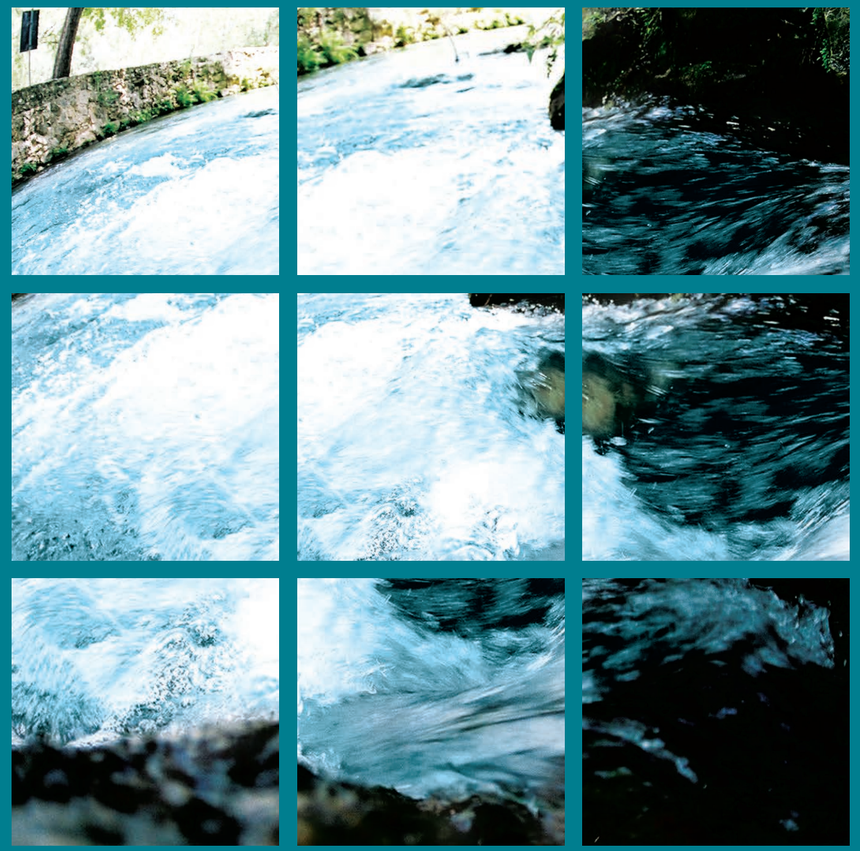
Comprehensive Water Management Plan

EDWARDS AQUIFER AUTHORITY

Adopted by the Board of Directors on December 14, 2004

EDWARDS AQUIFER
AUTHORITY



ACKNOWLEDGEMENTS

The Edwards Aquifer Authority's (Authority) *Comprehensive Water Management Plan* was prepared under the guidance and direction of the Authority's Board of Directors. Specifically, the Aquifer Management Planning (AMP) Committee, chaired by Mr. Ken Barnes, District 10, Hays County Director; and the Comprehensive Water Management Plan (CWMP) Work Group, chaired by Ms. Luana Buckner, District 13, Medina and Atascosa Director. The Stakeholders Work Group, an advisory committee composed of representatives of surface water management entities, other groundwater conservation districts operating within the Authority's boundaries, irrigators, agricultural applicants, water supply companies, and other interested parties also provided input to this plan. Members of the Authority staff including Mr. Gregory M. Ellis, General Manager, Mr. Geary M. Schindel, P.G., Chief Technical Officer, Mr. Rick Illgner, Program Manager – Groundwater Management Strategies, Ms. Margaret Garcia, Program Manager – Public Affairs, and Mr. Ray Buck, AICP, Water Resources Coordinator provided valuable input toward the preparation of this document. Additional assistance was provided by Dr. Charles W. Kreitler, Vice President, and Mr. Andrew C.A. Donnelly, Senior Hydrologist, of LBG-Guyton Associates; Turner Collie & Braden, Inc., and Mr. Michael L. Personett.

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FREQUENTLY USED ACRONYMS AND ABBREVIATIONS

Act	Edwards Aquifer Authority enabling legislation (Act), Act of May 30, 1993, 73rd Leg., R.S., ch 626, 1993 Tex. Gen. Laws 2353-74, as amended. Senate Bill 1477
Authority	Edwards Aquifer Authority
Brown-Lewis Water Plan	Senate Bill 1 state water planning initiative
Bad water line	Interface between aquifer water with <1000 mg/L TDS and water with >1000 mg/LTDS
BEG	Bureau of Economic Geology
BMWD	Bexar-Metropolitan Water District
Board	Edwards Aquifer Authority Board of Directors
CPR	Edwards Aquifer Authority Critical Period Rules
CRWA	Canyon Regional Water Authority
CWMP	Edwards Aquifer Authority Comprehensive Water Management Plan
EAOP	Edwards Aquifer Optimization Program
EIS	Environmental Impact Statement
ESA	Endangered Species Act
EUWD	Edwards Underground Water District
GBRA	Guadalupe-Blanco River Authority
GCD	Groundwater Conservation District
GMP	Groundwater Management Plan
HCP	Habitat Conservation Plan
NBU	New Braunfels Utilities
NEPA	National Environmental Protection Agency
Planning Area	Edwards Aquifer Authority Jurisdictional Area
Region L	One of 16 planning regions for Brown-Lewis Water Plan (Edwards Aquifer Authority is located in this region)
RWPG	Regional Water Planning Group (acronym for the Region L Board of Directors)

SAWS	San Antonio Water System
SCTWAC	South Central Texas Water Advisory Committee
State Water Plan	Product from the Brown-Lewis Water Plan process
TCEQ	Texas Commission on Environmental Quality (formerly the TNRCC)
TDS	Total Dissolved Solids
TNRCC	Texas Natural Resource Conservation Commission
TWC	Texas Water Commission
TWDB	Texas Water Development Board
USDA	United States Department of Agriculture
USGS	United States Geological Survey
USFWS	United States Fish & Wildlife Service
WQPP	Water Quality Protection Program

EXECUTIVE SUMMARY

OVERVIEW OF PLAN DEVELOPMENT

The Edwards Aquifer Authority Act (Act) was passed in 1993 and legislators envisioned that the Authority would be the regional water planning entity responsible for developing a future water supply plan for the Edwards Aquifer Region. Section 1.25 of the Act requires the Authority to develop a CWMP complete with a 20-year water supply plan. However, in 1997, the Texas Legislature passed the Brown-Lewis Water Plan that led to the creation of 16 regional water planning groups by the Texas Water Development Board (TWDB) which became responsible for developing regional water supply plans.

Discussions with the CWMP Work Group, the Aquifer Management Planning Committee of the board, and the CWMP Stakeholder Group revealed that a duplicative planning effort for a major component of the CWMP, the 20-year water supply plan, was being conducted by the South Central Texas Regional Water Planning Group (SCTRWPG).

In order to avoid duplication, the Authority agreed to delay development of the CWMP pending the development of the SCTRWPG regional water supply plan. Additionally, to facilitate regional cooperation, the Authority modified the water supply component of the CWMP to 30-years from the original 20-years stipulated in the Act.

Legal challenges to the Authority's rules and subsequent changes further delayed the development of the CWMP. In 2001, the development of the Authority's five-year Strategic Plan took priority and completion of the CWMP was deferred pending its adoption in April 2002.

OVERVIEW OF THE PLAN

The key objective of the CWMP is to satisfy the Authority's statutory requirement to develop and adopt a regional water management plan. The CWMP is intended to serve as an "umbrella" document that encompasses all of the Authority's plans, programs, and policies essential to managing the Edwards Aquifer. The CWMP defines and outlines a coordinated operational plan that unifies all of the Authority's water management plans, programs, and policies into a cohesive aquifer management program that balances the needs and interests of all aquifer users.

In addition to federally endangered and threatened species concerns, another challenge that the plan addresses is the increasing water demand from a rapidly growing population. Coupled with these issues, the plan also addresses the mandate for the Authority to restrict permitted pumpage from the Edwards Aquifer to 450,000 acre-feet per year through December 2007. In addition, the Authority is required to reduce permitted pumpage to 400,000 acre-feet per year beginning in January 2008.

The planning area is projected to have an overall increase of approximately 34 percent in water demand from 2000 to 2030. Bexar County alone has projected an increase of more than one-half million people during this 30-year planning period, attributed primarily to the growth of San Antonio and surrounding suburban areas. Managing the aquifer as the major component of meeting the water supply needs of this relatively large influx of people into the planning area will be one of the greatest challenges faced by the Authority in the coming years.

Section 7.0 of this plan describes the various water management plans and programs developed by the Authority. The current water management strategies include:

- Water Quality Protection Program
- Groundwater Conservation and Reuse Plan
- Demand Management/Critical Period Management Plan
- Permit Program
- Alternative Water Supply Plan
- Habitat Conservation Plan
- Groundwater Management Plan
- Applied Research
- Withdrawal Reduction and Permit Retirement Plans
- Recharge Storage and Recovery Program

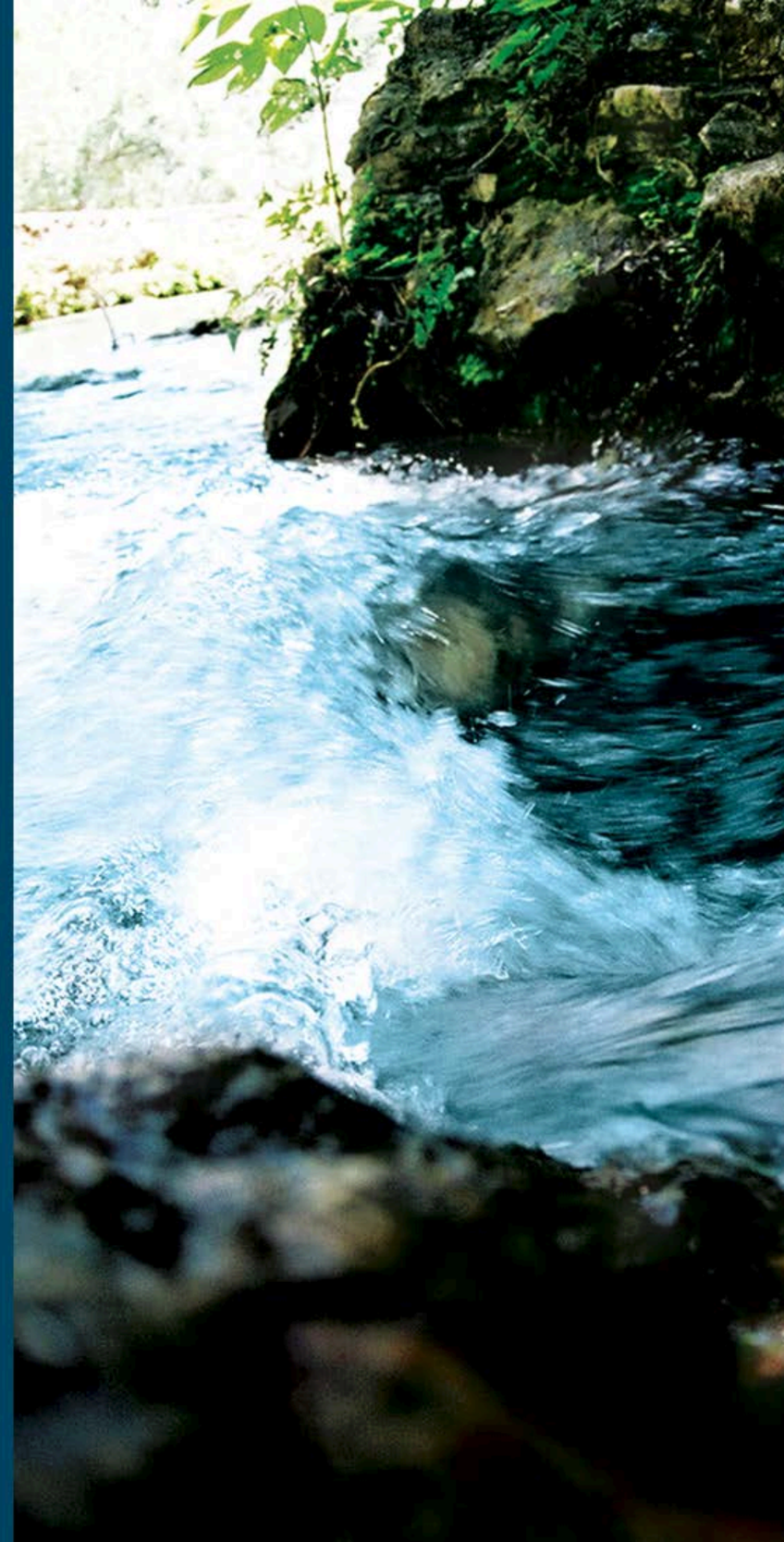
Research supports the Authority's planning process. Section 9.0 describes the ongoing planning processes that include:

- Edwards Aquifer Optimization Program
- Alternative Technology
- Data Acquisition and Analysis

The CWMP will be evaluated annually and a report presented to the Authority's Board of Directors (board). Revisions and modifications will be determined by the development of new data regarding management of the aquifer, legislative changes that affect the Authority, and policy directions of the board.

