lavaca-Guadalupe	Gulf Coast			413	412	411	410	409	409
	Colorado-Lavaca	Gulf Coast			454	454	454	453	453	453
	San Antonio-Nueces	Gulf Coast			30	28	25	23	23	23
	Total Allocated				910	903	895	888	885	885
	Total Unallocated				2,030	2,037	2,045	2,052	2,055	2,055

Notes:
[1] Contract with GBRA expires in 2008. Contract renewal is a water management strategy.

Table 4-5
Projected Water Demands, Supplies, and Needs
Comal County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Municipal Demand									
San Antonio Basin									
Fair Oaks Ranch		19	27	58	58	54	57	60	64
Schertz (part)		19	65	150	440	913	997	1,092	1,192
Rural		1,718	1,619	1,897	2,115	2,442	3,333	4,298	5,330
Subtotal		1,756	1,711	2,105	2,613	3,409	4,387	5,450	6,586
Guadalupe Basin									
Garden Ridge		361	401	616	689	728	856	917	911
New Braunfels		6,199	7,284	10,335	12,570	15,436	19,499	22,447	25,717
Rural		2,099	4,482	5,531	6,908	9,114	11,827	14,776	18,013
Subtotal		8,659	12,167	16,482	20,167	25,278	32,182	38,140	44,641
Total Municipal Demand		10,415	13,878	18,587	22,780	28,687	36,569	43,590	51,227
Municipal Existing Supply									
San Antonio Basin									
Fair Oaks Ranch	Trinity			15	15	15	15	15	15
Schertz (part)	Edwards			27	27	27	27	27	27
Rural	Trinity			238	238	238	238	238	182
Subtotal				280	280	280	280	280	224
Guadalupe Basin									
Garden Ridge	Edwards			294	294	294	294	294	294
New Braunfels	Edwards			4,802	4,802	4,802	4,802	4,802	4,802
	Run-of-River			2,092	2,092	2,092	2,092	2,092	2,092
	Canyon (GBRA)[1]			6,676	0	0	0	0	0
New Braunfels Subtotal				13,570	6,894	6,894	6,894	6,894	6,894
Rural	Edwards			207	207	207	207	207	207
	Trinity			1,491	1,491	1,491	1,491	1,491	1,223
	Run-of-River			5	5	5	5	5	5
	Canyon (GBRA)			110	110	110	110	110	110
Rural Subtotal				1,813	1,813	1,813	1,813	1,813	1,545
Subtotal				15,677	9,001	9,001	9,001	9,001	8,733
Total Municipal Existing Supply				15,957	9,281	9,281	9,281	9,281	8,957
Municipal Surplus/Shortage									
San Antonio Basin									
Fair Oaks Ranch				-43	-43	-39	-42	-45	-49
Schertz (part)				-123	-413	-886	-970	-1,065	-1,165
Rural				-1,659	-1,877	-2,204	-3,095	-4,060	-5,148
Subtotal				-1,825	-2,333	-3,129	-4,107	-5,170	-6,362
Guadalupe Basin									
Garden Ridge				-322	-395	-434	-562	-623	-617
New Braunfels				3,235	-5,676	-8,542	-12,605	-15,553	-18,823
Rural				-3,718	-5,095	-7,301	-10,014	-12,963	-16,468
Subtotal				-805	-11,166	-16,277	-23,181	-29,139	-35,908
Total Municipal Surplus/Shortage				-2,630	-13,499	-19,406	-27,288	-34,309	-42,270

Table 4-5
Projected Water Demands, Supplies, and Needs
Comal County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Municipal New Supply Need										
San Antonio Basin										
Fair Oaks Ranch					43	43	39	42	45	49
Schertz (part)					123	413	886	970	1,065	1,165
Rural					1,659	1,877	2,204	3,095	4,060	5,148
	Subtotal				1,825	2,333	3,129	4,107	5,170	6,362
Guadalupe Basin										
Garden Ridge					322	395	434	562	623	617
New Braunfels					0	5,676	8,542	12,605	15,553	18,823
Rural					3,718	5,095	7,301	10,014	12,963	16,468
	Subtotal				4,040	11,166	16,277	23,181	29,139	35,908
Total Municipal New Supply Need					5,865	13,499	19,406	27,288	34,309	42,270
Industrial Demand										
San Antonio Basin			0	264	0	0	0	0	0	0
Guadalupe Basin			3,248	11,700	3,450	3,487	3,548	3,799	4,071	4,351
Total Industrial Demand			3,248	11,964	3,450	3,487	3,548	3,799	4,071	4,351
Industrial Existing Supply										
San Antonio Basin					0	0	0	0	0	0
Guadalupe Basin		Edwards			793	793	793	793	793	793
		Run-of-River			6,773	6,773	6,773	6,773	6,773	6,773
		Canyon (GBRA)			1	1	1	1	1	1
Guadalupe Basin Subtotal					7,567	7,567	7,567	7,567	7,567	7,567
Total Industrial Existing Supply					7,567	7,567	7,567	7,567	7,567	7,567
Industrial Surplus/Shortage										
San Antonio Basin					0	0	0	0	0	0
Guadalupe Basin					4,117	4,080	4,019	3,768	3,496	3,216
Total Industrial Surplus/Shortage					4,117	4,080	4,019	3,768	3,496	3,216
Industrial New Supply Need										
San Antonio Basin					0	0	0	0	0	0
Guadalupe Basin					0	0	0	0	0	0
Total Industrial New Supply Need					0	0	0	0	0	0
Steam-Electric Demand										
San Antonio Basin			0	0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0	0
Total Steam-Electric Demand			0	0	0	0	0	0	0	0
Steam-Electric Existing Supply										
San Antonio Basin					0	0	0	0	0	0
Guadalupe Basin					0	0	0	0	0	0
Total Steam-Electric Existing Supply					0	0	0	0	0	0
Steam-Electric Surplus/Shortage										
San Antonio Basin					0	0	0	0	0	0
Guadalupe Basin					0	0	0	0	0	0
Total Steam-Electric Surplus/Shortage					0	0	0	0	0	0
Steam-Electric New Supply Need										
San Antonio Basin					0	0	0	0	0	0
Guadalupe Basin					0	0	0	0	0	0
Total Steam-Electric New Supply Need					0	0	0	0	0	0

Table 4-5
Projected Water Demands, Supplies, and Needs
Comal County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Irrigation Demand									
San Antonio Basin		409	18	66	63	61	58	56	53
Guadalupe Basin		70	17	393	377	361	347	332	318
Total Irrigation Demand		479	35	459	440	422	405	388	371
Irrigation Supply									
San Antonio Basin	Edwards			549	549	549	549	549	549
San Antonio Basin Subtotal				549	549	549	549	549	549
Guadalupe Basin	Edwards			344	344	344	344	344	344
	Canyon (GBRA)			16	16	16	16	16	16
	Run-of-River			127	127	127	127	127	127
Guadalupe Basin Subtotal				487	487	487	487	487	487
Total Irrigation Supply				1,036	1,036	1,036	1,036	1,036	1,036
Irrigation Surplus/Shortage									
San Antonio Basin				483	486	488	491	493	496
Guadalupe Basin				94	110	126	140	155	169
Total Irrigation Surplus/Shortage				577	596	614	631	648	665
Mining Demand									
San Antonio Basin		0	0	0	0	0	0	0	0
Guadalupe Basin		946	8,909	5,570	5,464	5,628	5,796	3,590	2,224
Total Mining Demand		946	8,909	5,570	5,464	5,628	5,796	3,590	2,224
Mining Supply									
San Antonio Basin				0	0	0	0	0	0
Guadalupe Basin	Trinity			0	0	0	0	0	0
Total Mining Supply				0	0	0	0	0	0
Mining Surplus/Shortage									
San Antonio Basin				0	0	0	0	0	0
Guadalupe Basin				-5,570	-5,464	-5,628	-5,796	-3,590	-2,224
Total Mining Surplus/Shortage				-5,570	-5,464	-5,628	-5,796	-3,590	-2,224
Livestock Demand									
San Antonio Basin		45	44	50	50	50	50	50	50
Guadalupe Basin		271	261	306	306	306	306	306	306
Total Livestock Demand		316	305	356	356	356	356	356	356
Livestock Supply									
San Antonio Basin	Local	45	44	50	50	50	50	50	50
Guadalupe Basin	Local	271	261	306	306	306	306	306	306
Total Livestock Supply		316	305	356	356	356	356	356	356
Livestock Surplus/Shortage									
San Antonio Basin		0	0	0	0	0	0	0	0
Guadalupe Basin		0	0	0	0	0	0	0	0
Total Livestock Surplus/Shortage		0	0	0	0	0	0	0	0
Total Comal County Demand									
Municipal		10,415	13,878	18,587	22,780	28,687	36,569	43,590	51,227
Industrial		3,248	11,964	3,450	3,487	3,548	3,799	4,071	4,351
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		479	35	459	440	422	405	388	371
Mining		946	8,909	5,570	5,464	5,628	5,796	3,590	2,224
Livestock		316	305	356	356	356	356	356	356
Total County Demand		15,404	35,091	28,422	32,527	38,641	46,925	51,995	58,529

Table 4-5
Projected Water Demands, Supplies, and Needs
Comal County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Total Comal County Supply									
Municipal				15,957	9,281	9,281	9,281	9,281	8,957
Industrial				7,567	7,567	7,567	7,567	7,567	7,567
Steam-Electric				0	0	0	0	0	0
Irrigation				1,036	1,036	1,036	1,036	1,036	1,036
Mining				0	0	0	0	0	0
Livestock				356	356	356	356	356	356
Total County Supply				24,916	18,240	18,240	18,240	18,240	17,916
Total Comal County Surplus/Shortage									
Municipal				-2,630	-13,499	-19,406	-27,288	-34,309	-42,270
Industrial				4,117	4,080	4,019	3,768	3,496	3,216
Steam-Electric				0	0	0	0	0	0
Irrigation				577	596	614	631	648	665
Mining				-5,570	-5,464	-5,628	-5,796	-3,590	-2,224
Livestock				0	0	0	0	0	0
Total County Surplus/Shortage				-3,506	-14,287	-20,401	-28,685	-33,755	-40,613
Total Basin Demand									
San Antonio									
Municipal		1,756	1,711	2,105	2,613	3,409	4,387	5,450	6,586
Industrial		0	264	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		409	18	66	63	61	58	56	53
Mining		0	0	0	0	0	0	0	0
Livestock		45	44	50	50	50	50	50	50
Total San Antonio Basin Demand		2,210	2,037	2,221	2,726	3,520	4,495	5,556	6,689
Guadalupe									
Municipal		8,659	12,167	16,482	20,167	25,278	32,182	38,140	44,641
Industrial		3,248	11,700	3,450	3,487	3,548	3,799	4,071	4,351
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		70	17	393	377	361	347	332	318
Mining		946	8,909	5,570	5,464	5,628	5,796	3,590	2,224
Livestock		271	261	306	306	306	306	306	306
Total Guadalupe Basin Demand		13,194	33,054	26,201	29,801	35,121	42,430	46,439	51,840
Total Basin Supply									
San Antonio									
Municipal				280	280	280	280	280	224
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				549	549	549	549	549	549
Mining				0	0	0	0	0	0
Livestock				50	50	50	50	50	50
Total San Antonio Basin Supply				879	879	879	879	879	823
Guadalupe									
Municipal				15,677	9,001	9,001	9,001	9,001	8,733
Industrial				7,567	7,567	7,567	7,567	7,567	7,567
Steam-Electric				0	0	0	0	0	0
Irrigation				487	487	487	487	487	487
Mining				0	0	0	0	0	0
Livestock				306	306	306	306	306	306
Total Guadalupe Basin Supply				24,037	17,361	17,361	17,361	17,361	17,093

Table 4-5
Projected Water Demands, Supplies, and Needs
Comal County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Total Basin Surplus/Shortage										
San Antonio										
Municipal					-1,825	-2,333	-3,129	-4,107	-5,170	-6,362
Industrial					0	0	0	0	0	0
Steam-Electric					0	0	0	0	0	0
Irrigation					483	486	488	491	493	496
Mining					0	0	0	0	0	0
Livestock					0	0	0	0	0	0
Total San Antonio Basin Surplus/Shortage					-1,342	-1,847	-2,641	-3,616	-4,677	-5,866
Guadalupe										
Municipal					-805	-11,166	-16,277	-23,181	-29,139	-35,908
Industrial					4,117	4,080	4,019	3,768	3,496	3,216
Steam-Electric					0	0	0	0	0	0
Irrigation					94	110	126	140	155	169
Mining					-5,570	-5,464	-5,628	-5,796	-3,590	-2,224
Livestock					0	0	0	0	0	0
Total Guadalupe Basin Surplus/Shortage					-2,164	-12,440	-17,760	-25,069	-29,078	-34,747
Groundwater Supplies										
	Available									
	San Antonio	Edwards			576	576	576	576	576	576
	Guadalupe	Edwards			6,440	6,440	6,440	6,440	6,440	6,440
	San Antonio	Trinity			309	309	309	309	309	253
	Guadalupe	Trinity			1,491	1,491	1,491	1,491	1,491	1,223
	Total Available				8,816	8,816	8,816	8,816	8,816	8,492
	Allocated									
	San Antonio	Edwards			576	576	576	576	576	576
	Guadalupe	Edwards			6,440	6,440	6,440	6,440	6,440	6,440
	San Antonio	Trinity			309	309	309	309	309	253
	Guadalupe	Trinity			1,491	1,491	1,491	1,491	1,491	1,223
	Total Allocated				8,816	8,816	8,816	8,816	8,816	8,492
	Total Unallocated				0	0	0	0	0	0
Notes:										
[1] Contract with GBRA expires in 2001. Contract renewal is a water management strategy.										

Table 4-6
Projected Water Demands, Supplies, and Needs
DeWitt County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Municipal Demand										
San Antonio Basin										
Rural			109	148	109	102	98	100	103	106
	Subtotal		109	148	109	102	98	100	103	106
Guadalupe Basin										
Cuero			1,716	1,462	1,767	1,710	1,684	1,749	1,823	1,891
Yorktown			405	407	438	427	424	451	479	510
Rural			762	955	683	609	553	532	512	482
	Subtotal		2,883	2,824	2,888	2,746	2,661	2,732	2,814	2,883
Lavaca Basin										
Yoakum			425	382	478	493	517	576	640	718
Rural			136	183	136	126	121	124	128	131
	Subtotal		561	565	614	619	638	700	768	849
Lavaca-Guadalupe Coastal Basin										
Rural			3	4	3	3	3	3	3	3
	Subtotal		3	4	3	3	3	3	3	3
Total Municipal Demand			3,556	3,541	3,614	3,470	3,400	3,535	3,688	3,841
Municipal Existing Supply										
San Antonio Basin										
Rural		Gulf Coast			109	109	109	109	109	109
	Subtotal				109	109	109	109	109	109
Guadalupe Basin										
Cuero		Gulf Coast			2,762	2,762	2,762	2,762	2,762	2,762
Yorktown		Gulf Coast			1,210	1,210	1,210	1,210	1,210	1,210
Rural		Gulf Coast			683	683	683	683	683	683
	Subtotal				4,655	4,655	4,655	4,655	4,655	4,655
Lavaca Basin										
Yoakum	Estimate	Gulf Coast			790	790	790	790	790	790
Rural		Gulf Coast			136	136	136	136	136	136
	Subtotal				926	926	926	926	926	926
Lavaca-Guadalupe Coastal Basin										
Rural		Gulf Coast			3	3	3	3	3	3
	Subtotal				3	3	3	3	3	3
Total Municipal Existing Supply					5,693	5,693	5,693	5,693	5,693	5,693
Municipal Surplus/Shortage										
San Antonio Basin										
Rural					0	7	11	9	6	3
	Subtotal				0	7	11	9	6	3
Guadalupe Basin										
Cuero					995	1,052	1,078	1,013	939	871
Yorktown					772	783	786	759	731	700
Rural					0	74	130	151	171	201
	Subtotal				1,767	1,909	1,994	1,923	1,841	1,772
Lavaca Basin										
Yoakum					312	297	273	214	150	72
Rural					0	10	15	12	8	5
	Subtotal				312	307	288	226	158	77
Lavaca-Guadalupe Coastal Basin										
Rural					0	0	0	0	0	0
	Subtotal				0	0	0	0	0	0
Total Municipal Surplus/Shortage					2,079	2,223	2,293	2,158	2,005	1,852

Table 4-6
Projected Water Demands, Supplies, and Needs
DeWitt County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Municipal New Supply Need										
San Antonio Basin										
Rural					0	0	0	0	0	0
	Subtotal				0	0	0	0	0	0
Guadalupe Basin										
Cuero					0	0	0	0	0	0
Yorktown					0	0	0	0	0	0
Rural					0	0	0	0	0	0
	Subtotal				0	0	0	0	0	0
Lavaca Basin										
Yoakum					0	0	0	0	0	0
Rural					0	0	0	0	0	0
	Subtotal				0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin										
Rural					0	0	0	0	0	0
	Subtotal				0	0	0	0	0	0
Total Municipal New Supply Need					0	0	0	0	0	0
Industrial Demand										
San Antonio Basin			0	0	0	0	0	0	0	0
Guadalupe Basin			91	42	108	126	146	170	195	223
Lavaca Basin			0	5	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin			0	0	0	0	0	0	0	0
Total Industrial Demand			91	47	108	126	146	170	195	223
Industrial Existing Supply										
San Antonio Basin					0	0	0	0	0	0
Guadalupe Basin		Canyon (GBRA)			5	5	5	5	5	5
		Gulf Coast			108	126	146	170	195	223
Guadalupe Basin Subtotal					113	131	151	175	200	228
Lavaca Basin					0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin					0	0	0	0	0	0
Total Industrial Existing Supply					113	131	151	175	200	228
Industrial Surplus/Shortage										
San Antonio Basin					0	0	0	0	0	0
Guadalupe Basin					5	5	5	5	5	5
Lavaca Basin					0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin					0	0	0	0	0	0
Total Industrial Surplus/Shortage					5	5	5	5	5	5
Industrial New Supply Need										
San Antonio Basin					0	0	0	0	0	0
Guadalupe Basin					0	0	0	0	0	0
Lavaca Basin					0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin					0	0	0	0	0	0
Total Industrial New Supply Need					0	0	0	0	0	0

Table 4-6
Projected Water Demands, Supplies, and Needs
DeWitt County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Steam-Electric Demand										
San Antonio Basin			0	0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0	0
Lavaca Basin			0	0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin			0	0	0	0	0	0	0	0
Total Steam-Electric Demand			0	0	0	0	0	0	0	0
Steam-Electric Existing Supply										
San Antonio Basin					0	0	0	0	0	0
Guadalupe Basin					0	0	0	0	0	0
Lavaca Basin					0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin					0	0	0	0	0	0
Total Steam-Electric Existing Supply					0	0	0	0	0	0
Steam-Electric Surplus/Shortage										
San Antonio Basin					0	0	0	0	0	0
Guadalupe Basin					0	0	0	0	0	0
Lavaca Basin					0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin					0	0	0	0	0	0
Total Steam-Electric Surplus/Shortage					0	0	0	0	0	0
Steam-Electric New Supply Need										
San Antonio Basin					0	0	0	0	0	0
Guadalupe Basin					0	0	0	0	0	0
Lavaca Basin					0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin					0	0	0	0	0	0
Total Steam-Electric New Supply Need					0	0	0	0	0	0
Irrigation Demand										
San Antonio Basin			22	0	19	17	15	13	11	10
Guadalupe Basin			263	31	231	203	178	156	137	120
Lavaca Basin			0	57	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin			0	0	0	0	0	0	0	0
Total Irrigation Demand			285	88	250	220	193	169	148	130
Irrigation Supply										
San Antonio Basin		Gulf Coast			19	17	15	13	11	10
Guadalupe Basin		Run-of-River			156	156	156	156	156	156
		Gulf Coast			75	47	22	0	0	0
	Subtotal				231	203	178	156	156	156
Lavaca Basin					0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin					0	0	0	0	0	0
Total Irrigation Supply					250	220	193	169	167	166
Irrigation Surplus/Shortage										
San Antonio Basin					0	0	0	0	0	0
Guadalupe Basin					0	0	0	0	19	36
Lavaca Basin					0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin					0	0	0	0	0	0
Total Irrigation Surplus/Shortage					0	0	0	0	19	36
Mining Demand										
San Antonio Basin			0	0	0	0	0	0	0	0
Guadalupe Basin			21	22	24	24	25	26	27	28
Lavaca Basin			108	78	94	52	26	18	16	16
Lavaca-Guadalupe Coastal Basin			0	21	43	30	19	6	1	0
Total Mining Demand			129	121	161	106	70	50	44	44
Mining Supply										
San Antonio Basin					0	0	0	0	0	0
Guadalupe Basin		Gulf Coast			24	24	25	26	27	28
Lavaca Basin		Gulf Coast			94	52	26	18	16	16
Lavaca-Guadalupe Coastal Basin		Gulf Coast			43	30	19	6	1	0
Total Mining Supply					161	106	70	50	44	44

Table 4-6
Projected Water Demands, Supplies, and Needs
DeWitt County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Mining Surplus/Shortage									
San Antonio Basin				0	0	0	0	0	0
Guadalupe Basin				0	0	0	0	0	0
Lavaca Basin				0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin				0	0	0	0	0	0
Total Mining Surplus/Shortage				0	0	0	0	0	0
Livestock Demand									
San Antonio Basin		148	146	153	153	153	153	153	153
Guadalupe Basin		1,378	1,339	1,419	1,419	1,419	1,419	1,419	1,419
Lavaca Basin		263	256	271	271	271	271	271	271
Lavaca-Guadalupe Coastal Basin		51	50	53	53	53	53	53	53
Total Livestock Demand		1,840	1,791	1,896	1,896	1,896	1,896	1,896	1,896
Livestock Supply									
San Antonio Basin	Local	148	146	153	153	153	153	153	153
Guadalupe Basin	Local	1,378	1,339	1,419	1,419	1,419	1,419	1,419	1,419
Lavaca Basin	Local	263	256	271	271	271	271	271	271
Lavaca-Guadalupe Coastal Basin	Local	51	50	53	53	53	53	53	53
Total Livestock Supply		1,840	1,791	1,896	1,896	1,896	1,896	1,896	1,896
Livestock Surplus/Shortage									
San Antonio Basin		0	0	0	0	0	0	0	0
Guadalupe Basin		0	0	0	0	0	0	0	0
Lavaca Basin		0	0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin		0	0	0	0	0	0	0	0
Total Livestock Surplus/Shortage		0	0	0	0	0	0	0	0
Total DeWitt County Demand									
Municipal		3,556	3,541	3,614	3,470	3,400	3,535	3,688	3,841
Industrial		91	47	108	126	146	170	195	223
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		285	88	250	220	193	169	148	130
Mining		129	121	161	106	70	50	44	44
Livestock		1,840	1,791	1,896	1,896	1,896	1,896	1,896	1,896
Total County Demand		5,901	5,588	6,029	5,818	5,705	5,820	5,971	6,134
Total DeWitt County Supply									
Municipal				5,693	5,693	5,693	5,693	5,693	5,693
Industrial				113	131	151	175	200	228
Steam-Electric				0	0	0	0	0	0
Irrigation				250	220	193	169	167	166
Mining				161	106	70	50	44	44
Livestock				1,896	1,896	1,896	1,896	1,896	1,896
Total County Supply				8,113	8,046	8,003	7,983	8,000	8,027
Total DeWitt County Surplus/Shortage									
Municipal				2,079	2,223	2,293	2,158	2,005	1,852
Industrial				5	5	5	5	5	5
Steam-Electric				0	0	0	0	0	0
Irrigation				0	0	0	0	19	36
Mining				0	0	0	0	0	0
Livestock				0	0	0	0	0	0
Total County Surplus/Shortage				2,084	2,228	2,298	2,163	2,029	1,893

Table 4-6
Projected Water Demands, Supplies, and Needs
DeWitt County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Total Basin Demand									
San Antonio									
Municipal		109	148	109	102	98	100	103	106
Industrial		0	0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		22	0	19	17	15	13	11	10
Mining		0	0	0	0	0	0	0	0
Livestock		148	146	153	153	153	153	153	153
Total San Antonio Basin Demand		279	294	281	272	266	266	267	269
Guadalupe									
Municipal		2,883	2,824	2,888	2,746	2,661	2,732	2,814	2,883
Industrial		91	42	108	126	146	170	195	223
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		263	31	231	203	178	156	137	120
Mining		21	22	24	24	25	26	27	28
Livestock		1,378	1,339	1,419	1,419	1,419	1,419	1,419	1,419
Total Guadalupe Basin Demand		4,636	4,258	4,670	4,518	4,429	4,503	4,592	4,673
Lavaca									
Municipal		561	565	614	619	638	700	768	849
Industrial		0	5	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		0	57	0	0	0	0	0	0
Mining		108	78	94	52	26	18	16	16
Livestock		263	256	271	271	271	271	271	271
Total Lavaca Basin Demand		932	961	979	942	935	989	1,055	1,136
Lavaca-Guadalupe									
Municipal		3	4	3	3	3	3	3	3
Industrial		0	0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		0	0	0	0	0	0	0	0
Mining		0	21	43	30	19	6	1	0
Livestock		51	50	53	53	53	53	53	53
Total Lavaca-Guadalupe Basin Demand		54	75	99	86	75	62	57	56
Total Basin Supply									
San Antonio									
Municipal				109	109	109	109	109	109
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				19	17	15	13	11	10
Mining				0	0	0	0	0	0
Livestock				153	153	153	153	153	153
Unallocated Groundwater Supply				1,072	1,074	1,076	1,078	1,080	1,081
Total San Antonio Basin Supply				1,353	1,353	1,353	1,353	1,353	1,353
Guadalupe									
Municipal				4,655	4,655	4,655	4,655	4,655	4,655
Industrial				113	131	151	175	200	228
Steam-Electric				0	0	0	0	0	0
Irrigation				231	203	178	156	156	156
Mining				24	24	25	26	27	28
Livestock				1,419	1,419	1,419	1,419	1,419	1,419
Unallocated Groundwater Supply				7,235	7,245	7,249	7,246	7,220	7,191
Total Guadalupe Basin Supply				13,677	13,677	13,677	13,677	13,677	13,677
Lavaca									
Municipal				926	926	926	926	926	926
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				0	0	0	0	0	0
Mining				94	52	26	18	16	16
Livestock				271	271	271	271	271	271
Unallocated Groundwater Supply				1,448	1,490	1,516	1,524	1,526	1,526
Total Lavaca Basin Supply				2,739	2,739	2,739	2,739	2,739	2,739

Table 4-6
Projected Water Demands, Supplies, and Needs
DeWitt County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Lavaca-Guadalupe									
Municipal				3	3	3	3	3	3
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				0	0	0	0	0	0
Mining				43	30	19	6	1	0
Livestock				53	53	53	53	53	53
Unallocated Groundwater Supply				55	68	79	92	97	98
Total Lavaca-Guadalupe Basin Supply				154	154	154	154	154	154
Total Basin Surplus/Shortage									
San Antonio									
Municipal				0	7	11	9	6	3
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				0	0	0	0	0	0
Mining				0	0	0	0	0	0
Livestock				0	0	0	0	0	0
Unallocated Groundwater Supply				1,072	1,074	1,076	1,078	1,080	1,081
Total San Antonio Basin Surplus/Shortage				1,072	1,081	1,087	1,087	1,086	1,084
Guadalupe									
Municipal				1,767	1,909	1,994	1,923	1,841	1,772
Industrial				5	5	5	5	5	5
Steam-Electric				0	0	0	0	0	0
Irrigation				0	0	0	0	19	36
Mining				0	0	0	0	0	0
Livestock				0	0	0	0	0	0
Unallocated Groundwater Supply				7,235	7,245	7,249	7,246	7,220	7,191
Total Guadalupe Basin Surplus/Shortage				9,007	9,159	9,248	9,174	9,085	9,004
Lavaca									
Municipal				312	307	288	226	158	77
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				0	0	0	0	0	0
Mining				0	0	0	0	0	0
Livestock				0	0	0	0	0	0
Unallocated Groundwater Supply				1,448	1,490	1,516	1,524	1,526	1,526
Total Lavaca Basin Surplus/Shortage				1,760	1,797	1,804	1,750	1,684	1,603
Lavaca-Guadalupe									
Municipal				0	0	0	0	0	0
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				0	0	0	0	0	0
Mining				0	0	0	0	0	0
Livestock				0	0	0	0	0	0
Unallocated Groundwater Supply				55	68	79	92	97	98
Total Lavaca-Guadalupe Basin Surplus/Shortage				55	68	79	92	97	98

Table 4-6
Projected Water Demands, Supplies, and Needs
DeWitt County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Groundwater Supplies										
	Available									
	San Antonio	Gulf Coast			1,200	1,200	1,200	1,200	1,200	1,200
	Guadalupe	Gulf Coast			12,097	12,097	12,097	12,097	12,097	12,097
	Lavaca	Gulf Coast			2,468	2,468	2,468	2,468	2,468	2,468
	Lavaca-Guadalupe	Gulf Coast			101	101	101	101	101	101
	Total Available				15,866	15,866	15,866	15,866	15,866	15,866
	Allocated									
	San Antonio	Gulf Coast			128	126	124	122	120	119
	Guadalupe	Gulf Coast			4,862	4,852	4,848	4,851	4,877	4,906
	Lavaca	Gulf Coast			1,020	978	952	944	942	942
	Lavaca-Guadalupe	Gulf Coast			46	33	22	9	4	3
	Total Allocated				6,056	5,989	5,946	5,926	5,943	5,970
	Total Unallocated				9,810	9,877	9,920	9,940	9,923	9,896

Table 4-7
Projected Water Demands, Supplies, and Needs
Dimmit County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Municipal Demand										
Rio Grande Basin										
Rural			6	8	6	6	6	6	6	7
	Subtotal		6	8	6	6	6	6	6	7
Nueces Basin										
Asherton			215	302	211	205	206	224	243	267
Big Wells			178	186	165	153	143	146	147	149
Carrizo Springs			1,592	1,946	2,316	2,583	2,827	3,232	3,657	4,137
Rural			217	373	238	221	194	214	245	265
	Subtotal		2,202	2,807	2,930	3,162	3,370	3,816	4,292	4,818
Total Municipal Demand			2,208	2,815	2,936	3,168	3,376	3,822	4,298	4,825
Municipal Existing Supply										
Rio Grande Basin										
Rural		Carrizo			7	7	7	7	7	7
	Subtotal				7	7	7	7	7	7
Nueces Basin										
Asherton	Estimate	Carrizo			294	294	294	294	294	294
Big Wells	Estimate	Carrizo			189	189	189	189	189	189
Carrizo Springs		Carrizo			2,178	2,178	2,178	2,178	2,178	2,178
Rural		Carrizo			265	265	265	265	265	265
	Subtotal				2,926	2,926	2,926	2,926	2,926	2,926
Total Municipal Existing Supply					2,933	2,933	2,933	2,933	2,933	2,933
Municipal Surplus/Shortage										
Rio Grande Basin										
Rural					1	1	1	1	1	0
	Subtotal				1	1	1	1	1	0
Nueces Basin										
Asherton					83	89	88	70	51	27
Big Wells					24	36	46	43	42	40
Carrizo Springs					-138	-405	-649	-1,054	-1,479	-1,959
Rural					27	44	71	51	20	0
	Subtotal				-4	-236	-444	-890	-1,366	-1,892
Total Municipal Surplus/Shortage					-3	-235	-443	-889	-1,365	-1,892
Municipal New Supply Need										
Rio Grande Basin										
Rural					0	0	0	0	0	0
	Subtotal				0	0	0	0	0	0
Nueces Basin										
Asherton					0	0	0	0	0	0
Big Wells					0	0	0	0	0	0
Carrizo Springs					138	405	649	1,054	1,479	1,959
Rural					0	0	0	0	0	0
	Subtotal				138	405	649	1,054	1,479	1,959
Total Municipal New Supply Need					138	405	649	1,054	1,479	1,959

Table 4-7
Projected Water Demands, Supplies, and Needs
Dimmit County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Industrial Demand									
Rio Grande		0	0	0	0	0	0	0	0
Nueces Basin		3	4	11	11	12	13	14	15
Total Industrial Demand		3	4	11	11	12	13	14	15
Industrial Existing Supply									
Rio Grande				0	0	0	0	0	0
Nueces Basin	Carrizo			15	15	15	15	15	15
Total Industrial Existing Supply				15	15	15	15	15	15
Industrial Surplus/Shortage									
Rio Grande				0	0	0	0	0	0
Nueces Basin				4	4	3	2	1	0
Total Industrial Surplus/Shortage				4	4	3	2	1	0
Industrial New Supply Need									
Rio Grande				0	0	0	0	0	0
Nueces Basin				0	0	0	0	0	0
Total Industrial New Supply Need				0	0	0	0	0	0
Steam-Electric Demand									
Rio Grande		0	0	0	0	0	0	0	0
Nueces Basin		0	0	0	0	0	0	0	0
Total Steam-Electric Demand		0	0	0	0	0	0	0	0
Steam-Electric Existing Supply									
Rio Grande				0	0	0	0	0	0
Nueces Basin				0	0	0	0	0	0
Total Steam-Electric Existing Supply				0	0	0	0	0	0
Steam-Electric Surplus/Shortage									
Rio Grande				0	0	0	0	0	0
Nueces Basin				0	0	0	0	0	0
Total Steam-Electric Surplus/Shortage				0	0	0	0	0	0
Steam-Electric New Supply Need									
Rio Grande				0	0	0	0	0	0
Nueces Basin				0	0	0	0	0	0
Total Steam-Electric New Supply Need				0	0	0	0	0	0
Irrigation Demand									
Rio Grande		0	0	0	0	0	0	0	0
Nueces Basin		11,185	10,946	10,551	10,199	9,932	9,828	9,432	9,026
Total Irrigation Demand		11,185	10,946	10,551	10,199	9,932	9,828	9,432	9,026
Irrigation Supply									
Rio Grande				0	0	0	0	0	0
Nueces Basin	Run-of-River			4,101	4,101	4,101	4,101	4,101	4,101
	Carrizo			10,551	10,199	9,932	3,594	3,594	3,594
Nueces Basin Subtotal				14,652	14,300	14,033	7,695	7,695	7,695
Total Irrigation Supply				14,652	14,300	14,033	7,695	7,695	7,695
Irrigation Surplus/Shortage									
Rio Grande				0	0	0	0	0	0
Nueces Basin				4,101	4,101	4,101	-2,133	-1,737	-1,331
Total Irrigation Surplus/Shortage				4,101	4,101	4,101	-2,133	-1,737	-1,331

Table 4-7
Projected Water Demands, Supplies, and Needs
Dimmit County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Mining Demand									
Rio Grande		0	0	0	0	0	0	0	0
Nueces Basin		506	919	1,003	817	906	916	926	950
Total Mining Demand		506	919	1,003	817	906	916	926	950
Mining Supply									
Rio Grande				0	0	0	0	0	0
Nueces Basin	Run-of-River			1	1	1	1	1	1
	Carrizo			1,003	817	906	0	0	0
Nueces Basin Subtotal				1,004	818	907	1	1	1
Total Mining Supply				1,004	818	907	1	1	1
Mining Surplus/Shortage									
Rio Grande				0	0	0	0	0	0
Nueces Basin				1	1	1	-915	-925	-949
Total Mining Surplus/Shortage				1	1	1	-915	-925	-949
Livestock Demand									
Rio Grande		192	166	150	150	150	150	150	150
Nueces Basin		795	686	621	621	621	621	621	621
Total Livestock Demand		987	852	771	771	771	771	771	771
Livestock Supply									
Rio Grande	Local	192	166	150	150	150	150	150	150
Nueces Basin	Local	795	686	621	621	621	621	621	621
Total Livestock Supply		987	852	771	771	771	771	771	771
Livestock Surplus/Shortage									
Rio Grande		0	0	0	0	0	0	0	0
Nueces Basin		0	0	0	0	0	0	0	0
Total Livestock Surplus/Shortage		0	0	0	0	0	0	0	0
Total Dimmit County Demand									
Municipal		2,208	2,815	2,936	3,168	3,376	3,822	4,298	4,825
Industrial		3	4	11	11	12	13	14	15
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		11,185	10,946	10,551	10,199	9,932	9,828	9,432	9,026
Mining		506	919	1,003	817	906	916	926	950
Livestock		987	852	771	771	771	771	771	771
Total County Demand		14,889	15,536	15,272	14,966	14,997	15,350	15,441	15,587
Total Dimmit County Supply									
Municipal				2,933	2,933	2,933	2,933	2,933	2,933
Industrial				15	15	15	15	15	15
Steam-Electric				0	0	0	0	0	0
Irrigation				14,652	14,300	14,033	7,695	7,695	7,695
Mining				1,004	818	907	1	1	1
Livestock				771	771	771	771	771	771
Total County Supply				19,375	18,837	18,659	11,415	11,415	11,415
Total Dimmit County Surplus/Shortage									
Municipal				-3	-235	-443	-889	-1,365	-1,892
Industrial				4	4	3	2	1	0
Steam-Electric				0	0	0	0	0	0
Irrigation				4,101	4,101	4,101	-2,133	-1,737	-1,331
Mining				1	1	1	-915	-925	-949
Livestock				0	0	0	0	0	0
Total County Surplus/Shortage				4,103	3,871	3,662	-3,935	-4,026	-4,172

Table 4-7
Projected Water Demands, Supplies, and Needs
Dimmit County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Total Basin Demand									
Rio Grande									
Municipal		6	8	6	6	6	6	6	7
Industrial		0	0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		0	0	0	0	0	0	0	0
Mining		0	0	0	0	0	0	0	0
Livestock		192	166	150	150	150	150	150	150
Total Rio Grande Basin Demand		198	174	156	156	156	156	156	157
Nueces									
Municipal		2,202	2,807	2,930	3,162	3,370	3,816	4,292	4,818
Industrial		3	4	11	11	12	13	14	15
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		11,185	10,946	10,551	10,199	9,932	9,828	9,432	9,026
Mining		506	919	1,003	817	906	916	926	950
Livestock		795	686	621	621	621	621	621	621
Total Nueces Basin Demand		14,691	15,362	15,116	14,810	14,841	15,194	15,285	15,430
Total Basin Supply									
Rio Grande									
Municipal				7	7	7	7	7	7
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				0	0	0	0	0	0
Mining				0	0	0	0	0	0
Livestock				150	150	150	150	150	150
Unallocated Groundwater Supply				3,848	3,848	3,848	1,545	1,545	1,545
Total Rio Grande Basin Supply				4,005	4,005	4,005	1,702	1,702	1,702
Nueces									
Municipal				2,926	2,926	2,926	2,926	2,926	2,926
Industrial				15	15	15	15	15	15
Steam-Electric				0	0	0	0	0	0
Irrigation				14,652	14,300	14,033	7,695	7,695	7,695
Mining				1,004	818	907	1	1	1
Livestock				621	621	621	621	621	621
Unallocated Groundwater Supply				11,926	12,464	12,642	4,101	4,101	4,101
Total Nueces Basin Supply				31,144	31,144	31,144	15,359	15,359	15,359
Total Basin Surplus/Shortage									
Rio Grande									
Municipal				1	1	1	1	1	0
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				0	0	0	0	0	0
Mining				0	0	0	0	0	0
Livestock				0	0	0	0	0	0
Unallocated Groundwater Supply				3,848	3,848	3,848	1,545	1,545	1,545
Total Rio Grande Basin Surplus/Shortage				3,849	3,849	3,849	1,546	1,546	1,545
Nueces									
Municipal				-4	-236	-444	-890	-1,366	-1,892
Industrial				4	4	3	2	1	0
Steam-Electric				0	0	0	0	0	0
Irrigation				4,101	4,101	4,101	-2,133	-1,737	-1,331
Mining				1	1	1	-915	-925	-949
Livestock				0	0	0	0	0	0
Unallocated Groundwater Supply				11,926	12,464	12,642	4,101	4,101	4,101
Total Nueces Basin Surplus/Shortage				4,102	3,870	3,661	-3,936	-4,027	-4,172

Table 4-7
Projected Water Demands, Supplies, and Needs
Dimmit County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Groundwater Supplies										
	Available									
	Rio Grande	Carrizo			3,855	3,855	3,855	1,552	1,552	1,552
	Nueces	Carrizo			26,422	26,422	26,422	10,637	10,637	10,637
	Total Available				30,277	30,277	30,277	12,189	12,189	12,189
	Allocated									
	Rio Grande	Carrizo			7	7	7	7	7	7
	Nueces	Carrizo			14,496	13,958	13,780	6,536	6,536	6,536
	Total Allocated				14,503	13,965	13,787	6,543	6,543	6,543
	Total Unallocated				15,774	16,312	16,490	5,646	5,646	5,646

Table 4-8
Projected Water Demands, Supplies, and Needs
Frio County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Municipal Demand										
Nueces Basin										
Dilley			771	720	824	855	873	906	939	962
Pearsall			1,602	1,446	1,955	2,020	2,057	2,146	2,210	2,263
Rural			672	897	731	740	740	761	784	799
	Subtotal		3,045	3,063	3,510	3,615	3,670	3,813	3,933	4,024
Total Municipal Demand			3,045	3,063	3,510	3,615	3,670	3,813	3,933	4,024
Municipal Existing Supply										
Nueces Basin										
Dilley		Carrizo			2,742	2,742	2,742	2,742	2,742	2,742
Pearsall		Carrizo			3,371	3,371	3,371	3,371	3,371	3,371
Rural		Carrizo			619	619	619	444	444	444
		Sparta			114	114	114	225	225	225
		Queen City			66	66	66	130	130	130
Rural Subtotal					799	799	799	799	799	799
Total Municipal Existing Supply					6,912	6,912	6,912	6,912	6,912	6,912
Municipal Surplus/Shortage										
Nueces Basin										
Dilley					1,918	1,887	1,869	1,836	1,803	1,780
Pearsall					1,416	1,351	1,314	1,225	1,161	1,108
Rural					68	59	59	38	15	0
	Subtotal				3,402	3,297	3,242	3,099	2,979	2,888
Total Municipal Surplus/Shortage					3,402	3,297	3,242	3,099	2,979	2,888
Municipal New Supply Need										
Nueces Basin										
Dilley					0	0	0	0	0	0
Pearsall					0	0	0	0	0	0
Rural					0	0	0	0	0	0
	Subtotal				0	0	0	0	0	0
Total Municipal New Supply Need					0	0	0	0	0	0
Industrial Demand										
Nueces Basin			0	0	0	0	0	0	0	0
Total Industrial Demand			0	0	0	0	0	0	0	0
Industrial Existing Supply										
Nueces Basin					0	0	0	0	0	0
Total Industrial Existing Supply					0	0	0	0	0	0
Industrial Surplus/Shortage										
Nueces Basin					0	0	0	0	0	0
Total Industrial Surplus/Shortage					0	0	0	0	0	0
Industrial New Supply Need										
Nueces Basin					0	0	0	0	0	0
Total Industrial New Supply Need					0	0	0	0	0	0

Table 4-8
Projected Water Demands, Supplies, and Needs
Frio County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Steam-Electric Demand										
Nueces Basin			38	227	400	400	400	400	400	400
Total Steam-Electric Demand			38	227	400	400	400	400	400	400
Steam-Electric Existing Supply										
Nueces Basin										
		Carrizo			310	310	310	222	222	222
		Sparta			57	57	57	112	112	112
		Queen City			33	33	33	65	65	65
Total Steam-Electric Existing Supply					400	400	400	400	400	400
Steam-Electric Surplus/Shortage										
Nueces Basin					0	0	0	0	0	0
Total Steam-Electric Surplus/Shortage					0	0	0	0	0	0
Steam-Electric New Supply Need										
Nueces Basin					0	0	0	0	0	0
Total Steam-Electric New Supply Need					0	0	0	0	0	0
Irrigation Demand										
Nueces Basin			83,233	93,421	94,688	91,294	88,045	84,933	81,955	79,103
Total Irrigation Demand			83,233	93,421	94,688	91,294	88,045	84,933	81,955	79,103
Irrigation Supply										
Nueces Basin		Run-of-River			110	110	110	110	110	110
		Carrizo			16,806	16,873	16,897	1,908	1,912	1,915
		Sparta			4,208	4,220	4,224	4,058	4,061	4,062
		Queen City			2,439	2,446	2,449	2,352	2,353	2,354
Total Irrigation Supply					23,562	23,648	23,680	8,428	8,436	8,441
Irrigation Surplus/Shortage										
Nueces Basin					-71,126	-67,646	-64,365	-76,505	-73,519	-70,662
Total Irrigation Surplus/Shortage					-71,126	-67,646	-64,365	-76,505	-73,519	-70,662
Mining Demand										
Nueces Basin			313	139	150	63	32	16	7	3
Total Mining Demand			313	139	150	63	32	16	7	3
Mining Supply										
Nueces Basin										
		Carrizo			116	49	25	9	4	2
		Sparta			21	9	5	4	2	1
		Queen City			12	5	3	3	1	0
Total Mining Supply					150	63	32	16	7	3
Mining Surplus/Shortage										
Nueces Basin					0	0	0	0	0	0
Total Mining Surplus/Shortage					0	0	0	0	0	0
Livestock Demand										
Nueces Basin			1,097	906	1,192	1,192	1,192	1,192	1,192	1,192
Total Livestock Demand			1,097	906	1,192	1,192	1,192	1,192	1,192	1,192
Livestock Supply										
Nueces Basin		Local	1,097	906	1,192	1,192	1,192	1,192	1,192	1,192
Total Livestock Supply			1,097	906	1,192	1,192	1,192	1,192	1,192	1,192
Livestock Surplus/Shortage										
Nueces Basin			0	0	0	0	0	0	0	0
Total Livestock Surplus/Shortage			0	0	0	0	0	0	0	0

Table 4-8
Projected Water Demands, Supplies, and Needs
Frio County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Total Frio County Demand									
Municipal		3,045	3,063	3,510	3,615	3,670	3,813	3,933	4,024
Industrial		0	0	0	0	0	0	0	0
Steam-Electric		38	227	400	400	400	400	400	400
Irrigation		83,233	93,421	94,688	91,294	88,045	84,933	81,955	79,103
Mining		313	139	150	63	32	16	7	3
Livestock		1,097	906	1,192	1,192	1,192	1,192	1,192	1,192
Total County Demand		87,726	97,756	99,940	96,564	93,339	90,354	87,487	84,722
Total Frio County Supply									
Municipal				6,912	6,912	6,912	6,912	6,912	6,912
Industrial				0	0	0	0	0	0
Steam-Electric				400	400	400	400	400	400
Irrigation				23,562	23,648	23,680	8,428	8,436	8,441
Mining				150	63	32	16	7	3
Livestock				1,192	1,192	1,192	1,192	1,192	1,192
Total County Supply				32,216	32,215	32,216	16,948	16,947	16,948
Total Frio County Surplus/Shortage									
Municipal				3,402	3,297	3,242	3,099	2,979	2,888
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				-71,126	-67,646	-64,365	-76,505	-73,519	-70,662
Mining				0	0	0	0	0	0
Livestock				0	0	0	0	0	0
Total County Surplus/Shortage				-67,724	-64,349	-61,123	-73,406	-70,540	-67,774
Total Basin Demand									
Nueces									
Municipal		3,045	3,063	3,510	3,615	3,670	3,813	3,933	4,024
Industrial		0	0	0	0	0	0	0	0
Steam-Electric		38	227	400	400	400	400	400	400
Irrigation		83,233	93,421	94,688	91,294	88,045	84,933	81,955	79,103
Mining		313	139	150	63	32	16	7	3
Livestock		1,097	906	1,192	1,192	1,192	1,192	1,192	1,192
Total Nueces Basin Demand		87,726	97,756	99,940	96,564	93,339	90,354	87,487	84,722
Total Basin Supply									
Nueces									
Municipal				6,912	6,912	6,912	6,912	6,912	6,912
Industrial				0	0	0	0	0	0
Steam-Electric				400	400	400	400	400	400
Irrigation				23,562	23,648	23,680	8,428	8,436	8,441
Mining				150	63	32	16	7	3
Livestock				1,192	1,192	1,192	1,192	1,192	1,192
Total Nueces Basin Supply				32,216	32,215	32,216	16,948	16,947	16,948
Total Basin Surplus/Shortage									
Nueces									
Municipal				3,402	3,297	3,242	3,099	2,979	2,888
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				-71,126	-67,646	-64,365	-76,505	-73,519	-70,662
Mining				0	0	0	0	0	0
Livestock				0	0	0	0	0	0
Total Nueces Basin Surplus/Shortage				-67,724	-64,349	-61,123	-73,406	-70,540	-67,774

Table 4-8
Projected Water Demands, Supplies, and Needs
Frio County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Groundwater Supplies										
	Available									
	Nueces	Carrizo			23,964	23,964	23,964	8,696	8,696	8,696
	Nueces	Sparta			4,400	4,400	4,400	4,400	4,400	4,400
	Nueces	Queen City			2,550	2,550	2,550	2,550	2,550	2,550
	Total Available				30,914	30,914	30,914	15,646	15,646	15,646
	Allocated									
	Nueces	Carrizo			23,964	23,964	23,964	8,696	8,696	8,696
	Nueces	Sparta			4,400	4,400	4,400	4,400	4,400	4,400
	Nueces	Queen City			2,550	2,550	2,550	2,550	2,550	2,550
	Total Allocated				30,914	30,914	30,914	15,646	15,646	15,646
	Total Unallocated				0	0	0	0	0	0

Table 4-9
Projected Water Demands, Supplies, and Needs
Goliad County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Municipal Demand										
San Antonio Basin										
Goliad			412	414	429	419	408	407	416	440
Rural			261	285	259	245	233	233	234	247
	Subtotal		673	699	688	664	641	640	650	687
Guadalupe Basin										
Rural			184	197	182	172	164	164	165	174
	Subtotal		184	197	182	172	164	164	165	174
San Antonio-Nueces Coastal Basin										
Rural			59	61	58	55	53	52	53	56
	Subtotal		59	61	58	55	53	52	53	56
Total Municipal Demand			916	957	928	891	858	856	868	917
Municipal Existing Supply										
San Antonio Basin										
Goliad		Gulf Coast			1,355	1,355	1,355	1,355	1,355	1,355
Rural		Gulf Coast			259	259	259	259	259	259
	Subtotal				1,614	1,614	1,614	1,614	1,614	1,614
Guadalupe Basin										
Rural		Gulf Coast			182	182	182	182	182	182
	Subtotal				182	182	182	182	182	182
San Antonio-Nueces Coastal Basin										
Rural		Gulf Coast			58	58	58	58	58	58
	Subtotal				58	58	58	58	58	58
Total Municipal Existing Supply					1,854	1,854	1,854	1,854	1,854	1,854
Municipal Surplus/Shortage										
San Antonio Basin										
Goliad					926	936	947	948	939	915
Rural					0	14	26	26	25	12
	Subtotal				926	950	973	974	964	927
Guadalupe Basin										
Rural					0	10	18	18	17	8
	Subtotal				0	10	18	18	17	8
San Antonio-Nueces Coastal Basin										
Rural					0	3	5	6	5	2
	Subtotal				0	3	5	6	5	2
Total Municipal Surplus/Shortage					926	963	996	998	986	937
Municipal New Supply Need										
San Antonio Basin										
Goliad					0	0	0	0	0	0
Rural					0	0	0	0	0	0
	Subtotal				0	0	0	0	0	0
Guadalupe Basin										
Rural					0	0	0	0	0	0
	Subtotal				0	0	0	0	0	0
San Antonio-Nueces Coastal Basin										
Rural					0	0	0	0	0	0
	Subtotal				0	0	0	0	0	0
Total Municipal New Supply Need					0	0	0	0	0	0

Table 4-9
Projected Water Demands, Supplies, and Needs
Goliad County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Industrial Demand									
San Antonio Basin		0	0	0	0	0	0	0	0
Guadalupe Basin		0	0	0	0	0	0	0	0
San Antonio-Nueces Basin		0	0	0	0	0	0	0	0
Total Industrial Demand		0	0	0	0	0	0	0	0
Industrial Existing Supply									
San Antonio Basin				0	0	0	0	0	0
Guadalupe Basin				0	0	0	0	0	0
San Antonio-Nueces Basin				0	0	0	0	0	0
Total Industrial Existing Supply				0	0	0	0	0	0
Industrial Surplus/Shortage									
San Antonio Basin				0	0	0	0	0	0
Guadalupe Basin				0	0	0	0	0	0
San Antonio-Nueces Basin				0	0	0	0	0	0
Total Industrial Surplus/Shortage				0	0	0	0	0	0
Industrial New Supply Need									
San Antonio Basin				0	0	0	0	0	0
Guadalupe Basin				0	0	0	0	0	0
San Antonio-Nueces Basin				0	0	0	0	0	0
Total Industrial New Supply Need				0	0	0	0	0	0
Steam-Electric Demand									
San Antonio Basin		0	0	0	0	0	0	0	0
Guadalupe Basin		12,165	11,037	15,000	15,000	20,000	20,000	20,000	20,000
San Antonio-Nueces Basin		0	0	0	0	0	0	0	0
Total Steam-Electric Demand		12,165	11,037	15,000	15,000	20,000	20,000	20,000	20,000
Steam-Electric Existing Supply									
San Antonio Basin				0	0	0	0	0	0
Guadalupe Basin	Gulf Coast			2,719	2,722	2,726	2,729	2,731	2,731
	Canyon (GBRA)			6,000	6,000	6,000	6,000	6,000	6,000
	Coleto Creek Reservoir[1]			14,848	14,848	14,848	14,848	14,848	14,848
Guadalupe Basin Subtotal				23,567	23,570	23,574	23,577	23,579	23,579
San Antonio-Nueces Basin				0	0	0	0	0	0
Total Steam-Electric Existing Supply				23,567	23,570	23,574	23,577	23,579	23,579
Steam-Electric Surplus/Shortage									
San Antonio Basin				0	0	0	0	0	0
Guadalupe Basin				8,567	8,570	3,574	3,577	3,579	3,579
San Antonio-Nueces Basin				0	0	0	0	0	0
Total Steam-Electric Surplus/Shortage				8,567	8,570	3,574	3,577	3,579	3,579
Steam-Electric New Supply Need									
San Antonio Basin				0	0	0	0	0	0
Guadalupe Basin				0	0	0	0	0	0
San Antonio-Nueces Basin				0	0	0	0	0	0
Total Steam-Electric New Supply Need				0	0	0	0	0	0
Irrigation Demand									
San Antonio Basin		685	157	592	511	442	382	330	285
Guadalupe Basin		0	26	0	0	0	0	0	0
San Antonio-Nueces Basin		0	6	0	0	0	0	0	0
Total Irrigation Demand		685	189	592	511	442	382	330	285
Irrigation Supply									
San Antonio Basin	Run-of-River			2,556	2,556	2,556	2,556	2,556	2,556
Subtotal				2,556	2,556	2,556	2,556	2,556	2,556
Guadalupe Basin				0	0	0	0	0	0
San Antonio-Nueces Basin				0	0	0	0	0	0
Total Irrigation Supply				2,556	2,556	2,556	2,556	2,556	2,556

Table 4-9
Projected Water Demands, Supplies, and Needs
Goliad County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Irrigation Surplus/Shortage									
San Antonio Basin				1,964	2,045	2,114	2,174	2,226	2,271
Guadalupe Basin				0	0	0	0	0	0
San Antonio-Nueces Basin				0	0	0	0	0	0
Total Irrigation Surplus/Shortage				1,964	2,045	2,114	2,174	2,226	2,271
Mining Demand									
San Antonio Basin		0	0	0	0	0	0	0	0
Guadalupe Basin		0	6	12	9	5	2	0	0
San Antonio-Nueces Basin		0	7	5	3	1	1	0	0
Total Mining Demand		0	13	17	12	6	3	0	0
Mining Supply									
San Antonio Basin				0	0	0	0	0	0
Guadalupe Basin	Gulf Coast			12	9	5	2	0	0
San Antonio-Nueces Basin	Gulf Coast			5	3	1	1	0	0
Total Mining Supply				17	12	6	3	0	0
Mining Surplus/Shortage									
San Antonio Basin				0	0	0	0	0	0
Guadalupe Basin				0	0	0	0	0	0
San Antonio-Nueces Basin				0	0	0	0	0	0
Total Mining Surplus/Shortage				0	0	0	0	0	0
Livestock Demand									
San Antonio Basin		345	337	471	471	471	471	471	471
Guadalupe Basin		195	190	267	267	267	267	267	267
San Antonio-Nueces Basin		344	336	470	470	470	470	470	470
Total Livestock Demand		884	863	1,208	1,208	1,208	1,208	1,208	1,208
Livestock Supply									
San Antonio Basin	Local	345	337	471	471	471	471	471	471
Guadalupe Basin	Local	195	190	267	267	267	267	267	267
San Antonio-Nueces Basin	Local	344	336	470	470	470	470	470	470
Total Livestock Supply		884	863	1,208	1,208	1,208	1,208	1,208	1,208
Livestock Surplus/Shortage									
San Antonio Basin		0	0	0	0	0	0	0	0
Guadalupe Basin		0	0	0	0	0	0	0	0
San Antonio-Nueces Basin		0	0	0	0	0	0	0	0
Total Livestock Surplus/Shortage		0	0	0	0	0	0	0	0
Total Goliad County Demand									
Municipal		916	957	928	891	858	856	868	917
Industrial		0	0	0	0	0	0	0	0
Steam-Electric		12,165	11,037	15,000	15,000	20,000	20,000	20,000	20,000
Irrigation		685	189	592	511	442	382	330	285
Mining		0	13	17	12	6	3	0	0
Livestock		884	863	1,208	1,208	1,208	1,208	1,208	1,208
Total County Demand		14,650	13,059	17,745	17,622	22,514	22,449	22,406	22,410
Total Goliad County Supply									
Municipal				1,854	1,854	1,854	1,854	1,854	1,854
Industrial				0	0	0	0	0	0
Steam-Electric				23,567	23,570	23,574	23,577	23,579	23,579
Irrigation				2,556	2,556	2,556	2,556	2,556	2,556
Mining				17	12	6	3	0	0
Livestock				1,208	1,208	1,208	1,208	1,208	1,208
Total County Supply				29,202	29,200	29,198	29,198	29,197	29,197

Table 4-9
Projected Water Demands, Supplies, and Needs
Goliad County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Total Goliad County Surplus/Shortage									
Municipal				926	963	996	998	986	937
Industrial				0	0	0	0	0	0
Steam-Electric				8,567	8,570	3,574	3,577	3,579	3,579
Irrigation				1,964	2,045	2,114	2,174	2,226	2,271
Mining				0	0	0	0	0	0
Livestock				0	0	0	0	0	0
Total County Surplus/Shortage				11,457	11,578	6,684	6,749	6,791	6,787
Total Basin Demand									
San Antonio									
Municipal		673	699	688	664	641	640	650	687
Industrial		0	0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		685	157	592	511	442	382	330	285
Mining		0	0	0	0	0	0	0	0
Livestock		345	337	471	471	471	471	471	471
Total San Antonio Basin Demand		1,703	1,193	1,751	1,646	1,554	1,493	1,451	1,443
Guadalupe									
Municipal		184	197	182	172	164	164	165	174
Industrial		0	0	0	0	0	0	0	0
Steam-Electric		12,165	11,037	15,000	15,000	20,000	20,000	20,000	20,000
Irrigation		0	26	0	0	0	0	0	0
Mining		0	6	12	9	5	2	0	0
Livestock		195	190	267	267	267	267	267	267
Total Guadalupe Basin Demand		12,544	11,456	15,461	15,448	20,436	20,433	20,432	20,441
San Antonio-Nueces									
Municipal		59	61	58	55	53	52	53	56
Industrial		0	0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		0	6	0	0	0	0	0	0
Mining		0	7	5	3	1	1	0	0
Livestock		344	336	470	470	470	470	470	470
Total San Antonio-Nueces Basin Demand		403	410	533	528	524	523	523	526
Total Basin Supply									
San Antonio									
Municipal				1,614	1,614	1,614	1,614	1,614	1,614
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				2,556	2,556	2,556	2,556	2,556	2,556
Mining				0	0	0	0	0	0
Livestock				471	471	471	471	471	471
Unallocated Groundwater Supply				3,460	3,460	3,460	3,460	3,460	3,460
Total San Antonio Basin Supply				8,101	8,101	8,101	8,101	8,101	8,101
Guadalupe									
Municipal				182	182	182	182	182	182
Industrial				0	0	0	0	0	0
Steam-Electric				23,567	23,570	23,574	23,577	23,579	23,579
Irrigation				0	0	0	0	0	0
Mining				12	9	5	2	0	0
Livestock				267	267	267	267	267	267
Total Guadalupe Basin Supply				24,028	24,028	24,028	24,028	24,028	24,028

Table 4-9
Projected Water Demands, Supplies, and Needs
Goliad County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
San Antonio-Nueces										
Municipal					58	58	58	58	58	58
Industrial					0	0	0	0	0	0
Steam-Electric					0	0	0	0	0	0
Irrigation					0	0	0	0	0	0
Mining					5	3	1	1	0	0
Livestock					470	470	470	470	470	470
Unallocated Groundwater Supply					4,760	4,762	4,764	4,764	4,765	4,765
Total San Antonio-Nueces Basin Supply					5,293	5,293	5,293	5,293	5,293	5,293
Total Basin Surplus/Shortage										
San Antonio										
Municipal					926	950	973	974	964	927
Industrial					0	0	0	0	0	0
Steam-Electric					0	0	0	0	0	0
Irrigation					1,964	2,045	2,114	2,174	2,226	2,271
Mining					0	0	0	0	0	0
Livestock					0	0	0	0	0	0
Unallocated Groundwater Supply					3,460	3,460	3,460	3,460	3,460	3,460
Total San Antonio Basin Surplus/Shortage					6,350	6,455	6,547	6,608	6,650	6,658
Guadalupe										
Municipal					0	10	18	18	17	8
Industrial					0	0	0	0	0	0
Steam-Electric					8,567	8,570	3,574	3,577	3,579	3,579
Irrigation					0	0	0	0	0	0
Mining					0	0	0	0	0	0
Livestock					0	0	0	0	0	0
Total Guadalupe Basin Surplus/Shortage					8,567	8,580	3,592	3,595	3,596	3,587
San Antonio-Nueces										
Municipal					0	3	5	6	5	2
Industrial					0	0	0	0	0	0
Steam-Electric					0	0	0	0	0	0
Irrigation					0	0	0	0	0	0
Mining					0	0	0	0	0	0
Livestock					0	0	0	0	0	0
Unallocated Groundwater Supply					4,760	4,762	4,764	4,764	4,765	4,765
Total San Antonio-Nueces Basin Surplus/Shortage					4,760	4,765	4,769	4,770	4,770	4,767
Groundwater Supplies										
	Available									
	San Antonio	Gulf Coast			5,074	5,074	5,074	5,074	5,074	5,074
	Guadalupe	Gulf Coast			2,913	2,913	2,913	2,913	2,913	2,913
	San Antonio-Nueces	Gulf Coast			4,823	4,823	4,823	4,823	4,823	4,823
	Total Available				12,810	12,810	12,810	12,810	12,810	12,810
	Allocated									
	San Antonio	Gulf Coast			1,614	1,614	1,614	1,614	1,614	1,614
	Guadalupe	Gulf Coast			2,913	2,913	2,913	2,913	2,913	2,913
	San Antonio-Nueces	Gulf Coast			63	61	59	59	58	58
	Total Allocated				4,590	4,588	4,586	4,586	4,585	4,585
	Total Unallocated				8,220	8,222	8,224	8,224	8,225	8,225

Note:
[1] Supply from Coleto Creek Reservoir of 20,848 acft/yr is dependent upon a contract with GBRA of 6,000 acft/yr to make up for evaporation losses.

Table 4-10
Projected Water Demands, Supplies, and Needs
Gonzales County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Municipal Demand										
Guadalupe Basin										
Gonzales			1,646	1,693	1,648	1,607	1,566	1,564	1,589	1,623
Nixon			373	406	384	368	353	351	358	363
Waelder			169	138	157	146	141	142	140	140
Rural			1,636	1,898	1,676	1,595	1,540	1,519	1,528	1,545
	Subtotal		3,824	4,135	3,865	3,716	3,600	3,576	3,615	3,671
Lavaca Basin										
Rural			8	16	14	13	13	13	13	13
	Subtotal		8	16	14	13	13	13	13	13
Total Municipal Demand			3,832	4,151	3,879	3,729	3,613	3,589	3,628	3,684
Municipal Existing Supply										
Guadalupe Basin										
Gonzales		Run-of-River			2,240	2,240	2,240	2,240	2,240	2,240
Nixon		Carrizo			1,508	1,508	1,508	1,508	1,508	1,508
Waelder		Carrizo			173	173	173	173	173	173
Rural		Canyon (GBRA)			700	700	700	700	700	700
		Carrizo			1,104	1,104	1,104	1,086	1,086	1,086
		Sparta			384	384	384	396	396	396
		Queen City			143	143	143	148	148	148
		Gulf Coast			45	45	45	46	46	46
Rural Subtotal					2,376	2,376	2,376	2,376	2,376	2,376
	Subtotal				6,297	6,297	6,297	6,297	6,297	6,297
Lavaca Basin										
Rural		Carrizo			4	4	4	4	4	4
		Gulf Coast			10	10	10	10	10	10
	Subtotal				14	14	14	14	14	14
Total Municipal Existing Supply					6,311	6,311	6,311	6,311	6,311	6,311
Municipal Surplus/Shortage										
Guadalupe Basin										
Gonzales					592	633	674	676	651	617
Nixon					1,124	1,140	1,155	1,157	1,150	1,145
Waelder					16	27	32	31	33	33
Rural					700	781	836	857	848	831
	Subtotal				2,432	2,581	2,697	2,721	2,682	2,626
Lavaca Basin										
Rural					0	1	1	1	1	1
	Subtotal				0	1	1	1	1	1
Total Municipal Surplus/Shortage					2,432	2,582	2,698	2,722	2,683	2,627
Municipal New Supply Need										
Guadalupe Basin										
Gonzales					0	0	0	0	0	0
Nixon					0	0	0	0	0	0
Waelder					0	0	0	0	0	0
Rural					0	0	0	0	0	0
	Subtotal				0	0	0	0	0	0
Lavaca Basin										
Rural					0	0	0	0	0	0
	Subtotal				0	0	0	0	0	0
Total Municipal New Supply Need					0	0	0	0	0	0

Table 4-10
Projected Water Demands, Supplies, and Needs
Gonzales County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Industrial Demand									
Guadalupe Basin		865	1,091	929	992	1,043	1,083	1,160	1,231
Lavaca Basin		0	0	0	0	0	0	0	0
Total Industrial Demand		865	1,091	929	992	1,043	1,083	1,160	1,231
Industrial Existing Supply									
Guadalupe Basin	Carrizo			811	811	811	797	797	797
	Sparta			282	282	282	291	291	291
	Queen City			105	105	105	109	109	109
	Gulf Coast			33	33	33	34	34	34
Guadalupe Basin Subtotal				1,231	1,231	1,231	1,231	1,231	1,231
Lavaca Basin				0	0	0	0	0	0
Total Industrial Existing Supply				1,231	1,231	1,231	1,231	1,231	1,231
Industrial Surplus/Shortage									
Guadalupe Basin				302	239	188	148	71	0
Lavaca Basin				0	0	0	0	0	0
Total Industrial Surplus/Shortage				302	239	188	148	71	0
Industrial New Supply Need									
Guadalupe Basin				0	0	0	0	0	0
Lavaca Basin				0	0	0	0	0	0
Total Industrial New Supply Need				0	0	0	0	0	0
Steam-Electric Demand									
Guadalupe Basin		0	0	0	0	0	0	0	0
Lavaca Basin		0	0	0	0	0	0	0	0
Total Steam-Electric Demand		0	0	0	0	0	0	0	0
Steam-Electric Existing Supply									
Guadalupe Basin				0	0	0	0	0	0
Lavaca Basin				0	0	0	0	0	0
Total Steam-Electric Existing Supply				0	0	0	0	0	0
Steam-Electric Surplus/Shortage									
Guadalupe Basin				0	0	0	0	0	0
Lavaca Basin				0	0	0	0	0	0
Total Steam-Electric Surplus/Shortage				0	0	0	0	0	0
Steam-Electric New Supply Need									
Guadalupe Basin				0	0	0	0	0	0
Lavaca Basin				0	0	0	0	0	0
Total Steam-Electric New Supply Need				0	0	0	0	0	0
Irrigation Demand									
Guadalupe Basin		3,540	1,379	3,052	2,632	2,269	1,957	1,687	1,455
Lavaca Basin		0	0	0	0	0	0	0	0
Total Irrigation Demand		3,540	1,379	3,052	2,632	2,269	1,957	1,687	1,455
Irrigation Supply									
Guadalupe Basin	Run-of-River			1,485	1,485	1,485	1,485	1,485	1,485
	Carrizo			2,010	2,010	2,010	1,977	1,977	1,977
	Sparta			699	699	699	722	722	722
	Queen City			261	261	261	270	270	270
	Gulf Coast			81	81	81	84	84	84
Guadalupe Basin Subtotal				4,537	4,537	4,537	4,537	4,537	4,537
Lavaca Basin				0	0	0	0	0	0
Total Irrigation Supply				4,537	4,537	4,537	4,537	4,537	4,537
Irrigation Surplus/Shortage									
Guadalupe Basin				1,485	1,905	2,268	2,580	2,850	3,082
Lavaca Basin				0	0	0	0	0	0
Total Irrigation Surplus/Shortage				1,485	1,905	2,268	2,580	2,850	3,082

Table 4-10
Projected Water Demands, Supplies, and Needs
Gonzales County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Mining Demand									
Guadalupe Basin		21	31	37	34	32	29	29	30
Lavaca Basin		0	2	4	3	1	0	0	0
Total Mining Demand		21	33	41	37	33	29	29	30
Mining Supply									
Guadalupe Basin	Carrizo			24	22	21	19	19	20
	Sparta			8	8	7	7	7	7
	Queen City			3	3	3	2	2	2
	Gulf Coast			1	1	1	1	1	1
Guadalupe Basin Subtotal				37	34	32	29	29	30
Lavaca Basin	Carrizo			1	1	0	0	0	0
	Gulf Coast			3	2	1	0	0	0
Lavaca Basin Subtotal				4	3	1	0	0	0
Total Mining Supply				41	37	33	29	29	30
Mining Surplus/Shortage									
Guadalupe Basin				0	0	0	0	0	0
Lavaca Basin				0	0	0	0	0	0
Total Mining Surplus/Shortage				0	0	0	0	0	0
Livestock Demand									
Guadalupe Basin		4,072	3,389	4,071	5,945	6,277	6,277	6,277	6,277
Lavaca Basin		36	31	37	54	57	57	57	57
Total Livestock Demand		4,108	3,420	4,108	5,999	6,334	6,334	6,334	6,334
Livestock Supply									
Guadalupe Basin	Local	4,072	3,389	4,071	5,945	6,277	6,277	6,277	6,277
Lavaca Basin	Local	36	31	37	54	57	57	57	57
Total Livestock Supply		4,108	3,420	4,108	5,999	6,334	6,334	6,334	6,334
Livestock Surplus/Shortage									
Guadalupe Basin		0	0	0	0	0	0	0	0
Lavaca Basin		0	0	0	0	0	0	0	0
Total Livestock Surplus/Shortage		0	0	0	0	0	0	0	0
Total Gonzales County Demand									
Municipal		3,832	4,151	3,879	3,729	3,613	3,589	3,628	3,684
Industrial		865	1,091	929	992	1,043	1,083	1,160	1,231
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		3,540	1,379	3,052	2,632	2,269	1,957	1,687	1,455
Mining		21	33	41	37	33	29	29	30
Livestock		4,108	3,420	4,108	5,999	6,334	6,334	6,334	6,334
Total County Demand		12,366	10,074	12,009	13,389	13,292	12,992	12,838	12,734
Total Gonzales County Supply									
Municipal				6,311	6,311	6,311	6,311	6,311	6,311
Industrial				1,231	1,231	1,231	1,231	1,231	1,231
Steam-Electric				0	0	0	0	0	0
Irrigation				4,537	4,537	4,537	4,537	4,537	4,537
Mining				41	37	33	29	29	30
Livestock				4,108	5,999	6,334	6,334	6,334	6,334
Total County Supply				16,228	18,115	18,446	18,442	18,442	18,443
Total Gonzales County Surplus/Shortage									
Municipal				2,432	2,582	2,698	2,722	2,683	2,627
Industrial				302	239	188	148	71	0
Steam-Electric				0	0	0	0	0	0
Irrigation				1,485	1,905	2,268	2,580	2,850	3,082
Mining				0	0	0	0	0	0
Livestock				0	0	0	0	0	0
Total County Surplus/Shortage				4,219	4,726	5,154	5,450	5,604	5,709

Table 4-10
Projected Water Demands, Supplies, and Needs
Gonzales County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Total Basin Demand									
Guadalupe									
Municipal		3,824	4,135	3,865	3,716	3,600	3,576	3,615	3,671
Industrial		865	1,091	929	992	1,043	1,083	1,160	1,231
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		3,540	1,379	3,052	2,632	2,269	1,957	1,687	1,455
Mining		21	31	37	34	32	29	29	30
Livestock		4,072	3,389	4,071	5,945	6,277	6,277	6,277	6,277
Total Guadalupe Basin Demand		12,322	10,025	11,954	13,319	13,221	12,922	12,768	12,664
Lavaca									
Municipal		8	16	14	13	13	13	13	13
Industrial		0	0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		0	0	0	0	0	0	0	0
Mining		0	2	4	3	1	0	0	0
Livestock		36	31	37	54	57	57	57	57
Total Lavaca Basin Demand		44	49	55	70	71	70	70	70
Total Basin Supply									
Guadalupe									
Municipal				6,297	6,297	6,297	6,297	6,297	6,297
Industrial				1,231	1,231	1,231	1,231	1,231	1,231
Steam-Electric				0	0	0	0	0	0
Irrigation				4,537	4,537	4,537	4,537	4,537	4,537
Mining				37	34	32	29	29	30
Livestock				4,071	5,945	6,277	6,277	6,277	6,277
Unallocated Groundwater Supply				63,632	63,635	63,637	61,450	61,450	61,449
Total Guadalupe Basin Supply				79,805	81,679	82,011	79,821	79,821	79,821
Lavaca									
Municipal				14	14	14	14	14	14
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				0	0	0	0	0	0
Mining				4	3	1	0	0	0
Livestock				37	54	57	57	57	57
Unallocated Groundwater Supply				233	234	236	234	234	234
Total Lavaca Basin Supply				288	305	308	305	305	305
Total Basin Surplus/Shortage									
Guadalupe									
Municipal				2,432	2,581	2,697	2,721	2,682	2,626
Industrial				302	239	188	148	71	0
Steam-Electric				0	0	0	0	0	0
Irrigation				1,485	1,905	2,268	2,580	2,850	3,082
Mining				0	0	0	0	0	0
Livestock				0	0	0	0	0	0
Unallocated Groundwater Supply				63,632	63,635	63,637	61,450	61,450	61,449
Total Guadalupe Basin Surplus/Shortage				67,851	68,360	68,790	66,899	67,053	67,157
Lavaca									
Municipal				0	1	1	1	1	1
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				0	0	0	0	0	0
Mining				0	0	0	0	0	0
Livestock				0	0	0	0	0	0
Unallocated Groundwater Supply				233	234	236	234	234	234
Total Lavaca Basin Surplus/Shortage				233	235	237	235	235	235

Table 4-10
Projected Water Demands, Supplies, and Needs
Gonzales County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Groundwater Supplies										
	Available									
	Guadalupe	Carrizo			46,964	46,964	46,964	44,774	44,774	44,774
	Guadalupe	Sparta			16,340	16,340	16,340	16,340	16,340	16,340
	Guadalupe	Queen City			6,104	6,104	6,104	6,104	6,104	6,104
	Guadalupe	Gulf Coast			1,901	1,901	1,901	1,901	1,901	1,901
	Lavaca	Carrizo			69	69	69	66	66	66
	Lavaca	Gulf Coast			182	182	182	182	182	182
	Total Available				71,560	71,560	71,560	69,367	69,367	69,367
	Allocated									
	Guadalupe	Carrizo			5,630	5,628	5,627	5,560	5,560	5,561
	Guadalupe	Sparta			1,374	1,373	1,373	1,415	1,415	1,416
	Guadalupe	Queen City			513	513	513	529	529	528
	Guadalupe	Gulf Coast			160	160	160	165	165	165
	Lavaca	Carrizo			5	5	4	4	4	4
	Lavaca	Gulf Coast			13	12	11	10	10	10
	Total Allocated				7,695	7,691	7,687	7,683	7,683	7,684
	Total Unallocated				63,865	63,869	63,873	61,684	61,684	61,683

Table 4-11
Projected Water Demands, Supplies, and Needs
Guadalupe County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Municipal Demand										
San Antonio Basin										
Cibolo			178	316	441	437	464	519	593	632
Marion			111	157	131	120	113	113	113	114
Schertz (part)			1,454	1,811	4,612	4,508	4,261	4,654	5,094	5,563
Rural			1,666	978	1,125	1,565	2,104	2,857	3,254	3,835
	Subtotal		3,409	3,262	6,309	6,630	6,942	8,143	9,054	10,144
Guadalupe Basin										
McQueeney			250	318	251	242	232	254	272	277
New Braunfels			55	81	75	84	98	139	155	171
Seguin			3,604	4,530	4,566	5,093	5,711	6,800	8,073	9,538
Rural			2,309	3,825	4,279	5,883	7,864	10,617	12,094	14,166
	Subtotal		6,218	8,754	9,171	11,302	13,905	17,810	20,594	24,152
Total Municipal Demand			9,627	12,016	15,480	17,932	20,847	25,953	29,648	34,296
Municipal Existing Supply										
San Antonio Basin										
Cibolo		Canyon (GBRA)			409	409	409	409	409	409
Marion		Edwards			102	102	102	102	102	102
Schertz (part)		Edwards			817	817	817	817	817	817
Rural		Edwards			527	527	527	527	527	527
		Carrizo			2,010	2,010	2,010	1,379	1,379	1,379
		Canyon (GBRA)			22	22	22	22	22	22
Rural Subtotal					2,559	2,559	2,559	1,928	1,928	1,928
	Subtotal				3,887	3,887	3,887	3,256	3,256	3,256
Guadalupe Basin										
McQueeney	Estimated	Carrizo			279	279	279	279	279	279
New Braunfels		Edwards			35	35	35	35	35	35
		Run-of-River			14	14	14	14	14	14
		Canyon (GBRA)[1]			44	0	0	0	0	0
New Braunfels Subtotal					93	49	49	49	49	49
Seguin		Run-of-River			6,064	6,064	6,064	6,064	6,064	6,064
Rural		Edwards			441	441	441	441	441	441
		Carrizo			9,294	9,294	9,294	7,289	7,289	7,289
		Canyon (GBRA)			4,778	4,778	4,778	4,778	4,778	4,778
Rural Subtotal					14,513	14,513	14,513	12,508	12,508	12,508
	Subtotal				20,949	20,905	20,905	18,900	18,900	18,900
Total Municipal Existing Supply					24,836	24,792	24,792	22,156	22,156	22,156
Municipal Surplus/Shortage										
San Antonio Basin										
Cibolo					-32	-28	-55	-110	-184	-223
Marion					-29	-18	-11	-11	-11	-12
Schertz (part)					-3,795	-3,691	-3,444	-3,837	-4,277	-4,746
Rural					1,434	994	455	-929	-1,326	-1,907
	Subtotal				-2,422	-2,743	-3,055	-4,887	-5,798	-6,888
Guadalupe Basin										
McQueeney					28	37	47	25	7	2
New Braunfels					18	-35	-49	-90	-106	-122
Seguin					1,498	971	353	-736	-2,009	-3,474
Rural					10,234	8,630	6,649	1,891	414	-1,658
	Subtotal				11,778	9,603	7,000	1,090	-1,694	-5,252
Total Municipal Surplus/Shortage					9,356	6,860	3,945	-3,797	-7,492	-12,140

Table 4-11
Projected Water Demands, Supplies, and Needs
Guadalupe County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Municipal New Supply Need										
San Antonio Basin										
Cibolo					32	28	55	110	184	223
Marion					29	18	11	11	11	12
Schertz (part)					3,795	3,691	3,444	3,837	4,277	4,746
Rural					0	0	0	929	1,326	1,907
	Subtotal				3,856	3,737	3,510	4,887	5,798	6,888
Guadalupe Basin										
McQueeney					0	0	0	0	0	0
New Braunfels					0	35	49	90	106	122
Seguin					0	0	0	736	2,009	3,474
Rural					0	0	0	0	0	1,658
	Subtotal				0	35	49	826	2,115	5,254
Total Municipal New Supply Need					3,856	3,772	3,559	5,713	7,913	12,142
Industrial Demand										
San Antonio Basin			0	2	0	0	0	0	0	0
Guadalupe Basin			1,661	2,893	1,883	2,102	2,248	2,385	2,590	2,797
Total Industrial Demand			1,661	2,895	1,883	2,102	2,248	2,385	2,590	2,797
Industrial Existing Supply										
San Antonio Basin					0	0	0	0	0	0
Guadalupe Basin		Edwards			44	44	44	44	44	44
		Run-of-River			44	44	44	44	44	44
		Canyon (GBRA)			810	810	810	810	810	810
Guadalupe Basin Subtotal					898	898	898	898	898	898
Total Industrial Existing Supply					898	898	898	898	898	898
Industrial Surplus/Shortage										
San Antonio Basin					0	0	0	0	0	0
Guadalupe Basin					-985	-1,204	-1,350	-1,487	-1,692	-1,899
Total Industrial Surplus/Shortage					-985	-1,204	-1,350	-1,487	-1,692	-1,899
Industrial New Supply Need										
San Antonio Basin					0	0	0	0	0	0
Guadalupe Basin					985	1,204	1,350	1,487	1,692	1,899
Total Industrial New Supply Need					985	1,204	1,350	1,487	1,692	1,899
Steam-Electric Demand										
San Antonio Basin			0	0	0	0	0	0	0	0
Guadalupe Basin			0	0	10,760	10,760	10,760	10,760	10,760	10,760
Total Steam-Electric Demand			0	0	10,760	10,760	10,760	10,760	10,760	10,760
Steam-Electric Existing Supply										
San Antonio Basin					0	0	0	0	0	0
Guadalupe Basin		Canyon (GBRA)			9,840	9,840	9,840	9,840	9,840	9,840
Total Steam-Electric Existing Supply					9,840	9,840	9,840	9,840	9,840	9,840
Steam-Electric Surplus/Shortage										
San Antonio Basin					0	0	0	0	0	0
Guadalupe Basin					-920	-920	-920	-920	-920	-920
Total Steam-Electric Surplus/Shortage					-920	-920	-920	-920	-920	-920
Steam-Electric New Supply Need										
San Antonio Basin					0	0	0	0	0	0
Guadalupe Basin					920	920	920	920	920	920
Total Steam-Electric New Supply Need					920	920	920	920	920	920

Table 4-11
Projected Water Demands, Supplies, and Needs
Guadalupe County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Irrigation Demand									
San Antonio Basin		343	0	326	311	296	282	268	255
Guadalupe Basin		2,303	373	2,194	2,088	1,988	1,893	1,803	1,717
Total Irrigation Demand		2,646	373	2,520	2,399	2,284	2,175	2,071	1,972
Irrigation Supply									
San Antonio Basin	Carrizo			326	311	296	282	268	255
Guadalupe Basin	Carrizo			0	0	0	0	0	0
	Run-of-River			942	942	942	942	942	942
	Canyon (GBRA)			312	312	312	312	312	312
Guadalupe Basin Subtotal				1,254	1,254	1,254	1,254	1,254	1,254
Total Irrigation Supply				1,580	1,565	1,550	1,536	1,522	1,509
Irrigation Surplus/Shortage									
San Antonio Basin				0	0	0	0	0	0
Guadalupe Basin				-940	-834	-734	-639	-549	-463
Total Irrigation Surplus/Shortage				-940	-834	-734	-639	-549	-463
Mining Demand									
San Antonio Basin		8	9	10	10	10	10	10	10
Guadalupe Basin		0	261	186	188	190	192	197	203
Total Mining Demand		8	270	196	198	200	202	207	213
Mining Supply									
San Antonio Basin	Carrizo			0	0	0	0	0	0
Guadalupe Basin	Carrizo			0	0	0	0	0	0
Total Mining Supply				0	0	0	0	0	0
Mining Surplus/Shortage									
San Antonio Basin				-10	-10	-10	-10	-10	-10
Guadalupe Basin				-186	-188	-190	-192	-197	-203
Total Mining Surplus/Shortage				-196	-198	-200	-202	-207	-213
Livestock Demand									
San Antonio Basin		258	460	284	284	284	284	284	284
Guadalupe Basin		773	1,372	848	848	848	848	848	848
Total Livestock Demand		1,031	1,832	1,132	1,132	1,132	1,132	1,132	1,132
Livestock Supply									
San Antonio Basin	Local	258	460	284	284	284	284	284	284
Guadalupe Basin	Local	773	1,372	848	848	848	848	848	848
Total Livestock Supply		1,031	1,832	1,132	1,132	1,132	1,132	1,132	1,132
Livestock Surplus/Shortage									
San Antonio Basin		0	0	0	0	0	0	0	0
Guadalupe Basin		0	0	0	0	0	0	0	0
Total Livestock Surplus/Shortage		0	0	0	0	0	0	0	0
Total Guadalupe County Demand									
Municipal		9,627	12,016	15,480	17,932	20,847	25,953	29,648	34,296
Industrial		1,661	2,895	1,883	2,102	2,248	2,385	2,590	2,797
Steam-Electric		0	0	10,760	10,760	10,760	10,760	10,760	10,760
Irrigation		2,646	373	2,520	2,399	2,284	2,175	2,071	1,972
Mining		8	270	196	198	200	202	207	213
Livestock		1,031	1,832	1,132	1,132	1,132	1,132	1,132	1,132
Total County Demand		14,973	17,386	31,971	34,523	37,471	42,607	46,408	51,170
Total Guadalupe County Supply									
Municipal				24,836	24,792	24,792	22,156	22,156	22,156
Industrial				898	898	898	898	898	898
Steam-Electric				9,840	9,840	9,840	9,840	9,840	9,840
Irrigation				1,580	1,565	1,550	1,536	1,522	1,509
Mining				0	0	0	0	0	0
Livestock				1,132	1,132	1,132	1,132	1,132	1,132
Total County Supply				38,286	38,227	38,212	35,562	35,548	35,535

Table 4-11
Projected Water Demands, Supplies, and Needs
Guadalupe County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Total Guadalupe County Surplus/Shortage									
Municipal				9,356	6,860	3,945	-3,797	-7,492	-12,140
Industrial				-985	-1,204	-1,350	-1,487	-1,692	-1,899
Steam-Electric				-920	-920	-920	-920	-920	-920
Irrigation				-940	-834	-734	-639	-549	-463
Mining				-196	-198	-200	-202	-207	-213
Livestock				0	0	0	0	0	0
Total County Surplus/Shortage				6,315	3,704	741	-7,045	-10,860	-15,635
Total Basin Demand									
San Antonio									
Municipal		3,409	3,262	6,309	6,630	6,942	8,143	9,054	10,144
Industrial		0	2	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		343	0	326	311	296	282	268	255
Mining		8	9	10	10	10	10	10	10
Livestock		258	460	284	284	284	284	284	284
Total San Antonio Basin Demand		4,018	3,733	6,929	7,235	7,532	8,719	9,616	10,693
Guadalupe									
Municipal		6,218	8,754	9,171	11,302	13,905	17,810	20,594	24,152
Industrial		1,661	2,893	1,883	2,102	2,248	2,385	2,590	2,797
Steam-Electric		0	0	10,760	10,760	10,760	10,760	10,760	10,760
Irrigation		2,303	373	2,194	2,088	1,988	1,893	1,803	1,717
Mining		0	261	186	188	190	192	197	203
Livestock		773	1,372	848	848	848	848	848	848
Total Guadalupe Basin Demand		10,955	13,653	25,042	27,288	29,939	33,888	36,792	40,477
Total Basin Supply									
San Antonio									
Municipal				3,887	3,887	3,887	3,256	3,256	3,256
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				326	311	296	282	268	255
Mining				0	0	0	0	0	0
Livestock				284	284	284	284	284	284
Total San Antonio Basin Supply				4,497	4,482	4,467	3,822	3,808	3,795
Guadalupe									
Municipal				20,949	20,905	20,905	18,900	18,900	18,900
Industrial				898	898	898	898	898	898
Steam-Electric				9,840	9,840	9,840	9,840	9,840	9,840
Irrigation				1,254	1,254	1,254	1,254	1,254	1,254
Mining				0	0	0	0	0	0
Livestock				848	848	848	848	848	848
Total Guadalupe Basin Supply				33,789	33,745	33,745	31,740	31,740	31,740
Total Basin Surplus/Shortage									
San Antonio									
Municipal				-2,422	-2,743	-3,055	-4,887	-5,798	-6,888
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				0	0	0	0	0	0
Mining				-10	-10	-10	-10	-10	-10
Livestock				0	0	0	0	0	0
Total San Antonio Basin Surplus/Shortage				-2,432	-2,753	-3,065	-4,897	-5,808	-6,898
Guadalupe									
Municipal				11,778	9,603	7,000	1,090	-1,694	-5,252
Industrial				-985	-1,204	-1,350	-1,487	-1,692	-1,899
Steam-Electric				-920	-920	-920	-920	-920	-920
Irrigation				-940	-834	-734	-639	-549	-463
Mining				-186	-188	-190	-192	-197	-203
Livestock				0	0	0	0	0	0
Total Guadalupe Basin Surplus/Shortage				8,747	6,457	3,806	-2,148	-5,052	-8,737

Table 4-11
Projected Water Demands, Supplies, and Needs
Guadalupe County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Groundwater Supplies										
	Available									
	Guadalupe	Edwards			520	520	520	520	520	520
	San Antonio	Edwards			1,446	1,446	1,446	1,446	1,446	1,446
	Guadalupe	Carrizo			9,573	9,573	9,573	7,568	7,568	7,568
	San Antonio	Carrizo			3,010	3,010	3,010	2,379	2,379	2,379
	Total Available				14,549	14,549	14,549	11,913	11,913	11,913
	Allocated									
	Guadalupe	Edwards			520	520	520	520	520	520
	San Antonio	Edwards			1,446	1,446	1,446	1,446	1,446	1,446
	Guadalupe	Carrizo			9,573	9,573	9,573	7,568	7,568	7,568
	San Antonio	Carrizo			2,336	2,321	2,306	1,661	1,647	1,634
	Total Allocated				13,875	13,860	13,845	11,195	11,181	11,168
	Total Unallocated				674	689	704	718	732	745

Note:
[1] Contract with GBRA expires in 2001. Contract renewal is a water management strategy.

Table 4-12
Projected Water Demands, Supplies, and Needs
Hays County (Part)
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Municipal Demand										
Guadalupe Basin										
Kyle			326	307	353	337	339	376	435	504
San Marcos			6,321	6,404	9,393	11,600	14,381	18,671	24,078	31,049
Wimberley			732	576	615	732	790	898	1,004	1,128
Woodcreek			182	208	171	160	149	150	153	157
Rural			2,244	3,634	5,569	6,646	7,236	8,315	9,255	8,325
	Subtotal		9,805	11,129	16,101	19,475	22,895	28,410	34,925	41,163
Total Municipal Demand			9,805	11,129	16,101	19,475	22,895	28,410	34,925	41,163
Municipal Existing Supply										
Guadalupe Basin										
Kyle		Edwards			279	279	279	279	279	279
		Canyon (GBRA)[1]			589	589	589	589	0	0
Kyle Subtotal					868	868	868	868	279	279
San Marcos		Edwards			3,752	3,752	3,752	3,752	3,752	3,752
		Canyon (GBRA)[2]			5,000	5,000	5,000	5,000	5,000	0
San Marcos Subtotal					8,752	8,752	8,752	8,752	8,752	3,752
Wimberley	Estimated	Trinity			1,025	1,025	1,025	1,025	1,025	806
Woodcreek	Estimated	Trinity			188	188	188	188	188	188
Rural		Edwards			357	357	357	357	357	357
		Run-of-River			513	513	513	513	513	513
		Run-of-River (CRWA)			111	111	111	111	111	111
		Canyon (GBRA)			984	984	984	984	984	984
Rural Subtotal					1,965	1,965	1,965	1,965	1,965	1,965
	Subtotal				12,798	12,798	12,798	12,798	12,209	6,990
Total Municipal Existing Supply					12,798	12,798	12,798	12,798	12,209	6,990
Municipal Surplus/Shortage										
Guadalupe Basin										
Kyle					515	531	529	492	-156	-225
San Marcos					-641	-2,848	-5,629	-9,919	-15,326	-27,297
Wimberley					410	293	235	127	21	-322
Woodcreek					17	28	39	38	35	31
Rural					-3,604	-4,681	-5,271	-6,350	-7,290	-6,360
	Subtotal				-3,303	-6,677	-10,097	-15,612	-22,716	-34,173
Total Municipal Surplus/Shortage					-3,303	-6,677	-10,097	-15,612	-22,716	-34,173
Municipal New Supply Need										
Guadalupe Basin										
Kyle					0	0	0	0	156	225
San Marcos					641	2,848	5,629	9,919	15,326	27,297
Wimberley					0	0	0	0	0	322
Woodcreek					0	0	0	0	0	0
Rural					3,604	4,681	5,271	6,350	7,290	6,360
	Subtotal				4,245	7,529	10,900	16,269	22,772	34,204
Total Municipal New Supply Need					4,245	7,529	10,900	16,269	22,772	34,204
Industrial Demand										
Guadalupe Basin			57	96	93	105	118	129	142	154
Total Industrial Demand			57	96	93	105	118	129	142	154

Table 4-12
Projected Water Demands, Supplies, and Needs
Hays County (Part)
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Industrial Existing Supply									
Guadalupe Basin	Edwards			902	902	902	902	902	902
	Run-of-River			539	539	539	539	539	539
Total Industrial Existing Supply				1,441	1,441	1,441	1,441	1,441	1,441
Industrial Surplus/Shortage									
Guadalupe Basin				1,348	1,336	1,323	1,312	1,299	1,287
Total Industrial Surplus/Shortage				1,348	1,336	1,323	1,312	1,299	1,287
Industrial New Supply Need									
Guadalupe Basin				0	0	0	0	0	0
Total Industrial New Supply Need				0	0	0	0	0	0
Steam-Electric Demand									
Guadalupe Basin		0	0	0	6,400	6,400	6,400	6,400	6,400
Total Steam-Electric Demand		0	0	0	6,400	6,400	6,400	6,400	6,400
Steam-Electric Existing Supply									
Guadalupe Basin	Canyon (GBRA)			2,500	2,500	2,500	2,500	2,500	2,500
	San Marcos Reclaimed			0	3,936	3,936	3,936	3,936	3,936
Total Steam-Electric Existing Supply				2,500	6,436	6,436	6,436	6,436	6,436
Steam-Electric Surplus/Shortage									
Guadalupe Basin				2,500	36	36	36	36	36
Total Steam-Electric Surplus/Shortage				2,500	36	36	36	36	36
Steam-Electric New Supply Need									
Guadalupe Basin				0	0	0	0	0	0
Total Steam-Electric New Supply Need				0	0	0	0	0	0
Irrigation Demand									
Guadalupe Basin		298	137	294	292	289	287	284	281
Total Irrigation Demand		298	137	294	292	289	287	284	281
Irrigation Supply									
Guadalupe Basin	Edwards			458	458	458	458	458	458
	Run-of-River			341	341	341	341	341	341
Total Irrigation Supply				799	799	799	799	799	799
Irrigation Surplus/Shortage									
Guadalupe Basin				505	507	510	512	515	518
Total Irrigation Surplus/Shortage				505	507	510	512	515	518
Mining Demand									
Guadalupe Basin		0	153	84	82	68	55	37	28
Total Mining Demand		0	153	84	82	68	55	37	28
Mining Supply									
Guadalupe Basin	Trinity			0	0	0	0	0	0
Total Mining Supply				0	0	0	0	0	0
Mining Surplus/Shortage									
Guadalupe Basin				-84	-82	-68	-55	-37	-28
Total Mining Surplus/Shortage				-84	-82	-68	-55	-37	-28
Livestock Demand									
Guadalupe Basin		378	281	271	271	271	271	271	271
Total Livestock Demand		378	281	271	271	271	271	271	271
Livestock Supply									
Guadalupe Basin	Local	378	281	271	271	271	271	271	271
Total Livestock Supply		378	281	271	271	271	271	271	271

Table 4-12
Projected Water Demands, Supplies, and Needs
Hays County (Part)
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Livestock Surplus/Shortage									
Guadalupe Basin		0	0	0	0	0	0	0	0
Total Livestock Surplus/Shortage		0	0	0	0	0	0	0	0
Total Hays County Demand									
Municipal		9,805	11,129	16,101	19,475	22,895	28,410	34,925	41,163
Industrial		57	96	93	105	118	129	142	154
Steam-Electric		0	0	0	6,400	6,400	6,400	6,400	6,400
Irrigation		298	137	294	292	289	287	284	281
Mining		0	153	84	82	68	55	37	28
Livestock		378	281	271	271	271	271	271	271
Total County Demand		10,538	11,796	16,843	26,625	30,041	35,552	42,059	48,297
Total Hays County Supply									
Municipal				12,798	12,798	12,798	12,798	12,209	6,990
Industrial				1,441	1,441	1,441	1,441	1,441	1,441
Steam-Electric				2,500	6,436	6,436	6,436	6,436	6,436
Irrigation				799	799	799	799	799	799
Mining				0	0	0	0	0	0
Livestock				271	271	271	271	271	271
Total County Supply				17,809	21,745	21,745	21,745	21,156	15,937
Total Hays County Surplus/Shortage									
Municipal				-3,303	-6,677	-10,097	-15,612	-22,716	-34,173
Industrial				1,348	1,336	1,323	1,312	1,299	1,287
Steam-Electric				2,500	36	36	36	36	36
Irrigation				505	507	510	512	515	518
Mining				-84	-82	-68	-55	-37	-28
Livestock				0	0	0	0	0	0
Total County Surplus/Shortage				966	-4,880	-8,296	-13,807	-20,903	-32,360
Total Basin Demand									
Guadalupe									
Municipal		9,805	11,129	16,101	19,475	22,895	28,410	34,925	41,163
Industrial		57	96	93	105	118	129	142	154
Steam-Electric		0	0	0	6,400	6,400	6,400	6,400	6,400
Irrigation		298	137	294	292	289	287	284	281
Mining		0	153	84	82	68	55	37	28
Livestock		378	281	271	271	271	271	271	271
Total Guadalupe Basin Demand		10,538	11,796	16,843	26,625	30,041	35,552	42,059	48,297
Total Basin Supply									
Guadalupe									
Municipal				12,798	12,798	12,798	12,798	12,209	6,990
Industrial				1,441	1,441	1,441	1,441	1,441	1,441
Steam-Electric				2,500	6,436	6,436	6,436	6,436	6,436
Irrigation				799	799	799	799	799	799
Mining				0	0	0	0	0	0
Livestock				271	271	271	271	271	271
Total Guadalupe Basin Supply				17,809	21,745	21,745	21,745	21,156	15,937
Total Basin Surplus/Shortage									
Guadalupe									
Municipal				-3,303	-6,677	-10,097	-15,612	-22,716	-34,173
Industrial				1,348	1,336	1,323	1,312	1,299	1,287
Steam-Electric				2,500	36	36	36	36	36
Irrigation				505	507	510	512	515	518
Mining				-84	-82	-68	-55	-37	-28
Livestock				0	0	0	0	0	0
Total Guadalupe Basin Surplus/Shortage				966	-4,880	-8,296	-13,807	-20,903	-32,360

Table 4-12
Projected Water Demands, Supplies, and Needs
Hays County (Part)
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Groundwater Supplies										
	Available									
	Guadalupe	Edwards			5,748	5,748	5,748	5,748	5,748	5,748
	Guadalupe	Trinity			1,213	1,213	1,213	1,213	1,213	994
	Total Available				6,961	6,961	6,961	6,961	6,961	6,742
	Allocated									
	Guadalupe	Edwards			5,748	5,748	5,748	5,748	5,748	5,748
	Guadalupe	Trinity			1,213	1,213	1,213	1,213	1,213	994
	Total Allocated				6,961	6,961	6,961	6,961	6,961	6,742
	Total Unallocated				0	0	0	0	0	0

Notes:
[1] Contract with GBRA expires in 2038. Contract renewal is a water management strategy.
[2] Contract with GBRA expires in 2047. Contract renewal is a water management strategy.

Table 4-13
Projected Water Demands, Supplies, and Needs
Karnes County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Municipal Demand									
Nueces Basin									
Rural		39	98	74	68	68	71	75	76
Subtotal		39	98	74	68	68	71	75	76
San Antonio Basin									
Karnes City		410	393	468	435	442	468	491	515
Kenedy		682	587	828	779	799	847	885	931
Runge		164	153	199	184	187	196	203	213
Rural		820	1,240	936	860	865	904	945	958
Subtotal		2,076	2,373	2,431	2,258	2,293	2,415	2,524	2,617
Guadalupe Basin									
Rural		14	36	27	25	25	26	28	28
Subtotal		14	36	27	25	25	26	28	28
San Antonio-Nueces Coastal Basin									
Rural		58	72	54	50	50	52	55	55
Subtotal		58	72	54	50	50	52	55	55
Total Municipal Demand		2,187	2,579	2,586	2,401	2,436	2,564	2,682	2,776
Municipal Existing Supply									
Nueces Basin									
Rural	Carrizo			44	44	44	34	34	34
	Gulf Coast			32	32	32	42	42	42
Subtotal				76	76	76	76	76	76
San Antonio Basin									
Karnes City	Carrizo			1,024	1,024	1,024	1,024	1,024	1,024
Kenedy	Carrizo			1,216	1,216	1,216	1,216	1,216	1,216
Runge	Gulf Coast			468	468	468	468	468	468
Rural	Carrizo			714	714	714	607	607	607
	Gulf Coast			244	244	244	351	351	351
Rural Subtotal				958	958	958	958	958	958
Subtotal				3,666	3,666	3,666	3,666	3,666	3,666
Guadalupe Basin									
Rural	Carrizo			25	25	25	24	24	24
	Gulf Coast			3	3	3	4	4	4
Subtotal				28	28	28	28	28	28
San Antonio-Nueces Coastal Basin									
Rural	Gulf Coast			55	55	55	55	55	55
Subtotal				55	55	55	55	55	55
Total Municipal Existing Supply				3,825	3,825	3,825	3,825	3,825	3,825
Municipal Surplus/Shortage									
Nueces Basin									
Rural				2	8	8	5	1	0
Subtotal				2	8	8	5	1	0
San Antonio Basin									
Karnes City				556	589	582	556	533	509
Kenedy				388	437	417	369	331	285
Runge				269	284	281	272	265	255
Rural				22	98	93	54	13	0
Subtotal				1,235	1,408	1,373	1,251	1,142	1,049
Guadalupe Basin									
Rural				1	3	3	2	0	0
Subtotal				1	3	3	2	0	0
San Antonio-Nueces Coastal Basin									
Rural				1	5	5	3	0	0
Subtotal				1	5	5	3	0	0
Total Municipal Surplus/Shortage				1,239	1,424	1,389	1,261	1,143	1,049

Table 4-13
Projected Water Demands, Supplies, and Needs
Karnes County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Municipal New Supply Need										
Nueces Basin										
Rural					0	0	0	0	0	0
	Subtotal				0	0	0	0	0	0
San Antonio Basin										
Karnes City					0	0	0	0	0	0
Kenedy					0	0	0	0	0	0
Runge					0	0	0	0	0	0
Rural					0	0	0	0	0	0
	Subtotal				0	0	0	0	0	0
Guadalupe Basin										
Rural					0	0	0	0	0	0
	Subtotal				0	0	0	0	0	0
San Antonio-Nueces Coastal Basin										
Rural					0	0	0	0	0	0
	Subtotal				0	0	0	0	0	0
Total Municipal New Supply Need					0	0	0	0	0	0
Industrial Demand										
Nueces Basin			0	0	0	0	0	0	0	0
San Antonio Basin			270	80	296	320	331	340	356	383
Guadalupe Basin			0	0	0	0	0	0	0	0
San Antonio-Nueces Basin			0	0	0	0	0	0	0	0
Total Industrial Demand			270	80	296	320	331	340	356	383
Industrial Existing Supply										
Nueces Basin					0	0	0	0	0	0
San Antonio Basin		Carrizo			285	285	285	242	242	242
		Gulf Coast			98	98	98	141	141	141
San Antonio Basin Subtotal					383	383	383	383	383	383
Guadalupe Basin					0	0	0	0	0	0
San Antonio-Nueces Basin					0	0	0	0	0	0
Total Industrial Existing Supply					383	383	383	383	383	383
Industrial Surplus/Shortage										
Nueces Basin					0	0	0	0	0	0
San Antonio Basin					87	63	52	43	27	0
Guadalupe Basin					0	0	0	0	0	0
San Antonio-Nueces Basin					0	0	0	0	0	0
Total Industrial Surplus/Shortage					87	63	52	43	27	0
Industrial New Supply Need										
Nueces Basin					0	0	0	0	0	0
San Antonio Basin					0	0	0	0	0	0
Guadalupe Basin					0	0	0	0	0	0
San Antonio-Nueces Basin					0	0	0	0	0	0
Total Industrial New Supply Need					0	0	0	0	0	0
Steam-Electric Demand										
Nueces Basin			0	0	0	0	0	0	0	0
San Antonio Basin			0	0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0	0
San Antonio-Nueces Basin			0	0	0	0	0	0	0	0
Total Steam-Electric Demand			0	0	0	0	0	0	0	0
Steam-Electric Existing Supply										
Nueces Basin					0	0	0	0	0	0
San Antonio Basin					0	0	0	0	0	0
Guadalupe Basin					0	0	0	0	0	0
San Antonio-Nueces Basin					0	0	0	0	0	0
Total Steam-Electric Existing Supply					0	0	0	0	0	0

Table 4-13
Projected Water Demands, Supplies, and Needs
Karnes County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Steam-Electric Surplus/Shortage									
Nueces Basin				0	0	0	0	0	0
San Antonio Basin				0	0	0	0	0	0
Guadalupe Basin				0	0	0	0	0	0
San Antonio-Nueces Basin				0	0	0	0	0	0
Total Steam-Electric Surplus/Shortage				0	0	0	0	0	0
Steam-Electric New Supply Need									
Nueces Basin				0	0	0	0	0	0
San Antonio Basin				0	0	0	0	0	0
Guadalupe Basin				0	0	0	0	0	0
San Antonio-Nueces Basin				0	0	0	0	0	0
Total Steam-Electric New Supply Need				0	0	0	0	0	0
Irrigation Demand									
Nueces Basin		0	0	0	0	0	0	0	0
San Antonio Basin		2,034	2,157	1,840	1,664	1,505	1,362	1,232	1,114
Guadalupe Basin		0	0	0	0	0	0	0	0
San Antonio-Nueces Basin		0	0	0	0	0	0	0	0
Total Irrigation Demand		2,034	2,157	1,840	1,664	1,505	1,362	1,232	1,114
Irrigation Supply									
Nueces Basin				0	0	0	0	0	0
San Antonio Basin	Run-of-River			873	873	873	873	873	873
Guadalupe Basin				0	0	0	0	0	0
San Antonio-Nueces Basin				0	0	0	0	0	0
Total Irrigation Supply				873	873	873	873	873	873
Irrigation Surplus/Shortage									
Nueces Basin				0	0	0	0	0	0
San Antonio Basin				-967	-791	-632	-489	-359	-241
Guadalupe Basin				0	0	0	0	0	0
San Antonio-Nueces Basin				0	0	0	0	0	0
Total Irrigation Surplus/Shortage				-967	-791	-632	-489	-359	-241
Mining Demand									
Nueces Basin		0	0	0	0	0	0	0	0
San Antonio Basin		187	127	147	59	23	15	8	4
Guadalupe Basin		0	6	11	8	4	1	0	0
San Antonio-Nueces Basin		0	4	8	6	4	3	2	0
Total Mining Demand		187	137	166	73	31	19	10	4
Mining Supply									
Nueces Basin				0	0	0	0	0	0
San Antonio Basin	Carrizo			110	44	17	9	5	3
	Gulf Coast			37	15	6	6	3	1
San Antonio Basin Subtotal				147	59	23	15	8	4
Guadalupe Basin	Carrizo			10	7	4	1	0	0
	Gulf Coast			1	1	0	0	0	0
Guadalupe Basin Subtotal				11	8	4	1	0	0
San Antonio-Nueces Basin	Gulf Coast			8	6	4	3	2	0
Total Mining Supply				166	73	31	19	10	4
Mining Surplus/Shortage									
Nueces Basin				0	0	0	0	0	0
San Antonio Basin				0	0	0	0	0	0
Guadalupe Basin				0	0	0	0	0	0
San Antonio-Nueces Basin				0	0	0	0	0	0
Total Mining Surplus/Shortage				0	0	0	0	0	0

Table 4-13
Projected Water Demands, Supplies, and Needs
Karnes County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Livestock Demand									
Nueces Basin		118	151	117	117	117	117	117	117
San Antonio Basin		1,088	1,374	1,060	1,060	1,060	1,060	1,060	1,060
Guadalupe Basin		94	120	92	92	92	92	92	92
San Antonio-Nueces Basin		71	90	70	70	70	70	70	70
Total Livestock Demand		1,371	1,735	1,339	1,339	1,339	1,339	1,339	1,339
Livestock Supply									
Nueces Basin	Local	118	151	117	117	117	117	117	117
San Antonio Basin	Local	1,088	1,374	1,060	1,060	1,060	1,060	1,060	1,060
Guadalupe Basin	Local	94	120	92	92	92	92	92	92
San Antonio-Nueces Basin	Local	71	90	70	70	70	70	70	70
Total Livestock Supply		1,371	1,735	1,339	1,339	1,339	1,339	1,339	1,339
Livestock Surplus/Shortage									
Nueces Basin		0	0	0	0	0	0	0	0
San Antonio Basin		0	0	0	0	0	0	0	0
Guadalupe Basin		0	0	0	0	0	0	0	0
San Antonio-Nueces Basin		0	0	0	0	0	0	0	0
Total Livestock Surplus/Shortage		0	0	0	0	0	0	0	0
Total Karnes County Demand									
Municipal		2,187	2,579	2,586	2,401	2,436	2,564	2,682	2,776
Industrial		270	80	296	320	331	340	356	383
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		2,034	2,157	1,840	1,664	1,505	1,362	1,232	1,114
Mining		187	137	166	73	31	19	10	4
Livestock		1,371	1,735	1,339	1,339	1,339	1,339	1,339	1,339
Total County Demand		6,049	6,688	6,227	5,797	5,642	5,624	5,619	5,616
Total Karnes County Supply									
Municipal				3,825	3,825	3,825	3,825	3,825	3,825
Industrial				383	383	383	383	383	383
Steam-Electric				0	0	0	0	0	0
Irrigation				873	873	873	873	873	873
Mining				166	73	31	19	10	4
Livestock				1,339	1,339	1,339	1,339	1,339	1,339
Total County Supply				6,586	6,493	6,451	6,439	6,430	6,424
Total Karnes County Surplus/Shortage									
Municipal				1,239	1,424	1,389	1,261	1,143	1,049
Industrial				87	63	52	43	27	0
Steam-Electric				0	0	0	0	0	0
Irrigation				-967	-791	-632	-489	-359	-241
Mining				0	0	0	0	0	0
Livestock				0	0	0	0	0	0
Total County Surplus/Shortage				359	696	809	815	811	808
Total Basin Demand									
Nueces									
Municipal		39	98	74	68	68	71	75	76
Industrial		0	0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		0	0	0	0	0	0	0	0
Mining		0	0	0	0	0	0	0	0
Livestock		118	151	117	117	117	117	117	117
Total Nueces Basin Demand		157	249	191	185	185	188	192	193

Table 4-13
Projected Water Demands, Supplies, and Needs
Karnes County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
San Antonio									
Municipal		2,076	2,373	2,431	2,258	2,293	2,415	2,524	2,617
Industrial		270	80	296	320	331	340	356	383
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		2,034	2,157	1,840	1,664	1,505	1,362	1,232	1,114
Mining		187	127	147	59	23	15	8	4
Livestock		1,088	1,374	1,060	1,060	1,060	1,060	1,060	1,060
Total San Antonio Basin Demand		5,655	6,111	5,774	5,361	5,212	5,192	5,180	5,178
Guadalupe									
Municipal		14	36	27	25	25	26	28	28
Industrial		0	0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		0	0	0	0	0	0	0	0
Mining		0	6	11	8	4	1	0	0
Livestock		94	120	92	92	92	92	92	92
Total Guadalupe Basin Demand		108	162	130	125	121	119	120	120
San Antonio-Nueces									
Municipal		58	72	54	50	50	52	55	55
Industrial		0	0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		0	0	0	0	0	0	0	0
Mining		0	4	8	6	4	3	2	0
Livestock		71	90	70	70	70	70	70	70
Total San Antonio-Nueces Basin Demand		129	166	132	126	124	125	127	125
Total Basin Supply									
Nueces									
Municipal				76	76	76	76	76	76
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				0	0	0	0	0	0
Mining				0	0	0	0	0	0
Livestock				117	117	117	117	117	117
Unallocated Groundwater Supply				2,966	2,966	2,966	2,037	2,037	2,037
Total Nueces Basin Supply				3,159	3,159	3,159	2,230	2,230	2,230
San Antonio									
Municipal				3,666	3,666	3,666	3,666	3,666	3,666
Industrial				383	383	383	383	383	383
Steam-Electric				0	0	0	0	0	0
Irrigation				873	873	873	873	873	873
Mining				147	59	23	15	8	4
Livestock				1,060	1,060	1,060	1,060	1,060	1,060
Unallocated Groundwater Supply				9,479	9,567	9,603	6,364	6,371	6,375
Total San Antonio Basin Supply				15,608	15,608	15,608	12,361	12,361	12,361
Guadalupe									
Municipal				28	28	28	28	28	28
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				0	0	0	0	0	0
Mining				11	8	4	1	0	0
Livestock				92	92	92	92	92	92
Unallocated Groundwater Supply				1,657	1,660	1,664	1,042	1,043	1,043
Total Guadalupe Basin Supply				1,788	1,788	1,788	1,163	1,163	1,163

Table 4-13
Projected Water Demands, Supplies, and Needs
Karnes County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
San Antonio-Nueces									
Municipal				55	55	55	55	55	55
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				0	0	0	0	0	0
Mining				8	6	4	3	2	0
Livestock				70	70	70	70	70	70
Unallocated Groundwater Supply				304	306	308	309	310	312
Total San Antonio-Nueces Basin Supply				437	437	437	437	437	437
Total Basin Surplus/Shortage									
Nueces									
Municipal				2	8	8	5	1	0
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				0	0	0	0	0	0
Mining				0	0	0	0	0	0
Livestock				0	0	0	0	0	0
Unallocated Groundwater Supply				2,966	2,966	2,966	2,037	2,037	2,037
Total Nueces Basin Surplus/Shortage				2,968	2,974	2,974	2,042	2,038	2,037
San Antonio									
Municipal				1,235	1,408	1,373	1,251	1,142	1,049
Industrial				87	63	52	43	27	0
Steam-Electric				0	0	0	0	0	0
Irrigation				-967	-791	-632	-489	-359	-241
Mining				0	0	0	0	0	0
Livestock				0	0	0	0	0	0
Unallocated Groundwater Supply				9,479	9,567	9,603	6,364	6,371	6,375
Total San Antonio Basin Surplus/Shortage				9,834	10,247	10,396	7,169	7,181	7,183
Guadalupe									
Municipal				1	3	3	2	0	0
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				0	0	0	0	0	0
Mining				0	0	0	0	0	0
Livestock				0	0	0	0	0	0
Unallocated Groundwater Supply				1,657	1,660	1,664	1,042	1,043	1,043
Total Guadalupe Basin Surplus/Shortage				1,658	1,663	1,667	1,044	1,043	1,043
San Antonio-Nueces									
Municipal				1	5	5	3	0	0
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				0	0	0	0	0	0
Mining				0	0	0	0	0	0
Livestock				0	0	0	0	0	0
Unallocated Groundwater Supply				304	306	308	309	310	312
Total San Antonio-Nueces Basin Surplus/Shortage				305	311	313	312	310	312

Table 4-13
Projected Water Demands, Supplies, and Needs
Karnes County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Groundwater Supplies										
	Available									
	Guadalupe	Carrizo			1,524	1,524	1,524	899	899	899
	Nueces	Carrizo			2,267	2,267	2,267	1,338	1,338	1,338
	San Antonio	Carrizo			7,917	7,917	7,917	4,670	4,670	4,670
	San Antonio-Nueces	Gulf Coast			367	367	367	367	367	367
	Guadalupe	Gulf Coast			172	172	172	172	172	172
	Nueces	Gulf Coast			775	775	775	775	775	775
	San Antonio	Gulf Coast			5,758	5,758	5,758	5,758	5,758	5,758
	Total Available				18,780	18,780	18,780	13,979	13,979	13,979
	Allocated									
	Guadalupe	Carrizo			35	32	29	24	24	24
	Nueces	Carrizo			44	44	44	34	34	34
	San Antonio	Carrizo			3,349	3,283	3,257	3,099	3,094	3,092
	San Antonio-Nueces	Gulf Coast			63	61	59	58	57	55
	Guadalupe	Gulf Coast			4	4	3	5	4	4
	Nueces	Gulf Coast			32	32	32	42	42	42
	San Antonio	Gulf Coast			847	825	815	965	963	961
	Total Allocated				4,374	4,281	4,239	4,227	4,218	4,212
	Total Unallocated				14,406	14,499	14,541	9,752	9,761	9,767

Table 4-14
Projected Water Demands, Supplies, and Needs
Kendall County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Municipal Demand										
San Antonio Basin										
Boerne			785	1,083	1,259	1,711	1,718	2,199	2,812	3,598
Fair Oaks Ranch			64	81	232	359	326	331	336	342
Rural			515	876	1,070	1,539	2,808	4,099	5,578	6,847
	Subtotal		1,364	2,040	2,561	3,609	4,852	6,629	8,726	10,787
Guadalupe Basin										
Comfort			278	293	265	254	245	254	269	285
Rural			468	873	686	874	1,094	1,378	1,513	1,661
	Subtotal		746	1,166	951	1,128	1,339	1,632	1,782	1,946
Lower Colorado Basin										
Rural			20	33	22	21	22	23	25	28
	Subtotal		20	33	22	21	22	23	25	28
Total Municipal Demand			2,130	3,239	3,534	4,758	6,213	8,284	10,533	12,761
Municipal Existing Supply										
San Antonio Basin										
Boerne		Boerne Lake			506	506	506	506	506	506
		Trinity			719	719	719	719	719	564
Boerne Subtotal					1,225	1,225	1,225	1,225	1,225	1,070
Fair Oaks Ranch		Trinity			142	142	142	142	142	142
Rural		Trinity			0	0	0	0	0	0
	Subtotal				1,367	1,367	1,367	1,367	1,367	1,212
Guadalupe Basin										
Comfort		Edwards-Trinity			641	641	641	641	641	641
Rural		Edwards-Trinity			57	57	57	57	57	57
		Trinity			1,604	1,604	1,604	1,604	1,604	1,604
Rural Subtotal					1,661	1,661	1,661	1,661	1,661	1,661
	Subtotal				2,302	2,302	2,302	2,302	2,302	2,302
Lower Colorado Basin										
Rural		Edwards-Trinity			22	22	22	22	22	23
		Trinity			6	6	6	6	6	5
	Subtotal				28	28	28	28	28	28
Total Municipal Existing Supply					3,697	3,697	3,697	3,697	3,697	3,542
Municipal Surplus/Shortage										
San Antonio Basin										
Boerne					-34	-486	-493	-974	-1,587	-2,528
Fair Oaks Ranch					-90	-217	-184	-189	-194	-200
Rural					-1,070	-1,539	-2,808	-4,099	-5,578	-6,847
	Subtotal				-1,194	-2,242	-3,485	-5,262	-7,359	-9,575
Guadalupe Basin										
Comfort					376	387	396	387	372	356
Rural					975	787	567	283	148	0
	Subtotal				1,351	1,174	963	670	520	356
Lower Colorado Basin										
Rural					6	7	6	5	3	0
	Subtotal				6	7	6	5	3	0
Total Municipal Surplus/Shortage					163	-1,061	-2,516	-4,587	-6,836	-9,219

Table 4-14
Projected Water Demands, Supplies, and Needs
Kendall County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Municipal New Supply Need										
San Antonio Basin										
Boerne					34	486	493	974	1,587	2,528
Fair Oaks Ranch					90	217	184	189	194	200
Rural					1,070	1,539	2,808	4,099	5,578	6,847
	Subtotal				1,194	2,242	3,485	5,262	7,359	9,575
Guadalupe Basin										
Comfort					0	0	0	0	0	0
Rural					0	0	0	0	0	0
	Subtotal				0	0	0	0	0	0
Lower Colorado Basin										
Rural					0	0	0	0	0	0
	Subtotal				0	0	0	0	0	0
Total Municipal New Supply Need					1,194	2,242	3,485	5,262	7,359	9,575
Industrial Demand										
San Antonio Basin			2	6	2	3	4	4	5	6
Guadalupe Basin			0	1	0	0	0	0	0	0
Lower Colorado Basin			0	0	0	0	0	0	0	0
Total Industrial Demand			2	7	2	3	4	4	5	6
Industrial Existing Supply										
San Antonio Basin		Trinity			0	0	0	0	0	0
Guadalupe Basin					0	0	0	0	0	0
Lower Colorado Basin					0	0	0	0	0	0
Total Industrial Existing Supply					0	0	0	0	0	0
Industrial Surplus/Shortage										
San Antonio Basin					-2	-3	-4	-4	-5	-6
Guadalupe Basin					0	0	0	0	0	0
Lower Colorado Basin					0	0	0	0	0	0
Total Industrial Surplus/Shortage					-2	-3	-4	-4	-5	-6
Industrial New Supply Need										
San Antonio Basin					2	3	4	4	5	6
Guadalupe Basin					0	0	0	0	0	0
Lower Colorado Basin					0	0	0	0	0	0
Total Industrial New Supply Need					2	3	4	4	5	6
Steam-Electric Demand										
San Antonio Basin			0	0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0	0
Lower Colorado Basin			0	0	0	0	0	0	0	0
Total Steam-Electric Demand			0	0	0	0	0	0	0	0
Steam-Electric Existing Supply										
San Antonio Basin					0	0	0	0	0	0
Guadalupe Basin					0	0	0	0	0	0
Lower Colorado Basin					0	0	0	0	0	0
Total Steam-Electric Existing Supply					0	0	0	0	0	0
Steam-Electric Surplus/Shortage										
San Antonio Basin					0	0	0	0	0	0
Guadalupe Basin					0	0	0	0	0	0
Lower Colorado Basin					0	0	0	0	0	0
Total Steam-Electric Surplus/Shortage					0	0	0	0	0	0
Steam-Electric New Supply Need										
San Antonio Basin					0	0	0	0	0	0
Guadalupe Basin					0	0	0	0	0	0
Lower Colorado Basin					0	0	0	0	0	0
Total Steam-Electric New Supply Need					0	0	0	0	0	0

Table 4-14
Projected Water Demands, Supplies, and Needs
Kendall County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Irrigation Demand									
San Antonio Basin		0	330	0	0	0	0	0	0
Guadalupe Basin		380	894	364	349	334	320	306	293
Lower Colorado Basin		0	0	0	0	0	0	0	0
Total Irrigation Demand		380	1,224	364	349	334	320	306	293
Irrigation Supply									
San Antonio Basin				0	0	0	0	0	0
Guadalupe Basin	Run-of-River			69	69	69	69	69	69
	Edwards-Trinity			0	0	0	0	0	0
	Trinity			300	285	270	256	242	229
Guadalupe Basin Subtotal				369	354	339	325	311	298
Lower Colorado Basin				0	0	0	0	0	0
Total Irrigation Supply				369	354	339	325	311	298
Irrigation Surplus/Shortage									
San Antonio Basin				0	0	0	0	0	0
Guadalupe Basin				5	5	5	5	5	5
Lower Colorado Basin				0	0	0	0	0	0
Total Irrigation Surplus/Shortage				5	5	5	5	5	5
Mining Demand									
San Antonio Basin		0	0	0	0	0	0	0	0
Guadalupe Basin		0	0	0	0	0	0	0	0
Lower Colorado Basin		0	6	13	9	5	1	0	0
Total Mining Demand		0	6	13	9	5	1	0	0
Mining Supply									
San Antonio Basin				0	0	0	0	0	0
Guadalupe Basin				0	0	0	0	0	0
Lower Colorado Basin	Edwards-Trinity			10	7	4	1	0	0
	Trinity			3	2	1	0	0	0
Lower Colorado Basin Subtotal				13	9	5	1	0	0
Total Mining Supply				13	9	5	1	0	0
Mining Surplus/Shortage									
San Antonio Basin				0	0	0	0	0	0
Guadalupe Basin				0	0	0	0	0	0
Lower Colorado Basin				0	0	0	0	0	0
Total Mining Surplus/Shortage				0	0	0	0	0	0
Livestock Demand									
San Antonio Basin		70	68	91	91	91	91	91	91
Guadalupe Basin		307	299	404	404	404	404	404	404
Lower Colorado Basin		12	13	17	17	17	17	17	17
Total Livestock Demand		389	380	512	512	512	512	512	512
Livestock Supply									
San Antonio Basin	Local	70	68	91	91	91	91	91	91
Guadalupe Basin	Local	307	299	404	404	404	404	404	404
Lower Colorado Basin	Local	12	13	17	17	17	17	17	17
Total Livestock Supply		389	380	512	512	512	512	512	512
Livestock Surplus/Shortage									
San Antonio Basin		0	0	0	0	0	0	0	0
Guadalupe Basin		0	0	0	0	0	0	0	0
Lower Colorado Basin		0	0	0	0	0	0	0	0
Total Livestock Surplus/Shortage		0	0	0	0	0	0	0	0

Table 4-14
Projected Water Demands, Supplies, and Needs
Kendall County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Total Kendall County Demand									
Municipal		2,130	3,239	3,534	4,758	6,213	8,284	10,533	12,761
Industrial		2	7	2	3	4	4	5	6
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		380	1,224	364	349	334	320	306	293
Mining		0	6	13	9	5	1	0	0
Livestock		389	380	512	512	512	512	512	512
Total County Demand		2,901	4,856	4,425	5,631	7,068	9,121	11,356	13,572
Total Kendall County Supply									
Municipal				3,697	3,697	3,697	3,697	3,697	3,542
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				369	354	339	325	311	298
Mining				13	9	5	1	0	0
Livestock				512	512	512	512	512	512
Total County Supply				4,591	4,572	4,553	4,535	4,520	4,352
Total Kendall County Surplus/Shortage									
Municipal				163	-1,061	-2,516	-4,587	-6,836	-9,219
Industrial				-2	-3	-4	-4	-5	-6
Steam-Electric				0	0	0	0	0	0
Irrigation				5	5	5	5	5	5
Mining				0	0	0	0	0	0
Livestock				0	0	0	0	0	0
Total County Surplus/Shortage				166	-1,059	-2,515	-4,586	-6,836	-9,220
Total Basin Demand									
San Antonio									
Municipal		1,364	2,040	2,561	3,609	4,852	6,629	8,726	10,787
Industrial		2	6	2	3	4	4	5	6
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		0	330	0	0	0	0	0	0
Mining		0	0	0	0	0	0	0	0
Livestock		70	68	91	91	91	91	91	91
Total San Antonio Basin Demand		1,436	2,444	2,654	3,703	4,947	6,724	8,822	10,884
Guadalupe									
Municipal		746	1,166	951	1,128	1,339	1,632	1,782	1,946
Industrial		0	1	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		380	894	364	349	334	320	306	293
Mining		0	0	0	0	0	0	0	0
Livestock		307	299	404	404	404	404	404	404
Total Guadalupe Basin Demand		1,433	2,360	1,719	1,881	2,077	2,356	2,492	2,643
Lower Colorado									
Municipal		20	33	22	21	22	23	25	28
Industrial		0	0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		0	0	0	0	0	0	0	0
Mining		0	6	13	9	5	1	0	0
Livestock		12	13	17	17	17	17	17	17
Total Lower Colorado Basin Demand		32	52	52	47	44	41	42	45
Total Basin Supply									
San Antonio									
Municipal				1,367	1,367	1,367	1,367	1,367	1,212
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				0	0	0	0	0	0
Mining				0	0	0	0	0	0
Livestock				91	91	91	91	91	91
Total San Antonio Basin Supply				1,458	1,458	1,458	1,458	1,458	1,303

Table 4-14
Projected Water Demands, Supplies, and Needs
Kendall County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Guadalupe									
Municipal				2,302	2,302	2,302	2,302	2,302	2,302
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				369	354	339	325	311	298
Mining				0	0	0	0	0	0
Livestock				404	404	404	404	404	404
Unallocated Groundwater Supply				1,119	1,134	1,149	1,163	1,177	646
Total Guadalupe Basin Supply				4,194	4,194	4,194	4,194	4,194	3,650
Lower Colorado									
Municipal				28	28	28	28	28	28
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				0	0	0	0	0	0
Mining				13	9	5	1	0	0
Livestock				17	17	17	17	17	17
Unallocated Groundwater Supply				217	221	225	229	230	220
Total Lower Colorado Basin Supply				275	275	275	275	275	265
Total Basin Surplus/Shortage									
San Antonio									
Municipal				-1,194	-2,242	-3,485	-5,262	-7,359	-9,575
Industrial				-2	-3	-4	-4	-5	-6
Steam-Electric				0	0	0	0	0	0
Irrigation				0	0	0	0	0	0
Mining				0	0	0	0	0	0
Livestock				0	0	0	0	0	0
Total San Antonio Basin Surplus/Shortage				-1,196	-2,245	-3,489	-5,266	-7,364	-9,581
Guadalupe									
Municipal				1,351	1,174	963	670	520	356
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				5	5	5	5	5	5
Mining				0	0	0	0	0	0
Livestock				0	0	0	0	0	0
Unallocated Groundwater Supply				1,119	1,134	1,149	1,163	1,177	646
Total Guadalupe Basin Surplus/Shortage				2,475	2,313	2,117	1,838	1,702	1,007
Lower Colorado									
Municipal				6	7	6	5	3	0
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				0	0	0	0	0	0
Mining				0	0	0	0	0	0
Livestock				0	0	0	0	0	0
Unallocated Groundwater Supply				217	221	225	229	230	220
Total Lower Colorado Basin Surplus/Shortage				223	228	231	234	233	220

Table 4-14
Projected Water Demands, Supplies, and Needs
Kendall County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Groundwater Supplies										
	Available									
	Colorado	Edwards-Trinity			207	207	207	207	207	207
	Guadalupe	Edwards-Trinity			698	698	698	698	698	698
	Colorado	Trinity			51	51	51	51	51	41
	Guadalupe	Trinity			3,023	3,023	3,023	3,023	3,023	2,479
	San Antonio	Trinity			861	861	861	861	861	706
	Total Available				4,840	4,840	4,840	4,840	4,840	4,131
	Allocated									
	Colorado	Edwards-Trinity			33	30	26	23	22	23
	Guadalupe	Edwards-Trinity			698	698	698	698	698	698
	Colorado	Trinity			8	7	7	6	6	5
	Guadalupe	Trinity			1,904	1,889	1,874	1,860	1,846	1,833
	San Antonio	Trinity			861	861	861	861	861	706
	Total Allocated				3,504	3,485	3,466	3,448	3,433	3,265
	Total Unallocated				1,336	1,355	1,374	1,392	1,407	866

Table 4-15
Projected Water Demands, Supplies, and Needs
LaSalle County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Municipal Demand										
Nueces Basin										
Cotulla			795	1,057	908	934	942	970	1,005	1,040
Encinal			98	98	93	75	61	55	51	48
Rural			340	231	371	382	389	397	403	398
	Subtotal		1,233	1,386	1,372	1,391	1,392	1,422	1,459	1,486
Total Municipal Demand			1,233	1,386	1,372	1,391	1,392	1,422	1,459	1,486
Municipal Existing Supply										
Nueces Basin										
Cotulla	Estimated	Carrizo			1,248	1,248	1,248	1,248	1,248	1,248
Encinal	Estimated	Carrizo			108	108	108	108	108	108
Rural		Carrizo			383	383	383	352	352	352
		Sparta			15	15	15	39	39	39
		Queen City			5	5	5	12	12	12
Rural Subtotal					403	403	403	403	403	403
	Subtotal				1,759	1,759	1,759	1,759	1,759	1,759
Total Municipal Existing Supply					1,759	1,759	1,759	1,759	1,759	1,759
Municipal Surplus/Shortage										
Nueces Basin										
Cotulla					340	314	306	278	243	208
Encinal					15	33	47	53	57	60
Rural					32	21	14	6	0	5
	Subtotal				387	368	367	337	300	273
Total Municipal Surplus/Shortage					387	368	367	337	300	273
Municipal New Supply Need										
Nueces Basin										
Cotulla					0	0	0	0	0	0
Encinal					0	0	0	0	0	0
Rural					0	0	0	0	0	0
	Subtotal				0	0	0	0	0	0
Total Municipal New Supply Need					0	0	0	0	0	0
Industrial Demand										
Nueces Basin			0	0	0	0	0	0	0	0
Total Industrial Demand			0	0	0	0	0	0	0	0
Industrial Existing Supply										
Nueces Basin					0	0	0	0	0	0
Total Industrial Existing Supply					0	0	0	0	0	0
Industrial Surplus/Shortage										
Nueces Basin					0	0	0	0	0	0
Total Industrial Surplus/Shortage					0	0	0	0	0	0
Industrial New Supply Need										
Nueces Basin					0	0	0	0	0	0
Total Industrial New Supply Need					0	0	0	0	0	0
Steam-Electric Demand										
Nueces Basin			0	0	0	0	0	0	0	0
Total Steam-Electric Demand			0	0	0	0	0	0	0	0

Table 4-15
Projected Water Demands, Supplies, and Needs
LaSalle County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Steam-Electric Existing Supply									
Nueces Basin				0	0	0	0	0	0
Total Steam-Electric Existing Supply				0	0	0	0	0	0
Steam-Electric Surplus/Shortage									
Nueces Basin				0	0	0	0	0	0
Total Steam-Electric Surplus/Shortage				0	0	0	0	0	0
Steam-Electric New Supply Need									
Nueces Basin				0	0	0	0	0	0
Total Steam-Electric New Supply Need				0	0	0	0	0	0
Irrigation Demand									
Nueces Basin		7,292	7,209	7,067	6,849	6,638	6,433	6,234	6,042
Total Irrigation Demand		7,292	7,209	7,067	6,849	6,638	6,433	6,234	6,042
Irrigation Supply									
Nueces Basin	Run-of-River			3,292	3,292	3,292	3,292	3,292	3,292
	Carrizo			3,587	3,380	3,179	2,744	2,571	2,403
	Sparta			144	136	128	304	285	266
	Queen City			44	41	39	92	86	81
Total Irrigation Supply				7,067	6,849	6,638	6,433	6,234	6,042
Irrigation Surplus/Shortage									
Nueces Basin				0	0	0	0	0	0
Total Irrigation Surplus/Shortage				0	0	0	0	0	0
Mining Demand									
Nueces Basin		0	0	0	0	0	0	0	0
Total Mining Demand		0	0	0	0	0	0	0	0
Mining Supply									
Nueces Basin				0	0	0	0	0	0
Total Mining Supply				0	0	0	0	0	0
Mining Surplus/Shortage									
Nueces Basin				0	0	0	0	0	0
Total Mining Surplus/Shortage				0	0	0	0	0	0
Livestock Demand									
Nueces Basin		988	574	1,077	1,077	1,077	1,077	1,077	1,077
Total Livestock Demand		988	574	1,077	1,077	1,077	1,077	1,077	1,077
Livestock Supply									
Nueces Basin	Local	988	574	1,077	1,077	1,077	1,077	1,077	1,077
Total Livestock Supply		988	574	1,077	1,077	1,077	1,077	1,077	1,077
Livestock Surplus/Shortage									
Nueces Basin		0	0	0	0	0	0	0	0
Total Livestock Surplus/Shortage		0	0	0	0	0	0	0	0
Total La Salle County Demand									
Municipal		1,233	1,386	1,372	1,391	1,392	1,422	1,459	1,486
Industrial		0	0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		7,292	7,209	7,067	6,849	6,638	6,433	6,234	6,042
Mining		0	0	0	0	0	0	0	0
Livestock		988	574	1,077	1,077	1,077	1,077	1,077	1,077
Total County Demand		9,513	9,169	9,516	9,317	9,107	8,932	8,770	8,605

Table 4-15
Projected Water Demands, Supplies, and Needs
LaSalle County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Total La Salle County Supply									
Municipal				1,759	1,759	1,759	1,759	1,759	1,759
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				7,067	6,849	6,638	6,433	6,234	6,042
Mining				0	0	0	0	0	0
Livestock				1,077	1,077	1,077	1,077	1,077	1,077
Total County Supply				9,903	9,685	9,474	9,269	9,070	8,878
Total La Salle County Surplus/Shortage									
Municipal				387	368	367	337	300	273
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				0	0	0	0	0	0
Mining				0	0	0	0	0	0
Livestock				0	0	0	0	0	0
Total County Surplus/Shortage				387	368	367	337	300	273
Total Basin Demand									
Nueces									
Municipal		1,233	1,386	1,372	1,391	1,392	1,422	1,459	1,486
Industrial		0	0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		7,292	7,209	7,067	6,849	6,638	6,433	6,234	6,042
Mining		0	0	0	0	0	0	0	0
Livestock		988	574	1,077	1,077	1,077	1,077	1,077	1,077
Total Nueces Basin Demand		9,513	9,169	9,516	9,317	9,107	8,932	8,770	8,605
Total Basin Supply									
Nueces									
Municipal				1,759	1,759	1,759	1,759	1,759	1,759
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				7,067	6,849	6,638	6,433	6,234	6,042
Mining				0	0	0	0	0	0
Livestock				1,077	1,077	1,077	1,077	1,077	1,077
Unallocated Groundwater Supply				31,101	31,319	31,530	9,556	9,755	9,947
Total Nueces Basin Supply				41,004	41,004	41,004	18,825	18,825	18,825
Total Basin Surplus/Shortage									
Nueces									
Municipal				387	368	367	337	300	273
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				0	0	0	0	0	0
Mining				0	0	0	0	0	0
Livestock				0	0	0	0	0	0
Unallocated Groundwater Supply				31,101	31,319	31,530	9,556	9,755	9,947
Total Nueces Basin Surplus/Shortage				31,488	31,687	31,897	9,893	10,055	10,220
Groundwater Supplies									
Available									
Nueces	Carrizo			34,810	34,810	34,810	12,631	12,631	12,631
Nueces	Sparta			1,400	1,400	1,400	1,400	1,400	1,400
Nueces	Queen City			425	425	425	425	425	425
Total Available				36,635	36,635	36,635	14,456	14,456	14,456
Allocated									
Nueces	Carrizo			5,326	5,119	4,918	4,453	4,279	4,111
Nueces	Sparta			160	151	143	343	324	305
Nueces	Queen City			48	46	43	104	98	93
Total Allocated				5,534	5,316	5,105	4,900	4,701	4,509
Total Unallocated				31,101	31,319	31,530	9,556	9,755	9,947

Table 4-16
Projected Water Demands, Supplies, and Needs
Medina County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Municipal Demand										
Nueces Basin										
Devine			630	755	953	943	940	964	987	1,005
Hondo			1,456	1,777	2,032	2,092	2,164	2,263	2,327	2,393
Lytle			73	90	92	89	87	88	90	92
Natalia			294	283	397	408	422	440	452	464
Rural			1,535	2,158	1,961	2,038	2,075	2,197	2,272	2,416
	Subtotal		3,988	5,063	5,435	5,570	5,688	5,952	6,128	6,370
San Antonio Basin										
Castroville			779	670	958	985	1,013	1,061	1,092	1,123
La Coste			229	213	278	299	300	326	345	365
Rural			258	468	441	458	466	493	509	540
	Subtotal		1,266	1,351	1,677	1,742	1,779	1,880	1,946	2,028
Total Municipal Demand			5,254	6,414	7,112	7,312	7,467	7,832	8,074	8,398
Municipal Existing Supply										
Nueces Basin										
Devine		Edwards			287	287	287	287	287	287
Hondo		Edwards			1,109	1,109	1,109	1,109	1,109	1,109
Lytle		Edwards			41	41	41	41	41	41
Natalia	Estimated	Carrizo			510	510	510	510	510	510
Rural		Edwards			668	668	668	668	668	668
		Carrizo			1,585	1,585	1,585	1,372	1,372	1,372
		Trinity			163	163	163	376	376	376
Rural Subtotal					2,416	2,416	2,416	2,416	2,416	2,416
	Subtotal				4,363	4,363	4,363	4,363	4,363	4,363
San Antonio Basin										
Castroville		Edwards			730	730	730	730	730	730
La Coste		Edwards			131	131	131	131	131	131
Rural		Edwards			316	316	316	316	316	316
		Carrizo			20	20	20	8	8	8
		Trinity			146	146	146	146	146	146
Rural Subtotal					482	482	482	470	470	470
	Subtotal				1,343	1,343	1,343	1,331	1,331	1,331
Total Municipal Existing Supply					5,706	5,706	5,706	5,694	5,694	5,694
Municipal Surplus/Shortage										
Nueces Basin										
Devine					-666	-656	-653	-677	-700	-718
Hondo					-923	-983	-1,055	-1,154	-1,218	-1,284
Lytle					-51	-48	-46	-47	-49	-51
Natalia					113	102	88	70	58	46
Rural					455	378	341	219	144	0
	Subtotal				-1,072	-1,207	-1,325	-1,589	-1,765	-2,007
San Antonio Basin										
Castroville					-228	-255	-283	-331	-362	-393
La Coste					-147	-168	-169	-195	-214	-234
Rural					41	24	16	-23	-39	-70
	Subtotal				-334	-399	-436	-549	-615	-697
Total Municipal Surplus/Shortage					-1,406	-1,606	-1,761	-2,138	-2,380	-2,704

Table 4-16
Projected Water Demands, Supplies, and Needs
Medina County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Municipal New Supply Need										
Nueces Basin										
Devine					666	656	653	677	700	718
Hondo					923	983	1,055	1,154	1,218	1,284
Lytle					51	48	46	47	49	51
Natalia					0	0	0	0	0	0
Rural					0	0	0	0	0	0
	Subtotal				1,640	1,687	1,754	1,878	1,967	2,053
San Antonio Basin										
Castroville					228	255	283	331	362	393
Lacoste					147	168	169	195	214	234
Rural					0	0	0	23	39	70
	Subtotal				375	423	452	549	615	697
Total Municipal New Supply Need					2,015	2,110	2,206	2,427	2,582	2,750
Industrial Demand										
Nueces Basin			286	47	302	319	339	361	384	411
San Antonio Basin			0	0	0	0	0	0	0	0
Total Industrial Demand			286	47	302	319	339	361	384	411
Industrial Existing Supply										
Nueces Basin		Edwards			825	825	825	825	825	825
San Antonio Basin					0	0	0	0	0	0
Total Industrial Existing Supply					825	825	825	825	825	825
Industrial Surplus/Shortage										
Nueces Basin					523	506	486	464	441	414
San Antonio Basin					0	0	0	0	0	0
Total Industrial Surplus/Shortage					523	506	486	464	441	414
Industrial New Supply Need										
Nueces Basin					0	0	0	0	0	0
San Antonio Basin					0	0	0	0	0	0
Total Industrial New Supply Need					0	0	0	0	0	0
Steam-Electric Demand										
Nueces Basin			0	0	0	0	0	0	0	0
San Antonio Basin			0	0	0	0	0	0	0	0
Total Steam-Electric Demand			0	0	0	0	0	0	0	0
Steam-Electric Existing Supply										
Nueces Basin					0	0	0	0	0	0
San Antonio Basin					0	0	0	0	0	0
Total Steam-Electric Existing Supply					0	0	0	0	0	0
Steam-Electric Surplus/Shortage										
Nueces Basin					0	0	0	0	0	0
San Antonio Basin					0	0	0	0	0	0
Total Steam-Electric Surplus/Shortage					0	0	0	0	0	0
Steam-Electric New Supply Need										
Nueces Basin					0	0	0	0	0	0
San Antonio Basin					0	0	0	0	0	0
Total Steam-Electric New Supply Need					0	0	0	0	0	0
Irrigation Demand										
Nueces Basin			133,196	69,573	120,332	115,260	110,402	105,749	101,291	97,022
San Antonio Basin			24,184	16,783	24,081	23,322	22,402	21,521	20,678	19,869
Total Irrigation Demand			157,380	86,356	144,413	138,582	132,804	127,270	121,969	116,891

Table 4-16
Projected Water Demands, Supplies, and Needs
Medina County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Irrigation Supply									
Nueces Basin	Edwards			46,624	46,624	46,624	46,624	46,624	46,624
	Carrizo			4,783	4,797	4,798	682	681	679
	Trinity			544	545	546	326	326	326
Nueces Basin Subtotal				51,951	51,966	51,968	47,632	47,631	47,629
San Antonio Basin	Edwards			14,244	14,244	14,244	14,244	14,244	14,244
	Run-of-River			12	12	12	12	12	12
San Antonio Basin Subtotal				14,256	14,256	14,256	14,256	14,256	14,256
Total Irrigation Supply				66,207	66,222	66,224	61,888	61,887	61,885
Irrigation Surplus/Shortage									
Nueces Basin				-68,381	-63,294	-58,434	-58,117	-53,660	-49,393
San Antonio Basin				-9,825	-9,066	-8,146	-7,265	-6,422	-5,613
Total Irrigation Surplus/Shortage				-78,206	-72,360	-66,580	-65,382	-60,082	-55,006
Mining Demand									
Nueces Basin		67	62	75	60	58	57	58	60
San Antonio Basin		53	56	68	68	70	72	74	76
Total Mining Demand		120	118	143	128	128	129	132	136
Mining Supply									
Nueces Basin	Carrizo			68	54	53	45	46	47
	Trinity			7	6	5	12	12	13
Subtotal				75	60	58	57	58	60
San Antonio Basin	Carrizo			0	0	0	0	0	0
	Trinity			0	0	0	0	0	0
Subtotal				0	0	0	0	0	0
Total Mining Supply				75	60	58	57	58	60
Mining Surplus/Shortage									
Nueces Basin				0	0	0	0	0	0
San Antonio Basin				-68	-68	-70	-72	-74	-76
Total Mining Surplus/Shortage				-68	-68	-70	-72	-74	-76
Livestock Demand									
Nueces Basin		1,336	1,648	1,638	1,638	1,638	1,638	1,638	1,638
San Antonio Basin		224	277	276	276	276	276	276	276
Total Livestock Demand		1,560	1,925	1,914	1,914	1,914	1,914	1,914	1,914
Livestock Supply									
Nueces Basin	Local	1,336	1,648	1,638	1,638	1,638	1,638	1,638	1,638
San Antonio Basin	Local	224	277	276	276	276	276	276	276
Total Livestock Supply		1,560	1,925	1,914	1,914	1,914	1,914	1,914	1,914
Livestock Surplus/Shortage									
Nueces Basin		0	0	0	0	0	0	0	0
San Antonio Basin		0	0	0	0	0	0	0	0
Total Livestock Surplus/Shortage		0	0	0	0	0	0	0	0
Total Medina County Demand									
Municipal		5,254	6,414	7,112	7,312	7,467	7,832	8,074	8,398
Industrial		286	47	302	319	339	361	384	411
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		157,380	86,356	144,413	138,582	132,804	127,270	121,969	116,891
Mining		120	118	143	128	128	129	132	136
Livestock		1,560	1,925	1,914	1,914	1,914	1,914	1,914	1,914
Total County Demand		164,600	94,860	153,884	148,255	142,652	137,506	132,473	127,750

Table 4-16
Projected Water Demands, Supplies, and Needs
Medina County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Total Medina County Supply									
Municipal				5,706	5,706	5,706	5,694	5,694	5,694
Industrial				825	825	825	825	825	825
Steam-Electric				0	0	0	0	0	0
Irrigation				66,207	66,222	66,224	61,888	61,887	61,885
Mining				75	60	58	57	58	60
Livestock				1,914	1,914	1,914	1,914	1,914	1,914
Total County Supply				74,727	74,727	74,727	70,378	70,378	70,378
Total Medina County Surplus/Shortage									
Municipal				-1,406	-1,606	-1,761	-2,138	-2,380	-2,704
Industrial				523	506	486	464	441	414
Steam-Electric				0	0	0	0	0	0
Irrigation				-78,206	-72,360	-66,580	-65,382	-60,082	-55,006
Mining				-68	-68	-70	-72	-74	-76
Livestock				0	0	0	0	0	0
Total County Surplus/Shortage				-79,157	-73,528	-67,925	-67,128	-62,095	-57,372
Total Basin Demand									
Nueces									
Municipal		3,988	5,063	5,435	5,570	5,688	5,952	6,128	6,370
Industrial		286	47	302	319	339	361	384	411
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		133,196	69,573	120,332	115,260	110,402	105,749	101,291	97,022
Mining		67	62	75	60	58	57	58	60
Livestock		1,336	1,648	1,638	1,638	1,638	1,638	1,638	1,638
Total Nueces Basin Demand		138,873	76,393	127,782	122,847	118,125	113,757	109,499	105,501
San Antonio									
Municipal		1,266	1,351	1,677	1,742	1,779	1,880	1,946	2,028
Industrial		0	0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		24,184	16,783	24,081	23,322	22,402	21,521	20,678	19,869
Mining		53	56	68	68	70	72	74	76
Livestock		224	277	276	276	276	276	276	276
Total San Antonio Basin Demand		25,727	18,467	26,102	25,408	24,527	23,749	22,974	22,249
Total Basin Supply									
Nueces									
Municipal				4,363	4,363	4,363	4,363	4,363	4,363
Industrial				825	825	825	825	825	825
Steam-Electric				0	0	0	0	0	0
Irrigation				51,951	51,966	51,968	47,632	47,631	47,629
Mining				75	60	58	57	58	60
Livestock				1,638	1,638	1,638	1,638	1,638	1,638
Total Nueces Basin Supply				58,852	58,852	58,852	54,515	54,515	54,515
San Antonio									
Municipal				1,343	1,343	1,343	1,331	1,331	1,331
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				14,256	14,256	14,256	14,256	14,256	14,256
Mining				0	0	0	0	0	0
Livestock				276	276	276	276	276	276
Total San Antonio Basin Supply				15,875	15,875	15,875	15,863	15,863	15,863

Table 4-16
Projected Water Demands, Supplies, and Needs
Medina County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Total Basin Surplus/Shortage										
Nueces										
Municipal					-1,072	-1,207	-1,325	-1,589	-1,765	-2,007
Industrial					523	506	486	464	441	414
Steam-Electric					0	0	0	0	0	0
Irrigation					-68,381	-63,294	-58,434	-58,117	-53,660	-49,393
Mining					0	0	0	0	0	0
Livestock					0	0	0	0	0	0
Total Nueces Basin Surplus/Shortage					-68,930	-63,995	-59,273	-59,242	-54,984	-50,986
San Antonio										
Municipal					-334	-399	-436	-549	-615	-697
Industrial					0	0	0	0	0	0
Steam-Electric					0	0	0	0	0	0
Irrigation					-9,825	-9,066	-8,146	-7,265	-6,422	-5,613
Mining					-68	-68	-70	-72	-74	-76
Livestock					0	0	0	0	0	0
Total San Antonio Basin Surplus/Shortage					-10,227	-9,533	-8,652	-7,886	-7,111	-6,386
Groundwater Supplies										
	Available									
	Nueces	Edwards			49,554	49,554	49,554	49,554	49,554	49,554
	San Antonio	Edwards			15,421	15,421	15,421	15,421	15,421	15,421
	Nueces	Carrizo			6,946	6,946	6,946	2,609	2,609	2,609
	San Antonio	Carrizo			20	20	20	8	8	8
	Nueces	Trinity			714	714	714	714	714	714
	San Antonio	Trinity			146	146	146	146	146	146
	Total Available				72,801	72,801	72,801	68,452	68,452	68,452
	Allocated									
	Nueces	Edwards			49,554	49,554	49,554	49,554	49,554	49,554
	San Antonio	Edwards			15,421	15,421	15,421	15,421	15,421	15,421
	Nueces	Carrizo			6,946	6,946	6,946	2,609	2,609	2,609
	San Antonio	Carrizo			20	20	20	8	8	8
	Nueces	Trinity			714	714	714	714	714	714
	San Antonio	Trinity			146	146	146	146	146	146
	Total Allocated				72,801	72,801	72,801	68,452	68,452	68,452
	Total Unallocated				0	0	0	0	0	0

Table 4-17
Projected Water Demands, Supplies, and Needs
Refugio County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Municipal Demand										
San Antonio Basin										
Rural			11	10	10	9	9	8	8	8
	Subtotal		11	10	10	9	9	8	8	8
San Antonio-Nueces Coastal Basin										
Refugio			569	616	638	626	608	604	599	589
Woodsboro			309	261	328	317	304	298	293	288
Rural			338	359	352	323	299	288	277	265
	Subtotal		1,216	1,236	1,318	1,266	1,211	1,190	1,169	1,142
Total Municipal Demand			1,227	1,246	1,328	1,275	1,220	1,198	1,177	1,150
Municipal Existing Supply										
San Antonio Basin										
Rural		Gulf Coast			10	10	10	10	10	10
	Subtotal				10	10	10	10	10	10
San Antonio-Nueces Coastal Basin										
Refugio		Gulf Coast			1,895	1,895	1,895	1,895	1,895	1,895
Woodsboro		Gulf Coast			468	468	468	468	468	468
Rural		Gulf Coast			352	352	352	352	352	352
	Subtotal				2,715	2,715	2,715	2,715	2,715	2,715
Total Municipal Existing Supply					2,725	2,725	2,725	2,725	2,725	2,725
Municipal Surplus/Shortage										
San Antonio Basin										
Rural					0	1	1	2	2	2
	Subtotal				0	1	1	2	2	2
San Antonio-Nueces Coastal Basin										
Refugio					1,257	1,269	1,287	1,291	1,296	1,306
Woodsboro					140	151	164	170	175	180
Rural					0	29	53	64	75	87
	Subtotal				1,397	1,449	1,504	1,525	1,546	1,573
Total Municipal Surplus/Shortage					1,397	1,450	1,505	1,527	1,548	1,575
Municipal New Supply Need										
San Antonio Basin										
Rural					0	0	0	0	0	0
	Subtotal				0	0	0	0	0	0
San Antonio-Nueces Coastal Basin										
Refugio					0	0	0	0	0	0
Woodsboro					0	0	0	0	0	0
Rural					0	0	0	0	0	0
	Subtotal				0	0	0	0	0	0
Total Municipal New Supply Need					0	0	0	0	0	0
Industrial Demand										
San Antonio Basin			0	0	0	0	0	0	0	0
San Antonio-Nueces Basin			0	0	0	0	0	0	0	0
Total Industrial Demand			0	0	0	0	0	0	0	0
Industrial Existing Supply										
San Antonio Basin					0	0	0	0	0	0
San Antonio-Nueces Basin					0	0	0	0	0	0
Total Industrial Existing Supply					0	0	0	0	0	0

Table 4-17
Projected Water Demands, Supplies, and Needs
Refugio County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Industrial Surplus/Shortage									
San Antonio Basin				0	0	0	0	0	0
San Antonio-Nueces Basin				0	0	0	0	0	0
Total Industrial Surplus/Shortage				0	0	0	0	0	0
Industrial New Supply Need									
San Antonio Basin				0	0	0	0	0	0
San Antonio-Nueces Basin				0	0	0	0	0	0
Total Industrial New Supply Need				0	0	0	0	0	0
Steam-Electric Demand									
San Antonio Basin		0	0	0	0	0	0	0	0
San Antonio-Nueces Basin		0	0	0	0	0	0	0	0
Total Steam-Electric Demand		0	0	0	0	0	0	0	0
Steam-Electric Existing Supply									
San Antonio Basin				0	0	0	0	0	0
San Antonio-Nueces Basin				0	0	0	0	0	0
Total Steam-Electric Existing Supply				0	0	0	0	0	0
Steam-Electric Surplus/Shortage									
San Antonio Basin				0	0	0	0	0	0
San Antonio-Nueces Basin				0	0	0	0	0	0
Total Steam-Electric Surplus/Shortage				0	0	0	0	0	0
Steam-Electric New Supply Need									
San Antonio Basin				0	0	0	0	0	0
San Antonio-Nueces Basin				0	0	0	0	0	0
Total Steam-Electric New Supply Need				0	0	0	0	0	0
Irrigation Demand									
San Antonio Basin		0	0	0	0	0	0	0	0
San Antonio-Nueces Basin		0	0	0	0	0	0	0	0
Total Irrigation Demand		0	0	0	0	0	0	0	0
Irrigation Supply									
San Antonio Basin				0	0	0	0	0	0
San Antonio-Nueces Basin				0	0	0	0	0	0
Total Irrigation Supply				0	0	0	0	0	0
Irrigation Surplus/Shortage									
San Antonio Basin				0	0	0	0	0	0
San Antonio-Nueces Basin				0	0	0	0	0	0
Total Irrigation Surplus/Shortage				0	0	0	0	0	0
Mining Demand									
San Antonio Basin		0	0	0	0	0	0	0	0
San Antonio-Nueces Basin		77	112	44	26	19	11	4	4
Total Mining Demand		77	112	44	26	19	11	4	4
Mining Supply									
San Antonio Basin				0	0	0	0	0	0
San Antonio-Nueces Basin	Gulf Coast			44	26	19	11	4	4
Total Mining Supply				44	26	19	11	4	4
Mining Surplus/Shortage									
San Antonio Basin				0	0	0	0	0	0
San Antonio-Nueces Basin				0	0	0	0	0	0
Total Mining Surplus/Shortage				0	0	0	0	0	0

