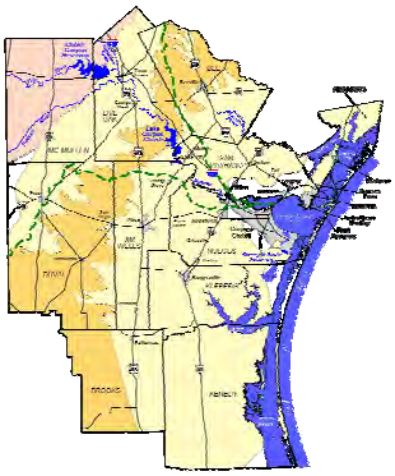
Coastal Bend
Regional Water Planning Area
Region N

Regional Water Plan
Volume I
Executive Summary and Regional Water Plan



Prepared for:

Texas Water Development Board

Prepared by:

Coastal Bend Regional Water Planning Group

With Administration by:

Nueces River Authority

With Technical Assistance by:

HDR Engineering, Inc.

In Association with:

The Rodman Company

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Coastal Bend (Region N)
Regional Water Plan

Executive Summary

ES.1 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 current state water plan, *Water for Texas, January 2007,* was produced by the TWDB and based on approved regional water plans pursuant to requirements of Senate Bill 1 (SB1), enacted in 1997 by the 75th Legislature. As stated in SB1, the purpose of the regional water 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 Texas Commission on Environmental Quality (TCEQ) 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. As shown is Figure ES-1, the Coastal Bend Region (Region N) includes 11 counties. The Coastal Bend Regional Water Planning Group (CBRWPG) has a total of 17 voting members. The members represent 11 interests or stakeholders (Public, Counties, Municipalities, Industry, Agriculture, Environmental, Small Business, Electric Generating Utilities, River Authorities, Water Districts, and Water Utilities), serve without pay, and are responsible for the development of the Coastal Bend Regional Water Plan (Table ES-1).

The CBRWPG adopted bylaws to govern its operations and, in accordance with its bylaws, selected the Nueces River Authority to serve as its administrative agency (Qualified Political Subdivision) to: (1) Develop scopes of work; (2) Apply for TWDB planning grants; (3) Contract with the TWDB for the grants; and (4) Manage the development of the Regional Water Plan.

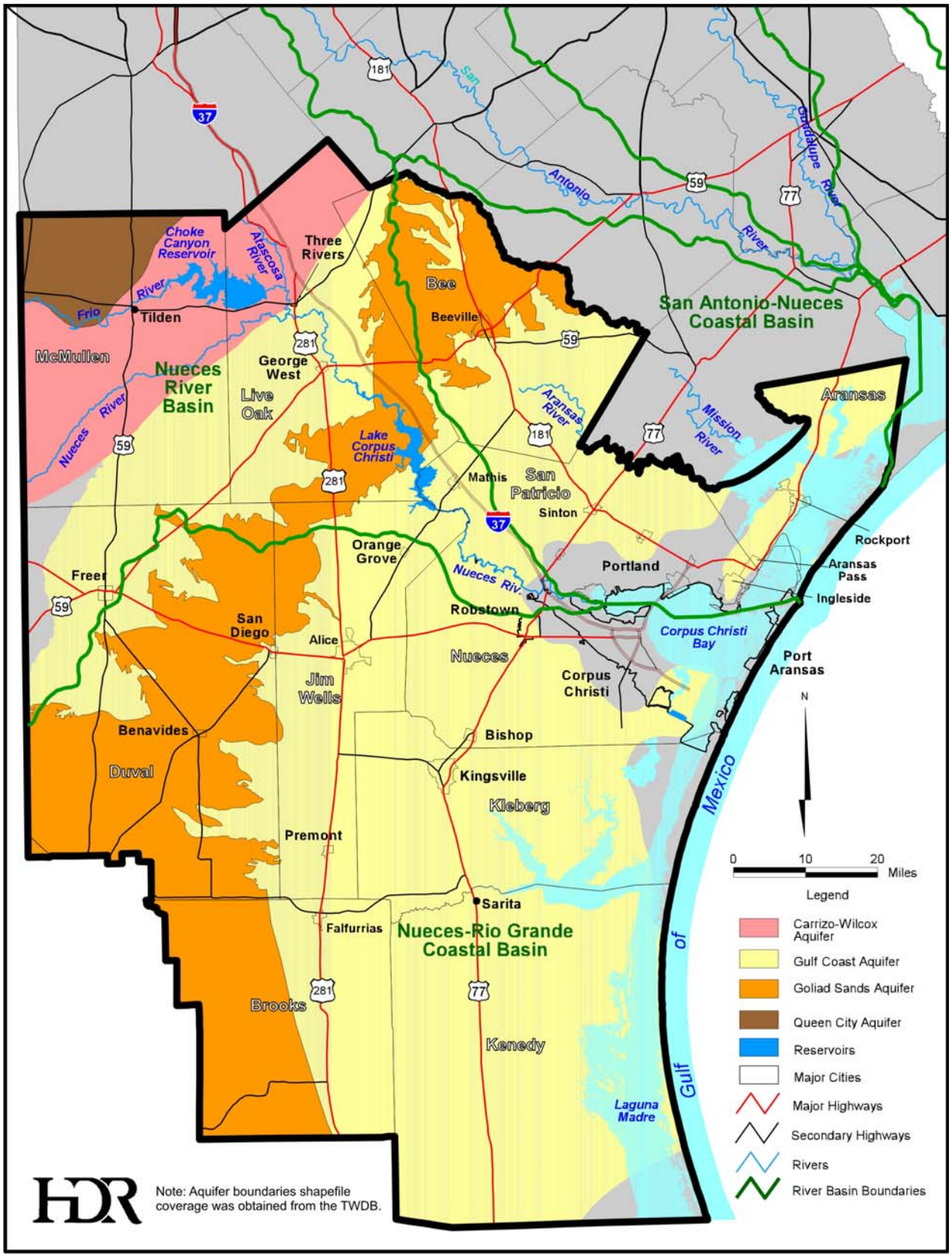

Figure ES-1. Coastal Bend Regional Water Planning Area

Table ES-1.
Coastal Bend RWPG Members
(as of January 2010)

Interest Group	*Name*	*Entity*
	Voting Members	
Agriculture	Mr. Charles Ring Mr. Chuck Burns	 Rancher
Counties	Mr. Bill Stockton Mr. Lavoyger J. Durham	
Electric Generating Utilities	Mr. Gary Eddins	
Environmental	Ms. Teresa Carrillo	Coastal Bend Bays Foundation
Industry	Mr. Tom Ballou Mr. Robert Kunkel	Sherwin Alumina Lyondell Basell
Municipalities	Mr. Billy Dick Mr. Mark Scott	City of Rockport City of Corpus Christi Councilmember
Other	Mr. Bernard Paulson, Executive Committee	Port Authority
Public	Ms. Kimberly Stockseth	
River Authorities	Mr. Thomas M. Reding, Jr., Executive Committee	Nueces River Authority
Small Business	Dr. Pancho Hubert Mr. Pearson Knolle	
Water Districts	Mr. Scott Bledsoe III, Co-Chair	Live Oak UWCD
Water Utilities	Ms. Carola Serrato, Co-Chair	South Texas Water Authority
	Non-Voting Members	
	Ms. Virginia Sabia	Texas Water Development Board
	George Aguilar	Texas Department of Agriculture
	Dr. Jim Tolan	Texas Parks and Wildlife Department
	Mr. Tomas Dominguez	USDA – NRCS
Liaison, South Central Texas RWPG	Mr. Con Mims	Nueces River Authority
Liaison, Rio Grande RWPG	Mr. Robert Fulbright	
Liaison, Lower Colorado RWPG	Mr. Haskell Simon	
Staff	Ms. Rocky Freund	Nueces River Authority

Pursuant to Regional and State Water Planning Guidelines (Texas Administrative Code, Title 31, Part 10, Chapters 357 and 358), the CBRWPG developed the 2001 and 2006 Regional Water Plans, which were then integrated into Water for Texas – 2002 and 2007, respectively, by the TWDB. The 2011 Coastal Bend Regional Water Plan, of which this Executive Summary is a part, represents the second update of a plan as presently required to occur on a five-year cycle. The TWDB will integrate this Regional Water Plan into a State Water Plan to be issued in 2012.

This executive summary and the accompanying *Regional Water Plan* convey water supply planning information, projected needs in the region, proposed water management strategies to meet those needs, and other findings. The report is provided in two volumes. Figure ES-2 shows the contents of each volume.

ES.2 Description of the Region

The area represented by the Coastal Bend Region includes the following counties: Aransas, Bee, Brooks, Duval, Jim Wells, Kenedy, Kleberg, Live Oak, McMullen, Nueces, and San Patricio (Figure ES-1). The Coastal Bend Region has four regional Wholesale Water Providers: the City of Corpus Christi (City), San Patricio Municipal Water District (SPMWD), South Texas Water Authority (STWA), and Nueces County Water Control and Improvement District #3 (Nueces County WCID #3). The City, the largest of the four, sells water to two of the other regional water providers—SPMWD and STWA. The City and the SPMWD distribute water to cities, water districts, and water supply corporations for residential, commercial, and industrial customers. STWA provides water to cities and water supply corporations that supply both residential and commercial customers within the western portion of Nueces County as well as Kleberg County. The smallest regional wholesale water provider, Nueces County WCID #3, provides water to the City of Robstown and other rural municipal entities in the western portion of Nueces County. The major water demand areas are primarily municipal systems in the greater Corpus Christi area, as well as large industrial (manufacturing, steam-electric, and mining) users primarily located along the Corpus Christi and La Quinta Ship Channels. Based on state surveys[1] of industrial water use, industries in the Coastal Bend area are very efficient in their water use. For example, petroleum refineries in the Coastal Bend area use on the average 60 percent less water to produce a barrel of refined crude oil than refineries in the Houston/Beaumont area.

[1] Texas Water Development Board, "Industrial Water Use Efficiency Study," 1993.