1.0

Introduction



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1.0 INTRODUCTION

1.1 PURPOSE AND OBJECTIVES OF THE COMPREHENSIVE WATER MANAGEMENT PLAN

The authors of the Edwards Aquifer Authority Act (Act) intended for the Edwards Aquifer Authority (Authority) to develop and implement a Comprehensive Water Management Plan (CWMP). Specifically, Section 1.25 of the Act requires the Authority to develop and implement a CWMP by September 1, 1995, or two years after the Authority's original establishment date of September 1, 1993. The development of the CWMP was delayed due to legal challenges regarding the constitutionality of the Act and to legislation passed in 1995 (see Section 2.1 History of Edwards Aquifer Management Issues).

While the Act mandates the development and implementation of a CWMP, it is vague in describing the plan development process and its contents. The Act does, however, outline some of the key elements of the CWMP. For example, the CWMP must include conservation, future supply, and demand management plans.

Generally, the purpose and objective of the CWMP is defined by the Authority's mission statement:

> ***"The Edwards Aquifer Authority is committed to manage, enhance, and protect the Edwards Aquifer system."***

More specifically, a key objective of this CWMP is to satisfy the Authority's statutory requirement to develop and adopt a regional water management plan. The CWMP is intended to serve as an "umbrella" plan that encompasses all of the Authority's plans, programs, and policies essential to managing the Edwards Aquifer (see Section 7.0). The CWMP therefore defines and outlines a coordinated operational plan that unifies all of the Authority's water management plans, programs, and policies into a cohesive aquifer management program that balances the needs and interests of all users dependent on the aquifer.

The CWMP is also intended to be flexible and dynamic. It will be revisited and revised periodically to reflect changing conditions – changes in demographics, water uses, water law, technology, water supply availability, and environmental concerns, as well as any unforeseen issues that may arise and affect management of the aquifer.

The CWMP is built upon known and proven aquifer management strategies that are in turn based on sound, reproducible science. However, it is important to note that research into cutting-edge management concepts is an integral part of the Authority's ongoing planning processes. As new ideas are explored and new technologies are developed and proven, they will be evaluated for possible inclusion in the CWMP. Specifically, the Authority is committed to a multi-year research program – the Edwards Aquifer Optimization Program (EAOP) – that could result in the development of new aquifer management strategies that would be incorporated into the CWMP in future updates and revisions of the plan (see Section 9.0).

1.2 PLAN DEVELOPMENT PROCESS

Water management planning is a basic statutory responsibility of the Authority. The Act outlines research and studies that should be conducted and incorporated in the planning process. The Act anticipates that the water management planning process will create a product developed with public participation, flexible enough to incorporate new research and technologies and broad enough in scope to accomplish the Authority's aquifer management goals.

The CWMP development process began with the planning process to develop the Authority's Groundwater Management Plan (GMP).The Authority Board of Directors (Board) approved the GMP in 1998. It was subsequently certified by the Texas Water Development Board (TWDB) in September 1998. Though since revised, the 1998 GMP's Management Objective 6.1 in Section 4.6 describes the Authority's intention to revise the GMP in order to develop the CWMP. Below is an excerpt and management objective from the 1998 GMP demonstrating that intention.

> ***"Management Objective 6.1 in Section 4.6 describes the Edwards Aquifer Authority's intention to revise its initial Groundwater Management Plan to incorporate elements of the Brown-Lewis Water Plan regional water plan, and in doing so, develop a 'comprehensive' Groundwater Management Plan that fulfills the planning requirements of the EAA Act."***

Management Objective 6.1 – Comprehensive Management Plan

By the end of 2002, the Edwards Aquifer Authority will adopt a Comprehensive Water Management Plan for the Edwards Aquifer that includes aquifer management, water conservation, supply, and critical period plans. The plan will have five-year goals and will recommend alternative water management technologies based on analyses of costs, benefits, and environmental impacts. The plan will also consider the options for financing the recommended water management technologies that are available from the TWDB.

Performance Standards:

> ***6.1(a)*** *Achieve 450,000 acre-feet per year Edwards Aquifer withdrawal limitation for initial regular permits by January 2000 unless otherwise directed by the Authority's Board of Directors.*
>
> ***6.1(b)*** *The board will develop and adopt a Comprehensive Water Management Plan by the end of 2002 that will balance water supplies and demands for each five-year period during the planning period.*
>
> ***6.1(c)*** *The plan will provide the means to achieve flow requirements at Comal and San Marcos springs by the end of 2012.*

TWDB rules require that the GMP be revised or readopted every five years. In order to alleviate potential confusion among the Authority's several planning efforts, the Strategic Plan, the Comprehensive Water Management Plan mandated by the Authority's enabling legislation, and the TWDB-required GMP, staff significantly revised the Authority's initial GMP in 2003. Management Objective 3.0 (seen below) of the revised CWMP addresses the development of the CWMP.

Management Objective 3.0 – Address future water supply needs with the Edwards Aquifer.

Action Step 3.1: Develop a comprehensive water management plan.

Performance Measure 3.1.1: Complete draft CWMP by December 31, 2004.

The CWMP incorporates a 30-year water supply plan developed in concert with the South Central Texas Regional Water Planning Group's (SCTRWPG) regional water plan. This document represents the product of planning evolution and becomes the Authority's water management plan, the CWMP.

1.3 PUBLIC PARTICIPATION

From the beginning, the CWMP was developed in a public forum. The Authority has expended a great deal of effort to facilitate open and ongoing communication between constituents and their representatives, with staff and consultants working directly on the CWMP. Constituents are given many opportunities to participate, from open, well-noticed board and committee meetings, to serving on advisory committees, such as the stakeholder work group.

Again, it is important to view public participation as continuous and ongoing at the Authority as it relates to the many plans and programs that make up water management. Specific elements of this CWMP's public participation process include:

- Establishing a CWMP work group comprised of Authority board members representing the various constituencies of the Authority. This group posted its meetings and met regularly to review and provide input on the CWMP process.

- Conducting a formal review of all work on the CWMP through the Aquifer Management Planning Committee, a standing committee comprised of Authority directors. This committee posted its meetings and met monthly to consider recommendations from the CWMP work group and to review and comment on the CWMP process.
- Establishing a stakeholder work group comprised of individuals representing groups impacted by aquifer management decisions. This group represented water purveyors, water conservation districts, state, federal and local government agencies, downstream water users, river authorities, property owners, and regional water planning interests (members from the SCTRWPG). This group met periodically to review the technical data developed for the 30-year water supply plan component of the CWMP and to review and comment on the plan process.
- Periodic updates on the CWMP in the Authority's newsletter, *General Manager's Report*. This report is distributed free of charge to approximately 300 recipients ranging from state legislators, local officials, and interested parties.
- Formal public meetings to receive citizen comment on the draft CWMP. Public meetings were conducted in the Western, Central, and Eastern regions of the Edwards Aquifer area.
- Submission of technical memorandum to the SCTRWPG requesting input in selecting water management strategies. As the SCTRWPG is composed of members outside of the Edwards Aquifer area, this provided an avenue for broader public participation.
- Presentation made to the SCTRWPG by Authority staff and consultants to increase awareness of the process and to solicit input. The 30-year water supply plan component of the CWMP was closely coordinated with the development of the SCTRWPG regional plan and with input from the regional planning group.
- The rules for each plan and program component of the CWMP will be thoroughly assessed by an independent contractor before adoption by the board.
- Public input is also solicited through the various ad hoc groups such as the Biological Advisory Team (BAT), the Citizens Advisory Committee (CAC), the Technical Advisory Group (TAG), and the Blue Ribbon Panel.

1.4 CONCURRENT PLANNING EFFORTS

There are several concurrent planning processes that have been conducted by or with the active participation of the Authority. These are:

- Development of a Groundwater Management Plan.
- State and regional water supply planning.
- Development of a water supply plan for the Authority's jurisdictional area.
- Development of a Habitat Conservation Plan (HCP) pursuant to the Federal Endangered Species Act (ESA).

Each of these planning processes is described briefly on the next page. The relationships between these processes are illustrated in Figure 1.1.

1.4.1 GROUNDWATER MANAGEMENT PLAN

In 1997, the 75th Texas Legislature enacted Senate Bill 1 (herein referred to as the Brown-Lewis Water Plan), providing a major overhaul of many long-standing state water laws and policies. Among its many provisions, the Brown-Lewis Water Plan amends Chapter 36 of the Texas Water Code to require all underground water conservation districts to develop a groundwater management plan within each district's jurisdiction. The initial groundwater management plans were to be submitted to the TWDB for review and certification by September 1, 1998. The Authority adopted its initial GMP on August 11, 1998. The TWDB Executive Administrator subsequently certified the Authority's initial GMP as administratively complete on September 17, 1998.

In 2001, the 77thTexas Legislature enacted Senate Bill 2, significantly amending the Brown-Lewis Water Plan. Some of the amendments affecting groundwater management planning include new planning requirements for addressing drought conditions and conservation. Additionally, districts are required to use best available data in developing their GMPs, and are required to submit their GMP to the Chair of any Regional Water Planning Group (RWPG) in which any part of the district is located. The district must request that the RWPG review the GMP and specify any area(s) of conflict with the approved Regional Water Plan. The revised GMP was approved by the board in 2003 and certified by the TWDB in 2004.