Table 4-17
Projected Water Demands, Supplies, and Needs
Refugio County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Livestock Demand									
San Antonio Basin		21	19	16	16	16	16	16	16
San Antonio-Nueces Basin		542	476	391	391	391	391	391	391
Total Livestock Demand		563	495	407	407	407	407	407	407
Livestock Supply									
San Antonio Basin	Local	21	19	16	16	16	16	16	16
San Antonio-Nueces Basin	Local	542	476	391	391	391	391	391	391
Total Livestock Supply		563	495	407	407	407	407	407	407
Livestock Surplus/Shortage									
San Antonio Basin		0	0	0	0	0	0	0	0
San Antonio-Nueces Basin		0	0	0	0	0	0	0	0
Total Livestock Surplus/Shortage		0	0	0	0	0	0	0	0
Total Refugio County Demand									
Municipal		1,227	1,246	1,328	1,275	1,220	1,198	1,177	1,150
Industrial		0	0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		0	0	0	0	0	0	0	0
Mining		77	112	44	26	19	11	4	4
Livestock		563	495	407	407	407	407	407	407
Total County Demand		1,867	1,853	1,779	1,708	1,646	1,616	1,588	1,561
Total Refugio County Supply									
Municipal				2,725	2,725	2,725	2,725	2,725	2,725
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				0	0	0	0	0	0
Mining				44	26	19	11	4	4
Livestock				407	407	407	407	407	407
Total County Supply				3,176	3,158	3,151	3,143	3,136	3,136
Total Refugio County Surplus/Shortage									
Municipal				1,397	1,450	1,505	1,527	1,548	1,575
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				0	0	0	0	0	0
Mining				0	0	0	0	0	0
Livestock				0	0	0	0	0	0
Total County Surplus/Shortage				1,397	1,450	1,505	1,527	1,548	1,575
Total Basin Demand									
San Antonio									
Municipal		11	10	10	9	9	8	8	8
Industrial		0	0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		0	0	0	0	0	0	0	0
Mining		0	0	0	0	0	0	0	0
Livestock		21	19	16	16	16	16	16	16
Total San Antonio Basin Demand		32	29	26	25	25	24	24	24
San Antonio-Nueces									
Municipal		1,216	1,236	1,318	1,266	1,211	1,190	1,169	1,142
Industrial		0	0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		0	0	0	0	0	0	0	0
Mining		77	112	44	26	19	11	4	4
Livestock		542	476	391	391	391	391	391	391
Total San Antonio-Nueces Basin Demand		1,835	1,824	1,753	1,683	1,621	1,592	1,564	1,537

Table 4-17
Projected Water Demands, Supplies, and Needs
Refugio County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Total Basin Supply										
San Antonio										
Municipal					10	10	10	10	10	10
Industrial					0	0	0	0	0	0
Steam-Electric					0	0	0	0	0	0
Irrigation					0	0	0	0	0	0
Mining					0	0	0	0	0	0
Livestock					16	16	16	16	16	16
Unallocated Groundwater Supply					350	350	350	350	350	350
Total San Antonio Basin Supply					376	376	376	376	376	376
San Antonio-Nueces										
Municipal					2,715	2,715	2,715	2,715	2,715	2,715
Industrial					0	0	0	0	0	0
Steam-Electric					0	0	0	0	0	0
Irrigation					0	0	0	0	0	0
Mining					44	26	19	11	4	4
Livestock					391	391	391	391	391	391
Unallocated Groundwater Supply					4,649	4,667	4,674	4,682	4,689	4,689
Total San Antonio-Nueces Basin Supply					7,799	7,799	7,799	7,799	7,799	7,799
Total Basin Surplus/Shortage										
San Antonio										
Municipal					0	1	1	2	2	2
Industrial					0	0	0	0	0	0
Steam-Electric					0	0	0	0	0	0
Irrigation					0	0	0	0	0	0
Mining					0	0	0	0	0	0
Livestock					0	0	0	0	0	0
Unallocated Groundwater Supply					350	350	350	350	350	350
Total San Antonio Basin Surplus/Shortage					350	351	351	352	352	352
San Antonio-Nueces										
Municipal					1,397	1,449	1,504	1,525	1,546	1,573
Industrial					0	0	0	0	0	0
Steam-Electric					0	0	0	0	0	0
Irrigation					0	0	0	0	0	0
Mining					0	0	0	0	0	0
Livestock					0	0	0	0	0	0
Unallocated Groundwater Supply					4,649	4,667	4,674	4,682	4,689	4,689
Total San Antonio Basin-Nueces Surplus/Shortage					6,046	6,116	6,178	6,207	6,235	6,262
Groundwater Supplies										
	Available									
	San Antonio	Gulf Coast			360	360	360	360	360	360
	San Antonio-Nueces	Gulf Coast			7,408	7,408	7,408	7,408	7,408	7,408
	Total Available				7,768	7,768	7,768	7,768	7,768	7,768
	Allocated									
	San Antonio	Gulf Coast			10	10	10	10	10	10
	San Antonio-Nueces	Gulf Coast			2,759	2,741	2,734	2,726	2,719	2,719
	Total Allocated				2,769	2,751	2,744	2,736	2,729	2,729
	Total Unallocated				4,999	5,017	5,024	5,032	5,039	5,039

Table 4-18
Projected Water Demands, Supplies, and Needs
Uvalde County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Municipal Demand										
Nueces Basin										
Sabinal			381	454	510	546	573	632	683	739
Uvalde			3,915	4,435	5,173	5,621	5,921	6,610	7,198	7,871
Rural			982	1,248	1,027	907	823	777	737	661
	Subtotal		5,278	6,137	6,710	7,074	7,317	8,019	8,618	9,271
Total Municipal Demand			5,278	6,137	6,710	7,074	7,317	8,019	8,618	9,271
Municipal Existing Supply										
Nueces Basin										
Sabinal		Edwards			263	263	263	263	263	263
Uvalde		Edwards			2,738	2,738	2,738	2,738	2,738	2,738
Rural		Edwards			81	81	81	81	81	81
		Carrizo			512	512	512	284	284	284
		ETPlateau			367	367	367	560	560	560
		Trinity			67	67	67	102	102	102
Rural Subtotal					1,027	1,027	1,027	1,027	1,027	1,027
	Subtotal				4,028	4,028	4,028	4,028	4,028	4,028
Total Municipal Existing Supply					4,028	4,028	4,028	4,028	4,028	4,028
Municipal Surplus/Shortage										
Nueces Basin										
Sabinal					-247	-283	-310	-369	-420	-476
Uvalde					-2,435	-2,883	-3,183	-3,872	-4,460	-5,133
Rural					0	120	204	250	290	366
	Subtotal				-2,682	-3,046	-3,289	-3,991	-4,590	-5,243
Total Municipal Surplus/Shortage					-2,682	-3,046	-3,289	-3,991	-4,590	-5,243
Municipal New Supply Need										
Nueces Basin										
Sabinal					247	283	310	369	420	476
Uvalde					2,435	2,883	3,183	3,872	4,460	5,133
Rural					0	0	0	0	0	0
	Subtotal				2,682	3,166	3,493	4,241	4,880	5,609
Total Municipal New Supply Need					2,682	3,166	3,493	4,241	4,880	5,609
Industrial Demand										
Nueces Basin			557	337	600	643	675	700	759	817
Total Industrial Demand			557	337	600	643	675	700	759	817
Industrial Existing Supply										
Nueces Basin		Edwards			1,110	1,110	1,110	1,110	1,110	1,110
Total Industrial Existing Supply					1,110	1,110	1,110	1,110	1,110	1,110
Industrial Surplus/Shortage										
Nueces Basin					510	467	435	410	351	293
Total Industrial Surplus/Shortage					510	467	435	410	351	293
Industrial New Supply Need										
Nueces Basin					0	0	0	0	0	0
Total Industrial New Supply Need					0	0	0	0	0	0
Steam-Electric Demand										
Nueces Basin			0	0	0	0	0	0	0	0
Total Steam-Electric Demand			0	0	0	0	0	0	0	0

Table 4-18
Projected Water Demands, Supplies, and Needs
Uvalde County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Steam-Electric Existing Supply									
Nueces Basin				0	0	0	0	0	0
Total Steam-Electric Existing Supply				0	0	0	0	0	0
Steam-Electric Surplus/Shortage									
Nueces Basin				0	0	0	0	0	0
Total Steam-Electric Surplus/Shortage				0	0	0	0	0	0
Steam-Electric New Supply Need									
Nueces Basin				0	0	0	0	0	0
Total Steam-Electric New Supply Need				0	0	0	0	0	0
Irrigation Demand									
Nueces Basin		140,669	84,588	135,168	129,883	124,804	119,924	115,234	110,728
Total Irrigation Demand		140,669	84,588	135,168	129,883	124,804	119,924	115,234	110,728
Irrigation Supply									
Nueces Basin	Edwards			78,563	78,563	78,563	78,563	78,563	78,563
	Carrizo			3,695	3,704	3,665	1,157	1,130	1,097
	ETPlateau			2,646	2,652	2,625	2,284	2,231	2,165
	Trinity			482	483	478	416	406	290
	Run-of-River			1,231	1,231	1,231	1,231	1,231	1,231
Total Irrigation Supply				86,617	86,633	86,562	83,651	83,561	83,346
Irrigation Surplus/Shortage									
Nueces Basin				-48,551	-43,250	-38,242	-36,273	-31,673	-27,382
Total Irrigation Surplus/Shortage				-48,551	-43,250	-38,242	-36,273	-31,673	-27,382
Mining Demand									
Nueces Basin		399	521	444	428	499	576	666	777
Total Mining Demand		399	521	444	428	499	576	666	777
Mining Supply									
Nueces Basin	Carrizo			240	232	270	173	200	233
	ETPlateau			172	166	194	341	394	460
	Trinity			31	30	35	62	72	84
Total Mining Supply				444	428	499	576	666	777
Mining Surplus/Shortage									
Nueces Basin				0	0	0	0	0	0
Total Mining Surplus/Shortage				0	0	0	0	0	0
Livestock Demand									
Nueces Basin		994	1,864	1,494	1,494	1,494	1,494	1,494	1,494
Total Livestock Demand		994	1,864	1,494	1,494	1,494	1,494	1,494	1,494
Livestock Supply									
Nueces Basin	Local	994	1,864	1,494	1,494	1,494	1,494	1,494	1,494
Total Livestock Supply		994	1,864	1,494	1,494	1,494	1,494	1,494	1,494
Livestock Surplus/Shortage									
Nueces Basin		0	0	0	0	0	0	0	0
Total Livestock Surplus/Shortage		0	0	0	0	0	0	0	0
Total Uvalde County Demand									
Municipal		5,278	6,137	6,710	7,074	7,317	8,019	8,618	9,271
Industrial		557	337	600	643	675	700	759	817
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		140,669	84,588	135,168	129,883	124,804	119,924	115,234	110,728
Mining		399	521	444	428	499	576	666	777
Livestock		994	1,864	1,494	1,494	1,494	1,494	1,494	1,494
Total County Demand		147,897	93,447	144,416	139,522	134,789	130,713	126,771	123,087

Table 4-18
Projected Water Demands, Supplies, and Needs
Uvalde County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Total Uvalde County Supply										
Municipal					4,028	4,028	4,028	4,028	4,028	4,028
Industrial					1,110	1,110	1,110	1,110	1,110	1,110
Steam-Electric					0	0	0	0	0	0
Irrigation					86,617	86,633	86,562	83,651	83,561	83,346
Mining					444	428	499	576	666	777
Livestock					1,494	1,494	1,494	1,494	1,494	1,494
Total County Supply					93,693	93,693	93,693	90,859	90,859	90,755
Total Uvalde County Surplus/Shortage										
Municipal					-2,682	-3,046	-3,289	-3,991	-4,590	-5,243
Industrial					510	467	435	410	351	293
Steam-Electric					0	0	0	0	0	0
Irrigation					-48,551	-43,250	-38,242	-36,273	-31,673	-27,382
Mining					0	0	0	0	0	0
Livestock					0	0	0	0	0	0
Total County Surplus/Shortage					-50,723	-45,829	-41,096	-39,854	-35,912	-32,332
Total Basin Demand										
Nueces										
Municipal			5,278	6,137	6,710	7,074	7,317	8,019	8,618	9,271
Industrial			557	337	600	643	675	700	759	817
Steam-Electric			0	0	0	0	0	0	0	0
Irrigation			140,669	84,588	135,168	129,883	124,804	119,924	115,234	110,728
Mining			399	521	444	428	499	576	666	777
Livestock			994	1,864	1,494	1,494	1,494	1,494	1,494	1,494
Total Nueces Basin Demand			147,897	93,447	144,416	139,522	134,789	130,713	126,771	123,087
Total Basin Supply										
Nueces										
Municipal					4,028	4,028	4,028	4,028	4,028	4,028
Industrial					1,110	1,110	1,110	1,110	1,110	1,110
Steam-Electric					0	0	0	0	0	0
Irrigation					86,617	86,633	86,562	83,651	83,561	83,346
Mining					444	428	499	576	666	777
Livestock					1,494	1,494	1,494	1,494	1,494	1,494
Total Nueces Basin Supply					93,693	93,693	93,693	90,859	90,859	90,755
Total Basin Surplus/Shortage										
Nueces										
Municipal					-2,682	-3,046	-3,289	-3,991	-4,590	-5,243
Industrial					510	467	435	410	351	293
Steam-Electric					0	0	0	0	0	0
Irrigation					-48,551	-43,250	-38,242	-36,273	-31,673	-27,382
Mining					0	0	0	0	0	0
Livestock					0	0	0	0	0	0
Total Nueces Basin Surplus/Shortage					-50,723	-45,829	-41,096	-39,854	-35,912	-32,332
Groundwater Supplies										
	Available									
	Nueces	Edwards			82,755	82,755	82,755	82,755	82,755	82,755
	Nueces	Carrizo			4,448	4,448	4,448	1,614	1,614	1,614
	Nueces	Edwards-Trinity			3,185	3,185	3,185	3,185	3,185	3,185
	Nueces	Trinity			580	580	580	580	580	476
	Total Available				90,968	90,968	90,968	88,134	88,134	88,030
	Allocated									
	Nueces	Edwards			82,755	82,755	82,755	82,755	82,755	82,755
	Nueces	Carrizo			4,448	4,448	4,448	1,614	1,614	1,614
	Nueces	Edwards-Trinity			3,185	3,185	3,185	3,185	3,185	3,185
	Nueces	Trinity			580	580	580	580	580	476
	Total Allocated				90,968	90,968	90,968	88,134	88,134	88,030
	Total Unallocated				0	0	0	0	0	0

Table 4-19
Projected Water Demands, Supplies, and Needs
Victoria County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Municipal Demand										
San Antonio Basin										
Rural			34	19	34	33	32	33	34	37
	Subtotal		34	19	34	33	32	33	34	37
Guadalupe Basin										
Victoria			7,269	8,922	8,345	8,533	8,762	9,304	9,927	10,590
Rural			1,220	1,201	1,195	1,141	1,109	1,151	1,188	1,290
	Subtotal		8,489	10,123	9,540	9,674	9,871	10,455	11,115	11,880
Lavaca Basin										
Rural			21	23	22	22	23	23	23	25
	Subtotal		21	23	22	22	23	23	23	25
Lavaca-Guadalupe Coastal Basin										
Bloomington			181	258	269	268	281	316	343	373
Victoria			1,883	2,310	2,161	2,210	2,269	2,410	2,571	2,743
Rural			937	1,031	987	939	906	941	970	1,058
	Subtotal		3,001	3,599	3,417	3,417	3,456	3,667	3,884	4,174
Total Municipal Demand			11,545	13,764	13,013	13,146	13,382	14,178	15,056	16,116
Municipal Existing Supply										
San Antonio Basin										
Rural		Gulf Coast			37	37	37	37	37	37
	Subtotal				37	37	37	37	37	37
Guadalupe Basin										
Victoria [1]		Gulf Coast			7,331	7,589	8,681	9,576	9,576	9,576
		Run-of-River			1,048	1,048	1,048	1,048	1,048	1,048
Victoria Subtotal					8,379	8,637	9,729	10,624	10,624	10,624
Rural		Gulf Coast			1,284	1,284	1,284	1,284	1,284	1,284
		Run-of-River			6	6	6	6	6	6
Rural Subtotal					1,290	1,290	1,290	1,290	1,290	1,290
	Subtotal				9,669	9,927	11,019	11,914	11,914	11,914
Lavaca Basin										
Rural		Gulf Coast			25	25	25	25	25	25
	Subtotal				25	25	25	25	25	25
Lavaca-Guadalupe Coastal Basin										
Bloomington		Gulf Coast			565	565	565	565	565	565
Victoria [1]		Gulf Coast			3,256	3,256	3,256	3,256	3,256	3,256
		Run-of-River			272	272	272	272	272	272
Victoria Subtotal					3,528	3,528	3,528	3,528	3,528	3,528
Rural		Gulf Coast			1,058	1,058	1,058	1,058	1,058	1,058
	Subtotal				5,151	5,151	5,151	5,151	5,151	5,151
Total Municipal Existing Supply					14,882	15,140	16,232	17,127	17,127	17,127
Municipal Surplus/Shortage										
San Antonio Basin										
Rural					3	4	5	4	3	0
	Subtotal				3	4	5	4	3	0
Guadalupe Basin										
Victoria					34	104	967	1,320	697	34
Rural					95	149	181	139	102	0
	Subtotal				129	253	1,148	1,459	799	34
Lavaca Basin										
Rural					3	3	2	2	2	0
	Subtotal				3	3	2	2	2	0
Lavaca-Gudalupe Coastal Basin										
Bloomington					296	297	284	249	222	192
Victoria					1,367	1,318	1,259	1,118	957	785
Rural					71	119	152	117	88	0
	Subtotal				1,734	1,734	1,695	1,484	1,267	977
Total Municipal Surplus/Shortage					1,869	1,994	2,850	2,949	2,071	1,011

Table 4-19
Projected Water Demands, Supplies, and Needs
Victoria County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Municipal New Supply Need									
San Antonio Basin									
Rural				0	0	0	0	0	0
Subtotal				0	0	0	0	0	0
Guadalupe Basin									
Victoria				0	0	0	0	0	0
Rural				0	0	0	0	0	0
Subtotal				0	0	0	0	0	0
Lavaca Basin									
Rural				0	0	0	0	0	0
Subtotal				0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin									
Bloomington				0	0	0	0	0	0
Victoria				0	0	0	0	0	0
Rural				0	0	0	0	0	0
Subtotal				0	0	0	0	0	0
Total Municipal New Supply Need				0	0	0	0	0	0
Industrial Demand									
San Antonio Basin		0	0	0	0	0	0	0	0
Guadalupe Basin		20,032	19,587	24,115	28,446	31,157	33,670	37,900	42,201
Lavaca Basin		0	0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin		0	0	0	0	0	0	0	0
Total Industrial Demand		20,032	19,587	24,115	28,446	31,157	33,670	37,900	42,201
Industrial Existing Supply									
San Antonio Basin				0	0	0	0	0	0
Guadalupe Basin [1]	Run-of-River			35,324	35,324	35,324	35,324	35,324	35,324
	Gulf Coast			3,716	4,755	4,755	4,755	4,755	4,824
	Gulf Coast (Lavaca-Guad. CB)			2,053	2,053	2,053	2,053	2,053	2,053
Guadalupe Basin Subtotal				41,093	42,132	42,132	42,132	42,132	42,201
Lavaca Basin				0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin				0	0	0	0	0	0
Total Industrial Existing Supply				41,093	42,132	42,132	42,132	42,132	42,201
Industrial Surplus/Shortage									
San Antonio Basin				0	0	0	0	0	0
Guadalupe Basin				16,978	13,686	10,975	8,462	4,232	0
Lavaca Basin				0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin				0	0	0	0	0	0
Total Industrial Surplus/Shortage				16,978	13,686	10,975	8,462	4,232	0
Industrial New Supply Need									
San Antonio Basin				0	0	0	0	0	0
Guadalupe Basin				0	0	0	0	0	0
Lavaca Basin				0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin				0	0	0	0	0	0
Total Industrial New Supply Need				0	0	0	0	0	0
Steam-Electric Demand									
San Antonio Basin		0	0	0	0	0	0	0	0
Guadalupe Basin		887	1,893	8,000	10,000	10,000	10,000	10,000	10,000
Lavaca Basin		0	0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin		0	0	0	0	0	0	0	0
Total Steam-Electric Demand		887	1,893	8,000	10,000	10,000	10,000	10,000	10,000
Steam-Electric Existing Supply									
San Antonio Basin				0	0	0	0	0	0
Guadalupe Basin [1]	Run-of-River			1,900	1,900	1,900	1,900	1,900	1,900
	Gulf Coast			5,384	4,087	2,995	2,100	2,100	2,100
	Gulf Coast (Lavaca-Guad CB)			2,716	4,013	5,105	6,000	6,000	6,000
Guadalupe Basin Subtotal				10,000	10,000	10,000	10,000	10,000	10,000
Lavaca Basin				0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin				0	0	0	0	0	0
Total Steam-Electric Existing Supply				10,000	10,000	10,000	10,000	10,000	10,000

Table 4-19
Projected Water Demands, Supplies, and Needs
Victoria County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Steam-Electric Surplus/Shortage									
San Antonio Basin				0	0	0	0	0	0
Guadalupe Basin				2,000	0	0	0	0	0
Lavaca Basin				0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin				0	0	0	0	0	0
Total Steam-Electric Surplus/Shortage				2,000	0	0	0	0	0
Steam-Electric New Supply Need									
San Antonio Basin				0	0	0	0	0	0
Guadalupe Basin				0	0	0	0	0	0
Lavaca Basin				0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin				0	0	0	0	0	0
Total Steam-Electric New Supply Need				0	0	0	0	0	0
Irrigation Demand									
San Antonio Basin		0	0	0	0	0	0	0	0
Guadalupe Basin		1,995	1,672	1,723	1,487	1,284	1,108	956	825
Lavaca Basin		0	0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin		11,704	10,617	10,101	8,718	7,524	6,494	5,605	4,838
Total Irrigation Demand		13,699	12,289	11,824	10,205	8,808	7,602	6,561	5,663
Irrigation Supply									
San Antonio Basin				0	0	0	0	0	0
Guadalupe Basin [1]	Run-of-River			680	680	680	680	680	680
	Gulf Coast (Lavaca Basin)			246	246	246	246	181	50
	Gulf Coast (San Antonio Basin)			702	466	263	87	0	0
Guadalupe Basin Subtotal				1,628	1,392	1,189	1,013	861	730
Lavaca Basin				0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin	Gulf Coast			10,101	8,718	7,524	6,494	5,605	4,838
Total Irrigation Supply				11,729	10,110	8,713	7,507	6,466	5,568
Irrigation Surplus/Shortage									
San Antonio Basin				0	0	0	0	0	0
Guadalupe Basin				-95	-95	-95	-95	-95	-95
Lavaca Basin				0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin				0	0	0	0	0	0
Total Irrigation Surplus/Shortage				-95	-95	-95	-95	-95	-95
Mining Demand									
San Antonio Basin		0	0	0	0	0	0	0	0
Guadalupe Basin		2,398	2,596	1,938	1,302	904	783	675	688
Lavaca Basin		0	0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin		11	419	640	726	828	931	1,045	1,174
Total Mining Demand		2,409	3,015	2,578	2,028	1,732	1,714	1,720	1,862
Mining Supply									
San Antonio Basin				0	0	0	0	0	0
Guadalupe Basin [1]	Gulf Coast			959	959	904	783	675	688
	Gulf Coast (San Antonio Basin)			979	343	0	0	0	0
Guadalupe Basin Subtotal				1,938	1,302	904	783	675	688
Lavaca Basin				0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin	Gulf Coast			640	726	828	931	1,045	1,174
Total Mining Supply				2,578	2,028	1,732	1,714	1,720	1,862
Mining Surplus/Shortage									
San Antonio Basin				0	0	0	0	0	0
Guadalupe Basin				0	0	0	0	0	0
Lavaca Basin				0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin				0	0	0	0	0	0
Total Mining Surplus/Shortage				0	0	0	0	0	0

Table 4-19
Projected Water Demands, Supplies, and Needs
Victoria County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Livestock Demand									
San Antonio Basin		70	97	78	78	78	78	78	78
Guadalupe Basin		626	813	653	653	653	653	653	653
Lavaca Basin		6	8	7	7	7	7	7	7
Lavaca-Guadalupe Coastal Basin		569	822	660	660	660	660	660	660
Total Livestock Demand		1,271	1,740	1,398	1,398	1,398	1,398	1,398	1,398
Livestock Supply									
San Antonio Basin	Local	70	97	78	78	78	78	78	78
Guadalupe Basin	Local	626	813	653	653	653	653	653	653
Lavaca Basin	Local	6	8	7	7	7	7	7	7
Lavaca-Guadalupe Coastal Basin	Local	569	822	660	660	660	660	660	660
Total Livestock Supply		1,271	1,740	1,398	1,398	1,398	1,398	1,398	1,398
Livestock Surplus/Shortage									
San Antonio Basin		0	0	0	0	0	0	0	0
Guadalupe Basin		0	0	0	0	0	0	0	0
Lavaca Basin		0	0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin		0	0	0	0	0	0	0	0
Total Livestock Surplus/Shortage		0	0	0	0	0	0	0	0
Total Victoria County Demand									
Municipal		11,545	13,764	13,013	13,146	13,382	14,178	15,056	16,116
Industrial		20,032	19,587	24,115	28,446	31,157	33,670	37,900	42,201
Steam-Electric		887	1,893	8,000	10,000	10,000	10,000	10,000	10,000
Irrigation		13,699	12,289	11,824	10,205	8,808	7,602	6,561	5,663
Mining		2,409	3,015	2,578	2,028	1,732	1,714	1,720	1,862
Livestock		1,271	1,740	1,398	1,398	1,398	1,398	1,398	1,398
Total County Demand		49,843	52,288	60,928	65,223	66,477	68,562	72,635	77,240
Total Victoria County Supply									
Municipal				14,882	15,140	16,232	17,127	17,127	17,127
Industrial				41,093	42,132	42,132	42,132	42,132	42,201
Steam-Electric				10,000	10,000	10,000	10,000	10,000	10,000
Irrigation				11,729	10,110	8,713	7,507	6,466	5,568
Mining				2,578	2,028	1,732	1,714	1,720	1,862
Livestock				1,398	1,398	1,398	1,398	1,398	1,398
Total County Supply				81,680	80,808	80,207	79,878	78,843	78,156
Total Victoria County Surplus/Shortage									
Municipal				1,869	1,994	2,850	2,949	2,071	1,011
Industrial				16,978	13,686	10,975	8,462	4,232	0
Steam-Electric				2,000	0	0	0	0	0
Irrigation				-95	-95	-95	-95	-95	-95
Mining				0	0	0	0	0	0
Livestock				0	0	0	0	0	0
Total County Surplus/Shortage				20,752	15,585	13,730	11,316	6,208	916
Total Basin Demand									
San Antonio									
Municipal		34	19	34	33	32	33	34	37
Industrial		0	0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		0	0	0	0	0	0	0	0
Mining		0	0	0	0	0	0	0	0
Livestock		70	97	78	78	78	78	78	78
Total San Antonio Basin Demand		104	116	112	111	110	111	112	115

Table 4-19
Projected Water Demands, Supplies, and Needs
Victoria County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Guadalupe									
Municipal		8,489	10,123	9,540	9,674	9,871	10,455	11,115	11,880
Industrial		20,032	19,587	24,115	28,446	31,157	33,670	37,900	42,201
Steam-Electric		887	1,893	8,000	10,000	10,000	10,000	10,000	10,000
Irrigation		1,995	1,672	1,723	1,487	1,284	1,108	956	825
Mining		2,398	2,596	1,938	1,302	904	783	675	688
Livestock		626	813	653	653	653	653	653	653
Total Guadalupe Basin Demand		34,427	36,684	45,969	51,562	53,869	56,669	61,299	66,247
Lavaca									
Municipal		21	23	22	22	23	23	23	25
Industrial		0	0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		0	0	0	0	0	0	0	0
Mining		0	0	0	0	0	0	0	0
Livestock		6	8	7	7	7	7	7	7
Total Lavaca Basin Demand		27	31	29	29	30	30	30	32
Lavaca-Guadalupe									
Municipal		3,001	3,599	3,417	3,417	3,456	3,667	3,884	4,174
Industrial		0	0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		11,704	10,617	10,101	8,718	7,524	6,494	5,605	4,838
Mining		11	419	640	726	828	931	1,045	1,174
Livestock		569	822	660	660	660	660	660	660
Total Lavaca-Guadalupe Basin Demand		15,285	15,457	14,818	13,521	12,468	11,752	11,194	10,846
Total Basin Supply									
San Antonio									
Municipal				37	37	37	37	37	37
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				0	0	0	0	0	0
Mining				0	0	0	0	0	0
Livestock				78	78	78	78	78	78
Unallocated Groundwater Supply				82	954	1,500	1,676	1,763	1,763
Total San Antonio Basin Supply				197	1,069	1,615	1,791	1,878	1,878
Guadalupe									
Municipal				9,669	9,927	11,019	11,914	11,914	11,914
Industrial				41,093	42,132	42,132	42,132	42,132	42,201
Steam-Electric				10,000	10,000	10,000	10,000	10,000	10,000
Irrigation				1,628	1,392	1,189	1,013	861	730
Mining				1,938	1,302	904	783	675	688
Livestock				653	653	653	653	653	653
Unallocated Groundwater Supply				-5	-5	50	171	279	197
Total Guadalupe Basin Supply				64,976	65,401	65,947	66,666	66,514	66,383
Lavaca									
Municipal				25	25	25	25	25	25
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				0	0	0	0	0	0
Mining				0	0	0	0	0	0
Livestock				7	7	7	7	7	7
Unallocated Groundwater Supply				0	0	0	0	65	196
Total Lavaca Basin Supply				32	32	32	32	97	228

Table 4-19
Projected Water Demands, Supplies, and Needs
Victoria County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Lavaca-Guadalupe									
Municipal				5,151	5,151	5,151	5,151	5,151	5,151
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				10,101	8,718	7,524	6,494	5,605	4,838
Mining				640	726	828	931	1,045	1,174
Livestock				660	660	660	660	660	660
Unallocated Groundwater Supply				0	0	0	32	807	1,445
Total Lavaca-Guadalupe Basin Supply				16,552	15,255	14,163	13,268	13,268	13,268
Total Basin Surplus/Shortage									
San Antonio									
Municipal				3	4	5	4	3	0
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				0	0	0	0	0	0
Mining				0	0	0	0	0	0
Livestock				0	0	0	0	0	0
Unallocated Groundwater Supply				82	954	1,500	1,676	1,763	1,763
Total San Antonio Basin Surplus/Shortage				85	958	1,505	1,680	1,766	1,763
Guadalupe									
Municipal				129	253	1,148	1,459	799	34
Industrial				16,978	13,686	10,975	8,462	4,232	0
Steam-Electric				2,000	0	0	0	0	0
Irrigation				-95	-95	-95	-95	-95	-95
Mining				0	0	0	0	0	0
Livestock				0	0	0	0	0	0
Unallocated Groundwater Supply				-5	-5	50	171	279	197
Total Guadalupe Basin Surplus/Shortage				19,007	13,839	12,078	9,997	5,215	136
Lavaca									
Municipal				3	3	2	2	2	0
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				0	0	0	0	0	0
Mining				0	0	0	0	0	0
Livestock				0	0	0	0	0	0
Unallocated Groundwater Supply				0	0	0	0	65	196
Total Lavaca Basin Surplus/Shortage				3	3	2	2	67	196
Lavaca-Guadalupe									
Municipal				1,734	1,734	1,695	1,484	1,267	977
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				0	0	0	0	0	0
Mining				0	0	0	0	0	0
Livestock				0	0	0	0	0	0
Unallocated Groundwater Supply				0	0	0	32	807	1,445
Total Lavaca-Guadalupe Basin Surplus/Shortage				1,734	1,734	1,695	1,516	2,074	2,422

Table 4-19
Projected Water Demands, Supplies, and Needs
Victoria County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Groundwater Supplies										
	Available									
	Guadalupe	Gulf Coast			18,669	18,669	18,669	18,669	18,669	18,669
	Lavaca	Gulf Coast			271	271	271	271	271	271
	Lavaca-Guadalupe	Gulf Coast			20,389	20,389	20,389	20,389	20,389	20,389
	San Antonio	Gulf Coast			1,800	1,800	1,800	1,800	1,800	1,800
	Total Available				41,129	41,129	41,129	41,129	41,129	41,129
	Allocated									
	Guadalupe	Gulf Coast			18,674	18,674	18,619	18,498	18,390	18,472
	Lavaca	Gulf Coast			271	271	271	271	206	75
	Lavaca-Guadalupe	Gulf Coast			20,389	20,389	20,389	20,357	19,582	18,944
	San Antonio	Gulf Coast			1,718	846	300	124	37	37
	Total Allocated				41,052	40,180	39,579	39,250	38,215	37,528
	Total Unallocated				77	949	1,550	1,879	2,914	3,601

Notes:
[1] The total surface and groundwater supplies within the Lower Guadalupe River Basin and adjoining coastal basins are adequate to meet Victoria County's projected demands. The surface and groundwater supplies for municipal, industrial, steam-electric, irrigation, and mining uses were allocated accordingly; however, this resulted in a supply projection that is not constant throughout the planning period for the City of Victoria, industrial, mining, and irrigation uses.

Table 4-20
Projected Water Demands, Supplies, and Needs
Wilson County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Municipal Demand										
Nueces Basin										
Rural			121	153	173	181	188	198	209	229
	Subtotal		121	153	173	181	188	198	209	229
San Antonio Basin										
Floresville			1,044	1,146	1,290	1,340	1,385	1,453	1,531	1,613
La Vernia			218	203	225	230	234	254	276	286
Poth			361	325	449	474	494	522	552	600
Stockdale			273	317	334	353	369	392	412	448
Rural			1,660	2,247	3,392	4,523	5,003	6,413	7,831	9,205
	Subtotal		3,556	4,238	5,690	6,920	7,485	9,034	10,602	12,152
Guadalupe Basin										
Rural			68	100	113	118	123	129	137	150
	Subtotal		68	100	113	118	123	129	137	150
Total Municipal Demand			3,745	4,491	5,976	7,219	7,796	9,361	10,948	12,531
Municipal Existing Supply										
Nueces Basin										
Rural		Carrizo			134	134	134	106	106	106
		Sparta			63	63	63	81	81	81
		Queen City			33	33	33	42	42	42
	Subtotal				229	229	229	229	229	229
San Antonio Basin										
Floresville		Carrizo			1,468	1,468	1,468	1,468	1,468	1,468
La Vernia		Carrizo			395	395	395	395	395	395
Poth		Carrizo			2,017	2,017	2,017	2,017	2,017	2,017
Stockdale		Carrizo			1,372	1,372	1,372	1,372	1,372	1,372
Rural		Edwards			29	29	29	29	29	29
		Carrizo			6,887	6,887	6,887	5,953	5,953	5,953
		Sparta			1,730	1,730	1,730	2,435	2,435	2,435
		Queen City			560	560	560	788	788	788
Rural Subtotal					9,205	9,205	9,205	9,205	9,205	9,205
	Subtotal				14,457	14,457	14,457	14,457	14,457	14,457
Guadalupe Basin										
Rural		Carrizo			91	91	91	73	73	73
		Sparta			40	40	40	52	52	52
		Queen City			19	19	19	24	24	24
	Subtotal				150	150	150	150	150	150
Total Municipal Existing Supply					14,836	14,836	14,836	14,836	14,836	14,836
Municipal Surplus/Shortage										
Nueces Basin										
Rural					56	48	41	31	20	0
	Subtotal				56	48	41	31	20	0
San Antonio Basin										
Floresville					178	128	83	15	-63	-145
La Vernia					170	165	161	141	119	109
Poth					1,568	1,543	1,523	1,495	1,465	1,417
Stockdale					1,038	1,019	1,003	980	960	924
Rural					5,813	4,682	4,202	2,792	1,374	0
	Subtotal				8,767	7,537	6,972	5,423	3,855	2,305
Guadalupe Basin										
Rural					37	32	27	21	13	0
	Subtotal				37	32	27	21	13	0
Total Municipal Surplus/Shortage					8,860	7,617	7,040	5,475	3,888	2,305

Table 4-20
Projected Water Demands, Supplies, and Needs
Wilson County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Municipal New Supply Need										
Nueces Basin										
Rural					0	0	0	0	0	0
	Subtotal				0	0	0	0	0	0
San Antonio Basin										
Floresville					0	0	0	0	63	145
La Vernia					0	0	0	0	0	0
Poth					0	0	0	0	0	0
Stockdale					0	0	0	0	0	0
Rural					0	0	0	0	0	0
	Subtotal				0	0	0	0	63	145
Guadalupe Basin										
Rural					0	0	0	0	0	0
	Subtotal				0	0	0	0	0	0
Total Municipal New Supply Need					0	0	0	0	63	145
Industrial Demand										
Nueces Basin			0	0	0	0	0	0	0	0
San Antonio Basin			2	1	2	3	4	4	5	6
Guadalupe Basin			48	0	59	69	81	95	110	128
Total Industrial Demand			50	1	61	72	85	99	115	134
Industrial Existing Supply										
Nueces Basin					0	0	0	0	0	0
San Antonio Basin		Carrizo			5	5	5	4	4	4
		Sparta			1	1	1	1	1	1
		Queen City			0	0	0	1	1	1
San Antonio Basin Subtotal					6	6	6	6	6	6
Guadalupe Basin		Carrizo			78	78	78	62	62	62
		Sparta			34	34	34	45	45	45
		Queen City			16	16	16	21	21	21
Guadalupe Basin Subtotal					128	128	128	128	128	128
Total Industrial Existing Supply					134	134	134	134	134	134
Industrial Surplus/Shortage										
Nueces Basin					0	0	0	0	0	0
San Antonio Basin					4	3	2	2	1	0
Guadalupe Basin					69	59	47	33	18	0
Total Industrial Surplus/Shortage					73	62	49	35	19	0
Industrial New Supply Need										
Nueces Basin					0	0	0	0	0	0
San Antonio Basin					0	0	0	0	0	0
Guadalupe Basin					0	0	0	0	0	0
Total Industrial New Supply Need					0	0	0	0	0	0
Steam-Electric Demand										
Nueces Basin			0	0	0	0	0	0	0	0
San Antonio Basin			0	0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0	0
Total Steam-Electric Demand			0	0	0	0	0	0	0	0
Steam-Electric Existing Supply										
Nueces Basin					0	0	0	0	0	0
San Antonio Basin					0	0	0	0	0	0
Guadalupe Basin					0	0	0	0	0	0
Total Steam-Electric Existing Supply					0	0	0	0	0	0

Table 4-20
Projected Water Demands, Supplies, and Needs
Wilson County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Steam-Electric Surplus/Shortage									
Nueces Basin				0	0	0	0	0	0
San Antonio Basin				0	0	0	0	0	0
Guadalupe Basin				0	0	0	0	0	0
Total Steam-Electric Surplus/Shortage				0	0	0	0	0	0
Steam-Electric New Supply Need									
Nueces Basin				0	0	0	0	0	0
San Antonio Basin				0	0	0	0	0	0
Guadalupe Basin				0	0	0	0	0	0
Total Steam-Electric New Supply Need				0	0	0	0	0	0
Irrigation Demand									
Nueces Basin		4,096	5,213	3,659	3,231	2,853	2,521	2,227	1,969
San Antonio Basin		9,485	10,853	10,759	9,767	8,893	8,122	7,443	6,845
Guadalupe Basin		116	0	101	90	80	70	62	55
Total Irrigation Demand		13,697	16,066	14,519	13,088	11,826	10,713	9,732	8,869
Irrigation Supply									
Nueces Basin	Carrizo			2,134	1,884	1,664	1,165	1,029	910
	Sparta			1,004	887	783	893	789	697
	Queen City			521	460	406	463	409	362
Nueces Basin Subtotal				3,659	3,231	2,853	2,521	2,227	1,969
San Antonio Basin	Carrizo			6,393	5,648	4,218	3,127	2,813	2,565
	Sparta			1,606	1,419	1,603	2,025	1,659	1,343
	Queen City			519	459	831	729	730	696
	Run-of-River			2,241	2,241	2,241	2,241	2,241	2,241
San Antonio Basin Subtotal				10,759	9,767	8,893	8,122	7,443	6,845
Guadalupe Basin	Carrizo			61	55	49	34	30	27
	Sparta			27	24	21	24	22	19
	Queen City			13	11	10	11	10	9
Guadalupe Basin Subtotal				101	90	80	70	62	55
Total Irrigation Supply				14,519	13,088	11,826	10,713	9,732	8,869
Irrigation Surplus/Shortage									
Nueces Basin				0	0	0	0	0	0
San Antonio Basin				0	0	0	0	0	0
Guadalupe Basin				0	0	0	0	0	0
Total Irrigation Surplus/Shortage				0	0	0	0	0	0
Mining Demand									
Nueces Basin		0	0	0	0	0	0	0	0
San Antonio Basin		281	271	182	97	58	38	30	20
Guadalupe Basin		0	6	11	8	4	1	0	0
Total Mining Demand		281	277	193	105	62	39	30	20
Mining Supply									
Nueces Basin				0	0	0	0	0	0
San Antonio Basin	Carrizo			137	73	44	25	19	13
	Sparta			34	18	11	10	8	5
	Queen City			11	6	4	3	3	2
San Antonio Basin Subtotal				182	97	58	38	30	20
Guadalupe Basin	Carrizo			7	5	2	1	0	0
	Sparta			3	2	1	0	0	0
	Queen City			1	1	0	0	0	0
Guadalupe Basin Subtotal				11	8	4	1	0	0
Total Mining Supply				193	105	62	39	30	20

Table 4-20
Projected Water Demands, Supplies, and Needs
Wilson County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Mining Surplus/Shortage									
Nueces Basin				0	0	0	0	0	0
San Antonio Basin				0	0	0	0	0	0
Guadalupe Basin				0	0	0	0	0	0
Total Mining Surplus/Shortage				0	0	0	0	0	0
Livestock Demand									
Nueces Basin		146	164	154	154	154	154	154	154
San Antonio Basin		1,606	1,801	1,687	1,687	1,687	1,687	1,687	1,687
Guadalupe Basin		61	69	64	64	64	64	64	64
Total Livestock Demand		1,813	2,034	1,905	1,905	1,905	1,905	1,905	1,905
Livestock Supply									
Nueces Basin	Local	146	164	154	154	154	154	154	154
San Antonio Basin	Local	1,606	1,801	1,687	1,687	1,687	1,687	1,687	1,687
Guadalupe Basin	Local	61	69	64	64	64	64	64	64
Total Livestock Supply		1,813	2,034	1,905	1,905	1,905	1,905	1,905	1,905
Livestock Surplus/Shortage									
Nueces Basin		0	0	0	0	0	0	0	0
San Antonio Basin		0	0	0	0	0	0	0	0
Guadalupe Basin		0	0	0	0	0	0	0	0
Total Livestock Surplus/Shortage		0	0	0	0	0	0	0	0
Total Wilson County Demand									
Municipal		3,745	4,491	5,976	7,219	7,796	9,361	10,948	12,531
Industrial		50	1	61	72	85	99	115	134
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		13,697	16,066	14,519	13,088	11,826	10,713	9,732	8,869
Mining		281	277	193	105	62	39	30	20
Livestock		1,813	2,034	1,905	1,905	1,905	1,905	1,905	1,905
Total County Demand		19,586	22,869	22,654	22,389	21,674	22,117	22,730	23,459
Total Wilson County Supply									
Municipal				14,836	14,836	14,836	14,836	14,836	14,836
Industrial				134	134	134	134	134	134
Steam-Electric				0	0	0	0	0	0
Irrigation				14,519	13,088	11,826	10,713	9,732	8,869
Mining				193	105	62	39	30	20
Livestock				1,905	1,905	1,905	1,905	1,905	1,905
Total County Supply				31,587	30,068	28,763	27,627	26,637	25,764
Total Wilson County Surplus/Shortage									
Municipal				8,860	7,617	7,040	5,475	3,888	2,305
Industrial				73	62	49	35	19	0
Steam-Electric				0	0	0	0	0	0
Irrigation				0	0	0	0	0	0
Mining				0	0	0	0	0	0
Livestock				0	0	0	0	0	0
Total County Surplus/Shortage				8,933	7,679	7,089	5,510	3,907	2,305
Total Basin Demand									
Nueces									
Municipal		121	153	173	181	188	198	209	229
Industrial		0	0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		4,096	5,213	3,659	3,231	2,853	2,521	2,227	1,969
Mining		0	0	0	0	0	0	0	0
Livestock		146	164	154	154	154	154	154	154
Total Nueces Basin Demand		4,363	5,530	3,986	3,566	3,195	2,873	2,590	2,352

Table 4-20
Projected Water Demands, Supplies, and Needs
Wilson County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
San Antonio									
Municipal		3,556	4,238	5,690	6,920	7,485	9,034	10,602	12,152
Industrial		2	1	2	3	4	4	5	6
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		9,485	10,853	10,759	9,767	8,893	8,122	7,443	6,845
Mining		281	271	182	97	58	38	30	20
Livestock		1,606	1,801	1,687	1,687	1,687	1,687	1,687	1,687
Total San Antonio Basin Demand		14,930	17,164	18,320	18,474	18,127	18,885	19,767	20,710
Guadalupe									
Municipal		68	100	113	118	123	129	137	150
Industrial		48	0	59	69	81	95	110	128
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		116	0	101	90	80	70	62	55
Mining		0	6	11	8	4	1	0	0
Livestock		61	69	64	64	64	64	64	64
Total Guadalupe Basin Demand		293	175	348	349	352	359	373	397
Total Basin Supply									
Nueces									
Municipal				229	229	229	229	229	229
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				3,659	3,231	2,853	2,521	2,227	1,969
Mining				0	0	0	0	0	0
Livestock				154	154	154	154	154	154
Unallocated Groundwater Supply				4,711	5,139	5,517	3,913	4,207	4,465
Total Nueces Basin Supply				8,753	8,753	8,753	6,817	6,817	6,817
San Antonio									
Municipal				14,457	14,457	14,457	14,457	14,457	14,457
Industrial				6	6	6	6	6	6
Steam-Electric				0	0	0	0	0	0
Irrigation				10,759	9,767	8,893	8,122	7,443	6,845
Mining				182	97	58	38	30	20
Livestock				1,687	1,687	1,687	1,687	1,687	1,687
Unallocated Groundwater Supply				24,308	25,385	26,298	13,347	14,034	14,642
Total San Antonio Basin Supply				51,399	51,399	51,399	37,657	37,657	37,657
Guadalupe									
Municipal				150	150	150	150	150	150
Industrial				128	128	128	128	128	128
Steam-Electric				0	0	0	0	0	0
Irrigation				101	90	80	70	62	55
Mining				11	8	4	1	0	0
Livestock				64	64	64	64	64	64
Unallocated Groundwater Supply				4,166	4,180	4,194	3,138	3,147	3,154
Total Guadalupe Basin Supply				4,620	4,620	4,620	3,551	3,551	3,551
Total Basin Surplus/Shortage									
Nueces									
Municipal				56	48	41	31	20	0
Industrial				0	0	0	0	0	0
Steam-Electric				0	0	0	0	0	0
Irrigation				0	0	0	0	0	0
Mining				0	0	0	0	0	0
Livestock				0	0	0	0	0	0
Unallocated Groundwater Supply				4,711	5,139	5,517	3,913	4,207	4,465
Total Nueces Basin Surplus/Shortage				4,767	5,187	5,558	3,944	4,227	4,465

Table 4-20
Projected Water Demands, Supplies, and Needs
Wilson County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
San Antonio										
Municipal					8,767	7,537	6,972	5,423	3,855	2,305
Industrial					4	3	2	2	1	0
Steam-Electric					0	0	0	0	0	0
Irrigation					0	0	0	0	0	0
Mining					0	0	0	0	0	0
Livestock					0	0	0	0	0	0
Unallocated Groundwater Supply					24,308	25,385	26,298	13,347	14,034	14,642
Total San Antonio Basin Surplus/Shortage					33,079	32,925	33,272	18,772	17,890	16,947
Guadalupe										
Municipal					37	32	27	21	13	0
Industrial					69	59	47	33	18	0
Steam-Electric					0	0	0	0	0	0
Irrigation					0	0	0	0	0	0
Mining					0	0	0	0	0	0
Livestock					0	0	0	0	0	0
Unallocated Groundwater Supply					4,166	4,180	4,194	3,138	3,147	3,154
Total Guadalupe Basin Surplus/Shortage					4,272	4,271	4,268	3,192	3,178	3,154
Groundwater Supplies										
	Available									
	Guadalupe	Carrizo			2,769	2,769	2,769	1,700	1,700	1,700
	Nueces	Carrizo			5,015	5,015	5,015	3,079	3,079	3,079
	San Antonio	Carrizo			35,607	35,607	35,607	21,865	21,865	21,865
	Guadalupe	Sparta			1,218	1,218	1,218	1,218	1,218	1,218
	Nueces	Sparta			2,360	2,360	2,360	2,360	2,360	2,360
	San Antonio	Sparta			8,942	8,942	8,942	8,942	8,942	8,942
	Guadalupe	Queen City			569	569	569	569	569	569
	Nueces	Queen City			1,224	1,224	1,224	1,224	1,224	1,224
	San Antonio	Queen City			2,893	2,893	2,893	2,893	2,893	2,893
	Total Available				60,597	60,597	60,597	43,850	43,850	43,850
	Allocated									
	Guadalupe	Carrizo			237	229	220	171	166	162
	Nueces	Carrizo			2,267	2,018	1,797	1,271	1,135	1,016
	San Antonio	Carrizo			18,673	17,865	16,405	14,361	14,042	13,787
	Guadalupe	Sparta			104	101	97	122	119	116
	Nueces	Sparta			1,067	950	846	974	870	778
	San Antonio	Sparta			3,371	3,168	3,345	4,471	4,103	3,784
	Guadalupe	Queen City			49	47	45	57	55	54
	Nueces	Queen City			553	493	439	505	451	404
	San Antonio	Queen City			1,090	1,024	1,394	1,521	1,521	1,486
	Total Allocated				27,412	25,893	24,588	23,452	22,462	21,589
	Total Unallocated				33,185	34,704	36,009	20,398	21,388	22,261

Table 4-21
Projected Water Demands, Supplies, and Needs
Zavala County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Municipal Demand									
Nueces Basin									
Batesville		208	234	212	200	196	204	212	209
Crystal City		1,692	1,891	2,034	1,948	1,850	1,908	1,902	1,908
La Pryor		278	336	238	203	171	157	150	145
Rural		171	229	290	343	357	383	489	658
Subtotal		2,349	2,690	2,774	2,694	2,574	2,652	2,753	2,920
Total Municipal Demand		2,349	2,690	2,774	2,694	2,574	2,652	2,753	2,920
Municipal Existing Supply									
Nueces Basin									
Batesville	Carrizo			589	589	589	589	589	589
Crystal City	Carrizo			3,887	3,887	3,887	3,887	3,887	3,887
La Pryor	Carrizo			839	839	839	839	839	839
Rural	Carrizo			658	658	658	658	658	658
Subtotal				5,973	5,973	5,973	5,973	5,973	5,973
Total Municipal Existing Supply				5,973	5,973	5,973	5,973	5,973	5,973
Municipal Surplus/Shortage									
Nueces Basin									
Batesville				377	389	393	385	377	380
Crystal City				1,853	1,939	2,037	1,979	1,985	1,979
La Pryor				601	636	668	682	689	694
Rural				368	315	301	275	169	0
Subtotal				3,199	3,279	3,399	3,321	3,220	3,053
Total Municipal Surplus/Shortage				3,199	3,279	3,399	3,321	3,220	3,053
Municipal New Supply Need									
Nueces Basin									
Batesville				0	0	0	0	0	0
Crystal City				0	0	0	0	0	0
La Pryor				0	0	0	0	0	0
Rural				0	0	0	0	0	0
Subtotal				0	0	0	0	0	0
Total Municipal New Supply Need				0	0	0	0	0	0
Industrial Demand									
Nueces Basin		1,306	721	1,407	1,507	1,582	1,642	1,780	1,914
Total Industrial Demand		1,306	721	1,407	1,507	1,582	1,642	1,780	1,914
Industrial Existing Supply									
Nueces Basin	Carrizo			1,914	1,914	1,914	1,914	1,914	1,914
Total Industrial Existing Supply				1,914	1,914	1,914	1,914	1,914	1,914
Industrial Surplus/Shortage									
Nueces Basin				507	407	332	272	134	0
Total Industrial Surplus/Shortage				507	407	332	272	134	0
Industrial New Supply Need									
Nueces Basin				0	0	0	0	0	0
Total Industrial New Supply Need				0	0	0	0	0	0
Steam-Electric Demand									
Nueces Basin		0	0	0	0	0	0	0	0
Total Steam-Electric Demand		0	0	0	0	0	0	0	0

Table 4-21
Projected Water Demands, Supplies, and Needs
Zavala County
South Central Texas Region

Basin	Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Steam-Electric Existing Supply									
Nueces Basin				0	0	0	0	0	0
Total Steam-Electric Existing Supply				0	0	0	0	0	0
Steam-Electric Surplus/Shortage									
Nueces Basin				0	0	0	0	0	0
Total Steam-Electric Surplus/Shortage				0	0	0	0	0	0
Steam-Electric New Supply Need									
Nueces Basin				0	0	0	0	0	0
Total Steam-Electric New Supply Need				0	0	0	0	0	0
Irrigation Demand									
Nueces Basin		110,922	74,669	103,213	99,135	95,218	91,456	87,842	84,371
Total Irrigation Demand		110,922	74,669	103,213	99,135	95,218	91,456	87,842	84,371
Irrigation Supply									
Nueces Basin	Carrizo			22,491	22,546	22,563	3,163	3,169	3,171
Total Irrigation Supply				22,491	22,546	22,563	3,163	3,169	3,171
Irrigation Surplus/Shortage									
Nueces Basin				-80,722	-76,589	-72,655	-88,293	-84,673	-81,200
Total Irrigation Surplus/Shortage				-80,722	-76,589	-72,655	-88,293	-84,673	-81,200
Mining Demand									
Nueces Basin		116	114	97	42	25	8	2	0
Total Mining Demand		116	114	97	42	25	8	2	0
Mining Supply									
Nueces Basin	Carrizo			97	42	25	8	2	0
Total Mining Supply				97	42	25	8	2	0
Mining Surplus/Shortage									
Nueces Basin				0	0	0	0	0	0
Total Mining Surplus/Shortage				0	0	0	0	0	0
Livestock Demand									
Nueces Basin		714	809	881	881	881	881	881	881
Total Livestock Demand		714	809	881	881	881	881	881	881
Livestock Supply									
Nueces Basin	Local	714	809	881	881	881	881	881	881
Total Livestock Supply		714	809	881	881	881	881	881	881
Livestock Surplus/Shortage									
Nueces Basin		0	0	0	0	0	0	0	0
Total Livestock Surplus/Shortage		0	0	0	0	0	0	0	0
Total Zavala County Demand									
Municipal		2,349	2,690	2,774	2,694	2,574	2,652	2,753	2,920
Industrial		1,306	721	1,407	1,507	1,582	1,642	1,780	1,914
Steam-Electric		0	0	0	0	0	0	0	0
Irrigation		110,922	74,669	103,213	99,135	95,218	91,456	87,842	84,371
Mining		116	114	97	42	25	8	2	0
Livestock		714	809	881	881	881	881	881	881
Total County Demand		115,407	79,003	108,372	104,259	100,280	96,639	93,258	90,086

Table 4-21
Projected Water Demands, Supplies, and Needs
Zavala County
South Central Texas Region

Basin		Source	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Total Zavala County Supply										
Municipal					5,973	5,973	5,973	5,973	5,973	5,973
Industrial					1,914	1,914	1,914	1,914	1,914	1,914
Steam-Electric					0	0	0	0	0	0
Irrigation					22,491	22,546	22,563	3,163	3,169	3,171
Mining					97	42	25	8	2	0
Livestock					881	881	881	881	881	881
Total County Supply					31,356	31,356	31,356	11,939	11,939	11,939
Total Zavala County Surplus/Shortage										
Municipal					3,199	3,279	3,399	3,321	3,220	3,053
Industrial					507	407	332	272	134	0
Steam-Electric					0	0	0	0	0	0
Irrigation					-80,722	-76,589	-72,655	-88,293	-84,673	-81,200
Mining					0	0	0	0	0	0
Livestock					0	0	0	0	0	0
Total County Surplus/Shortage					-77,016	-72,903	-68,924	-84,700	-81,319	-78,147
Total Basin Demand										
Nueces										
Municipal			2,349	2,690	2,774	2,694	2,574	2,652	2,753	2,920
Industrial			1,306	721	1,407	1,507	1,582	1,642	1,780	1,914
Steam-Electric			0	0	0	0	0	0	0	0
Irrigation			110,922	74,669	103,213	99,135	95,218	91,456	87,842	84,371
Mining			116	114	97	42	25	8	2	0
Livestock			714	809	881	881	881	881	881	881
Total Nueces Basin Demand			115,407	79,003	108,372	104,259	100,280	96,639	93,258	90,086
Total Basin Supply										
Nueces										
Municipal					5,973	5,973	5,973	5,973	5,973	5,973
Industrial					1,914	1,914	1,914	1,914	1,914	1,914
Steam-Electric					0	0	0	0	0	0
Irrigation					22,491	22,546	22,563	3,163	3,169	3,171
Mining					97	42	25	8	2	0
Livestock					881	881	881	881	881	881
Total Nueces Basin Supply					31,356	31,356	31,356	11,939	11,939	11,939
Total Basin Surplus/Shortage										
Nueces										
Municipal					3,199	3,279	3,399	3,321	3,220	3,053
Industrial					507	407	332	272	134	0
Steam-Electric					0	0	0	0	0	0
Irrigation					-80,722	-76,589	-72,655	-88,293	-84,673	-81,200
Mining					0	0	0	0	0	0
Livestock					0	0	0	0	0	0
Total Nueces Basin Surplus/Shortage					-77,016	-72,903	-68,924	-84,700	-81,319	-78,147
Groundwater Supplies										
	Available									
	Nueces	Carrizo			30,475	30,475	30,475	11,058	11,058	11,058
	Total Available				30,475	30,475	30,475	11,058	11,058	11,058
	Allocated									
	Nueces	Carrizo			30,475	30,475	30,475	11,058	11,058	11,058
	Total Allocated				30,475	30,475	30,475	11,058	11,058	11,058
	Total Unallocated				0	0	0	0	0	0

Table 4-22
Projected Water Demands, Supplies, and Needs
River Basin and South Central Texas Region Summaries
South Central Texas Region

Basin	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Nueces Basin Demand								
Municipal	24,157	27,760	31,702	33,357	34,711	37,811	40,607	42,873
Industrial	2,152	1,109	2,320	2,480	2,608	2,716	2,937	3,157
Steam-Electric	6,074	6,075	12,400	12,400	12,400	12,400	15,400	22,400
Irrigation	539,759	396,701	527,710	507,105	487,545	468,496	450,261	432,753
Mining	2,212	3,300	3,509	3,171	3,396	3,566	3,771	4,037
Livestock	7,767	8,597	8,942	8,942	8,942	8,942	8,942	8,942
Total Nueces Basin Demand	582,121	443,542	586,583	567,455	549,602	533,931	521,918	514,162
Nueces Basin Supply								
Municipal			41,087	41,086	41,087	40,507	40,507	40,507
Industrial			3,864	3,864	3,864	3,864	3,864	3,864
Steam-Electric			22,400	22,400	22,400	13,896	13,896	13,896
Irrigation			218,245	217,394	216,406	163,915	162,949	161,883
Mining			3,327	2,993	3,213	2,382	2,468	2,599
Livestock			8,942	8,942	8,942	8,942	8,942	8,942
Unallocated Groundwater Supply			54,790	55,974	56,741	16,544	17,423	18,255
Total Nueces Basin Supply			352,655	352,653	352,653	250,050	250,049	249,946
Nueces Basin Surplus/Shortage [1]								
Municipal			9,385	7,729	6,376	2,696	-100	-2,366
Industrial			1,544	1,384	1,256	1,148	927	707
Steam-Electric			10,000	10,000	10,000	1,496	-1,504	-8,504
Irrigation			-309,465	-289,711	-271,139	-304,581	-287,312	-270,870
Mining			-182	-178	-183	-1,184	-1,303	-1,438
Livestock			0	0	0	0	0	0
Unallocated Groundwater Supply			54,790	55,974	56,741	16,544	17,423	18,255
San Antonio Basin Demand								
Municipal	239,648	273,481	326,748	361,978	407,215	471,381	530,877	575,125
Industrial	14,323	20,980	17,105	20,008	22,698	25,283	28,630	32,092
Steam-Electric	24,263	25,714	36,000	36,000	40,000	45,000	50,000	56,000
Irrigation	72,216	69,515	75,669	70,571	66,913	63,951	60,869	57,988
Mining	1,973	6,892	5,188	4,992	5,179	5,352	5,573	5,873
Livestock	5,285	6,480	5,693	5,693	5,693	5,693	5,693	5,693
Total San Antonio Basin Demand	357,708	403,062	466,403	499,242	547,698	616,660	681,642	732,771
San Antonio Basin Supply								
Municipal			200,941	200,941	200,941	193,469	193,469	193,258
Industrial			23,896	23,896	23,896	23,896	23,896	23,896
Steam-Electric			59,428	59,428	59,428	59,428	59,428	59,428
Irrigation			56,027	55,018	54,127	53,138	52,443	51,831
Mining			329	156	81	53	38	24
Livestock			5,693	5,693	5,693	5,693	5,693	5,693
Unallocated Groundwater Supply			37,813	40,028	41,684	25,816	26,729	27,460
Total San Antonio Basin Supply			384,127	385,160	385,850	361,493	361,696	361,590
San Antonio Basin Surplus/Shortage [1]								
Municipal			-125,807	-160,037	-206,274	-277,912	-337,408	-381,867
Industrial			6,791	3,888	1,198	-1,387	-4,734	-8,196
Steam-Electric			23,428	23,428	19,428	14,428	9,428	3,428
Irrigation			-19,642	-15,553	-12,786	-10,813	-8,426	-6,157
Mining			-4,859	-4,836	-5,098	-5,299	-5,535	-5,849
Livestock			0	0	0	0	0	0
Unallocated Groundwater Supply			37,813	40,028	41,684	25,816	26,729	27,460

Table 4-22
Projected Water Demands, Supplies, and Needs
River Basin and South Central Texas Region Summaries
South Central Texas Region

Basin	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Guadalupe Basin Demand								
Municipal	45,608	55,704	66,249	75,973	87,784	105,664	121,908	139,281
Industrial	26,235	35,515	31,118	35,887	38,958	42,009	46,912	51,898
Steam-Electric	13,052	12,930	33,760	42,160	47,160	47,160	47,160	47,160
Irrigation	10,320	6,257	9,556	8,588	7,734	6,982	6,318	5,731
Mining	3,413	12,002	7,894	7,135	6,870	6,889	4,555	3,201
Livestock	8,836	8,803	10,967	11,299	11,299	11,299	11,299	11,299
Total Guadalupe Basin Demand	107,464	131,211	159,544	181,042	199,805	220,003	238,152	258,570
Guadalupe Basin Supply								
Municipal			82,366	76,040	77,223	75,463	74,968	69,563
Industrial			68,109	69,166	69,186	69,215	69,240	69,337
Steam-Electric			45,907	49,846	49,850	49,853	49,855	49,855
Irrigation			11,445	11,015	10,639	10,309	10,039	9,803
Mining			2,054	1,401	984	846	731	746
Livestock			10,967	11,299	11,299	11,299	11,299	11,299
Unallocated Groundwater Supply			78,137	78,191	78,323	74,550	74,662	74,029
Total Guadalupe Basin Supply			298,985	296,958	297,504	291,535	290,794	284,632
Guadalupe Basin Surplus/Shortage [1]								
Municipal			16,117	67	-10,561	-30,201	-46,940	-69,718
Industrial			36,991	33,279	30,228	27,206	22,328	17,439
Steam-Electric			12,147	7,686	2,690	2,693	2,695	2,695
Irrigation			1,889	2,427	2,905	3,327	3,721	4,072
Mining			-5,840	-5,734	-5,886	-6,043	-3,824	-2,455
Livestock			0	0	0	0	0	0
Unallocated Groundwater Supply			78,137	78,191	78,323	74,550	74,662	74,029
Lower Colorado Basin Demand								
Municipal	236	148	143	154	167	180	182	186
Industrial	0	0	0	0	0	0	0	0
Steam-Electric	0	0	0	0	0	0	0	0
Irrigation	20	14	18	16	14	13	11	10
Mining	0	12	26	18	10	3	0	0
Livestock	147	146	156	156	156	156	156	156
Total Lower Colorado Basin Demand	403	320	343	344	347	352	349	352
Lower Colorado Basin Supply								
Municipal			186	186	186	186	186	186
Industrial			0	0	0	0	0	0
Steam-Electric			0	0	0	0	0	0
Irrigation			18	16	14	13	11	10
Mining			26	18	10	3	0	0
Livestock			156	156	156	156	156	156
Unallocated Groundwater Supply			792	802	812	754	759	750
Total Lower Colorado Basin Supply			1,178	1,178	1,178	1,112	1,112	1,102
Lower Colorado Basin Surplus/Shortage [1]								
Municipal			43	32	19	6	4	0
Industrial			0	0	0	0	0	0
Steam-Electric			0	0	0	0	0	0
Irrigation			0	0	0	0	0	0
Mining			0	0	0	0	0	0
Livestock			0	0	0	0	0	0
Unallocated Groundwater Supply			792	802	812	754	759	750

Table 4-22
Projected Water Demands, Supplies, and Needs
River Basin and South Central Texas Region Summaries
South Central Texas Region

Basin	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Colorado-Lavaca Basin Demand								
Municipal	217	257	417	419	425	454	487	529
Industrial	6,343	19,824	16,538	20,391	22,590	25,036	27,669	30,494
Steam-Electric	62	29	100	100	100	100	100	100
Irrigation	0	0	0	0	0	0	0	0
Mining	0	1	1	1	1	0	0	0
Livestock	13	16	15	15	15	15	15	15
Total Colorado-Lavaca Basin Demand	6,635	20,127	17,071	20,926	23,131	25,605	28,271	31,138
Colorado-Lavaca Basin Supply								
Municipal			531	531	531	531	531	531
Industrial			32,426	32,426	32,426	32,426	32,426	32,426
Steam-Electric			100	100	100	100	100	100
Irrigation			0	0	0	0	0	0
Mining			1	1	1	0	0	0
Livestock			15	15	15	15	15	15
Unallocated Groundwater Supply			1,013	1,013	1,013	1,014	1,014	1,014
Total Colorado-Lavaca Basin Supply			34,086	34,086	34,086	34,086	34,086	34,086
Colorado-Lavaca Basin Surplus/Shortage [1]								
Municipal			114	112	106	77	44	2
Industrial			15,888	12,035	9,836	7,390	4,757	1,932
Steam-Electric			0	0	0	0	0	0
Irrigation			0	0	0	0	0	0
Mining			0	0	0	0	0	0
Livestock			0	0	0	0	0	0
Unallocated Groundwater Supply			1,013	1,013	1,013	1,014	1,014	1,014
Lavaca Basin Demand								
Municipal	590	604	650	654	674	736	804	887
Industrial	0	5	0	0	0	0	0	0
Steam-Electric	0	0	0	0	0	0	0	0
Irrigation	0	57	0	0	0	0	0	0
Mining	108	80	98	55	27	18	16	16
Livestock	305	295	332	335	335	335	335	335
Total Lavaca Basin Demand	1,003	1,041	1,080	1,044	1,036	1,089	1,155	1,238
Lavaca Basin Supply								
Municipal			965	965	965	965	965	965
Industrial			0	0	0	0	0	0
Steam-Electric			0	0	0	0	0	0
Irrigation			0	0	0	0	0	0
Mining			98	55	27	18	16	16
Livestock			332	335	335	335	335	335
Unallocated Groundwater Supply			1,681	1,724	1,752	1,758	1,825	1,956
Total Lavaca Basin Supply			3,076	3,079	3,079	3,076	3,141	3,272
Lavaca Basin Surplus/Shortage [1]								
Municipal			315	311	291	229	161	78
Industrial			0	0	0	0	0	0
Steam-Electric			0	0	0	0	0	0
Irrigation			0	0	0	0	0	0
Mining			0	0	0	0	0	0
Livestock			0	0	0	0	0	0
Unallocated Groundwater Supply			1,681	1,724	1,752	1,758	1,825	1,956

Table 4-22
Projected Water Demands, Supplies, and Needs
River Basin and South Central Texas Region Summaries
South Central Texas Region

Basin	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Lavaca-Guadalupe Basin Demand								
Municipal	6,696	6,005	7,389	7,431	7,561	8,083	8,642	9,360
Industrial	17,963	20,109	46,069	56,704	62,813	69,603	76,905	84,738
Steam-Electric	0	0	0	0	0	0	0	0
Irrigation	47,125	58,699	36,923	31,465	27,474	24,167	21,737	19,866
Mining	12	444	689	761	851	940	1,048	1,176
Livestock	898	1,172	1,000	1,000	1,000	1,000	1,000	1,000
Total Lavaca-Guadalupe Basin Demand	72,694	86,429	92,070	97,361	99,699	103,793	109,332	116,140
Lavaca-Guadalupe Basin Supply								
Municipal			13,013	11,513	11,513	11,513	11,513	11,513
Industrial			92,414	92,414	92,414	92,414	92,414	92,414
Steam-Electric			0	0	0	0	0	0
Irrigation			41,623	40,240	39,046	38,016	37,127	36,360
Mining			689	761	851	940	1,048	1,176
Livestock			1,000	1,000	1,000	1,000	1,000	1,000
Unallocated Groundwater Supply			976	990	1,002	1,048	1,829	2,468
Total Lavaca-Guadalupe Basin Supply			149,715	146,918	145,826	144,931	144,931	144,931
Lavaca-Guadalupe Basin Surplus/Shortage [1]								
Municipal			5,624	4,082	3,952	3,430	2,871	2,153
Industrial			46,345	35,710	29,601	22,811	15,509	7,676
Steam-Electric			0	0	0	0	0	0
Irrigation			4,700	8,775	11,572	13,849	15,390	16,494
Mining			0	0	0	0	0	0
Livestock			0	0	0	0	0	0
Unallocated Groundwater Supply			976	990	1,002	1,048	1,829	2,468
San Antonio-Nueces Basin Demand								
Municipal	1,337	1,373	1,446	1,387	1,331	1,312	1,297	1,275
Industrial	0	0	0	0	0	0	0	0
Steam-Electric	0	0	0	0	0	0	0	0
Irrigation	0	6	0	0	0	0	0	0
Mining	81	127	65	41	27	16	7	5
Livestock	957	902	931	931	931	931	931	931
Total San Antonio-Nueces Basin Demand	2,375	2,408	2,442	2,359	2,289	2,259	2,235	2,211
San Antonio-Nueces Basin Supply								
Municipal			2,850	2,850	2,850	2,850	2,850	2,850
Industrial			0	0	0	0	0	0
Steam-Electric			0	0	0	0	0	0
Irrigation			0	0	0	0	0	0
Mining			65	41	27	16	7	5
Livestock			931	931	931	931	931	931
Unallocated Groundwater Supply			9,780	9,804	9,818	9,829	9,838	9,840
Total San Antonio-Nueces Basin Supply			13,626	13,626	13,626	13,626	13,626	13,626
San Antonio-Nueces Basin Surplus/Shortage [1]								
Municipal			1,404	1,463	1,519	1,538	1,553	1,575
Industrial			0	0	0	0	0	0
Steam-Electric			0	0	0	0	0	0
Irrigation			0	0	0	0	0	0
Mining			0	0	0	0	0	0
Livestock			0	0	0	0	0	0
Unallocated Groundwater Supply			9,780	9,804	9,818	9,829	9,838	9,840

Table 4-22
Projected Water Demands, Supplies, and Needs
River Basin and South Central Texas Region Summaries
South Central Texas Region

Basin	Total in 1990 (acft)	Total in 1996 (acft)	Projections 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
Rio Grande Basin Demand								
Municipal	6	8	6	6	6	6	6	7
Industrial	0	0	0	0	0	0	0	0
Steam-Electric	0	0	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0	0	0
Mining	0	0	0	0	0	0	0	0
Livestock	192	166	150	150	150	150	150	150
Total Rio Grande Basin Demand	198	174	156	156	156	156	156	157
Rio Grande Basin Supply								
Municipal			7	7	7	7	7	7
Industrial			0	0	0	0	0	0
Steam-Electric			0	0	0	0	0	0
Irrigation			0	0	0	0	0	0
Mining			0	0	0	0	0	0
Livestock			150	150	150	150	150	150
Unallocated Groundwater Supply			3,848	3,848	3,848	1,545	1,545	1,545
Total Rio Grande Basin Supply			4,005	4,005	4,005	1,702	1,702	1,702
Rio Grande Basin Surplus/Shortage [1]								
Municipal			1	1	1	1	1	0
Industrial			0	0	0	0	0	0
Steam-Electric			0	0	0	0	0	0
Irrigation			0	0	0	0	0	0
Mining			0	0	0	0	0	0
Livestock			0	0	0	0	0	0
Unallocated Groundwater Supply			3,848	3,848	3,848	1,545	1,545	1,545
South Central Texas Region Demand								
Municipal	318,495	365,340	434,750	481,359	539,874	625,627	704,810	769,523
Industrial	67,016	97,542	113,150	135,470	149,667	164,647	183,053	202,379
Steam-Electric	43,451	44,748	82,260	90,660	99,660	104,660	112,660	125,660
Irrigation	669,440	531,249	649,876	617,745	589,680	563,609	539,196	516,348
Mining	7,799	22,858	17,470	16,174	16,361	16,784	14,970	14,308
Livestock	24,400	26,577	28,186	28,521	28,521	28,521	28,521	28,521
Total South Central Texas Region Demand	1,130,601	1,088,314	1,325,692	1,369,929	1,423,763	1,503,848	1,583,210	1,656,739
South Central Texas Region Supply								
Municipal			341,945	334,119	335,303	325,490	324,995	319,379
Industrial			270,709	221,766	221,786	221,815	221,840	221,937
Steam-Electric			127,835	131,774	131,778	123,277	123,279	123,279
Irrigation			327,358	323,683	320,232	265,391	262,569	259,887
Mining			6,589	5,426	5,195	4,258	4,308	4,566
Livestock			28,186	28,521	28,521	28,521	28,521	28,521
Unallocated Groundwater Supply			188,831	192,375	194,993	132,859	135,625	137,318
Total South Central Texas Region Supply			1,241,453	1,237,663	1,237,807	1,101,611	1,101,137	1,094,887
South Central Texas Region Surplus/Shortage [1]								
Municipal			-92,805	-147,240	-204,571	-300,137	-379,815	-450,144
Industrial			107,559	86,296	72,119	57,168	38,787	19,558
Steam-Electric			45,575	41,114	32,118	18,617	10,619	-2,381
Irrigation			-322,518	-294,062	-269,448	-298,218	-276,627	-256,461
Mining			-10,881	-10,748	-11,166	-12,526	-10,662	-9,742
Livestock			0	0	0	0	0	0
Unallocated Groundwater Supply			188,831	192,375	194,993	132,859	135,625	137,318

Notes:
[1] The values listed in this section of the table are not necessarily additive due to the fact that demands and supplies are not necessarily located in close proximity to each other.

4.2 Water Needs Projections by Major Water Provider

For purposes of this regional planning project, and in accordance with TWDB Rules, water supply projections and needs projections are tabulated for each Major Water Provider identified by the South Central Texas RWPG (Table 4-23).[2] For each Major Water Provider the water demands were brought forward from "South Central Texas Region Water Management Plan; Introduction, Description of the Planning Region (Task 1) and Population and Water Demand Projections (Task 2), Table 2-13; South Central Texas Regional Water Planning Group, HDR Engineering, Inc., San Antonio, TX, August 2000."

Of the six Major Water Providers identified by the South Central Texas RWPG, five (SAWS, BMWD, CRWA, NBU, and the City of San Marcos) are projected to have a water shortage during the planning period (Table 4-23).

[2] 31 Texas Administrative Code, Chapter 357, Regional Water Planning Guideline Rules, Texas Water Development Board, Austin, Texas, March 11, 1998.

Table 4-23.
Projected Water Demands, Supplies and Needs for Major Water Providers

	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)
San Antonio Water System (SAWS)						
Projected Supply						
Direct Reuse	18,193	18,193	18,193	18,193	18,193	18,193
Edwards Aquifer	103,985	103,985	103,985	103,985	103,985	103,985
Total Projected Supply	122,178	122,178	122,178	122,178	122,178	122,178
Projected Demand[1]	228,728	251,024	281,693	322,846	360,936	403,397
Projected Surplus/Shortage	-106,550	-128,846	-159,515	-200,668	-238,758	-281,219
Bexar Metropolitan Water District (BMWD)						
Projected Supply						
Run-of-River Rights	2,549	2,549	2,549	2,549	2,549	2,549
Carrizo Aquifer	2,500	2,500	2,500	2,500	2,500	2,500
Edwards Aquifer	13,848	13,848	13,848	13,848	13,848	13,848
Trinity Aquifer	583	583	583	583	583	583
Total Projected Supply	19,480	19,480	19,480	19,480	19,480	19,480
Projected Demand[1]	32,542	38,885	45,035	51,988	59,133	63,581
Projected Surplus/Shortage	-13,062	-19,405	-25,555	-32,508	-39,653	-44,101
Canyon Regional Water Authority (CRWA)						
Projected Supply						
Canyon Reservoir[2]	2,780	2,780	2,780	2,780	2,780	2,780
Run-of-River Rights	446	446	446	446	446	446
Total Projected Supply	3,226	3,226	3,226	3,226	3,226	3,226
Projected Demand[1]	2,536	3,716	4,996	6,675	8,043	9,557
Projected Surplus/Shortage	690	-490	-1,770	-3,449	-4,817	-6,331
Guadalupe-Blanco River Authority (GBRA)						
Projected Supply						
Canyon Reservoir	50,000	50,000	50,000	50,000	50,000	50,000
Run-of-River Rights	131,380	131,380	131,380	131,380	131,380	131,380
Total Projected Supply	181,380	181,380	181,380	181,380	181,380	181,380
Projected Demand[1]	74,452	70,595	70,003	68,015	66,746	65,945
Projected Surplus/Shortage	106,928	110,785	111,377	113,365	114,634	115,435
New Braunfels Utilities (NBU)						
Projected Supply						
Edwards Aquifer	4,837	4,837	4,837	4,837	4,837	4,837
Total Projected Supply[3]	4,837	4,837	4,837	4,837	4,837	4,837
Projected Demand[1]	4,280	6,922	10,263	14,972	18,376	22,202
Projected Surplus/Shortage	557	-2,085	-5,426	-10,135	-13,539	-17,365
City of San Marcos						
Projected Supply						
Edwards Aquifer	3,752	3,752	3,752	3,752	3,752	3,752
Total Projected Supply[3]	3,752	3,752	3,752	3,752	3,752	3,752
Projected Demand[1]	5,391	7,643	10,493	14,844	20,317	27,358
Projected Surplus/Shortage	-1,639	-3,891	-6,741	-11,092	-16,565	-23,606

[1]See Section 2.10 (Table 2-13) for a more detailed description of how projected demands were calculated.
[2]The supply from Canyon Reservoir to CRWA of 2,780 acft/yr represents a portion of the 50,000 acft/yr current supply from Canyon Reservoir
[3]The total projected supply does not include the entity's contract with GBRA. For purposes of this planning effort, those contracts were considered to be a part of GBRA's projected demand.

4.3 Social and Economic Impacts of Not Meeting Projected Water Needs

Section 357.7(4) of the rules for implementing Senate Bill 1 requires that the social and economic impact of not meeting regional water supply needs be evaluated by the SCTRWPG. TWDB is required to provide technical assistance, upon request, to complete the evaluations. SCTRWPG requested technical assistance of TWDB to perform the required analyses. TWDB conducted the required analysis of the impacts of the identified needs for the South Central Texas Region using the same methodology that was used for all other regions.

The purpose of this element of Senate Bill 1 planning is to provide an estimate of the social and economic importance of meeting projected water needs or, conversely, provides estimates of potential costs of not meeting projected needs of each water user group. The social and economic effects of not meeting a projected water need can be viewed as the potential benefit to be gained from implementing a strategy to meet the particular need. The summation of all the impacts gives a view of the ultimate magnitude of the impacts caused by not meeting all of the projected needs.

The projected total water demands for the South Central Texas Region increase from 1.32 million acft in 2000 to 1.50 million acft in 2030, and 1.66 million acft in 2050 (Table 2-10). Under historic drought of record water supply conditions, and with no water management strategies in place, water shortages amount to 495,000 acft/yr in 2000, increasing to 670,900 acft/yr in 2030 and to 785,700 acft/yr by 2050 (Table 4-24).

The water needs (shortages) of the region amount to about 39 percent of the projected demand by 2020, increasing to 47 percent in 2040, and to 48 percent in 2050. This means that by 2050 the region would be able to supply only 54 percent of the projected water demands unless supply development or other water management strategies are implemented.

The SCTRWPG identified 66 individual water user groups that showed an unmet need during drought-of-record supply conditions for each decade from 2000 to 2050 (Table 4-24). Of the 21 counties of the South Central Texas Region, 14 have water user groups with projected water needs (shortages). The water user groups having projected water needs, together with the quantities of projected needs (shortages), are listed by county and river basin of location in the region (Table 4-24).[3] For example, the projected municipal needs for the City of Lytle (Atascosa

[3] If there is no water user group that has a projected water need (shortage) in a county, then that county is not listed in Table 4-24. The following counties of the South Central Texas Region that did not have water user groups with projected water needs are DeWitt, Goliad, Gonzales, Karnes, La Salle, Refugio, and Victoria.

County) in the Nueces River Basin are 325 acft/yr in 2000, 467 acft/yr in 2030, and 577 acft/yr in 2050 (Table 4-24). The projected needs for irrigation in Atascosa County in the Nueces River Basin are 37,557 acft/yr in 2000 and for Atascosa County in the San Antonio River Basin in 2000 are 861 acft/yr, bringing the year 2000 projected need for irrigation water in Atascosa County to 38,418 acft/yr (Table 4-24). The projected water needs for irrigation in Atascosa County in 2030 are 43,726 acft/yr, of which 42,812 acft/yr are in the Nueces River Basin and 914 acft/yr are in the San Antonio River Basin (Table 4-24). The total projected need for Atascosa County in 2050 is 51,043 acft/yr, of which 50,210 acft/yr are in the Nueces River Basin, and 833 acft/yr are in the San Antonio River Basin (Table 4-24).

The water user groups having projected water needs (shortages) of Atascosa, Bexar, Caldwell, Calhoun, Comal, Dimmit, Frio, Guadalupe, Hays, Kendall, Medina, Uvalde, Wilson, and Zavala Counties are tabulated in Table 4-24, with summaries by user group, river basin, and the entire region presented at the end of the table. For example, the projected need (shortage) for the region is 670,946 acft/yr in 2030, of which 314,332 acft/yr is in the Nueces River Basin, 301,581 acft/yr is in the San Antonio River Basin, and 54,181 acft/yr is in the Guadalupe River Basin (Table 4-24). Of the total projected need in 2030 of 670,946 acft/yr, 335,943 acft/yr is for municipal purposes, 2,913 acft/yr is for industrial purposes, 920 acft/yr is for steam-electric power generation, 318,644 acft/yr is for irrigation, and 12,526 acft/yr is for mining purposes (Table 4-24). The quantities for each county and river basin are shown in Table 4-24 and will not be repeated in the text.

The detailed results of the social and economic analyses of not meeting the projected water needs (shortages) are shown in Tables 4-24 through 4-28. Each water user group with a need is evaluated in terms of effects upon population, school enrollment, gross business, employment, and personal income (see Methodology in Supplement at end of subsection 4.3). Both the direct and indirect social and economic impacts on the region resulting from the shortage were calculated. The effects of shortages on population and school enrollments are the social variables of the analysis. Declining populations indicate a deprecation of social services in most cases, while declining school enrollment indicates loss of younger cohorts of the population and possibilities of strains on the tax bases, when combined with economic losses. Economic variables chosen by TWDB for this analysis include gross economic output (sales and business gross income), employment (number of jobs), and personal income (wages, salaries, and proprietors net receipts).

The regional effects upon population, school enrollment, gross value of business, employment, and personal incomes are stated below. The values for individual water user groups, counties, and river basins are shown in Table 4-24 for population, Table 4-25 for school enrollment, Table 4-26 for gross business value, Table 4-27 for employment, and Table 4-28 for personal income.

Population: The projected population growth of the region would be economically restricted by curtailed potential job creation. This would result in out-migration of some current population, reduced migration, and reduced future population growth. Compared to the baseline growth in population, the region could expect 807,923 fewer people in 2010, 1.30 million fewer in 2030, and 2.00 million fewer in 2050 (Table 4-24). The expected 2050 population under the unmet water need (shortage) conditions would be 44 percent lower than projected in the region's most likely growth projection.

School Enrollment: School enrollment is related to the size of the population of childbearing age, which is dependent upon employment, as mentioned above. Failure to meet the projected water needs of the region, such that employment opportunities are affected, would result in lower population and reduced school enrollment. School enrollment estimates for the region are 206,369 less in 2010, 328,528 less in 2030, and 500,891 less in 2050 than if the projected water needs are met (Table 4-25).

Gross Business Value: The estimated effect of water shortages projected for the South Central Texas Region upon gross value of business, which includes the direct and indirect effects, are \$31.9 billion per year in 2010, \$52.4 billion per year in 2030, and \$78.8 billion per year in 2050 (Table 4-26). The economic impact of unmet water needs varies depending on the water user group for which the shortage is projected. On a per acre-foot basis, the largest impacts result from shortages in manufacturing and municipal uses, while shortages for irrigation typically result in the smallest impact. Impacts for individual water user groups are shown in Table 4-26.

Employment Effect: The estimated effect of water shortages upon employment in the region is 461,698 jobs in 2010, 748,081 jobs in 2030, and 1.10 million jobs in 2050 (Table 4-27).

Personal Income Effect: Failure to meet the projected water needs would result in an estimated loss of personal income of \$12.96 billion in 2010, \$21.02 billion in 2030, and \$31.14 billion in 2050 (Table 4-28).

The largest percentage of the economic and social impacts of unmet water needs in the South Central Texas Region results from municipal water shortages. In 2010, municipalities have unmet needs of 198,198 acft—38 percent of the total unmet needs. The economic impacts of this shortage (456,069 jobs, $31.4 billion in output, and $12.8 billion of income) represent about 98 percent of the total impacts (Tables 4-27, 4-26, and 4-28, respectively). By 2050, unmet municipal needs total 475,466 acft (60.5 percent of the total) resulting in 1.04 million jobs not created, reductions of $72.3 billion in potential output, and $29.3 billion in potential income (Tables 4-27, 4-26, and 4-28).

Unmet irrigation needs represent the largest category of need through 2030 but, due to the relatively small value of economic output added per acre-foot, the impacts of not meeting irrigation needs are considerably less. In 2010, irrigation has unmet needs of 308,275 acft, 59 percent of the total. The economic impacts of the shortage (1,710 direct and indirect jobs, $66.9 million in output, and $19.8 million in income) represent less than one-half of 1 percent of the total economic impact (Tables 4-27, 4-26, and 4-28, respectively).

The impact of not meeting manufacturing needs increases with each decade. In 2010, manufacturing has unmet needs of 1,201 acft, 0.23 percent of the total unmet needs. The economic impacts of this shortage include loss of 3,172 jobs (0.7 percent of the total employment impact) and $370 million in output (1.16 percent of the total output impact). In 2050, unmet manufacturing needs are 10,640 acft (1.4 percent of the total) resulting in 53,423 jobs not created, and reduction of $6.2 billion in output (7.9 percent of the total output impact) (Tables 4-27, 4-26, and 4-28).

If the water needs are left entirely unmet, the level of shortage in 2010 results in 461,698 fewer jobs than would be expected if the water needs of 2010 are fully met. The gap in job growth due to water shortages grows to 748,081 by 2030 and to 1.1 million by 2050.

The potential loss of economic production in the region amounts to about 37 percent less income to people in 2010, with the gap growing to 44 percent less than expected in 2030. By 2050 the region would have 51 percent less income than is currently projected, assuming no water restrictions.

Table 4-24.
Projected Water Needs by Water User Group and Impacts of Not Meeting Water Needs upon Population South Central Texas Region

County/Basin/Water User Group	Projected Water Needs[1]						Population Effects[2]					
	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2000 Number	2010 Number	2020 Number	2030 Number	2040 Number	2050 Number
Atascosa County												
Nueces Basin												
Lytle–Municipal	325	366	401	467	520	577	1,488	1,666	1,800	2,095	2,333	2,577
Steam-Electric	0	0	0	0	1,504	8,504	0	0	0	0	167	1,072
Irrigation	37,557	35,909	34,411	42,812	41,323	39,890	435	414	392	481	469	453
Mining	0	0	0	995	1,109	1,239	0	0	0	125	129	143
San Antonio Basin												
Rural–Municipal	0	0	0	1	10	10	0	0	0	2	13	13
Irrigation	861	809	759	914	867	823	10	9	8	10	9	9
Atascosa County Totals												
Municipal	325	366	401	468	530	587	1,488	1,666	1,800	2,097	2,346	2,590
Steam-Electric	0	0	0	0	1,504	8,504	0	0	0	0	167	1,072
Irrigation	38,418	36,718	35,170	43,726	42,190	40,713	445	423	400	491	478	462
Mining	0	0	0	995	1,109	1,239	0	0	0	125	129	143
County Total	38,743	37,084	35,571	45,189	45,333	51,043	1,933	2,089	2,200	2,713	3,120	4,267
Bexar County												
Nueces Basin												
Rural–Municipal	0	0	36	929	1,211	1,074	0	0	48	1,267	1,667	1,478
Irrigation	3,129	3,023	3,031	2,579	2,462	2,341	35	36	34	27	25	23
Mining	182	178	183	189	194	199	24	24	24	24	22	23

Table 4-24 (continued)

County/Basin/Water User Group	Projected Water Needs[1]						Population Effects[2]					
	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2000 Number	2010 Number	2020 Number	2030 Number	2040 Number	2050 Number
San Antonio Basin												
Alamo Heights–Municipal	1,299	1,232	1,186	1,206	1,228	1,242	6,602	6,201	5,941	6,041	6,152	6,191
Balcones Heights–Municipal	419	427	447	486	531	573	1,917	1,945	2,007	2,181	2,384	2,856
China Grove–Municipal	155	172	189	240	289	312	709	784	849	1,066	1,298	1,400
Converse–Municipal	1,560	2,270	2,962	3,931	4,798	5,889	11,677	16,830	26,794	33,316	43,191	34,903
Elmendorf–Municipal	33	34	34	44	54	63	147	158	148	188	242	283
Fair Oaks Ranch–Municipal	1,309	1,312	1,149	1,153	1,158	1,157	5,961	6,604	5,756	5,775	5,802	5,767
Helotes–Municipal	152	179	207	286	326	369	696	815	929	1,271	1,464	1,656
Kirby–Municipal	963	1,070	1,216	1,476	1,720	1,991	7,209	7,933	8,971	10,890	12,690	14,619
Leon Valley–Municipal	570	417	240	238	236	322	4,266	3,092	1,771	1,740	1,740	2,364
Live Oak Water Public Utility–Municipal	0	7	84	255	420	604	0	54	619	1,864	3,100	5,410
Olmos Park–Municipal	311	312	322	345	371	395	1,423	1,421	1,445	1,533	1,665	1,773
San Antonio (SAWS)–Municipal	102,394	124,328	154,496	194,684	231,946	273,629	404,646	485,222	606,752	764,582	933,695	1,128,355
Schertz	207	506	869	953	1,048	1,148	1,900	4,577	7,823	8,579	9,434	6,771
Schertz (Outside City)	674	970	1,098	1,310	1,522	1,735	945	1,354	1,511	1,784	2,095	2,375
Shavano Park–Municipal	675	750	779	819	871	929	3,074	3,383	3,495	3,676	3,909	4,149
Terrell Hills–Municipal	540	506	504	520	513	500	2,744	2,546	2,526	2,606	2,571	2,493
Universal City–Municipal	2,012	2,374	2,812	3,490	4,117	4,826	15,061	17,601	20,847	29,577	37,062	43,444
BMWD (Castle Hills)–Municipal	1,209	1,238	1,260	1,281	1,264	1,246	5,506	6,232	6,312	6,417	6,332	6,212
BMWD (Somerset)–Municipal	121	110	101	91	83	79	554	501	453	404	373	355
BMWD (Hill Country/Hollywood Park)–Municipal	1,694	1,932	2,200	2,606	2,963	3,378	7,715	8,714	9,873	11,695	13,298	15,086
BMWD (Other Subdivisions)–Municipal	9,795	15,820	21,637	28,031	34,706	38,617	13,674	21,873	29,915	36,311	47,753	53,134
Fort Sam Houston–Municipal	1,453	1,184	955	929	902	888	10,876	8,778	7,046	6,853	6,654	6,520
Lackland AFB–Municipal	1,222	970	750	729	708	698	6,211	4,882	3,758	3,651	3,547	3,480
Randolph AFB–Municipal	906	790	687	678	673	664	4,125	3,564	3,083	3,042	3,020	2,966
Rural–Municipal	2,211	5,197	10,178	25,757	32,681	22,000	3,087	7,185	14,004	33,366	44,967	30,270
Industrial	0	0	0	1,428	4,757	8,190	0	0	0	16,068	53,528	92,156
Irrigation	10,930	7,912	6,345	5,304	3,991	2,741	124	94	70	57	40	27
Mining	4,781	4,758	5,018	5,217	5,451	5,763	642	636	660	680	718	759

Table 4-24 (continued)

County/Basin/Water User Group	Projected Water Needs[1]						Population Effects[2]					
	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2000 Number	2010 Number	2020 Number	2030 Number	2040 Number	2050 Number
Bexar County Totals												
Municipal	131,884	164,107	206,398	272,467	326,339	364,328	520,725	622,249	772,676	979,675	1,196,105	1,384,310
Industrial	0	0	0	1,428	4,757	8,190	0	0	0	16,068	53,528	92,156
Irrigation	14,059	10,935	9,376	7,883	6,453	5,082	159	130	104	84	65	50
Mining	4,963	4,936	5,201	5,406	5,645	5,962	666	660	684	704	740	782
County Total	150,906	179,978	220,975	287,184	343,194	383,562	521,550	623,039	773,464	996,531	1,250,438	1,477,298
Caldwell County												
Guadalupe Basin												
Lockhart–Municipal	0	188	393	668	714	737	0	1,408	2,899	4,928	5,269	5,410
County Total	0	188	393	668	714	737	0	1,408	2,899	4,928	5,269	5,410
Calhoun County												
Lavaca-Guadalupe Coastal Basin												
Port Lavaca	0	769	758	852	969	1,093	0	5,702	5,592	6,285	7,148	8,025
County Totals	0	769	758	852	969	1,093	0	5,702	5,592	6,285	7,148	8,025
Comal County												
San Antonio Basin												
Rural–Municipal	1,659	1,877	2,204	3,095	4,060	5,148	2,315	2,596	3,032	4,258	5,586	7,048
Guadalupe Basin												
Garden Ridge–Municipal	322	395	434	562	623	617	1,473	1,799	1,948	2,522	3,120	3,076
New Braunfels–Municipal	0	7,768	10,634	14,697	17,645	20,915	0	46,263	63,333	82,006	104,577	123,957
Fair Oaks Ranch–Municipal	43	43	39	42	45	49	192	218	190	209	226	246
Schertz–Municipal	3,795	3,691	3,444	3,837	4,277	4,746	0	33,388	31,153	32,519	38,501	28,128
Rural–Municipal	1,703	3,080	5,286	7,999	10,948	14,453	2,377	4,258	7,273	11,006	15,063	19,790
Industrial	0	0	0	0	271	551	0	0	0	0	3,481	7,044
Mining	5,570	5,464	5,628	5,796	3,590	2,224	748	730	742	755	474	293

Table 4-24 (continued)

County/Basin/Water User Group	Projected Water Needs[1]						Population Effects[2]					
	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2000 Number	2010 Number	2020 Number	2030 Number	2040 Number	2050 Number
Comal County (cont.)												
Comal County Totals												
Municipal	7,522	16,854	22,041	30,232	37,598	45,928	6,357	88,522	106,929	132,520	167,073	182,245
Industrial	0	0	0	0	271	551	0	0	0	0	3,481	7,044
Mining	5,570	5,464	5,628	5,796	3,590	2,224	748	730	742	755	474	293
County Total	13,092	22,318	27,669	36,028	41,459	48,703	7,105	89,252	107,671	133,275	171,028	189,582
Dimmit County												
Nueces Basin												
Carrizo Springs–Municipal	138	405	649	1,054	1,479	1,959	704	2,059	4,789	7,776	10,912	14,382
County Total	138	405	649	1,054	1,479	1,959	704	2,059	4,789	7,776	10,912	14,382
Frio County												
Nueces Basin												
Irrigation	71,126	67,646	64,365	76,505	73,519	70,662	823	780	732	861	836	804
County Total	71,126	67,646	64,365	76,505	73,519	70,662	823	780	732	861	836	804
Guadalupe County												
San Antonio Basin												
Rural–Municipal	0	0	0	922	1,319	1,900	0	0	0	1,257	1,814	2,601
Mining	10	10	10	10	10	10	2	2	2	2	2	2
Guadalupe Basin												
New Braunfels–Municipal	0	49	63	104	120	136	0	295	373	611	711	806
Schertz–Municipal	123	413	886	970	1,065	1,165	1,129	3,737	7,977	8,731	9,588	6,871
Seguin–Municipal	0	0	0	7	1,280	2,745	0	0	0	61	11,523	16,189
Rural–Municipal	0	0	0	0	533	2,605	0	0	0	0	734	3,566
Industrial	979	1,198	1,344	1,481	1,686	1,893	5,379	6,520	7,278	8,020	9,131	10,200
Steam-Electric	920	920	920	920	920	920	116	122	114	112	104	102
Irrigation	883	777	677	582	492	406	10	9	8	6	5	4
Mining	186	188	190	192	197	203	24	26	24	24	24	23

Table 4-24 (continued)

County/Basin/Water User Group	Projected Water Needs[1]						Population Effects[2]					
	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2000 Number	2010 Number	2020 Number	2030 Number	2040 Number	2050 Number
Guadalupe County (cont.)												
Guadalupe County Totals												
Municipal	123	462	949	2,003	4,317	8,551	1,129	4,032	8,350	10,660	24,370	30,033
Industrial	979	1,198	1,344	1,481	1,686	1,893	5,379	6,520	7,278	8,020	9,131	10,200
Steam-Electric	920	920	920	920	920	920	116	122	114	112	104	102
Irrigation	883	777	677	582	492	406	10	9	8	6	5	4
Mining	196	198	200	202	207	213	26	28	26	26	26	25
County Total	3,101	3,555	4,090	5,188	7,622	11,983	6,660	10,711	15,776	18,824	33,636	40,364
Hays County												
Guadalupe Basin												
San Marcos–Municipal	641	2,848	5,629	9,919	15,326	27,297	5,855	25,762	33,524	55,347	90,833	161,782
Kyle–Municipal	0	0	0	0	156	225	0	0	0	0	701	1,011
Wimberley–Municipal	0	0	0	0	0	322	0	0	0	0	0	1,613
Rural–Municipal	3,604	4,681	5,271	6,350	7,290	6,360	5,032	6,473	7,253	8,737	10,031	8,709
Mining	84	82	68	55	37	28	10	11	8	8	4	4
Hays County Totals												
Municipal	4,245	7,529	10,900	16,269	22,772	34,204	10,887	32,235	40,777	64,084	101,565	173,115
Mining	84	82	68	55	37	28	10	11	8	8	4	4
County Total	4,329	7,611	10,968	16,324	22,809	34,232	10,897	32,246	40,785	64,092	101,569	173,119
Kendall County												
San Antonio Basin												
Boerne–Municipal	34	486	493	974	1,587	2,528	169	2,447	3,637	7,185	11,710	18,560
Fair Oaks Ranch–Municipal	90	217	184	189	194	200	412	1,102	923	938	972	1,002
Rural–Municipal	1,070	1,539	2,808	4,099	5,578	6,847	1,501	2,128	3,864	5,640	7,675	9,376
Industrial	2	3	4	4	5	6	10	17	20	20	24	27
Kendall County Totals												
Municipal	1,194	2,242	3,485	5,262	7,359	9,575	2,082	5,677	8,424	13,763	20,357	28,938
Industrial	2	3	4	4	5	6	10	17	20	20	24	27
County Total	1,196	2,245	3,489	5,266	7,364	9,581	2,092	5,694	8,444	13,783	20,831	28,965

Table 4-24 (continued)

County/Basin/Water User Group	Projected Water Needs[1]						Population Effects[2]					
	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2000 Number	2010 Number	2020 Number	2030 Number	2040 Number	2050 Number
Medina County												
Nueces Basin												
Devine–Municipal	666	656	653	677	700	718	3,033	2,958	3,272	3,391	3,506	3,578
Hondo–Municipal	923	983	1,055	1,154	1,218	1,284	4,690	4,948	5,285	5,781	6,101	6,399
Lytle–Municipal	51	48	46	47	49	51	234	218	207	209	219	230
Irrigation	68,381	63,294	58,434	58,117	53,660	49,393	792	730	664	654	611	562
San Antonio Basin												
Castroville–Municipal	228	255	283	331	362	393	1,043	1,161	1,271	1,472	1,626	1,763
La Coste–Municipal	147	168	169	195	214	234	673	765	759	867	961	1,050
Rural–Municipal	0	0	0	23	39	70	0	0	0	29	47	84
Irrigation	9,825	9,066	8,146	7,265	6,422	5,613	110	107	90	78	66	55
Mining	68	68	70	72	74	76	8	8	8	10	9	9
Medina County Totals												
Municipal	2,015	2,110	2,206	2,427	2,582	2,750	9,673	10,050	10,794	11,749	12,460	13,104
Irrigation	78,206	72,360	66,580	65,382	60,082	55,006	902	837	754	732	677	617
Mining	68	68	70	72	74	76	8	8	8	10	9	9
County Total	80,289	74,538	63,856	67,881	62,738	57,832	10,583	10,895	11,556	12,491	13,146	13,730
Uvalde County												
Nueces Basin												
Sabinal–Municipal	247	283	310	369	420	476	1,131	1,290	1,392	1,640	1,884	2,126
Uvalde–Municipal	2,435	2,883	3,183	3,872	4,460	5,133	18,229	21,375	23,599	32,816	40,149	46,207
Irrigation	48,551	43,250	38,242	36,273	31,673	27,382	562	499	435	408	361	312
Uvalde County Totals												
Municipal	2,682	3,166	3,493	4,241	4,880	5,609	19,360	22,665	24,991	34,456	42,033	48,333
Irrigation	48,551	43,250	38,242	36,273	31,673	27,382	562	499	435	408	361	312
County Total	51,233	46,416	41,735	40,514	36,553	32,991	19,922	23,164	25,426	34,864	42,394	48,645

Table 4-24 (continued)

County/Basin/Water User Group	Projected Water Needs[1]						Population Effects[2]					
	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2000 Number	2010 Number	2020 Number	2030 Number	2040 Number	2050 Number
Wilson County												
San Antonio Basin												
Floresville–Municipal	0	0	0	0	63	145	0	0	0	0	316	726
County Total	0	0	0	0	63	145	0	0	0	0	316	726
Zavala County												
Nueces Basin												
Irrigation	80,685	76,589	72,655	88,293	84,673	81,200	936	884	826	995	964	923
County Total	80,685	76,589	72,655	88,293	84,673	81,200	936	884	826	995	964	923
Nueces Basin Totals												
Municipal	4,785	5,624	6,333	8,569	10,057	11,272	29,509	34,514	40,392	54,975	66,771	76,977
Industrial	0	0	0	0	0	0	0	0	0	0	0	0
Steam-Electric	0	0	0	0	1,504	8,504	0	0	0	0	167	1,072
Irrigation	309,466	289,711	271,138	304,579	287,310	270,868	3,583	3,343	3,083	3,426	3,266	3,077
Mining	182	178	183	1,184	1,303	1,438	24	24	24	149	151	166
Total	314,433	295,513	277,654	314,332	300,174	292,082	33,116	37,881	43,499	58,550	70,355	81,292
San Antonio Basin Totals												
Municipal	135,112	168,649	212,503	281,367	338,554	380,729	526,838	632,448	786,114	1,000,056	1,225,158	1,425,055
Industrial	2	3	4	1,432	4,762	8,196	10	17	20	16,088	53,552	92,183
Steam-Electric	0	0	0	0	0	0	0	0	0	0	0	0
Irrigation	21,616	17,787	15,250	13,483	11,280	9,177	244	210	168	145	115	91
Mining	4,859	4,836	5,098	5,299	5,535	5,849	652	646	670	692	729	770
Total	161,589	191,275	232,855	301,581	360,131	403,951	527,744	633,321	786,972	1,016,981	1,279,554	1,518,099
Guadalupe Basin Totals												
Municipal	10,231	23,156	32,079	45,155	60,022	82,372	16,058	123,601	155,923	206,677	290,877	381,154
Industrial	979	1,198	1,344	1,481	1,957	2,444	5,379	6,520	7,278	8,020	12,612	17,244
Steam-Electric	920	920	920	920	920	920	116	122	114	112	104	102
Irrigation	883	777	677	582	492	406	10	9	8	6	5	4
Mining	5,840	5,734	5,886	6,043	3,824	2,455	782	767	774	787	502	320
Total	18,853	31,785	40,906	54,181	67,215	88,597	22,345	131,019	164,097	215,602	304,100	398,824

Table 4-24 (continued)

County/Basin/Water User Group	Projected Water Needs[1]						Population Effects[2]					
	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2000 Number	2010 Number	2020 Number	2030 Number	2040 Number	2050 Number
Lavaca-Guadalupe Coastal Basin Totals												
Municipal	0	769	758	852	969	1,093	0	5,702	5,592	6,285	7,148	8,025
Industrial	0	0	0	0	0	0	0	0	0	0	0	0
Steam-Electric	0	0	0	0	0	0	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0	0	0	0	0	0	0
Mining	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	769	758	852	969	1,093	0	5,702	5,592	6,285	7,148	8,025
South Central Texas Region Totals												
Municipal	150,128	198,198	251,673	335,943	409,602	475,466	572,405	796,265	988,021	1,267,993	1,589,954	1,891,211
Industrial	981	1,201	1,348	2,913	6,719	10,640	5,389	6,537	7,298	24,108	66,164	109,427
Steam-Electric	920	920	920	920	2,424	9,424	116	122	114	112	271	1,174
Irrigation	331,965	308,275	287,056	318,644	299,082	280,451	3,837	3,562	3,259	3,577	3,386	3,172
Mining	10,881	10,748	11,167	12,526	10,662	9,742	1,458	1,437	1,468	1,628	1,382	1,256
Total	494,875	519,342	552,173	670,946	728,489	785,723	583,205	807,923	1,000,160	1,297,418	1,661,157	2,006,240
Percent of Totals												
Municipal	30.34	38.16	45.58	50.07	56.23	60.51	98.15	98.56	98.79	97.73	95.71	94.27
Industrial	0.20	0.23	0.24	0.43	0.92	1.35	0.92	0.81	0.73	1.86	3.98	5,45
Steam-Electric	0.19	0.18	0.17	0.14	0.33	1.20	0.02	0.02	0.01	0.01	0.02	0.06
Irrigation	67.08	59.36	51.99	47.49	41.06	35.69	0.66	0.44	0.33	0.28	0.20	0.16
Mining	2.20	2.07	2.02	1.87	1.46	1.24	0.25	0.18	0.15	0.13	0.08	0.06
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

[1]Summary from Tables 4-1 through 4-21. Water needs are the differences between projected water supplies for an individual water user group and projected water demands for that water user group (i.e., projected water shortages for that water user group. If the calculation of supply minus demand is positive, the water user group has a surplus, and consequently, does not have a projected water need at the date for which the calculation is made. Only those water user groups having a calculated shortage (need) are included in this table.

[2]Computations were provided by the Texas Water Development Board in response to request of South-Central Texas Regional Water Planning Group.

Table 4-25. Projected Water Needs by Water User Group and Impacts of Not Meeting Water Needs upon School Enrollment South Central Texas Region

County/Basin/Water User Group	Projected Water Needs[1]						School Enrollment Effects[2]					
	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2000 Number	2010 Number	2020 Number	2030 Number	2040 Number	2050 Number
Atascosa County												
Nueces Basin												
Lytle–Municipal	325	366	401	467	520	577	384	409	457	521	580	644
Steam-Electric	0	0	0	0	1,504	8,504	0	0	0	0	71	272
Irrigation	37,557	35,909	34,411	42,812	41,323	39,890	112	101	99	121	121	115
Mining	0	0	0	995	1,109	1,239	0	0	0	33	55	38
San Antonio Basin												
Rural–Municipal	0	0	0	1	10	10	0	0	0	1	5	3
Irrigation	861	809	759	914	867	823	3	2	2	3	4	2
Atascosa County Totals												
Municipal	325	366	401	468	530	587	384	409	457	522	585	647
Steam-Electric	0	0	0	0	1,504	8,504	0	0	0	0	71	272
Irrigation	38,418	36,718	35,170	43,726	42,190	40,713	115	103	101	124	125	117
Mining	0	0	0	995	1,109	1,239	0	0	0	33	55	38
County Total	38,743	37,084	35,571	45,189	45,333	51,043	499	512	558	679	836	1,074
Bexar County												
Nueces Basin												
Rural–Municipal	0	0	36	929	1,211	1,074	0	0	13	318	431	375
Irrigation	3,129	3,023	3,031	2,579	2,462	2,341	9	7	9	7	11	6
Mining	182	178	183	189	194	199	6	5	7	6	9	6

Table 4-25 (continued)

County/Basin/Water User Group	Projected Water Needs[1]						School Enrollment Effects[2]					
	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2000 Number	2010 Number	2020 Number	2030 Number	2040 Number	2050 Number
San Antonio Basin												
Alamo Heights–Municipal	1,299	1,232	1,186	1,206	1,228	1,242	1,682	1,565	1,507	1,503	1,531	1,548
Balcones Heights–Municipal	419	427	447	486	531	573	495	477	509	543	593	714
China Grove–Municipal	155	172	189	240	289	312	183	192	215	268	335	355
Converse–Municipal	1,560	2,270	2,962	3,931	4,798	5,889	2,975	4,248	6,764	8,286	10,745	8,683
Elmendorf–Municipal	33	34	34	44	54	63	37	30	41	50	63	72
Fair Oaks Ranch–Municipal	1,309	1,312	1,149	1,153	1,158	1,157	1,519	1,667	1,460	1,437	1,443	1,442
Helotes–Municipal	152	179	207	286	326	369	180	200	236	319	378	420
Kirby–Municipal	963	1,070	1,216	1,476	1,720	1,991	1,837	2,003	2,276	2,709	3,157	3,655
Leon Valley–Municipal	570	417	240	238	236	322	1,087	781	449	437	450	591
Live Oak Water Public Utility–Municipal	0	7	84	255	420	604		10	157	468	771	1,353
Olmos Park–Municipal	311	312	322	345	371	395	368	348	367	385	430	450
San Antonio (SAWS)–Municipal	102,394	124,328	154,496	194,684	231,946	273,629	103,047	125,120	155,480	195,924	239,117	282,089
Schertz	207	506	869	953	1,048	1,148	491	1,155	1,984	2,134	2,347	1,693
Schertz (Outside City)	674	970	1,098	1,310	1,522	1,735	244	332	383	448	521	594
Shavano Park–Municipal	675	750	779	819	871	929	783	854	887	914	973	1,037
Terrell Hills–Municipal	540	506	504	520	513	500	699	643	641	648	640	623
Universal City–Municipal	2,012	2,374	2,812	3,490	4,117	4,826	3,838	4,443	5,262	7,356	9,220	10,808
BMWD (Castle Hills)–Municipal	1,209	1,238	1,260	1,281	1,264	1,246	1,403	1,573	1,601	1,596	1,575	1,553
BMWD (Somerset)–Municipal	121	110	101	91	83	79	143	123	115	101	96	90
BMWD (Hill Country/Hollywood Park)–Municipal	1,694	1,932	2,200	2,606	2,963	3,378	1,966	2,200	2,504	2,910	3,308	3,771
BMWD (Other Subdivisions)–Municipal	9,795	15,820	21,637	28,031	34,706	38,617	3,484	5,521	7,551	9,031	11,880	13,219
Fort Sam Houston–Municipal	1,453	1,184	955	929	902	888	2,771	2,216	1,787	1,705	1,655	1,630
Lackland AFB–Municipal	1,222	970	750	729	708	698	1,583	1,232	953	908	882	870
Randolph AFB–Municipal	906	790	687	678	673	664	1,051	900	782	757	751	742
Rural–Municipal	2,211	5,197	10,178	25,757	32,681	22,000	787	1,814	3,552	8,298	11,187	7,531
Industrial	0	0	0	1,428	4,757	8,190	0	0	0	3,997	13,317	22,927
Irrigation	10,930	7,912	6,345	5,304	3,991	2,741	32	18	19	15	17	7
Mining	4,781	4,758	5,018	5,217	5,451	5,763	166	156	167	171	186	192

Table 4-25 (continued)

	Projected Water Needs [1]						***School Enrollment Effects*** [2]					
County/Basin/Water User Group	***2000 (acft)***	***2010 (acft)***	***2020 (acft)***	***2030 (acft)***	***2040 (acft)***	***2050 (acft)***	***2000 Number***	***2010 Number***	***2020 Number***	***2030 Number***	***2040 Number***	***2050 Number***
Bexar County Totals												
Municipal	131,884	164,107	206,398	272,467	326,339	364,328	132,653	159,647	197,476	249,453	304,479	345,908
Industrial	0	0	0	1,428	4,757	8,190	0	0	0	3,997	13,317	22,927
Irrigation	14,059	10,935	9,376	7,883	6,453	5,082	41	25	28	22	28	13
Mining	4,963	4,936	5,201	5,406	5,645	5,962	172	161	174	177	195	198
County Total	150,906	179,978	220,975	287,184	343,194	383,562	132,866	159,833	197,678	253,649	318,019	369,046
Caldwell County												
Guadalupe Basin												
Lockhart–Municipal	0	188	393	668	714	737	0	345	735	1,226	1,311	1,353
County Total	0	188	393	668	714	737	0	345	735	1,226	1,311	1,353
Calhoun County												
Lavaca-Guadalupe Coastal Basin												
Port Lavaca	0	769	758	852	969	1,093	0	1,439	1,419	1,564	1,778	2,006
County Total	0	769	758	852	969	1,093	0	1,439	1,419	1,564	1,778	2,006
Comal County												
San Antonio Basin												
Rural–Municipal	1,659	1,877	2,204	3,095	4,060	5,148	590	655	769	1,059	1,390	1,762
Guadalupe Basin												
Garden Ridge–Municipal	322	395	434	562	623	617	381	441	494	627	776	769
New Braunfels–Municipal	0	7,768	10,634	14,697	17,645	20,915	0	11,678	15,987	20,395	26,017	30,838
Fair Oaks Ranch–Municipal	43	43	39	42	45	49	49	54	52	53	58	62
Schertz–Municipal	3,795	3,691	3,444	3,837	4,277	4,746	0	8,428	7,864	8,088	9,578	6,998
Rural–Municipal	1,703	3,080	5,286	7,999	10,948	14,453	606	1,075	1,845	2,738	3,747	4,948
Industrial	0	0	0	0	271	551	0	0	0	0	866	1,761
Mining	5,570	5,464	5,628	5,796	3,590	2,224	193	179	188	190	122	74

Table 4-25 (continued)

County/Basin/Water User Group	Projected Water Needs[1]						School Enrollment Effects[2]					
	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2000 Number	2010 Number	2020 Number	2030 Number	2040 Number	2050 Number
Comal County (cont.)												
Comal County Totals												
Municipal	7,522	16,854	22,041	30,232	37,598	45,928	1,626	22,331	27,011	32,960	41,566	45,377
Industrial	0	0	0	0	271	551	0	0	0	0	866	1,761
Mining	5,570	5,464	5,628	5,796	3,590	2,224	193	179	188	190	122	74
County Total	13,092	22,318	27,669	36,028	41,459	48,703	1,819	22,510	27,199	33,150	42,554	47,212
Dimmit County												
Nueces Basin												
Carrizo Springs–Municipal	138	405	649	1,054	1,479	1,959	182	505	1,215	1,934	2,715	3,596
County Total	138	405	649	1,054	1,479	1,959	182	505	1,215	1,934	2,715	3,596
Frio County												
Nueces Basin												
Irrigation	71,126	67,646	64,365	76,505	73,519	70,662	213	191	186	216	216	204
County Total	71,126	67,646	64,365	76,505	73,519	70,662	213	191	186	216	216	204
Guadalupe County												
San Antonio Basin												
Rural–Municipal	0	0	0	922	1,319	1,900	0	0	0	316	469	650
Mining	10	10	10	10	10	10	1	0	1	1	1	0
Guadalupe Basin												
New Braunfels–Municipal	0	49	63	104	120	136	0	72	95	154	184	204
Schertz–Municipal	123	413	886	970	1,065	1,165	292	943	2,023	2,172	2,385	1,718
Seguin–Municipal	0	0	0	7	1,280	2,745	0	0	0	16	2,867	4,047
Rural–Municipal	0	0	0	0	533	2,605	0	0	0	0	190	891
Industrial	979	1,198	1,344	1,481	1,686	1,893	1,371	1,646	1,846	1,995	2,272	2,550
Steam-Electric	920	920	920	920	920	920	30	23	31	30	44	27
Irrigation	883	777	677	582	492	406	3	2	2	2	2	1
Mining	186	188	190	192	197	203	6	5	7	6	10	6

Table 4-25 (continued)

County/Basin/Water User Group	Projected Water Needs[1]						School Enrollment Effects[2]					
	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2000 Number	2010 Number	2020 Number	2030 Number	2040 Number	2050 Number
Guadalupe County (cont.)												
Guadalupe County Totals												
Municipal	123	462	949	2,003	4,317	8,551	292	1,015	2,118	2,658	6,095	7,510
Industrial	979	1,198	1,344	1,481	1,686	1,893	1,371	1,646	1,846	1,995	2,272	2,550
Steam-Electric	920	920	920	920	920	920	30	23	31	30	44	27
Irrigation	883	777	677	582	492	406	3	2	2	2	2	1
Mining	196	198	200	202	207	213	7	5	8	7	11	6
County Total	3,101	3,555	4,090	5,188	7,622	11,983	1,703	2,691	4,005	4,692	8,424	10,094
Hays County												
Guadalupe Basin												
San Marcos–Municipal	641	2,848	5,629	9,919	15,326	27,297	1,492	6,503	8,462	13,765	22,598	40,248
Kyle–Municipal	0	0	0	0	156	225	0	0	0	0	181	256
Wimberley–Municipal	0	0	0	0	0	322	0	0	0	0	0	409
Rural–Municipal	3,604	4,681	5,271	6,350	7,290	6,360	1,282	1,634	1,840	2,174	2,495	2,177
Mining	84	82	68	55	37	28	3	2	2	2	2	1
Hays County Totals												
Municipal	4,245	7,529	10,900	16,269	22,772	34,204	2,774	8,137	10,302	15,939	25,274	43,090
Mining	84	82	68	55	37	28	3	2	2	2	2	1
County Total	4,329	7,611	10,968	16,324	22,809	34,232	2,777	8,139	10,304	15,941	25,276	43,091
Kendall County												
San Antonio Basin												
Boerne–Municipal	34	486	493	974	1,587	2,528	43	618	922	1,788	2,913	4,640
Fair Oaks Ranch–Municipal	90	217	184	189	194	200	106	270	234	236	251	254
Rural–Municipal	1,070	1,539	2,808	4,099	5,578	6,847	388	537	980	1,403	0	2,344
Industrial	2	3	4	4	5	6	3	3	6	5	10	7
Kendall County Totals												
Municipal	1,194	2,242	3,485	5,262	7,359	9,575	537	1,425	2,136	3,427	5,073	7,238
Industrial	2	3	4	4	5	6	3	3	6	5	10	7
County Total	1,196	2,245	3,489	5,266	7,364	9,581	540	1,428	2,142	3,432	5,083	7,245

Table 4-25 (continued)

County/Basin/Water User Group	Projected Water Needs[1]						School Enrollment Effects[2]					
	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2000 Number	2010 Number	2020 Number	2030 Number	2040 Number	2050 Number
Medina County												
Nueces Basin												
Devine–Municipal	666	656	653	677	700	718	773	747	830	844	872	895
Hondo–Municipal	923	983	1,055	1,154	1,218	1,284	1,195	1,249	1,341	1,438	1,518	1,600
Lytle–Municipal	51	48	46	47	49	51	60	54	53	53	57	58
Irrigation	68,381	63,294	58,434	58,117	53,660	49,393	205	179	168	164	158	142
San Antonio Basin												
Castroville–Municipal	228	255	283	331	362	393	269	285	322	370	420	447
La Coste–Municipal	147	168	169	195	214	234	174	188	192	218	249	266
Rural–Municipal	0	0	0	23	39	70	0	0	0	8	20	22
Irrigation	9,825	9,066	8,146	7,265	6,422	5,613	28	21	25	21	28	15
Mining	68	68	70	72	74	76	2	2	2	3	4	2
Medina County Totals												
Municipal	2,015	2,110	2,206	2,427	2,582	2,750	2,471	2,523	2,738	2,931	3,136	3,288
Irrigation	78,206	72,360	66,580	65,382	60,082	55,006	233	200	193	185	186	157
Mining	68	68	70	72	74	76	2	2	2	3	4	2
County Total	80,289	74,538	68,856	67,881	62,738	57,832	2,706	2,725	2,933	3,119	3,326	3,447
Uvalde County												
Nueces Basin												
Sabinal–Municipal	247	283	310	369	420	476	292	316	353	412	487	531
Uvalde–Municipal	2,435	2,883	3,183	3,872	4,460	5,133	4,645	5,396	5,957	8,161	9,988	11,495
Irrigation	48,551	43,250	38,242	36,273	31,673	27,382	145	122	110	103	93	79
Uvalde County Totals												
Municipal	2,682	3,166	3,493	4,241	4,880	5,609	4,937	5,712	6,310	8,573	10,475	12,026
Irrigation	48,551	43,250	38,242	36,273	31,673	27,382	145	122	110	103	93	79
County Total	51,233	46,416	41,735	40,514	36,553	32,991	5,082	5,834	6,420	8,676	10,568	12,105

Table 4-25 (continued)

County/Basin/Water User Group	Projected Water Needs[1]						School Enrollment Effects[2]					
	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2000 Number	2010 Number	2020 Number	2030 Number	2040 Number	2050 Number
Wilson County												
San Antonio Basin												
Floresville–Municipal	0	0	0	0	63	145	0	0	0	0	82	184
County Total	0	0	0	0	63	145	0	0	0	0	82	184
Zavala County												
Nueces Basin												
Irrigation	80,685	76,589	72,655	88,293	84,673	81,200	242	217	210	250	249	234
County Total	80,685	76,589	72,655	88,293	84,673	81,200	242	217	210	250	249	234
Nueces Basin Totals												
Municipal	4,785	5,624	6,333	8,569	10,057	11,272	7,531	8,676	10,219	13,681	16,648	19,194
Industrial	0	0	0	0	0	0	0	0	0	0	0	0
Steam-Electric	0	0	0	0	1,504	8,504	0	0	0	0	71	272
Irrigation	309,466	289,711	271,138	304,579	387,310	270,868	926	817	782	861	848	780
Mining	182	178	183	1,184	1,303	1,438	6	5	7	39	64	44
Total	314,433	295,513	277,654	314,332	300,174	292,082	8,463	9,498	11,008	14,581	17,631	20,290
San Antonio Basin Totals												
Municipal	135,112	168,649	212,503	281,367	338,554	380,729	134,223	162,200	200,882	254,534	311,756	356,105
Industrial	2	3	4	1,434	4,764	8,196	3	3	6	4,002	13,327	22,934
Steam-Electric	0	0	0	0	0	0	0	0	0	0	0	0
Irrigation	21,616	17,787	15,250	13,483	11,280	9,177	63	41	46	39	49	24
Mining	4,859	4,836	5,098	5,299	5,535	5,849	169	158	170	175	191	194
Total	161,589	191,275	232,855	301,581	360,131	403,951	134,458	162,402	201,104	258,750	325,323	379,257
Guadalupe Basin Totals												
Municipal	10,231	23,156	32,079	45,155	60,022	82,372	4,102	31,173	39,397	51,408	72,387	94,918
Industrial	979	1,198	1,344	1,481	1,957	2,444	1,371	1,646	1,846	1,995	3,138	4,311
Steam-Electric	920	920	920	920	920	920	30	23	31	30	44	27
Irrigation	883	777	677	582	492	406	3	2	2	2	2	1
Mining	5,840	5,734	5,886	6,043	3,824	2,455	202	186	197	198	134	81
Total	18,853	31,785	40,906	54,181	67,215	88,597	5,708	33,030	41,473	53,633	75,705	99,338

Table 4-25 (continued)

County/Basin/Water User Group	Projected Water Needs[1] 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	School Enrollment Effects[2] 2000 Number	2010 Number	2020 Number	2030 Number	2040 Number	2050 Number
Lavaca-Guadalupe Coastal Basin Totals												
Municipal	0	769	758	852	969	1,093	0	1,439	1,419	1,564	1,778	2,006
Industrial	0	0	0	0	0	0	0	0	0	0	0	0
Steam-Electric	0	0	0	0	0	0	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0	0	0	0	0	0	0
Mining	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	769	758	852	969	1,093	0	1,439	1,419	1,564	1,778	2,006
South Central Texas Region Totals												
Municipal	150,128	198,198	251,673	335,943	409,602	475,466	145,856	203,488	251,917	321,187	402,569	472,223
Industrial	981	1,201	1,348	2,913	6,719	10,640	1,374	1,649	1,852	5,997	16,465	27,245
Steam-Electric	920	920	920	920	2,424	9,424	30	23	31	30	115	199
Irrigation	331,965	308,275	287,065	318,644	299,082	280,451	992	860	830	902	899	805
Mining	10,881	10,748	11,167	12,526	10,662	9,742	377	349	374	412	389	319
Total	498,875	519,342	552,173	670,946	728,489	785,723	148,629	206,369	255,004	328,528	420,437	500,891
Percent of Totals												
Municipal	30.34	38.16	45.58	50.07	56.23	60.51	98.13	98.60	98.79	97.77	95.75	94.28
Industrial	0.20	0.23	0.24	0.43	0.92	1.35	0.92	0.80	0.73	1.83	3.92	5.44
Steam-Electric	0.19	0.18	0.17	0.14	0.33	1.20	0.02	0.01	0.01	0.01	0.03	0.06
Irrigation	67.08	59.36	51.99	47.49	41.06	35.69	0.67	0.42	0.33	0.27	0.21	0.16
Mining	2.20	2.07	2.02	1.87	1.46	1.24	0.25	0.17	0.15	0.13	0.09	0.06
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

[1]Summary from Tables 4-1 through 4-21. Water needs are the differences between projected water supplies for an individual water user group and projected water demands for that water user group; i.e.; projected water shortages for that water user group. If the calculation of supply minus demand is positive, the water user group has a surplus, and consequently does not have a projected water need at the date for which the calculation is made. Only those water user groups having a calculated shortage (need) are included in this table.

[2] Computations were provided by the Texas Water Development Board in response to request of South Central Texas Regional Water Planning Group.

Table 4-26.
Projected Water Needs by Water User Group and Impacts of Not Meeting Water Needs upon Gross Business South Central Texas Region

County/Basin/Water User Group	Projected Water Needs[1]						Gross Business Effects -- Millions of 1999 Dollars[2]					
	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2000 $million	2010 $million	2020 $million	2030 $million	2040 $million	2050 $million
Atascosa County												
Nueces Basin												
Lytle–Municipal	325	366	401	467	520	577	49.3	55.5	60.8	70.8	78.9	87.5
Steam-Electric	0	0	0	0	1,504	8,504	0.0	0.0	0.0	0.0	15.3	86.4
Irrigation	37,557	35,909	34,411	42,812	41,323	39,890	8.1	7.8	7.5	9.3	9.0	8.7
Mining	0	0	0	995	1,109	1,239	0.0	0.0	0.0	9.4	10.5	11.7
San Antonio Basin												
Rural–Municipal	0	0	0	1	10	10	0.0	0.0	0.0	0.1	0.6	0.6
Irrigation	861	809	759	914	867	823	0.2	0.2	0.2	0.2	0.2	0.2
Atascosa County Totals												
Municipal	325	366	401	468	530	587	49.3	55.5	60.8	70.9	79.5	88.1
Steam-Electric	0	0	0	0	1,504	8,504	0.0	0.0	0.0	0.0	15.3	86.4
Irrigation	38,418	36,718	35,170	43,726	42,190	40,713	8.3	8.0	7.6	9.5	9.2	8.8
Mining	0	0	0	995	1,109	1,239	0.0	0.0	0.0	9.4	10.5	11.7
County Total	38,743	37,084	35,571	45,189	45,333	51,043	57.6	63.5	68.5	89.8	114.4	195.1
Bexar County												
Nueces Basin												
Rural–Municipal	0	0	36	929	1,211	1,074	0.0	0.0	2.2	56.9	74.2	65.8
Irrigation	3,129	3,023	3,031	2,579	2,462	2,341	0.7	0.7	0.7	0.6	0.5	0.5
Mining	182	178	183	189	194	199	1.7	1.7	1.7	1.8	1.8	1.9

Table 4-26 (continued)

County/Basin/Water User Group	Projected Water Needs[1]						Gross Business Effects -- Millions of 1999 Dollars[2]					
	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2000 $million	2010 $million	2020 $million	2030 $million	2040 $million	2050 $million
San Antonio Basin												
Alamo Heights–Municipal	1,299	1,232	1,186	1,206	1,228	1,242	216.7	205.6	197.9	201.2	204.9	207.2
Balcones Heights–Municipal	419	427	447	486	531	573	63.6	64.8	67.8	73.7	80.6	95.6
China Grove–Municipal	155	172	189	240	289	312	23.5	26.1	28.7	36.4	43.8	47.3
Converse–Municipal	1,560	2,270	2,962	3,931	4,798	5,889	367.6	535.0	837.8	1,111.9	1,357.1	1,139.6
Elmendorf–Municipal	33	34	34	44	54	63	5.0	5.2	5.2	6.7	8.2	9.6
Fair Oaks Ranch–Municipal	1,309	1,312	1,149	1,153	1,158	1,157	198.6	218.9	191.7	192.4	193.2	193.0
Helotes–Municipal	152	179	207	286	326	369	23.1	27.2	31.4	43.4	49.5	56.0
Kirby–Municipal	963	1,070	1,216	1,476	1,720	1,991	226.9	252.2	286.6	347.8	405.4	469.2
Leon Valley–Municipal	570	417	240	238	236	322	134.3	98.3	56.6	56.1	55.6	75.9
Live Oak Water Public Utility–Municipal	0	7	84	255	420	604	0.0	1.6	19.8	60.1	99.0	170.8
Olmos Park–Municipal	311	312	322	345	371	395	47.2	47.3	48.8	52.3	56.3	59.9
San Antonio (SAWS)–Municipal	102,394	124,238	154,496	194,684	231,946	273,629	17,151.7	20,825.8	25,879.1	32,610.9	38,852.6	45,834.7
Schertz	207	506	869	953	1,048	1,148	58.6	143.1	245.8	269.6	296.4	222.1
Schertz (Outside City)	674	970	1,098	1,310	1,522	1,735	41.3	59.4	67.3	80.3	93.3	106.3
Shavano Park–Municipal	675	750	779	819	871	929	102.4	113.8	118.2	124.2	132.1	140.9
Terrell Hills–Municipal	540	506	504	520	513	500	90.1	84.4	84.1	86.8	85.6	83.4
Universal City–Municipal	2,012	2,374	2,812	3,490	4,117	4,826	474.2	559.5	662.7	987.2	1,164.5	1,365.1
BMWD (Castle Hills)–Municipal	1,209	1,238	1,260	1,281	1,264	1,246	183.4	206.6	210.2	213.7	210.9	207.9
BMWD (Somerset)–Municipal	121	110	101	91	83	79	18.4	16.7	15.3	13.8	12.6	12.0
BMWD (Hill Country/Hollywood Park)–Municipal	1,694	1,932	2,200	2,606	2,963	3,378	257.0	293.1	333.8	395.3	449.5	512.5
BMWD (Other Subdivisions)–Municipal	9.795	15,820	21,637	28,031	34,706	38,617	600.3	969.6	1,326.1	1,718.0	2,127.1	2,366.7
Fort Sam Houston–Municipal	1,453	1,184	955	929	902	888	342.4	279.0	225.1	218.9	212.6	209.3
Lackland AFB–Municipal	1,222	970	750	729	708	698	203.9	161.8	125.1	121.6	118.1	116.5
Randolph AFB–Municipal	906	790	687	678	673	664	137.4	119.8	104.2	102.9	102.1	100.7
Rural–Municipal	2,211	5,197	10,178	25,757	32,681	22,000	135.5	318.5	623.8	1,578.6	2,002.9	1,348.3
Industrial	0	0	0	1,428	4,757	8,190	0	0	0	914.3	3,0435.7	5,243.7
Irrigation	10,930	7,912	6,345	5,304	3,991	2,741	2.4	1.7	1.4	1.2	0.9	0.6
Mining	4,781	4,758	5,018	5,217	5,451	5,763	45.3	45.1	47.6	49.5	51.7	54.6

Table 4-26 (continued)

County/Basin/Water User Group	Projected Water Needs[1]						Gross Business Effects -- Millions of 1999 Dollars[2]					
	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2000 $million	2010 $million	2020 $million	2030 $million	2040 $million	2050 $million
Bexar County (cont.)												
Bexar County Totals												
Municipal	131,884	164,107	206,398	272,467	326,339	364,328	21,103.1	25,633.2	31,795.2	40,760.8	48,488.0	55,216.5
Industrial	0	0	0	1,428	4,757	8,190	0.0	0.0	0.0	914.3	3,045.7	5,243.7
Irrigation	14,059	10,935	9,376	7,883	6,453	5,082	3.1	2.4	2.0	1.7	1.4	1.1
Mining	4,963	4,936	5,201	5,406	5,645	5,962	47.1	46.8	49.3	51.3	53.5	56.5
County Total	150,906	179,978	220,975	287,184	343,194	383,562	21,153.2	25,682.4	31,846.6	41,728.0	51,588.6	60,517.8
Caldwell County												
Guadalupe Basin												
Lockhart–Municipal	0	188	393	668	714	737	0.0	44.3	92.6	157.4	168.3	173.7
County Total	0	188	393	668	714	737	0.0	44.3	92.6	157.4	168.3	173.7
Calhoun County												
Lavaca-Guadalupe Coastal Basin												
Port Lavaca	0	769	758	852	969	1,093	0.0	181.2	178.6	200.8	228.4	257.6
County Total	0	769	758	852	969	1,093	0.0	181.2	178.6	200.8	228.4	257.6
Comal County												
San Antonio Basin												
Rural–Municipal	1,659	1,877	2,204	3,095	4,060	5,148	101.7	115.0	135.1	189.7	248.8	315.5
Guadalupe Basin												
Garden Ridge–Municipal	322	395	434	562	623	617	48.8	59.9	65.8	85.3	103.9	102.9
New Braunfels–Municipal	0	7,768	10,634	14,697	17,645	20,915	0.0	1,503.2	2,057.7	2,844.0	3,414.4	4,047.2
Fair Oaks Ranch–Municipal	43	43	39	42	45	49	6.5	7.2	6.5	7.0	7.5	8.2
Schertz–Municipal	3,795	3,691	3,444	3,837	4,277	4,746	1,073.4	1,044.0	974.2	1,085.3	1,209.8	918.4
Rural–Municipal	1,703	3,080	5,286	7,999	10,948	14,453	104.4	188.8	324.0	490.2	671.0	885.8
Industrial	0	0	0	0	271	551	0.0	0.0	0.0	0.0	198.1	402.8
Mining	5,570	5,464	5,628	5,796	3,590	2,224	52.8	51.8	53.4	55.0	34.0	21.1

Table 4-26 (continued)

County/Basin/Water User Group	Projected Water Needs[1]						Gross Business Effects -- Millions of 1999 Dollars[2]					
	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2000 $million	2010 $million	2020 $million	2030 $million	2040 $million	2050 $million
Comal County (cont.)												
Comal County Totals												
Municipal	7,522	16,854	22,041	30,232	37,598	45,928	1,334.9	2,918.1	3,563.3	4,701.5	5,655.4	6,278.0
Industrial	0	0	0	0	271	551	0.0	0.0	0.0	0.0	198.1	402.8
Mining	5,570	5,464	5,628	5,796	3,590	2,224	52.8	51.8	53.4	55.0	34.0	21.1
County Total	13,092	22,318	27,669	36,028	41,459	48,703	1,387.7	2,969.9	3,616.6	4,756.4	5,887.6	6,701.9
Dimmit County												
Nueces Basin												
Carrizo Springs–Municipal	138	405	649	1,054	1,479	1,959	23.0	67.6	152.9	248.4	348.6	461.7
County Total	138	405	649	1,054	1,479	1,959	23.0	67.6	152.9	248.4	348.6	461.7
Frio County												
Nueces Basin												
Irrigation	71,126	67,646	64,365	76,505	73,519	70,662	15.4	14.7	14.0	16.6	16.0	15.3
County Total	71,126	67,646	64,365	76,505	73,519	70,662	15.4	14.7	14.0	16.6	16.0	15.3
Guadalupe County												
San Antonio Basin												
Rural–Municipal	0	0	0	922	1,319	1,900	0.0	0.0	0.0	56.5	80.8	116.4
Mining	10	10	10	10	10	10	0.1	0.1	0.1	0.1	0.1	0.1
Guadalupe Basin												
New Braunfels–Municipal	0	49	63	104	120	136	0.00	9.5	12.2	20.1	23.2	26.3
Schertz–Municipal	123	413	886	970	1,065	1,165	34.8	116.8	250.6	274.4	301.2	225.4
Seguin–Municipal	0	0	0	7	1,280	2,745	0.0	0.0	0.0	2.0	362.1	531.2
Rural–Municipal	0	0	0	0	533	2,605	0.0	0.0	0.0	0.0	32.7	159.7
Industrial	979	1,198	1,344	1,481	1,686	1,893	301.7	369.1	414.1	456.3	519.5	583.3
Steam-Electric	920	920	920	920	920	920	9.3	9.3	9.3	9.3	9.3	9.3
Irrigation	883	777	677	582	492	406	0.2	0.2	0.1	0.1	0.1	0.1
Mining	186	188	190	192	197	203	1.8	1.8	1.8	1.8	1.9	1.9

Table 4-26 (continued)

County/Basin/Water User Group	Projected Water Needs[1] 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	Gross Business Effects -- Millions of 1999 Dollars[2] 2000 $million	2010 $million	2020 $million	2030 $million	2040 $million	2050 $million
Guadalupe County (cont.)												
Guadalupe County Totals												
Municipal	123	462	949	2,003	4,317	8,551	34.8	126.3	262.8	353.0	800.0	1,059.0
Industrial	979	1,198	1,344	1,481	1,686	1,893	301.7	369.1	414.1	456.3	519.5	583.3
Steam-Electric	920	920	920	920	920	920	9.3	9.3	9.3	9.3	9.3	9.3
Irrigation	883	777	677	582	492	406	0.2	0.2	0.1	0.1	0.1	0.1
Mining	196	198	200	202	207	213	1.9	1.9	1.9	1.9	2.0	2.0
County Total	3,101	3,555	4,090	5,188	7,622	11,983	347.9	506.8	688.3	820.7	1,331.0	1,653.7
Hays County												
Guadalupe Basin												
San Marcos–Municipal	641	2,848	5,629	9,919	15,326	27,297	181.3	805.6	1,089.2	1,919.4	2,965.7	5,282.1
Kyle–Municipal	0	0	0	0	156	225	0	0	0	0	23.7	34.1
Wimberley–Municipal	0	0	0	0	0	322	0.0	0.0	0.0	0.0	0.0	53.7
Rural–Municipal	3,604	4,681	5,271	6,350	7,290	6,360	220.9	286.9	323.0	389.2	446.8	389.8
Mining	84	82	68	55	37	28	0.8	0.8	0.6	0.5	0.4	0.3
Hays County Totals												
Municipal	4,245	7,529	10,900	16,269	22,772	34,204	402.2	1,092.5	1,412.3	2,308.6	3,436.1	5,759.8
Mining	84	82	68	55	37	28	0.8	0.8	0.6	0.5	0.4	0.3
County Total	4,329	7,611	10,968	16,324	22,809	34,232	403.0	1,093.2	1,412.9	2,309.1	3,436.5	5,760.0
Kendall County												
San Antonio Basin												
Boerne–Municipal	34	486	493	974	1,587	2,528	5.7	81.1	116.2	229.5	374.0	595.8
Fair Oaks Ranch–Municipal	90	217	184	189	194	200	13.7	36.2	30.7	31.5	32.4	33.4
Rural–Municipal	1,070	1,539	2,808	4,099	5,578	6,847	65.6	94.3	172.1	251.2	341.9	419.6
Industrial	2	3	4	4	5	6	0.6	0.9	1.2	1.2	1.5	1.8

Table 4-26 (continued)

County/Basin/Water User Group	*Projected Water Needs[1]*						*Gross Business Effects -- Millions of 1999 Dollars[2]*					
	2000 (acft)	*2010 (acft)*	*2020 (acft)*	*2030 (acft)*	*2040 (acft)*	*2050 (acft)*	*2000 $million*	*2010 $million*	*2020 $million*	*2030 $million*	*2040 $million*	*2050 $million*
Kendall County (cont.)												
Kendall County Totals												
Municipal	1,194	2,242	3,485	5,262	7,359	9,575	84.9	211.6	319.0	512.3	748.3	1,048.8
Industrial	2	3	4	4	5	6	0.6	0.9	1.2	1.2	1.5	1.8
County Total	1,196	2,245	3,489	5,266	7,364	9,581	85.5	212.5	320.1	513.5	449.8	1,050.5
Medina County												
Nueces Basin												
Devine–Municipal	666	656	653	677	700	718	101.0	99.5	109.0	113.0	116.8	119.8
Hondo–Municipal	923	983	1,055	1,154	1,218	1,284	154.0	164.0	176.0	192.5	203.2	214.2
Lytle–Municipal	51	48	46	47	49	51	7.7	7.3	7.0	7.1	7.4	7.7
Irrigation	68,381	63,294	58,434	58,117	53,660	49,393	14.8	13.7	12.7	12.6	11.6	10.7
San Antonio Basin												
Castroville–Municipal	228	255	283	331	362	393	34.6	38.7	42.9	50.2	54.9	59.6
La Coste–Municipal	147	168	169	195	214	234	22.3	25.5	25.6	29.6	32.5	35.5
Rural–Municipal	0	0	0	23	39	70	0.0	0.0	0.0	1.4	2.4	4.3
Irrigation	9,825	9,066	8,146	7,265	6.422	5,613	2.1	2.0	1.8	1.6	1.4	1.2
Mining	68	68	70	72	74	76	0.6	0.6	0.7	0.7	0.7	0.7
Medina County Totals												
Municipal	2,015	2,110	2,206	2,427	2,582	2,750	319.7	335.0	360.5	393.8	417.2	441.2
Irrigation	78,206	72,360	66,580	65,382	60,082	55,006	17.0	15.7	14.4	14.2	13.0	11.9
Mining	68	68	70	72	74	76	0.6	0.6	0.7	0.7	0.7	0.7
County Total	80,289	74,538	68,856	67,881	62,738	57,832	337.3	351.3	375.6	408.7	431.0	453.8
Uvalde County												
Nueces Basin												
Sabinal–Municipal	247	283	310	369	420	476	37.5	42.9	47.0	56.0	63.7	72.2
Uvalde–Municipal	2,435	2,883	3,183	3,872	4,460	5,133	573.9	679.4	750.1	1,095.2	1,261.5	1,451.9
Irrigation	48,551	43,250	38,242	36,273	31,673	27,382	10.5	9.4	8.3	7.9	6.9	5.9

Table 4-26 (continued)

County/Basin/Water User Group	*Projected Water Needs[1]*						*Gross Business Effects -- Millions of 1999 Dollars[2]*					
	2000 (acft)	*2010 (acft)*	*2020 (acft)*	*2030 (acft)*	*2040 (acft)*	*2050 (acft)*	*2000 $million*	*2010 $million*	*2020 $million*	*2030 $million*	*2040 $million*	*2050 $million*
Uvalde County (cont.)												
Uvalde County Totals												
Municipal	2,682	3,166	3,493	4,241	4,880	5,609	611.3	722.4	797.2	1,151.2	1,325.2	1,524.1
Irrigation	48,551	43,250	38,242	36,273	31,673	27,382	10.5	9.4	8.3	7.9	6.9	5.9
County Total	51,233	46,416	41,735	40,514	36,553	32,991	621.9	731.7	805.5	1,159.1	1,332.1	1,530.0
Wilson County												
San Antonio Basin												
Floresville–Municipal	0	0	0	0	63	145	0	0	0	0	10.5	24.2
County Total	0	0	0	0	63	145	0	0	0	0	10.5	24.2
Zavala County												
Nueces Basin												
Irrigation	80,722	76,589	72,655	88,293	84,673	81,200	17.5	16.6	15.8	19.2	18.4	17.6
County Total	80,722	76,589	72,655	88,293	84,673	81,200	17.5	16.6	15.8	19.2	18.4	17.6
Nueces Basin Totals												
Municipal	4,785	5,624	6,333	8,569	10,057	11,272	946.4	1,116.3	1,305.1	1,840.0	2,154.4	2,480.9
Industrial	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
Steam-Electric	0	0	0	0	1,504	8,504	0.0	0.0	0.0	0.0	15.3	86.4
Irrigation	309,466	289,711	271,138	304,579	287,310	270,868	67.1	62.9	58.8	66.1	62.3	58.8
Mining	182	178	183	1,184	1,303	1,438	1.7	1.7	1.7	11.2	12.4	13.6
Total	314,433	295,513	277,654	314,332	300,174	292,082	1,015.3	1,180.8	1,365.7	1,917.3	2,244.3	2,639.7
San Antonio Basin Totals												
Municipal	135,112	168,649	212,503	281,367	338,554	380,729	21,346.6	26,024.1	32,315.7	41,543.6	49,592.6	56,755.6
Industrial	2	3	4	1,432	4,762	8,196	0.6	0.9	1.2	915.4	3,047.1	5,245.4
Steam-Electric	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
Irrigation	21,616	17,787	15,250	13,483	11,280	9,177	4.7	3.9	3.3	2.9	2.4	2.0
Mining	4,859	4,836	5,098	5,299	5,535	5,849	46.1	45.8	48.3	50.2	52.5	55.5
Total	161,589	191,275	232,855	301,581	360,131	403,951	21,397.9	26,074.6	32,368.5	42,512.2	52,694.6	62,058.5

Table 4-26 (continued)

County/Basin/Water User Group	Projected Water Needs[1]						Gross Business Effects -- Millions of 1999 Dollars[2]					
	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2000 $million	2010 $million	2020 $million	2030 $million	2040 $million	2050 $million
Guadalupe Basin Totals												
Municipal	10,231	23,156	32,079	45,155	60,022	82,372	1,670.2	4,066.1	5,195.9	7,274.2	9,730.2	12,838.5
Industrial	979	1,198	1,344	1,481	1,957	2,444	301.7	369.1	414.1	456.3	717.6	986.1
Steam-Electric	920	920	920	920	920	920	9.3	9.3	9.3	9.3	9.3	9.3
Irrigation	883	777	677	582	492	406	0.2	0.2	0.1	0.1	0.1	0.1
Mining	5,840	5,734	5,886	6,043	3,824	2,455	55.4	54.4	55.8	57.3	36.3	23.3
Total	18,853	31,785	40,906	54,181	67,215	88,597	2,036.7	4,499.1	5,675.3	7,797.4	10,493.6	13,857.3
Lavaca-Guadalupe Coastal Basin Totals												
Municipal	0	769	758	852	969	1,093	0.0	181.2	178.6	200.8	228.4	257.6
Industrial	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
Steam-Electric	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
Irrigation	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
Mining	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
Total	0	769	758	852	969	1,093	0.0	181.2	178.6	200.8	228.4	257.6
South Central Texas Region Totals												
Municipal	150,128	198,198	251,673	335,943	409,602	475,466	23,963.2	31,387.7	38,995.3	50,858.6	61,705.6	72,332.6
Industrial	981	1,201	1,348	2,913	6,719	10,640	302.2	370.0	415.3	1,371.8	3,764.7	6,231.5
Steam-Electric	920	920	920	920	2,424	9,424	9.3	9.3	9.3	9.3	24.6	95.7
Irrigation	331,965	308,275	287,065	318,644	299,082	280,451	72.0	66.9	62.3	69.1	64.9	60.8
Mining	10,881	10,748	11,167	12,526	10,662	9,742	103.2	101.9	105.9	118.8	101.1	92.3
Total	494,875	519,342	552,173	670,946	728,489	785,723	24,450.0	31,935.8	39,588.1	52,427.7	65,660.9	78,813.0
Percent of Totals												
Municipal	30.34	38.16	45.58	50.07	56.23	60.51	98.01	98.28	98.50	97.01	93.97	91.78
Industrial	0.20	0.23	0.24	0.43	0.92	1.35	1.24	1.16	1.05	2.62	5.73	7.91
Steam-Electric	0.19	0.18	0.17	0.14	0.33	1.20	0.04	0.03	0.02	0.02	0.04	0.12
Irrigation	67.08	59.36	51.99	47.49	41.06	35.69	0.29	0.21	0.16	0.13	0.10	0.08
Mining	2.20	2.07	2.02	1.87	1.46	1.24	0.42	0.32	0.27	0.23	0.15	0.12
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

[1]Summary from Tables 4-1 through 4-21. Water needs are the differences between projected water supplies for an individual water user group and projected water demands for that water user group; i.e.; projected water shortages for that water user group. If the calculation of supply minus demand is positive, the water user group has a surplus, and consequently does not have a projected water need at the date for which the calculation is made. Only those water user groups having a calculated shortage (need) are included in this table.

[2] Computations were provided by the Texas Water Development Board in response to request of South Central Texas Regional Water Planning Group.