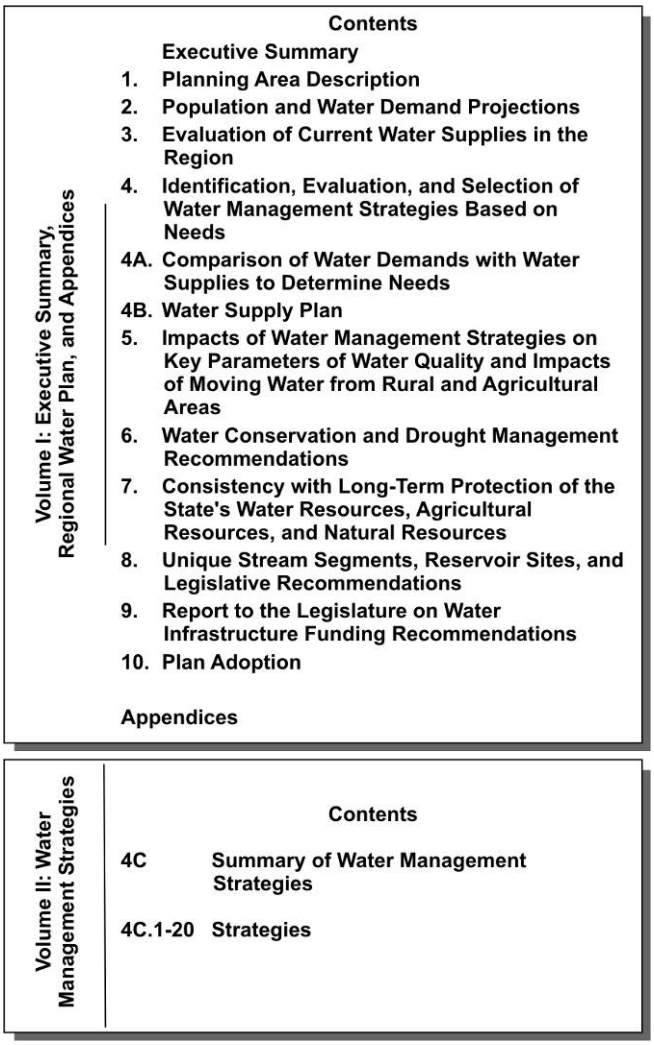

Figure ES-2. Plan Structure

Copies of Volumes I and II are filed at each County Clerk's office and at one public library in each county. Copies of individual sections can be obtained by calling the Nueces River Authority at (361) 653-2110.

In addition to the work contained in the two volumes of the *Regional Water Plan*, other important products produced as part of the Coastal Bend planning effort include the Phase I studies. These included the following reports, which are summarized in Appendix B:

Study 1 – Evaluation of Additional Potential Regional Water Supplies for Delivery through the Mary Rhodes Pipeline, Including Gulf Coast Groundwater and Garwood Project

Study 2 – Optimization and Implementation Studies for Off-Channel Reservoir

Study 3 – Implementation Analysis for Pipeline from CCR to LCC, Including Channel Loss Study Downstream of Choke Canyon Reservoir

Study 4 – Water Quality Modeling of Regional Water Supply System to Enhance Water Quality and Improve Industrial Water Conservation

Study 5 – Region-Specific Water Conservation Best Management Practices (BMPs)

The Coastal Bend Region depends mostly on surface water sources for municipal and industrial water supply use. The two major surface water supply sources include the Choke Canyon Reservoir/Lake Corpus Christi System (CCR/LCC System) in the Nueces River Basin and Lake Texana on the Navidad River in Jackson County. The water quality of these sources is generally good. However, there are some areas of concern, specifically within the Lower Nueces River and the Calallen Pool, where the bulk of the region's water supply intakes are located.

There are some areas in the region that are dependent on groundwater. There are two major aquifers that lie beneath the region—the Carrizo-Wilcox and Gulf Coast Aquifers. The Gulf Coast Aquifer underlies all counties within the Coastal Bend Region and yields moderate to large amounts of both fresh and slightly saline water. The Carrizo-Wilcox Aquifer only underlies parts of McMullen, Live Oak, and Bee Counties and contains moderate to large amounts of either fresh or slightly saline water. The Yegua-Jackson is an official minor aquifer and covers parts of McMullen, Live Oak, and Bee counties within the Coastal Bend Region.

In 2000, the population of the Coastal Bend Region was 541,184 with a regional average per capita income of $19,833, ranging from $14,876 in Brooks County to $26,458 in McMullen County.[2] By 2007, the estimated population for the Coastal Bend Region was 549,686 with a regional average per capita income of $27,518, ranging from $20,887 in Bee County to $33,970 in Nueces County.[3] The Corpus Christi Metropolitan Statistical Area, consisting of Aransas, Nueces, and San Patricio Counties, accounts for 75 percent of the Coastal Bend Region's population and 79 percent of the total personal income. In 2007, the total personal income in the Coastal Bend Region was nearly $17.3 billion.[4,5]

The primary economic activities within the Coastal Bend Region include oil/gas production and refining, petrochemical manufacturing, military installations, retail/trade, agriculture, and service industries including health services, tourism/recreation industries, and governmental agencies. In 2007, these industries employed nearly 311,000 people in the Coastal Bend Region with annual earnings over $11.1 billion.[6] The services sector had the biggest economic impact in 2007, with an economic contribution of $3.8 billion, while employing 48%

[2] U.S. Department of Commerce Bureau of Economic Analysis, REIS Database, 2007.
[3] Ibid
[4] Ibid.
[5] Total personal income includes net earnings, dividends, and personal transfer receipts. Personal transfer receipts are government payments to individuals, including retirement and disability insurance and medical services.
[6] U.S. Department of Commerce Bureau of Economic Analysis, REIS Database, 2007.

of the total workforce within the Region. The petrochemical and refining industries had total compensation to employees of almost $600 million in 2007.

ES.3 Population and Water Demand Projections

For the 2011 Coastal Bend Regional Water Plan, the TWDB did not issue new population or water demand projections due to the lack of new Census data. The Coastal Bend RWPG did request a water demand revision for irrigation in Bee and San Patricio Counties. This is discussed further in Section 2.3.5. In all other cases, the population and water demand projections remained identical to the 2006 Regional Water Plan as developed by the TWDB. Population projections were developed for cities with a population greater than 500, water supply corporations and special utility districts using volumes of 280 acft or more in 2000, and 'county-other' to capture those people living outside the cities or water utility service areas for each county. Water demand projections were developed by type of use: municipal for cities and water supply corporations/special utility districts (along with a 'county-other' for each county), and countywide for manufacturing, steam-electric, mining, irrigation, and livestock.

ES.4 Population Projections

Figure ES-3 illustrates population growth in the entire Coastal Bend Region for 1990 and 2000 and projected growth for 2010, 2020, 2030, 2040, 2050, and 2060. In 2060, the population of the Coastal Bend Regional Water Planning Area is projected to be 885,665.

As can be seen in Figure ES-4, the average annual growth rate of the region over the 50-year planning period is 0.82 percent. San Patricio and Nueces Counties have growth rates higher than the regional average, while the other counties have lower growth rates than the average, and in the case of McMullen County, negative growth rate.

ES.5 Water Demand Projections

Water demand projections have been compiled for six categories of water use: (1) Municipal, (2) Manufacturing, (3) Steam-Electric Cooling, (4) Mining, (5) Irrigation, and (6) Livestock.

Water User Groups

Each of these consumptive water uses is termed a "water user group" according to Senate Bill 1. Incorporated cities and County-Other category are water user groups within the Municipal Use category. County-Other category includes persons residing outside of cities and also outside water utility boundaries. Water demand projections and supplies have been estimated for all water user groups.

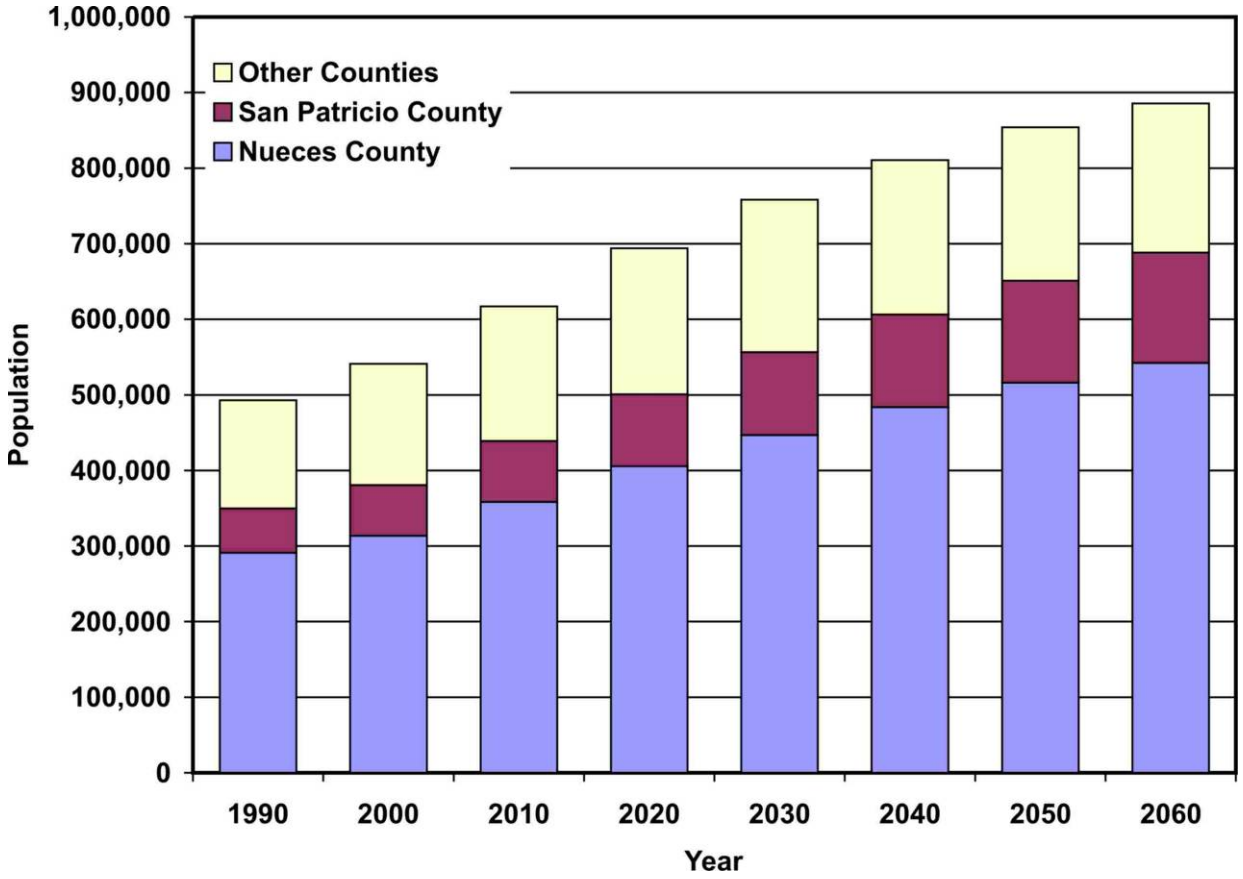

Figure ES-3. Historical and Projected Coastal Bend Regional Water Planning Area Population