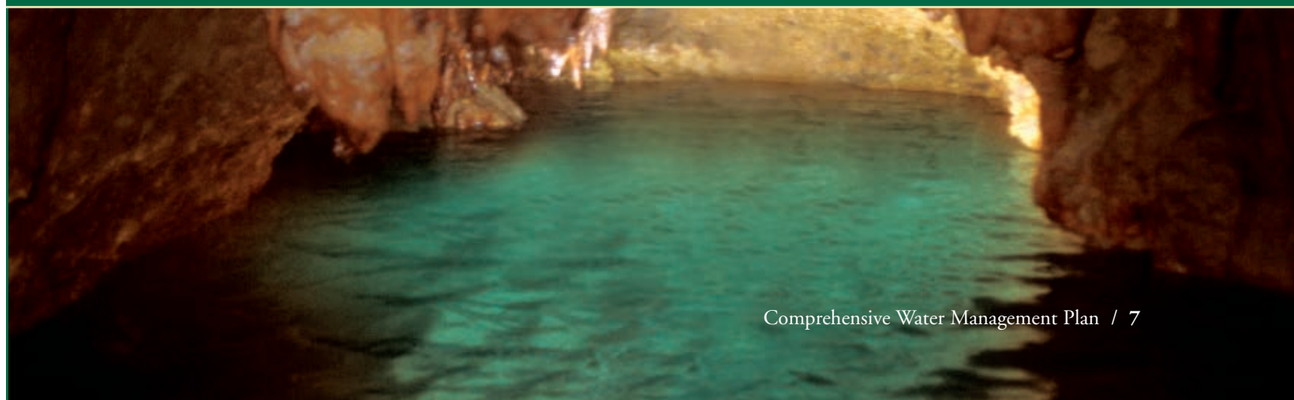
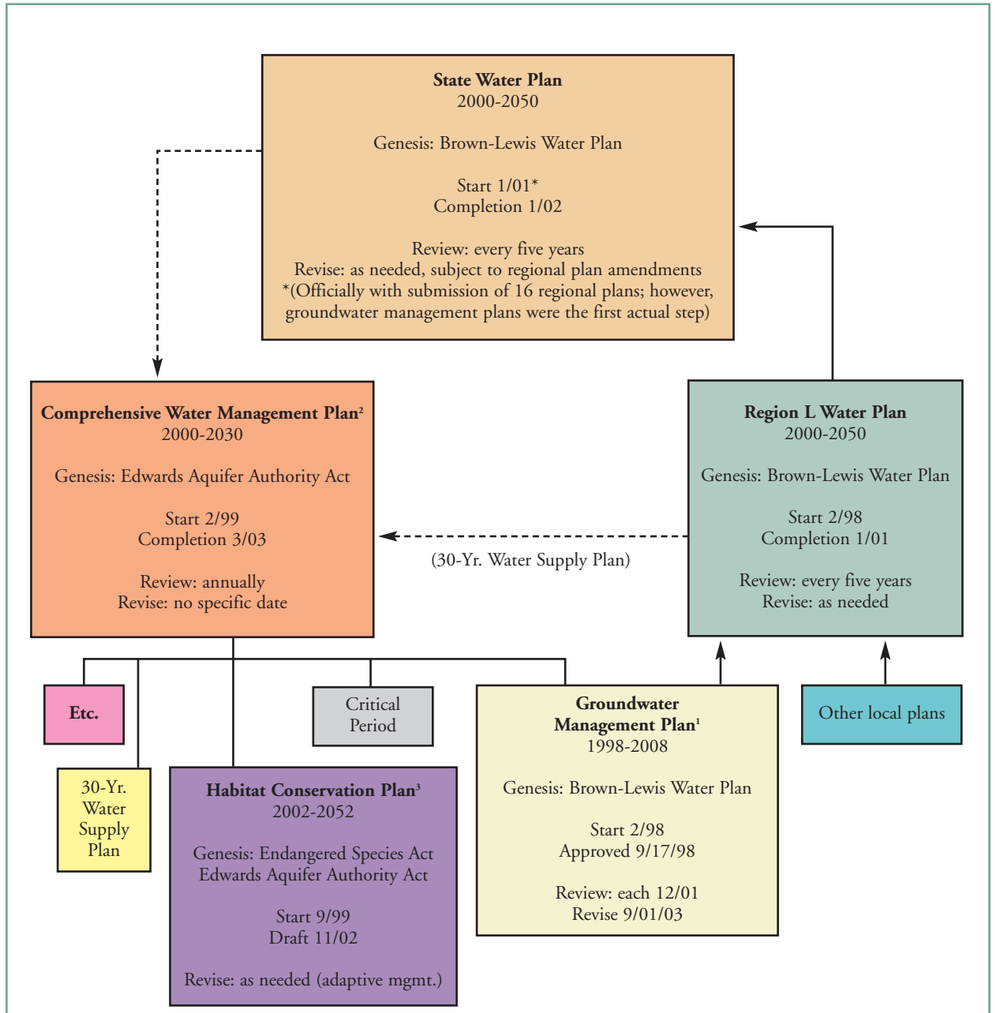


Figure 1.1: Relationship of Planning Processes that Affect the Edwards Aquifer Authority



1 – The GMP is the first step for regional water plans and State Water Plan. Requires quantifiable management objectives and performance standards for five goals: efficiency, prevention of waste, conjunctive use of surface and groundwater, natural resource issues, and controlling subsidence. The GMP provides initial input to the CWMP and the Regional Water Plan. When the GMP is revised, the input process is reversed.

2 – The CWMP is the most comprehensive planning effort of the Authority and is the core of the management and regulatory responsibilities of the Authority. The 30-Year Water Supply Plan of the CWMP was completed on a parallel track and must be consistent with the Regional Water Plan. As the ultimate management plan, all plans (HCP, GMP, Critical Period Plan, etc.) and regulatory directions (rules, administrative procedures) will be located or guided by the CWMP. The CWMP will be modified after completion of the HCP to include new material.

3 – The HCP will receive and provide input to the CWMP and provide input to the Regional Water Plan. While an important political effort, the HCP is a component of the CWMP.

1.4.2 STATE AND REGIONAL WATER SUPPLY PLANS

Sections 16.051 and 16.055 of the Texas Water Code direct the executive administrator of the TWDB to prepare and maintain a comprehensive State Water Plan, which is to serve as a flexible guide for the development and management of all water resources in Texas. The plan is to ensure that sufficient supplies of water are available at a reasonable cost to further the state's economic development. Section 16.056 requires the TWDB to amend the plan as needed in response to increased knowledge and changing conditions.

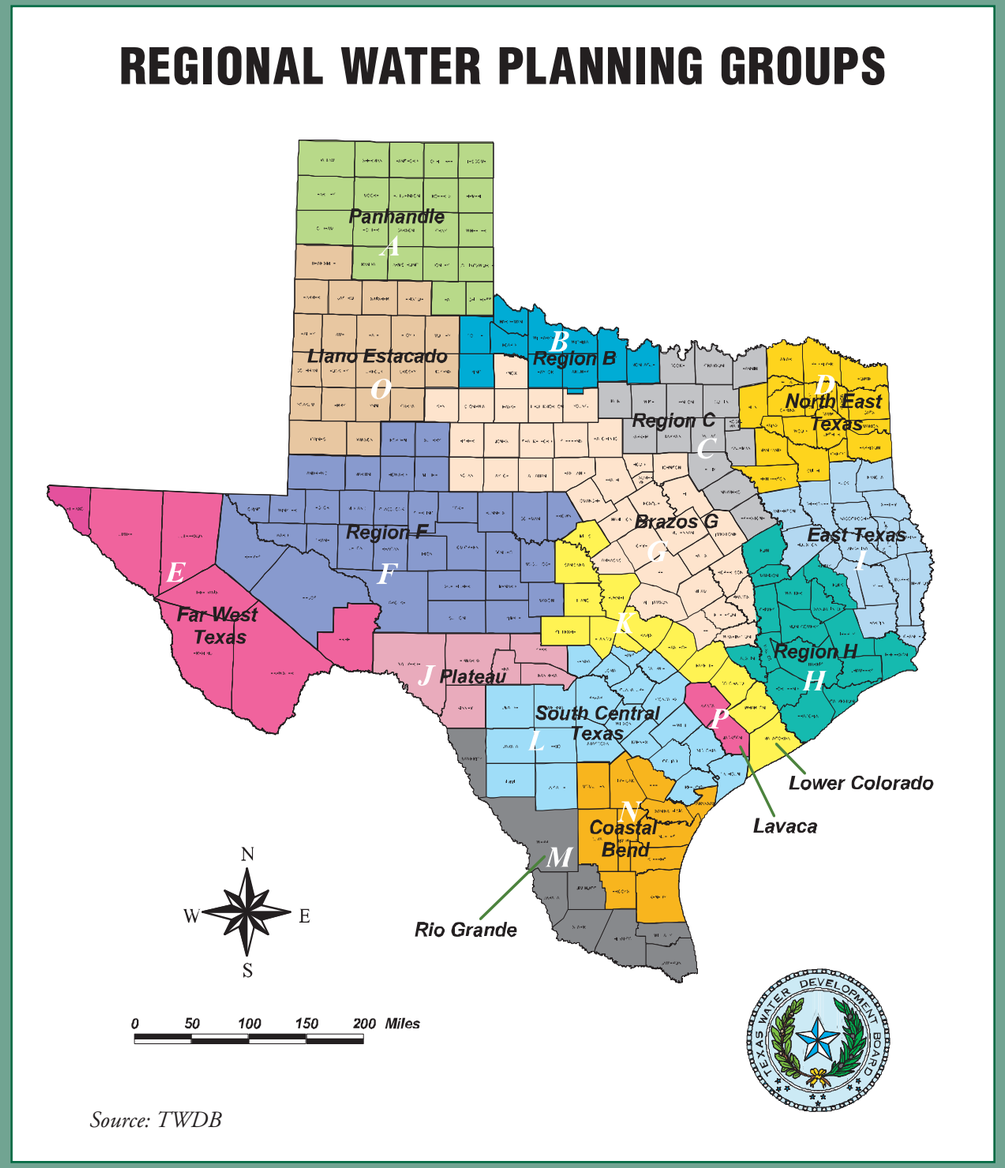
The Brown-Lewis Water Plan included a major overhaul of the state water planning process, which had its genesis with the creation of the TWDB in 1957. Specifically, the Brown-Lewis Water Plan established a bottom-up planning process whereby the State Water Plan would henceforth be based on regional water plans that are prepared by appointed Regional Water Planning Groups (RWPG).

In February 1998, the TWDB adopted rules for the implementation of the new state water planning process. This included designation of 16 regional water planning areas (see Figure 1.2) and appointment of the initial members of the RWPGs. With technical and financial assistance from the TWDB, and in accordance with planning guidelines set forth by TWDB, the RWPGs were directed to prepare consensus-based regional water plans by January 5, 2001. Subsequently, the TWDB assembled the regional water plans into a new State Water Plan, which was adopted by the TWDB on December 12, 2001. The regional water plans, as well as the State Water Plan, can be amended as necessary and are to be updated every five years.

The SCTRWPG, initially designated by the TWDB as "Region L," encompasses all or parts of 21 counties within the Guadalupe, Nueces, and San Antonio river basins. As depicted in Figure 1.2, the entire jurisdiction of the Authority is within the SCTRWPG.

The SCTRWPG represents 11 interest group categories specified in state law. The SCTRWPG is responsible for the development, amendment, and periodic update of the regional water plan for the SCTRWPG. The current voting membership of the SCTRWPG is provided in Table 1.1. The Authority is represented in the regional water planning process by its current general manager, and two board members, Ms. Susan Hughes and Mr. Doug Miller.