Table 4-27.
Projected Water Needs by Water User Group and Impacts of Not Meeting Water Needs upon Employment South Central Texas Region

County/Basin/Water User Group	Projected Water Needs[1] 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	Employment Effects[2] 2000 Number	2010 Number	2020 Number	2030 Number	2040 Number	2050 Number
Atascosa County												
Nueces Basin												
Lytle–Municipal	325	366	401	467	520	577	712	801	878	1,022	1,138	1,263
Steam-Electric	0	0	0	0	1,504	8,504	0	0	0	0	92	523
Irrigation	37,557	35,909	34,411	42,812	41,323	39,890	208	199	191	237	229	221
Mining	0	0	0	995	1,109	1,239	0	0	0	64	71	80
San Antonio Basin												
Rural–Municipal	0	0	0	1	10	10	0	0	0	1	7	7
Irrigation	861	809	759	914	867	823	5	4	4	5	5	5
Atascosa County Totals												
Municipal	325	366	401	468	530	587	712	801	878	1,023	1,145	1,270
Steam-Electric	0	0	0	0	1,504	8,504	0	0	0	0	92	523
Irrigation	38,418	36,718	35,170	43,726	42,190	40,713	213	204	195	243	234	226
Mining	0	0	0	995	1,109	1,239	0	0	0	64	71	80
County Total	38,743	37,084	35,571	45,189	45,333	51,043	925	1,005	1,073	1,330	1,543	2,098
Bexar County												
Nueces Basin												
Rural–Municipal	0	0	36	929	1,211	1,074	0	0	24	624	813	721
Irrigation	3,129	3,023	3,031	2,579	2,462	2,341	17	17	17	14	14	13
Mining	182	178	183	189	194	199	12	11	12	12	12	13

Table 4-27 (continued)

County/Basin/Water User Group	Projected Water Needs[1]						Employment Effects[2]					
	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2000 Number	2010 Number	2020 Number	2030 Number	2040 Number	2050 Number
San Antonio Basin												
Alamo Heights–Municipal	1,299	1,232	1,186	1,206	1,228	1,242	3,174	3,010	2,898	2,947	3,001	3,035
Balcones Heights–Municipal	419	427	447	486	531	573	917	935	979	1,064	1,163	1,400
China Grove–Municipal	155	172	189	240	289	312	339	377	414	525	633	683
Converse–Municipal	1,560	2,270	2,962	3,931	4,798	5,889	5,614	8,170	13,007	17,262	21,069	17,026
Elmendorf–Municipal	33	34	34	44	54	63	72	74	74	96	118	138
Fair Oaks Ranch–Municipal	1,309	1,312	1,149	1,153	1,158	1,157	2,866	3,206	2,808	2,817	2,830	2,827
Helotes–Municipal	152	179	207	286	326	369	333	392	453	626	714	808
Kirby–Municipal	963	1,070	1,216	1,476	1,720	1,991	3,466	3,851	4,376	5,312	6,190	7,166
Leon Valley–Municipal	570	417	240	238	236	322	2,051	1,501	864	857	849	1,159
Live Oak Water Public Utility–Municipal	0	7	84	255	420	604		25	302	918	1,512	2,652
Olmos Park–Municipal	311	312	322	345	371	395	681	683	705	755	812	865
San Antonio (SAWS)–Municipal	102,394	124,328	154,496	194,684	231,946	273,629	251,333	305,171	379,220	477,864	569,326	671,640
Schertz	207	506	869	953	1,048	1,148	909	2,222	3,816	4,185	4,602	3,319
Schertz (Outside City)	674	970	1,098	1,310	1,522	1,735	452	651	737	879	1,022	1,164
Shavano Park–Municipal	675	750	779	819	871	929	1,478	1,642	1,705	1,793	1,907	2,034
Terrell Hills–Municipal	540	506	504	520	513	500	1,319	1,236	1,232	1,271	1,254	1,222
Universal City–Municipal	2,012	2,374	2,812	3,490	4,117	4,826	7,241	8,544	10,120	15,325	18,079	21,192
BMWD (Castle Hills)–Municipal	1,209	1,238	1,260	1,281	1,264	1,246	2,647	3,025	3,079	3,130	3,089	3,045
BMWD (Somerset)–Municipal	121	110	101	91	83	79	265	241	221	199	182	173
BMWD (Hill Country/Hollywood Park)–Municipal	1,694	1,932	2,200	2,606	2,963	3,378	3,709	4,230	4,816	5,705	6,487	7,395
BMWD (Other Subdivisions)–Municipal	9,795	15,820	21,637	28,031	34,706	38,617	6,574	10,618	14,522	18,814	23,294	25,919
Fort Sam Houston–Municipal	1,453	1,184	955	929	902	888	5,229	4,261	3,437	3,343	3,246	3,196
Lackland AFB–Municipal	1,222	970	750	729	708	698	2,986	2,370	1,833	1,781	1,730	1,706
Randolph AFB–Municipal	906	790	687	678	673	664	1,983	1,730	1,504	1,484	1,473	1,454
Rural–Municipal	2,211	5,197	10,178	25,757	32,681	22,000	1,484	3,488	6,831	17,288	21,935	14,766
Industrial	0	0	0	1,428	4,757	8,190	0	0	0	7,838	26,111	44,954
Irrigation	10,930	7,912	6,345	5,304	3,991	2,741	61	44	35	29	22	15
Mining	4,781	4,758	5,018	5,217	5,451	5,763	307	306	322	335	350	370

Table 4-27 (continued)

County/Basin/Water User Group	Projected Water Needs[1]						Employment Effects[2]					
	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2000 Number	2010 Number	2020 Number	2030 Number	2040 Number	2050 Number
Bexar County Totals												
Municipal	131,884	164,107	206,398	272,467	326,339	364,328	307,124	371,653	459,978	586,866	697,327	796,703
Industrial	0	0	0	1,428	4,757	8,190	0	0	0	7,838	26,111	44,954
Irrigation	14,059	10,935	9,376	7,883	6,453	5,082	78	61	52	44	36	28
Mining	4,963	4,936	5,201	5,406	5,645	5,962	319	317	334	347	363	383
County Total	150,906	179,978	220,975	287,184	343,194	383,562	307,521	372,030	460,364	595,095	723,836	842,068
Caldwell County												
Guadalupe Basin												
Lockhart–Municipal	0	188	393	668	714	737	0	677	1,414	2,404	2,570	2,652
County Total	0	188	393	668	714	737	0	677	1,414	2,404	2,570	2,652
Calhoun County												
Lavaca-Guadalupe Coastal Basin												
Port Lavaca	0	769	758	852	969	1,093	0	2,768	2,728	3,066	3,487	3,934
County Total	0	769	758	852	969	1,093	0	2,768	2,728	3,066	3,487	3,934
Comal County												
San Antonio Basin												
Rural–Municipal	1,659	1,877	2,204	3,095	4,060	5,148	1,113	1,260	1,479	2,077	2,725	3,455
Guadalupe Basin												
Garden Ridge–Municipal	322	395	434	562	623	617	705	865	950	1,230	1,522	1,508
New Braunfels–Municipal	0	7,768	10,634	14,697	17,645	20,915	0	22,458	30,744	42,490	51,013	60,467
Fair Oaks Ranch–Municipal	43	43	39	42	45	49	94	105	95	103	110	120
Schertz–Municipal	3,795	3,691	3,444	3,837	4,277	4,746	16,665	16,208	15,123	16,849	18,781	13,721
Rural–Municipal	1,703	3,080	5,286	7,999	10,948	14,453	1,143	2,067	3,548	5,369	7,348	9,701
Industrial	0	0	0	0	271	551	0	0	0	0	1,698	3,453
Mining	5,570	5,464	5,628	5,796	3,590	2,224	358	351	362	372	231	143

Table 4-27 (continued)

County/Basin/Water User Group	Projected Water Needs[1]						Employment Effects[2]					
	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2000 Number	2010 Number	2020 Number	2030 Number	2040 Number	2050 Number
Comal County (cont.)												
Comal County Totals												
Municipal	7,522	16,854	22,041	30,232	37,598	45,928	19,720	42,963	51,940	68,118	81,500	88,971
Industrial	0	0	0	0	271	551	0	0	0	0	1,698	3,453
Mining	5,570	5,464	5,628	5,796	3,590	2,224	358	351	362	372	231	143
County Total	13,092	22,318	27,669	36,028	41,459	48,703	20,078	43,314	52,310	68,491	83,429	92,567
Dimmit County												
Nueces Basin												
Carrizo Springs–Municipal	138	405	649	1,054	1,479	1,959	337	990	2,336	3,793	5,323	7,050
County Total	138	405	649	1,054	1,479	1,959	337	990	2,336	3,793	5,323	7,050
Frio County												
Nueces Basin												
Irrigation	71,126	67,646	64,365	76,505	73,519	70,662	394	375	357	424	408	392
County Total	71,126	67,646	64,365	76,505	73,519	70,662	394	375	357	424	408	392
Guadalupe County												
San Antonio Basin												
Rural–Municipal	0	0	0	922	1,319	1,900	0	0	0	619	885	1,275
Mining	10	10	10	10	10	10	1	1	1	1	1	1
Guadalupe Basin												
New Braunfels–Municipal	0	49	63	104	120	136	0	142	182	301	347	393
Schertz–Municipal	123	413	886	970	1,065	1,165	540	1,814	3,891	4,259	4,677	3,368
Seguin–Municipal	0	0	0	7	1,280	2,745	0	0	0	31	5,621	7,936
Rural–Municipal	0	0	0	0	533	2,605	0	0	0	0	358	1,748
Industrial	979	1,198	1,344	1,481	1,686	1,893	2,586	3,165	3,550	3,912	4,454	5,000
Steam-Electric	920	920	920	920	920	920	57	57	57	57	57	57
Irrigation	883	777	677	582	492	406	5	4	4	3	3	2
Mining	186	188	190	192	197	203	12	12	12	12	13	13

Table 4-27 (continued)

County/Basin/Water User Group	*Projected Water Needs*[1] 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	*Employment Effects*[2] 2000 Number	2010 Number	2020 Number	2030 Number	2040 Number	2050 Number
Guadalupe County (cont.)												
<u>Guadalupe County Totals</u>												
Municipal	123	462	949	2,003	4,317	8,551	540	1,955	4,073	5,210	11,887	14,721
Industrial	979	1,198	1,344	1,481	1,686	1,893	2,586	3,165	3,550	3,912	4,454	5,000
Steam-Electric	920	920	902	920	920	920	57	57	57	57	57	57
Irrigation	883	777	677	582	492	406	5	4	4	3	3	2
Mining	196	198	200	202	207	213	13	13	13	13	13	14
County Total	3,101	3,555	4,090	5,188	7,622	11,983	3,200	5,193	7,696	9,195	16,414	19,794
Hays County												
<u>Guadalupe Basin</u>												
San Marcos–Municipal	641	2,848	5,629	9,919	15,326	27,297	2,815	12,506	16,274	28,677	44,309	78,918
Kyle–Municipal	0	0	0	0	156	225	0	0	0	0	342	493
Wimberley–Municipal	0	0	0	0	0	322	0	0	0	0	0	787
Rural–Municipal	3,604	4,681	5,271	6,350	7,290	6,360	2,419	3,142	3,538	4,262	4,893	4,269
Mining	84	82	68	55	37	28	5	5	4	4	2	2
<u>Hays County Totals</u>												
Municipal	4,245	7,529	10,900	16,269	22,772	34,204	5,234	15,648	19,812	32,939	49,543	84,466
Mining	84	82	68	55	37	28	5	5	4	4	2	2
County Total	4,329	7,611	10,968	16,324	22,809	34,232	5,239	15,653	19,816	32,942	49,546	84,468
Kendall County												
<u>San Antonio Basin</u>												
Boerne–Municipal	34	486	493	974	1,587	2,528	83	1,188	1,774	3,505	5,712	9,098
Fair Oaks Ranch–Municipal	90	217	184	189	194	200	197	530	450	462	474	489
Rural–Municipal	1,070	1,539	2,808	4,099	5,578	6,847	718	1,033	1,885	2,751	3,744	4,596
Industrial	2	3	4	4	5	6	5	8	10	10	13	15
<u>Kendall County Totals</u>												
Municipal	1,194	2,242	3,485	5,262	7,359	9,575	998	2,751	4,109	6,178	9,930	14,182
Industrial	2	3	4	4	5	6	5	8	10	10	13	15
County Total	1,196	2,245	3,489	5,266	7,364	9,581	1,003	2,758	4,119	6,728	9,943	14,197

Table 4-27 (continued)

County/Basin/Water User Group	Projected Water Needs[1]						Employment Effects[2]					
	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2000 Number	2010 Number	2020 Number	2030 Number	2040 Number	2050 Number
Medina County												
Nueces Basin												
Devine–Municipal	666	656	653	677	700	718	1,458	1,436	1,596	1,654	1,710	1,754
Hondo–Municipal	923	983	1,055	1,154	1,218	1,284	2,255	2,402	2,578	2,820	2,976	3,137
Lytle–Municipal	51	48	46	47	49	51	112	105	101	103	107	112
Irrigation	68,381	63,294	58,434	58,117	53,660	49,393	379	351	324	322	298	274
San Antonio Basin												
Castroville–Municipal	228	255	283	331	362	393	499	558	620	725	793	860
La Coste–Municipal	147	168	169	195	214	234	322	368	370	427	469	512
Rural–Municipal	0	0	0	23	39	70	0	0	0	15	26	47
Irrigation	9,825	9,066	8,146	7,265	6,422	5,613	54	50	45	40	36	31
Mining	68	68	70	72	74	76	4	4	4	5	5	5
Medina County Totals												
Municipal	2,015	2,110	2,206	2,427	2,582	2,750	4,646	4,869	5,264	5,744	6,081	6,423
Irrigation	78,206	72,360	66,580	65,382	60,082	55,006	434	401	369	363	333	305
Mining	68	68	70	72	74	76	4	4	4	5	5	5
County Total	80,289	74,538	68,856	67,881	62,738	57,832	5,084	5,275	5,638	6,111	6,419	6,733
Uvalde County												
Nueces Basin												
Sabinal–Municipal	247	283	310	369	420	476	541	620	679	808	919	1,042
Uvalde–Municipal	2,435	2,883	3,183	3,872	4,460	5,133	8,764	10,376	11,456	17,003	19,585	22,540
Irrigation	48,551	43,250	38,242	36,273	31,673	27,382	269	240	212	201	176	152
Uvalde County Totals												
Municipal	2,682	3,166	3,493	4,241	4,880	5,609	9,304	10,995	12,134	17,811	20,504	23,582
Irrigation	48,551	43,250	38,242	36,273	31,673	27,382	269	240	212	201	176	152
County Total	51,233	46,416	41,735	40,514	36,553	32,991	9,574	11,235	12,346	18,012	20,680	23,734

Table 4-27 (continued)

County/Basin/Water User Group	*Projected Water Needs*[1]						*Employment Effects*[2]					
	2000 (acft)	*2010 (acft)*	*2020 (acft)*	*2030 (acft)*	*2040 (acft)*	*2050 (acft)*	*2000 Number*	*2010 Number*	*2020 Number*	*2030 Number*	*2040 Number*	*2050 Number*
Wilson County												
San Antonio Basin												
Floresville–Municipal	0	0	0	0	63	145	0	0	0	0	154	354
County Total	0	0	0	0	63	145	0	0	0	0	154	354
Zavala County												
Nueces Basin												
Irrigation	80,722	76,589	72,655	88,293	84,673	81,200	448	425	403	490	470	450
County Total	80,722	76,589	72,655	88,293	84,673	81,200	448	425	403	490	470	450
Nueces Basin Totals												
Municipal	4,785	5,624	6,333	8,569	10,057	11,272	14,178	16,730	19,646	27,827	32,572	37,620
Industrial	0	0	0	0	0	0	0	0	0	0	0	0
Steam-Electric	0	0	0	0	1,504	8,504	0	0	0	0	92	523
Irrigation	309,466	289,711	271,138	304,579	287,310	270,868	1,716	1,607	1,504	1,689	1,594	1,502
Mining	182	178	183	1,184	1,303	1,438	12	11	12	76	84	92
Total	314,433	295,513	277,654	314,332	300,174	292,082	15,906	18,348	21,162	29,592	34,342	39,738
San Antonio Basin Totals												
Municipal	135,112	168,649	212,503	281,367	338,554	380,729	310,056	376,589	466,531	596,824	711,502	816,675
Industrial	2	3	4	1,432	4,762	8,196	5	8	10	7,848	26,123	44,969
Steam-Electric	0	0	0	0	0	0	0	0	0	0	0	0
Irrigation	21,616	17,787	15,250	13,483	11,280	9,177	120	99	85	75	63	51
Mining	4,859	4,836	5,098	5,299	5,535	5,849	312	311	328	340	356	376
Total	161,589	191,275	232,855	301,581	360,131	403,951	310,494	377,006	466,953	605,088	738,043	862,071
Guadalupe Basin Totals												
Municipal	10,231	23,156	32,079	45,155	60,022	82,372	24,381	59,983	75,759	105,975	141,890	186,080
Industrial	979	1,198	1,344	1,481	1,957	2,444	2,586	3,165	3,550	3,912	6,152	8,454
Steam-Electric	920	920	920	920	920	920	57	57	57	57	57	57
Irrigation	883	777	677	582	492	406	5	4	4	3	3	2
Mining	5,840	5,734	5,886	6,043	3,824	2,455	375	368	378	388	246	158
Total	18,853	31,785	40,906	54,181	67,215	88,597	27,403	63,577	79,748	110,335	148,347	194,750

Table 4-27 (continued)

County/Basin/Water User Group	Projected Water Needs[1]						Employment Effects[2]					
	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2000 Number	2010 Number	2020 Number	2030 Number	2040 Number	2050 Number
Lavaca-Guadalupe Coastal Basin Totals												
Municipal	0	769	758	852	969	1,093	0	2,768	2,728	3,066	3,487	3,934
Industrial	0	0	0	0	0	0	0	0	0	0	0	0
Steam-Electric	0	0	0	0	0	0	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0	0	0	0	0	0	0
Mining	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	769	758	852	969	1,093	0	2,768	2,728	3,066	3,487	3,934
South Central Texas Region Totals												
Municipal	150,128	198,198	251,673	335,943	409,602	475,466	348,615	456,069	564,665	733,692	889,451	1,044,309
Industrial	981	1,201	1,348	2,913	6,719	10,640	2,591	3,172	3,560	11,760	32,275	53,423
Steam-Electric	920	920	920	920	2,424	9,424	57	57	57	57	149	579
Irrigation	331,965	308,275	287,065	318,644	299,082	280,451	1,841	1,710	1,592	1,767	1,659	1,556
Mining	10,881	10,748	11,167	12,526	10,662	9,742	699	691	718	805	685	626
Total	494,875	519,342	552,173	670,946	728,489	785,723	353,803	461,698	570,591	748,081	924,219	1,100,493
Percent of Totals												
Municipal	30.34	38.16	45.58	50.07	56.23	60.51	98.53	98.78	98.96	98.08	96.24	94.89
Industrial	0.20	0.23	0.24	0.43	0.92	1.35	0.73	0.69	0.62	1.57	3.49	4.85
Steam-Electric	0.19	0.18	0.17	0.14	0.33	1.20	0.02	0.01	0.01	0.01	0.02	0.05
Irrigation	67.08	59.36	51.99	47.49	41.06	35.69	0.52	0.37	0.28	0.24	0.18	0.14
Mining	2.20	2.07	2.02	1.87	1.46	1.24	0.20	0.15	0.13	0.11	0.07	0.06
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

[1]Summary from Tables 4-1 through 4-21. Water needs are the differences between projected water supplies for an individual water user group and projected water demands for that water user group; i.e.; projected water shortages for that water user group. If the calculation of supply minus demand is positive, the water user group has a surplus, and consequently does not have a projected water need at the date for which the calculation is made. Only those water user groups having a calculated shortage (need) are included in this table.

[2] Computations were provided by the Texas Water Development Board in response to request of South Central Texas Regional Water Planning Group.

Table 4-28.
Projected Water Needs by Water User Group and Impacts of Not Meeting Water Needs upon Personal Income South Central Texas Region

County/Basin/Water User Group	Projected Water Needs[1]						Personal Income Effects — Millions of 1999 Dollars[2]					
	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2000 $million	2010 $million	2020 $million	2030 $million	2040 $million	2050 $million
Atascosa County												
Nueces Basin												
Lytle–Municipal	325	366	401	467	520	577	20.0	22.5	24.6	28.7	31.9	35.4
Steam-Electric	0	0	0	0	1,504	8,504	0.0	0.0	0.0	0.0	4.4	24.7
Irrigation	37,557	35,909	34,411	42,812	41,323	39,890	2.4	2.3	2.2	2.7	2.7	2.6
Mining	0	0	0	995	1,109	1,239	0.0	0.0	0.0	2.4	2.6	2.9
San Antonio Basin												
Rural–Municipal	0	0	0	1	10	10	0.0	0.0	0.0	0.0	0.2	0.2
Irrigation	861	809	759	914	867	823	0.1	0.1	0.0	0.1	0.1	0.1
Atascosa County Totals												
Municipal	325	366	401	468	530	587	20.0	22.5	24.6	28.7	32.1	35.6
Steam-Electric	0	0	0	0	1,504	8,504	0.0	0.0	0.0	0.0	4.4	24.7
Irrigation	38,418	36,718	35,170	43,726	42,190	40,713	2.5	2.4	2.3	2.8	2.7	2.6
Mining	0	0	0	995	1,109	1,239	0.0	0.0	0.0	2.4	2.6	2.9
County Total	38,743	37,084	35,571	45,189	45,333	51,043	22.4	24.8	26.9	33.9	41.8	65.9
Bexar County												
Nueces Basin												
Rural–Municipal	0	0	36	929	1,211	1,074	0.0	0.0	0.6	16.1	21.0	18.6
Irrigation	3,129	3,023	3,031	2,579	2,462	2,341	0.2	0.2	0.2	0.2	0.2	0.2
Mining	182	178	183	189	194	199	0.4	0.4	0.4	0.4	0.5	0.5

Table 4-28 (continued)

County/Basin/Water User Group	Projected Water Needs[1]						Personal Income Effects — Millions of 1999 Dollars[2]					
	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2000 $million	2010 $million	2020 $million	2030 $million	2040 $million	2050 $million
San Antonio Basin												
Alamo Heights–Municipal	1,299	1,232	1,186	1,206	1,228	1,242	89.3	84.7	81.6	82.9	84.4	85.4
Balcones Heights–Municipal	419	427	447	486	531	573	25.7	26.2	27.4	29.8	32.6	39.4
China Grove–Municipal	155	172	189	240	289	312	9.5	10.6	11.6	14.7	17.7	19.2
Converse–Municipal	1,560	2,270	2,962	3,931	4,798	5,889	159.6	232.2	371.1	492.5	601.1	481.4
Elmendorf–Municipal	33	34	34	44	54	63	2.0	2.1	2.1	2.7	3.3	3.9
Fair Oaks Ranch–Municipal	1,309	1,312	1,149	1,153	1,158	1,157	80.4	90.2	79.0	79.3	79.6	79.6
Helotes–Municipal	152	179	207	286	326	369	9.3	11.0	12.7	17.6	20.0	22.7
Kirby–Municipal	963	1,070	1,216	1,476	1,720	1,991	98.5	109.5	124.4	151.0	175.9	203.7
Leon Valley–Municipal	570	417	240	238	236	322	58.3	42.7	24.6	24.3	24.1	32.9
Live Oak Water Public Utility–Municipal	0	7	84	255	420	604	0.0	0.7	8.6	26.1	43.0	75.7
Olmos Park–Municipal	311	312	322	345	371	395	19.1	19.2	19.8	21.2	22.8	24.2
San Antonio (SAWS)–Municipal	102,394	124,328	154,496	194,684	231,946	273,629	7,073.9	8,589.2	10,673.3	13,449.7	16,024.0	18,903.6
Schertz	207	506	869	953	1,048	1,148	25.9	63.4	108.9	119.4	131.3	93.9
Schertz (Outside City)	674	970	1,098	1,310	1,522	1,735	11.7	16.8	19.0	22.7	26.4	30.1
Shavano Park–Municipal	675	750	779	819	871	929	41.4	46.0	47.8	50.3	53.5	57.0
Terrell Hills–Municipal	540	506	504	520	513	500	37.1	34.8	34.7	35.8	35.3	34.4
Universal City–Municipal	2,012	2,374	2,812	3,490	4,117	4,826	205.8	242.8	287.6	437.2	515.8	604.6
BMWD (Castle Hills)–Municipal	1,209	1,238	1,260	1,281	1,264	1,246	74.2	85.1	86.6	88.1	86.9	85.7
BMWD (Somerset)–Municipal	121	110	101	91	83	79	7.4	6.8	6.2	5.6	5.1	4.8
BMWD (Hill Country/Hollywood Park)–Municipal	1,694	1,932	2,200	2,606	2,963	3,378	104.0	118.6	135.1	160.0	181.9	207.4
BMWD (Other Subdivisions)–Municipal	9,795	15,820	21,637	28,031	34,706	38,617	169.8	274.3	375.1	485.9	601.7	669.5
Fort Sam Houston–Municipal	1,453	1,184	955	929	902	888	148.6	121.1	97.7	95.0	92.3	90.8
Lackland AFB–Municipal	1,222	970	750	729	708	698	84.0	66.7	51.6	50.1	48.7	48.0
Randolph AFB–Municipal	906	790	687	678	673	664	55.6	48.5	42.2	41.6	41.3	40.8
Rural–Municipal	2,211	5,197	10,178	25,757	32,681	22,000	38.3	90.1	176.4	446.5	566.6	381.4
Industrial	0	0	0	1,428	4,757	8,190	0.0	0.0	0.0	261.9	872.4	1,502.0
Irrigation	10,930	7,912	6,345	5,304	3,991	2,741	0.7	0.5	0.4	0.3	0.3	0.2
Mining	4,781	4,758	5,018	5,217	5,451	5,763	11.4	11.3	11.9	12.4	13.0	13.7

Table 4-28 (continued)

County/Basin/Water User Group	*Projected Water Needs*[1]						*Personal Income Effects — Millions of 1999 Dollars*[2]					
	2000 (acft)	*2010 (acft)*	*2020 (acft)*	*2030 (acft)*	*2040 (acft)*	*2050 (acft)*	*2000 $million*	*2010 $million*	*2020 $million*	*2030 $million*	*2040 $million*	*2050 $million*
Bexar County (cont.)												
Bexar County Totals												
Municipal	131,884	164,107	206,398	272,467	326,339	364,328	8,629.7	10,433.2	12,905.6	16,446.2	19,536.2	22,338.5
Industrial	0	0	0	1,428	4,757	8,190	0.0	0.0	0.0	261.9	872.4	1,502.0
Irrigation	14,059	10,935	9,376	7,883	6,453	5,082	0.9	0.7	0.6	0.5	0.4	0.3
Mining	4,963	4,936	5,201	5,406	5,645	5,962	11.8	11.8	12.4	12.9	13.4	14.2
County Total	150,906	179,978	220,975	287,184	343,194	383,562	8,642.4	10,445.6	12,918.6	16,721.5	20,422.5	23,855.1
Caldwell County												
Guadalupe Basin												
Lockhart–Municipal	0	188	393	668	714	737	0.0	19.2	40.2	68.3	73.0	75.4
County Total	0	188	393	668	714	737	0.0	19.2	40.2	68.3	73.0	75.4
Calhoun County												
Lavaca-Guadalupe Coastal Basin												
Port Lavaca	0	769	758	852	969	1,093	0.0	78.7	77.5	87.2	99.1	111.8
County Total	0	769	758	852	969	1,093	0.0	78.7	77.5	87.2	99.1	111.8
Comal County												
San Antonio Basin												
Rural–Municipal	1,659	1,877	2,204	3,095	4,060	5,148	28.8	32.5	38.2	53.7	70.4	89.2
Guadalupe Basin												
Garden Ridge–Municipal	322	395	434	562	623	617	19.8	24.2	26.6	34.5	42.8	42.4
New Braunfels–Municipal	0	7,768	10,634	14,697	17,645	20,915	0	635.0	869.3	1,201.5	1,442.5	1,709.8
Fair Oaks Ranch–Municipal	43	43	39	42	45	49	2.6	3.0	2.7	2.9	3.1	3.4
Schertz–Municipal	3,795	3,691	3,444	3,837	4,277	4,746	475.4	462.4	431.5	480.7	535.8	388.0
Rural–Municipal	1,703	3,080	5,286	7,999	10,948	14,453	29.5	53.4	91.6	138.7	189.8	250.6
Industrial	0	0	0	0	271	551	0.0	0.0	0.0	0.0	56.7	115.4
Mining	5,570	5,464	5,628	5,796	3,590	2,224	13.3	13.0	13.4	13.8	8.5	5.3
Comal County Totals												
Municipal	7,522	16,854	22,041	30,232	37,598	45,928	556.1	1,201.6	1,460.0	1,911.9	2,284.4	2,483.4
Industrial	0	0	0	0	271	551	0.0	0.0	0.0	0.0	56.7	115.4
Mining	5,570	5,464	5,628	5,796	3,590	2,224	13.3	13.0	13.4	13.8	8.5	5.3
County Total	13,092	22,318	27,669	36,028	41,459	48,703	569.4	1,223.6	1,473.4	1,925.7	2,349.7	2,604.1

Table 4-28 (continued)

County/Basin/Water User Group	Projected Water Needs[1] 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	Personal Income Effects — Millions of 1999 Dollars[2] 2000 $million	2010 $million	2020 $million	2030 $million	2040 $million	2050 $million
Dimmit County												
Nueces Basin												
Carrizo Springs–Municipal	138	405	649	1,054	1,479	1,959	9.5	27.8	66.4	107.8	151.3	200.4
County Total	138	405	649	1,054	1,479	1,959	9.5	27.8	66.4	107.8	151.3	200.4
Frio County												
Nueces Basin												
Irrigation	71,126	67,646	64,365	76,505	73,519	70,662	4.6	4.3	4.1	4.9	4.7	4.5
County Total	71,126	67,646	64,365	76,505	73,519	70,662	4.6	4.3	4.1	4.9	4.7	4.5
Guadalupe County												
San Antonio Basin												
Rural–Municipal	0	0	0	922	1,319	1,900	0.0	0.0	0.0	16.0	22.9	32.9
Mining	10	10	10	10	10	10	0.0	0.0	0.0	0.0	0.0	0.0
Guadalupe Basin												
New Braunfels–Municipal	0	49	63	104	120	136	0.0	4.0	5.2	8.5	9.8	11.1
Schertz–Municipal	123	413	886	970	1,065	1,165	15.4	51.7	111.0	121.5	133.4	95.2
Seguin–Municipal	0	0	0	7	1,280	2,745	0.0	0.0	0.0	0.9	160.4	224.4
Rural–Municipal	0	0	0	0	533	2,605	0.0	0.0	0.0	0.0	9.2	45.2
Industrial	979	1,198	1,344	1,481	1,686	1,893	86.4	105.7	118.6	130.7	148.8	167.1
Steam-Electric	920	920	920	920	920	920	2.7	2.7	2.7	2.7	2.7	2.7
Irrigation	883	777	677	582	492	406	0.1	0.0	0.0	0.0	0.0	0.0
Mining	186	188	190	192	197	203	0.4	0.4	0.5	0.5	0.5	0.5
Guadalupe County Totals												
Municipal	123	462	949	2,003	4,317	8,551	15.4	55.7	116.1	146.9	335.7	408.9
Industrial	979	1,198	1,344	1,481	1,686	1,893	86.4	105.7	118.6	130.7	148.8	167.1
Steam-Electric	920	920	920	920	920	920	2.7	2.7	2.7	2.7	2.7	2.7
Irrigation	883	777	677	582	492	406	1.0	0.0	0.0	0.0	0.0	0.0
Mining	196	198	200	202	207	213	0.5	0.5	0.5	0.5	0.5	0.5
County Total	3,101	3,555	4,090	5,188	7,622	11,983	105.0	164.7	238.0	280.8	487.7	579.1

Table 4-28 (continued)

County/Basin/Water User Group	*Projected Water Needs*[1]						*Personal Income Effects — Millions of 1999 Dollars*[2]					
	2000 (acft)	*2010 (acft)*	*2020 (acft)*	*2030 (acft)*	*2040 (acft)*	*2050 (acft)*	*2000 $million*	*2010 $million*	*2020 $million*	*2030 $million*	*2040 $million*	*2050 $million*
Hays County												
Guadalupe Basin												
San Marcos–Municipal	641	2,848	5,629	9,919	15,326	27,297	80.3	356.8	460.2	810.9	1,252.9	2,231.6
Kyle–Municipal	0	0	0	0	156	225	0.0	0.0	0.0	0.0	9.6	13.8
Wimberley–Municipal	0	0	0	0	0	322	0.0	0.0	0.0	0.0	0.0	22.1
Rural–Municipal	3,604	4,681	5,271	6,350	7,290	6,360	62.5	81.1	91.4	110.1	126.4	110.3
Mining	84	82	68	55	37	28	0.2	0.2	0.2	0.1	0.1	0.1
Hays County Totals												
Municipal	4,245	7,529	10,900	16,269	22,772	34,204	142.8	438.0	551.6	921.0	1,388.9	2,377.8
Mining	84	82	68	55	37	28	0.2	0.2	0.2	0.1	0.1	0.1
County Total	4,329	7,611	10,968	16,324	22,809	34,232	143.0	438.1	551.7	921.1	1,389.0	2,377.8
Kendall County												
San Antonio Basin												
Boerne–Municipal	34	486	493	974	1,587	2,528	2.3	33.4	50.4	99.6	162.3	258.6
Fair Oaks Ranch–Municipal	90	217	184	189	194	200	5.5	14.9	12.7	13.0	13.3	13.8
Rural–Municipal	1,070	1,539	2,808	4,099	5,578	6,847	18.5	26.7	48.7	71.1	96.7	118.7
Industrial	2	3	4	4	5	6	0.2	0.3	0.3	0.3	0.4	0.5
Kendall County Totals												
Municipal	1,194	2,242	3,485	5,262	7,359	9,575	26.4	75.0	111.8	183.7	272.4	391.0
Industrial	2	3	4	4	5	6	0.2	0.3	0.3	0.3	0.4	0.5
County Total	1,196	2,245	3,489	5,266	7,364	9,581	26.6	75.3	112.1	184.0	272.8	391.5
Medina County												
Nueces Basin												
Devine–Municipal	666	656	653	677	700	718	40.9	40.3	44.9	46.6	48.1	49.4
Hondo–Municipal	923	983	1,055	1,154	1,218	1,284	63.5	67.6	72.5	79.4	83.8	88.3
Lytle–Municipal	51	48	46	47	49	51	3.1	2.9	2.8	2.9	3.0	3.1
Irrigation	68,381	63,294	58,434	58,117	53,660	49,393	4.4	4.1	3.7	3.7	3.4	3.2

Table 4-28 (continued)

County/Basin/Water User Group	***Projected Water Needs[1]***						***Personal Income Effects — Millions of 1999 Dollars[2]***					
	2000 (acft)	***2010 (acft)***	***2020 (acft)***	***2030 (acft)***	***2040 (acft)***	***2050 (acft)***	***2000 $million***	***2010 $million***	***2020 $million***	***2030 $million***	***2040 $million***	***2050 $million***
Medina County (cont.)												
San Antonio Basin												
Castroville–Municipal	228	255	283	331	362	393	14.0	15.7	17.4	20.3	22.2	24.1
La Coste–Municipal	147	168	169	195	214	234	9.0	10.3	10.4	12.0	13.1	14.4
Rural–Municipal	0	0	0	23	39	70	0.0	0.0	0.0	0.4	0.7	1.2
Irrigation	9,825	9,066	8,146	7,265	6,422	5,613	0.6	0.6	0.5	0.5	0.4	0.4
Mining	68	68	70	72	74	76	0.2	0.2	0.2	0.2	0.2	0.2
Medina County Totals												
Municipal	2,015	2,110	2,206	2,427	2,582	2,750	130.5	136.8	148.0	161.5	170.9	180.5
Irrigation	78,206	72,360	66,580	65,382	60,082	55,006	5.0	4.6	4.3	4.2	3.9	3.5
Mining	68	68	70	72	74	76	0.2	0.2	0.2	0.2	0.2	0.2
County Total	80,289	74,538	63,856	67,881	62,738	57,832	135.7	141.6	152.5	165.8	175.0	184.2
Uvalde County												
Nueces Basin												
Sabinal–Municipal	247	283	310	369	420	476	15.2	17.4	19.0	22.7	25.8	29.2
Uvalde–Municipal	2,435	2,883	3,183	3,872	4,460	5,133	249.1	294.9	325.6	485.1	558.8	643.1
Irrigation	48,551	43,250	38,242	36,273	31,673	27,382	3.1	2.8	2.5	2.3	2.0	1.8
Uvalde County Totals												
Municipal	2,682	3,166	3,493	4,241	4,880	5,609	264.2	312.3	344.6	507.7	584.5	672.3
Irrigation	48,551	43,250	38,242	36,273	31,673	27,382	3.1	2.8	2.5	2.3	2.0	1.8
County Total	51,233	46,416	41,735	40,514	36,553	32,991	267.4	315.1	347.1	510.1	586.6	674.0
Wilson County												
San Antonio Basin												
Floresville–Municipal	0	0	0	0	63	145	0.0	0.0	0.0	0.0	4.3	10.0
County Total	0	0	0	0	63	145	0.0	0.0	0.0	0.0	4.3	10.0
Zavala County												
Nueces Basin												
Irrigation	80,722	76,589	72,655	88,293	84,673	81,200	5.2	4.9	4.7	5.7	5.4	5.2
County Total	80,722	76,589	72,655	88,293	84,673	81,200	5.2	4.9	4.7	5.7	5.4	5.2

Table 4-28 (continued)

County/Basin/Water User Group	Projected Water Needs[1]						Personal Income Effects — Millions of 1999 Dollars[2]					
	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2000 $million	2010 $million	2020 $million	2030 $million	2040 $million	2050 $million
Nueces Basin Totals												
Municipal	4,785	5,624	6,333	8,569	10,057	11,272	401.2	473.4	556.5	789.1	923.6	1,067.5
Industrial	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
Steam-Electric	0	0	0	0	1,504	8,504	0.0	0.0	0.0	0.0	4.4	24.7
Irrigation	309,466	289,711	271,138	304,579	287,310	270,868	19.9	18.6	17.4	19.5	18.4	17.4
Mining	182	178	183	1,184	1,303	1,438	0.4	0.4	0.4	2.8	3.1	3.4
Total	314,433	295,513	277,654	314,332	300,174	292,082	421.5	492.4	574.4	811.5	949.5	1,113.1
San Antonio Basin Totals												
Municipal	135,112	168,649	212,503	281,367	338,554	380,729	8,707.9	10,566.7	13,082.7	16,716.1	19,921.4	22,883.0
Industrial	2	3	4	1,434	4,764	8,196	0.2	0.3	0.3	262.2	872.8	1,502.5
Steam-Electric	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
Irrigation	21,616	17,787	15,250	13,483	11,280	9,177	1.4	1.1	1.0	0.9	0.7	0.6
Mining	4,859	4,836	5,098	5,299	5,535	5,849	11.6	11.5	12.1	12.6	13.2	13.9
Total	161,589	191,275	232,855	301,581	360,131	403,951	8,721.0	10,579.6	13,096.2	16,991.8	20,808.1	24,400.0
Guadalupe Basin Totals												
Municipal	10,231	23,156	32,079	45,155	60,022	82,372	685.6	1,691.0	2,129.7	2,978.5	3,988.8	5,223.3
Industrial	979	1,198	1,344	1,481	1,957	2,444	86.4	105.7	118.6	130.7	205.6	282.5
Steam-Electric	920	920	920	920	920	920	2.7	2.7	2.7	2.7	2.7	2.7
Irrigation	883	777	677	582	492	406	0.1	0.0	0.0	0.0	0.0	0.0
Mining	5,840	5,734	5,886	6,043	3,824	2,455	13.9	13.6	14.0	14.4	9.1	5.8
Total	18,853	31,785	40,906	54,181	67,215	88,597	788.6	1,813.1	2,265.0	3,126.3	4,206.2	5,514.3
Lavaca-Guadalupe Coastal Basin Totals												
Municipal	0	769	758	852	969	1,093	0.0	78.7	77.5	87.2	99.1	111.8
Industrial	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
Steam-Electric	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
Irrigation	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
Mining	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
Total	0	769	758	852	969	1,093	0.0	78.7	77.5	87.2	99.1	111.8

Table 4-28 (continued)

County/Basin/Water User Group	Projected Water Needs[1]						Personal Income Effects — Millions of 1999 Dollars[2]					
	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2000 $million	2010 $million	2020 $million	2030 $million	2040 $million	2050 $million
South Central Texas Region Totals												
Municipal	150,128	198,198	251,673	335,943	409,602	475,466	9,794.6	12,809.8	15,846.5	20,570.9	24,932.9	29,285.6
Industrial	981	1,201	1,348	2,913	6,719	10,640	86.6	106.0	119.0	392.9	1,078.4	1,785.0
Steam-Electric	920	920	920	920	2,424	9,424	2.7	2.7	2.7	2.7	7.1	27.4
Irrigation	331,965	308,275	287,065	318,644	299,082	280,451	21.3	19.8	18.4	20.4	19.2	18.0
Mining	10,881	10,748	11,167	12,526	10,662	9,742	25.9	25.6	26.6	29.8	25.4	23.2
Total	494,875	519,342	552,173	670,946	728,489	785,723	9,931.1	12,963.8	16,013.1	21,016.7	26,062.9	31,139.1
Percent of Totals												
Municipal	30.34	38.16	45.58	50.07	56.23	60.51	98.63	98.81	98.96	97.88	95.66	94.05
Industrial	0.20	0.23	0.24	0.43	0.92	1.35	0.87	0.82	0.74	1.87	4.14	5.73
Steam-Electric	0.19	0.18	0.17	0.14	0.33	1.20	0.03	0.02	0.02	0.01	0.03	0.09
Irrigation	67.08	59.36	51.99	47.49	41.06	35.69	0.21	0.15	0.12	0.10	0.07	0.06
Mining	2.20	2.07	2.02	1.87	1.46	1.24	0.26	0.20	0.17	0.14	0.10	0.07
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

[1]Summary from Tables 4-1 through 4-21. Water needs are the differences between projected water supplies for an individual water user group and projected water demands for that water user group; i.e.; projected water shortages for that water user group. If the calculation of supply minus demand is positive, the water user group has a surplus, and consequently does not have a projected water need at the date for which the calculation is made. Only those water user groups having a calculated shortage (need) are included in this table.

[2] Computations were provided by the Texas Water Development Board in response to request of South Central Texas Regional Water Planning Group.

Section 4.3 — Supplement

Overview of the Methodology Used by the Texas Water Development Board to Estimate Social and Economic Impacts of Not Meeting Projected Water Demands

Copied directly from
Texas Water Development Board
Preliminary Report to Region L RWPG on July 25, 2000

Estimation of the socioeconomic impact of unmet water needs begins with estimation of the direct impact of the absence of water on the individual or business making productive use of the water. The direct economic impact of unmet water needs is defined as the dollar value of final demand (production for sale to final consumers) that could not be produced because of the absence of water. This direct impact per acre-foot was estimated by region for each type of water user – residential, commercial, manufacturing, irrigation, livestock, mining, and steam-electric.

The term *Water Use Coefficients* is used in this study to refer to the direct impact on the different water user groups of the loss of one acre-foot of water. Estimates were based on the average value of output added per acre-foot of water used by those firms/individuals that are reliant on water (i.e., where lack of water would result in inability to operate or at least cause significant curtailment of operations).

The total regional impact of water shortage does not end with the direct impact. Indirect impacts (often referred to as third-party impacts) refer to the reduction of output by firms/individuals which result from change in operations by those who are directly impacted by lack of water. Those who are directly impacted, producing less due to lack of water, will make fewer purchases of inputs, thus resulting in losses to the firms/individuals who produce and sell those products. These firms, facing less demand for their products, then reduce their purchases from their own suppliers. Indirect impacts can thus be said to continue to ripple throughout the economy.

The most common method of estimating the extent of indirect impact is the *Input-Output Model*. This type of model uses actual data from local economies to show the buying and selling linkages among the different economic sectors. For this study, input-output models were assembled for each of the 16 regions from county-level input-output models developed by the Minnesota Implan Group.

The total extent of economic loss, direct plus indirect impact relative to the estimated direct impact, is derived from the input-output model in the form of a *multiplier*. Multipliers have been derived to estimate the total impact on three important economic variables – Total business output, personal income, and employment.

In addition to the economic impacts related to water shortages, demographic changes would also be expected to take place. While availability of jobs is not the sole reason for living in a given place, the absence of jobs created would be expected to cause many current residents to leave a region in search of other opportunities or cause reduction of anticipated migration into the region by current nonresidents. Thus, the estimated employment impact was used to estimate change in two important social variables – regional population and school enrollment.

The relationship between employment change and change in population and school enrollment was estimated using the model developed for the Texas Population Estimates and Projections Program, specifically modified for the purposes of this study by the Department of Rural Sociology at Texas A&M University.

Water Use Coefficients (Region L)

Water Use Coefficients, as used in this study, represent the average dollar value of output sold to final demand per acre-foot of water used in the production of this output.

For 4 of the 6 types of Water User Group, a single Water Use Coefficient has been estimated for all users in the region:

Water User Group	Water Use Coefficient ($ per acre-foot)
Steam Electric	6,501
Mining	5,786
Irrigation	121
Livestock	13,356

The Municipal water user group provides water for both commercial and residential users, each of which were estimated to have a different water use coefficient. The distribution of water use between the two types of users was assumed to vary depending on whether the water user group had a city or a "county other" classification. For cities, the assumed distribution is dependent on population.

User Type	Water Use Coefficient ($ per acre-foot)
Residential	39,514
Commercial	335,305

Population	% Sales to Residential	% Sales to Commercial
< 5000	85.09%	14.91%
5,000-10,000	82.71%	17.29%
10,000-25,000	71.89%	28.11%
25,000-50,000	64.48%	35.52%
50,000-250,000	78.52%	21.48%
> 250,000	82.61%	17.39%
"County Other"	99.30%	0.70%

Water use coefficients for manufacturing were estimated separately for individual counties, based on the distribution of water use among different manufacturing industries in the county and the average productivity of water in different types of manufacturing industries.

County	Water Use Coefficient ($ per acre-foot)
BEXAR	304,666
CALDWELL	375,479
CALHOUN	48,600
COMAL	347,864
DEWITT	249,830
DIMMITT	138,963
GONZALES	267,611
GUADALUPE	146,622
HAYS	420,322
KARNES	48,260
KENDALL	138,963
MEDINA	366,394
UVALDE	138,963
VICTORIA	48,527
ZAVALA	138,963

Regional Economic Model Data, Multipliers, and Base Year Variables (Region L)

The impact analysis was conducted using a regional interindustry (input/output) model for the region. These models were developed by TWDB using IMPLAN Professional™ Version 2.0 software, a proprietary product of MIG, Inc. of Stillwater, MN. The county economic data was provided in a dataset containing details for 586 economic sectors in Texas for 1995. TWDB collapsed these sectors into models of seven sectors, representing the major water use categories used in water development planning. The data are unique to the region.

For this region, the summary data in IMPLAN for the 1995 base year for major economic variables were as follows:

POPULATION	1,893,928	
EMPLOYMENT	1,030,707	
HOUSEHOLDS	662,246	
TOTAL PERSONAL INCOME	$36.562 Billion	In 1999 dollars– $39.962 Billion

The Final Demand data were used to calculate the Water Use Coefficients by matching each sector's dollar totals to volumes of water use in the corresponding category for the calendar year–base year 1995. The result is an average of production associated with an acre-foot of water use. This measure produces an average value of water in terms that can be used to apply the IMPLAN multipliers. Regional indirect economic changes can then be estimated.

The multipliers are ratios that, when applied to the direct changes (estimated by the Water Use Coefficients), result in a total impact on the entire region. The impact totals represent the sum of successive changes among all economic sectors caused by the initial change in the affected sector. Multipliers are listed for Employment, Output (Gross Sales or Receipts), and Income (earned income from business and labor activity, not including transfer payments).

Comments About the Estimates

Users are cautioned not to assume that the entire list of needs with impacts is a prediction of future water disasters. These data simply give regional planners one source of information by which to develop efficient and effective means to meet the needs and avoid calamities.

Some clarification is needed to understand the impact numbers. The following points must be kept in mind when using the data:

a) The impacts are expressed in terms of regional impact. Thus, individual water user group shortages are shown as they influence the entire region's economy and not just the limits of the direct impact. The total impact of municipal shortage for a particular city, for example, includes the direct impact within the city limits and the impact indirectly through the region. The indirect linkages were derived from regional economic models. There are no models for individual water user groups.

b) While the entirety of an estimated impact applies to the region as a whole, a significant portion will generally be felt in the local area where the shortage occurs. An impact that is of a small magnitude relative to impacts of other shortages on other areas may be extremely severe if its magnitude is large relative to the size of the local economy. Thus, while the absolute magnitude of agricultural shortages may appear to be small, the true severity of the impact may be much more significant to the surrounding rural area.

c) Water supplies are calculated on drought-of-record levels. Shortages that show up for the 2000 decade and beyond are considered to be mostly the result of severe dry conditions; this contributes to the apparent abnormally large size of some impacts. This approach to supply analysis results in a worst-case scenario. Historically, most water user groups have at least partially met their needs through management of the remaining supplies, either by conservation, limitations on lower-valued uses such as lawn watering, or finding alternative sources of water. The results in this report assume no applied management strategies. The entirety of the needs is not met in any fashion.

d) The analysis begins by calculating water use coefficients–defined as production (dollars of sales to final customers, or final demand) resulting from use of an acre-foot of water. This measure is considered an average, not marginal measure of water use. Thus, the analysis does not attempt to measure the market forces that would tend to drive the price of water higher or reserve limited water for the highest-valued uses, as it becomes scarce. The average value approach was used because the analysis is intended to show the present value in today's regional economies of differing amounts of water use. With this information analysts can answer the question, "How much water does it take to support the current level and structure of economic activity and population?" The baseline projections for the future of regional economies assume a continuation of this known relationship of volumes of water use to economic output, under current structures of use. The models do not attempt to estimate the market allocation of the resource among competing activities because this change in structure is considered a possible management strategy–relying on market forces to work in a water-marketing system. Marginal cost analysis would be necessary for evaluating such an approach.

e) The Municipal water use category includes commercial establishments. The impacts from even small shortages in many such establishments are considerably higher on a per-acre-foot basis than in any other category. Thus, relatively small Municipal shortages can have a very large amount of economic impact, since the analysis assumes a direct relationship between curtailed water use and lost economic production. Since this analysis is intended to provide impacts without assuming any strategies, the normal response of conservation programs is not assumed. The impact data appear to overstate the Municipal category, but the results are consistently measured, since no response to the shortage is assumed that would mitigate loss of critical water used in commercial and residential settings.

The sizes of the projected impacts do not represent reductions from the current levels of economic activity or population. That is, the data are a comparison between a baseline forecast, assuming no water shortages, and a restricted forecast, based on the assumption of future water shortages. In some cases, with severe water shortages the regional economy could actually decline, dropping employment below current levels. For most regions, however, the measurement of impact represents an opportunity cost, or lost potential development that would be foregone in the absence of water management strategies.

Section 5
Regional, County, City,
Water User Group, and Major Provider Plans

5.1 Regional Water Planning Process

The South Central Texas Regional Water Planning Group (SCTRWPG) has employed a planning process (Figure 5.1-1) focused on the development of a Regional Water Plan to meet the needs of every water user group in the region for a period of fifty years. Given the history of sharp and divisive conflict concerning water planning in this region, the planning process has provided extraordinary opportunities for participation by water user groups in providing input to achieve the goal of a plan that will "provide for the orderly development, management, and conservation of water resources…" 31 TAC 357.5(a). To build consensus among the constituencies represented by the members of the SCTRWPG, the planning process has emphasized the coordination and careful integration of technical information with information provided through public participation.

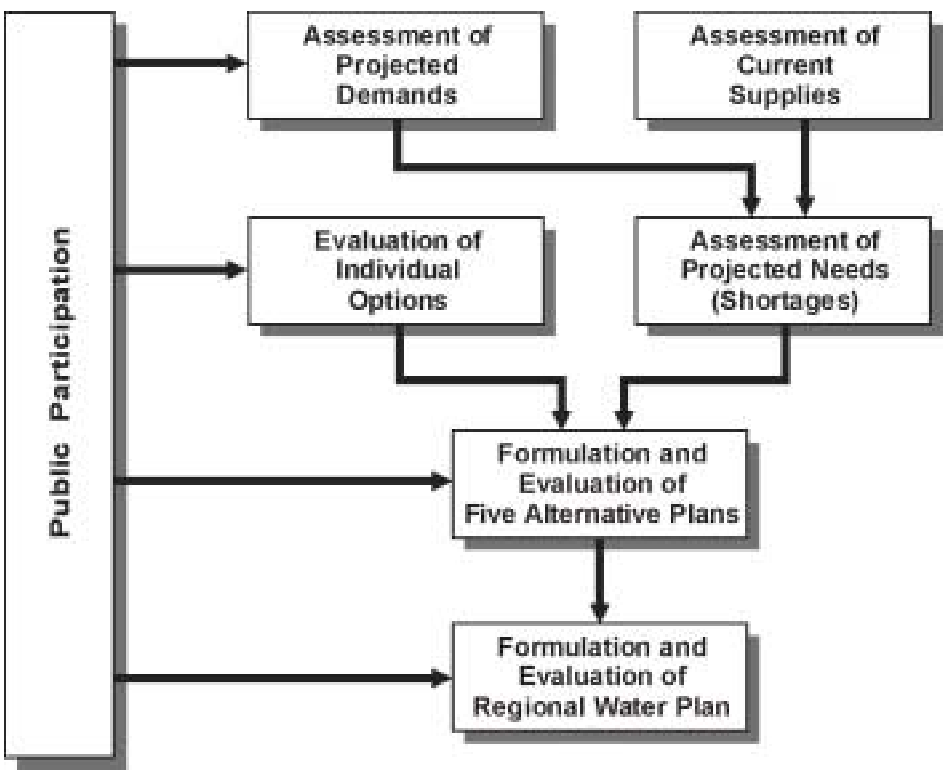

Figure 5.1-1. Planning Process

Conflict over the past several decades in this region has focused on how to manage the Edwards Aquifer so as to meet the needs of many water user groups. Central to progress in resolving this conflict, and thus in achieving the formulation of a water plan acceptable to all constituencies represented in the SCTRWPG, is the assurance that all of the different competing strategies for meeting water needs will be given consideration. It has thus been central to the viability of the planning process itself that the evaluation of water supply options and combinations of these options in the context of a regional plan receive extraordinary attention.

To this end, the SCTRWPG has employed a planning process that ensures evaluation of virtually all the water supply options or management strategies that have been proposed or discussed in the past, together with several new ones that have never before been subjected to technical evaluation. To achieve confidence by all constituencies in the planning process, it has been necessary to evaluate the options both on a stand-alone basis (Volume III—Technical Evaluations of Water Supply Options) and in various combinations in the context of alternative plans (Volume II—Technical Evaluations of Alternative Regional Water Plans). Given the fact that some of the proposed strategies for regional management are at odds with one another, it has been important to look at a series of alternative regional water plans. By formulating five alternative regional water plans, the SCTRWPG has carefully considered many diverse management strategies. In keeping with logical and acceptable planning methods, the SCTRWPG has taken the best components of these alternative plans and developed a Regional Water Plan (Volume I – Executive Summary and Regional Water Plan).

5.1.1 Water Supply Options

The SCTRWPG completed the technical evaluation of some 61 water supply options identified for potential inclusion in alternative plans and ultimately the Regional Water Plan (see Volume III, Introduction for a description of procedures used to identify and evaluate water supply options). These options can be generally categorized by source of water as follows:

- Local/Conservation/Reuse/Exchange
- Edwards Aquifer Recharge
- River Diversions with Storage
- Existing Reservoirs
- Potential New Reservoirs
- Carrizo and Other Aquifers

Table 5.1-1 summarizes key information regarding some 79 water supply options (including variations of the 61 originally identified for consideration) for which technical evaluations were completed. In Table 5.1-1, the water supply options are categorized in accordance with the manner in which the water might be used within the context of a regional plan and ranked by unit cost of supply. Additional summary information in Table 5.1-1 includes quantity of water, land impacted, time to implement, and qualitative measures of environmental sensitivity, public acceptability, and reliability. Comprehensive documentation of the technical evaluation of these water supply options is included in Volume III.

5.1.2 Alternative Regional Water Plans

The SCTRWPG defined a Regional Water Management Alternative Plan (hereinafter referenced as an Alternative Regional Water Plan) as a combination of options and strategies that could meet the water needs of the entire South Central Texas Region. The SCTRWPG formulated five alternative regional water plans using the water supply options in Table 5.1-1 (and others identified through public participation) and authorized technical evaluation of each plan. Appendix B summarizes the procedures followed in the formulation of alternative regional water plans. The five alternative regional water plans are identified as follows:

- Planning Unit (PU) Alternative
- Environmental/Conservation (EC) Alternative
- Economic/Reliability/Environmental/Public Acceptance (EREPA) Alternative
- Inter-Regional Cooperation (IRC) Alternative
- Recharge & Recirculation (R&R) Alternative

Technical evaluations and comparisons of these five alternative regional water plans are summarized in Volume II. Upon review and consideration of these five alternative plans, the SCTRWPG formulated the Regional Water Plan which is summarized at the regional, county, city, and water user group level in Section 5.2. General procedures and assumptions for technical evaluation of the five alternative plans and the Regional Water Plan are enumerated in Appendix B.

In Volume III, the technical evaluations of the water supply options are presented as if each would be a stand-alone, individual management strategy. These stand-alone options were often modified in the formulation of alternative regional water plans. In many cases, only a portion of the potential water supply of an individual option was needed to satisfy the projected water needs of water users of the region. In other cases, a similar option evaluated at one location on a stand-alone basis was included in an alternative regional water plan at another location. Incorporating such modifications and refinements, the Regional Water Plan and the alternative regional water plans were individually evaluated using technical procedures and assumptions similar to those for the evaluations of water supply options.

In order to facilitate and expedite the technical evaluations of alternative regional water plans, the Guadalupe–San Antonio River Basin Water Availability Model (WAM)[1] and the Edwards Aquifer Model (GWSIM4)[2,3] were enhanced and computationally linked. Enhancements to GWSIM4 include program logic and data development for simulation of Critical Period Management Rules under development by the Edwards Aquifer Authority, Edwards Aquifer pumpage transfers from irrigation to municipal use, and the southern Bexar County aquifer storage and recovery program being developed by the San Antonio Water System. Enhancements to the WAM include the addition of program logic to facilitate daily computations necessary for application of Consensus Environmental Water Needs Criteria (Appendix B, Volume III) in the simulation of new reservoirs and river diversions with storage. In addition, GWSIM4 and the WAM may now be computationally linked so that options and alternative plans involving diversions of springflow and other streamflow to the outcrop of the Edwards Aquifer for recharge enhancement and increased pumpage from the aquifer may be simulated efficiently.

In the process of evaluating alternative regional water plans, consideration of seasonal and peak day water demands was essential to ensure that sufficient water treatment and distribution capacities would be included. Daily variations in water supplied by the San Antonio Water System during 1996 were assumed representative of typical urban areas during drought. For planning purposes, it has been assumed that regional water treatment and distribution

[1] HDR Engineering, Inc., "Water Availability in the Guadalupe – San Antonio River Basin," Texas Natural Resource Conservation Commission, December 1999.
[2] Klemt, W.B., Knowles, T.R., Elder, G.R., and Sieh, T.W., "Ground-water Resources and Model Applications for the Edwards (Balcones Faulty Zone) Aquifer in the San Antonio Region, Texas," Texas Water Development Board Report 239, 1979.
[3] Thorkildsen, D. and McElhaney, P.D.., "Model Refinement and Applications for the Edwards (Balcones Fault Zone) Aquifer in the San Antonio Region, Texas," Texas Water Development Board Report 340, 1992.

Table 5.1-1. South Central Texas Regional Water Plan
Water Supply Option Summary Sorted by Unit Cost*

Count No.	Section	Option No.	Water Supply Options	Type of Water Supply Option	Type of Water Supply	Efficiency / Unit Cost ($/acft)	Quantity of Water (acft/yr)	Environmental Composite Average[1]	Environmental Public Acceptability[2]	Reliability[3]	Time to Implement (years)	Land Impacted (acres)
			Treated Water Supply Options									
1	1.10	SCTN-17	Desalination of Brackish Groundwater	Local/Conservation/Reuse/Exchange	Treated Water Delivered	564	476	1.0	1.0	1.0	1 to 5	0
2	6.1	CZ-10C	Carrizo-Wilcox Aquifer between San Marcos and Frio Rivers (75,000 acft/yr)	Carrizo and Other Aquifers	Treated Water Distributed	590	75,000	1.1	2.0	1.0	1 to 5	429
3	6.2	CZ-10D	Carrizo-Wilcox Aquifer between Colorado and Frio Rivers	Carrizo and Other Aquifers	Treated Water Distributed	632	220,000	1.3	2.0	1.0	1 to 5	1,437
4	4.1	G-15C	Canyon Reservoir Water Released to Lake Nolte - Treated Water to Distribution System or Recharge Zone	Existing Reservoirs	Treated Water Distributed	672	15,000	1.0	1.0	1.0	1 to 5	151
5	3.3	C-17A	Colorado River in Colorado County - Buy Stored Water and Irrigation Rights; Firm Yield	River Diversion with Storage	Treated Water Distributed	677	125,000	1.0	3.0	1.0	5 to 15	749
6	6.3	SCTN-3c	Simsboro Aquifer - Bastrop, Lee, and Milam Counties with Delivery to Major Municipal Demand Center	Carrizo and Other Aquifers	Treated Water Distributed	707	75,000	1.2	3.0	1.0	1 to 5	671
7	5.12	G-16C1	Cuero Reservoir - Firm Yield	Potential New Reservoirs	Treated Water Distributed	718	152,606	2.3	3.0	1.0	> 15	41,886
8	3.1	G-38C	Guadalupe River Diversion at Gonzales to Mid-Cities and/or Major Water Providers, with Regional Water Treatment Plant	River Diversion with Storage	Treated Water Delivered	736	29,217	1.0	1.0	1.0	1 to 5	644
9	3.2c	SCTN-16c	Lower Guadalupe River Diversions	River Diversion with Storage	Treated Water Distributed	755	94,000	1.4	1.0	1.0	1 to 5	2,040
10	4.4	C-13C	Colorado River at Bastrop - Purchase of Stored Water - Firm Yield	Existing Reservoirs	Treated Water Distributed	769	50,000	1.0	3.0	1.0	5 to 15	440
11	5.2b	S-15Db	Cibolo Reservoir with Imported Water from the San Antonio and Guadalupe Rivers - Firm Yield	Potential New Reservoirs	Treated Water Distributed	773	91,942	2.1	3.0	1.0	5 to 15	17,160
12	5.2a	S-15Da	Cibolo Reservoir with Imported Water from the San Antonio River - Firm Yield	Potential New Reservoirs	Treated Water Distributed	779	69,925	2.1	3.0	1.0	5 to 15	16,960
13	3.2b	SCTN-16b	Lower Guadalupe River Diversions	River Diversion with Storage	Treated Water Distributed	788	74,000	1.4	1.0	1.0	1 to 5	1,886
14	5.4	S-16C	Goliad Reservoir - Firm Yield	Potential New Reservoirs	Treated Water Distributed	856	99,687	2.4	3.0	1.0	> 15	28,272
15	5.11	G-17C1	Sandies Creek Reservoir - Firm Yield	Potential New Reservoirs	Treated Water Distributed	865	80,836	2.4	3.0	1.0	> 15	27,240
16	4.3b	SCTN-14b	Joint Development of Water Supply with Corpus Christi - Firm Yield	Existing Reservoirs	Treated Water Distributed	869	148,200	1.4	1.0	1.0	1 to 5	958
17	3.2a	SCTN-16a	Lower Guadalupe River Diversions	River Diversion with Storage	Treated Water Distributed	870	56,276	1.1	1.0	1.0	1 to 5	1,884
18	3.6c	SCTN-20c	Lower Colorado River Basin - Combined Diversion of Unused Irrigation Water Supplies and Unappropriated Streamflow	River Diversion with Storage	Treated Water Distributed		117,077	1.7	2.0	1.0	5 to 15	5,466
19	5.2c	S-15Dc	Cibolo Reservoir with Imported Water from the San Antonio, Guadalupe, and Colorado Rivers - Firm Yield	Potential New Reservoirs	Treated Water Distributed	965	106,482	2.3	3.0	1.0	5 to 15	17,493
20	3.4	C-17B	Colorado River in Wharton County - Buy Irrigation Rights and Groundwater; Firm Yield	River Diversion with Storage	Treated Water Distributed	974	69,000	1.1	3.0	1.0	5 to 15	2,216
21	5.3a	S-15Ea	Cibolo Reservoir with Imported Water from the Guadalupe River Saltwater Barrier - Firm Yield	Potential New Reservoirs	Treated Water Distributed	993	68,688	2.1	3.0	1.0	5 to 15	17,396
22	3.6b	SCTN-20b	Lower Colorado River Basin - Diversion of Unappropriated Streamflow	River Diversion with Storage	Treated Water Distributed		57,037	1.6	2.0	1.0	5 to 15	3,050
23	3.5	SCTN-11	Purchase/Lease Surface Water Irrigation Rights for Municipal/Industrial Use	River Diversion with Storage	Treated Water Delivered	1,007	40,000	1.1	2.0	1.0	5 to 15	3,260
24	4.3a	SCTN-14a	Joint Development of Water Supply with Corpus Christi - Firm Yield	Existing Reservoirs	Treated Water Distributed	1,015	79,000	1.2	1.0	1.0	1 to 5	810
25	5.16	B-10C	Allens Creek Reservoir - Firm Yield	Potential New Reservoirs	Treated Water Distributed	1,016	57,800	1.9	1.0	1.0	5 to 15	9,036
26	3.6a	SCTN-20a	Lower Colorado River Basin - Water Sales Contract for Unused Irrigation Water Supplies	River Diversion with Storage	Treated Water Distributed		100,060	1.2	2.0	1.0	5 to 15	5,162
27	5.15	SCTN-15	Cummins Creek Off-Channel Reservoir (Colorado River Basin)	Potential New Reservoirs	Treated Water Distributed	1,111	45,712	1.9	3.0	1.0	5 to 15	7,274
28	5.1	S-15C	Cibolo Reservoir - Firm Yield	Potential New Reservoirs	Treated Water Distributed	1,131	33,200	1.8	3.0	1.0	5 to 15	16,914
29	5.14	C-18	Shaws Bend Reservoir - Firm Yield (Colorado River Basin)	Potential New Reservoirs	Treated Water Distributed	1,178	51,576	2.1	3.0	1.0	5 to 15	13,023
30	1.10	SCTN-17	Desalination of Seawater (100 MGD)	Local/Conservation/Reuse/Exchange	Treated Water Distributed	1,333	112,016	1.2	1.0	1.0	1 to 5	704
31	5.3b	S-15Eb	Cibolo Reservoir with Imported Water from the Guadalupe River Saltwater Barrier and the Colorado River near Bay City	Potential New Reservoirs	Treated Water Distributed	1,357	79,090	2.1	3.0	1.0	5 to 15	17,787
32	1.10	SCTN-17	Desalination of Seawater (75 MGD)	Local/Conservation/Reuse/Exchange	Treated Water Distributed	1,407	84,012	1.2	1.0	1.0	1 to 5	694
33	1.10	SCTN-17	Desalination of Seawater (50 MGD)	Local/Conservation/Reuse/Exchange	Treated Water Distributed	1,447	56,008	1.2	1.0	1.0	1 to 5	684
34	4.2	G-24	Wimberley and Woodcreek Water Supply from Canyon Reservoir; 2030 Demands	Existing Reservoirs	Treated Water Delivered	1,595	1,048	1.0	1.0	1.0	1 to 5	119
35	1.10	SCTN-17	Desalination of Seawater (25 MGD)	Local/Conservation/Reuse/Exchange	Treated Water Distributed	1,621	28,004	1.2	1.0	1.0	1 to 5	678
36	5.5	S-14D	Applewhite Reservoir - Firm Yield	Potential New Reservoirs	Treated Water Distributed	3,295	4,032	1.8	3.0	1.0	5 to 15	2,607
			Raw Water in Aquifer Water Supply Options									
37	2.3	S-13B	Medina Lake - Existing Rights and Contracts with Irrigation Use Reduction for Recharge Enhancement	Edwards Aquifer Recharge	Raw Water in Aquifer	193	8,136	1.0	3.0	1.0	1 to 5	0
38	2.2	L-18c	Edwards Aquifer Recharge from Natural Drainage - Type 2 Projects (Program 2C)	Edwards Aquifer Recharge	Raw Water in Aquifer	486	13,451	1.2	1.0	1.0	5 to 15	2,595
39	6.4	SCTN-7a	Wintergarden Carrizo Recharge Enhancement (Nueces River Alternative)	Carrizo and Other Aquifers	Raw Water in Aquifer	511	11,000	1.3	1.0	1.0	5 to 15	1,633
40	2.6	SCTN-6a	Edwards Aquifer Recharge Enhancement with Guadalupe River Diversions at Lake Dunlap (SCTN-6a)	Edwards Aquifer Recharge	Raw Water in Aquifer	534	42,121	1.2	1.0	1.0	5 to 15	443
41	6.4	SCTN-7b	Wintergarden Carrizo Recharge Enhancement (Atascosa River Alternative)	Carrizo and Other Aquifers	Raw Water in Aquifer	627	7,200	1.3	1.0	1.0	5 to 15	1,210
42	1.2	L-11	Exchange Reclaimed Water for Edwards Irrigation Water	Local/Conservation/Reuse/Exchange	Raw Water in Aquifer	743	10,300	1.2	1.0	1.0	1 to 5	827
43	2.2	L-18b	Edwards Aquifer Recharge from Natural Drainage - Type 2 Projects (Program 2B)	Edwards Aquifer Recharge	Raw Water in Aquifer	800	15,980	1.8	1.0	1.0	5 to 15	4,186
44	2.2	L-18a	Edwards Aquifer Recharge from Natural Drainage - Type 2 Projects (Program 2A)	Edwards Aquifer Recharge	Raw Water in Aquifer	1,087	21,577	1.8	1.0	1.0	5 to 15	8,448
45	6.10	SCTN-8	Trinity Aquifer Optimization	Carrizo and Other Aquifers	Raw Water in Aquifer	1,886	390	1.2	1.0	1.0	5 to 15	460
46	2.6	SCTN-6b	Edwards Aquifer Recharge Enhancement with Guadalupe River Diversions near Gonzales (SCTN-6b)	Edwards Aquifer Recharge	Raw Water in Aquifer	1,941	51,133	1.3	1.0	1.0	5 to 15	893
47	2.4	G-30	Guadalupe River Diversion near Comfort to Recharge Zone via Medina Lake	Edwards Aquifer Recharge	Raw Water in Aquifer	2,079	3,902	1.4	1.0	1.0	1 to 5	256
48	2.1	L-17a	Edwards Aquifer Recharge from Natural Drainage - Type 1 Projects (Program 1B)	Edwards Aquifer Recharge	Raw Water in Aquifer	2,557	1,958	1.9	1.0	1.0	5 to 15	1,340
49	2.1	L-17b	Edwards Aquifer Recharge from Natural Drainage - Type 1 Projects (Program 1A)	Edwards Aquifer Recharge	Raw Water in Aquifer	3,309	5,554	2.2	1.0	1.0	5 to 15	4,042
50	2.5	G-32	Diversion of Canyon Reservoir Flood Storage to Recharge Zone via Cibolo Creek - Long-Term Average	Edwards Aquifer Recharge	Raw Water in Aquifer	6,198	2,088	1.4	1.0	1.0	1 to 5	518
			Raw (Surface) Water Supply Options									
51	1.4	L-20	Transfer of SAWS Reclaimed Water to Coleto Creek Reservoir (Exchange for CP&L Rights and GBRA Canyon Contract)	Local/Conservation/Reuse/Exchange	Raw Water at Source	79	17,000	1.3	1.0	1.0	1 to 5	24
52	6.3	SCTN-3a	Simsboro Aquifer - Bastrop, Lee, and Milam Counties with Delivery to Colorado River	Carrizo and Other Aquifers	Raw Water Delivered	203	75,000	1.1	3.0	1.0	1 to 5	78
53	5.7	G-20	Gonzales Reservoir - Firm Yield	Potential New Reservoirs	Raw Water at Reservoir	260	69,897	2.2	1.0	1.0	> 15	21,370
54	6.3	SCTN-3b	Simsboro Aquifer - Bastrop, Lee, and Milam Counties with Delivery to Plum Creek	Carrizo and Other Aquifers	Raw Water Delivered	290	75,000	1.1	3.0	1.0	1 to 5	269
55	1.5	L-14	Transfer of Reclaimed Water to Corpus Christi through Choke Canyon Reservoir	Local/Conservation/Reuse/Exchange	Raw Water at Reservoir	297	23,903	1.3	1.0	1.0	1 to 5	240
56	5.17	SCTN-18	Cotulla Reservoir - Raw Water at the Reservoir	Potential New Reservoirs	Raw Water at Reservoir	299	57,080	1.7	1.0	1.0	> 15	31,410
57	5.13	SCTN-13	Palmetto Bend Stage II Reservoir (Delivery to Corpus Christi)	Potential New Reservoirs	Raw Water Delivered	431	28,200	1.4	1.0	1.0	5 to 15	4,701
58	1.9	SCTN-12b	Exchange of Groundwater from the Gulf Coast Aquifer for Irrigation Surface Water Rights (Guadalupe-San Antonio River Basin)	Local/Conservation/Reuse/Exchange	Raw Water at Source	437	13,200	1.1	1.0	1.0	1 to 5	1,015
59	5.9	G-22	Dilworth Reservoir - Raw Water at the Reservoir	Potential New Reservoirs	Raw Water at Reservoir	446	19,705	1.7	1.0	1.0	> 15	15,400
60	5.10	G-40	Cloptin Crossing Reservoir - Raw Water at the Reservoir	Potential New Reservoirs	Raw Water at Reservoir	473	32,458	2.2	1.0	1.0	> 15	6,060
61	1.9	SCTN-12b	Exchange of Groundwater from the Gulf Coast Aquifer for Irrigation Surface Water Rights (Colorado River Basin)	Local/Conservation/Reuse/Exchange	Raw Water at Source	518	10,748	1.0	1.0	1.0	1 to 5	656
62	5.13	SCTN-13	Palmetto Bend Stage II Reservoir (Delivery to Bay City)	Potential New Reservoirs	Raw Water Delivered	560	30,200	1.4	1.0	1.0	5 to 15	4,902
63	5.13	SCTN-13	Palmetto Bend Stage II Reservoir (Delivery to Saltwater Barrier)	Potential New Reservoirs	Raw Water Delivered	585	28,100	1.4	1.0	1.0	5 to 15	4,891
64	5.6	G-19	Guadalupe River Dam No. 7 - Firm Yield	Potential New Reservoirs	Raw Water at Reservoir	732	30,890	2.2	1.0	1.0	> 15	12,830
65	5.8	G-21	Lockhart Reservoir - Raw Water at the Reservoir	Potential New Reservoirs	Raw Water at Reservoir	764	5,627	1.2	1.0	1.0	5 to 15	2,910
			Other Water Supply Options									
66	1.1	L-10 (Mun.)	Demand Reduction (Water Conservation) - Municipal	Local/Conservation/Reuse/Exchange		~400	~43,000	1.0	1.0	1.0	1 to 5	N/A
67	1.1	L-10 (Irr.)	Demand Reduction (Water Conservation) - Irrigation	Local/Conservation/Reuse/Exchange		~54	~80,000	1.0	1.0	1.0	1 to 5	N/A
68	1.3	L-15	Purchase or Lease of Edwards Irrigation Water for Municipal and Industrial Use	Local/Conservation/Reuse/Exchange	Raw Water in Aquifer	51	95430 Max.	1.0	1.0	3.0	1 to 5	N/A
69	1.6	SCTN-4	Brush Management	Local/Conservation/Reuse/Exchange		Undetermined	Undetermined	1.2	1.0	3.0	> 15	Undetermined
70	1.7	SCTN-5	Weather Modification	Local/Conservation/Reuse/Exchange		Undetermined	Undetermined	1.0	1.0	3.0	1 to 5	Undetermined
71	1.8	SCTN-9	Rainwater Harvesting	Local/Conservation/Reuse/Exchange		16,178	.057/household	1.0	1.0	3.0	1 to 5	0
72	1.11	SCTN-10	Off-Channel Local Storage (Guadalupe River near Victoria)	Local/Conservation/Reuse/Exchange	Treated Water Delivered	587	10,000	1.1	1.0	3.0	1 to 5	481
73	1.11	SCTN-10	Off-Channel Local Storage (Guadalupe River near Boerne)	Local/Conservation/Reuse/Exchange	Treated Water Delivered	2,681	1,500	1.4	1.0	3.0	1 to 5	595
74	1.11	SCTN-10	Off-Channel Local Storage (Medina River near Von Ormy)	Local/Conservation/Reuse/Exchange	Treated Water Delivered	1,190	5,000	1.2	1.0	3.0	1 to 5	595
75	6.5	SCTN-2a	Groundwater Supplies for Municipal Water Systems in the Carrizo-Wilcox Aquifer	Carrizo and Other Aquifers		N/A	N/A	1.0	1.0	1.0	1 to 5	N/A
76	6.6	SCTN-2b	Groundwater Supplies for Municipal Water Systems in the Gulf Coast Aquifer	Carrizo and Other Aquifers		N/A	N/A	1.0	1.0	1.0	1 to 5	N/A
77	6.7	SCTN-2c	Groundwater Supplies for Municipal Water Systems in the Trinity Aquifer	Carrizo and Other Aquifers		N/A	N/A	1.0	1.0	3.0	1 to 5	N/A
78	6.8	SCTN-1a	Aquifer Storage and Recovery (ASR)	Carrizo and Other Aquifers		2428 to 1009	2,792	1.0	1.0	1.0	1 to 5	286
79	6.9	SCTN-1b	Aquifer Storage and Recovery (ASR) - Local Option	Carrizo and Other Aquifers		2,089	279	1.0	1.0	1.0	1 to 5	3

Notes:

*This is the list of stand alone options as presented in Volume III. As these options were fitted into the Regional Water Plan, the quantities were reduced in some cases, and the costs were recalculated for the quantity included in the plan.

1 Environmental Composite Average based on nine Qualitative Measures of Environmental Impacts (High = 3; Medium = 2; Low = 1) and one measure of Sustainability (High = 1; Medium = 2; Low = 3).

2 Public Acceptability based on present existence of organized local opposition to the water supply option at the source of water (Yes = 3, Limited = 2, No = 1).

3 Reliability based on availability of supply during drought of record (Yes = 1, No/Uncertain = 3)

facilities would be developed to serve multiple user groups with water from multiple sources, thereby realizing economies of scale. Considering the dependable annual supply and transmission capacity associated with each of the various water supply options comprising an alternative plan as well as the daily variations in water demand, small reservoirs providing balancing storage were sized and located near regional water treatment facilities in Bexar, Comal, and Hays Counties.

5.2 South Central Texas Regional Water Plan

5.2.1 Regional Summaries

The South Central Texas Regional Water Plan includes water management strategies which emphasize water conservation and reuse and maximize use of available water rights and existing reservoirs. The Plan avoids development of large new reservoirs and minimizes depletion of water stored in aquifers. The Plan recognizes and includes several projects that are in various stages of implementation at this time, but are not yet complete. Additional strategies having significant support within the region, yet requiring further study regarding quantity of dependable water supply made available during severe drought, feasibility, and/or cost of implementation, are also included in the Plan. The water management strategies included in the South Central Texas Regional Water Plan are shown in Figure 5.2-1 and identified in Table 5.2-1 along with the associated new supply and presumed allocation to each county in the year 2050.

Water management strategies emphasizing conservation and reuse are expected to provide for about 21 percent of new supplies available in the year 2050 and include:

- Municipal Demand Reduction (Conservation) (L-10 Mun.);
- Irrigation Demand Reduction (Conservation) with Transfer (L-10 Irr.);
- SAWS Recycled Water Program;
- Aquifer Storage & Recovery (ASR) (SCTN-1a); and
- Irrigation Demand Reduction (Conservation) (L-10 Irr.).

Water management strategies maximizing use of available water rights and resources and existing reservoirs are expected to provide for about 61 percent of new supplies available in the year 2050 and include:

- Edwards Irrigation Transfers (L-15);
- Canyon Reservoir – River Diversion (G-15C);

- Canyon Reservoir – Wimberley, Woodcreek, & Blanco (G-24);
- Lower Guadalupe River Diversions (SCTN-16);
- New Colorado River Diversion (LCRA);[4]
- Simsboro Aquifer (SCTN-3c);
- Purchase Water from Major Provider (PMP); and
- Desalination of Seawater (SCTN-17).

Water management strategies that simultaneously develop groundwater supplies and minimize depletion of storage in regional aquifers are expected to provide for about 11 percent of new supplies available in the year 2050 and include:

- Edwards Recharge – Type 2 Projects (L-18a);
- Carrizo Aquifer – Wilson & Gonzales (CZ-10C);
- Carrizo Aquifer – Gonzales & Bastrop (CZ-10D); and
- Carrizo Aquifer – Local Supply (SCTN-2a).

Projects recognized in the Plan that are presently being implemented are expected to provide for about 7 percent of new supplies available in the year 2050 and include:

- Schertz-Seguin Water Supply Project (SSWSP);
- Western Canyon Regional Water Supply Project (WCRWSP);
- Hays/IH35 Water Supply Project (HIH35WSP)
- Lake Dunlap WTP Expansion and Mid-Cities Water Transmission System (CRWA);
- Carrizo Aquifer – Bexar & Guadalupe (BMWD);
- Trinity Aquifer – Bexar (BMWD); and
- Canyon Reservoir Contract Renewal (GBRA).

[4] On December 14, 2000, late in the planning cycle, additional analysis by Region K of the Colorado River Diversion option with the full application of consensus environmental flow criteria indicated the yield of the project could be reduced by 19,000 acft/yr, resulting in an estimated 131,000 acft/yr of water available for transfer to Region L (Bexar and Hays Counties). The SCTRWPG acknowledges the different yield amounts for this project contained in Region L and Region K, and acknowledges that the yield of this project may be reduced to 131,000 acft/yr, and that the unit cost would be increased somewhat. This change could affect supplies to Hays County and Bexar County, and may necessitate supplying Hays County needs from other sources. However, due to this information being discovered late in the planning cycle, the SCTRWPG decided to retain the project in the Region L Plan with a yield of 150,000 acft/yr; however, this discrepancy between the two regional plans will be addressed early in the next planning cycle. There are adequate "contingency" supplies available within the Region L Plan to compensate for the proposed reduction in yield of the project.

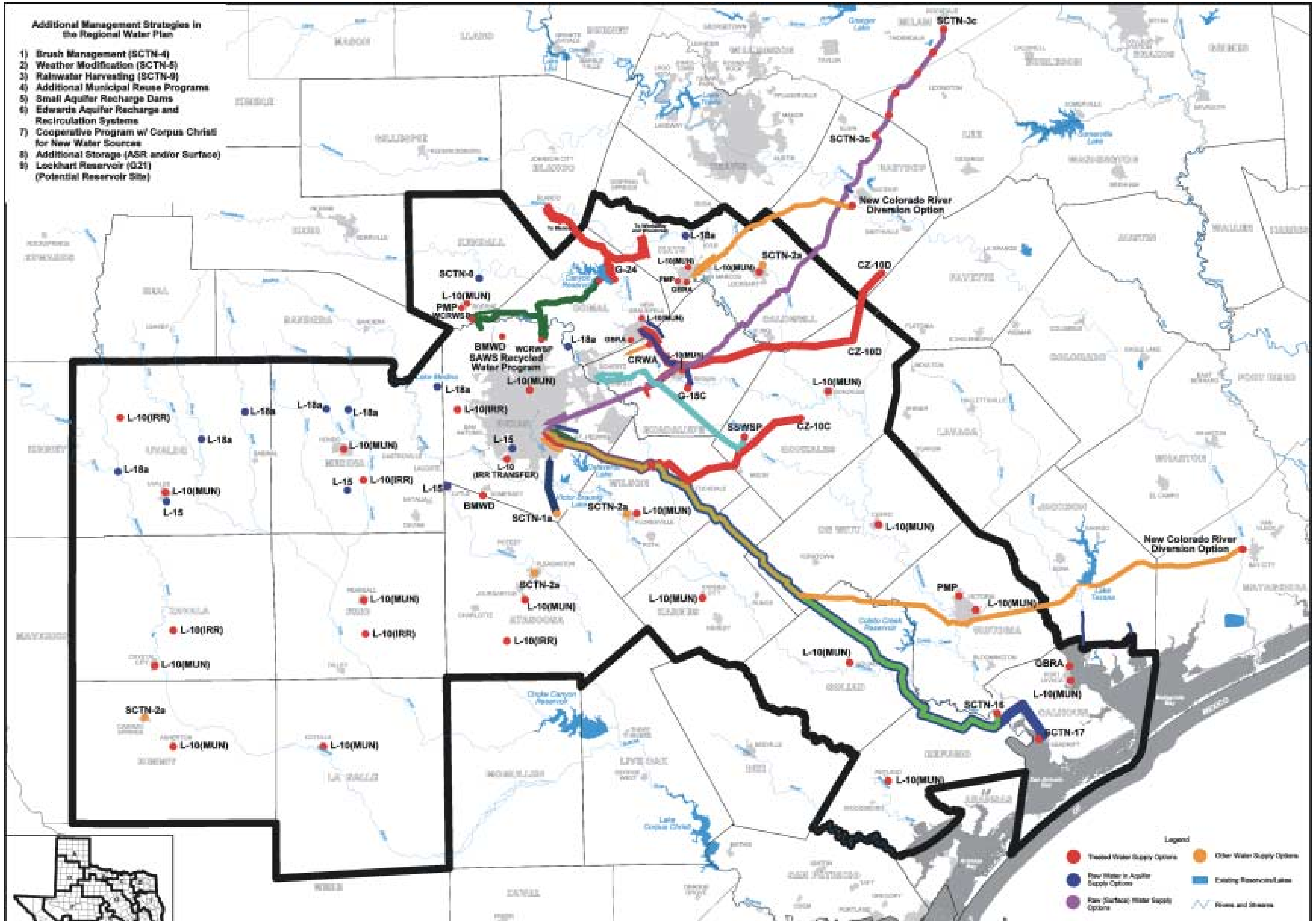

Figure 5.2-1 - Regional Water Plan
South Central Texas - Region L
Regional Water Planning Area

Table 5.2-1. South Central Texas Regional Water Plan
Water Management Strategies, County Needs, and County Allocation of New Supplies in 2050

Water Management Strategies for Municipal, Industrial, Steam-Electric, and/or Mining Needs (Shortages)																							
		County Allocation of New Supplies in 2050 (acft/yr)																					
ID#	**Description**	**Atascosa**	**Bexar**	**Caldwell**	**Calhoun**	**Comal**	**Dewitt**	**Dimmit**	**Frio**	**Goliad**	**Gonzales**	**Guadalupe**	**Hays**	**Karnes**	**Kendall**	**La Salle**	**Medina**	**Refugio**	**Uvalde**	**Victoria**	**Wilson**	**Zavala**	**Total**
L-10 (Mun.)	Municipal Demand Reduction (Conservation)	319	40,934	104		942	74	133	124		67	6	1,174		11	83	78		283		130	104	**44,566**
L-10 (Irr.)	Irrigation Demand Reduction (Conservation) w/ Transfer		27,314																				**27,314**
L-15	Edwards Irrigation Transfers	700	32,986														3,000		6,000				**42,686**
L-18a	Edwards Recharge - Type 2 Projects		21,577																				**21,577**
G-15C	Canyon Reservoir - River Diversion					15,700																	**15,700**
G-24	Canyon Reservoir - Wimberley, Woodcreek, & Blanco												1,348										**1,348**
SCTN-16	Lower Guadalupe River Diversions		94,500																				**94,500**
LCRA	New Colorado River Diversion Option*		132,000										18,000										**#####**
CZ-10C	Carrizo Aquifer - Wilson & Gonzales		16,000																				**16,000**
CZ-10D	Carrizo Aquifer - Gonzales & Bastrop					23,000						4,500											**27,500**
SCTN-2a	Carrizo Aquifer - Local Supply	10,000		1,000				3,500													200		**14,700**
SCTN-3c	Simsboro Aquifer		55,000																				**55,000**
SAWS	SAWS Recycled Water Program		52,215																				**52,215**
PMP	Purchase Water From Major Provider												5,000		8,000					1,240			**14,240**
SCTN-17	Desalination of Seawater		84,012																				**84,012**
SCTN-1a	Aquifer Storage & Recovery (ASR)																						
Management Strategies in Implementation																							
SSWSP	Schertz-Seguin Water Supply Project (Carrizo)		3,919			1,315						14,766											**20,000**
WCRWSP	Western Canyon Regional Water Supply Project		500			7,716									2,311								**10,527**
CRWA	Lake Dunlap WTP Expansion and Mid-Cities Project																						**0**
HIH35WSP	Hays/IH 35 Water Supply Project												4,500										**4,500**
BMWD	Carrizo Aquifer - Bexar & Guadalupe (BMWD)		4,000																				**4,000**
BMWD	Trinity Aquifer - Bexar (BMWD)		1,000																				**1,000**
GBRA	GBRA Canyon Reservoir Contract Renewal				1,500	6,676							5,589										**13,765**
Additional Management Strategies Requiring Further Study Regarding Quantity, Cost, and/or Feasibility																							
SCTN-4	Brush Management**																						
SCTN-5	Weather Modification**																						
SCTN-9	Rainwater Harvesting**																						
	Additional Municipal Reuse Programs**																						
	Small Aquifer Recharge Dams**																						
	Edwards Aquifer Recharge & Recirculation Systems**																						
	Cooperation w/ Corpus Christi for New Water Sources**																						
	Additional Storage (ASR and/or Surface)**																						
G-21	Lockhart Reservoir																						
Total New Mun, Ind, S-E, & Min Supplies (Year 2050)		**11,019**	**####**	**1,104**	**1,500**	**####**	**74**	**3,633**	**124**	**0**	**67**	**19,272**	**35,611**	**0**	**####**	**83**	**3,078**	**0**	**6,283**	**1,240**	**330**	**104**	**#####**
Total Mun, Ind, S-E, & Min Needs (Year 2050)		**10,330**	**####**	**737**	**1,093**	**####**	**0**	**1,959**	**0**	**0**	**0**	**15,158**	**####**	**0**	**9,581**	**0**	**2,826**	**0**	**5,609**	**0**	**145**	**0**	**#####**
Total Mun, Ind, S-E, & Min Management Supplies (Year 2050)		**689**	**####**	**367**	**407**	**####**	**74**	**1,674**	**124**	**0**	**67**	**4,114**	**1,379**	**0**	**741**	**83**	**252**	**0**	**674**	**1,240**	**185**	**104**	**#####**

Water Management Strategies for Irrigation Needs (Shortages)																							
		County Allocation of New Supplies in 2050 (acft/yr)																					
ID#	**Description**	**Atascosa**	**Bexar**	**Caldwell**	**Calhoun**	**Comal**	**Dewitt**	**Dimmit**	**Frio**	**Goliad**	**Gonzales**	**Guadalupe**	**Hays**	**Karnes**	**Kendall**	**La Salle**	**Medina**	**Refugio**	**Uvalde**	**Victoria**	**Wilson**	**Zavala**	**Total**
L-10 (Irr.)	Irrigation Demand Reduction (Conservation)	3,692	1,905	0	0	0	0	0	5,947	0	0	0	0	0	0	0	5,000	0	5,958	0	0	6,401	**28,903**
Total New Irrigation Supplies (Year 2050)		**3,692**	**1,905**	**0**	**0**	**0**	**0**	**0**	**5,947**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5,000**	**0**	**5,958**	**0**	**0**	**6,401**	**28,903**
Total Irrigation Needs (Year 2050)		**40,713**	**5,082**	**0**	**0**	**0**	**0**	**0**	**####**	**0**	**0**	**406**	**0**	**0**	**0**	**0**	**####**	**0**	**####**	**0**	**0**	**####**	**#####**
Total Irrigation Shortage (Year 2050)		**#####**	**-3,177**	**0**	**0**	**0**	**0**	**0**	**####**	**0**	**0**	**-406**	**0**	**0**	**0**	**0**	**####**	**0**	**####**	**0**	**0**	**####**	**#####**

* On December 14, 2000, late in the planning cycle, additional analysis by Region K of the Colorado River Diversion option with the full application of consensus environmental flow criteria indicated the yield of the project could be reduced by 19,000 acft/yr, resulting in an estimated 131,000 acft/yr of water available for transfer to Region L (Bexar and Hays Counties). The SCTRWPG acknowledges the different yield amounts for this project contained in the Regional Water Plans for Region L and Region K, and acknowledges that the yield of this project may be reduced to 131,000 acft/yr, and that the unit cost could be increased somewhat. This change could affect supplies to Hays County and Bexar County and may necessitate supplying Hays County needs from other sources. However, due to this information being discovered late in the planning cycle, the SCTRWPG decided to retain the project in the Region L Plan with a yield of 150,000 acft/yr; however, this discrepancy between the two regional plans will be add
** Option expected to provide additional water supply in many years, but dependable supply during drought is presently unquantified.

The Regional Water Plan includes several water management strategies that require further study and funding prior to implementation. Several of these strategies employ technologies that have been used previously, but further research is necessary to determine the cost of implementation, optimal scale and location, and quantity of dependable water supply that would be available in severe drought. These strategies are:

- Brush Management (SCTN-4);
- Weather Modification (SCTN-5);
- Rainwater Harvesting (SCTN-9);
- Additional Municipal Recycling (Reuse) Programs;
- Small Aquifer Recharge Dams;
- Edwards Aquifer Recharge & Recirculation Systems;
- Cooperation with Corpus Christi for New Water Sources; and
- Additional Storage (ASR and/or Surface).

Although specific quantities of new supply dependable in drought have not been determined for these strategies, it is understood that their implementation will contribute positively to storage and system management of many diverse strategies in the Regional Water Plan. The SCTRWPG recommends that State funding be made available to cooperatively support the refinement and implementation of these strategies.

The Regional Water Plan also includes the Edwards Aquifer Recharge and Recirculation Systems. The SCTRWPG recommends State and local funding for research at a level that would ensure consideration of this strategy in the next 5-year planning cycle. However, this management strategy may not be implemented unless the Plan is specifically amended to allow implementation.

Following publication of the Initially Prepared Plan (IPP) on August 17, 2000, the Regional Water Planning Group carefully reconsidered this strategy in light of its fundamental importance to many interests. The IPP included a footnote (IPP at pages ES-25 and 5-8) that indicated the strategy was included for research but not for implementation "unless the Plan is specifically amended to allow implementation." The Planning Group has replaced that footnote with a discussion of its reasons for including the water management strategy for research and not for implementation.

Members of the SCTRWPG have expressed a wide range of views about this strategy. On the one hand, the Recharge and Recirculation System is viewed as experimental at best and dangerous at worst by several members of the RWPG. First, communities dependent on springflow from the Edwards formation to meet needs in the Guadalupe River Basin point to computer model runs showing potential aquifer drawdowns to levels far below its historic lows in the San Antonio area and the consequent potential for drying up the springs. The downstream Guadalupe River Basin interests state that they cannot accept a regional plan that jeopardizes this essential source of water. They want to see a clear demonstration that implementing Recharge and Recirculation will not damage the springs. Environmental groups wanting to protect endangered and threatened species at the springs also find the risk associated with what is regarded as an unproven technology to be unacceptable. They are also concerned about the potential damage to riparian and estuarine species and habitat if base flows are diverted during drought periods and/or flood flows are diverted during wetter periods. Utility managers, citing their requirements under Certificates of Convenience and Necessity to provide reliable supplies for municipal uses, are concerned that the lack of experience with this technology and the adverse results of computer model runs conducted by the Technical Consultant raise too many questions about the strategy for it to be recommended for implementation.

On the other hand, some members of the RWPG believe that the computer modeling done to date does not present an accurate picture of the system's effects and capabilities. They believe the modeling is unfair in presenting results for a time period beginning with the drought of record, and they compare this to modeling the yield of a reservoir built early in the drought of record—there would be no yield for many years. (The Technical Consultant states that the modeling of this strategy was based on beginning conditions of a full aquifer and advise that substantial start-up time could be needed upon implementation in order for this strategy to provide additional dependable water supply during drought.) Others fear that implementation of some of the water management strategies included in the plan would preclude implementation of Recharge and Recirculation at a later time. They focus, in particular, on the need to include in the plan the strategy of Lake Dunlap diversions to the recharge area of the Edwards Aquifer. If the strategy of diverting water from the Guadalupe River at the Saltwater Barrier is implemented first, they fear that the Dunlap diversions would be impossible. That would mean that a major component of Recharge and Recirculation System would be precluded, damaging the chances of ever implementing this strategy.

All these interests nevertheless agree that the Recharge and Recirculation strategy may hold great promise and that optimizing use of the Edwards Aquifer is a cornerstone of water policy for the Water User Groups dependent on this underground source. They all support inclusion of this strategy in the Regional Water Plan for purposes of assuring continued research. They agree that implementation of the strategy would require an amendment of the Regional Water Plan. The amendment process can occur at any time after formal approval of the Regional Water Plan and requires a public hearing after a 30-day notice period.

The members of the South Central Texas Regional Water Planning Group have further agreed that the Recharge and Recirculation strategy must move as expeditiously as possible through the necessary phases of research to resolve uncertainties about how it could work in practice. To this end, the Planning Group members agree to support the accelerated research effort in the manner appropriate to each, whether by providing funding, reviewing research findings, offering in-kind services or other means. The goal of this effort will be to conclude the research as soon as practicable, possibly within a 3-year period and in any case in time for reviewing results for possible inclusion of this strategy in the next planning cycle. In this way, the Regional Water Planning Group intends to maintain its consensus approach to planning with careful regard to all interests it represents across the South Central Texas Region.

The Lockhart Reservoir is recommended as a potential reservoir site. Although the Regional Plan recommends other means of meeting projected water needs in Caldwell County, the SCTRWPG recognizes the strong interest of the local government in shifting from low-quality groundwater sources to a surface water supply system. The reservoir is considered by the local government to be an important economic development project to create new growth opportunities for the area. There are questions about economic feasibility at present, but the SCTRWPG recognizes the efforts in Caldwell County and by the Guadalupe Blanco River Authority to find a viable strategy to move the project forward. When that strategy is ready, the SCTRWPG will review the Lockhart Reservoir water supply option as a possible amendment to the Regional Water Plan.

The majority of the projected water supply needs or shortages in the South Central Texas Region are associated with municipal, industrial, steam-electric, and mining uses. Figure 5.2-2

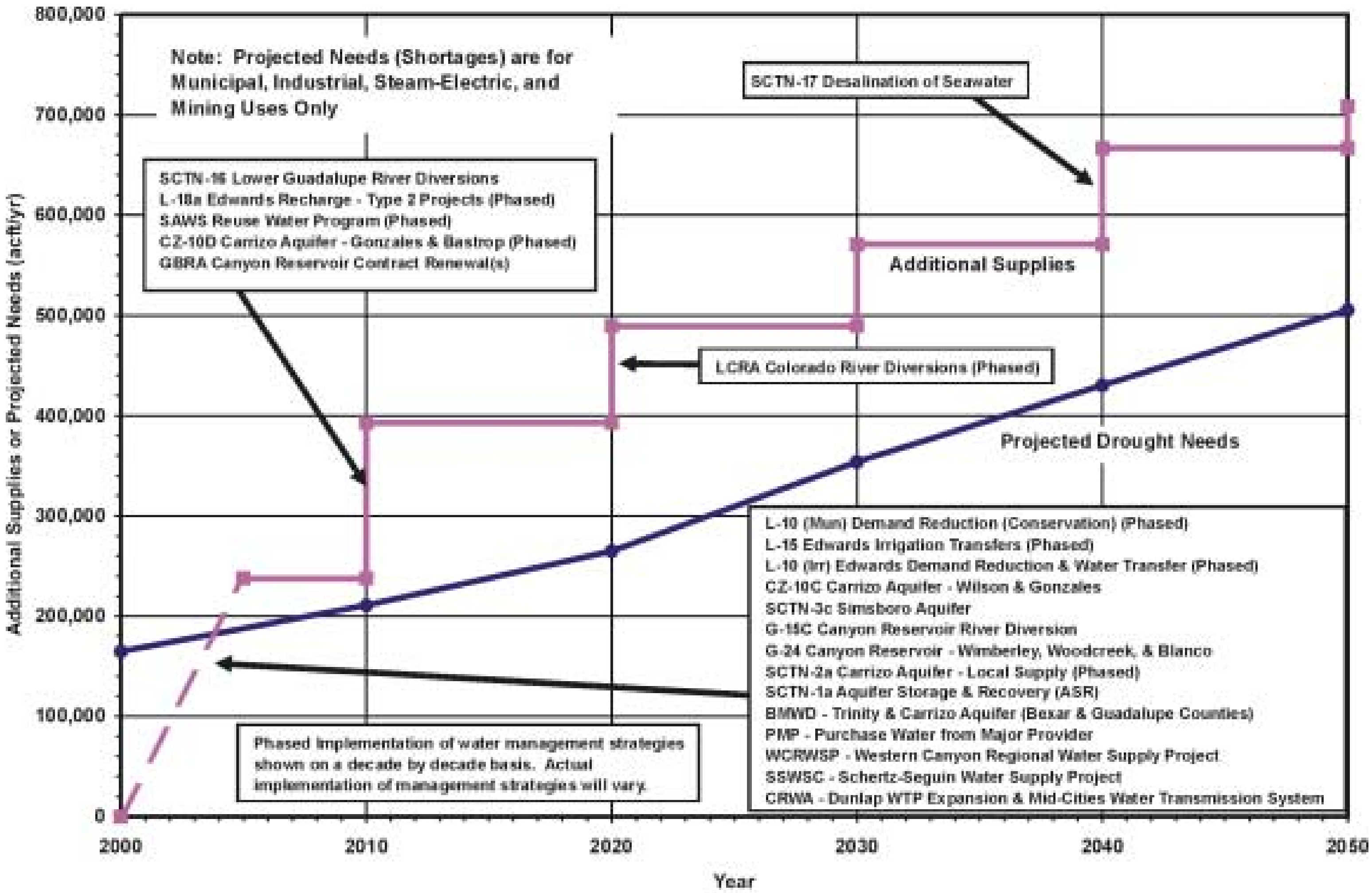

Figure 5.2-2. Regional Water Plan

summarizes these projected needs and illustrates the phased implementation of water management strategies necessary to ensure that these needs are satisfied. Clearly, implementation of a number of water management strategies on an expedited basis will be necessary to avoid significant hardship, water rationing, and/or cessation of discharge from Comal Springs in the event of severe drought during the next decade. Implementation of the South Central Texas Regional Water Plan could result in the development of more than 700,000 acft/yr of new water supplies that will be reliable in the event of a repeat of the most severe drought on record.

Substantial water supply needs or shortages are also projected for irrigation use in the South Central Texas Region. The Regional Water Planning Group has determined that it is not economically feasible to meet projected irrigation needs at this time since the net farm income to pay for water is less than the costs of water at the potential sources (Section 6). However, installation of Low Energy Precision Application (LEPA) equipment in six counties (Table 5.2-1) is recommended as part of the Irrigation Demand Reduction (Conservation) (L-10 Irr.) water supply strategy included in the Plan. During the next planning cycle, the RWPG intends to examine agricultural needs throughout the region and to undertake additional socio-economic studies of Regional Water Plan impacts on agricultural resources. It will also review water management strategies that may meet irrigation needs during the planning period of 2005–2055.

Costs associated with the implementation and long-term operations and maintenance of water management strategies have been estimated in accordance with Texas Water Development Board rules and general guidelines. Projected annual and unit costs for the South Central Texas Regional Water Plan are summarized by decade in Figures 5.2-3 and 5.2-4, respectively. Annual costs (in 1999 dollars) are estimated to range from a low of about $120,000,000 in the immediate future, as some of the least costly water management strategies are developed, to a high of about $420,000,000 in 2040, at which time Desalination of Seawater (SCTN-17) is projected to be implemented. Estimated unit costs for the development of new supplies range from a low of $530 per acft to a high of $737 per acft and average $617 per acft or $1.89 per 1,000 gallons over the 50-year planning horizon. Unit costs tend to decrease beyond 2030 as the 30-year debt service period is completed for the many strategies to be implemented on an expedited basis. Cost estimates reflect regional water treatment capacity and balancing storage facilities sufficient to meet peak daily and seasonal water demands in the larger urban areas. Note also that no costs have been included for those projects in the Plan that are presently being implemented. Specific cost estimating procedures used in the technical evaluation of water management strategies for the South Central Texas Region are summarized in Appendix A of Volume III.

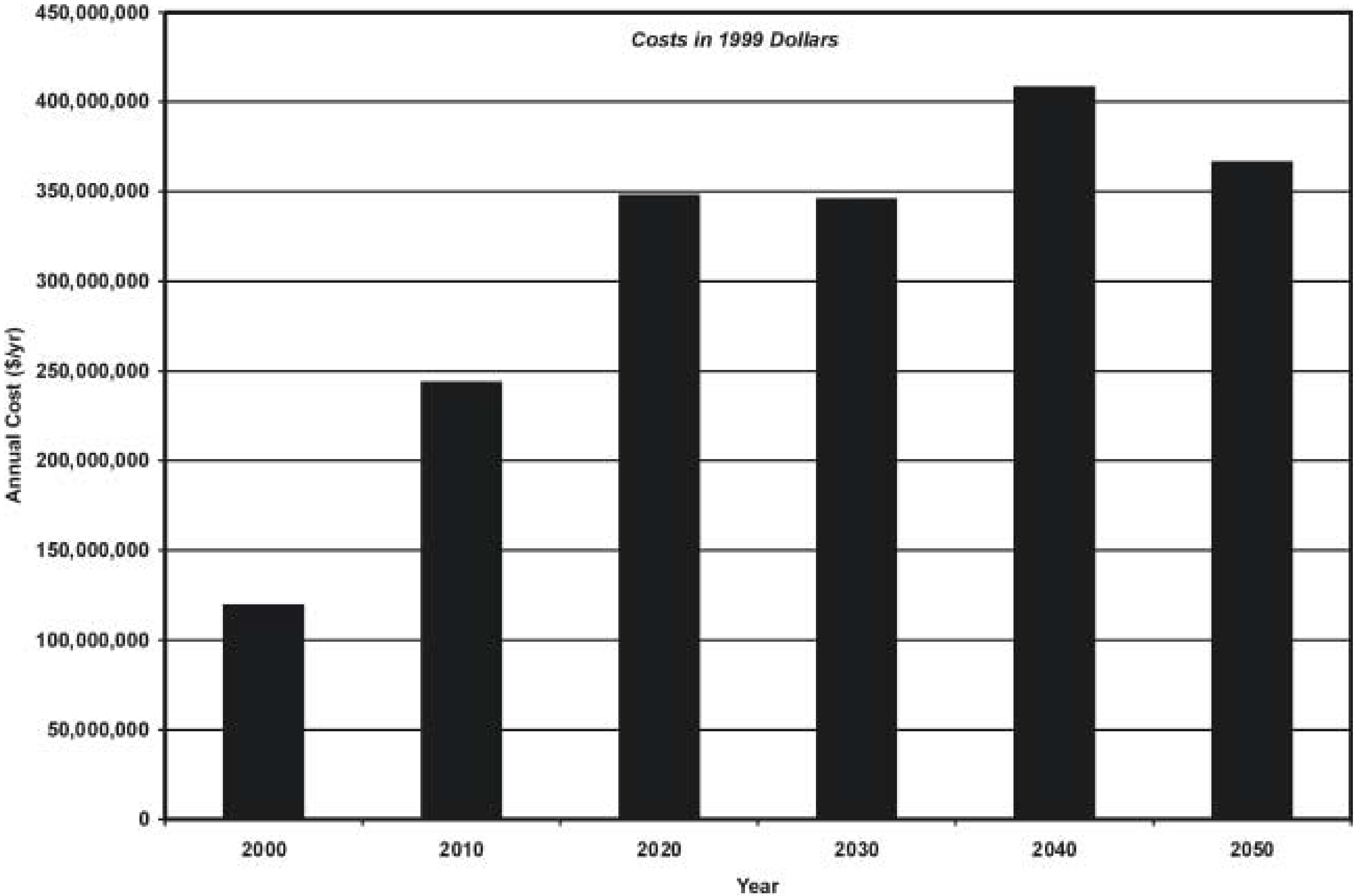

Figure 5.2-3. Regional Water Plan — Annual Cost of Cumulative Additional Water Supply

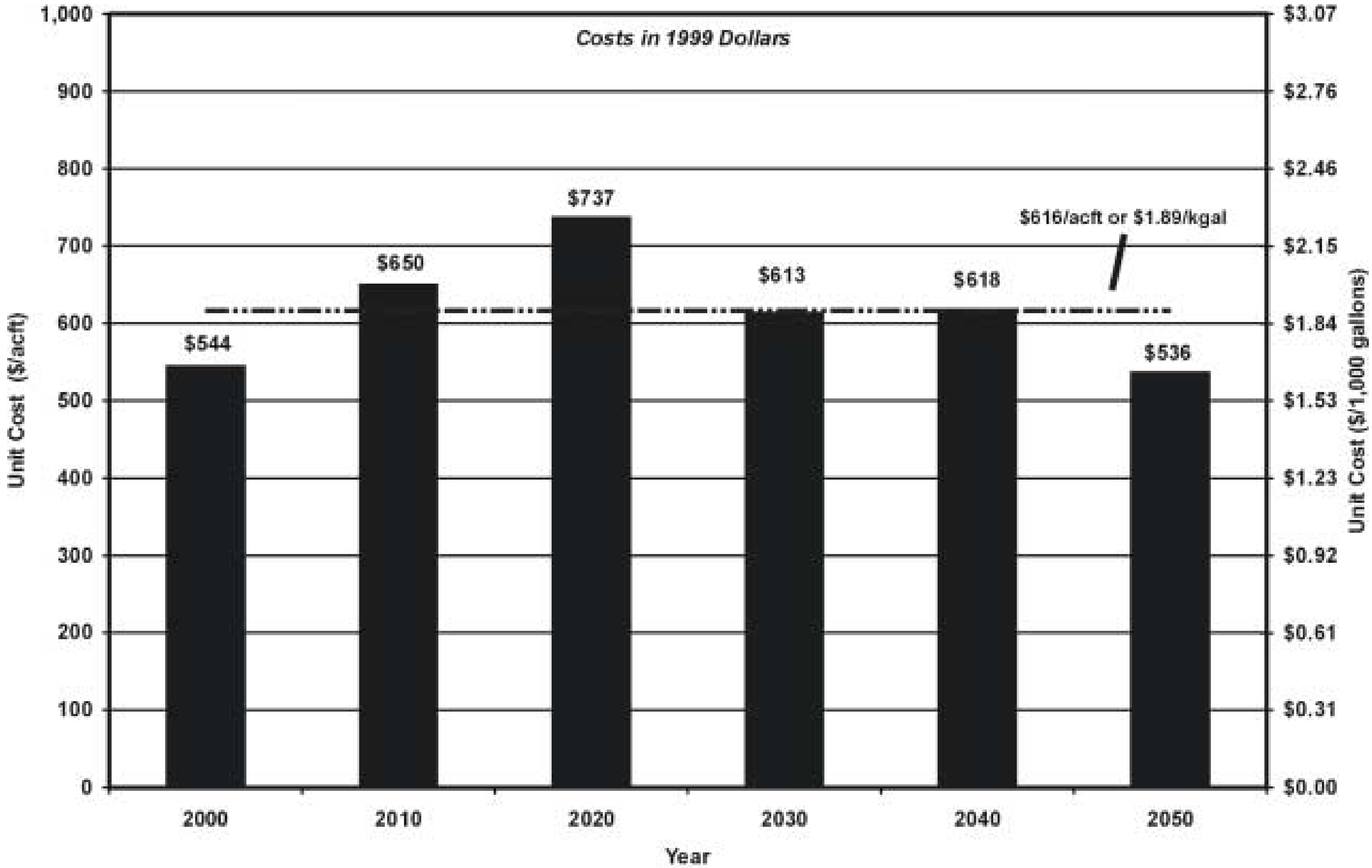

Figure 5.2-4. Regional Water Plan — Unit Cost of Cumulative Additional Water Supply

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5.2.2 County Summaries

Water management strategies recommended for implementation to meet projected needs or shortages in each of the 21 counties within the South Central Texas Region are summarized in Tables 5.2-2 through 5.2-22 and Figures 5.2-5 through 5.2-25. These tables and figures illustrate the phased implementation of water management strategies at the county level. Counties are presented in alphabetical order from Atascosa County to Zavala County. The counties having the greatest municipal, industrial, steam-electric, and mining needs and, hence, the greatest quantities of new water supply are Bexar, Comal, Hays, and Guadalupe. Particular attention to the notes at the base of each county table is encouraged. More detailed information regarding allocation of new water supplies to specific cities and other water user groups within each county may be found in Section 5.3.

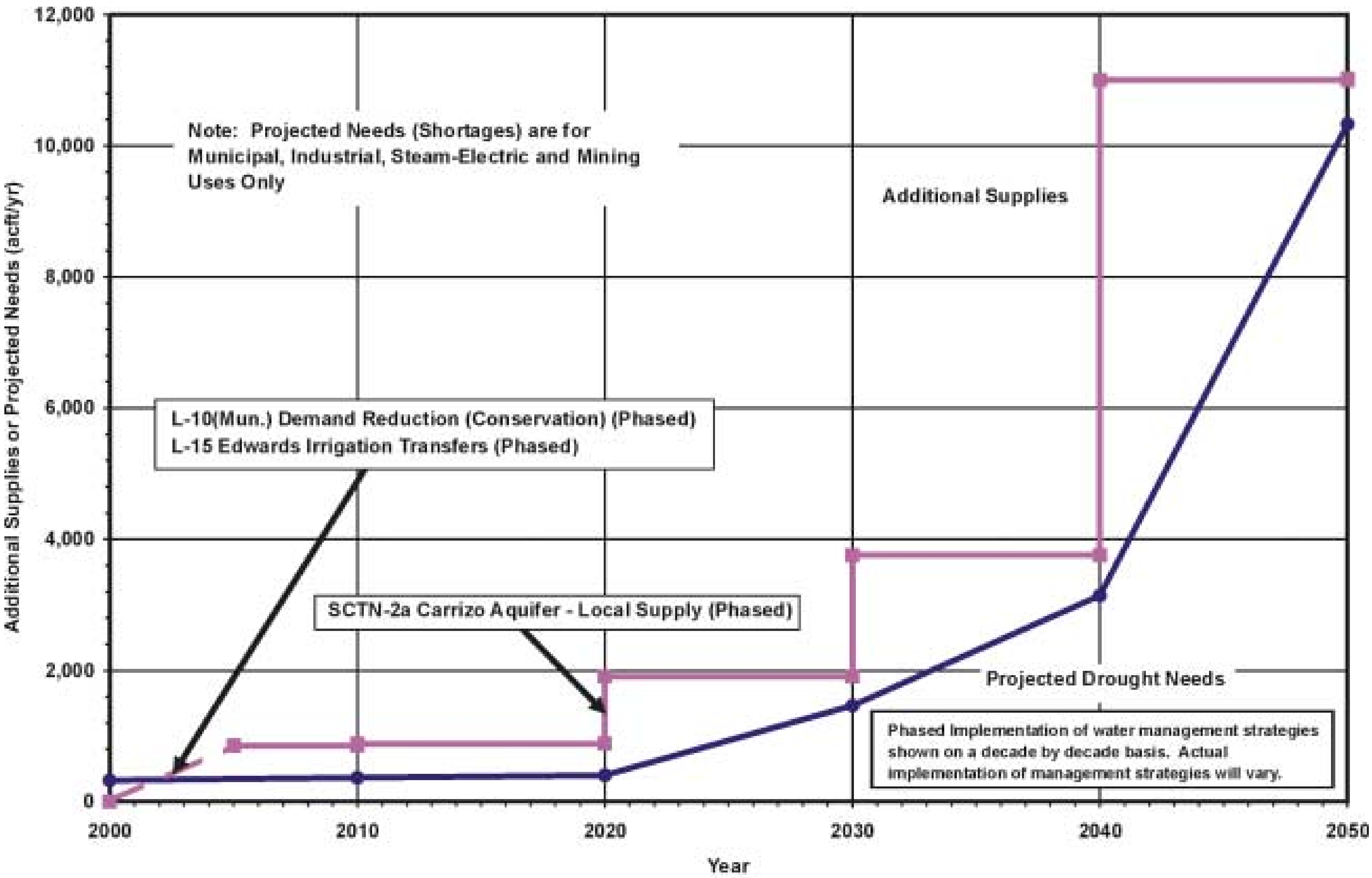


Figure 5.2-5. Regional Water Plan - Atascosa County

South Central Texas Region								County = Atascosa
County Summary of Projected Water Needs (Shortages) and Water Management Strategies								User Group(s) = all

Projected Water Needs (acft/yr)									
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		325	366	401	468	530	587	
	Industrial		0	0	0	0	0	0	
	Steam-Electric		0	0	0	0	1,504	8,504	
	Mining		0	0	0	995	1,109	1,239	
	Irrigation		38,418	36,719	35,170	43,726	42,190	40,713	
	Total Needs		**38,743**	**37,085**	**35,571**	**45,189**	**45,333**	**51,043**	
	Mun, Ind, S-E, & Min Needs		**325**	**366**	**401**	**1,463**	**3,143**	**10,330**	
	Irrigation Needs		**38,418**	**36,719**	**35,170**	**43,726**	**42,190**	**40,713**	

Water Management Strategies (acft/yr)		Candidate							
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)		356	384	411	259	300	319	1
L-15	Edwards Irrigation Transfers	42,686	500	500	500	500	700	700	2, 3, 4
SCTN-2a	Carrizo Aquifer - Local Supply	10,000				1,000	3,000	10,000	5, 6
SCTN-4	Brush Management								7
SCTN-5	Weather Modification								7
SCTN-9	Rainwater Harvesting								7
	Small Aquifer Recharge Dams								7
L-10 (Irr.)	Demand Reduction (Conservation)		3,692	3,692	3,692	3,692	3,692	3,692	8
	Total New Supplies		**4,548**	**4,576**	**4,603**	**5,451**	**7,692**	**14,711**	
	Total System Mgmt. Supply / Deficit		**-34,195**	**-32,509**	**-30,968**	**-39,738**	**-37,641**	**-36,332**	
	Mun, Ind, S-E, & Min System Mgmt. Supply / Deficit		**531**	**518**	**510**	**296**	**857**	**689**	
	Irrigation System Mgmt. Supply / Deficit		**-34,726**	**-33,027**	**-31,478**	**-40,034**	**-38,498**	**-37,021**	

Notes:

*	Candidate New Supplies shown for year 2000 are identified for priority implementation, but will not be available immediately.
1	Many Conservation strategies included in projected water demands. Supplies shown reflect implementation of additional conservation measures in the Cities of Charlotte, Jourdanton, Lytle, Pleasanton, and Poteet.
2	Candidate New Supply to be shared among Uvalde, Medina, Atascosa, and Bexar Counties.
3	Pursuant to draft EAA Critical Period Management rules, Candidate New Supply represents approximately 85 percent of the estimated annual transfer of 50,219 acft (about 53 percent of a maximum annual transfer of 95,430 acft based on Proposed Permits prorated to 400,000 acft/yr).
4	Additional Edwards supply is for City of Lytle.
5	Additional Carrizo supply is for Steam-Electric and Mining use.
6	Early implementation of facilities assumed in cost estimation to ensure sufficient supply during drought.
7	Option expected to provide additional water supply in many years, but dependable supply during drought is presently unquantified.
8	Estimates based upon use of LEPA systems on 50 percent of acreage irrigated in 1997, with conservation at 20 percent of irrigation application rate.

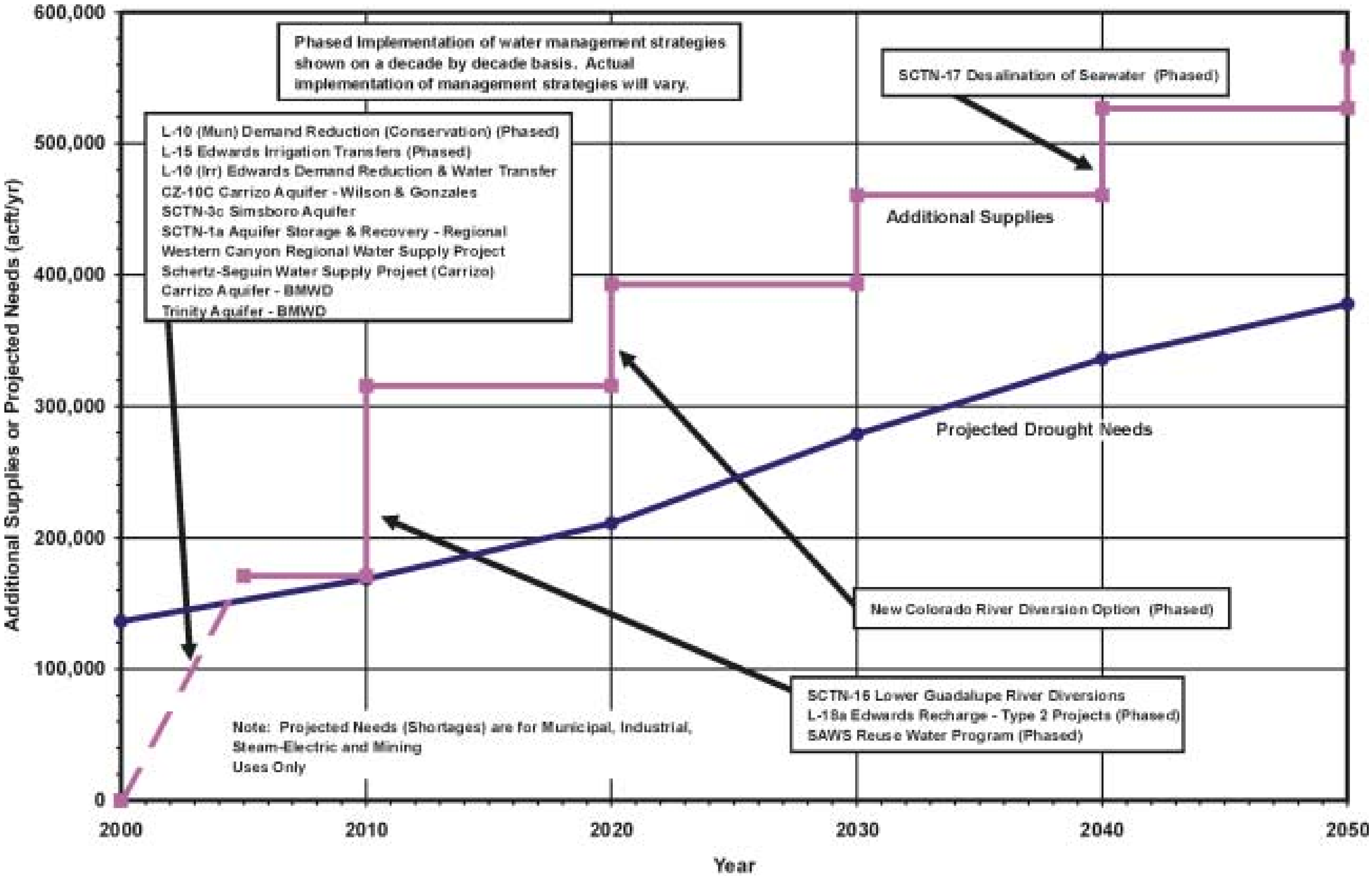


Figure 5.2-6. Regional Water Plan - Bexar County

South Central Texas Region									County = Bexar
County Summary of Projected Water Needs (Shortages) and Water Management Strategies									**User Group(s) = all**
Projected Water Needs (acft/yr)									
	User Group(s)		**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
	Municipal		131,884	164,107	206,398	272,467	326,339	364,328	
	Industrial		0	0	0	1,428	4,757	8,190	
	Steam-Electric		0	0	0	0	0	0	
	Mining		4,963	4,936	5,201	5,406	5,645	5,962	
	Irrigation		14,059	10,935	9,376	7,883	6,453	5,082	
	Total Needs		**150,906**	**179,978**	**220,975**	**287,184**	**343,194**	**383,562**	
	Mun, Ind, S-E, & Min Needs		**136,847**	**169,043**	**211,599**	**279,301**	**336,741**	**378,480**	
	Irrigation Needs		**14,059**	**10,935**	**9,376**	**7,883**	**6,453**	**5,082**	
Water Management Strategies (acft/yr)		**Candidate**							
ID#	**Description**	**New Supply**	**2000***	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
L-10 (Mun.)	Demand Reduction (Conservation)		33,528	42,509	41,210	36,533	38,834	40,934	1
L-15	Edwards Irrigation Transfers	42,686	25,000	32,986	32,986	32,986	32,986	32,986	2, 3
L-10 (Irr.)	Demand Reduction (Conservation) w/ Transfer	27,314	27,314	27,314	27,314	27,314	27,314	27,314	4
SSWSP	Schertz-Seguin Water Supply Project (Carrizo)	20,000	3,919	3,919	3,919	3,919	3,919	3,919	5
WCRWSP	Western Canyon Regional Water Supply Project	10,527	4,500	4,500	4,500	4,500	500	500	6
CRWA	Lake Dunlap WTP Expansion & Mid-Cities Project	5,200	5,200	5,200	0	0	0	0	7
BMWD	Carrizo Aquifer - Bexar & Guadalupe (BMWD)	4,000	4,000	4,000	4,000	4,000	4,000	4,000	8
BMWD	Trinity Aquifer - Bexar (BMWD)	1,000	1,000	1,000	1,000	1,000	1,000	1,000	8
CZ-10C	Carrizo Aquifer - Wilson & Gonzales	16,000	16,000	16,000	16,000	16,000	16,000	16,000	9
SCTN-3c	Simsboro Aquifer	55,000	55,000	55,000	55,000	55,000	55,000	55,000	10
SCTN-16	Lower Guadalupe River Diversions	94,500		94,500	94,500	94,500	94,500	94,500	11
L-18a	Edwards Recharge - Type 2 Projects	21,577		13,451	21,577	21,577	21,577	21,577	12
SAWS	SAWS Recycled Water Program	52,215		19,826	26,737	35,824	43,561	52,215	13, 14
LCRA	New Colorado River Diversion Option	150,000			66,000	132,000	132,000	132,000	15
SCTN-17	Desalination of Seawater (75 mgd)	84,012					56,008	84,012	16
SCTN-1a	Aquifer Storage & Recovery - Regional								17
SCTN-4	Brush Management								18
SCTN-5	Weather Modification								18
SCTN-9	Rainwater Harvesting								18
	Small Aquifer Recharge Dams								18
	Edwards Aquifer Recharge & Recirculation Systems								
	Cooperation w/ Corpus Christi for New Water Sources								
	Additional Storage (ASR and/or Surface)								
L-10 (Irr.)	Demand Reduction (Conservation)		1,905	1,905	1,905	1,905	1,905	1,905	19
	Total New Supplies		**177,366**	**322,110**	**396,648**	**467,058**	**529,104**	**567,862**	
	Total System Mgmt. Supply / Deficit		**26,460**	**142,132**	**175,673**	**179,874**	**185,910**	**184,300**	
	Mun, Ind, S-E, & Min System Mgmt. Supply / Deficit		**38,614**	**151,162**	**183,144**	**185,852**	**190,458**	**187,477**	
	Irrigation System Mgmt. Supply / Deficit		**-12,154**	**-9,030**	**-7,471**	**-5,978**	**-4,548**	**-3,177**	

Notes:	
*	Candidate New Supplies shown for year 2000 are identified for priority implementation, but will not be available immediately.
1	Many Conservation strategies included in projected water demands. Supplies shown reflect implementation of additional conservation measures.
2	Candidate New Supply to be shared among Uvalde, Medina, Atascosa, and Bexar Counties.
3	Pursuant to draft EAA Critical Period Management rules, Candidate New Supply represents approximately 85 percent of the estimated annual
	transfer of 50,219 acft (about 53 percent of a maximum annual transfer of 95,430 acft based on Proposed Permits prorated to 400,000 acft/yr).
4	Pursuant to draft EAA Critical Period Management rules, Candidate New Supply represents approximately 85 percent of the estimated annual
	transfer of 32,134 acft (based on installation of LEPA systems on about 53 percent of applicable acreage in Bexar, Medina, & Uvalde Counties).
5	Project in implementation phase. Includes delivery of groundwater from southern Gonzales County to the City of Schertz.
6	Project in implementation phase. Includes delivery of GBRA Canyon Reservoir water from Lake Dunlap to entities in Bexar County.
	Project is dependent upon amendment of CA# 18-2074 authorizing additional diversions from Canyon Reservoir.
7	Project in implementation phase. Includes delivery of Canyon Reservoir water to CRWA's member entities. Contract expires in 2018.
8	Project in implementation phase. Non-interruptible supplies identified by BMWD in Water Supply Program of 1/31/2000.
9	Includes 11,000 acft/yr and 5,000 acft/yr. from Wilson and Gonzales Counties, respectively. Effects on regional aquifer levels quantified.
10	Effects on regional aquifer levels quantified. Region L estimates of groundwater development exceed Region K estimates of availability in and
	beyond 2030. Regions have agreed that discussion of differences will be more productive upon completion of new Groundwater Availability Models
11	Candidate New Supply includes existing water rights, unappropriated streamflow, off-channel storage, and groundwater.
12	Includes 15 recharge enhancement projects on streams from the Nueces River in the west to the Blanco River in the east.
	Alternative size projects at identified locations are consistent with Regional Water Plan.
13	Current SAWS Reuse Water Program is included as 24,941 acft/yr (consumptive reuse) in existing supply.
14	Future use of reuse water for non-potable uses and based on goal of meeting 20 percent of SAWS projected water demand.
15	Candidate New Supply to be shared by Bexar and Hays Counties. Based on LCRA Regional Water Sharing Alternatives (7/6/2000).
	Delivery to Bexar County through diversion from Colorado River @ Bay City.
16	Saltwater intake located in San Antonio Bay.
17	SAWS ASR program in southern Bexar County increases reliability of Edwards Aquifer supply and reduces seasonal aquifer demands.
18	Option expected to provide additional water supply in many years, but dependable supply during drought is presently unquantified.
19	Estimates based on remaining irrigation water conservation potential through LEPA installation after consideration of Edwards Irrigation
	Transfers (L-15) and transfer of water conserved through irrigation Demand Reduction (L-10) to Bexar County municipal supply.

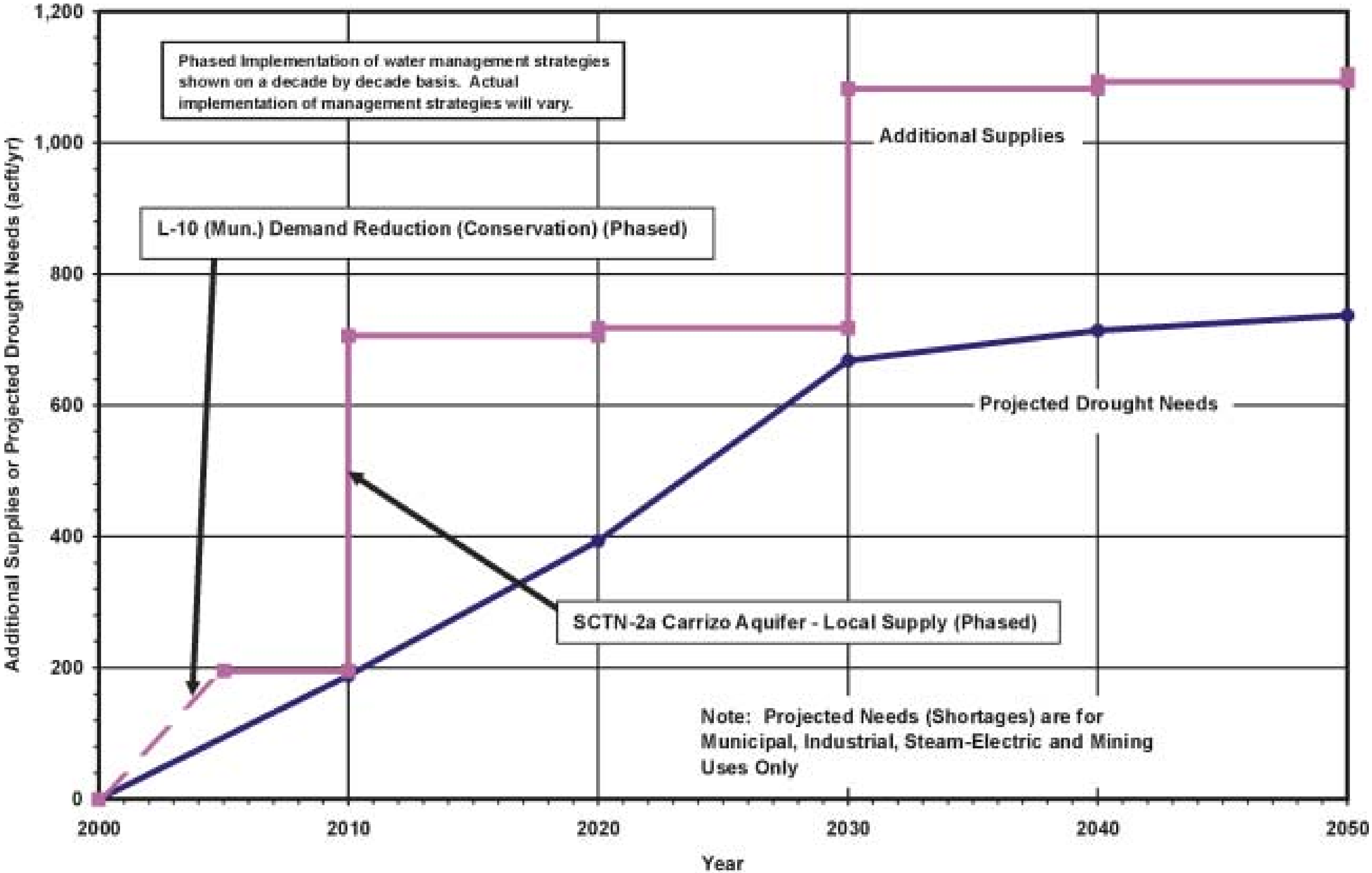


Figure 5.2-7. Regional Water Plan - Caldwell County

South Central Texas Region									County = Caldwell
County Summary of Projected Water Needs (Shortages) and Water Management Strategies									**User Group(s) = all**

Projected Water Needs (acft/yr)

	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		0	188	393	668	714	737	
	Industrial		0	0	0	0	0	0	
	Steam-Electric		0	0	0	0	0	0	
	Mining		0	0	0	0	0	0	
	Irrigation		0	0	0	0	0	0	
	Total Needs		**0**	**188**	**393**	**668**	**714**	**737**	
	Mun, Ind, S-E, & Min Needs		**0**	**188**	**393**	**668**	**714**	**737**	
	Irrigation Needs		**0**	**0**	**0**	**0**	**0**	**0**	

Water Management Strategies (acft/yr)

ID#	Description	Candidate New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)		195	206	218	82	93	104	1
SCTN-2a	Carrizo Aquifer - Local Supply	1,000		500	500	1,000	1,000	1,000	2
	Small Aquifer Recharge Dams								3
G-21	Lockhart Reservoir								4
	Total New Supplies		**195**	**706**	**718**	**1,082**	**1,093**	**1,104**	

	Total System Mgmt. Supply / Deficit		**195**	**518**	**325**	**414**	**379**	**367**	
	Mun, Ind, S-E, & Min System Mgmt. Supply / Deficit		**195**	**518**	**325**	**414**	**379**	**367**	
	Irrigation System Mgmt. Supply / Deficit		**0**	**0**	**0**	**0**	**0**	**0**	

Notes:

*	Candidate New Supplies shown for year 2000 are identified for priority implementation, but will not be available immediately.
1	Many Conservation strategies included in projected water demands. Supplies shown reflect implementation of additional conservation measures in the Cities of Lockhart, Luling, and Martindale.
2	Additional well(s) for Lockhart.
3	Option expected to provide additional water supply in many years, but dependable supply during drought is presently unquantified.
4	Water supply option identified as a "potential reservoir" and may be considered as a possible amendment to the Regional Water Plan.

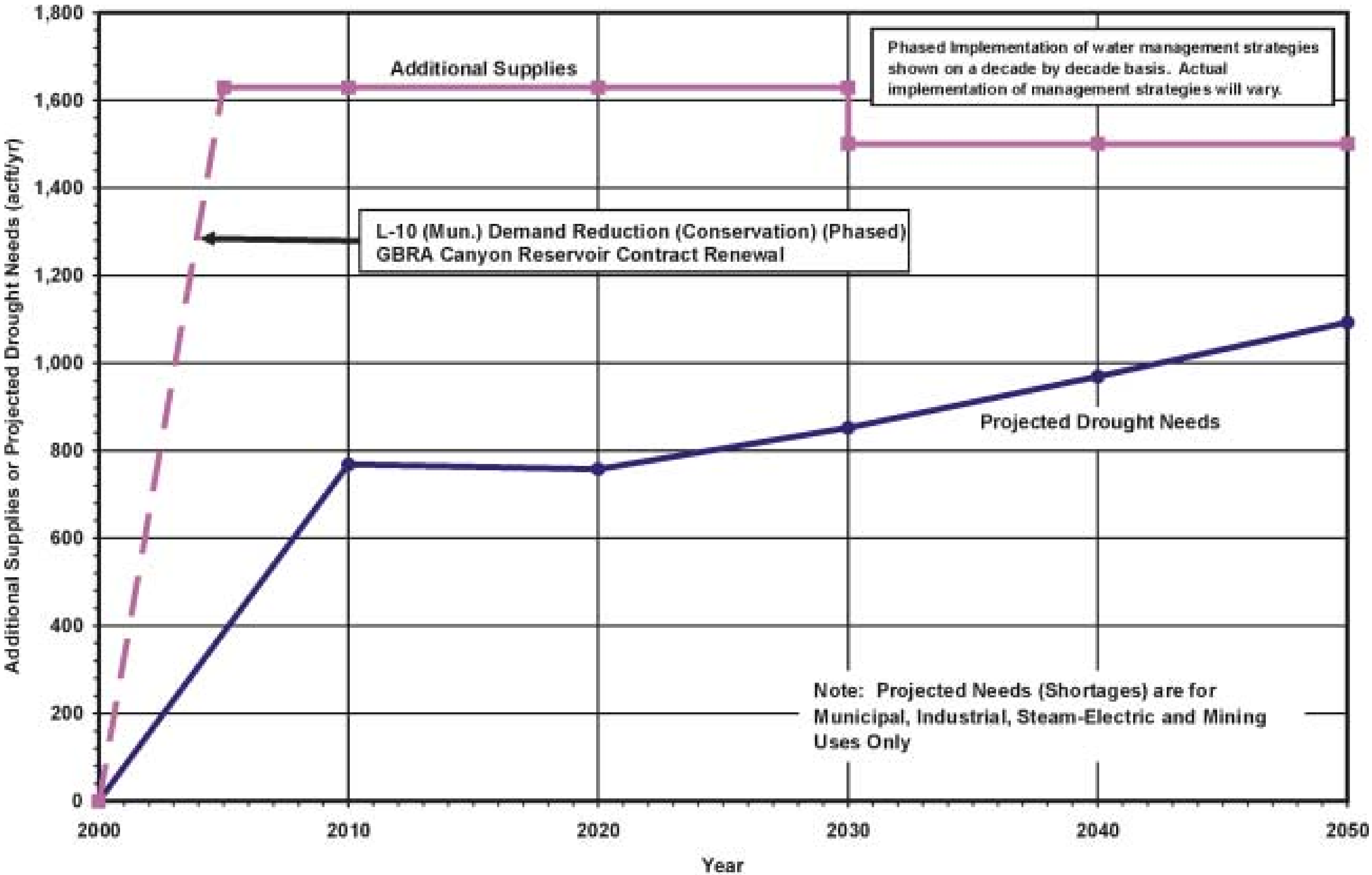


Figure 5.2-8. Regional Water Plan - Calhoun County

South Central Texas Region									County = Calhoun
County Summary of Projected Water Needs (Shortages) and Water Management Strategies									User Group(s) = all
Projected Water Needs (acft/yr)									
	User Group(s)		**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
	Municipal		0	769	758	852	969	1,093	
	Industrial		0	0	0	0	0	0	
	Steam-Electric		0	0	0	0	0	0	
	Mining		0	0	0	0	0	0	
	Irrigation		0	0	0	0	0	0	
	Total Needs		**0**	**769**	**758**	**852**	**969**	**1,093**	
	Mun, Ind, S-E, & Min Needs		**0**	**769**	**758**	**852**	**969**	**1,093**	
	Irrigation Needs		**0**	**0**	**0**	**0**	**0**	**0**	
Water Management Strategies (acft/yr)		**Candidate**							
ID#	**Description**	**New Supply**	**2000***	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
L-10 (Mun.)	Demand Reduction (Conservation)		129	129	129	0	0	0	1
GBRA	GBRA Canyon Reservoir Contract Renewal	1,500		1,500	1,500	1,500	1,500	1,500	2,3
	Total New Supplies		**129**	**1,629**	**1,629**	**1,500**	**1,500**	**1,500**	
	Total System Mgmt. Supply / Deficit		**129**	**860**	**871**	**648**	**531**	**407**	
	Mun, Ind, S-E, & Min System Mgmt. Supply / Deficit		**129**	**860**	**871**	**648**	**531**	**407**	
	Irrigation System Mgmt. Supply / Deficit		**0**	**0**	**0**	**0**	**0**	**0**	
Notes:									
*	Candidate New Supplies shown for year 2000 are identified for priority implementation, but will not be available immediately.								
1	Many Conservation strategies included in projected water demands. Supplies shown reflect implementation of additional conservation								
	measures in the Cities of Port Lavaca, Point Comfort, and Seadrift.								
2	Renewal of current GBRA Canyon Reservoir Contract with the City of Port Lavaca which expires in February 2008.								
3	Early implementation of contract renewal assumed to insure sufficient supply during drought.								

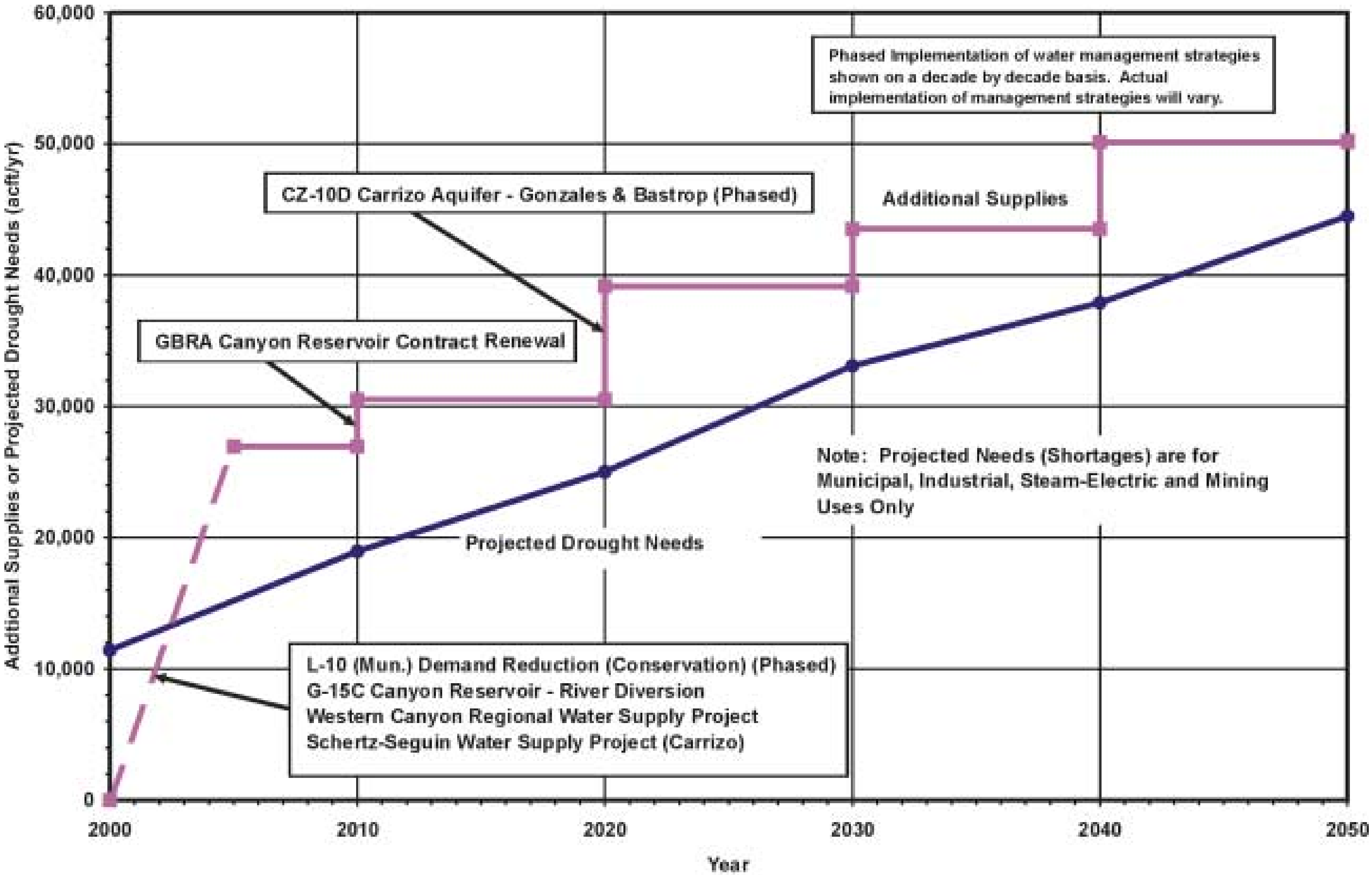


Figure 5.2-9. Regional Water Plan - Comal County

South Central Texas Region									County = Comal
County Summary of Projected Water Needs (Shortages) and Water Management Strategies									User Group(s) = all
Projected Water Needs (acft/yr)									
	User Group(s)		**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
	Municipal		3,850	13,576	19,483	27,365	34,386	42,347	
	Industrial		0	0	0	0	271	551	
	Steam-Electric		0	0	0	0	0	0	
	Mining		5,570	5,464	5,628	5,796	3,590	2,224	
	Irrigation		0	0	0	0	0	0	
	Total Needs		**9,420**	**19,040**	**25,111**	**33,161**	**38,247**	**45,122**	
	Mun, Ind, S-E, & Min Needs		**9,420**	**19,040**	**25,111**	**33,161**	**38,247**	**45,122**	
	Irrigation Needs		**0**	**0**	**0**	**0**	**0**	**0**	
Water Management Strategies (acft/yr)		**Candidate**							
ID#	**Description**	**New Supply**	**2000***	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
L-10 (Mun.)	Demand Reduction (Conservation)		616	718	848	718	824	942	1
WCRWSP	Western Canyon Regional Water Supply Project	10,527	3,716	3,716	3,716	3,716	7,716	7,716	2, 3
SSWSP	Schertz-Seguin Water Supply Project (Carrizo)	20,000	1,315	1,315	1,315	1,315	1,315	1,315	4
G-15C	Canyon Reservoir - River Diversion	15,700	10,500	10,500	15,700	15,700	15,700	15,700	3, 5
GBRA	GBRA Canyon Reservoir Contract Renewal	6,676		6,676	6,676	6,676	6,676	6,676	6
CZ-10D	Carrizo Aquifer - Gonzales & Bastrop	27,500			3,500	12,000	16,500	23,000	7, 8, 9, 10
	Additional Municipal Reuse Programs								11
SCTN-4	Brush Management								11
SCTN-5	Weather Modification								11
SCTN-9	Rainwater Harvesting								11
	Small Aquifer Recharge Dams								11
	Total New Supplies		**16,147**	**22,925**	**31,755**	**40,125**	**48,731**	**55,349**	
	Total System Mgmt. Supply / Deficit		**6,727**	**3,885**	**6,644**	**6,964**	**10,484**	**10,227**	
	Mun, Ind, S-E, & Min System Mgmt. Supply / Deficit		**6,727**	**3,885**	**6,644**	**6,964**	**10,484**	**10,227**	
	Irrigation System Mgmt. Supply / Deficit		**0**	**0**	**0**	**0**	**0**	**0**	

Notes:

*	Candidate New Supplies shown for year 2000 are identified for priority implementation, but may not be available immediately.
1	Many Conservation strategies included in projected water demands. Supplies shown reflect implementation of additional conservation measures in the Cities of Fair Oaks Ranch, Garden Ridge, and New Braunfels.
2	Project in implementation phase. Includes delivery of GBRA Canyon Reservoir water to entities in Comal, Kendall, and Bexar Counties.
3	Project is dependent upon amendment of CA# 18-2074 authorizing additional diversions from Canyon Reservoir.
4	Project in implementation phase. Includes delivery of groundwater from southern Gonzales County to the City of Schertz.
5	Portion of Canyon firm yield diverted at or below New Braunfels. Includes water available upon expiration of CRWA contract in 2018.
6	Renewal of current GBRA Canyon Reservoir Contract with the City of New Braunfels which expires in December 2001.
7	Candidate New Supply to be shared by Comal and Guadalupe Counties. Effects on regional aquifer levels quantified.
8	Supply based on up to 15,000 acft/yr from northern Gonzales County and up to 12,500 acft/yr from southern Bastrop County.
9	Early implementation of facilities assumed in cost estimation to ensure sufficient supply during drought.
10	Region L estimates of groundwater development exceed Region K estimates of availability in and beyond 2030. Regions have agreed that discussion of differences will be more productive upon completion of new Groundwater Availability Models.
11	Option expected to provide additional water supply in many years, but dependable supply during drought is presently unquantified.

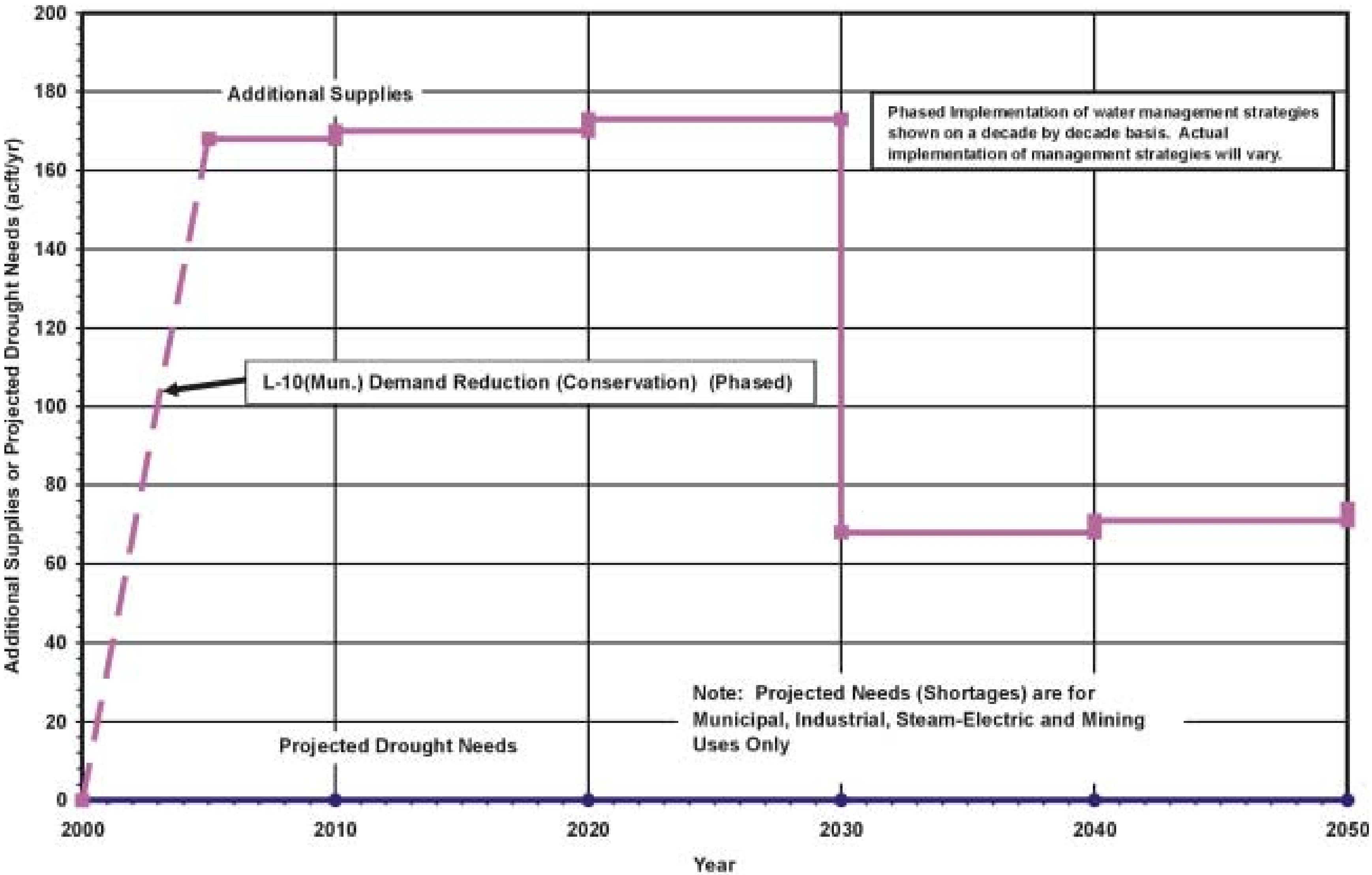


Figure 5.2-10. Regional Water Plan - DeWitt County

South Central Texas Region									County = DeWitt
County Summary of Projected Water Needs (Shortages) and Water Management Strategies									User Group(s) = all

Projected Water Needs (acft/yr)

	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		0	0	0	0	0	0	
	Industrial		0	0	0	0	0	0	
	Steam-Electric		0	0	0	0	0	0	
	Mining		0	0	0	0	0	0	
	Irrigation		0	0	0	0	0	0	
	Total Needs		**0**	**0**	**0**	**0**	**0**	**0**	
	Mun, Ind, S-E, & Min Needs		**0**	**0**	**0**	**0**	**0**	**0**	
	Irrigation Needs		**0**	**0**	**0**	**0**	**0**	**0**	

Water Management Strategies (acft/yr)

ID#	Description	Candidate New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)		168	170	173	68	71	74	1
	Total New Supplies		**168**	**170**	**173**	**68**	**71**	**74**	
	Total System Mgmt. Supply / Deficit		**168**	**170**	**173**	**68**	**71**	**74**	
	Mun, Ind, S-E, & Min System Mgmt. Supply / Deficit		**168**	**170**	**173**	**68**	**71**	**74**	
	Irrigation System Mgmt. Supply / Deficit		**0**	**0**	**0**	**0**	**0**	**0**	

Notes:

*	Candidate New Supplies shown for year 2000 are identified for priority implementation, but may not be available immediately.
1	Many Conservation strategies included in projected water demands. Supplies shown reflect implementation of additional conservation measures in the Cities of Cuero, Yoakum, and Yorktown.

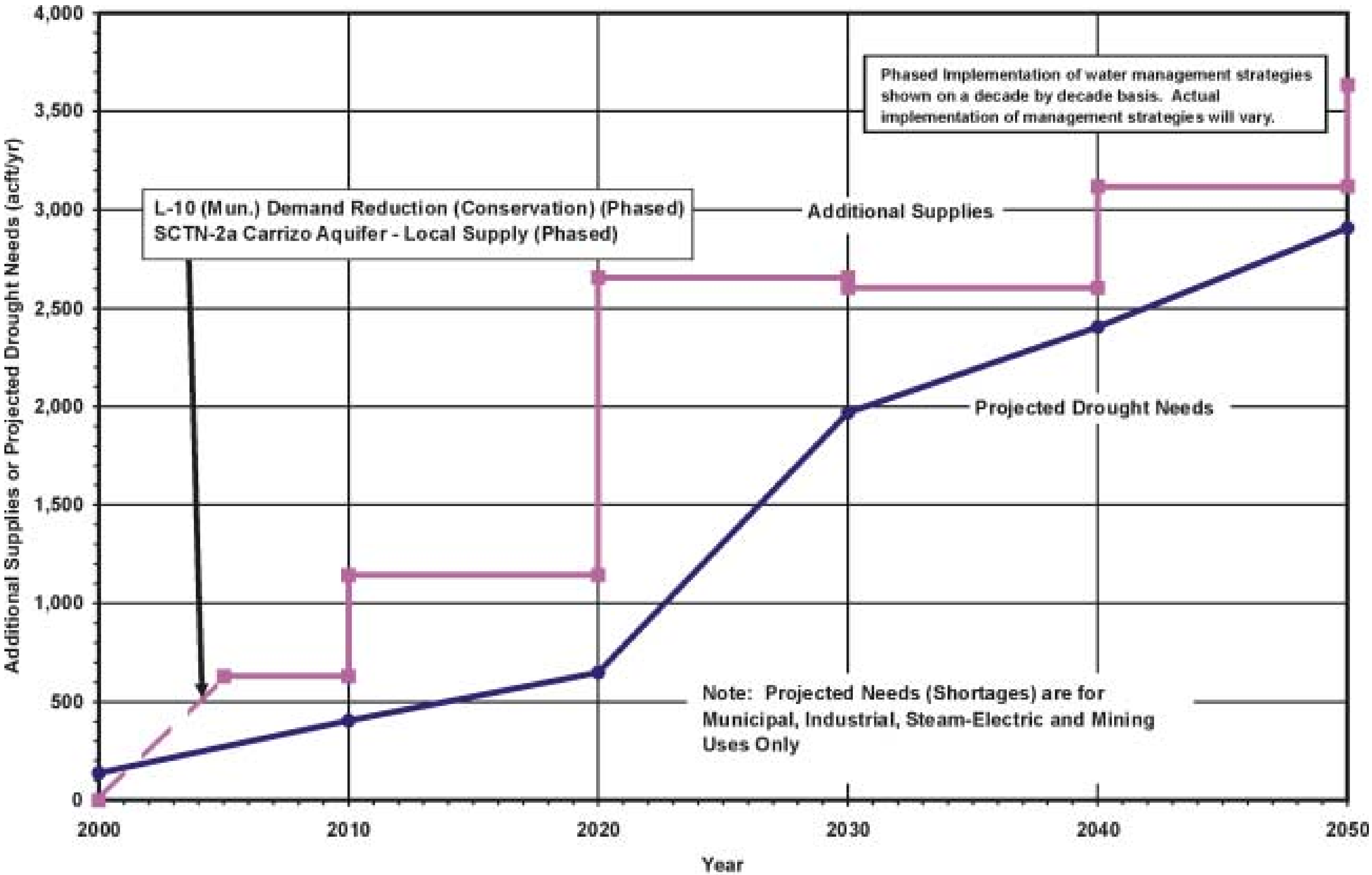


Figure 5.2-11. Regional Water Plan - Dimmit County

South Central Texas Region									County = Dimmit
County Summary of Projected Water Needs (Shortages) and Water Management Strategies									**User Group(s) = all**
Projected Water Needs (acft/yr)									
	User Group(s)		**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
	Municipal		138	405	649	1,054	1,479	1,959	
	Industrial		0	0	0	0	0	0	
	Steam-Electric		0	0	0	0	0	0	
	Mining		0	0	0	0	0	0	
	Irrigation		0	0	0	0	0	0	
	Total Needs		**138**	**405**	**649**	**1,054**	**1,479**	**1,959**	
	Mun, Ind, S-E, & Min Needs		**138**	**405**	**649**	**1,054**	**1,479**	**1,959**	
	Irrigation Needs		**0**	**0**	**0**	**0**	**0**	**0**	
Water Management Strategies (acft/yr)		**Candidate**							
ID#	**Description**	**New Supply**	**2000***	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
L-10 (Mun.)	Demand Reduction (Conservation)		131	144	156	104	118	133	1
SCTN-2a	Carrizo Aquifer - Local Supply	3,500	500	1,000	1,000	2,500	3,000	3,500	2, 3
	Additional Municipal Reuse Programs								4
SCTN-4	Brush Management								4
SCTN-5	Weather Modification								4
SCTN-9	Rainwater Harvesting								4
	Small Aquifer Recharge Dams								4
	Total New Supplies		**631**	**1,144**	**1,156**	**2,604**	**3,118**	**3,633**	
	Total System Mgmt. Supply / Deficit		**493**	**739**	**507**	**1,550**	**1,639**	**1,674**	
	Mun, Ind, S-E, & Min System Mgmt. Supply / Deficit		**493**	**739**	**507**	**1,550**	**1,639**	**1,674**	
	Irrigation System Mgmt. Supply / Deficit		**0**	**0**	**0**	**0**	**0**	**0**	

Notes:

*	Candidate New Supplies shown for year 2000 are identified for priority implementation, but will not be available immediately.
1	Many Conservation strategies included in projected water demands. Supplies shown reflect implementation of additional conservation measures in the Cities of Big Wells and Carrizo Springs.
2	Additional well(s) for Carrizo Springs supply.
3	Early implementation of facilities assumed in cost estimation to ensure sufficient supply during drought.
4	Option expected to provide additional water supply in many years, but dependable supply during drought is presently unquantified.