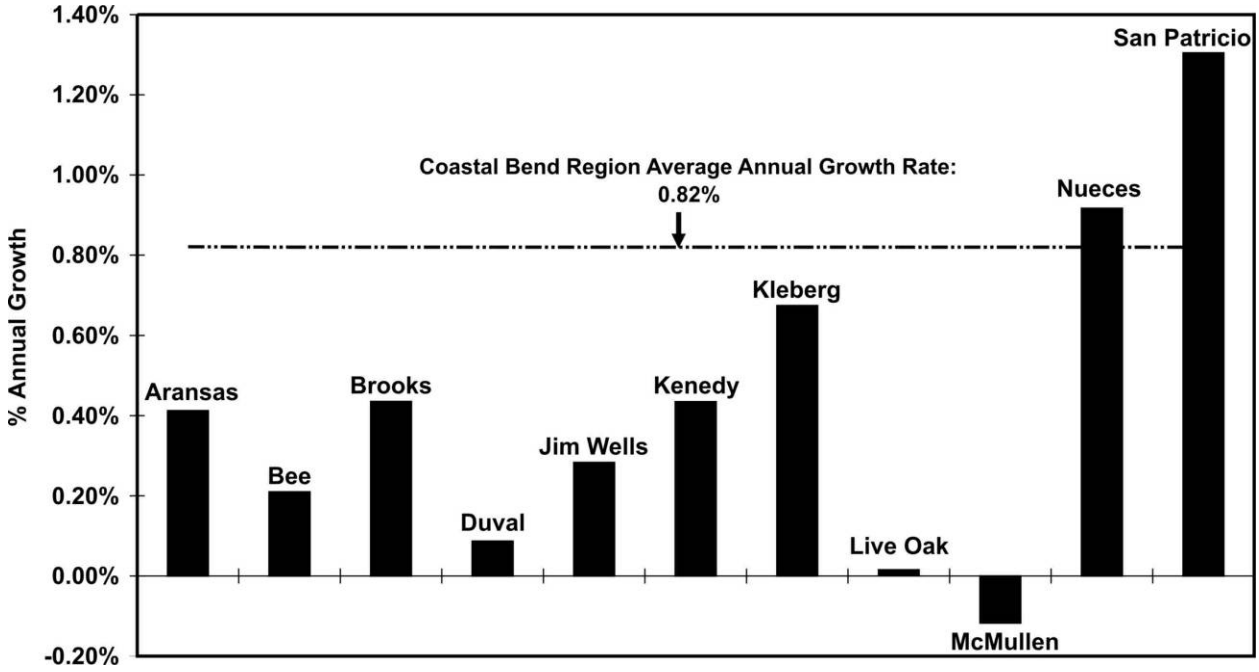

Figure ES-4. Percent Annual Population Growth Rate for 2000 through 2060 by County

Total water use for the region is projected to increase from 205,936 acft in 2000 to 324,938 acft in 2060, a 57.8 percent increase. The trend in total water use is shown in Figure ES-5. The six types of water use and associated demands are shown for 2000 and 2060 in Figure ES-6. Municipal, manufacturing, steam-electric, irrigation, and mining water use are all projected to increase, while livestock use is unchanged.

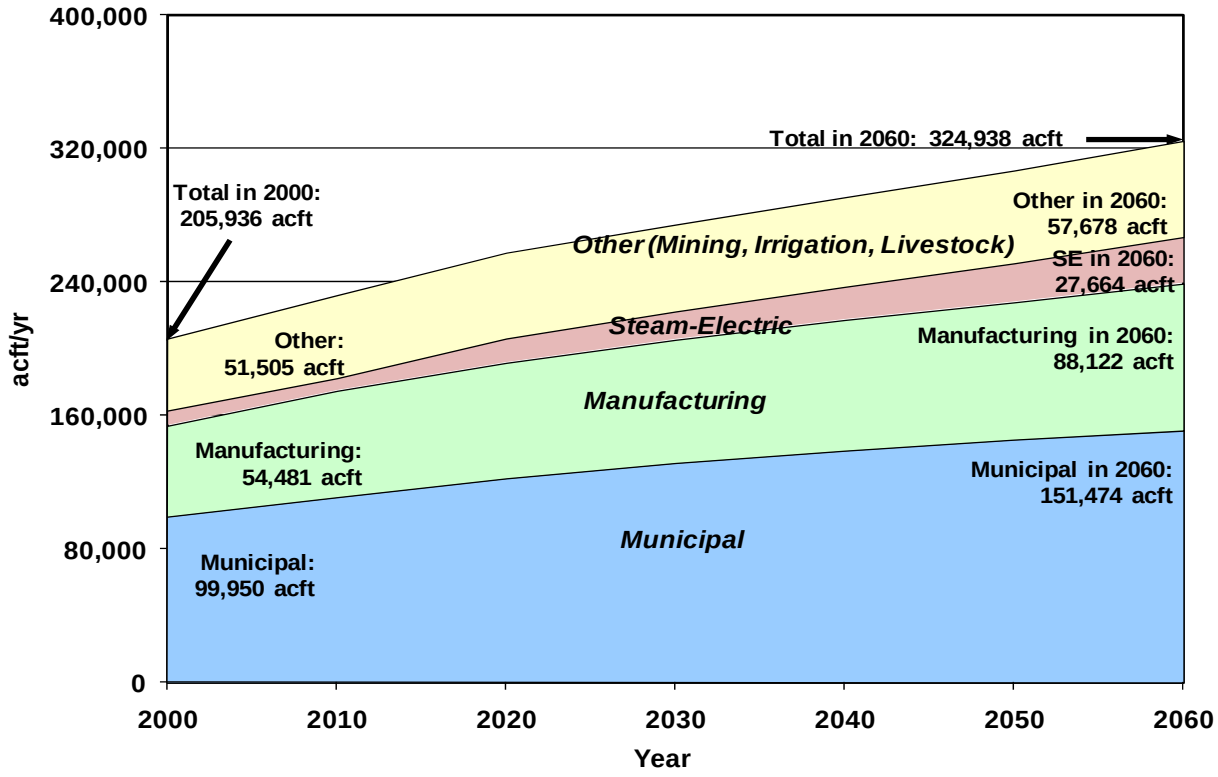

Figure ES-5. Projected Total Water Demand

ES.6 Water Supply

ES.6.1 Surface Water Supplies

Streamflow in the Nueces River and its tributaries, along with reservoirs in the Nueces River Basin and interbasin transfers from Lake Texana, comprise the most significant supply of surface water in the Coastal Bend Region. Water rights associated with major water supply reservoirs are owned by the City of Corpus Christi and the Nueces River Authority. The western and southern parts of the region are heavily dependent on groundwater sources, due to limited access to surface water supplies.

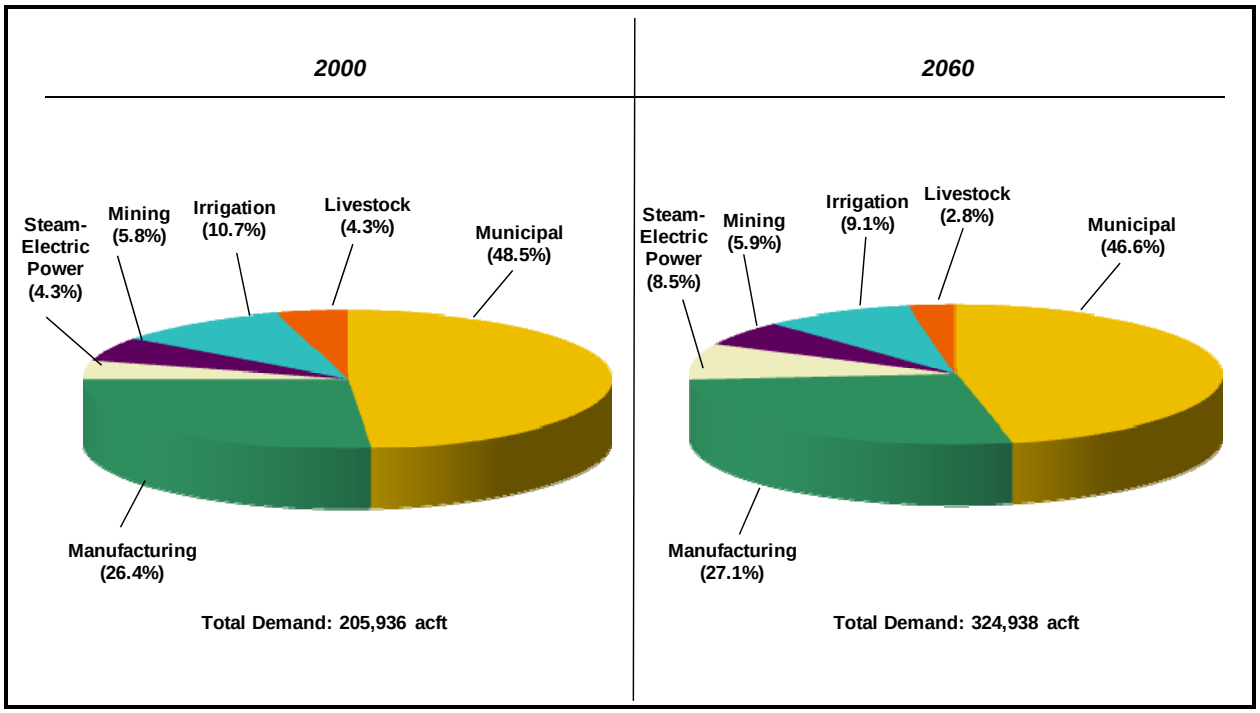

Figure ES-6. Total Water Demand by Type of Use

Municipal Use and Water Conservation

The 51.5 percent projected increase in municipal water demand over the 50-year planning horizon is lower than the projected population increase of 63.6 percent due to expected savings in per capita water use resulting from water conservation. Average per capita municipal water use in 2000 was 165 gallons per capita per day and is projected to decrease to 152 gallons per capita per day by 2060 due to built-in savings for low flow plumbing fixtures. This results in a reduction of 13,313 acft/yr in municipal water demand in 2060.

Many entities within the Coastal Bend Region obtain surface water through water supply contracts. The City is the largest provider of water supply contracts in the Coastal Bend Region with 205,000 acft/yr raw water available from its reservoir system (2010 sediment conditions).[7] Run-of-river and small municipal water rights provide 8,603 acft/yr of reliable water. Other surface water supplies are provided by on-farm local sources and small supplies from adjacent coastal basins.

In addition to raw water supply contracts and/or availability, total surface water supplies are constrained based on existing water treatment plant capacities as discussed in Section 3. As shown in Table ES-2, total surface water from all surface water sources in year 2060 is 198,816 acft/yr, of which 93 percent is provided by the City's supplies.

[7] The City of Corpus Christi holds a contract with the Lavaca-Navidad River Authority to provide a base amount of 41,840 acft/yr and a maximum of 12,000 acft/yr on an interruptible basis from Lake Texana to the City.

Table ES-2.
Total Supply in 2060 from
All Surface Water Sources (acft)

Municipal	133,596
Manufacturing	38,827
Steam-Electric	14,481
Mining	0
Irrigation	4,332
Livestock	7,580
Total	**198,816**

Note: This table considers both treatment plant capacity and raw water constraints.

ES.6.2 Groundwater Supplies

Two major aquifers and two minor aquifers underlie parts of the Coastal Bend Planning Region (Figure ES-1) and have a combined reliable yield of about 109,351 acft/yr and projected 2060 use of 81,426 acft if recommended water management strategies are implemented.[8] The two major aquifers include the Gulf Coast Aquifer, which supplies significant quantities of water throughout the region and the Carrizo-Wilcox Aquifer, which supplies water to the northwest portion of the study area in parts of McMullen, Live Oak, and Bee Counties (Figure ES-1). Groundwater supplies are based on projected groundwater use, well capacities, and drawdown constraints adopted by the Coastal Bend Region. In the northwestern part of the region, the Carrizo-Wilcox is a prolific aquifer with lesser quality water in most areas.

The TWDB is currently working with the Groundwater Management Areas (GMAs) to determine desired future conditions. Once these have been determined, the groundwater models will be used to simulate those conditions to determine aquifer availability for future planning cycles. These values may be different than what has been previously adopted by the CBRWPG.