Figure 1.2: Texas Water Development Board Designated Regional Water Planning Areas

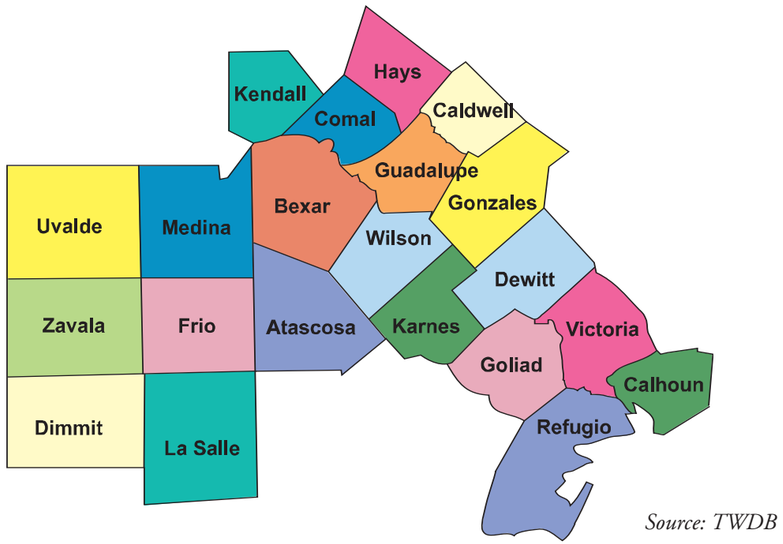


Source: TWDB

Table 1.1: Voting Membership of the SCTRWPG

Interest	Name	Entity	County *(Location of Interest)*
Public	Evelyn Bonavita	League of Women Voters	Bexar, Comal, and Victoria
Counties	Jay Millikin John Kight	Comal County Commissioners Court Kendall County Commissioners Court	Comal Kendall
Municipalities	Vacant Pedro G. Nieto Gary Middleton	San Antonio Water System City of Uvalde City of Victoria	Bexar Uvalde Victoria
Industries	James M. Miller	Du Pont	Victoria
Agricultural	Richard Eppright Milton Stolte Bill Jones	Lagunillas Cattle Co. Texas Farm Bureau D.M. O'Conner Ranches	Gonzales Medina Victoria
Environmental	Susan Hughes	Bexar Audubon Society	Bexar
Small Businesses	Doug Miller Gloria Rivera Darrell Brownlow	Miller & Miller Electical Engineer Environmental Consultant	Comal & Guadalupe Guadalupe Wilson
Elec. Generating Utilities	Mike Fields	AEP Coleto Plant	Goliad
River Authorities	Bill West Greg Rothe Con Mims	Guadalupe-Blanco River Authority San Antonio River Authority Nueces River Authority	Guadalupe, Kendall, Comal, Hays, Caldwell, Gonzales, De Witt, Victoria, Calhoun, and Refugio Bexar, Wilson, Goliad, and Karnes Uvalde, Zavala, Frio, La Salle, Dimmit, Atascosa, and Medina
Water Districts	Robert Potts Mike Mahoney	Edwards Aquifer Authority Evergreen UWCD	Bexar, Uvalde, Medina, Comal, Hays, Caldwell, Guadalupe, portion of Atascosa Frio, Atascosa, Karnes, and Wilson
Water Utilities	Ron Naumann	Spring Hill WSC	Guadalupe
Administrative Agency	Steven J. Raabe, P.E.	San Antonio River Authority	
Non-Voting	Ralph Boeker Patrick Brzozowski, P.E. Norman Boyd Ronald L. Fiesler Jack C. Nelson Scott Bledsoe, III Stephen Brooks Jonathan Letz Jock Davis Fernando Garza Robert White Mercurio Martinez	Texas Water Development Board Lavaca RWPG Texas Parks and Wildlife Lower Colorado RWPG Lavaca-Navidad River Authority Coastal Bend Regional Water Planning Group U.S. Army Corps of Engineers Plateau GRWP Texas Department of Agriculture U.S. Department of Agriculture, Natural Resources Conservation Service Texas Commission on Environmental Quality Rio Grande RWPG	31 TAC 357.4(g)(1) 31 TAC 357.4(g)(3) 31 TAC 357.4(g)(2) 31 TAC 357.4(g)(3) 31 TAC 357.4(g)(4) 31 TAC 357.4(g)(3) 31 TAC 357.4(h)(3) 31 TAC 357.4(g)(3) 31 TAC 357.4(g)(5) 31 TAC 357.4(h)(3) 31 TAC 357.4(h)(3) 31 TAC 357.4(g)(3)
Consultants	Dr. Herb Grubb/Sam Vaugh Margaret Moorhouse		

Figure 1.3: South Central Texas Regional Water Planning Group (Region L)



Source: TWDB

For the inaugural regional water planning cycles, TWDB rules and guidelines required the RWPG to complete the following tasks:

1) Develop a description of the regional water planning area.

2) Adopt population and water demand projections for 2000-2030.

3) Develop estimates of currently available water supplies under drought-of-record conditions for 2000-2030.

4) Compare currently available water supplies with projected water demands to identify current and future water supply needs for 2000-2030.

5) Identify and evaluate alternative water management strategies to meet the identified needs.

6) Develop a regional water plan that includes:

   a. Specific strategies to meet near-term water needs (2000-2030).

   b. Options for meeting long-term needs (2030-2050).

   c. Identification of needs for which there is no feasible solution.

   d. Recommendations for legislative designation of ecologically unique stream segments.

   e. Recommendations for legislative designation of sites uniquely suited for reservoir construction.

   f. Coordination with the RWPGs for adjacent planning areas concerning mutual interests and shared resources.

   g. Regulatory, administrative, and/or legislative recommendations to improve water resources management in the region or the state as a whole.

Note: Items 6(d) through 6(g) may be included in a regional water plan at the discretion of the RWPG.

Texas is an extremely diverse state in terms of climate, water availability and use, and socio-economic characteristics. This diversity was recognized in the Brown-Lewis Water Plan and in the shift to a regional-based State Water Plan. It is also recognized in the requirements that the RWPG evaluate a broad array of water management strategies including:

- Expected/advanced water conservation for municipal user groups.
- Water reuse.
- Expanded use of existing supplies.
- Reallocation of reservoir storage.
- Water marketing and interbasin transfers.
- Subordination of water rights.
- Yield enhancement measures.
- Chloride control measures.
- New supply development.

Water availability, economics, environmental concerns, and public acceptance were considered in the evaluation and selection of recommended water management strategies.

1.4.3 20-YEAR WATER SUPPLY PLAN

The Act requires that the CWMP include a 20-year water supply plan. Specifically, the Authority is to work with the South Central Texas Water Advisory Committee (SCTWAC), the TWDB, and other underground water conservation districts within the Authority's boundaries to develop a plan to meet the region's water supply needs for the next 20 years. It must include goals and objectives to be implemented by the Authority in five-year increments. The Edwards Aquifer Legislative Oversight Committee and "appropriate" state agencies must annually review this plan.

Further, the Act specifies that in developing the water supply plan the Authority must:

1) Thoroughly investigate all alternative technologies.

2) Investigate mechanisms for providing financial assistance for alternative water supplies through the TWDB.

3) Perform a cost-benefit analysis and an environmental analysis.

The Authority played a key role in the Brown-Lewis Water Plan regional water planning process, both to facilitate the regional consensus on water management strategies and to ensure that the regional water plan and the Authority's water supply plan are consistent. As indicated, the Authority had three representatives on the SCTRWPG. For conformity with the regional water plan for the SCTRWPG, the Authority changed the planning period for its water supply plan from 20 to 30 years, with 10-year instead of 5-year milestones. The first regional water plan was approved by the board March 2001. Authority staff also worked closely with the SCTRWPG to coordinate planning efforts in order to avoid duplication of effort and ensure consistency. Furthermore, to ensure full consistency between plans, the information and recommendations presented in the Authority's initial 30-year water supply plan was, in essence, extracted from the regional water plan approved by the SCTRWPG.

1.4.4 HABITAT CONSERVATION PLAN

The U.S. Fish & Wildlife Service (USFWS) has listed one threatened and seven endangered species in the Comal and San Marcos springs and the Comal and San Marcos rivers. Federal and state laws require that the threatened and endangered species and their critical habitat be protected to prevent "take" or "jeopardy" of the species. The Authority, as the regional regulatory agency, has opted to assume the responsibility of maintaining the aquatic habitat that supports these threatened and endangered species through the development of a Habitat Conservation Plan (HCP).

The Act allows the Authority to apply for and hold permits under the Federal Endangered Species Act (ESA). The USFWS may issue permits that allow for the "incidental take" of endangered species if an HCP has been developed and approved by the USFWS. A HCP is a management plan that will ensure the continued survival of the covered threatened and endangered species in their natural habitat. The Authority has undertaken development of a regional HCP, which is scheduled for completion by March 2006.

1.5 LEGAL FRAMEWORK

The Authority's CWMP was developed in conformance with applicable state and federal law for water resources planning. Chief among these are:

- The Authority's enabling act.
- The Brown-Lewis Water Plan and associated TWDB rules and guidelines (see previous discussion).
- Chapter 36 of the Texas Water Code, which provides authority to groundwater districts in Texas.
- Modifications, specifically applicable to the Authority, of the legal doctrine of "rule of capture" that governs groundwater management in Texas.
- The Federal Endangered Species Act, which requires the protection of threatened and endangered plant and animal species.

1.5.1 THE EDWARDS AQUIFER AUTHORITY ACT

The 1993 Edwards Aquifer Authority Act (the Act) and its amendments (Act of May 30, 1993, 73rd Leg., R.S., ch. 626, 1993 Tex. Gen. Laws 2350; as amended by Act of May 29, 1995, 74th Leg., R.S., ch. 261, 1995 Tex. Gen. Laws 2505; Act of May 16, 1995, 74th Leg., R.S., ch. 524, 1995 Tex. Gen. Laws 3280; Act of May 6, 1999, 76th Leg., R.S., ch. 163, 1999 Tex. Gen. Laws 634; and Act of May 28, 2001, 77th Leg., R.S., ch 966, §§ 2.60-2.62 and 6.01-6.05, 2001 Tex. Gen. Laws 1880, 1910, and 1961-62; and *see also* Act of May 23, 2001, 77th Leg., R.S., ch. 1192, Tex. Gen. Laws 2552 created the Authority as a conservation and reclamation district for:

> ***"…the effective control of the resource to protect terrestrial and aquatic life, domestic and municipal water supplies, the operation of existing industries, and the economic development of the state."***

The Authority is created under Article XVI, Section 59 of the Texas Constitution to serve a public use and benefit. As such, it has the status of a governmental agency that does not require a confirmation election. The Authority has been granted all of the necessary powers and rights of rule making necessary to regulate withdrawals from the Edwards Aquifer in order to manage, conserve, preserve, and protect the aquifer. The Authority's powers apply only to water supplies from that portion of the Edwards Aquifer within its jurisdictional boundaries. It explicitly excludes surface water supplies and groundwater from other aquifers within the boundaries of the Authority.

Key provisions of the Act that relate to the Authority's planning, regulatory, and reporting responsibilities are:

- The Authority, in order to prevent pollution and to enforce water quality standards, **shall** apply pollution control regulations equally and uniformly in the counties included within the Authority's jurisdictional boundaries (Appendix A, Section 1.08 c). These standards **shall** also apply to the area within a buffer zone encompassing most of the area five miles and less outside and bordering the Authority's boundaries.
- The Authority **shall** consider the SCTWAC report in managing the Authority's affairs (Appendix A, Section 1.10 h).