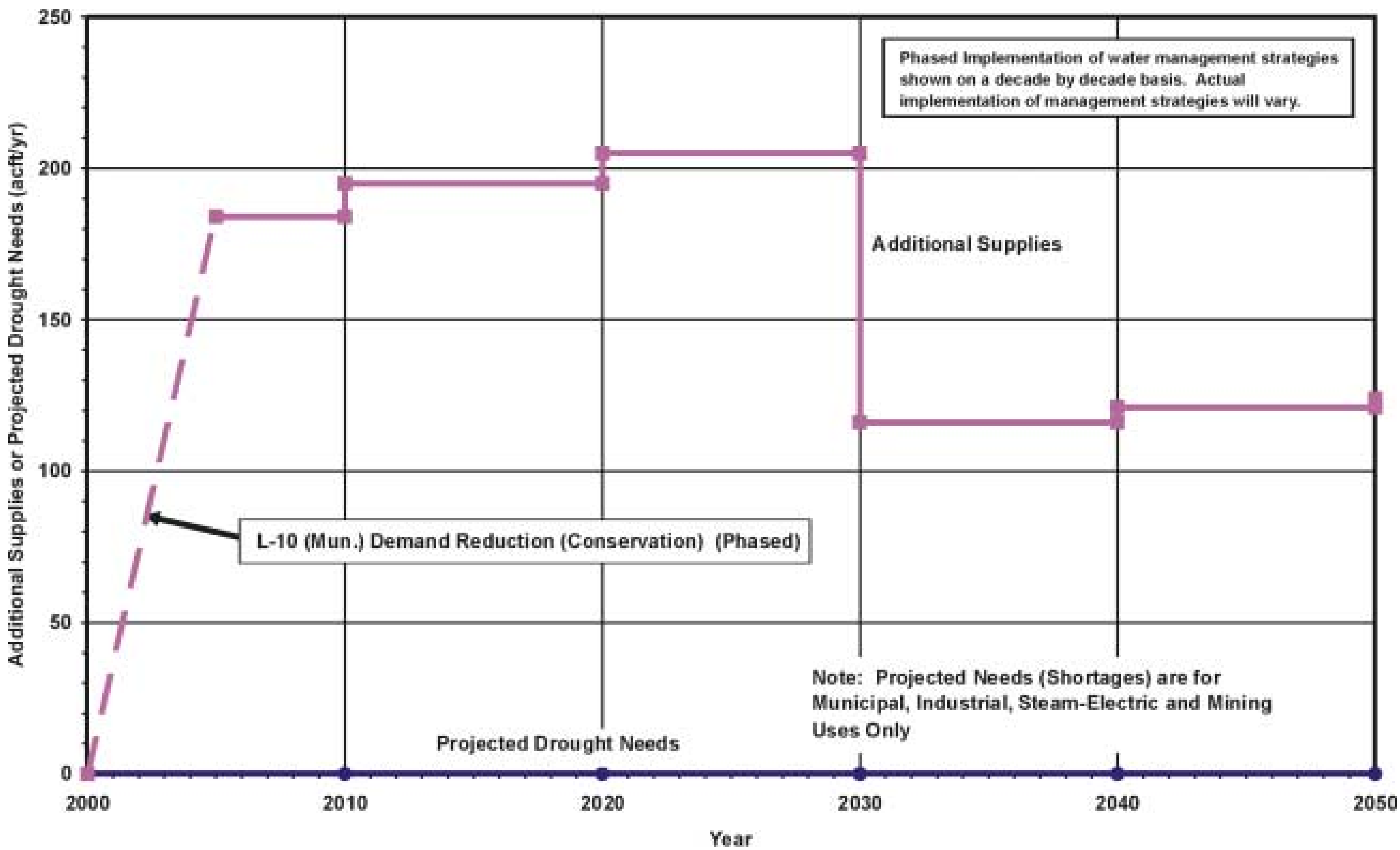


Figure 5.2-12. Regional Water Plan - Frio County

South Central Texas Region									**County = Frio**
County Summary of Projected Water Needs (Shortages) and Water Management Strategies									**User Group(s) = all**
Projected Water Needs (acft/yr)									
	User Group(s)		**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
	Municipal		0	0	0	0	0	0	
	Industrial		0	0	0	0	0	0	
	Steam-Electric		0	0	0	0	0	0	
	Mining		0	0	0	0	0	0	
	Irrigation		71,125	67,645	64,365	76,506	73,520	70,663	
	Total Needs		**71,125**	**67,645**	**64,365**	**76,506**	**73,520**	**70,663**	
	Mun, Ind, S-E, & Min Needs		**0**	**0**	**0**	**0**	**0**	**0**	
	Irrigation Needs		**71,125**	**67,645**	**64,365**	**76,506**	**73,520**	**70,663**	
Water Management Strategies (acft/yr)		**Candidate**							
ID#	**Description**	**New Supply**	**2000***	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
L-10 (Mun.)	Demand Reduction (Conservation)		184	195	205	116	121	124	1
SCTN-4	Brush Management								2
SCTN-5	Weather Modification								2
SCTN-9	Rainwater Harvesting								2
	Small Aquifer Recharge Dams								2
L-10 (Irr.)	Demand Reduction (Conservation)		5,947	5,947	5,947	5,947	5,947	5,947	3
	Total New Supplies		**6,131**	**6,142**	**6,152**	**6,063**	**6,068**	**6,071**	
	Total System Mgmt. Supply / Deficit		**-64,994**	**-61,503**	**-58,213**	**-70,443**	**-67,452**	**-64,592**	
	Mun, Ind, S-E, & Min System Mgmt. Supply / Deficit		**184**	**195**	**205**	**116**	**121**	**124**	
	Irrigation System Mgmt. Supply / Deficit		**-65,178**	**-61,698**	**-58,418**	**-70,559**	**-67,573**	**-64,716**	

Notes:

*	Candidate New Supplies shown for year 2000 are identified for priority implementation, but will not be available immediately.
1	Many Conservation strategies included in projected water demands. Supplies shown reflect implementation of additional conservation measures in the Cities of Dilley and Pearsall.
2	Option expected to provide additional water supply in many years, but dependable supply during drought is presently unquantified.
3	Estimates based upon use of LEPA systems on 50 percent of acreage irrigated in 1997, with conservation at 20 percent of irrigation application rate.

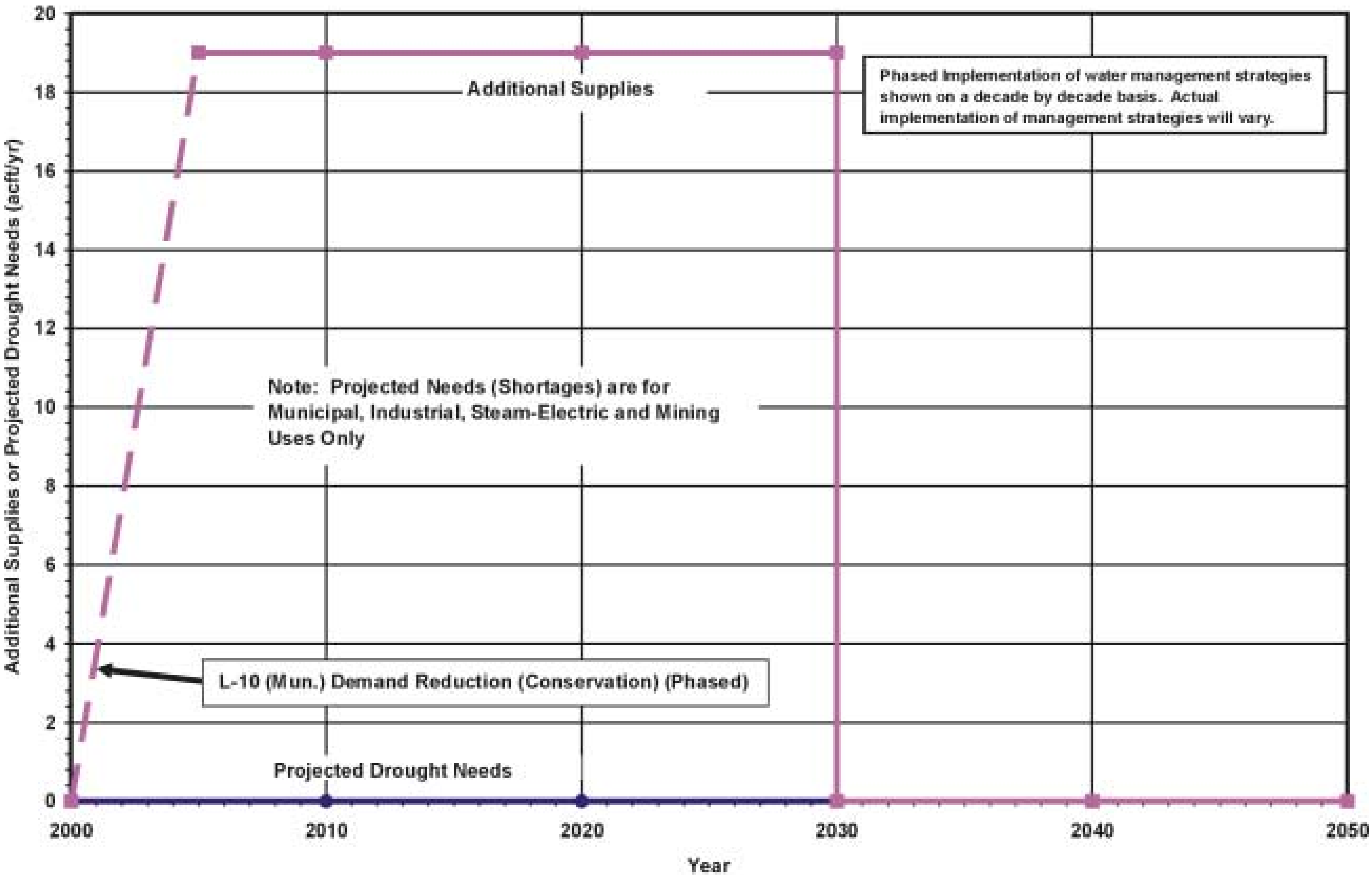


Figure 5.2-13. Regional Water Plan - Goliad County

South Central Texas Region									County = Goliad
County Summary of Projected Water Needs (Shortages) and Water Management Strategies									User Group(s) = all
Projected Water Needs (acft/yr)									
	User Group(s)		**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
	Municipal		0	0	0	0	0	0	
	Industrial		0	0	0	0	0	0	
	Steam-Electric		0	0	0	0	0	0	
	Mining		0	0	0	0	0	0	
	Irrigation		0	0	0	0	0	0	
	Total Needs		**0**	**0**	**0**	**0**	**0**	**0**	
	Mun, Ind, S-E, & Min Needs		**0**	**0**	**0**	**0**	**0**	**0**	
	Irrigation Needs		**0**	**0**	**0**	**0**	**0**	**0**	
Water Management Strategies (acft/yr)		**Candidate**							
ID#	**Description**	**New Supply**	**2000***	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
L-10 (Mun.)	Demand Reduction (Conservation)		19	19	19	0	0	0	1
	Total New Supplies		**19**	**19**	**19**	**0**	**0**	**0**	
	Total System Mgmt. Supply / Deficit		**19**	**19**	**19**	**0**	**0**	**0**	
	Mun, Ind, S-E, & Min System Mgmt. Supply / Deficit		**19**	**19**	**19**	**0**	**0**	**0**	
	Irrigation System Mgmt. Supply / Deficit		**0**	**0**	**0**	**0**	**0**	**0**	

Notes:

* Candidate New Supplies shown for year 2000 are identified for priority implementation, but will not be available immediately.

1 Many Conservation strategies included in projected water demands. Supplies shown reflect implementation of additional conservation measures in the City of Goliad.

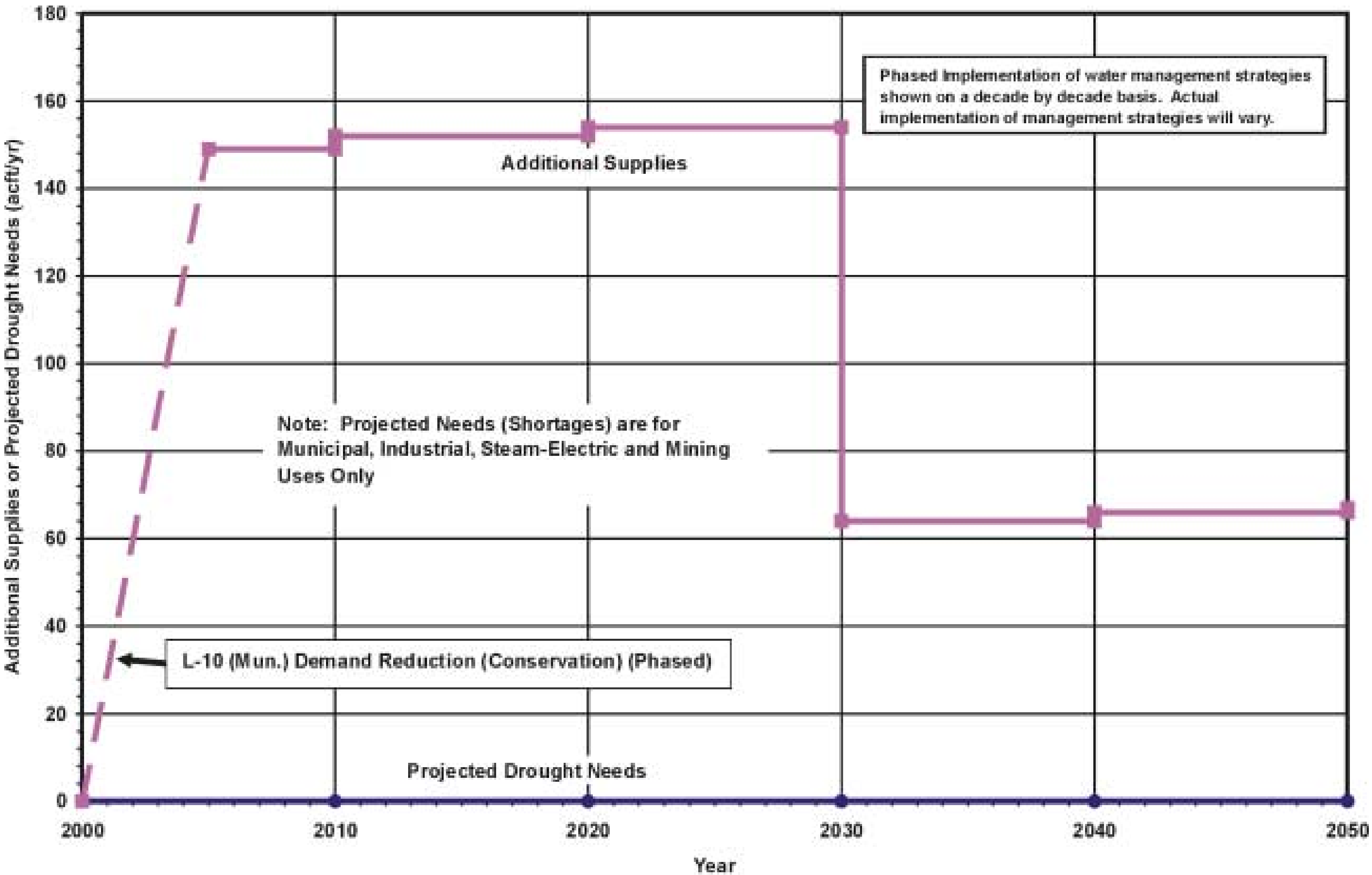


Figure 5.2-14. Regional Water Plan - Gonzales County

South Central Texas Region								County = Gonzales
County Summary of Projected Water Needs (Shortages) and Water Management Strategies								User Group(s) = all

Projected Water Needs (acft/yr)									
	User Group(s)		**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
	Municipal		0	0	0	0	0	0	
	Industrial		0	0	0	0	0	0	
	Steam-Electric		0	0	0	0	0	0	
	Mining		0	0	0	0	0	0	
	Irrigation		0	0	0	0	0	0	
	Total Needs		**0**	**0**	**0**	**0**	**0**	**0**	
	Mun, Ind, S-E, & Min Needs		**0**	**0**	**0**	**0**	**0**	**0**	
	Irrigation Needs		**0**	**0**	**0**	**0**	**0**	**0**	

Water Management Strategies (acft/yr)		**Candidate**							
ID#	**Description**	**New Supply**	**2000***	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
L-10 (Mun.)	Demand Reduction (Conservation)		149	152	154	64	66	67	1
	Total New Supplies		**149**	**152**	**154**	**64**	**66**	**67**	
	Total System Mgmt. Supply / Deficit		**149**	**152**	**154**	**64**	**66**	**67**	
	Mun, Ind, S-E, & Min System Mgmt. Supply / Deficit		**149**	**152**	**154**	**64**	**66**	**67**	
	Irrigation System Mgmt. Supply / Deficit		**0**	**0**	**0**	**0**	**0**	**0**	

Notes:

* Candidate New Supplies shown for year 2000 are identified for priority implementation, but will not be available immediately.

1 Many Conservation strategies included in projected water demands. Supplies shown reflect implementation of additional conservation measures in the Cities of Gonzales, Nixon, and Waelder.

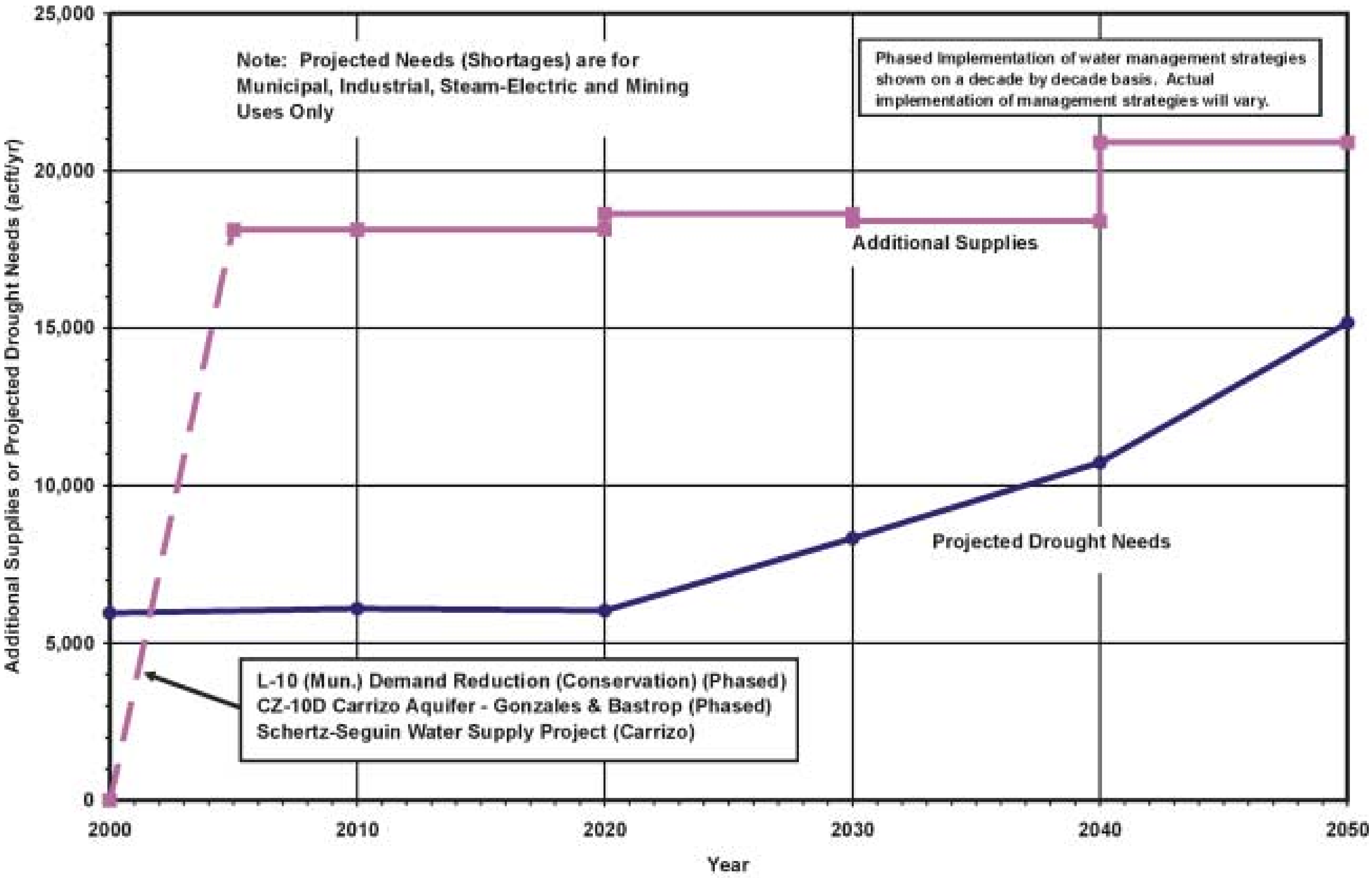


Figure 5.2-15. Regional Water Plan - Guadalupe County

South Central Texas Region									County = Guadalupe
County Summary of Projected Water Needs (Shortages) and Water Management Strategies									User Group(s) = all

Projected Water Needs (acft/yr)

	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		3,795	3,740	3,507	4,870	7,529	12,132	
	Industrial		979	1,198	1,344	1,481	1,686	1,893	
	Steam-Electric		920	920	920	920	920	920	
	Mining		196	198	200	202	207	213	
	Irrigation		883	777	677	582	492	406	
	Total Needs		**6,773**	**6,833**	**6,648**	**8,055**	**10,834**	**15,564**	
	Mun, Ind, S-E, & Min Needs		**5,890**	**6,056**	**5,971**	**7,473**	**10,342**	**15,158**	
	Irrigation Needs		**883**	**777**	**677**	**582**	**492**	**406**	

Water Management Strategies (acft/yr)

ID#	Description	Candidate New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)		235	236	236	5	5	6	1
CZ-10D	Carrizo Aquifer - Gonzales & Bastrop	27,500	1,500	1,500	2,000	2,000	2,500	4,500	2, 3, 4, 5
SSWSP	Schertz-Seguin Water Supply Project (Carrizo)	20,000	14,766	14,766	14,766	14,766	14,766	14,766	6
	Additional Municipal Reuse Programs								7
	Small Aquifer Recharge Dams								7
CRWA	Lake Dunlap WTP Expansion & Mid-Cities Project								
	Total New Supplies		**16,501**	**16,502**	**17,002**	**16,771**	**17,271**	**19,272**	
	Total System Mgmt. Supply / Deficit		**9,728**	**9,669**	**10,354**	**8,716**	**6,437**	**3,708**	
	Mun, Ind, S-E, & Min System Mgmt. Supply / Deficit		**10,611**	**10,446**	**11,031**	**9,298**	**6,929**	**4,114**	
	Irrigation System Mgmt. Supply / Deficit		**-883**	**-777**	**-677**	**-582**	**-492**	**-406**	

Notes:

*	Candidate New Supplies shown for year 2000 are identified for priority implementation, but will not be available immediately.
1	Many Conservation strategies included in projected water demands. Supplies shown reflect implementation of additional conservation measures in the Cities of Cibolo, Marion, McQueeney, New Braunfels, and Seguin.
2	Candidate New Supply to be shared by Comal and Guadalupe Counties. Effects on regional aquifer levels quantified.
3	Supply based on up to 15,000 acft/yr from northern Gonzales County and up to 12,500 acft/yr from southern Bastrop County.
4	Early implementation of facilities assumed in cost estimation to ensure sufficient supply during drought.
5	Region L estimates of groundwater development exceed Region K estimates of availability in and beyond 2030. Regions have agreed that discussion of differences will be more productive upon completion of new Groundwater Availability Models.
6	Project in implementation phase. Includes delivery of groundwater from southern Gonzales County to the Cities of Schertz and Seguin.
7	Option expected to provide additional water supply in many years, but dependable supply during drought is presently unquantified.

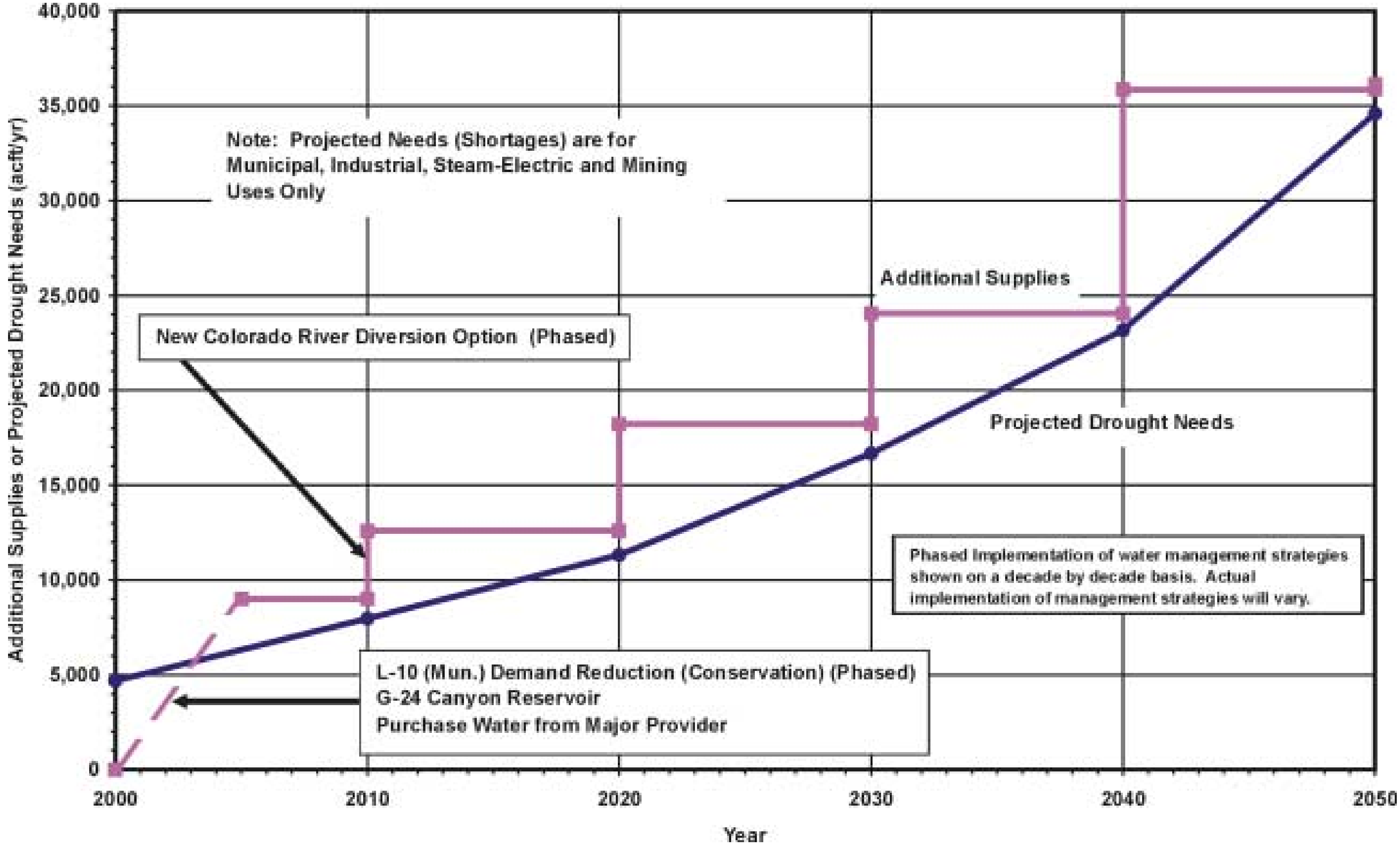


Figure 5.2-16. Regional Water Plan - Hays County

South Central Texas Region									County = Hays
County Summary of Projected Water Needs (Shortages) and Water Management Strategies									**User Group(s) = all**
Projected Water Needs (acft/yr)									
	User Group(s)		**2000***	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
	Municipal		4,245	7,529	10,900	16,269	22,772	34,204	
	Industrial		0	0	0	0	0	0	
	Steam-Electric		0	0	0	0	0	0	
	Mining		84	82	68	55	37	28	
	Irrigation		0	0	0	0	0	0	
	Total Needs		**4,329**	**7,611**	**10,968**	**16,324**	**22,809**	**34,232**	
	Mun, Ind, S-E, & Min Needs		**4,329**	**7,611**	**10,968**	**16,324**	**22,809**	**34,232**	
	Irrigation Needs		**0**	**0**	**0**	**0**	**0**	**0**	
Water Management Strategies (acft/yr)		**Candidate**							
ID#	**Description**	**New Supply**	**2000***	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
L-10 (Mun.)	Demand Reduction (Conservation)		647	747	873	699	906	1,174	1
PMP	Purchase Water from Major Provider	5,000	5,000	5,000	5,000	5,000	5,000	5,000	2, 3
HIH35WSP	Hays/IH 35 Water Supply Project	4,500	4,500	4,500	4,500	4,500	4,500	4,500	3
G-24	Canyon Reservoir	1,348	1,348	1,348	1,348	1,348	1,348	1,348	4
LCRA	New Colorado River Diversion Option	150,000				6,000	12,000	18,000	5, 6
GBRA	GBRA Canyon Reservoir Contract Renewal						589	5,589	7
	Additional Municipal Reuse Programs								8
SCTN-4	Brush Management								8
SCTN-5	Weather Modification								8
SCTN-9	Rainwater Harvesting								8
	Small Aquifer Recharge Dams								8
	Total New Supplies		**11,495**	**11,595**	**11,721**	**17,547**	**24,343**	**35,611**	
	Total System Mgmt. Supply / Deficit		**7,166**	**3,984**	**753**	**1,223**	**1,534**	**1,379**	
	Mun, Ind, S-E, & Min System Mgmt. Supply / Deficit		**7,166**	**3,984**	**753**	**1,223**	**1,534**	**1,379**	
	Irrigation System Mgmt. Supply / Deficit		**0**	**0**	**0**	**0**	**0**	**0**	

Notes:

*	Candidate New Supplies shown for year 2000 are identified for priority implementation, but will not be available immediately.
1	Many Conservation strategies included in projected water demands. Supplies shown reflect implementation of additional conservation measures in the Cities of Kyle, San Marcos, Wimberley, and Woodcreek.
2	Purchase of additional water supply under GBRA Canyon Reservoir Contract. Delivery through existing facilities.
3	Purchase dependent upon CA#18-2074 amendment authorizing additional diversions from Canyon Reservoir. Project in implementation phase.
4	Candidate New Supply for Wimberley, Woodcreek, and Blanco. Blanco located in Region K and has estimated need of 300 acft/yr.
5	Candidate New Supply to be shared by Bexar and Hays Counties. Delivery to Hays County through diversion from Colorado River @ Bastrop.
6	Early implementation of facilities assumed in cost estimation to ensure sufficient supply during drought.
7	Renewal of current GBRA Canyon Reservoir Contracts with the Cities of Kyle and San Marcos which expire in December 2038 and July 2047, respectively.
8	Option expected to provide additional water supply in many years, but dependable supply during drought is presently unquantified.

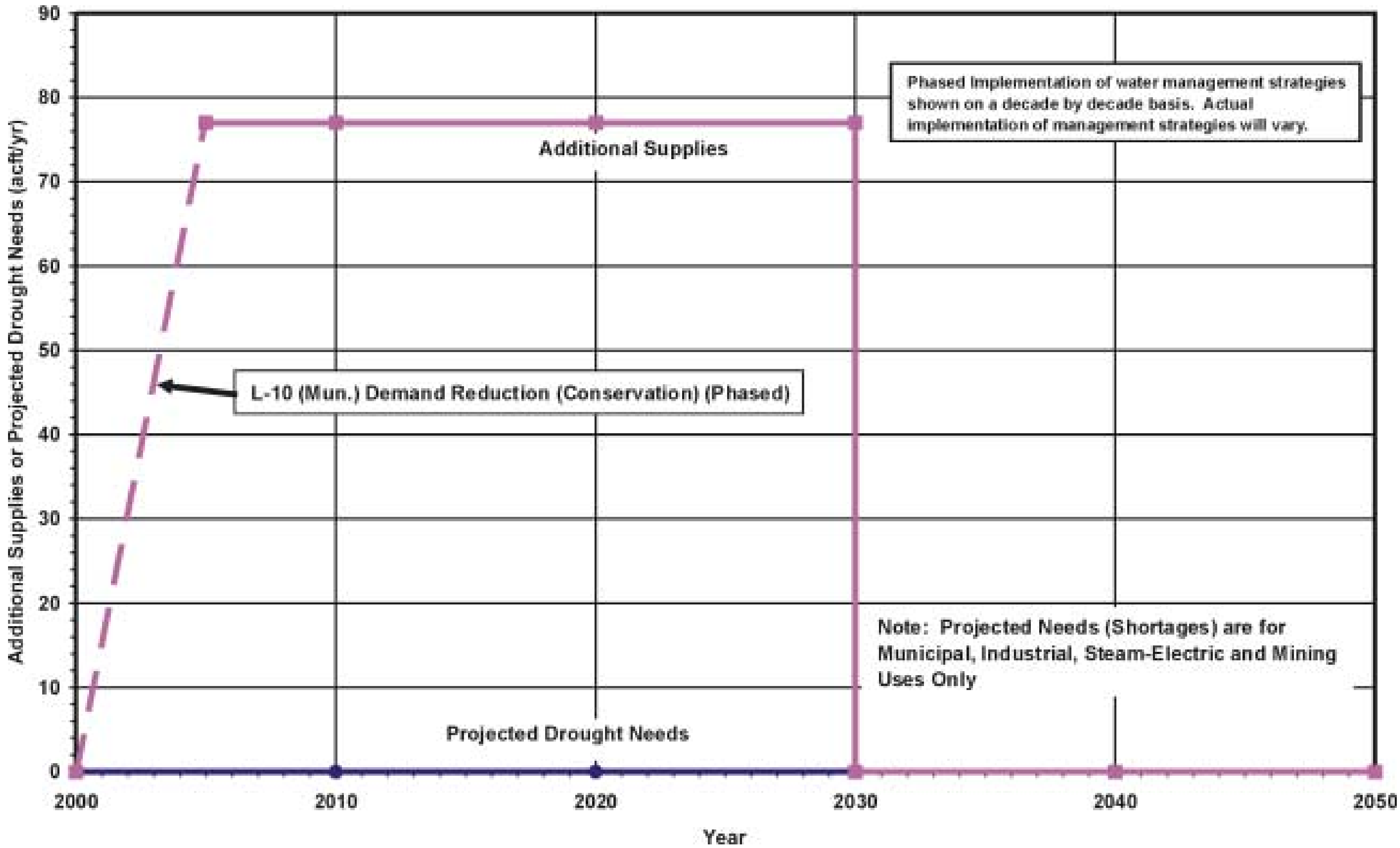


Figure 5.2-17. Regional Water Plan - Karnes County

South Central Texas Region								County = Karnes
County Summary of Projected Water Needs (Shortages) and Water Management Strategies								User Group(s) = all
Projected Water Needs (acft/yr)								
	User Group(s)		**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
	Municipal		0	0	0	0	0	0	
	Industrial		0	0	0	0	0	0	
	Steam-Electric		0	0	0	0	0	0	
	Mining		0	0	0	0	0	0	
	Irrigation		0	0	0	0	0	0	
	Total Needs		**0**	**0**	**0**	**0**	**0**	**0**	
	Mun, Ind, S-E, & Min Needs		**0**	**0**	**0**	**0**	**0**	**0**	
	Irrigation Needs		**0**	**0**	**0**	**0**	**0**	**0**	
Water Management Strategies (acft/yr)		**Candidate**							
ID#	**Description**	**New Supply**	**2000***	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
L-10 (Mun.)	Demand Reduction (Conservation)		77	77	77	0	0	0	1
	Total New Supplies		**77**	**77**	**77**	**0**	**0**	**0**	
	Total System Mgmt. Supply / Deficit		**77**	**77**	**77**	**0**	**0**	**0**	
	Mun, Ind, S-E, & Min System Mgmt. Supply / Deficit		**77**	**77**	**77**	**0**	**0**	**0**	
	Irrigation System Mgmt. Supply / Deficit		**0**	**0**	**0**	**0**	**0**	**0**	

Notes:

* Candidate New Supplies shown for year 2000 are identified for priority implementation, but will not be available immediately.

1 Many Conservation strategies included in projected water demands. Supplies shown reflect implementation of additional conservation measures in the Cities of Karnes City, Kenedy, and Runge.

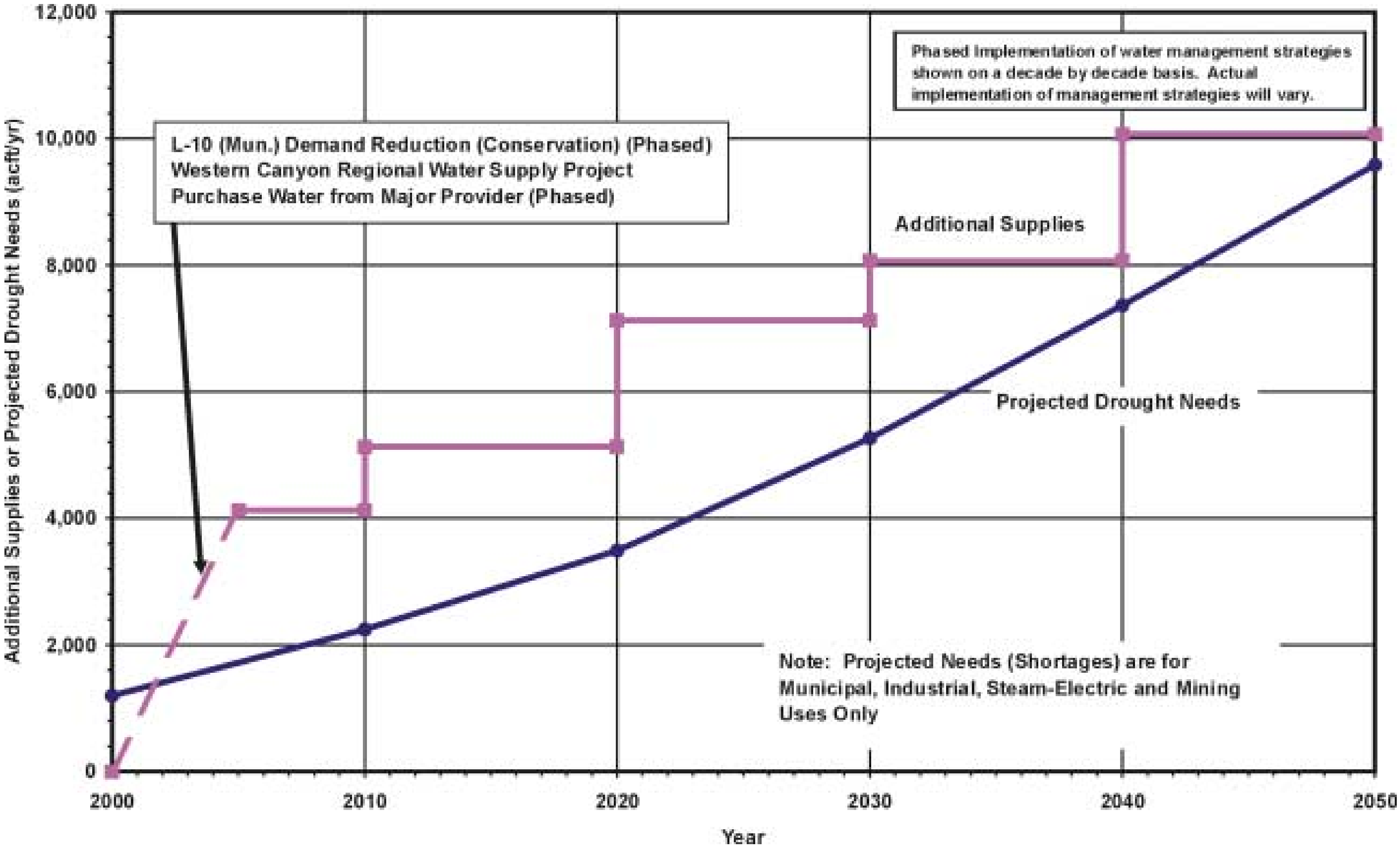


Figure 5.2-18. Regional Water Plan - Kendall County

South Central Texas Region									County = Kendall
County Summary of Projected Water Needs (Shortages) and Water Management Strategies									**User Group(s) = all**
Projected Water Needs (acft/yr)									
	User Group(s)		**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
	Municipal		1,194	2,242	3,485	5,262	7,359	9,575	
	Industrial		2	3	4	4	5	6	
	Steam-Electric		0	0	0	0	0	0	
	Mining		0	0	0	0	0	0	
	Irrigation		0	0	0	0	0	0	
	Total Needs		**1,196**	**2,245**	**3,489**	**5,266**	**7,364**	**9,581**	
	Mun, Ind, S-E, & Min Needs		**1,196**	**2,245**	**3,489**	**5,266**	**7,364**	**9,581**	
	Irrigation Needs		**0**	**0**	**0**	**0**	**0**	**0**	
Water Management Strategies (acft/yr)		**Candidate**							
ID#	**Description**	**New Supply**	**2000***	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
L-10 (Mun.)	Demand Reduction (Conservation)		67	71	71	11	11	11	1
WCRWSP	Western Canyon Regional Water Supply Project	10,527	2,311	2,311	2,311	2,311	2,311	2,311	2
PMP	Purchase Water from Major Provider	8,000	2,000	2,000	3,000	5,000	6,000	8,000	3, 4
	Additional Municipal Reuse Programs								5
SCTN-4	Brush Management								5
SCTN-5	Weather Modification								5
SCTN-9	Rainwater Harvesting								5
	Small Aquifer Recharge Dams								5
	Total New Supplies		**4,378**	**4,382**	**5,382**	**7,322**	**8,322**	**10,322**	
	Total System Mgmt. Supply / Deficit		**3,182**	**2,137**	**1,893**	**2,056**	**958**	**741**	
	Mun, Ind, S-E, & Min System Mgmt. Supply / Deficit		**3,182**	**2,137**	**1,893**	**2,056**	**958**	**741**	
	Irrigation System Mgmt. Supply / Deficit		**0**	**0**	**0**	**0**	**0**	**0**	

Notes:

*	Candidate New Supplies shown for year 2000 are identified for priority implementation, but will not be available immediately.
1	Many Conservation strategies included in projected water demands. Supplies shown reflect implementation of additional conservation measures in the Cities of Boerne, Comfort, and Fair Oaks Ranch.
2	Project in implementation phase. Includes delivery of GBRA Canyon Reservoir water from Lake Dunlap to Boerne and Fair Oaks Ranch. Project is dependent upon amendment of CA# 18-2074 authorizing additional diversions from Canyon Reservoir.
3	Assumed purchase from Regional Water Provider for Bexar County or other major provider. Kendall County water needs are not reflected in Bexar County table.
4	Early implementation of facilities assumed in cost estimation to ensure sufficient supply during drought.
5	Option expected to provide additional water supply in many years, but dependable supply during drought is presently unquantified.

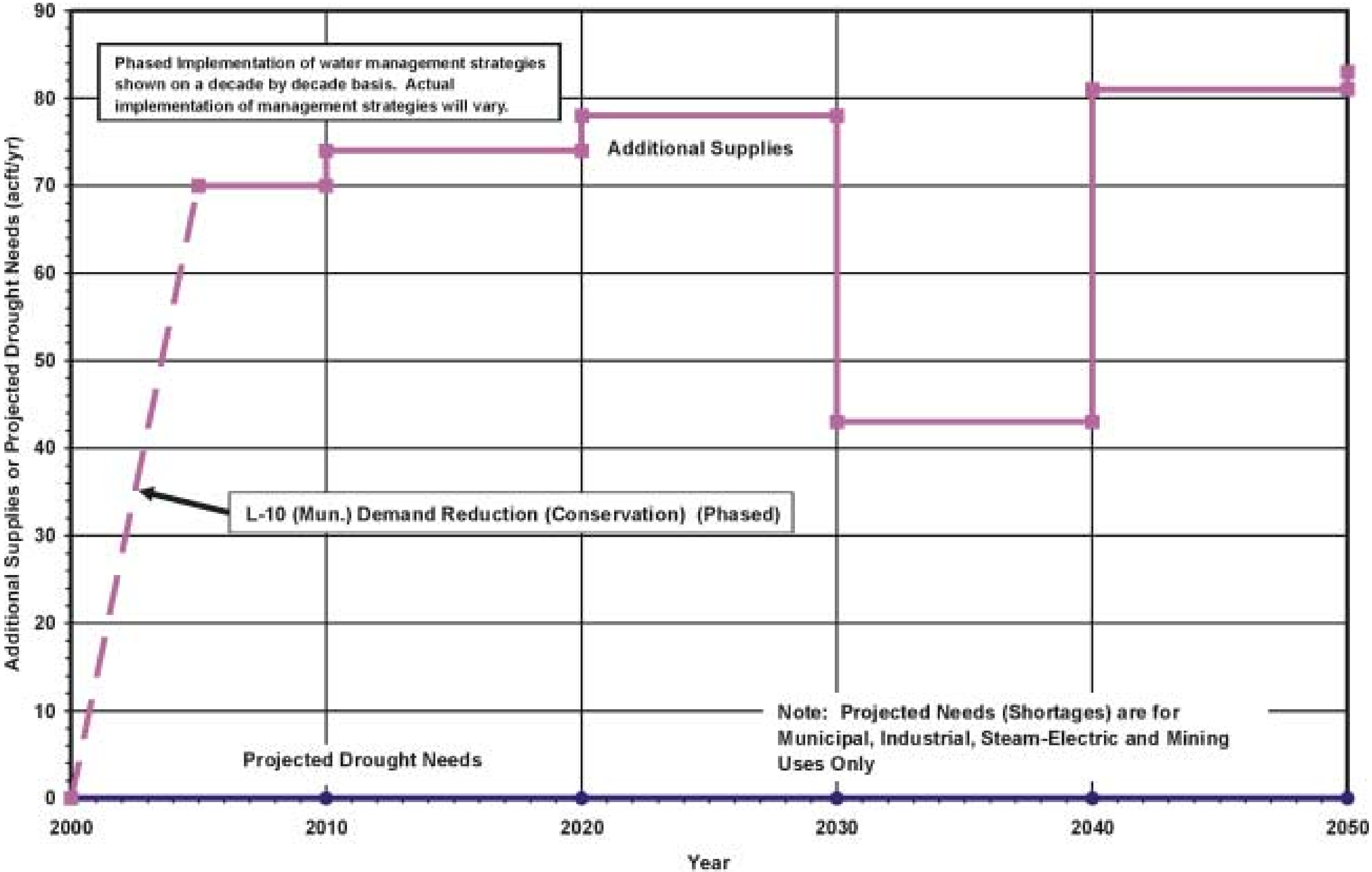


Figure 5.2-19. Regional Water Plan - La Salle County

South Central Texas Region								County = La Salle
County Summary of Projected Water Needs (Shortages) and Water Management Strategies								User Group(s) = all
Projected Water Needs (acft/yr)								
	User Group(s)		**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
	Municipal		0	0	0	0	0	0	
	Industrial		0	0	0	0	0	0	
	Steam-Electric		0	0	0	0	0	0	
	Mining		0	0	0	0	0	0	
	Irrigation		0	0	0	0	0	0	
	Total Needs		**0**	**0**	**0**	**0**	**0**	**0**	
	Mun, Ind, S-E, & Min Needs		**0**	**0**	**0**	**0**	**0**	**0**	
	Irrigation Needs		**0**	**0**	**0**	**0**	**0**	**0**	
Water Management Strategies (acft/yr)		**Candidate**							
ID#	**Description**	**New Supply**	**2000***	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
L-10 (Mun.)	Demand Reduction (Conservation)		76	80	84	43	81	83	1
	Total New Supplies		**76**	**80**	**84**	**43**	**81**	**83**	
	Total System Mgmt. Supply / Deficit		**76**	**80**	**84**	**43**	**81**	**83**	
	Mun, Ind, S-E, & Min System Mgmt. Supply / Deficit		**76**	**80**	**84**	**43**	**81**	**83**	
	Irrigation System Mgmt. Supply / Deficit		**0**	**0**	**0**	**0**	**0**	**0**	
Notes:									
*	Candidate New Supplies shown for year 2000 are identified for priority implementation, but will not be available immediately.								
1	Many Conservation strategies included in projected water demands. Supplies shown reflect implementation of additional conservation measures in the Cities of Cotulla and Encinal.								

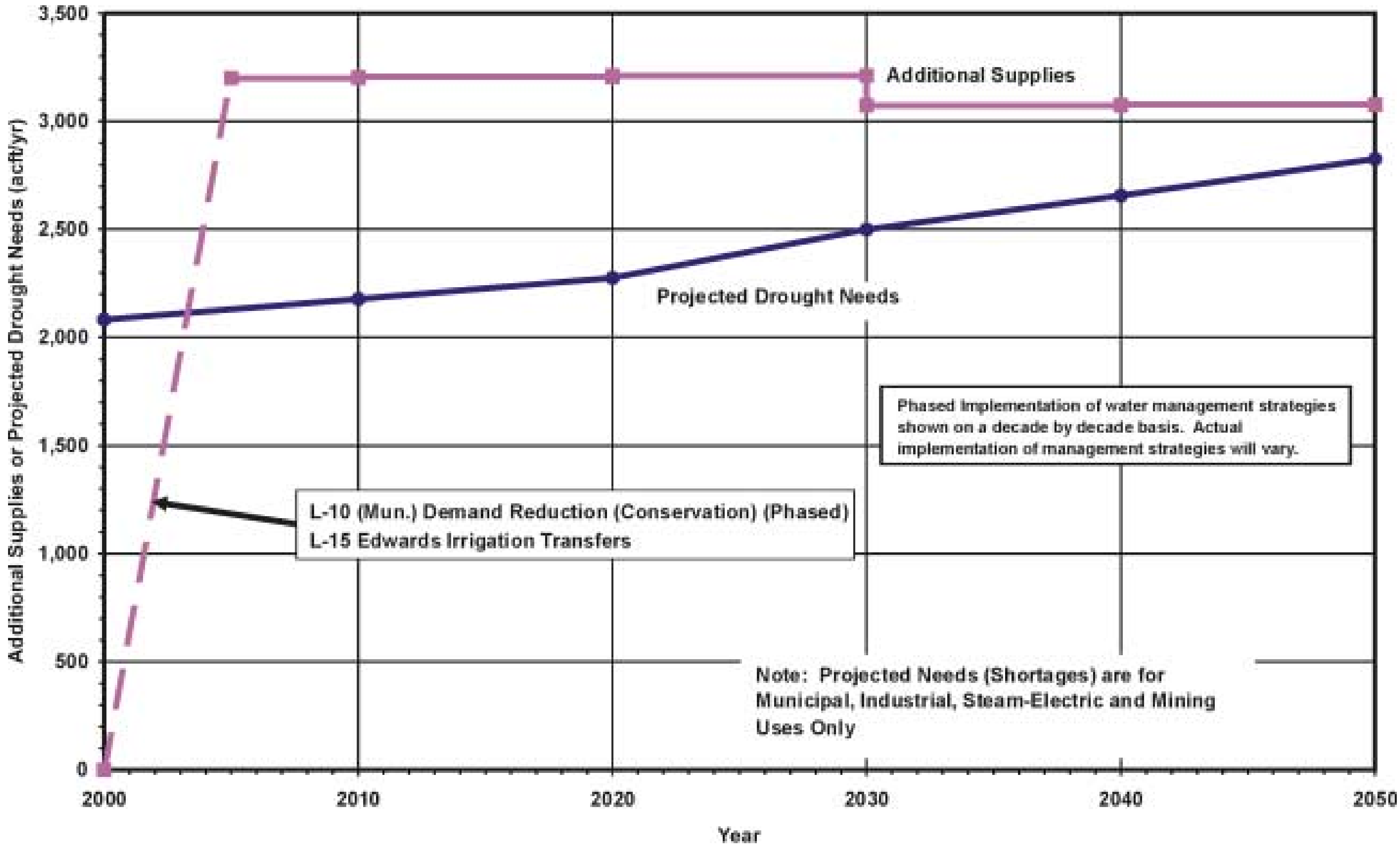


Figure 5.2-20. Regional Water Plan - Medina County

South Central Texas Region

County = Medina

County Summary of Projected Water Needs (Shortages) and Water Management Strategies

User Group(s) = all

Projected Water Needs (acft/yr)

	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		2,015	2,110	2,206	2,427	2,582	2,750	
	Industrial		0	0	0	0	0	0	
	Steam-Electric		0	0	0	0	0	0	
	Mining		68	68	70	72	74	76	
	Irrigation		78,206	72,360	66,580	65,382	60,082	55,006	
	Total Needs		**80,289**	**74,538**	**68,856**	**67,881**	**62,738**	**57,832**	
	Mun, Ind, S-E, & Min Needs		**2,083**	**2,178**	**2,276**	**2,499**	**2,656**	**2,826**	
	Irrigation Needs		**78,206**	**72,360**	**66,580**	**65,382**	**60,082**	**55,006**	

Water Management Strategies (acft/yr)

ID#	Description	Candidate New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)		200	205	211	73	76	78	1
L-15	Edwards Irrigation Transfers	42,686	3,000	3,000	3,000	3,000	3,000	3,000	2, 3
	Additional Municipal Reuse Programs								4
SCTN-4	Brush Management								4
SCTN-5	Weather Modification								4
SCTN-9	Rainwater Harvesting								4
	Small Aquifer Recharge Dams								4
L-10 (Irr.)	Demand Reduction (Conservation)		5,000	5,000	5,000	5,000	5,000	5,000	5
	Total New Supplies		**8,200**	**8,205**	**8,211**	**8,073**	**8,076**	**8,078**	
	Total System Mgmt. Supply / Deficit		**-72,089**	**-66,333**	**-60,645**	**-59,808**	**-54,662**	**-49,754**	
	Mun, Ind, S-E, & Min System Mgmt. Supply / Deficit		**1,117**	**1,027**	**935**	**574**	**420**	**252**	
	Irrigation System Mgmt. Supply / Deficit		**-73,206**	**-67,360**	**-61,580**	**-60,382**	**-55,082**	**-50,006**	

Notes:

*	Candidate New Supplies shown for year 2000 are identified for priority implementation, but will not be available immediately.
1	Many Conservation strategies included in projected water demands. Supplies shown reflect implementation of additional conservation measures in the Cities of Castroville, Devine, Hondo, Lacoste, and Natalia.
2	Candidate New Supply to be shared among Uvalde, Medina, Atascosa, and Bexar Counties.
3	Pursuant to draft EAA Critical Period Management rules, Candidate New Supply represents approximately 85 percent of the estimated annual transfer of 50,219 acft (about 53 percent of a maximum annual transfer of 95,430 acft based on Proposed Permits prorated to 400,000 acft/yr).
4	Option expected to provide additional water supply in many years, but dependable supply during drought is presently unquantified.
5	Estimates based on remaining irrigation water conservation potential through LEPA installation after consideration of Edwards Irrigation Transfers (L-15) and transfer of water conserved through irrigation Demand Reduction (L-10) to Bexar County municipal supply.

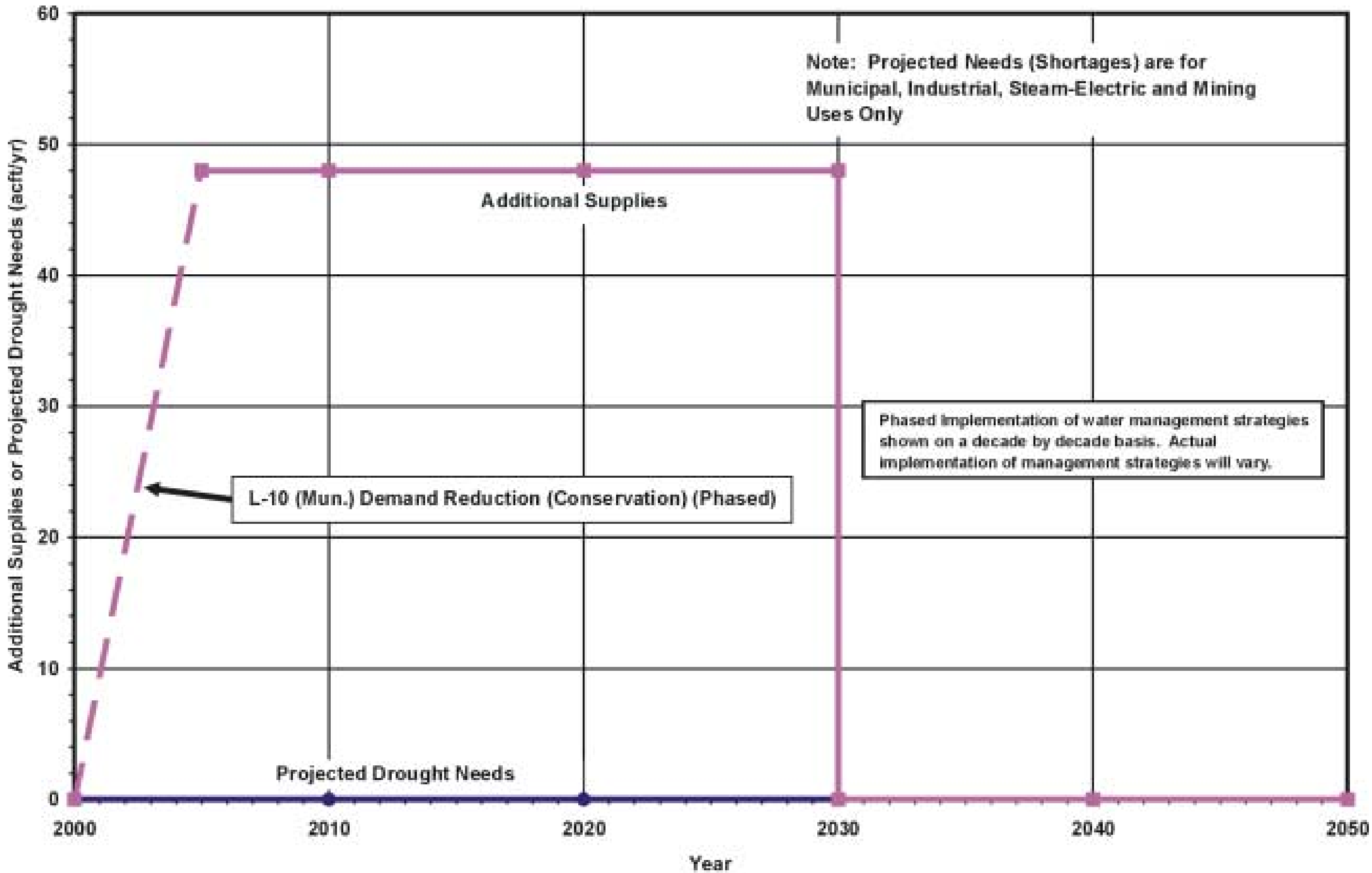


Figure 5.2-21. Regional Water Plan - Refugio County

South Central Texas Region									County = Refugio
County Summary of Projected Water Needs (Shortages) and Water Management Strategies									User Group(s) = all
Projected Water Needs (acft/yr)									
	User Group(s)		**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
	Municipal		0	0	0	0	0	0	
	Industrial		0	0	0	0	0	0	
	Steam-Electric		0	0	0	0	0	0	
	Mining		0	0	0	0	0	0	
	Irrigation		0	0	0	0	0	0	
	Total Needs		**0**	**0**	**0**	**0**	**0**	**0**	
	Mun, Ind, S-E, & Min Needs		**0**	**0**	**0**	**0**	**0**	**0**	
	Irrigation Needs		**0**	**0**	**0**	**0**	**0**	**0**	
Water Management Strategies (acft/yr)		**Candidate**							
ID#	**Description**	**New Supply**	**2000***	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
L-10 (Mun.)	Demand Reduction (Conservation)		48	48	48	0	0	0	1
	Total New Supplies		**48**	**48**	**48**	**0**	**0**	**0**	
	Total System Mgmt. Supply / Deficit		**48**	**48**	**48**	**0**	**0**	**0**	
	Mun, Ind, S-E, & Min System Mgmt. Supply / Deficit		**48**	**48**	**48**	**0**	**0**	**0**	
	Irrigation System Mgmt. Supply / Deficit		**0**	**0**	**0**	**0**	**0**	**0**	
Notes:									
*	Candidate New Supplies shown for year 2000 are identified for priority implementation, but will not be available immediately.								
1	Many Conservation strategies included in projected water demands. Supplies shown reflect implementation of additional conservation measures in the Cities of Refugio and Woodsboro.								

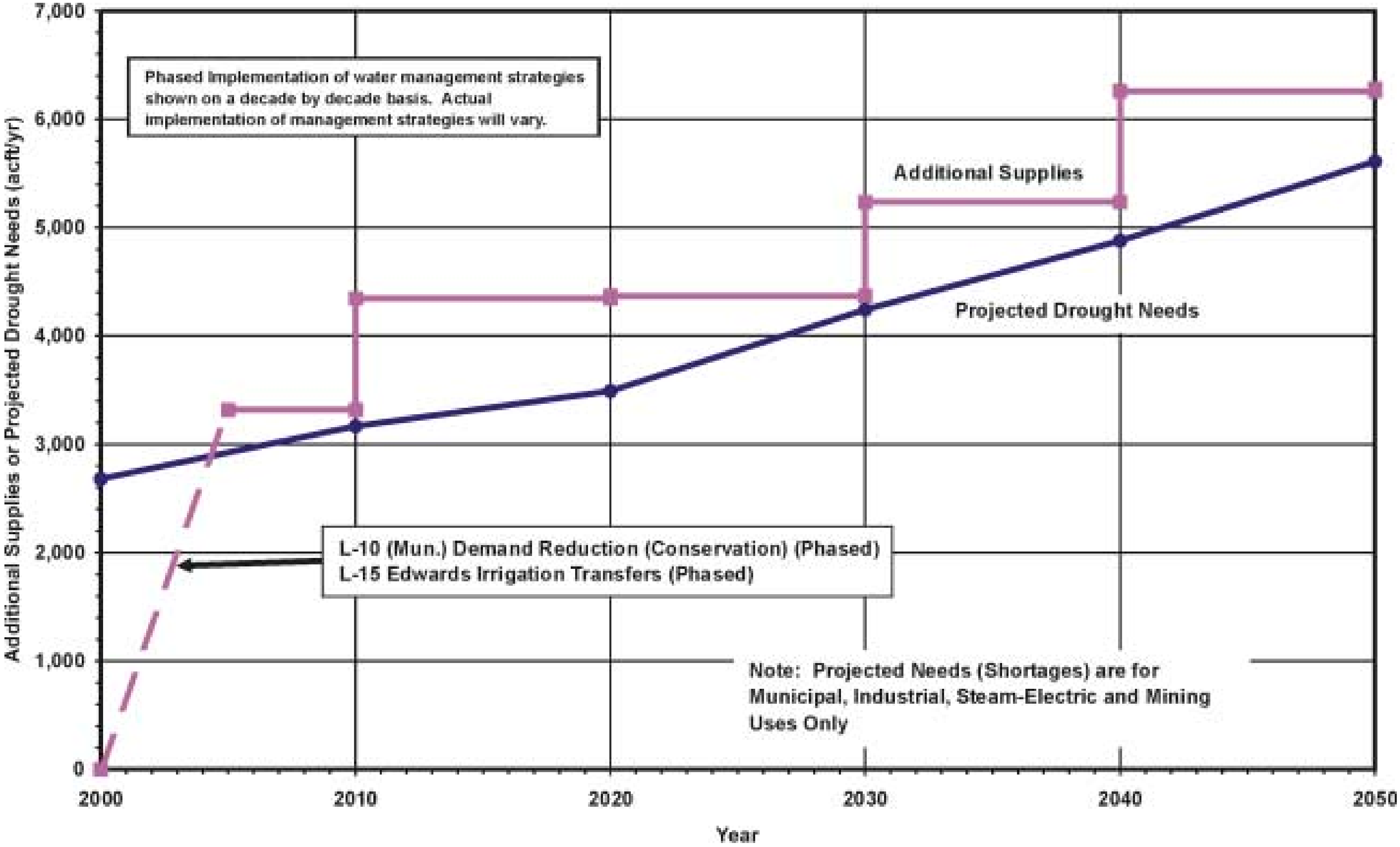


Figure 5.2-22. Regional Water Plan - Uvalde County

South Central Texas Region									County = Uvalde
County Summary of Projected Water Needs (Shortages) and Water Management Strategies									User Group(s) = all
Projected Water Needs (acft/yr)									
	User Group(s)		**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
	Municipal		2,682	3,166	3,493	4,241	4,880	5,609	
	Industrial		0	0	0	0	0	0	
	Steam-Electric		0	0	0	0	0	0	
	Mining		0	0	0	0	0	0	
	Irrigation		48,551	43,250	38,243	36,274	31,674	27,383	
	Total Needs		**51,233**	**46,416**	**41,736**	**40,515**	**36,554**	**32,992**	
	Mun, Ind, S-E, & Min Needs		**2,682**	**3,166**	**3,493**	**4,241**	**4,880**	**5,609**	
	Irrigation Needs		**48,551**	**43,250**	**38,243**	**36,274**	**31,674**	**27,383**	
Water Management Strategies (acft/yr)		**Candidate**							
ID#	**Description**	**New Supply**	**2000***	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
L-10 (Mun.)	Demand Reduction (Conservation)		318	346	371	235	258	283	1
L-15	Edwards Irrigation Transfers	42,686	3,000	4,000	4,000	5,000	5,000	6,000	2, 3, 4
	Additional Municipal Reuse Programs								5
SCTN-4	Brush Management								5
SCTN-5	Weather Modification								5
SCTN-9	Rainwater Harvesting								5
	Small Aquifer Recharge Dams								5
L-10 (Irr.)	Demand Reduction (Conservation)		5,958	5,958	5,958	5,958	5,958	5,958	6
	Total New Supplies		**9,276**	**10,304**	**10,329**	**11,193**	**11,216**	**12,241**	
	Total System Mgmt. Supply / Deficit		**-41,957**	**-36,112**	**-31,407**	**-29,322**	**-25,338**	**-20,751**	
	Mun, Ind, S-E, & Min System Mgmt. Supply / Deficit		**636**	**1,180**	**878**	**994**	**378**	**674**	
	Irrigation System Mgmt. Supply / Deficit		**-42,593**	**-37,292**	**-32,285**	**-30,316**	**-25,716**	**-21,425**	

Notes:

*	Candidate New Supplies shown for year 2000 are identified for priority implementation, but will not be available immediately.
1	Many Conservation strategies included in projected water demands. Supplies shown reflect implementation of additional conservation measures in the Cities of Sabinal and Uvalde.
2	Candidate New Supply to be shared among Uvalde, Medina, Atascosa, and Bexar Counties.
3	Pursuant to draft EAA Critical Period Management rules, Candidate New Supply represents approximately 85 percent of the estimated annual transfer of 50,219 acft (about 53 percent of a maximum annual transfer of 95,430 acft based on Proposed Permits prorated to 400,000 acft/yr).
4	Early implementation of facilities assumed in cost estimation to ensure sufficient supply during drought.
5	Option expected to provide additional water supply in many years, but dependable supply during drought is presently unquantified.
6	Estimates based on remaining irrigation water conservation potential through LEPA installation after consideration of Edwards Irrigation Transfers (L-15) and transfer of water conserved through irrigation Demand Reduction (L-10) to Bexar County municipal supply.

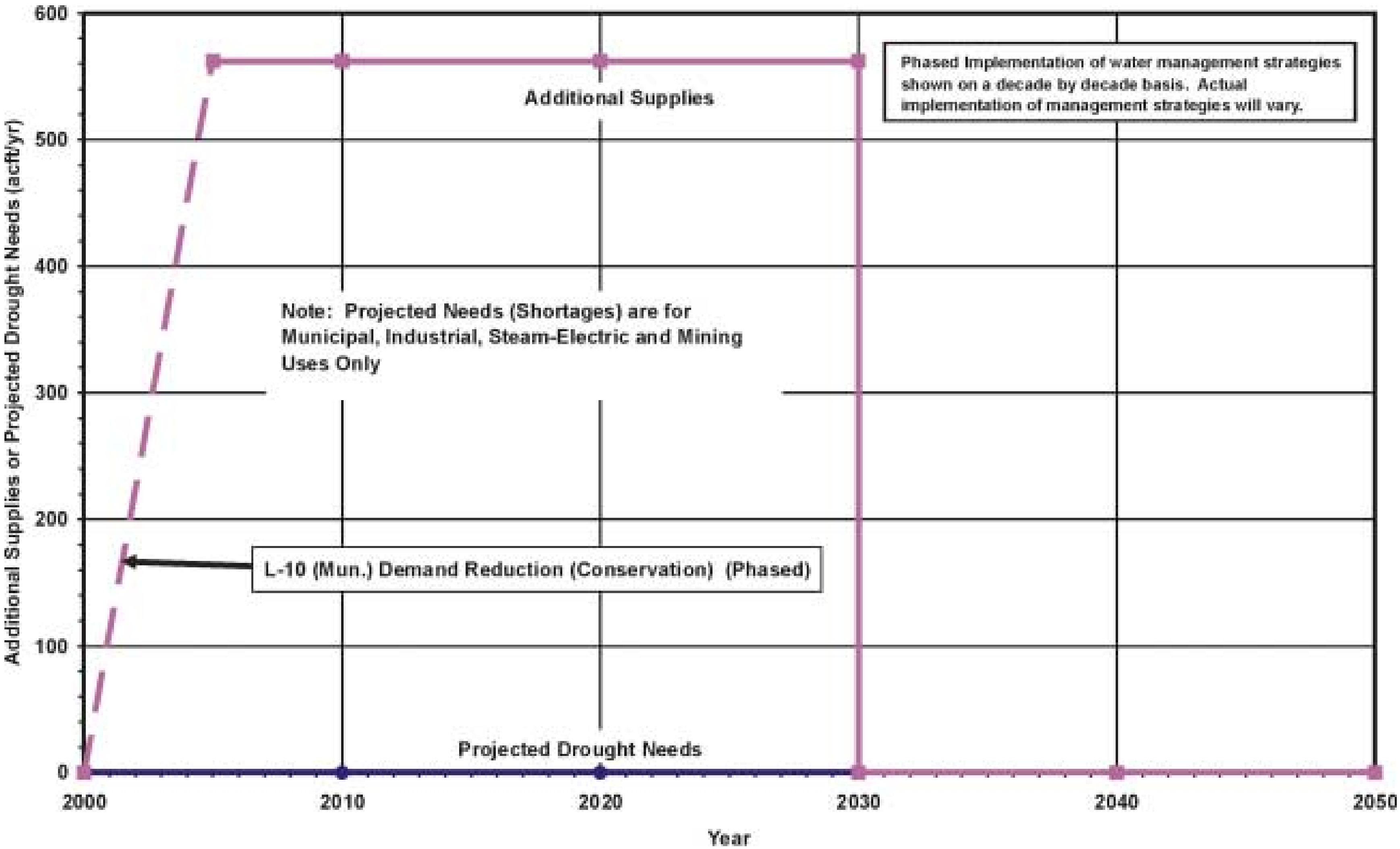


Figure 5.2-23. Regional Water Plan - Victoria County

South Central Texas Region								County = Victoria
County Summary of Projected Water Needs (Shortages) and Water Management Strategies								User Group(s) = all

Projected Water Needs (acft/yr)

	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		0	0	0	0	0	0	
	Industrial		0	0	0	0	0	0	
	Steam-Electric		0	0	0	0	0	0	
	Mining		0	0	0	0	0	0	
	Irrigation		0	0	0	0	0	0	
	Total Needs		**0**	**0**	**0**	**0**	**0**	**0**	
	Mun, Ind, S-E, & Min Needs		**0**	**0**	**0**	**0**	**0**	**0**	
	Irrigation Needs		**0**	**0**	**0**	**0**	**0**	**0**	

Water Management Strategies (acft/yr)

ID#	Description	Candidate New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)		562	562	562	0	0	0	1
PMP	Purchase Water from Major Provider	1,240	1,240	1,240	1,240	1,240	1,240	1,240	2
	Total New Supplies		**1,802**	**1,802**	**1,802**	**1,240**	**1,240**	**1,240**	
	Total System Mgmt. Supply / Deficit		**1,802**	**1,802**	**1,802**	**1,240**	**1,240**	**1,240**	
	Mun, Ind, S-E, & Min System Mgmt. Supply / Deficit		**1,802**	**1,802**	**1,802**	**1,240**	**1,240**	**1,240**	
	Irrigation System Mgmt. Supply / Deficit		**0**	**0**	**0**	**0**	**0**	**0**	

Notes:

*	Candidate New Supplies shown for year 2000 are identified for priority implementation, but will not be available immediately.
1	Many Conservation strategies included in projected water demands. Supplies shown reflect implementation of additional conservation measures in the Cities of Victoria and Bloomington.
2	Contract is dependent upon amendment of CA# 18-2074 authorizing additional diversions from Canyon Reservoir.

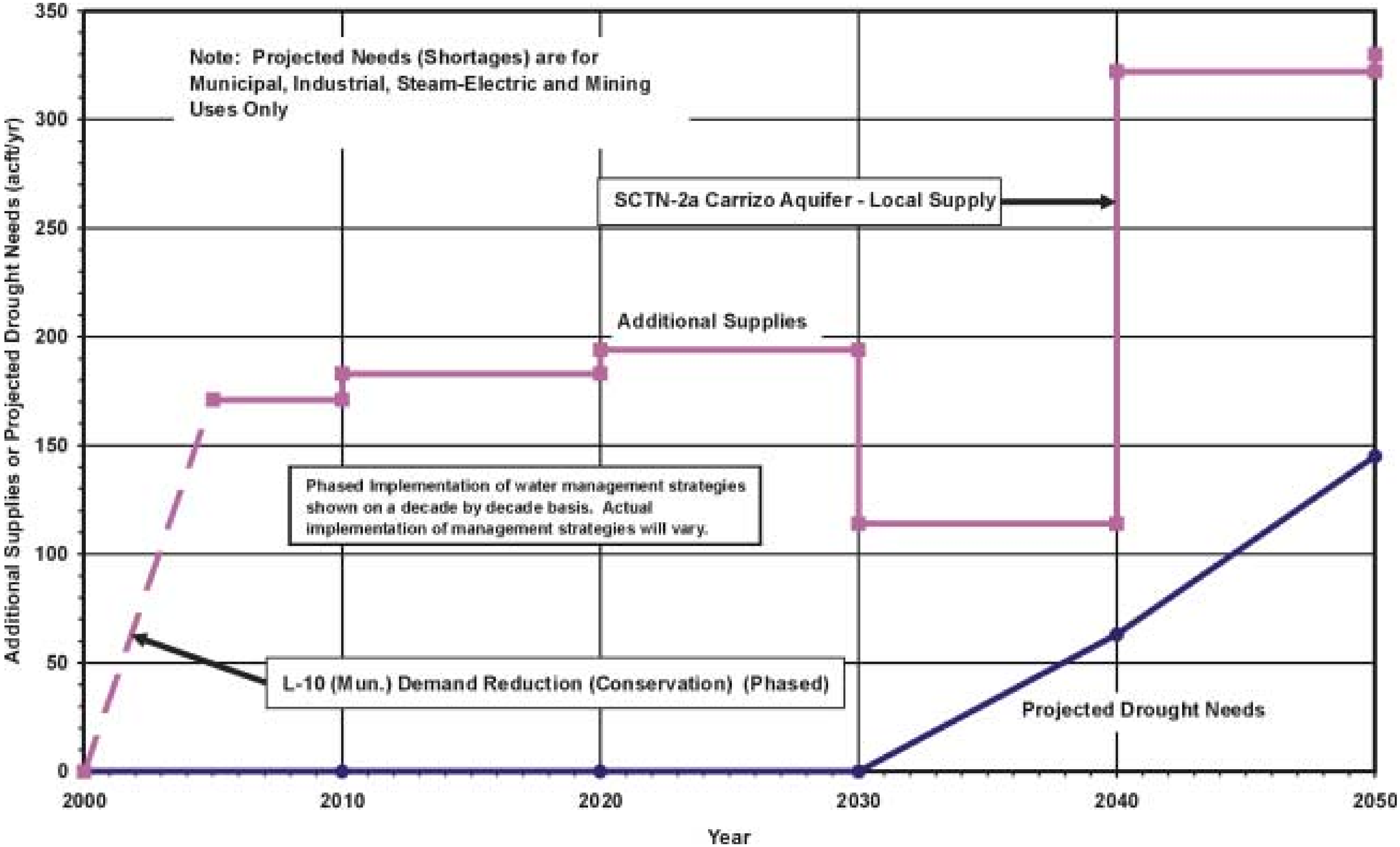


Figure 5.2-24. Regional Water Plan - Wilson County

South Central Texas Region									County = Wilson
County Summary of Projected Water Needs (Shortages) and Water Management Strategies									**User Group(s) = all**

Projected Water Needs (acft/yr)									
	User Group(s)		**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
	Municipal		0	0	0	0	63	145	
	Industrial		0	0	0	0	0	0	
	Steam-Electric		0	0	0	0	0	0	
	Mining		0	0	0	0	0	0	
	Irrigation		0	0	0	0	0	0	
	Total Needs		**0**	**0**	**0**	**0**	**63**	**145**	
	Mun, Ind, S-E, & Min Needs		**0**	**0**	**0**	**0**	**63**	**145**	
	Irrigation Needs		**0**	**0**	**0**	**0**	**0**	**0**	

Water Management Strategies (acft/yr)		**Candidate**							
ID#	**Description**	**New Supply**	**2000***	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
L-10 (Mun.)	Demand Reduction (Conservation)		171	183	194	114	122	130	1
SCTN-2a	Carrizo Aquifer - Local Supply	200					200	200	2
	Small Aquifer Recharge Dams								3
	Total New Supplies		**171**	**183**	**194**	**114**	**322**	**330**	
	Total System Mgmt. Supply / Deficit		**171**	**183**	**194**	**114**	**259**	**185**	
	Mun, Ind, S-E, & Min System Mgmt. Supply / Deficit		**171**	**183**	**194**	**114**	**259**	**185**	
	Irrigation System Mgmt. Supply / Deficit		**0**	**0**	**0**	**0**	**0**	**0**	

Notes:

*	Candidate New Supplies shown for year 2000 are identified for priority implementation, but will not be available immediately.
1	Many Conservation strategies included in projected water demands. Supplies shown reflect implementation of additional conservation measures in the Cities of Floresville, LaVernia, Poth, and Stockdale.
2	Additional well(s) for Floresville.
3	Option expected to provide additional water supply in many years, but dependable supply during drought is presently unquantified.

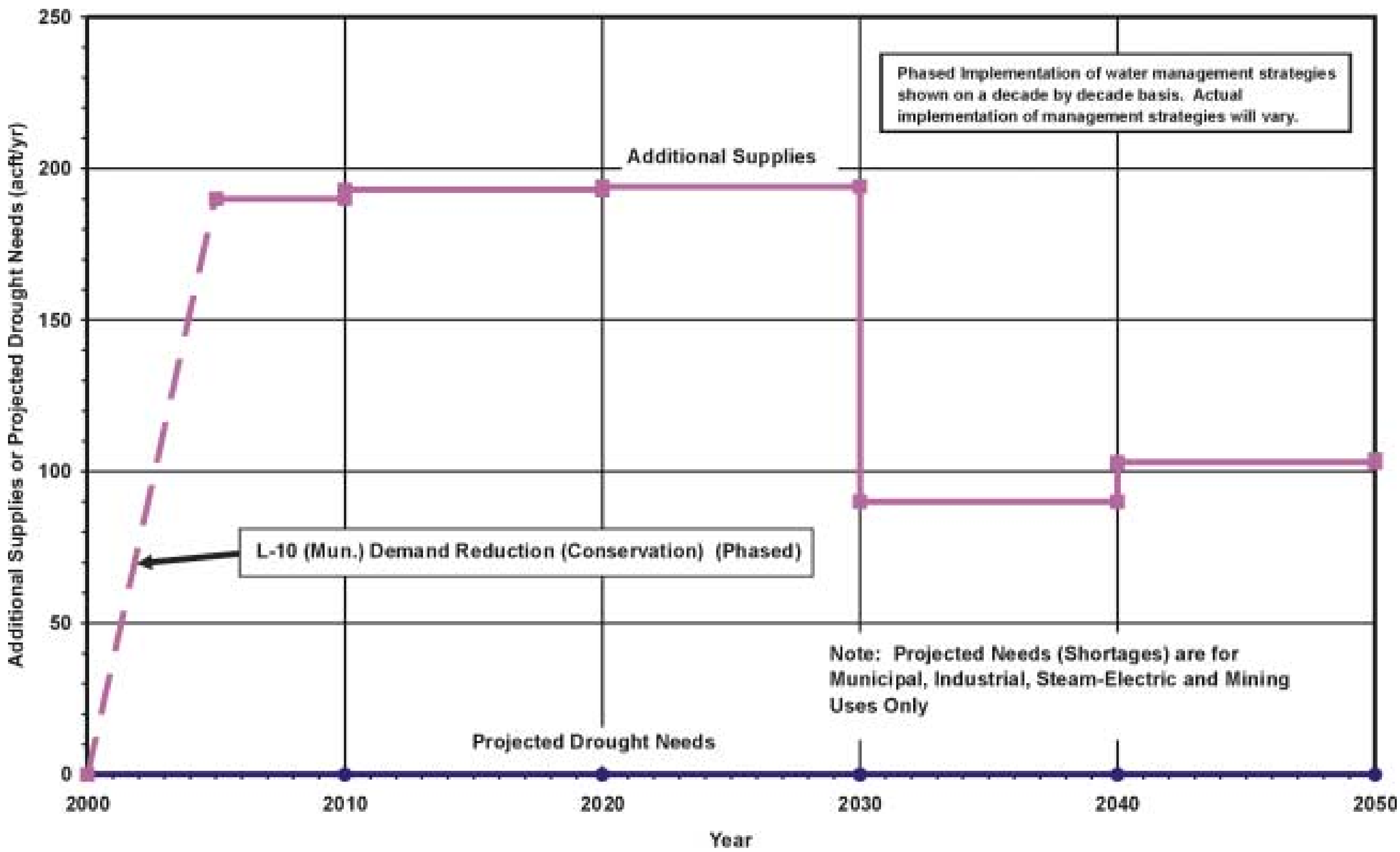


Figure 5.2-25. Regional Water Plan - Zavala County

South Central Texas Region

County = Zavala

County Summary of Projected Water Needs (Shortages) and Water Management Strategies

User Group(s) = all

Projected Water Needs (acft/yr)

	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		0	0	0	0	0	0	
	Industrial		0	0	0	0	0	0	
	Steam-Electric		0	0	0	0	0	0	
	Mining		0	0	0	0	0	0	
	Irrigation		80,722	76,589	72,655	88,293	84,673	81,200	
	Total Needs		**80,722**	**76,589**	**72,655**	**88,293**	**84,673**	**81,200**	
	Mun, Ind, S-E, & Min Needs		**0**	**0**	**0**	**0**	**0**	**0**	
	Irrigation Needs		**80,722**	**76,589**	**72,655**	**88,293**	**84,673**	**81,200**	

Water Management Strategies (acft/yr)

ID#	Description	Candidate New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)		190	193	194	90	103	104	1
SCTN-4	Brush Management								2
SCTN-5	Weather Modification								2
SCTN-9	Rainwater Harvesting								2
	Small Aquifer Recharge Dams								2
L-10 (Irr.)	Demand Reduction (Conservation)		6,401	6,401	6,401	6,401	6,401	6,401	3
	Total New Supplies		**6,591**	**6,594**	**6,595**	**6,491**	**6,504**	**6,505**	
	Total System Mgmt. Supply / Deficit		**-74,131**	**-69,995**	**-66,060**	**-81,802**	**-78,169**	**-74,695**	
	Mun, Ind, S-E, & Min System Mgmt. Supply / Deficit		**190**	**193**	**194**	**90**	**103**	**104**	
	Irrigation System Mgmt. Supply / Deficit		**-74,321**	**-70,188**	**-66,254**	**-81,892**	**-78,272**	**-74,799**	

Notes:

* Candidate New Supplies shown for year 2000 are identified for priority implementation, but will not be available immediately.

1 Many Conservation strategies included in projected water demands. Supplies shown reflect implementation of additional conservation measures in the Cities of Batesville, Crystal City, and LaPryor.

2 Option expected to provide additional water supply in many years, but dependable supply during drought is presently unquantified.

3 Estimates based upon use of LEPA systems on 50 percent of acreage irrigated in 1997, with conservation at 20 percent of irrigation application rate.

5.2.3 Water Management Strategies

Following is a brief description of each of the water management strategies included in the South Central Texas Regional Water Plan along with the associated dependable water supply during drought.

Municipal Demand Reduction (Conservation) (L-10 Mun.)

Management strategy includes municipal water conservation practices and programs to reduce per capita water use in cities by amounts in addition to reductions already incorporated into the TWDB advanced water conservation case water demand projections. Planned additional municipal water conservation focused on public education programs, accelerated retrofit of toilets, and changes in lawn irrigation could effectively increase supply through demand reduction in the South Central Texas Region by about 44,600 acft/yr in the year 2050. Volume III, Section 1.1 includes a detailed discussion of this management strategy.

Irrigation Demand Reduction (Conservation) (L-10 Irr.)

Management strategy achieves water conservation through the installation of Low Energy Precision Application (LEPA) irrigation systems and furrow dikes. Planned implementation of these conservation measures in Bexar, Medina, Uvalde, Atascosa, Frio, and Zavala Counties could effectively increase supply for irrigation through demand reduction by about 28,900 acft/yr after adjustment for planned Edwards Irrigation Transfers (L-15). Volume III, Section 1.1 includes a detailed discussion of this management strategy.

Irrigation Demand Reduction (Conservation) with Transfer (L-10 Irr.)

Management strategy involves voluntary transfer of water conserved through the installation of Low Energy Precision Application (LEPA) irrigation systems and furrow dikes on farms obtaining supplies from the Edwards Aquifer to municipal users. Planned implementation of these conservation measures on about 53 percent of applicable acreage in Bexar, Medina, and Uvalde Counties could effectively increase municipal water supply for Bexar County by about 27,300 acft/yr (85 percent of 32,134 acft/yr), after adjustment for planned Edwards Irrigation Transfers (L-15) and consideration of Critical Period Management reductions during drought.

Edwards Irrigation Transfers (L-15)

Management strategy is based upon the provisions of Senate Bill 1477, as amended, which provides for the creation of the Edwards Aquifer Authority, establishes a withdrawal permit system, and potentially allows a permit holder to sell or lease up to 50 percent of his irrigation rights. Planned voluntary transfers of 50,219 acft/yr (about 53 percent of eligible proposed Edwards irrigation rights in Bexar, Medina, and Uvalde Counties totaling 95,430 acft/yr) could effectively increase municipal water supply by about 42,700 acft/yr (85 percent of 50,219 acft/yr), after consideration of Critical Period Management reductions during drought. Volume III, Section 1.3 includes a detailed discussion of this management strategy.

Edwards Recharge – Type 2 Projects (L-18a)

Management strategy involves the construction of recharge enhancement structures located atop the Edwards Aquifer recharge zone (Type 2 Projects) on streams that are often dry. These structures impound water only for a few days or weeks following storm events and recharge water very quickly to the aquifer, typically draining at a rate of 2 to 3 feet per day. Planned projects include Indian Creek, Lower Frio, Lower Sabinal, Lower Hondo, Lower Verde, San Geronimo, Northern Bexar / Medina County Projects (Limekiln, Culebra, Government Canyon, Deep Creek, Salado Dam No. 3), Salado Creek FRS, Cibolo Dam No. 1, Dry Comal, and Lower Blanco. Consensus Environmental Criteria were applied in the technical evaluations of projects comprising this management strategy located on streams which typically flow. Summaries of applicable instream flow criteria are included in Volume III, Appendix F. Implementation of these projects could enhance spring discharge and increase dependable municipal water supply for Bexar County by about 21,600 acft/yr. It is specifically recognized by the SCTRWPG that alternative projects at these locations that may be larger in size and storage capacity are consistent with the Regional Water Plan. Volume III, Section 2.2 includes a detailed discussion of this management strategy.

Canyon Reservoir – River Diversion (G-15C)

Management strategy involves the purchase of stored water from Canyon Reservoir made available by amendment of Certificate of Adjudication No. 18-2074 to authorize additional diversions. An application for this amendment has been submitted by the Guadalupe-Blanco River Authority (GBRA) and is presently under consideration by the Texas Natural Resource

Conservation Commission (TNRCC). Planned implementation of this strategy could include diversion from Lake Nolte, transmission and treatment facilities, and distribution of an additional dependable supply of about 15,700 acft/yr in Comal County.

Volume III, Section 4.1 includes a detailed discussion of a water supply option identified as Canyon Lake Water Released to Lake Nolte – Treated Water to Distribution System or Recharge Zone. The SCTRWPG has considered the utility of this management strategy as a potential new treated water supply to Comal, Guadalupe, and/or Hays Counties in the context of alternative regional water plans (Volume II) and has recommended its implementation to meet projected needs in Comal County in the Regional Water Plan. Estimates of cost and assessments of environmental issues and cumulative effects of implementation are presented herein.

Canyon Reservoir – Wimberley, Woodcreek, and Blanco (G-24)

Management strategy involves the purchase of stored water from Canyon Reservoir made available by amendment of Certificate of Adjudication No. 18-2074 to authorize additional diversions. An application for this amendment has been submitted by GBRA and is presently under consideration by the TNRCC. Planned implementation of this strategy would include diversion from Canyon Reservoir, transmission and treatment facilities, and distribution of an additional dependable supply of about 1,350 acft/yr to the Cities of Wimberley, Woodcreek, and Blanco in rural Hays and Blanco Counties.

Lower Guadalupe River Diversions (SCTN-16)

Management strategy involves the diversion of water from the San Antonio River above the Guadalupe River Saltwater Barrier to two 25,000 acft off-channel reservoirs, transmission to a regional water treatment facility, and distribution in Bexar County. Sources of water include presently underutilized surface water rights held by GBRA and Union Carbide Corporation (up to about 67,200 acft/yr), unappropriated streamflow, and groundwater from the Gulf Coast Aquifer (up to 20,000 acft/yr). Planned implementation of this strategy will provide a dependable supply of about 94,500 acft/yr beginning in 2010. Based on long-term averages derived from monthly simulations over a 56 year historical period, this dependable supply is comprised of 66,200 acft/yr available under existing water rights, 20,200 acft/yr available as unappropriated streamflow, 11,200 acft/yr available as groundwater from the Gulf Coast Aquifer, and a loss of 3,100 acft/yr to net evaporation from the off-channel reservoirs. The off-channel reservoirs would be located in Refugio, Victoria, or Calhoun Counties proximate to the diversion facilities. Technical evaluations of this management strategy have assumed that this off-channel storage will be in the form of reservoirs created by two “ring-dike” embankments and will have no contributing drainage area. Consensus Environmental Criteria were applied in the technical evaluation of this management strategy. Summaries of applicable instream flow criteria are included in Volume III, Appendix F.

New Colorado River Diversion Option (LCRA)

Management strategy is based on a July 6, 2000 proposal by the Lower Colorado River Authority (LCRA) and involves the diversion of water from the Colorado River near Bastrop and Bay City to off-channel reservoirs, transmission to regional water treatment facilities, and distribution in Hays and Bexar Counties. Sources of water include presently underutilized surface water rights, stored water from the Highland Lakes System, and groundwater from the Gulf Coast Aquifer. Planned implementation of this strategy will provide a dependable supply of about 150,000 acft/yr to the South Central Texas Region in 2050 as well as an additional 180,000 acft/yr to meet irrigation needs in the Lower Colorado Region.

The SCTRWPG has, with certain qualifications, adopted this management strategy and its associated facilities necessary to provide for a new supply of 150,000 acft/yr as proposed by the LCRA and Region K. The recommended management strategy includes approximately 100,000 acft of off-channel storage to be located in Wharton and Matagorda Counties. Estimates of cost have assumed that this off-channel storage will be in the form of reservoirs created by four “ring-dike” embankments and having no contributing drainage area. Potential sharing of costs for such associated facilities is a subject of on-going negotiations. Estimated costs for purchase of water from the LCRA shown in the Regional Water Plan are based on LCRA’s current in-basin rate of $105 acft/yr plus a 25 percent out-of-basin surcharge. Ultimate costs for purchase of water will be a subject of negotiation.

The SCTRWPG has been informed that evaluations of this option have been completed by Region K in accordance with applicable law. The SCTRWPG is also cognizant of various comments and concerns regarding potential effects of this option on instream flows and freshwater inflows to bays and estuaries and has included summary information provided by LCRA regarding potential changes in streamflow in Section 5.2.4. As the quantity of water which may ultimately be made available to Region L by the LCRA and Region K is uncertain at this time, the SCTRWPG has included the originally proposed quantity of 150,000 acft/yr in the Regional Water Plan.[5] More specifically, the Plan includes up to 18,000 acft/yr diverted near Bastrop for delivery to Hays County and up to 132,000 acft/yr diverted near Bay City for delivery to Bexar County.

Carrizo Aquifer – Wilson & Gonzales (CZ-10C)

Management strategy involves the immediate development of well fields in the Carrizo Aquifer in northern Wilson and southern Gonzales Counties, a collection system, transmission to a regional water treatment facility, and distribution in Bexar County. Strategy has been formulated subject to the rules and policies of the Evergreen and Gonzales County Underground Water Conservation Districts. Planned implementation of this strategy includes annual production of approximately 11,000 acft and 5,000 acft from Wilson and Gonzales Counties, respectively, throughout the 50-year planning period.

Volume III, Section 6.1 includes a detailed discussion of water supply options identified as Carrizo-Wilcox Aquifer between San Marcos and Frio Rivers which involve the potential production of either 40,000 acft/yr or 75,000 acft/yr from new well fields in Wilson and Gonzales Counties. Upon consideration of simulated Carrizo Aquifer drawdown associated with these production rates in the context of alternative regional water plans (Volume II), the SCTRWPG has included the production rate of 16,000 acft/yr in the Regional Water Plan. The cumulative effects of implementation and long-term operation of this management strategy, as included in the Regional Water Plan, are summarized in Section 5.2.4.

Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)

Management strategy involves the phased development of well fields in the Carrizo Aquifer in northern Gonzales and southern Bastrop Counties, a collection system, transmission

[5] On December 14, 2000, late in the planning cycle, additional analysis by Region K of the Colorado River Diversion option with the full application of consensus environmental flow criteria indicated the yield of the project could be reduced by 19,000 acft/yr, resulting in an estimated 131,000 acft/yr of water available for transfer to Region L (Bexar and Hays Counties). The SCTRWPG acknowledges the different yield amounts for this project contained in the Regional Water Plans for Region L and Region K, and acknowledges that the yield of this project may be reduced to 131,000 acft/yr, and that the unit cost could be increased somewhat. This change could affect supplies to Hays County and Bexar County and may necessitate supplying Hays County needs from other sources. However, due to this information being discovered late in the planning cycle, the SCTRWPG decided to retain the project in the Region L Plan with a yield of 150,000 acft/yr, however, this discrepancy between the two regional plans will be addressed early in the next planning cycle. There are adequate “contingency” supplies available wtihin the Region L plan to compensate for the proposed reduction in yield of the project.

to a regional water treatment facility, and distribution in Comal and Guadalupe Counties. Strategy has been formulated subject to the rules and policies of the Gonzales County Underground Water Conservation District and consideration of the draft rules of the Lost Pines Groundwater Conservation District. Well field development in southern Bastrop County is not expected to occur prior to the year 2040. Planned implementation of this strategy includes maximum annual production of approximately 15,000 acft and 12,500 acft from Gonzales and Bastrop Counties, respectively, in 2050.

Volume III, Section 6.2 includes a detailed discussion of a water supply option identified as Carrizo-Wilcox Aquifer between Colorado and Frio Rivers which involves the potential production of 220,000 acft/yr from new well fields in Atascosa, Wilson, Gonzales, and Bastrop Counties. Upon consideration of simulated Carrizo Aquifer drawdown associated with production rates of 58,500 acft/yr and 90,000 acft/yr from Gonzales and Bastrop Counties in the context of alternative regional water plans (Volume II), the SCTRWPG has included a maximum production rate of 27,500 acft/yr in the Regional Water Plan at year 2050. The cumulative effects of implementation and long-term operation of this management strategy, as included in the Regional Water Plan, are summarized in Section 5.2.4. It is noted that the Region L estimates of groundwater production in Bastrop County exceed Region K estimates of availability in and beyond year 2030. The two Regional Water Planning Groups have agreed that discussion of differences will be more productive upon completion of the new Groundwater Water Availability Models presently under development by the TWDB.

Carrizo Aquifer – Local Supply (SCTN-2a)

Management strategy involves the phased development or expansion of well fields in the Carrizo Aquifer for the purpose of meeting local municipal, industrial, steam-electric, or mining needs in Atascosa, Caldwell, Dimmit, and Wilson Counties. Planned implementation of this strategy provides new dependable supplies totaling about 14,700 acft/yr for the South Central Texas Region in 2050.

Simsboro Aquifer (SCTN-3c)

Management strategy involves the phased development and expansion of well fields in the Simsboro Aquifer in Milam, Lee, and Bastrop Counties for the purposes of facilitating on-going mining operations and production of municipal and industrial water supply.

Implementation of this management strategy maximizes the beneficial use of water that is pumped to depressurize the mines by developing collection, transmission, treatment, and distribution facilities for use in Bexar County as opposed to being discharged into local streams for disposal. Planned implementation of this strategy will provide a dependable annual supply of approximately 55,000 acft throughout the 50-year planning period.

Projected pumpage associated with this management strategy is consistent with the Brazos G Initially Prepared Regional Water Plan (Milam and Lee Counties) for the entire 50-year planning period. Projected pumpage in Bastrop County after 2020, however, exceeds the current estimate of available supply adopted by the Lower Colorado Regional Water Planning Group (Region K). Periodic discussions between representatives of the South Central Texas and Lower Colorado Regions have focused on concerns regarding potential water level declines in the outcrop of the Simsboro Aquifer, three different groundwater models of the area, mitigation of impacts to affected wells, and equitable treatment of property owners within a groundwater district. Differences between Region L's projected pumpage and Region K's estimate of available supply are more than 20 years from the present while development of new Carrizo (Simsboro) Aquifer Groundwater Availability Models (GAMs) under Texas Water Development Board direction is to be completed by about 2002. Hence, it has been agreed that discussions will be more productive upon completion of the GAMs at which time additional scientific information will be available to both regions.

Volume III, Section 6.3 includes a detailed discussion of a water supply option identified as Simsboro Aquifer – Bastrop, Lee, and Milam Counties with Delivery to a Major Municipal Demand Center which involves the potential production of 75,000 acft/yr from new and existing well fields. Subsequent to the completion this analysis in late 1999, the San Antonio Water System completed a study of its own[6] and recommended that a production rate of 55,000 acft/yr be considered in the technical evaluation of alternative regional water plans in which this management strategy would be included. The cumulative effects of implementation and long-term operation of this management strategy, as included in the Regional Water Plan, are summarized in Section 5.2.4.

[6] HDR Engineering, Inc. and Paul Price Associates, Inc., "Preliminary Feasibility of Options to Deliver Alcoa/CPS Groundwater to Bexar County," San Antonio Water System, January 2000.

SAWS Recycled Water Program (SAWS)

Management strategy involves the phased expansion of SAWS Recycled Water Program to provide dependable water supplies for non-potable uses and meet 20 percent of SAWS projected water demand. Current SAWS Recycled Water Program is capable of delivering about 35,000 acft/yr and consumptive reuse of about 25,000 acft/yr is included as current supply. Planned phased implementation of this management strategy will provide an additional dependable annual supply of about 19,800 acft in 2010 and about 52,200 acft in 2050.

This management strategy involves the continued implementation and expected future expansion of the SAWS Recycled Water Program. Facilities for future expansion are expected to include Southern Interconnections between the Leon Creek, Dos Rios, and Salado Creek wastewater treatment facilities as well as a Northern Interconnection linking the Leon Creek and Salado Creek transmission lines. Costs for expected future expansion are based on actual costs for implementation to-date and are included in the Regional Water Plan.

The SCTRWPG recognizes that SAWS and other water suppliers throughout the region may choose to reuse or reclaim the increased treated wastewater volumes associated with increased municipal water use, especially such wastewater volumes derived from privately owned groundwater and interbasin transfer of surface water. The SCTRWPG further recognizes that this reuse may be accomplished directly (“flange-to-flange”) or indirectly through bed and banks delivery to downstream diversion and/or storage sites subject to applicable low. Such lawful reuse of treated wastewater is consistent with the South Central Texas Regional Water Plan.

Purchase Water from Major Provider (PMP)

Management strategy involves the purchase of water supplies from, or participation in the development of new water supplies with, an identified Major Water Provider. Major water providers include the San Antonio Water System (SAWS), Bexar Metropolitan Water District (BMWD), Guadalupe-Blanco River Authority (GBRA), City of New Braunfels, City of San Marcos, and Canyon Regional Water Authority (CRWA). This strategy may also involve the purchase of water supplies from, or participation in the development of new water supplies with, the Regional Water Provider(s) for Bexar County.

Three purchases of water from major providers have been specifically identified in the Regional Water Plan and total 14,240 acft/yr. The largest of these involves the phased purchase of up to 8,000 acft/yr by Kendall County water user groups from the Regional Water Provider for Bexar County or another major provider. Costs for this management strategy include those for purchase, treatment, transmission, and distribution of water and are based on detailed feasibility studies for the Western Canyon Regional Water Supply Project. The Plan includes a purchase of 5,000 acft/yr by the City of San Marcos from the Guadalupe-Blanco River Authority (GBRA) for diversion at Lake Dunlap and transmission in an existing pipeline to a regional treatment facility at San Marcos. Costs include those for water purchase, expansion of the treatment facility, and distribution. The Plan also includes the purchase of 1,240 acft/yr by the City of Victoria from GBRA. This additional water supply would be delivered from Canyon Reservoir via the Guadalupe River and diverted, treated, and distributed using primarily existing facilities.

Desalination of Seawater (SCTN-17)

Management strategy involves the long-term development of intake and treatment facilities on the north shore of San Antonio Bay near Seadrift and transmission of treated water for distribution in Bexar County. This management strategy utilizes a source of water that is essentially unlimited; however, costs of treatment and location for brine discharge (as may affect marine habitat and species) remain concerns. Planned implementation of this strategy will provide a dependable annual supply of approximately 56,000 acft beginning in 2040 and increasing to about 84,000 acft by 2050. Volume III, Section 1.10 includes a detailed discussion of this management strategy.

The SCTRWPG also considered an alternative water supply option involving desalination of seawater[7] sponsored by the TWDB and the Lavaca Regional Water Planning Group (Region P). This option would include intake and treatment facilities at the Joslin Steam-Electric Station near Point Comfort with additional facilities for transmission to and distribution within Bexar County. The option has not been included in the Regional Water Plan because the intake is located in an estuary reportedly having sediments contaminated with mercury and Polycyclic

[7] Turner, Collie & Braden, Inc., "Investigation of Joslin Steam Electric Station for Co-Location of a Desalination Facility," Lavaca Regional Water Planning Group in Conjunction with Region L and N Planning Groups, June 2000.

Aromatic Hydrocarbons[8]. In addition, the Calhoun County Navigation District has communicated to members of the SCTRWPG that the location of such a facility is unacceptable because of potential liability to the District. Should these matters be favorably resolved, the SCTRWPG may consider amendment of the Regional Water Plan at some time in the future.

Aquifer Storage & Recovery (ASR) (SCTN-1a)

Management strategy involves the immediate development of SAWS planned 60 mgd aquifer storage and recovery (ASR) system in southern Bexar County so that supplies available from the Edwards Aquifer in winter months may be stored in the Carrizo Aquifer for subsequent recovery in the summer months, thereby substantially reducing peak municipal demands on the Edwards Aquifer during the summer. Planned implementation of this strategy does not increase overall water supply on an annual basis, but does increase the reliability of current supplies for all municipal water user groups dependent upon the Edwards Aquifer. While Volume III, Section 6.8 includes detailed discussions of similar management strategies, the specific strategy included in the Regional Water Plan is best described in a report prepared for SAWS.[9]

Schertz-Seguin Water Supply Project (SSWSP)

Management strategy involves the development of a well field located primarily in southern Gonzales County by the Schertz-Seguin Local Government Corporation and is currently in the implementation phase. This Corporation will be responsible for creating and operating a wholesale water supply system to serve the long-term needs of these two communities located in Guadalupe and Bexar Counties. Planned implementation of this strategy will provide a dependable annual supply of approximately 20,000 acft.

Western Canyon Regional Water Supply Project (WCRWSP)

Management strategy is currently in the implementation phase and involves the development of a water treatment plant west of Canyon Reservoir and a water transmission system to deliver treated water to project participants. This strategy is dependent upon the amendment of Certificate of Adjudication No. 18-2074 authorizing additional diversions from

[8] U.S. Environmental Protection Agency, "Alcoa/Lavaca Bay, Texas," EPA ID# TXD008123168, EPA Region 6, February 2, 2000.
[9] CH2M Hill, "Aquifer Storage Recovery Project, Preliminary Investigation and Feasibility Analysis Step 2 Report," San Antonio Water System, February 2000.

Canyon Reservoir which is currently pending before the Texas Natural Resource Conservation Commission. Planned implementation of this strategy by the Guadalupe-Blanco River Authority will provide a dependable annual supply of approximately 10,500 acft to participants including the Bulverde Utility Company, Apex Water Services, Comal Independent School District, City of Boerne, City of Fair Oaks Ranch, San Antonio Water System, Bexar Metropolitan Water District, and San Antonio River Authority.

Hays/IH35 Water Supply Project

Management strategy is currently in the implementation phase and involves the delivery of stored water from Canyon Reservoir via a diversion facility at Lake Dunlap and transmission pipeline paralleling IH 35 to supply water user groups in Hays County. A regional water treatment plant near San Marcos and a raw water pipeline connecting the plant to Lake Dunlap have been completed to-date. Planned facilities include a potable water pipeline from the San Marcos Water Treatment Plant to the City of Kyle, Creedmoor-Maha, City of Buda, and other county entities.

Lake Dunlap WTP Expansion and Mid-Cities Water Transmission System (CRWA)

Management strategy is a part of the Canyon Regional Water Authority plan, and is currently in the design and construction phase. The Lake Dunlap WTP Expansion and Mid-Cities Water Transmission System will supply approximately 5,200 acft/yr of additional supply to Canyon Regional Water Authority's member entities which include Crystal Clear WSC, Springs Hill WSC, Green Valley SUD, East Central WSC, City of Marion, City of Cibolo, and BMWD (NE Service Area). The water will be diverted from Lake Dunlap north of the City of Seguin and delivered via a new pipeline network to those participating entities.

Carrizo Aquifer – Bexar & Guadalupe (BMWD)

Management strategy is a part of Bexar Metropolitan Municipal Water District (BMWD) plan. The strategy is being implemented and will supply about 4,000 acft/yr to BMWD to supply to its customers in southern and northeastern Bexar County.

Trinity Aquifer – Bexar (BMWD)

Management strategy is a part of Bexar Metropolitan Municipal Water District (BMWD) plan. The strategy is in the process of being implemented and is estimated to supply about 1,000 acft/yr to BMWD to supply to its customers in Northern Bexar County.

Canyon Reservoir Contract Renewal (GBRA)

Management strategy is renewal of existing contracts with New Braunfels (December 5, 2001 expiration) for 6,700 acft/yr, with San Marcos (July 7, 2047 expiration) for 5,000 acft/yr, with Kyle (December 31, 2038 expiration) for 589 acft/yr, and with Port Lavaca (February 20, 2008 expiration) for 1,500 acft/yr. Other existing Canyon Reservoir contracts remain in force throughout the planning period or are assumed to be renewed upon expiration.

Brush Management (SCTN-4)

Management strategy involves the selective removal of brush from rangeland watersheds in counties of the South Central Texas Region located in the Edwards Plateau Vegetational Area or having significant projected shortages. In other counties, it is assumed that the quantities of brush are not large enough to produce water supply benefits. There are 1.1 million acres of brush infested land in the 12.8 million acre planning region. The practice has been studied, some watersheds have been treated and others are presently being selectively cleared. The Texas State Soil and Water Conservation Board, and agencies of the U.S. Department of Agriculture have landowner cost sharing and technical assistance programs for well-planned wildlife habitat compatible brush management/clearing programs. Although it is not possible to estimate the quantities of water that this strategy would contribute during drought, the strategy could contribute to increased streamflows and increased aquifer recharge during non-drought periods. To the extent that such additions to these water resources are stored for use later, the strategy could contribute to supplies available during drought. The water from this strategy would be available for development or recovery by individual water user groups and by water suppliers that serve several different water user groups.

Weather Modification (SCTN-5)

Management strategy involves the seeding of clouds with silver iodide by licensed professionals to increase precipitation within the planning region. This management strategy has been studied and is being practiced in 15 counties of the region's 21 county area at the present time. Although it is not possible to estimate the quantities of water that this strategy would contribute during drought, the strategy could contribute to increased precipitation on rangeland and cropland, as well as increasing stream flows and aquifer recharge during non-drought periods. Increased precipitation on range and cropland would contribute directly to crop, livestock, and wildlife production, and in the case of irrigated crop production would reduce the need to apply irrigation water. To the extent that such additions to these water resources are stored for use later, the strategy could contribute to supplies available during drought. The water from this strategy would be available for development or recovery by individual water user groups and by water suppliers that serve several different water user groups.

Rainwater Harvesting (SCTN-9)

Management strategy is the catching and storing of rainwater from roofs of homes and other buildings largely for use at or very near the sites from which the water is caught. The strategy is being used in parts of the South Central Texas Planning Region for household water supplies for both potable and non-potable uses. Although this strategy is limited due to rainfall levels, time of rainfall events, and capacities of storage facilities, the strategy can supply a part, or in some cases all, of the water needed by individual households and business establishments in areas that are too distant or too sparsely settled to be served efficiently by public systems. Rainwater harvesting in the Trinity Aquifer area of the region (Northern Bexar, Comal, Hays, Medina, and Uvalde Counties) can supplement supplies from wells completed in this aquifer, and thereby extend the capabilities of this aquifer to support the demands that are projected to be placed upon it.

Additional Municipal Recycling (Reuse) Programs

Management strategy involves expansion of programs that reclaim municipal wastewater for non-potable uses such as irrigation of golf courses, parks, and open spaces of cities, landscape watering of large office and business complexes, cooling of large office and business complexes, steam-electric power plant cooling, irrigation of farms that produce livestock feed and forage, irrigation of farms that produce sod, ornamentals, and landscape plants, and for instream uses such as river walks and waterways. This strategy is being used within the region by entities including SAWS, SARA, and CCMA and can be expanded as the quantities of municipal wastewater increase with population growth. An advantage of this strategy is that the water has already been developed and brought to the locations of many of the uses listed above.

With additional treatment, this water can be reclaimed for further use, as opposed to being discharged for disposal, at a cost to the municipalities that have used it once.

The SCTRWPG recognizes that SAWS, SARA, CCMA, and other water suppliers throughout the region may choose to reuse or reclaim the increased treated wastewater volumes associated with increased municipal water use, especially such wastewater volumes derived from privately owned groundwater and interbasin transfer of surface water. The SCTRWPG further recognizes that this reuse may be accomplished directly ("flange-to-flange") or indirectly through bed and banks delivery to downstream diversion and/or storage sites subject to applicable law. Such lawful reuse of treated wastewater is consistent with the South Central Texas Regional Water Plan.

Small Aquifer Recharge Dams

Management strategy is the construction of small dams on ephemeral waterways to capture runoff and hold it for seepage into aquifers of the planning region. The strategy is needed and appears to be applicable in the northern parts of the northern counties of the South Central Texas Water Planning Region overlying the Trinity Group of Aquifers that are being heavily stressed by a rapidly growing population. This strategy can be implemented by individual landowners of the area, but would probably need cost sharing by organized groups who obtain and depend upon the aquifers to be recharged, and to the extent that such structures reduce soil erosion, may qualify for technical and financial assistance from state and federal agencies.

Edwards Aquifer Recharge & Recirculation Systems

Management strategy involves artificial recharge of the Edwards Aquifer, capture of the resulting increased springflows, and returning these quantities of water to further recharge the aquifer. Artificial recharge could be done using runoff from the Edwards Plateau, water imported from other watersheds, the subsequent increment of springflow resulting from artificial recharge, and/or a combination of these sources. The purpose of this strategy is to maintain springflows at satisfactory levels to protect the habitats of endangered species that exist in the springs and specified reaches of spring fed streams, while at the same time increasing the quantity of water that can be withdrawn from the aquifer to meet the needs of water user groups. The quantities of water that could be withdrawn from the aquifer depend upon the quantities of recharge, the location(s) at which the recharge is made to the aquifer, levels of the aquifer at the time of recharge, residence time of recharged water in the aquifer, and perhaps other factors that are not known or well understood. The major reason for the Recharge and Recirculation strategy is to use the aquifer to store and distribute water to water user groups that have already established themselves in proximity to the aquifer.

Cooperation with Corpus Christi for New Water Sources

Management strategy involves cooperation and partnership with Corpus Christi of the Coastal Bend Water Planning Region (Region N) in the development of additional or "New Water Sources." The potentials include desalination, surface water from the Lower Colorado River that might be conveyed via Corpus Christi's Mary Rhodes Pipeline from Lake Texana to the City of Corpus Christi in exchange for water to recharge the Edwards Aquifer that is now included in Corpus Christi's permit for Choke Canyon Reservoir, groundwater along and near the Mary Rhodes Pipeline, surface water from the Brazos River Basin via the Mary Rhodes Pipeline, and perhaps other sources in or adjacent to the coastal areas of Regions L and N. In any case, the objective of this option is benefit both regions by improving efficiency and lowering costs of developing New Sources of water for both regions. One of the ways to accomplish parts of this objective is to increase the usage of already existing facilities and sources of water.

Additional Storage (ASR and/or Surface)

Management strategy involves implementing large, regional scale ASR and/or surface storage facilities adequate in size to store surplus flows of surface water during periods of high streamflows, including flood flows, to be available during extended periods of drought. Present management strategies of the South Central Texas Regional Water Plan are sized and scheduled to meet seasonal and daily variations of demand, but some current supplies may not be fully reliable during extended or multi-year droughts. Thus the need for surface reservoirs, large scale ASR Systems, or multipurpose reservoirs. If the water management issue is a supply for emergencies or drought, water could be stored in the Carrizo or Gulf Coast Aquifers for several years before it is recovered. Water treatment capacity necessary to meet peak day demands may be available at non-peak times (fall, winter, and spring) to treat water for aquifer storage and subsequent recovery.

Lockhart Reservoir (G-21)

The Lockhart Reservoir is recommended as a potential reservoir site. Although the Regional Water Plan recommends other means of meeting projected water needs in Caldwell County, the SCTRWPG recognizes the strong interest of the local government in shifting from low-quality groundwater sources to a surface water supply system. The reservoir is considered by the local government to be an important economic development project to create new growth opportunities for the area. There are questions about economic feasibility at present, but the SCTRWPG recognizes the efforts in Caldwell County and by the Guadalupe Blanco River Authority to find a viable strategy to move the project forward. When that strategy is ready, the RWPG will review the Lockhart Reservoir water supply option as a possible amendment to the Regional Water Plan.

5.2.4 Cumulative Effects

Sophisticated hydrologic models have been employed to quantify the cumulative effects of implementation of the South Central Texas Regional Water Plan through the year 2050. These cumulative effects are quantified through long-term simulation of natural hydrologic processes including precipitation, streamflow, aquifer recharge, springflow, and evaporation as they are affected by human influences such as aquifer pumpage, reservoirs, diversions, and the discharge of treated effluent. Cumulative effects of plan implementation on the Edwards Aquifer are measured against a baseline representative of full utilization of proposed permits prorated to a total of 400,000 acft/yr subject to Critical Period Management Rules without any additional recharge enhancement projects. Edwards Aquifer simulations with implementation of the Plan do not reflect the activation of available Management Supplies as may be necessary to offset Edwards Aquifer pumpage reductions necessary to maintain springflow. The baseline for consideration of effects on streamflow reflects the baseline for the Edwards Aquifer, full utilization of existing water rights, and treated effluent discharge representative of current conditions. Cumulative effects of plan implementation on Carrizo and Simsboro Aquifer levels are measured against a baseline of projected local pumpage.

The potential cumulative effects of plan implementation on Comal Springs discharge from the Edwards Aquifer are shown in Figure 5.2-26 for a 56-year historical simulation period. Springflows would increase much of the time and particularly in the summer due to Edwards Recharge – Type 2 Projects (L-18a) and SAWS Aquifer Storage & Recovery (ASR) Program in southern Bexar County (SCTN-1a), respectively. However, springflow increases would be offset to some degree by increased pumpage closer to the springs associated with Edwards Irrigation Transfers (L-15) and Irrigation Demand Reduction (Conservation) with Transfer (L-10 Irr.). As shown in Figure 5.2-27, simulated San Marcos Springs discharges would increase substantially because the Edwards Recharge – Type 2 Projects (L-18a) include a recharge enhancement dam on the Blanco River with pumped diversions to the outcrop in the Upper San Marcos River watershed. Overall pumpage from the Edwards Aquifer would increase (Figure 5.2-28) due to potential EAA authorizations for recharge recovery (see Appendix C in Volume III) pursuant to development of the Edwards Recharge – Type 2 Projects (L-18a). Figure 5.2-29 shows

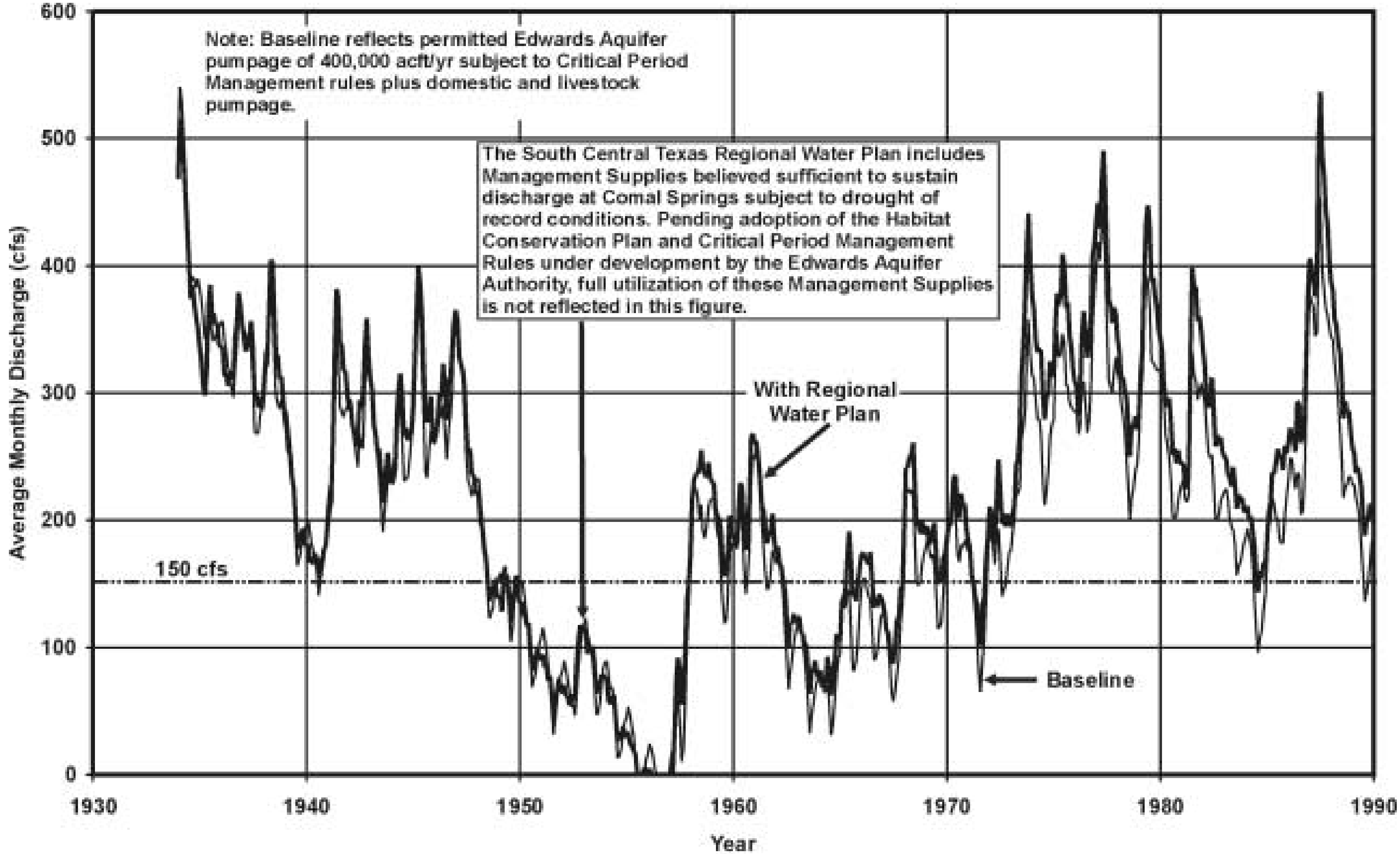


Figure 5.2-26. Regional Water Plan — Simulated Comal Springs Discharge

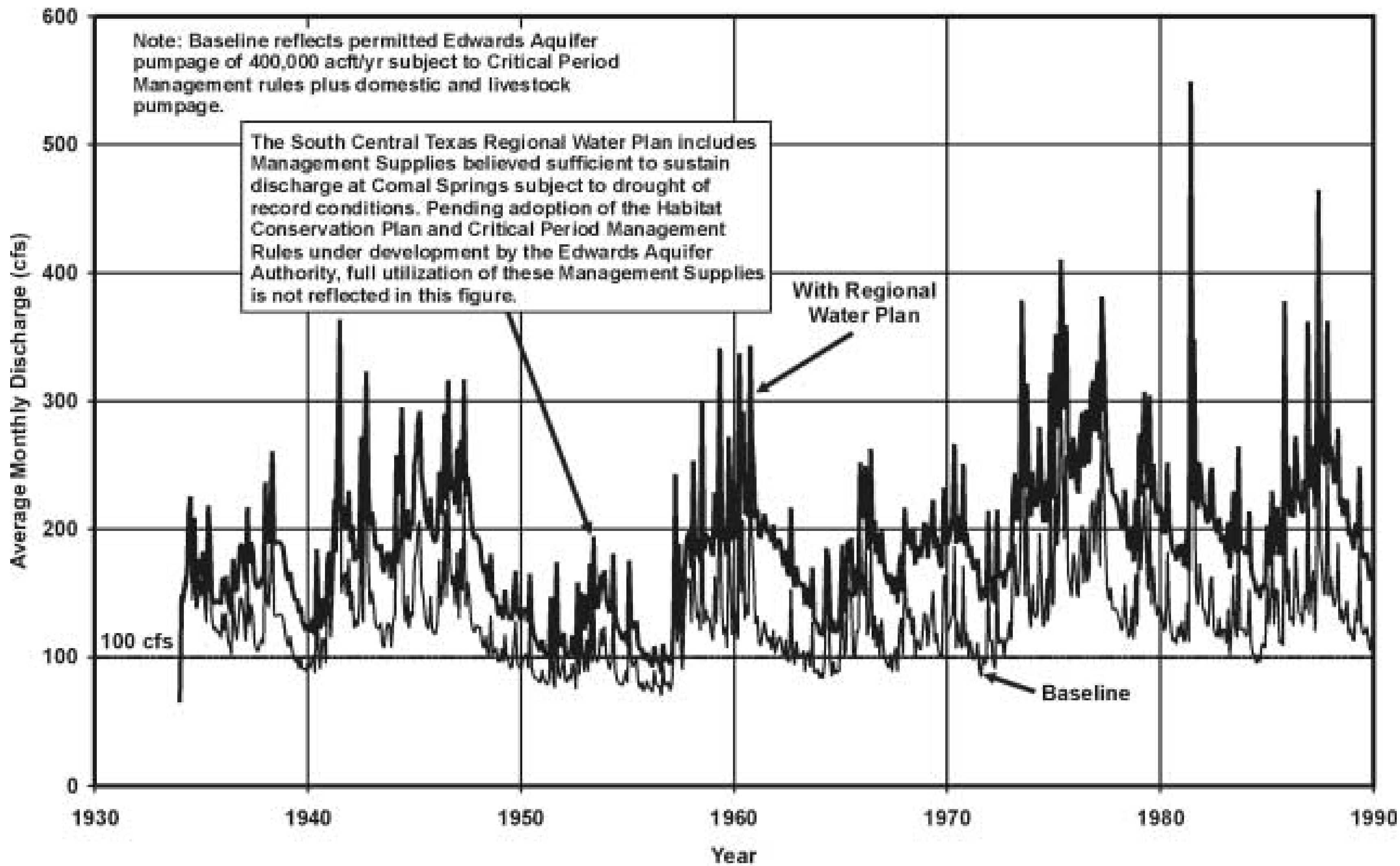


Figure 5.2-27. Regional Water Plan — Simulated San Marcos Springs Discharge

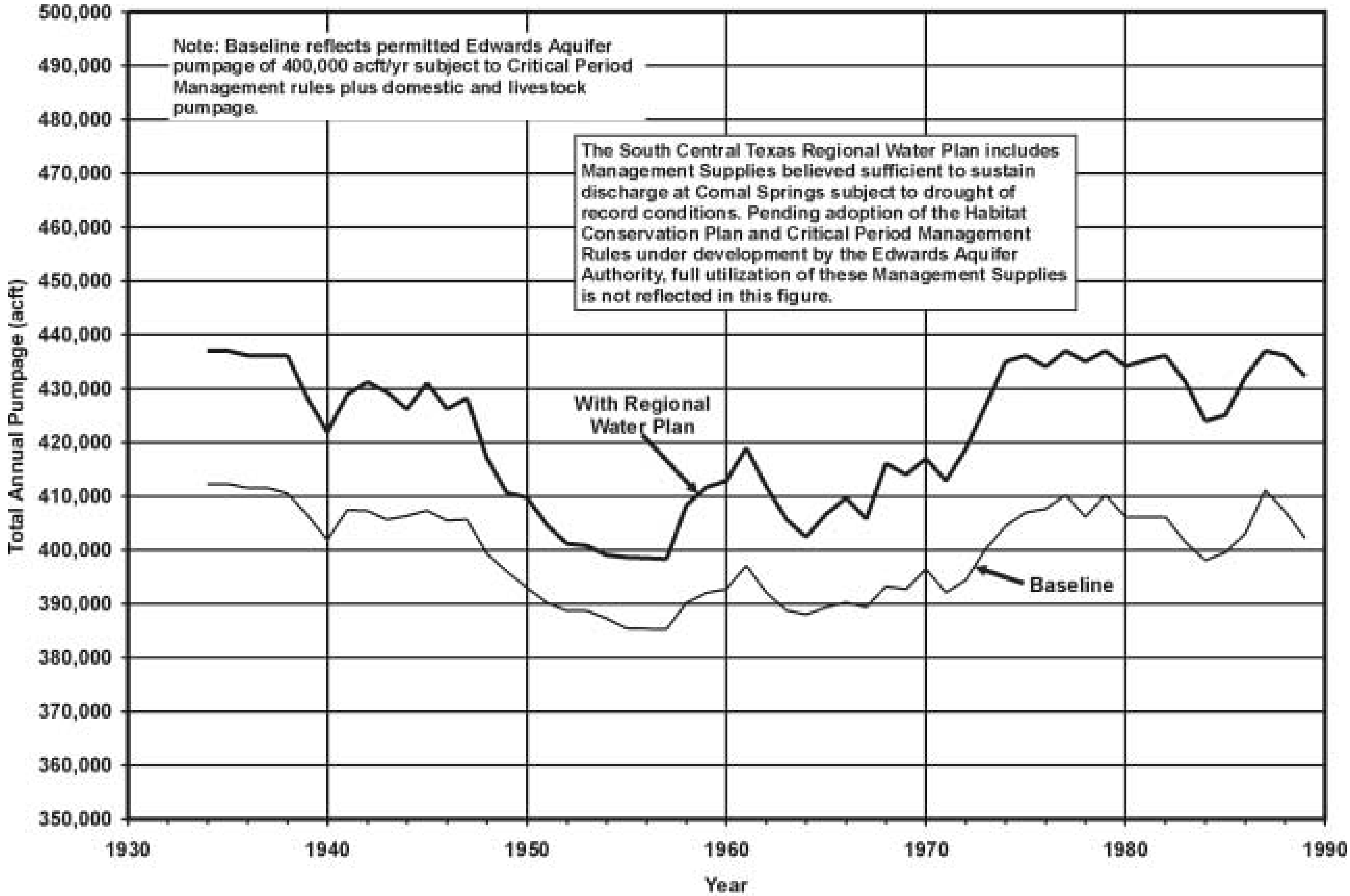


Figure 5.2-28. Regional Water Plan — Simulated Edwards Aquifer Pumpage

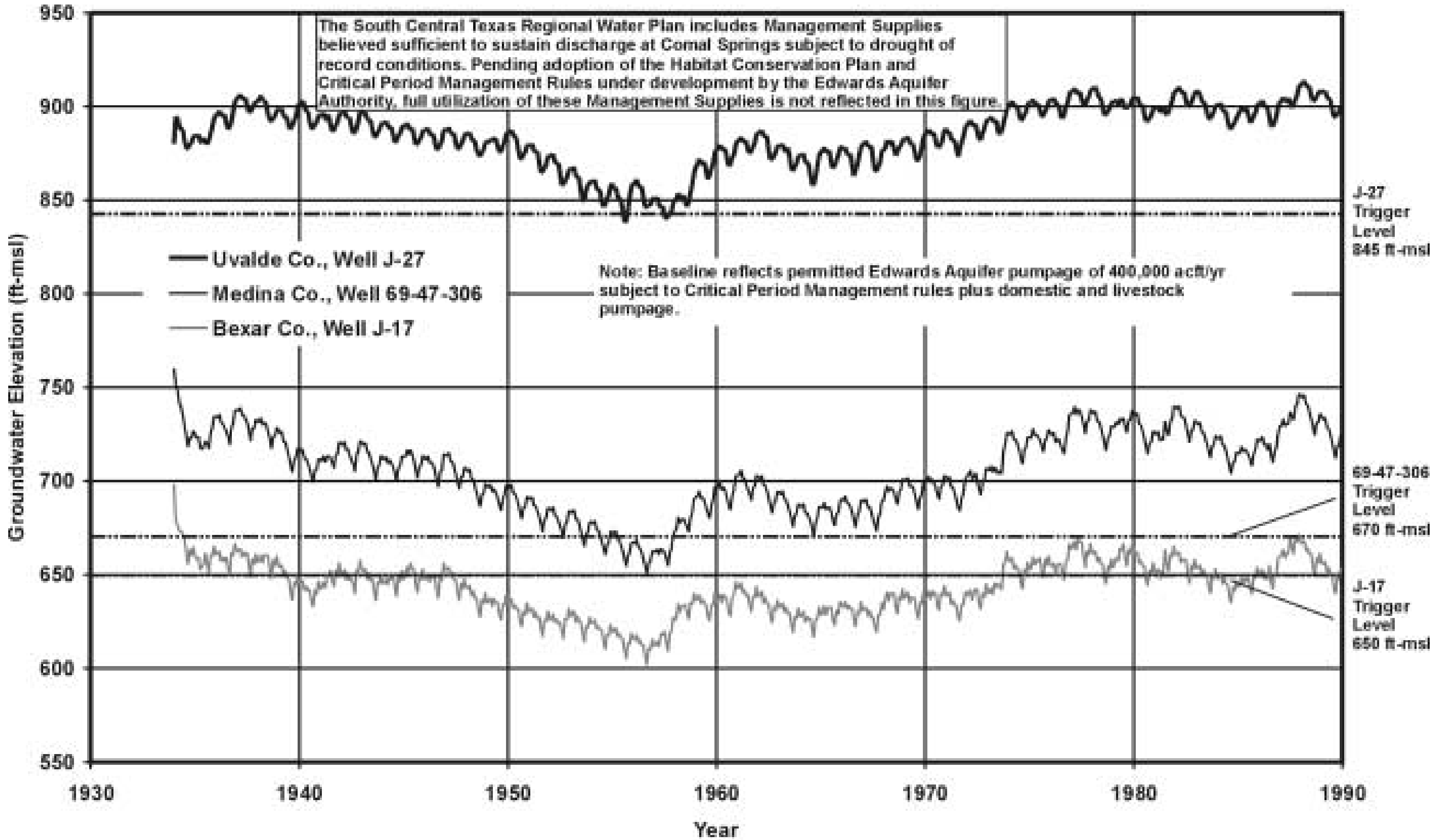


Figure 5.2-29. Regional Water Plan — Simulated Edwards Aquifer Levels

simulated water levels at key monitoring wells in Uvalde, Medina, and Bexar Counties with implementation of the Plan. Percentages of time under Critical Period Management in Uvalde and Medina Counties would be less with the Plan than for baseline conditions.

The potential cumulative effects of phased implementation of water management strategies involving pumpage from the Carrizo Aquifer are summarized in Figures 5.2-30 through 5.2-36. Figure 5.2-30 shows the projected pumpage from Wilson, Gonzales, and Bastrop Counties associated with the following water management strategies: Carrizo Aquifer–Wilson & Gonzales (CZ-10C); Carrizo Aquifer – Gonzales & Bastrop (CZ-10D); and Schertz-Seguin Water Supply Project (SSWSP). Projected drawdown associated with CZ-10C and SSWSP is referenced to simulated 1994 aquifer levels and shown in plan view in Figure 5.2-31 along with monitoring well locations for the simulated well hydrographs presented in Figures 5.2-32 through 5.2-35. Note that projected drawdown shown in these figures is a result of both projected local demands and the development of two water management strategies in the Plan. Drawdown associated with CZ-10D in northern Gonzales County and southern Bastrop County, in addition to that associated with projected local demands, is shown in Figure 5.2-36.

Simulated cumulative effects of implementation of the Simsboro Aquifer (SCTN-3c) strategy in Milam, Lee, and Bastrop Counties are summarized in Figures 5.2-37 through 5.2-39. Projected drawdown associated with SCTN-3c between years 2000 and 2050 is shown in plan view in Figure 5.2-37. Figures 5.2-38 and 5.2-39 illustrate the simulated incremental effects on Simsboro Aquifer levels associated with local demands and mining operations (baseline) and the implementation of the Plan for the Aluminum Company of America (Alcoa) and San Antonio City Public Service (CPS) well fields.

Potential cumulative effects of implementation of the South Central Texas Regional Water Plan on streamflows at selected locations in the Guadalupe – San Antonio River Basin are summarized in Figures 5.2-40 through 5.2-42. Streamflow comparisons for the Guadalupe River at Cuero (Figure 5.2-40) and the San Antonio River at Falls City (Figure 5.2-41) indicate that streamflows are expected to increase with full implementation of the Plan. Increased streamflow at Cuero will be primarily due to Edwards Recharge – Type 2 Projects (L-18a) and the associated increases in Comal and San Marcos springflow. Note that average annual freshwater inflows to the Nueces Estuary will be reduced by approximately three percent due to enhanced recharge

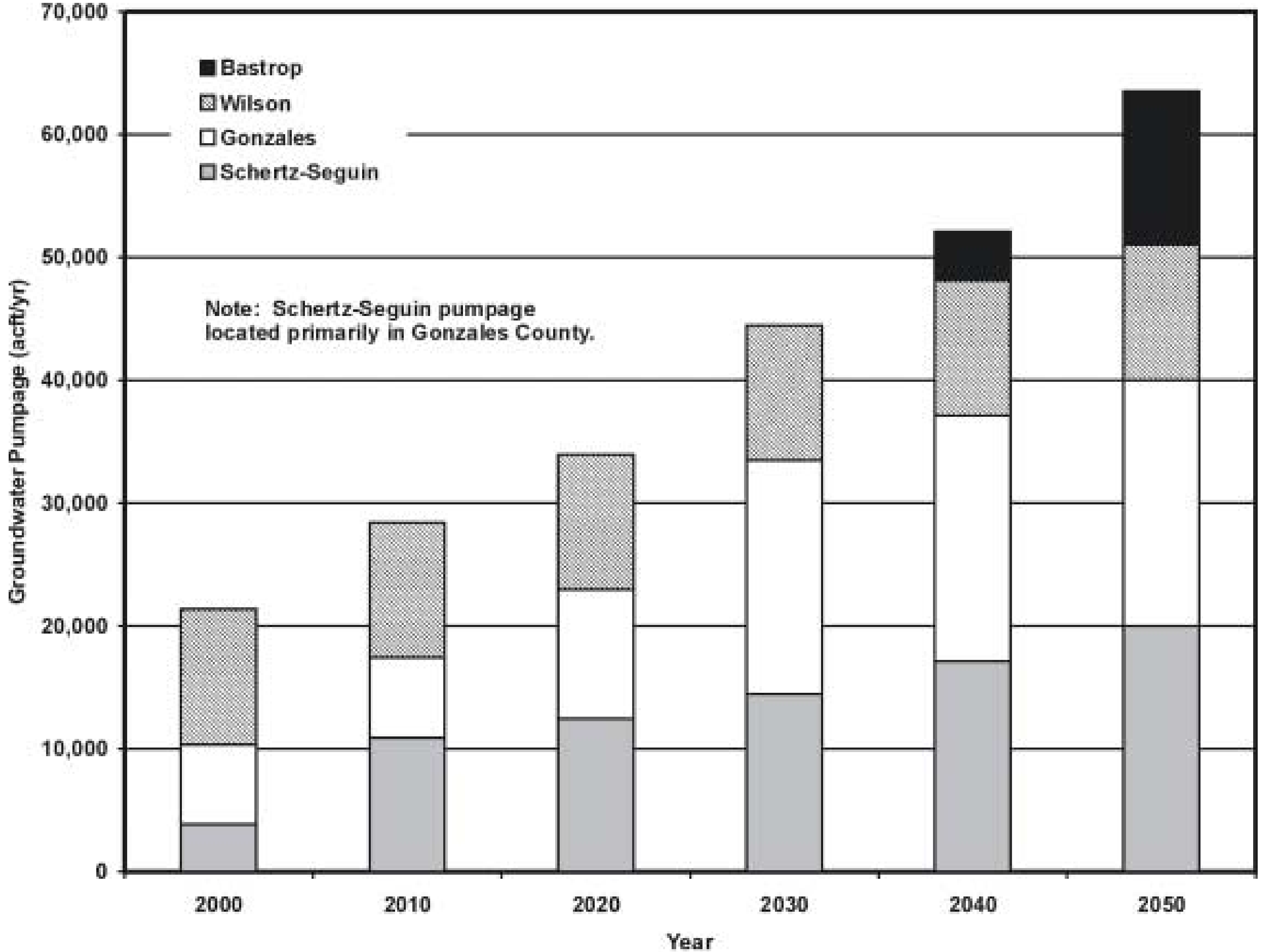
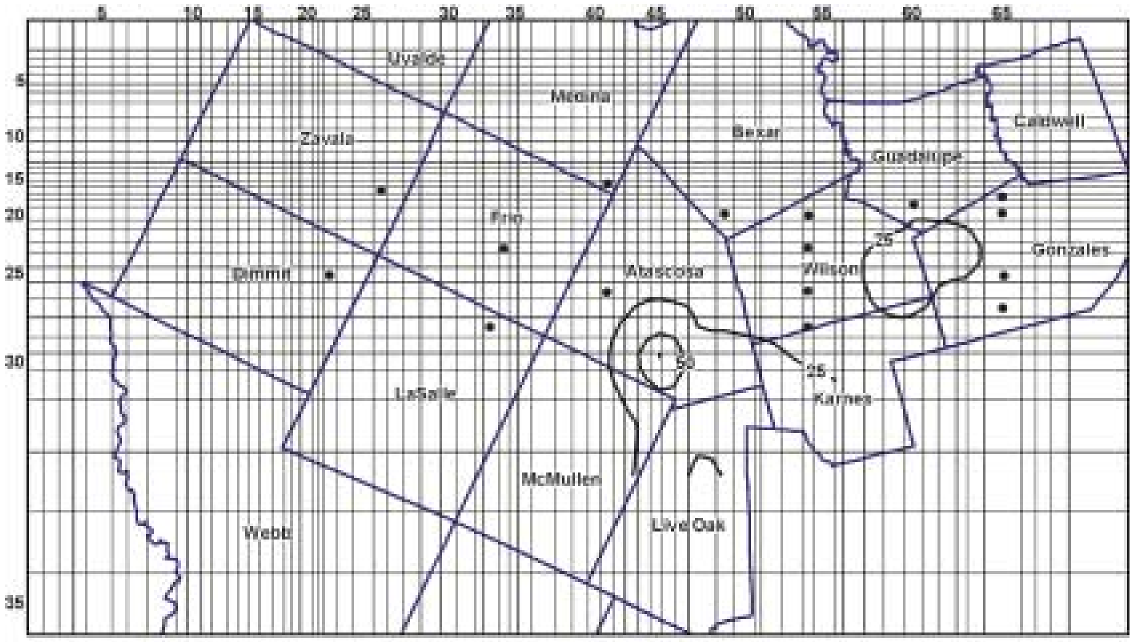
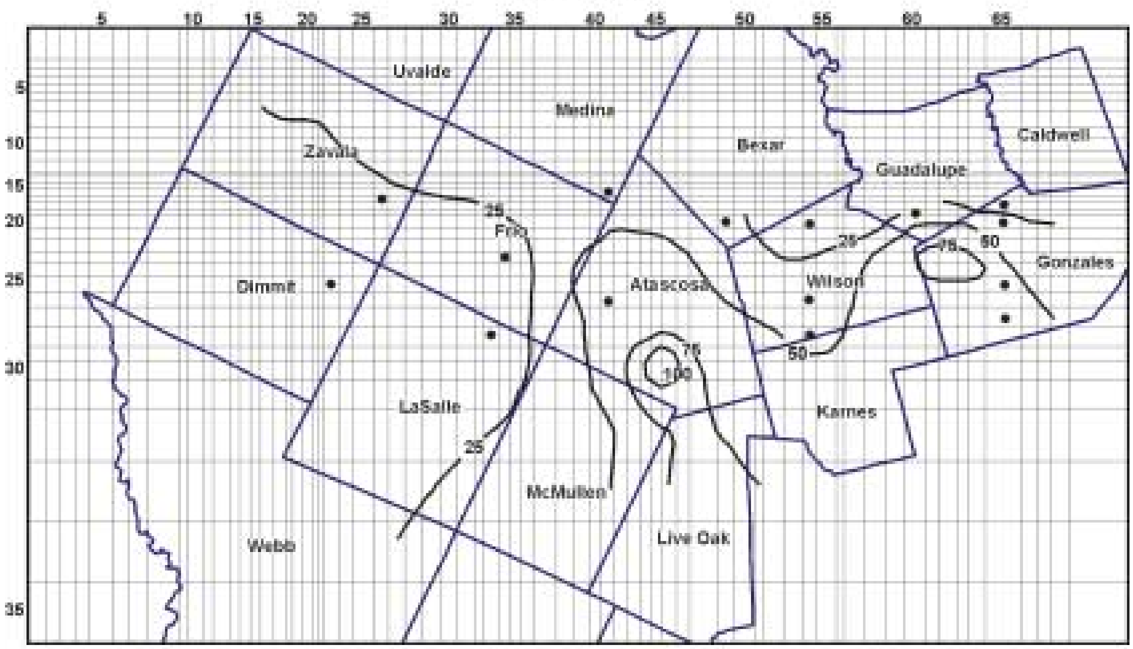


Figure 5.2-30. Regional Water Plan — Additional Carrizo Groundwater Pumpage

Year 2010



Year 2050



Note: Drawdown is referenced to simulated 1994 aquifer levels and includes both projected local demands and development of water supply options in this regional water plan.