ES.6.3 Water Quality

Previous studies by the U.S. Geological Survey and others show a significant increase in the concentration of dissolved minerals occurring in the Lower Nueces River between Lake Corpus Christi and the Calallen Saltwater Barrier Dam, where the vast majority of the Region's

[8] Based on TWDB Central Gulf Coast Groundwater Availability Model analyses.

surface water is diverted.[9] Figure ES-7 shows that median chloride concentrations at the Calallen Pool near the City of Corpus Christi's O.N. Stevens Water Treatment Plant intake (155 mg/L) are 2 times the level of chlorides in water released from Lake Corpus Christi (80 mg/L). The results of these studies indicate that on the average about 60 percent of the increase in chlorides occurs upstream of the Calallen Pool and about 40 percent of the increase within the pool.

Potential sources of minerals to the Calallen Pool include saltwater intrusion, groundwater seepage, and upstream sources of contamination from abandoned wells in adjacent oil fields and gravel washing operations. Previous 2001 and 2006 Plans included results of a Nueces River sampling program confirming the increase in mineral concentrations. The results of this sampling program strongly suggested that poor quality groundwater is entering the river and resulting in the increase. The effect of the high dissolved solids concentrations is two-fold and includes an increase in industrial water demands due to accelerated buildup of minerals in industrial cooling facilities, as well as high levels of chlorides and bromides, which sometimes exceed drinking water standards. Since a large portion of the Region's water demands are for industrial use, improvements in water quality will result in reduced levels of water consumption and provide additional water conservation for the region. Reductions in chloride and bromide levels will help ensure Safe Drinking Water Act requirements can be achieved without having to resort to expensive treatment methods.

An assessment was conducted during development of the 2011 Plan to evaluate water quality in Lake Corpus Christi and downstream Lower Nueces River segment to Calallen Pool (Section 4C.3). A water management strategy for potential interconnections to the Mary Rhodes Pipeline was also evaluated to provide water supplies from Lake Texana for industries with intakes located in the Calallen Pool to reduce water quality fluctuations in their water supply as is currently experienced with supplies from the Lower Nueces River (Section 4C.3.6.6).

Groundwater supplies are generally of good water quality. However, some areas in the region have slightly brackish groundwater (TDS ≈ 1,000 to 1,500 mg/L). In previous studies, several small rural utilities have had water quality concerns associated with salinity and other water quality constituents. For these systems, brackish groundwater desalination may be considered in the future.

[9] USGS studies report average chloride concentrations in the Calallen Pool are 2.5 times the level of chlorides in water released from Lake Corpus Christi.

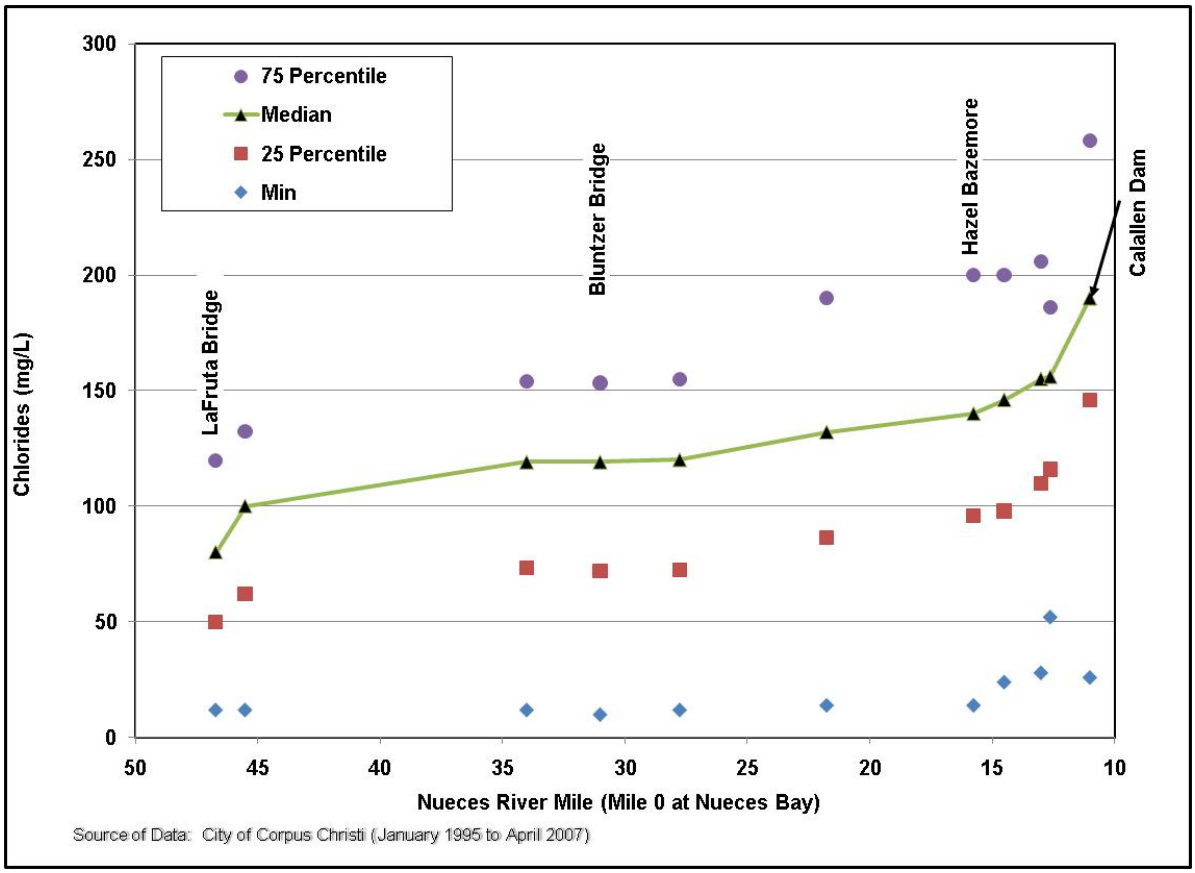

Figure ES-7. Summary of Historical Data — Chloride Content of the Lower Nueces River, Segment 2102

ES.6.4 Supply and Demand Comparison

The CBRWPG identified 18 individual cities and water user groups that showed unmet needs during drought of record supply conditions during the 60-year planning horizon. Figure ES-8 shows these water user groups with shortages for both the 2030 and 2060 timeframes.

Eight of the 11 counties in the region have a projected shortage in at least one of the water user groups in the county. These are Aransas, Bee, Duval, Jim Wells, Kleberg, Live Oak, Nueces and San Patricio. None of the water user groups in Brooks, Kenedy, or McMullen Counties have projected shortages. Table ES-5 is organized by county and information on each municipality and water use category in the county is listed. The tables can be examined for each county to determine which cities and water user groups have projected shortages.

Constraints on Water Supply

Water supplies are also affected by contractual arrangements and infrastructure constraints. Expiring contracts, insufficient well capacity, and water treatment plant capacity - each of these supply constraints was taken into account in estimating water supplies available to municipal water user groups. Consequently, the water supply listed for a given city may be less than the quantity in their water purchase contract or water right.

ES.7 Wholesale Water Providers

There are four wholesale water providers in the Region: the City of Corpus Christi, SPMWD, STWA, and Nueces County WCID #3. In 2000, the City of Corpus Christi supplied about 77 percent of the Region's water demands, and SPMWD (a major customer of the City of Corpus Christi) supplied about 11 percent of the Region's water demands. Both STWA and Nueces County WCID #3 combined provided less than 3 percent of the Region's water demand. Figure ES-9 shows a comparison of water demands to currently available water supplies for each of these providers. The City of Corpus Christi needs additional water treatment plant capacity beginning before 2020 to effectively utilize raw water supplies. SPMWD needs additional supplies beginning around 2035. STWA and Nueces County WCID #3 have sufficient supplies to meet their projected customer demands to 2060.

By 2060, the Corpus Christi Service Area is estimated to need 54,357 acft of additional water supply based on existing treatment plant and raw water supply constraints, and of this amount 39,517 acft is attributed to raw water supply shortages. SPMWD Service Area is estimated to need 7,898 acft of additional water supply based on existing treatment plant and raw water supply constraints, and of this amount 5,742 acft is attributed to raw water supply shortages. Surface water allocation for wholesale water providers is discussed in Section 4A.5.

ES.8 Water Supply Strategies to Meet Needs

Numerous water management strategies were identified by the CBRWPG as potentially feasible to meet water supply shortages. Each strategy was evaluated by the consultant team and compared to criteria adopted by the CBRWPG. The Coastal Bend Regional Water Plan includes recommended water management strategies that emphasize water conservation; maximize utilization of available resources, water rights, and reservoirs; engage the efficiency of conjunctive use of surface and groundwater; and limit depletion of storage in aquifers. There are additional strategies that have significant support within the region, yet require further study regarding quantity of dependable water supply made available during severe drought, feasibility,