- The board **shall** adopt rules necessary to carry out the Authority's powers and duties (Appendix A, Section 1.11 a).
- The Authority **shall** ensure compliance with permitting, metering, and reporting requirements and **shall** regulate permits (Appendix A, Section 1.11 b).
- Authorizations to withdraw water from the aquifer and all authorizations and rights to make a withdrawal under the Act **shall** be limited to:
  1) Protect the water quality of the aquifer.
  2) Protect the water quality of the surface streams to which the aquifer provides springflow.
  3) Achieve water conservation.
  4) Maximize the beneficial use of water available for withdrawal from the aquifer.
  5) Protect aquatic and wildlife habitat.
  6) Protect species that are designated as threatened or endangered under applicable federal or state law.
  7) Provide for instream uses, bays, and estuaries (Appendix A, Section 1.14 a)
- The Authority **shall** limit the additional withdrawals to ensure that springflows are not affected during critical drought conditions (Appendix A, Section 1.14 f).
- 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 law (Appendix A, Section 1.14 h).
- The Authority **shall** manage withdrawals from the aquifer and **shall** manage all withdrawal points from the aquifer (Appendix A, Section 1.15).
- The Authority **shall** issue an initial regular permit without a term, and an initial regular permit remains in effect until the permit is abandoned, cancelled, or retired (Appendix A, Section 1.16 2 g).
- The Authority **shall** prepare and implement a plan for reducing by January 1, 2008, the maximum annual volume of water authorized to be withdrawn from the aquifer under regular permits to 400,000 acre-feet per year or an adjusted amount as determined by the Act (Appendix A, Section 1.21).
- The Authority biennially **shall** prepare and update enforceable and effective conservation and reuse plans as required by the Act. Not later than January 1 of each odd-numbered year the Authority **shall** submit the plan to the legislature (Appendix A, Section 1.23 c).

- The Authority **shall** develop and implement a Comprehensive Water Management Plan that includes conservation, future supply, and demand management plans (Appendix A, Section 1.25 a).
- The Authority in conjunction with SCTWAC, TWDB, and underground water conservation districts within the Authority's boundaries **shall** develop a 20-year water supply plan for providing alternative supplies of water to the region with 5-year goals and objectives to be implemented by the Authority and reviewed annually by the appropriate state agencies and the Edwards Aquifer Legislative Oversight Committee (Appendix A, Section 1.25 b).
- The Authority **shall** prepare and coordinate implementation of a plan for critical period management (Appendix A, Section 1.26).

The Act as amended, in its entirety, is included as Appendix A of this plan.

1.5.2 RULE OF CAPTURE

The most fundamental legal principle in the State of Texas concerning groundwater use is the "rule of capture," a legal doctrine adopted by the Texas Supreme Court in 1904. This doctrine gives a landowner the unrestricted right to pump as much groundwater as desired, provided the water is not "willfully wasted, used maliciously to injure a third party, or pumped negligently." This doctrine provides that groundwater is the property of the owner of the overlying land and does not prevent the withdrawals of water that lies under separate adjoining properties. The "rule of capture" is currently the governing doctrine in areas of the state that do not have an established Groundwater Conservation District (GCD). In areas within the jurisdiction of a GCD the "rule of capture" is still the underlying legal principle. However, the doctrine has been modified by state law to allow for the management of groundwater resources by GCDs through the permitting of water withdrawals and other regulatory measures.

1.5.3 CHAPTER 36 OF THE TEXAS WATER CODE

Another important state law involving groundwater management is found in Chapter 36 of the Texas Water Code. This law provides for the creation of GCDs in Texas, whose purpose is:

> ***"… to provide for the conservation, preservation, protection, recharging, and prevention of waste of groundwater, and of groundwater reservoirs or their subdivisions, and to control subsidence caused by withdrawal of water from those groundwater reservoirs or their subdivisions, consistent with the objectives of Section 59, Article XVI, Texas Constitution, groundwater conservation districts may be created as provided by this chapter. Groundwater conservation districts created as provided by this chapter are the state's preferred method of groundwater management."***

The Edwards Aquifer Authority Act states that the Authority "…has all of the powers, rights, and privileges necessary to manage, conserve, preserve, and protect the aquifer and to increase the recharge of, and prevent the waste or pollution of water in the aquifer," which are included in Chapters 50, 51, and 52 of the Texas Water Code. These sections of the water code specify the rights, powers, privileges, authority, functions, and duties applicable to general law districts, water control and improvement districts, and groundwater conservation districts. The content of these sections have now been incorporated into Chapter 36 of the Texas Water Code as well.

Chapter 26, Subsections D and E, of the Texas Water Code also grant powers to local governments, which includes the Authority, to prevent and control water pollution and enforce water quality standards.

1.5.4 FEDERAL ENDANGERED SPECIES ACT

The 1973 Federal Endangered Species Act (ESA) provides, through federal action and by encouraging the establishment of state programs, for the conservation of ecosystems upon which threatened and endangered species of fish, wildlife, and plants depend. The ESA:

- Authorizes the determination and listing of species as endangered and threatened.
- Prohibits unauthorized taking, possession, sale, and transport of endangered species.
- Provides authority to acquire land for the conservation of listed species, using land and water conservation funds.
- Authorizes establishment of cooperative agreements and grants-in-aid to states that establish and maintain active and adequate programs for endangered and threatened wildlife and plants.
- Authorizes the assessment of civil and criminal penalties for violating the ESA or regulations.
- Authorizes the payment of rewards to anyone furnishing information leading to arrest and conviction for any violation of the ESA of any regulation issued thereunder.

Compliance with the requirements of the ESA was a key factor in the creation of the Authority. Section 1.14 of the Act provides that the Authority may regulate withdrawals from the Edwards Aquifer in order to "…protect species that are designated threatened or endangered under applicable federal or state law." This section of the Act further states that the Authority "…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."

Between 1967 and 1980, the USFWS listed five plant and animal species at Comal and San Marcos springs as endangered or threatened. In 1997, the USFWS listed three additional species. These federally listed endangered or threatened species are dependent upon springflows from the Edwards Aquifer and their protection is the focus and objective of the Authority's HCP. The Authority's HCP will address the regional conflict in place since the 1950s between aquifer and downstream users. The federally endangered and threatened species in the Edwards Aquifer are listed on the following page. A more complete discussion on species and critical habitat is found in Section 3.0.

Table 1.2: Federally Endangered and Threatened Species in the Edwards Aquifer

Federally endangered species in the Edwards Aquifer	Federally threatened species in the Edwards Aquifer
Fountain Darter (*Etheostoma fonticola*)	San Marcos Salamander (*Eurycea nana*)
Texas Wild Rice (*Zizania texana*)	
Texas Blind Salamander (*Typhlomolge rathbuni*)	
San Marcos Gambusia (*Gambusia georgei*)	
Comal Springs Riffle Beetle (*Heterelmis comalensis*)	
Comal Springs Dryopid Beetle (*Stygoparnus comalensis*)	
Peck's Cave Amphipod (*Stygobromus pecki*)	

1.6 DYNAMIC PLANNING REQUIREMENT

Water management planning is best characterized as a continuous process or ongoing activity. The CWMP serves as an umbrella for all other operational water management plans and programs for the Authority (see Section 8.0). As such, it must be continually monitored and evaluated to determine if it is achieving its goals. New information, new insights, and/or new technology will necessitate revisiting this plan.

The regional water plans created under the Brown-Lewis Water Plan are scheduled to be updated every five years. The first regional water plans were approved by the TWDB in January 2001. Amendments, however, can be made and submitted to the TWDB at any time by the individual regional water planning groups. Change in the CWMP may necessitate changes in the SCTRWPG regional water plan.

Article 1, Section 1.25 of the Act requires the Authority's alternative supply plan be reviewed annually by appropriate state agencies and the Edwards Aquifer Legislative Oversight Committee (oversight committee). The oversight committee consists of three members of the Texas Senate appointed by the Lieutenant Governor and three members of the House of Representatives appointed by the Speaker of the House.

The Authority's ongoing program efforts may impact the planning process by providing information for new aquifer management strategies and options. The research conducted under the Edwards Aquifer Optimization Program (see Section 9.0) will provide information on flow paths in the aquifer, springflow augmentation, saline water components of the aquifer, fracture and conduits in the aquifer, and a new model for modeling the aquifer. All of the optimization research is scheduled to be completed in 2006.

This document provides the user with a broader understanding of the issues surrounding the management of the Edwards Aquifer and the challenges faced by the Authority. The succeeding sections will take the user from a historical perspective of the aquifer through current use and future need. It will culminate in describing the current activities used to manage the aquifer and describe ongoing activities to support this plan.

2.0

Background

EDWARDS AQUIFER
AUTHORITY

EDWARDS AQUIFER
AUTHORITY

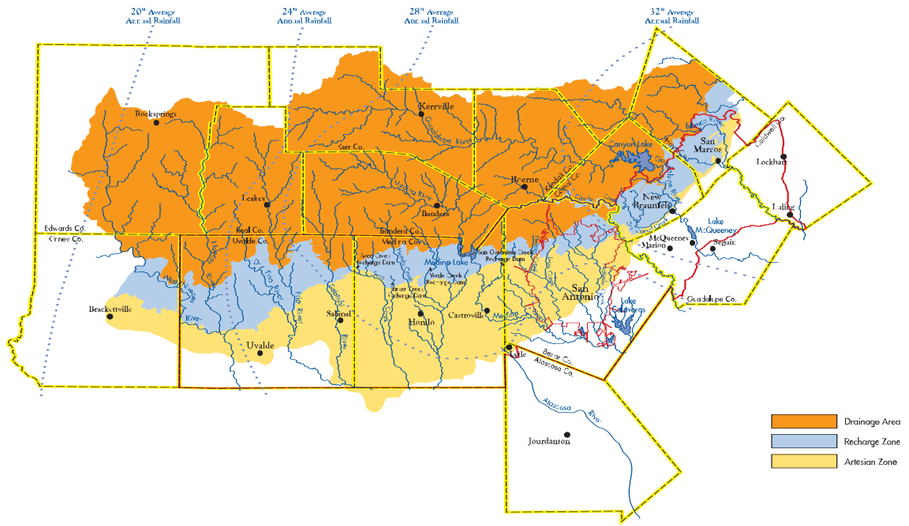
2.0 BACKGROUND

2.1 HISTORY OF EDWARDS AQUIFER MANAGEMENT ISSUES

The San Antonio segment of the Balcones Fault Zone Edwards Aquifer, (the aquifer) is a geologically complex underground water source that has historically been the sole source of water for area residents and industry (see Figure 2.1). It currently provides water for more than 1.7 million people. In addition, the aquifer supports extensive irrigated agriculture, a flourishing trade and service economy, and aquatic habitat for plant and animal species listed as endangered or threatened under the Federal Endangered Species Act (ESA). The aquifer also provides instream flows to the San Antonio and Guadalupe rivers and contributes freshwater inflows necessary for the health and productivity of coastal estuaries.

The waters of the Edwards Aquifer were first harnessed for use in the early 1700s. Friar Olivares established the Mission de San Antonio de Valero in the spring of 1718. Olivares abandoned an earlier mission near the Rio Grande that lacked adequate water supply in favor of the San Antonio location with its springs and flowing streams. He immediately began construction of acequias (water conveyance ditches) to harness the abundant water flowing from the numerous springs.

Figure 2.1: Edwards Aquifer Authority, Balcones Fault Zone



The history of the acequia system is vague, but it is believed that several acequias were built and abandoned before the first attempt at a major water management project began in 1729, at which time construction began on the Pajalache or Conception Acequia. The acequias were built to serve the water needs of the five missions along the San Antonio River. Each acequia

was constructed in such a manner that running water could be obtained within the mission grounds. The water was used for drinking, cooking, bathing, and for irrigation of vegetable and grain crops to feed the population of the missions. The acequia system was in use for more than 200 years.

In 1888, the first artesian water well was drilled into the Edwards Aquifer four miles east of San Antonio. The free-flowing artesian water well generated much excitement and many more wells soon followed. Thus began a new era for the Edwards Aquifer area – a shift from dependence on surface water emanating from the Edwards Aquifer to dependence on groundwater withdrawn directly from the aquifer.

The management of the Edwards Aquifer has long been the subject of controversy and public debate because of its hydrogeologic complexity and its history of development and use. The following chronology highlights some of the more recent events and milestones that led to the creation and operation of the Edwards Aquifer Authority.