● Monitoring Well Locations

Figure 5.2-31. Regional Water Plan — Simulated Carrizo Aquifer Drawdown

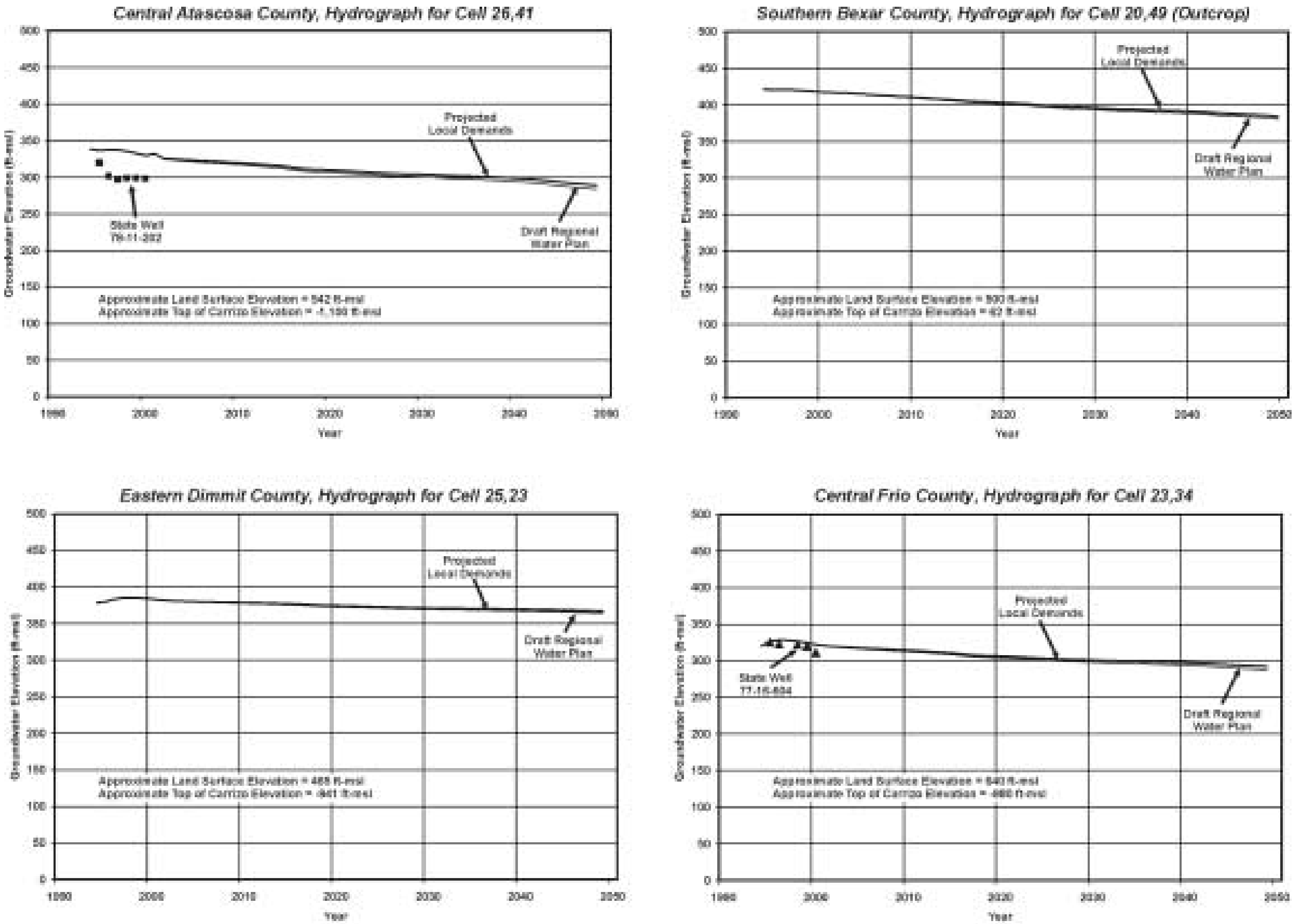


Figure 5.2-32. Regional Water Plan — Carrizo Aquifer

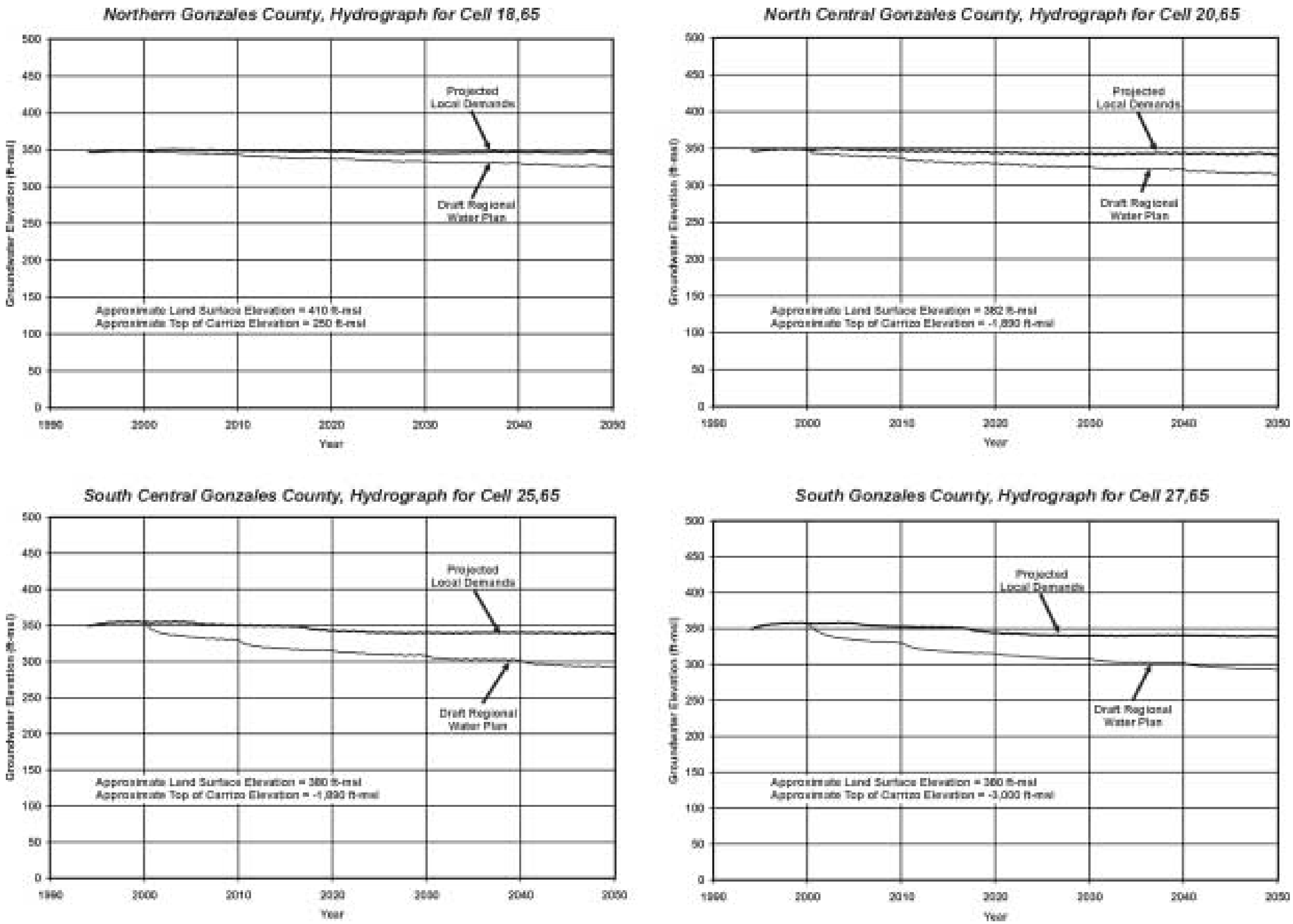


Figure 5.2-33. Regional Water Plan — Carrizo Aquifer

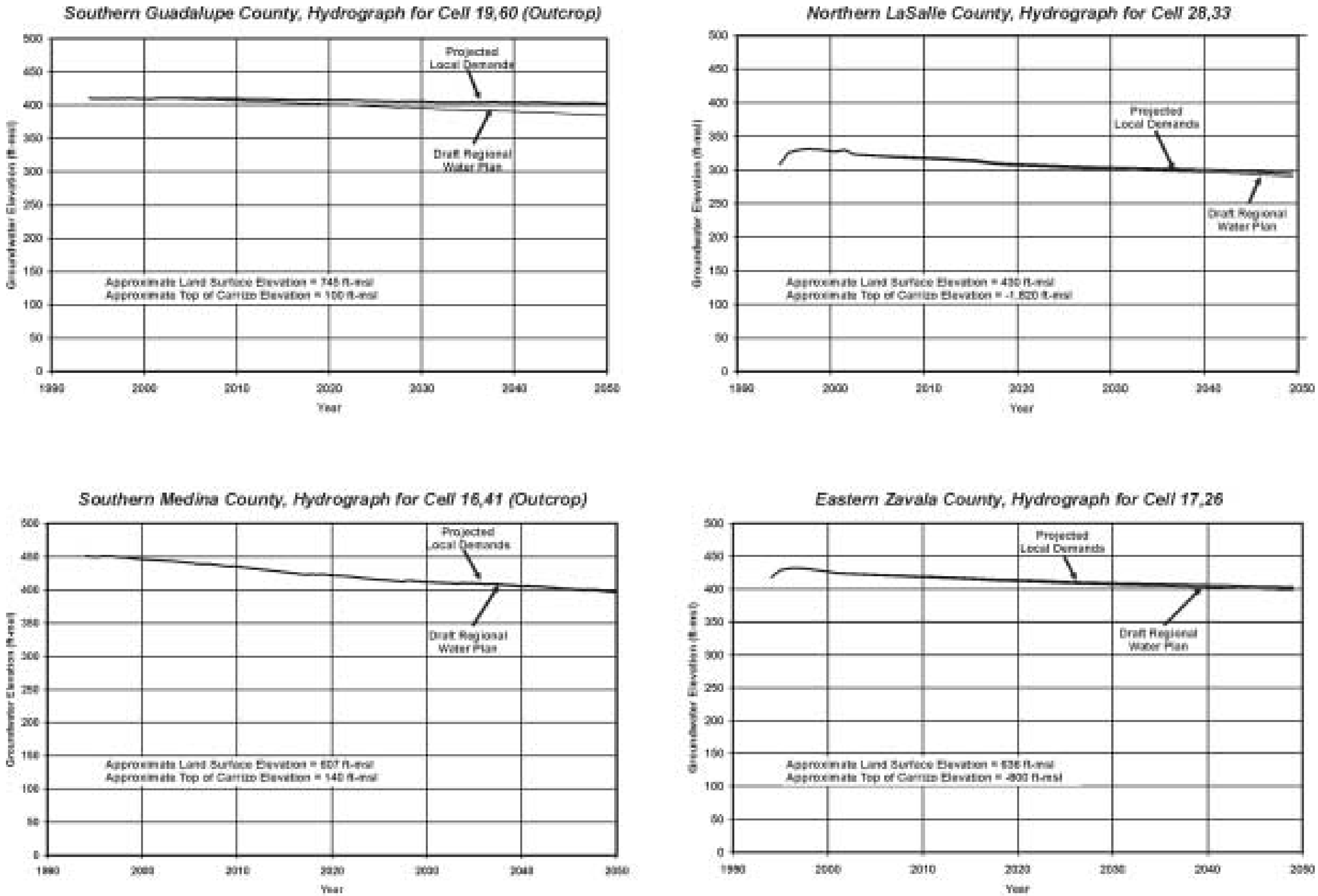


Figure 5.2-34. Regional Water Plan — Carrizo Aquifer

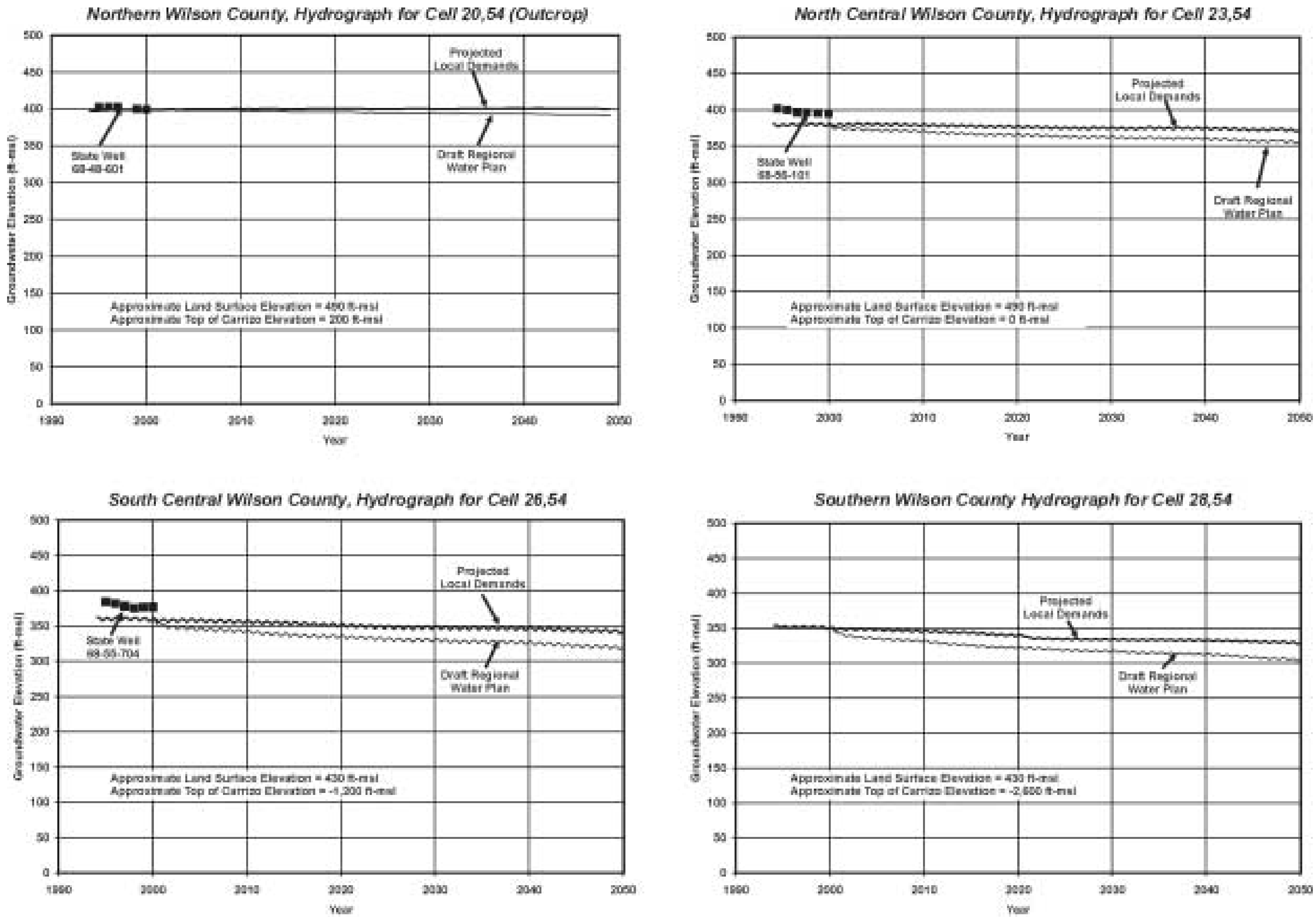
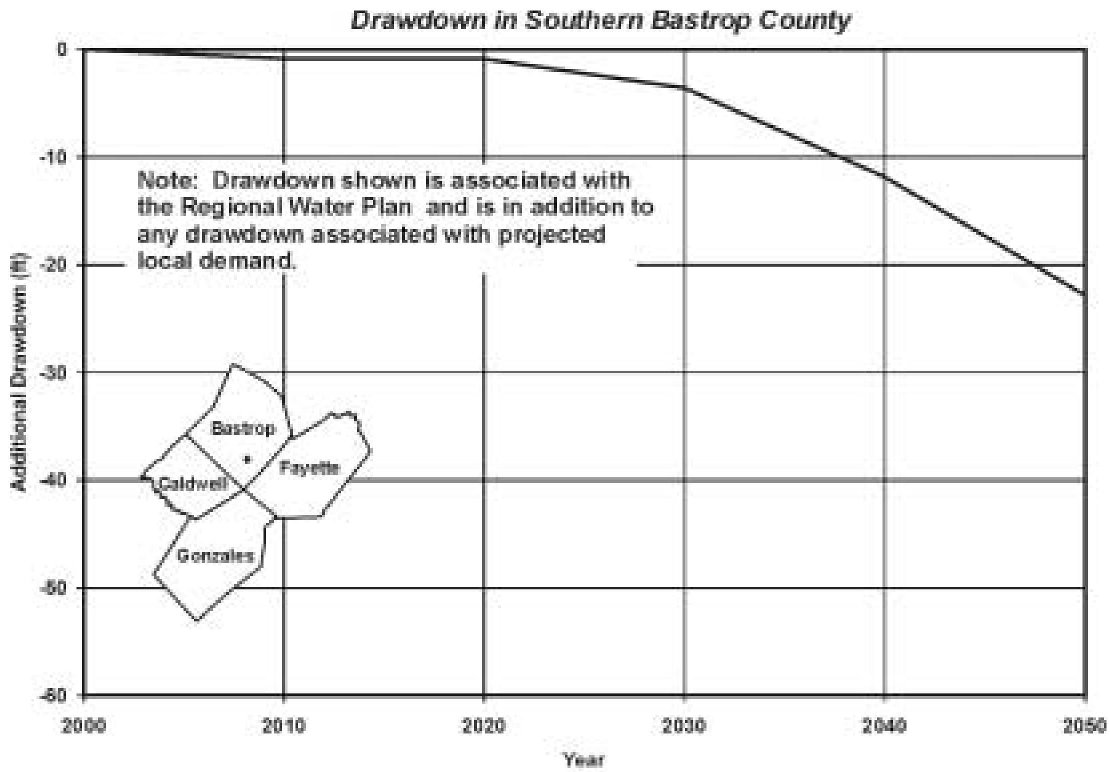


Figure 5.2-35. Regional Water Plan — Carrizo Aquifer



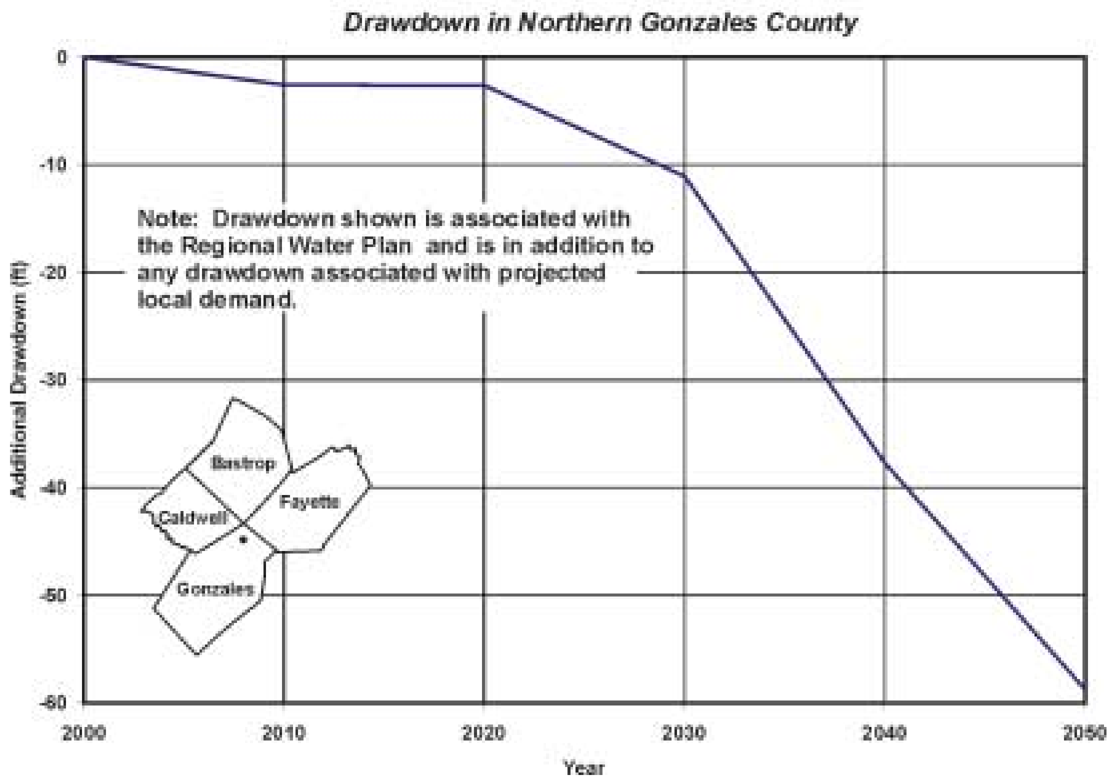


Figure 5.2-36. Regional Water Plan — Carrizo Aquifer

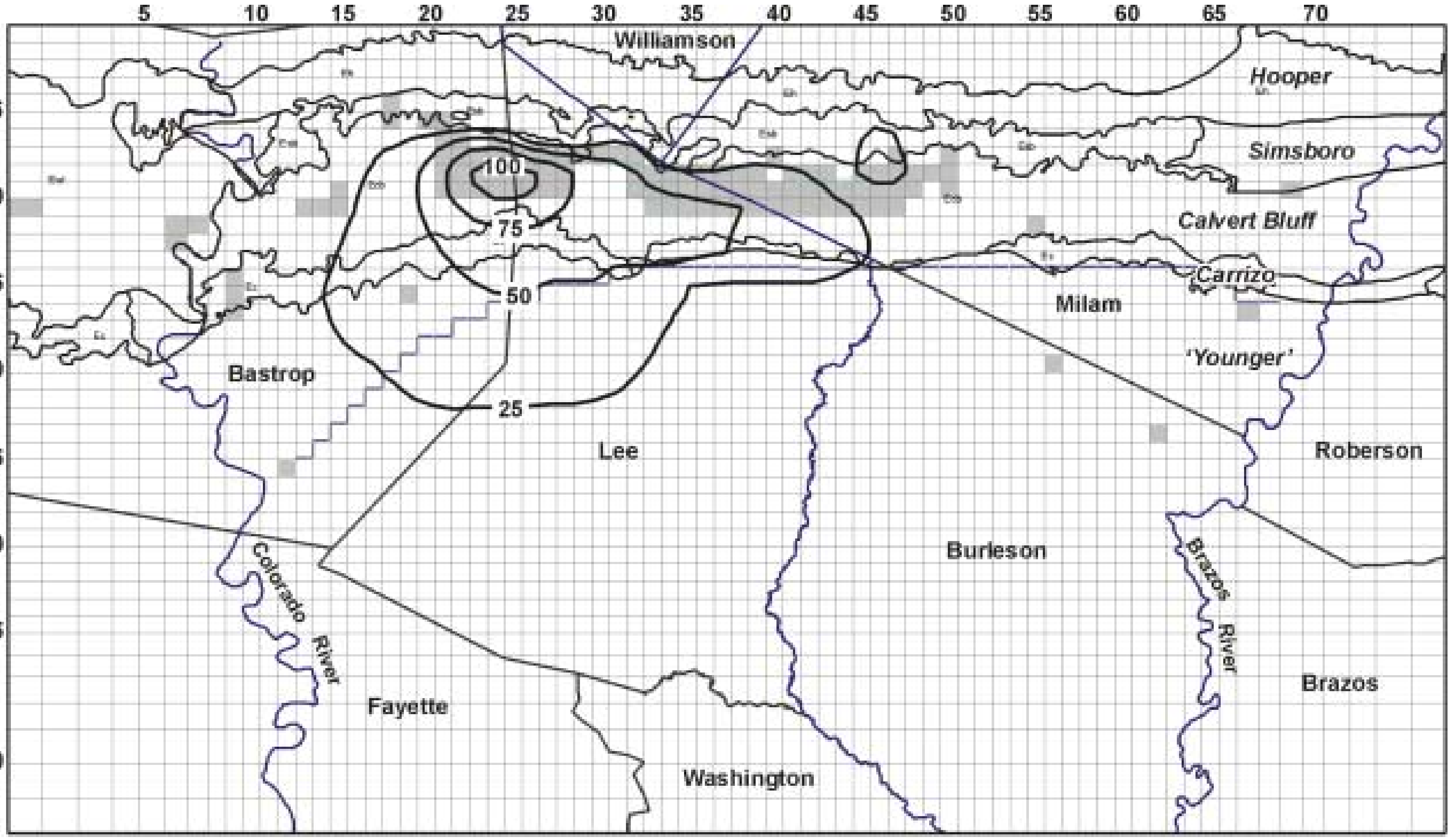


Figure 5.2-37. Simsboro Aquifer in CPS-ALCOA Area Drawdown between Years 2000 and 2050 for 55,000 acft/yr Water Supply

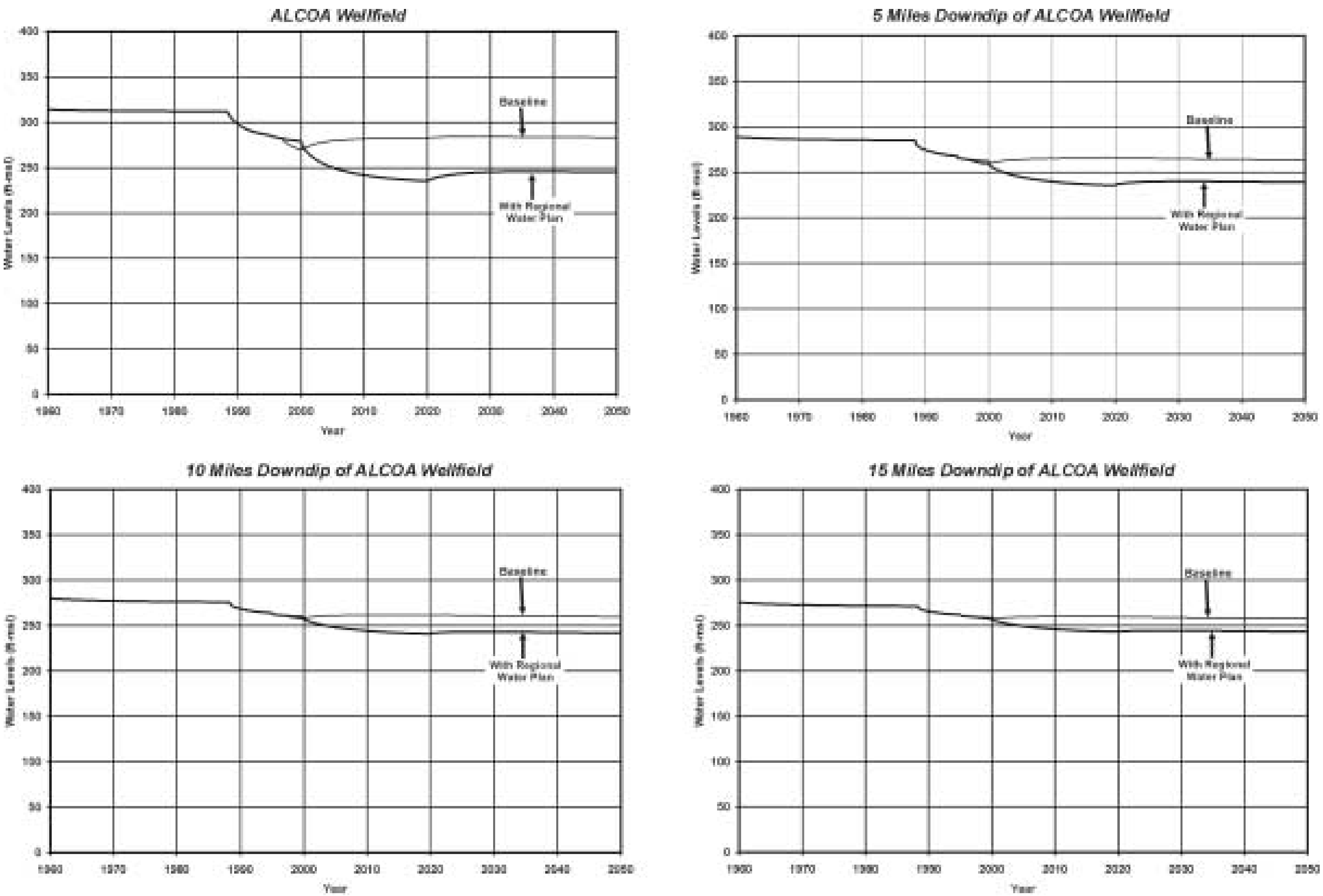


Figure 5.2-38. Regional Water Plan — Simsboro Aquifer

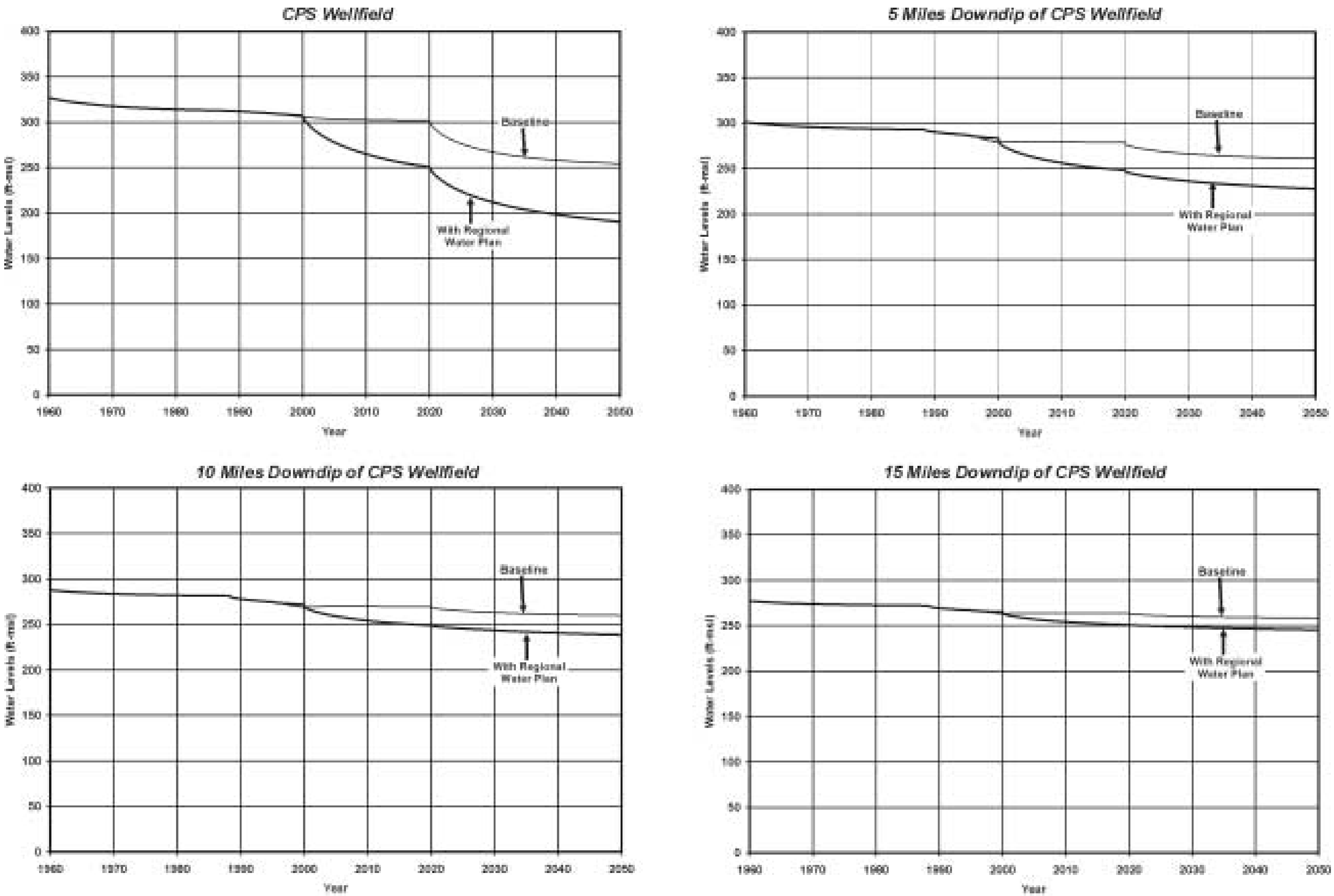
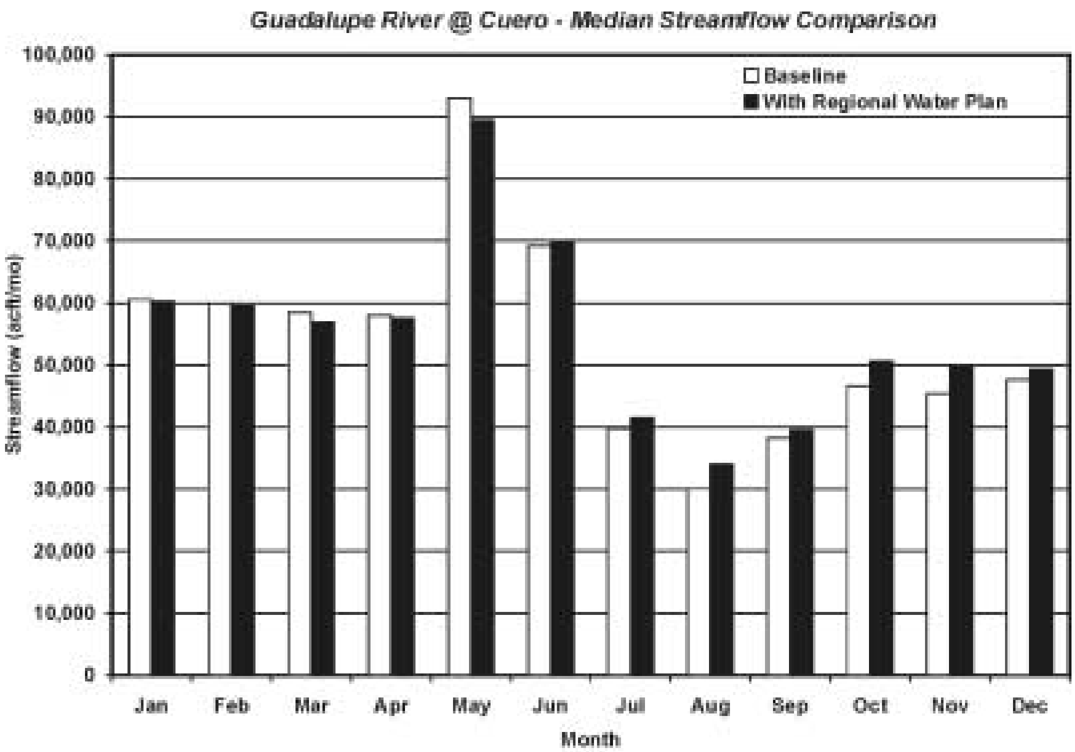


Figure 5.2-39. Regional Water Plan — Simsboro Aquifer



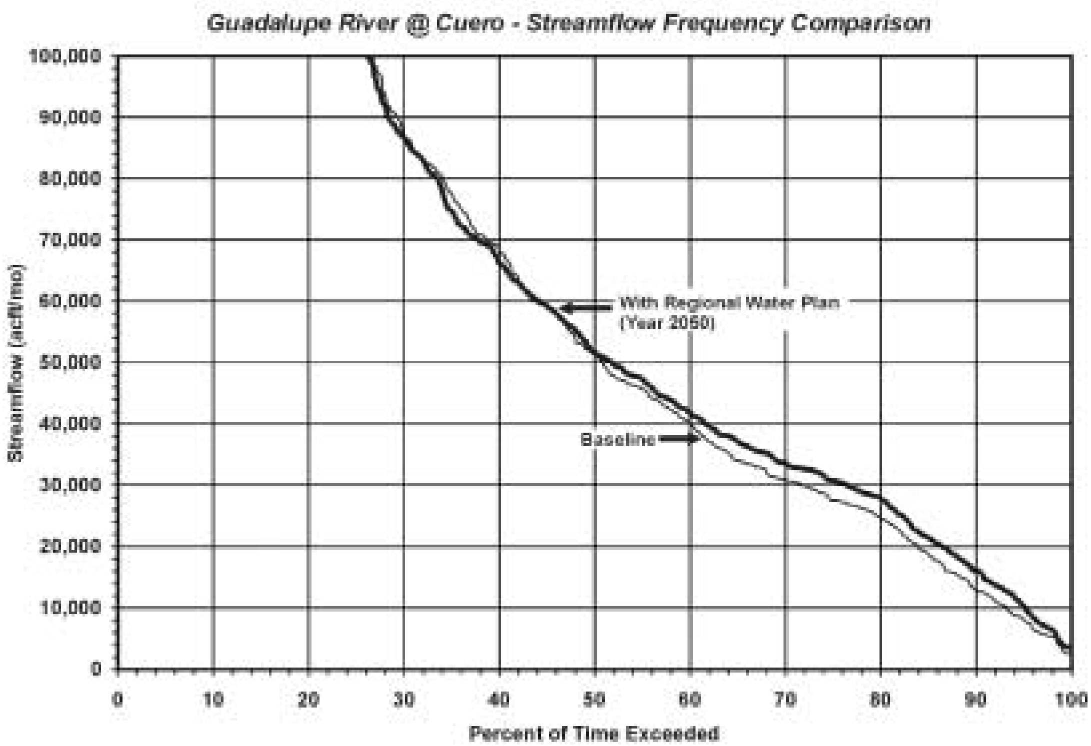
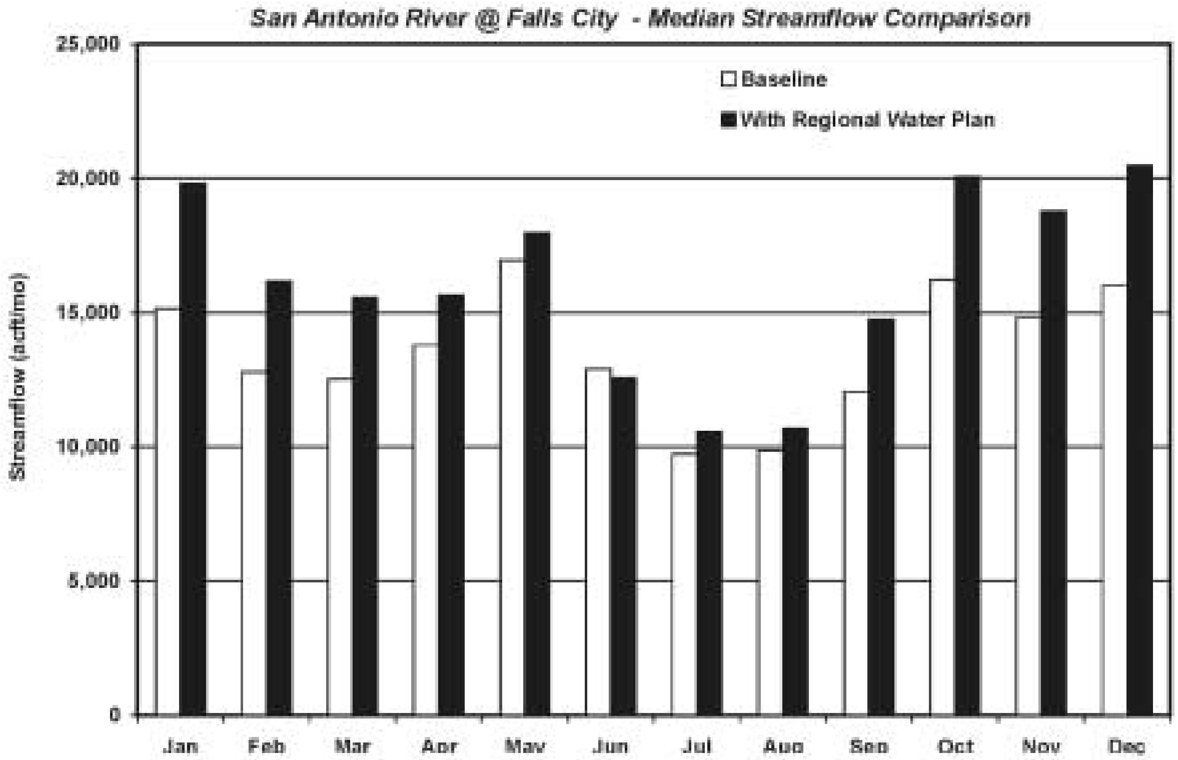


Figure 5.2-40. Regional Water Plan - Streamflow Comparisons



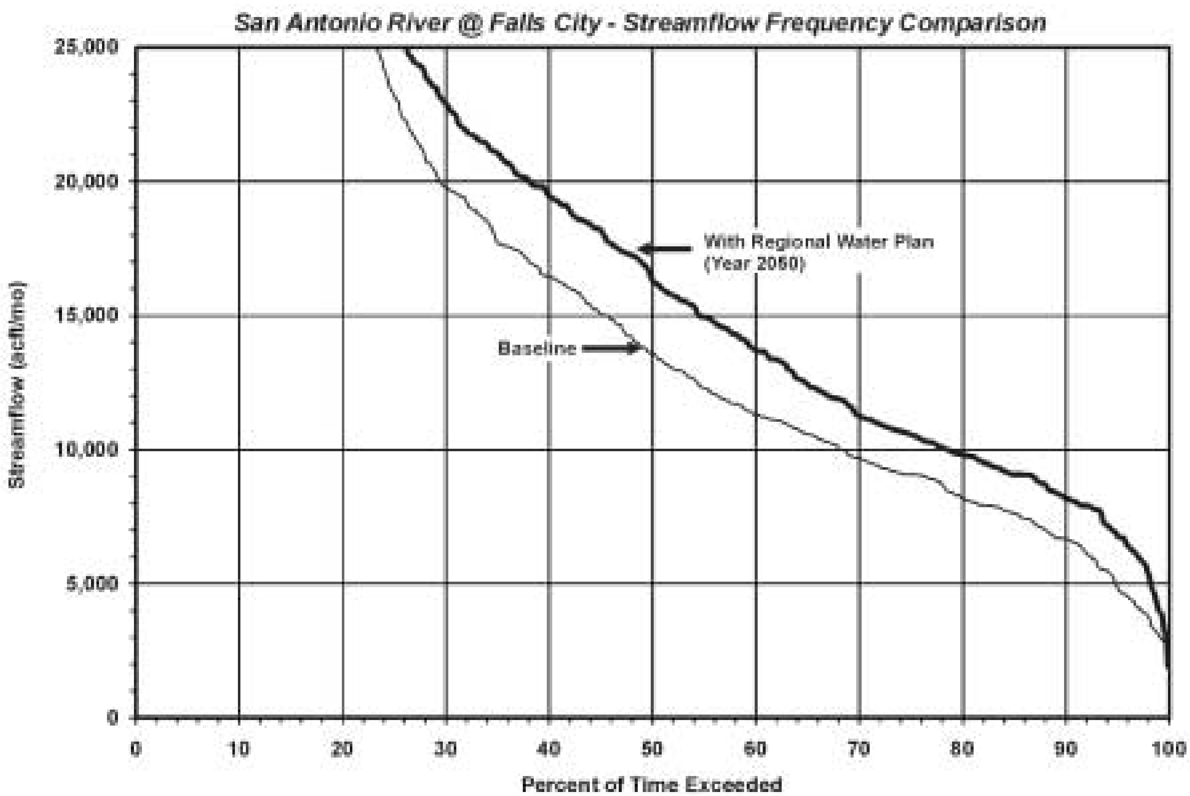
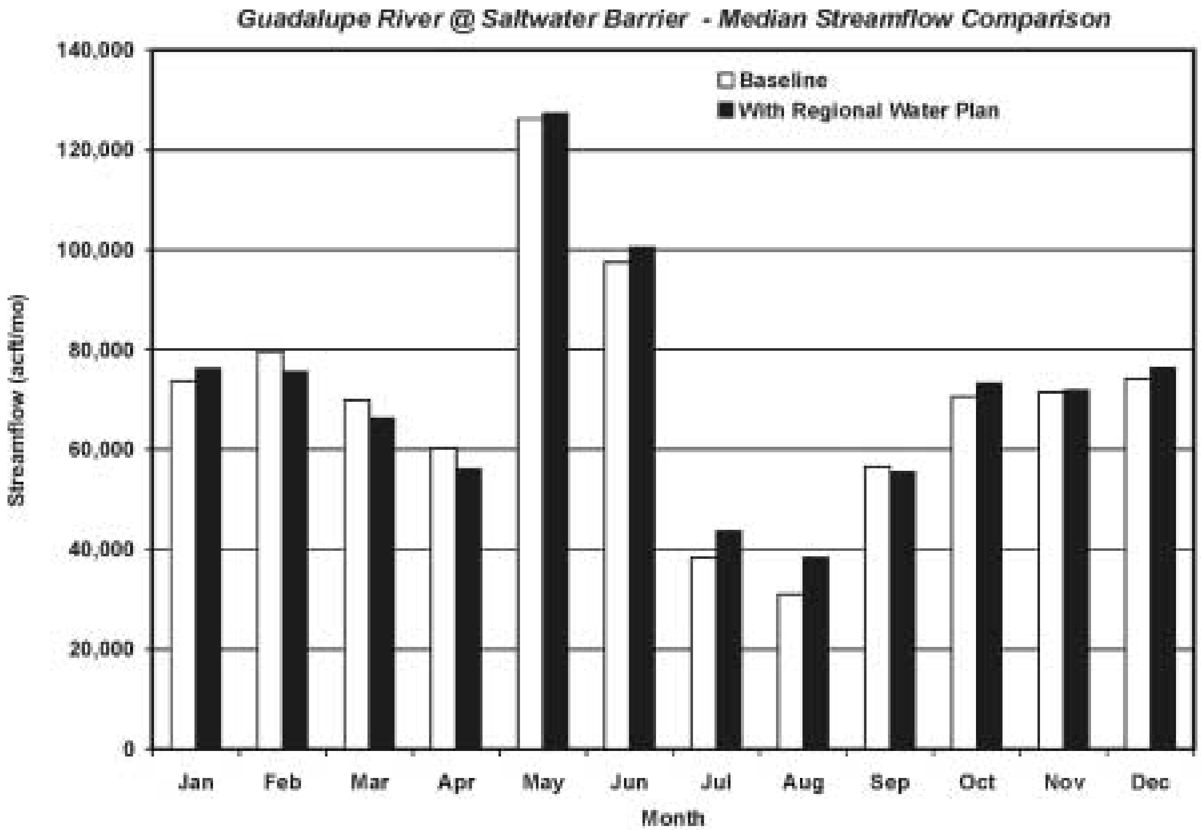


Figure 5.2-41. Regional Water Plan - Streamflow Comparisons

associated with Edwards Recharge – Type 2 Projects (L-18a). Increased streamflow at Falls City will be a direct result of net projected increases in treated effluent discharge associated with increasing water use and expansion of SAWS Recycled Water Program in Bexar County. Figure 5.2-42 shows increased streamflows (as compared to the baseline) in the Guadalupe River at the Saltwater Barrier in 2050. This is particularly evident during low streamflow periods.

Potential effects of implementation of the South Central Texas Regional Water Plan on streamflows in the Colorado River at Bay City are summarized in Figure 5.2-43. Results of statistical analyses of simulated streamflows from each of two potential Regional Water Sharing Alternatives proposed by the LCRA are presented in Figure 5.2-43. The Plan includes diversions from both Bastrop and Bay City totaling 150,000 acft/yr, which is the same annual diversion from the Colorado River as simulated by LCRA. Median streamflow in months during which irrigation use is limited or non-existent (October through March) may be reduced by more than 300 cfs once this management strategy is fully implemented in 2050.



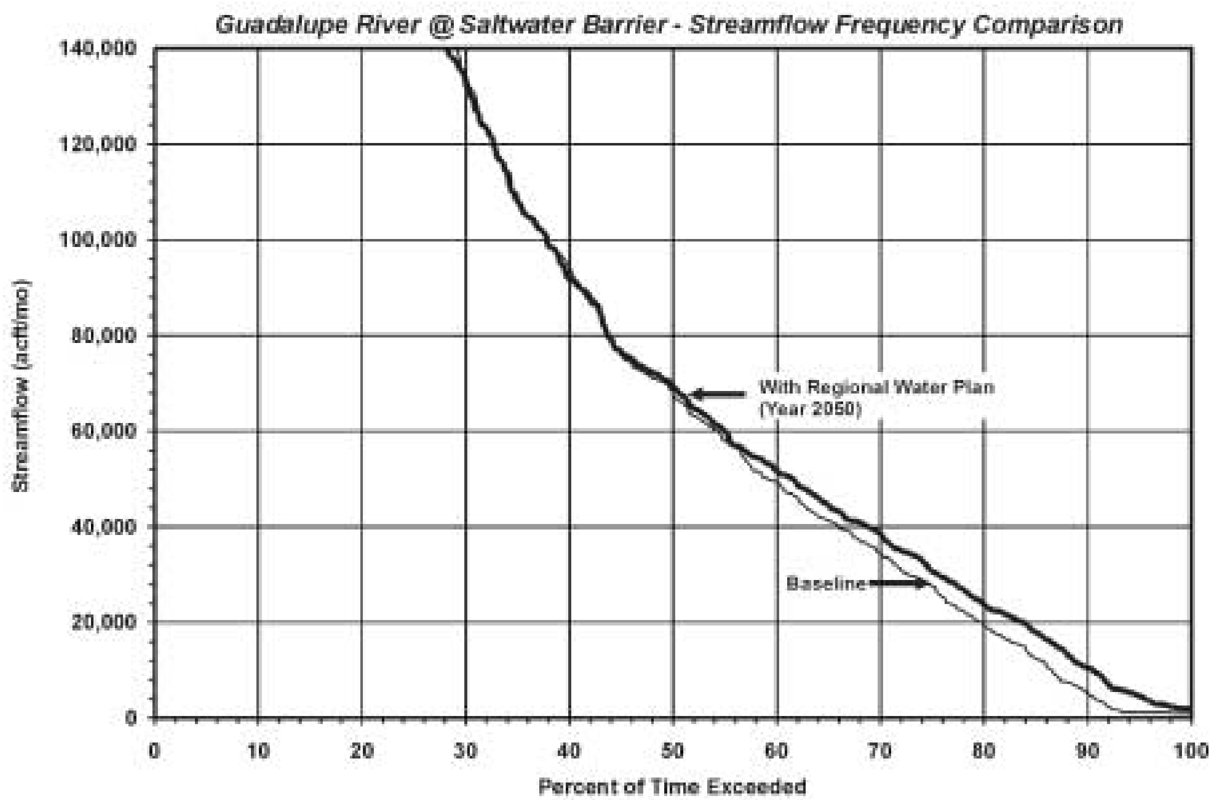
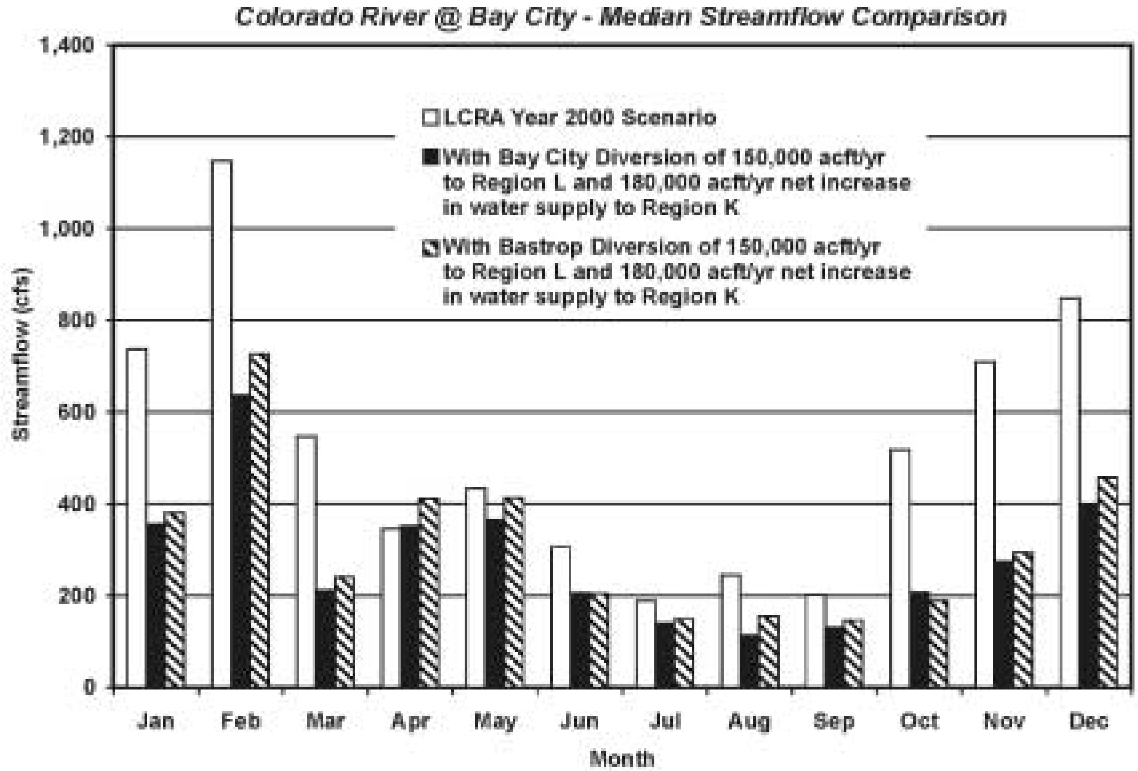


Figure 5.2-42. Regional Water Plan - Streamflow Comparisons



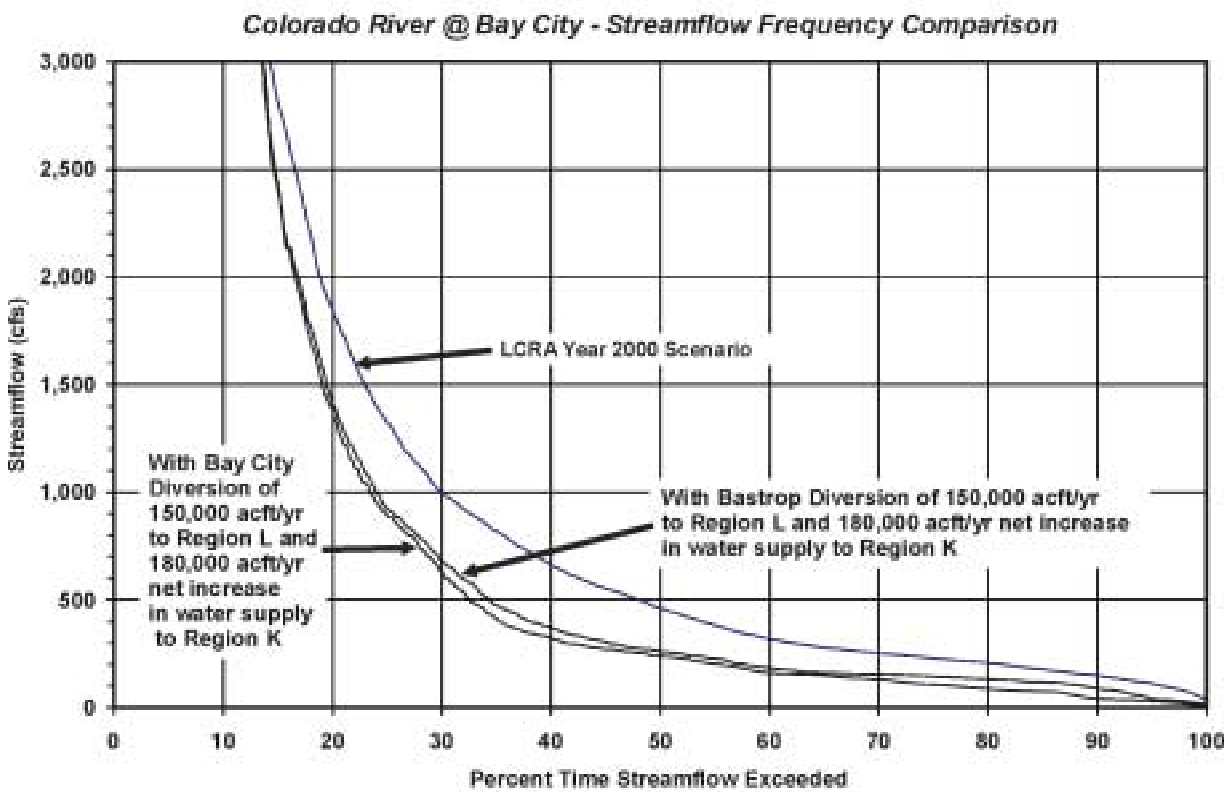


Figure 5.2-43. Regional Water Plan - Streamflow Comparisons

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5.2.5 Environmental Assessment

5.2.5.1 Environmental Setting

Brief discussions of the predominant land uses, vegetation, topography, habitats, and important species are included in the descriptions and environmental effects assessments of the individual water management strategies in Volume III of this document. The South Central Texas Regional Water Plan must meet the municipal, industrial, mining, and steam-electric power water needs of a region that spans southern Texas from Hays and Caldwell Counties in the north to the Colorado and Guadalupe Estuaries on the Gulf Coast, to the headwaters of the Nueces River in Uvalde County. The South Central Texas Region (Region L) exhibits a unique biological diversity as a consequence of its location in an area of transition between major vegetational and faunal regions to the north, east and south (respectively, the Kansan, Austroriparian and Tamaulipan), and its position astride migration corridors important to numerous bird, bat and insect populations. Locally, the prairie and coastal ecoregions circumscribe sets of habitats, plants and animals distinct from those of the Central Texas Plateau, and the more tropical affinities of the Southern Texas Plains. The eastern and southern margins of the Edwards Plateau are incised by a series of rugged, wooded canyons traversed by a series of streams where clear, spring fed waters intimately associated with a cavernous limestone aquifer provide the present primary water supply for Region L.

The Edwards Aquifer itself, together with the karst geology of its recharge zone and the major perennial springs, constitute a unique set of habitats in which a significant concentration of isolated, endemic species have developed. The porous to cavernous formation making up the Edwards and associated limestones constitute the Edwards Aquifer, the ground water source that presently supplies the City of San Antonio, and numerous other users, and which is critical to maintenance of spring habitats containing several endemic, endangered species. The Edwards Aquifer is the only important aquifer habitat in Texas in which vertebrate species live[1] and it supports a surprisingly diverse ecosystem. The aquifer has three parts: the drainage, or catchment area, the recharge zone, and the reservoir zone. Input to the aquifer comes from

[1] Edwards, Robert J., Glen Longley, Randy Moss, John Ward, Ray Mathews, and Bruce Stewart, "A Classification of Texas Aquatic Communities with Special Consideration Toward the Conservation of Endangered and Threatened Taxa," Vol. 41, No. 3, The Texas Journal of Science, University of Texas at Austin, Austin, Texas, 1989.

rainfall over the watershed and recharge occurs primarily in the beds of streams crossing the recharge zone, which consist of a band of fractured and cavernous limestone (Karst geology) that harbors a growing number of endemic, terrestrial cave species. Where rivers flowing across the plateau have carved deep canyons and exposed the base of the Edwards Limestone, spring fed streams arise and flow south and eastward over the impermeable older formations to the recharge zone, at the base of which a set of larger springs (e.g., Leona, San Antonio, San Pedro, Comal, Hueco, and San Marcos Springs) emerge that support still more species of limited distribution.

Omernik[2] utilized criteria that included topography, climate, vegetation type and land use characteristics to divide the United States into ecological regions, or ecoregions, that exhibit more or less distinct sets of physical habitats and species. According to Omernik's classification Region L includes parts of five Ecoregions: the Central Texas Plateau, Southern Texas Plains, Texas Blackland Prairies, East Central Texas Plains, and the Western Gulf Coastal Plains (Figure 5.2-44). Focusing specifically on Texas and excluding explicit land use criteria, Gould[3] delineated 10 vegetational areas, which generally correspond with the portions of Omernik's Ecoregions that extend into the state. The corresponding names for the vegetational areas in Region L are Edwards Plateau, South Texas Plains, Blackland Prairies, Post Oak Savannah, and the Gulf Prairies and Marshes (Figure 5.2-45).

The Edwards Plateau vegetational area encompasses approximately 24 million acres of tall or mid-grass understory and a brushy, savanna-type overstory complex of live oak (*Quercus virginiana*) and other oaks (*Q.fusiformis*, *Q. buckleyi*, *Q sinuata* var. *breviloba*), ashe junipers (*Juniperus ashei*), cedar elm (*Ulmus crassifolia*), mesquite (*Prosopis glandulosa*), various species of acacia (*Acacia* sp.), and sumacs, including the prairie flame-leaf (*Rhus copallina* var. *lanceolata*). The most important climax grasses include switchgrass (*Panicum virgatum*), several species of bluestem (*Schizachyrium* and *Andropogon* spp.), gramas (*Bouteloua* spp.), Indian grass (*Sorghastrum nutans*), Canadian wild rye (*Elymus canadensis*), buffalo grass (*Buchloe dactyloides*) and curly mesquite (*Hilaria belangeri*).[4]

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[2] Omernik, James M., "Ecoregions of the Conterminous United States," Annals of the Association of American Geographers, 77(1) pp. 118-125, 1987.
[3] Gould, F.W., "The Grasses of Texas," Texas A&M University Press, College Station, Texas, 1975.
[4] Correll, D.S., and M.C. Johnston, "Manual of Vascular Plants of Texas," Texas Research Foundation, Renner, Texas, 1979.

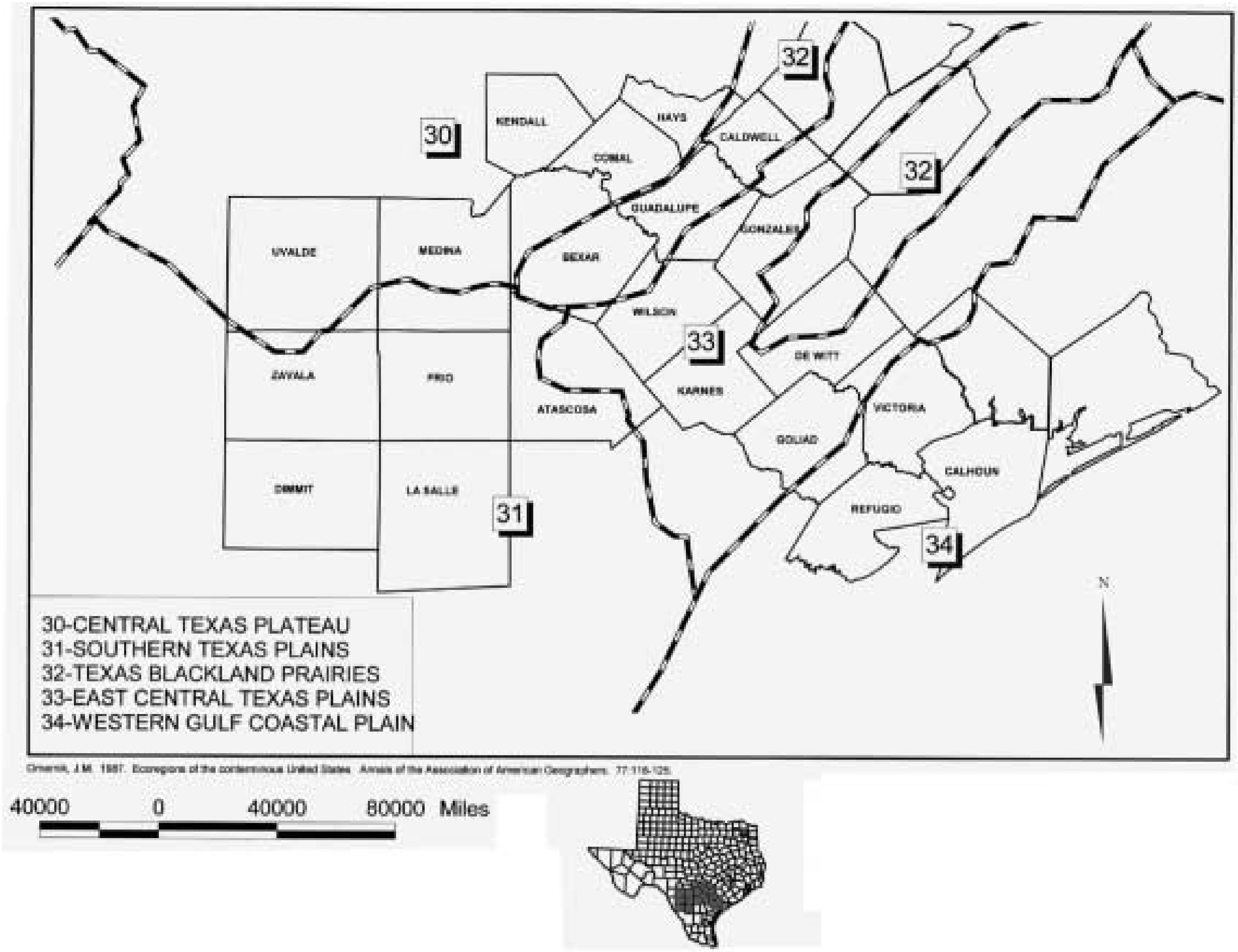

Figure 5.2-44. Omernick's Ecoregions for the Regional Water Plan within Region L

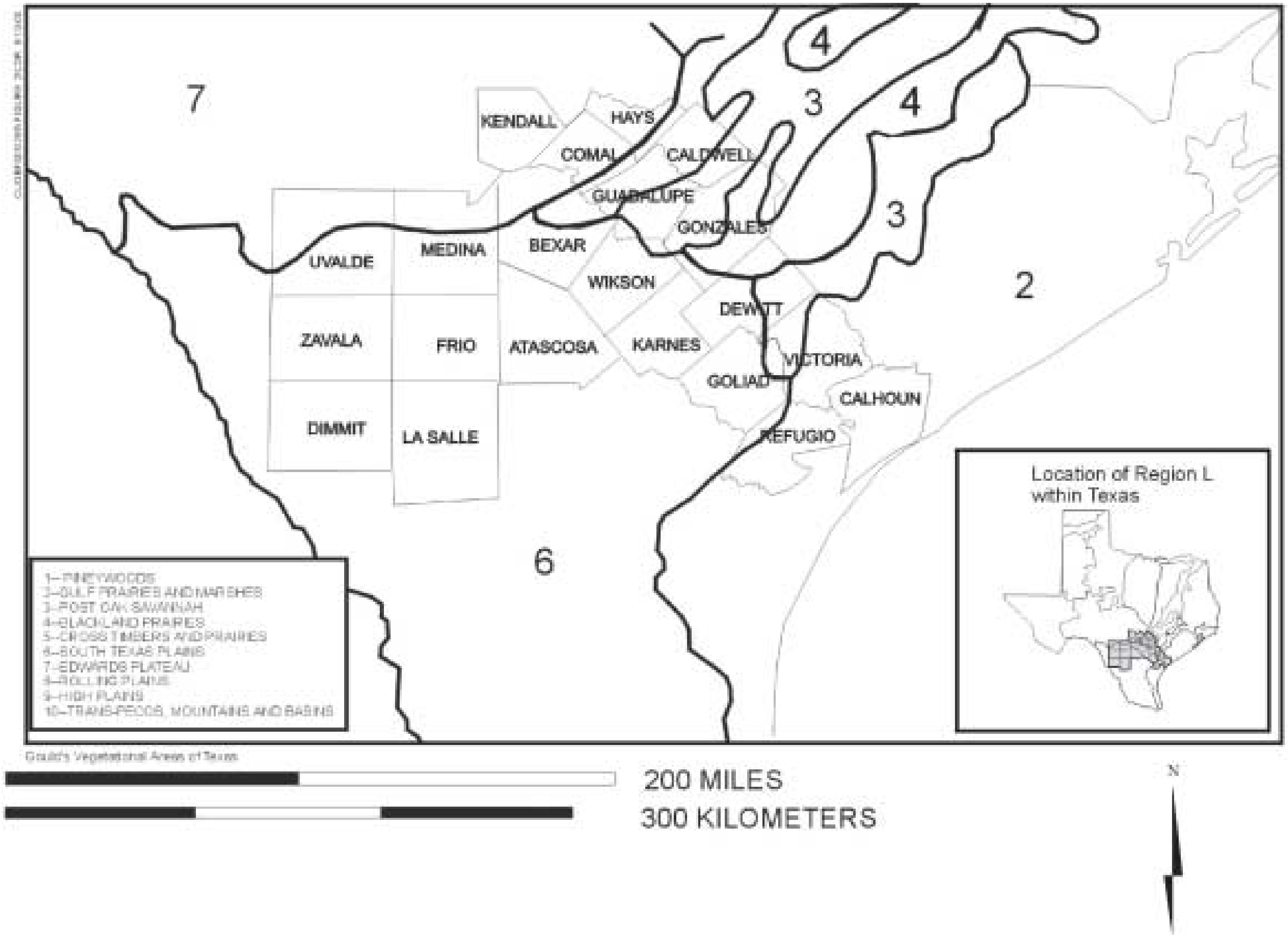

Figure 5.2-45. Gould's Vegetational Areas for the Regional Water Plan within Region L

Juniper and mesquite brush are generally considered invaders into a presumed climax of largely grassland or savannah, except on the steeper slopes which have continually supported a dense cedar-oak thicket. Bald cypress (*Taxodium distichum*) occurs along perennial streams and rivers, while pecan (*Carya illinoiensis*), Arizona and little walnut (*Juglans major*, *J. microcarpa*) hackberry (*Celtis laevigata*), black and sandbar willow (*Salix nigra*, *S. interior*), and eastern cottonwood (*Populus deltoides*) are more widely distributed in riparian areas of both perennial and intermittent streams. Cultivated fields are generally in the relatively broad, level stream valleys where deeper soils have accumulated.[5] Upland agriculture consists primarily of livestock grazing and harvest of cedar and oak for fence posts and firewood, respectively.

The Post Oak Savannah vegetational area, which covers approximately 8.5 million acres, consists of gently rolling or hilly country, with elevations ranging from 300 to 800 ft-msl. Upland soils of the region are light-colored, acid sandy loams or sands. Bottomland soils are light brown to dark gray and acid, with textures ranging from sandy loams to clays. The area is characterized by pastureland with frequent stands of woodland and occasional cropland. The dominant species of the Post Oak Savannah is post oak (*Quercus stellata*), which occurs in open stands with a ground cover of grasses.[6] Other associated species include blackjack oak (*Quercus marilandica*), black hickory (*Carya texana*), cedar elm (*Ulmus crassifolia*), and eastern redcedar (*Juniperus virginiana*). This vegetation type is either considered to be a part of the Eastern Deciduous Forest association or as part of the Prairie association.[7,8,9,10] During the last few decades, open savannah has been converted into dense woodland stands of post oak and winged elm (*Ulmus alata*). This has occurred as a result of overgrazing, abandonment from cultivation, and removal of fire. Grazing is the major land use of both upland and bottomland sites within the vegetation type. Large acreages of both upland and bottomland forests have been cleared for grazing and most of this is in tame pasture.

[5] Ibid.
[6] Correll, D.S., and M.C. Johnston, Op. Cit., 1979.
[7] Tharp, B.C., "The Vegetation of Texas," Texas Acad. Sci., Anson Jones Press, Houston, 1939.
[8] Braun, E.L., "Deciduous Forests of Eastern North America," Hafner Publ. Co., Inc., New York, 1950.
[9] Weaver, J.E. and F.E. Clements, "Plant Ecology," 2nd Ed., McGraw-Hill Book Co., New York, 1938.
[10] Daubenmire, Rexford, "Plant Geography with Special Reference to North America," Academic Press, New York, 1978.

The Blackland Prairies is considered true prairie because of its native vegetation, which includes little bluestem as the climax dominant of the region. Elevations for the region as a whole range from 300 to 800 ft-msl. Uniform, dark-colored calcareous clays, which are interspersed with gray acid sandy loams, constitute the fertile Blackland soils. According to Thomas, most of the region is under cultivation, although there are some excellent native hay meadows and a few ranches remaining.[11] Big bluestem, Indiangrass, switchgrass (*Panicum virgatum*), sideoats grama (*Bouteloua curtipendula*), hairy grama(*Bouteloua hirsuta*), tall dropseed (*Sporobolus asper*), silver bluestem (*Bothriochloa saccharoides*), and Texas wintergrass (*Stipa leucotricha*) are other important grasses in the region.[12] If heavy grazing is allowed, Texas wintergrass, buffalo grass (*Buchloe dactyloides*), Texas grama (*Bouteloua rigidiseta*), smutgrass (*Sporobolus indicus*) and many annuals may increase or invade the prairies, causing deterioration of the native community.[13] Other invasive species are mesquite (*Prosopis sp.*) in the southern portion of the Blackland Prairies, and post oak and blackjack oak in areas of medium to light-textured soils. Grasses that have been used to seed improved pastures within the Blackland Prairies are dallisgrass (*Paspalum dilatatum*), common and coastal bermudagrass (*Cynodon dactylon*), and some native species.

The South Texas Plains vegetational area (corresponding to the Southern Texas Plains Ecoregion) encompasses approximately 20 million acres of level to rolling topography, with elevations ranging from 1,000 feet to about sea level. Soil types cover a wide range, from clays to sandy loams, creating variations in soil drainage and moisture-holding capacities. Though there are large areas of cultivated land, most of the area is still rangeland. The South Texas Plains region originally supported a grassland or savannah climax vegetation.[14] A long period of grazing and the reduction of fire have affected the plant communities and have led to an increase of brush. Species which have increased in the area include honey mesquite (*Prosopis glandulosa*), post oak, live oak (*Quercus virginiana*), several acacias (*Acacia* spp.) and members of the cactus family (Cactaceae). Distinct differences in climax plant communities and successional patterns occur on the many range sites that are found in the region.

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[11] Thomas, G.W., "Texas Plants – An Ecological Summary," In: F.W. Gould. 1975. Texas Plants – A Checklist and Ecological Summary, Texas Agricultural Experiment Station, MP-585/Rev., College Station, Texas, 1975.
[12] Correll, D.S., and M.C. Johnston, Op. Cit., 1979.
[13] Ibid.
[14] Thomas, G.W., OP. Cit., 1975.

The Gulf Prairies and Marshes vegetational region of Texas consists of about 9,500,000 acres. This nearly level, slowly drained plain is less than 150 feet in elevation and is cut by sluggish rivers, creeks, bayous, and sloughs. Habitats include coastal salt marshes, dunes, prairies, riverbottoms, and fresh water ponds. Soils are acid sands, sandy loams and clays. The upland prairie soils tend to be heavier textured acid clays or clay loams. Much of the region is fertile farmland or pastureland. The climax vegetation of the region is mostly tall grass prairie or post oak savannah.[15] Principal grasses are big bluestem (*Andropogon gerardi*), little bluestem (*Schizachyrium scoparium*), seacoast bluestem (*S. scoparium* var. *litoralis*), indiangrass *(Sorghastrum nutans*), eastern gamma grass (*Tripsacum dactyloides*), Texas wintergrass (*Stipa leucotricha*) and switchgrass (*Panicum virgatum*) and gulf cordgrass (*Spartina spp.*). Seashore saltgrass (*Distichlis spicata*) occurs on moist saline sites. Since the region is heavily used for ranching and agriculture, extensive disturbance has allowed invader species, such as mesquite (*Prosopis glandulosa*), huisache (*Acacia smallii*), prickly pear (*Opuntia* spp.), Acacia (*Acacia* spp.), ragweed (*Ambrosia psilostachya*), broomweed (*Xanthocephalum* spp.) and others to become well established.[16,17] Heavy grazing and/or abandoned farmland has changed the predominant grasses to species such as broomsedge (*Andropogon virginicus*), smutgrass (*Sporobolus indicus*), threeawns (*Aristida* spp.) and introduced bermudagrass (*Cynodon dactylon*), fesque (*Vulpia* spp.) and dallisgrass (*Paspalum dilatatum*).

Large acreages of both upland and bottomland forests have been cleared for grazing and much of this land is planted with domestic grasses. Major creek and river floodplains may retain more or less well-developed hardwood forests, but upland areas are generally cleared for cultivation or pasturage. However, uplands support scattered, dense, shrubby thickets of oak, huisache and mesquite and occasional freshwater marshes in relict drainages. Principal tree and shrub species observed in uplands include live oak (*Quercus virginiana*), post oak (*Q. stellata*),

[15] Correll, D.S., and M.C. Johnston, “Manual of the Vascular Plants of Texas,” Texas Research Foundation, Renner, Texas, Second printing, 1979.
[16] Johnston, M.C., “The Vascular Plants of Texas, A List Updating the Manual of the Vascular Plants of Texas,” Austin, Texas, 1988.
[17] Thomas, G.W., Op. Cit., 1975.

cedar elm (*Ulmus crassifolia*), hackberry (*Celtis laevigata*), honey mesquite, huisache, and yaupon (*Ilex vomitoria*).[18,19,20]

Species listed by the Federal and state governments as Endangered or Threatened (see Volume III, Appendices D and E for lists by county), species that are candidates for listing as endangered and threatened, and other resources of concern are listed and discussed in terms of the potential impacts of each water management strategy in Volume III. Stream segments nominated by Texas Parks and Wildlife Department for designation as Ecologically Unique River and Stream Segments in Region L are listed, along with the listing criteria employed in the nomination process, in Table 8-7 in Volume II. Tables 8-4 and 8-4a list the potential effects on the nominated segments for each water management strategy, and Table 8-8 presents additional information on potential impacts by nominated segment.

With respect to Cultural Resources, Region L is the location of much of the earliest European activity in Texas, including concentrations of important historical sites on Matagorda bay, along the Guadalupe and San Antonio Rivers, in Bexar County and at the perennial spring along the margin of the Edwards Plateau. Prehistoric sites also tend to be concentrated in many of the same areas, and Region L contains some of the oldest Native American habitation sites known in the United States. Large National Historic Districts encompass areas on the lower Guadalupe and San Antonio Rivers that are particularly rich in both historic and prehistoric remains.

5.2.5.2 Environmental Effects

A number of the Water Management Strategies included in the Regional Water Plan are expected to involve little potential impact to environmental or cultural resources, except with respect to changes in land use practices that may affect wildlife habitats and uses in both rural and urban areas. These include the conservation options (L-10), transfer of Edwards irrigation water to municipal uses (L-15), rainwater harvesting (SCTN-9), and aquifer storage and recovery in the Carrizo-Wilcox Aquifer (SCTN-1). Some concern has been expressed that implementation of L-15 might adversely affect Comal springflows when a portion of the water

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[18] Bureau of Reclamation, "Palmetto Bend Project – Texas Final Environmental Impact Statement," Bureau of Reclamation, U.S. Department of the Interior, 1974.
[19] Soil Conservation Service (SCS), "Soil survey of Calhoun County, Texas," SCS, Temple, Texas, 1978.
[20] Texas Department of Water Resources, " Land Use/Land Cover Maps of Texas," Austin, Texas, LP-62, Reprinted 1978, 1977.

that has been pumped from the aquifer for irrigation in Uvalde and Medina Counties is withdrawn instead from Bexar County wells.

Potential adverse environmental and cultural resources impacts are minimized in the Regional Water Plan by the inclusion of options which maximize the efficient use of existing surface water resources (G-15C and G-24), or which develop groundwater supplies (SCTN-2a, SCTN-3c, CZ-10C, CZ-10D), thereby avoiding the extensive habitat conversions and streamflow changes that can accompany comparable surface water development.

Construction of pipelines and well fields, and similarly dispersed facilities that typically have substantial flexibility in terms of alignment or site selection, will generally result in relatively localized disturbances of vegetation and habitats. While a major pipeline may disturb several hundred acres in total, effects are generally minor at the landscape scale because construction and maintenance activities are dispersed among the much larger physiographic and habitat elements in which they are placed. In addition, field studies conducted prior to design and easement procurement can substantially reduce the potential to adversely affect individual members of Endangered and Threatened species populations, historic and prehistoric sites, and other resources that are present only at particular locations. Where sensitive resources at stream crossings cannot be adequately protected or avoided, boring or tunneling can be considered as construction options to avoid disturbance to aquatic habitats.

Pipeline or well field construction are features of water management strategies that are present in all the Ecoregions. Recharge reservoir or pipeline construction associated with water management strategies L-18a and G-24 (and other facilities located in northern Bexar, Comal, and Hays Counties) have the potential to encounter a number of Endangered and Threatened species occurring in association with the margin of the Edwards Plateau (e.g., golden-cheeked warbler, *Dendroica chrysoparia*) and the Edwards Aquifer or its associated Karst recharge zone and springs. Many of these species are currently being affected by the urban and suburban development of the City of San Antonio and the Interstate Highway 35 corridor, and pipeline construction in these areas should be preceded by consultation with U.S. Fish and Wildlife Service.

The species mapped by the Texas Parks and Wildlife Texas Biological and Conservation Data System maintained by the Texas Parks and Wildlife Department Wildlife Diversity Branch and designated Endangered, and which inhabit extensive areas (or more correctly inhabit fragments of habitat dispersed over a large area) along pipeline alignments in the Coastal Plain, Blackland Prairies, and Central Texas Plains Ecoregions include Attwater's Prairie Chicken (*Tympanuchus cupido attwateri*), Houston Toad (*Bufo houstonensis*), Two-Flower Stickpea (*Calliandra biflora*), and Welder Machaeranthera *(Psilactis heterocarpa*). The relatively large number of protected species mapped within the one mile pipeline corridors associated with water management strategies SCTN-16, SCTN-17, and LCRA Colorado River Diversions include a number of marine species, some of which may be affected by changes in estuarine inflows as a result of diversions from the Guadalupe and Colorado Rivers, or by discharge of reject water (brine) from a desalination facility. Pipeline construction by itself is unlikely to significantly affect any marine species.

The water management strategies that include development of groundwater (CZ-10C, CZ10D, SCTN-3c, SCTN-16, and LCRA Colorado River Diversions) all avoid the potential environmental and cultural resources impacts usually attendant to development of similar volumes of surface water. However, local residents of the areas that would be affected have expressed concerns about declining well levels and potential impacts to springs and streamflows. Hydrogeological studies have indicated that substantial aquifer drawdowns will be largely limited to the vicinity of the well fields and effects on nearby wells can be mitigated. With respect to effects on the flow of springs, and streams crossing the aquifer outcrops, existing information indicates that most of the springs in the vicinity of the Simsboro Aquifer well fields (SCTN-3c) originate in local alluvial aquifers and are presently being impacted by local groundwater users. None have been identified that would be adversely affected by a drawdown in the Simsboro Aquifer. Likewise, hydrogeological and surface water modeling shows that streamflows in the Brazos and Colorado Rivers, and in the intervening streams crossing the Simsboro outcrop, would not be significantly affected by this strategy.

In contrast to the Simsboro Aquifer project, development of groundwater from the Carrizo-Wilcox Aquifer (CZ-10C, CZ-10D) is projected to result in reductions in streamflow in both the San Antonio and Guadalupe Rivers, and in inflows to the Guadalupe Estuary. Proportionally, reductions in flow would be greatest in the middle San Antonio River and least at the Saltwater Barrier (estuary inflows). Unlike the river diversions discussed below, flow reductions resulting from implementation of these options are most pronounced during dry weather to drought conditions, when aquatic communities are most stressed. Potential reductions in Guadalupe and San Antonio River streamflow as a result of groundwater pumpage will be largely offset by enhanced Edwards springflow (L-18a) and increasing treated effluent discharge, respectively.

The large river diversion water management strategies, the Lower Guadalupe River Diversion (SCTN-16) and the LCRA Colorado River Diversion, include diversion of water under existing water rights. SCTN-16 includes unappropriated streamflow for which rights have to be obtained through the state permitting process. Under both strategies, water supplies from off-channel and upstream reservoirs and from newly developed groundwater may be used to insure firm supplies throughout a drought comparable to the most severe on record. The additional water is necessary because the unused water rights and the unappropriated water are either not physically present during low flow periods, are unavailable due to senior water rights demands, or are assigned to environmental streamflow needs. The bulk of these diversions will occur during higher flow periods – when streamflows exceed the monthly medians (for a given month in the period of record, half the time flows were less than the median, and half the time flows were greater than the median), and low flow regimes will be affected to a much lesser degree. Operations of both water management strategies are consistent with the inflow needs outlined in the Inflow Needs Reports for the two estuaries.[21,22]

Water management strategy L-18a includes dams where selected streams cross the Edwards Aquifer recharge zone to increase the amount of water entering the aquifer. Most of the recharge occurs during heavy rains that result in streamflows exceeding the maximum possible recharge rate of the reach over the recharge zone and contributes instead to downstream flow. In addition, most of the time, streambeds in the recharge zone (and for substantial distances downstream) are dry, and streamflows entering the zone are usually well below maximum recharge amounts. Slowing the flow of water in order to increase the amount of time water remains over the recharge zone would increase recharge to the aquifer without substantially impacting stream habitats and populations, because water is not present in most of the stream reaches recommended at frequencies sufficient to support aquatic communities in the recharge and downstream reaches. Because these projects involve natural recharge, no changes in water

[21] Martin, Q., D. Mosier, J. Patek, C. Gorham-Test. 1997. Freshwater Inflow Needs of the Matagorda Bay System. Lower Colorado River Authority, Austin, Texas.
[22] TPWD and TWDB, "Freshwater Inflow Recommendation for the Guadalupe Estuary of Texas," Coastal Studies Technical Report No. 98-1, TPWD and TWDB, Austin, Texas, 1998.

quality are expected. The brief retention times for the impounded water are not expected to significantly alter the types and amounts of suspended and dissolved materials entering the recharge zone.

Major exceptions include the Nueces and Blanco River sites that do ordinarily exhibit surface water and aquatic communities at the proposed recharge sites. However, permanent aquatic habitats are not generally maintained in the Nueces River between US 90 and the “braided reach” of the Nueces River, while the Blanco River joins with the San Marcos River only a few miles below the proposed recharge dam site. Most of the water entering the aquifer from the Blanco River is expected to be discharged from the nearby springs in San Marcos and flow down the San Marcos River. Recharge sites proposed for northern Bexar County may be near caves in which reside populations of endemic invertebrates that may be listed by U.S. Fish and Wildlife Service as Endangered or Threatened, and one site is in Government Canyon State Park.

As a result of diverting flood flows in the upper Nueces River basin into the Edwards Aquifer, thence to the Guadalupe-San Antonio River Basin through enhanced springflows and wastewater discharges, implementation of L-18a would result in small decreases in the firm yield of the Choke Canyon Reservoir/Lake Corpus Christi System and inflows to the Nueces Estuary. At the same time, instream flows would increase in the Guadalupe-San Antonio River Basin, as would inflows to the Guadalupe Estuary.

Several stream segments that contain proposed recharge project sites have been nominated by Texas Parks and Wildlife Department for designation as Ecologically Unique Segments. Table 5.2-23 lists the nominated streams in Region L together with the criteria that were used to select these segments. All of the streams having segments that would have recharge projects (Blanco, Frio, Nueces, and Sabinal) have Edwards Aquifer recharge as a hydrologic criterion. The other criteria tabulated include nomination for inclusion in Texas Natural River Systems, the presence of Garner State Park, overall use, and aesthetics. As the recharge projects are all located at the downstream end of perennial flow, none of the criteria used to nominate these stream segments will be affected adversely. Table 5.2-24 summarizes the potential effects on Ecologically Unique Segments of all the water management strategies included in the Regional Water Plan.

Table 5.2-23.
Criteria Used by TPWD to Nominate Ecologically Unique River and Stream Segments In and Adjacent to the Region L Planning Area

	Biological Function	***Hydrologic Function***	***Riparian Conservation***	***Water Quality Aquatic Life/Uses***	***Threatened and Endangered Species.***
Arenosa Cr.				ecoregion stream	
Blanco R.		Edwards Aquifer Recharge		overall use	
Carpers Cr.				ecoregion stream	
Comal R.		Edwards Aquifer Recharge	Landa Park		multiple spring-dependent species
Cypress Cr.		Edwards Aquifer Recharge		overall use	
Frio R.	Texas Natural River Systems Nominee	Edwards Aquifer Recharge	Garner State Park	overall use, aesthetic	
Garcitas Cr.	Estuarine wetlands			ecoregion stream	diamondback terrapin*
Geronimo Cr.				ecoregion stream	
Guadalupe R., Upper		Edwards Aquifer Recharge	Guadalupe River Park	overall use, #2 scenic river in Texas	
Guadalupe R., Middle					golden orb*
Guadalupe R., Lower	Freshwater and marine wetlands		Victoria Municipal Park Guadalupe Delta WMA	overall use	whooping crane
Honey Cr.			Honey Creek Natural Area		
Mission R.	Freshwater and marine wetlands				
Upper Nueces R.	T. Nat R Systems	Edwards Aquifer Recharge		Aesthetic	
Sabinal R.	T. Nat R Systems	Edwards Aquifer Recharge		Aesthetic	
Upper San Marcos R.			multiple university and city parks	overall use	multiple spring- dependent species
Lower San Marcos R.			Palmetto State Park		
San Miguel Cr.				ecoregion stream	
West Nueces R.		Edwards Aquifer Recharge			
West Verde Cr.			Hill Country Natural Area		
West Carancahua Cr.				ecoregion stream	
Colorado R.-Bastrop				overall use	blue sucker
Tidal Colorado R.	Freshwater and marine wetlands				
Onion Creek				ecoregion stream	

* Not listed as Threatened or Endangered by the State of Texas or U.S. Fish and Wildlife Service

Table 5.2-24
Construction or Operational Activities of Water Management Strategies Potentially Affecting Ecologically Unique River and Stream Segments

Option	Unique Segments Affected	Types of Impacts
SCTN-1a	No impact	
SCTN-2a	No impact	
SCTN-3c	Comal and Colorado Rivers	xing, xing
SCTN-4	No impact	
SCTN-5	No impact	
SCTN-16	Lower Guadalupe River	rdsxu
G-15C	Geronimo Creek and Guadalupe River	xing, lds
G-24	Blanco River	xing
L-10	No impact	
L-15	No impact	
L-18a	Blanco, Frio, Sabinal, and Nueces Rivers	rcp, rci, rci, rcp
CZ-10C	Guadalupe River	gw
CZ-10D	Geronimo Creek, Guadalupe River	Xing, gw
LCRA Colorado River Diversions	Colorado River in Bastrop Co.	cdrdsx
LCRA Colorado River Diversions	Colorado River in Matagorda Co.	cdrdsx
SAWS Recycle	No impact	
Trinity Aquifer Bexar	No impact	
LCRA Colorado River Diversions	West Caranchahua and Garcitas Creeks, Lower Guadalupe and Colorado Rivers	Rd, xing, xing, xing

** Key to Table Entries
rci - recharge dam; median daily flow <0, intermittent impoundment
rcp - recharge dam; median daily flow >0, perennial impoundment
cd – channel dam; diversion pool only
ld – reservoir diversion
rd – river diversion
s=stored water, x=existing run of river rights, u=unappropriated flow, ( )=tributary impoundments
xing-Pipeline crossing
gw – groundwater withdrawals with a significant effect on streamflow
rfp – reduced flood peaks from upstream dam operation
[1] Diversion at Lake Dunlap
[2] Diversion at Gonzales

The cultural resources of Region L include historical markers designated by the Texas Historical Commission. One concentration of markers is located in central Bexar County within the City of San Antonio. Other areas where substantial numbers of historical markers are found within the mile-wide pipeline corridors discussed and assessed in the presentation of individual water management strategies CZ-10C, SCTN-17, LCRA Colorado River Diversions, SCTN-3c, and SCTN-16 in Volume III of this document. Stream terraces, particularly where they are in proximity to a tributary confluence, are thought to have substantially higher probabilities of holding significant archaeological sites than do either floodplains or more upland areas. In addition, terrace and floodplain (riparian) areas are likely to include deep, geologically recent sediments in which archaeological sites may be buried. Finding and investigating such sites can be a lengthy and difficult process, and may significantly affect implementation of options that include reservoir construction or substantial lengths of pipeline in such settings.

Potential environmental and cultural resources impacts associated with water management strategy SCTN-17, desalination of seawater, would result primarily from construction of the facility and its intake, discharge and water delivery pipelines. Field studies conducted prior to design and easement procurement can substantially reduce the potential to adversely affect individual members of Endangered and Threatened species populations, historic and prehistoric sites, and other resources that may be present. Because the reject water (brine) can be 3 to 4 times more saline than seawater, and could amount to as much as 100 acft per day, the outfall will likely need to be sited in the Gulf of Mexico because of potential salinity impacts that may occur in an enclosed estuarine environment.

5.2.6 Implementation Issues

5.2.6.1 Summary of Key Information

Pursuant to TAC 357.7(a)(7), regional water plan development shall include evaluations of water management strategies providing certain key information pursuant to TWDB criteria. Key information regarding the South Central Texas Regional Water Plan is summarized by subject area below. In addition, Table 5.2-25 provides a summary of key information, pursuant to TWDB evaluation criteria, for each water management strategy included in the Regional Water Plan.

Quantity, Reliability, and Cost

- Plan reflects substantial commitment to Municipal and Irrigation Demand Reduction (Conservation) (L-10) throughout the South Central Texas Region, thereby encouraging efficient utilization of existing water supplies and reducing quantities of new supply needed.
- Plan includes reliable new water supplies sufficient to meet projected drought needs for municipal, industrial, steam-electric power, and mining uses through the year 2050.
- Plan recognizes that water management strategies such as brush management, weather modification, rainwater harvesting, and small recharge dams contribute positively to storage and system management of diverse sources of supply.
- Annual costs associated with new supplies delivered to each water user group range from about $120,000,000 dollars early in the planning period to about $420,000,000 in 2040. Unit costs range from $530 per acft to $737 per acft and average $617 per acft or $1.89 per 1,000 gallons over the 50-year planning period.
- During the more immediate planning period extending through 2030, the Regional Water Plan has the least average unit cost of the alternative plans considered.

Environmental Factors

- See Section 5.2.6.2 for summary of environmental benefits and concerns.

Impacts on Water Resources

- Plan implementation results in no unmitigated reductions in water available to existing rights.
- Generally modest long-term reductions in water levels in the Carrizo Aquifer as withdrawals associated with management strategies in the Plan are in conformance with the policies of the Evergreen and Gonzales County Underground Water Conservation Districts.

Impacts on Agricultural and Natural Resources

- Inclusion of water management strategies to meet projected irrigation needs (shortages) in full is estimated to be economically infeasible at this time. Irrigation Demand Reduction

Table 5.2-25. South Central Texas Regional Water Plan – TWDB Evaluation Criteria Summary

Management Strategy	Quantity (acft/yr)[1]	Reliability[2]	Unit Cost ($/acft)[3]	Environmental Factors	Impacts on Water Resources	Impacts on Agricultural and Natural Resources	Other Relevant Factors per SCTRWPG
Municipal Demand Reduction (Conservation) (L-10 Mun.)	44,566	Firm	$173	• None. Supply developed through demand reduction.	• Slight reductions in treated effluent discharge.	• Fewer water management strategies necessary to meet projected needs.	• Conservation is a central element of the Plan.
Irrigation Demand Reduction (Conservation) w/ Transfer (L-10 Irr.)	27,314	Firm	$36	• None. Supply developed through demand reduction.	• Reductions in springflow due to relocation of pumpage closer to springs.	• Installation of LEPA systems on 53 percent of applicable acreage in Uvalde, Medina, & Bexar.	• Consistent with conservation focus of Plan.
Irrigation Demand Reduction (Conservation) (L-10 Irr.)	28,903	Firm	$77	• None. Supply developed through conservation.	• More efficient use of limited water resources.	• Potential to irrigate more acres using less water.	• Recommended to offset projected irrigation needs (shortages) in six counties.
Edwards Irrigation Transfers (L-15)	42,686	Firm	$80	• None. Supply developed without new facilities.	• Reductions in springflow due to relocation of pumpage closer to springs.	• Plan includes 53 percent of potential maximum voluntary transfer through lease or purchase.	• Encourages beneficial use of available rights.
Edwards Recharge – Type 2 Projects (L-18a)	21,577	Firm	$1,087	• Concerns with endangered & threatened species, habitat, and TPWD Ecologically Unique Stream Segments at some sites. • Enhanced springflows help endangered species.	• Limited, as most projects are located on streams that are frequently dry. • Increased aquifer levels and springflows.	• Typically higher aquifer levels in Uvalde & Medina Counties.	• Positive effects on discharges from Comal and San Marcos Springs. • Mitigation of impacts on firm yield of Choke Canyon Res. / Lake Corpus Christi System.
Canyon Reservoir – River Diversion (G-15C)	15,700	Firm	$743	• Minimal. Canyon Reservoir is an existing resource.	• Increased instream flows associated with downstream deliveries of water supply.	• Not applicable.	• Encourages beneficial use of existing reservoir. • Recreational benefits with downstream delivery.
Canyon Reservoir – Wimberley, Woodcreek, & Blanco (G-24)	1,348	Firm	$1,378	• Minimal. Pipeline could encounter endangered or threatened species habitat.	• Minimal, if any.	• Not applicable.	• Encourages beneficial use of existing reservoir.
Lower Guadalupe River Diversion (SCTN-16)	94,500	Firm	$819	• Concerns with endangered & threatened species, habitat, cultural resources, and TPWD Ecologically Unique Stream Segment.	• Some reductions in freshwater inflows to the Guadalupe Estuary associated with greater utilization of existing water rights and diversion of unappropriated flow.	• Minimal, if any.	• Encourages beneficial use of available rights. • Protects instream flows and recreational opportunities through lower basin diversion.
Colorado River Diversions (LCRA)[4]	150,000	Firm	$1,017	• Concerns with endangered & threatened species, habitat, cultural resources, and TPWD Ecologically Unique Stream Segments.	• Reductions in freshwater inflows to Matagorda Bay associated with greater utilization of existing water rights.	• Potential increases in reliable water supply for irrigation and improved irrigation efficiency in Region K.	• Encourages beneficial use of available rights and existing reservoirs. • Determination of equitable cost sharing for development of water supplies in Region K.
Carrizo Aquifer – Wilson & Gonzales (CZ-10C)	16,000	Firm	$781	• Minimal. Pipeline could encounter cultural resource sites.	• Modest long-term reductions in aquifer levels. • Minimal reductions in instream flow at outcrop. • Potential effects on discharge of small springs.	• Minimal, if any.	• Conformance with policies of underground water conservation districts.
Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)	27,500	Firm	$1,044	• Minimal. Pipeline could encounter cultural resource sites.	• Modest long-term reductions in aquifer levels. • Minimal reductions in instream flow at outcrop. • Potential effects on discharge of small springs.	• Minimal, if any.	• Conformance with policies of Gonzales County Underground Water Conservation District. • Planned Bastrop Co. supply exceeds 2030 availability per Region K.
Carrizo Aquifer – Local Supply (SCTN-2a)	14,700	Firm	$386	• Minimal, if any.	• Modest long-term reductions in aquifer levels.	• Minimal, if any.	
Simsboro Aquifer (SCTN-3c)	55,000	Firm	$865	• Concerns with endangered & threatened species, habitat, and cultural resources.	• Long-term reductions in aquifer levels. • Minimal reductions in instream flow at outcrop. • Potential effects on discharge of small springs.	• Minimal, if any.	• Beneficial use of groundwater now unused. • Planned Bastrop Co. supply for Region L exceeds 2030 availability per Region K.
SAWS Recycled Water Program (SAWS)	52,215	Firm	$395	• None. Water supply derived from increased volumes of treated wastewater.	• Minimal, if any.	• Not applicable.	• Encourages beneficial use of available resource.
Purchase of Water From Major Provider (PMP)	14,240	Firm	Variable	• Minimal, if any. Supply developed as part of other water management strategies.	• Minimal, if any.	• Not applicable.	
Desalination of Seawater (SCTN-17)	84,012	Firm	$1,440	• Intake siting and brine discharge location(s). • Potential effects on marine habitat and species. • Pipeline could traverse important habitat.	• No apparent impacts on other water resources. • Potential benefit to demand centers due to increased reclaimed water supply	• Not applicable.	• Perceived to have fewer associated environmental effects than typical fresh surface water supplies.
Aquifer Storage & Recovery (ASR) (SCTN-1a)	Unquantified	Firm	Unquantified	• Minimal. Pipeline could encounter important habitat or encounter cultural resource sites.	• Reduced peak summer pumpage from Edwards Aquifer increases aquifer levels and springflow.	• Not applicable.	• SAWS South Bexar County ASR presently in implementation phase.
Schertz-Seguin Water Supply Project (SSWSP)[5]	20,000	Firm					
Western Canyon Rgnl. Water Supply Proj. (WCRWSP)[5]	10,527	Firm					
Hays/IH35 Water Supply Project (HIH35WSP)[5]	4,500	Firm					
Lake Dunlap WTP Exp. & Mid-Cities Proj. (CRWA)[5]	0	Firm					
Carrizo Aquifer – Bexar & Guadalupe (BMWD)[5]	4,000	Firm					
Trinity Aquifer – Bexar (BMWD)[5]	1,000	Firm					
GBRA Canyon Reservoir Contract Renewal (GBRA)[5]	13,765	Firm					
Brush Management (SCTN-4)	Unquantified	Unknown	Unquantified	• Concerns regarding endangered & threatened species, vegetation & wildlife habitat, and cultural resources.	• Potential benefit to Edwards Aquifer due to increased water for recharge.	• Potential improvement of pasture for grazing.	• Additional studies needed to determine quantity of dependable supply during drought
Weather Modification (SCTN-5)	Unquantified	Unknown	Unquantified	• Potential increases in water supply for wildlife habitat.	• Potential increases in rainfall, runoff, and aquifer recharge.	• Provides water for irrigated and dry-land agriculture (crops & ranching).	• Concerns regarding increased flood potential.
Rainwater Harvesting (SCTN-9)	Unquantified	Unknown	Unquantified	• Minimal, if any.	• Minimal, if any.	• Not applicable.	• Consistent with conservation focus of Plan.
Additional Municipal Reuse Programs	Unquantified	Unknown	Unquantified	• None. Water supply derived from increased volumes of treated wastewater.	• Minimal, if any.	• Not applicable.	• Encourages beneficial use of available resource.
Small Aquifer Recharge Dams	Unquantified	Unknown	Unquantified	• Small potential effects on habitat.	• Potential increases in local aquifer levels.	• Minimal, if any.	
Edwards Aquifer Recharge & Recirculation Systems	Unquantified	Unknown	Unquantified	• Unknown at this time.	• Unknown at this time.	• Unknown at this time.	• Additional feasibility studies necessary. • Implemented only with Plan amendment.
Cooperation w/ Corpus Christi for New Water Sources	Unquantified	Unknown	Unquantified	• Unknown at this time.	• Unknown at this time.	• Unknown at this time.	• Cooperation must be beneficial to both regions.
Additional Storage (ASR and/or Surface)	Unquantified	Unknown	Unquantified	• Unknown at this time.	• Unknown at this time.	• Unknown at this time.	• May be necessary to meet peak drought needs.
Lockhart Reservoir (G-21)	5,627	Firm	$764 @ Reservoir	• Concerns regarding habitat & cultural resources.	• Reduced streamflow immediately below dam.	• Minimal.	• Questions regarding economic feasibility. • Strong local government support.
Total of New Supplies	**744,053**						

Table 5.2-25. South Central Texas Regional Water Plan – TWDB Evaluation Criteria Summary (Continued)

Management Strategy	Comparison of Strategies to Meet Needs	Interbasin Transfer Issues	Third-Party Impacts of Voluntary Transfers	Regional Efficiency	Effect on Navigation
Municipal Demand Reduction (Conservation) (L-10 Mun.)	• Low unit cost. • Inherent environmental benefits.	• Not applicable.	• Not applicable.	• Implementable throughout the region.	• None
Irrigation Demand Reduction (Conservation) w/ Transfer (L-10 Irr.)	• Low unit cost.	• Not applicable.	• Limited transfer allows irrigators to install high efficiency systems so irrigation can continue at present levels and avoid impact to local economy.	• Requires no new facilities other than LEPA equipment on farms.	• None
Irrigation Demand Reduction (Conservation) (L-10 Irr.)	• Potentially feasible management strategy to meet a portion of projected irrigation needs.	• Not applicable.	• Not applicable.	• Recommended specifically for counties having sufficient applicable acreage in irrigation.	• None
Edwards Irrigation Transfers (L-15)	• Low unit cost.	• Not applicable.	• Limited transfer to avoid potential socio-economic impacts to third parties.	• Requires no new facilities.	• None
Edwards Recharge – Type 2 Projects (L-18a)	• Project unit costs range from low to high.	• Not applicable.	• Not applicable.	• Requires no new transmission/treatment facilities.	• None
Canyon Reservoir – River Diversion (G-15C)	• Low to moderate unit cost.	• Not applicable.	• Not applicable.	• Significant additional surface water supply without construction of a new reservoir.	• None
Canyon Reservoir – Wimberley, Woodcreek, & Blanco (G-24)	• High unit cost, but options to meet needs are limited.	• Not applicable.	• Not applicable.	• Additional surface water supply without construction of a new reservoir.	• None
Lower Guadalupe River Diversion (SCTN-16)	• Moderate unit cost.	• Not applicable with diversion facilities located in San Antonio River Basin.	• Not applicable.	• Shared pipeline alignment with other strategies. • Shared water treatment and balancing storage facilities in Bexar County.	• None
Colorado River Diversions (LCRA)[4]	• Moderate to high unit cost.	• TNRCC Interbasin Transfer permit required. • Applicability of Consensus Environmental Criteria to diversions under existing water rights.	• Potential benefits to Lower Colorado River Basin irrigation interests in Region K.	• Shared pipeline alignment with other strategies. • Shared water treatment and balancing storage facilities in Bexar County.	• None
Carrizo Aquifer – Wilson & Gonzales (CZ-10C)	• Moderate unit cost.	• Not applicable.	• Limited transfer to avoid potential socio-economic impacts to third parties.	• New supply proximate to Bexar County.	• None
Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)	• Moderate to high unit cost.	• Not applicable.	• Limited transfer to avoid potential socio-economic impacts to third parties.	• New supply reasonably proximate to Comal and Guadalupe Counties.	• None
Carrizo Aquifer – Local Supply (SCTN-2a)	• Low unit cost.	• Not applicable.	• Not applicable.	• New supply proximate to points of need.	• None
Simsboro Aquifer (SCTN-3c)	• Moderate unit cost.	• Not applicable.	• Limited transfer to avoid potential socio-economic impacts to third parties.	• Beneficial use of groundwater presently produced, but unused.	• None
SAWS Recycled Water Program (SAWS)	• Low to moderate unit cost.	• Not applicable.	• Not applicable.	• New supply proximate to points of need.	• None
Purchase of Water From Major Provider (PMP)	• Low to moderate unit cost.	• Not applicable.	• Not applicable.	• Economy of participation in regional projects.	• None
Desalination of Seawater (SCTN-17)	• High unit cost based on present technology.	• TNRCC Interbasin Transfer permit required.	• Not applicable.	• Shared pipeline alignment with other strategies.	• None
Aquifer Storage & Recovery (ASR) (SCTN-1a)	• Effective means of reducing peak summer pumpage from the Edwards Aquifer.	• Not applicable.	• Not applicable.	• Increases reliability of current supply from the Edwards Aquifer.	• None
Schertz-Seguin Water Supply Project (SSWSP) [5]					
Western Canyon Rgnl. Water Supply Proj. (WCRWSP) [5]					
Hays/IH35 Water Supply Project (HIH35WSP) [5]					
Lake Dunlap WTP Exp. & Mid-Cities Proj. (CRWA) [5]					
Carrizo Aquifer – Bexar & Guadalupe (BMWD) [5]					
Trinity Aquifer – Bexar (BMWD) [5]					
GBRA Canyon Reservoir Contract Renewal (GBRA)[5]					
Brush Management (SCTN-4)	• Insufficient information at this time.	• Not applicable.	• Not applicable.	• May contribute positively to storage and system management of supplies.	• None
Weather Modification (SCTN-5)	• Potentially feasible management strategy to meet a portion of projected irrigation needs.	• Not applicable.	• Not applicable.	• May contribute positively to storage and system management of supplies.	• None
Rainwater Harvesting (SCTN-9)	• High unit cost.	• Not applicable.	• Not applicable.	• Implementable throughout the region.	• None
Additional Municipal Reuse Programs	• Low to moderate unit cost.	• Not applicable.	• Not applicable.	• New supply proximate to points of need.	• None
Small Aquifer Recharge Dams	• High unit cost.	• Not applicable.	• Not applicable.	• Implementable throughout the region.	• None
Edwards Aquifer Recharge & Recirculation Systems	• Insufficient information at this time.	• TNRCC Interbasin Transfer permit required.	• Not applicable.	• Insufficient information at this time.	• None
Cooperation w/ Corpus Christi for New Water Sources	• Insufficient information at this time.	• Unknown at this time.	• Not applicable.	• Multi-regional efficiency is basis for cooperation.	• None
Additional Storage (ASR and/or Surface)	• Effective means of meeting peak needs.	• Unknown at this time.	• Not applicable.	• Potential contribution to regional efficiency.	• None
Lockhart Reservoir (G-21)	• High unit cost.	• Not applicable.	• Not applicable.	• New supply proximate to Lockhart.	• None

Notes:
1) Quantity based on full implementation and utilization of new supplies in year 2050. Total excludes Lockhart Reservoir.
2) Firm reliability indicates that new supply is dependable in a drought of record with full implementation of the Regional Water Plan.
3) Unit cost based on full utilization of supply at ultimate capacity of planned facilities and includes treatment and distribution facilities necessary to meet peak daily needs.
4) On December 14, 2000, late in the planning cycle, additional analysis by Region K of the Colorado River Diversion option with the full application of consensus environmental flow criteria indicated the yield of the project could be reduced by 19,000 acft/yr, resulting in an estimated 131,000 acft/yr of water available for transfer to Region L (Bexar and Hays Counties). The SCTRWPG acknowledges the different yield amounts for this project contained in the Regional Water Plans for Region L and Region K, and acknowledges that the yield of this project may be reduced to 131,000 acft/yr, and that the unit cost could be increased somewhat. This change could affect supplies to Hays County and Bexar County and may necessitate supplying Hays County needs from other sources. However, due to this information being discovered late in the planning cycle, the SCTRWPG decided to retain the project in the Region L Plan with a yield of 150,000 acft/yr; however, this discrepancy between the two regional plans will be addressed early in the next planning cycle. There are adequate "contingency" supplies available within the Region L Plan to compensate for the proposed reduction in yield of the project.
5) Management strategies are in implementation phase.

(Conservation) (L-10 Irr.) through the installation of Low Energy Precision Application (LEPA) systems is recommended to offset a portion of projected irrigation needs (shortages) in six counties.

- Plan includes Brush Management (SCTN-4) and Weather Modification (SCTN-5) which are expected to contribute positively to storage and system management of diverse water management strategies. Weather Modification (SCTN-5) assists irrigation and dry-land agriculture (crops and ranching) and increases water supply for wildlife habitat.
- Plan includes about 53 percent of potential maximum voluntary transfer of Edwards Aquifer irrigation permits to municipal use through lease or purchase.
- Plan includes installation of LEPA systems on about 53 percent of applicable acreage in Uvalde, Medina, and Bexar Counties with conserved water being transferred to municipal use.

Other Relevant Factors per SCTRWPG

- Potential effects of Plan implementation on Edwards Aquifer springflows has been identified as a relevant factor by the South Central Texas Regional Water Planning Group (SCTRWPG). As shown in Section 5.2.3, implementation of Plan is expected to increase discharges from both Comal Springs and San Marcos Springs.
- Flexibility in the phasing and order of implementation of management strategies comprising the Plan has been identified as a relevant factor or concern by the SCTRWPG. Major Water Providers and water user groups need the ability to expedite or reschedule implementation of any specific management strategy as necessary and appropriate.

Comparison of Strategies to Meet Needs

- Selection of water management strategies comprising the Regional Water Plan was based upon guiding principles and assumptions of the SCTRWPG as discussed in Section 6.3.

Interbasin Transfer Issues

- Plan includes at least three potential interbasin transfers: (a) from the Lower Colorado River near Bastrop to Hays County; (b) from the Lower Colorado River near Bay City to Bexar County; and (c) from San Antonio Bay near Seadrift to Bexar County. Interbasin transfer(s) may also be associated with Edwards Aquifer Recharge & Recirculation Systems once this management strategy is more completely defined.
- Projected needs (shortages) in basin(s) of origin are met throughout the planning period.

Third-Party Impacts of Voluntary Redistribution of Water

- Positive effects for municipal water user groups and potentially negative effects upon rural economies associated with Edwards Irrigation Transfers (L-15) and Irrigation Demand Reduction (Conservation) (L-10 Irr.) with Transfers.
- Payment to farmers for voluntary irrigation water transfer provides capital for farmers to install higher efficiency irrigation systems. In many cases, this allows irrigation to continue at present levels so that the transfer does not adversely affect the regional economy.
- Lower water levels in some portions of the Carrizo Aquifer.

Regional Efficiency

- Edwards Irrigation Transfers (L-15) require no new facilities. Transferred water would likely be available at or very near locations having projected municipal, industrial, steam-electric power, and mining needs in Uvalde, Medina, Atascosa, and Bexar Counties.
- Regional water treatment and balancing storage facilities in Bexar County increase efficiency, improve reliability, and reduce unit cost.
- San Antonio Water System Regional Aquifer Storage & Recovery System (SCTN-1a) substantially reduces peak summer pumpage from the Edwards Aquifer.

Effect on Navigation

- Not applicable.

5.2.6.2 Environmental Benefits and Concerns

The South Central Texas Regional Water Planning Group has identified the following environmental benefits and concerns associated with the implementation of the Regional Water Plan.

Environmental Benefits

- Substantial commitment to water conservation through adoption of Texas Water Development Board (TWDB) advanced conservation water demand projections results in fewer water management strategies necessary to meet projected water needs. The South Central Texas Region is the only planning region in the state to adopt the advanced conservation water demand projections.
- Additional commitment to accelerated conservation (above and beyond that in the TWDB's advanced conservation water demand projections) through Demand Reduction (L-10) results in fewer water management strategies necessary to meet projected water needs. Demand Reduction (L-10) accounts for more than 22 percent of the total new water supplies for municipal, industrial, steam-electric, and mining uses in 2010. Even in 2050, Demand Reduction (L-10) accounts for more than 10 percent of the total new water supplies for the referenced uses.
- Development of new water supply sources for Bexar, Comal, and Hays Counties reduces reliance on the Edwards Aquifer during drought thereby contributing to maintenance of springflow and protection of endangered species. The Regional Water Plan recognizes the on-going initiatives of the Edwards Aquifer Authority (EAA) to develop a Habitat Conservation Plan and implement Critical Period Management rules which will help to define the requirements for maintenance of springflow and protection of endangered species.
- Phased implementation of the Regional Water Plan (including timely utilization of Management Supplies) results in increased instream flows in the Guadalupe and San Antonio Rivers and increased freshwater inflows to the Guadalupe Estuary, particularly during the drier months and more extended drought periods.
- Edwards Aquifer Recharge Enhancement through the construction of Type 2 recharge dams (L-18a) contributes not only to municipal water supply, but also to maintenance of

springflow, protection of endangered species, increased instream flows, and increased freshwater inflows to the Guadalupe Estuary.

- The Regional Water Plan makes greatest beneficial use of existing surface water rights and major storage facilities (Canyon Reservoir, Highland Lakes System) thereby minimizing the development of new water supply sources and associated environmental impacts. Examples include reliance on presently under-utilized water rights held by the Guadalupe-Blanco River Authority (GBRA) and Union Carbide Corporation (UCC) below the confluence of the Guadalupe and San Antonio Rivers (SCTN-16) and by the Lower Colorado River Authority (LCRA) on the Lower Colorado River. Enhanced use of existing surface water rights and major storage facilities accounts for more than one third of the total new water supplies for municipal, industrial, steam-electric, and mining uses by 2050.
- The Regional Water Plan avoids large-scale development of new reservoirs having associated terrestrial and aquatic habitat and cultural resources impacts and focuses on smaller, off-channel balancing reservoirs essential for efficient operations and meeting peak seasonal water needs.
- Inclusion of Edwards Aquifer transfers from irrigation use to municipal use through lease/purchase of pumpage rights (L-15) and development of conserved water through installation of LEPA irrigation systems (L-10 Irr.) results in substantial increases in municipal water supply without construction of additional transmission and storage facilities having associated environmental effects.
- The San Antonio Water System (SAWS) goal of meeting 20 percent of projected water demand through its Recycled Water Program makes greatest use of developed water resulting in fewer water management strategies necessary to meet projected water needs.
- Inclusion of modest Carrizo Aquifer groundwater development (CZ-10C, CZ-10D, and SCTN-2a) has minimal associated environmental effects as compared to those typically associated with development of new surface water supplies.
- Inclusion of Desalination of Seawater (SCTN-17) is perceived to have fewer associated environmental effects, as compared to those typically associated with development of new (fresh) surface water supplies.

Environmental Concerns

- Potential reductions in freshwater inflows to bays and estuaries including associated effects on wetland and marsh habitats and marine species are identified as matters of concern. Primary concerns focus upon the potential effects of the New Colorado River Diversion Option (LCRA) on freshwater inflows to Matagorda Bay. Secondary concerns are identified for the Nueces Estuary as a result of implementation of Edwards Recharge—Type 2 Projects (L-18a).
- Concentration of Edwards Aquifer pumpage closer to Comal Springs as a result of implementation of Edwards Irrigation Transfers (L-15) and additional transfers of conserved water developed by installation of LEPA irrigation systems (L-10 Irr.) tends to reduce discharge from Comal Springs.
- Potential conflicts with stream segments identified by TPWD as ecologically significant are associated with the New Lower Colorado River Diversion Option (LCRA), Lower Guadalupe River Diversions (SCTN-16), and Edwards Recharge—Type 2 Projects (L-18a).

- Potential effects on small springs may be associated with the development of groundwater supplies from the Carrizo Aquifer (CZ-10C, CZ-10D, and SCTN-2a) and from the Simsboro Aquifer (SCTN-3c).
- Intake siting, brine discharge location(s), and potential effects on marine habitat and species are environmental concerns associated with Desalination of Seawater (SCTN-17).

5.2.7 Special Water Resources

The Texas Water Development Board has designated Canyon Reservoir and the Medina Lake System as special water resources located within the South Central Texas Regional Water Planning Area (Region L). This designation is pursuant to TAC 357.5 (g) & (h) as surface water supplies from these reservoirs may be obligated to meet demands outside of Region L. Water rights to Canyon Reservoir are held by the Guadalupe-Blanco River Authority (GBRA) which is headquartered in Guadalupe County. Water rights to the Medina Lake System are held by the Bexar-Medina-Atascosa Counties Water Control & Improvement District #1 (BMA) which is headquartered in Medina County. TAC 357.5 (h) requires that "the regional water planning group for the regional water planning area which contains the special water resource shall protect the water rights, water supply contracts, and water supply option agreements associated with the special water resource(s) so that supplies obligated to meet demands outside the regional water planning area shall not be impacted." Present and potential obligations of supplies from these special water resources to meet demands outside Region L are summarized in the following paragraphs.

5.2.7.1 Canyon Reservoir

There is only one current contractural obligation with an entity located outside of Region L for water supply from Canyon Reservoir. This upstream diversion contract is between GBRA and the City of Kerrville and represents a commitment of up to 26 acft/yr from the firm yield of Canyon Reservoir for irrigation use in Kerr County. The South Central Texas Regional Water Plan includes approximately 300 acft/yr from Canyon Reservoir to meet projected needs for the City of Blanco located in Blanco County in the Lower Colorado Regional Water Planning Area (Region K). Pursuant to a Memorandum of Understanding (MOU) between GBRA and the Commissioners' Court of Kerr County, the South Central Texas Regional Water Planning Group (SCTRWPG) recognizes a potential commitment of approximately 2,000 acft/yr from the firm yield of Canyon Reservoir for the calendar years 2021 through 2050. Subject to and conditioned upon the Texas Natural Resource Conservation Commission (TNRCC) granting, in whole, GBRA's application to amend the Canyon water right, this MOU states:

> *Upon request from Kerr County, at any time after January 1, 2021 and prior to December 31, 2050, GBRA will support and assist Kerr County in obtaining from*

the TNRCC permits to divert water from the Guadalupe River or its tributaries at one or more diversion points within Kerr County for use within the County, up to a total diversion of not to exceed 6,000 acft/yr, pursuant to GBRA's then-standard agreement for "upstream sales of water from storage."

GBRA's hydrology studies have indicated that a commitment of 2,000 acft/yr is necessary to allow permits for 6,000 acft/yr to be issued by TNRCC for diversion in Kerr County. No additional supplies from Canyon Reservoir are specifically reserved for entities within the Plateau Regional Water Planning Area (Region J) at this time.

5.2.7.2 Medina Lake System

The South Central Texas Regional Water Plan does not specifically include any supplies from the Medina Lake System to meet present or projected needs for water user groups within Region L or any adjacent planning regions. Simulations using the Guadalupe—San Antonio River Basin Water Availability Model (GSA WAM) indicate that there would be no dependable surface water supply from the Medina Lake System in a repeat of the drought of record if operated in accordance with its current Certificate of Adjudication (19-2130C). It is recognized, however, that the Medina Lake System may supply up to an authorized 66,750 acft for municipal (20,144 acft), irrigation (45,856 acft), and domestic and livestock (750 acft) uses in many years. Most of these supplies are contractually committed to irrigators in Region L and to the Bexar Metropolitan Water District (BMWD). The South Central Texas Regional Water Planning Group (SCTRWPG) recognizes that some supplies from the Medina Lake System may be committed to Region J pursuant to a March 1997 Memorandum of Understanding (MOU) between BMA, BMWD, Bandera County, and the Springhills Water Management District.[23] This MOU indicates that BMA will make up to 5,000 acft/yr available to Bandera County when Medina Lake exceeds 1,035 ft-msl (BMA datum) and up to 1,000 acft/yr when Medina Lake falls below this level. It is assumed that interests upstream of Medina Lake will obtain the necessary water rights permit(s) for diversion from the Medina River and/or its tributaries and will mitigate any associated impacts upon recharge of the Edwards Aquifer within Region L.

[23] Memoram of Understanding to Facilitate Regional Cooperation for the Maximization of Beneficial Development of the Water Resources Available from Medina Lake Pursuant to BMA's Certificate of Adjudication No. 19-2130 and to Settle and Compromise Issues and Disputes Among the Parties, March 19, 1997.

5.3 Water User Group Plans and Costs

In Section 1, the South Central Texas Region was described. In Section 2 projections of population and water demand were presented. In Section 3, existing water supplies were tabulated, and in Section 4, the projected water demands of Section 2 were compared with the existing water supplies of Section 3, and shortages or needs for additional supplies were calculated. It is very important to note that the water needs (shortages) were calculated on the basis of water demands for below average precipitation conditions, with advanced water conservation efforts, and water supplies that can be expected for the drought of record conditions (i.e., dry weather water demands to be met with the worst weather water supply conditions). The case for which the water plan is being developed is, therefore, the "worst case" water demand/supply scenario.

In Sections 5.1 and 5.2, more than 75 water management strategies were identified, described, and evaluated as to quantity of water; total and unit costs of water; environmental effects; effects on state water resources; threats to agricultural and natural resources; recreation; comparison and consistency; interbasin transfers, where appropriate; third party social and economic impacts of voluntary transfers; efficient use of existing supplies; regional opportunities; and effects on navigation. The information from Sections 1, 2, 3, 4, and 5 mentioned above is used in the development of a water plan for the region.

Water management strategies included in the plan to meet the needs of specific water user groups that are projected to have water needs (shortages) include water conservation, aquifer recharge, local groundwater development, and river diversions, while strategies that are not specific to a particular water user group, but instead are strategies for large areas include weather modification and brush management.

The proposed plan to meet the specific needs of municipal, industrial, steam-electric power, and mining water user groups located within the region is to implement water conservation programs to reduce water demands to the extent possible, and develop additional groundwater and surface water supplies located as near as possible to each respective water user to the extent that supplies are available. As local supply development potentials for each respective user group were exhausted, water management strategies located at greater distances from the water users had to be selected, as has been explained earlier.

In the case of the irrigation water user group, the South Central Texas Regional Water Planning Group found that at the present time it is not economically feasible to meet all of the projected irrigation water need (shortage). However, the proposed plan includes the irrigation water conservation strategy to meet as much as possible of the projected irrigation needs of the region. Therefore, each individual irrigation water user will need to install Low Energy Precision Application (LEPA), Low Pressure Spray (LESA), or other efficient irrigation systems which will result in irrigation water savings due to lower irrigation water application requirements.

In the case of "Rural Area Residential and Commercial" water users, the projections have included local surface and groundwater quantities to meet projected needs. However, no specific plans have been formulated to supply the projected quantities of water needed. Instead, it is presumed that those individual households and businesses that are located in rural areas, and rural and investor owned water supply districts, authorities, and companies that operate public water supply systems to serve rural areas will meet these needs either from locally available supplies, or through arrangements to obtain water from other water utilities. In the case of cities that have been incorporated subsequent to 1996, the date the population and water demand projections were made, no specific plans are included. Instead, the needs of these cities remain in the "Rural Area Residential and Commercial" category, where water supplies have been included for them, but no specific plan has been developed.

The detailed plans for each of the 21 counties of the South Central Texas Planning Region are presented in alphabetic order below. In each county plan, each water user group of the county is listed, and demand reduction has been included in the plan for each municipal water user and the irrigation user group, where appropriate. In addition, if the water user group has a need (shortage) during the planning horizon, a water management strategy to meet the need is included, except in the case of irrigated agriculture, for which it has been determined that it is not economically feasible to meet all of the projected needs, as was explained above.

The total unit costs of potable water (surface water treated to regulatory standards for public supply and/or groundwater that meets regulatory standards for public supply), delivered to the water user groups' retail distribution systems were computed as follows. For water user groups whose needs can be met from a single local source by an individual water management strategy that can be scheduled and sized to meet that particular need, such as local groundwater for the City of Carrizo Springs, total and unit costs in Second Quarter 1999 prices are presented for additional wells to be added at the time of the projected need. Costs were calculated in accordance with TWDB Rules and are presented in Volume III and the county tables that follow in Volume I. In this case, and in all cases described below, water treatment and associated facilities were sized to meet peak day demands, which are approximately twice average day demands. Both debt service and operation and maintenance are calculated accordingly.

For water user groups that do not have the potential to adopt readily available individual water management strategies using local sources of supply to meet their individual needs at the time these needs are projected to occur, such as cities of Comal and Hays counties, large scale water management strategies to meet regional needs involving two or more water user groups were selected by the RWPG for inclusion in the regional water plan. In the latter cases, total and unit costs (Second Quarter 1999 prices) were calculated to obtain, convey, treat, and deliver potable water (surface and/or groundwater that meets regulatory standards for public supply) to the respective water user groups' retail distribution systems. As was the case for individual local systems, the costs were computed according to TWDB Rules and are reported in Volume III and are tabulated in the respective county tables of Volume I. However, it was necessary to allocate the costs of these large scale, regional water management strategies among the water user groups they are intended to serve. The allocation procedure was to prorate the total annual costs for debt service to each water user group to be supplied from a water management strategy as is the water user group's proportion or share of quantity obtained from that strategy in 2050, or if a user group takes a larger share of the total capacity of a strategy than is needed by 2050, the total annual share of debt service is based on this larger share or fraction. The water user groups would begin paying their prorata share of annual debt service at the time the strategy is implemented whether or not they begin taking water at that time. The reason for using this principal of dividing debt service among water user groups of a water management strategy is to facilitate the development of a strategy to its relevant size, and to assure that those user groups who need the water will have invested in and thereby reserved their respective shares so that water will be there when needed. In the case of the South Central Texas Region, most water user groups will need, or in many cases, already need the water as soon as the water management strategy can be implemented. It is important to note that individual water user groups could participate in the development of a water management strategy in the cost sharing manner outlined here, and then lease part or all of their respective shares to others until they have grown enough to fully utilize them. Therefore, few, if any user groups would be paying debt service for idle capacity.

Operation and maintenance costs as well as treatment and distribution costs are based solely on the quantity obtained from the water management strategy at the time water is obtained. In the regional plan, operation and maintenance costs are in terms of second quarter 1999 prices, and in accordance with TWDB Rules.

In the case of water to meet the projected needs of the large number of water user groups in Bexar County, it has been assumed that one or more regional providers will implement the large scale, distantly located water management strategies included in the Regional Plan, and since these supplies are needed as soon as possible, the water user groups (customers) will begin paying debt service and operation maintenance costs on the basis of their prorata share of the quantities of water taken. For example, if SAWS implements a strategy, SAWS and its customers will use the water and pay all the costs. If some other supplier implements a strategy, the costs would be prorated among the users on the basis of the proportion of the quantity taken.

The plan recognizes and includes several projects that at this time are in various stages of implementation. An illustration of those included is the Western Canyon regional plan to supply areas of Comal and North Bexar County, including quantities to SAWS and BMWD, Schertz-Seguin, and Canyon Regional Water Authority projects. In the plan, quantities these projects will supply to the water user group(s) that are implementing them are shown, but no costs are shown for these quantities, since the sponsoring user groups have already calculated costs and decided to implement.

5.3.1 Atascosa County Water Supply Plan

Table 5.3.1-1 lists each water user group in Atascosa County and their corresponding surplus or shortage in years 2030 and 2050. For each water user group with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 5.3.1-1.
Atascosa County Surplus/Shortage

Water User Group	Surplus/Shortage[1]		Comment
	2030 (acft/yr)	2050 (acft/yr)	
City of Charlotte	958	900	Projected surplus
City of Jourdanton	1,069	933	Projected surplus
City of Lytle	-514	-628	Projected shortage – see plan below
City of Pleasanton	450	1	Projected surplus
City of Poteet	529	379	Projected surplus
Rural Area Residential and Commercial	764	-10	Projected shortage (2050) – see plan below
Industrial	0	0	No projected demand
Steam-Electric Power	1,496	-8,504	Projected shortage (2040 and 2050) – see plan below
Mining	-995	-1,239	Projected shortage (2030 through 2050) – see plan below
Irrigation	-43,726	-40,713	Projected shortage – see plan below
Livestock	0	0	No projected surplus/shortage

[1] From Table 4-1, Section 4.1 – Water Needs Projections by Water User Group.

5.3.1.1 City of Charlotte

The City of Charlotte is projected to have adequate water supplies available from the Carrizo Aquifer to meet the city's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Charlotte implement the following water supply plan (Table 5.3.1-2).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 30 acft/yr beginning in year 2000, decreasing to 24 acft/yr of supply in 2050 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.1-2.
Recommended Water Supply Plan for the City of Charlotte

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	30	32	34	22	23	24
Total New Supply	30	32	34	22	23	24

The costs of the recommended plan for the City of Charlotte are shown in Table 5.3.1-3.

Table 5.3.1-3.
Recommended Plan Costs by Decade for the City of Charlotte

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$7,845	$7,758	$7,720	$2,284	$2,062	$2,023
Unit Cost ($/acft)	$261	$242	$227	$104	$90	$84

5.3.1.2 City of Jourdanton

The City of Jourdanton is projected to have adequate water supplies available from the Carrizo Aquifer to meet the city's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Jourdanton implement the following water supply plan (Table 5.3.1-4).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 63 acft/yr beginning in year 2000, decreasing to 52 acft/yr of supply in 2050 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.1-4.
Recommended Water Supply Plan for the City of Jourdanton

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	63	68	72	45	48	52
Total New Supply	63	68	72	45	48	52

The costs of the recommended plan for the City of Jourdanton are shown in Table 5.3.1-5.

Table 5.3.1-5.
Recommended Plan Costs by Decade for the City of Jourdanton

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$16,474	$16,485	$16,348	$4,672	$4,303	$4,384
Unit Cost ($/acft)	$261	$242	$227	$104	$90	$84

5.3.1.3 City of Lytle

The City of Lytle's current water supply is obtained from the Edwards Aquifer. The City of Lytle is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Edwards Irrigation Transfers (L-15)
- Carrizo Aquifer – Local Supply (SCTN-2a)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Lytle implement the following water supply plan to meet the projected need for the city (Table 5.3.1-6).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 41 acft/yr beginning in year 2000, increasing to 55 acft/yr of supply in 2050 (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Edwards Irrigation Transfers (L-15) to be implemented in 2000. This project can provide an additional 500 acft/yr from 2000 to 2030 and 700 acft/yr in 2040 and 2050.

Table 5.3.1-6.
Recommended Water Supply Plan for the City of Lytle

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	376	414	447	514	569	628
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	41	44	47	28	53	55
Edwards Irrigation Transfers (L-15)	500	500	500	500	700	700
Total New Supply	541	544	547	528	753	755

The costs of the recommended plan to meet the City of Lytle's projected need are shown in Table 5.3.1-7.

Table 5.3.1-7.
Recommended Plan Costs by Decade for the City of Lytle

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$10,721	$10,667	$10,671	$2,907	$4,751	$4,637
Unit Cost ($/acft)	$261	$242	$227	$104	$90	$84
Edwards Irrigation Transfers (L-15)						
Annual Cost ($/yr)	$47,059	$47,059	$47,059	$47,059	$65,882	$65,882
Unit Cost ($/acft)	$80	$80	$80	$80	$80	$80

5.3.1.4 City of Pleasanton

The City of Pleasanton is projected to have adequate water supplies available from the Carrizo Aquifer to meet the city's projected demands during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Pleasanton implement the following water supply plan (Table 5.3.1-8).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 158 acft/yr beginning in year 2000, decreasing to 140 acft/yr of supply in 2050 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.1-8.
Recommended Water Supply Plan for the City of Pleasanton

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	158	172	185	121	130	140
Total New Supply	158	172	185	121	130	140

The costs of the recommended plan for the City of Pleasanton are shown in Table 5.3.1-9.

Table 5.3.1-9.
Recommended Plan Costs by Decade for the City of Pleasanton

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$41,315	$41,697	$42,004	$12,563	$11,653	$11,802
Unit Cost ($/acft)	$261	$242	$227	$104	$90	$84

5.3.1.5 City of Poteet

The City of Poteet is projected to have adequate water supplies available from the Carrizo Aquifer to meet the city's projected demands during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Poteet implement the following water supply plan (Table 5.3.1-10).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 64 acft/yr beginning in year 2000, decreasing to 48 acft/yr of supply in 2050 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.1-10.
Recommended Water Supply Plan for the City of Poteet

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	64	68	72	43	46	48
Total New Supply	64	68	72	43	46	48

The costs of the recommended plan for the City of Poteet are shown in Table 5.3.1-11.

Table 5.3.1-11.
Recommended Plan Costs by Decade for the City of Poteet

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$16,735	$16,485	$16,348	$4,465	$4,123	$4,046
Unit Cost ($/acft)	$261	$242	$227	$104	$90	$84

5.3.1.6 Rural Area Residential and Commercial

Rural area's current water supply is obtained from the Carrizo Aquifer, Sparta Aquifer, and the Queen City Aquifer. Rural areas are projected to need additional water supplies beginning in the planning year 2030 (San Antonio River Basin). The following options were considered to meet the projected need for rural areas:

- Carrizo Aquifer – Local Supply (SCTN-2a)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that rural area water supply districts and authorities and individual households and/or businesses not served by public water supply systems implement the following water supply plan to meet the projected need for rural areas (Table 5.3.1-12).

- Carrizo Aquifer – Local Supply (SCTN-2a) to be implemented in 2030. This project can provide an additional 5 acft/yr of supply in 2030 and 10 acft/yr of supply in 2040 and 2050.

Table 5.3.1-12.
Recommended Water Supply Plan for Rural Areas

	2000 (acft/yr)	*2010 (acft/yr)*	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*
Projected Need (Shortage)	0	0	0	1	10	10
Recommended Plan						
Carrizo Aquifer – Local Supply (SCTN-2a)				5	10	10
Total New Supply				5	10	10

The costs of the recommended plan to meet the projected need of rural areas are shown in Table 5.3.1-13.

Table 5.3.1-13.
Recommended Plan Costs by Decade for Rural Areas

Plan Element	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*
Carrizo Aquifer – Local Supply (SCTN-2a)						
Annual Cost ($/yr)				$3,055	$3,240	$3,240
Unit Cost ($/acft)				$611	$324	$324

5.3.1.7 Industrial

There is no projected industrial water demand in Atascosa County, therefore no water management strategies are recommended for this water user group.

5.3.1.8 Steam-Electric Power

Steam-electric power's current water supply is obtained from the Carrizo Aquifer, Sparta Aquifer, and the Queen City Aquifer. Steam-electric power is projected to need additional water supplies in the planning year 2040. The following options were considered to meet the steam-electric power projected need:

- Carrizo Aquifer – Local Supply (SCTN-2a)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that individual steam-electric power operations implement the following water supply plan to meet the projected need for steam-electric power (Table 5.3.1-14).

- Carrizo Aquifer – Local Supply (SCTN-2a) to be implemented in 2040. This project can provide an additional 1,600 acft/yr of supply in 2040 and 8,600 acft/yr in 2050.

Table 5.3.1-14.
Recommended Water Supply Plan for Steam-Electric Power

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	1,504	8,504
Recommended Plan						
Carrizo Aquifer – Local Supply (SCTN-2a)					1,600	8,600
Total New Supply					1,600	8,600

The costs of the recommended plan to meet the steam-electric power projected need are shown in Table 5.3.1-15.

Table 5.3.1-15.
Recommended Plan Costs by Decade for Steam-Electric Power

Plan Element	2000	2010	2020	2030	2040	2050
Carrizo Aquifer – Local Supply (SCTN-2a)						
Annual Cost ($/yr)					$518,400	$2,786,400
Unit Cost ($/acft)					$324	$324

5.3.1.9 Mining

Mining's current water supply is obtained from the Carrizo Aquifer, Sparta Aquifer, and the Queen City Aquifer. Mining is projected to need additional water supplies in the planning year 2030. The following options were considered to meet the mining projected need:

- Carrizo Aquifer – Local Supply (SCTN-2a)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that individual mining operations implement the following water supply plan to meet the projected need for mining (Table 5.3.1-16).

- Carrizo Aquifer – Local Supply (SCTN-2a) to be implemented in 2030 which will provide in additional 995 acft/yr of supply in 2030 and 1,390 acft/yr of additional supply in 2040 and 2050.

Table 5.3.1-16.
Recommended Water Supply Plan for Mining

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	995	1,109	1,239
Recommended Plan						
Carrizo Aquifer – Local Supply (SCTN-2a)				995	1,390	1,390
Total New Supply				995	1,390	1,390

The costs of the recommended plan to meet the mining projected need are shown in Table 5.3.1-17.

Table 5.3.1-17.
Recommended Plan Costs by Decade for Mining

Plan Element	2000	2010	2020	2030	2040	2050
Carrizo Aquifer – Local Supply (SCTN-2a)						
Annual Cost ($/yr)				$332,380	$450,360	$450,360
Unit Cost ($/acft)				$324	$324	$324

5.3.1.10 Irrigation

Irrigation's current water supply is obtained from the Edwards Aquifer, Carrizo Aquifer, Sparta Aquifer, Queen City Aquifer, and run-of-river rights. Irrigation is projected to need additional water supplies in the planning year 2000. The following options were considered to meet the irrigation projected need:

- Demand Reduction (Conservation) (L-10 Irr.) (See Section 6, Supplement 2)

Working within the planning criteria established by the SCTRWPG and the TWDB, it has been found that it is not economically feasible to meet all of the projected irrigation needs at this time, since the cost of the water management strategies with enough water supply to meet the needs far exceeds the ability of irrigators to pay for the water. However, the irrigation water conservation option will meet a part of the projected irrigation needs in Atascosa County where further irrigation conservation opportunity exists. It is recommended that individual irrigators implement the following water supply plan to meet a portion of the projected need for irrigation (Table 5.3.1-18).

- Demand Reduction (Conservation) to be implemented in 2000. This project can provide an additional 3,692 acft/yr of supply.

Table 5.3.1-18.
Recommended Water Supply Plan for Irrigation

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	38,418	36,719	35,170	43,726	42,190	40,713
Recommended Plan						
Demand Reduction (Conservation) (L-10 Irr.)	3,692	3,692	3,692	3,692	3,692	3,692
Total New Supply	3,692	3,692	3,692	3,692	3,692	3,692

The costs of the recommended plan to meet the irrigation projected need are shown in Table 5.3.1-19.

Table 5.3.1-19.
Recommended Plan Costs by Decade for Irrigation

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Irr.)						
Annual Cost ($/yr)	$509,754	$509,754	$509,754	$0	$0	$0
Unit Cost ($/acft)	$138	$138	$138	$0	$0	$0

5.3.1.11 Livestock

Livestock is projected to have adequate water supplies available from local sources to meet the water user group's projected demand during the planning period.

5.3.2 Bexar County Water Supply Plan

Table 5.3.2-1 lists each water user group in Bexar County and its corresponding surplus or shortage in years 2030 and 2050. For each water user group with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 5.3.2-1.
Bexar County Surplus/Shortage

Water User Group	Surplus/Shortage[1] 2030 (acft/yr)	Surplus/Shortage[1] 2050 (acft/yr)	Comment
City of Alamo Heights	-1,206	-1,242	Projected shortage – see plan below
City of Balcones Heights	-486	-573	Projected shortage – see plan below
City of China Grove	-240	-312	Projected shortage – see plan below
City of Converse	-3,931	-5,889	Projected shortage – see plan below
City of Elmendorf	-44	-63	Projected shortage – see plan below
City of Fair Oaks Ranch	-1,384	-1,406	Projected shortage – see plan below
City of Helotes	-286	-369	Projected shortage – see plan below
City of Kirby	-1,476	-1,991	Projected shortage – see plan below
City of Leon Valley	-238	-322	Projected shortage – see plan below
Live Oak Water Public Utility	-255	-604	Projected shortage – see plan below
City of Lytle			See Atascosa County
City of Olmos Park	-345	-395	Projected shortage – see plan below
City of San Antonio (SAWS)	-194,684	-273,629	Projected shortage – see plan below
Schertz (Outside City)	-1,310	-1,735	Projected shortage – see plan below
City of Schertz			See Guadalupe County
City of Shavano Park	-819	-929	Projected shortage – see plan below
City of St. Hedwig	129	37	Projected surplus
City of Terrell Hills	-520	-500	Projected shortage – see plan below
City of Universal City	-3,490	-4,826	Projected shortage – see plan below
Windcrest (WC&ID No. 10)	217	173	Projected surplus
BMWD (Castle Hills)	-1,281	-1,246	Projected shortage – see plan below
BMWD (Somerset)	-91	-79	Projected shortage – see plan below
BMWD (Hill Ctry/HollywPk)	-2,606	-3,378	Projected shortage – see plan below
BMWD (Other Subdivisions)	-28,031	-38,617	Projected shortage – see plan below
Fort Sam Houston	-929	-888	Projected shortage – see plan below
Lackland AFB	-729	-698	Projected shortage – see plan below

Table 5.3.2-1 (continued)

Water User Group	Surplus/Shortage[1] 2030 (acft/yr)	Surplus/Shortage[1] 2050 (acft/yr)	Comment
Randolph AFB	-678	-664	Projected shortage – see plan below
Rural Area Residential and Commercial	-26,686	-23,074	Projected shortage – see plan below
Industrial	-1,428	-8,190	Projected shortage – see plan below
Steam-Electric Power	14,428	3,428	Projected surplus
Mining	-5,406	-5,962	Projected shortage – see plan below
Irrigation	-7,883	-5,082	Projected shortage – see plan below
Livestock	0	0	No projected surplus/shortage

[1] From Table 4-2, Section 4.1 – Water Needs Projections by Water User Group.

5.3.2.1 Regional Water Provider(s) for Bexar County

Bexar County represents the major municipal demand center of the South Central Texas Region and encompasses not only the City of San Antonio, but more numerous suburban cities and communities (water user groups). It is apparent that the most economical development of additional water supplies to meet the present and future needs of Bexar County can best be accomplished on a regional, rather than a major provider or city by city, basis. Development of additional water supplies for Bexar County will most likely be accomplished strategy by strategy, with a single sponsor or varying groups of sponsors involved in the cooperative implementation of each major strategy. Hence, for the purposes of this regional water plan, the concept of Regional Water Provider(s) for Bexar County is employed. Designation of Regional Water Provider(s) for Bexar County accounts for the fact that water supplies may be developed by individual sponsors and/or coalitions of sponsors. Furthermore, it ensures the flexibility necessary to facilitate activities of identified major water providers (Section 5.4), water user groups, and others in their independent or collective efforts to develop additional water supplies for Bexar County.

Bexar County's current water supply is obtained from the Edwards Aquifer, Carrizo Aquifer, Trinity Aquifer, Canyon Reservoir, Victor Braunig Lake, Calaveras Lake, the Medina Lake System, Direct Reuse, and run-of-river rights. Bexar County is projected to need additional water supplies beginning in the year 2000. The management strategies listed in Table 5.3.2-2, as well as several variations of these options, were considered to meet the county's projected need.

Table 5.3.2-2
Water Management Strategies Considered for Bexar County

Local/Conservation/Reuse/Exchange
Demand Reduction (Water Conservation) (L-10)
Exchange Reclaimed Water for Edwards Irrigation Water (L-11)
Edwards Irrigation Transfers (L-15)
Exchange SAWS Reclaimed Water for CP&L Rights and GBRA Canyon Contract (L-20)
Brush Management (SCTN-4)
Weather Modification (SCTN-5)
Rainwater Harvesting (SCTN-9)
Gulf Coast Aquifer Exchange for Surface Water Rights (SCTN-12)
Desalination of Seawater (SCTN-17)
Off-Channel Local Storage (SCTN-10)
Edwards Aquifer Recharge
Edwards Recharge – Type 1 Projects (L-17)
Edwards Recharge – Type 2 Projects (L-18)
Medina Lake Recharge Enhancement (S-13B)
Guadalupe River Diversion to Recharge Zone Via Medina Lake (G-30)
Diversion of Canyon Reservoir Flood Storage to Recharge Zone (G-32)
Edwards Aquifer Recharge Enhancement with Guadalupe River Diversions (SCTN-6)
River Diversions with Storage
Guadalupe River Diversions at Gonzales (G-38C)
Lower Guadalupe River Diversions (SCTN-16)
Colorado River in Colorado County (C-17A)
Colorado River in Wharton County (C-17B)
Purchase/Lease Surface Water Irrigation Rights (SCTN-11)
Colorado River Diversion Option (LCRA)
Existing Reservoirs
Joint Development of Water Supply with Corpus Christi (SCTN-14)
Colorado River at Bastrop – Purchase of Stored Water (C-13C)
Potential New Reservoirs
Cibolo Reservoir (S-15)
Goliad Reservoir (S-16C)
Applewhite Reservoir (S-14D)
Sandies Creek Reservoir (G-17C1)
Cuero Reservoir (G-16C1)
Shaws Bend Reservoir (C-18)
Cummins Creek Reservoir (SCTN-15)
Allens Creek Reservoir (B-10C)
Carrizo and Other Aquifers
Carrizo Aquifer – Wilson & Gonzales Counties (CZ-10C)
Carrizo Aquifer – Gonzales & Bastrop Counties (CZ-10D)
Simsboro Aquifer (SCTN-3)
Local Groundwater Supply (SCTN-2)
Aquifer Storage & Recovery (SCTN-1)
Additional Management Strategies
Small Aquifer Recharge Dams
Edwards Aquifer Recharge & Recirculation Systems
Cooperation w/ Corpus Christi for New Water Sources
Additional Storage (ASR and/or Surface)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the Regional Water Provider(s) for Bexar County implement the following water supply plan to meet the projected need for the portions of the county (Table 5.3.2-3).

- Edwards Irrigation Transfers (L-15) to be implemented in 2000. This project can provide an additional 25,000 acft/yr of supply in 2000, increasing to 32,986 acft/yr of additional supply in 2050.
- Demand Reduction (Conservation) (L-10 Irr.) w/Transfer to be implemented in 2000. This project can provide an additional 27,314 acft/yr of additional supply from 2000 through 2050.
- Carrizo Aquifer – Wilson & Gonzales (CZ-10C) to be implemented in 2000. This project can provide an additional 16,000 acft/yr of supply from 2000 through 2050.
- Lower Guadalupe River Diversion (SCTN-16) to be implemented in 2010. This project can provide an additional 94,500 acft/yr of supply.
- Edwards Recharge – Type 2 Projects (L-18a) to be implemented in 2010. This project can provide an additional 13,451 acft/yr of supply in 2010, increasing to 21,577 acft/yr of additional supply in 2050.
- Colorado River Diversion Option (LCRA) to be implemented in 2020. This project can provide an additional 66,000 acft/yr of supply in 2020, increasing to 132,000 acft/yr of additional supply in 2050.
- Desalination of Seawater – 75 MGD (SCTN-17) to be implemented in 2040. This project can provide an additional 56,008 acft/yr in 2040 and 84,012 acft/yr of additional supply in 2050.
- Brush Management
- Weather Modification
- Rainwater Harvesting
- Additional Municipal Recycling (Reuse) Programs
- Small Aquifer Recharge Dams
- Edwards Aquifer Recharge & Recirculation Systems
- Cooperation with Corpus Christi for New Water Sources
- Additional Storage (ASR and/or Surface)

Table 5.3.2-3.
Recommended Water Supply Plan for the Regional Water Provider(s) for Bexar County

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Recommended Plan						
Edwards Irrigation Transfers (L-15)	25,000	32,986	32,986	32,986	32,986	32,986
Demand Reduction (Conservation) (L-10 Irr.) w/Trans.	27,314	27,314	27,314	27,314	27,314	27,314
Carrizo Aquifer – Wilson & Gonzales (CZ-10C)	16,000	16,000	16,000	16,000	16,000	16,000
Lower Guadalupe River Diversions (SCTN-16)		94,500	94,500	94,500	94,500	94,500
Edwards Recharge – Type 2 Projects (L-18a)		13,451	21,577	21,577	21,577	21,577
Colorado River Diversion Option (LCRA)			66,000	132,000	132,000	132,000
Desalination of Seawater – 75 MGD (SCTN-17)					56,008	84,012
Brush Management						
Weather Modification						
Rainwater Harvesting						
Additional Municipal Recycling (Reuse) Programs						
Small Aquifer Recharge Dams						
Edwards Aquifer Recharge & Recirculation Systems						
Cooperation w/ Corpus Christi for New Water Sources						
Additional Storage (ASR and/or Surface)[1]						
Total New Supply	68,314	184,251	258,377	324,377	380,385	408,389

[1] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.

The costs of the recommended plan for the Regional Water Provider(s) for Bexar County are shown in Table 5.3.2-4.

Table 5.3.2-4.
Recommended Plan Costs by Decade for the Regional Water Provider(s) for Bexar County

Plan Element	2000	2010	2020	2030	2040	2050
Edwards Irrigation Transfers (L-15)						
Annual Cost ($/yr)	$2,353,000	$3,104,642	$3,104,642	$3,104,642	$3,104,642	$3,104,642
Unit Cost ($/acft)	$80	$80	$80	$80	$80	$80
Demand Reduction (Conservation) (L-10 Irr.) w/Trans.						
Annual Cost ($/yr)	$992,318	$992,318	$992,318	$0	$0	$0
Unit Cost ($/acft)	$36	$36	$36	$0	$0	$0
Carrizo Aquifer – Wilson & Gonzales (CZ-10C)						
Annual Cost ($/yr)	$12,496,000	$12,496,000	$12,496,000	$6,608,000	$6,608,000	$6,608,000
Unit Cost ($/acft)	$781	$781	$781	$413	$413	$413
Lower Guadalupe River Diversions (SCTN-16)						
Annual Cost ($/yr)		$75,925,080	$77,059,080	$77,437,080	$50,902,425	$47,504,205
Unit Cost ($/acft)		$805	$815	$819	$539	$503
Edwards Recharge – Type 2 Projects (L-18a)						
Annual Cost ($/yr)		$21,893,245	$23,455,062	$23,455,062	$20,843,166	$4,147,099
Unit Cost ($/acft)		$1,628	$1,087	$1,087	$966	$192
Colorado River Diversion Option (LCRA)						
Annual Cost ($/yr)			$88,859,760	$134,163,480	$134,163,480	$96,476,440
Unit Cost ($/acft)			$1,346	$1,016	$1,016	$735
Desalination of Seawater – 75 MGD (SCTN-17)						
Annual Cost ($/yr)					$102,214,600	$120,977,280
Unit Cost ($/acft)					$1,825	$1,440
Additional Storage (ASR and/or Surface)[1]						
Annual Cost ($/yr)	$6,207,500	$5,007,990	$5,007,990	$2,074,280	$92,270	$184,540
Unit Cost ($/acft)	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]

[1] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.
[2] The cost representing additional storage is not calculated on a unit basis because a supply quantity has not been assigned to this management strategy.

5.3.2.2 City of Alamo Heights

The City of Alamo Heights' current water supply is obtained from the Edwards Aquifer. The City of Alamo Heights is projected to need additional water supplies beginning in the year

2000. The options listed in Table 5.3.2-2 were considered to meet the city's projected need (as a part of Bexar County's projected need).

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Alamo Heights implement the following water supply plan to meet the projected need for the city (Table 5.3.2-5).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 122 acft/yr of supply in 2000, decreasing to 66 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County to obtain additional supplies of 1,500 acft/yr by the year 2000.

Table 5.3.2-5.
Recommended Water Supply Plan for the City of Alamo Heights

	2000 (acft/yr)	*2010 (acft/yr)*	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*
Projected Need (Shortage)	1,299	1,232	1,186	1,206	1,228	1,242
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	122	124	127	64	65	66
Purchase/Participate with Regional Water Provider(s)	1,500	1,500	1,500	1,500	1,500	1,500
Total New Supply	1,622	1,624	1,627	1,564	1,565	1,566

The costs of the recommended plan to meet the City of Alamo Heights' projected need are shown in Table 5.3.2-6.

Table 5.3.2-6.
Recommended Plan Costs by Decade for the City of Alamo Heights

Plan Element	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$30,813	$29,409	$29,781	$3,495	$3,339	$3,217
Unit Cost ($/acft)	$253	$237	$234	$55	$51	$49
Purchase/Participate with Regional Water Provider(s)						
Annual Cost ($/yr)	$484,135	$972,200	$1,224,808	$1,141,461	$1,253,711	$1,026,603
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684

5.3.2.3 City of Balcones Heights

The City of Balcones Heights' current water supply is obtained from the Edwards Aquifer. The City of Balcones Heights is projected to need additional water supplies beginning in the year 2000. The options listed in Table 5.3.2-2 were considered to meet the city's projected need (as a part of Bexar County's projected need).

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Balcones Heights implement the following water supply plan to meet the projected need for the city (Table 5.3.2-7).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 58 acft/yr of supply in 2000, decreasing to 41 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County to obtain additional supplies of 500 acft/yr by the year 2000, increasing to 1,000 acft/yr by 2050.

Table 5.3.2-7.
Recommended Water Supply Plan for the City of Balcones Heights

	2000 (acft/yr)	*2010 (acft/yr)*	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*
Projected Need (Shortage)	419	427	447	486	531	573
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	58	61	64	36	39	41
Purchase/Participate with Regional Water Provider(s)	500	500	500	500	1,000	1,000
Total New Supply	558	561	564	536	1,039	1,041

The costs of the recommended plan to meet the City of Balcones Heights' projected need are shown in Table 5.3.2-8.

Table 5.3.2-8.
Recommended Plan Costs by Decade for the City of Balcones Heights

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$14,518	$13,971	$14,261	$1,966	$2,003	$1,998
Unit Cost ($/acft)	$250	$229	$223	$55	$51	$49
Purchase/Participate with Regional Water Provider(s)						
Annual Cost ($/yr)	$161,378	$324,067	$408,269	$380,487	$835,807	$684,402
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684

5.3.2.4 City of China Grove

The City of China Grove's current water supply is obtained from the Edwards Aquifer. The City of China Grove is projected to need additional water supplies beginning in the year 2000. The options listed in Table 5.3.2-2 were considered to meet the city's projected need (as a part of Bexar County's projected need).

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of China Grove implement the following water supply plan to meet the projected need for the city (Table 5.3.2-9).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 20 acft/yr of supply in 2000, decreasing to 19 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1.)
- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County to obtain additional supplies of 500 acft/yr by the year 2000.

Table 5.3.2-9.
Recommended Water Supply Plan for the City of China Grove

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	155	172	189	240	289	312
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	20	22	23	16	18	19
Purchase/Participate with Regional Water Provider(s)	500	500	500	500	500	500
Total New Supply	520	522	523	516	518	519

The costs of the recommended plan to meet the City of China Grove's projected need are shown in Table 5.3.2-10.

Table 5.3.2-10.
Recommended Plan Costs by Decade for the City of China Grove

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$4,900	$4,765	$4,866	$874	$925	$926
Unit Cost ($/acft)	$245	$217	$212	$55	$51	$49
Purchase/Participate with Regional Water Provider(s)						
Annual Cost ($/yr)	$161,378	$324,067	$408,269	$380,487	$417,904	$342,201
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684

5.3.2.5 City of Converse

The City of Converse's current water supply is obtained from the Edwards Aquifer. The City of Converse is projected to need additional water supplies beginning in the year 2000. The options listed in Table 5.3.2-2 were considered to meet the city's projected need (as a part of Bexar County's projected need).

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Converse implement the following water supply plan to meet the projected need for the city (Table 5.3.2-11).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 88 acft/yr of supply in 2000, decreasing to 0 acft/yr of additional supply in 2030. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County to obtain additional supplies of 2,000 acft/yr by the year 2000, increasing to 6,000 acft/yr by 2050.

Table 5.3.2-11.
Recommended Water Supply Plan for the City of Converse

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	1,560	2,270	2,962	3,931	4,798	5,889
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	88	88	88	0	0	0
Purchase/Participate with Regional Water Provider(s)	2,000	2,500	3,000	4,000	5,000	6,000
Total New Supply	2,088	2,588	3,088	4,000	5,000	6,000

The costs of the recommended plan to meet the City of Converse's projected need are shown in Table 5.3.2-12.

Table 5.3.2-12.
Recommended Plan Costs by Decade for the City of Converse

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$35,112	$35,112	$35,112	$0	$0	$0
Unit Cost ($/acft)	$399	$399	$399	$0	$0	$0
Purchase/Participate with Regional Water Provider(s)						
Annual Cost ($/yr)	$645,514	$1,620,334	$2,449,616	$3,043,897	$4,174,037	$4,106,411
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684

5.3.2.6 City of Elmendorf

The City of Elmendorf's current water supply is obtained from the Edwards Aquifer. The City of Elmendorf is projected to need additional water supplies beginning in the year 2000. The options listed in Table 5.3.2-2 were considered to meet the city's projected need (as a part of Bexar County's projected need).

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Elmendorf implement the following water supply plan to meet the projected need for the city (Table 5.3.2-13).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 6 acft/yr of supply in 2000, decreasing to 0 acft/yr of additional supply in 2030. (See Section 6, Supplement 2 and Volume III, Section 1.1).

- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County to obtain additional supplies of 100 acft/yr by the year 2000.

Table 5.3.2-13.
Recommended Water Supply Plan for the City of Elmendorf

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	33	34	34	44	54	63
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	6	6	6	0	0	0
Purchase/Participate with Regional Water Provider(s)	100	100	100	100	100	100
Total New Supply	106	106	106	100	100	100

The costs of the recommended plan to meet the City of Elmendorf's projected need are shown in Table 5.3.2-14.

Table 5.3.2-14.
Recommended Plan Costs by Decade for the City of Elmendorf

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$2,394	$2,394	$2,394	$0	$0	$0
Unit Cost ($/acft)	$399	$399	$399	$0	$0	$0
Purchase/Participate with Regional Water Provider(s)						
Annual Cost ($/yr)	$32,276	$64,813	$81,654	$76,097	$83,581	$68,440
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684

5.3.2.7 City of Fair Oaks Ranch

The City of Fair Oaks Ranch's current water supply is obtained from the Trinity Aquifer. The City of Fair Oaks Ranch is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Western Canyon Regional Water Supply Project
- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Fair Oaks Ranch implement the following water supply plan to meet the projected need for the city (Table 5.3.2-15).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 58 acft/yr in 2000, decreasing to 54 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Western Canyon Regional Water Supply Project to be implemented in 2000. This project can provide an additional 1,400 acft/yr of supply.
- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County to obtain additional supplies of 500 acft/yr by the year 2000.

Table 5.3.2-15.
Recommended Water Supply Plan for the City of Fair Oaks Ranch

	2000 (acft/yr)	*2010 (acft/yr)*	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*
Projected Need (Shortage)	1,442	1,572	1,372	1,384	1,397	1,406
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	58	67	68	52	52	54
Western Canyon Regional Water Supply Project	1,400	1,400	1,400	1,400	1,400	1,400
Purchase/Participate with Regional Water Provider(s)	500	500	500	500	500	500
Total New Supply	1,958	1,967	1,968	1,952	1,952	1,954

The costs of the recommended plan to meet the City of Fair Oaks Ranch's projected need are shown in Table 5.3.2-16.

Table 5.3.2-16.
Recommended Plan Costs by Decade for the City of Fair Oaks Ranch

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$9,485	$8,260	$8,681	$2,130	$2,003	$1,949
Unit Cost ($/acft)	$198	$156	$161	$55	$51	$49
Western Canyon Regional Water Supply Project						
Annual Cost ($/yr)	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*
Unit Cost ($/acft)	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*
Purchase/Participate with Regional Water Provider(s)						
Annual Cost ($/yr)	$161,378	$324,067	$408,269	$380,487	$417,904	$342,201
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684

* This project is currently underway with existing funds, therefore no cost has been projected.

5.3.2.8 City of Helotes

The City of Helotes' current water supply is obtained from the Edwards Aquifer. The City of Helotes is projected to need additional water supplies beginning in the year 2000. The options listed in Table 5.3.2-2 were considered to meet the city's projected need (as a part of Bexar County's projected need).

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Helotes implement the following water supply plan to meet the projected need for the city (Table 5.3.2-17).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 15 acft/yr of supply in 2000, decreasing to 0 acft/yr of additional supply in 2030. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County to obtain additional supplies of 500 acft/yr by the year 2000.

Table 5.3.2-17.
Recommended Water Supply Plan for the City of Helotes

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	152	179	207	286	326	369
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	15	15	15	0	0	0
Purchase/Participate with Regional Water Provider(s)	500	500	500	500	500	500
Total New Supply	515	515	515	500	500	500

The costs of the recommended plan to meet the City of Helotes' projected need are shown in Table 5.3.2-18.

Table 5.3.2-18.
Recommended Plan Costs by Decade for the City of Helotes

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$5,985	$5,985	$5,985	$0	$0	$0
Unit Cost ($/acft)	$399	$399	$399	$0	$0	$0
Purchase/Participate with Regional Water Provider(s)						
Annual Cost ($/yr)	$161,378	$324,067	$408,269	$380,487	$417,904	$342,201
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684

5.3.2.9 City of Kirby

The City of Kirby's current water supply is obtained from the Edwards Aquifer. The City of Kirby is projected to need additional water supplies beginning in the year 2000. The options listed in Table 5.3.2-2 were considered to meet the city's projected need (as a part of Bexar County's projected need).

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Kirby implement the following water supply plan to meet the projected need for the city (Table 5.3.2-19).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 82 acft/yr of supply in 2000, decreasing to 0 acft/yr of additional supply in 2030. (See Section 6, Supplement 2 and Volume III, Section 1.1).

- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County to obtain additional supplies of 1,000 acft/yr by the year 2000, increasing to 2,000 acft/yr by 2050.

Table 5.3.2-19.
Recommended Water Supply Plan for the City of Kirby

	2000 (acft/yr)	*2010 (acft/yr)*	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*
Projected Need (Shortage)	963	1,070	1,216	1,476	1,720	1,991
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	82	82	82	0	0	0
Purchase/Participate with Regional Water Provider(s)	1,000	1,500	1,500	1,500	2,000	2,000
Total New Supply	1,082	1,582	1,582	1,500	2,000	2,000

The costs of the recommended plan to meet the City of Kirby's projected need are shown in Table 5.3.2-20.

Table 5.3.2-20.
Recommended Plan Costs by Decade for the City of Kirby

Plan Element	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$32,718	$32,718	$32,718	$0	$0	$0
Unit Cost ($/acft)	$399	$399	$399	$0	$0	$0
Purchase/Participate with Regional Water Provider(s)						
Annual Cost ($/yr)	$322,757	$972,200	$1,244,808	$1,141,461	$1,671,615	$1,368,804
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684

5.3.2.10 City of Leon Valley

The City of Leon Valley's current water supply is obtained from the Edwards Aquifer. The City of Leon Valley is projected to need additional water supplies beginning in the year 2000. The options listed in Table 5.3.2-2 were considered to meet the city's projected need (as a part of Bexar County's projected need).

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Leon Valley implement the following water supply plan to meet the projected need for the city (Table 5.3.2-21).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 94 acft/yr of supply in 2000, decreasing to 0 acft/yr of additional supply in 2030. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County to obtain additional supplies of 600 acft/yr by the year 2000.

Table 5.3.2-21.
Recommended Water Supply Plan for the City of Leon Valley

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	570	417	240	238	236	322
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	94	94	94	0	0	0
Purchase/Participate with Regional Water Provider(s)	600	600	600	600	600	600
Total New Supply	694	694	694	600	600	600

The costs of the recommended plan to meet the City of Leon Valley's projected need are shown in Table 5.3.2-22.

Table 5.3.2-22.
Recommended Plan Costs by Decade for the City of Leon Valley

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$37,506	$37,506	$37,506	$0	$0	$0
Unit Cost ($/acft)	$399	$399	$399	$0	$0	$0
Purchase/Participate with Regional Water Provider(s)						
Annual Cost ($/yr)	$193,654	$388,880	$489,923	$456,585	$501,484	$410,641
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684

5.3.2.11 Live Oak Water Public Utility

The Live Oak Water Public Utility's current water supply is obtained from the Edwards Aquifer. The Live Oak Water Public Utility is projected to need additional water supplies beginning in the year 2000. The options listed in Table 5.3.2-2 were considered to meet the city's projected need (as a part of Bexar County's projected need).

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the Live Oak Water Public Utility implement the following water supply plan to meet the projected need for the utility (Table 5.3.2-23).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 99 acft/yr of supply in 2000, decreasing to 0 acft/yr of additional supply in 2030. (See Section 6, Supplement 2 and Volume III, Section 1.1)
- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County to obtain additional supplies of 100 acft/yr by the year 2010, increasing to 1,000 acft/yr by 2050.

Table 5.3.2-23.
Recommended Water Supply Plan for the Live Oak Water Public Utility

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	7	84	255	420	604
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	99	99	99	0	0	0
Purchase/Participate with Regional Water Provider(s)	0	100	100	500	500	1,000
Total New Supply	99	199	199	500	500	1,000

The costs of the recommended plan to meet the Live Oak Water Public Utility's projected need are shown in Table 5.3.2-24.

Table 5.3.2-24.
Recommended Plan Costs by Decade for the Live Oak Water Public Utility

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$39,501	$39,501	$39,501	$0	$0	$0
Unit Cost ($/acft)	$399	$399	$399	$0	$0	$0
Purchase/Participate with Regional Water Provider(s)						
Annual Cost ($/yr)		$64,813	$81,654	$380,487	$417,904	$684,402
Unit Cost ($/acft)		$648	$817	$761	$836	$684

5.3.2.12 City of Lytle (See Atascosa County)

5.3.2.13 City of Olmos Park

The City of Olmos Park's current water supply is obtained from the Edwards Aquifer. The City of Olmos Park is projected to need additional water supplies beginning in the year 2000. The options listed in Table 5.3.2-2 were considered to meet the city's projected need (as a part of Bexar County's projected need).

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Olmos Park implement the following water supply plan to meet the projected need for the city (Table 5.3.2-25).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 41 acft/yr of supply in 2000, increasing to 49 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County to obtain additional supplies of 500 acft/yr by the year 2000.

Table 5.3.2-25.
Recommended Water Supply Plan for the City of Olmos Park

	2000 (acft/yr)	***2010 (acft/yr)***	***2020 (acft/yr)***	***2030 (acft/yr)***	***2040 (acft/yr)***	***2050 (acft/yr)***
Projected Need (Shortage)	311	312	322	345	371	395
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	41	43	45	25	48	49
Purchase/Participate with Regional Water Provider(s)	500	500	500	500	500	500
Total New Supply	541	543	545	525	548	549

The costs of the recommended plan to meet the City of Olmos Park's projected need are shown in Table 5.3.2-26.

Table 5.3.2-26.
Recommended Plan Costs by Decade for the City of Olmos Park

Plan Element	***2000***	***2010***	***2020***	***2030***	***2040***	***2050***
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$10,199	$9,799	$9,996	$1,365	$2,466	$2,388
Unit Cost ($/acft)	$249	$228	$222	$55	$51	$49
Purchase/Participate with Regional Water Provider(s)						
Annual Cost ($/yr)	$161,378	$324,067	$408,269	$380,487	$417,904	$342,201
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684

5.3.2.14 City of San Antonio (SAWS)

The City of San Antonio's current water supply is obtained from the Edwards Aquifer and direct reuse. The City of San Antonio is projected to need additional water supplies beginning in the year 2000. The options listed in Table 5.3.2-2 were considered to meet the city's projected need (as a part of Bexar County's projected need).

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of San Antonio implement the following water supply plan to meet the projected need for the city (Table 5.3.2-27).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 29,610 acft/yr of supply in 2000, increasing to 37,555 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Western Canyon Regional Water Supply Project to be implemented in 2000. This project can provide an additional 1,813 acft/yr of supply until 2040, at which time the supply becomes 0 acft/yr.
- Simsboro Aquifer (SCTN-3c) to be implemented in 2000. This project can provide an additional 55,000 acft/yr of supply.
- SAWS Recycled Water Program to be implemented in 2010. This project can provide an additional 19,826 acft/yr of supply in 2010, increasing to 52,215 acft/yr of additional supply in 2050.
- Aquifer Storage & Recovery – Regional (SCTN-1a)
- Act as or cooperate with the Regional Water Provider(s) for Bexar County in the development of some or all of the management strategies listed below in order to obtain additional supplies of 35,114 acft/yr by the year 2000, increasing to 295,189 acft/yr in 2050.
    - Edwards Irrigation Transfers (L-15)
    - Demand Reduction (Conservation) (L-10 Irr.)
    - Carrizo Aquifer – Wilson & Gonzales (CZ-10C)
    - Lower Guadalupe River Diversion (SCTN-16)
    - Edwards Recharge – Type 2 Projects (L-18a)
    - Colorado River Diversion Option (LCRA)
    - Desalination of Seawater – 75 MGD (SCTN-17)
    - Brush Management
    - Weather Modification
    - Rainwater Harvesting
    - Additional Municipal Recycling (Reuse) Programs
    - Small Aquifer Recharge Dams
    - Edwards Aquifer Recharge & Recirculation Systems

- Cooperation with Corpus Christi for New Water Sources
- Additional Storage (ASR and/or Surface)

Table 5.3.2-27.
Recommended Water Supply Plan for the City of San Antonio

	2000 (acft/yr)	*2010 (acft/yr)*	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*
Projected Need (Shortage)	102,394	124,328	154,496	194,684	231,946	273,629
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	29,610	38,185	36,477	33,805	35,710	37,555
Western Canyon Regional Water Supply Project	1,813	1,813	1,813	1,813	0	0
Simsboro Aquifer (SCTN-3c)	55,000	55,000	55,000	55,000	55,000	55,000
SAWS Recycled Water Program		19,826	26,737	35,824	43,561	52,215
Aquifer Storage & Recovery – Regional (SCTN-1a)						
Regional Water Provider(s) (SAWS)*	35,114	140,951	199,577	241,677	277,185	295,189
Total New Supply	121,537	255,775	319,604	368,119	411,456	439,959
***Water Management Strategies to be Developed by the Regional Water Provider(s) for Bexar County**						
Edwards Irrigation Transfers (L-15)						
Demand Reduction (Conservation) (L-10 Irr.)						
Carrizo Aquifer – Wilson & Gonzales (CZ-10C)						
Lower Guadalupe River Diversions (SCTN-16)						
Edwards Recharge – Type 2 Projects (L-18a)						
Colorado River Diversion Option (LCRA)						
Desalination of Seawater – 75 MGD (SCTN-17)						
Brush Management						
Weather Modification						
Rainwater Harvesting						
Additional Municipal Recycling (Reuse) Programs						
Small Aquifer Recharge Dams						
Edwards Aquifer Recharge & Recirculation Systems						
Cooperation w/ Corpus Christi for New Water Sources						
Additional Storage (ASR and/or Surface)[1]						

[1] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.