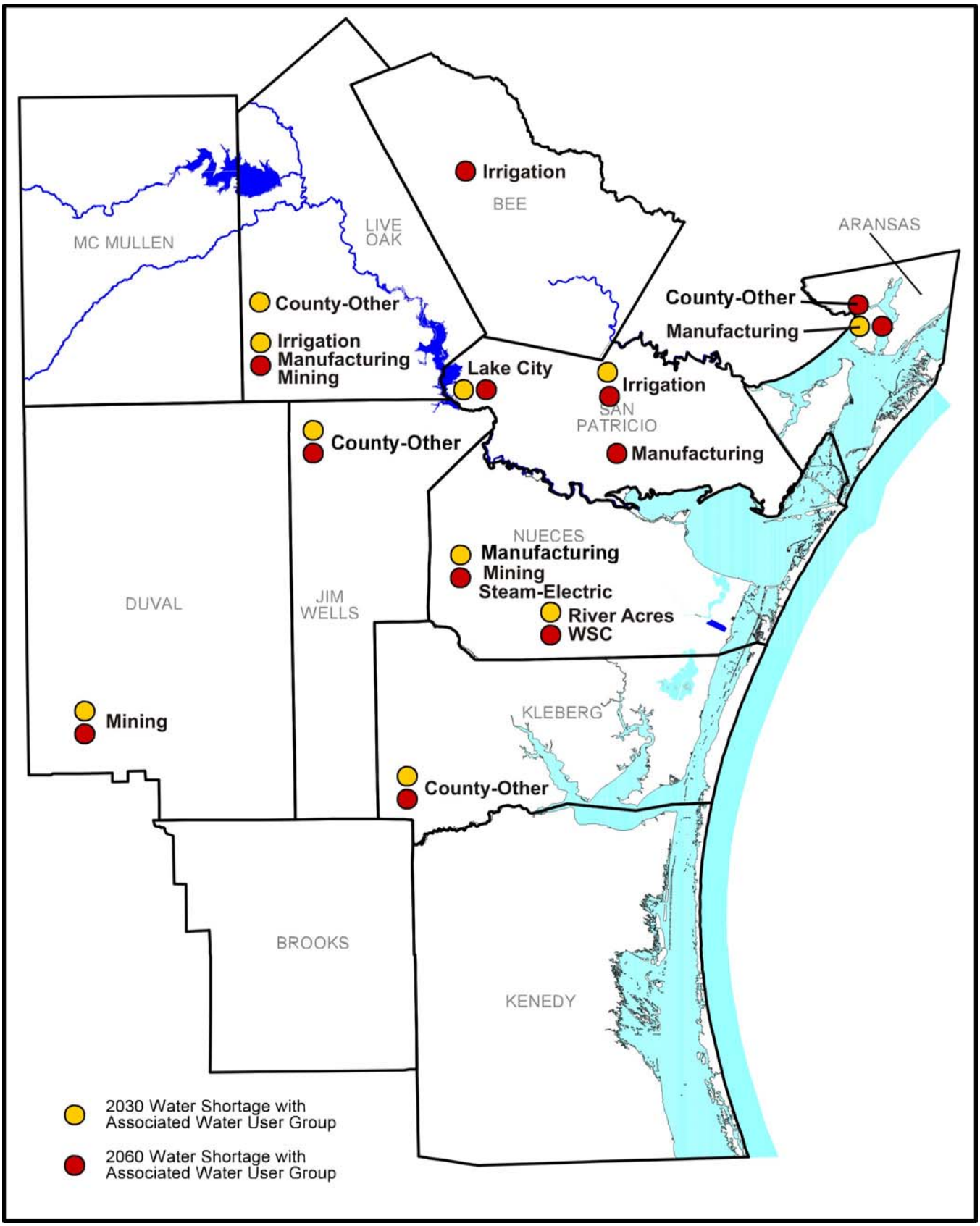

Figure ES-8. Location and Type of Use for 2030 and 2060 Water Supply Shortage

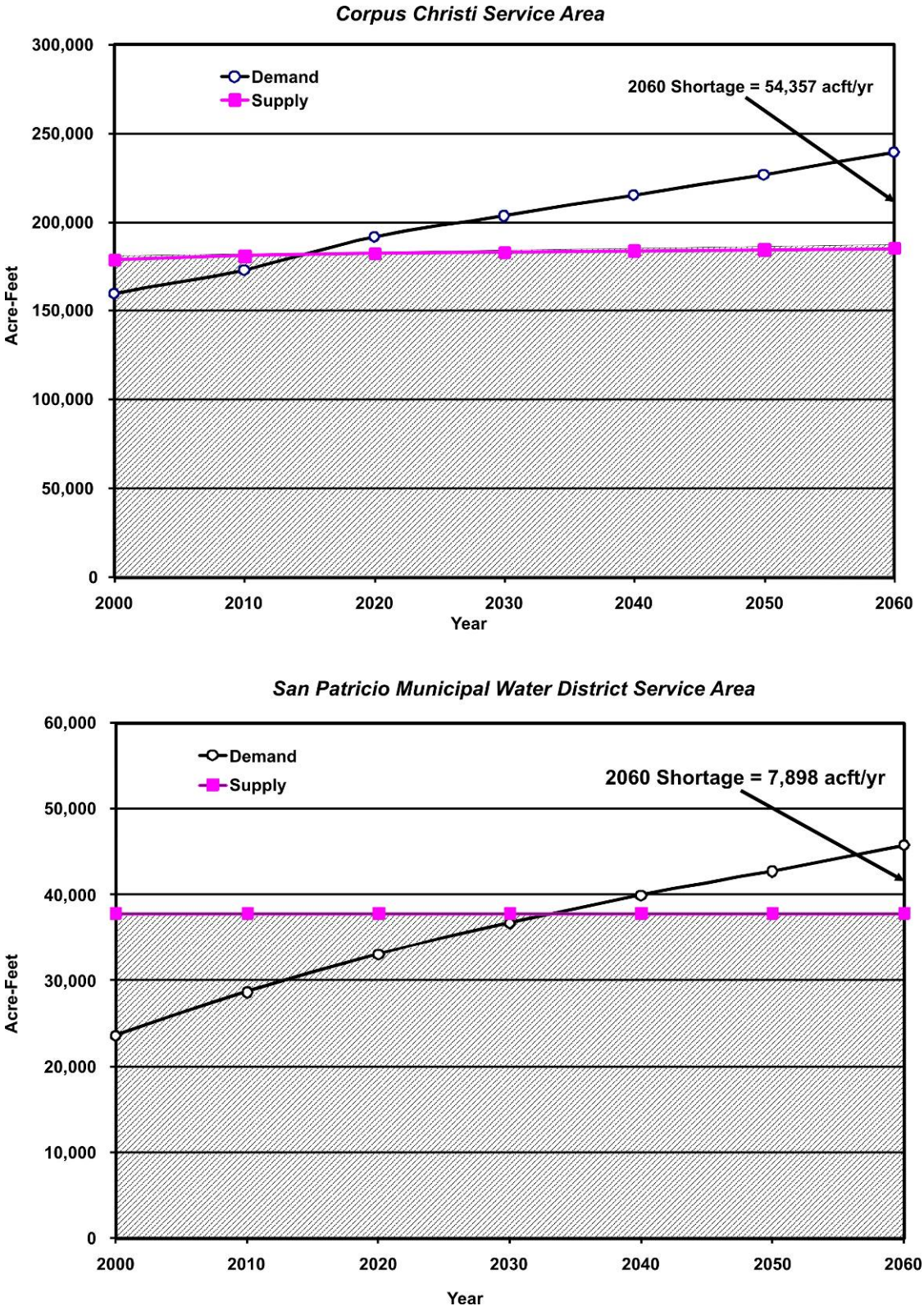

Figure ES-9. Water Supply vs. Demand for Major Water Providers
Water Plan Findings and Recommendations
(Page 1 of 2)

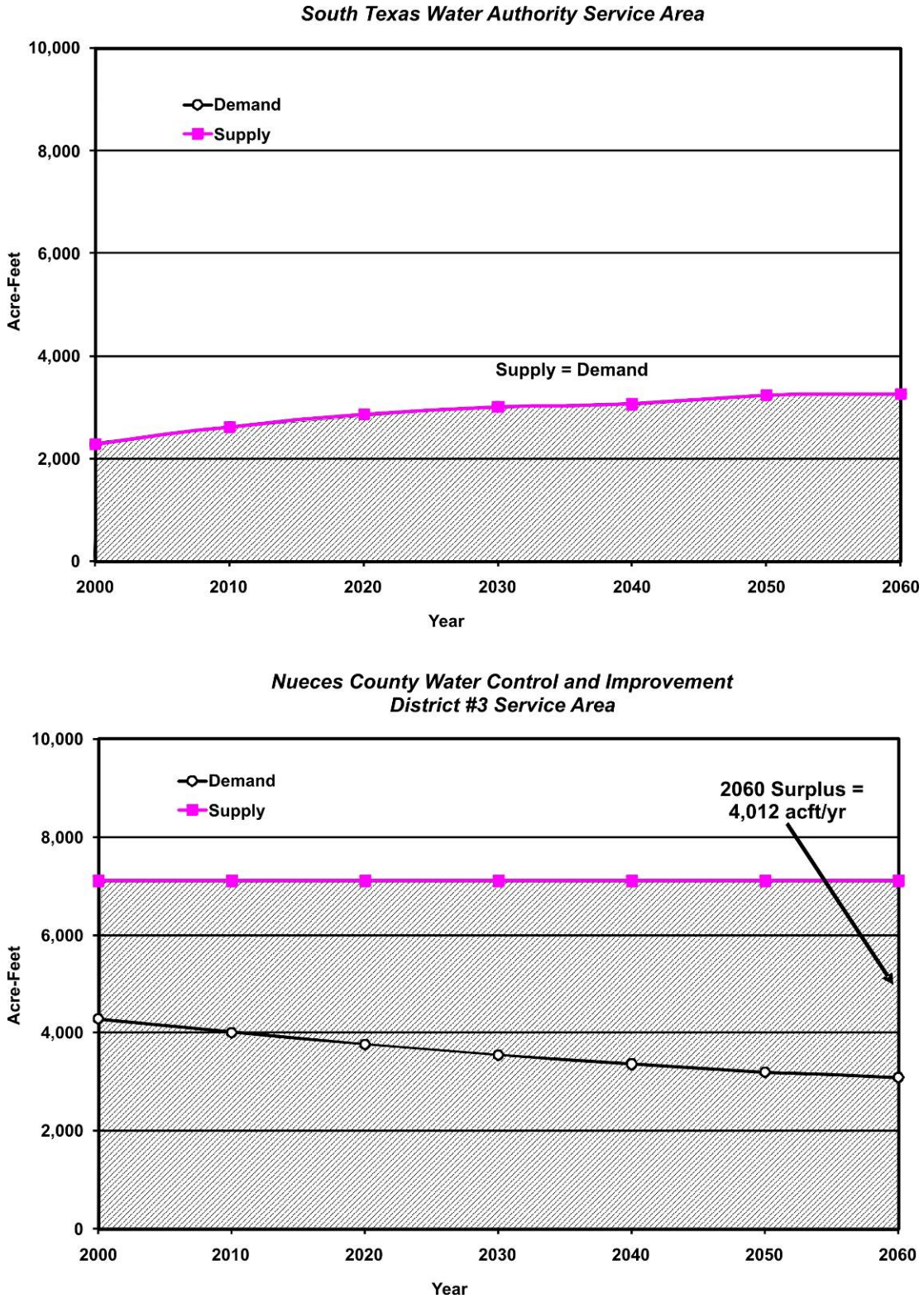

Figure ES-9. Water Supply vs. Demand for Major Water Providers
Water Plan Findings and Recommendations
(Page 2 of 2)

and/or cost of implementation, that are also included in the plan. The strategies identified as potentially feasible are tabulated in Tables ES-3 and ES-4. Table ES-3 summarizes potential strategies for the Corpus Christi Service Area, while Table ES-4 summarizes strategies to other service areas. Additionally, Figure ES-10 provides a graphical comparison of unit costs and quantities of water provided for selected strategies evaluated. Section 4C in Volume II contains sections discussing each of these possible strategies in detail.

Table ES-5 summarizes findings and recommendations for every water user group with projected water shortages. The table also lists each municipality and water user group by county. Water demands are listed for years 2010, 2030, and 2060. Shortages are listed for years 2010, 2030, and 2060, along with recommended actions to meet these shortages. The recommended water supply plans are presented by county in greater detail in Section 4B of Volume I. Water management strategies recommended in the Coastal Bend Region could produce new supplies in excess of the projected regional need of 75,744 acft in Year 2060. Supplies exceed shortages in case water growth patterns and demands exceed TWDB projections or supplies are reduced under current interbasin water supply contracts.

Table ES-6 summarizes those strategies that are recommended in the regional water plan. Total estimated project cost (in September 2008 dollars) for the recommended water management strategies for the Coastal Bend Region is $546,164,950. Table ES-7 summarizes alternative water management strategies developed as part of the planning process.

Future projects involving authorization from either the TCEQ and/or TWDB, which are not specifically addressed in the plan, are considered to be consistent with the plan under the following circumstances:

- TWDB receives applications for financial assistance for many types of water supply projects, including water conservation, and when appropriate, wastewater reuse strategies. Other projects involve repairing, replacing, or expanding treatment plants, pump stations, pipelines, and water storage facilities. The CBRWPG considers projects that do not involve the development of or connection to a new water source to be consistent with the regional water plan even though not specifically recommended in the plan.