1904 By judgment in the case of Houston and T.C. Railroad Co. vs. East, the "rule of capture" becomes the legal doctrine for groundwater development in Texas. This doctrine provides that groundwater is private property and that a landowner may withdraw groundwater from beneath his or her property for beneficial use without limitation or liability for impact on neighboring landowners.

1949 The Texas Legislature authorizes the voluntary creation of groundwater conservation districts. These districts have limited powers to regulate and manage groundwater withdrawals and use within their boundaries.

1959 The Texas Legislature creates the Edwards Underground Water District (EUWD) to "conserve, protect, and increase the recharge of" the Edwards Aquifer. The EUWD's original jurisdiction included five counties overlying the southern portion of the Edwards Aquifer: Bexar, Comal, Hays, Medina, and Uvalde counties. While similar to other groundwater districts, the EUWD differed in that it was not granted the rule-making authority to regulate withdrawals from the aquifer.

1987 The Texas Legislature provides the EUWD with specific authority to develop, implement, and enforce a regional drought management plan.

1989 Uvalde and Medina counties, which rely heavily on the Edwards Aquifer for agricultural irrigation, withdraw from the EUWD. In withdrawing from the EUWD, Medina and Uvalde county residents cited concerns about proposed plans to limit and assess fees on withdrawals from the Edwards Aquifer.

1989 The Guadalupe-Blanco River Authority (GBRA) files suit in state district court seeking a declaration that the Edwards Aquifer is an underground stream subject to state regulation.

1992 Seeking to avoid federal intervention, the Texas Water Commission (TWC) attempts to mediate among the regional interests to achieve support for an Edwards Aquifer management plan. After failing to reach an agreement, the TWC declares the Edwards Aquifer to be an underground stream subject to state regulation and adopts rules for the management and regulation of withdrawals from the aquifer. Subsequently, TWC's actions are invalidated by a state district court.

1993 *Sierra Club v. Lujan*. The Sierra Club sues the U.S. Fish & Wildlife Service (USFWS), among others, for failing to protect the endangered species that live in Comal and San Marcos springs. The Sierra Club claims that by not providing information as to necessary springflows, the USFWS is not carrying out its responsibilities under the Federal ESA. The trial court rules in favor of the Sierra Club and orders USFWS to designate minimum springflows required at San Marcos and Comal springs to ensure protection of endangered species. The court also orders the TWC to prepare a plan to ensure the springs will not drop below the minimum levels defined by USFWS during times of drought.

1993 Edwards Aquifer Authority Act (Act), Senate Bill 1477, is enacted by the 73rd Texas Legislature providing for the creation of a "conservation and reclamation district" named the Edwards Aquifer Authority. The Edwards Aquifer Authority replaces the EUWD, and is given broad powers to regulate withdrawals from the Edwards Aquifer. However, establishment of the Authority is delayed because of a Justice Department ruling in a suit brought under the Federal Voting Rights Act. The suit contends that the Voting Rights Act had been violated since the Edwards Aquifer Authority Act replaced an agency governed by an elected board of directors with an agency run by an appointed board.

1995 The 74th Texas Legislature enacts House Bill 3189, which amends the Act to provide for an elected board of directors for the Edwards Aquifer Authority. However, establishment of the Edwards Aquifer Authority is again delayed as a result of a lawsuit filed by local groundwater districts and a state district court ruling that the Act, on its face constituted an unconstitutional "taking" of private property.

1996 *Sierra Club v. Glickman*. The Sierra Club claims that the United States Department of Agriculture's (USDA) subsidies for farming, while failing to establish agricultural water conservation programs, has led to over-pumping of the aquifer, thereby threatening endangered species and causing water pollution. The trial court renders judgment in favor of the Sierra Club, ordering USDA: (1) to develop and carry out a program to assist in preserving natural resources and protecting fish and wildlife through land conservation and utilization; (2) to develop and implement an intra-agency program to protect waters from contamination; and (3) to evaluate and consult with USFWS in implementing a program to conserve endangered species in the aquifer.

1996 *Sierra Club v. City of San Antonio*. The Sierra Club seeks certification of a defendant class of aquifer pumpers and alleges that, by their pumping from the Edwards Aquifer, the defendants are "taking" endangered species in violation of the ESA. Although it refuses to grant the class certification sought by the Sierra Club, the trial court enters a preliminary injunction, orders pumping restrictions based upon springflows, and orders the injunction to remain in effect until the defendants can "…demonstrate that a critical management plan developed by the Edwards Aquifer Authority will be operative." On appeal to the U.S. Fifth Circuit Court of Appeals, the Fifth Circuit Court vacates the lower Court's preliminary injunction, reasoning that, under the Burford doctrine, abstention is proper where, by proceeding, the Court could risk reaching a different answer than the state institution with a greater interest in and familiarity with the matters at issue (the Authority). *Sierra Club v. City of San Antonio, et al.*, 112 F.3d 789. The Fifth Circuit Court reasons that the federal courts should abstain from becoming involved in regulating the aquifer in order to give the Authority the opportunity to do its job. On January 26, 1998, the U.S. Supreme Court denies, without comment, the Sierra Club's writ of appeal, thereby letting stand the Fifth Circuit Court's ruling.

1996 On June 28, 1996, the Texas Supreme Court rules unanimously in overturning the district court ruling finding the Act unconstitutional. The EUWD ceases to exist and the Edwards Aquifer Authority commences operations.

1997 The Brown-Lewis Water Plan (Senate Bill 1) is enacted and provides for a major overhaul of many longstanding state water laws and policies. Among its many provisions, the Brown-Lewis Water Plan requires all water conservation districts to develop a management plan for the groundwater within each district's jurisdiction. Additionally, the Brown-Lewis Water Plan revises the state's water planning process by requiring a new State Water Plan to be developed based on regional water plans prepared by appointed regional water planning groups.

1998 A temporary injunction is issued by a Travis County district court preventing the Authority from proceeding with its well permitting process, and consequently, the Authority's permit rules are invalidated by the court. In December, Travis County Judge issues a final order enjoining all Edwards Aquifer Authority rules. In an effort to begin its mandated tasks, the Authority initiates a new rule adoption procedure.

1998 The Authority adopts a Groundwater Management Plan (GMP) to fulfill the requirements of the Brown-Lewis Water Plan and associated TWDB rules (TAC, Chapter 356). The approval of the GMP represents a first step towards fulfilling the requirements of the Authority's enabling statute, which requires the Edwards Aquifer Authority to develop and implement a comprehensive water management plan.

2000 Fourth Court of Appeals rules in favor of the Authority in the case of Edwards Aquifer Authority v. Glenn Bragg and Jolynn Bragg. The Court rules "we hold the trial court did not have jurisdiction to invalidate the EAA's proposed actions and it erred in concluding that the EAA was required to perform takings impact assessments before promulgating rules and proposing action on the Bragg's permit application. We therefore vacate the trial court's judgement in part, and reverse it in part, and render judgement in favor of the EAA and Ellis."

2000 The Authority adopts proposed rules for permits, fees, and procedures before the board of directors.

2000 The Authority adopts emergency drought management rules.

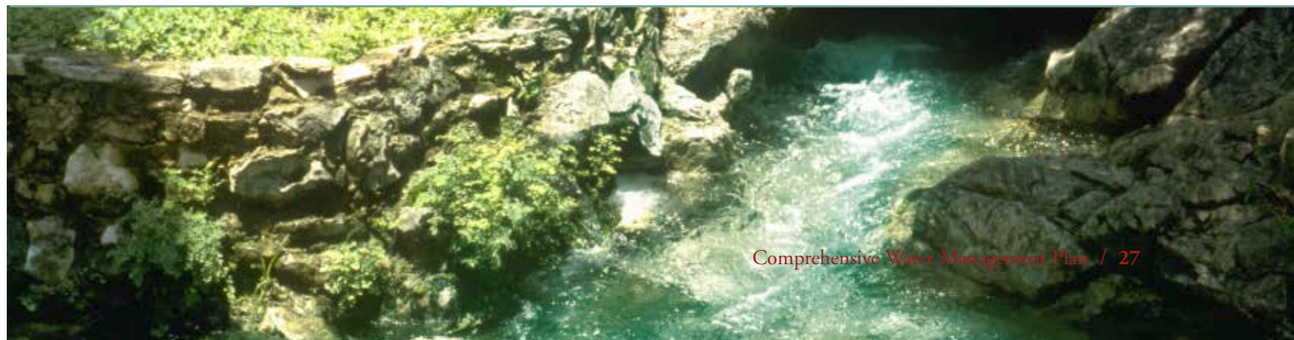
2000 The Authority issues proposed initial regular permits based on historical use. One thousand eighty four (1,084) municipal, industrial and irrigation permits are issued on November 9. The proposed permits total 532,008 acre-feet/year.

2000 The Texas Supreme Court denies Glenn and JoLynn Bragg's petition for review in the case of Edwards Aquifer Authority v. Glenn Bragg and JoLynn Bragg, allowing the judgement and the opinion of the Fourth Court of Appeals to stand.

2001 The Authority adopts an Omnibus Final Order granting applications for uncontested initial regular permits and issues initial regular permits for groundwater withdrawals to approximately 315 applicants.

2001 On Tuesday, October 2, 2001, the Supreme Court of Texas hears oral arguments in the case of *Glenn and Jolynn Bragg v. Edwards Aquifer Authority*. The Supreme Court of Texas agrees to hear the oral arguments after receiving a petition from Glenn and Jolynn Bragg following the January 2000 decision of the Fourth Court of Appeals ruling in favor of the Edwards Aquifer Authority. Oral arguments are made in Brownsville.

2002 On February 14, 2002, the Texas Supreme Court issues its unanimous opinion in the case *Glenn and JoLynn Bragg v. Edwards Aquifer Authority, et al.*, No. 00-0436 (Tex. 2002) (Bragg). The Supreme Court's opinion affirms the January 2000 judgment of the Fourth Court of Appeals. In its opinion, the Supreme Court ruled that actions of the Edwards Aquifer Authority are exempt from the requirement to prepare a Takings Impact Assessment required by the Texas Private Real Property Rights Preservation Act.



2002 Authority directors approve tighter restrictions for petroleum storage tanks located on the Edwards Aquifer Recharge Zone. Chapter 713 Edwards Aquifer Authority rules (water quality) addresses the Phase 1 Water Quality rules related to the construction of underground and aboveground storage tanks. These rules became effective on October 18, 2002. This is the first step the Authority has taken to address water quality issues in the Edwards Aquifer.

2002 Authority Board of Directors adopt Demand Management/Critical Period Management (DM/CPM) rules. These rules generally address staged reductions for aquifer withdrawals during periods of low aquifer conditions. The DM/CPM rules became effective November 22, 2002. The new regulations require municipal and industrial users to submit a quarterly pumping allocation schedule by January 1, 2003. Irrigators must submit schedules by February 1, 2003. DM/CPM reductions would only occur if aquifer trigger levels are reached. Reductions of 5%, 10%, 15%, and 23% of a pumper's authorized use are required in Stage I, II, III, and IV, respectively. Reductions for irrigators will only occur under Stage III and Stage IV conditions and municipal and industrial users are responsible for determining how they achieve the required reductions. This is the first time a permanent DM/CPM plan has been implemented on a regional basis.

2003 Final rules for Edwards Aquifer Authority Rules regarding well construction and aquifer storage and recovery are approved. The Authority's well construction rules address procedures for constructing, operating, maintaining, and plugging wells that penetrate the Edwards Aquifer. The new well construction rules are more stringent than those currently mandated by the state. The Authority's aquifer, storage, and recovery rules generally address permits to add more water to the aquifer, and how that water can be recaptured for later use.