The costs of the recommended plan to meet the City of San Antonio's projected need are shown in Table 5.3.2-28.

Table 5.3.2-28.
Recommended Plan Costs by Decade for the City of San Antonio

Plan Element	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$5,850,787	$5,951,075	$5,864,082	$1,845,999	$1,834,483	$1,830,288
Unit Cost ($/acft)	$198	$156	$161	$55	$51	$49
Western Canyon Regional Water Supply Project						
Annual Cost ($/yr)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Unit Cost ($/acft)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Simsboro Aquifer (SCTN-3c)						
Annual Cost ($/yr)	$47,590,400	$47,590,400	$47,590,400	$28,029,650	$28,029,650	$28,029,650
Unit Cost ($/acft)	$865	$865	$865	$510	$510	$510
SAWS Recycled Water Program						
Annual Cost ($/yr)		$17,264,566	$17,981,583	$18,924,359	$4,519,454	$5,417,306
Unit Cost ($/acft)		$871	$673	$528	$104	$104
Aquifer Storage & Recovery – Regional (SCTN-1a)						
Annual Cost ($/yr)	$11,762,100	$11,762,100	$11,762,100	$3,389,053	$3,389,053	$3,389,053
Unit Cost ($/acft)	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]
Regional Water Provider(s) (SAWS)*						
Annual Cost ($/yr)	$11,333,287	$91,355,088	$162,962,369	$183,909,974	$231,673,263	$202,027,911
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684
Costs for the Following Management Strategies are Included in the Cost for Regional Water Provider(s) (SAWS)						
Edwards Irrigation Transfers (L-15)						
Demand Reduction (Conservation) (L-10 Irr.)						
Carrizo Aquifer – Wilson & Gonzales (CZ-10C)						
Lower Guadalupe River Diversions (SCTN-16)						
Edwards Recharge – Type 2 Projects (L-18a)						
Colorado River Diversion Option (LCRA)						
Desalination of Seawater – 75 MGD (SCTN-17)						
Additional Storage (ASR and/or Surface)[3]						

[1] This project is currently underway with existing funds, therefore no cost has been projected.
[2] The cost representing aquifer storage & recovery is not calculated on a unit cost basis because a supply quantity has not been assigned to this management strategy.
[3] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.

5.3.2.15 Schertz (Outside City)

Schertz (Outside City's) current water supply is obtained from the Edwards Aquifer. Schertz (Outside City) is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the water user group's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Schertz-Seguin Water Supply Project (Carrizo)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Schertz (Outside City) implement the following water supply plan to meet the projected need for the water user group (Table 5.3.2-29).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 77 acft/yr of supply in 2000, increasing to 84 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Schertz-Seguin Water Supply Project (Carrizo) to be implemented in 2000. This project can provide an additional 2,404 acft/yr of supply.

Table 5.3.2-29.
Recommended Water Supply Plan for Schertz (Outside City)

	2000 (acft/yr)	*2010 (acft/yr)*	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*
Projected Need (Shortage)	674	970	1,098	1,310	1,522	1,735
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	77	84	95	64	73	84
Schertz-Seguin Water Supply Project (Carrizo)*	2,404	2,404	2,404	2,404	2,404	2,404
Total New Supply	2,481	2,488	2,499	2,468	2,477	2,488

*Schertz's share of the Schertz-Seguin Water Supply Project is 10,000 acft/yr. See Table 5.3.11-8 for the remaining 7,596 acft/yr.

The costs of the recommended plan to meet Schertz (Outside City's) projected need are shown in Table 5.3.2-30.

Table 5.3.2-30.
Recommended Plan Costs by Decade for Schertz (Outside City)

Plan Element	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$20,251	$19,804	$20,661	$3,495	$3,750	$4,094
Unit Cost ($/acft)	$263	$236	$217	$55	$51	$49
Schertz-Seguin Water Supply Project						
Annual Cost ($/yr)	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*
Unit Cost ($/acft)	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*

* This project is currently underway with existing funds, therefore no cost has been projected.

5.3.2.16 City of Schertz (See Guadalupe County)

5.3.2.17 City of Shavano Park

The City of Shavano Park's current water supply is obtained from the Edwards Aquifer. The City of Shavano Park is projected to need additional water supplies beginning in the year 2000. The options listed in Table 5.3.2-2 were considered to meet the city's projected need (as a part of Bexar County's projected need).

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Shavano Park implement the following water supply plan to meet the projected need for the city (Table 5.3.2-31).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 34 acft/yr of supply in 2000, decreasing to 25 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County to obtain additional supplies of 1,000 acft/yr by the year 2000.

Table 5.3.2-31.
Recommended Water Supply Plan for the City of Shavano Park

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	675	750	779	819	871	929
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	34	37	39	23	24	25
Purchase/Participate with Regional Water Provider(s)	1,000	1,000	1,000	1,000	1,000	1,000
Total New Supply	1,034	1,037	1,039	1,023	1,024	1,025

The costs of the recommended plan to meet the City of Shavano Park's projected need are shown in Table 5.3.2-32.

Table 5.3.2-32.
Recommended Plan Costs by Decade for the City of Shavano Park

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$8,330	$8,074	$8,265	$1,256	$1,233	$1,218
Unit Cost ($/acft)	$245	$218	$212	$55	$51	$49
Purchase/Participate with Regional Water Provider(s)						
Annual Cost ($/yr)	$322,757	$648,134	$816,539	$760,974	$835,807	$684,402
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684

5.3.2.18 City of St. Hedwig

The City of St. Hedwig is projected to have adequate water supplies available from the Edwards Aquifer to meet the city's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of St. Hedwig implement the following water supply plan (Table 5.3.2-33).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 14 acft/yr beginning in year 2000, decreasing to 0 acft/yr of supply in 2050 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.2-33.
Recommended Water Supply Plan for the City of St. Hedwig

	2000 (acft/yr)	*2010 (acft/yr)*	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	14	14	14	0	0	0
Total New Supply	14	14	14	0	0	0

The costs of the recommended plan for the City of St. Hedwig are shown in Table 5.3.2-34.

Table 5.3.2-34.
Recommended Plan Costs by Decade for the City of St. Hedwig

Plan Element	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$5,586	$5,586	$5,586	$0	$0	$0
Unit Cost ($/acft)	$399	$399	$399	$0	$0	$0

5.3.2.19 City of Terrell Hills

The City of Terrell Hills' current water supply is obtained from the Edwards Aquifer. The City of Terrell Hills is projected to need additional water supplies beginning in the year 2000. The options listed in Table 5.3.2-2 were considered to meet the city's projected need (as a part of Bexar County's projected need).

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Terrell Hills implement the following water supply plan to meet the projected need for the city (Table 5.3.2-35).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 87 acft/yr of supply in 2000, decreasing to 49 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County to obtain additional supplies of 1,000 acft/yr by the year 2000.

Table 5.3.2-35.
Recommended Water Supply Plan for the City of Terrell Hills

	2000 (acft/yr)	*2010 (acft/yr)*	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*
Projected Need (Shortage)	540	506	504	520	513	500
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	87	89	93	49	49	49
Purchase/Participate with Regional Water Provider(s)	1,000	1,000	1,000	1,000	1,000	1,000
Total New Supply	1,087	1,089	1,093	1,049	1,049	1,049

The costs of the recommended plan to meet the City of Terrell Hills' projected need are shown in Table 5.3.2-36.

Table 5.3.2-36.
Recommended Plan Costs by Decade for the City of Terrell Hills

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$21,777	$20,795	$21,190	$2,676	$2,517	$2,388
Unit Cost ($/acft)	$250	$234	$228	$55	$51	$49
Purchase/Participate with Regional Water Provider(s)						
Annual Cost ($/yr)	$322,757	$648,134	$816,539	$760,474	$835,807	$684,402
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684

5.3.2.20 City of Universal City

The City of Universal City's current water supply is obtained from the Edwards Aquifer. The City of Universal City is projected to need additional water supplies beginning in the year 2000. The options listed in Table 5.3.2-2 were considered to meet the city's projected need (as a part of Bexar County's projected need).

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Universal City implement the following water supply plan to meet the projected need for the city (Table 5.3.2-37).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 260 acft/yr of supply in 2000, increasing to 292 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County to obtain additional supplies of 2,500 acft/yr by the year 2000, increasing to 5,000 acft/yr by 2050.

Table 5.3.2-37.
Recommended Water Supply Plan for the City of Universal City

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	2,012	2,374	2,812	3,490	4,117	4,826
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	260	288	321	226	257	292
Purchase/Participate with Regional Water Provider(s)	2,500	2,500	3,000	3,500	4,500	5,000
Total New Supply	2,760	2,788	3,321	3,726	4,757	5,292

The costs of the recommended plan to meet the City of Universal City's projected need are shown in Table 5.3.2-38.

Table 5.3.2-38.
Recommended Plan Costs by Decade for the City of Universal City

Plan Element	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$63,391	$61,735	$64,409	$12,342	$13,202	$14,231
Unit Cost ($/acft)	$244	$214	$201	$55	$51	$49
Purchase/Participate with Regional Water Provider(s)						
Annual Cost ($/yr)	$806,842	$1,620,334	$2,449,616	$2,663,410	$3,761,133	$3,422,099
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684

5.3.2.21 City of Windcrest

The City of Windcrest is projected to have adequate water supplies available from the Edwards Aquifer to meet the city's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Windcrest implement the following water supply plan (Table 5.3.2-39).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 101 acft/yr beginning in year 2000, decreasing to 57 acft/yr of supply in 2050 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.2-39.
Recommended Water Supply Plan for the City of Windcrest

	2000 (acft/yr)	*2010 (acft/yr)*	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	101	103	106	55	56	57
Total New Supply	101	103	106	55	56	57

The costs of the recommended plan for the City of Windcrest are shown in Table 5.3.2-40.

Table 5.3.2-40.
Recommended Plan Costs by Decade for the City of Windcrest

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$25,515	$24,375	$24,718	$3,003	$2,877	$2,778
Unit Cost ($/acft)	$253	$237	$233	$55	$51	$49

5.3.1.3 BMWD (Castle Hills)

BMWD's (Castle Hills) current water supply is obtained from the Edwards Aquifer. BMWD (Castle Hills) is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Act as or cooperate with the Regional Water Provider(s) for Bexar County

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that BMWD (Castle Hills) implement the following water supply plan to meet the projected need for this entity (Table 5.3.2-41).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 82 acft/yr of supply in 2000, decreasing to 47 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Act as or cooperate with the Regional Water Provider(s) for Bexar County in the development of some or all of the management strategies listed below in order to obtain additional supplies of 1,500 acft./yr by the year 2000.
  - Edwards Irrigation Transfers (L-15)
  - Demand Reduction (Conservation) (L-10 Irr.)
  - Carrizo Aquifer – Wilson & Gonzales (CZ-10D)
  - Lower Guadalupe River Diversion (SCTN-16)
  - Edwards Recharge – Type 2 Projects (L-18a)
  - Colorado River Diversion Option (LCRA)
  - Desalination of Seawater – 75 MGD (SCTN-17)
  - Brush Management
  - Weather Modification
  - Rainwater Harvesting
  - Additional Municipal Recycling (Reuse) Programs
  - Small Aquifer Recharge Dams

- Edwards Aquifer Recharge & Recirculation Systems
- Cooperation with Corpus Christi for New Water Sources
- Additional Storage (ASR and/or Surface)

Table 5.3.2-41.
Recommended Water Supply Plan for BMWD (Castle Hills)

	2000 (acft/yr)	*2010 (acft/yr)*	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*
Projected Need (Shortage)	1,209	1,238	1,260	1,281	1,264	1,246
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	82	85	87	47	47	47
Regional Water Provider(s) (BMWD)*	1,500	1,500	1,500	1,500	1,500	1,500
Total New Supply	1,582	1,585	1,587	1,547	1,547	1,547
****Water Management Strategies to be Developed by the Regional Water Provider(s) for Bexar County***						
Edwards Irrigation Transfers (L-15)						
Demand Reduction (Conservation) (L-10 Irr.)						
Carrizo Aquifer – Wilson & Gonzales (CZ-10C)						
Lower Guadalupe River Diversions (SCTN-16)						
Edwards Recharge – Type 2 Projects (L-18a)						
Colorado River Diversion Option (LCRA)						
Desalination of Seawater – 75 MGD (SCTN-17)						
Brush Management						
Weather Modification						
Rainwater Harvesting						
Additional Municipal Recycling (Reuse) Programs						
Small Aquifer Recharge Dams						
Edwards Aquifer Recharge & Recirculation Systems						
Cooperation w/ Corpus Christi for New Water Sources						
Additional Storage (ASR and/or Surface)[1]						

[1] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.

The costs of the recommended plan to meet BMWD's (Castle Hills) projected need are shown in Table 5.3.2-42.

Table 5.3.2-42.
Recommended Plan Costs by Decade for BMWD (Castle Hills)

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$20,090	$19,199	$19,459	$2,567	$2,414	$2,291
Unit Cost ($/acft)	$245	$226	$224	$55	$51	$49
Regional Water Provider(s) (BMWD)*						
Annual Cost ($/yr)	$484,135	$472,200	$1,224,808	$1,141,461	$1,253,711	$1,026,603
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684
Costs for the Following Management Strategies are Included in the Cost for Regional Water Provider(s) (BMWD)						
Edwards Irrigation Transfers (L-15)						
Demand Reduction (Conservation) (L-10 Irr.)						
Carrizo Aquifer – Wilson & Gonzales (CZ-10C)						
Lower Guadalupe River Diversions (SCTN-16)						
Edwards Recharge – Type 2 Projects (L-18a)						
Colorado River Diversion Option (LCRA)						
Desalination of Seawater – 75 MGD (SCTN-17)						
Additional Storage (ASR and/or Surface)[1]						

[1] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.

5.3.2.22 BMWD (Somerset)

BMWD's (Somerset) current water supply is obtained from the new Medina River Water Treatment Plant and/or the Edwards Aquifer. BMWD (Somerset) is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Carrizo Aquifer – Bexar & Guadalupe (BMWD)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that BMWD (Somerset) implement the following water supply plan to meet the projected need for this entity (Table 5.3.2-43).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 21 acft/yr of supply in 2000, decreasing to 10 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Carrizo Aquifer – Bexar & Guadalupe (BMWD) to be implemented in 2000. This project can provide an additional 300 acft/yr of supply.

Table 5.3.2-43.
Recommended Water Supply Plan for BMWD (Somerset)

	2000 (acft/yr)	*2010 (acft/yr)*	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*
Projected Need (Shortage)	121	110	101	91	83	79
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	21	22	22	11	10	10
Carrizo Aquifer – Bexar & Guadalupe (BMWD)	300	300	300	300	300	300
Total New Supply	321	322	322	311	310	310

The costs of the recommended plan to meet BMWD's (Somerset) projected need are shown in Table 5.3.2-44.

Table 5.3.2-44.
Recommended Plan Costs by Decade for BMWD (Somerset)

Plan Element	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$5,299	$5,099	$8,778	$601	$514	$487
Unit Cost ($/acft)	$252	$232	$399	$55	$51	$49
Carrizo Aquifer – Bexar & Guadalupe (BMWD)						
Annual Cost ($/yr)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Unit Cost ($/acft)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]

[1] This project is currently underway with existing funds, therefore no cost has been projected.

5.3.2.23 BMWD (Hill Country Village/Hollywood Park)

BMWD's (Hill Ctry/HollwPk) current water supply is obtained from the Edwards Aquifer. BMWD (Hill Ctry/HollwPk) is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Trinity Aquifer – Bexar (BMWD)
- Act as or cooperate with the Regional Water Provider(s) for Bexar County

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that BMWD (Hill Ctry/HollwPk) implement the following water supply plan to meet the projected need for this entity (Table 5.3.2-45).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 79 acft/yr of supply in 2000, increasing to 82 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Trinity Aquifer – Bexar (BMWD) to be implemented in 2000. This project can provide an additional 1,000 acft/yr of supply.
- Act as or cooperate with the Regional Water Provider(s) for Bexar County in the development of some or all of the management strategies listed below in order to obtain additional supplies of 2,200 acft/yr by the year 2000, increasing to 2,700 acft/yr by 2050.
    - Edwards Irrigation Transfers (L-15)
    - Demand Reduction (Conservation) (L-10 Irr.)
    - Carrizo Aquifer – Wilson & Gonzales (CZ-10D)
    - Lower Guadalupe River Diversion (SCTN-16)
    - Edwards Recharge – Type 2 Projects (L-18a)
    - Colorado River Diversion Option (LCRA)
    - Desalination of Seawater – 75 MGD (SCTN-17)
    - Brush Management
    - Weather Modification
    - Rainwater Harvesting
    - Additional Municipal Recycling (Reuse) Programs
    - Small Aquifer Recharge Dams
    - Edwards Aquifer Recharge & Recirculation Systems
    - Cooperation with Corpus Christi for New Water Sources
    - Additional Storage (ASR and/or Surface)

Table 5.3.2-45.
Recommended Water Supply Plan for BMWD (Hill Ctry/HollwPk)

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	1,694	1,932	2,200	2,606	2,963	3,378
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	79	86	95	65	73	82
Trinity Aquifer – Bexar (BMWD)	1,000	1,000	1,000	1,000	1,000	1,000
Regional Water Provider(s) (BMWD)*	2,200	2,200	2,200	2,200	2,200	2,700
Total New Supply	3,279	3,286	3,295	3,265	3,273	3,782
****Water Management Strategies to be Developed by the Regional Water Provider(s) for Bexar County***						
Edwards Irrigation Transfers (L-15)						
Demand Reduction (Conservation) (L-10 Irr.)						
Carrizo Aquifer – Wilson & Gonzales (CZ-10C)						
Lower Guadalupe River Diversions (SCTN-16)						
Edwards Recharge – Type 2 Projects (L-18a)						
Colorado River Diversion Option (LCRA)						
Desalination of Seawater – 75 MGD (SCTN-17)						
Brush Management						
Weather Modification						
Rainwater Harvesting						
Additional Municipal Recycling (Reuse) Programs						
Small Aquifer Recharge Dams						
Edwards Aquifer Recharge & Recirculation Systems						
Cooperation w/ Corpus Christi for New Water Sources						
Additional Storage (ASR and/or Surface)[1]						

[1] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.

The costs of the recommended plan to meet BMWD's (Hill Ctry/HollwPk) projected need are shown in Table 5.3.2-46.

Table 5.3.2-46.
Recommended Plan Costs by Decade for BMWD (Hill Ctry/HollwPk)

Plan Element	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$18,893	$18,260	$19,003	$3,550	$3,750	$3,996
Unit Cost ($/acft)	$239	$212	$200	$55	$51	$49
Trinity Aquifer – Bexar (BMWD)						
Annual Cost ($/yr)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Unit Cost ($/acft)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Regional Water Provider(s) (BMWD)*						
Annual Cost ($/yr)	$710,065	$1,425,894	$1,796,385	$1,674,143	$1,838,776	$1,847,885
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684
***Costs for the Following Management Strategies are Included in the Cost for Regional Water Provider(s) (BMWD)**						
Edwards Irrigation Transfers (L-15)						
Demand Reduction (Conservation) (L-10 Irr.)						
Carrizo Aquifer – Wilson & Gonzales (CZ-10C)						
Lower Guadalupe River Diversions (SCTN-16)						
Edwards Recharge – Type 2 Projects (L-18a)						
Colorado River Diversion Option (LCRA)						
Desalination of Seawater – 75 MGD (SCTN-17)						
Additional Storage (ASR and/or Surface)[2]						

[1] This project is currently underway with existing funds, therefore no cost has been projected.
[2] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.

5.3.2.24 BMWD (Other Subdivisions)

BMWD's (Other Subdivisions) current water supply is obtained from the Edwards Aquifer, Trinity Aquifer, Carrizo Aquifer, Canyon Reservoir, and run-of-river rights. BMWD (Other Subdivisions) is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Carrizo Aquifer – Bexar & Guadalupe (BMWD)

- Trinity Aquifer – Bexar (BMWD)
- Western Canyon Regional Water Supply Project
- Lake Dunlap WTP Expansion & Mid-Cities Water Transmission System
- Act as or cooperate with the Regional Water Provider(s) for Bexar County

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that BMWD (Other Subdivisions) implement the following water supply plan to meet the projected need for this water user group (Table 5.3.2-47).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 2,102 acft/yr of additional supply in 2000, increasing to 2,518 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Carrizo Aquifer – Bexar & Guadalupe (BMWD) to be implemented in 2000. This project can provide an additional 3,700 acft/yr of supply.
- Western Canyon Regional Water Supply Project to be implemented in 2000. This project can provide an additional 2,137 acft/yr of supply until 2040, at which time the supply become 0 acft/yr.
- Lake Dunlap WTP Expansion & Mid-Cities Water Transmission System to be implemented in 2000. This project can provide an additional 4,000 acft/yr of supply through 2020.
- Act as or cooperate with the Regional Water Provider(s) for Bexar County in the development of some or all of the management strategies listed below in order to obtain additional supplies of 6,300 acft/yr by the year 2000, increasing to 35,300 acft/yr by 2050.
  - Edwards Irrigation Transfers (L-15)
  - Demand Reduction (Conservation) (L-10 Irr.)
  - Carrizo Aquifer – Wilson & Gonzales (CZ-10C)
  - Lower Guadalupe River Diversion (SCTN-16)
  - Edwards Recharge – Type 2 Projects (L-18a)
  - Colorado River Diversion Option (LCRA)
  - Desalination of Seawater – 75 MGD (SCTN-17)
  - Brush Management
  - Weather Modification
  - Rainwater Harvesting
  - Additional Municipal Recycling (Reuse) Programs
  - Small Aquifer Recharge Dams
  - Edwards Aquifer Recharge & Recirculation Systems
  - Cooperation with Corpus Christi for New Water Sources
  - Additional Storage (ASR and/or Surface)

Table 5.3.2-47.
Recommended Water Supply Plan for BMWD (Other Subdivisions)

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	9,795	15,820	21,637	28,031	34,706	38,617
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	2,102	2,440	2,774	2,007	2,327	2,518
Carrizo Aquifer – Bexar & Guadalupe (BMWD)	3,700	3,700	3,700	3,700	3,700	3,700
Western Canyon Regional Water Supply Project	2,137	2,137	2,137	2,137	0	0
Lake Dunlap WTP Expansion & Mid-Cities Water Transmission System (CRWA)	4,000	4,000	0	0	0	0
Regional Water Provider(s) (BMWD)*	6,300	12,300	16,300	24,300	31,300	35,300
Total New Supply	18,239	24,577	24,911	32,144	37,327	41,518
Water Management Strategies to be Developed by the Regional Water Provider(s) for Bexar County						
Edwards Irrigation Transfers (L-15)						
Demand Reduction (Conservation) (L-10 Irr.)						
Carrizo Aquifer – Wilson & Gonzales (CZ-10C)						
Lower Guadalupe River Diversions (SCTN-16)						
Edwards Recharge – Type 2 Projects (L-18a)						
Colorado River Diversion Option (LCRA)						
Desalination of Seawater – 75 MGD (SCTN-17)						
Brush Management						
Weather Modification						
Rainwater Harvesting						
Additional Municipal Recycling (Reuse) Programs						
Small Aquifer Recharge Dams						
Edwards Aquifer Recharge & Recirculation Systems						
Cooperation w/ Corpus Christi for New Water Sources						
Additional Storage (ASR and/or Surface)[1]						

[1] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.

The costs of the recommended plan to meet BMWD's (Other Subdivisions) projected need are shown in Table 5.3.2-48.

Table 5.3.2-48.
Recommended Plan Costs by Decade for BMWD (Other Subdivisions)

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$522,064	$516,704	$543,083	$109,600	$119,539	$122,718
Unit Cost ($/acft)	$248	$212	$196	$55	$51	$49
Carrizo Aquifer – Bexar & Guadalupe (BMWD)						
Annual Cost ($/yr)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Unit Cost ($/acft)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Western Canyon Regional Water Supply Project						
Annual Cost ($/yr)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Unit Cost ($/acft)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Lake Dunlap WTP Expansion & Mid-Cities Water Transmission System (CRWA)						
Annual Cost ($/yr)	N/A[1]	N/A[1]				
Unit Cost ($/acft)	N/A[1]	N/A[1]				
Regional Water Provider(s) (BMWD)*						
Annual Cost ($/yr)	$2,033,369	$7,972,044	$13,309,583	$18,491,674	$26,160,770	$24,159,387
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684
Costs for the Following Management Strategies are Included in the Cost for Regional Water Provider(s) (BMWD)						
Edwards Irrigation Transfers (L-15)						
Demand Reduction (Conservation) (L-10 Irr.)						
Carrizo Aquifer – Wilson & Gonzales (CZ-10C)						
Lower Guadalupe River Diversions (SCTN-16)						
Edwards Recharge – Type 2 Projects (L-18a)						
Colorado River Diversion Option (LCRA)						
Desalination of Seawater – 75 MGD (SCTN-17)						
Additional Storage (ASR and/or Surface)[2]						

[1] This project is currently underway with existing funds, therefore no cost has been projected.
[2] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.

5.3.2.25 Fort Sam Houston

Fort Sam Houston's current water supply is obtained from the Edwards Aquifer. Fort Sam Houston is projected to need additional water supplies beginning in the year 2000. The options listed in Table 5.3.2-2 were considered to meet the city's projected need (as a part of Bexar County's projected need).

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Fort Sam Houston implement the following water supply plan to meet the projected need for this entity (Table 5.3.2-49).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 118 acft/yr of supply in 2000, decreasing to 0 acft/yr of additional supply in 2030. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County to obtain additional supplies of 1,500 acft/yr by the year 2000.

Table 5.3.2-49.
Recommended Water Supply Plan for Fort Sam Houston

	2000 (acft/yr)	*2010 (acft/yr)*	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*
Projected Need (Shortage)	1,453	1,184	955	929	902	888
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	118	118	118	0	0	0
Purchase/Participate with Regional Water Provider(s)	1,500	1,500	1,500	1,500	1,500	1,500
Total New Supply	1,618	1,618	1,618	1,500	1,500	1,500

The costs of the recommended plan to meet Fort Sam Houston's projected need are shown in Table 5.3.2-50.

Table 5.3.2-50.
Recommended Plan Costs by Decade for Fort Sam Houston

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$47,082	$47,082	$47,082	$0	$0	$0
Unit Cost ($/acft)	$399	$399	$399	$0	$0	$0
Purchase/Participate with Regional Water Provider(s)						
Annual Cost ($/yr)	$484,135	$972,200	$1,224,808	$1,141,461	$1,253,711	$1,026,603
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684

5.3.2.26 Lackland AFB

Lackland AFB's current water supply is obtained from the Edwards Aquifer. Lackland AFB is projected to need additional water supplies beginning in the year 2000. The options listed in Table 5.3.2-2 were considered to meet the city's projected need (as a part of Bexar County's projected need).

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Lackland AFB implement the following water supply plan to meet the projected need for this entity (Table 5.3.2-51).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 92 acft/yr of supply in 2000, decreasing to 0 acft/yr of additional supply in 2030. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County to obtain additional supplies of 1,500 acft/yr by the year 2000.

Table 5.3.2-51.
Recommended Water Supply Plan for Lackland AFB

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	1,222	970	750	729	708	698
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	92	92	92	0	0	0
Purchase/Participate with Regional Water Provider(s)	1,500	1,500	1,500	1,500	1,500	1,500
Total New Supply	1,592	1,592	1,592	1,500	1,500	1,500

The costs of the recommended plan to meet Lackland AFB's projected need are shown in Table 5.3.2-52.

Table 5.3.2-52.
Recommended Plan Costs by Decade for Lackland AFB

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$36,708	$36,708	$36,708	$0	$0	$0
Unit Cost ($/acft)	$399	$399	$399	$0	$0	$0
Purchase/Participate with Regional Water Provider(s)						
Annual Cost ($/yr)	$484,135	$972,200	$1,224,808	$1,141,461	$1,253,711	$1,026,603
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684

5.3.2.27 Randolph AFB

Randolph AFB's current water supply is obtained from the Edwards Aquifer. Randolph AFB is projected to need additional water supplies beginning in the year 2000. The options listed in Table 5.3.2-2 were considered to meet the city's projected need (as a part of Bexar County's projected need).

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Randolph AFB implement the following water supply plan to meet the projected need for this entity (Table 5.3.2-53).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 39 acft/yr of supply in 2000, decreasing to 0 acft/yr of additional supply in 2030. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County to obtain additional supplies of 1,000 acft/yr by the year 2000.

Table 5.3.2-53.
Recommended Water Supply Plan for Randolph AFB

	2000 (acft/yr)	*2010 (acft/yr)*	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*
Projected Need (Shortage)	906	790	687	678	673	664
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	39	39	39	0	0	0
Purchase/Participate with Regional Water Provider(s)	1,000	1,000	1,000	1,000	1,000	1,000
Total New Supply	1,039	1,039	1,039	1,000	1,000	1,000

The costs of the recommended plan to meet Randolph AFB's projected need are shown in Table 5.3.2-54.

Table 5.3.2-54.
Recommended Plan Costs by Decade for Randolph AFB

Plan Element	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$15,561	$15,561	$15,561	$0	$0	$0
Unit Cost ($/acft)	$399	$399	$399	$0	$0	$0
Purchase/Participate with Regional Water Provider(s)						
Annual Cost ($/yr)	$322,757	$648,134	$816,539	$760,474	$835,807	$684,402
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684

5.3.2.28 Rural Area Residential and Commercial

Rural area's current water supply is obtained from the Edwards Aquifer, Carrizo Aquifer, Trinity Aquifer, and Canyon Reservoir. Rural areas are projected to need additional water supplies beginning in the year 2000. The options listed in Table 5.3.2-2 were considered to meet the water user group's projected need (as a part of Bexar County's projected need).

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that rural area water supply districts and authorities and individual households and/or businesses not served by public water supply systems implement the following water supply plan to meet the projected need for rural areas (Table 5.3.2-55).

- Western Canyon Regional Water Supply Project to be implemented in 2000. This project can provide an additional 50 acft/yr of supply until 2040, at which time the supply becomes 0 acft/yr.
- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County to obtain additional supplies of 2,000 acft/yr by the year 2000, increasing to 34,000 acft/yr by 2050.
- Lake Dunlap WTP Expansion & Mid-Cities Water Transmission System to be implemented in 2000. This project can provide an additional 1,200 acft/yr of supply until 2020, then decrease to 0 acft/yr in 2020.

Table 5.3.2-55.
Recommended Water Supply Plan for Rural Areas

	2000 (acft/yr)	*2010 (acft/yr)*	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*
Projected Need (Shortage)	2,211	5,197	10,214	26,686	33,892	23,074
Recommended Plan						
Western Canyon Regional Water Supply Project	50	50	50	50	0	0
Purchase/Participate with Regional Water Provider(s)	2,000	5,000	15,000	27,000	34,000	34,000
Lake Dunlap WTP Expansion & Mid-Cities Water Transmission System (CRWA)	1,200	1,200	0	0	0	0
Total New Supply	3,250	6,250	15,050	27,050	34,000	34,000

The costs of the recommended plan to meet rural areas projected need are shown in Table 5.3.2-56.

Table 5.3.2-56.
Recommended Plan Costs by Decade for Rural Areas

Plan Element	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*
Western Canyon Regional Water Supply Project						
Annual Cost ($/yr)	N/A[1]	N/A[1]	N/A[1]	N/A[1]		
Unit Cost ($/acft)	N/A[1]	N/A[1]	N/A[1]	N/A[1]		
Purchase/Participate with Regional Water Provider(s)						
Annual Cost ($/yr)	$645,514	$3,240,668	$12,248,082	$20,546,305	$28,417,450	$23,269,664
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684
Lake Dunlap WTP Expansion & Mid-Cities Water Transmission System (CRWA)						
Annual Cost ($/yr)	N/A[1]	N/A[1]				
Unit Cost ($/acft)	N/A[1]	N/A[1]				
[1] This project is currently underway with existing funds, therefore no cost has been projected.						

5.3.2.29 Industrial

Industrial's current water supply is obtained from the Edwards Aquifer, Carrizo Aquifer, Trinity Aquifer, run-of-river rights, and direct reuse. Industrial is projected to need additional water supplies beginning in the planning year 2030. The following options were considered to meet industrial's projected need:

- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that individual industrial operations implement the following water supply plan to meet the projected need for industrial (Table 5.3.2-57).

- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County to obtain additional supplies of 2,000 acft/yr by the year 2030, increasing to 8,500 acft/yr by 2050.

Table 5.3.2-57.
Recommended Water Supply Plan for Industrial

	2000 (acft/yr)	*2010 (acft/yr)*	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*
Projected Need (Shortage)	0	0	0	1,428	4,757	8,190
Recommended Plan						
Purchase/Participate with Regional Water Provider(s)				2,000	5,000	8,500
Total New Supply				2,000	5,000	8,500

The costs of the recommended plan to meet industrial's projected need are shown in Table 5.3.2-58.

Table 5.3.2-58.
Recommended Plan Costs by Decade for Industrial

Plan Element	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*
Purchase/Participate with Regional Water Provider(s)						
Annual Cost ($/yr)				$1,521,948	$4,179,037	$5,817,416
Unit Cost ($/acft)				$761	$836	$648

5.3.2.30 Steam-Electric Power

Steam-electric power is projected to have adequate water supplies available from Victor Braunig Lake and Calaveras Lake to meet the water user group's projected demand during the planning period.

5.3.2.31 Mining

Mining's current water supply is obtained from the Carrizo Aquifer and Trinity Aquifer. Mining is projected to need additional water supplies in the planning year 2000. The following options were considered to meet the mining projected need:

- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that individual mining operations implement the following water supply plan to meet the projected need for mining (Table 5.3.2-59).

- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County to obtain additional supplies of 5,000 acft/yr in 2000, increasing to 6,000 acft/yr in 2050.

Table 5.3.2-59.
Recommended Water Supply Plan for Mining

	2000 (acft/yr)	*2010 (acft/yr)*	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*
Projected Need (Shortage)	4,963	4,936	5,201	5,406	5,645	5,962
Recommended Plan						
Purchase/Participate with Regional Water Provider(s)	5,000	5,000	5,500	5,500	6,000	6,000
Total New Supply	5,000	5,000	5,500	5,500	6,000	6,000

The costs of the recommended plan to meet the mining projected need are shown in Table 5.3.2-60.

Table 5.3.2-60.
Recommended Plan Costs by Decade for Mining

Plan Element	2000	2010	2020	2030	2040	2050
Purchase/Participate with Regional Water Provider(s)						
Annual Cost ($/yr)	$1,613,785	$3,240,668	$4,490,964	$4,185,358	$5,014,849	$4,106,411
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684

5.3.2.32 Irrigation

Irrigation's current water supply is obtained from the Edwards Aquifer, Carrizo Aquifer, Trinity Aquifer, and run-of-river rights. Irrigation is projected to need additional water supplies in the planning year 2000. The following options were considered to meet the irrigation projected need:

- Demand Reduction (Conservation) (L-10 Irr.) (See Section 6, Supplement 2)

Working within the planning criteria established by the SCTRWPG and the TWDB, it has been found that it is not economically feasible to meet all of the projected irrigation needs at this time, since the cost of the water management strategies with enough water supply to meet the needs far exceeds the ability of irrigators to pay for the water. However, the irrigation water conservation option will meet a part of the projected irrigation needs in Bexar County where further irrigation conservation opportunity exists. It is recommended that individual irrigators implement the following water supply plan to meet a portion of the projected need for irrigation (Table 5.3.2-61).

- Demand Reduction (Conservation) to be implemented in 2000. This project can provide an additional 1,905 acft/yr of supply.

Table 5.3.2-61.
Recommended Water Supply Plan for Irrigation

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	14,059	10,935	9,376	7,883	6,453	5,082
Recommended Plan						
Demand Reduction (Conservation) (L-10 Irr.)	1,905	1,905	1,905	1,905	1,905	1,905
Total New Supply	1,905	1,905	1,905	1,905	1,905	1,905

The costs of the recommended plan to meet the irrigation projected need are shown in Table 5.3.2-62.

Table 5.3.2-62.
Recommended Plan Costs by Decade for Irrigation

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Irr.)						
Annual Cost ($/yr)	$69,209	$69,209	$69,209	$0	$0	$0
Unit Cost ($/acft)	$36	$36	$36	$0	$0	$0

5.3.2.33 Livestock

Livestock is projected to have adequate water supplies available from local sources to meet the water user group's projected demand during the planning period.

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5.3.3 Caldwell County Water Supply Plan

Table 5.3.3-1 lists each water user group in Caldwell County and their corresponding surplus or shortage in years 2030 and 2050. For each water user group with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 5.3.3-1.
Caldwell County Surplus/Shortage

Water User Group	Surplus/Shortage[1] 2030 (acft/yr)	Surplus/Shortage[1] 2050 (acft/yr)	Comment
City of Lockhart	-668	-737	Projected shortage – see plan below
City of Luling	585	10	Projected surplus
City of Martindale	149	135	Projected surplus
Rural Area Residential and Commercial	383	1,173	Projected surplus
Industrial	10	0	Projected surplus
Steam-Electric Power	0	0	No projected demand
Mining	0	0	No projected surplus/shortage
Irrigation	72	68	Projected surplus
Livestock	0	0	No projected surplus/shortage

[1] From Table 4-3, Section 4.1 – Water Needs Projections by Water User Group.

5.3.3.1 City of Lockhart

The City of Lockhart's current water supply is obtained from the Carrizo Aquifer. The City of Lockhart is projected to need additional water supplies beginning in the planning year 2010. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Carrizo Aquifer – Local Supply (SCTN-2a)
- Lockhart Reservoir (G-21) (See Section 6.2.2)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Lockhart implement the following water supply plan to meet the projected need for the city (Table 5.3.3-2).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 91 acft/yr of supply in 2000, decreasing to 0 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).

- Carrizo Aquifer – Local Supply (SCTN-2a) to be implemented in 2010. This project can provide an additional 500 acft/yr of supply in 2010 and 2020 and an additional 1,000 acft/yr of supply from 2030 through 2050.

Table 5.3.3-2.
Recommended Water Supply Plan for the City of Lockhart

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	188	393	668	714	737
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	91	91	91	0	0	0
Carrizo Aquifer – Local Supply (SCTN-2a)		500	500	1,000	1,000	1,000
Total New Supply	91	591	591	1,000	1,000	1,000

The costs of the recommended plan to meet the City of Lockhart's projected need are shown in Table 5.3.3-3.

Table 5.3.3-3.
Recommended Plan Costs by Decade for the City of Lockhart

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$36,491	$36,491	$36,491	$0	$0	$0
Unit Cost ($/acft)	$401	$401	$401	$0	$0	$0
Carrizo Aquifer – Local Supply (SCTN-2a)						
Annual Cost ($/yr)		$487,000	$487,000	$974,000	$938,500	$938,500
Unit Cost ($/acft)		$974	$974	$974	$939	$939

5.3.3.2 City of Luling

The City of Luling is projected to have adequate water supplies available from the Carrizo Aquifer and run-of-river rights to meet the city's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Luling implement the following water supply plan (Table 5.3.3-4).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 94 acft/yr of supply in 2000, increasing to 104 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.3-4.
Recommended Water Supply Plan for the City of Luling

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	94	105	117	82	93	104
Total New Supply	94	105	117	82	93	104

The costs of the recommended plan for the City of Luling are shown in Table 5.3.3-5.

Table 5.3.3-5.
Recommended Plan Costs by Decade for the City of Luling

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$44,931	$44,931	$44,931	$26,485	$26,485	$26,485
Unit Cost ($/acft)	$478	$428	$384	$323	$285	$255

5.3.3.3 City of Martindale

The City of Martindale is projected to have adequate water supplies available from Canyon Reservoir and run-of-river rights to meet the city's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Martindale implement the following water supply plan (Table 5.3.3-6).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 10 acft/yr of supply in 2000, decreasing to 0 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.3-6.
Recommended Water Supply Plan for the City of Martindale

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	10	10	10	0	0	0
Total New Supply	10	10	10	0	0	0

The costs of the recommended plan for the City of Martindale are shown in Table 5.3.3-7.

Table 5.3.3-7.
Recommended Plan Costs by Decade for the City of Martindale

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$4,010	$4,010	$4,010	$0	$0	$0
Unit Cost ($/acft)	$401	$401	$401	$0	$0	$0

5.3.3.4 Rural Area Residential and Commercial

The rural area of Caldwell County is projected to have adequate water supplies available from the Edwards Aquifer, Carrizo Aquifer, Queen City Aquifer, run-of-river rights, and Canyon Reservoir to meet the water user group's projected demand during the planning period.

5.3.3.5 Industrial

Industrial is projected to have adequate water supplies available from the Carrizo Aquifer and Queen City Aquifer to meet the water user group's projected demand during the planning period.

5.3.3.6 Steam-Electric Power

There is no projected steam-electric power water demand in Caldwell County, therefore no water management strategies are recommended for this water user group.

5.3.3.7 Mining

Mining is projected to have adequate water supplies available from the Carrizo Aquifer and Queen City Aquifer to meet the water user group's projected demand during the planning period.

5.3.3.8 Irrigation

Irrigation is projected to have adequate water supplies available from the Carrizo Aquifer, Queen City Aquifer, and run-of-river rights to meet the water user group's projected demand during the planning period.

5.3.3.9 Livestock

Livestock is projected to have adequate water supplies available from local sources to meet the water user group's projected demand during the planning period.

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5.3.4 Calhoun County Water Supply Plan

Table 5.3.4-1 lists each water user group in Calhoun County and their corresponding surplus or shortage in years 2030 and 2050. For each water user group with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 5.3.4-1.
Calhoun County Surplus/Shortage

Water User Group	Surplus/Shortage[1]		Comment
	2030 (acft/yr)	2050 (acft/yr)	
City of Point Comfort	18	2	Projected surplus
City of Port Lavaca	-852	-1,093	Projected shortage – see plan below
City of Seadrift	169	127	Projected surplus
Rural Area Residential and Commercial	3,241	2,689	Projected surplus
Industrial	48,917	28,199	Projected surplus
Steam-Electric Power	0	0	No projected surplus/shortage
Mining	0	0	No projected surplus/shortage
Irrigation	13,849	16,494	Projected surplus
Livestock	0	0	No projected surplus/shortage

[1]From Table 4-4, Section 4.1 – Water Needs Projections by Water User Group.

5.3.4.1 City of Point Comfort

The City of Point Comfort is projected to have adequate water supplies available from Lake Texana to meet the city's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Point Comfort implement the following water supply plan (Table 5.3.4-2).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 9 acft/yr beginning in year 2000, decreasing to 0 acft/yr of supply in 2030 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.4-2.
Recommended Water Supply Plan for the City of Point Comfort

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	9	9	9	0	0	0
Total New Supply	9	9	9	0	0	0

The costs of the recommended plan for the City of Point Comfort are shown in Table 5.3.4-3.

Table 5.3.4-3.
Recommended Plan Costs by Decade for the City of Point Comfort

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$3,724	$3,724	$3,724	$0	$0	$0
Unit Cost ($/acft)	$414	$414	$414	$0	$0	$0

5.3.4.2 City of Port Lavaca

The City of Port Lavaca's current water supply is obtained from Canyon Reservoir and run-of-river rights. The City of Port Lavaca is projected to need additional water supplies beginning in the planning year 2010. The following options were considered to meet the city's projected need:

- GBRA Canyon Reservoir Contract Renewal

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Port Lavaca implement the following water supply plan to meet the projected need for the city (Table 5.3.4-4).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 107 acft/yr beginning in year 2000, decreasing to 0 acft/yr of supply in 2030 (See Section 6, Supplement 2 and Volume III, Section 1.1).
- GBRA Canyon Reservoir Contract Renewal to be implemented in 2008. This project can provide an additional 1,500 acft/yr of supply.

Table 5.3.4-4.
Recommended Water Supply Plan for the City of Port Lavaca

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	769	758	852	969	1,093
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	107	107	107	0	0	0
GBRA Canyon Reservoir Contract Renewal		1,500	1,500	1,500	1,500	1,500
Total New Supply	107	1,607	1,607	1,500	1,500	1,500

The costs of the recommended plan to meet the City of Port Lavaca's projected need are shown in Table 5.3.4-5.

Table 5.3.4-5.
Recommended Plan Costs by Decade for the City of Port Lavaca

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$44,278	$44,278	$44,278	$0	$0	$0
Unit Cost ($/acft)	$414	$414	$414	$0	$0	$0
GBRA Canyon Reservoir Contract Renewal						
Annual Cost ($/yr)		N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Unit Cost ($/acft)		N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]

[1] As this is a renewal of an existing contract the cost to renew this contract was not included.

5.3.4.3 City of Seadrift

The City of Seadrift is projected to have adequate water supplies available from the Gulf Coast Aquifer to meet the city's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Seadrift implement the following water supply plan (Table 5.3.4-6).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 13 acft/yr beginning in year 2000, decreasing to 0 acft/yr of supply in 2030 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.4-6.
Recommended Water Supply Plan for the City of Seadrift

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	13	13	13	0	0	0
Total New Supply	13	13	13	0	0	0

The costs of the recommended plan for the City of Seadrift are shown in Table 5.3.4-7.

Table 5.3.4-7.
Recommended Plan Costs by Decade for the City of Seadrift

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$5,380	$5,380	$5,380	$0	$0	$0
Unit Cost ($/acft)	$414	$414	$414	$0	$0	$0

5.3.4.4 Rural Area Residential and Commercial

The rural area of Calhoun County is projected to have adequate water supplies available from the Gulf Coast Aquifer, Canyon Reservoir, and run-of-river rights to meet the water user group's projected demand during the planning period.

5.3.4.5 Industrial

Industrial is projected to have adequate water supplies available from Lake Texana, Canyon Reservoir, and run-of-river rights to meet the water user group's projected demand during the planning period.

5.3.4.6 Steam-Electric Power

Steam-electric power is projected to have adequate water supplies available from the Gulf Coast Aquifer to meet the water user group's projected demand during the planning period.

5.3.4.7 Mining

Mining is projected to have adequate water supplies available from the Gulf Coast Aquifer to meet the water user group's projected demand during the planning period.

5.3.4.8 Irrigation

Irrigation is projected to have adequate water supplies available from run-of-river rights to meet the water user group's projected demand during the planning period.

5.3.4.9 Livestock

Livestock is projected to have adequate water supplies available from local sources to meet the water user group's projected demand during the planning period.

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5.3.5 Comal County Water Supply Plan

Table 5.3.5-1 lists each water user group in Comal County and their corresponding surplus or shortage in years 2030 and 2050. For each water user group with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 5.3.5-1.
Comal County Surplus/Shortage

Water User Group	Surplus/Shortage[1] 2030 (acft/yr)	Surplus/Shortage[1] 2050 (acft/yr)	Comment
City of Fair Oaks Ranch			See Bexar County
City of Garden Ridge	-562	-617	Projected shortage – see plan below
City of New Braunfels	-14,801	-21,051	Projected shortage – see plan below
City of Schertz			See Guadalupe County
Rural Area Residential and Commercial	-11,094	-19,601	Projected shortage – see plan below
Industrial	1	-551	Projected shortage – see plan below
Steam-Electric Power	0	0	No projected demand
Mining	-5,796	-2,224	Projected shortage – see plan below
Irrigation	631	665	Projected surplus
Livestock	0	0	No projected surplus/shortage

[1] From Table 4-5, Section 4.1 – Water Needs Projections by Water User Group.

5.3.5.1 City of Fair Oaks Ranch (See Bexar County)

5.3.5.2 City of Garden Ridge

The City of Garden Ridge's current water supply is obtained from the Edwards Aquifer. The City of Garden Ridge is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Canyon Reservoir – River Diversion (G-15C)
- Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Garden Ridge implement the following water supply plan to meet the projected need for the city (Table 5.3.5-2).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 35 acft/yr of supply in 2000, increasing to 41 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1)
- Canyon Reservoir – River Diversion (G-15C) to be implemented in 2000. This project can provide an additional 400 acft/yr of supply in 2000, increasing to 700 acft/yr of additional supply in 2050.

Table 5.3.5-2.
Recommended Water Supply Plan for the City of Garden Ridge

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	322	395	434	562	623	617
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	35	40	46	38	41	41
Canyon Reservoir – River Diversion (G-15C)	400	450	500	700	700	700
Total New Supply	435	490	546	738	741	741

The costs of the recommended plan to meet the City of Garden Ridge's projected need are shown in Table 5.3.5-3.

Table 5.3.5-3.
Recommended Plan Costs by Decade for the City of Garden Ridge

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$10,503	$10,271	$10,037	$3,951	$3,719	$3,249
Unit Cost ($/acft)	$300	$257	$218	$104	$91	$79
Canyon Reservoir – River Diversion (G-15C)						
Annual Cost ($/yr)	$310,983	$349,856	$371,500	$440,300	$440,300	$440,300
Unit Cost ($/acft)	$777	$777	$743	$629	$629	$629

5.3.5.3 City of New Braunfels

The City of New Braunfels' current water supply is obtained from the Edwards Aquifer, Canyon Reservoir and run-of-river rights. The City of New Braunfels is projected to need additional water supplies beginning in the planning year 2010. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Canyon Reservoir – River Diversion (G-15C)
- GBRA Canyon Reservoir Contract Renewal
- Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)
- Additional Storage (ASR and/or Surface)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of New Braunfels implement the following water supply plan to meet the projected need for the city (Table 5.3.5-4).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 583 acft/yr of supply in 2000, increasing to 904 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1)
- Canyon Reservoir – River Diversion (G-15C) to be implemented in 2000. This project can provide an additional 580 acft/yr of supply in 2000, increasing to 10,000 acft/yr of additional supply in 2030 through 2050.
- GBRA Canyon Reservoir Contract Renewal to be implemented in 2001. This project can provide an additional 6,720 acft/yr of supply.
- Carrizo Aquifer – Gonzales & Bastrop (CZ-10D) to be implemented in 2040. This project can provide an additional 4,000 acft/yr of supply in 2040, increasing to 7,000 acft/yr of additional supply in 2050.
- Additional Storage (ASR and/or Surface)

Table 5.3.5-4.
Recommended Water Supply Plan for the City of New Braunfels

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	7,817	10,697	14,801	17,765	21,051
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	583	680	804	683	785	904
Canyon Reservoir – River Diversion (G-15C)	580	580	7,200	10,000	10,000	10,000
GBRA Canyon Reservoir Contract Renewal		6,720	6,720	6,720	6,720	6,720
Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)[1]					4,000	7,000
Additional Storage (ASR and/or Surface)[2]						
Total New Supply	1,163	7,980	14,724	17,403	21,505	24,624

[1] Region L estimates of groundwater development exceed Region K estimates of availability in and beyond 2030. The regions have agreed that discussion of differences will be more productive upon completion of new Groundwater Availability Models.
[2] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.

The costs of the recommended plan to meet the City of New Braunfels' projected need are shown in Table 5.3.5-5.

Table 5.3.5-5.
Recommended Plan Costs by Decade for the City of New Braunfels

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$180,940	$181,223	$181,497	$70,491	$70,750	$71,163
Unit Cost ($/acft)	$312	$268	$227	$104	$91	$79
Canyon Reservoir – River Diversion (G-15C)						
Annual Cost ($/yr)	$450,925	$450,925	$5,349,600	$6,290,000	$6,290,000	$6,290,000
Unit Cost ($/acft)	$777	$777	$743	$629	$629	$629
GBRA Canyon Reservoir Contract Renewal						
Annual Cost ($/yr)		N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Unit Cost ($/acft)		N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)						
Annual Cost ($/yr)			$2,702,000	$2,702,000	$5,022,000	$4,069,000
Unit Cost ($/acft)			N/A[2]	N/A[2]	$1,256	$580
Additional Storage (ASR and/or Surface)[3]						
Annual Cost ($/yr)	$1,052,135	$1,081,868	$1,111,602	$590,341	$120,078	$150,002
Unit Cost ($/acft)	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]

[1] As this is a renewal of an existing contract, the cost to renew this contract was not included.
[2] Reflects early participation in a project to ensure future needs are met.
[3] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.
[4] The cost representing additional storage is not calculated on a unit basis because a supply quantity has not been assigned to this management strategy.

5.3.5.4 City of Schertz (See Guadalupe County)

5.3.5.5 Rural Area Residential and Commercial

Rural area's current water supply is obtained from the Edwards Aquifer, Trinity Aquifer, Canyon Reservoir, and run-of-river rights. Rural areas are projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the projected need for rural areas:

- Western Canyon Regional Water Supply Project
- Canyon Reservoir – River Diversion (G-15C)
- Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that rural area water supply districts and authorities and individual households and/or businesses not served by public water supply systems implement the following water supply plan to meet the projected need for rural area (Table 5.3.5-6).

- Western Canyon Regional Water Supply Project which is currently in the implementation phase. This project can provide an additional 3,266 acft/yr of supply starting in the year 2000.
- Canyon Reservoir – River Diversion (G-15C) to be implemented in 2000. This project can provide an additional 2,500 acft/yr of supply in 2000, increasing to 5,000 acft/yr of additional supply in 2020 through 2050.
- Carrizo Aquifer – Gonzales & Bastrop (CZ-10D) to be implemented in 2030. This project can provide an additional 5,500 acft/yr of supply in 2030, increasing to 13,100 acft/yr of additional supply in 2050.

Table 5.3.5-6.
Recommended Water Supply Plan for Rural Areas

	2000 (acft/yr)	***2010 (acft/yr)***	***2020 (acft/yr)***	***2030 (acft/yr)***	***2040 (acft/yr)***	***2050 (acft/yr)***
Projected Need (Shortage)	3,362	4,957	7,490	11,094	15,008	19,601
Recommended Plan						
Western Canyon Regional Water Supply Project	3,266	3,266	3,266	3,266	7,266	7,266
Canyon Reservoir – River Diversion (G-15C)	2,500	4,000	5,000	5,000	5,000	5,000
Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)[1]				5,500	8,100	13,100
Total New Supply	5,766	7,266	8,266	13,766	20,366	25,366

[1] Region L estimates of groundwater development exceed Region K estimates of availability in and beyond 2030. The regions have agreed that discussion of differences will be more productive upon completion of new Groundwater Availability Models.

The costs of the recommended plan to meet the rural area's projected need are shown in Table 5.3.5-7.

Table 5.3.5-7.
Recommended Plan Costs by Decade for Rural Areas

Plan Element	2000	2010	2020	2030	2040	2050
Western Canyon Regional Water Supply Project						
Annual Cost ($/yr)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Unit Cost ($/acft)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Canyon Reservoir – River Diversion (G-15C)						
Annual Cost ($/yr)	$1,943,643	$3,109,829	$3,715,000	$3,145,000	$3,145,000	$3,145,000
Unit Cost ($/acft)	$777	$777	$743	$629	$629	$629
Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)						
Annual Cost ($/yr)			$5,056,600	$8,268,600	$9,754,600	$7,598,000
Unit Cost ($/acft)			N/A[2]	$1,503	$1,204	$580

[1] This project is currently under development with existing funds, therefore costs not included.
[2] Reflects early participation in a project to ensure future needs are met.

5.3.5.6 Industrial

Industrial's current water supply is obtained from the Edwards Aquifer, Canyon Reservoir, and run-of-river rights. Industrial is projected to need additional water supplies in the planning year 2040. The following options were considered to meet the industrial projected need:

- Carrizo Aquifer – Gonzales and Bastrop (CZ-10D)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that individual industrial operations implement the following water supply plan to meet the projected need for industrial (Table 5.3.5-8).

- Carrizo Aquifer – Gonzales & Bastrop (CZ-10D) to be implemented in 2040. This project can provide an additional 600 acft/yr of supply.

Table 5.3.5-8.
Recommended Water Supply Plan for Industrial

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	271	551
Recommended Plan						
Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)[1]					600	600
Total New Supply					600	600

[1] Region L estimates of groundwater development exceed Region K estimates of availability in and beyond 2030. The regions have agreed that discussion of differences will be more productive upon completion of new Groundwater Availability Models.

The costs of the recommended plan to meet the industrial projected need are shown in Table 5.3.5-9.

Table 5.3.5-9.
Recommended Plan Costs by Decade for Industrial

Plan Element	2000	2010	2020	2030	2040	2050
Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)						
Annual Cost ($/yr)			$231,600	$231,600	$579,600	$348,000
Unit Cost ($/acft)			N/A[1]	N/A[1]	$966	$580

[1] Reflects early participation in a project to ensure future needs are met.

5.3.5.7 Steam-Electric Power

There is no projected steam-electric power water demand in Comal County, therefore no water management strategies are recommended for this water user group.

5.3.5.8 Mining

Mining's current water supply is obtained from the Trinity Aquifer. Mining is projected to need additional water supplies in the planning year 2000. The following options were considered to meet the mining projected need:

- Canyon Reservoir – River Diversion (G-15C)
- Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that individual mining operations implement the following water supply plan to meet the projected need for mining (Table 5.3.5-10).

- Canyon Reservoir – River Diversion (G-15C) to be implemented in 2000. This project can provide an additional 7,020 acft/yr of supply in 2000, 5,470 acft/yr of additional supply in 2010, and 3,000 acft/yr of additional supply in 2020.
- Carrizo Aquifer – Gonzales & Bastrop (CZ-10D) to be implemented in 2020. This project can provide an additional 3,500 acft/yr of supply in 2020, 6,500 acft/yr of additional supply in 2030, 3,800 acft/yr of additional supply in 2040, and 2,300 acft/yr of additional supply in 2050.

Table 5.3.5-10.
Recommended Water Supply Plan for Mining

Plan Element	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*
Projected Need (Shortage)	5,570	5,464	5,628	5,796	3,590	2,224
Recommended Plan						
Canyon Reservoir – River Diversion (G-15C)	7,020	5,470	3,000	0	0	0
Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)[1]			3,500	6,500	3,800	2,300
Total New Supply	7,020	5,470	6,500	6,500	3.800	2,300

[1] Region L estimates of groundwater development exceed Region K estimates of availability in and beyond 2030. The regions have agreed that discussion of differences will be more productive upon completion of new Groundwater Availability Models.

The costs of the recommended plan to meet the mining projected need are shown in Table 5.3.5-11.

Table 5.3.5-11.
Recommended Plan Costs by Decade for Mining

Plan Element	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*
Canyon Reservoir – River Diversion (G-15C))						
Annual Cost ($/yr)	$5,457,749	$4,252,641	$2,229,000	$0	$0	$0
Unit Cost ($/acft)	$777	$777	$743	$0	$0	$0
Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)						
Annual Cost ($/yr)			$4,317,100	$6,305,000	$4,713,000	$1,334,000
Unit Cost ($/acft)			$1,371	$970	$1,240	$580

5.3.5.9 Irrigation

Irrigation is projected to have adequate water supplies available from the Edwards Aquifer, Canyon Reservoir, and run-of-river rights to meet the water user group's projected demand during the planning period.

5.3.5.10 Livestock

Livestock is projected to have adequate water supplies available from local sources to meet the water user group's projected demand during the planning period.

5.3.6 DeWitt County Water Supply Plan

Table 5.3.6-1 lists each water user group in DeWitt County and their corresponding surplus or shortage in years 2030 and 2050. For each water user group with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 5.3.6-1.
DeWitt County Surplus/Shortage

Water User Group	Surplus/Shortage[1]		Comment
	2030 (acft/yr)	2050 (acft/yr)	
City of Cuero	1,013	871	Projected surplus
City of Yoakum	214	72	Projected surplus
City of Yorktown	759	700	Projected surplus
Rural Area Residential and Commercial	172	209	Projected surplus
Industrial	5	5	Projected surplus
Steam-Electric Power	0	0	No projected demand
Mining	0	0	No projected surplus/shortage
Irrigation	57	93	Projected surplus
Livestock	0	0	No projected surplus/shortage

[1] From Table 4-6, Section 4.1 – Water Needs Projections by Water User Group.

5.3.6.1 City of Cuero

The City of Cuero is projected to have adequate water supplies available from the Gulf Coast Aquifer to meet the city's projected demands during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Cuero implement the following water supply plan (Table 5.3.6-2).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 125 acft/yr beginning in year 2000, decreasing to 74 acft/yr of supply in 2050 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.6-2.
Recommended Water Supply Plan for the City of Cuero

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	125	127	130	68	71	74
Total New Supply	125	127	130	68	71	74

The costs of the recommended plan for the City of Cuero are shown in Table 5.3.6-3.

Table 5.3.6-3.
Recommended Plan Costs by Decade for the City of Cuero

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$40,580	$40,580	$40,580	$12,808	$12,808	$12,808
Unit Cost ($/acft)	$325	$320	$312	$188	$180	$173

5.3.6.2 City of Yoakum

The City of Yoakum is projected to have adequate water supplies available from the Gulf Coast Aquifer to meet the city's projected demands during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Yoakum implement the following water supply plan (Table 5.3.6-4).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 21 acft/yr beginning in year 2000, decreasing to 0 acft/yr of supply in 2050 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.6-4.
Recommended Water Supply Plan for the City of Yoakum

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	21	21	21	0	0	0
Total New Supply	21	21	21	0	0	0

The costs of the recommended plan for the City of Yoakum are shown in Table 5.3.6-5.

Table 5.3.6-5.
Recommended Plan Costs by Decade for the City of Yoakum

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$8,837	$8,837	$8,837	$0	$0	$0
Unit Cost ($/acft)	$421	$421	$421	$0	$0	$0

5.3.6.3 City of Yorktown

The City of Yorktown is projected to have adequate water supplies available from the Gulf Coast Aquifer to meet the city's projected demands during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Yorktown implement the following water supply plan (Table 5.3.6-6).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 22 acft/yr beginning in year 2000, decreasing to 0 acft/yr of supply in 2050 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.6-6.
Recommended Water Supply Plan for the City of Yorktown

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	22	22	22	0	0	0
Total New Supply	22	22	22	0	0	0

The costs of the recommended plan for the City of Yorktown are shown in Table 5.3.6-7.

Table 5.3.6-7.
Recommended Plan Costs by Decade for the City of Yorktown

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$9,257	$9,257	$9,257	$0	$0	$0
Unit Cost ($/acft)	$421	$421	$421	$0	$0	$0

5.3.6.4 Rural Area Residential and Commercial

The rural area of DeWitt County is projected to have adequate water supplies available from the Gulf Coast Aquifer to meet the water user group's projected demand during the planning period.

5.3.6.5 Industrial

Industrial is projected to have adequate water supplies available from the Gulf Coast Aquifer and Canyon Reservoir to meet the water user group's projected demand during the planning period.

5.3.6.6 Steam-Electric Power

There is no projected steam-electric power water demand in DeWitt County, therefore no water management strategies are recommended for this water user group.

5.3.6.7 Mining

Mining is projected to have adequate water supplies available from the Gulf Coast Aquifer to meet the water user group's projected demand during the planning period.

5.3.6.8 Irrigation

Irrigation is projected to have adequate water supplies available from the Gulf Coast Aquifer and run-of-river rights to meet the water user group's projected demand during the planning period.

5.3.6.9 Livestock

Livestock is projected to have adequate water supplies available from local sources to meet the water user group's projected demand during the planning period.

5.3.7 Dimmit County Water Supply Plan

Table 5.3.7-1 lists each water user group in Dimmit County and their corresponding surplus or shortage in years 2030 and 2050. For each water user group with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 5.3.7-1.
Dimmit County Surplus/Shortage

Water User Group	Surplus/Shortage[1]		Comment
	2030 (acft/yr)	2050 (acft/yr)	
City of Asherton	70	27	Projected surplus
City of Big Wells	43	40	Projected surplus
City of Carrizo Springs	-1,054	-1,959	Projected shortage – see plan below
Rural Area Residential and Commercial	49	0	Projected surplus
Industrial	2	0	Projected surplus
Steam-Electric Power	0	0	No projected demand
Mining	0	0	No projected surplus/shortage
Irrigation	0	0	No projected surplus/shortage
Livestock	0	0	No projected surplus/shortage

[1] From Table 4-7, Section 4.1 – Water Needs Projections by Water User Group.

5.3.7.1 City of Asherton

The City of Asherton is projected to have adequate water supplies available from the Carrizo Aquifer to meet the city's projected demand during the planning period.

5.3.7.2 City of Big Wells

The City of Big Wells is projected to have adequate water supplies available from the Carrizo Aquifer to meet the city's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Big Wells implement the following water supply plan (Table 5.3.7-2).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 15 acft/yr beginning in year 2000, decreasing to 8 acft/yr of supply in 2050 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.7-2.
Recommended Water Supply Plan for the City of Big Wells

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	15	15	15	8	8	8
Total New Supply	15	15	15	8	8	8

The costs of the recommended plan for the City of Big Wells are shown in Table 5.3.7-3.

Table 5.3.7-3.
Recommended Plan Costs by Decade for the City of Big Wells

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$4,038	$3,861	$3,722	$826	$735	$652
Unit Cost ($/acft)	$269	$257	$248	$103	$92	$82

5.3.7.3 City of Carrizo Springs

The City of Carrizo Springs' current water supply is obtained from the Carrizo Aquifer. The City of Carrizo Springs is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Carrizo Aquifer – Local Supply (SCTN-2a)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Carrizo Springs implement the following water supply plan to meet the projected need for the city (Table 5.3.7-4).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 116 acft/yr of supply in 2000, increasing to 125 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Carrizo Aquifer – Local Supply (SCTN-2a) to be implemented in 2000. This project can provide additional supplies of 500 acft/yr in 2000, 1,000 acft/yr in 2010 and 2020, 2,500 acft/yr in 2030, 3,000 acft/yr in 2040, and 3,500 acft/yr in 2050.

Table 5.3.7-4.
Recommended Water Supply Plan for the City of Carrizo Springs

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	138	405	649	1,054	1,479	1,959
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	116	128	141	97	110	125
Carrizo Aquifer – Local Supply (SCTN-2a)	500	1,000	1,000	2,500	3,000	3,500
Total New Supply	616	1,128	1,141	2,597	3,110	3,625

The costs of the recommended plan to meet the City of Carrizo Springs' projected need are shown in Table 5.3.7-5.

Table 5.3.7-5.
Recommended Plan Costs by Decade for the City of Carrizo Springs

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$30,267	$30,444	$30,583	$10,014	$10,105	$10,188
Unit Cost ($/acft)	$261	$238	$217	$103	$92	$82
Carrizo Aquifer – Local Supply (SCTN-2a)						
Annual Cost ($/yr)	$193,500	$387,000	$387,000	$812,500	$851,000	$1,044,500
Unit Cost ($/acft)	$387	$387	$387	$325	$284	$298

5.3.7.4 Rural Area Residential and Commercial

The rural area of Dimmit County is projected to have adequate water supplies available from the Carrizo Aquifer to meet the water user group's projected demands during the planning period.

5.3.7.5 Industrial

Industrial is projected to have adequate water supplies available from the Carrizo Aquifer to meet the water user group's projected demands during the planning period.

5.3.7.6 Steam-Electric Power

There is no projected steam-electric power water demand in Dimmit County, therefore no water management strategies are recommended for this water user group.

5.3.7.7 Mining

Mining is projected to have adequate water supplies available from the Carrizo Aquifer and run-of-river rights to meet the water user group's projected demand during the planning period.

5.3.7.8 Irrigation

Irrigation is projected to have adequate water supplies available from the Carrizo Aquifer and run-of-river rights to meet the water user group's projected demand during the palnning period.

5.3.7.9 Livestock

Livestock is projected to have adequate water supplies available from local sources to meet the water user group's projected demand during the planning period.

5.3.8 Frio County Water Supply Plan

Table 5.3.8-1 lists each water user group in Frio County and their corresponding surplus or shortage in years 2030 and 2050. For each water user group with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 5.3.8-1.
Frio County Surplus/Shortage

Water User Group	Surplus/Shortage[1] 2030 (acft/yr)	Surplus/Shortage[1] 2050 (acft/yr)	Comment
City of Dilley	1,836	1,780	Projected surplus
City of Pearsall	1,225	1,108	Projected surplus
Rural Area Residential and Commercial	38	0	Projected surplus
Industrial	0	0	No projected demand
Steam-Electric Power	0	0	No projected surplus/shortage
Mining	0	0	No projected surplus/shortage
Irrigation	-76,506	-70,662	Projected shortage – see plan below
Livestock	0	0	No projected surplus/shortage

[1] From Table 4-8, Section 4.1 – Water Needs Projections by Water User Group.

5.3.8.1 City of Dilley

The City of Dilley is projected to have adequate water supplies available from the Carrizo Aquifer to meet the city's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Dilley implement the following water supply plan (Table 5.3.8-2).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 51 acft/yr beginning in year 2000, decreasing to 34 acft/yr of supply in 2050 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.8-2.
Recommended Water Supply Plan for the City of Dilley

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	51	54	57	32	33	34
Total New Supply	51	54	57	32	33	34

The costs of the recommended plan for the City of Dilley are shown in Table 5.3.8-3.

Table 5.3.8-3.
Recommended Plan Costs by Decade for the City of Dilley

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$12,504	$12,497	$12,523	$3,561	$3,550	$3,540
Unit Cost ($/acft)	$245	$231	$220	$111	$108	$104

5.3.8.2 City of Pearsall

The City of Pearsall is projected to have adequate water supplies available from the Carrizo Aquifer to meet the city's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Pearsall implement the following water supply plan (Table 5.3.8-4).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 133 acft/yr beginning in year 2000, decreasing to 90 acft/yr of supply in 2050 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.8-4.
Recommended Water Supply Plan for the City of Pearsall

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	133	141	148	84	87	90
Total New Supply	133	141	148	84	87	90

The costs of the recommended plan for the City of Pearsall are shown in Table 5.3.8-5.

Table 5.3.8-5.
Recommended Plan Costs by Decade for the City of Pearsall

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$32,648	$32,655	$32,629	$9,349	$9,360	$9,370
Unit Cost ($/acft)	$245	$232	$220	$111	$108	$104

5.3.8.3 Rural Area Residential and Commercial

The rural area of Frio County is projected to have adequate water supplies available from the Carrizo Aquifer, Sparta Aquifer, and Queen City Aquifer to meet the water user group's projected demand during the planning period.

5.3.8.4 Industrial

There is no projected industrial water demand in Frio County, therefore no water management strategies are recommended for this water user group.

5.3.8.5 Steam-Electric Power

Steam-electric power is projected to have adequate water supplies available from the Carrizo Aquifer, Sparta Aquifer, and Queen City Aquifer to meet the water user group's projected demand during the planning period.

5.3.8.6 Mining

Mining is projected to have adequate water supplies available from the Carrizo Aquifer, Sparta Aquifer, and Queen City Aquifer to meet the water user group's projected demand during the planning period.

5.3.8.7 Irrigation

Irrigation's current water supply is obtained from the Carrizo Aquifer, Sparta Aquifer, Queen City Aquifer, and run-of-river rights. Irrigation is projected to need additional water supplies in the planning year 2000. The following options were considered to meet the irrigation projected need:

- Demand Reduction (Conservation) (L-10 Irr.) (See Section 6, Supplement 2)

Working within the planning criteria established by the SCTRWPG and the TWDB, it has been found that it is not economically feasible to meet all of the projected irrigation needs at this time, since the cost of the water management strategies with enough water supply to meet the needs far exceeds the ability of irrigators to pay for the water. However, the irrigation water conservation option will meet a part of the projected irrigation needs in Frio County where further irrigation conservation opportunity exists. It is recommended that individual irrigators implement the following water supply plan to meet a portion of the projected need for irrigation (Table 5.3.8-6).

- Demand Reduction (Conservation) to be implemented in 2000. This project can provide an additional 5,947 acft/yr of supply.

Table 5.3.8-6.
Recommended Water Supply Plan for Irrigation

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	71,125	67,645	64,365	76,506	73,520	70,663
Recommended Plan						
Demand Reduction (Conservation) (L-10 Irr.)	5,947	5,947	5,947	5,947	5,947	5,947
Total New Supply	5,947	5,947	5,947	5,947	5,947	5,947

The costs of the recommended plan to meet the irrigation projected need are shown in Table 5.3.8-7.

Table 5.3.8-7.
Recommended Plan Costs by Decade for Irrigation

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Irr.)						
Annual Cost ($/yr)	$758,183	$758,183	$758,183	$0	$0	$0
Unit Cost ($/acft)	$127	$127	$127	$0	$0	$0

5.3.8.8 Livestock

Livestock is projected to have adequate water supplies available from local sources to meet the water user group's projected demand during the planning period.

5.3.9 Goliad County Water Supply Plan

Table 5.3.9-1 lists each water user group in Goliad County and their corresponding surplus or shortage in years 2030 and 2050. For each water user group with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 5.3.9-1.
Goliad County Surplus/Shortage

Water User Group	Surplus/Shortage[1] 2030 (acft/yr)	Surplus/Shortage[1] 2050 (acft/yr)	Comment
City of Goliad	948	915	Projected surplus
Rural Area Residential and Commercial	50	22	Projected surplus
Industrial	0	0	No projected demand
Steam-Electric Power	3,577	3,579	Projected surplus
Mining	3	0	Projected surplus
Irrigation	2,434	2,531	Projected surplus
Livestock	0	0	No projected surplus/shortage

[1] From Table 4-9, Section 4.1 – Water Needs Projections by Water User Group.

5.3.9.1 City of Goliad

The City of Goliad is projected to have adequate water supplies available from the Gulf Coast Aquifer to meet the city's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Goliad implement the following water supply plan (Table 5.3.9-2).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 19 acft/yr beginning in year 2000, decreasing to 0 acft/yr of supply in 2050 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.9-2.
Recommended Water Supply Plan for the City of Goliad

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	19	19	19	0	0	0
Total New Supply	19	19	19	0	0	0

The costs of the recommended plan for the City of Goliad are shown in Table 5.3.9-3.

Table 5.3.9-3.
Recommended Plan Costs by Decade for the City of Goliad

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$8,626	$8,626	$8,626	$0	$0	$0
Unit Cost ($/acft)	$454	$454	$454	$0	$0	$0

5.3.9.2 Rural Area Residential and Commercial

The rural area of Goliad County is projected to have adequate water supplies available from the Gulf Coast Aquifer to meet the water user group's projected demand during the planning period.

5.3.9.3 Industrial

There is no projected industrial water demand in Goliad County, therefore no water management strategies are recommended for this water user group.

5.3.9.4 Steam-Electric Power

Steam-electric power is projected to have adequate water supplies available from the Gulf Coast Aquifer and Coleto Creek Reservoir to meet the water user group's projected demand during the planning period.

5.3.9.5 Mining

Mining is projected to have adequate water supplies available from the Gulf Coast Aquifer to meet the water user group's projected demand during the planning period.

5.3.9.6 Irrigation

Irrigation is projected to have adequate water supplies available from run-of-river rights to meet the water user group's projected demand during the planning period.

5.3.9.7 Livestock

Livestock is projected to have adequate water supplies available from local sources to meet the water user group's projected demand during the planning period.

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5.3.10 Gonzales County Water Supply Plan

Table 5.3.10-1 lists each water user group in Gonzales County and their corresponding surplus or shortage in years 2030 and 2050. For each water user group with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 5.3.10-1.
Gonzales County Surplus/Shortage

Water User Group	Surplus/Shortage[1]		Comment
	2030 (acft/yr)	2050 (acft/yr)	
City of Gonzales	676	617	Projected surplus
City of Nixon	1,157	1,145	Projected surplus
City of Waelder	31	33	Projected surplus
Rural Area Residential and Commercial	858	832	Projected surplus
Industrial	148	0	Projected surplus
Steam-Electric Power	0	0	No projected demand
Mining	0	0	No projected surplus/shortage
Irrigation	3,025	3,527	Projected surplus
Livestock	0	0	No projected surplus/shortage

[1] From Table 4-10, Section 4.1 – Water Needs Projections by Water User Group.

5.3.10.1 City of Gonzales

The City of Gonzales is projected to have adequate water supplies available from run-of-river rights to meet the city’s projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Gonzales implement the following water supply plan (Table 5.3.10-2).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 122 acft/yr beginning in year 2000, decreasing to 67 acft/yr of supply in 2050 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.10-2.
Recommended Water Supply Plan for the City of Gonzales

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	122	125	127	64	66	67
Total New Supply	122	125	127	64	66	67

The costs of the recommended plan for the City of Gonzales are shown in Table 5.3.10-3.

Table 5.3.10-3.
Recommended Plan Costs by Decade for the City of Gonzales

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$35,962	$35,962	$35,962	$9,338	$9,338	$9,338
Unit Cost ($/acft)	$295	$288	$283	$146	$141	$139

5.3.10.2 City of Nixon

The City of Nixon is projected to have adequate water supplies available from the Carrizo Aquifer to meet the city's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Nixon implement the following water supply plan (Table 5.3.10-4).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 20 acft/yr beginning in year 2000, decreasing to 0 acft/yr of supply in 2050 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.10-4.
Recommended Water Supply Plan for the City of Nixon

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	20	20	20	0	0	0
Total New Supply	20	20	20	0	0	0

The costs of the recommended plan for the City of Nixon are shown in Table 5.3.10-5.

Table 5.3.10-5.
Recommended Plan Costs by Decade for the City of Nixon

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$8,320	$8,320	$8,320	$0	$0	$0
Unit Cost ($/acft)	$416	$416	$416	$0	$0	$0

5.3.10.3 City of Waelder

The City of Waelder is projected to have adequate water supplies available from the Carrizo Aquifer to meet the city's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Waelder implement the following water supply plan (Table 5.3.10-6).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 7 acft/yr beginning in year 2000, decreasing to 0 acft/yr of supply in 2050 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.10-6.
Recommended Water Supply Plan for the City of Waelder

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	7	7	7	0	0	0
Total New Supply	7	7	7	0	0	0

The costs of the recommended plan for the City of Waelder are shown in Table 5.3.10-7.

Table 5.3.10-7.
Recommended Plan Costs by Decade for the City of Waelder

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$2,912	$2,912	$2,912	$0	$0	$0
Unit Cost ($/acft)	$416	$416	$416	$0	$0	$0

5.3.10.4 Rural Area Residential and Commercial

The rural area of Gonzales County is projected to have adequate water supplies available from the Carrizo Aquifer, Sparta Aquifer, Queen City Aquifer, Gulf Coast Aquifer, and Canyon Reservoir to meet the water user group's projected demand during the planning period.

5.3.10.5 Industrial

Industrial is projected to have adequate water supplies available from the Carrizo Aquifer, Sparta Aquifer, Queen City Aquifer, and Gulf Coast Aquifer to meet the water user group's projected demand during the planning period.

5.3.10.6 Steam-Electric Power

There is no projected steam-electric power water demand in Gonzales County, therefore no water management strategies are recommended for this water user group.

5.3.10.7 Mining

Mining is projected to have adequate water supplies available from the Carrizo Aquifer, Sparta Aquifer, Queen City Aquifer, and Gulf Coast Aquifer to meet the water user group's projected demand during the planning period.

5.3.10.8 Irrigation

Irrigation is projected to have adequate water supplies available from the Carrizo Aquifer, Sparta Aquifer, Queen City Aquifer, Gulf Coast Aquifer, Canyon Reservoir, and run-of-river rights to meet the water user group's projected demand during the planning period.

5.3.10.9 Livestock

Livestock is projected to have adequate water supplies available from local sources to meet the water user group's projected demand during the planning period.

5.3.11 Guadalupe County Water Supply Plan

Table 5.3.11-1 lists each water user group in Guadalupe County and their corresponding surplus or shortage in years 2030 and 2050. For each water user group with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 5.3.11-1.
Guadalupe County Surplus/Shortage

Water User Group	Surplus/Shortage[1]		Comment
	2030 (acft/yr)	2050 (acft/yr)	
City of Cibolo	231	118	Projected surplus
City of Marion	64	63	Projected surplus
McQueeney (CDP)	25	2	Projected surplus
City of New Braunfels			See Comal County
City of Schertz	-5,760	-7,059	Projected shortage – see plan below
City of Seguin	-7	-2,745	Projected shortage – see plan below
Rural Area Residential and Commercial[2]	22	-4,505	Projected shortage – see plan below
Industrial	-1,481	-1,893	Projected shortage – see plan below
Steam-Electric Power	-920	-920	Projected shortage – see plan below
Mining	-202	-213	Projected shortage – see plan below
Irrigation	-582	-406	Projected shortage – see plan below
Livestock	0	0	No projected surplus/shortage

[1] From Table 4-11, Section 4.1 – Water Needs Projections by Water User Group.
[2] Includes the Cities of Santa Clara and New Berlin.

5.3.11.1 City of Cibolo

The City of Cibolo's current water supply is obtained from the Edwards Aquifer through Green Valley Special Utility District and from Canyon Reservoir. The City of Cibolo is projected to have adequate water supplies from these sources to meet the city's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Cibolo implement the following water supply plan (Table 5.3.11-2).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 17 acft/yr of supply in 2000, decreasing to 0 acft/yr of additional supply in 2030. (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.11-2.
Recommended Water Supply Plan for the City of Cibolo

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	17	17	17	0	0	0
Total New Supply	17	17	17	0	0	0

The costs of the recommended plan to meet the City of Cibolo's projected need are shown in Table 5.3.11-3.

Table 5.3.11-3.
Recommended Plan Costs by Decade for the City of Cibolo

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$6,807	$6,807	$6,807	$0	$0	$0
Unit Cost ($/acft)	$400	$400	$400	$0	$0	$0

5.3.11.2 City of Marion

The City of Marion's current water supply is obtained from the Edwards Aquifer and Canyon Reservoir. The City of Marion is projected to have adequate water supplies from these sources to meet the City's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Marion implement the following water supply plan (Table 5.3.11-4).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 10 acft/yr of supply in 2000, decreasing to 0 acft/yr of additional supply in 2030. (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.11-4.
Recommended Water Supply Plan for the City of Marion

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	10	10	10	0	0	0
Total New Supply	10	10	10	0	0	0

The costs of the recommended plan to meet the City of Marion's projected need are shown in Table 5.3.11-5.

Table 5.3.11-5.
Recommended Plan Costs by Decade for the City of Marion

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$4,004	$4,004	$4,004	$0	$0	$0
Unit Cost ($/acft)	$400	$400	$400	$0	$0	$0

5.3.11.3 McQueeney (CDP)

McQueeney (CDP) is projected to have adequate water supplies available through contracts with Springs Hill WSC for the area east of Lake Dunlap and Green Valley SUD for the area west of Lake Dunlap to meet the city's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that McQueeney implement the following water supply plan (Table 5.3.11-6).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 19 acft/yr beginning in year 2000, decreasing to 0 acft/yr of supply in 2050 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.11-6.
Recommended Water Supply Plan for McQueeney

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	19	19	19	0	0	0
Total New Supply	19	19	19	0	0	0

The costs of the recommended plan for McQueeney are shown in Table 5.3.11-7.

Table 5.3.11-7.
Recommended Plan Costs by Decade for McQueeney

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$7,608	$7,608	$7,608	$0	$0	$0
Unit Cost ($/acft)	$400	$400	$400	$0	$0	$0

5.3.11.4 City of New Braunfels (See Comal County)

5.3.11.5 City of Schertz

The City of Schertz's current water supply is obtained from the Edwards Aquifer. The City of Schertz is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Schertz-Seguin Water Supply Project (Carrizo)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Schertz implement the following water supply plan to meet the projected need for the city (Table 5.3.11-8).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 140 acft/yr of supply in 2000, decreasing to 0 acft/yr of additional supply in 2030. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Schertz-Seguin Water Supply Project (Carrizo) to be implemented in 2000. This project can provide an additional 7,596 acft/yr of supply beginning in 2000.

Table 5.3.11-8.
Recommended Water Supply Plan for the City of Schertz

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage) – Inside City	4,125	4,610	5,199	5,760	6,390	7,059
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	140	140	140	0	0	0
Schertz-Seguin Water Supply Project (Carrizo)*	7,596	7,596	7,596	7,596	7,596	7,596
Total New Supply	7,736	7,736	7,736	7,596	7,596	7,596
*Schertz's share of the Schertz-Seguin Water Supply Project is 10,000 acft/yr. See Table 5.3.2-29 for the remaining 2,404 acft/yr.						

The costs of the recommended plan to meet the City of Schertz's projected need are shown in Table 5.3.11-9.

Table 5.3.11-9.
Recommended Plan Costs by Decade for the City of Schertz

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$56,000	$56,000	$56,000	$0	$0	$0
Unit Cost ($/acft)	$400	$400	$400	$0	$0	$0
Schertz-Seguin Water Supply Project (Carrizo)						
Annual Cost ($/yr)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Unit Cost ($/acft)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
[1] This project is currently underway with existing funds, therefore costs are not included.						

5.3.11.6 City of Seguin

The City of Seguin's current water supply is obtained from run-of-river rights firmed with a GBRA contract for water from Canyon Lake. The City of Seguin is projected to need additional water supplies beginning in the planning year 2030. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Schertz-Seguin Water Supply Project (Carrizo)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Seguin implement the following water supply plan to meet the projected need for the city (Table 5.3.11-10).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 186 acft/yr of supply in 2000, decreasing to 0 acft/yr of additional supply in 2030. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Schertz-Seguin Water Supply Project (Carrizo) to be implemented in 2000. Seguin's share of this project is 10,000 acft/yr, and for the purposes of this study is divided as follows: 6,400 acft/yr of supply for the City, 1,700 acft/yr for adjacent rural areas (Table 5.3.11-12), 900 acft/yr for industry (Table 5.3.11-14), and 1,000 acft/yr for steam-electric power (Table 5.3.11-16).

Table 5.3.11-10.
Recommended Water Supply Plan for the City of Seguin

	2000 (acft/yr)	*2010 (acft/yr)*	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*
Projected Need (Shortage)	0	0	0	7	1,280	2,745
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	186	186	186	0	0	0
Schertz-Seguin Water Supply Project (Carrizo)*	6,400	6,400	6,400	6,400	6,400	6,400
Total New Supply	6,586	6,586	6,586	6,400	6,400	6,400

* Seguin's share of this project is 10,000 acft/yr, and for the purposes of this study is divided as follows: 6,400 acft/yr of supply for the City, 1,700 acft/yr for adjacent rural areas (Table 5.3.11-12), 900 acft/yr for industry (Table 5.3.11-14), and 1,000 acft/yr for steam-electric power (Table 5.3.11-16).

The costs of the recommended plan to meet the City of Seguin's projected need are shown in Table 5.3.11-11.

Table 5.3.11-11.
Recommended Plan Costs by Decade for the City of Seguin

Plan Element	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$74,478	$74,478	$74,478	$0	$0	$0
Unit Cost ($/acft)	$400	$400	$400	$0	$0	$0
Schertz-Seguin Water Supply Project (Carrizo)						
Annual Cost ($/yr)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Unit Cost ($/acft)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]

[1] This project is currently underway with existing funds, therefore costs are not included.

5.3.11.7 Rural Area Residential and Commercial

Rural area's current water supply is obtained from the Edwards Aquifer, Carrizo Aquifer, and Canyon Reservoir. Rural areas are projected to need additional water supplies beginning in the planning year 2030. The following options were considered to meet the projected need for rural areas:

- Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)
- Schertz-Seguin Water Supply Project (Carrizo)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that rural area water districts and authorities and individual households and/or businesses not served by public water supply systems implement the following water supply plan to meet the projected need for rural areas (Table 5.3.11-12).

- Carrizo Aquifer – Gonzales & Bastrop (CZ-10D) to be implemented in 2000. This project can provide an additional 100 acft/yr of supply in 2000, increasing to 3,200 acft/yr of additional supply in 2050.
- Schertz-Seguin Water Supply Project (Carrizo) to be implemented in 2000. This project can provide an additional 1,700 acft/yr of supply beginning in 2000.

Table 5.3.11-12.
Recommended Water Supply Plan for Rural Areas

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	929	1,326	3,565
Recommended Plan						
Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)[1]	100	100	600	600	1,100	3,100
Schertz-Seguin Water Supply Project (Carrizo)[2]	1,700	1,700	1,700	1,700	1,700	1,700
Total New Supply	1,800	1,800	2,300	2,300	2,800	4,800

[1] Region L estimates of groundwater development exceed Region K estimates of availability in and beyond 2030. The regions have agreed that discussion of differences will be more productive upon completion of new Groundwater Availability Models.

[2] Seguin's share of this project is 10,000 acft/yr, and for the purposes of this study is divided as follows: 6,400 acft/yr of supply for the City, 1,700 acft/yr for adjacent rural areas (Table 5.3.11-12), 900 acft/yr for industry (Table 5.3.11-14), and 1,000 acft/yr for steam-electric power (Table 5.3.11-16).

The costs of the recommended plan to meet rural area's projected need are shown in Table 5.3.11-13.

Table 5.3.11-13.
Recommended Plan Costs by Decade for Rural Areas

Plan Element	2000	2010	2020	2030	2040	2050
Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)						
Annual Cost ($/yr)	$1,272,400	$1,272,400	$1,687,400	$490,800	$816,200	$2,300,600
Unit Cost ($/acft)	$12,724	$12,724	$2,812	$818	$742	$742
Schertz-Seguin Water Supply Project (Carrizo)						
Annual Cost ($/yr)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Unit Cost ($/acft)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]

[1] This project is currently underway with existing funds, therefore costs are not included

5.3.11.8 Industrial

Industrial's current water supply is obtained from the Edwards Aquifer, Canyon Reservoir, and run-of-river rights. Industrial is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the industrial projected need:

- Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)
- Schertz-Seguin Water Supply Project (Carrizo)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that individual industrial operations implement the following water supply plan to meet the projected need for industrial (Table 5.3.11-14).

- Carrizo Aquifer – Gonzales & Bastrop (CZ-10D) to be implemented in 2000. This project can provide an additional 1,100 acft/yr of supply beginning in 2000.
- Schertz-Seguin Water Supply Project (Carrizo) to be implemented in 2000. This project can provide an additional 900 acft/yr of supply beginning in 2000.

Table 5.3.11-14.
Recommended Water Supply Plan for Industrial

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	979	1,198	1,344	1,481	1,686	1,893
Recommended Plan						
Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)[1]	1,100	1,100	1,100	1,100	1,100	1,100
Schertz-Seguin Water Supply Project (Carrizo)[2]	900	900	900	900	900	900
Total New Supply	2,000	2,000	2,000	2,000	2,000	2,000

[1] Region L estimates of groundwater development exceed Region K estimates of availability in and beyond 2030. The regions have agreed that discussion of differences will be more productive upon completion of new Groundwater Availability Models.

[2] Seguin's share of this project is 10,000 acft/yr, and for the purposes of this study is divided as follows: 6,400 acft/yr of supply for the City, 1,700 acft/yr for adjacent rural areas (Table 5.3.11-12), 900 acft/yr for industry (Table 5.3.11-14), and 1,000 acft/yr for steam-electric power (Table 5.3.11-16).

The costs of the recommended plan to meet the industrial projected need are shown in Table 5.3.11-15.

Table 5.3.11-15.
Recommended Plan Costs by Decade for Industrial

Plan Element	2000	2010	2020	2030	2040	2050
Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)						
Annual Cost ($/yr)	$1,258,400	$1,258,400	$1,324,400	$899,800	$816,200	$816,200
Unit Cost ($/acft)	$1,144	$1,144	$1,204	$818	$742	$742
Schertz-Seguin Water Supply Project (Carrizo)						
Annual Cost ($/yr)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Unit Cost ($/acft)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]

[1] This project is currently underway with existing funds, therefore costs are not included

5.3.11.9 Steam-Electric Power

Steam-electric power's current water supply is obtained from Canyon Reservoir. Steam-electric power is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the steam-electric power projected need:

- Schertz-Seguin Water Supply Project (Carrizo)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that individual steam-electric power operations implement the following water supply plan to meet the projected need for steam-electric power (Table 5.3.11-16).

- Schertz-Seguin Water Supply Project (Carrizo) to be implemented in 2000. This project can provide an additional 1,000 acft/yr of supply beginning in 2000.

Table 5.3.11-16.
Recommended Water Supply Plan for Steam-Electric Power

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	920	920	920	920	920	920
Recommended Plan						
Schertz-Seguin Water Supply Project (Carrizo)*	1,000	1,000	1,000	1,000	1,000	1,000
Total New Supply	1,000	1,000	1,000	1,000	1,000	1,000

* Seguin's share of this project is 10,000 acft/yr, and for the purposes of this study is divided as follows: 6,400 acft/yr of supply for the City, 1,700 acft/yr for adjacent rural areas (Table 5.3.11-12), 900 acft/yr for industry (Table 5.3.11-14), and 1,000 acft/yr for steam-electric power (Table 5.3.11-16).

The costs of the recommended plan to meet the steam-electric power projected need are shown in Table 5.3.11-17.

Table 5.3.11-17.
Recommended Plan Costs by Decade for Steam-Electric Power

Plan Element	2000	2010	2020	2030	2040	2050
Schertz-Seguin Water Supply Project (Carrizo)						
Annual Cost ($/yr)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Unit Cost ($/acft)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]

[1] This project is currently underway with existing funds, therefore costs are not included

5.3.11.10 Mining

Mining's current water supply is obtained from the Carrizo Aquifer. Mining is projected to need additional water supplies in the planning year 2000. The following options were considered to meet the mining projected need:

- Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that individual mining operations implement the following water supply plan to meet the projected need for mining (Table 5.3.11-18).

- Carrizo Aquifer – Gonzales & Bastrop (CZ-10D) to be implemented in 2000. This project can provide an additional 300 acft/yr of supply beginning in 2000.

Table 5.3.11-18.
Recommended Water Supply Plan for Mining

	2000 (acft/yr)	*2010 (acft/yr)*	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*
Projected Need (Shortage)	196	198	200	202	207	213
Recommended Plan						
Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)[1]	300	300	300	300	300	300
Total New Supply	300	300	300	300	300	300

[1] Region L estimates of groundwater development exceed Region K estimates of availability in and beyond 2030. The regions have agreed that discussion of differences will be more productive upon completion of new Groundwater Availability Models.

The costs of the recommended plan to meet the mining projected need are shown in Table 5.3.11-19.

Table 5.3.11-19.
Recommended Plan Costs by Decade for Mining

Plan Element	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*
Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)						
Annual Cost ($/yr)	$343,200	$343,200	$361,200	$245,400	$222,600	$222,600
Unit Cost ($/acft)	$1,144	$1,144	$1,204	$818	$742	$742

5.3.11.11 Irrigation

Irrigation's current water supply is obtained from the Carrizo Aquifer, Canyon Reservoir, and run-of-river rights. Irrigation is projected to need additional water supplies in the planning year 2000. However, at this time there does not appear to be any feasible option to meet the need either in whole or in part, therefore, no water management strategies are recommended to meet the water user group's projected need.

5.3.11.12 Livestock

Livestock is projected to have adequate water supplies available from local sources to meet the water user group's projected demand during the planning period.

5.3.12 Hays County Water Supply Plan

Table 5.3.12-1 lists each water user group in Hays County and their corresponding surplus or shortage in years 2030 and 2050. For each water user group with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 5.3.12-1.
Hays County Surplus/Shortage

Water User Group	Surplus/Shortage[1]		Comment
	2030 (acft/yr)	2050 (acft/yr)	
City of Kyle	492	-225	Projected shortage – see plan below
City of San Marcos	-9,919	-27,297	Projected shortage – see plan below
City of Wimberley	127	-322	Projected shortage – see plan below
City of Woodcreek	38	31	Projected surplus
Rural Area Residential and Commercial	-6,350	-6,360	Projected shortage – see plan below
Industrial	1,312	1,287	Projected surplus
Steam-Electric Power	36	36	Projected surplus
Mining	-55	-28	Projected shortage – see plan below
Irrigation	512	518	Projected surplus
Livestock	0	0	No projected surplus/shortage

[1] From Table 4-12, Section 4.1 – Water Needs Projections by Water User Group.

5.3.12.1 City of Kyle

The City of Kyle's current water supply is obtained from the Edwards Aquifer. In addition, the City of Kyle has contracted with the Guadalupe-Blanco River Authority (GBRA) for supplies from Canyon Reservoir to be delivered through the Hays/IH35 Water Supply Project which is present in the implementation phase. Without these supplies from Canyon Reservoir, the City of Kyle is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Hays/IH35 Water Supply Project (HIH35WSP)
- GBRA Canyon Reservoir Contract Renewal

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Kyle implement the following water supply plan to meet the projected need for the city (Table 5.3.12-2).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 22 acft/yr beginning in year 2000, decreasing to 0 acft/yr of supply in 2030 (see Section 6, Supplement 2 and Volume III, Section 1.1).
- Hays/IH35 Water Supply Project to be completed in year 2000. This project can provide 589 acft/yr of supply through 2038.
- GBRA Canyon Reservoir Contract Renewal to be implemented in 2038. This project can provide an additional 589 acft/yr of supply.

Table 5.3.12-2.
Recommended Water Supply Plan for the City of Kyle

	2000 (acft/yr)	*2010 (acft/yr)*	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*
Projected Need (Shortage)[1]	0	0	0	0	156	225
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	22	22	22	0	0	0
Hays/IH35 Water Supply Project (HIH35WSP)[2]	*	*	*	*		
GBRA Canyon Reservoir Contract Renewal[3]					589	589
Total New Supply	22	22	22	0	589	589

[1] Includes 589 acft/yr GBRA contract from Canyon Reservoir as current supply to be delivered upon completion of Hays/IH35 Water Supply Project.
[2] The Hays/IH35 Water Supply Project is currently in the implementation phase; however the 589 acft/yr supply from this project has been counted as a current supply for the City of Kyle.
[3] GBRA contract renewal for the Hays/IH35 Water Supply Project.

The costs of the recommended plan to meet the City of Kyle's projected need are shown in Table 5.3.12-3.

Table 5.3.12-3.
Recommended Plan Costs by Decade for the City of Kyle

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$8,822	$8,822	$8,822	$0	$0	$0
Unit Cost ($/acft)	$401	$401	$401	$0	$0	$0
Hays/IH35 Water Supply Project (HIH35WSP)						
Annual Cost ($/yr)	N/A[1]	N/A[1]	N/A[1]	N/A[1]		
Unit Cost ($/acft)	N/A[1]	N/A[1]	N/A[1]	N/A[1]		
GBRA Canyon Contract Renewal (GBRA)						
Annual Cost ($/yr)					N/A[2]	N/A[2]
Unit Cost ($/acft)					N/A[2]	N/A[2]

[1] This project is currently underway with existing funds, therefore, no cost has been projected.
[2].Cost would be to renew an existing contract acquired under existing funds, therefore no new cost shown.

5.3.12.2 City of San Marcos

The City of San Marcos' current water supply is obtained from the Edwards Aquifer and Canyon Reservoir. The City of San Marcos is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Purchase Water from Major Provider(s) (PMP)
- Colorado River Diversion Option (LCRA)
- GBRA Canyon Reservoir Contract Renewal (GBRA)
- Additional Storage (ASR and/or Surface)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of San Marcos implement the following water supply plan to meet the projected need for the city (Table 5.3.12-4).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 590 acft/yr of supply in 2000, increasing to 1,174 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1)
- Purchase Water from Major Provider to be implemented in 2000. This project can provide an additional 5,000 acft/yr of supply beginning in 2000.

- Colorado River Diversion Option (LCRA) to be implemented between 2020 and 2030. This project can provide an additional 4,900 acft/yr of supply in 2030, increasing to 16,500 acft/yr of additional supply in 2050.
- GBRA Canyon Contract Renewal to be implemented in 2047. This project can provide an additional 5,000 acft/yr of supply in 2050.
- Additional Storage (Surface and/or ASR)

Table 5.3.12-4.
Recommended Water Supply Plan for the City of San Marcos

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	641	2,848	5,629	9,919	15,326	27,297
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	590	690	816	699	906	1,174
Purchase Water from Major Provider (PMP)	5,000	5,000	5,000	5,000	5,000	5,000
Colorado River Diversion Option (LCRA)				4,900	10,000	16,500
GBRA Canyon Contract Renewal (GBRA)						5,000
Additional Storage (ASR and/or Surface)[1]						
Total New Supply	5,590	5,690	5,816	10,599	15,906	27,674

[1] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.

The costs of the recommended plan to meet the City of San Marcos' projected need are shown in Table 5.3.12-5.

Table 5.3.12-5.
Recommended Plan Costs by Decade for the City of San Marcos

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$194,586	$194,586	$194,586	$81,103	$81,103	$81,103
Unit Cost ($/acft)	$330	$282	$238	$116	$90	$69
Purchase Water from Major Provider (PMP)[1]						
Annual Cost ($/yr)	$2,995,000	$2,995,000	$3,015,000	$3,015,000	$3,015,000	$3,015,000
Unit Cost ($/acft)	$599	$599	$603	$603	$603	$603
Colorado River Diversion Option (LCRA)						
Annual Cost ($/yr)				$7,494,331	$11,678,275	$16,837,260
Unit Cost ($/acft)				$1,529	$1,168	$1,020
GBRA Canyon Contract Renewal (GBRA)						
Annual Cost ($/yr)						N/A[3]
Unit Cost ($/acft)						N/A[3]
Additional Storage (ASR and/or Surface)[2]						
Annual Cost ($/yr)	$1,514,459	$1,561,151	$1,607,843	$1,103,533	$194,216	$240,999
Unit Cost ($/acft)	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]

[1] The cost associated with this management strategy represents purchase, treatment, and distribution. There are currently sufficient facilities in place to deliver this water.
[2] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.
[3] The cost of renewing the contract is based on the cost of the existing contract that is paid from existing funds.
[4] The cost representing additional storage is not calculated on a unit basis because a supply quantity has not been assigned to this management strategy.

5.3.12.3 City of Wimberley

The City of Wimberley's current water supply is obtained from the Trinity Aquifer. The City of Wimberley is projected to need additional water supplies beginning in the planning year 2050. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Canyon Reservoir (G-24)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Wimberley implement the following water supply plan to meet the projected need for the city (Table 5.3.12-6).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 25 acft/yr beginning in year 2000, decreasing to 0 acft/yr in 2030 (see Section 6, Supplement 2 and Volume III, Section 1.1).
- Canyon Reservoir (G-24) to be implemented in 2050. This project can provide an additional 400 acft/yr of supply.

Table 5.3.12-6.
Recommended Water Supply Plan for the City of Wimberley

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	322
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	25	25	25	0	0	0
Canyon Reservoir (G-24)						400
Total New Supply	25	25	25	0	0	400

The costs of the recommended plan to meet the City of Wimberley's projected need are shown in Table 5.3.12-7.

Table 5.3.12-7.
Recommended Plan Costs by Decade for the City of Wimberley

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$10,025	$10,025	$10,025	$0	$0	$0
Unit Cost ($/acft)	$401	$401	$401	$0	$0	$0
Canyon Reservoir (G-24)						
Annual Cost ($/yr)	$245,540	$245,540	$245,540			$305,660
Unit Cost ($/acft)	N/A[1]	N/A[1]	N/A[1]			$764
[1] Reflects early participation in a project to ensure future needs are met.						

5.3.12.4 City of Woodcreek

The City of Woodcreek is projected to have adequate water supplies available from the Trinity Aquifer to meet the city's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Woodcreek implement the following water supply plan (Table 5.3.12-8).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 10 acft/yr beginning in year 2000, decreasing to 0 acft/yr of supply in 2050 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.12-8.
Recommended Water Supply Plan for the City of Woodcreek

	2000 (acft/yr)	*2010 (acft/yr)*	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	10	10	10	0	0	0
Total New Supply	10	10	10	0	0	0

The costs of the recommended plan for the City of Woodcreek are shown in Table 5.3.12-9.

Table 5.3.12-9.
Recommended Plan Costs by Decade for the City of Woodcreek

Plan Element	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$4,010	$4,010	$4,010	$0	$0	$0
Unit Cost ($/acft)	$401	$401	$401	$0	$0	$0

5.3.12.5 Rural Area Residential and Commercial

Rural area's current water supply is obtained from the Edwards Aquifer, Canyon Reservoir, and run-of-river rights. Rural areas are projected to need additional water supplies beginning in the year 2000. The following options were considered to meet projected need for rural areas:

- Hays/IH35 Water Supply Project (HIH35WSP)
- Canyon Reservoir (G-24)
- Colorado River Diversion Option (LCRA)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that rural water supply districts and authorities and individual households and/or businesses not served by public water supply systems implement the following water supply plan to meet the projected need for rural areas (Table 5.3.12-10).

- Hays/IH35 Water Supply Project to be implemented in 2000. This project can provide an additional 4,400 acft/yr of supply beginning in 2000.
- Canyon Reservoir (G-24) to be implemented in 2000. This project can provide an additional 1,048 acft/yr of supply beginning in 2000, decreasing to 648 acft/yr of additional supply in 2050.
- Colorado River Diversion Option (LCRA) to be implemented in 2020 and 2030. This project can provide an additional 1,100 acft/yr of supply in 2030, increasing to 2,000 acft/yr of additional supply in 2040, then decreasing to 1,500 acft/yr of additional supply in 2050.

Table 5.3.12-10.
Recommended Water Supply Plan for Rural Areas

	2000 (acft/yr)	*2010 (acft/yr)*	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*
Projected Need (Shortage)	3,958	5,035	5,625	6,704	7,644	6,714
Recommended Plan						
Hays/IH35 Water Supply Project (HIH35WSP)	4,400	4,400	4,400	4,400	4,400	4,400
Canyon Reservoir (G-24)	1,048	1,048	1,048	1,048	1,048	648
Colorado River Diversion Option (LCRA)				1,100	2,000	1,500
Total New Supply	5,448	5,448	5,448	6,548	7,448	6,548

The costs of the recommended plan to meet rural area's projected need are shown in Table 5.3.12-11.

Table 5.3.12-11.
Recommended Plan Costs by Decade for Rural Areas

Plan Element	2000	2010	2020	2030	2040	2050
Hays/IH 35 Water Supply Project (HIH35WSP)						
Annual Cost ($/yr)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Unit Cost ($/acft)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Canyon Reservoir (G-24)						
Annual Cost ($/yr)	$1,439,952	1,439,952	$1,444,144	$800,829	$800,829	$495,169
Unit Cost ($/acft)	$1,374	$1,374	$1,378	$764	$764	$764
Colorado River Diversion Option (LCRA)						
Annual Cost ($/yr)				$1,310,059	$2,040,880	$1,644,035
Unit Cost ($/acft)				$1,191	$1,020	$1,096

[1] This project is currently underway with existing funds, therefore no cost has been projected.

5.3.12.6 Industrial

Industrial is projected to have adequate water supplies available from the Edwards Aquifer and run-of-river rights to meet the water user group's projected demand during the planning period.

5.3.12.7 Steam-Electric Power

Steam-electric power is projected to have adequate water supplies available from Canyon Reservoir and reclaimed sources to meet the water user group's projected demand during the planning period.

5.3.12.8 Mining

Mining's current water supply is obtained from the Trinity Aquifer. Mining is projected to need additional water supplies in the planning year 2000. The following options were considered to meet the mining projected need:

- Hays/IH35 Water Supply Project (HIH35WSP)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that individual mining operations implement the following water supply plan to meet the projected need for mining (Table 5.3.12-12).

- Hays/IH35 Water Supply Project to be implemented in 2000. This project can provide an additional 100 acft/yr of supply beginning in 2000.

Table 5.3.12-12.
Recommended Water Supply Plan for Mining

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	84	82	68	55	37	28
Recommended Plan						
Hays/IH35 Water Supply Project (HIH35WSP)	100	100	100	100	100	100
Total New Supply	100	100	100	100	100	100

The costs of the recommended plan to meet the mining projected need are shown in Table 5.3.12-13.

Table 5.3.12-13.
Recommended Plan Costs by Decade for Mining

Plan Element	2000	2010	2020	2030	2040	2050
Hays/IH35 Water Supply Project (HIH35WSP)						
Annual Cost ($/yr)	$66,300	$66,100	$63,900	$62,900	$62,300	$62,300
Unit Cost ($/acft)	$663	$661	$639	$629	$623	$623

5.3.12.9 Irrigation

Irrigation is projected to have adequate water supplies available from the Edwards Aquifer and run-of-river rights to meet the water user group's projected demand during the planning period.

5.3.12.10 Livestock

Livestock is projected to have adequate water supplies available from local sources to meet the water user group's projected demand during the planning period.

5.3.13 Karnes County Water Supply Plan

Table 5.3.13-1 lists each water user group in Karnes County and their corresponding surplus or shortage in years 2030 and 2050. For each water user group with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 5.3.13-1.
Karnes County Surplus/Shortage

Water User Group	Surplus/Shortage[1]		Comment
	2030 (acft/yr)	2050 (acft/yr)	
City of Karnes City	556	509	Projected surplus
City of Kenedy	369	285	Projected surplus
City of Runge	272	255	Projected surplus
Rural Area Residential and Commercial	64	0	Projected surplus
Industrial	43	0	Projected surplus
Steam-Electric Power	0	0	No projected demand
Mining	0	0	No projected surplus/shortage
Irrigation	0	0	No projected surplus/shortage
Livestock	0	0	No projected surplus/shortage

[1] From Table 4-13, Section 4.1 – Water Needs Projections by Water User Group.

5.3.13.1 City of Karnes City

The City of Karnes City is projected to have adequate water supplies available from the Carrizo Aquifer to meet the city's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Karnes City implement the following water supply plan (Table 5.3.13-2).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 29 acft/yr beginning in year 2000, decreasing to 0 acft/yr of supply in 2030 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.13-2.
Recommended Water Supply Plan for the City of Karnes City

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	29	29	29	0	0	0
Total New Supply	29	29	29	0	0	0

The costs of the recommended plan for the City of Karnes City are shown in Table 5.3.13-3.

Table 5.3.13-3.
Recommended Plan Costs by Decade for the City of Karnes City

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$11,513	$11,513	$11,513	$0	$0	$0
Unit Cost ($/acft)	$397	$397	$397	$0	$0	$0

5.3.13.2 City of Kenedy

The City of Kenedy is projected to have adequate water supplies available from the Carrizo Aquifer to meet the city's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Kenedy implement the following water supply plan (Table 5.3.13-4).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 37 acft/yr beginning in year 2000, decreasing to 0 acft/yr of supply in 2030 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.13-4.
Recommended Water Supply Plan for the City of Kenedy

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	37	37	37	0	0	0
Total New Supply	37	37	37	0	0	0

The costs of the recommended plan for the City of Kenedy are shown in Table 5.3.13-5.

Table 5.3.13-5.
Recommended Plan Costs by Decade for the City of Kenedy

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$14,689	$14,689	$14,689	$0	$0	$0
Unit Cost ($/acft)	$397	$397	$397	$0	$0	$0

5.3.13.3 City of Runge

The City of Runge is projected to have adequate water supplies available from the Gulf Coast Aquifer to meet the city's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Runge implement the following water supply plan (Table 5.3.13-6).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 11 acft/yr beginning in year 2000, decreasing to 0 acft/yr of supply in 2030 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.13-6.
Recommended Water Supply Plan for the City of Runge

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	11	11	11	0	0	0
Total New Supply	11	11	11	0	0	0

The costs of the recommended plan for the City of Runge are shown in Table 5.3.13-7.

Table 5.3.13-7.
Recommended Plan Costs by Decade for the City of Runge

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$4,367	$4,367	$4,367	$0	$0	$0
Unit Cost ($/acft)	$397	$397	$397	$0	$0	$0

5.3.13.4 Rural Area Residential and Commercial

The rural area of Karnes County is projected to have adequate water supplies available from the Carrizo Aquifer and Gulf Coast Aquifer to meet the water user group's projected demand during the planning period.

5.3.13.5 Industrial

Industrial is projected to have adequate water supplies available from the Carrizo Aquifer and Gulf Coast Aquifer to meet the water user group's projected demand during the planning period.

5.3.13.6 Steam-Electric Power

There is no projected steam-electric power water demand in Karnes County, therefore no water management strategies are recommended for this water user group.

5.3.13.7 Mining

Mining is projected to have adequate water supplies available from the Carrizo Aquifer and Gulf Coast Aquifer to meet the water user group's projected demand during the planning period.

5.3.13.8 Irrigation

Irrigation is projected to have adequate water supplies available from the Carrizo Aquifer and run-of-river rights to meet the water user group's projected demand during the planning period.

5.3.13.9 Livestock

Livestock is projected to have adequate water supplies available from local sources to meet the water user group's projected demand during the planning period.

5.3.14 Kendall County Water Supply Plan

Table 5.3.14-1 lists each water user group in Kendall County and their corresponding surplus or shortage in years 2030 and 2050. For each water user group with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 5.3.14-1.
Kendall County Surplus/Shortage

Water User Group	Surplus/Shortage[1] 2030 (acft/yr)	Surplus/Shortage[1] 2050 (acft/yr)	Comment
City of Boerne	-974	-2,528	Projected shortage – see plan below
City of Comfort	387	356	Projected surplus
City of Fair Oaks Ranch			See Bexar County
Rural Area Residential and Commercial	-3,811	-6,847	Projected shortage – see plan below
Industrial	-4	-6	Projected shortage – see plan below
Steam-Electric Power	0	0	No projected demand
Mining	1	0	Projected surplus
Irrigation	30	30	Projected surplus
Livestock	0	0	No projected surplus/shortage

[1] From Table 4-14, Section 4.1 – Water Needs Projections by Water User Group.

5.3.14.1 City of Boerne

The City of Boerne's current water supply is obtained from the Trinity Aquifer and Cibolo Creek at Boerne Lake. The City of Boerne is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Western Canyon Regional Water Supply Project
- Purchase Water from Major Provider

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Boerne implement the following water supply plan to meet the projected need for the city (Table 5.3.14-2).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 42 acft/yr of supply in 2000, decreasing to 0 acft/yr in 2030. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Western Canyon Regional Water Supply Project to be implemented in 2000. This project can provide an additional 1,861 acft/yr of supply beginning in 2000.
- Purchase Water from Major Provider, such as the Regional Water Provider for Bexar County, to obtain additional supplies of 1,000 acft/yr in 2050.

Table 5.3.14-2.
Recommended Water Supply Plan for the City of Boerne

	2000 (acft/yr)	*2010 (acft/yr)*	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*
Projected Need (Shortage)	34	486	493	974	1,587	2,528
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	42	42	42	0	0	0
Western Canyon Regional Water Supply Project	1,861	1,861	1,861	1,861	1,861	1,861
Purchase Water from Major Provider						1,000
Total New Supply	1,903	1,903	1,903	1,861	1,861	2,861

The costs of the recommended plan to meet the City of Boerne's projected need are shown in Table 5.3.14-3.

Table 5.3.14-3.
Recommended Plan Costs by Decade for the City of Boerne

Plan Element	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$16,340	$16,340	$16,340	$0	$0	$0
Unit Cost ($/acft)	$389	$389	$389	$0	$0	$0
Western Canyon Regional Water Supply Project						
Annual Cost ($/yr)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Unit Cost ($/acft)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Purchase Water from Major Provider						
Annual Cost ($/yr)	$549,000	$549,000	$549,000			$328,000
Unit Cost ($/acft)	N/A[2]	N/A[2]	N/A[2]			$328

[1] This project is currently under development with existing funds, therefore costs not included.
[2] Reflects early participation in a project to ensure future needs are met.

5.3.14.2 City of Comfort

The City of Comfort is projected to have adequate water supplies available from the Edwards-Trinity Aquifer to meet the city's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Comfort implement the following water supply plan (Table 5.3.14-4).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 17 acft/yr beginning in year 2000, decreasing to 0 acft/yr of supply in 2050 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.14-4.
Recommended Water Supply Plan for the City of Comfort

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	17	17	17	0	0	0
Total New Supply	17	17	17	0	0	0

The costs of the recommended plan for the City of Comfort are shown in Table 5.3.14-5.

Table 5.3.14-5.
Recommended Plan Costs by Decade for the City of Comfort

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$6,614	$6,614	$6,614	$0	$0	$0
Unit Cost ($/acft)	$389	$389	$389	$0	$0	$0

5.3.14.3 City of Fair Oaks Ranch (See Bexar County)

5.3.14.4 Rural Area Residential and Commercial

Rural area's current water supply is obtained from the Trinity Aquifer and the Edwards-Trinity Aquifer. Rural areas are projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the projected need for rural areas:

- Purchase Water from Major Provider

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that rural area water supply districts and authorities and individual households and/or businesses not served by public water supply systems implement the following water supply plan to meet the projected need for rural areas (Table 5.3.14-6).

- Purchase Water from Major Provider, such as the Regional Water Provider for Bexar County, to be implemented in 2000 that can provide an additional 1,990 acft/yr of supply in 2000, increasing to 6,990 acft/yr of additional supply in 2050.

Table 5.3.14-6.
Recommended Water Supply Plan for Rural Areas

	2000 (acft/yr)	*2010 (acft/yr)*	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*
Projected Need (Shortage)	1,070	1,539	2,808	4,099	5,578	6,847
Recommended Plan						
Purchase Water from Major Provider	1,990	1,990	2,990	4,990	5,990	6,990
Total New Supply	1,990	1,990	2,990	4,990	5,990	6,990

The costs of the recommended plan to meet rural area's projected need are shown in Table 5.3.14-7.

Table 5.3.14-7.
Recommended Plan Costs by Decade for Rural Areas

Plan Element	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*
Purchase Water from Major Provider						
Annual Cost ($/yr)	$4,490,230	$4,490,230	$4,818,230	$1,636,720	$1,964,720	$2,292,720
Unit Cost ($/acft)	$2,256	$2,256	$1,611	$328	$328	$328

5.3.14.5 Industrial

Industrial's current water supply is obtained from the Trinity Aquifer. Industrial is projected to need additional water supplies in the planning year 2000. The following options were considered to meet the industrial projected need:

- Purchase Water from Major Provider

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that individual industrial operations implement the following water supply plan to meet the projected need for industrial (Table 5.3.14-8).

- Purchase Water from Major Provider, such as the Regional Water Provider for Bexar County, to be implemented in 2000 that can provide an additional 10 acft/yr of supply beginning in 2000.

Table 5.3.14-8.
Recommended Water Supply Plan for Industrial

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	2	3	4	4	5	6
Recommended Plan						
Purchase Water from Major Provider	10	10	10	10	10	10
Total New Supply	10	10	10	10	10	10

The costs of the recommended plan to meet the industrial projected need are shown in Table 5.3.14-9.

Table 5.3.14-9.
Recommended Plan Costs by Decade for Industrial

Plan Element	2000	2010	2020	2030	2040	2050
Purchase Water from Major Provider						
Annual Cost ($/yr)	$8,770	$8,770	$8,770	$3,280	$3,280	$3,280
Unit Cost ($/acft)	$877	$877	$877	$328	$328	$328

5.3.14.6 Steam-Electric Power

There is no projected steam-electric power water demand in Kendall County, therefore no water management strategies are recommended for this water user group.

5.3.14.7 Mining

Mining is projected to have adequate water supplies available from the Edwards-Trinity Aquifer and Trinity Aquifer to meet the water user group's projected demand during the planning period.

5.3.14.8 Irrigation

Irrigation is projected to have adequate water supplies available from the Edwards-Trinity Aquifer, Trinity Aquifer, and run-of-river rights to meet the water user group's projected demand during the planning period.

5.3.14.9 Livestock

Livestock is projected to have adequate water supplies available from local sources to meet the water user group's projected demand during the planning period.

5.3.15 LaSalle County Water Supply Plan

Table 5.3.15-1 lists each water user group in LaSalle County and their corresponding surplus or shortage in years 2030 and 2050. For each water user group with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 5.3.15-1.
LaSalle County Surplus/Shortage

Water User Group	*Surplus/Shortage*[1]		*Comment*
	2030 (acft/yr)	*2050 (acft/yr)*	
City of Cotulla	278	208	Projected surplus
City of Encinal	53	60	Projected surplus
Rural Area Residential and Commercial	6	5	Projected surplus
Industrial	0	0	No projected demand
Steam-Electric Power	0	0	No projected demand
Mining	0	0	No projected demand
Irrigation	0	0	No projected surplus/shortage
Livestock	0	0	No projected surplus/shortage

[1] From Table 4-15, Section 4.1 – Water Needs Projections by Water User Group.

5.3.15.1 City of Cotulla

The City of Cotulla is projected to have adequate water supplies available from the Carrizo Aquifer to meet the city's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Cotulla implement the following water supply plan (Table 5.3.15-2).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 70 acft/yr beginning in year 2000, increasing to 83 acft/yr of supply in 2050 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.15-2.
Recommended Water Supply Plan for the City of Cotulla

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	70	74	78	43	81	83
Total New Supply	70	74	78	43	81	83

The costs of the recommended plan for the City of Cotulla are shown in Table 5.3.15-3.

Table 5.3.15-3.
Recommended Plan Costs by Decade for the City of Cotulla

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$19,268	$19,268	$19,268	$4,868	$4,868	$4,868
Unit Cost ($/acft)	$275	$260	$247	$113	$60	$59

5.3.15.2 City of Encinal

The City of Encinal is projected to have adequate water supplies available from the Carrizo Aquifer to meet the city's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Encinal implement the following water supply plan (Table 5.3.15-4).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 6 acft/yr beginning year 2000, decreasing to 0 acft/yr of supply in 2030. (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.15-4.
Recommended Water Supply Plan for the City of Encinal

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	6	6	6	0	0	0
Total New Supply	6	6	6	0	0	0

The costs of the recommended plan for the City of Encinal are shown in Table 5.3.15-5.

Table 5.3.15-5.
Recommended Plan Costs by Decade for the City of Encinal

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$2,400	$2,400	$2,400	$0	$0	$0
Unit Cost ($/acft)	$400	$400	$400	$0	$0	$0

5.3.15.3 Rural Area Residential and Commercial

The rural area of LaSalle County is projected to have adequate water supplies available from the Carrizo Aquifer, Sparta Aquifer, and Queen City Aquifer to meet the water user group's projected demand during the planning period.

5.3.15.4 Industrial

There is no projected industrial water demand in LaSalle County, therefore no water management strategies are recommended for this water user group.

5.3.15.5 Steam-Electric Power

There is no projected steam-electric power water demand in LaSalle County, therefore no water management strategies are recommended for this water user group.

5.3.15.6 Mining

There is no projected mining water demand in LaSalle County, therefore no water management strategies are recommended for this water user group.

5.3.15.7 Irrigation

Irrigation is projected to have adequate water supplies available from the Carrizo Aquifer, Sparta Aquifer, Queen City Aquifer, and run-of-river rights to meet the water user group's projected demand during the planning period.

5.3.15.8 Livestock

Livestock is projected to have adequate water supplies available from local sources to meet the water user group's projected demand during the planning period.

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5.3.16 Medina County Water Supply Plan

Table 5.3.16-1 lists each water user group in Medina County and their corresponding surplus or shortage in years 2030 and 2050. For each water user group with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 5.3.16-1.
Medina County Surplus/Shortage

Water User Group	Surplus/Shortage[1] 2030 (acft/yr)	Surplus/Shortage[1] 2050 (acft/yr)	Comment
City of Castroville	-331	-393	Projected shortage – see plan below
City of Devine	-677	-718	Projected shortage – see plan below
City of Hondo	-1,154	-1,284	Projected shortage – see plan below
City of La Coste	-195	-234	Projected shortage – see plan below
City of Lytle			See Atascosa County
City of Natalia	70	46	Projected surplus
Rural Area Residential and Commercial	196	-70	Projected shortage – see plan below
Industrial	464	414	Projected surplus
Steam-Electric Power	0	0	No projected demand
Mining	-72	-76	Projected shortage – see plan below
Irrigation	-65,382	-55,006	Projected shortage – see plan below
Livestock	0	0	No projected surplus/shortage

[1] From Table 4-16, Section 4.1 – Water Needs Projections by Water User Group.

5.3.16.1 City of Castroville

The City of Castroville's current water supply is obtained from the Edwards Aquifer. The City of Castroville is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Edwards Irrigation Transfers (L-15)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Castroville implement the following water supply plan to meet the projected need for the city (Table 5.3.16-2).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 43 acft/yr of supply in 2000, decreasing to 30 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Edwards Irrigation Transfers (L-15) to be implemented in 2000. This project can provide an additional 400 acft/yr of supply from 2000 to 2050.

Table 5.3.16-2.
Recommended Water Supply Plan for the City of Castroville

	2000 (acft/yr)	*2010 (acft/yr)*	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*
Projected Need (Shortage)	228	255	283	331	362	393
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	43	45	48	28	29	30
Edwards Irrigation Transfers (L-15)	400	400	400	400	400	400
Total New Supply	443	445	448	428	429	430

The costs of the recommended plan to meet the City of Castroville's projected need are shown in Table 5.316-3.

Table 5.3.16-3.
Recommended Plan Costs by Decade for the City of Castroville

Plan Element	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$15,111	$15,152	$15,360	$7,435	$7,495	$7,455
Unit Cost ($/acft)	$351	$337	$320	$266	$258	$249
Edwards Irrigation Transfers (L-15)						
Annual Cost ($/yr)	$37,647	$37,647	$37,647	$37,647	$37,647	$37,647
Unit Cost ($/acft)	$80	$80	$80	$80	$80	$80

5.3.16.2 City of Devine

The City of Devine's current water supply is obtained from the Edwards Aquifer. The City of Devine is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Edwards Irrigation Transfers (L-15)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Divine implement the following water supply plan to meet the projected need for the city (Table 5.3.16-4).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 76 acft/yr of supply in 2000, decreasing to an additional 48 acft/yr of supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Edwards Irrigation Transfers (L-15) to be implemented in 2000. This project can provide an additional 800 acft/yr of supply from 2000 through 2050.

Table 5.3.16-4.
Recommended Water Supply Plan for the City of Devine

	2000 (acft/yr)	*2010 (acft/yr)*	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*
Projected Need (Shortage)	666	656	653	677	700	718
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	76	79	82	45	46	48
Edwards Irrigation Transfers (L-15)	800	800	800	800	800	800
Total New Supply	876	879	882	845	846	848

The costs of the recommended plan to meet the City of Devine's projected need are shown in Table 5.3.16-5.

Table 5.3.16-5.
Recommended Plan Costs by Decade for the City of Devine

Plan Element	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$26,796	$26,755	$26,547	$11,948	$11,888	$11,928
Unit Cost ($/acft)	$353	$339	$324	$266	$258	$249
Edwards Irrigation Transfers (L-15)						
Annual Cost ($/yr)	$75,294	$75,294	$75,294	$75,294	$75,294	$75,294
Unit Cost ($/acft)	$80	$80	$80	$80	$80	$80

5.3.16.3 City of Hondo

The City of Hondo's current water supply is obtained from the Edwards Aquifer. The City of Hondo is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Edwards Irrigation Transfers (L-15)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Hondo implement the following water supply plan to meet the projected need for the city (Table 5.3.16-6).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 59 acft/yr of supply in 2000, decreasing to 0 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Edwards Irrigation Transfers (L-15) to be implemented in 2000. This project can provide an additional 1,300 acft/yr of supply from 2000 through 2050.

Table 5.3.16-6.
Recommended Water Supply Plan for the City of Hondo

	2000 (acft/yr)	*2010 (acft/yr)*	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*
Projected Need (Shortage)	923	983	1,055	1,154	1,218	1,284
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	59	59	59	0	0	0
Edwards Irrigation Transfers (L-15)	1,300	1,300	1,300	1,300	1,300	1,300
Total New Supply	1,359	1,359	1,359	1,300	1,300	1,300

The costs of the recommended plan to meet the City of Hondo's projected need are shown in Table 5.3.16-7.

Table 5.3.16-7.
Recommended Plan Costs by Decade for the City of Hondo

Plan Element	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$22,148	$22,148	$22,148	$0	$0	$0
Unit Cost ($/acft)	$375	$375	$375	$0	$0	$0
Edwards Irrigation Transfers (L-15)						
Annual Cost ($/yr)	$122,352	$122,352	$122,352	$122,352	$122,352	$122,352
Unit Cost ($/acft)	$80	$80	$80	$80	$80	$80

5.3.16.4 City of La Coste

The City of La Coste's current water supply is obtained from the Edwards Aquifer. The City of La Coste is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Edwards Irrigation Transfers (L-15)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of La Coste implement the following water supply plan to meet the projected need for the city (Table 5.3.16-8).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 10 acft/yr of supply, decreasing to 0 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Edwards Irrigation Transfers (L-15) to be implemented in 2000. This project can provide an additional 300 acft/yr of supply from 2000 through 2050.

Table 5.3.16-8.
Recommended Water Supply Plan for the City of La Coste

	2000 (acft/yr)	*2010 (acft/yr)*	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*
Projected Need (Shortage)	147	168	169	195	214	234
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	10	10	10	0	0	0
Edwards Irrigation Transfers (L-15)	300	300	300	300	300	300
Total New Supply	310	310	310	300	300	300

The costs of the recommended plan to meet the City of La Coste's projected need are shown in Table 5.3.16-9.

Table 5.3.16-9.
Recommended Plan Costs by Decade for the City of La Coste

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$3,754	$3,754	$3,754	$0	$0	$0
Unit Cost ($/acft)	$375	$375	$375	$0	$0	$0
Edwards Irrigation Transfers (L-15)						
Annual Cost ($/yr)	$28,236	$28,236	$28,236	$28,236	$28,236	$28,236
Unit Cost ($/acft)	$80	$80	$80	$80	$80	$80

5.3.16.5 City of Lytle (See Atascosa County)

5.3.16.6 City of Natalia

The City of Natalia projected to have adequate water supplies available from the Carrizo Aquifer to meet the city’s projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Natalia implement the following water supply plan (Table 5.316-10).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 12 acft/yr of supply, decreasing to 0 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.16-10.
Recommended Water Supply Plan for the City of Natalia

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	12	12	12	0	0	0
Total New Supply	12	12	12	0	0	0

The costs of the recommended plan for the City of Natalia are shown in Table 5.3.16-11.

Table 5.3.16-11.
Recommended Plan Costs by Decade for the City of Natalia

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$4,505	$4,505	$4,505	$0	$0	$0
Unit Cost ($/acft)	$375	$375	$375	$0	$0	$0

5.3.16.7 Rural Area Residential and Commercial

Rural area's current water supply is obtained from the Edwards Aquifer, Carrizo Aquifer, and Trinity Aquifer. Rural areas are projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the projected need for rural areas:

- Edwards Irrigation Transfers (L-15)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that rural area water supply districts and authorities and individual households and/or businesses not served by public water supply systems implement the following water supply plan to meet the projected need for rural areas (Table 5.3.16-12).

- Edwards Irrigation Transfers (L-15) to be implemented in 2000. This project can provide an additional 100 acft/yr of supply from 2000 through 2050.

Table 5.3.16-12.
Recommended Water Supply Plan for Rural Areas

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	23	39	70
Recommended Plan						
Edwards Irrigation Transfers (L-15)	100	100	100	100	100	100
Total New Supply	100	100	100	100	100	100

The costs of the recommended plan to meet rural area's projected need are shown in Table 5.3.16-13.

Table 5.3.16-13.
Recommended Plan Costs by Decade for Rural Areas

Plan Element	2000	2010	2020	2030	2040	2050
Edwards Irrigation Transfers (L-15)						
Annual Cost ($/yr)	$9,412	$9,412	$9,412	$9,412	$9,412	$9,412
Unit Cost ($/acft)	$80	$80	$80	$80	$80	$80

5.3.16.8 Industrial

Industrial is projected to have adequate water supplies available from the Edwards Aquifer to meet the water user group's projected demand during the planning period.

5.3.16.9 Steam-Electric Power

There is no projected steam-electric power water demand in Medina County, therefore no water management strategies are recommended for this water user group.

5.3.16.10 Mining

Mining's current water supply is obtained from the Carrizo Aquifer and Trinity Aquifer. Mining is projected to need additional water supplies in the planning year 2000. The following options were considered to meet the mining projected need:

- Edwards Irrigation Transfers (L-15)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that individual mining operations implement the following water supply plan to meet the projected need for mining (Table 5.3.16-14).

- Edwards Irrigation Transfers (L-15) to be implemented in 2000. This project can provide an additional 100 acft/yr of supply from 2000 through 2050.

Table 5.3.16-14.
Recommended Water Supply Plan for Mining

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	68	68	70	72	74	76
Recommended Plan						
Edwards Irrigation Transfers (L-15)	100	100	100	100	100	100
Total New Supply	100	100	100	100	100	100

The costs of the recommended plan to meet the mining projected need are shown in Table 5.3.16-15.

Table 5.3.16-15.
Recommended Plan Costs by Decade for Mining

Plan Element	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*
Edwards Irrigation Transfers (L-15)						
Annual Cost ($/yr)	$9,412	$9,412	$9,412	$9,412	$9,412	$9,412
Unit Cost ($/acft)	$80	$80	$80	$80	$80	$80

5.3.16.11 Irrigation

Irrigation's current water supply is obtained from the Edwards Aquifer, Carrizo Aquifer, Trinity Aquifer, and run-of-river rights. Irrigation is projected to need additional water supplies in the planning year 2000. The following options were considered to meet the irrigation projected need:

- Demand Reduction (Conservation) (L-10 Irr.) (See Section 6, Supplement 2)

Working within the planning criteria established by the SCTRWPG and the TWDB, it has been found that it is not economically feasible to meet all of the projected irrigation needs at this time, since the cost of the water management strategies with enough water supply to meet the needs far exceeds the ability of irrigators to pay for the water. However, the irrigation water conservation option will meet a part of the projected irrigation needs in Medina County where further irrigation conservation opportunity exists. It is recommended that individual irrigators implement the following water supply plan to meet a portion of the projected need for irrigation (Table 5.3.16-16).

- Demand Reduction (Conservation) to be implemented in 2000. This project can provide an additional 5,000 acft/yr of supply.

Table 5.3.16-16.
Recommended Water Supply Plan for Irrigation

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	78,206	72,360	66,580	65,382	60,082	55,006
Recommended Plan						
Demand Reduction (Conservation) (L-10 Irr.)	5,000	5,000	5,000	5,000	5,000	5,000
Total New Supply	5,000	5,000	5,000	5,000	5,000	5,000

The costs of the recommended plan to meet the irrigation projected need are shown in Table 5.3.16-17.

Table 5.3.16-17.
Recommended Plan Costs by Decade for Irrigation

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Irr.)						
Annual Cost ($/yr)	$181,650	$181,650	$181,650	$0	$0	$0
Unit Cost ($/acft)	$36	$36	$36	$0	$0	$0

5.3.16.12 Livestock

Livestock is projected to have adequate water supplies available from local sources to meet the water user group's projected demand during the planning period.

5.3.17 Refugio County Water Supply Plan

Table 5.3.17-1 lists each water user group in Refugio County and their corresponding surplus or shortage in years 2030 and 2050. For each water user group with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 5.3.17-1.
Refugio County Surplus/Shortage

Water User Group	Surplus/Shortage[1]		Comment
	2030 (acft/yr)	2050 (acft/yr)	
City of Refugio	1,291	1,306	Projected surplus
City of Woodsboro	170	180	Projected surplus
Rural Area Residential and Commercial	66	89	Projected surplus
Industrial	0	0	No projected demand
Steam-Electric Power	0	0	No projected demand
Mining	0	0	No projected surplus/shortage
Irrigation	0	0	No projected demand
Livestock	0	0	No projected surplus/shortage

[1] From Table 4-17, Section 4.1 – Water Needs Projections by Water User Group.

5.3.17.1 City of Refugio

The City of Refugio is projected to have adequate water supplies available from the Gulf Coast Aquifer to meet the city's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Refugio implement the following water supply plan (Table 5.3.17-2).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 31 acft/yr of supply, decreasing to 0 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.17-2.
Recommended Water Supply Plan for the City of Refugio

	2000 (acft/yr)	*2010 (acft/yr)*	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	31	31	31	0	0	0
Total New Supply	31	31	31	0	0	0

The costs of the recommended plan for the City of Refugio are shown in Table 5.3.17-3.

Table 5.3.17-3.
Recommended Plan Costs by Decade for the City of Refugio

Plan Element	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$13,919	$13,919	$13,919	$0	$0	$0
Unit Cost ($/acft)	$449	$449	$449	$0	$0	$0

5.3.17.2 City of Woodsboro

The City of Woodsboro is projected to have adequate water supplies available from the Gulf Coast Aquifer to meet the city's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Woodsboro implement the following water supply plan (Table 5.3.17-4).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 17 acft/yr of supply, decreasing to 0 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.17-4.
Recommended Water Supply Plan for the City of Woodsboro

	2000 (acft/yr)	*2010 (acft/yr)*	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	17	17	17	0	0	0
Total New Supply	17	17	17	0	0	0

The costs of the recommended plan for the City of Woodsboro are shown in Table 5.3.17-5.

Table 5.3.17-5.
Recommended Plan Costs by Decade for the City of Woodsboro

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$7,633	$7,633	$7,633	$0	$0	$0
Unit Cost ($/acft)	$449	$449	$449	$0	$0	$0

5.3.17.3 Rural Area Residential and Commercial

The rural area of Refugio County is projected to have adequate water supplies available from the Gulf Coast Aquifer to meet the water user group's projected demand during the planning period.

5.3.17.4 Industrial

There is no projected industrial water demand in Refugio County, therefore no water management strategies are recommended for this water user group.

5.3.17.5 Steam-Electric Power

There is no projected steam-electric power water demand in Refugio County, therefore no water management strategies are recommended for this water user group.

5.3.17.6 Mining

Mining is projected to have adequate water supplies available from the Gulf Coast Aquifer to meet the water user group's projected demand during the planning period.

5.3.17.7 Irrigation

There is no projected irrigation water demand in Refugio County, therefore no water management strategies are recommended for this water user group.

5.3.17.8 Livestock

Livestock is projected to have adequate water supplies available from local sources to meet the water user group's projected demand during the planning period.

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5.3.18 Uvalde County Water Supply Plan

Table 5.3.18-1 lists each water user group in Uvalde County and their corresponding surplus or shortage in years 2030 and 2050. For each water user group with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 5.3.18-1. Uvalde County Surplus/Shortage

Water User Group	Surplus/Shortage[1] 2030 (acft/yr)	Surplus/Shortage[1] 2050 (acft/yr)	Comment
City of Sabinal	-369	-476	Projected shortage – see plan below
City of Uvalde	-3,872	-5,133	Projected shortage – see plan below
Rural Area Residential and Commercial	250	366	Projected surplus
Industrial	410	293	Projected surplus
Steam-Electric Power	0	0	No projected demand
Mining	0	0	No projected surplus/shortage
Irrigation	-36,274	-27,383	Projected shortage – see plan below
Livestock	0	0	No projected surplus/shortage

[1] From Table 4-18, Section 4.1 – Water Needs Projections by Water User Group.

5.3.18.1 City of Sabinal

The City of Sabinal's current water supply is obtained from the Edwards Aquifer. The City of Sabinal is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Edwards Irrigation Transfers (L-15)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Sabinal implement the following water supply plan to meet the projected need for the city (Table 5.3.18-2).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 31 acft/yr of supply in 2000, decreasing to 26 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).

- Edwards Irrigation Transfers (L-15) to be implemented in 2000. This project can provide an additional 500 acft/yr beginning in the year 2000 through 2050.

Table 5.3.18-2. Recommended Water Supply Plan for the City of Sabinal

	2000 (acft/yr)	*2010 (acft/yr)*	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*
Projected Need (Shortage)	247	283	310	369	420	476
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	31	34	36	22	24	26
Edwards Irrigation Transfers (L-15)	500	500	500	500	500	500
Total New Supply	531	534	536	522	524	526

The costs of the recommended plan to meet the City of Sabinal's projected need are shown in Table 5.3.18-3.

Table 5.3.18-3. Recommended Plan Costs by Decade for the City of Sabinal

Plan Element	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$8,364	$8,392	$8,342	$2,287	$2,272	$2,244
Unit Cost ($/acft)	$270	$247	$232	$104	$95	$86
Edwards Irrigation Transfers (L-15)						
Annual Cost ($/yr)	$47,060	$47,060	$47,060	$47,060	$47,060	$47,060
Unit Cost ($/acft)	$80	$80	$80	$80	$80	$80

5.3.18.2 City of Uvalde

The City of Uvalde's current water supply is obtained from the Edwards Aquifer. The City of Uvalde is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Edwards Irrigation Transfers (L-15)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Uvalde implement the following water supply plan to meet the projected need for the city (Table 5.3.18-4).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 286 acft/yr of supply in 2000, declining to 257 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Edwards Irrigation Transfers (L-15) to be implemented in 2000. This project can provide additional supplies of 2,500 acft/yr 2000, 3,500 acft/yr in 2010 and 2020, 4,500 acft/yr in 2030 and 2040, and 5,500 acft/yr in 2050.

Table 5.3.18-4.
Recommended Water Supply Plan for the City of Uvalde

	2000 (acft/yr)	*2010 (acft/yr)*	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*
Projected Need (Shortage)	2,435	2,883	3,183	3,872	4,460	5,133
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	286	312	335	213	234	257
Edwards Irrigation Transfers (L-15)	2,500	3,500	3,500	4,500	4,500	5,000
Total New Supply	2,786	3,812	3,835	4,713	4,734	5,257

The costs of the recommended plan to meet the City of Uvalde's projected need are shown in Table 5.3.18-5.

Table 5.3.18-5.
Recommended Plan Costs by Decade for the City of Uvalde

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$76,596	$76,568	$76,618	$0	$0	$0
Unit Cost ($/acft)	$268	$245	$229	$0	$0	$0
Edwards Irrigation Transfers (L-15)						
Annual Cost ($/yr)	$235,300	$329,420	$329,420	$423,540	$423,540	$470,600
Unit Cost ($/acft)	$80	$80	$80	$80	$80	$80

5.3.18.3 Rural Area Residential and Commercial

The rural area of Uvalde County is projected to have adequate water supplies available from the Edwards Aquifer, Carrizo Aquifer, Edwards-Trinity Aquifer, and Trinity Aquifer to meet the water user group's projected demand during the planning period.

5.3.18.4 Industrial

Industrial is projected to have adequate water supplies available from the Edwards Aquifer to meet the water user group's projected demand during the planning period.

5.3.18.5 Steam-Electric Power

There is no projected steam-electric power water demand in Uvalde County, therefore no water management strategies are recommended for this water user group.

5.3.18.6 Mining

Mining is projected to have adequate water supplies available from the Carrizo Aquifer, Edwards-Trinity Aquifer, and Trinity Aquifer to meet the water user group's projected demand during the planning period.

5.3.18.7 Irrigation

Irrigation's current water supply is obtained from the Edwards Aquifer, Carrizo Aquifer, Edwards-Trinity (Plateau) Aquifer, Trinity Aquifer, and run-of-river rights. Irrigation is projected to need additional water supplies in the planning year 2000. The following options were considered to meet the irrigation projected need:

- Demand Reduction (Conservation) (L-10 Irr.) (See Section 6, Supplement 2)

Working within the planning criteria established by the SCTRWPG and the TWDB, it has been found that it is not economically feasible to meet all of the projected irrigation needs at this time, since the cost of the water management strategies with enough water supply to meet the needs far exceeds the ability of irrigators to pay for the water. However, the irrigation water conservation option will meet a part of the projected irrigation needs in Uvalde County where further irrigation conservation opportunity exists. It is recommended that individual irrigators implement the following water supply plan to meet a portion of the projected need for irrigation (Table 5.3.18-6).

- Demand Reduction (Conservation) to be implemented in 2000. This project can provide an additional 5,958 acft/yr of supply.

Table 5.3.18-6.
Recommended Water Supply Plan for Irrigation

	2000 (acft/yr)	*2010 (acft/yr)*	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*
Projected Need (Shortage)	48,551	43,250	38,253	36,274	31,674	27,383
Recommended Plan						
Demand Reduction (Conservation) (L-10 Irr.)	5,958	5,958	5,958	5,958	5,958	5,958
Total New Supply	5,958	5,958	5,958	5,958	5,958	5,958

The costs of the recommended plan to meet the irrigation projected need are shown in Table 5.3.18-7.

Table 5.3.18-7.
Recommended Plan Costs by Decade for Irrigation

Plan Element	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*
Demand Reduction (Conservation) (L-10 Irr.)						
Annual Cost ($/yr)	$216,454	$216,454	$216,454	$0	$0	$0
Unit Cost ($/acft)	$36	$36	$36	$0	$0	$0

5.3.18.8 Livestock

Livestock is projected to have adequate water supplies available from local sources to meet the water user group's projected demand during the planning period.

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5.3.19 Victoria County Water Supply Plan

Table 5.3.19-1 lists each water user group in Victoria County and their corresponding surplus or shortage in years 2030 and 2050. For each water user group with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 5.3.19-1.
Victoria County Surplus/Shortage

Water User Group	*Surplus/Shortage[1]* 2030 (acft/yr)	*Surplus/Shortage[1]* 2050 (acft/yr)	*Comment*
City of Bloomington	249	192	Projected surplus
City of Victoria	2,438	819	Projected surplus
Rural Area Residential and Commercial	262	0	Projected surplus
Industrial	8,462	0	Projected surplus
Steam-Electric Power	0	0	No projected surplus/shortage
Mining	0	0	No projected surplus/shortage
Irrigation	162	162	Projected surplus
Livestock	0	0	No projected surplus/shortage

[1] From Table 4-19, Section 4.1 – Water Needs Projections by Water User Group.

5.3.19.1 City of Bloomington

The City of Bloomington is projected to have adequate water supplies available from the Gulf Coast Aquifer to meet the city's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Bloomington implement the following water supply plan (Table 5.3.19-2).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 19 acft/yr beginning in year 2000, decreasing to 0 acft/yr of supply in 2030 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.19-2.
Recommended Water Supply Plan for the City of Bloomington

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	19	19	19	0	0	0
Total New Supply	19	19	19	0	0	0

The costs of the recommended plan for the City of Bloomington are shown in Table 5.3.19-3.

Table 5.3.19-3.
Recommended Plan Costs by Decade for the City of Bloomington

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$7,683	$7,683	$7,683	$0	$0	$0
Unit Cost ($/acft)	$404	$404	$404	$0	$0	$0

5.3.19.2 City of Victoria

The City of Victoria is projected to have adequate water supplies available from the Gulf Coast Aquifer and run-of-river rights to meet the city's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Victoria implement the following water supply plan (Table 5.3.19-4).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 543 acft/yr beginning in year 2000, decreasing to 0 acft/yr of supply in 2030 (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Purchase Water from Major Provider to be implemented in 2000. This project can supply an additional 1,240 acft/yr beginning in 2000.

Table 5.3.19-4.
Recommended Water Supply Plan for the City of Victoria

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	543	543	543	0	0	0
Purchase Water from Major Provider	1,240	1,240	1,240	1,240	1,240	1,240
Total New Supply	1,783	1,783	1,783	1,240	1,240	1,240

The costs of the recommended plan for the City of Victoria are shown in Table 5.3.19-5.

Table 5.3.19-5.
Recommended Plan Costs by Decade for the City of Victoria

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$219,577	$219,577	$219,577	$0	$0	$0
Unit Cost ($/acft)	$404	$404	$404	$0	$0	$0
Purchase Water from Major Provider						
Annual Cost ($/yr)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Unit Cost ($/acft)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
[1] This project is currently underway with existing funds, therefore no cost has been projected.						

5.3.19.3 Rural Area Residential and Commercial

The rural area of Victoria County is projected to have adequate water supplies available from the Gulf Coast Aquifer and run-of-river rights to meet the water user group's projected demand during the planning period.

5.3.19.4 Industrial

Industrial is projected to have adequate water supplies available from the Gulf Coast Aquifer and run-of-river rights to meet the water user group's projected demand during the planning period.

5.3.19.5 Steam-Electric Power

Steam-electric power is projected to have adequate water supplies available from the Gulf Coast Aquifer and run-of-river rights to meet the water user group's projected demand during the planning period.

5.3.19.6 Mining

Mining is projected to have adequate water supplies available from the Gulf Coast Aquifer to meet the water user group's projected demand during the planning period.

5.3.19.7 Irrigation

Irrigation is projected to have adequate water supplies available from the Gulf Coast Aquifer and run-of-river rights to meet the water user group's projected demand during the planning period.

5.3.19.8 Livestock

Livestock is projected to have adequate water supplies available from local sources to meet the water user group's projected demand during the planning period.

5.3.20 Wilson County Water Supply Plan

Table 5.3.20-1 lists each water user group in Wilson County and their corresponding surplus or shortage in years 2030 and 2050. For each water user group with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 5.3.20-1.
Wilson County Surplus/Shortage

Water User Group	Surplus/Shortage[1] 2030 (acft/yr)	Surplus/Shortage[1] 2050 (acft/yr)	Comment
City of Floresville	15	-145	Projected shortage – see plan below
City of La Vernia	141	109	Projected surplus
City of Poth	1,495	1,417	Projected surplus
City of Stockdale	980	924	Projected surplus
Rural Area Residential and Commercial	2,844	0	Projected surplus
Industrial	35	0	Projected surplus
Steam-Electric Power	0	0	No projected demand
Mining	0	0	No projected surplus/shortage
Irrigation	169	169	Projected surplus
Livestock	0	0	No projected surplus/shortage

[1] From Table 4-20, Section 4.1 – Water Needs Projections by Water User Group.

5.3.20.1 City of Floresville

The City of Floresville's current water supply is obtained from the Carrizo Aquifer. The City of Floresville is projected to need additional water supplies beginning in the planning year 2040. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Carrizo Aquifer – Local Supply (SCTN-2a)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Floresville implement the following water supply plan to meet the projected need for the city (Table 5.3.20-2).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 101 acft/yr of supply in 2000, decreasing to 75 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Carrizo Aquifer – Local Supply (SCTN-2a) to be implemented in 2040. This project can provide an additional 200 acft/yr of supply in 2040 and 2050.

Table 5.3.20-2.
Recommended Water Supply Plan for the City of Floresville

	2000 (acft/yr)	*2010 (acft/yr)*	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*
Projected Need (Shortage)	0	0	0	0	63	145
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	101	108	114	66	70	75
Carrizo Aquifer – Local Supply (SCTN-2a)					200	200
Total New Supply	101	108	114	66	270	275

The costs of the recommended plan to meet the City of Floresville's projected need are shown in Table 5.3.20-3.

Table 5.3.20-3.
Recommended Plan Costs by Decade for the City of Floresville

Plan Element	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$26,216	$26,216	$26,235	$6,872	$6,867	$6,848
Unit Cost ($/acft)	$260	$243	$230	$104	$98	$91
Carrizo Aquifer – Local Supply (SCTN-2a)						
Annual Cost ($/yr)					$110,000	$110,000
Unit Cost ($/acft)					$550	$550

5.3.20.2 City of La Vernia

The City of La Vernia is projected to have adequate water supplies available from the Carrizo Aquifer to meet the city's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of La Vernia implement the following water supply plan (Table 5.3.20-4).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 14 acft/yr of supply, decreasing to 11 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.20-4.
Recommended Water Supply Plan for the City of La Vernia

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	14	15	15	9	10	11
Total New Supply	14	15	15	9	10	11

The costs of the recommended plan for the City of La Vernia are shown in Table 5.3.20-5.

Table 5.3.20-5.
Recommended Plan Costs by Decade for the City of La Vernia

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$3,586	$3,586	$3,493	$937	$981	$1,004
Unit Cost ($/acft)	$256	$239	$233	$104	$98	$91

5.3.20.3 City of Poth

The City of Poth is projected to have adequate water supplies available from the Carrizo Aquifer to meet the city's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Poth implement the following water supply plan (Table 5.3.20-6).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 32 acft/yr of supply, decreasing to 25 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.20-6.
Recommended Water Supply Plan for the City of Poth

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	32	34	36	22	23	25
Total New Supply	32	34	36	22	23	25

The costs of the recommended plan for the City of Poth are shown in Table 5.3.20-7.

Table 5.3.20-7.
Recommended Plan Costs by Decade for the City of Poth

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$8,197	$8,162	$8,176	$2,291	$2,256	$2,283
Unit Cost ($/acft)	$256	$240	$227	$104	$98	$91

5.3.20.4 City of Stockdale

The City of Stockdale is projected to have adequate water supplies available from the Carrizo Aquifer to meet the city's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Stockdale implement the following water supply plan (Table 5.3.20-8).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 24 acft/yr of supply, decreasing to 19 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.20-8.
Recommended Water Supply Plan for the City of Stockdale

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	24	26	28	17	18	19
Total New Supply	24	26	28	17	18	19

The costs of the recommended plan for the City of Stockdale are shown in Table 5.3.20-9.

Table 5.3.20-9. Recommended Plan Costs by Decade for the City of Stockdale

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$6,148	$6,183	$6,244	$1,770	$1,766	$1,735
Unit Cost ($/acft)	$256	$238	$223	$104	$98	$91

5.3.20.5 Rural Area Residential and Commercial

The rural area of Wilson County is projected to have adequate water supplies available from the Edwards Aquifer, Carrizo Aquifer, Sparta Aquifer, and Queen City Aquifer to meet the water user group's projected demand during the planning period.

5.3.20.6 Industrial

Industrial is projected to have adequate water supplies available from the Carrizo Aquifer, Sparta Aquifer, and Queen City Aquifer to meet the water user group’s projected demand during the planning period.

5.3.20.7 Steam-Electric Power

There is no projected steam-electric power water demand in Wilson County, therefore no water management strategies are recommended for this water user group.

5.3.20.8 Mining

Mining is projected to have adequate water supplies available from the Carrizo Aquifer, Sparta Aquifer, and Queen City Aquifer to meet the water user group’s projected demand during the planning period.

5.3.20.9 Irrigation

Irrigation is projected to have adequate water supplies available from the Carrizo Aquifer, Sparta Aquifer, Queen City Aquifer, and run-of-river rights to meet the water user group’s projected demand during the planning period.

5.3.20.10 Livestock

Livestock is projected to have adequate water supplies available from local sources to meet the water user group's projected need during the planning period.

5.3.21 Zavala County Water Supply Plan

Table 5.3.21-1 lists each water user group in Zavala County and their corresponding surplus or shortage in years 2030 and 2050. For each water user group with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 5.3.21-1.
Zavala County Surplus/Shortage

Water User Group	Surplus/Shortage[1] 2030 (acft/yr)	Surplus/Shortage[1] 2050 (acft/yr)	Comment
City of Batesville	385	380	Projected surplus
City of Crystal City	1,979	1,979	Projected surplus
City of La Pryor	682	694	Projected surplus
Rural Area Residential and Commercial	275	0	Projected surplus
Industrial	272	0	Projected surplus
Steam-Electric Power	0	0	No projected demand
Mining	0	0	No projected surplus/shortage
Irrigation	-88,293	-81,200	Projected shortage – see plan below
Livestock	0	0	No projected surplus/shortage

[1] From Table 4-21, Section 4.1 – Water Needs Projections by Water User Group.

5.3.21.1 City of Batesville

The City of Batesville is projected to have adequate water supplies available from the Carrizo Aquifer to meet the city's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Batesville implement the following water supply plan (Table 5.3.21-2).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 13 acft/yr of supply. (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.21-2.
Recommended Water Supply Plan for the City of Batesville

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	13	13	13	0	0	0
Total New Supply	13	13	13	0	0	0

The costs of the recommended plan for the City of Batesville are shown in Table 5.3.21-3.

Table 5.3.21-3.
Recommended Plan Costs by Decade for the City of Batesville

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$4,277	$4,277	$4,277	$0	$0	$0
Unit Cost ($/acft)	$329	$329	$329	$0	$0	$0

5.3.21.2 City of Crystal City

The City of Crystal City is projected to have adequate water supplies available from the Carrizo Aquifer to meet the city's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Crystal City implement the following water supply plan (Table 5.3.21-4).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 154 acft/yr of supply, decreasing to 83 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.21-4.
Recommended Water Supply Plan for the City of Crystal City

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	154	157	159	81	82	83
Total New Supply	154	157	159	81	82	83

The costs of the recommended plan for the City of Crystal City are shown in Table 5.3.21-5.

Table 5.3.21-5.
Recommended Plan Costs by Decade for the City of Crystal City

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$36,019	$36,063	$36,200	$9,695	$9,706	$9,716
Unit Cost ($/acft)	$234	$230	$228	$120	$118	$117

5.3.21.3 City of La Pryor

The City of La Pryor is projected to have adequate water supplies available from the Carrizo Aquifer to meet the city's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of La Pryor implement the following water supply plan (Table 5.3.21-6).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 23 acft/yr of supply, decreasing to 8 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.21-6.
Recommended Water Supply Plan for the City of La Pryor

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	23	23	23	8	8	8
Total New Supply	23	23	23	8	8	8

The costs of the recommended plan for the City of La Pryor are shown in Table 5.3.21-7.