Table ES-3.
Potential Water Management Strategies to Meet Long-Term Needs for Wholesale Water Providers

WMS ID	Water Management Strategy	Additional Water Supply (acft/yr)	Total Project Cost	Annual Cost	Unit Cost of Additional Treated Water ($ per acft/yr)	Degree of Water Quality Improvement	Environmental Issues/ Special Concerns
N-1	**Municipal Water Conservation**	up to 1,428	Variable; Regional Cost up to $1,052,529[1]	Variable	$423-$448	No Change	Possible reduction in return flows to bay and estuary.
N-3	**Manufacturing Water Conservation**						
N-3-1	Blending of Texana Water	up to 2,050	Not Applicable	Not Applicable	Not Applicable[2]	Significant Improvement	None
N-3-2	Outlet works to remove high TDS from Calallen Pool	150-730	$2,904,000	$511,000[3]	$700-$2,146[3]	Significant Improvement	None
N-3-3	Intake Modifications	150-300	$7,694,000	$875,000[3]	$2,916-$5,506[3]	Significant Improvement	None
N-3-4	Pipeline from LCC to Calallen	19,600-23,900	$159,655,000	up to $24,715,000[3]	$1,070-$1,203[3]	Significant Improvement	Potentially significant environmental impacts/Construction and maintenance of pipeline corridors
N-4	**Mining Water Conservation**	up to 259	Highly Variable	Highly Variable	Variable	No Change	None
N-5	**Reclaimed Wastewater Supplies**	250	Not Applicable	$206,500[3,9]	$826[5]	No Change	Potential reduction of freshwater inflows to estuary/Construction and maintenance of pipeline corridors
N-7	**Gulf Coast Aquifer Supplies**						
	Groundwater supplies from Bee and/or San Patricio Counties	up to 18,000	$59,245,000	$15,354,000[3,9]	$853[3,4]	Some Degradation	Potential for increased freshwater inflows to estuary
N-8	**Multi-Year ASR along STWA Pipeline**	Negligible	Not Applicable[6]	Not Applicable[6]	-	No Change	Minor impacts
	Seasonal ASR in CC Distribution System	None	Variable				
N-10	**Pipeline from CCR to LCC[10]**	33,700	$138,067,000	$26,821,000[3,9]	$679[3]	No Change	Reduction in stream flows between CCR and LCC
N-11	**Off-channel Reservoir near Lake Corpus Christi[10]**	30,340	$105,201,950	$21,696,800[3,9]	$715[3]	No Change	Direct impact to 4,000 to 6,000 acres, depending on reservoir size
N-12	**Voluntary Redistribution and USACOE Nueces Feasibility Study**	Variable	Variable	Variable	Variable	Variable	Possible cost reduction with federal participation. Ecosystem restoration benefits. Portion of projects may be used for additional inflows to Nueces Bay and Estuary.
N-13	**Stage II of Lake Texana**						
	Palmetto Bend (On-Channel)	22,964[11]	$232,828,000	$27,855,000[3,9]	$1,213[3]	No Change	Direct impact to 4,769 acres
	Lavaca River Diversion and Off-Channel Reservoir	26,242[11]	$224,183,000	$26,971,000[3,9]	$1,027[3]	No Change	Direct impact to around 3,000 acres.
N-14	**Garwood Pipeline**	35,000	$112,798,000	$23,958,000[3,9]	$685[3]	No Change	Construction and maintenance of pipeline corridors and off-channel storage
N-17	**Desalination**						
	Desalination of Seawater[7,10]	28,000	$260,914,000	$47,498,000	$1,696	Significant Improvement	Brine from desalt plant requires disposal. Construction and maintenance of pipeline corridor
N-19	**O.N. Stevens WTP Improvements**	32,996 in 2060	$31,324,000[8]	$7,554,000	$146 in 2060	No change	None
N-20	**Brackish Groundwater Desalination[10]**	18,000	$108,331,000	$17,584,000	$977	Significant Improvement	Brine from desalt plant requires disposal. Construction and maintenance of pipeline corridor

1 Assumes unit costs of $423 to $448/acft.
2 Cost of Manufacturing Water Conservation not determined.
3 Cost has been adjusted to include treatment. Cost for treatment is estimated at $326 per acft.
4 Cost based on 18,000 acft supply.
5 See Section 4C.5. Costs to maintain ongoing Nueces Delta studies are $500,000 per year (assumed cost associated with Allison Demonstration Project is 25 percent). Treatment cost of $326/acft have been added.
6 ASR is not recommended as a viable water management strategy to provide water supply. Costs are not included.
7 Additional water supply is unlimited. Supply numbers and unit costs are shown for a 25 MGD facility.
8 Total project cost includes improvements to the following WTP components: raw influent, raw water intake pump station, and O.N. Stevens solids handling facilities.
9 Annual costs calculated as the unit cost times the additional water supply volume. For Gulf Coast Aquifer Supplies the full 18,000 acft/yr yield was used. For both the Lake Texana options the annual cost is based on the full yield of the project. Annual costs for the portion of supplies allotted to the Coastal Bend wholesale water providers is less as shown in Sections 4B.11 and 4B.12.
10 There is federal participation opportunities for these projects. Federal participation is assumed in water supply plans (Section 4B) and Section 4C.10.
11 Full yield shown for projects. Only portion of project identified for Region N.

Table ES-4.
Potential Water Management Strategies to Meet Long-Term Needs for Local Service Areas

WMS	Water Management Strategy	Additional Water Supply (acft/yr)	Total Project Cost	Annual Cost	Unit Cost of Additional Treated Water ($ per acft/yr)	Degree of Water Quality Improvement	Environmental Issues/ Special Concerns
N-1	**Municipal Water Conservation**	up to 2,415	Variable; Regional Cost up to $1,052,529[1]	Variable	$423-$448	No Change	Possible reduction in return flows to bay and estuary.
N-2	**Irrigation Water Conservation**	up to 342	Highly Variable	$3,900 - $78,000	$228[2]	No Change	None
N-4	**Mining Water Conservation**	up to 2,343	Highly Variable	Highly Variable	Variable	No Change	None
N-5	**Reclaimed Wastewater Supplies**	250	Not Applicable	$206,500[3]	$826[3]	No Change	Potential reduction of freshwater inflows to estuary/Construction and maintenance of pipeline corridors
N-7	**Gulf Coast Aquifer Supplies**						
	Drill additional well	Variable	Variable; up to $8,110,000[4]	Variable; up to $925,000[4]	Variable	Some Degradation	Minor impacts
	Brackish groundwater desalination (local projects)	Variable	Variable; up to $12,250,000[5]	Variable; up to $2,207,000[5]	Variable	Significant Improvement	Brine from desalt plant requires disposal by evaporation, deep well injection, blending, or discharging to saltwater body.
N-12	**Voluntary Redistribution/ Reallocation**	Variable	Variable; as needed	Variable; as needed	$685[6]	Variable	None
N-18	**Potential System Interconnections**						
	Duval County	974-2,520	Up to $30,113,000	Up to $4,823,000	$1,161-$1,914	Some Negative Impact	Construction and maintenance of pipeline corridor.
	Jim Wells County	246-1,434	Up to $10,824,000	Up to $1,929,000	$1,345-$2,248	Some Negative Impact	Construction and maintenance of pipeline corridor.
	Brooks County	2554	$16,195,000	$3,523,000	$1,379	Some Negative Impact	Construction and maintenance of pipeline corridor.
	San Patricio County	125-1,120	$2,517,000 to $3,136,000	$401,000 to $1,018,000	$909- $3,208	Some Negative Impact	Construction and maintenance of pipeline corridor.

[1]Assumes unit costs of $423 to $448/acft.

[2]Unit cost for raw water supplies.

[3]See Section 4C.5. Costs to maintain ongoing Nueces Delta studies are $500,000 per year (assumed cost associated with Allison Demonstration Project is 25 percent). Treatment cost of $326/acft have been added.

[4]Costs based on drilling 23 wells for San Patricio County – Irrigation.

[5]Estimated cost for 3 MGD facility. In Section 4B, the largest local brackish groundwater desalination plant considered was for Freer. The project cost for the 1.2 MGD plant i s $6,899,000. This results in an annual cost of $1,121,000 for a unit cost of $834 per acft.

[6]Unit cost of $685 per acft assumed to be comparable to cost of Garwood water. Costs should be revised in the future, as rate study information becomes available .

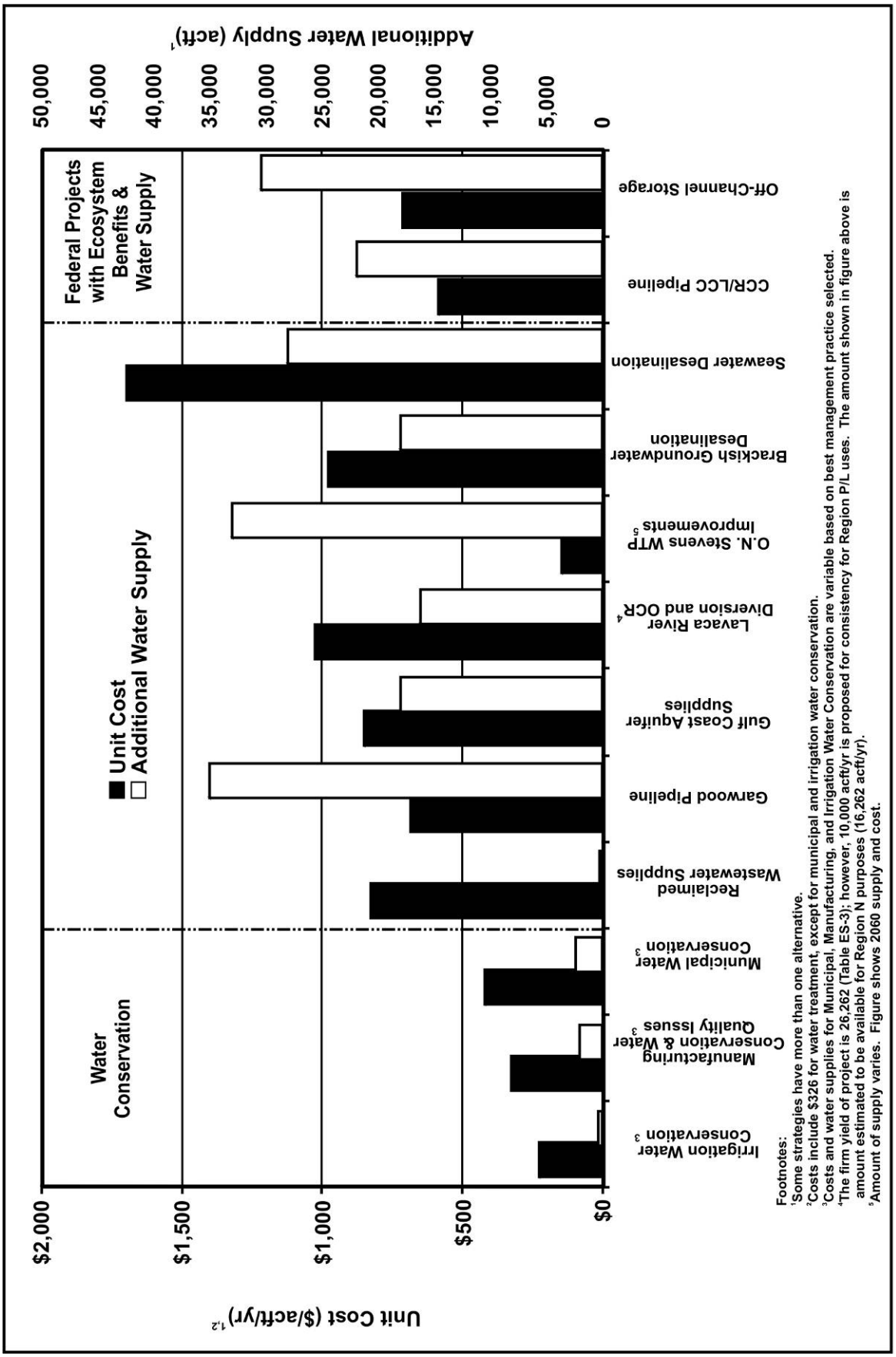

Figure ES-10. Comparison of Unit Costs and Water Supply Quantities for Potential Water Management Strategies for Coastal Bend