2003 Final rules are approved to amend the initial regular permit rules. These final rules will help the Authority avoid having to purchase initial regular permits to meet a 450,000 acre-foot permit cap. These final rules will divide initial regular permits into two portions. One portion of the permit, the "Junior Groundwater Withdrawal Right," can be used by permittees when the Edwards Aquifer is above 665' above mean sea level at the J-17 index well (San Antonio pool) and 865' above mean sea level at the J-27 index well (Uvalde pool). The second portion, the "Senior Groundwater Withdrawal Right," can be used at any time, but may be subject to water use reductions when the Edwards Aquifer drops below 650' above mean sea level at the J-17 well and 845' above mean sea level at the J-27 well.

2.2 PURPOSE OF THE EDWARDS AQUIFER AUTHORITY

The Authority began operations on June 28, 1996, as a "conservation and reclamation district" to manage the Edwards Aquifer, San Antonio area, as specified in its enabling statute, the Act. The Act establishes the purposes and responsibilities of the Authority, specifies management functions and goals, and provides guidelines for the operation of the Authority. The Texas Legislature, as evidenced by the Act, directed the Authority to:

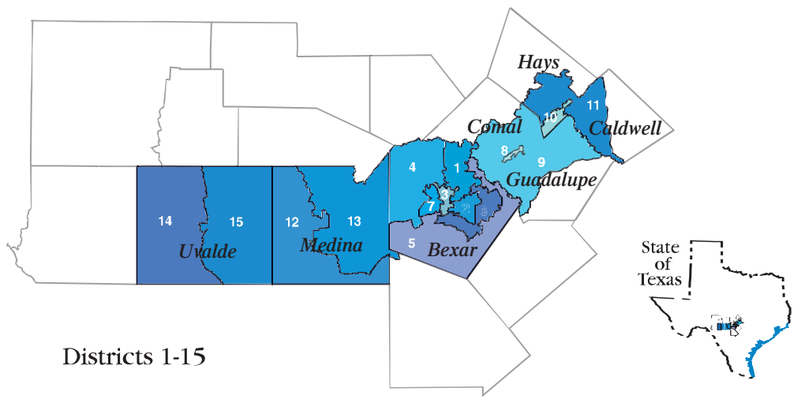
- Protect the water quality of the aquifer.
- Protect the water quality of the surface streams to which the aquifer provides streamflow.
- Achieve water conservation.
- Maximize the beneficial use of water available for withdrawal from the aquifer.
- Protect aquatic and wildlife habitat.
- Protect species that are designated as threatened or endangered under state or federal law.
- Provide for instream uses, bays, and estuaries.
- Protect domestic and municipal water supplies.
- Protect the operation of existing industries.
- Protect the economic development of the state.
- Prevent the waste of water from the aquifer.
- Increase recharge of water to the aquifer.

In order to meet these objectives, the Act directs that, unless increased by Authority directors as a result of research, permitted withdrawals from the Edwards Aquifer are to be limited to no more than 450,000 acre-feet per calendar year through the year 2007. In 2003, the Authority recognized permitted withdrawals would exceed 450,000 acre-feet per year in 2004. To address this issue, the Authority amended its rules to allow increased withdrawals at specific aquifer levels. Below certain aquifer levels, water rights are prorated down so that the total authorized withdrawals equal 450,000 acre-feet per year. These rules are referred to as "Junior/Senior" or "Interruptible/Uninterruptible." The rules are set to expire December 31, 2007 (See Section 7.4.3). Beginning in 2008, permitted withdrawals are to be reduced to 400,000 acre-feet per year unless increased by the board of directors. Aquifer users are solely responsible for the cost of reducing withdrawals to 450,000 acre-feet. However, the cost of reducing withdrawals to 400,000 acre-feet will be borne equally by aquifer users and downstream water rights holders on the Guadalupe River. Further, by December 31, 2012, the Authority is to ensure that the continuous minimum springflows at Comal and San Marcos springs are maintained to protect endangered and threatened species to the extent required by federal law. In addition to these requirements, the Act requires the Authority to develop and implement a "Critical Period Management Plan" to address aquifer usage during times of drought. In addition to its specific powers, the Authority is also granted, among other powers, the rule-making and enforcement powers of other Texas groundwater districts created under Chapter 36 of the Texas Water Code.

It should be noted that the Authority's responsibilities only apply to the use and management of the Edwards Aquifer within the Authority's boundaries (see Figure 2.2). The Authority has no regulatory powers over portions of the Edwards Aquifer outside of its boundaries, other groundwater, or any surface water resources within its boundaries.

Funding sources for the Authority include agricultural, municipal, and industrial user assessment fees, state and federal grants, and interest earnings.

Figure 2.2: Edwards Aquifer Authority Jurisdictional Boundary



The Act also gives the Authority responsibilities to conduct research on topics relevant to regional water resources management. This includes the authority to conduct or contract for research on topics such as the development of additional water supplies, water quality, water resources management, and augmentation of aquifer springflow. Optimizing the use of the Edwards Aquifer is a keystone of the Authority's current research efforts. Current and future research efforts under the Edwards Aquifer Optimization Program (EAOP) are discussed in Section 9.0 of this document.

Another mission-critical research and planning effort that is currently under development by the Authority is the preparation of a Habitat Conservation Plan (HCP). The HCP's planning area includes the Authority's jurisdiction and the downstream counties within the South Central Texas Water Advisory Committee (SCTWAC). The purpose of the HCP is to identify and implement measures for protecting endangered and/or threatened plant and animal species that depend on the Edwards Aquifer and the associated San Marcos and Comal springs that will ensure their long-term survival. The HCP is expected to provide the basis for issuance of a permit to the Authority by the USFWS allowing the lawful "taking" of endangered and threatened species. The HCP is being developed in conjunction with a Federal Environmental Impact Statement, which is required by the National Environmental Policy Act.

2.3 GOVERNANCE OF THE EDWARDS AQUIFER AUTHORITY

The Authority operates through the coordinated efforts of its board of directors; SCTWAC, and Authority staff. The functions are described briefly on the next page.

2.3.1 EDWARDS AQUIFER AUTHORITY BOARD OF DIRECTORS

The Act prescribes that the Authority is to be governed by a 17-member board of directors; 15 members are elected and two are appointed. Elected directors represent 15 single-member districts within Uvalde, Medina, Bexar and portions of Atascosa, Comal, Hays, Caldwell, and Guadalupe counties (see Figure 2.2). The Authority's elected directors serve staggered four-year terms, with approximately one half of the terms expiring December 1 of each even numbered year.

The two non-voting appointed directors represent the specific interests of Medina and Uvalde counties, and the interests of downstream water users. The Medina and Uvalde counties director is appointed to serve a four-year term by the Commissioner's Court of either Medina or Uvalde county on an alternating basis. The Commissioner's Court of Uvalde County appointed a director in December 2000. SCTWAC is responsible for appointing the second non-voting director to serve a four-year term.

To facilitate its operation, the Authority's directors have established five standing committees as described on the previous page. Each committee consists of five to eight directors, with staff support provided by an employee of the Authority designated as the committee liaison. The chairman appoints members of the board to serve on ad-hoc committees and work-groups to consider and make recommendations to the board concerning matters of interest to the Authority.

Standing Committees

Executive Committee – Assures the overall performance of the Edwards Aquifer Authority. Responsibilities include conducting assessments of the performance of the general manager, monitoring and approving director expenses, and interim responses from the board that are required between meetings. The committee also monitors legal issues affecting the Edwards Aquifer Authority and provides oversight of the general counsel and other legal services.

Finance/Administrative Committee – Oversees the fiscal operations of the Edwards Aquifer Authority. Responsibilities include budget development and oversight, assessment of user fees, and management of internal audits. The committee also develops operational procedures including management policies, internal administrative organization, employee policies and benefits, public information, meeting procedures, and bylaw review.

Permits Committee – Oversees administration of the Authority's permit programs. Responsibilities include oversight of permit issuance and monitoring of permit compliance, grievance, enforcement, monitoring, reporting, and meter installation requirements.

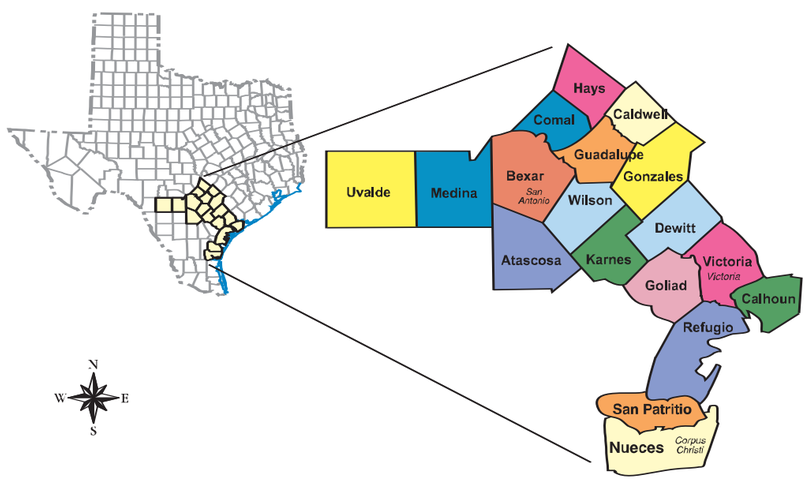
Research & Technology Committee – Ensures that the Edwards Aquifer Authority fulfills its goals for conducting mission-directed research. Responsibilities include the collection and development of scientific data, technological assessment of alternative management practices, and water quality.

Aquifer Management Planning Committee – Plans for the management of water usage from the Edwards Aquifer. Responsibilities include development of the Critical Period Management Plan, the Groundwater Management Plan, the Comprehensive Water Management Plan, the Groundwater Conservation Plan, the Habitat Conservation Plan, and the Irrigation Withdrawal Suspension Plan. The committee is also responsible for transfer marketing rules, evaluation of new supply sources, implementation of alternative management practices, development of strategies for achieving legislative mandates, economic impact studies, and interaction with other regional water agencies.

2.3.2 SOUTH CENTRAL TEXAS WATER ADVISORY COMMITTEE (SCTWAC)

The Act also established the SCTWAC to advise the Authority's directors on downstream water rights and issues. SCTWAC consists of one representative from each of 17 counties, shown below in Figure 2.3, plus the cities of San Antonio, Corpus Christi, and Victoria. However, when Atascosa County has a representative on the Authority's Board of Directors, it may not have a representative on SCTWAC. In addition to serving in an advisory role for matters relating to Edwards Aquifer management, the presiding officer of the SCTWAC is also required to assess the effectiveness of the Authority and the impacts of management policies on downstream water rights. A biennial report of this assessment is to be submitted to the Authority and the Texas Commission on Environmental Quality (TCEQ) by March 31 of each even-numbered year.