Table 5.3.21-7.
Recommended Plan Costs by Decade for the City of La Pryor

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$5,560	$5,516	$5,379	$958	$947	$937
Unit Cost ($/acft)	$242	$240	$245	$120	$118	$117

5.3.21.4 Rural Area Residential and Commercial

The rural area of Zavala County is projected to have adequate water supplies available from the Carrizo Aquifer to meet the city's projected demand during the planning period.

5.3.21.5 Industrial

Industrial is projected to have adequate water supplies available from the Carrizo Aquifer to meet the water user group's projected demand during the planning period.

5.3.21.6 Steam-Electric Power

There is no projected steam-electric water demand in Zavala County, therefore no water management strategies are recommended for this water user group.

5.3.21.7 Mining

Mining is projected to have adequate water supplies available from the Carrizo Aquifer to meet the water user group's projected demand during the planning period.

5.3.21.8 Irrigation

Irrigation's current water supply is obtained from the Carrizo Aquifer. Irrigation is projected to need additional water supplies in the planning year 2000. The following options were considered to meet the irrigation projected need:

- Demand Reduction (Conservation) (L-10 Irr.) (See Section 6, Supplement 2)

Working within the planning criteria established by the SCTRWPG and the TWDB, it has been found that it is not economically feasible to meet all of the projected irrigation needs at this time, since the cost of the water management strategies with enough water supply to meet the needs far exceeds the ability of irrigators to pay for the water. However, the irrigation water conservation option will meet a part of the projected irrigation needs in Zavala County where further irrigation conservation opportunity exists. It is recommended that individual irrigators implement the following water supply plan to meet a portion of the projected need for irrigation (Table 5.3.21-8).

- Demand Reduction (Conservation) to be implemented in 2000. This project can provide an additional 6,401 acft/yr of supply.

Table 5.3.21-8.
Recommended Water Supply Plan for Irrigation

	2000 (acft/yr)	*2010 (acft/yr)*	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*
Projected Need (Shortage)	80,722	76,589	72,655	88,293	84,673	81,200
Recommended Plan						
Demand Reduction (Conservation) (L-10 Irr.)	6,401	6,401	6,401	6,401	6,401	6,401
Total New Supply	6,401	6,401	6,401	6,401	6,401	6,401

The costs of the recommended plan to meet the projected irrigation need are shown in Table 5.3.21-9.

Table 5.3.21-9.
Recommended Plan Costs by Decade for Irrigation

Plan Element	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*
Demand Reduction (Conservation) (L-10 Irr.)						
Annual Cost ($/yr)	$497,102	$497,102	$497,102	$0	$0	$0
Unit Cost ($/acft)	$78	$78	$78	$0	$0	$0

5.3.21.9 Livestock

Livestock is projected to have adequate water supplies available from local sources to meet the water user group's projected demand during the planning period.

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5.4 Water Supply Plans for Major Water Providers

Table 5.4-1 lists each Major Water Provider identified by the SCTRWPG and their corresponding surplus or shortage in years 2030 and 2050. For each Major Water Provider with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 5.4-1.
Major Water Provider Surplus/Shortage

Major Water Provider	Surplus/Shortage[1] 2030 (acft/yr)	Surplus/Shortage[1] 2050 (acft/yr)	Comment
San Antonio Water System (SAWS)	-200,668	-281,219	Projected shortage – see plan below
Bexar Metropolitan Water District (BMWD)	-32,434	-44,010	Projected shortage – see plan below
Canyon Regional Water Authority (CRWA)	-3,449	-6,331	Projected shortage – see plan below
Guadalupe-Blanco River Authority (GBRA)	113,365	115,435	Projected surplus
New Braunfels Utilities (NBU)	-10,135	-17,365	Projected shortage – see plan below
City of San Marcos	-11,092	-23,606	Projected shortage – see plan below

[1] From Table 4-23, Section 4.2 – Water Needs Projections by Major Water Provider

5.4.1 Regional Water Provider(s) for Bexar County

Bexar County represents the major municipal demand center of the South Central Texas Region and encompasses not only the City of San Antonio, but more numerous suburban cities and communities (water user groups). It is apparent that the most economical development of additional water supplies to meet the present and future needs of Bexar County can best be accomplished on a regional, rather than a major provider or city by city, basis. Development of additional water supplies for Bexar County will most likely be accomplished strategy by strategy, with a single sponsor or varying groups of sponsors involved in the cooperative implementation of each major strategy. Hence, for the purposes of this regional water plan, the concept of Regional Water Provider(s) for Bexar County is employed. Designation of Regional Water Provider(s) for Bexar County accounts for the fact that water management strategies may be developed by individual sponsors and/or coalitions of sponsors. Furthermore, it ensures the flexibility necessary to facilitate activities of identified major water providers, water user groups, and others in their independent or collective efforts to develop additional water supplies for Bexar County.

Bexar County's current water supply is obtained from the Edwards Aquifer, Carrizo Aquifer, Trinity Aquifer, Canyon Reservoir, Victor Braunig Lake, Calaveras Lake, the Medina Lake System, Direct Reuse, and run-of-river rights. Bexar County is projected to need additional water supplies beginning in the year 2000. The management strategies listed in Table 5.3.2-2, as well as several variations of these options, were considered to meet the county's projected need.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the Regional Water Provider(s) for Bexar County implement the following water supply plan to meet the projected need for the portions of the county (Table 5.4-2).

- Edwards Irrigation Transfers (L-15) to be implemented in 2000. This project can provide an additional 25,000 acft/yr of supply in 2000, increasing to 32,986 acft/yr of additional supply in 2050.
- Demand Reduction (Conservation) (L-10 Irr.) to be implemented in 2000. This project can provide an additional 27,314 acft/yr of additional supply from 2000 through 2050.
- Carrizo Aquifer – Wilson & Gonzales (CZ-10C) to be implemented in 2000. This project can provide an additional 16,000 acft/yr of supply from 2000 through 2050.
- Lower Guadalupe River Diversion (SCTN-16) to be implemented in 2010. This project can provide an additional 94,500 acft/yr of supply.
- Edwards Recharge – Type 2 Projects (L-18a) to be implemented in 2010. This project can provide an additional 13,451 acft/yr of supply in 2010, increasing to 21,577 acft/yr of additional supply in 2050.
- Colorado River Diversion Option (LCRA) to be implemented in 2020. This project can provide an additional 66,000 acft/yr of supply in 2020, increasing to 132,000 acft/yr of additional supply in 2050.
- Desalination of Seawater – 75 MGD (SCTN-17) to be implemented in 2040. This project can provide an additional 56,008 acft/yr in 2040 and 84,012 acft/yr of additional supply in 2050.
- Brush Management
- Weather Modification
- Rainwater Harvesting
- Additional Municipal Recycling (Reuse) Programs
- Small Aquifer Recharge Dams
- Edwards Aquifer Recharge & Recirculation Systems
- Cooperation with Corpus Christi for New Water Sources
- Additional Storage (ASR and/or Surface)

Table 5.4-2.
Recommended Water Supply Plan for the Regional Water Provider(s) for Bexar County

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Recommended Plan						
Edwards Irrigation Transfers (L-15)	25,000	32,986	32,986	32,986	32,986	32,986
Demand Reduction (Conservation) (L-10 Irr.) w/Trans.	27,314	27,314	27,314	27,314	27,314	27,314
Carrizo Aquifer – Wilson & Gonzales (CZ-10C)	16,000	16,000	16,000	16,000	16,000	16,000
Lower Guadalupe River Diversions (SCTN-16)		94,500	94,500	94,500	94,500	94,500
Edwards Recharge – Type 2 Projects (L-18a)		13,451	21,577	21,577	21,577	21,577
Colorado River Diversion Option (LCRA)			66,000	132,000	132,000	132,000
Desalination of Seawater – 75 MGD (SCTN-17)					56,008	84,012
Brush Management						
Weather Modification						
Rainwater Harvesting						
Additional Municipal Recycling (Reuse) Programs						
Small Aquifer Recharge Dams						
Edwards Aquifer Recharge & Recirculation Systems						
Cooperation w/ Corpus Christi for New Water Sources						
Additional Storage (ASR and/or Surface)[1]						
Total New Supply	68,314	184,251	258,377	324,377	380,385	408,389

[1] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.

The costs of the recommended plan for the Regional Water Provider for Bexar County are shown in Table 5.4-3.

**Table 5.4-3.
Recommended Plan Costs by Decade
for the Regional Water Provider(s) for Bexar County**

Plan Element	2000	2010	2020	2030	2040	2050
Edwards Irrigation Transfers (L-15)						
Annual Cost ($/yr)	$2,353,000	$3,104,642	$3,104,642	$3,104,642	$3,104,642	$3,104,642
Unit Cost ($/acft)	$80	$80	$80	$80	$80	$80
Demand Reduction (Conservation) (L-10 Irr.) w/Trans.						
Annual Cost ($/yr)	$992,318	$992,318	$992,318	$0	$0	$0
Unit Cost ($/acft)	$36	$36	$36	$0	$0	$0
Carrizo Aquifer – Wilson & Gonzales (CZ-10C)						
Annual Cost ($/yr)	$12,496,000	$12,496,000	$12,496,000	$6,608,000	$6,608,000	$6,608,000
Unit Cost ($/acft)	$781	$781	$781	$413	$413	$413
Lower Guadalupe River Diversions (SCTN-16)						
Annual Cost ($/yr)		$75,925,080	$77,059,080	$77,437,080	$50,902,425	$47,509,205
Unit Cost ($/acft)		$803	$815	$819	$539	$503
Edwards Recharge – Type 2 Projects (L-18a)						
Annual Cost ($/yr)		$21,893,245	$23,455,062	$23,455,062	$20,843,166	$4,147,099
Unit Cost ($/acft)		$1,628	$1,087	$1,087	$966	$192
Colorado River Diversion Option (LCRA)						
Annual Cost ($/yr)			$88,859,760	$134,163,480	$134,163,480	$96,976,490
Unit Cost ($/acft)			$1,346	$1,016	$1,016	$735
Desalination of Seawater – 75 MGD (SCTN-17)						
Annual Cost ($/yr)					$102,214,600	$120,977,280
Unit Cost ($/acft)					$1,825	$1,440
Additional Storage (ASR and/or Surface)[1]						
Annual Cost ($/yr)	$6,207,500	$5,007,990	$5,007,990	$2,074,280	$92,270	$184,540
Unit Cost ($/acft)	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]

[1] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.

[2] The cost representing additional storage is not calculated on a unit basis because a supply quantity has not been assigned to this management strategy.

5.4.2 San Antonio Water System (SAWS)

SAWS' current water supply is obtained from the Edwards Aquifer and direct reuse. SAWS is projected to need additional water supplies beginning in the year 2000. The options listed in Table 5.3.2-2 were considered to meet the Major Water Provider's projected need.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that SAWS implement the following water supply plan to meet the projected need for SAWS (Table 5.4-4).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 29,610 acft/yr of supply in 2000, increasing to 37,555 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Western Canyon Regional Water Supply Project to be implemented in 2000. This project can provide an additional 1,813 acft/yr of supply until 2040, at which time the supply becomes 0 acft/yr.
- Simsboro Aquifer (SCTN-3c) to be implemented in 2000. This project can provide an additional 55,000 acft/yr of supply.
- SAWS Recycled Water Program to be implemented in 2010. This project can provide an additional 19,826 acft/yr of supply in 2010, increasing to 52,215 acft/yr of additional supply in 2050.
- Aquifer Storage & Recovery – Regional (SCTN-1a)
- Act as or cooperate with the Regional Water Provider(s) for Bexar County in the development of some or all of the management strategies listed below in order to obtain additional supplies of 35,114 acft/yr by the year 2000, increasing to 295,189 acft/yr in 2050.
    - Edwards Irrigation Transfers (L-15)
    - Demand Reduction (Conservation) (L-10 Irr.)
    - Carrizo Aquifer – Wilson & Gonzales (CZ-10C)
    - Lower Guadalupe River Diversion (SCTN-16)
    - Edwards Recharge – Type 2 Projects (L-18a)
    - Colorado River Diversion Option (LCRA)
    - Desalination of Seawater – 75 MGD (SCTN-17)
    - Brush Management
    - Weather Modification
    - Rainwater Harvesting
    - Additional Municipal Recycling (Reuse) Programs
    - Small Aquifer Recharge Dams
    - Edwards Aquifer Recharge & Recirculation Systems
    - Cooperation with Corpus Christi for New Water Sources
    - Additional Storage (ASR and/or Surface)

Table 5.4-4.
Recommended Water Supply Plan for SAWS[1]

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need	106,550	128,846	159,515	200,668	238,758	281,219
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	29,610	38,185	36,477	33,805	35,710	37,555
Western Canyon Regional Water Supply Project	1,813	1,813	1,813	1,813	0	0
Simsboro Aquifer (SCTN-3c)	55,000	55,000	55,000	55,000	55,000	55,000
SAWS Recycled Water Program		19,826	26,737	35,824	43,561	52,215
Aquifer Storage & Recovery – Regional (SCTN - 1a)						
Regional Water Provider(s) (SAWS)*	35,114	140,951	199,577	241,677	277,185	295,189
Total New Supply	121,537	255,775	319,604	368,119	411,456	439,959
****Water Management Strategies to be Developed by the Regional Water Provider(s) for Bexar County***						
Edwards Irrigation Transfers (L-15)						
Demand Reduction (Conservation) (L-10 Irr.)						
Carrizo Aquifer – Wilson & Gonzales (CZ-10C)						
Lower Guadalupe River Diversions (SCTN-16)						
Edwards Recharge – Type 2 Projects (L-18a)						
Colorado River Diversion Option (LCRA)						
Desalination of Seawater – 75 MGD (SCTN-17)						
Brush Management						
Weather Modification						
Rainwater Harvesting						
Additional Municipal Recycling (Reuse) Programs						
Small Aquifer Recharge Dams						
Edwards Aquifer Recharge & Recirculation Systems						
Cooperation w/ Corpus Christi for New Water Sources						
Additional Storage (ASR and/or Surface)[2]						

[1] Needs and supplies for SAWS as a major water provider include service to surrounding rural areas and are generally greater than comparable figures for the City of San Antonio (Table 5.3.2-27).

[2] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.

The costs of the recommended plan to meet SAWS' projected need are shown in Table 5.4-5.

Table 5.4-5.
Recommended Plan Costs by Decade for SAWS

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$5,535,926	$5,550,525	$5,517,515	$1,846,050	$1,834,436	$1,830,288
Unit Cost ($/acft)	$187	$145	$151	$55	$51	$49
Western Canyon Regional Water Supply Project						
Annual Cost ($/yr)	N/A[1]	N/A[1]	N/A[1]	N/A[1]		
Unit Cost ($/acft)	N/A[1]	N/A[1]	N/A[1]	N/A[1]		
Simsboro Aquifer (SCTN-3c)						
Annual Cost ($/yr)	$47,590,400	$47,590,400	$47,590,400	$28,029,650	$28,029,650	$28,029,650
Unit Cost ($/acft)	$865	$865	$865	$510	$510	$510
SAWS Recycled Water Program						
Annual Cost ($/yr)		$17,264,566	$17,981,583	$18,924,359	$4,519,454	$5,417,306
Unit Cost ($/acft)		$871	$673	$528	$104	$104
Aquifer Storage & Recovery (SCTN – 1a)						
Annual Cost ($/yr)	$11,762,100	$11,762,100	$11,762,100	$3,389,053	$3,389,053	$3,389,053
Unit Cost ($/acft)	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]
Regional Water Provider(s) (SAWS)*						
Annual Cost ($/yr)	$11,533,287	$91,355,088	$162,962,369	$183,909,974	$231,673,263	$202,027,911
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684
Costs for the Following Management Strategies are Included in the Cost for Regional Water Provider(s) (SAWS)						
Edwards Irrigation Transfers (L-15)						
Demand Reduction (Conservation) (L-10 Irr.)						
Carrizo Aquifer – Wilson & Gonzales (CZ-10C)						
Lower Guadalupe River Diversions (SCTN-16)						
Edwards Recharge – Type 2 Projects (L-18a)						
Colorado River Diversion Option (LCRA)						
Desalination of Seawater – 75 MGD (SCTN-17)						
Additional Storage (ASR and/or Surface)[3]						

[1] This project is currently underway with existing funds, therefore no cost has been projected.
[2] The cost representing aquifer storage recovery is not calculated on a unit cost basis because a supply quantity has not been assigned to this management strategy.
[3] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.

5.4.3 Bexar Metropolitan Water District (BMWD)

BMWD's current water supply is obtained from the Edwards Aquifer, Carrizo Aquifer, Trinity Aquifer, Canyon Reservoir, Medina Lake, and run-of-river rights. BMWD is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the Major Water Provider's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Carrizo Aquifer – Bexar and Guadalupe (BMWD)
- Trinity Aquifer – Bexar (BMWD)
- Western Canyon Regional Water Supply System
- Lake Dunlap WTP Expansion and Mid-Cities Water Transmission System (CRWA)
- Act as or cooperate with the Regional Water Provider(s) for Bexar County

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that BMWD implement the following water supply plan to meet the projected need for BMWD (Table 5.4-6).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 2,284 acft/yr of supply in 2000, increasing to 2,657 acft/yr in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Carrizo Aquifer – Bexar & Guadalupe (BMWD) to be implemented in 2000. This project can provide an additional 4,000 acft/yr of supply.
- Trinity Aquifer – Bexar (BMWD) to be implemented in 2000. This project can provide an additional 1,000 acft/yr of supply.
- Western Canyon Regional Water Supply System to be implemented in 2000. This project can provide an additional 2,137 acft/yr of supply until 2040, at which time the supply becomes 0 acft/yr.
- Lake Dunlap WTP Expansion & Mid-Cities Water Transmission System (CRWA) to be implemented in 2000. This project can provide an additional 4,000 acft/yr of supply through 2018, at which time the supply becomes 0 acft/yr.
- Act as or cooperate with the Regional Water Provider(s) for Bexar County in the development of some or all of the management strategies listed below in order to obtain additional supplies of 10,000 acft/yr by the year 2000, increasing to 39,500 acft/yr in 2050.
  - Edwards Irrigation Transfers (L-15)
  - Demand Reduction (Conservation) (L-10 Irr.)
  - Carrizo Aquifer – Wilson & Gonzales (CZ-10C)
  - Lower Guadalupe River Diversion (SCTN-16)
  - Edwards Recharge – Type 2 Projects (L-18a)

- Colorado River Diversion Option (LCRA)
- Desalination of Seawater – 75 MGD (SCTN-17)
- Brush Management
- Weather Modification
- Rainwater Harvesting
- Additional Municipal Recycling (Reuse) Programs
- Small Aquifer Recharge Dams
- Edwards Aquifer Recharge & Recirculation Systems
- Cooperation with Corpus Christi for New Water Sources
- Additional Storage (ASR and/or Surface)

Table 5.4-6.
Recommended Water Supply Plan for BMWD[1]

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need	13,033	19,360	25,496	32,434	39,569	44,010
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	2,284	2,633	2,978	2,130	2,457	2,657
Carrizo Aquifer – Bexar & Guadalupe (BMWD)	4,000	4,000	4,000	4,000	4,000	4,000
Trinity Aquifer – Bexar (BMWD)	1,000	1,000	1,000	1,000	1,000	1,000
Western Canyon Regional Water Supply System	2,137	2,137	2,137	2,137	0	0
Lake Dunlap WTP Expansion & Mid-Cities Water Transmission System (CRWA)	4,000	4,000	0	0	0	0
Regional Water Provider(s) (BMWD)*	10,000	16,000	20,000	28,000	35,000	39,500
Total New Supply	23,421	29,770	30,115	37,267	42,457	47,157
****Water Management Strategies to be Developed by the Regional Water Provider(s) for Bexar County***						
Edwards Irrigation Transfers (L-15)						
Demand Reduction (Conservation) (L-10 Irr.)						
Carrizo Aquifer – Wilson & Gonzales (CZ-10C)						
Lower Guadalupe River Diversions (SCTN-16)						
Edwards Recharge – Type 2 Projects (L-18a)						
Colorado River Diversion Option (LCRA)						
Desalination of Seawater – 75 MGD (SCTN-17)						
Brush Management						
Weather Modification						
Rainwater Harvesting						
Additional Municipal Recycling (Reuse) Programs						
Small Aquifer Recharge Dams						
Edwards Aquifer Recharge & Recirculation Systems						
Cooperation w/ Corpus Christi for New Water Sources						
Additional Storage (ASR and/or Surface)[2]						

[1] Needs and supplies for BMWD as a major water provider include service to surrounding rural areas and are generally greater than comparable figures for the BMWD service areas in Tables 5.3.2-41, 5.3.2-43, 5.3.2-45, and 5.3.2-47.

[2] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.

The costs of the recommended plan to meet BMWD's projected need are shown in Table 5.4-7.

Table 5.4-7.
Recommended Plan Costs by Decade for BMWD

Plan Element	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$566,345	$559,262	$590,322	$116,317	$126,217	$129,492
Unit Cost ($/acft)	$248	$212	$198	$55	$51	$49
Carrizo Aquifer – Bexar & Guadalupe (BMWD)						
Annual Cost ($/yr)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Unit Cost ($/acft)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Trinity Aquifer – Bexar (BMWD)						
Annual Cost ($/yr)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Unit Cost ($/acft)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Western Canyon Regional Water Supply System						
Annual Cost ($/yr)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Unit Cost ($/acft)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Lake Dunlap WTP Expansion & Mid-Cities Water Transmission System						
Annual Cost ($/yr)	N/A[1]	N/A[1]				
Unit Cost ($/acft)	N/A[1]	N/A[1]				
Regional Water Provider(s) (BMWD)*						
Annual Cost ($/yr)	$3,227,569	$10,370,139	$16,330,777	$21,307,279	$29,253,258	$27,033,875
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684
***Costs for the Following Management Strategies are Included in the Cost for Regional Water Provider(s) (BMWD))**						
Edwards Irrigation Transfers (L-15)						
Demand Reduction (Conservation) (L-10 Irr.)						
Carrizo Aquifer – Wilson & Gonzales (CZ-10C)						
Lower Guadalupe River Diversions (SCTN-16)						
Edwards Recharge – Type 2 Projects (L-18a)						
Colorado River Diversion Option (LCRA)						
Desalination of Seawater – 75 MGD (SCTN-17)						
Additional Storage (ASR and/or Surface)[2]						

[1] This project is currently underway with existing funds, therefore no cost has been projected.
[2] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage

5.4.4 Canyon Regional Water Authority (CRWA)

CRWA's current water supply is obtained from Canyon Reservoir. CRWA is projected to need additional water supplies beginning in the planning year 2010. The following options were considered to meet the Major Water Provider's projected need:

- Lake Dunlap WTP Expansion & Mid-Cities Water Transmission System
- Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)
- Cooperate with or purchase water from the Regional Water Provider(s)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that CRWA implement the following water supply plan to meet the projected need for CRWA (Table 5.4-8).

- Lake Dunlap WTP Expansion & Mid-Cities Water Transmission System which is currently being implemented. This project can provide an additional 5,200 acft/yr of supply through 2018.
- Carrizo Aquifer – Gonzales & Bastrop (CZ-10D) to be implemented in 2020. This project can provide an additional 550 acft/yr of supply in 2020, increasing to 2,600 acft/yr of additional supply in 2050.
- Cooperate with or purchase water from the Regional Water Provider(s) to obtain additional supplies of 550 acft/yr by the year 2020, increasing to 4,000 acft/yr by 2050.

Table 5.4-8.
Recommended Water Supply Plan for CRWA

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need	0	490	1,770	3,449	4,817	6,331
Recommended Plan						
Lake Dunlap WTP Expansion & Mid-Cities Water Transmission System	5,200	5,200	0	0	0	0
Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)[1]			550	550	1,000	2,600
Purchase/Participate with Regional Water Provider(s)			1,500	3,000	4,000	4,000
Total New Supply	5,200	5,200	2,050	3,550	5,000	6,600

[1] Region L estimates of groundwater development exceed Region K estimates of availability in and beyond 2030. The regions have agreed that discussion of differences will be more productive upon completion of new Groundwater Availability Models.

The costs of the recommended plan to meet CRWA's projected need are shown in Table 5.4-9.

Table 5.4-9.
Recommended Plan Costs by Decade for CRWA

Plan Element	2000	2010	2020	2030	2040	2050
Lake Dunlap WTP Expansion & Mid-Cities Water Transmission System						
Annual Cost ($/yr)	N/A[1]	N/A[1]				
Unit Cost ($/acft)	N/A[1]	N/A[1]				
Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)						
Annual Cost ($/yr)	$1,003,600	$1,003,600	$1,453,500	$449,900	$742,000	$1,160,000
Unit Cost ($/acft)	N/A[2]	N/A[2]	$2,643	$818	$742	$742
Purchase/Participate with Regional Provider						
Annual Cost ($/yr)			$1,224,808	$2,282,923	$3,343,229	$2,737,608
Unit Cost ($/acft)			$817	$761	$836	$684

[1] This project is currently underway with existing funds, therefore no cost has been projected.
[2] Reflects early participation in a project to ensure future needs are met.

5.4.5 Guadalupe-Blanco River Authority (GBRA)

GBRA is projected to have adequate water supplies available from Canyon Reservoir and run-of-river rights to meet the Major Water Provider's projected demands, however certain entities within GBRA's service area are projected to have a shortage (need) during the planning period. GBRA, acting as a Major Water Provider, plans to develop or participate in the following water management strategies to meet those projected needs:

- Additional Canyon Reservoir Diversions (Amend CA#18-2074);
- Major Provider of Additional Supplies;
- Canyon Reservoir – River Diversion (G-15C);
- Canyon Reservoir – Wimberley, Woodcreek, & Blanco (G-24);
- Western Canyon Regional Water Supply Project (WCRWSP); and
- Hays/IH35 Water Supply Project (HIH35WSP)
- Lake Dunlap WTP Expansion & Mid-Cities Project (CRWA).

Costs for implementation of these various water management strategies are shown for the water user group(s) for which these water management strategies are recommended.

5.4.6 New Braunfels Utilities (NBU)

NBU's current water supply is obtained from the Edwards Aquifer and run-of-river rights.[1] NBU is projected to need additional water supplies beginning in the planning year 2020. The following options were considered to meet the Major Water Provider's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Canyon Reservoir – River Diversion (G-15C)
- Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)
- Additional Storage (ASR and/or Surface)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that NBU implement the following water supply plan to meet the projected need for NBU (Table 5.4-10).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 583 acft/yr of supply in 2000, increasing to 904 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Canyon Reservoir – River Diversion (G-15C) to be implemented in 2000. This project can provide an additional 580 acft/yr of supply in 2000, increasing to 15,000 acft/yr of additional supply in 2050.
- Carrizo Aquifer – Gonzales & Bastrop (CZ-10D) to be implemented in 2040. This project can provide an additional 1,800 acft/yr of supply in 2040, increasing to 5,100 acft/yr of additional supply in 2050.
- Additional Storage (ASR and/or Surface)

[1] NBU also obtains a part of its water supply from Canyon Reservoir, however, for the purposes of calculating supplies available for Major Water Providers, the contract with GBRA was considered to be a part of GBRA's available supply to meet that contractual obligation.

Table 5.4-10.
Recommended Water Supply Plan for NBU[1]

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need	0	2,085	5,426	10,135	13,539	17,365
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	583	680	804	683	785	904
Canyon Reservoir – River Diversion (G-15C)	580	2,080	7,200	11,200	15,000	15,000
Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)[2]					4,000	7,000
Additional Storage (ASR and/or Surface)[3]						
Total New Supply	1,163	2,760	8,004	19,785	19,785	22,904

[1] Needs and supplies for NBU as a major water provider include service to surrounding rural areas and are generally greater (when adjusted for Canyon contract) than comparable figures for the City of New Braunfels (Table 5.3.5-5)..
[2] Region L estimates of groundwater development exceed Region K estimates of availability in and beyond 2030. The regions have agreed that discussion of differences will be more productive upon completion of new Groundwater Availability Models.
[3] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.

The costs of the recommended plan to meet NBU's projected need are shown in Table 5.4-11.

Table 5.4-11.
Recommended Plan Costs by Decade for NBU

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$181,922	$182,046	$182,246	$71,011	$71,116	$71,562
Unit Cost ($/acft)	$312	$268	$227	$104	$91	$79
Canyon Reservoir – River Diversion (G-15C)						
Annual Cost ($/yr)	$2,062,060	$2,922,560	$6,238,800	$7,044,800	$9,435,000	$4,435,000
Unit Cost ($/acft)	$3,555	$1,429	$867	$629	$629	$629
Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)						
Annual Cost ($/yr)			$2,702,000	$2,702,000	$5,022,000	$5,069,000
Unit Cost ($/acft)			N/A[2]	N/A[2]	$1,256	$580
Additional Storage (ASR and/or Surface)[1]						
Annual Cost ($/yr)	$1,052,135	$1,081,868	$1,111,602	$590,341	$120,078	$150,002
Unit Cost ($/acft)	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]

[1] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.
[2] Reflects early participation in a project to ensure future needs are met.
[3] The cost representing additional storage is not calculated on a unit basis because a supply quantity has not been assigned to this management strategy.

5.4.7 City of San Marcos

The City of San Marcos' current water supply is obtained from the Edwards Aquifer.[2] The City of San Marcos is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the Major Water Provider's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Purchase Water from Major Provider
- Colorado River Diversion Option (LCRA)
- Additional Storage (ASR and/or Surface)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of San Marcos implement the following water supply plan to meet the projected need for the City of San Marcos (Table 5.4-12).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 590 acft/yr of supply in 2000, increasing to 1,174 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Purchase Water from Major Provider to be implemented in 2000. This project can provide an additional 5,000 acft/yr of supply in 2000, increasing to 6,000 acft/yr of additional supply in 2050.
- Colorado River Diversion Option (LCRA) to be implemented in 2030. This project can provide an additional 4,900 acft/yr of supply in 2030, increasing to 16,900 acft/yr of additional supply in 2050.
- Additional Storage (ASR and/or Surface)

[2] The City of San Marcos also obtains a part of its water supply from Canyon Reservoir, however, for the purposes of calculating supplies available for Major Water Providers, the contract with GBRA was considered to be a part of GBRA's available supply to meet that contractual obligation.

Table 5.4-12.
Recommended Water Supply Plan for the City of San Marcos[1]

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need	1,639	3,891	6,741	11,092	16,565	23,606
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	590	690	816	699	906	1,174
Purchase Water from Major Provider	5,000	5,000	6,000	6,000	6,000	6,000
Colorado River Diversion Option (LCRA)				4,900	10,000	16,900
Additional Storage (ASR and/or Surface)[2]						
Total New Supply	5,590	5,690	6,816	11,599	16,906	24,074

[1] Needs and supplies for San Marcos as a major water provider include service to surrounding rural areas and are generally greater than comparable figures for the City of San Marcos (Table 5.3.12-4).

[2] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.

The costs of the recommended plan to meet the City of San Marcos's projected need are shown in Table 5.4-13.

Table 5.4-13.
Recommended Plan Costs by Decade for the City of San Marcos

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$198,286	$200,851	$203,245	$81,103	$81,103	$81,103
Unit Cost ($/acft)	$336	$291	$249	$116	$90	$69
Purchase Water from Major Provider						
Annual Cost ($/yr)	$2,995,000	$2,995,000	$3,618,000	$3,618,000	$3,618,000	$3,618,000
Unit Cost ($/acft)	$599	$599	$603	$603	$603	$603
Colorado River Diversion Option (LCRA)						
Annual Cost ($/yr)				$7,721,156	$11,768,975	$17,245,436
Unit Cost ($/acft)				$1,576	$1,177	$1,020
Additional Storage (ASR and/or Surface)[1]						
Annual Cost ($/yr)	$1,514,459	$1,561,151	$1,607,843	$1,103,533	$194,216	$240,999
Unit Cost ($/acft)	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]

[1] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.

[2] The cost representing additional storage is not calculated on a unit basis because a supply quantity has not been assigned to this management strategy.

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Section 6
Policies and Recommendations

6.1 Introduction

The South Central Texas Regional Water Planning Group developed numerous policies and guiding assumptions as it worked on the Regional Plan. An important part of this effort was the definition of a set of evaluation criteria employed during the process of reviewing options and strategies, creating alternative plan approaches and building consensus. In addition, the RWPG produced a number of legislative recommendations, a statement on ecologically unique stream segments and unique reservoir sites, and other recommendations, all of which are integral to achieving the Regional Plan's goals and articulating the values on which it is based.

6.2 Additional Regional Water Plan Recommendations

6.2.1 Additional Regional Water Supply Storage

The Regional Water Plan creates opportunities for additional year-to-year storage that can conserve new supplies and extend their usefulness. The Planning Group therefore recommends further study and eventual implementation of one or more of several possible storage strategies. These include:

- Additional Aquifer Storage and Recovery projects in all aquifers, including the saline zone of the Edwards Aquifer
- Unused storage capacity of existing regional reservoirs
- Use of additional small off-channel storage facilities
- Palmetto Bend Stage 2 Reservoir

The purpose of this additional regional storage facility is to store wet-year supplies from the options and strategies included in the Regional Water Plan for use in drought situations. As noted in the policy statements accompanying the plan, the Edwards Aquifer Authority could require reductions in pumpage below the 340,000 acft/yr planning level in order to protect springflow. [1] Such reductions could exhaust the additional management supply already built into the Regional Water Plan. The added storage capacity would enable the region to preserve

[1] As noted in Section 5 of the Regional Water Plan, the RWPG agreed to use the pumping level of 340,000 acre-feet per year <u>for planning purposes only</u>. Also, see Section 6.3, "Guiding Principles and Assumptions; and Section 6.3.6, "Protection of Edwards Aquifer Springflow and Downstream Water Rights."

imported, take-or-pay and other water supplies when not needed for delivery to water user groups.

6.2.2 Lockhart Reservoir

The Lockhart Reservoir is recommended as a potential reservoir site. Although the Regional Plan recommends other means of meeting projected water needs in Caldwell County, the Planning Group recognizes the strong interest of the local government in shifting from low-quality groundwater sources to a surface water supply system. The reservoir is considered by the local government to be an important economic development project to create new growth opportunities for the area. There are questions about economic feasibility at present, but the RWPG recognizes the efforts in Caldwell County and by the Guadalupe Blanco River Authority to find a viable strategy to move the project forward.

When that strategy is ready, the RWPG will review the Lockhart Reservoir water supply option as a possible amendment to the Regional Water Plan.

6.3 Guiding Principles and Assumptions

The South Central Texas Regional Water Planning Group bases the criteria for evaluating alternative regional water plans on these overarching assumptions and principles:

6.3.1 Regional Balance of Benefits and Costs — Mitigation Policy

The plan must meet the defined water needs of every Water User Group in each of the region's 21 counties and must consider carefully the impact and the balance of benefits and costs of water supply development for every county in the region. In evaluating the impacts of one or more components of the Regional Plan, the SCTRWPG will consider the long and short term costs, benefits, losses and gains to affected communities and the environment, to the extent reliable information is readily available. The developer of any option or strategy included in the Regional Water Plan should implement effective and specific mitigation measures designed to minimize any social, cultural, economic and environmental adverse impacts, including impacts on rate-payers, caused by the option or strategy. The goal of the Regional Plan is to maximize benefits and minimize negative impacts for affected communities, the region, the state and the environment.

To further the goal of maximizing benefits, the Regional Water Planning Group encourages developers of water management strategies under this Plan to consider alternative distribution, routing or other project modifications that would extend benefits to agricultural and other Water User Groups presently lacking access to new water sources.

6.3.2 Conservation

Conservation is basic to the regional water planning strategy. The Texas Water Development Board has built substantial conservation assumptions into its projections of water demand. Furthermore, the South Central Texas Regional Water Planning Group has adopted the advanced conservation case of the alternative per capita water use levels applied by the TWDB in its water demand projections. Thus, the water demands used in the alternative plans already reflect significant reductions in water use from those that would have been projected without the conservation assumptions. The conservation options and strategies evaluated during the planning process would aim for further reductions in demand beyond those already reflected in the projections.

6.3.3 Use of Evaluation Criteria

The Regional Water Planning Group uses the criteria in evaluating each alternative plan *as an integrated whole* and not as a series of independent projects. The options and strategies selected for each alternative have already been evaluated on a stand-alone basis using the evaluation criteria enumerated in the TWDB regulations at §357.7 (a)(7).

6.3.4 Potential Reductions in Permitted Groundwater Supply

The Plan identifies amounts of water that would be withdrawn from various aquifers as part of the region’s projected available supplies. It is understood that, if a permitting agency, such as a groundwater district, restricts these withdrawals, then additional supplies will need to be identified to compensate for any reductions in supply. The Regional Water Plan respects the rules and regulations of groundwater districts, just as it does those of all other state subdivisions and agencies. The RWPG believes that all rules should be adopted pursuant to accepted administrative procedures based on the standards of rationality, equity and scientific evidence.

6.3.5 Groundwater Sustainability

The Regional Water Planning Group has adopted the goal of groundwater sustainability and recommends management strategies needed to accomplish this goal. This recommendation is intended to help protect all users of those aquifers that are subject to increased withdrawals, to help preserve the long-term integrity of those aquifers and to build awareness of the effects of pumping on those aquifers and of their recovery capabilities. The Planning Group recommends that any person implementing any groundwater option or strategy identified as part of this Regional Plan consider and incorporate groundwater monitoring of both quantity and quality, recharge protection and enhancement, conservation methods and related practices, as determined to be appropriate by local groundwater districts. Where no district exists, the developer should monitor impacts and, when appropriate, take corrective action consistent with the goal of groundwater sustainability.

6.3.6 Protection of Edwards Aquifer Springflow and Downstream Water Rights

While the plan assumes annual withdrawals of 340,000 acre-feet from the Edwards Aquifer under drought of record conditions, it is recognized that this level of pumpage may not protect springflows. A plan for protecting springflow may not be available for approximately three years, when a Habitat Conservation Plan being prepared by the Edwards Aquifer Authority (EAA) is completed. If the EAA or other government authorities mandate reductions in pumpage from the Edwards Aquifer below 340,000 acre-feet, annually, water options and management strategies in addition to those identified in this plan will be needed to meet the projected demands of Water User Groups, to manage peak water demand periods and to protect downstream water rights. Recognizing this, the South Central Texas Regional Water Planning Group accepts 340,000 acre-feet as an appropriate pumpage level for planning purposes.

6.3.7 Planning for System Management Water Supplies

System Management water supplies, i.e. supplies over and above those apparently needed to meet projected demands, must be included in the plan, first, so that water options and management strategies are identified to replace any planned options or strategies that may fail to develop and, second, to serve as additional supplies in the event rules, regulations or other restrictions limit use of any planned options or strategies. The plan should specify those factors affecting reliability of the recommended options and strategies and indicate what alternatives are available as possible replacements**.**

6.4 Feasibility of Meeting Irrigation Water Needs

The South Central Texas Regional Water Planning Group finds that, under current conditions, it is not economically feasible for agricultural producers to pay for additional water supplies to meet project irrigation water shortages

See Supplement 1 to this chapter for the analysis of economic feasibility underlying this finding of the Regional Water Planning Group.

During the next planning cycle, the SCTRWPG will conduct additional socio-economic studies regarding impacts of the Regional Water Plan on agricultural resources and also carry out additional studies on water management strategies that may meet irrigation needs.

6.5 Evaluation Criteria

The South Central Texas Regional Water Planning Group initially adopted a set of criteria to guide the evaluation of alternative Regional Water Plans in January 1999. In response to public comment, concerns of Planning Group members and technical evaluation, the RWPG twice revised the criteria, in December 1999 and in July 2000. These criteria are distinct from the criteria described in the TWDB regulations, which are used to evaluate the individual water supply options and strategies. Unique among the water planning regions, the South Central Texas Region chose to develop a series of alternative regional plans and to supplement technical evaluation by using the following set of additional criteria. These criteria have been used by the RWPG to evaluate each alternative *as a whole* (see section 6.2.3 above) rather than its individual component options and strategies.

- Economic Impact
  - (1) Furthers economic development
  - (2) Minimizes long-range negative socio-economic impacts (including loss of tax base)
  - (3) Promotes opportunities for cost-sharing and economic partnership
  - (4) Provides cost-effective solutions
- Water Quality
  - (1) Provides and maintains appropriate quality for the intended use

- Fairness
  (1) Emphasizes efficient use of water in areas that import water
  (2) Promotes equitable distribution of costs and benefits in meeting region's water needs
- Feasibility
  (1) Demonstrates feasibility in terms of the following factors:
    (a) Timing
    (b) Technical/ scientific
    (c) Economic
    (d) Political
    (e) Regulatory
    (f) Legal
    (g) Public acceptance
- Efficiency
  (1) Minimizes evaporative and distribution losses
  (2) Promotes conservation
  (3) Promotes conjunctive use
- Flexibility
  (1) Adaptable to new and innovative technology
  (2) Adaptable to changes in demand projections
  (3) Adaptable to changes in law
  (4) Adaptable to future supply options
- Compatibility
  (1) Maximizes regional compatibility with local water plans
  (2) Minimizes negative impacts on property rights
  (3) Maximizes consistency with local growth management plans
  (4) Maximizes compatibility with plans from surrounding regions
- Reliability
  (1) Maximizes a sustainable (referring to yield) supply of water for short-term and long-term needs
  (2) Minimizes interruptions to water supplies
- Environment
  (1) Minimizes short-term and long-term negative impacts on native species and habitat diversity, including but not necessarily limited to:
    (a) Endangered & Threatened Species
    (b) Ecologically Unique Stream Segment Candidate Sites (as identified by Texas Parks and Wildlife Department)

(c) Vegetation & Wildlife Habitat (including wooded riparian areas, wetlands and other habitat categories defined by the Physiognomic Regions of the Texas Parks and Wildlife Department)

(d) Groundwater Sustainability (as measured by aquifer drawdown)

(e) Water Quality and Aquatic Habitat (including streamflows, springflows, estuarine inflows, and all aquatic habitats)

(2) Minimizes short-term and long-term negative impacts to the human environment

(a) Cultural Resources (including archeological and historic sites)

(b) Recreational

(c) Aesthetics

6.6 Conservation Planning Guidelines

Because of the central role of advanced conservation in achieving the water supply objectives of the Regional Plan, the RWPG is including in this report Conservation Planning Guidelines for potential use by water user groups across the region. We recognize that the creation of conservation programs and the selection of specific conservation technologies is a matter of local choice. The RWPG hopes that this educational tool will facilitate understanding of the importance of conservation efforts and the wide range of methods available for use.

See Supplement 2 to this section for the full text of the Conservation Planning Guidelines.

6.7 Legislative Recommendations

6.7.1 Plan Implementation

Given the unprecedented level of time and money expended in the development of Regional Water Plans across the state, the South Central Texas Regional Water Planning Group urges the Legislature to act promptly to help ensure full implementation of these plans.

6.7.1.1 Funding

The South Central Texas Regional Water Planning Group believes that State funding should be provided as a key incentive for partnership in funding from local, regional and federal governmental agencies.

State Water Plan Implementation. State support is fundamental for the successful implementation of the water resources projects in the State Water Plan resulting from the SB-1

Regional Planning Process. Specifically, new legislation to create State support for implementation of the State Plan should include the following:

- A statewide funding mechanism for projects included in the State Water Plan.
- Sufficient funding for TWDB and TNRCC to administer their programs and activities associated with planning, financing and permitting of the projects in the State Plan.

Water Data Collection. The Legislature should fully fund the cooperative, federal-state-local program of basic water data collection, including (a) Stream gages-quantity and quality; (b) Groundwater monitoring-water levels and quality; (c) Hydrographic surveys-sediment accumulation in reservoirs; (d) Water surface evaporation rates; (e) Water use data for all water user groups; and (e) Population projections.

Access to State Water Data. There should be adequate funding for the critical roles of TWDB and TNRCC in facilitating access to water data essential for local and regional planning and plan implementation purposes.

Continuation of Regional Water Planning. The SB-1 Planning Process is an important program, and funding should be continued to sustain the work of the Regional Water Planning Groups after January 2001.

Surface Water Rights Monitoring and Administration. TNRCC should be adequately staffed and funded to ensure the legal and appropriate use of permitted surface water rights through comprehensive monitoring and administrative programs such as the watermaster program.

Assistance for Alternative Water Supply Strategies. The State should provide funding to assist water planning regions and local water entities in developing demonstration projects for alternative water supply strategies and technologies, such as but not limited to desalination. With this assistance, water planning regions could avoid short-term projects that may be less costly but also less desirable because of environmental and socio-economic impacts. By funding demonstration projects for alternative technologies that may not yet be cost-effective, the State can help local water management entities avoid adverse impacts to the environment, to property rights and to local socio-economic conditions. In this way, the State can play a crucial role in guiding regions to water supply solutions that meet needs while also resolving conflict. Funding to demonstrate the value of innovative long-term strategies thus can help achieve cost-saving, efficient regional water management solutions.

Irrigation Technology Center. The State should provide funding to help establish within the South Central Texas Water Planning Region the Irrigation Technology Center, as proposed by the Texas A&M University System, in order to provide hands-on access to state-of-the-art water conservation technologies tailored to the specific urban and agricultural conservation needs of this region.

UTSA Center for Water Research. The South Central Texas Regional Water Planning Group recommends funding for the UTSA Center for Water Research. Central Texas and the U.S./Mexico border region are areas of rapid population growth and of tremendous demands on limited natural resources, especially water. In order to meet and sustain growth, these areas must have access to the information, education, research capabilities, technology and highly trained individuals necessary to address current problems and provide professional management for the future.

The Center for Water Research at the University of Texas at San Antonio, a component of the university that is not funded by the State budget, has been providing these services on a limited basis for the past thirteen years. With adequate State funding the Center could be a resource for:

- Water quality concerns, including public health issues, water treatment and water chemistry.
- Water resource management, including the application of models to surface and groundwater resource management.
- Education and technology transfer to other institutions and individuals in this region using state-of-the-art distance learning technologies and on-site education assets.
- Land use, environmental issues, reclamation techniques, pollution prevention and control, especially as these issues relate to the rapid growth and resource demands of the border regions along the Rio Grande, in South Texas, and in the environmentally fragile Hill Country of Central Texas.

Edwards Aquifer Research and Data Center. The South Central Texas Regional Water Planning Group supports funding for the Edwards Aquifer Research and Data Center at Southwest Texas State University in San Marcos. The Edwards Aquifer Research and Data Center (EARDC) was established in 1979 by special funding for Southwest Texas State University to provide a public service in the study, understanding and use of the very fragile natural resource, the Edwards Aquifer. EARDC operations are organized around four major areas:

- The Data Center, operating both statewide and nationally, collects, maintains, and makes available information on the Edwards Aquifer.
- The Technical Services Center offers a variety of technical services to the public and various government offices. Most prominent at the present are the Laboratory Services for water analyses.
- The Education Center seeks to improve public understanding of the Edwards Aquifer through the development and the dissemination of educational materials and through development and implementation of educational programs.
- The Research Center conducts basic and applied research related to the Aquifer in the area of aquatic biology, geochemistry, and hydrogeology.

Public Education on Water. The State should fund a state-wide program to educate the general public about water in coordination with the Agricultural Extension Service offices. The program should produce water-related materials with special components adapted for each water planning region and should also include a component comparable to the "Major Rivers" program that would be available to the public schools through the Regional Education Service Centers and by other means.

6.7.1.2 Other Implementation Issues

SB-1 Junior Water Rights Provision. The Regional Water Planning Group has considered the positive and negative impacts of the Junior Water Rights provision. Among the negative impacts cited by some members are these:

- It imposes limitations on surface water rights permits that have previously been issued, possibly diminishing the value of some permits to the owners.
- It forces greater use of groundwater supplies, and potentially, encourages the mining of aquifers.
- It can result in construction of new reservoirs that would not be needed if seniority of rights were preserved in interbasin transfers because of the need to provide reliable water supplies in the plans.

Other members of the Planning Group cite the following positive effects of the Junior Water Rights provision of SB-1.

- The provision protects municipalities and other water users, especially in cases where the interbasin transfer of senior water rights would put junior rights at risk.

- Bays and estuaries and instream flows have added protection from the impact of water exportation.
- Establishing the seniority of basin-of-origin water rights over those used for export preserves the economic value of the resource for the future development of the basin.

The Regional Water Planning Group makes no specific recommendation for legislative change at this time.

County Authority. Counties should have additional authority for land use planning and for regulating development based on availability and protection of water resources.

Water Withdrawn from Coastal Bays or the Gulf of Mexico. The Legislature should clarify that water withdrawn from the coastal bays or the Gulf of Mexico for desalination projects does not constitute an Interbasin Transfer.

6.7.2 Changes in TWDB Planning Process

6.7.2.1 Notice of Projects with Impacts on Shared Groundwater Resources

In the event a Water User Group relies on a groundwater management strategy to meet the Water User Group's demand during the planning period and the strategy would have a significant impact on a groundwater resource shared with adjoining planning region(s), notice shall be provided to the adjoining region(s) of the proposed date of implementation and anticipated acre-feet per year demand on the shared groundwater resource.

6.7.2.2 Regional Boundaries

The boundaries of Region L should be adjusted to include the southern portion of Blanco County that is to be served by a Major Water Provider in Region L.

6.7.2.3 Population and Water Demand Projections

The RWPG recognizes that the TWDB bases its water demand projections on patterns of population and economic growth while also permitting revisions of state data to incorporate additional information developed by the planning regions. Nevertheless, some groups believe that the methodology puts an unfair limitation on access to water for future growth, particularly in areas that may experience more rapid change than they have in the past. The Legislature should modify the Regional Water Planning process to allow for greater flexibility and for earlier and more active involvement of the Regional Water Planning Groups in developing growth and water demand projection methodologies consistent with water availability strategies.

6.7.2.4 "County Other" Water User Group

The Planning Regions should have the option and the resources required to disaggregate the "County Other" Water User Group and to develop water demand projections and water management strategies in cooperation with the entities included within this group on an individual basis, according to an agreed-upon methodology.

6.7.2.5 Ecosystem Health, Quality of Life, and Growth Management for Texas

The rapid growth occurring in South Central Texas has the potential to negatively impact quality of life. Human demands for water and infrastructure development may outstrip the ability of all of the region's resources to respond and to be sustainable. Texas should focus on these issues and evaluate land use and the health of its ecosystem in order to prepare for the future and support a sustainable quality of life for all Texans.

6.7.2.6 Coastal Basins

Coastal basins adjacent to major river basins are considered part of the major basins. The RWPG recommends eliminating the requirement to tabulate data for these areas by county and basin boundary since the result is a set of essentially empty tables.

6.7.2.7 Planning Requirements

There should be no changes in the planning process or additional planning requirements except through the formal rule-making procedure. Contract requirements should be established and in place prior to submission of grant proposals.

6.7.2.8 Volunteer Travel Expenses

Many members of Planning Groups do not receive any compensation or reimbursement for expenses. These volunteer members of Regional Water Planning Groups must often travel significant distances to attend meetings and should receive state-funded reimbursement for travel expenses. The lack of travel expense reimbursement has created an undue hardship in some regions.

6.7.2.9 Regional Boundaries Should Foster Collaboration

The Planning Group recommends that the Legislature make it very clear to all Texans that the boundaries of the regional water planning regions were drawn only to define water planning regions and that the boundaries are not intended to be barriers to prevent water transport from one region to another – nor to pit one region against another for any reason.

6.7.3 Proposals for Other Legislative Changes

6.7.3.1 Proposal to Support the Recommendations of the Texas Groundwater Collaborative Process

The South Central Texas Regional Water Planning Group commends the effort of participants in the Texas Groundwater Collaborative Process to address important and difficult issues pertaining to groundwater management in the state. The SCTRWPG supports their recommendations as recorded in the report, *Future of Groundwater Management in Texas*, except for the recommendation supporting repeal of the Junior Water Rights Provision of SB-1. As noted above, the South Central Texas Regional Water Planning Group takes no position on that issue.

6.7.3.2 Groundwater District Management Plans

Current law [36.1071 (e)(4)] requires groundwater district management plans to "address water supply needs in a manner that is not in conflict with the appropriate approved regional water plan if a regional water plan has been approved under Section 16.053". The Legislature should amend 36.1071 (e)(4) by substituting a requirement that groundwater district management plans and regional water plans use the same data, provided by TWDB under the applicable regional water planning rules, regarding water demand projections.

6.7.3.3 State Position in Federal Permitting

In the context of the federal permitting processes pertaining to water resources, all state agencies should present a single position consistent with the State's position as articulated in the State Water Plan.

6.7.4 Ecologically Unique Stream Segments and Unique Reservoir Sites

The South Central Texas Regional Water Planning Group asks the Legislature to provide further definition and clarification of the legal implications it intends by the designation of stream segments as either "ecologically unique" or as "unique reservoir sites". Until that definition and clarification occurs, the RWGP recommends that there be no designation of sites in this round of planning. However, the RWPG recognizes the great importance of the issue for the protection of sites of high ecological value as well as future reservoir sites.

The RWPG has ample evidence of the existence in this region of many streams that may deserve recognition and protection, including the list prepared by the Texas Department of Parks and Wildlife identifying 20 stream segments meeting one or more of the criteria specified in S.B-1. There have been additional suggestions of sites made by members of the RWPG, by many individuals through our public involvement process and by such organizations as the San Antonio River Basin Alliance, the Texas Rivers Protection Association, the San Marcos River Foundation, and the Wimberley Valley Watershed Association.

The RWPG believes there should be a clear process for the development of recommendations on site designation. Such a process should include extensive public involvement and ample opportunity and resources for the assessment of all potential impacts.

The RWPG should address any conflict between water supply strategies and the candidate sites for designation as ecologically unique within the context of the regional water planning process. In addressing this task, the RWPG will work with TPWD on refinement of candidate stream segments that are also potential sites for recharge structures.

The group urges all advocates of river protection and potential site designation to provide whatever relevant documentation they possess during the plan development process. The RWPG will use this documentation in its consideration of alternative plans and possible modification of specific water supply strategies.

SUPPLEMENT 1

South Central Texas Region

Regional Water Plan

Special Report

Economic Feasibility of Meeting Projected Irrigation Water Needs

Prepared by HDR

August 2000

Projected Irrigation Water Needs and Economic Feasibility of Meeting Projected Irrigation Water Needs

South Central Texas Region

Introduction

Texas Water Development Board (TWDB) Rules, Section 357.7(5)(A) specify that Regional Water Management Plans "…shall meet all needs for the water use categories of municipal, manufacturing, irrigation, steam-electric power generation, mining, and livestock watering except: (A) plans may identify those needs for which no water management strategy is feasible. Full evaluation of water management strategies must be presented and reasons given for why no water management strategies are feasible; or (B)…"[1] The purposes of this report are to present: (1) estimates of projected irrigation water needs of the South Central Texas Region (Region L), and (2) information about the economic feasibility of meeting the projected irrigation water needs.

Irrigation Water Needs

The TWDB's estimates of irrigation water use in the 21-county South Central Texas Region was 669,440 acft/yr in 1990, with projected irrigation water demands in 2030 of 563,513 acft/yr, and in 2050 of 516,244 acft/yr.[2] A comparison of projected irrigation demands with available irrigation supplies for each of the counties of the region shows that 14 counties do not have an irrigation water need, with 7 counties showing an irrigation water need (Table A). The total of the projected irrigation needs for these 7 counties, with adjustments for water conservation in 2030 are 289,743 acft/yr, and in 2050 are 251,550 acft/yr (Table A).[3] Estimated additional irrigation conservation is 28,903 acft/yr (Table A and Demand Reduction [L-10] Water Management Strategy).[4]

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[1] Regional Water Planning Areas and Special Water Resources, Adopted Rules for: Regional Water Planning Grants, Regional Water Planning Guidelines, State Water Planning Guidelines, and Initial Coordinating Body Representatives, Texas Water Development Board, Austin, Texas, March 11, 1998.
[2] South Central Texas Region Water Management Plan, Task 1 and Task 2, Interim Report, SCTRWPG, San Antonio, Texas, August 1999.
[3] South Central Texas Region Water Management Plan, Water Supplies and Water Needs by Water User Group, Task 3 and Task 4, Interim Report, SCTRWPG, San Antonio, Texas, February 2000.
[4] Water conservation in addition to that included in the irrigation water demand projections.

Table A
Projected Irrigation Water Needs*
South Central Texas Region

Counties	Projections (acft)					
	2000	**2010**	**2020**	**2030**	**2040**	**2050**
1 Atascosa	38,418	36,719	35,170	43,726	42,190	40,713
2 Bexar	14,059	10,935	9,376	7,883	6,453	5,082
3 Caldwell	0	0	0	0	0	0
4 Calhoun	0	0	0	0	0	0
5 Comal	0	0	0	0	0	0
6 De Witt	0	0	0	0	0	0
7 Dimmit	0	0	0	0	0	0
8 Frio	71,125	67,645	64,365	76,506	73,520	70,663
9 Goliad	0	0	0	0	0	0
10 Gonzales	0	0	0	0	0	0
11 Guadalupe	883	777	677	582	492	406
12 Hays(part)**	0	0	0	0	0	0
13 Karnes	0	0	0	0	0	0
14 Kendall	0	0	0	0	0	0
15 LaSalle	0	0	0	0	0	0
16 Medina	78,206	72,360	66,580	65,382	60,082	55,006
17 Refugio	0	0	0	0	0	0
18 Uvalde	48,551	43,250	38,243	36,274	31,674	27,383
19 Victoria	0	0	0	0	0	0
20 Wilson	0	0	0	0	0	0
21 Zavala	80,772	76,589	72,655	88,293	84,673	81,200
Total Projected Irrigation Water Needs	**332,014**	**308,275**	**287,066**	**318,646**	**299,084**	**280,453**
Additional Irrigation Conservation						
Edwards Counties**						
Bexar	1,905	1,905	1,905	1,905	1,905	1,905
Medina	5,000	5,000	5,000	5,000	5,000	5,000
Uvalde	5,958	5,958	5,958	5,958	5,958	5,958
Subtotal	12,863	12,863	12,863	12,863	12,863	12,863
Carrizo Counties						
Atascosa	3,692	3,692	3,692	3,692	3,692	3,692
Frio	5,947	5,947	5,947	5,947	5,947	5,947
Zavala	6,401	6,401	6,401	6,401	6,401	6,401
Subtotal	16,040	16,040	16,040	16,040	16,040	16,040
Total Additional Conservation	**28,903**	**28,903**	**28,903**	**28,903**	**28,903**	**28,903**
Total Water Need Adjusted for Effects of Additional Conservation****	**303,111**	**279,372**	**258,163**	**289,743**	**270,181**	**151,550**

* Based upon TWDB irrigation water demand projections, with advanced conservation

** Estimates based upon use of Low Energy Precision Application Systems (LEPA), with furrow dikes, applied to 80 percent of acres irrigated in 1997, with water savings of 40 percent of irrigation rate, but applicable to only 50 percent of Edwards Aquifer irrigation permitted quantities (e.g., the 50 percent that is required by SB-1477 to remain with the land and be used for the purposes for which it was permitted.

*** Estimates based upon use of Low Energy Precision Application Systems (LEPA), with furrow dikes, applied to 50 percent of acres irrigated in 1997, with water savings of 20 percent of irrigation rate.

**** The quantity of conservation is considered a part of irrigation water supply and is used to reduce needs.

Economic Feasibility of Meeting Projected Irrigation Water Needs of South Central Texas Region

The concept or expression of economic feasibility to be used in this analysis is based upon estimated income per acre-foot of water used in irrigation that remains after all other irrigation production expenses have been met (e.g., net return to water at the irrigation farm, on the surface of the land, at the point from which the water is distributed to the crops being irrigated). For example, in the South Central Texas Region for the case of irrigation using groundwater, this is net return per acre-foot of water at the land surface where the irrigation well is located. In the case of irrigation using surface water, the net income data needed are for the land surface location on the irrigation farm where water is or would be diverted from delivery canals or pipelines to be distributed to the crops being irrigated.

The reason for the form of net income to irrigation water expressed above is that information is available in the form of Crop Enterprise Budgets of the "costs and returns" from irrigation of individual crops in the South Central Texas Region.[5] These Crop Enterprise Budgets were developed using representative crop yields, production practices, and irrigation applications of the region. These budges take into account the gross income, the quantity of water applied per acre, and all of the costs of production, including pumping costs to lift water from the aquifer to the surface of the land, costs to move the water from the well and distribute it to the crops, hired labor, seed, fertilizer, fungicides, insecticides, pesticide application, harvesting, transportation, insurance, fuel, lubrication, interest on capital, machinery depreciation and maintenance, administration, and a charge for land use. Thus, by deleting from the Crop Enterprise Budgets, the cost of pumping water (pump fuel and maintenance, amortized well drilling, pump, and motor costs) one can see the net returns from the water used for irrigation, as of the location from which it is distributed to the crops.

Net income computations have been made for crops that are irrigated in the South Central Texas Region, including: corn, cotton, grain sorghum, guar, peanuts, sesame, wheat, beets, cantaloupes, carrots, cucumbers, cabbage, lettuce, onions, and spinach (Table B). For example, in the case of corn for food, the yield is 115 bushels per acre and gross income is $373.75 per acre (Table B). The quantity of water used per acre is 1.42 acft (17 inches) (Table B). Variable

[5] "Texas Crop Enterprise Budgets," Southwest Texas District, Texas Agricultural Extension Service, B-1241 (C10), Texas A&M University System, College Station, Texas, 1997.

costs per acre are $234.20 and fixed costs are $112.98, for a total cost of $347.18 per acre (Table B). Net income to pay for water from the production of corn for food is $26.57 per acre, and $18.71 per acft of water used for irrigation (Table B). That is to say, that for 1997 price and cost conditions, the most that an irrigation farmer of the South Central Texas Region could afford to pay for water delivered to his present well locations for use in producing corn for food is $18.71 per acft.

The estimated net returns to water for other irrigated crops of the region are shown in Table B and range from a loss of $75.80 for lettuce to a positive net return of $782.80 for onions.

Although costs have not been computed for water management strategies that would deliver water to the locations of irrigation water needs in the South Central Texas Region, costs were calculated for water management strategies that are indicative of strategies which would provide meaningful quantities of water that could be considered to meet irrigation needs. These include (1) raw water at new reservoirs, (2) Edwards Recharge—raw water in the aquifer, and (3) Carrizo Aquifer water pumped and delivered to the major municipal demand center. These costs of raw water, which is judged to be suitable for irrigation of crops grown in the region, range from $390 per acft to $764 per acft (Table B, Page 2, Box in Lower Right Corner and Figure 1). When compared to net returns to water, as described above, of all the crops produced in the region only one crop—onions—could afford any of this water (Table B). In addition, the costs of raw water shown in Table B are only a portion of the total costs to develop and convey this water from reservoirs and/or the Carrizo Aquifer to the irrigation farms of the South Central Texas Region. For example, the costs shown in Table B do not include conveyance costs to the farms from the reservoirs and Carrizo wells. Thus, it is clear that it is not economically feasible to meet the projected irrigation needs of the South Central Texas Region, since the net income to pay for water is less than the costs of water at the sources without including the conveyance costs from the sources to the farms (Table B).

Third party impacts of water shortages for all water user groups, including irrigated agriculture, were computed by TWDB for the SCTRWPG (Tables 4-24 through 4-28). The SCTRWPG has recognized the importance of both direct and third party impacts of irrigation water shortages, and has recommended an irrigation technology center, expanded water data and research programs, and major emphasis be placed upon in-depth socio-economic analyses of water shortages in the next water planning cycle (see Section 6).

Table B

Estimates of Income from Irrigation to Produce Crops*

South Central Texas Region

Grains, Cotton, & Nuts	Corn for Food	Cotton (Long Season)	Cotton (Short Season)	Grain Sorghum	Guar	Peanuts	Sesame	Winter Wheat	Spring Wheat
Yield Per Acre	115 bu.	1,000 lb lint	960 lb lint	50.00 cwt**	18.50 cwt**	35.00 cwt**	12.5 cwt**	40.00 bu	50.00 bu
Yield Per Acre		0.81 ton seed	0.77 ton seed					90day/grz	
Water Use Per Acre in Acre-Feet	1.42	1.67	1.00	1.00	1.08	1.75	1.00	1.00	1.08
	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)
Gross Income Per Acre	373.75	789.21	756.48	250.00	296.00	1,120.00	375.00	191.00	200.00
Costs Per Acre Except Irrigation Pumping									
Variable (Seed, Chemicals, Labor, Harvesting)	234.20	495.49	418.60	187.05	174.54	451.46	127.01	141.58	130.79
Fixed (Depreciation, Land, Management)	112.98	128.70	124.15	97.23	87.80	331.11	98.67	62.44	59.82
Total Costs Per Acre Except Irrigation Pumping	347.18	624.19	542.75	284.28	262.34	782.57	225.68	204.02	190.61
Net Income Per Acre to Pay for Water	26.57	165.02	213.73	-34.28	33.66	337.43	149.32	-13.02	9.39
Net Income Per Acre-Foot of Water	18.71	98.81	213.73	-34.28	31.17	192.82	149.32	-13.02	8.69

Deep Rooted Vegetables	Beets for Processing	Cantaloupes for Fresh Mkt	Carrots for Fresh Mkt	Carrots for Processing	Cucumbers for Fresh Mkt	Cucumbers for Pickles
Yield Per Acre	14 tons	300 cartons	500 bags	14 Tons	250 cartons	160 cwt**
Water Use Per Acre in Acre-Feet	1.00	2.33	1.75	1.67	1.67	1.00
	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)
Gross Income Per Acre	560.00	1,800.00	2,750.00	525.00	1,625.00	1,680.00
Costs Per Acre Except Irrigation Pumping						
Variable (Seed, Chemicals, Labor, Harvesting)	229.38	1,672.49	2,530.90	299.89	1,429.68	1,284.11
Fixed (Depreciation, Land, Management)	117.25	128.00	118.25	118.25	115.61	115.12
Total Costs Per Acre Except Irrigation Pumping	346.63	1,800.49	2,649.15	418.14	1,545.29	1,399.23
Net Income Per Acre to Pay for Water	213.37	-0.49	100.85	106.86	79.71	280.77
Net Income Per Acre-Foot of Water	213.37	-0.21	57.63	63.99	47.73	280.77

*"Texas Crop Enterprise Budgets;" Southwest Texas District, Texas Agricultural Extension Service, B-1241(C10); Texas A&M Univ. System, College Sta. Tx., 19
This is the most recent information available for the SCT region. Income and costs are in 1997 prices. 1997 farm prices were higher than either 1998 or 1999, which results in a higher net income than would have been the result if 1998 or 1999 farm prices had been used.

**cwt means hundredweight.

Continued next page

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Table B (Continued)
Estimates of Income from Irrigation to Produce Crops*
South Central Texas Region

Continued from previous page

Shallow Rooted Vegetables	Cabbage for Fresh Mkt	Lettuce for Fresh Mkt	Onions for Fresh Mkt	Spinach for Fresh Mkt	Spinach for Processing
Yield Per Acre	650 bags	500 cartons	750 bags	450 bu	11 Tons
Water Use Per Acre in Acre-Feet	2.33	1.00	2.25	1.67	1.83
	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)
Gross Income Per Acre	2,925.00	2,750.00	5,625.00	2,925.00	814.00
Costs Per Acre Except Irrigation Pumping					
Variable (Seed, Chemicals, Labor, Harvesting)	2,160.63	2,704.13	3,728.05	2,319.55	318.35
Fixed (Depreciation, Land, Management)	121.35	121.67	135.65	123.69	119.56
Total Costs Per Acre Except Irrigation Pumping	2,281.98	2,825.80	3,863.70	2,443.24	437.91
Net Income Per Acre to Pay for Water	643.02	-75.80	1,761.30	481.76	376.09
Net Income Per Acre-Foot of Water	275.97	-75.80	782.80	288.48	205.51

SUMMARY OF NET RETURNS TO WATER AT FARM IN SOUTH CENTRAL TEXAS REGION

CROP	**DOLLARS PER ACRE-FOOT (rounded down)**
Grains, Cotton, & Nuts	
Corn for food	18
Cotton (Long Season)	98
Cotton(Short Season)	213
Grain Sorghum	-34
Guar	31
Peanuts	192
Sesame	149
Winter Wheat	-13
Spring Wheat	8
Deep Rooted Vegetables	
Beets for Processing	213
Cantaloupes	0
Carrots for Fresh Mkt	57
Carrots for Processing	63
Cucumbers for Fresh Mk	47
Cucumbers for Pickles	280

CROP	**DOLLARS PER ACRE-FOOT (rounded down)**
Shallow Rooted Vegetables	
Cabbage for Fresh Mkt	275
Lettuce for Fresh Mkt	-75
Onions for Fresh Mkt	782
Spinach for Fresh Mkt	288
Spinach for Processing	205

Estimated costs of water to meet projected needs in SCTR **	
New Reservoirs/Raw Water at Reservoir	$560 to $764 per acft.
Edwards Recharge/Raw Water in Aquifer	$486 to $627 per acft.
Carrizo CZ-10C Raw Water at Municipal Demand Center	~$390 to $505 per acft.

Note: Cost estimates presented above do not include cost to pump to location of irrigation need, nor cost to deliver water to irrigation farms within irrigation centers of need; e.g.; irrigation laterals from main pipelines to farms.

* See footnotes on previous page.
** Abstracted from "Technical Evaluations of South Central Texas Region Water Supply Options", Oct. 1999.

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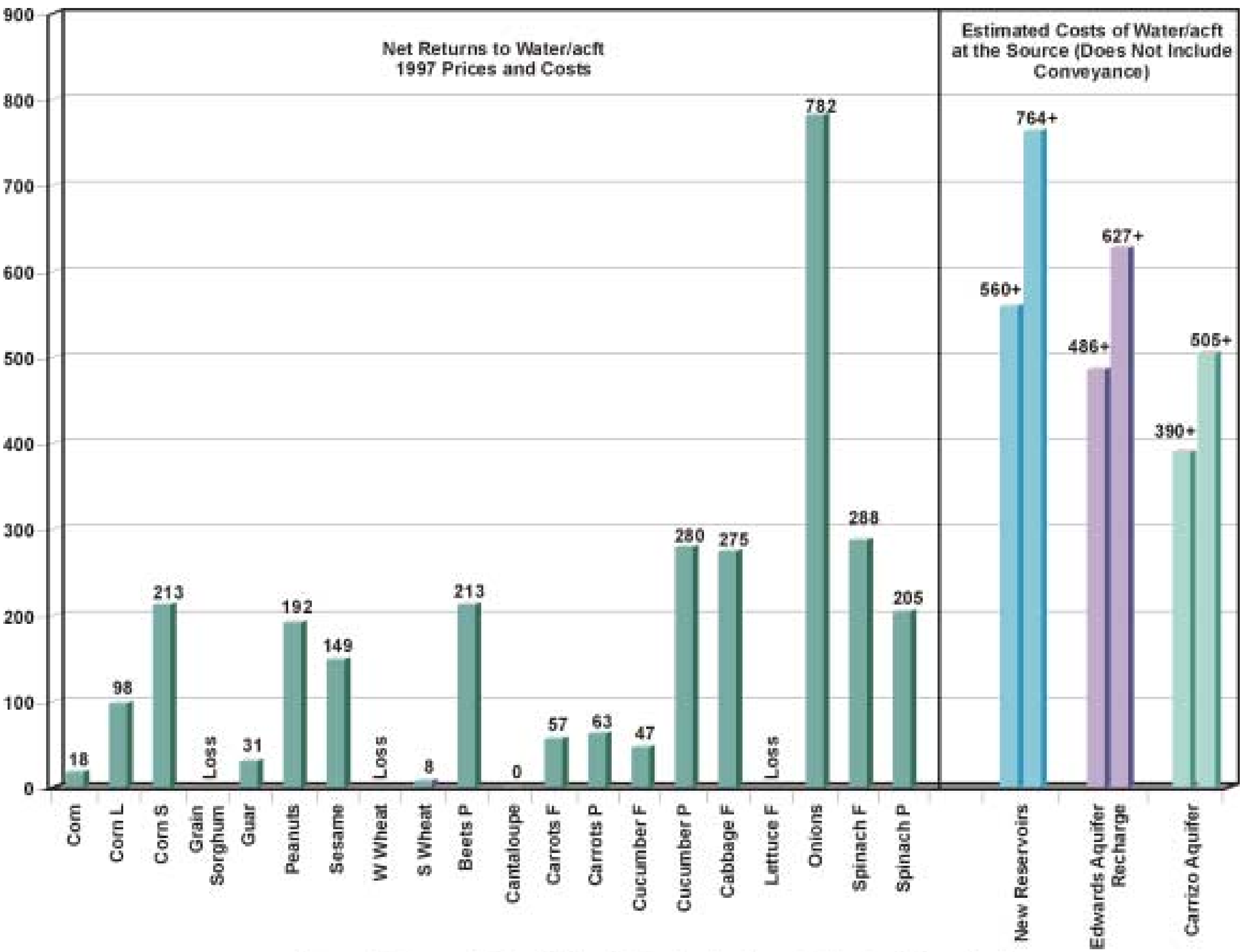

Figure 1. Economic Feasibility of Meeting Projected Irrigation Water Needs South Central Texas Region

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SUPPLEMENT 2

South Central Texas Region

Regional Water Plan

Special Report

Water Conservation Planning Guidelines

Prepared by Chris Brown

August 2000

Conservation Planning Guidelines
South Central Texas Regional Water Planning Group

Introduction

Aggressive conservation measures have been helping communities in Texas and throughout the world reduce demand as an alternative to developing new water supplies. Large municipal purveyors, such as the San Antonio Water System, have award-winning conservation programs. Many of the elements of conservation programs have been developed into Best Management Practices by agencies such as the California Urban Water Conservation Council and the Edwards Aquifer Authority. The South Central Texas Regional Water Planning Group has chosen the advanced conservation option in projecting water demands for the future. The Conservation Practices and water saving tips in this document will assist communities in meeting those projections.

Successful conservation programs will help to expand the existing water supply of the region by reducing demand. At a minimum conservation programs need to address two means of reducing water use: change of behavior and change of equipment. Turning off the water when it is no longer necessary for rinsing, irrigating, or other productive uses, plays a significant role in reducing demand. Replacing older, less efficient equipment, with new modern equipment can realize water savings mechanically.

These Conservation Planning Guidelines of the South Central Texas Regional Water Planning Group are designed to assist new and existing conservation programs to pick the best of available options to help reduce water demand. Conservation programs are tailored to meet the specific demand profile of communities or regions, as defined in planning documents. As such they will have unique elements regarding the cost of water, the type of promotional activities, and the specific measures which are combined within a program. However, past success in conservation efforts of communities throughout Texas and the western United States has led to the development of a basic framework for program development referred to as conservation best management practices. This Planning Guidelines document is organized into a description of specific Conservation Practices which can be used to meet the demand reductions anticipated in the South Central Texas Regional Water Plan's Option L-10, Demand Reduction.

Each Conservation Practice comprises a grouping of conservation measures. It contains some information that will assist a utility or water district in achieving its goals, and suggestions for how to calculate anticipated water savings. Conservation measures are the basic elements of a practice or program. They include for example toilet retrofits or showerhead replacements.

Each practice description is followed by some coverage prerequisites that will assist a planning unit in designing a successful program. The final section of each Practice is a set of assumptions or equations that will assist in determining the potential water savings.

Conservation practices include system-wide measures, such as System Water Audits, Leak Detection and Repair, Metering of all New Connections and Retrofit of Existing Connections, and Water Waste Prohibition. Practices directed at the customer or general public include Public Information Programs and School Education Programs.

Other conservation practices include measures intended to assist residents and businesses in the installation of new or retrofitted equipment that is water efficient. These include Water Survey Programs for Single- and Multi-Family Residential Customers with Residential Plumbing Retrofit Programs, Residential Ultra-Low-Flush Toilet (ULFT) Replacement Programs, High-Efficiency Washing Machine Rebate Programs, Hot Water on Demand Systems, and Conservation Programs for Industrial, Commercial, and Institutional (ICI) Accounts including ICI ULFT Replacement Programs.

South Central Texas is located in a semi-arid ecoregion on the edge of the Chihuahua desert. High temperatures and long periods without a significant amount of rainfall place a premium on outdoor water conservation. Conservation practices directed at outdoor water use include Landscape Conservation Programs and Incentives and Rainwater Harvesting Systems.

Following the section on Conservation Practices is a list of water saving tips prepared by the Texas Water Development Board. The tips are aimed for the residential water user, and can be used by municipal utilities and water districts in their public information or education programs. The conservation practices described in this document are listed below. References at the end of the Guidelines give additional facts including anecdotal information regarding successful conservation programs that have implemented these practices.

Conservation Practices

1. System Water Audits, Leak Detection and Repair
2. Metering of all New Connections and Retrofit of Existing Connections
3. Water Waste Prohibition
4. Conservation Pricing
5. Public Information Programs
6. School Education Programs
7. Water Survey Programs for Single and Multi-Family Residential Customers (Including Plumbing Retrofit Programs)
8. Residential Ultra-Low Flush Toilet (ULFT) Replacement Programs
9. High-Efficiency Washing Machine Rebate Programs
10. Hot Water on Demand Systems
11. Conservation Programs for Industrial, Commercial, and Institutional Accounts (Including ULFT Replacement Programs)
12. Cooling Water Recirculation Systems
13. Landscape Conservation Programs and Incentives
14. Rainwater Harvesting Systems
15. Agricultural Irrigation Conservation Programs

Conservation Practice 1: System Water Audits, Leak Detection and Repair

Description

System Water Audit and Leak Detection and Repair programs are effective methods of accounting for all water usage within a service area and are essential to a sound water management program. Under this Conservation Practice, the purveyor needs to conduct annual pre-screening system audits to determine if full-scale system audits are necessary. If determined to be necessary, the purveyor then will conduct a full distribution-system audit.

In order to reduce water losses due to leakage, the purveyor needs to maintain a Leak Detection and Repair Program and needs to repair leaks when detected. Unaccounted water losses need to be no more than 10 percent of total water in the system. The purveyor needs to make every effort to inform customers when leaks exist on the customers' side of the meter.

Coverage Conditions

To realize this practice, the purveyor needs to accomplish the following:

1. Annually complete a pre-screening system audit to determine the need for a full-scale system audit. The pre-screening system audit needs to be calculated as follows:
    a. Determine metered sales and other system verifiable uses;
    b. Determine total supply into the system; and
    c. If metered sales plus other verifiable uses represent less than 90 percent of total supply into the system, a full-scale system audit is necessary.
2. Annually conduct a distribution system water audit using methodology consistent with that described in AWWA's "Water Audit and Leak Detection Guidebook" (if applicable);
3. Perform distribution system leak detection when warranted and repair identified leaks when cost-effective; and
4. Advise customers when it appears that leaks exist on the customers' side of the meter.

Water Savings Assumptions

In the case of purveyors who do not have existing programs, substantial savings can accrue from implementing this practice. In the South Central Texas Region some purveyors have shown water loss rates upward of 30 percent prior to implementing System Water Audit and Leak Detection and Repair programs.

Conservation Practice 2: Metering of All New Connections and Retrofit of Existing Connections

Description

Metering of all connections within a service area is an effective method of accounting for all water usage and is essential to a sound water management program. Under this conservation practice, the purveyor needs to meter all new connections within the service area and needs to develop and implement a program to retrofit all existing unmetered accounts within the service area.

Many Industrial, Commercial and Institutional (ICI) accounts use significant amounts of water for landscape irrigation. Unless these accounts have dedicated landscape meters, it is difficult to track and control landscape water usage. For this reason, the purveyor needs to determine the feasibility of retrofitting mixed-use ICI meters with dedicated landscape meters. If it is determined that retrofitting is a feasible method of reducing landscape water usage, the purveyor needs to develop a plan to retrofit mixed-use meters, either through incentive programs or mandates.

Many multi-family and ICI accounts require large meters that cannot measure water usage during low-flow periods. In order to account for all water usage for large users, the purveyor should determine the feasibility of retrofitting multi-family and ICI accounts with compound meters or similar technology.

Coverage Prerequisites

To realize this practice, the purveyor needs to accomplish the following:

20. Install meters on all new connections;
21. Within 1 year of implementation date, develop a plan to retrofit existing unmetered connections;
22. Within 1 year of implementation date, determine the feasibility of retrofitting mixed-use ICI meters with dedicated irrigation meters; and
23. By March 31, 2007, install meters on 100 percent of existing unmetered connections.

Water Savings Assumptions

Assume meter retrofits will result in a 20 percent reduction in demand by retrofitted accounts.

Conservation Practice 3: Water Waste Prohibition

Description

Water Waste Prohibition measures are enforceable actions intended to prohibit specific wasteful activities. Under this practice, the purveyor needs to enact and enforce ordinances to prohibit wasteful activities including: gutter flooding, landscape watering by sprinkler system between the hours of 10:00 a.m. and 8:00 p.m., single pass cooling systems in new connections, non-recirculating systems in new conveyer car washes, non-recirculating systems in new commercial laundry systems, non-recycling decorative water fountains, and other wasteful activities.

Coverage Prerequisites

To realize this practice, the purveyor needs to adopt and enforce water waste prohibitions consistent with the description above.

Water Savings Assumptions

Not quantified. Water savings will depend on previous ordinances and local practices. If available, provide calculated water savings and calculation methodology.

Municipal Conservation Practice 4: Conservation Pricing

Description

Conservation Pricing is a method of encouraging efficient water use through quantity-based pricing structures. In order to provide economic incentives for efficient water use, the purveyor must bill by metered volume of use. Conservation pricing provides incentives to customers to reduce average or peak use, or both. Such pricing includes: rates designed to recover the cost of providing service and billing for water and sewer service based on metered water use.

Conservation pricing is also characterized by one or more of the following components: rates in which the unit rate is constant regardless of the quantity used (uniform rates) or increases as the quantity used increases (increasing block rates); seasonal rates or excess-use surcharges to reduce peak demands during summer months; and rates based upon the long-run marginal cost or the cost of adding the next unit of capacity to the system.

For purveyors supplying both water and sewer service, this Practice applies to pricing of both water and sewer service. Purveyors that supply water but not sewer service need to make good faith efforts to work with sewer agencies so that those sewer agencies adopt conservation pricing for sewer service.

Adoption of lifeline rates for low-income customers will neither qualify nor disqualify a rate structure as meeting the requirements of this Practice.

Coverage Requirements

Purveyors need to maintain rate structure consistent with this Practice's definition of conservation pricing.

Water Savings Assumptions

Studies done within the region have shown a price elasticity of approximately -0.20. This means that for every 10 percent increase in water prices a resulting 2.0 percent reduction in water use may be anticipated. Increase in average income must be factored in by the utility to determine the actual net impact on consumer perception and response to price. For planning purposes this number may be used.

Source: Whitcomb, J., Stratus Consulting, 1999.

Conservation Practice 5: Public Information Programs

Description

Public Information Programs are effective methods of promoting water conservation and informing the public of the necessity to use water efficiently. Under this practice, the purveyor needs to establish and maintain an active public information program to educate and inform the public about water conservation.

An effective public information program should include, but is not limited to: providing speakers to employees, community groups, and the media; using paid and public service advertising; using bill inserts; providing individualized trend and comparison information on bills; and providing informational pamphlets, flyers, and manuals. In order to maximize available resources, the purveyor should coordinate with government agencies, industry groups, public interest groups, and the media.

The purveyor may realize this practice by employing resources available through the Edwards Aquifer Authority, Texas Water Development Board, or Texas Natural Resource Conservation Commission.

Coverage Prerequisites

To accomplish this practice, the purveyor needs to realize the following:

Establish and maintain an active public information program to promote and educate customers about water conservation.

Water Savings Assumptions

Not quantified. If available, provide calculated water savings and calculation methodology.

Conservation Practices 6: School Education Programs

Description

School Education Programs are a proven and widely accepted method of achieving water conservation. Under this practice, the purveyor should establish and maintain an active school education program to inform and educate students within the service area of the importance of efficient water use.

An effective school education program should include, but is not limited to: classroom presentations, instructional assistance, and distribution of educational materials. Grade-appropriate materials and presentations should be available for grade levels K-12. The purveyor is encouraged to coordinate with government agencies, industry groups, public interest groups, and the media to maximize available educational resources. Education materials should meet the state education framework requirements. Some programs, such as the “Learning to Be Water Wise and Energy Efficient” program described below, also include retrofit kits for use in the home.

Coverage Prerequisites

To realize this practice, the purveyor should accomplish the following:

Establish and maintain an active school education program to educate students in the service areas about water conservation and efficient water usage.

To accomplish this practice the following documentation will assist the purveyor:

1. Number of school presentations made annually;
2. Number and grade level of students reached;
3. Number of in-service presentations or teacher's workshops conducted annually;
4. Number of teachers reached;
5. Number and type of curriculum materials developed or provided by the purveyor; and
6. Estimated water savings achieved through school education programs.

Water Savings Assumptions

Not quantified. If available, purveyors should attempt to calculate water savings and costs. The exact methods and content of programs will affect the final water savings obtained.

One successfully implemented program where water savings have been quantified in Texas was the Harris-Galveston, Texas, collaboration with schools and private partners to distribute conservation kits to sixth-grade students using the "Learning to Be Water Wise and Energy Efficient" curriculum. At a cost of $31 per kit, water savings were calculated at an average of 1,400 gallons per month per household over a 10-year period.[1]

Conservation Practice 7: Water Survey Programs for Single-Family and Multi-Family Residential Customers

Description

Water survey programs are an effective method of tracking and controlling water usage in the single-family and multi-family residential sector. Under this practice, the purveyor needs to develop and implement a plan to market water-use surveys to single-family and multi-family residential customers.

At a minimum the survey needs to include: meter checks; leak checks for toilets and faucets; determination of flow rates for showerheads, aerators, and toilets; irrigation system and timer checks; and review or development of irrigation schedules. Residential water-use surveys should also include measurement of currently landscaped and total irrigable areas. The purveyor needs to provide the customer with an information packet including evaluation results and water saving recommendations.

Purveyors should include water softener checks in residential water surveys and should distribute information about demand-initiated regenerating (DIR) and exchange-type water softeners to encourage replacement of the less efficient timer models.

[1]Gerston, J., "Schoolkids Home in on Conservation," Texas Watersavers, TAEX, College Station, Texas, Summer 1998.

Residential Plumbing Retrofit Programs

A related method of reducing residential water use is plumbing retrofits. Under this practice, the purveyor should identify single-family and multi-family residences constructed prior to 1992, and develop a plan to distribute or directly install high-quality, low-flow plumbing devices as needed. High-quality, low-flow plumbing devices include: showerheads rated at 2.5 gallons per minute (gpm) or less, faucet aerators rated at 2.2 gpm or less, toilet displacement devices, and toilet flappers. The purveyor needs to maintain the distribution or installation programs to achieve retrofits on at least 10 percent of single-family residences and 10 percent of multi-family residences each reporting period.

The purveyor may meet the prerequisites of this practice through enforceable ordinances requiring replacement of inefficient plumbing fixtures.

Coverage Prerequisites

To realize this practice, the purveyor needs to accomplish the following:

1. Within 1 year of implementation date, develop and implement a plan to market water-use surveys to single-family and multi-family residential customers;
2. Within 10 years of implementation, contact and offer water-use surveys to all single-family and multi-family residential customers;
3. Within 10 years of implementation, complete water-use surveys for at least 15 percent of single-family residential accounts; and
4. Within 10 years of implementation, complete water-use surveys for at least 15 percent of multi-family residential accounts.

Water Savings Assumptions

Calculate water savings as follows:

Water Savings = Device Savings * Number of Devices * Probability of Installation

Where:

Device Savings may be found in the Retrofit Device Savings table.

Probability of Installation may be determined by the purveyor using the following guidelines or may be determined independently by the purveyor.

a. 100 percent for retrofits resulting from surveys conducted by the purveyor
b. 80 percent for retrofits resulting from customer requests for survey kits
c. 50 percent for retrofits resulting from survey kit distribution at public events
d. Survey follow-ups increase the probability of installation.

Retrofit Device Savings Table

Device	***Initial Savings (gpd per device)***	***Device Life Span***
Low Flow Showerheads	5.5 gpd	3 to 7 years
Toilet Displacement Devices	4 gpd	2 to 5 years
Faucet Aerators	1.5 gpd	1 to 3 years
Toilet Leak Detection	.64 gpd (8 gpd per repaired leaking toilet; 8 percent of toilets leaking)*	7 to 10 years
Other Household Leak Check	.5 gpd (12.4 gpd per household repair; 4 percent of households with leaks)	7 to 10 years
Turf Survey	12.2 gpd	4 years
Turf Survey with Timer	25.9 gpd (12.2 gpd for turf audit plus 14.7 if timer)	4 years
Source	Field Studies	Judgement

*Municipal purveyors that implement conservation programs with household leak repairs are recommended to update these calculations at their earliest convenience as water hardness and age of device will have direct impacts on these rates.

Source: A&N Technical Services, Inc, 1999.

Conservation Practice 8: Residential ULFT Replacement Programs

Description

Ultra-low-flush toilet (ULFT) replacement programs are an effective method of achieving conservation in the residential sector. Under this practice, the purveyor needs to develop and implement a program to replace existing high-water-using toilets with ULFTs in single-family and multi-family residences. ULFTs are toilets that use 1.6 gallons per flush or less.

The purveyor's ULFT replacement programs need to be at least as effective as ordinances requiring toilet replacement at the time of resale.

Purveyors should consider supplementing ULFT replacement programs with ordinances that require ULFT replacement at the time of resale.

Coverage Prerequisites

To receive credit for this practice, the purveyor needs to accomplish the following:

Develop and implement a program to replace existing high-water-using toilets with ULFTs in single-family and multi-family residences.

Water Savings Assumptions

Calculate water savings as follows:

For single-family dwellings:

Water Savings = [6.693 * Persons per Dwelling - 0.529 * (Persons per Dwelling)2 + 7.826] * 365 * Number of Toilets

OR

Water Savings = [29.9 * Number of First Toilets Replaced + 20.6 * Number of Second Toilets Replaced + 19.1 * Number of third (or higher) Toilets Replaced] * 365

For multi-family dwellings:

Water Savings = [19.138 * Persons per Unit - 0.942 * (Persons per Unit)2 + 2.181] * 365 * Number of Toilets

OR

Water Savings = [44 * Number of First Toilets Replaced + 34 * Number of Second Toilets Replaced] *365

Where: Water Savings = Gallons per Year

Source: A&N Technical Services, Inc., 1999.

Conservation Practice 9: High-Efficiency Washing Machine Rebate Programs

Description

High-efficiency washing machines are an effective method of achieving conservation in the residential sector. Under this practice, the purveyor needs to offer cost-effective financial incentives to encourage the purchase and use of high-efficiency washing machines. Incentive levels may be calculated using methods found in *A Guide to Customer* Incentives *for Water* Conservation, prepared by Barakat and Chamberlain (February 1994).

Incentives and rebates may be offered in conjunction with rebate programs sponsored by local energy providers.

Coverage Prerequisites

To realize this practice, the purveyor needs to accomplish the following:

Provide cost-effective customer incentives for the purchase of high-efficiency washing machines.

Water Savings Assumptions

Calculate water savings as follows:

For single-family machines:

Water Savings = Savings per Load ∗ Water use per Load ∗ Loads per Person ∗ Persons per Household ∗ 365 ∗ Number of Machines

For multi-family machines:

Water Savings = Savings per Load ∗ Water use per Load ∗ Loads per Person ∗ Persons per Household * Units per Machine ∗ 365 ∗ Number of Machines

Where: Water Savings = Gallons per Year

Savings per Load = 37.8 percent

Water Use per Load = 48.5 Gallons

Loads per Person = 0.45

Source: A&N Technical Services, Inc., 1999.

Conservation Practice 10: Hot Water on Demand Systems

Description

Hot water on demand systems deliver hot water at the showerhead or faucet without draining cold water from the pipes between the fixture and the water heater. This is accomplished by either a valve and pump to recirculate cold water to the water heater, or by using a instantaneous heater located near the fixture of interest. In the valve and pump system, the recirculating pump stops and the valve closes when a temperature sensor measures the arrival of hot water from the heater.

Factors that influence savings include the distance between the water heater and the fixtures, and pipe location and insulation (pipes are often uninsulated and in attics or under a pier and beam foundation). Most of these devices are targeted for the single-family residential sector, although the ICI and multi-family sectors have potential.

Some communities have taken the approach of requiring installation of recirculating hot water systems similar to those used in the commercial sector in new houses.

Coverage Prerequisites

To accomplish this practice, the purveyor needs to achieve the following:

1. Establish and maintain an active public information program to promote and educate customers about hot water on demand systems;
2. Identify average distance from hot water heater to shower in local homes or businesses;
3. Determine the benefits of a hot water on demand systems for average home or business, and develop incentives for existing customers to retrofit; or
4. Where pertinent an ordinance requiring installation of hot water on demand systems in new construction.

Water Savings Assumptions

Savings Calculation (gpd/hot water demand unit):

Water Savings = Cold Start Hot Water Runs * Savings per Run * Plumbing

Where: Cold Start Hot Water Runs = PPH * Hot Water Runs * Scale Factor

Savings per Run: Mean: 4.0 gallons per hot water run; Range: 2 to 12 gallons per run

Hot Water Runs: Mean: 6 hot water runs per day per person; Range: 2 to 10

Scale Factor: .8

PPH: Persons per household—single-family

Plumbing: .75 Plumbing system factor assumes half of houses realize only half savings.

Source: A&N Technical Services, Inc., 1995; CEC, 1995.

The savings figures are for retrofits. The savings estimates may be underestimated because they do not account for all behavioral components. For example, many people tend to warm up their water beyond what is necessary (e.g., until it "steams").

Conservation Practices 11: Conservation Programs for Industrial, Commercial, and Institutional Accounts

Description

Conservation programs for industrial, commercial, and institutional (ICI) accounts are essential for reducing water usage in the ICI sector. Under this practice, the purveyor needs to identify industrial, commercial, and institutional customers and rank them according to water usage.

To accurately track water usage by ICI accounts, the purveyor needs to develop and market an ICI water-use survey and customer incentives program. Directly contact (via letter, telephone, or personal visit) and offer water use surveys and customer incentives to at least 10 percent of commercial, industrial, and institutional accounts on a repeating basis. A water use survey needs to include: a site visit; an evaluation of all water-using equipment and processes; a report identifying recommended conservation measures and their expected payback; and available agency incentives. The purveyor should conduct annual follow-up visits to evaluate the status of recommended water-saving improvements.

In lieu of the water-use survey and customer incentives program, the purveyor may choose to implement other programs to reduce water usage in the ICI sector. The purveyor may reduce ICI water usage through rebates for equipment replacement, perform workshops targeted to specific sectors of their ICI base, or provide other incentives for new and established businesses to improve their water efficiency.

Providing educational materials for visitors to South Central Texas through commercial hospitality industry, such as optional laundry services in hotels/motels, is one innovative example of public/private partnerships for water conservation in San Antonio. Incentives for commercial and industrial users who can recycle water internally can also lead to significant water savings. On-site water recycling systems require proper plumbing and treatment equipment. Retrofits of existing and construction of new car washes or other industrial uses in San Antonio have shown recycling capabilities of 60 to 90 percent.

For purposes of this practice, commercial, industrial, and institutional customers are defined as follows:

A. Commercial Customers: any water user that provides or distributes a product or service, such as hotels, restaurants, office buildings, commercial businesses, or other places of commerce. These do not include multi-family residences, agricultural users, or customers that fall within the industrial or institutional classifications.
B. Institutional Customers: any water-using establishment dedicated to public service. This includes schools, courts, churches, hospitals, and government facilities. All facilities serving these functions are to be considered institutions regardless of ownership.
C. Industrial Customers: any water users that are primarily manufacturers or processors of materials as defined by the Standard Industrial Classifications (SIC) Code numbers 2000 through 3999.

Coverage Prerequisites

To realize this practice, the purveyor needs to accomplish the following:

1. Identify industrial, commercial, and institutional accounts and rank them by water use;
2. Within 10 years of initiation, contact and offer water-use surveys and/or customer incentives to 100 percent of ICI accounts;
3. Within 10 years of initiation, complete water-use surveys for 10 percent of ICI accounts; and
4. If utilizing other programs in lieu of the water-use survey and customer incentives program: within 10 years of initiation, reduce ICI water usage by 10 percent of baseline ICI usage.

Water Savings Assumptions

Calculate water savings as follows:

Water Savings = Number of Surveys * Estimated Savings * Water Used

Where: Estimated Savings = 18 percent or percentage determined through survey results
Water Used = Average (5 years) annual water use by ICI customers receiving the survey

Source: A&N Technical Services, Inc., 1999.

For purveyors considering a ULFT replacement or retrofit program for ICI customers the following table will assist in calculating estimated water savings by market segment.

Savings per ICI ULFT Installed

Market Segment	Estimated Savings (gpd)	90 percent Confidence Interval
Wholesale	57	19-94
Food Store	48	37-59
Restaurant	47	36-58
Retail	37	33-42
Automotive	36	22-50
Multiple Use	29	14-45
Religious	28	20-37
Manufacturing	23	15-32
Health Care	21	13-28
Office	20	17-23
Miscellaneous	17	11-23
Hotel/Motel	16	11-20
Source: Hagler Bailly Services, 1997.		

ICI Conservation Practice 12: Cooling Water Recirculation

The use of water for cooling towers in industrial and commercial applications represents a significant water use in the South Central Texas. Water is typically used to cool heat-generating equipment or to condense gases in a thermodynamic cycle. Single-pass cooling is the most water-intensive cooling method used in industrial applications. Water contacts a heat source, lowers its temperature, and then is discharged.

Recycling water within a recirculating cooling system can greatly reduce water use by using the same water to perform several cooling operations. The EPA notes that the water savings are sufficiently substantial to result in overall cost savings to the industry.[2] Three cooling water conservation approaches that can be used to reduce water use are evaporative cooling, ozonation, and air heat exchange (Brown and Caldwell, 1990).

In industrial/commercial evaporative cooling systems, water loses heat when a portion of it is evaporated. Evaporation, drift, and blowdown result in substantial water loss from evaporative cooling towers. (Blowdown is a process in which some of the poor-quality recirculating water is discharged from the tower in order to reduce the total dissolved solids and protect the equipment from corrosion.) Water savings associated with the use of evaporative cooling towers can be increased by treating the water to reduce blowdown or water discharges from cooling towers.

Air heat exchange works on the same principle as a car's radiator. In an air heat exchanger, a fan blows air past finned tubes carrying the recirculating cooling water. Air heat exchangers involve no water loss, but they can be relatively expensive when compared with cooling towers (Brown and Caldwell, 1990).

Coverage Prerequisites

To realize this practice, the purveyor needs to accomplish the following:

1. Identify industrial, commercial, and institutional accounts with significant water use for cooling;
2. Within 10 years of initiation, contact and offer water-use surveys and/or customer incentives to 100 percent of these ICI accounts;
3. Within 10 years of initiation, complete water-use surveys for 10 percent of ICI accounts; and
4. If utilizing other programs in lieu of the water-use survey and customer incentives program: within 10 years of initiation, reduce ICI water usage by 10 percent of baseline ICI cooling water usage.

[2] EPA, Cleaner Water Through Conservation, http://www.epa.gov/OWOW/NPS/sec6/chap3.html, 2000

Water Savings Assumptions

Steam generating plants have shown ten-fold reductions in water use by converting from water heat exchangers to air heat exchangers. The higher cost of operating an air heat exchanger may provide a disincentive to such conversions. Industrial, commercial and institutional consumers may save significant amounts of water by moving from single-pass cooling to multiple cycles through use of chemical or ozone treatment systems.

The use of ozone to treat cooling water (ozonation) can result in a five-fold reduction in blowdown when compared to traditional chemical treatments and should be considered as an option for increasing water savings in a cooling tower (Brown and Caldwell, 1990).

A simple formula for estimating potential savings is:

Water Savings = (evap loss in gpm/(cycles of concentration after conversion- 1)) - (evap loss in gpm/(cycles of concentration before conversion - 1))

Where: evap loss in gpm = 30 gpm evaporation is standard for a 1,000 ton cooling tower

Source: San Antonio Water System Conservation Department, 2000.

Conservation Practices 13: Landscape Conservation Programs and Incentives

Description

Landscape conservation programs are an effective method of accounting for and reducing outdoor water usage. Under this practice, the purveyor should provide non-residential customers with customer support, education, incentives, and assistance in improving their landscape water use efficiency. To increase the cost-effectiveness of these programs many purveyors target customers with large landscapes.

The purveyor should identify accounts with dedicated irrigation meters and assign PET-based water use budgets equal to no more than 100 percent of the potential evapotranspiration of turfgrass per square foot of landscape area.[3] For accounts with water-use budgets, the purveyor

[3]Potential evapotranspiration data for turfgrasses can be obtained from the Texas A&M PET web site (http://texaset.tamu.edu/). Potential Evapotranspiration (PET) = reference evapotranspiration (ETo) multiplied by a cool-season turfgrass coefficient. Information on adjusting the coefficient for common varieties of warm-season grasses found in South Central Texas can be found in the *"San Antonio EvapoTranspiration Pilot Study Report,"* Texas Agricultural Extension Service, Bexar County, for San Antonio Water System, 1998.

should provide notices each billing cycle showing the relationship between budgeted water usage and actual consumption.

The purveyor should develop and implement a plan to market large landscape water-use surveys to Industrial, Commercial and Institutional (ICI) accounts with mixed-use meters. At a minimum the water-use surveys should include: measurement of the landscape area; measurement of the total irrigable area; irrigation system checks and distribution uniformity analysis; review of irrigation schedules or development of schedules as appropriate; provision of a customer survey report and information packet. When cost-effective, the purveyor should offer the following: landscape water-use analyses and surveys; voluntary water-use budgets; installation of dedicated landscape meters; and follow-up to water-use analyses and surveys. Similar services can be extended to residential customers.

The San Antonio Water System offers rebates to customers who install xeriscape landscaping in place of turfgrass. Xeriscape plants are typically lower water users than turfgrass and are better adapted to long periods without rainfall. Greywater reuse systems are another innovative means of supplementing or replacing potable irrigation water for landscape irrigation. Proper filtration is required on greywater reuse systems.

For new customers and change-of-service customer accounts, the purveyor should provide information on landscape design appropriate to the climate and efficient irrigation equipment and management. The purveyor should install water-efficient landscaping appropriate to the climate at water-agency facilities and install landscape meters where appropriate. Ordinances requiring minimum design standards for efficient irrigation systems is another potential approach.

When cost-effective, the purveyor should consider offering the following services:

1. Training in landscape maintenance and irrigation system design;
2. Financial incentives (such as loans, rebates, and grants) to improve irrigation system efficiency and to purchase and/or install water efficient irrigation systems;
3. Financial incentives to replace high-water-use plants with drought-tolerant ones;
4. Rebates and incentives to purchase rain sensors or soil-moisture sensors;
5. Notices at the start and end of the irrigation season alerting customers to check irrigation systems and to make repairs and adjustments as necessary.

Coverage Prerequisites

To realize this practice, the purveyor should accomplish the following:

1. Within 1 year of implementation date, develop and implement a plan to market water-use surveys to ICI accounts with mixed-use meters;
2. Within 1 year of implementation date, develop and implement a customer incentive program;
3. Within 2 years of implementation date, develop ETo-based water-use budgets for 90 percent of ICI accounts with dedicated irrigation meters;
4. Within 10 years of implementation date, contact and offer landscape water-use surveys to 100 percent of ICI accounts with mixed-use meters; and
5. Within 10 years of implementation date, complete landscape water-use surveys for at least 15 percent of ICI accounts with mixed-use meters.

Water Savings Assumptions

For planning purposes assume landscape surveys will result in a 15 percent reduction in demand for landscape uses by surveyed accounts. Actual savings should be calculated from surveys or landscape conversions that are realized.

Conservation Practice 14: Rainwater Harvesting

Description

Rainwater harvesting has been practiced in Texas to provide for household, landscape, livestock, and agricultural use. By catching the rain that falls upon the roof or other impervious surface and routing it to a cistern for storage an additional or alternative water supply can be created.

Rainwater harvesting can be a significant supply where costs for drilling and pumping water are high or as a supplement where supply limitations call for augmentation to provide for aesthetic uses such as landscape watering. A successful project calls for adequate storage space to accommodate anticipated uses of the water and intermittent and intense rainfall events.

Rainfall harvesting systems in Texas have capacities ranging from 55 gallon water barrels to 25,000 gallon capacity ferrocement or metal cisterns. Rainfall harvesting requires an impervious surface, preferably smooth, but some composite roofs are used. Water is collected and transferred to the cistern by means of pipes and then pumped to its final use. The final use dictates the type of treatment or filtration the water will need. Screening, settling, filtering, and disinfecting are all techniques which may be used in a rainwater harvesting system.

In addition to public education about the water saving potential for rainwater harvesting, incentives can be offered to customers who choose to install a system. The City of Austin, Texas, offers a rebate to its customers who properly install a rainwater harvesting system. The costs for design and installation of a rainwater harvesting system during new construction are significantly lower than retrofits. Rainwater harvesting systems may also be combined with greywater reuse system, but additional filtration equipment is required for the greywater.

Coverage Prerequisites

To accomplish this practice, the purveyor needs to achieve the following:

1. Identify potential uses of rainwater harvesting in their planning area;
2. Establish and maintain an active public information program to promote and educate customers about rainwater harvesting;
3. Where a rebate program is established, keep records of the total number of rebates and gallons saved.

Water Saving Assumptions

In the South Central Texas planning region average annual precipitation rates range widely—from 21 inches in the west to 40 inches in the east. Each inch of rain represents 0.62 gallons of water for each square foot of collection area. Catchment efficiency rates are estimated to be from 75 percent to 95 percent.

Water Savings = Inches of rain * area of catchment in sq. ft. * 0.62 * catchment efficiency rate.

Source: Texas Water Development Board, 1997.

Conservation Practice 15: Agricultural Irrigation Conservation

Description

Over the last several decades irrigation technology and cropping practices have dramatically increased the efficiency of water use in farming, leading to lower water and energy costs. This demand reduction can also play a part in conservation planning for future water needs. The Edwards Aquifer Authority has developed a number of Best Management Practices for agricultural irrigation conservation that are summarized in this Practice.

Leak detection and repair programs are an effective method of minimizing water losses due to leakage. An irrigator needs to develop and implement a program to regularly monitor and maintain irrigation pipelines, canals, equipment, etc. Lining of irrigation ditches is another effective method of reducing water losses due to percolation. Lining materials may include, but are not limited to, flexible pipelines, plastic membranes, or concrete.

Irrigation equipment can also increase water-use efficiency through increasing the uniformity of water application, thus reducing water waste. Depending upon soil type and slope, size, and shape of the field, a number of options are available. A generally accepted list of water saving irrigation techniques includes: surge-flow, side-roll sprinkler, center-pivot sprinkler such as LPIC or LEPA,[4] linear-move sprinkler, and drip- or micro-irrigation systems.

In addition to irrigation techniques a number of irrigation and farming practices can contribute significant water savings. These include irrigation scheduling, tailwater recovery and reuse systems, furrow dikes, land leveling, cropping practices, and use of treated effluent for non-food crops. These farming conservation practices can be combined with efficient irrigation techniques to extend water savings.

A water district or other planning unit needs to provide incentives in the form of assistance with the expense of retrofitting or installing efficient irrigation equipment. A number of federal programs exist which assist with the financing of water conserving irrigation equipment. Accelerated conservation programs can work in tandem with programs such as the Environmental Quality Incentives Program (EQIP).

Coverage Prerequisites

In order to achieve this practice, the planning unit needs to account for the following information:

1. Copies of equipment invoices or other evidence of equipment purchase;
2. Within 1 year of implementation date, farmer installs and maintains a water conserving irrigation system consistent with the description above; and

[4] LPIC = Low Pressure in Canopy (includes LEPA-like systems which do not have all LEPA components)
LEPA = Low Energy Precision Application

3. Evidence of equipment installed to monitor soil moisture, reference evapotranspiration (ETo), or crop water stress index (CWSI) to implement an irrigation schedule.

Where applicable, the following may be documented:

1. Description of tailwater recovery and reuse system;
2. Description of irrigation system used with furrow dikes;
3. Pre- and post-leveling grade and roughness, or other evidence of leveling activities;
4. Replacement of potable water usage with usage of treated municipal effluent for irrigation of non-food crops; or
5. Change of crops or cropping practices to reduce irrigation water usage.

Water Savings Assumptions

Savings calculation.

Total annual water savings = Current total water applied - potential total water applied

Where: potential total water applied = (current total water applied) * (present application efficiency) ÷ (potential application efficiency)

Representative Application Efficiency[1]

System Type	Percentage Efficiency Range
Stationary Sprinklers	20 to 60%
Furrow	50 to 65%
Surge-flow	60 to 65%
Center Pivot Systems[2]	
Spray	40 to 78%
LPIC	75 to 90%
LEPA	80 to 95%
Drip- or Micro-irrigation	70 to 95%

1 Soil type, field contours, and age and maintenance level of current system will affect actual values. The author recommends consultation with NRCS field staff from a local office to determine values for particular fields within the South Central Texas Region.

2 Linear Move Irrigation systems, depending upon their design, may have efficiencies in the range of Center-Pivot Spray systems to as high as Center Pivot LPIC systems if they have dropped heads.

Source: NRCS, Irrigation Water Savings Documentation Form

Water Saving Tips

In the Bathroom...

- Install a low-flow showerhead that limits the flow from the shower to less than 3 gpm.
- Take short showers and install a cutoff valve, or turn the water off while washing and back on again only to rinse.
- Take a shower instead of taking a bath. Showers with low-flow showerheads often use less water than taking a bath.
- Reduce the level of the water being used in a bathtub by 1 or 2 inches if a shower is not available.
- Shampoo hair in the shower. Shampooing in the shower takes only a little more water than is used to shampoo hair during a bath and much less than shampooing and bathing separately.
- When remodeling a bathroom, install a new low-volume flush toilet that uses only 1.6 gallons per flush or choose a dual flush option toilet fixture.
- Test toilets for leaks. Add a few drops of food coloring or a dye tablet to the water in the tank, but do not flush the toilet. Watch to see if the coloring appears in the bowl within a few minutes. If it does, the toilet has a silent leak that needs to be repaired.
- Use a toilet tank displacement device such as a toilet dam or bag. Also, a plastic bottle can be filled with stones or water, recapped, and placed in the toilet tank. These devices will reduce the volume of water in the tank but will still provide enough for flushing. (Bricks are not recommended since they eventually crumble and could damage the working mechanism.) Displacement devices are not recommended with new low-volume flush toilets.
- Never use the toilet to dispose of cleansing tissues, cigarette butts, or other trash. This wastes a great deal of water and also places an unnecessary load on the sewage treatment plant or septic tank.
- Do not use hot water when cold will do. Water and energy can be saved by washing hands with soap and cold water. Hot water should be added only when hands are especially dirty.
- Do not let the water run when washing hands. Water should be turned off while washing and scrubbing and be turned on again to rinse. A cutoff valve may be installed on the faucet.
- When brushing teeth, turn the water off until it is time to rinse.
- When shaving, fill the lavatory basin with hot water instead of letting the water run continuously.

- Install faucet aerators to reduce water consumption.

In the Kitchen...

- Scrape the dishes clean instead of rinsing them before washing. There is no need to rinse unless they are heavily soiled.
- Use a pan of water (or place a stopper in the sink) for washing and rinsing pots, pans, dishes, and cooking implements, rather than turning on the water faucet each time a rinse is needed.
- Never run the dishwasher without a full load. This practice will save water, energy, detergent, and money.
- Use the garbage disposal sparingly or start a compost pile.
- Keep a container of drinking water in the refrigerator. Running water from the tap until it is cool is wasteful. Better still, both water and energy can be saved by keeping cold water in a picnic jug on a kitchen counter to avoid opening the refrigerator door frequently.
- Use a small pan of cold water when cleaning vegetables, rather than letting the water run over them.
- Use only a little water in the pot and put a lid on it for cooking most food. Not only does this method save water, but food is more nutritious since vitamins and minerals are not poured down the drain with the extra cooking water.
- Always keep water conservation in mind, and think of other ways to save in the kitchen. Small kitchen savings from not making too much coffee or letting ice cubes melt in a sink can add up in a year's time.

In the Laundry...

- Wash only a full load when using an automatic washing machine (32 to 59 gallons are required per load).
- Whenever possible, use the lowest water-level setting on the washing machine for light or partial loads.
- Use cold water as often as possible to save energy and to conserve the hot water for uses that cold water cannot serve. (This is also better for clothing made of today's synthetic fabrics.)

For Appliances and Plumbing...

- Check water requirements of various models and brands when considering purchasing any new appliances. Some use less water than others.
- Check all water-line connections and faucets for leaks. A slow drip can waste as much as 170 gallons of water EACH DAY, or 5,000 gallons per month, and will add to the water bill.
- Learn to repair faucets so that drips can be corrected promptly. It is easy to do, costs very little, and can mean a substantial savings in plumbing and water bills.

- Check for hidden water leakage such as a leak between the water meter and the house. To check, turn off all indoor and outdoor faucets and water-using appliances. The water meter should be read at 10 to 20 minute intervals. If it continues to run or turn, a leak probably exists and needs to be located.
- Insulate all hot water pipes to reduce the delays (and wasted water) experienced while waiting for the water to "run hot."
- Be sure the water heater thermostat is not set too high. Extremely hot settings waste water and energy because the water often has to be cooled with cold water before it can be used.
- Use a moisture meter to determine when houseplants need water. More plants die from over-watering than from being on the dry side.

For Outdoor Use ...

- Water only when needed. Look at the grass, feel the soil, or use a soil moisture meter to determine when to water.
- Do not over-water. Soil can hold only so much moisture, and the rest simply runs off. A timer will help, and either a kitchen timer or an alarm clock will do. Apply only enough water to fill the plant's root zone. Excess water beyond that is wasted. Three quarters of an inch to 1 inch of water applied once a week in the summer will keep most Texas grasses alive and healthy.
- Water lawns early in the morning during the hotter summer months. Otherwise, much of the water used on the lawn can simply evaporate between the sprinkler and the grass.
- Forget about watering the streets or walks or driveways. They will never grow a thing.
- To avoid excessive evaporation, use a sprinkler that produces large drops of water, rather than a fine mist. Sprinklers that send droplets out on a low angle also help control evaporation. Adjust sprinkler heads as necessary, to avoid waste and runoff and ensure proper coverage.
- Set automatic sprinkler systems to provide thorough but infrequent watering. Pressure-regulating devices should be set to design specifications. Rain shutoff devices can prevent watering in the rain.
- Use drip-irrigation systems for bedded plants, trees, or shrubs, or turn soaker hoses upside-down so the holes are on the bottom. This will help avoid evaporation.
- Water slowly for better absorption, and never water on windy days.
- Condition the soil with mulch or compost before planting grass or flowerbeds so that water will soak in rather than run off.
- Fertilize lawns at least twice a year for root stimulation, but do not over-fertilize. Grass with a good root system makes better use of less water and is more drought-tolerant.

- Do not scalp lawns when mowing during hot weather. Taller grass holds moisture better. Grass should be cut fairly often, so that only 1/2 to 3/4 inch is trimmed off. A better looking lawn will result.
- Use a watering can or hand water with the hose in small areas of the lawn that need more frequent watering (those near walks or driveways or in especially hot, sunny spots).
- Use water-wise plants. Learn what types of grass, shrubbery, and plants do best in the area and in which parts of the lawn, and then plant accordingly. Choose plants that have low water requirements, are drought-tolerant, and are adapted to the area of the state where they are to be planted.
- Consider decorating some areas of the lawn with wood chips, rocks, gravel, or other materials now available that require no water at all.
- Do not "sweep" walks and driveways with the hose. Use a broom or rake instead.
- When washing the car, use a bucket of soapy water and turn on the hose only for rinsing.
- Learn and use waterwise concepts in your landscape.

Source: Texas Water Development Board, 2000.

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Section 7
Regional Water Plan Adoption

7.1 Facilitation

7.1.1 Overview

From the outset of the planning process, the South Central Texas Regional Water Planning Group decided to emphasize a consensus approach to decision-making. That process has been facilitated first by the members' awareness of the need for cooperative and open attitudes when dealing with controversial issues. In addition, the Chair has fostered an atmosphere of fairness and open dialogue during the regular meetings of the RWPG. The group has also used an independent facilitator to assist with special meetings and workshops devoted to building consensus on specific elements of the planning process. This process has also drawn extensively on the major public involvement effort that has kept the RWPG members informed at critical times of the full range of ideas, values and concerns of constituencies throughout the region. This is an on-going process that will continue through adoption of the final Regional Water Plan. The following is a brief summary of the key procedural steps undertaken by the Facilitation Team in helping the Chair and Members of the RWPG manage the process of developing the Initially Prepared Plan. The Public Involvement Program, already described, played a major role in shaping a broadly acceptable plan. In addition, the Technical Consultant supported the process of building consensus by providing the necessary tools and technical means for testing alternative approaches. The full facilitation process, then, must be seen as the interplay of all these efforts.

7.1.2 Initial Workshop

After many months of meetings devoted to procedural matters, the RWPG held a workshop (January 1999), organized by the Facilitation and Public Involvement teams. The session helped the planning group begin discussions on substantive issues, revise the goal statement, initially adopt the evaluation criteria presented in Chapter 6 and begin the process of identifying the water options and strategies they wished to have technically evaluated. Regarding the options and strategies, the RWPG had a list of over 100 technical options for meeting water needs in the region. An early major step was to select a limited number for evaluation while committing the group to the principle of remaining as inclusive of strategies as possible. Over the next few months, the selection and redefinition of options and strategies was completed and the evaluation process was begun by the Technical Consultant.

7.1.3 Interviews

In addition to structured discussions during the workshop, the Facilitation Team used another technique to identify the issues and concerns most important to members of the RWPG. Individual interviews were held on a confidential basis in order to encourage members to be as candid as possible about their aims and hopes for the process. The interviews brought out numerous issues, later summarized in a report, that needed to be addressed if consensus was to be achieved.

7.1.4 Facilitation

The major procedural objectives of the Facilitation Team, as expressed in the Scope of Work, remained central throughout the many months of meetings, workshops and small group sessions that comprised the major portion of the planning process. These were:

1. To facilitate a good working relationship among the RWPG members in order to lay the foundation for the decision process,
2. To facilitate the process of identifying and assessing the trade-offs among various water supply options and strategies by the application of selection criteria developed through the public participation process,
3. To assist the RWPG in using the criteria to formulate as many as six regional water management alternative plans for initial evaluation, then facilitate the process by which those six were reduced to three, then reduced to two,
4. To provide facilitation, as needed, during the RWPG's decision making process in order to
   - Ensure that all viewpoints were heard;
   - Ensure that minority viewpoints were preserved;
   - Ensure that the decision making process abided by any ground rules established by the RWPG;
   - Ensure the decision making process was fair and unbiased;
5. To coordinate closely with the Technical Consultant, the Public Involvement Consultant, the Chairperson and the Administrator in order to harmonize efforts to achieve agreement among the RWPG members on a consensus plan.

The Facilitation Team consulted closely with the Chair and Administrator regarding the handling of issues in each of the monthly meetings, which were presided over by the Chair. Special workshops, small group meetings and individual interviews were used by the Facilitator to make additional progress to ensure movement toward the development of a consensus plan.

7.1.5 Development of Alternatives

The Facilitation Team became especially active in the development of a series of alternative plans. A workshop was held for the purpose of identifying up to six major plan approaches. During the discussions, the Planning Group members coalesced their thinking about alternatives under four of the Evaluation Criteria they had previously adopted. The Group decided to structure alternatives around: 1) Economic – Cost-Effectiveness, 2) Environment, 3) Compatibility – Local Plans and 4) Compatibility – Other Regions. Following the workshop, small working groups developed a procedure for identifying water management strategies that could be applied by the Technical Consultant. They prepared descriptions of each approach, and the RWGP as a whole reviewed and approved each of the four approaches. The RWGP then assigned the Technical Consultant the task of developing each alternative approach into a regional plan capable of meeting the needs of the water user groups. Each of the four alternatives emphasized the Evaluation Criteria as follows:

- The Planning Unit Approach Alternative gave highest emphasis to the criterion of compatibility with local water plans.
- The Environment and Conservation Alternative emphasized nine elements, each of which was used to evaluate the list of available options and strategies. The nine elements, which differed from the sub-headings under the Environment Criteria previously adopted, were as follows:
- Endangered Species
- Unique Stream Segments
- Bays & Estuaries
- Instream Flows
- Riparian Forests
- Cultural Resources
- Size of Habitat Disturbance
- Water Quality
- Sustainability (Level of Groundwater Decline)
- The EREPA Alternative (the acronym stood for Economic, Reliability, Environmental and Public Acceptance – four of the Evaluation Criteria) came to emphasize cost per acre foot of water produced by the options.

- The Inter-Regional Cooperation Alternative emphasized compatibility with other regions by developing a set of water supply options that necessitated joint planning with Corpus Christi and the Coastal Bend Region.

The Evaluation Criteria thus played an important role in shaping, and later evaluating, the alternatives, but were not applied to component management strategies. The purpose of the Evaluation Criteria was to guide the RWPG members in their assessment of each alternative as a whole. These Criteria were not expected to be applied by the Technical Consultant in the same way as the criteria detailed in the TWDB rules for preparation of regional water plans (though there is some overlap of the two sets of criteria). Rather the Technical Consultant responded to specific direction from the RWPG to apply those Evaluation Criteria that were relevant to each alternative. The RWPG members themselves applied the Evaluation Criteria during their deliberations in a subjective manner and recorded their rating of each alternative under each of these criteria by using a rating scale developed for this purpose, as noted below.

Following development of these alternatives, another approach, known as the Edwards Aquifer Recharge and Recirculation Alternative, was added, based on the ideas submitted by a member of the public.

Planning Group members suggested many additional ideas as the basis for alternatives, but it was the five listed above that moved on to the next stage of technical evaluation. When it became clear that some of the alternatives did not provide sufficient water from options and strategies chosen solely according to the rules and priorities of each plan, the RWPG authorized the Technical Consultant to add further options to meet water user group requirements. Thus, the alternatives departed, to some extent, from the original concept underlying each one.

In addition to reviewing the technical evaluations, the RWPG members individually used the Evaluation Criteria to assess the five alternative plans and also considered numerous public comments, RWPG member concerns and technical issues in moving to the next step of narrowing the number of alternatives.

7.1.6 Selection of Initially Prepared Plan

The process of selecting a plan originally envisioned by the Planning Group and incorporated into the Scope of Work for consultants, prepared in 1998, called for first developing as many as six alternative plans, then narrowing these down to as many as three for further evaluation, then two and finally arriving at agreement on the regional plan itself. After completing the first step in this process by the end of June 2000, the RWPG members felt there was no time to complete the remaining steps as originally contemplated. Instead of fashioning three alternatives based on the input to that point, the members chose to use a "single-text" procedure in the interest of meeting the deadline for preparation of the Initially Prepared Regional Water Plan. That procedure consists of focusing on a single plan and making revisions to it until consensus has been achieved.

By the time the RWPG members developed the single text, known as the "Hybrid Alternative", they had become familiar with extensive information from the public and from various county, municipal and other local officials about concerns relating to particular management strategies and the major alternatives. They had developed from this input a keen sense of which strategies and alternatives would gain the widest acceptance across the region. The Evaluation Criteria of economic impact relating to cost-effectiveness, environment, water quality, reliability, efficiency and flexibility all played a role in defining the "hybrid alternative." The key Evaluation Criteria at this stage, however, seemed to be *economic impact* (relating to minimizing negative socio-economic impacts)*, efficiency*(relating to promoting conservation and conjunctive use*), fairness* (relating to efficient use in a water-importing area and distribution of costs and benefits), *feasibility* (relating to public acceptance and political feasibility, in particular) and *compatibility* (with local and regional plans as well as with property rights).

At a special workshop, the Planning Group members began with a list of water supply options and strategies that had appeared in each of the five alternatives reviewed up to that point. They then added options that had either generated near unanimous support or which had little in the way of opposition or technical obstacles. In addition, they included strategies that were promising for the long-term but which needed further study. The RWPG built consensus on this alternative relatively quickly because of the extensive technical evaluations and comparative discussions that had preceded this phase of the process. The group did not require or pursue step-by-step documentation of the detailed basis for agreement on the part of each member or the specific way in which each arrived at the decision that he or she decided that the hybrid alternative was acceptable. While the RWPG was considering and refining this alternative, two river authorities in adjoining planning regions proposed new options, one of which was added to the emerging regional water plan. The Technical Consultant reviewed the new plan, and the

RWPG made a number of changes, culminating in acceptance of the Initially Prepared Regional Water Plan on August 17, 2000.

7.2 Public Participation

7.2.1 Introduction

Moorhouse Associates, Inc. was contracted by the SCTRWPG to provide Public Participation professional services. Moorhouse Associates representatives attended all RWPG meetings and staff work group meetings conducted during the planning process. The public participation process for the SCTRWPG was designed to facilitate information out to the public about the work of the planning group throughout the process, and to provide feedback from the public at key decision points.

7.2.2 Phase I Public Participation

The first phase of the public participation contract consisted of project planning and involved working with the planning group members, technical contractor, and the facilitator to define public participation roles and objectives. It also involved identifying the major planning components and issues for the region, as well as reviewing past public participation efforts. The Phase I Public Participation Report analyzes past public participation efforts and provides baseline information for performing the public participation process for the south Central Texas Regional Water Planning Group.

At the SCTRWPG workshop held in San Antonio on January 29-30, 1999, the planning group adopted a principle of public participation that was the guiding principle for the public participation process. Also at the workshop the group adopted the initial criteria for evaluation of water supply options. The criteria adopted by the planning group were those developed during the Trans Texas process. Future public participation and planning group input was designed to further define and/or weight these criteria for use in developing the regional water plan. The criteria, as adopted by the SCTRWPG, are listed in Section 6.5 of this volume.

Principle of Public Participation

The role of the Regional Water Planning Group is to create and implement a public participation plan that provides for meaningful participation in the development of an acceptable regional water plan. The public participation efforts should foster a relationship of mutual trust, honesty, respect, and interaction between the Planning Group and the public.

7.2.3 Phase II Public Participation

As part of the second phase of the public participation process, Moorhouse Associates, Inc. conducted two surveys for the SCTRWPG. The first survey asked the RWPG members to give their input as to how they would like to see the public participation process occur, how to best reach the group or groups that they represent on the committee, and how they would like to participate in the public participation process. The second survey was conducted to receive input from the public during the early planning stages of water option review and criteria development. The target audience for the survey was persons or groups that were already familiar with water issues in the region. The final task of the Phase II was to develop the scope of work for the Phase III or implementation phase of the Public Participation process.

7.2.3.1 Regional Water Planning Group Member Survey

Regional Water Planning Group members, as well as non-voting members, were surveyed in February 1999 regarding their perceptions of previous public participation efforts, effective participation and informational strategies, roles and responsibilities of group members and contractors, and key messages. A total of 24 responses were received, representing 19 voting and 5 non-voting members. Survey result highlights are presented in the Phase II Public Participation RWPG Survey and Targeted Audience Survey Results Report (May 6, 1999).

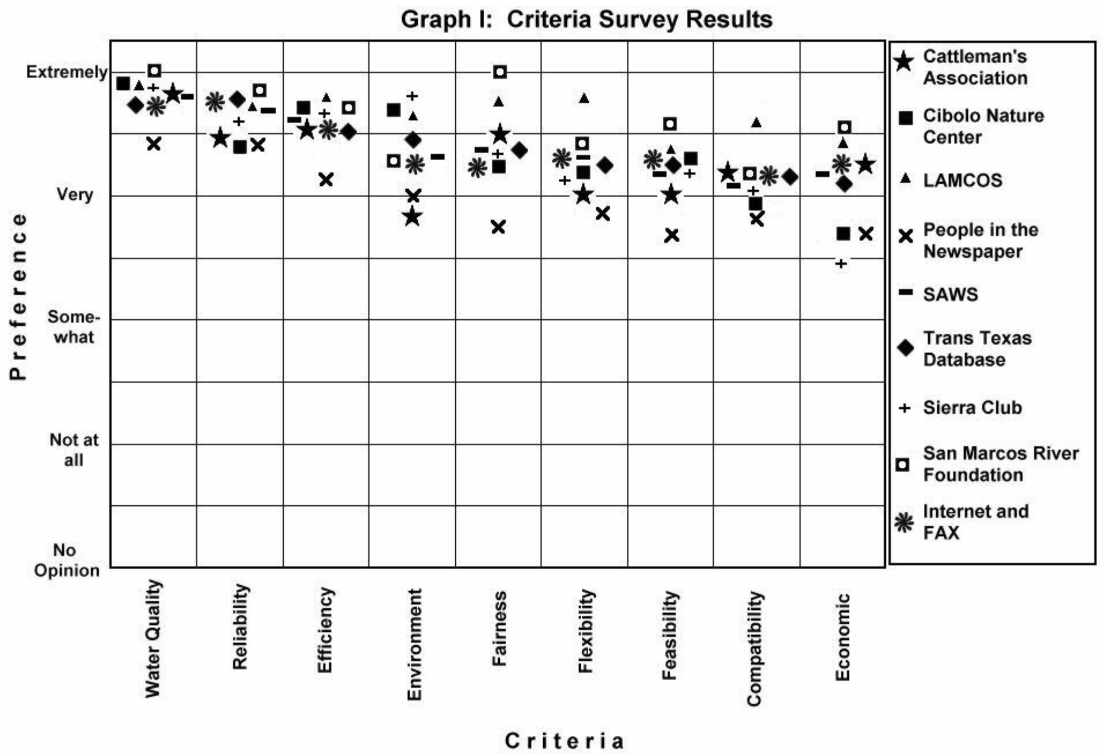
7.2.3.2 Targeted Audience Survey

The mailing list for the survey was compiled from several mailing lists provided by various organizations, associations, river authorities, clubs and interested parties. The survey is not a statistically valid random representation of the general public in the region. It is a targeted or focused survey of persons or groups active with water issues in the region.

The goal of the survey was to gather public input for guidance in three areas:

1. Rate water supply options.
2. Further develop evaluation criteria for water supply options.
3. Identify new water supply options.

The targeted audience public survey was sent to nine thousand four hundred twenty six (9,426) persons and seven hundred twenty (720) or eight percent (7.64%) of the surveys were returned. The responses indicated that all the evaluation criteria used by the planning group were considered to be extremely or very important by respondents. The water supply options were rated from extremely to somewhat important with conservation widely supported by all groups. The Phase II Public Participation RWPG Survey and Targeted Audience Survey Results Report (May 6, 1999) is available for viewing on the website.



7.2.4 Phase III Public Participation

The Phase III plan for public participation was developed with the goals of maximizing public involvement throughout the development of the regional water plan, and facilitating broad-based public understanding and support of the final plan.

7.2.4.1 Public Information Dialogue Presentations and Questions from the Public

Public Information was provided throughout the region in the form of Public Information Dialogue (PID) meetings. A presentation about the regional water planning process was made at total of seventy-one meetings. Approximately 3,634 persons attended these meetings, and 938 feedback cards were received from persons attending the meetings.

SCTRWPG meetings were well attended by the public and information was also gathered from input cards at the planning group meetings. A total of 286 input cards were collected from the SCTRWPG meetings.

Questions from the public were collected and distributed with answers at the monthly meetings. The individuals submitting the questions received a written mailed response to their inquiry. A total of 196 questions and answers were generated from July 1999 to July of 2000. Questions and Answers from the Public are available on the website.

7.2.4.2 Focus Group Report I

Focus groups were used during key decision points. The focus groups were established by contacting the County Judges in each of the 21 counties of the region. Each Judge was offered an individual briefing by a planning group member and a representative from Moorhouse Associates, Inc. The briefing provided an overview of the planning process, a discussion of the issues and a review of the upcoming schedule. The judges were asked to provide a list of persons from their county using the list of eleven interest categories represented on the planning groups. These persons were then invited to participate in a focus group that provided feedback on the criteria to the RWPG. Four hundred and one persons were invited to participate and two hundred thirty six were able to participate. The input was presented to the RWPG at a workshop October 12, 1999. The Phase III Public Participation Twenty-One County focus Group Report (October 1999) is available on the website.

7.2.4.3 Option Specific Public Input Sheets

For the workshops where the planning group was considering options to include in the alternative plans or the hybrid draft, option specific public participation input sheets were generated. These sheets summarized the Targeted Audience Survey Results, Focus Group input, public comments and concerns about the option, and any newspaper coverage relative to the option. These option specific input sheets were first presented at the workshop on January 27, 2000 and were updated for those options included in the five alternative plans and presented at the workshop on June 13, 2000.

7.2.4.4 Focus Group Report II

A second group of Focus Groups was conducted in July of 2000. The original lists provided by the County Judges were updated and supplemented by suggestions from area legislators. The legislators were provided the opportunity of a briefing and update on the plan process. They were then asked to suggest any additional names for focus group participation. Nine additional Focus Groups were included in the second round. Eight of these were Bexar County specific, one was for Trinity Aquifer representatives, and one was for the Bays and Estuaries or downstream interests. This second round of focus groups reviewed the 'Hybrid Draft Alternative Plan' as of July 2000. Three hundred and ninety nine persons participated in the second round of Focus Groups. A presentation of the results for the second round of focus groups was made at the August 3, 2000 SCTRWPG meeting. The Public Participation Focus Group II Report, Hybrid Draft Plan as of July 2000 (August 2000) is available on the website.

Website: www.watershedexperience.com

The website was presented for review at the September 14, 1999 SCTRWPG meeting. The website provided access to the technical documents, the calendar of events, meeting minutes, and several interactive map activities relative to the options under consideration. The website activity report was presented at each monthly SCTRWPG meeting. The busiest day (2633 hits) on the website was April 17, 2000. This was the time when alternative plan information was becoming available on the website. The total hits to the website from September 1999 to July 2000 were 275,902 and the number of users of the site during that time is estimated to be 8,167.

7.2.4.5 Planning Group Literature

The Phase III plan included the development of a general brochure for use during the public process. The brochure was an introductory piece that explained the region, the process, the schedule, and provided information on how to participate in the process. These brochures were distributed at all public information dialogue meetings, RWPG meetings and included in all mail-outs. The brochure was also available in Spanish.

A newspaper insert detailing the water planning process and the draft water plan was also developed for distribution to a mass audience. The insert was for area papers and included a circulation of about 550,000. The insert was also designed for use during the public hearing process in September 2000.

7.2.4.6 Media Relations and Monitoring

Press releases were distributed prior to every SCTRWPG meeting and staff work group meeting. Press releases were also issued about planning group decisions and studies as they became available. Media coverage of water issues was monitored through clippings. Coverage of RWPG business was more intense in areas where potential reservoir sites were under evaluation. The April 2000 press release outlining the five alternative plans was covered in twenty-two clippings throughout the region.

7.2.4.7 Public Hearings on Initially Prepared Regional Water Plan

The Initially Prepared Plan (IPP) was available for public review on August 25, 2000. Public hearings to receive comments on the IPP were scheduled in Victoria, Uvalde and San Antonio on September 25, 26 and 27, 2000 respectively. During the week prior to the public hearings an eight-page tabloid summarizing the IPP was inserted into newspapers throughout the region for a total circulation of 550,000. Approximately 650 persons attended the public hearings and oral comments were recorded by a court reporter that provided a certified transcript of the comments. The official public comment period ended on October 6, 2000. During the comment period the planning group received 270 written comments and heard 97 oral presentations at the public hearings.

Each written comment was entered into a database, assigned a number and reviewed individually. The transcripts from the public hearings were provided on computer disk and these oral comments were also integrated into the database format, assigned a number and reviewed individually. During the review process, thirty-eight common comment categories were identified. The list of categories is presented in Table 7-1, however, the categories are not presented in any particular order. Whenever a commenter addressed one of the issue categories it was indicated in the database entry for that comment. Many of the comments covered more than one category; so multiple issue categories were often assigned to one document or comment. Table 7-1 also indicates the number of comments addressing each category by source.

The planning group decided to develop responses to the comments by category groups. A set of comment documents sorted by category was provided to each planning group member for review. Through a series of workshops, the planning group developed responses by category for each comment received. HDR Engineering reviewed specific technical questions discussed in the comments and prepared draft responses for review by the planning group. The planning group responses to the comments are presented in Section 7.2.4.8, below, changes were made to the IPP in response to the public comments. The RWPG listened to the public, and the evidence is clear from the number of changes incorporated in the Final Regional Water Plan. Many communities, agencies and interest groups had a decisive role in shaping the development of the South Central Texas Regional Water Plan.

Table 7-1. Comment Categories and Number Received per Category

	Description	Written Comments	Victoria	Uvalde	San Antonio	Total
1	Recharge and Recirculation	170	0	0	6	**176**
2	Augmentation of Springflows	168	0	0	5	**173**
3	Goliad Reservoir	6	2	0	0	**8**
4	Growth Management/Smart Growth	18	3	1	3	**25**
5	Cisterns/Rainwater Harvesting	6	1	2	1	**10**
6	Infrastructure	1	0	0	0	**1**
7	Conservation/Recycling/Reuse	25	6	6	4	**41**
8	Groundwater/Carrizo	18	1	2	2	**23**
9	Groundwater/General	17	2	1	0	**20**
10	Desalination	13	3	0	1	**17**
11	Authority/Study Process/ Boundaries/Representation of RWPG	23	4	3	2	**32**
12	Endangered Species Protection	13	0	1	12	**26**
13	Population/Demand Projections	7	1	2	2	**12**
14	Third Party Impacts to Economy	11	0	1	0	**12**
15	Brush Management	8	1	2	2	**13**
16	Irrigation Technology Center	2	0	0	0	**2**
17	Reservoir Construction – General	4	2	1	2	**9**
18	Agricultural Water Rights Transfers	7	1	0	1	**9**
19	Recharge – General	9	1	3	2	**15**
20	Lake Dunlap Diversion	2	0	0	0	**2**
21	Public Education	4	0	0	1	**5**
22	Costs – General	25	3	0	6	**34**
23	Local Government Code/County Authority	10	0	1	0	**11**

Table 7-1. Comment Categories and Number Received per Category (Continued)

	Description	Written Comments	Victoria	Uvalde	San Antonio	Total
24	Rule of Capture	3	0	1	1	**5**
25	Junior Water Rights Provision/Interbasin Transfers	7	1	0	0	**8**
26	Simsboro/SAWS Alcoa	13	0	0	1	**14**
27	Cibolo Reservoir	15	3	2	1	**21**
28	Weather Modification	3	1	0	0	**4**
29	General Support for Plan/Process	4	1	0	0	**5**
30	LCRA Project	2	0	0	0	**2**
31	Downstream/Bays & Estuaries	11	1	0	4	**16**
32	Rules/Pumping Levels of EAA	9	0	3	5	**17**
33	Cumulative Effects Analysis	1	0	0	0	**1**
34	Do not support plan	3	0	0	3	**6**
35	ASR	4	1	0	0	**5**
36	Mixing Surface & Groundwater	0	0	1	0	**1**
37	Water Quality Regulations	0	0	1	0	**1**
38	Technical Issues	30	0	0	0	**30**
	TOTALS	**672**	**39**	**34**	**67**	**812**

7.2.4.8 Regional Planning Group Responses to TWDB and Public Comments on Initially Prepared Regional Water Plan

7.2.4.8.1 TWDB Comments and RWPG Responses

TWDB Preliminary Staff Comments, Letter 1, October 11, 2000

Section I. Comments that have to be satisfactorily addressed in order to meet Statute, Texas Water Development Board Rules and the Regional Water Planning Contract.

1. Texas Water Code Section 16.053(e)(3)(A) and 31 TAC §357.5(e)(7), require that for each source of water supply in the regional water planning area designated in accordance with 31 TAC §357.7(a)(1), the regional water plan shall identify: (A) factors specific to each source of water supply to be considered in determining whether to initiate a drought response, and (B) actions to be taken as part of the response. This information could not be located in the Initially prepared Plan (IPP) and must be clarified to explicitly address the referenced Statute and rule.
   Response: Sources of ground and surface water are listed and described in Section 3 of Volume I. Subsection 3.3 was added to Section 3 in which items A and B above are addressed. EAA's draft "Critical Period Management Rules" are included for the Edwards Aquifer. For other sources, the Emergency Demand Management Plans that have been summarized in Volume 1, Section 1 are referenced.

2. The supply available from Canyon Lake was not consistently reported in the following tables: IPP Volume I, Table 4-23, 52,350 ac-ft; Exhibit-B Table 6, 64,070 ac-ft. Additionally, IPP Volume I, Table 3-2, reports a <u>permitted</u> volume of 50,000 ac-ft. Please address the differences that relate to available supply and report the information in a manner consistent with 31 TAC §357.7(a)(3), regarding evaluation of adequacy of current water supplies available to the regional water planning area for use during drought of record.
   Response: Volume I, Table 4-23 shows 50,000 acft/yr for GBRA from Canyon Lake. The "additional" Canyon amount for CRWA is part of the 50,000 acft/yr and is noted accordingly. In Exhibit B, Table 6, Canyon supplies shown for New Braunfels, San Marcos, and CRWA are part of the 50,000 acft/yr for GBRA and are noted accordingly. Presentation in this manner is necessary to accurately portray supplies available to each Major Provider.

3. The surface water supply available from direct reuse was not consistently reported in the following tables: IPP Volume I, Page 3-11, item E, and IPP Volume I, Table 4-2, 24,941 ac-ft; Exhibit-B Table 4, 28,877 ac-ft. Please address these differences and report the information in a manner consistent with 31 TAC §357.7(a)(3), regarding evaluation of adequacy of current water supplies available to the regional water planning area for use during drought of record.
   Response: The 24,941 ac-ft is listed both in IPP Volume I Table 4-2 and Exhibit B Table 4 for Bexar County. An additional 3,936 acft/yr is listed in IPP Volume I, Table 4-12 and Exhibit B Table 4 for Hays County, bringing the total to the 28,877 ac-ft mentioned above. These are obtained from wastewater and are considered to be dependable during drought, as tabulated. The 3,939 acft/yr for steam-electric use in Hays County is noted in Section 3.4 (Section 3.3 in IPP).

4. Volume I, Section 3.1.8, Groundwater Availability in the South Central Texas Region, Page 3-4, includes a footnote regarding an agreement endorsed by staff of the TWDB relative to the available supply from the Edwards aquifer. To more adequately reflect the implication to the planning effort of the referred agreement, please expand and incorporate this reference in the main body of the report to better inform the reader as to the process resulting in the agreed supply volume and the conditions associated with the agreement regarding protection of endangered species.

Response: The following language is included in Volume I, (Page 3-4 of IPP) at the point in the text where footnote No. 1 previously appeared.

> **"For planning purposes, an estimate of 340,000 acft/yr of available supply during a drought of record from the Edwards Aquifer was agreed upon by the South Central Texas Regional Water Planning Group and the staff of the Texas Water Development Board. This quantity was adopted as a placeholder number until the EAA completes and acquires approval from the U.S. Fish and Wildlife Service for a Habitat Conservation Plan (HCP). TWDB staff, in a letter to Greg Ellis, dated November 16, 1999, agreed to accept water availability from the Edwards Aquifer as 340,000 acft/yr after 2012 in the Regional Water Plan if it includes actions to be taken to ensure that the required level of protection to the endangered species at San Marcos and Comal Springs will be maintained during a drought of record".**

The previous footnote was replaced with the new footnote No. 1 as stated above.

5. IPP Volume I, Page 3-11 through 3-15, Methodology to Calculate the Water Supplies Available to the South Central Texas Region and Methodology for Calculating Water Supplies Available for Water User Groups, and Tables 4-1 through 4-23. The report states that surface water availability for permits within the Nueces, Guadalupe and San Antonio River Basins were obtained from the Texas Natural Resource Conservation Commission (TNRCC) Water Availability Model (WAM) Runs. Table 4-22 provides the river basin summaries comparing water demand and supply within each basin. However, the report lacks a link to allow a correlation between the surface water availability for permts and the contents of Table 4 -1 to 4-22 and with the tables required as per Exhibit B of the contract. In order to allow for an independent verification of these facts and to assess compliance with 31 TAC §357.7(a)(3), please:

   a. Clarify which one of the various runs of the TNRCC WAM was used for this report.

      Response: For the Nueces, Run 9. For the Guadalupe – San Antonio, Run 10. Run 10 is a special run that provides information regarding water availability subject to assumptions adopted by the SCTRWPG. The technical assumptions and conditions used in Run 10 are stated in Section 3.4 (formerly 3.3), Volume I.

   b. Provide a list of major water right holders by river basins within the planning area, along with the permit number and the minimum annual supply during the drought of record from results of WAM. Please refer to Section 3.3.4, Required Documentation, of the TWDB technical memorandum for Tables 3 & 4, dated October 4, 1999;

      Response: This list is included in Appendix C –Major Water Right Holders by River Basin.

   c. Provide a list of the major reservoirs, supply available from these reservoirs, and the water rights associated with these reservoirs including permit numbers, for each of the river basins within the planning area.

      Response: Table 3-2, Page 3-7 of Volume I shows the list of reservoirs and permitted water rights values for each. The supplies available, as per Run 10 mentioned in 5.a above are tabulated in the Tables 4-1 through 4-22, and Exhibit B Table 4, as applicable. The list was added to Volume I, Section 3.

   d. For review purposes, please segregate the supply by source category in Table 4-22 to allow verification of these values with Exhibit B Table 4.

      Response: Table 4-22 is a River Basin by source category summary for all counties and parts of counties of the region. TWDB is referred to Tables 4-2 through 4-21 where the

sources of supply for the drought of record are shown, together with the name of the source. The sources are further tabulated by TWDB's numeric codes in Exhibit B, Table 4.

6. 31 TAC §357.5(e)(1) requires that in developing the regional water plan, the regional water planning groups shall "evaluate alternative water management strategies for effect on environmental water needs including effect on instream flows and bays and estuaries using environmental information resulting from site-specific studies, or, in the absence of such information, using state environmental planning criteria adopted by the board for inclusion in the state water plan after coordinating with staff of Texas Natural Resource Conservation Commission and Texas Parks and Wildlife Department." In order to verify compliance with the referenced rule, please explain how this requirement has been addressed in your evaluation of alternative water management strategies and provide the following information on the evaluation of each alternative water management strategy and the recommended regional water plan:

   a. List all diversion points in the WAM model where a decision is required for application of the environmental flow criteria.

      Response: This information is included in Volume III, Appendix F entitled Application of Consensus Environmental Criteria.

   b. For each one of the diversion points identified in item a., please show the median, 25%tile, and 7Q2 flows in cfs. The units for the tables and graphs presented in IPP Volume I, Figures 5.2-40 through 43 are not consistent.

      Response: Data are included in Volume III, Appendix F mentioned in Comment 6.a above. For Volume I, Figures 5.2-40- through 42, which are for the San Antonio and Guadalupe Basins, units on the vertical axes are in acft/mo. This is because the computer modeling for these basins was done in monthly time steps. For Figure 5.2-43, which is for the Colorado River Basin, the vertical axis units are in cfs, and is because the computer modeling was done in daily time steps.

   c. In order to facilitate review of this information with regards to the environmental flow requirements, please provide them in cfs as required in the Regional Water Planning Contract, Exhibit B, Section 1.3.1.

      Response: Data are included in Volume III, Appendix F as mentioned in Comment 6.a above.

7. 31 TAC §357.5 (d) requires that in developing regional water plans, regional water planning groups shall use state population and water demand projections contained in the state water plan or those adopted by the TWDB. On August 13, 1998 the South Central Texas Regional Water Planing Group (SCT RWPG) approved a scope of work and budget to conduct a review of the population and water demand projections for the planning region to correct those projection judged to be in error. On November 20, 1998, the SCT RWPG submitted a request for revisions of population and water demand projections to the TWDB. On January 21, 1999 the TWDB considered and approved a recommendation from TWDB staff that all revisions requested by the SCT RWPG be approved. Appendix A to these comments compares the information presented in the IPP with the TWDB approved projections. Please correct the discrepancies noted in Appendix A in order to comply with the referenced rule.

   Response: Subsequent to the actions described above, the Technical Consultant was presented information by GBRA and the Schertz-Seguin consultant that 3 new steam-electric power plants were being constructed in the region—2 in Guadalupe County and 1 in Hays County. The Technical Consultant obtained data about the water demands of each, conferred with representatives of TWDB (none of whom are still with TWDB), and proceeded to include these demands in the water demand tables of the plan, and in Exhibit

B, Table 4. In addition, the Technical Consultant remembered that the TWDB irrigation water demands are in terms of quantities of water on the farms in the fields being irrigated. For irrigation using groundwater sources, this is the appropriate and correct quantity, because in most cases the water is pumped from beneath the acres being irrigated, and does not have to be transported any distance to the points of use. In the case of irrigation using surface water, this may not be the correct quantity to use as the irrigation demand, because water diverted from streams usually must be transported to the fields to be distributed. This is the case in parts of Region L, where surface water is conveyed to the fields using unlined canals. Therefore the Technical Consultant obtained data from the TWDB with which to compute canal losses, and added these quantities to the irrigation demands where applicable (Calhoun, Medina, Zavala, and Dimmit Counties).

The Technical Consultant did not inform the SCTRWPG of the actions described above, and of course the SCTRWPG did not know that a formal, written request of the TWDB to get these changes approved was required. A letter was prepared requesting the changes mentioned above. At its regular meeting on November 2, 2000, the SCTRWPG approved the action to make the request.

8. In Exhibit-B Tables 1 and 2, the outside-city population and associated municipal water demands for the City of Schertz are noted under the water user group (WUG) number for the City of Schertz, #120808000. This is incorrect. The outside-city population and related demands should be included in the "county-other" category under WUG # 120996015. Please correct the error to facilitate accurate reporting and verification of compliance with 31 TAC §357.7 (a)(2).

   Response: The suggested change was made.

9. 31 TAC §357.7(4) requires that the social and economic impact of not meeting regional water supply needs be evaluated by the Region. The information is in the IPP; however, the corrections to the water demand projections (Comment #7) will cause changes in the projected water needs of the Region (IPP Volume I, Sections 4.1 and 4.2, Tables 4-1 through 4-9). The revised needs will require the update of Section 4.3 "Social and Economic Impacts of Failure to Meet Projected Water Needs" (Tables 4-24 through 4-28), an update of the "Exhibit B" electronic Tables 9 and 10, and a reevaluation of the impacts of unmet water needs by TWDB staff. In addition to the noted corrections, the Projected Water Needs for a significant number of Water User Groups in Tables 4-24 through 4-28 (socio-economic impacts) are NOT CONSISTENT with shortages listed earlier in the IPP (Tables 4-1 through 4-21) or with shortages provided to TWDB for the preparation of the socio-economic impact analysis. Please revise the socio-economic tables and Exhibit B, Tables 9 and 10. to ensure that water shortages are reported in a consistent manner throughout the document and in the TWDB analysis of socio-economic impacts.

   Response: The necessary changes were forwarded to TWDB on or about November 1, 2000. Upon receipt of the revised computations, Volume 1, Tables 4-24 through 4-28 were revised, as appropriate.

Section II. Comments/Suggestions for Improvements to the Regional Water Plan

1. 31 TAC §357.7(a)(1) requires that the regional water plan include a description of natural resources. Please consider the following suggestions to improve the plan's description of the natural resources in the region, specifically as related to Volume 1, Section 1.2.4.2, Wildlife Resources:

   a. The referenced section includes a description of the rare Texas Salamander, Eurycea neotenes, which is not listed as an Edwards aquifer dependent species in Volume III, Appendix E-1, Endangered Species Related to the Edwards. For completeness, the species should also be included in Appendix E-1.

   Response: The species is listed, as suggested.

b. Volume 1, Section 1.2.4.2, Wildlife Resources, discusses only one of 23 Edwards aquifer dependent species. This section would be more informative and benefit from inclusion of a more comprehensive discussion of the 23 species of listed in Volume III, Appendix E-1.

Response: Discussion in the SWG meeting on October 24 raised the question of what value the discussion is to development of the regional water plan, and especially since the IPP has been developed with only one species having been discussed. Therefore, the referenced discussion was removed.

c. It might also be appropriate to point out which species are dependent on San Marcos and Comal springs, versus those that are dependent on deeper aquatic environments of the Edwards aquifer. The later group of species may not be as sensitive to water planning issues.

Response: **Inasmuch as environmental laws and regulations have declared that the flows of these springs be maintained at levels satisfactory to protect the habitats of the species of the springs, and water planning has been directed to proceed accordingly, the SCTRWPG questions this comment, and has decided to forgo the opportunity to engage in the suggested exercise.**

2. 31 TAC §357.7 (a) (1) requires that the regional water plan include a description of any identified threats to the natural resources of the regional water planning area due to water quality problems or water quantity problems related to water supply. Even though there are various related references throughout the text in the report, the index to Volume I of the IPP directs the reader to Section 1.9, Volume I, Threats to Agricultural and Natural Resources, for information on this particular requirement. Please consider enhancing this section with more specific information related to threats to natural resources to improve the clarity of the report. Also note that, 31 TAC §375.7(a)(7)(D) requires that evaluations of water management strategies include impacts of water management strategies on threats to agricultural and natural resources of the regional water planning area.

   Response: Cross-references have been added in Section 1.9 to the other places in the report where the subject is addressed specifically.

3. Volume III, Appendix D, entitled Endangered Species by County, includes threatened and endangered species by county. Please consider changing the title to reflect the inclusion of threatened species. Also, there is apparently no reference in the text of the IPP to this appendix. It is recommended that information about threatened and endangered species in the region be referenced to Appendix D. Those endangered species dependent on the Edwards aquifer would be more appropriately located in Appendix E, Endangered Species Related to Edwards Aquifer.

   Response: **Appendix D was renamed, "Threatened, Endangered, and Rare Species by County." Each of the county tables already bears this title. A reference to Appendices D and E has been added to Volume I in Section 5.2.5.1.**

4. Volume I, Tables 1-13 and 3-3 are identical. Therefore, in Table 3-2, note 1, the IPP should also perhaps include a reference to Table 3-3.

   Response: Referenced.

5. IPP, Volume I, Table 3.2 in Section 3.2.1 reports permitted volumes for the various existing reservoirs in the planning region. 31 TAC §357.7(a)(3) requires that the analysis of surface water available during drought of record from reservoirs shall be based on firm yield analysis of reservoirs. Given that Section 3.2.1 is the logical place for the reader to find that information, it is suggested that the firm-yield information for the reservoirs in the region be included in Section 3 of Volume I.

   Response: Done.

Appendix A on the following pages contains a comparison of IPP and TWDB approved population and water demand projections. These will be reconciled and/ or corrected as needed.