Table ES-5.
Water Plan Summary for Coastal Bend Region

County/Water User Group	*Demand (acft)*			*Need (Shortage) (acft)*			*Recommended Management Strategies to Meet Need (Shortage)*
	2010	*2030*	*2060*	*2010*	*2030*	*2060*	
Aransas County	**See Section 4A.3.1**						**See Section 4B.2**
Aransas Pass (P)	**168**	**195**	**169**	none	none	none	
Fulton	**307**	**365**	**318**	none	none	none	
Rockport	**1,590**	**1,868**	**1,620**	none	none	none	
County-Other	**1,766**	**2,016**	**1,728**	none	none	(1,443)	Increase contract amount provided by Wholesale Water Provider (San Patricio Municipal Water District).
Manufacturing	**267**	**292**	**331**	(72)	(97)	(136)	Gulf Coast Aquifer Supplies – Drill additional well.
Steam-Electric	**0**	**0**	**0**	none	none	none	
Mining	**103**	**123**	**146**	none	none	none	
Irrigation	**0**	**0**	**0**	none	none	none	
Livestock	**23**	**23**	**23**	none	none	none	
Bee County	**See Section 4A.3.2**						**See Section 4B.3**
Beeville	**2,619**	**2,722**	**2,618**	none	none	none	
El Oso WSC (P)	**62**	**66**	**64**	none	none	none	
County-Other	**1,661**	**1,704**	**1,609**	none	none	none	
Manufacturing	**1**	**1**	**1**	none	none	none	
Steam-Electric	**0**	**0**	**0**	none	none	none	
Mining	**36**	**42**	**48**	none	none	none	
Irrigation	**3,796**	**4,632**	**6,243**	none	none	(890)	Gulf Coast Aquifer Supplies – Drill additional well.
Livestock	**995**	**995**	**995**	none	none	none	
Brooks County	**See Section 4A.3.3**						**See Section 4B.4**
Falfurrias	**2,135**	**2,795**	**3,032**	none	none	none	Additional municipal water conservation recommended by CBRWPG for all municipal entities with reported use greater than 165 gpcd in 2060.
County-Other	**180**	**62**	**13**	none	none	none	
Manufacturing	**0**	**0**	**0**	none	none	none	
Steam-Electric	**0**	**0**	**0**	none	none	none	
Mining	**150**	**167**	**184**	none	none	none	
Irrigation	**24**	**23**	**21**	none	none	none	
Livestock	**747**	**747**	**747**	none	none	none	
Duval County	**See Section 4A.3.4**						**See Section 4B.5**
Benavides	**326**	**334**	**302**	none	none	none	
Freer	**645**	**663**	**600**	none	none	none	
San Diego (P)	**479**	**479**	**426**	none	none	none	
County-Other	**950**	**987**	**895**	none	none	none	Additional municipal water conservation recommended by CBRWPG for all municipal entities with reported use greater than 165 gpcd in 2060.

Table ES-5 (Continued)

County/Water User Group	Demand (acft)			Need (Shortage) (acft)			Recommended Management Strategies to Meet Need (Shortage)
	2010	2030	2060	2010	2030	2060	
Duval County (cont.)	**See Section 4A.3.4**						**See Section 4B.5**
Manufacturing	**0**	**0**	**0**	none	none	none	
Steam-Electric	**0**	**0**	**0**	none	none	none	
Mining	**5,860**	**7,119**	**8,553**	(1,738)	(2,973)	(4,205)	Mining water conservation including potential reuse; consider possible socioeconomic impact analysis of unmet needs.
Irrigation	**4,444**	**4,289**	**4,064**	none	none	none	
Livestock	**873**	**873**	**873**	none	none	none	
Jim Wells County	**See Section 4A.3.5**						**See Section 4B.6**
Alice	**5,606**	**6,076**	**5,904**	none	none	none	Additional municipal water conservation recommended by CBRWPG for all municipal entities with reported use greater than 165 gpcd in 2060.
Orange Grove	**374**	**405**	**393**	none	none	none	Additional municipal water conservation recommended by CBRWPG for all municipal entities with reported use greater than 165 gpcd in 2060.
Premont	**858**	**931**	**905**	none	none	none	Additional municipal water conservation recommended by CBRWPG for all municipal entities with reported use greater than 165 gpcd in 2060.
San Diego (P)	**103**	**106**	**101**	none	none	none	
County-Other	**2,127**	**2,238**	**2,130**	(167)	(262)	(170)	Gulf Coast Aquifer Supplies – Drill additional well.
Manufacturing	**0**	**0**	**0**	none	none	none	
Steam-Electric	**0**	**0**	**0**	none	none	none	
Mining	**423**	**484**	**550**	none	none	none	
Irrigation	**3,278**	**2,528**	**1,717**	none	none	none	
Livestock	**1,064**	**1,064**	**1,064**	none	none	none	
Kenedy County	**See Section 4A.3.6**						**See Section 4B.7**
County-Other	**50**	**53**	**53**	none	none	none	
Manufacturing	**0**	**0**	**0**	none	none	none	
Steam-Electric	**0**	**0**	**0**	none	none	none	
Mining	**1**	**1**	**1**	none	none	none	
Irrigation	**107**	**107**	**107**	none	none	none	
Livestock	**901**	**901**	**901**	none	none	none	
Kleberg County	**See Section 4A.3.7**						**See Section 4B.8**
Kingsville	**4,570**	**4,604**	**4,619**	none	none	none	
Ricardo WSC	**682**	**1,130**	**1,397**	none	none	none	
County-Other	**799**	**930**	**1,004**	none	(81)	(155)	Gulf Coast Aquifer Supplies – Drill additional well.
Manufacturing	**0**	**0**	**0**	none	none	none	
Steam-Electric	**0**	**0**	**0**	none	none	none	
Mining	**2,917**	**2,207**	**2,232**	none	none	none	
Irrigation	**866**	**644**	**410**	none	none	none	
Livestock	**1,900**	**1,900**	**1,900**	none	none	none	

Table ES-5 (Continued)

County/Water User Group	Demand (acft)			Need (Shortage) (acft)			Recommended Management Strategies to Meet Need (Shortage)
	2010	2030	2060	2010	2030	2060	
Live Oak County	**See Section 4A.3.8**						**See Section 4B.9**
Choke Canyon WS (P)	**397**	**435**	**346**	none	none	none	
El Oso WSC (P)	**206**	**223**	**176**	none	none	none	
George West	**703**	**767**	**608**	none	none	none	Additional municipal water conservation recommended by CBRWPG for all municipal entities with reported use greater than 165 gpcd in 2060.
McCoy WSC	**54**	**58**	**46**	none	none	none	
Three Rivers	**465**	**505**	**399**	none	none	none	Additional municipal water conservation recommended by CBRWPG for all municipal entities with reported use greater than 165 gpcd in 2060.
County-Other	**748**	**808**	**638**	none	(44)	none	Gulf Coast Aquifer Supplies – Drill additional well.
Manufacturing	**1,946**	**2,032**	**2,194**	(337)	(559)	(764)	Voluntary Redistribution of City of Three Rivers supply.
Steam-Electric	**0**	**0**	**0**	none	none	none	
Mining	**3,894**	**4,583**	**5,341**	(64)	(928)	(1,755)	Mining water conservation including potential reuse; consider possible socioeconomic impact analysis of unmet needs.
Irrigation	**3,289**	**2,840**	**2,277**	(627)	(514)	(373)	Irrigation water conservation; Gulf Coast Aquifer Supplies – drill additional well.
Livestock	**833**	**833**	**833**	none	none	none	
McMullen County	**See Section 4A.3.9**						**See Section 4B.10**
Choke Canyon WS (P)	**43**	**42**	**35**	none	none	none	
County-Other	**143**	**138**	**117**	none	none	none	Additional municipal water conservation recommended by CBRWPG for all municipal entities with reported use greater than 165 gpcd in 2060.
Manufacturing	**0**	**0**	**0**	none	none	none	
Steam-Electric	**0**	**0**	**0**	none	none	none	
Mining	**195**	**207**	**218**	none	none	none	
Irrigation	**0**	**0**	**0**	none	none	none	
Livestock	**659**	**659**	**659**	none	none	none	
Nueces County	**See Section 4A.3.10**						**See Section 4B.11**
Agua Dulce	**112**	**107**	**103**	none	none	none	
Aransas Pass (P)	**26**	**53**	**81**	none	none	none	
Bishop	**444**	**422**	**404**	none	none	none	
Corpus Christi	**61,953**	**73,592**	**86,962**	none	none	none	
Driscoll	**122**	**171**	**224**	none	none	none	
Nueces County WCID #4	**1,913**	**3,729**	**5,655**	none	none	none	Additional municipal water conservation recommended by CBRWPG for all municipal entities with reported use greater than 165 gpcd in 2060.
Port Aransas	**2,606**	**4,558**	**6,637**	none	none	none	Additional municipal water conservation recommended by CBRWPG for all municipal entities with reported use greater than 165 gpcd in 2060.
River Acres WSC	**429**	**646**	**881**	(138)	(355)	(590)	Voluntary Redistribution- increase contracted amount from Nueces County WCID #3.
Robstown	**2,110**	**2,024**	**1,953**	none	none	none	
County-Other	**894**	**395**	**118**	(261)	none	none	Increase contracted amount provided by Wholesale Water Providers (City of Corpus Christi).

Table ES-5 (Concluded)

County/Water User Group	Demand (acft)			Need (Shortage) (acft)			Recommended Management Strategies to Meet Need (Shortage)
	2010	2030	2060	2010	2030	2060	
Nueces County (cont.)	**See Section 4A.3.10**						**See Section 4B.11**
Manufacturing	**46,510**	**53,425**	**63,313**	none	(15,203)	(39,550)	Development of additional water supplies for City of Corpus Christi and SPMWD considered jointly. (Manufacturing Water Conservation, O.N. Stevens Water Treatment Plant Improvements, Reclaimed Wastewater Supplies, Garwood Pipeline, Off-Channel Reservoir, Gulf Coast Aquifer Groundwater Supplies, and Lavaca River Diversion and Off-Channel Reservoir).[1]
Steam-Electric	**7,316**	**16,733**	**27,664**	none	(4,755)	(13,183)	Development of additional water supplies for City of Corpus Christi (O.N. Stevens Water Treatment Plant Improvements, Reclaimed Wastewater Supplies, Garwood Pipeline, Off-Channel Reservoir, Gulf Coast Aquifer Groundwater Supplies, and Lavaca River Diversion and Off-Channel Reservoir).[1]
Mining	**1,472**	**1,599**	**1,724**	none	(570)	(1,624)	Mining water conservation including potential reuse; Development of additional water supplies for City of Corpus Christi (O.N. Stevens Water Treatment Plant Improvements, Reclaimed Wastewater Supplies, Garwood Pipeline, Off-Channel Reservoir, Gulf Coast Aquifer Groundwater Supplies, and Lavaca River Diversion and Off-Channel Reservoir).[1]
Irrigation	**1,449**	**1,077**	**692**	none	none	none	
Livestock	**279**	**279**	**279**	none	none	none	
San Patricio County	**See Section 4A.3.11**						**See Section 4B.12**
Aransas Pass (P)	**1,405**	**1,828**	**2,386**	none	none	none	
Gregory	**239**	**223**	**210**	none	none	none	
Ingleside	**1,294**	**2,202**	**3,395**	none	none	none	
Ingleside On The Bay	**92**	**130**	**181**	none	none	none	
Lake City	**79**	**99**	**125**	none	(11)	(37)	Gulf Coast Aquifer Supplies – Drill additional well.
Mathis	**648**	**615**	**586**	none	none	none	
Odem	**330**	**361**	**408**	none	none	none	
Portland	**2,399**	**3,290**	**4,498**	none	none	none	
Sinton	**1,052**	**1,076**	**1,135**	none	none	none	
Taft	**586**	**648**	**736**	none	none	none	
County-Other	**1,946**	**2,189**	**2,533**	none	none	none	
Manufacturing	**15,096**	**18,111**	**22,283**	none	none	(6,455)	Development of additional water supplies for City of Corpus Christi and SPMWD considered jointly. (Manufacturing Water Conservation, O.N. Stevens Water Treatment Plant Improvements, Reclaimed Wastewater Supplies, Garwood Pipeline, Off-Channel Reservoir, Gulf Coast Aquifer Groundwater Supplies, and Lavaca River Diversion and Off-Channel Reservoir).[1]
Steam-Electric	**0**	**0**	**0**	none	none	none	
Mining	**99**	**108**	**117**	none	none	none	
Irrigation	**8,631**	**10,531**	**14,195**	none	(750)	(4,414)	Gulf Coast Aquifer Supplies – Drill additional well.
Livestock	**564**	**564**	**564**	none	none	none	
Total Needs by Water User Type							
Municipal	**111,495**	**132,063**	**151,474**	(566)	(753)	(2,395)	Municipal Water Conservation, Irrigation Water Conservation, Manufacturing Water Conservation and Nueces River Water Quality, Mining Water Conservation, Voluntary Redistribution, Additional Local Gulf Coast Aquifer Supplies, O.N. Stevens Water Treatment Plant Improvements, Reclaimed Wastewater Supplies, Garwood Pipeline, Off-Channel Reservoir, Gulf Coast Aquifer Groundwater Supplies, and Lavaca River Diversion and Off-Channel Reservoir.
Manufacturing	**63,820**	**73,861**	**88,122**	(409)	(15,859)	(46,905)	
Steam-Electric	**7,316**	**16,733**	**27,664**	—	(4,755)	(13,183)	
Mining	**15,150**	**16,640**	**19,114**	(1,802)	(4,471)	(7,584)	
Irrigation	**25,884**	**26,671**	**29,726**	(627)	(1,264)	(5,677)	
Livestock	**8,838**	**8,838**	**8,838**	—	—	—	
Region N Total	**232,503**	**274,806**	**324,938**	**(3,404)**	**(27,102)**	**(75,744)**	

(P) = Partial listing — water user group is in multiple counties.

[1] Alternative water management strategies are CCR/LCC Pipeline, Stage II Lake Texana, Brackish Groundwater Desalination, and Seawater Desalination.

- TCEQ considers water rights applications for various types of uses (e.g., recreation, navigation, irrigation, hydroelectric power, industrial, recharge, municipal, and others). Many of these applications are for small amounts of water, some are temporary, and some are even non-consumptive. Because waters of the Nueces River Basin are fully appropriated to the City of Corpus Christi and others, any new water rights application for consumptive water use from this Basin will need to protect the existing water rights or provide appropriate mitigation to existing water right owners. Throughout the Coastal Bend Region, the types of small projects that may arise are so unpredictable that the CBRWPG is of the opinion that each project should be considered by the TWDB and TCEQ on their merits, and that the Legislature foresaw this situation and provided appropriate language for each agency to deal with it.

  (Note: The provision related to TCEQ 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 appropriator addresses a water supply need in a manner consistent with an approved regional water plan. TCEQ 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.)

ES.9 Social and Economic Impacts of Not Meeting Projected Water Needs

If projected water needs are not met, the region could expect 520 fewer people in 2010, 13,590 fewer in 2030, and 66,280 fewer in 2060 under drought of record water supply conditions. The expected 2060 population under the unmet water need (shortage) condition would be 7.5 percent lower than the region's growth projection with adequate water supplies.

The estimated effect of projected water shortages upon income in the region, are $57.26 million per year in 2010, $1,617.17 million per year in 2030, and $7,840.56 million per year in 2060. If the water needs are left entirely unmet, the level of shortage in 2010 results in 430 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 11,275 fewer jobs by 2030 and 55,025 few jobs by 2060. Socioeconomic impacts of unmet needs were evaluated by the TWDB and costs of unmet needs were provided to represent regional impacts of leaving water needs entirely unmet, representing a worst-case scenario (Appendix F).

Tables ES-6.
Summary of Recommended Water Management Strategies in the Coastal Bend Region

ID	Recommended Water Management Strategy	Total Capital Costs	First Decade Estimated Annual Average Unit Cost ($/acft/yr)	Water Supply Volume (acrt/yr)						Year 2060 Estimated Annual Average Unit Cost ($/acft/yr)
				2010	2020	2030	2040	2050	2060	
N-1	**Municipal Water Conservation**									
	Alice	N/A	$423	50	133	219	306	438	585	$423
	Duval County-Other	N/A	$423	6	13	21	27	44	63	$423
	Falfurrias	N/A	$423	1	38	95	156	228	309	$423
	George West	N/A	$423	5	14	25	33	45	57	$423
	McMullen County-Other	N/A	$423	1	2	3	5	7	10	$423
	Nueces County WCID #4	N/A	$448	0	0	56	135	261	384	$448
	Orange Grove	N/A	$423	3	8	14	18	28	38	$423
	Port Aransas	N/A	$448	28	115	238	406	615	843	$448
	Premont	N/A	$423	9	22	36	49	70	92	$423
	Three Rivers	N/A	$423	3	8	14	18	27	34	$423
N-2	**Irrigation Conservation**									
	Live Oak County	N/A	$228	17	52	103	169	248	342	$228
N-3	**Manufacturing Conservation**	N/A	N/A	1,260	1,418	1,576	1,734	1,892	2,050	N/A
N-4	**Mining Water Conservation**									
	Duval County	N/A	N/A	147	332	534	761	1,014	1,283	N/A
	Live Oak County	N/A	N/A	97	216	344	485	639	801	N/A
	Nueces County	N/A	N/A	37	78	120	164	210	259	N/A
N-5	**Reclaimed Wastewater Supplies**	N/A	$826	250	250	250	250	250	250	$826
N-7	**Gulf Coast Aquifer Groundwater Supplies (Local)**									
	Aransas County - Manufacturing	$257,000	$135	200	200	200	200	200	200	$25
	Bee County - Irrigation	$1,763,000	$100	0	0	0	0	2,016	2,016	$100
	Jim Wells County - Other	$980,000	$213	565	565	565	565	565	565	$62
	Kleberg County - Other	$587,000	$185	0	400	400	400	400	400	$58
	Lake City	$343,000	$444	0	80	80	80	80	80	$75
	Live Oak County - Irrigation	$1,058,000	$100	1,210	1,210	1,210	1,210	1,210	1,210	$24
	Live Oak County - Other	$315,000	$438	0	80	80	80	80	80	$100
	San Patricio County - Irrigation	$8,110,000	$100	0	0	9,000	9,000	9,000	9,000	$24
N-7	**Gulf Coast Aquifer Groundwater Supplies (Regional)**	$59,245,000	$853	0	0	11,000	11,000	11,000	18,000	$566
N-11	**Off-Channel Reservoir**[1]	$105,201,950	$715	0	0	30,340	30,340	30,340	30,340	$578
N-12	**Voluntary Redistribution of City of Three Rivers Surplus**									
	Live Oak County - Manufacturing	N/A	$685	337	483	559	615	657	764	$685
	River Acres WSC	N/A	$798	138	255	355	445	522	590	$798
N-12	**Increase contracted amount provided by Wholesale Water Providers**									
	Aransas County - Other	N/A	$442	0	0	0	0	1,527	1,443	$471
	Nueces County - Other	N/A	$652	261	0	0	0	0	0	$0
N-13	**Lavaca River Diversion & Off-Channel Reservoir**[2]	$224,183,000	$1,027	0	0	0	0	0	16,242	$1,027
N-14	**Garwood Pipeline**	$112,798,000	$685	0	35,000	35,000	35,000	35,000	35,000	$402
N-19	**O.N. Stevens Water Treatment Plan Improvments**[3]	$31,324,000	$178	42,329	40,048	38,102	36,366	34,817	32,996	$146

1. Capital cost shown assume Federal and/or State participation of 65%. Without this funding, the total project cost is $30 0,577,000.
2. Total cost shown is not prorated between Region N and P; however, it is understood that Region N is only responsible for a portion of the total project cost.
3. Total capital cost include improvements to the following WTP components: raw influent, raw water intake pump station, and O.N. Stevens solids handling facilities.

N/A = Not Applicable

Table ES-7.
Summary of Alternative Water Management Strategies in the Coastal Bend Region

ID	Recommended Water Management Strategy	Total Capital Costs	First Decade Estimated Annual Average Unit Cost ($/acft)	Water Supply Volume (acft)						Year 2060 Estimated Annual Average Unit Cost ($/acft)
				2010	2020	2030	2040	2050	2060	
N-10	CCR/LCC Pipeline[1]	$48,324,000	$588	0	0	0	21,905	21,905	21,905	$588
N-13	Stage II Lake Texana (On-Channel)[2]	$232,828,000	$1,213	0	0	0	0	0	12,964	$1,213
N-17	Seawater Desalination	$260,914,000	$1,696	0	0	0	28,000	28,000	28,000	$1,696
N-20	Brackish Groundwater Desalination	$108,331,000	$977	0	0	0	18,000	18,000	18,000	$977

1. Capital cost shown assume Federal and/or State participation of 65%. Without this funding, the total project cost is $138,067,000.
2. Total cost shown is not prorated between Region N and P; however, it is understood that Region N is only responsible for a portion of the total project cost.