Appendix A
Review of Population and Water Demand Projections

Location in the IPP's Executive Summary -Page-	Water User Group		Number Listed in the IPP	SCT RWPG and TWDB-Approved
ES-11	Total Municipal water use	1990	318,495	318,430
ES-11	Total Municipal water use	2050	769,508	769,522
ES-12, Figure ES-3	Other (Steam-Electric Power, Mining and Livestock) Water Demand	2050	168,489	151,329
ES-12, Figure ES-3	Irrigation	2050	516,348	506,009
ES-12, Figure ES-3	Municipal	2050	769,508	769,522
ES-12	Mining	2050	7,799	7,795
ES-12	Total Irrigation water demand	2050	516,348	506,009
ES-29	Atascosa, Rural	2000	2,240	2,239
ES-32	Bexar, Irrigation	2000	40,003	36,318
ES-32	Bexar, Irrigation	2030	33,827	32,318
ES-32	Bexar, Irrigation	2050	31,026	29,717
ES-33	Calhoun, Irrigation	2000	26,822	22,233
ES-33	Calhoun, Irrigation	2030	17,673	9,138
ES-33	Calhoun, Irrigation	2050	15,028	6,794
ES-33	Calhoun, County-Other	2050	3,258	3,257
ES-33	Comal, Irrigation	2050	371	372
ES-34	Dimmit, County-Other	2030	220	237
ES-34	Dimmit, County-Other	2050	272	287
ES-34	Dimmit, Irrigation	2000	10,551	10,222
ES-34	Dimmit, Irrigation	2030	9,828	8,975
ES-34	Dimmit, Irrigation	2050	9,026	8,229
ES-35	Gonzales, Livestock	2000	4,108	5,999
ES-35	Guadalupe, Steam-Electric Power	2000	10,760	0
ES-35	Guadalupe, Steam-Electric Power	2030	10,760	0
ES-35	Guadalupe, Steam-Electric Power	2050	10,760	0
ES-36	Hays, Steam-Electric Power	2030	6,400	0
ES-36	Hays, Steam-Electric Power	2050	6,400	0
ES-36	Kendall, County-Other	2000	1,778	1,777
ES-37	Refugio, County-Other	2000	352	362
ES-37	Refugio, County-Other	2030	288	296
ES-37	Refugio, County-Other	2050	265	273
ES-38	Wilson, Irrigation	2000	14,519	14,521

Location in the IPP, Vol. I -Page-	Water User Group	Year	Number Listed in the IPP	SCT RWPG and TWDB-Approved
2-3, Table 2-2	Bexar County population	2030	2,419,290	2,491,291
2-3, Table 2-2	Comal County population	2000	79,396	79,378
2-3, Table 2-2	Kendall County population	2020	49,155	49,154
2-13, Table 2-4 4-3, Table 4-1	Atascosa County municipal	2000	7,794	7,793
2-13, Table 2-4	Atascosa County municipal	2040	11,211	11,210
2-13, Table 2-4	Bexar County municipal	2040	493,649	493,694
2-13, Table 2-4 4-19, Table 4-4	Calhoun County municipal	2010	4,455	4,456
2-13, Table 2-4 4-19, Table 4-4	Calhoun County municipal	2030	4,896	4,895
2-13, Table 2-4	Calhoun County municipal	2040	5,274	5,273
2-13, Table 2-4 4-19, Table 4-4	Calhoun County municipal	2050	5,747	5,746
2-13, Table 2-4 4-37, Table 4-7	Dimmit County municipal	2020	3,376	3,393
2-13, Table 2-4 4-37, Table 4-7	Dimmit County municipal	2030	3,822	3,839
2-13, Table 2-4 4-37, Table 4-7	Dimmit County municipal	2040	4,298	4,313
2-13, Table 2-4 4-37, Table 4-7	Dimmit County municipal	2050	4,825	4,840
2-13, Table 2-4 4-72, Table 4-14	Kendall County municipal	2000	3,534	3,533
2-13, Table 2-4 4-72, Table 4-14	Kendall County municipal	2020	6,213	6,214
2-18, Table 2-6 4-57, Table 4-11	Guadalupe County steam-electric power	2000	10,760	0
2-18, Table 2-6 4-57, Table 4-11	Guadalupe County steam-electric power	2010	10,760	0
2-18, Table 2-6 4-57, Table 4-11	Guadalupe County steam-electric power	2020	10,760	0
2-18, Table 2-6 4-57, Table 4-11	Guadalupe County steam-electric power	2030	10,760	0
2-18, Table 2-6 4-57, Table 4-11	Guadalupe County steam-electric power	2040	10,760	0
2-18, Table 2-6 4-57, Table 4-11	Guadalupe County steam-electric power	2050	10,760	0
2-18, Table 2-6 4-62, Table 4-12	Hays County steam-electric power	2010	6,400	0
2-18, Table 2-6 4-62, Table 4-12	Hays County steam-electric power	2020	6,400	0
2-18, Table 2-6 4-62, Table 4-12	Hays County steam-electric power	2030	6,400	0
2-18, Table 2-6 4-62, Table 4-12	Hays County steam-electric power	2040	6,400	0
2-18, Table 2-6	Hays County steam-electric power	2050	6,400	0

Location in the IPP, Vol. I -Page-	Water User Group	Year	Number Listed in the IPP	SCT RWPG and TWDB-Approved
4-62, Table 4-12				
2-19, Table 2-7	Calhoun County mining	1990	5	1
2-19, Table 2-7	Calhoun County mining	2020	13	12
2-22, Table 2-8 4-11, Table 4-2	Bexar County irrigation	2000	40,003	36,318
2-22, Table 2-8 4-11, Table 4-2	Bexar County irrigation	2010	36,879	34,796
2-22, Table 2-8 4-11, Table 4-2	Bexar County irrigation	2020	35,320	33,389
2-22, Table 2-8 4-11, Table 4-2	Bexar County irrigation	2030	33,827	32,191
2-22, Table 2-8 4-11, Table 4-2	Bexar County irrigation	2040	32,397	30,928
2-22, Table 2-8 4-11, Table 4-2	Bexar County irrigation	2050	31,026	29,717
2-22, Table 2-8 4-21, Table 4-4	Calhoun County irrigation	2000	26,822	22,235
2-22, Table 2-8 4-21, Table 4-4	Calhoun County irrigation	2010	22,747	16,526
2-22, Table 2-8 4-21, Table 4-4	Calhoun County irrigation	2020	19,950	14,228
2-22, Table 2-8 4-21, Table 4-4	Calhoun County irrigation	2030	17,673	9,138
2-22, Table 2-8 4-21, Table 4-4	Calhoun County irrigation	2040	16,132	7,879
2-22, Table 2-8 4-21, Table 4-4	Calhoun County irrigation	2050	15,028	6,794
2-22, Table 2-8 4-38, Table 4-7	Dimmit County irrigation	2000	10,551	10,222
2-22, Table 2-8 4-38, Table 4-7	Dimmit County irrigation	2010	10,199	9,788
2-22, Table 2-8 4-38, Table 4-7	Dimmit County irrigation	2020	9,932	9,373
2-22, Table 2-8 4-38, Table 4-7	Dimmit County irrigation	2030	9,828	8,975
2-22, Table 2-8 4-38, Table 4-7	Dimmit County irrigation	2040	9,432	8,594
2-22, Table 2-8 4-38, Table 4-7	Dimmit County irrigation	2050	9,026	8,229
2-22, Table 2-8 4-20, Table 4-20	Wilson County irrigation	2000	14,519	14,521
2-25, Table 2-9 4-53, Table 4-10	Gonzales County livestock	2000	4,108	5,999
2-25, Table 2-9 4-53, Table 4-10	Gonzales County livestock	2010	5,999	6,334

Location in the IPP, Vol. I -Page-	Water User Group	Year	Number Listed in the IPP	SCT RWPG and TWDB-Approved
2-28, Table 2-10 4-5, Table 4-1	Atascosa*	2000, 2040	**(*) These numbers are total water demand projected by counties.** **Please note that the corrections to individual WUGs will affect these values.**	
2-28, Table 2-10 4-12, Table 4-2	Bexar*	2000-2050		
2-28, Table 2-10 4-22, Table 4-4	Calhoun*	1990, 2000-2050		
2-28, Table 2-10 4-27, Table 4-5	Comal*	1990, 2050		
2-28, Table 2-10 4-39, Table 4-7	Dimmit*	2000-2050		
2-28, Table 2-10 4-53, Table 4-10	Gonzales*	2000, 2010		
2-28, Table 2-10 4-58, Table 4-11	Guadalupe*	2000-2050		
2-28, Table 2-10 4-63, Table 4-12	Hays*	1990, 2010-2050		
2-28, Table 2-10 4-75, Table 4-14	Kendall*	2000, 2020		
2-28, Table 2-10 4-103, Table 4-20	Wilson*	2000		
4-61, Table 4-12	Wimberly municipal	1990	732	418
4-61, Table 4-12	Woodcreek municipal	1990	182	155
4-61, Table 4-12	Hays County-Other municipal	1990	2,244	2,520
4-61, Table 4-12	Total Municipal Demand	1990	9,805	9,740

Exhibit B, Table 1. Population by City and Rural County

Fair Oaks Ranch, Bexar County		
Source	**2030**	**2040**
Table 1	4,799	4,719
TWDB	4,779	4,819

County-Other, Bexar County			
Source	**2030**	**2040**	**2050**
Table 1	397,524	464,729	435,328
TWDB	397,546	464,631	435,327

Schertz, Bexar County			
Source	**2030**	**2040**	**2050**
Table 1	6,270	6,912	7,602
TWDB	6,269	6,911	7,603

County-Other, Comal County						
Source	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Table 1	37,866	50,787	70,023	93,371	118,453	144,984
TWDB	37,780	50,714	69,989	93,385	118,507	145,089

Fair Oaks Ranch, Comal County						
Source	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Table 1	88	127	180	241	294	359
TWDB	174	200	214	227	240	254

Garden Ridge, Comal County	
Source	**2000**
Table 1	2,531
TWDB	2,513

County-Other, Dewitt County	
Source	**2040**
Table 1	11,631
TWDB	8,631

County-Other, Guadalupe County	
Source	**2000**
Table 1	33,488
TWDB	32,159

Schertz, Guadalupe County	
Source	**2000**
Table 1	22,750
TWDB	24,079

County-Other, Kendall County	
Source	**2020**
Table 1	35,499
TWDB	35,498

Exhibit B, Table 2. Water Demand by City and Category

County-Other, Atascosa County		
Source	**2000**	**2040**
Table 2	2,240	4,041
TWDB	2,239	4,040

County-Other, Calhoun County			
Source	**2010**	**2030**	**2050**
Table 2	2,384	2,706	3,258
TWDB	2,385	2,705	3,257

County-Other, Dimmit County				
Source	**2020**	**2030**	**2040**	**2050**
Table 2	200	220	251	272
TWDB	217	237	266	287

County-Other, Kendall County		
Source	**2000**	**2020**
Table 2	1,778	3,924
TWDB	1,777	3,925

Irrigation, Bexar County						
Source	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Table 2	40,003	36,879	35,320	33,827	32,397	31,026
TWDB	36,318	34,796	33,389	32,191	30,928	29,717

Irrigation, Calhoun County						
Source	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Table 2	26,822	22,747	19,950	17,673	16,132	15,028
TWDB	22,235	16,526	14,228	9,138	7,879	6,794

Irrigation, Comal County	
Source	**2050**
Table 2	371
TWDB	372

Irrigation, Dimmit County						
Source	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Table 2	10,551	10,199	9,932	9,828	9,432	9,026
TWDB	10,222	9,788	9,373	8,975	8,594	8,229

Irrigation, Wilson County	
Source	**2000**
Table 2	14,519
TWDB	14,521

Steam-Electric Power, Guadalupe County						
Source	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Table 2	10,760	10,760	10,760	10,760	10,760	10,760
TWDB	0	0	0	0	0	0

Steam-Electric Power, Hays County					
Source	**2010**	**2020**	**2030**	**2040**	**2050**
Table 2	6,400	6,400	6,400	6,400	6,400
TWDB	0	0	0	0	0

Mining, Calhoun County	
Source	**2020**
Table 2	13
TWDB	12

Livestock, Gonzales County		
Source	**2000**	**2010**
Table 2	4,054	5,999
TWDB	5,999	6,334

TWDB Partial Staff Comments, Letter 2, October 23

Section I. Comments that have to be satisfactorily addressed in order to meet statute, Texas Water Development Board Rules and the Regional Water Planning Contract

Section II, Article III, item I of the Regional Water Planning Contract, requires that the adopted regional water plan and the data collected and transmitted to the TWDB for the plan be prepared in the format and according to specifications prescribed in Exhibit B to the contract. The accuracy and completeness of the tables is pivotal to the TWDB ability to complete the state-wide database to prepare the State Water Plan. Therefore, the following comments are specific to accuracy and/or completeness of the various tables identified in the contract's Exhibit B and as individually noted in the comments below.

For review purposes, TWDB staff developed annotated review worksheets that parallel the original worksheets filed with the Initially Prepared Plan [IPP]. The comments to be addressed by the RWPG are noted under the column entitled TWDB REVIEW COMMENTS.

TWDB staff highlighted selected fields in the worksheets where data entries may need correction or clarification, as noted under the TWDB REVIEW COMMENTS column.

Also, cells in bold represent revisions performed by TWDB staff. Those revisions represent random review of cells and the corrections performed by TWDB staff. Please contact TWDB staff to discuss any need for additional clarification in those specific cases.

The worksheets have been slightly modified for quality assurance purposes and to reflect the table structure needed for database development. Thus, any additional non-essential fields that were provided in the original table were moved to the far right end of the worksheet; comments or footnotes included in the original worksheet were moved to a field entitled RWPG Comments; any totals, subtotals, extra headers, etc. were deleted; and, merged fields were adjusted as needed.

TWDB staff has provided electronic copies of the complete review worksheets to Mr. Steve Raabe of the San Antonio River Authority and to Dr. Herb Grubb of HDR Inc. The worksheets show all rows and identifies all fields that will require a correction based on the TWDB review.

1. Table 3, Water Demand by Major Provider of Municipal and Manufacturing Water.

    a. Please address the comments contained in the TWDB file RegL_QA_Table3_IPP, under the column heading entitled "TWDB COMMENTS."

    Response: The comments contained in the TWDB file RegL_QA_Table3_IPP, under the column heading entitled "TWDB COMMENTS" have been addressed. These revisions include obtaining alpha numbers for eight entities, removing records in which all values were zero, and performing the corrections made by the TWDB.

    b. Please note that 108 of 234 records show a zero demand for the years 2000-2050. According to the IPP Volume 1, Chapter 2, the majority of these entries are referenced with a zero demand to reflect instances where a Major Water Provider (MWP) customer has not in the past received water from that MWP. As contained in the IPP and Exhibit B tables, the implication is that these customers would not exercise their water supply option for the entire planning period. Please verify the accuracy of this interpretation.

    Response: Entries which show a projected demand of 0 acft/yr for the planning period reflect instances where a MWP customer in the past has not obtained water from that MWP, and is not projected to exercise their water supply options during the planning period. These records have been deleted from Exhibit B, Table 3.

c. The following alpha numbers associated with Bexar Metropolitan Water District were not used in Table 3. According to TWDB reported use from the Water Use Survey database, these entities received water in 1996. Please verify if these should be excluded in Table 3:

Major Water Provider			
Name	Alpha	Recipient	1996 Reported Use (ac/ft) Water Use Survey database
Bexar Metropolitan Water District	72600	BMWD-Southside	11,953
	477401	BMWD-Northwest	3,507
	477405	BMWD-Northeast	3,669
	944493	BMWD-Windy's	548

Response: The BMWD service area is composed primarily of small subdivisions or other small water utilities. In this regional water planning effort, many of these subdivision and small water utilities have been combined into a WUG labeled "BMWD – Other Subdivisions." This WUG has been assigned an alpha number of 72601 (alpha number obtained from Craig Caldwell of the TWDB). The four entities listed above (BMWD-Southside, BMWD-Northwest, BMWD-Northeast, and BMWD-Windy's) are included in the BMWD- Other Subdivisions WUG.

d. IPP, Volume 1, Table 2-13 pages 2-52 through 2-58, indicates that if an entity was supplied by more than one MWP the total demand was placed on only one provider. Please note that each supply transaction needs to be separately identified. Please make the necessary corrections to provide an accurate and complete representation of the water demand.

Response: In the IPP, Volume I, Table 2-13 on pages 2-52 through 2-58, demand is accounted for separately by MWP. For example, East Central WSC is located under SAWS, BMWD, and CRWA. The demands listed in Table 2-13 for East Central WSC are the demands this entity is projected to place upon each individual MWP. In cases where a city's entire municipal demand has been placed on a single MWP, historical data indicate that this MWP is the sole provider for that city or other water supply entity.

2. Table 4. Current Water Supply Sources.

a. Please address the comments contained in the TWDB file RegL_QA_Table4_IPP, under the column heading entitled TWDB COMMENTS.

Response: The comments contained in the TWDB file RegL_QA_Table4_IPP, under the column heading entitled "TWDB COMMENTS" have been addressed. These revisions include the firm yield value of Lake Texana to be consistent with data reported for Region P. In addition to these changes, the TWDB noted instances in which the amount of water allocated from a source (Exhibit B, Table 5) was greater than the availability reported in Exhibit B, Table 4 by 1 acft. This is due to rounding in the allocation process used to distribute available supplies. These rounding errors have been corrected to the extent possible.

b. Additionally, please note that "source" and "water user group" names should be consistent from table to table. An example of an inconsistency found is the listing in Table 4 of TWDB source ID 13013 as source name ETPLATEAU AQUIFER while

Table 5, Current Water Supplies Available to the RWPG by City and Category, lists source ID 13013 as EDWARDS-TRINITY AQUIFER.

Response: The "source" name in Table 5 of "EDWARDS-TRINITY AQUIFER" used in Wilson and Uvalde Counties has been revised as "ETPLATEAU AQUIFER" in order to be consistent with other tables.

3. Table 5. Current Water Supplies Available to the RWPG by City and Category.

   a. Please address the comments contained in the TWDB file RegL_QA_Table5_IPP, under the column heading entitled TWDB COMMENTS.

   Response: The comments contained in the TWDB file RegL_QA_Table5_IPP, under the column heading entitled "TWDB COMMENTS" have been addressed. The TWDB noted instances in which the amount of water allocated from a source (Exhibit B, Table 5) was greater than the availability reported in Exhibit B, Table 4 by 1 acft. This is due to rounding in the allocation process used to distribute available supplies. These rounding errors have been corrected to the extent possible.

   b. Please note that a cross reference with the 1996 Water Use Survey, shows that the following transactions are not reflected in Table 5 as submitted. Please clarify.

Entity	Identifier	Transaction
St Hedwig	120855000	Purchased surface water from Canyon Regional (alpha 133134). 1998 used 176.8 ac-ft
Gonzales	120348000	Self-supplied groundwater from Source ID 08910. 1998 used 316.6 ac-ft.
Karnes City	120457000	Purchased surface water from El Oso water supply. 1998 used 15 ac-ft.
La Vernia	120491000	Purchased surface water from Canyon Regional (alpha 133134). 1998 used 24.9 ac-ft
Schertz	120808000	Self-supplied groundwater from 2 wells in Comal County.

   Response: All entities listed have had the opportunity to review the projected supply sources for them contained in the plan. None of these entities have responded that the supply sources contained in the IPP plan are not those they plan on utilizing during the planning period.

4. Table 6. Current Water Supplies Available to the RWPG by Major Provider of Municipal and Manufacturing Water.

   a. Please address the comments contained in the TWDB file RegL_QA_Table6_IPP, under the column heading entitled TWDB COMMENTS.

   Response: The comments contained in the TWDB file RegL_QA_Table6_IPP, under the column heading entitled "TWDB COMMENTS" have been addressed.

5. Table 7. Comparison of Water Demands with Current Water Supplies by City and Category.

   a. Please address the comments contained in the TWDB file RegL_QA_Table7_IPP, under the column heading entitled TWDB COMMENTS.

      Response: The comments contained in the TWDB file RegL_QA_Table7_IPP, under the column heading entitled "TWDB COMMENTS" have been addressed. The TWDB noted instances in which the subtraction of the projected water demands (Exhibit B, Table 2) from the projected water supplies (Exhibit B, Table 5) differed from the amounts shown in Exhibit B, Table 7 by not more than 3 acft. This is due to rounding in the allocation process used to distribute available supplies. These rounding errors have been corrected to the extent possible.

6. Table 8. Comparison of Water Demands with Current Water Supplies by Major Provider of Municipal and Manufacturing Water.

   a. Please address the comments contained in the TWDB file RegL_QA_Table8_IPP, under the column heading entitled TWDB COMMENTS.

      Response: The comments contained in the TWDB file RegL_QA_Table8_IPP, under the column heading entitled "TWDB COMMENTS" have been addressed. Revisions primarily include distributing the projected needs for the MWP into the basins where the needs are located.

   b. Table 8 did not include the Guadalupe-Blanco River authority. Please correct the omission.

      Response: The GBRA is not included in Exhibit B, Table 8 (detail), however, the GBRA is included in Exhibit B, Table 8 (summary). As directed by staff of the TWDB, only those entities that show a projected shortage during the planning period, are to be included in the detail table. GBRA does not show a projected shortage during the planning period and is, therefore, not included in the detail table.

   c. A cross referenced review of the major water provider totals for tables 8, 6 [Current Water Supplies Available to the RWPG] and 3 [Water Demand by Major Provider of Municipal and Manufacturing Water] shows the following inconsistencies in the reporting for <u>New Braunfels Utilities</u>:

	Ac-ft in the year 2000
Table 6 totals	6,943
Table 3 totals	4,280
Table6 - Table 3	2,663
Table 8 totals	9,383

      Response: For the Initially Prepared Plan, Exhibit B Table 6 showed a current supply for New Braunfels Utilities of 13,663 acft/yr in 2000 and 6,943 acft/yr thereafter (due to the expiration of their Canyon Reservoir contract); Exhibit B, Table 3 showed a projected demand of 4,280 acft/yr in 2000; and Exhibit B, Table 8 showed the correct surplus/shortage value of 9,383 acft/yr. However, the values in these Exhibit B tables have been revised for the Regional Water Plan in response to public comment.

d. According to Table 3, New Braunfels Utilities provides service to entities located in the Guadalupe and San Antonio basin. Table 8 only lists basin 18 (Guadalupe) but appears to be based on the total need from both basins. Please revise as needed.

Response: In the Regional Water Plan, projected shortages and surpluses are apportioned to appropriate river basins based on the projected demand in each river basin for each Major Water Provider.

e. The following MWP service more than one basin; however, Table 8 only lists one basin and the reported needs appear to be based on the total need. Please revise as needed:

MWP	Basins where service is provided
BexarMet Water District	18 and 19
Canyon Regional Water Authority	18 and 19
Guadalupe-Blanco River Authority	17, 18, 19 [Table 3 also lists "various" for this MWP]
Regional Water Provider	19 and 21

Response: In the Regional Water Plan, projected shortages and surpluses are apportioned to appropriate river basins based on the projected demand in each river basin for each Major Water Provider.

7. Table 11. Potentially Feasible Water Management Strategies.

a. Please address the comments contained in the TWDB file RegL_QA_Table11_IPP, under the column heading entitled TWDB COMMENTS.

Response: The comments contained in the TWDB file RegL_QA_Table11_IPP under the column heading entitled "TWDB COMMENTS" have been addressed. Capital costs have been included in the table where appropriate. In instances for which the project listed is in the implementation phase, no capital costs are reported as explained in Volume I, Section 5.3.

Additional storage has been included for some entities in order to help meet peaking needs during the planning period. Such additional storage strategies may include ASR and/or additional surface storage facilities. Although quantities of additional water supply are not assigned to these facilities, they may be essential to the seasonal and daily management of future water supplies and costs have been included in the Regional Water Plan accordingly. As described in Section 6, Vol. I, the Regional water Plan also recognizes that additional year-to-year storage may be needed in the South Central Texas Region. Costs for this type of additional storage have not been included, as further study will likely be necessary to define specific strategies.

Region-wide strategies such as brush management and weather modification have also been included in the table. These strategies are not being used to meet a projected need, however, some entities have implemented these strategies and many entities are interested in pursuing funding for further investigation of their feasibility. Cost data has not been tabulated for these strategies due to uncertainties in their development and potential dependable water supply.

b. Please note that additional comments offered on Tables 12 and 13 need to be considered when revising Table 11.

Response: Additional comments have been considered.

8. Table 12. Recommended Management Strategies by City and Category.

a. Please address the comments contained in the TWDB file RegL_QA_Table12_IPP, under the column heading entitled TWDB COMMENTS.

Response: The comments contained in the TWDB file RegL_QA_Table12_IPP under the column heading entitled "TWDB COMMENTS" have been addressed. Capital costs have been included in the table where appropriate. In instances for which the project listed is in the implementation phase, no capital costs are reported as explained in Volume I, Section 5.3.

Additional storage has been included for some entities in order to help meet peaking needs during the planning period. Such additional storage strategies may include ASR and/or additional surface storage facilities. Although quantities of additional water supply are not assigned to these facilities, they may be essential to the seasonal and daily management of future water supplies and costs have been included in the Regional Water Plan accordingly. As described in Section 6, Vol. I, the Regional Water Plan also recognizes that additional year-to-year storage may be needed in the South Central Texas Region. Costs for this type of additional storage have not been included, as further study will likely be necessary to define specific strategies.

Region-wide strategies such as brush management and weather modification have also been included in the table. These strategies are not being used to meet a projected need, however, some entities have implemented these strategies and many entities are interested in pursuing funding for further investigation of their feasibility. Cost data has not been tabulated for these strategies due to uncertainties in their development and potential dependable water supply.

b. Please note that the total capital cost of a recommended water management strategy [WMS] must be reported in all cases. For those instances where a WMS benefits more than one water user group [WUG], then the cost has to be listed for one of the entities. Table 12 lacks a total capital cost for the following WMS:

i. 4b77, wastewater reuse
ii. 4c80
iii. 4c81
iv. 4c82
v. 4c83
vi. 4c84
vii. 4o91
viii. 4p85

Response: See response to comment 8a.

9. Table 13. Recommended Management Strategies by Major Provider of Municipal and Manufacturing Water.

a. Please address the comments contained in the TWDB file RegL_QA_Table13_IPP, under the column heading entitled TWDB COMMENTS.

Response: The comments contained in the TWDB file RegL_QA_Table13_IPP under the column heading entitled "TWDB COMMENTS" have been addressed. Capital costs have been included in the table where appropriate. In instances for which the project listed is in the implementation phase, no capital costs are reported as explained in Volume I, Section 5.3.

Additional storage has been included for some entities in order to help meet peaking needs during the planning period. Such additional storage strategies may include ASR and/or additional surface storage facilities. Although quantities of additional water supply are not assigned to these facilities, they may be essential to the seasonal and daily management of future water supplies and costs have been included in the Regional Water Plan accordingly. As described in Section 6, Vol. I, the Regional Water Plan also recognizes that additional year-to-year storage may be needed in the South Central Texas Region. Costs for this type of additional storage have not been included, as further study will likely be necessary to define specific strategies.

Region-wide strategies such as brush management and weather modification have also been included in the table. These strategies are not being used to meet a projected need, however, some entities have implemented these strategies and many entities are interested in pursuing funding for further investigation of their feasibility. Cost data has not been tabulated for these strategies due to uncertainties in their development and potential dependable water supply.

TWDB Partial Staff Comments, Letter 3, November 21, 2000

SECTION 1. COMMENTS THAT HAVE TO BE SATISFACTORILY ADDRESSED IN ORDER TO MEET STATUTE, TEXAS WATER DEVELOPMENT BOARD RULES AND THE REGIONAL WATER PLANNING CONTRACT.

1. 31 TAC §357.7 requires the regional water plan development to include evaluation of water management strategies and lists the evaluation criteria that must be considered in the analysis of these water management strategies.

   Also, 31 TAC §357.7(a)(8) requires that specific recommendations of water management strategies be described in sufficient detail to allow state agencies to determine whether future projects are consistent with the approved regional water plan.

   Additionally, the scope of work [SOW] approved by the SCT RWPG, indicates that water supply options identified as potentially feasible would be generally evaluated as per said criteria. The SOW represents that water supply options selected for final consideration as water management strategies in the alternative regional water plans and the recommended regional water plan would be evaluated in full compliance with the stated criteria.

   The following comments reflect areas where the review found potential inconsistencies or omissions in the presentation of water management strategies in the IPP. Please address the following comments as needed in order to clearly meet the referenced rules and approved SOW:

   a. <u>L-10, Demand Reduction.</u>

      i) IPP, Volume I, page 1.1-19, second paragraph, the statement "*The basis for this additional water conservation is to accelerate toilet retrofit (replacement of existing commodes with those that use 1.6 gallons per flush) to year 2010 in comparison to the rates used by TWDB which has this water conservation effect phased in by 2020*" is incorrect. The TWDB water demand projections start to phase in toilet retrofits in the year 2000 and reach 100% by the year 2050. By the year 2010, the TWDB's advanced conservation reflects a 60% of units retrofitted, affecting 70% of the 1990-2000 population. Please comment and make any necessary corrections in your estimates.

      Response: The statement referenced appears in Volume III, page 1.1-19. This is the first time that TWDB has provided a written explanation of the procedures used to calculate advanced water conservation, and differs from that provided verbally at an earlier date, as described in Volume III, as quoted above. The language of the text of Volume III will be modified in light of the comment. Any changes in the estimates of water supply available from this strategy would result in a reduction of quantities of management supply available, and would have no other effect upon the IPP. The calculations of additional municipal water conservation are being provided to TWDB for review (See response to comment a.iii below).

      ii) The IPP reflects the Beyond-Advanced conservation programs of aggressive public education and lawn irrigation conservation beginning in 2001 and continuing through the year 2050. The water management strategy is given full credit in 2001. Please explain the basis for this assumption.

      Response: Condition No. 9 of IPP Volume III, Page 1.1-20 is as follows: "The estimated water savings from public education (no. 7 above), and

lawn irrigation (no. 8 above) would begin in 2001 and continue through 2050." The strategy is not given full credit in 2001. The strategy is begun in 2001, and continued through 2050. In Volume III, Section 1.1 and in Volume I Section 5.2 for the Plans for each entity, the quantities of demand reduction (water supply credited to conservation) are tabulated in the year 2000 column, as is the case for all other strategies, and continue for each decade thereafter at the estimated quantity for that decade. Perhaps it would be helpful to insert a statement at the beginning of No. 9 as follows: "The public education program of No. 7 above would be started in 2001 (many cities had a program in 2000) and continued through 2050. Thus, the …."

iii) TWDB review selected the city of San Antonio for a spot review of the proposed savings. Using the Beyond-Advanced conservation measures (toilet retrofit, public education and lawn irrigation conservation) to the fullest extent possible, the TWDB reviewers could not replicate the water use savings for San Antonio as reported in IPP, Volume III, Table 1.1-5, page 1.1-23. TWDB staff calculations range from 6,000 to 16,000 ac-ft less than the amounts reported in the IPP. In order to verify and understand the reported savings, please provide the calculations showing the itemized increments due to conservation measures in excess of advanced conservation.

Response: The calculations are being provided in electronic form, with a hard copy of the matrices used in the computations.

iv) The analysis contained in the IPP, Volume III, reports this water management strategy as yielding 44,100 ac-ft/yr and 79,831 ac-ft/yr, beyond-advanced conservation municipal and irrigation savings, respectively. The information reported in IPP, Volume I, Section 5 reflects 44,572 ac-ft/yr [municipal] and 27,314 ac-ft/yr [irrigation]. Please reconcile these differences in order to clearly describe the recommended water management strategy.

Response: In Volume III, Page 1.1-31, the last sentence of the paragraph which ends at the top of the page is as follows: "The estimated additional municipal water conservation for the South Central Texas region are 38,081 acft/yr in 2000, 39,213 acft/yr in 2030, and 44,573 acft/yr in 2050 (last page of Table1.1-5). In Volume I, Table 5.2-1, Page 5-11, municipal water conservation at year 2050 is shown as 44,572 acft/yr. The difference of 1 (one) acft/yr at 2050 appears to be either a transcription error or a rounding error, and is of no consequence to the water plan. The figure of 44,100 acft/yr shown in the Option Data Sheet for Demand Reduction (Water Conservation) (L-10) (Vol. III) in the IPP has been revised to 44,572 acft/yr.

The figure of 79,831 acft/yr shown in the Option Data Sheet for Demand Reduction (Water Conservation) (L-10) (Vol. III) in the IPP represents an estimated maximum potential volume for irrigation conservation through the installation of LEPA systems in Bexar, Medina, Uvalde, Atascosa, Frio, Zavala, Dimmit, LaSalle, and Wilson Counties (see Table 1.1-8). In the development of the Regional Water Plan, this maximum potential volume was adjusted to account for Edwards Irrigation Transfers (L-15), Irrigation Demand Reduction w/ Transfers (L-10 Irr.), and counties using the Carrizo Aquifer for which LEPA applicable acres are sufficiently small that potential conservation savings may not be realized (Dimmit, LaSalle, & Wilson). As a result of these adjustments, the Plan includes 28,903 acft/yr for Irrigation Demand Reduction (L-10 Irr.) which is counted as a new supply to meet project irrigation needs (see Table 5.2-1 and appropriate County

Summaries of Projected Water Needs (Shortages) and Water Management Strategies in Section 5, Vol. I).

With respect to the 27,314 acft/yr mentioned in sentence 2 of the comment, this is the quantity of irrigation water conservation transferred to new municipal water supply for Bexar County. Derivation of the 27,314 acft/yr included in the IPP is summarized in the Bexar County Summary of Projected Water Needs (Shortages) and Water Management Strategies (Section 5.2.2, Vol. I) and in the description of this water management strategy (Section 5.2.3, Vol. I).

b. CZ-10C, Carrizo-Wilcox aquifer between San Marcos and Frio Rivers.

i) The IPP contains conflicting supply numbers and titles for this strategy: Volume III and Volume I, Table 5.1-1 describe this water management strategy as Carrizo Wilcox Aquifer between San Marcos and Frio Rivers. Volume III reports a yield of 40,000 ac-ft/yr and Volume I, Table 5.1-1 shows 75,000 ac-ft/yr; Volume I, Section 5, Table 5.2-1 reports a supply of 20,000 ac-ft/yr and refers to this strategy as Carrizo Wilcox-Wilson and Gonzales. Please reconcile these differences in order to clearly describe the recommended water management strategy and the cost associated with it.

Response: The SCTRWPG has considered new water supplies from the Carrizo Aquifer in a range of quantities and with respect to the rules and regulations of groundwater districts and has included a new supply of 16,000 acft/yr to be obtained from the Carrizo Aquifer in Wilson and Gonzales Counties. Although the new wellfields are expected to be located "between the San Marcos and Frio Rivers," the SCTRWPG elected to change the name of this strategy because Wilson County is represented by the Evergreen UWCD and Gonzales County is represented by the Gonzales County UWCD. The management strategy is described in Section 5.2.3, generally located in Figure 5.2-1, and costs are shown in Section 5.3.2. Explanatory text has been added to the description of this management strategy in Section 5.2.3 of Vol. I of the Adopted Regional Water Plan.

ii) The analysis of this strategy contained in the IPP, Volume III, lacks a discussion of the strategy's impact on threats to the agricultural resources of the region. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "impacts on agricultural and natural resources," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

iii) The analysis of this strategy contained in IPP, Volume III, lacks a discussion regarding third party impacts anticipated in association with this strategy. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "third-party impacts of

voluntary redistribution of water," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

c. CZ-10D, Carrizo-Wilcox aquifer between Gonzales and Bastrop.

i) The IPP contains conflicting supply numbers and titles associated with this strategy. Volume III, and Volume I, Table 5.1-1 report 220,000 ac-ft/yr and refer to the strategy as the Carrizo-Wilcox aquifer between Colorado and Frio rivers. Volume I, Table 5.2-1 refers to this strategy as Carrizo Aquifer-Gonzales and Bastrop with a supply of 27,500 ac-ft/yr. Please resolve this apparent inconsistency to clearly describe the recommended water management strategy.

Response: The SCTRWPG has considered new water supplies from the Carrizo Aquifer in a range of quantities and with respect to the rules and regulations of groundwater districts and has included a new supply of 27,500 acft/yr to be obtained from the Carrizo Aquifer in Gonzales and Bastrop Counties. Although the new wellfields are expected to be located "between the Colorado and Frio Rivers," the SCTRWPG elected to change the name of this strategy because Gonzales County is represented by the Gonzales County UWCD and Bastrop County is represented by the Lost Pines GCD. The management strategy is described in Section 5.2.3, generally located in Figure 5.2-1, and costs are shown in Sections 5.3.5 and 5.3.11. Explanatory text has been added to the description of this management strategy in Section 5.2.3 of Vol. I of the Adopted Regional Water Plan.

ii) The analysis of this strategy contained in the IPP, Volume III, lacks a discussion of the strategy's impact on threats to the agricultural resources of the region. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "impacts on agricultural and natural resources," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

iii) The analysis of this strategy contained in IPP, Volume III, lacks a discussion regarding third party impacts anticipated in association with this strategy. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "third-party impacts of voluntary redistribution of water," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

d. G-15C, Canyon Reservoir, river diversion.

i) The text and graphs of contained in the IPP, Volume III, describe this option as providing water to Bexar County. This description conflicts with that provided in the IPP, Volume I, Section 5. Please resolve this apparent inconsistency to clearly describe the recommended water management strategy.

Response: The SCTRWPG has considered the utility of this management strategy as a potential new supply to either Bexar County or Comal County and has recommended its implementation to meet projected needs in Comal County. The management strategy is described in Section 5.2.3, generally located in Figure 5.2-1, and costs are shown in Section 5.3.5. Explanatory text has been added to the description of this management strategy in Section 5.2.3 of Vol. I of the Adopted Regional Water Plan.

ii) The title for this strategy in Volume III "Canyon Lake water released to Lake Nolte, treated water to distribution system or recharge zone" which is a more detailed title that the one used in Volume I, Section 5. Please resolve this apparent inconsistency to clearly describe the recommended water management strategy.

Response: The description of this management strategy in Section 5.2.3 of Vol. I reflects the recommendation of the SCTRWPG regarding the implementation of this management strategy. Explanatory text has been added to the description of this management strategy in Section 5.2.3 of Vol. I of the Adopted Regional Water Plan.

iii) The IPP lacks the required consideration of the provisions in Texas Water Code, §11.085(k)(1) for interbasin transfers. Please note that this strategy must be evaluated in adherence to all interbasin transfer requirements; please discuss how this aspect of the evaluation was accomplished in the analysis of the strategy. Please ensure that the plan reflects and describes this analysis.

Response: Implementation of this management strategy as technically evaluated and recommended by the SCTRWPG in the Adopted Regional Water Plan does not constitute an interbasin transfer as new supplies are assigned to Comal County. Similarly, implementation of this management strategy as technically evaluated in each of the five alternative plans would not constitute an interbasin transfer as new supplies were assigned to Comal, Hays, and/or Guadalupe Counties.

iv) The analysis of this strategy contained in the IPP, Volume III, lacks a discussion of the strategy's impact on threats to the region's agricultural resources. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "impacts on agricultural and natural resources," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

v) The analysis of this strategy contained in IPP, Volume III, lacks a discussion regarding third party impacts anticipated in association with this strategy. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "third-party impacts of voluntary redistribution of water," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

e. SCTN-3c, Simsboro Aquifer.

i) The description provided in IPP, Volume III refers to 75,000 ac-ft/yr while the supply reported in Volume I, Section 5, Table 5.2-1 is 55,000 ac-ft/yr. Please resolve this apparent inconsistency to clearly describe the recommended water management strategy.

Response: The SCTRWPG has considered new water supplies from the Simsboro Aquifer in a range of quantities and with respect to contractual agreements between SAWS, Alcoa, and CPS. The management strategy is described in Section 5.2.3, generally located in Figure 5.2-1, and costs are shown in Section 5.3.2. Explanatory text has been added to the description of ths management strategy in Section 5.2.3 of Vol. I of the Adopted Regional Water Plan. A table summarizing the projected pumpage associated with this management strategy by county by decade has been added to Section 5.2.4 of Vol. I of the Adopted Regional Water Plan.

ii) The analysis of this strategy contained in the IPP, Volume III, lacks a discussion of the strategy's impact on threats to the region's agricultural resources. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "impacts on agricultural and natural resources," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

iii) The analysis of this strategy contained in Volume III, lacks a discussion regarding third party impacts associated with this strategy. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "third-party impacts of voluntary redistribution of water," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

f. SCTN-16 [a b, and c] Lower Guadalupe River diversions.

i) IPP, Volume I, Section 5 shows SCTN-16 as a water management strategy with a yield of 94,500 ac-ft/yr. This is 500 ac-ft/yr more than the closest of the various SCTN-16 analysis included in the IPP, Volume III [SCTN-16c]. Please correct or explain as appropriate to clearly describe the recommended water management strategy.

Response: The recommended management strategy will provide a dependable supply of 94,500 acft/yr and is described in Section 5.2.3, generally located in Figure 5.2-1, and costs are shown in Section 5.3.2. Explanatory text has been added to the description of this management strategy in Section 5.2.3 of Vol. I of the Adopted Regional Water Plan.

ii) Please enhance the description of the proposed off-channel storage associated with these strategies to facilitate future determinations of consistency of proposed projects with the recommendations of the regional water plan.

Response: The recommended management strategy includes approximately 50,000 acft of off-channel storage to be located somewhere in Refugio, Victoria, or Calhoun Counties proximate to diversion facilities near the pool created by the Guadalupe River Saltwater Barrier. Technical evaluations of this management strategy as included in the Adopted Regional Water Plan have assumed that this off-channel storage will be in the form of reservoirs created by two "ring-dike" embankments and having little, if any, contributing drainage area. As with transmission pipelines and many elements of the Adopted Regional Water Plan, specific facility locations will be determined in permitting and final design. Explanatory text has been added to the description of this management strategy in Section 5.2.3 of Vol. I of the Adopted Regional Water Plan.

iii) IPP, Volume III, page 3.2-3 assumes that the proposed diversions do not constitute an interbasin transfer and that water rights committed to such diversion would retain their current seniority relative to others. This assumption is incorrect. Please address the required consideration of the provisions in Texas Water Code, §11.085(k)(1) for interbasin transfers and include the revised evaluations in the adopted regional water plan. . Please note that this strategy must be evaluated in adherence to all interbasin transfer requirements; please discuss how this aspect of the evaluation was accomplished in the analysis of the strategy. Please ensure that the plan reflects and describes this analysis.

Response: The TWDB has, by rule, established the river basin boundaries for Texas and advised that the San Antonio River Basin extends to the confluence with the Guadalupe River. As the Guadalupe River Saltwater Barrier forms a pool that extends for several miles above the confluence of both the Guadalupe and San Antonio Rivers, the SCTRWPG has assumed that diversion facilities for this management strategy will be located in the San Antonio River Basin and the proposed diversions will not constitute an interbasin transfer. As with transmission pipelines and many elements of the Adopted Regional Water Plan, specific facility locations will be determined in permitting and final design. Explanatory text has been added to the description of this management strategy in Section 5.2.3 of Vol. I of the Adopted Regional Water Plan.

iv) The analysis of these strategies contained in IPP, Volume III, lack a discussion regarding third party impacts anticipated in association with this strategy. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "third-party impacts of voluntary redistribution of water," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

v) The analysis of these strategies contained in the IPP, Volume III, lack a discussion of the strategy's impact on threats to the region's agricultural resources. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "impacts on agricultural and natural resources," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

g. <u>New Colorado River diversion</u>.

i) The IPP lacks an evaluation of this option as required under 31 TAC 357.7(A)(7) and a detailed description as required in 31 TAC 357.7(A)(8) for recommended water management strategies. Please address these deficiencies in order to comply with the referenced rules.

Response: The SCTRWPG has, with certain qualifications, adopted this management strategy and its associated facilities necessary to provide for a new supply of 150,000 acft/yr as proposed by the Lower Colorado River Authority (LCRA) and Region K. Potential sharing of costs for some of these associated facilities is a subject of on-going negotiations. The estimated costs for purchase of water from the LCRA shown in the RWP are based on LCRA's current in-basin rate of $105 acft/yr plus a 25 percent out-of-basin surcharge. Ultimate costs for purchase of water will be a subject of negotiation. The SCTRWPG is under the impression that evaluations of this option pursuant to the referenced rules have been completed by Region K. Explanatory text has been added to the description of this management strategy in Section 5.2.3 of Vol. I of the Adopted Regional Water Plan. (See footnote on page 5-69).

ii) In view of the interregional aspect of this water management strategy, please take note of the following TWDB staff comment on the Region K IPP provided to that region:

> *Texas Water Code §16.053(a) and 16.053(e)(5)(F) require regional water planning to protect appropriate environmental flow needs of rivers, bays, and estuaries. TWDB rule §357.5(e)(1) provides that water management strategies be evaluated based on the consensus environmental planning criteria or on site-specific studies. Therefore,*

water available through each management strategy should be adjusted to reflect passage of sufficient flows for environmental needs. Chapter 5 of the IPP discusses some of the anticipated flow reductions from the recommended off-channel reservoir project, but does not show the adjustment or affect on project yields from the required passage of appropriate environmental flows. Please include this analysis in the appropriate sections of Chapter 5, which discuss the off-channel reservoir project.

Response: The SCTRWPG has been informed that evaluations of this option have been completed by Region K in accordance with applicable law. The SCTRWPG is also cognizant of various comments and concerns regarding potential effects of this option on instream flows and freshwater inflows to bays and estuaries. As the quantity of water which may ultimately be made available by the LCRA and Region K is uncertain at this time, the SCTRWPG has included the originally proposed quantity of 150,000 acft/yr in the RWP. (See footnote on page 5-69).

iii) Please include a description of the proposed off-channel storage associated with this strategy to facilitate future determinations of consistency of proposed projects with the recommendations of the regional water plan.

Response: The recommended management strategy includes approximately 100,000 acft of off-channel storage to be located somewhere in Wharton and Matagorda Counties. Estimates of cost for this management strategy as included in the Adopted Regional Water Plan have assumed that this off-channel storage will be in the form of reservoirs created by four "ring-dike" embankments and having little, if any, contributing drainage area. As with transmission pipelines and many elements of the Adopted Regional Water Plan, specific facility locations will be determined in permitting and final design. Explanatory text has been added to the description of this management strategy in Section 5.2.3 of Vol. I of the Adopted Regional Water Plan.

h. <u>Purchase water from major provider.</u> The IPP lacks an evaluation of this option as required under 31 TAC 357.7(A)(7) and a detailed description as required in 31 TAC 357.7(A)(8) for recommended water management strategies. Please address these deficiencies in order to comply with the referenced rules.

Response: Water purchased from a Major Provider and/or the Regional Water Provider(s) for Bexar County under this option will be developed through the implementation of one or more of the other management strategies in the RWP. Hence, the required evaluations for this management strategy have been completed in the evaluations of the management strategies from which the supply is to be developed.

i. <u>SAWS Recycled water program.</u> The IPP lacks an evaluation of this option as required under 31 TAC 357.7(A)(7) and a detailed description as required in 31 TAC 357.7(A)(8) for recommended water management strategies.

Response: This option represents the continued implementation and expected future expansion of the SAWS Recycled Water Program. Costs for this option, based on actual costs for implementation to-date, are included in the RWP. Explanatory text has been added to the description of this management strategy in Section 5.2.3 of Vol. I of the Adopted Regional Water Plan.

j. SCTN-17, desalination of seawater.

i) The analysis contained in the IPP, Volume III, indicates that an interbasin transfer analysis is not applicable for this strategy. That assumption is incorrect. Please address this deficiency and include the revised evaluations in the adopted plan.

Response: Table 1.10-9 in Volume III has been revised pursuant to this comment. Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "interbasin transfer issues," have been included in the Adopted Regional Water Plan.

ii) The analysis of this strategy contained in Volume III, lacks a discussion regarding third party impacts anticipated in association with this strategy. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "third-party impacts of voluntary redistribution of water," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

iii) The analysis of this strategy contained in the IPP, Volume III, lacks a discussion of the strategy's impact on threats to the region's agricultural resources. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "impacts on agricultural and natural resources," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

k. C-17A, Colorado River in Colorado County - Buy stored water and irrigation rights; firm yield, C-17B, Colorado River in Wharton County - Buy irrigation rights and groundwater; firm yield and, C-13, Colorado River at Bastrop - Purchase of stored water - Firm yield.

i) The IPP lacks the required consideration of the provisions in Texas Water Code, §11.085(k)(1) for interbasin transfers. . Please note that these strategies must be evaluated in adherence to all interbasin transfer requirements; please discuss how this aspect of the evaluation was accomplished in the analysis of the strategies.

Response: TWC 11.085(k)(1) involves consideration of the "need for the water in the basin of origin and in the proposed receiving basin." The RWPs for both the basin of origin (Colorado, Region K) and the proposed receiving basin (Guadalupe – San Antonio, Region L) identify the respective needs for the water. Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7),

including "interbasin transfer issues," have been included in the Adopted Regional Water Plan.

ii) The analysis of these strategies contained in IPP, Volume III, lack a discussion regarding third party impacts anticipated in association with this strategy. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "third-party impacts of voluntary redistribution of water," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

iii) The analysis of these strategies contained in the IPP, Volume III, lack a discussion of the strategy's impact on threats to the region's agricultural resources. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "impacts on agricultural and natural resources," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

l. S-15C, Cibolo reservoirs, firm yield.

i) The analysis of these strategies contained in IPP, Volume III, lack a discussion regarding third party impacts anticipated in association with this strategy. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "third-party impacts of voluntary redistribution of water," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

ii) The analysis of these strategies contained in the IPP, Volume III, lack a discussion of the strategy's impact on threats to the region's agricultural resources. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "impacts on agricultural and natural resources," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

m. L-18c, Edwards aquifer recharge from natural drainage - Type 2 projects (Program 2C).

i) The analysis of this strategy contained in Volume III, lacks a discussion regarding third party impacts anticipated in association with this strategy. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "third-party impacts of voluntary redistribution of water," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

ii) The analysis of this strategy contained in the IPP, Volume III, lacks a discussion of the strategy's impact on threats to the region's agricultural resources. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "impacts on agricultural and natural resources," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

n. SCTN-6a, Edwards aquifer recharge enhancement with Guadalupe river diversions at Lake Dunlap.

i) The IPP lacks the required consideration of the provisions in Texas Water Code, §11.085(k)(1) for interbasin transfers. Please ensure that the plan reflects and describes this analysis.

Response: TWC 11.085(k)(1) involves consideration of the "need for the water in the basin of origin and in the proposed receiving basin." These needs are addressed in the RWP. Water available for diversion, with the exception of enhanced springflow, has been computed subject to senior water rights and Consensus Environmental Criteria. Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "interbasin transfer issues," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

ii) The analysis of this strategy contained in the IPP, Volume III, lacks a discussion of the strategy's impact on threats to the region's agricultural resources. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "impacts on agricultural

and natural resources," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

iii) The analysis of this strategy contained in IPP, Volume III, lacks a discussion regarding third party impacts anticipated in association with this strategy. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "third-party impacts of voluntary redistribution of water," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

o. <u>SCTN-8, Trinity aquifer optimization.</u>

i) The analysis of this strategy contained in the IPP, Volume III, lacks a discussion of the strategy's impact on threats to the region's agricultural resources. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "impacts on agricultural and natural resources," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

ii) The analysis of this strategy contained in IPP, Volume III, lacks a discussion regarding third party impacts anticipated in association with this strategy. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "third-party impacts of voluntary redistribution of water," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

p. <u>G-30, Guadalupe River diversion near Comfort to recharge zone via Medina Lake.</u>

i) The IPP lacks the required consideration of the provisions in Texas Water Code, §11.085(k)(1) for interbasin transfers. Please note that this strategy must be evaluated in adherence to all interbasin transfer requirements; please discuss how this aspect of the evaluation was accomplished in the analysis of the strategy. Please ensure that the plan reflects and describes this analysis.

Response: TWC 11.085(k)(1) involves consideration of the "need for the water in the basin of origin and in the proposed receiving basin." These needs are addressed in the RWP. Water available for diversion has been computed subject to senior water rights and Consensus Environmental Criteria. Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "interbasin transfer issues," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

ii) The analysis of this strategy contained in the IPP, Volume III, lacks a discussion of the strategy's impact on threats to the region's agricultural resources. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "impacts on agricultural and natural resources," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

iii) The analysis of this strategy contained in IPP, Volume III, lacks a discussion regarding third party impacts anticipated in association with this strategy. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "third-party impacts of voluntary redistribution of water," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

4. TWDB staff committed[1] to accept water availability for the Edwards aquifer as 340,000 acre-feet per year after 2012 in the Regional Water Plan if it [the plan] includes actions to be taken to ensure that the required level of protection to the endangered species at San Marcos and Comal Springs will be maintained during a drought of record. IPP, Volume I, figures 5.2-26 and 27, show multiple instances where the spring flows go below 150 and 100 cfs, at Comal and San Marcos, respectively. In the case of Comal springs, figure 5.2-26 includes periods where the spring would stop flowing altogether. The review acknowledges the note included in the referenced figures indicating that "...the South Central Texas Regional Water Plan includes management supplies believed sufficient to sustain discharge at Comal Springs subject to drought of record conditions....". Please supplement this information with an explicit description of the specific actions that will be taken to ensure the protection of the endangered species at Comal and San Marcos springs.

[1] Correspondence from Dr. Tommy Knowles to Mr. Greg Ellis, copied to the South Central Texas Regional Water Planning Group, dated November 16, 1999.

Response: Sub-section 3.3 Drought Response in Vol. I of the Adopted Regional Water Plan summarizes the recommendations of the SCTRWPG regarding actions to be taken to ensure that the required level of protection to the endangered species at San Marcos and Comal Springs will be maintained during a drought of record.

5. The Volume III analysis of water management strategies that benefit the regional demand center include distribution costs that may be duplicative when those strategies are combined into one single plan. Please explain how this issue was handled in the IPP.

   Response: Distribution costs mentioned in the comment were not duplicated. In Volume I, distribution costs were calculated based on the total volumes of water to be distributed within each demand center with due consideration of economies of scale as reflected in the Cost Estimating Procedures (Appendix A, Vol. I). Additional explanatory text will be added to the Plan.

6. Please note that 31 TAC §357.11(b) requires the regional water planning group to submit in a timely manner to the executive administrator information on any known interregional conflict between regional water plans. Please discuss if the plan to be adopted and submitted to the TWDB by January 5th, 2001, is affected by an interregional conflict, and explain any efforts the RWPG has taken to resolve the conflicts.

   Response: There are no known interregional conflicts at this time. Coordination meetings have been held with Regions J and K for the purpose of resolving differences. The results are documented in Volume I of the Plan (Subsections 5.2.7 Special Water Resources, and 5.2.3).

SECTION 2. COMMENTS/SUGGESTIONS FOR IMPROVEMENTS TO THE REGIONAL WATER PLAN.

1. The Edwards Aquifer Authority has issued a notice of proposed initial regular permits. Given the significance of the Edwards aquifer to the South Central Texas Regional planning area, the plan may benefit from a brief discussion of this recent development and its impact to the region.

   Response: According to Mr. Greg Ellis, General Manager, EAA, when asked in open meeting of the SCTRWPG on November 9, 2000 if the action cited above would affect the IPP, the response was NO. Given that EAA has issued notice, and that the process will not be concluded prior to the due date of the Regional Plan, such a discussion may be premature, and at worst, erroneous. Therefore, such a discussion is not included.

TWDB Partial Staff Comments, Letter 4, December 12, 2000

SECTION 1. COMMENTS THAT HAVE TO BE SATISFACTORILY ADDRESSED IN ORDER TO MEET STATUTE, TEXAS WATER DEVELOPMENT BOARD RULES AND THE REGIONAL WATER PLANNING CONTRACT

1) 31 TAC §357.7(a)(8) requires that specific recommendations of water management strategies be described in sufficient detail to allow state agencies to determine whether future projects are consistent with the approved regional water plan. Volume I, Section 5, figures 5.2-3 and 5.2-4 present summary costs of the regional water plan. Volume III presents cost information for water management strategies; however, a cross-reference of the Volume III cost evaluations with the summary information provided in Volume I, Section 5 could not be accomplished. Therefore, in order to clearly address the referenced rule please include in the plan a breakdown of the plan's cost with identification of the individual cost contribution of the recommended water management strategies.

Response: The costs are presented for each water management strategy included in each of the alternative plans that were considered and in the adopted plan, along with the evaluations pursuant to 31 TAC Section 357.7(a)(7) (See Volume I, Table 5.2-25, for the analyses of the adopted plan, Volume II, tabular summaries for each alternative plan that are included at the end of alternative plan sections, and Exhibit B, Table 12).

2) Senate Bill 1 requires future projects to be consistent with the regional water plans to be eligible for Texas Water Development Board (TWDB) funding and Texas Natural Resource Conservation Commission (TNRCC) permitting. The provision related to TNRCC is found in Texas Water Code §11.134. It provides that the Commission shall grant an application to appropriate surface water, including amendments, only if the proposed appropriation address a water supply need in a manner that is consistent with an approved regional water plan. TNRCC may waive this requirement if conditions warrant. For TWDB funding, Texas Water Code §16.053(j) states that after January 5, 2002, TWDB may provide financial assistance to a water supply project only after the Board determines that the needs to be addressed by the project will be addressed in a manner that is consistent with that appropriate regional water plan. The TWDB may waive this provision if conditions warrant.

Before finalizing the regional water plans, the Regional Water Planning Groups (RWPG) should consider the scope of their plan against the variety of proposals that could be brought before TNRCC and TWDB and ensure the Group's intentions are clear to these agencies. For example, TNRCC considers water right applications for irrigation, hydroelectric power, and industrial purposes, in addition to water right applications for municipal purposes. It also considers other miscellaneous types of applications, such as navigation or recreation uses. Many of these applications are for small amounts of water, often less than 1,000 acre-feet per year. Some are temporary. In order to ensure these small applications are consistent with the regional water plan, the RWPG should consider adding specific language to their plans indicating that the surface water uses that will not have a significant impact on the region's water supply are consistent with the regional water plan even though not specifically recommended in the regional water plan.

TWDB receives applications for financial assistance for many types of water supply projects. Some involve repairing plants and pipelines and constructing new water towers. The RWPG should consider adding specific language to their regional water plans to indicate that the water supply projects that do not involve the development of or connection to a new water is consistent with the regional water plan even though not specifically recommended in the regional water plan.

Response: At its regularly scheduled meeting on December 6, 2000, the SCTRWPG discussed this suggestion and based upon the information that both TNRCC and TWDB

may waive the requirements cited above, decided not to consider language suggested by this TWDB comment. During the discussion, the point was made that the number and range of types of potential cases that may arise are so unpredictable that the RWPG is of the opinion that each should be considered by the agencies on their own merits, and that the Legislature foresaw this situation and provided for it. Thus, no specific language was added to the plan.

3) Task 6 of the technical scope of work [SOW] approved by the SCT RWPG, indicates that "each potential Regional Water Management Alternative Plan must and will be subjected to the analyses of the Criteria specified in TWDB's Rules (Appendix C)." Appendix C list the evaluation criteria described in 31 TAC §357.7(a)(7).

Please supplement the summary statements contained in Sections 2 through 6 of the IPP, Volume II, entitled Technical Evaluations of Alternative Regional Water Plans, to clearly address the following requirements:

a) 31 TAC §357.7(a)(7)(A) requires the evaluation of the quantity, reliability, and cost of water delivered and treated for the end user's requirements. To address this requirement, please provide a breakdown for each one of the alternative regional water plans of the cost of water management strategies and any other costs reflected in the cost comparison contained in the IPP, Volume II, Section 7.

b) 31 TAC §357.7(a)(7)(D) requires evaluations of impacts of water management strategies on threats to agricultural and natural resources of the regional water planning area. Please ensure that the alternative plans reflect and describe this analysis.

c) 31 TAC §357.7(a)(7)(G) requires the evaluations to include consideration of the provisions in Texas Water Code, §11.085(k)(1) for interbasin transfers; and (H) consideration of third party social and economic impacts resulting from voluntary redistributions of water. Please note that water management strategies involving interbasin transfers must be evaluated in adherence to all interbasin transfer requirements; please discuss how this aspect of the evaluation was accomplished in the analysis of the relevant strategies. Please ensure that the alternative plans reflect and describe this analysis.

Response: A summary was added in which the analyses are presented (See Volume I, Table 5.2-25, for the analyses of the adopted plan, Volume II, tabular summaries for each alternative plan that are included at the end of alternative plan sections, and Exhibit B, Table 12).

4) TWDB rules [§357.5(i)] and Phase I, Task 3 (G) in the scope of work requires an evaluation of the potential for emergency transfers of surface water. Please include in the plan a description of what consideration was given by the planning group to this rule and what decision was made.

Response: Section 3.4 Potential for Emergency Transfers of Surface Water has been added.

5) The SCT Technical SOW, Task 1, Description of the Planning Region, indicates that the description will include a summary of water availability requirements promulgated by a county commissioners court in accordance with Texas Water Code, Section 35.019. This summary could not be located within the IPP. Please ensure that the item is included in the plan.

Response: Section 1.11 Water Availability Requirements Promulgated by a County Commissioners Court, has been added.

6) The SCT Technical SOW, Tasks 4(B), Identification and evaluation of water supply options, 5, Formulation of regional water management alternative plans, and 6, Evaluation of regional water management alternative plans formulated in task 5, refer to the use of a selection criteria established in the Public Participation Process. Volume I, Section 6.5, Evaluation Criteria, describes this criteria. However, the review could not locate the comparison of water supply options and/or water management strategies and alternative water management plans on the basis of the referenced criteria. Please include these evaluations in the adopted plan.

Response: The procedures are described in Volume I, Sections 7.1 and 7.2, and in the Introduction to Volume III.

7) On April 19, 2000, the TWDB authorized funding for a study entitled "Investigation of Joslin Steam Electric Station for Co-Location of A Desalination Facility" by the Lavaca Regional Water Planning Group in conjunction with Regions L and N Planning Groups". The documentation for this application indicated that the SCT RWPG supported the application. The SCT RWPG required that HDR, in its capacity as technical consultant for the SCT region, be a participant in the study to ensure that the project was evaluated in a manner consistent with the protocol adopted by the SCT RWPG. Also, it noted that in order for the SCT RWPG to consider the results of the study it in the preparation of its plan the study should be competed by July 1, 2000.[2] The study was completed in June 2000 with the required participation of HDR.

A discussion or reference to this study could not be located in the IPP; nor is it listed in Volume I, Section 5, Table 5.1-1, Water Supply Option Summary. Please include in the plan a discussion of this project and the RWPG's decision with regards to the project's feasibility.

Response: Section 5.2.3, Desalination of Seawater (SCTN-17) was expanded to address this comment.

8) The SCT Technical Scope of Work, task #1, indicates that the description of the area will include a summary of existing Certified Groundwater Conservation District Management Plans. This is consistent with 31 TAC §357.5 (k)(1)(C). The review could not locate a discussion or reference to the TWDB certified groundwater management plan of Bexar Metropolitan Water District. Please correct as needed.

Response: The Bexar Metropolitan Water District Groundwater Management Plan is summarized in Vol I, Subsection 1.10.4.4).

9) 31 TAC §357.7(a)(7)(A) requires the evaluation of the quantity, reliability, and cost of water delivered and treated for the end user's requirements. Volume I, Section 5, Sub-section 5.2.3, Water Management Strategies, includes SCTN-1a, Aquifer Storage and Recovery [ASR]. Volume III includes analysis of two ASR strategies. Please note the following:

a) The evaluation of the ASR strategies do not address the reliability and cost of the strategies in terms that can be equitably compared with other strategies. Please complete the analysis to address these issues.

Response: Volume I, Section 5.2 has been expanded to provide further information. Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), have been included in the Adopted Regional Water Plan.

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[2] Correspondence from Ms. Evelyn Bonavita to Mr. Craig D. Pedersen, dated April 3, 2000.

b) The proposed sites for the ASR project shown in the Volume III, SCTN-1a, are located in northern Atascosa and northeast Wilson counties. The description in Volume I indicates that the site is located in southern Bexar County. Please correct the references as appropriate.

Response: In Volume I, Section 5.2, further explanation is given. Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), have been included in the Adopted Regional Water Plan.

10) Volume I, Section 1.1, Background, the second paragraph states "Dependable supplies from Canyon Reservoir for municipal and industrial customers are a function of springflows from the Edwards Aquifer." The Edwards aquifer springs that contribute to the Guadalupe River are located below Canyon Reservoir. Please revise the statement to more accurately reflect that dependable supplies from the Guadalupe River below Canyon Reservoir are a function of springflows from the Edwards aquifer.

Response: Dependable supplies from Canyon are presented accurately in Vol. I. The point is, when spring flow declines to certain levels, it becomes necessary to pass through inflows to Canyon to meet downstream water rights that would otherwise have been satisfied from streamflow, a part of which would have been from spring flow.

11) Volume I, Section 1.2.4.1, Water Resources, omits the Edwards-Trinity (Plateau) aquifer from the list of aquifers in the South Central Texas Region. Please revise the section to include this aquifer.

Response: The Edwards-Trinity (Plateau) aquifer is included in the Regional Water Plan as Subsection 1.7.1.7, and has been included in the aquifer list in Section 1.2.4.1.

12) Volume I, Section 3.3, Methodology to Calculate the Water Supplies Available to the South Central Texas Region and Methodology for Calculating Water supplies Available for Water User Groups; the specific details (saturated thickness and well capacities) by which groundwater availability (excepting the Edwards aquifer) was calculated for all user groups, was not found in this section. Please provide that information.

Response: This information is found in Vol. III, Sections 6.5, 6.6, and 6.7. Reference to the sections has been included in Vol. I, Section 3.3.

13) Volume I, Section 1.7.1.3, Trinity Aquifer. This section lacks a discussion of the water-level declines in the Trinity aquifer and the significant potential for new urban development to cause additional water-level declines within the South Central Texas Region. The report lacks a discussion or a reference to the findings of Mace and other (2000) regarding the Trinity aquifer. This report was conducted with the participation of the SCT RWPG. Its purpose was to provide the regional planning process with a tool for its consideration and analysis of the Trinity aquifer during the present round of regional planning. For technical completeness of the plan, please include in the report a discussion of this topic.

Response: The text of Section 1.7.1.3 mentions the stress that rapid development is placing upon the Trinity Aquifer in the South Central Texas Region, and a new Section 1.11 "Water Availability Requirements Promulgated by a County Commissioners Court," has been added to Volume I. Prior to the completion of a report by Mace and others (2000) regarding the Trinity Aquifer, the technical consultant used TWDB estimates of water available from the Trinity Aquifer in the individual counties of the South Central Texas Region.

14) Volume I, Section 6.5, Evaluation Criteria, includes a reference to a Section 6.2.3 which is not located in the plan. Please revise the plan as appropriate.

Response: The reference cited should have been Section 6.3.3. A correction has been made in the text.

15) In order to provide clarity and allow for verification of references, please include a bibliography in your final plan.

Response: A list of references is included in the Plan.

SECTION 2. COMMENTS/SUGGESTIONS FOR IMPROVEMENTS TO THE REGIONAL WATER PLAN

1) In Volume I, Section 1.10.1.3, Texas Clean Rivers Program does not identify current relevant program activities within the South Central Texas Planning Region. Please consider expanding this section to better describe the current program status within the region.

Response: The section was expanded to include information about the CRP being carried on by GBRA, SARA, and NRA, in partnership with the TNRCC in the South Central Texas Region.

2) Volume I, Section 1.7.1 Groundwater.

a) The citation for the source of data for this section is given as "Information obtained from the TWDB." Specific citations of the source of information should be given for each instance in the report where outside information has been used.
Response: The citations were reviewed, and made more specific.

b) The aquifers are discussed in apparently random order. Please consider presenting this information in either ascending or descending order by the age of the geologic units to add clarity to your presentation.
Response: In Section 1 of the planning report, the aquifers are presented in the order of importance insofar as quantity of water supplied is concerned, with major aquifers listed first. The Edwards Trinity (Plateau) Aquifer has been included among the list of major aquifers.

3) Volume I, Section 1.7.1.1 Edwards Aquifer.

a) No description of the water quality or down-dip extent of fresh water in the aquifer was included in this section. Please consider expanding the current description to include this item.
Response: Language was added in Section 1.7.1.1 to address this comment.

b) Please consider a more recent reference such as Rose (1974), Barker and Ardis (1996) for more widely accepted stratigraphic nomenclature, especially with respect to the use of terms such as Comanche Peak, Edwards and Georgetown.
Response: The Baker and Ardis (1996) reference is used.

4) Volume I, Section 1.7.1.2 Carrizo-Wilcox Aquifer.

   a) Please consider expanding the description to include a discussion of the water quality or down-dip extent of fresh water in the Carrizo-Wilcox aquifer.
   Response: Language was added to Section 1.7.1.2 to address this comment.

   b) The range of aquifer net sand thickness is offered in a manner that misrepresents the down-dip thickening of the aquifer. Please consider using a more descriptive range of thickness or location to illustrate this topic.
   Response: The wording of the sentence was revised to address this comment.

   c) The subdivisions of Wilcox Group portion of the Carrizo-Wilcox aquifer were not discussed in this section.
   Response: Language was added to Section 1.7.1.2 to address this comment.

5) Volume I, Section 1.7.1.3 Trinity Aquifer.

   a) The stratigraphic nomenclature used in this section is not appropriate for use in the South Central Texas Region. Please consider revising this section to better reflect the conditions of the region.
   Response: Section 1.7.1.3 was revised to address this comment.

   b) For completeness, please consider adding a discussion of the subdivisions of the Trinity aquifer into upper, middle and lower units in this section.
   Response: Section 1.7.1.3 was revised to address this comment.

   c) The Sligo limestone member of the Travis Peak Formation was omitted from the discussion of water bearing units in the Trinity aquifer.
   Response: Section 1.7.1.3 was revised to address this comment.

   d) The thickness of the Trinity aquifer in the South Central Texas Region was not included in this section.
   Response: Section 1.7.1.3 was revised to address this comment.

   e) For completeness, please consider adding a description of the water quality or extent of fresh water in the Trinity aquifer in this section.
   Response: Section 1.7.1.3 was revised to address this comment.

   f) For completeness, please consider adding a discussion of the anhydrite beds of the upper Trinity aquifer and the effect it has on Trinity aquifer water quality.
   Response: Section 1.7.1.3 was revised to address this comment.

   g) The inclusion of significant portions of the Trinity aquifer in the Hill Country Priority Groundwater Management Area was not discussed in this section. Please consider expanding the discussion to address this topic.
   Response: Section 1.7.1.3 was revised to address this comment (See response to Comment Number 4 of "must do" section above).

6) Volume I, Section 1.7.1.4 Gulf Coast Aquifer.

   a) There was no discussion of water quality or down-dip extent of fresh water in the Gulf Coast aquifer included in this section. Please consider expanding the discussion to address this topic.
   Response: The text was expanded to include an indication that water quality in the Gulf Coast Aquifer tends to decline nearer the gulf coast due to increased chloride content.

b) There was no discussion of trends in water levels in the Gulf Coast aquifer included in this section. Please consider expanding the discussion to address this topic.
Response: The text was expanded to address this topic.

c) There was no discussion of well yields in this section. Please consider expanding the discussion to address this topic.
Response: The text was expanded to include information about well yields.

7) Volume I, 1.7.1.5 Sparta Aquifer.

a) There was no discussion of water quality or down-dip extent of fresh water in the Sparta aquifer included in this section. Please consider expanding the discussion to address this topic.
Response: In Volume I, the Sparta Aquifer is presented in Section 1.7.1.6. The text of 1.7.1.6 was expanded to include information to address this topic (Also, see Section 1.8.1.6).

8) Volume I. Section 1.7.1.6 Queen City Aquifer.

a) There was no discussion of water quality or down-dip extent of fresh water in the Queen City aquifer included in this section. Please consider expanding the discussion to address this topic.
Response: In Volume I, the Queen City Aquifer is presented in Section 1.7.1.7. The text of 1.7.1.7 was expanded to include information to address this topic (Also, see Section 1.8.1.7).

9) Volume I, Section 1.7.1.7 Edwards-Trinity (Plateau) Aquifer.

a) There was no discussion of water quality or extent of fresh water included in this section. Please consider expanding the discussion to address this topic.
Response: In Volume I, the Edwards Trinity (Plateau) Aquifer is presented in Section 1.7.1.5. The text of 1.7.1.5 was expanded to include information to address this topic (Also, see Section 1.8.1.5).

b) There was no discussion of the aquifer thickness in this section. Please consider expanding the discussion to address this topic.
Response: The text was expanded to include information about aquifer thickness in the region.

c) The discussion states that the aquifer occurs "east of the Pecos River", however, the extent of the Edwards-Trinity (Plateau) aquifer includes areas both east and west of the Pecos River. Please revise the section as needed.
Response: The text was revised.

d) Please consider a more recent reference such as Rose (1974), Barker and Ardis (1996) for more widely accepted stratigraphic nomenclature, especially with respect to the use of terms such as Comanche Peak, Edwards and Georgetown.
Response: The Baker and Ardis (1996) reference is used.

10) Volume I, Section 1.7.1.8 Groundwater Availability. The citation for the source of data in Table 1-11 is given as "TWDB 1998", however, the bibliography section of the report could not be located to determine the specific source of information.
Response: The reference was revised to indicate staff member(s) who supplied the data.

11) Volume I, 1.8.1.1 Edwards Aquifer Water Quality.

a) The location of the down-dip extent of fresh water is not discussed in this section. For completeness, please consider expanding the discussion to address this topic.
Response: This topic is discussed in Section 1.7.1.1 and is cross referenced in Section 1.7.1.8.

b) No discussion of the mineral species associated with water quality issues was included. For completeness, please consider expanding the discussion to address this topic.
Response: The text was expanded to address this topic.

12) Volume I, Section 1.8.1.2 Carrizo Aquifer Water Quality.

a) The location of the down-dip extent of fresh water is not discussed in this section. For completeness, please consider expanding the discussion to address this topic.
Response: The text was expanded to address this topic.

b) The water quality of the subdivisions of Wilcox Group portion of the Carrizo-Wilcox aquifer was not discussed in this section. For completeness, please consider expanding the discussion to address this topic.
Response: The text was expanded to address this topic.

c) This section would benefit from quantitative referencing of ionic species or other quality parameters in the discussion of water quality in the aquifer.
Response: The text was expanded to address this topic.

13) Volume I, Section 1.8.1.3 Trinity Aquifer Water Quality.

a) The location of the down-dip extent of fresh water is not discussed in this section. For completeness, please consider expanding the discussion to address this topic.
Response: The text was expanded to address this topic.

b) This section would benefit from quantitative referencing of ionic species or other quality parameters in the discussion of water quality in the aquifer. For completeness, please consider expanding the discussion to address this topic.
Response: The text was expanded to address this topic.

14) Volume I, Section 1.8.1.4 Gulf Coast Aquifer Water Quality. The location of the down-dip extent of fresh water is not discussed in this section. For completeness, please consider expanding the discussion to address this topic.

Response: The text was expanded to address this topic.

15) Volume I, Section 1.8.1.5 Sparta Aquifer Water Quality.

a) The location of the down-dip extent of fresh water is not discussed in this section. For completeness, please consider expanding the discussion to address this topic.
Response: The text was expanded to address this topic.

b) This section would benefit from quantitative referencing of ionic species or other quality parameters in the discussion of water quality in the aquifer.
Response: The text was expanded to address this topic.

16) Volume I, Section 1.8.1.6 Queen City Aquifer Water Quality.

a) The location of the down-dip extent of fresh water is not discussed in this section. For completeness, please consider expanding the discussion to address this topic.
Response: The text was expanded to address this topic.

b) This section would benefit from quantitative referencing of ionic species or other quality parameters in the discussion of water quality in the aquifer.
Response: The text was expanded to address this topic..

17) Volume I, Section 1.8.1.7 Edwards-Trinity (Plateau) Aquifer Water Quality.

a) The location of the extent of fresh water is not discussed in this section. For completeness, please consider expanding the discussion to address this topic.
Response: The text was expanded to address this topic.

b) This section would benefit from quantitative referencing of ionic species or other quality parameters in the discussion of water quality in the aquifer.
Response: The text was expanded to address this topic.

18) Volume I, Section 3.1.2 Carrizo-Wilcox Aquifer. The subdivisions of Wilcox Group portion of the Carrizo-Wilcox aquifer were not discussed in this section. For completeness, please consider expanding the discussion to address this topic.

Response: The text was expanded to address this topic.

19) Volume I, Section 3.1.3 Trinity Aquifer.

a) The subdivisions of the Trinity aquifer into upper, middle and lower units are not discussed in this section. For completeness, please consider expanding the discussion to address this topic.
Response: The section was expanded to include these subdivisions of the aquifer.

b) The Trinity aquifer does not occur in Wilson County or supply water to that area. Please revise the report as appropriate.
Response: The correction was made.

20) Volume I, Section 3.1.7 Edwards-Trinity (Plateau) Aquifer. The discussion states that the aquifer occurs "east of the Pecos River", however, the extent of the Edwards-Trinity (Plateau) aquifer includes areas both east and west of the Pecos River. Please revise the report as appropriate.

Response: The suggested revision was made.

21) Volume I, Section 3.1.8 Groundwater Availability in the South Central Texas Region. The citation for the source of data in Table 3-1 is given as "TWDB 1998", however, the bibliography section of the report could not be located to determine the specific source of information. Please revise the report to include complete reference and a bibliography.

Response: Reference was revised to give name of file from which data were obtained.

7.2.4.8.2 Public Comments and South Central Texas Regional Water Planning Group Responses

Public comments have been organized in a database and sorted into 39 issue areas. The numbering of the issues corresponds to the grouping of public comments by Moorhouse Associates. A 39th issue area has been added for the response to Region K's comments. HDR has integrated responses to technical issues into the other categories, and issue area 38 now includes those technical questions not covered elsewhere. The final text has to be incorporated into the Regional Water Plan as a section of Chapter 7. In addition, HDR will modify other sections of the Plan to reflect policy agreements that were made at the meeting on November 9th and that are incorporated in the draft text below.

Issue 1. <u>Recharge and Recirculation</u>. Various comments urge the inclusion of additional recharge options, such as small recharge dams, and the inclusion of the Recharge and Recirculation System for the Edwards Aquifer as a strategy for implementation. These comments question the status of this alternative in the Initially Prepared Plan (IPP) and ask that it have the same status as the other water management strategies, such as brush management and rainwater harvesting, that require additional research before implementation. Several request specifically that the footnote requiring amendment of the plan before implementation of the Recharge and Recirculation System (found at IPP, ES-25) be removed. One commenter asserts that the plan contains recharge projects to the Edwards Aquifer that are inefficient due to losses to spring flows, and urges control of spring flows. Another comments that the Lower Guadalupe River Diversion (SCTN-16) should be evaluated in an unbiased manner for its advantages as compared to the Edwards Aquifer Recharge & Recirculation System proposal (EA R&R). Some commenters feel that the plan ignores cheaper, more reliable supplies within the region, like recharge & recirculation. One commenter believes that enhanced springflows resulting from recharge enhancement and/or recirculation are subject to downstream water rights.

<u>Response</u>

- The South Central Texas Regional Water Planning Group has revised the Regional Water Plan to discuss fully its intentions and reasoning for including the Edwards Aquifer

Recharge and Recirculation System in the Plan for purposes of research, but requiring an amendment to the Plan before implementation of this strategy. The footnote referred to in the comments has been replaced by a discussion incorporated into the main body of the text in Section 5.2 and in the Executive Summary.

- The footnote (IPP, ES-25) requiring an amendment to the Regional Water Plan before implementation of the Edwards Aquifer Recharge and Recirculation System read: "Management strategy is included as part of the Regional Water Plan, but may not be implemented unless the Plan is specifically amended to allow implementation."
- In previous versions of tables displaying the management strategies, there had been a line separating strategies included in the Plan from strategies needing further research. Strategies above the line were clearly included in the Plan, but there was confusion over the status of the strategies "below the line."
- Some members of the RWPG wanted the line removed and the strategies below it included in the Plan in order to make it clear that those strategies were "consistent" with the Plan and thus eligible for State funding.
- Other members of the RWPG agreed to remove the line only if it were clear that the Recharge and Recirculation System was included in the Plan for purposes of research funding, but not implementation.
- That condition for removing the line was discussed and agreed to during the RWPG meetings of July 25th and August 3rd. The agreement was later presented in the draft Initially Prepared Plan as a single list of strategies "requiring further study and funding in order to determine the quantity of dependable supply made available during severe drought, feasibility, and/or cost of implementation". In this list, the Edwards Aquifer Recharge & Recirculation System has an asterisk that refers to the footnote language quoted above. The RWPG approved this form of the agreement at its meeting of August 17, 2000, when the IPP as a whole was approved for release to the public.
- The Regional Water Planning Group has carefully reconsidered this issue in light of its fundamental importance to many interests. On the one hand, the Recharge and Recirculation System is viewed as experimental at best and dangerous at worst by several members of the RWPG. First, communities dependent on springflow from the Edwards

formation to meet needs in the Guadalupe basin point to computer model runs showing potential aquifer drawdowns to levels far below its historic lows in the San Antonio area and the consequent potential for drying up the springs "most of the time." The downstream Guadalupe Basin interests state that they cannot accept a regional plan that jeopardizes this essential source of water. They want to see a clear demonstration that implementing Recharge and Recirculation will neither damage the springs nor result in the migration of the bad water line potentially tainting municipal wells. Environmental groups wanting to protect endangered and threatened species at the springs also find the risk associated with what is regarded as an unproven technology to be unacceptable. They are also concerned about the potential damage to species and habitat in the bays and estuaries if flood flows are diverted for other purposes during wetter periods. Utility managers, citing their requirements under Certificates of Convenience and Necessity to provide reliable supplies for municipal uses, are concerned that the lack of experience with this technology and the adverse results of computer model runs conducted by the Technical Consultant raise too many questions about the strategy for it to be recommended for implementation. On the other hand, some members of the RWPG believe that the computer modeling done to date does not present an accurate picture of the system's effects and capabilities. They believe the modeling is unfair in presenting results for a time period beginning with the drought of record, and they compare this to modeling the yield of a reservoir built early in the drought of record – there would be no yield for many years. Although this belief is not accurate with respect to the way the strategy was modeled, i.e., the modeling was based on beginning conditions of a full aquifer, substantial start up time may be needed to give realistic results. Others fear that implementation of some of the water management strategies included in the plan would preclude implementation of Recharge and Recirculation at a later time. They focus, in particular, on the need to include in the plan the strategy of Lake Dunlap diversions to the recharge area of the Edwards Aquifer (see Issue 2 below). If the strategy of diverting water from the Guadalupe at the Saltwater Barrier is implemented first, they fear that the Dunlap diversions would be impossible. That would mean that a major component of Recharge and Recirculation would be gone, damaging the chances of ever implementing this strategy.

- All these interests nevertheless agree that the Recharge and Recirculation strategy may hold great promise and that optimizing use of the Edwards Aquifer is a cornerstone of water policy for the Water User Groups dependent on this underground source. They all support inclusion of this strategy in the Regional Water Plan for purposes of assuring continued research. They agree that implementation of the strategy would require an amendment of the Regional Plan. The amendment process can occur at any time after formal approval of the Regional Water Plan and requires a public hearing after a 30-day notice period.
- The members of the South Central Texas Regional Water Planning Group have further agreed that the Recharge and Recirculation strategy must move as expeditiously as possible through the necessary phases of research to resolve uncertainties about how it would work in practice. To this end, the Planning Group members agree to support the accelerated research effort in the manner appropriate to each, whether by providing funding, reviewing research findings, offering in-kind services or other means. The goal of this effort is to conclude the research as soon as practicable, possibly within a three-year period and in any case in time for reviewing results for possible inclusion of this strategy in the next planning cycle. In this way, the Regional Water Planning Group intends to maintain its consensus approach to planning with careful regard to all interests it represents across the South Central Texas Region.
- Control of flow from Comal, San Marcos, and other springs emanating from the Edwards Aquifer is not a strategy on which the SCTRWPG could reach consensus and include as a specifically identified management strategy in the Regional Water Plan. The Recharge and Recirculation Alternative Plan did include elements that influence spring discharge, and elements that involve storage effects associated with recharge enhancement west of the Knippa Gap.
- Small recharge dams are included in the Plan.
- SCTN-16 and the proposed Edwards Aquifer Recharge & Recirculation System have both been technically evaluated in an unbiased manner and both are included in the RWP. The RWP recognizes that additional study, much of which is already underway, is needed

before the EA R&R System may be more explicitly defined and relied upon as a dependable source of water supply during drought.

- The SCTRWPG has included Edwards Aquifer Recharge & Recirculation Systems in the plan and has recommended that state funding be made available to cooperatively support the refinement and implementation of this and other management strategies. Detailed technical evaluation of the Recharge & Recirculation Alternative Plan raised significant concerns including: 1) Simulated aquifer levels in Bexar County some 75 feet lower than the historical minimum; 2) Necessity to change existing law to allow groundwater export from Uvalde and Medina Counties; 3) Adequacy of existing Edwards Aquifer model(s) to accurately simulate proposed operations; and 4) Greatest initial annual costs and greatest reductions in freshwater inflows to the Guadalupe Estuary of the Alternative Regional Plans considered.
- The SCTRWPG acknowledges public concern about these strategies and will address the issues surrounding enhanced springflows and downstream water rights when additional modeling of recharge and recirculation strategies is being planned.

Issue 2. <u>Augmentation of Springflows (includes 20. Lake Dunlap)</u>. Some commenters propose inclusion of water management strategies to augment springflow during drought periods. One asserts that augmentation has worked in the Comal River, citing pumping during the drought of record. Another commenter proposes litigation as a strategy for protecting pumping levels. Other proposals include: 1) drilling wells in relative proximity to the springs as sources for augmentation water and 2) using Guadalupe River diversions as sources for augmentation water.

<u>Response</u>

- Augmentation is included in the Aquifer Optimization Studies now underway and jointly funded by EAA, SAWS and other water agencies.
- The comments suggesting inclusion of SCTN 6a (Guadalupe River Diversions from Lake Dunlap to the Edwards Aquifer for Spring Augmentation) have been carefully considered as a way of keeping open for future development an option that is important to the Recharge and Recirculation strategy discussed above. Some commenters have said that

failure to include this option now would preclude its implementation in the future because the water will have been used for other options, including Guadalupe River Diversions farther downstream at the Saltwater Barrier.

- Augmentation strategies using diversions from the Guadalupe River (such as SCTN 6a) would affect other strategies now included in the Initially Prepared Plan as well as downstream water rights. This would necessitate additional technical work and adjustments to the Plan as a whole.
- Some members of the RWPG feel strongly that augmentation needs to have scientific study completed before it can be included in the Plan for implementation. Some members believe that this option is regarded by Water User Groups in the Guadalupe Basin as "the poison pill" that would make it impossible for them to support the Regional Water Plan. The perception, these members assert, is a strong one that cannot be overlooked in the context of a consensus process. These members of the RWPG believe that the Plan as it is now presented was the result of a compromise and should stand without change in this regard. (See discussion under Issue 1.)
- The Regional Water Planning Group believes that the expedited research covering the Recharge and Recirculation strategy will also determine the feasibility of augmentation and the impacts of implementation on downstream water rights.

Issues 3, 17 & 27. <u>Goliad Reservoir, Cibolo Reservoir & Reservoirs in General</u>. This group of comments supports the absence of major reservoirs from the Initially Prepared Plan and urges that the potential reservoir sites that have provoked strong negative reactions be eliminated from any further consideration. Questions were also raised about the inclusion of additional storage, since there is strong opposition to surface water.

<u>Response</u>

- The RWPG has no mechanism for eliminating consideration of reservoir sites "for all time." Future RWPG's or other entities could consider any undeveloped potential site in the future.
- The IPP includes consideration of regional storage options that are necessary for the efficient operation of the system of new water management strategies, for increased

reliability of supply in case future droughts are more severe than the drought of record for which supplies were calculated, and for creation of opportunities to increase yield and dependability through systems operation of the several sources of supply. The Plan recommends consideration initially of such options as the use of existing reservoir storage capacity and off-channel structures and indicates that consideration of new reservoir construction should be viewed as a last resort.

Issues 4 & 23 (in part). ***<u>Growth Management (Local Governmental Code/County Authority)</u>. These commenters propose that the Regional Water Plan include more measures to regulate growth, control development over aquifer recharge zones and protect natural resources, aquifers and rivers from pollution. They cite uncontrolled growth of the greater San Antonio area as having many adverse effects, especially on rural counties that become "donors" of water, thus limiting their growth and undermining the agricultural economy. Others argue for increasing county authority to manage growth, creating a new management entity controlled by local residents for regulating water or curtailing the growth of San Antonio.***

<u>Response</u>

- The SCTRWPG has included policy and legislative recommendations that would further protect natural resources, enhance county authority to manage growth and bring new scrutiny to the impact of growth on the sustainability of resources and on the quality of life.
- The State planning rules require the Regional Water Planning Groups to recommend water management strategies that meet identified water needs. As defined in the rules, water "need" means the difference between projected demand and available supply.
- The Planning Group does not have leeway under TWDB rules to reduce the projected demand, though it can find, as the SCTRWPG did in the case of projected agricultural demand, that there are no feasible strategies to meet the needs. "Feasibility" in this case means that the Group did not identify any water management strategies capable of delivering water at a cost agricultural producers could afford under current conditions.

- Within this planning context, the Group is not permitted to recommend strategies to restrict growth in water demand. It has recommended a series of advanced conservation measures to reduce the impact of growth on water resources.
- Existing environmental laws address pollution issues. The SCTRWPG has no authority to impose any regulations to the effects suggested in some of the comments. However, the SCTRWPG is recommending that the Texas Legislature enact or amend laws to give counties more regulatory authority over development affecting demands for water.

Issues 5, 15, & 28. <u>Rainwater Harvesting, Brush Management & Weather Modification</u>. Several commenters support these "additional strategies" that require further research, indicating that they are preferable to structural projects. Some assert that adequate data now exists to support early implementation, especially of brush management. EAA recommends referencing current efforts to quantify results of these strategies.

<u>Response</u>

- Regarding comments that existing data already are available to support early implementation of brush management, the Technical Consultant determined that the available data was not adequate to establish firm water yield under drought of record conditions.
- Weather modification is already in use in the region, but the planning rules require that the strategy have a definite quantity of water it would yield under conditions of the drought of record. That data has not yet been obtained.
- References to ongoing studies regarding brush management and weather modification are added to the SCTRWP in the descriptions of these management strategies. It is the intent of the SCTRWPG to use information from these and other pertinent studies in the next planning cycle.
- Rainwater Harvesting is included in the Plan on the same basis as brush management and weather modification. The RWPG believes this technique may provide a significant source of supply for the region. To comply with TWDB planning rules, the RWPG must complete further research to quantify the firm yield this strategy would provide under drought of record conditions. Despite the absence of data that would permit the RWPG to

propose these strategies to meet the needs of specific Water User Groups, all three strategies are included in the Regional Water Plan in order to facilitate State and local funding of research efforts.

Issues 6 & 7. <u>Infrastructure & Conservation/Recycling/Reuse</u>. Many commenters support conservation, and several characterize San Antonio as an area that wastes water. Other commenters oppose large expenditures for conservation, claiming that there is no proof of their cost-effectiveness. Some commenters strongly opposed enforcement of conservation methods as too much government meddling in private affairs. Suggestions were made to outlaw St. Augustine Grass, and to collect air conditioning condensate. One commenter recognized that Region L is the only region to adopt "advanced conservation" assumptions in projecting water demand, but questions why some municipalities should need so much more water per person than others in the same region and recommends adoption of consistent conservation goals for all entities. Another commenter expresses the view that per capita water use in Bexar County should be reduced to 125 gallons per day.

<u>Response</u>

- The RWPG agrees with most of the comments supporting conservation measures. It is important to note the full scope of conservation measures now included in the Plan.
- The Plan uses water demand projections prepared by TWDB that reflect conservation assumptions. The "expected" scenario for conservation used by TWDB incorporates the assumption that new construction will follow state and federal law and use low-flow toilets and other water saving features.
- The SCTRWPG Plan uses the water demand projections based on the TWDB "advanced conservation" scenario that results in approximately 7.5 percent less water demand in 2050 than would be shown under the State's "expected conservation" scenario, and a reduction in per capita water demand of 15 percent between year 2000 and 2050. The advanced scenario assumes not only state and federal requirements for plumbing fixtures used in new construction but also when retrofitting to replace older fixtures. The IPP also includes an Advanced Conservation water management strategy that further reduces municipal demand by about 8.6 percent of the projected water demand of the municipal

water user groups in 2050. The measures needed to reach these goals have been agreed to by SAWS, the urban demand center's largest water provider, and many are now being implemented. In addition, the Plan identifies Municipal Water User Groups in the South Central Texas Region with relatively high per capita water usage rates and urges their adoption of conservation measures. To stimulate wide adoption of such measures, especially among smaller cities, the Plan includes Water Conservation Planning Guidelines that describe each of the available technologies.

- Water Reuse is included in the Plan as a water management strategy for municipal water user groups and would meet approximately 15 percent of the year 2050 identified municipal needs.
- Water utilities of Bexar County, including San Antonio have a very aggressive water conservation program and are implementing reclaimed water use programs to meet 20 percent of future needs. Per capita water use in Bexar County is among the lowest in the South Central Texas Region, and the goal of SAWS is to reduce average day per capita use within its system to 135 gallons per person per day by about 2040. The RWP reflects a City of San Antonio per capita water use goal of 146 gallons per day during drought conditions (Table 1.1-4, Vol. I). Since water demand during drought can be expected to exceed average demand by more than 15 percent, a drought demand of 146 gpcd is consistent wih the Sierra Club recommendation of 125 gallons per person per day.
- SCTRWPG does not have authority to prohibit the use of any particular species of plants, but in water conservation planning recommends drought tolerant landscaping plants and grasses.
- Collection of air conditioning condensate is not identified as a viable option to meet needs of population concentrations, but can be included as a water conservation technique in Section 6 of the Regional Water Plan.
- The Texas water planning process uses data as reported by each individual water using entity; i.e., water demands of municipalities are computed using each respective municipality's own data. Likewise, water conservation is based on each municipality's data. The plan is consistent in that it considers each case on its own basis, and has included conservation potentials based upon the entity's data.

Issues 8 & 9. <u>Groundwater/Carrizo & Groundwater/General</u>. Like many of the comments concerning reservoirs, several expressed deep concern that rural groundwater resources in the Carrizo-Wilcox, Trinity and Gulf Coast aquifers might be depleted to satisfy urban demand. Irrigators in the western Edwards Aquifer area and farm operators in the Winter Garden area, who are supported by water from the Carrizo formation, fear that impacts of the Plan will severely impair their economic base. Region K cites inconsistency between Regions L and K as to groundwater supply availability from Bastrop County to Region L. Commenters from Wilson County expressed concern that planned pumpage from the Carrizo Aquifer could result in migration of oil and/or salty water into wells, and dry up wells in the outcrop. Another commenter asserts that water needs must be addressed on a permanently sustainable basis, and that the Plan fails to accomplish this, since water level declines are anticipated in the Carrizo Aquifer.

<u>Response</u>

- The Plan incorporates a policy of groundwater sustainability and respect for regulatory rules limiting withdrawals under permits issued by groundwater districts. The SCTRWPG has adopted a goal of groundwater sustainability as described in Section 6.3.5 of Vol. I. of the RWP.
- The Plan uses the groundwater availability figures provided by the Evergreen Underground Water Conservation District and by the Gonzales County Groundwater District Conservation regarding potential withdrawals from the Carrizo-Wilcox aquifer.
- The districts have the authority to issue permits and will consider possible restrictions and conditions during the permit review process.
- The RWPG believes that some comments received with respect to the Initially Prepared Plan should more properly go to the Edwards Aquifer Authority. Comments about "stealing" rather than buying water refer to the EAA permitting rules rather than the IPP.
- After meeting with representatives from SAWS, Mr. Burke of the Lost Pines Groundwater Conservation District agreed to recommend to Region K that Region K increase Bastrop County groundwater availability from 5,000 acft/yr to 5,450 acft/yr for the time period 2000 to 2050. Region K adopted this recommendation. As a result, the first decadel point

at which the Region L RWP reflects groundwater development in Bastrop County in excess of Region K's estimate of availability is 2030. Pumpage from Bastrop County under Region L management strategy Carrizo Aquifer-Gonzales and Bastrop (CZ-10D) is not planned to begin until 2040. Regions L and K agreed to footnote the years where the discrepancy exists and wait on the upcoming Groundwater Availability Model to determine the availability for Bastrop County.

- The following paragraph has been added to the description of the Simsboro Aquifer (SCTN-3c) Water Management Strategy in Volume I, Section 5.2.3 of the South Central Texas Regional Water Plan.

> "Projected pumpage associated with this management strategy is consistent with the Brazos G Initially Prepared Regional Water Plan (Milam and Lee Counties) for the entire 50-year planning period. Projected pumpage in Bastrop County after 2020, however, exceeds the current estimate of available supply adopted by the Lower Colorado Regional Water Planning Group (Region K). Periodic discussions between representatives of the South Central Texas and Lower Colorado Regions have focused on concerns regarding potential water level declines in the outcrop of the Simsboro Aquifer, three different groundwater models of the area, mitigation of impacts to affected wells, and equitable treatment of property owners within a groundwater district. Differences between Region L's projected pumpage and Region K's estimate of available supply are more than 20 years from the present while development of new Carrizo (Simsboro) Aquifer Groundwater Availability Models (GAMs) under Texas Water Development Board direction is to be completed by about 2002. Hence, it has been agreed that discussions will be more productive upon completion of the GAMs at which time additional scientific information will be available to both regions."

- It is assumed that similar and consistent language will be added to the Lower Colorado Regional Water Plan at the appropriate location.
- Simulations of the effects of Carrizo Aquifer pumpage from Wilson and adjacent Counties indicate that water levels will remain well above the top of the formation in all but the shallowest of outcrop wells. Care in the installation of new wells, proper maintenance of existing wells, long-term monitoring of water levels and water quality, as required by groundwater conservation districts, can provide information needed to respond to threats of migration of oil and salty water into wells.

- Groundwater modeling runs performed by HDR as part of this planning effort, produced simulated drawdowns in Wilson County of up to 75 feet, maintaining water levels within 100 to 200 feet of the surface. This information, however, is not intended to remove the need for more detailed groundwater modeling studies to provide more accurate projections of groundwater level impacts resulting from proposed or projected pumping levels.
- The SCTRWPG has adopted a goal of groundwater sustainability as described in Section 6.3.5 of Vol. I of the RWP. The simulated 50-year water level decline or drawdown associated with the Carrizo Aquifer – Gonzales & Bastrop Counties (Option CZ-10D) as included in the RWP is less than 60 feet (Figure 5.2-36, Vol. I).

Issue 10. <u>Desalination</u>. There are widely divergent views in the comments on desalination. Some express concern that the option is effectively ignored since it does not come into use until 2040. Others oppose desalination because of its environmental impacts and/or because of potential impacts on Victoria and other communities near the mouth of the Guadalupe River. Still others believe desalination of seawater to be the only viable and permanent solution to San Antonio's current and future water needs.

<u>Response</u>

- The SCTRWPG recognizes the potential of seawater as a long-term source of water supply. However, as indicated in the RWP, there are a number of less costly and more geographically proximate water management strategies that should be developed prior to desalination of seawater.
- This water management strategy is in the plan, to begin meeting needs in 2040. That date for implementation was chosen in the expectation that further research and development over the next 30-40 years will make the strategy more cost-effective.
- All environmental and third-party impacts will be studied before implementation occurs, and there will be many opportunities to raise these issues during both the research and permitting phases.
- The SCTRWPG has also recommended that the State fund demonstration projects of desalination, among - other alternative technologies.

Issue 11. <u>Authority/Study Process/Boundaries/Representativeness of RWPG</u>. Many comments touch on procedural aspects of the regional water planning process. Some commenters found fault with the representativeness of the RWPG, saying that the "public" interest needed to have more than one representative and that the rural public interest is not adequately considered. Others assert that the process has used inaccurate and/or incomplete data, especially about agriculture and that it was important to have additional sources of technical information available, particularly for lay members of the Planning Group itself. Other commenters assert that the planning process is flawed since it does not provide enough socio-economic impact analysis, especially of the impact of meeting urban water needs on the rural areas. One comment asserts that the plan does not meet committee's evaluation criteria (economics, flexibility, fairness, water quality, feasibility, efficiency, compatibility, reliability, and environment). Other criticisms of the process are that the evaluation criteria defined by the RWPG were not applied to some of the major water management strategies, that the consensus process was compromised by side-bar agreements and that the boundaries of planning regions in some cases have created barriers to cooperation.

<u>Response</u>

- The SCTRWPG has already made recommendations to TWDB on the planning process during the public comment period in October, 2000. The Regional Water Plan includes additional measures that would improve many aspects of the regional water planning process.
- One recommendation calls for a boundary change for the South Central Texas Region by adding the portion of Blanco County within the Guadalupe River Basin. This change would conform to the planned pattern of water supply to the area. That is the only boundary change agreed to by the RWPG. The Group has also recommended to TWDB that the regional planning boundaries not be viewed as barriers but as opportunities for cooperation.
- The RWPG has recommended that the planning groups have more and earlier involvement in the development of TWDB's water demand projections and has proposed that TWDB give greater flexibility to planning groups for responding to local water plans for future growth.

- The RWPG has discussed the issue of representation several times and believes that the present membership well represents the breadth of interests and the geographical scope of the South Central Texas Region while keeping the numbers of voting members to a workable level.
- The RWPG has proposed including in the study plan for the next planning cycle additional training and information resources for members in order to establish greater access to information on which members can base their decisions.
- The Group has also recommended inclusion of more socio-economic analysis in future planning. At present, TWDB rules provide for such analysis in three areas: 1) consideration of the impact of not meeting the identified needs for water; 2) consideration of third party impacts of voluntary water transfers; and 3) consideration of economic impacts of interbasin transfers.
- The SCTRWPG has recommended, as have most of the regional water planning groups, additional State funding for the development of basic ground and surface water data and for enhancement of systems to facilitate access to State water data for planning purposes.
- Regarding the use of the RWPG evaluation criteria, the criteria were never intended to be applied to water management strategies on a stand-alone basis, but rather to serve as tools for evaluating the integration of strategies into alternative regional water plans. The criteria were applied to each of the alternatives. Please refer to Section 7.1 (Vol. I) for additional information on the evaluation criteria.

Issue 12. <u>Endangered Species Protection</u>. Some commenters criticize the RWPG for not considering a "water management strategy" of litigation to challenge the application of the Endangered Species Act in the circumstances found in the Edwards Aquifer and the springs. Other commenters say that the IPP does not adequately consider impacts on endangered species, particularly with reference to habitat needs of the springs and in the bays and estuaries.

<u>Response</u>

- The Regional Water Plan is required to be developed under existing law. Federal and state law protection of springflows for endangered species calls for maintaining minimum rates of flow, the precise levels of which are still under investigation.
- The RWPG is also required to meet the identified water needs under existing law, and, in this case, that means identifying alternative water management strategies under conditions of the drought of record when the application of State and Federal law requires reductions in pumping from the Edwards Aquifer. The TWDB rules do not allow the RWPG to project the elimination or reduction of the identified need or shortage through litigation.
- The Initially Prepared Plan complies with TWDB rules regarding the evaluation of environmental impacts, including impacts on threatened and endangered species and on aquatic habitats in the bays and estuaries. Impacts have been evaluated according to the State's Consensus Environmental Criteria, which have been developed jointly by the Texas Water Development Board, the Texas Natural Resource Conservation Commission, and the Texas Parks and Wildlife Department. The rules require a reconnaissance-level study, however, not the in-depth review that would be necessary at such time as a particular strategy is presented for consideration by a regulatory agency.
- The SCTRWPG has addressed the issue of spring flows and inflows to bays and estuaries to the extent possible at this time. Refer to Section 6.3.6 Protection of Edwards Aquifer Springflow and Downstream Water Rights in Vol. I.

Issue 13. Population/Water Demand Projections. There are many comments criticizing the accuracy of population and water demand projections, especially from the more rural counties of the region. Some commented that water demand projections are too low, while one commented that projections for his city are too high.

Response

- Population and water demand projections will be revised based on the 2000 census in the next planning cycle, beginning next year.
- The Planning Group is required to use TWDB population and water demand data. The data for each county was circulated to county and municipal officials for comment, and proposed revisions for this region were considered and accepted by the TWDB.

- The Planning Group has adopted a recommendation for earlier and more active involvement of the RWPG's in TWDB's process of developing its population and water demand data, and has urged counties to become more active in reviewing the data and requesting modifications.
- The SCTRWPG does not disagree with complaints about the accuracy of TWDB data and hopes that more active involvement of all concerned will result in more accurate data in the next cycle of planning.
- Some comments reflect confusion about the TWDB planning terminology. The word "needs" in this context refers only to the shortage of water identified when available supplies are compared to the projected water demands. "Demands" is the term that refers to the entire quantity of future water use. Problems with the water demand data provided by TWDB should be addressed by the increased involvement of counties, cities and regional planning groups in the State process.
- Water demand projections in this Plan reflect the impact of advanced water conservation. Emphasis is upon increasing efficiency of water use in order to hold down the need for additional water supplies.

Issues 14 & 18. <u>Third Party Impacts to Economy & Ag. Water Rights Transfer</u>. As noted in relation to other issue areas, several commenters criticize the Initially Prepared Plan for its treatment of agriculture and rural areas. Many of the comments project major negative indirect economic and social impacts of the Plan and decry the absence of detailed analysis of such impacts. Some commenters predict disastrous impacts from particular water management strategies. One commenter inquired as to why irrigation cannot afford new water when irrigators are selling what they have? Another commenter states that analysis of economic feasibility of meeting irrigation needs is erroneous with respect to vegetables, and that additional consideration needed of impact of this plan upon future economic viability of rural areas.

<u>Response</u>

- The Regional Water Planning Group did not meet identified agricultural needs, with the exception of the advanced conservation strategy for irrigation, because it found that agricultural producers, under current conditions, could not afford the price of the water management strategies that were evaluated. The TWDB projects a long-term decline in water use by agriculture in this region for varied reasons that go beyond the scope of water planning and include the diminishing role of federal subsidies, rising costs of farm inputs, and international market conditions for the major crops of this region.

- The SCTRWPG included weather modification, brush management, and irrigation water conservation strategies, all of which are believed to have potentials to increase water supplies of the region, and thereby would be of assistance to all water user groups.
- SCTRWPG included the social and economic impacts of projected irrigation and other water shortages in Section 4.3 of the Regional Water Plan, Tables 4-24 through 4-28.
- The decisions about water permitting and the availability of groundwater for agriculture are made by the appropriate groundwater district, and each district will determine the amount of supply available for new well permits, restrictions on water production, and other matters, as authorized by State law. The Regional Water Plan emphasizes its respect for the rules and regulations of the districts and will stay in close communication with them during the next planning cycle. Rural economic and social impacts of new permits are likely to be considered at that stage.
- Some commenters want to see more comprehensive economic and social impact analysis of the water management strategies, most of which meet municipal needs, on the rural and agricultural economy and way of life. At present, the TWDB rules do not require such analysis for all strategies. The rules do require analysis of third party impacts for all strategies involving the voluntary transfer of water. This analysis is incorporated in the evaluations of the relevant water management strategies. The TWDB also carried out a socio-economic impact analysis of not meeting the defined needs for all Water User Groups and found that the South Central Texas Region could forego hundreds of thousands of jobs and billions of dollars in income if the projected water needs were not met.
- The RWPG has adopted a recommendation to the State requiring additional socio-economic analysis and also is reviewing proposals to add this analysis to the scope of work for planning activities in the next planning cycle.

- Some commenters urge that more Edwards water be transferred to municipal use than the IPP projects, but others believe that the transfers will undermine the rural economy. The amount of Edwards Aquifer water that can be transferred from agricultural to urban use is limited both by the Edwards Aquifer Authority Act, which allows the transfer of no more than 50 percent of an irrigation right to municipal use, and by market forces. The Regional Water Plan projects an amount of transfer that balances two factors, the existence of a voluntary water market that enables irrigators to make their own decisions about the best return on their groundwater permits and the potential damage to the agricultural economic base of rural counties if too much irrigation water is shifted to municipal use. The Plan projects the transfer of approximately 82,000 acft, an amount that appears feasible based on past experience with the local water market. Recent estimates, however, indicate that as much as 140,000 acft could be available for transfer out of irrigation. The SCTRWPG believes the transfer of that full amount could have unacceptable socio-economic impacts on agricultural areas. The following information illustrates current and historic levels of irrigation water use in the Edwards Aquifer Area. Both 1998 and 1999 were considered "dry" years for agriculture in the Edwards Aquifer Area. EAA began metering irrigation usage in 1997. Metered irrigation usage in 1999 was 113,600 acft. The historic high on record (1955—1999) is 203,100 acft and occurred in 1985. The 5-year average (1995—1999) is 119,960 acft/yr, and the 10-year average (1989—1999) is 106,210 acft/yr.
- One commenter addresses the third party impacts of desalination and the diversion of Guadalupe River flows at the Saltwater Barrier. The impacts of these projects will be reviewed thoroughly when project permit applications are submitted. In particular, TNRCC will review availability of surface water, impacts on bays and estuaries, the economic impact on the area proximate to the source of supply, and many other factors. If and when permit applications are submitted, there will be opportunity to address these issues in the TNRCC forum.
- Some irrigation farmers who are entitled to irrigation permits for the use of Edwards Aquifer water are finding that the financial returns from the lease or sale of parts of these permits exceed the financial returns from using the water to grow and sell crops. The estimated cost of new water that would have to be obtained at distances of hundreds of miles away are many times greater than the estimated financial returns from the use of

such water in irrigation in the South Central Texas Region now or in the foreseeable future. In addition, it should be noted that returns from the lease or sale of irrigation water can be used to install water conservation equipment and thereby increase the efficiency of water use and contribute to maintaining irrigation production that is important to the local economies.

- Data used in the analysis of economic feasibility of meeting irrigation needs were obtained from official sources, including the Texas Agricultural Extension Service at Uvalde and the TWDB irrigation files.
- The SCTRWPG believes that this Plan includes strategies with significant positive benefits to rural areas in the form of increased water conservation on farms, increased rainfall through weather modification, increased livestock and water production from brush management, and a cash market for water that is voluntarily transferred from rural areas to municipal demand centers. The SCTRWPG feels that these benefits should be computed and used in the deliberations of future regional water planning.

Issue 16. Irrigation Technology Center. Comments urge RWPG support of State funding for this proposed center that would provide access to urban and rural irrigation conservation technologies.

Response

- Responding to comments regarding the proposed Irrigation Technology Center described in a brochure from the Texas A&M University System, the RWPG has adopted a recommendation to the Legislature advocating funding for a center in the region as well as funding for existing centers at the University of Texas at San Antonio and the Southwest Texas State University in San Marcos.

Issue 19. Recharge - General. In addition to comments already addressed under Issue 1, commenters in this group raise a series of specific questions, which are addressed below.

Response

- Commenters state that the County of Uvalde has already built recharge structures in areas that option L-18 is to place them. The RWPG supports past work of the County of Uvalde to recharge the aquifer and believes that the proposed structures in L-18 would further enhance recharge in the area and would not interfere with existing structures.
- One comment opposes building recharge structures in areas that are candidate perennial Ecologically Unique Stream Segments, as identified by the Texas Parks & Wildlife Department. The RWPG has opened a dialogue with the TPWD regarding potential conflicts between planned recharge structures and the resource characteristics identified by TPWD as leading to their recommendations of designation as an Ecologically Unique Stream Segment (Section 8, Vol. 2). Most of the recharge dam sites are not in conflict with the identified resources. For recharge dam sites at which perennial streamflow is indicated, Consensus Environmental Criteria were applied.
- The RWPG agrees with many commenters that recharge of the Edwards Aquifer is an important strategy, but sees it as one among many important strategies that will be necessary to meet the identified needs of the municipal water user groups.

Issue 21 Public Education. Numerous comments address the need for water education programs, especially in the schools.

Response

- The RWPG agrees with comments about the importance of educating the public about water conservation, the Edwards Aquifer, and other water issues specific to this region. The group has adopted a recommendation to the Legislature for funding a statewide water education program that would include region-specific materials.
- The advanced conservation strategy (L-10) and the conservation planning guidelines attached to the report include public education as one component.

Issue 22a. Costs – General. Comments on cost focus on two areas: 1) the presentation of cost data in the IPP is said to be confusing and misleading; and 2) the cost of the proposed plan is excessive and will place undue hardship on the San Antonio area ratepayers. One commenter objects to the idea of having to incur costs in the present in order to reserve water to meet

future needs. One commenter feels that the Plan relies too heavily on expensive, out-of-region projects.

Response

- The issues of who pays for projects and how much they pay are beyond the scope of the planning study. The TWDB rules require that costs of a project from a source to a Water User Group be calculated. Issues of how that cost is paid and by whom depend on whether the relevant water providers agree to implement a given project, how they agree to share costs and how those costs are then distributed to different classes of ratepayers. These are implementation issues rather than planning issues. However the basic principle reflected in the Regional Water Plan is that the water user pays the cost.
- Some commenters state that cost effective measures within the Region should be used before going outside the Region for water. The RWPG believes that use of water from adjoining regions must be planned now since sufficient water within the Region does not currently meet all identified needs under drought of record conditions. The Plan can be modified if further research shows that these needs can be met from cost-effective and environmentally sound strategies entirely within the Region.
- Some commenters identify "local" options as "inexpensive" and "distant" options as "expensive." For example, there are many factors besides the distance between the source of water and the Water User Group that affect cost and planning decisions. Legal constraints on availability, feasibility questions, and impacts on the environment or on other water users are among many factors that can make water strategies using local sources as expensive as those using more distant water sources. The RWPG believes that any combination of water management strategies, given current legal constraints, will cost a great deal. One of the purposes of long-range planning is to disclose to water providers and to the public the costs of meeting the needs for water.
- Regarding comments that the Regional Plan's costs are "hidden" or "misleading," the IPP presents a cost per acft in a uniform manner wherever possible. The annual operating costs are given at the decadal years (2010, 2020, etc.), and all cost assumptions are presented in a technical appendix. A determination about whether the portion of the plan

to be implemented by any one water provider and its customers is "too expensive" will be made during the implementation phase.

- Some commenters state that the Regional Plan is the "most expensive of any plans considered by the committee." There were two alternative plans considered by the Regional Water Planning Group that had a higher average cost per acft over the 50-year planning horizon. During the more immediate planning horizon extending through 2030, the RWP is less costly than any of the Alternative Plans considered. More significantly, the RWP provides approximately 150,000 acft/yr more water than the alternatives considered earlier in the planning process. This additional amount is necessary to provide adequate supplies in light of possible drought condition reductions in the assumed planning level of Edwards Aquifer pumping for the Region. The Plan also includes strategies that may be necessary if other options prove not to be implementable. In other words, the final implementation may not include every listed strategy.
- The SCTRWPG recommends that those who are projected to need additional water begin discussions with potential suppliers to ensure that quantities needed can be obtained in a timely fashion.
- Only about 30 percent of the new water supplies identified in the RWP for development within the next 50 years originate outside of the planning region. The RWP generally reflects priority implementation of the least costly water management strategies utilizing water originating within the planning region.

Issue 22b. Costs – Specific. Questions were asked about present cost, per acft, for SAWS to produce and deliver water to the ratepayer/customer in San Antonio, cost, per acft, that Alcoa and LGBRA(sic) will charge for water to the terminus at the Lower Guadalupe River Diversion Project, cost, per acft, that Alcoa will charge for water at the pipeline terminus at the Simsboro project, cost, per acft, that LCRA will charge for water at the new Colorado River Diversion Project, and costs in comparison to WSC and SUDS? A comment was made that the discounted cost for the City of San Antonio is $10 billion, and that this is too high for a city with 20 percent of its population living in poverty. Another commenter states that the plan maximizes energy requirement by bringing major amounts of water from sea level to population center. .

Response

- The present cost for the San Antonio Water System (SAWS) to produce and deliver water from the Edwards Aquifer to a typical residential ratepayer in San Antonio is about $1.23/1000 gallons or $400/acft.
- The purchase price for water that may be obtained from the Guadalupe-Blanco River Authority (GBRA) at the Guadalupe River Saltwater Barrier is under negotiation at this time. GBRA presently sells stored water from Canyon Reservoir at a rate of $69/acft/yr. Note that the costs of diversion, storage, transmission, treatment, distribution, and other facilities necessary to provide water to the typical residential ratepayer will greatly exceed the cost for purchase of water.
- Pursuant to the current agreement between SAWS and the Aluminum Company of America (Alcoa), water will be provided to SAWS for a price ranging from $50/acft/yr to $130/acft/yr.- Note that the costs of transmission, treatment, distribution, and other facilities necessary to provide water to the typical residential ratepayer will greatly exceed the cost for purchase of water.
- The purchase price for water that may be obtained from the Lower Colorado River Authority (LCRA) at one or more locations on the Colorado River is under negotiation at this time. LCRA presently sells stored water from the Highland Lakes System at an inbasin rate of $105/acft/yr. However, this may not be the negotiated price for Colorado River water to the South Central Texas Region. LCRA has indicated that it plans to include in the ultimate price of water, financial considerations for mitigation that could be equal to the price of water, e.g.; mitigation costs may be 100 percent of the price of water that is ultimately negotiated. Note that the costs of diversion, storage, transmission, treatment, distribution, and other facilities necessary to provide water to the typical residential ratepayer will greatly exceed the cost for purchase of water.
- SCTRWPG does not have information about costs of individual WSC/SUD supplies. Average cost of SCT Regional Plan is $1.89 per 1,000 gallons of treated water at the wholesale delivery point.
- The costs of water of the Regional Water Plan were calculated according to TWDB Rules, which specified that all elements were to be calculated in second quarter 1999 prices, with

an interest rate of 6 percent for calculating debt service, and that facilities were to be amortized over 30 years, except off-channel and storage reservoirs, which were to be amortized over 40 years. These cost calculating rules were specified so that each option being considered would be evaluated and compared on an equal basis, insofar as costs are concerned. Capital or project costs for the projects (management strategies to provide the additional water to meet the projected needs of Bexar County) of the regional plan for Bexar County, in second quarter 1999 prices, are $4.0 billion. The cost of this additional water delivered to the wholesale distribution points, including debt service (principal and interest) on the $4.0 billion of project costs, price of water, and operation and maintenance costs of all facilities, including water treatment, and energy for pumping water over the next 50 years is calculated to be $12.7 billion, or about $0.25 billion per year, in 1999 prices.

- The TWDB calculations of economic impact in Bexar County of not meeting the projected need for this new water is $25.7 billion per year in 2010, and increases to $41.7 billion per year in 2030, and to $60.5 billion per year in 2050. The impacts on ratepayers can only be determined by the local water providers at the time of implementation.
- The cost of implementing the plan is a small fraction of the annual economic impacts of not meeting the needs. See Tables 4-24 through 4-28 for information by county, city, and water user group in each county as to impact to population, school enrollment, gross business, employment, and personal income.
- The RWP does require significant quantities of energy to move water.
- Individual water management strategies in the RWP that affect springflows were evaluated as to effects upon springflow. The quantity of pumpage from the Edwards Aquifer during drought is a placeholder number awaiting an approved EAA Habitat Conservation Plan.

Issue 23. Local Government Code/County Authority. Several comments propose that County government have new authority to manage growth. Four County Judges propose a new State law requiring groundwater districts to give first priority to meeting the needs of residents of the district, to add scientific and impact analysis tests for the permitting of groundwater for

use outside the district and to mandate monitoring wells for such use, and empowering Counties to enact measures designed to compensate for the loss of exported groundwater.

Response

- The RWPG has included a recommendation to the Legislature to enhance County regulatory authority.
- The RWPG has included in the RWP its own guiding assumptions concerning respect for the regulations of groundwater districts, the importance of monitoring groundwater use, the need to minimize and mitigate impacts of groundwater use and the overall goal of groundwater sustainability. Consideration of additional proposals can occur in the next planning cycle.

Issue 24. Rule of Capture. Some commenters advocate repeal of the rule of capture. Others defend the existing property rights regime.

Response

- The RWPG is required to follow existing groundwater law.
- The Planning Group has adopted a recommendation supporting the findings of the TWDB-sponsored consensus report: "The Future of Groundwater Management in Texas," with the exception of that report's recommendation to repeal the junior water rights provision of Senate Bill 1. As noted in Section 6.6, the SCTRWPG takes no position on the junior water rights provision.
- The RWPG has not adopted a recommendation on the rule of capture.

Issue 25 Junior Water Rights Provision/Interbasin Transfers. Some comments call for repeal of the junior water rights provisions of SB-1, but others say that reliance on those provisions will help rural areas defend themselves from water management strategies to export water. One commenter believes that the focus of the Plan is upon obtaining water from other regions and from Region L's estuaries and ignores sources closer to the urban demand center.

Response

- Regarding comments on the merits of the junior water rights provisions of SB 1, the RWPG is required to follow existing law. The Planning Group has adopted a legislative recommendation recognizing the validity of opposing views on the subject of the junior water rights provision and interbasin transfers, but is taking no position on whether or not these provisions of SB 1 should be changed.
- Some commenters state that it is unwise or wrong to move water from one basin to another. The RWPG believes that the extensive needs for water in Region L under drought conditions will likely require importation of water across river basin boundaries. These transactions will involve willing buyers and sellers and will be closely evaluated by TNRCC as to their economic impacts in the originating basin. Questions of equity will be addressed in those proceedings.
- The focus of the plan is upon maximizing use of the region's resources, including advanced water conservation, use of reclaimed water, aquifer recharge, aquifer storage and recovery, and use of streamflows from the region's rivers. Water will be purchased from owners of water rights or permits.

Issue 26. Simsboro Aquifer/SAWS-Alcoa. Some commenters oppose this water management strategy based on cost, groundwater impacts, its association with Alcoa, and lack of need, among other factors. Other commenters expressed their view that the HDR models inaccurately predicted increases in water levels between 2000 and 2040, and underestimated drawdown that has already occurred.

Response

- The TWDB Rules specify that existing contracts and agreements be recognized. The contracts among SAWS, Alcoa, and CPS provide for the beneficial use of water currently being extracted to facilitate ongoing mining operations and provides for the production of additional supplies from private property subject to groundwater district rules applicable to other property owners within the district.

- The RWPG believes that this strategy is needed as part of an overall plan. Many issues raised by opponents will have to be dealt with by the parties directly involved in the course of permitting processes before the project can be implemented.
- The RWPG recognizes that there are differences between its Regional Water Plan and the IPP of Region K. The SCTRWPG has responded to the "Nine Points" presented in the Region K plan as a basis for negotiating water transfers from Region K to the South Central Texas Region (see Issue 39). It has also responded to the Region K projections of groundwater availability from the Carrizo Aquifer in Bastrop County, which differ from the projections in the South Central Texas Regional Plan at year 2030 and beyond. Differences prior to 2030 have been eliminated through discussions, but differences remain beyond that date.
- The rise in predicted water levels in the HDR model was due to initial water levels that were set slightly too low. A revision of the initial water levels in the model showed that simulated water levels in the area of interest would fall by about 3 feet less after 50 years than those calculated by the original model.
- The calibration process used by HDR stressed matching hydrographs of water levels in key observation wells instead of a simple comparison of measured and calculated water levels at the end of the simulation. The approach used by HDR allows one to consider starting conditions, changes in water levels that occurred during the calibration period (1951—1996), and locations of observation wells. In Lee and Milam Counties, the difference between measured and water levels calculated by the HDR model was usually less than 20 feet.

Issue 30. LCRA Project. Some commenters oppose this component of the RWP on the basis that Region L would pay the total cost of the water, when half of the water would be used by Region K. Others oppose the project because of its overall costs, the unreliability of the supply and/or its environmental impacts on instream flows and inflows to bays and estuaries.

Response

- All issues of allocating costs and benefits will be decided by the relevant parties to the proposed strategy, and any agreement reached could be subjected to scrutiny by the

TNRCC under the provisions of SB-1 and/or other applicable law concerning interbasin transfers. As described in the RWP, this management strategy includes all facilities necessary to develop the supply under the LCRA proposal. Such facilities include diversion works, off-channel storage, wells, transmission pipelines, water treatment plants, and distribution system improvements. Potential sharing of costs for some of these facilities is the subject of on-going negotiations. The estimated cost for purchase of water from the LCRA shown in the RWP is based on LCRA's current in-basin rate of $105/acft/yr plus a 25 percent out-of-basin surcharge. Ultimate costs for purchase of water will be a subject of negotiation.

- The version of the project proposed by the Lower Colorado River Authority (LCRA) firms up the variability of supply from the natural flow of the Colorado River through the use of off-channel storage, groundwater, and stored water from the Highland Lakes.
- The SCTRWPG understands that the LCRA has a state-approved instream flow plan under which LCRA has made the New Colorado River Diversion proposal. However, LCRA is continuing assessment of potential environmental impacts associated with the New Colorado River Diversion.

Issue 31. <u>Downstream Bays & Estuaries</u>. Several commenters have mentioned concern about adverse impacts on bays & estuaries that could result from one or more of the proposed management strategies in the RWP.

<u>Response</u>

- These impacts have been evaluated at a reconnaissance level under the State Consensus Environmental Criteria on instream flows and freshwater inflows to bays and estuaries. The State's Consensus Environmental Criteria were developed jointly by the Texas Water Development Board, the Texas Natural Resource Conservation Commission, and the Texas Parks and Wildlife Department. At such time as the relevant strategies are presented for permitting by TNRCC, they will be subject to further and extensive review with regard to associated impacts. Should any of these projects fail to meet both State and Federal criteria, they will either have to be modified or mitigated or will not be permitted.

- Cumulative impacts of the RWP include 1.3 percent (~19,000 acft) and 3.0 percent (~14,000 acft) reductions in mean annual freshwater inflows to the Guadalupe and Nueces Estuaries, respectively. LCRA information indicates that there would be no change in LCRA'a state-approved plan for freshwater inflows to Matagorda Bay.

Issue 32. Rules/Pumping Levels of EAA. One commenter urges the RWPG to use a draft EAA recharge credit rule to evaluate the Recharge and Recirculation strategy. Others are critical of EAA rules regarding permitting, forfeiture and other issues. One commenter asks if the Plan affects private residence wells in the Edwards Area, and observes that index wells in San Antonio are not a reflection of water levels in Medina County. One commenter feels that a sustainable yield concept applied to recharge understates the benefits and does not provide an equal comparison to other sources. One commenter recognizes that the assumption of 400,000 acft/yr of Edwards pumpage is valid for conservative assessment of water availability from downstream run-of-river options, but emphasizes that the 340,000 acft/yr Edwards pumpage used for assessment of current supply is a "place holder" until EAA completes its Habitat Conservation Plan as continuous pumpage of 340,000 acft/yr from the Edwards could seriously impact Comal and San Marcos Springs.

Response

- The SCTRWPG recognizes that there are uncertainties about the final form of EAA rules concerning such critical issues as recharge credits, additional reductions in pumping, and other matters. As these rules become final, the Regional Water Plan will be reviewed and may be amended in response to different legal requirements. The Regional Water Plan reflects current rules and planning assumptions accepted by members of the RWPG.
- The Plan has no effect on private residence wells. EAA rules and permits apply.
- EAA procedures account for local differences, using multiple key monitoring wells. The SCTRWPG has applied EAA draft Critical Period Management rules in the planning process and respects the EAA groundwater management plan.
- The sustainable yield concept was specifically adopted by the SCTRWPG for consideration of recharge enhancement projects so that they could be equitably compared to other projects on a firm yield or drought-of-record supply basis as required by TWDB

Rules for regional water planning under SB1. Furthermore, incremental increase in sustained yield of the Edwards Aquifer is one of the methods under consideration by the EAA for issuing permits for the recovery of enhanced Edwards Aquifer recharge.

- The SCTRWPG agrees with observations and concerns about Edwards Aquifer pumpage levels of 340,000 acft/yr to 400,000 acft/yr and has taken this into account in its plan for the development of sufficient additional water supplies (management supply) to protect springflow.

Issue 33. <u>Cumulative Effects Analysis</u>. One commenter believes environmental issues are an "afterthought" of the Initially Prepared Plan and calls for an assessment of the overall plan to evaluate cumulative impacts.

<u>Response</u>

- In response to comments that the IPP lacks any cumulative environmental impact analysis, each alternative plan and the Regional Water Plan, were evaluated for cumulative environmental effects over the 50-year planning horizon. Details of the methods and assumptions of these analyses are included in the Regional Water Plan, especially in Sections 5.2.3 and 5.2.4 of Vol. I. Substantial additional information regarding potential environmental concerns associated with implementation of the RWP and evaluation of alternative plans and management strategies may be found throughout Vols. II (especially Section 8) and III. The RWPG recognizes the limitations of these analyses, if only because the details of implementing each strategy cannot be known with precision at this time.
- The RWPG has discussed the problem of the regulatory agencies regarding each strategy on a stand-alone basis and have urged both State and Federal regulators to view each strategy in the context of an entire plan.

Issue 35. <u>Aquifer Storage & Recovery (ASR)</u>. Some comments express support for the use of ASR but also note a concern about the compatibility of mixing water of different chemical composition.

Response

- The ASR project in the plan will receive close scrutiny during the permitting process. Injection wells for this purpose are regulated by TNRCC. Drinking water standards must also be met for any water delivered to a public water supply system.

Issue 36. Mixing Surface and Groundwater. One commenter expresses concern about the mixing of aquifer and surface waters for delivery by water utilities, citing potential chemical incompatibilities. Another expresses concerns regarding feasibility of aquifer storage & recovery project(s) with respect to compatibility.

Response

- These are points well taken and an important concern of any water utility as part of its systems operations. Each case has to be reviewed for specific problems, and this will be dealt with at the level of each water provider's decision process.
- SAWS is presently conducting studies to address concerns regarding compatibility of waters from sources including surface water and groundwater from the Edwards and Carrizo Aquifers.

Issue 38. Technical Questions not Included in Issues Listed Above. One commenter raised questions regarding sources of supply for Kendall County, as follows: Who is the major provider? Source of funds? Source of water? How deliver water? When water available? Why other strategies not considered? How protect private wells?

Response, in order of questions listed above:

- May be either GBRA, SAWS, BMWD, or other to be organized.
- Rates to customers for water used.
- Major providers sources.
- Pipelines.
- Some within next 2 years, and more later, as needed.

- Others included are municipal water conservation, brush management, weather modification, and rainwater harvesting.
- Newly formed undergroundwater conservation districts.

One commenter states that water demand projections are too low by an order of magnitude, and advocates a pipeline system including South Central Texas Region, Dallas, and Far West Texas that would be supplied via desalted seawater

Response.

- Unlikely public support for suggested pipeline distribution system to large areas of Texas at this time.

Texas Nursery and Landscape Association requests that definition of agriculture include horticultural products.

Response

- Nursery and garden centers located in cities are commercial customers of municipal systems and are included in municipal demands. Growers are included in agriculture to the extent that data are available. The TWDB should work with the nursery and ornamentals industry to develop water use data and growth projections for use in future water plans.
- The SCTRWPG has no authority in the matter of definition of water users insofar as permit or pumpage fees are concerned.

EAA requests SCTRWPG recommendations for water supply options provided to EAA from final plan include only options to be used in EAA's jurisdiction.

Response.

- SCTRWPG's technical consultant is reviewing EAA's consultant's tabulation of the data.

One commenter inquired as to how rural areas are to be supplied.

Response

- For housing subdivisions, public and private water suppliers form water systems and arrange to obtain water supplies either from nearby groundwater sources or by purchase from regional systems and suppliers. Individual households and businesses install their own systems.

A local government official inquired as to whether of not water in the Plan is reserved for the entity identified with need, or is the water available to others.

Response.

- Water in the Regional Plan is not necessarily reserved for the entities to which it has been tabulated. However, under SB1, neither the TWDB nor the TNRCC can provide funding or permits, respectively, for projects that are inconsistent with the Regional Plan. Therefore, there may be some degree of reliability of supplies for entities in the Plan.

One commenter states that the Plan should provide the public with a list or map of the stream segments identified by TPWD as ecologically significant and indicate which of the proposed options would affect them.

Response

- The list is included in Volume 2, Section 8, Tables 8-4 and 8-7. There are 26 segments included on the TPWD list.

Two commenters made the following comments regarding the planning process and the flow and availability of planning information:

- ***Legislative intent of "Grass Roots" planning frustrated by lack of timely and important information.***
- ***No resources were provided SCTRWPG to present a forum for discussion of issues from outside Texas with history and experience in water policy issues such as transfer of water from agriculture to urban use, concepts and theories of water banking. economic definitions and sustainability, ethics of consensus building, or leveraging of state funds to ensure local government accountability in planning, growth management and policy.***
- ***During last 3 months, significant changes appeared in plan over night.***

- ***Delays in groundwater policy matters and EAA studies furnished too late.***
- ***Future of Groundwater Management in Texas incomplete and without dissenting opinion.***
- ***EAA recommendations not received by SCTRWPG.***

Response

- The SCTRWPG followed the planning rules and procedures of the TWDB, including use of data provided.
- All deliberations, including process to include options and strategies in Regional Plan were done in posted open meetings and complied fully with the Texas Open Meetings Act
- Information was available to all RWPG members, and was used during the time available.
- Information from the TWDB---sponsored consensus report; "Future of Groundwater Management in Texas"---was not brought to bear during development of the Regional Plan, and is being considered for inclusion in the Legislative Recommendations only.
- The EAA preliminary plan was timely delivered to the RWPG in December of 1999. Options and strategies of the EAA Plan were included in RWP and multiple alternative plans, in accordance with SCTRWPG procedures.
- The SCTRWPG acknowledges that much has been learned during this first planning cycle, and it intends to apply the lessons learned in future cycles to improve the process.

One commenter observes that there is no mention of the amount of water available from the lining of irrigation canals from the Medina Lake System managed by BMA.

Response

- Management strategies involving reduced irrigation demands (through canal lining and/or other conservation measures) and resulting enhancement of Edwards Aquifer recharge were removed from the RWP at the request of BMA and BMWD.

Commenters from Comal, Hays, and Guadalupe Counties and the Guadalupe-Blanco River Authority (GBRA) found and called attention to technical errors in the listing of water supply data for GBRA customers, including the allocations of existing supplies from Canyon Lake,

and the allocations of potentially new supplies from Canyon Lake that can be made available when GBRA's permit application pending before TNRCC is approved. In addition, one commenter has noted that the Hays/IH35 Water Supply Project, which is currently in the implementation, was not noted in the IPP.

Response

- The Technical Consultant has conferred with representatives of the entities involved, and made the necessary corrections and/or changes. It is important to note that the corrections and changes did not affect the RWP, except in the scheduling of when some water management strategies will be needed. In particular, the need for Lower Colorado River water from the proposed Bastrop diversion has been delayed from about 2010 to after 2020. In addition, the changes contribute to increased efficiencies during implementation, in that locally available supplies can be used to meet more of the projected near term rural area demands, with replacement supplies from more distant sources being scheduled at later dates. A part of these results is due to the principle that when water supplied by GBRA to customers outside GBRA's statutory service area is needed within its service area, it will be returned to meet needs of the service area. Quantities of such water now under contract to customers outside the service area were reallocated to meet needs within the service area, as of the dates these contracts are scheduled to expire. Likewise, in the RWP, water management strategies were included to meet the needs of those whose GBRA contracts are scheduled to expire. The RWP includes the Hays/IH35 Water Supply Project being implemented by GBRA.

Issue 39. Region K Policy Statement. Region K requested that Region L adopt Region K's 9 policy points for a framework within which Regions L and K can continue discussions.

Response.

Region L's perspective is presented below for each of Region K's conceptual elements using Region K's headings.

1. A cooperative regional water solution shall benefit each region.

Certainly we should strive for solutions that improve both regions' water supply situations. However, we think it is more appropriate that the criterion should be no worsening of our respective situations with interregional solutions. The statement about protecting the water resources of the LCRPA seems to be too general to have meaning for purposes of guiding future discussions. We believe our first priority should be providing adequate water supplies for our regions.

2. **Lower Colorado Regional Planning Area (LCRPA) water shortages shall be substantially reduced in exchange for an equitable contribution from the LCRPA to meet the municipal water shortages in the South Central Region.**

Reduction of shortages in LCRPA could be one of the benefits of our joint efforts. Reduction of shortages that could be satisfied by the LCRPA without interregional coordination should not be the burden of Region L. We understood from our previous discussions with you that most of your LCRPA shortage is irrigation demand that cannot be met because the economics of agriculture do not allow the development of new supplies for that use. We do not expect that the municipal and industrial users, who will pay for the distant supplies, can afford to contribute to meeting that shortage in a substantial way. The "substantially reduced" criterion for meeting irrigation shortages is too stringent.

3. **Proposed actions for interregional water transfers shall have minimal detrimental social, economic and cultural inputs.**

The South Central Texas Regional Water Planning Group (SCTRWPG) has adopted criteria to guide the selection of water supply solutions. They are compatibility, economic impact, efficiency, environmental impact, fairness, feasibility, flexibility, reliability and water quality. We will apply the criteria universally to all contemplated solutions and will strive to minimize impacts of any solutions regardless of location. The State has regulatory mechanisms in place to ensure that potential impacts are identified, quantified and addressed. These protections should be sufficient.

4. **Regional water plans with exports of significant water resources shall provide for the improvement of lake recreation and tourism in the Colorado River basin over what would occur without water exports.**

We are not sure why integrated solutions should be burdened with meeting demands that are not required to be met within the context of SB1 Regional Planning. Perhaps more dialogue will help here. We do not believe this is an appropriate criterion. However, to the extent that exports of water from the Colorado River basin generate resources or cash, such results can be used at the discretion of those who benefit to improve recreation or other activities of the basin.

5. **Each region shall determine its own water management strategies to meet internal water shortages when those strategies involve internal water supplies and/or water demand management.**

Generally, we agree that internal decisions should be made by the local regional planning group. Some flexibility in the general rule would be required to create a proper atmosphere within which interregional solutions could be creatively imagined.

An internal decision to pursue a local strategy should not preclude the use of a particular supply in an interregional solution if there are other ways to meet that local need.

6. **Cooperative regional solution shall include consideration of alternatives to resolve conflicts over groundwater availability.**

In your letter, you reference specific contracts held by the San Antonio Water System. As you know, it is beyond the purview of the regional planning groups to interfere with existing contracts and on-going projects. While we are sensitive to your concerns, it is not a matter for the South Central Texas Regional Water Planning Group to address as a whole. Any alternative to these contracts and proposed projects that you would suggest must be acceptable to all parties to these contracts. We suggest that you offer specific alternatives for consideration by the San Antonio Water System. If these alternatives are acceptable to the contract parties, the South Central Texas Regional Water Planning Group will consider them.

We also take note that Region K's proposed groundwater policy conflicts with our thoughts on groundwater management. The South Central Texas Regional Water Planning Group has not yet formulated policy recommendations to the legislature and therefore cannot comment directly on the draft policy. We look forward to discussing these issues with you further.

7. **Any water from the Colorado River would not be guaranteed on a permanent basis.**

We believe it is beyond the purview of the planning groups to set contract conditions or limitations for water sales between sellers in Region K and buyers in Region L. Conditions such as these will be the subject of negotiations between the sellers and buyers in water supply contract negotiations and subject to state regulations as administered by TNRCC. Unappropriated flows, to the extent that they may be available, belong to the state and should be available for appropriation subject to the limitations in law. Consideration should be given, however, to the anticipated future development of currently appropriated flows in the LCRPA plan.

8. **Any water from the Colorado River shall make maximum use of inflows below Austin.**

We will use economics, environmental impacts, availability of water and the other criteria discussed above to guide the selection of projects. Certainly we want to pursue projects that make sense for the basin of origin. We would prefer that this criterion be balanced and written in the positive. Specifically, it should be the objective of both regions to pursue projects that maximize the use of existing reservoirs for purposes of firming up interruptible supplies for all potential uses.

9. **Export from the Colorado River shall comply with the LCRA interbasin water transfer policy.**

We are well acquainted with LCRA policy on interbasin transfers and do not expect the LCRA to take any action that is inconsistent with their policy.

Following is one criterion that we think should be added, and Region K is requested to offer balancing language as Region L has for Region K's criteria.

1. The objective of the SB 1 planning effort is to provide water for all citizens of the state. The regional planning boundaries are a convenience for planning purposes and should not be taken as barriers to the movement of water from willing sellers to willing buyers, subject to applicable state regulations.

The South Central Texas Regional Water Planning Group approved this response at its regular meeting on June 1, 2000, and directed that it be transmitted to Region K via letter. The south Central Texas Regional Water Planning Group also approved at the April 6, 2000 meeting the analysis by Region L's technical consultant of additional options that were scoped subsequent to the meeting of the subgroup from Regions L and K on March 6, 2000.

Issue 40. Texas Parks and Wildlife Department Comments on Region L IPP. The Texas Parks and Wildlife Department provided General Comments and Comments on Volumes I, II, and III. The comments are summarized, and responses are given to the summaries.

General Comments:

The Plan tends to provide good to excellent summaries of environmental information, implement Consensus criteria when appropriate, and discuss potential and probable impacts of various options. However, the discussions associated with each option tend to minimize impacts without substantiation, and fail to address cumulative and/or existing impacts, and the adequacy of Consensus environmental criteria to provide adequate instream and bay and estuary flows. Environmental implications could not be located for some components of the Plan, and the regional plan made little effort to identify springs that would be negatively affected by implementation of various water management strategies.

Response:

- The discussions in Volume III contain cautions to use in projecting the potential impacts of projects of the Plan, whose facilities at this point can only be generally located and described. At the implementation phases, field surveys will be needed.

- It is the professional judgement of the environmental analysts that the consensus planning criteria provide adequate streamflow protection to the Region L reaches proposed for development, e.g.; the Consensus criteria put into place by agreement among TWDB, TPWD and TNRCC were used in the evaluations.
- The Phase 1 work (Technical Evaluations of South Central Texas Region Water Supply Options, October, 1999), and the LCRA publication footnoted on page 5-102, Volume I, provides information about the Colorado Diversion option.
- Regarding springs, an attempt was made to identify both potentially affected springs and changes in surface water hydrology in streams crossing the recharge zones of both the Carrizo and Simsboro Aquifers. Potential streamflow changes were found to be negligible over and below the Simsboro outcrop, but substantial in some of the Carrizo scenarios. No springs were found that would be affected by the proposed Simsboro projects, but comparable information was lacking for springs potentially affected by the Carrizo projects. The Carrizo and Simsboro options were modeled and simulations were made of effects upon streamflows and aquifer levels.

<u>Comments on Volume I (Executive Summary and Regional Water Plan)</u>: Executive Summary does not contain potential and probable environmental impacts of each water management strategy. In addition, specific comments were made about: (a) state and federal protected species, (b) Edwards Aquifer pumping limits, as related to the 340,000 acft/yr of the Plan, (c) meaning of dependable supplies of Canyon Lake in relation to spring flows, (d) lack of discussion of relative contributions of each spring to base flow of the Guadalupe River, (e) more detailed discussion of flora and fauna of the region is needed, (f) list of springs, including those that no longer flow, should be expanded, (g) water quality discussion inadequate, (h) some organization names are incorrect, and (i) index used to give environmental rank is inadequate.

<u>Responses:</u>
With respect to comments regarding technical points, clarification, rewording, corrections, and additional information was added to the text. Specific changes are referenced and listed below.

- ES-7 2nd Paragraph, 2nd sentence replaced with: These species are listed by County in Appendix D (Volume III) with notations concerning their habitat preferences and protected status, if any.
- Section 1, Page 1-10 (1.2.4.2) 1st paragraph replaced with: An overview of the environmental and cultural resources setting of Region L is presented in Volume I Section 5.2.5, and more specific discussions of resources and impacts are presented in the previously completed Phase 1 work (Technical Evaluations of South Central Texas Region Water Supply Options, October, 1999), and in Volume III of this series.
  - Virtually all wildlife habitat in the South Central Texas Region is on privately owned farm and ranch land. Region L encompasses a large and physiographically diverse area, including substantial portions of the Edwards Plateau, Blackland Prairies, and South Texas Plains, each of which exhibits a relatively characteristic array of vegetation types and plant species that reflect local geology, soils, land use, and climate. Because local physiography and vegetation tend to be the primary determinants of both terrestrial and aquatic wildlife habitat, the composition and relative abundance of wildlife populations varies substantially within Region L. In addition to the habitats and wildlife species common throughout Texas, Region L also contains areas of exceptional habitat, such as the southern and eastern margins of the Edwards Plateau, where high concentrations of rare or endemic species may occur.
  - Replaced last sentence, second paragraph with: These species are listed by County in Appendix D (Volume III) with notations concerning their habitat preferences and protected status, if any.
  - In third paragraph replaced "...underground aquatic..." with "...important aquifer..."
- *Eurycea* taxonomy used was that in current TPWD lists and publications.
- In Section 5, Page 5-92 1st Paragraph, replaced, "...underground aquatic..." with "...important aquifer..."
- In Section 5, Page 5-100 3rd Paragraph, replaced, "...Natural Heritage Program..." with "...Texas Biological and Conservation Data System maintained by the Texas Parks and Wildlife Department Wildlife Diversity Branch..."

- With respect to dependable supplies of water from Canyon Reservoir, the point is that when spring flow declines to certain levels, it becomes necessary to pass through inflows to Canyon to meet downstream water rights that would otherwise have been satisfied from streamflow, a part of which would have been from spring flow.
- With respect to the environmental scoring used in the Plan, if specific weightings could have been identified, perhaps a somewhat more meaningful approach could have been considered. The challenge is to develop a method of objectively comparing the potential impacts of Water Management Plans, each consisting of sets of individual Water Supply Options that encompass a wide range of locations, habitats and resources, and an equally diverse array of construction disturbances and long term management needs.

Comments on Volume II Technical Evaluations of Alternative Regional Water Plans: Organizations have been dissolved (TOES), names have changed, the list of species are not necessarily complete, and the statements about impacts of Colorado River diversions upon Matagorda Bay were questioned.

Responses:

- Volume II, Environmental Assessment Section, Page 8-2 1st Paragraph; the TOES list is useful for the purposes mentioned. In addition, it is somewhat unclear as to why the reviewer, while dismissing the TOES lists as having "no legal basis" recommends additional work to unearth "...the numerous other rare and endemic species..." that are not included on U.S. Fish and Wildlife Service, Texas Parks and Wildlife Department and TOES lists, but which, unlike the TOES species, are necessary to "...fully evaluate..." the proposed alternatives.
- Volume II, Environmental Assessment Section, Page 8-7 1st Paragraph; means that diversions would be made at high flow regimes where the amount of water diverted is small in proportion to total flow. The Lower Colorado River Authority has represented to the RWPG that the proposed diversions would be consistent with meeting the inflow needs set forth in Freshwater Inflow Needs of the Matagorda Bay System (Martin, Q., D. Mosier, J. Patek, and C. Gorham-Test, 1997, Lower Colorado River Authority) and with the existing, approved management plan for the Lower Colorado River.

Comments on Volume III Technical Evaluations of Water Supply Options: The following comments were made: (a) for consistency, the scientific and common names of organisms shuld be noted on first mention and the common name used thereafter; (b) organizations and organization names have changed; (c) there is an effect of changing location of pumping centers upon spring flows; (d) there is strong concern that brush management option could disrupt the ecological integrity of rivers, streams, springs, and riparian zones; (e) desalination of seawater is comparatively costly source of water but may be a low cost to environmental preservation; (f) effects of recharge enhancement may be understated; (g) effects of recharge upon aquifer dwelling species using water from sources outside the Edwards catchment areas

not adequately evaluated; and (h) need to correct names of species, give habitat preferences of species, and give locations of habitats for individual species.

Responses:

With respect to comments regarding technical points, clarification, rewording, corrections, and additional information was added to the text. Specific changes are referenced and listed below.

- Section 1, Page 1.2-10, 3rd paragraph: By definition "urodele" refers to salamanders, newts, and other amphibians that retain their tail throughout life, and "anurans" refers to frogs, toads, and tree toads, etc. Changing these terms to "frogs, toads, and salamanders" would unnecessarily constrict and change the meaning of this phrase.
- Section 1, Page 1.2-11, 2nd paragraph: Replaced "…Natural Heritage Program…" with "…Texas Biological and Conservation Data System maintained by the Texas Parks and Wildlife Department Wildlife Diversity Branch…"
- Section 1, Page 1.2-12, Table 1.2-5: The dates of TOES publications used as sources are referenced in each species table. Designations by TOES were not considered comparable to federal and state lists and were not considered in quantitative evaluations of the water supply options. The environmental consultant believes the TOES lists are useful as an additional source of information. Information on *Eurycea* salamanders was obtained from TPWD.
- Section 1, Page 1.4-13, Table 1.4-3: See previous comments concerning TOES.
- The "…C2 and C3 designations were removed and, the species were left for all other species in all species tables (in all volumes).
- Section 1, Page 1.9-9, 3rd full paragraph: Replaced "…wildlife management area…" with "…Wildlife Management Area…"
- Section 2, Page 2.4-10-11, Table 2.4-1: See previous comment concerning *Eurycea* salamanders.
- Guadalupe bass is listed on the TPWD county list of rare species for Bexar County (4/29/99).
- All common names were capitalized in the tables as a formatting procedure.

- Section 2, page 2.4-16, 2nd full paragraph: Replaced "…*myotis*…" with "…*Myotis*…" and "…*Rhadina*…" with "…*Rhadine*…"
- Section 3, Page 3.2-13, Table 3.2-2: See previous comments on Guadalupe bass and C2 designations. The life history of the Texas Asaphomyian tabanid fly is currently being researched.
- Section 5, Page 5.1-7, 2nd full paragraph: Replaced "…Terrapene…" with "…turtles…"
- See previous comments on anurans and urodeles.
- Section 5, page 5.2-17: Deleted "…byUSFWS as a candidate (C2) for protection and…"
- replaced "…*calgeii*…" with "…*caglei*…"
- Appendix D:
  - See previous comments on *Eurycea* salamanders.
  - Habitat information for *Haideoporus texanus* was obtained from TPWD county list of rare species (See Comal County -1/19/99). Only species on TPWD county lists were included in this table.
  - Habitat information for *Stygoparnus comalensis* was obtained from TPWD county list.
  - Guadalupe bass is listed on the TPWD county lists of rare species for several counties.
  - *Cheumatopsyche flinti* is on the TPWD county list for Hays County.
  - On page D-21 in the habitat preference section for *Protopila arca* replaced "…an Artesian well in Hays County…" with "…the upper San Marcos River…" [although the incorrect information remains on the TPWD county list]
  - Habitat information for Texas wild-rice was obtained from TPWD county list.
  - .The term "… subaquatic…" was taken from a TPWD county list.
- Appendix E
  - The rare species listed here are taken from the TPWD county lists of rare species.
  - See previous comment concerning *Cheumatopsyche flinti*.
  - On page E-1 replaced "…*Stigoparnus*…" with "…*Stygoparnus*…" and "…*Stigobromus*…" with "…*Stygobromus*…"

- Added "…Comal Springs;…" after "…Blanco River;…" to the habitat preference description for the fountain darter.
- The habitat preference description for the Blanco blind salamander does specify subterranean habitat.

Issue 41. ***<u>United States Department of the Interior, Fish and Wildlife Service Comments on Region L IPP</u>. The U. S. Fish and Wildlife Service of the U. S. Department of the Interior provided Comments on the Initially Prepared Plan. The comments are summarized, and responses are given to the summaries.***

<u>Comments</u>: ***The Service applauds the SB1 planning process and offers assistance in determining potential effects of individual options and strategies early in the planning process in order to avoid delays in implementation. Forecasts are for future population growth, therefore conservation is needed to reduce waste and lower per capita water use. The Plan should do more to emphasize instream and estuarine needs, as well as identify ecologically unique stream segments.***

<u>Responses.</u>

- As mandated by the Texas legislature and implemented by the Texas Water Development Board, conservation planning was built into the water use projections developed during the initial phases of the SB-1 process. The water savings to be achieved are substantial, and fully discussed in the Phase 1 documents. Instream and estuarine water needs are considered and provided for in the planning process through the use of the consensus planning criteria put in place for the SB-1 assessment process by agreement among TWDB, TPWD and TNRCC. It is also the professional judgement of the environmental analysts that the consensus planning criteria provide more than adequate streamflow and estuarine protection to the Region L reaches proposed for development.
- Ecologically unique stream segment nominations by Texas Parks and Wildlife Department, together with the explicit reasons given for those nominations were presented as part of the comparative assessment of water management plans in Volume II. However, the Regional Water Planning Group did not designate unique stream segments

because the effects of such designations upon the potential uses of property of adjacent landowners are not clear. The SCTRWPG has included in its legislative recommendations a request that the Texas Legislature clarify its intent as to the meaning of designation upon property that might be affected.

Comments. ***The Plan quantifies the municipal, industrial, steam-electric, irrigation, mining, and livestock water needs, but does not recognize the water needs of springs, streams, and estuaries. Emphasis upon water conservation is good. Drought management plans are a positive step, but drought triggers are usually not invoked soon enough to prevent negative effects, and spring flows should be used instead of J-17 well levels for Comal and San Marcos Springs. Drought management plans should include considerations of water supplies for environmental purposes. Use of reclaimed water is encouraged, however water quality is a concern and reuse should not be permitted over the recharge zone of the Edwards Aquifer until adequate studies have been conducted. Also, too much reuse can adversely affect quantities available for streams, e.g.; during droughts this may be the only supply available for some stream segments.***

Responses

- Nature's water needs are accommodated through the use of the consensus planning criteria.
- Many stream segments cease flow or dry up entirely during droughts. The consensus criteria provide for drought stress by forbidding diversions when streamflow falls below the 25th percentile flow. Release of stored water to meet "environmental needs" during drought will reduce the firm yield of the project unless the contingency was provided for in initial project planning. This is usually regarded as an unreasonable risk to human life and property. No large storage reservoir projects, the only type of project that could store sufficient water for environmental purposes, is being proposed for Region L.

Comments. ***Brush management can negatively affect wildlife habitat, there is no evidence that weather modification works during drought, and the Service has concerns about potential impacts from project construction and brine disposal for desalination strategy.***

Responses

- Brush management, as included in the regional plan, would be designed in accordance with standards acceptable to wildlife agencies and The Texas State Soil and Water Conservation Board, which is the Texas agency having authority for brush management in Texas. Weather modification is authorized by statute in Texas and is currently supported with both state and local funding. Its limitations during drought are recognized, but those who use it feel that it can assist in drought by increasing precipitation at other times, thereby increasing aquifer recharge and reservoir storage for use later during drought. In the case of desalination, project construction effects and brine disposal will be carefully considered and taken into account when permit applications are made and permits obtained.

Comments. ***The Service generally approves of Aquifer Storage and Recovery (ASR), but cautions that water quality of different sources must be compatible, and quality of Edwards Aquifer must be protected***

Responses

- Water quality assessments and analyses will be addressed in permitting and implementation of ASR projects. Edwards Aquifer water to be used in ASR will be taken directly to water users, as opposed to recharging the Edwards Aquifer.

Comments. ***Concern is expressed about environmental impacts of reservoirs, including off-channel reservoirs, and the diversion of Lower Guadalupe flows upon the habitat of whooping cranes.***

Responses.

- In the case of off-channel reservoirs, such facilities can be located to minimize effects upon wildlife habitat. Comment noted. Developers of these proposed projects will need to address explicitly their potential impacts. The water provided by management strategies involving the Lower Guadalupe is primarily, if not totally, from existing, but underutilized permits. Any permits needed for diversions of water from the Lower Guadalupe will address habitat for species of the area.

***Comments*. The routing of pipelines can affect wildlife habitat and endangered species. Concern is expressed about effects of recharge projects upon endemic species in the recharge features, sedimentation when recharge is located near springs, quality of recharge water, and loss of stream flows in the headwaters of the Nueces River and its tributaries.**

Responses

- The need to consider the effects of pipeline routes on wildlife habitat and endangered species was addressed to the extent possible given the conceptual level of project definition. The need for field studies to evaluate routing and avoid those kinds of conflicts were also addressed.
- No endemic species have been identified in recharge projects included in the analysis of options for Region L, and no proposed recharge projects are located near springs. The quality of recharge water and loss of streamflows are addressed in the report

***Comments*. The following technical comments were made: (a) Ashe Juniper was not listed in the Edwards Plateau, (b) mountain plover listed in Appendix D is now proposed to be listed as threatened, (c) no instream flow requirements have been determined for Cagle's map turtle, and (d) in the brush management description, there is no mention of the black-capped vireo nor the golden-cheeked warbler as species whose habitat might be affected.**

Responses

- Revisions are being made to the endangered species tables recommended by Texas Parks and Wildlife Department and will be included.

7.3 Coordination with Other Regions

Members of the SCTRWPG (Region L) have attended neighboring RWPG meetings and/or maintained contact with neighboring RWPGs for purposes of communicating content, status, and progress of planning work of the respective RWPGs. Status reports of coordination efforts were made at each meeting of the SCTRWPG. Representatives of Regions K and P attended many of Region L's meetings, and joint meetings were held with Regions K and J, to pursue water management strategies of mutual interest.

In addition, Region L's Executive Committee met upon separate occasions with Regions N and M for the same purpose. When requested by the SCTRWPG, members of HDR's project staff provided technical support to the SCTRWPG at joint meetings with neighboring regions and attended some of the meetings.

7.4 Final Plan Adoption

As explained in Section 7.2.4.7, the RWGP held public hearings in Victoria, Uvalde and San Antonio and also gathered written comments submitted by various individuals and organizations as well as public agencies, including the U.S. Fish and Wildlife Service and the Texas Parks and Wildlife Department. The TWDB reviewed the IPP and sent four letters of comments and questions. The TWDB comments, together with RWPG responses are included in Section 7.2.4.8.1. A summary of public comments and RWPG responses are presented in Section 7.2.4.8.2.

In addition to the regular monthly meetings, the RWPG held several workshops to complete the review and approval of responses to the comments. They agreed on numerous additional Legislative Recommendations (as presented in Section 6.6) and made extensive revisions of other parts of the IPP as a result of this period of responding to public and agency comments. Changes included the following:

Commitment to accelerated research on the Edwards Aquifer Recharge and Recirculation System Strategy and clarification that this strategy is included in the Regional Water Plan for research and will require a plan amendment prior to implementation.

New recommendations for funding of major centers within the South Central Texas Region in order to provide enhanced information and training on water conservation and other technologies.

A recommendation for State participation in funding alternative technologies, such as desalination.

Nine recommendations on improving TWDB's regional water planning process, including greater involvement of local planners in development of population and water demand projections and evaluation of the State's land use and ecosystem health.

A recommendation supporting many recommendations of the TWDB-sponsored consensus report: *Future of Groundwater Management in Texas*.

Recommendations for additional socio-economic impact analysis, particularly for the agricultural and other rural water user groups, and for additional notification of groundwater management strategies that have impacts across regional boundaries.

New Sections on Emergency Transfers of Water and on Drought Management Planning.

Summary and further explanation of the cumulative analysis of environmental impacts that was performed for each alternative considered by the Regional Water Planning Group.

Summary of the evaluations of each Water Management Strategy included in the five Regional Alternative Plans and of the Adopted Plan, in accordance to evaluation criteria specified in TWDB Rules, Section 357.7(a)(7).

The RWPG formally approved the revised South Central Texas Regional Water Plan on January 4, 2001.