Figure 2.3: South Central Texas Water Advisory Committee (SCTWAC)

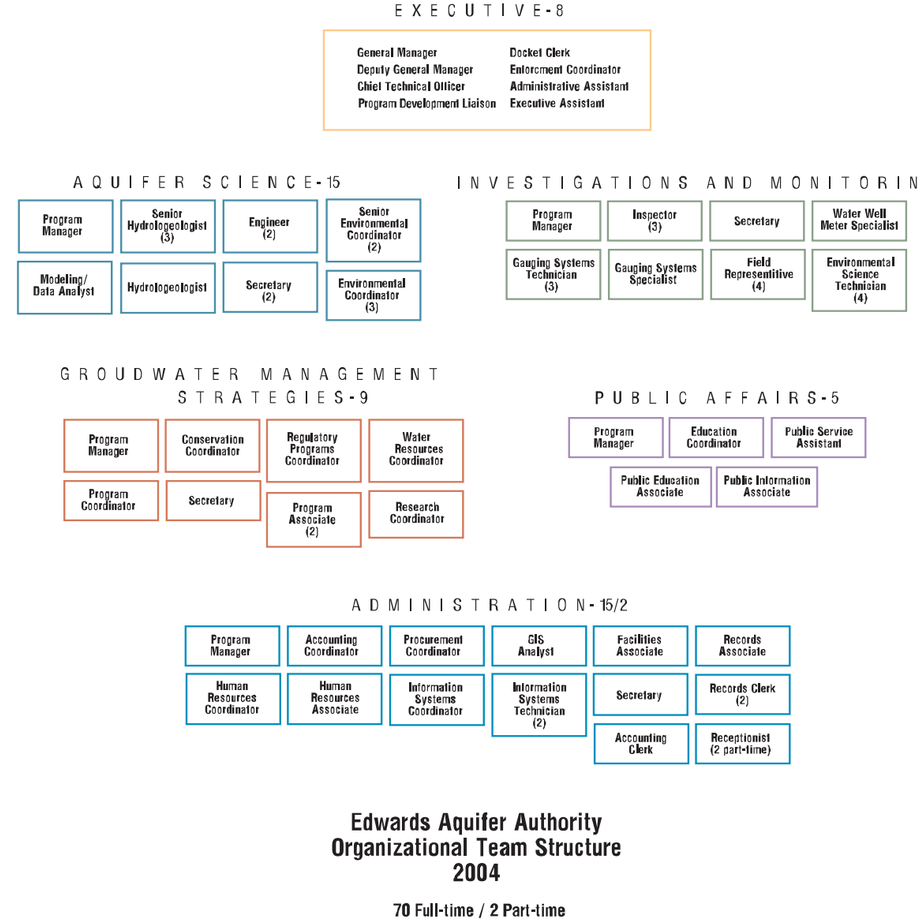


2.3.3 EDWARDS AQUIFER AUTHORITY STAFF

As of January 1, 2004, the Authority has 70 full-time and 2 part-time authorized staff positions. The staff performs the administrative, professional, and technical functions of the agency. The Authority's general manager reports to and serves at the pleasure of the board of directors. As the liaison to the board of directors, the general manager is responsible for executing board policy and overseeing the day-to-day operations of the organization.

The current organizational structure of the Authority is based on five organizational teams supporting the executive office, as depicted in Figure 2.4 below. The executive office is directed by the general manager and the organizational teams are led by program managers for each operational area.

Figure 2.4: Edwards Aquifer Authority Organizational Structure



The Authority has also created six functional teams, which are self-directed teams of employees that identify and solve issues to improve the Authority's operations. These teams consist of employees from a cross-section of the Authority with different backgrounds and different types of expertise. These functional teams bring together employees who normally do not have occasion to work together, thereby encouraging communication and cooperation in all aspects of the Authority's operations. The six functional teams are:

Customer Service: Focuses on ways to improve staff communication and effectiveness in serving the Authority's customers.

Database: Identifies and works to resolve problem areas in the Authority's various databases.

Information: Works to improve the Authority's internal and external communication.

Management: Concentrates on the effective management of all Authority operations.

Support: Addresses issues associated with the effective administrative operations of the Authority.

Technical: Undertakes issues requiring more technical expertise in a broad range of fields.

The employee membership of each functional team is provided in Table 2.1.

Table 2.1: Edwards Aquifer Authority Functional Team Structure

Management Team	Program Manager – Administration Deputy General Manager General Manager Program Manager – Public Information Program Manager – Aquifer Scienc Program Manager – Groundwater Management Stratagies Program Manager – Investigations & Monitoring Chief Technical Officer
Information Team	Public Information Assistant Receptionist (part-time/afternoon) Research Coordinator Senior Hydrogeologist Environmental Science Technician Gauging Systems Technician Gauging Systems Specialist Environmental Coordinator Information Systems Technician Field Representative
Support Team	Records Clerk Information Systems Technician Docket Clerk Receptionist (part-time/morning) Human Resources Coordinator Executive Assistant Secretary Secretary Secretary Secretary Accounting Clerk Environmental Science Technician Administrative Assistant
Technical Team	Education Coordinator Water Resources Coordinator Field Representative Environmental Coordinator Environmental Science Technician Enforcement Coordinator Procurement Coordinator Facilities Associate Gauging Systems Technician Senior Environmental Coordinator Field Representative GIS Analyst Senior Hydrogeologist
Customer Service Team	Environmental Science Technician Program Coordinator Water Well Meter Specialist Gauging Systems Technician Public Service Assistant Regulatory Programs Coordinator Environmental Coordinator Senior Environmental Coordinator Records Assistant Public Education Associate Human Resource Associate
Database Team	Field Representative Program Associate Hydrogeologist Program Associate - Transfers Conservation Coordinator Accounting Coordinator Senior Hydrogeologist Information Systems Coordinator Modeler/Data Analyst Program Development GIS Analyst

2.4 MAJOR ACCOMPLISHMENTS OF THE AUTHORITY

Since commencing operations in 1996, the Authority has made great strides in fulfilling the mission and purpose of the agency as prescribed by the Act. Highlights of some of the many accomplishments of the Authority through 2003 are:

Proposed Groundwater Permits – On November 9, 2000, the Authority proposed 818 permits for 1,084 applications. The proposed permits are for 532,275 acre-feet of groundwater. The Authority's board adopted final permit rules for groundwater withdrawals in October 2000. The Authority's original permit rules were invalidated by a state court based on a technicality of the Administrative Procedures Act, which required the Authority to revise its rules adoption procedures and adopt new rules.

Initial Regular Permits Issued – On January 9, 2001, the first set of initial regular permits were issued by the Authority's board to 306 applicants for 136,196 acre-feet of groundwater. In addition, 161 permits were denied.

Demand Management/Critical Period Management Rules – These rules protect springflow by reducing groundwater use during dry periods. Critical Period Management stages were in effect from June to August 1998 and from May to November 2000. The permanent Demand Management/Critical Period Management rules were approved by the board on November 12, 2002.

Well Registration Rules Adopted – Adopted in December 2000, these rules provide information regarding the number, location, and production capacity of all existing Edwards Aquifer wells.

Well Construction Rules Adopted - The Authority adopted new well construction rules in August 2003 that added requirements for well completion intended to protect the aquifer. In 2003, the Authority issued 385 well construction and plugging permits.

Term Permit Rules Adopted – These permit rules were adopted in October 2000 and provide for the withdrawal of additional water when Edwards Aquifer levels are higher than normal. Term permits are suspended when well J-17 levels drop below 665 feet above mean sea level (msl) in the San Antonio pool or when well J-27 drops below 865 feet above msl in Uvalde.

Emergency Permit Rules Adopted – Adopted in October 2000, these permits provide aquifer users with temporary access to Edwards Aquifer groundwater during emergencies in order to protect human health and safety.

Interim Authorization Pumping Amounts – These limits were created by the Authority in 1996 to establish interim pumping amounts until initial regular permits were issued.

Agricultural Water Conservation Loan Program – In 1998, the TWDB allocated $3.0 million to the Authority to implement an Agricultural Water Conservation Loan Program. An additional $1.0 million was allocated to the Authority in 2001. The Agricultural Water Conservation Loan Program provides low-interest loans to irrigators for the purchase and installation of water efficient irrigation equipment. Through 2002, the Authority had approved 32 loans totaling $2,471,000.

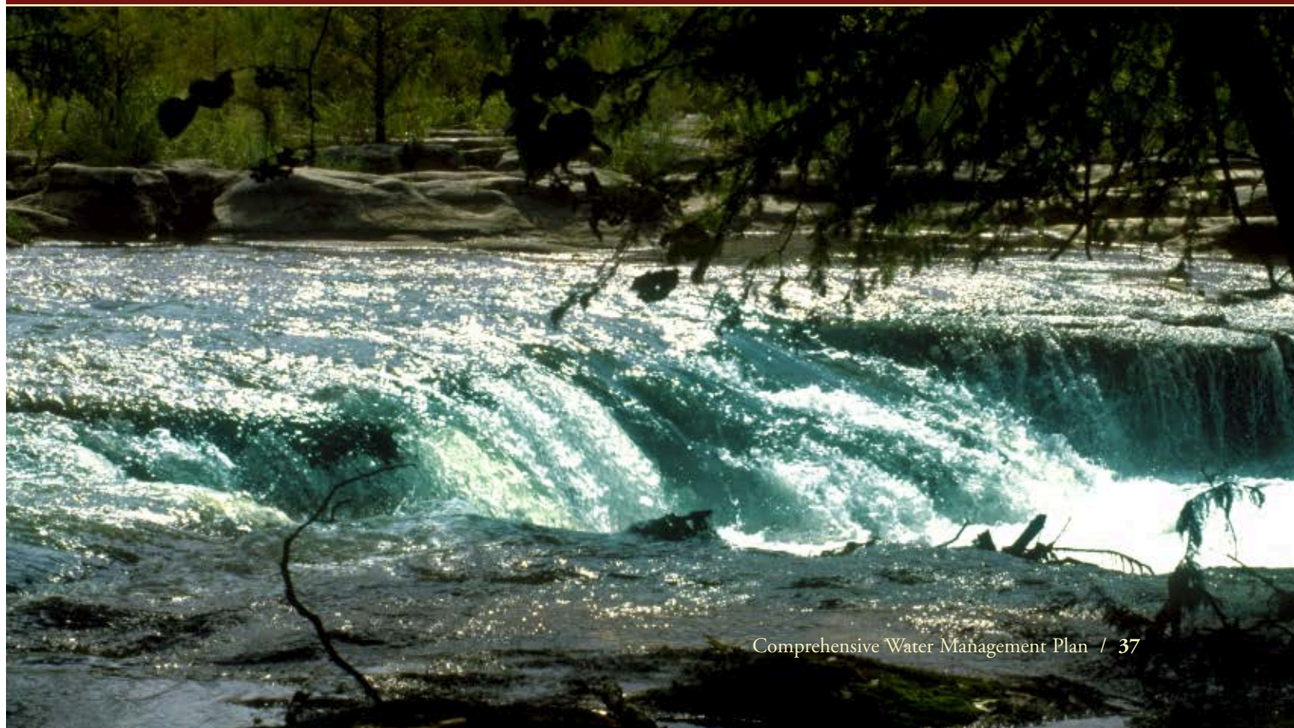
Irrigation Meters Installed & Other Well Meters – To date, 650 irrigation wells have had meters installed at a total cost to the Authority of $1,066,639. The data provided by these meters will improve management of groundwater withdrawals. Nearly all municipal and industrial wells are metered. Rules regarding the registration, installation, and operation of meters were adopted in December 2000.

Aquifer Management Fee Rules – In October 2000, the Authority's board adopted rules relating to fees. These rules control how the Authority will assess aquifer management fees. They became effective November 7, 2000.

Aquifer Management Fees – In December 2002, the Authority issued 235 invoices for 2003 aquifer management fees. These invoices totaled $9.3 million. In 2003, the Authority collected $9.5 million, of which $200,000 were from agricultural users. The Authority has operated in sound financial condition since its inception.

Groundwater Rights/Transfer Rules Adopted – Adopted in December 2000, these rules provide the mechanism for the Authority to administer Edwards Aquifer groundwater rights transfers in the region. As of September 2004, the transfer program has processed 1,095 partial sales and lease transfers representing 201,843 acre-feet of groundwater withdrawal rights.

Comprehensive Water Management Plan – The 30-year water supply plan, required by the Edwards Aquifer Authority Act, was completed on a parallel track with the Regional Water Plan for the South Central Texas Regional Water Planning Area. The plan presents recommended strategies for meeting current and projected water needs within the Authority's jurisdiction.



Groundwater Management Plan – The Authority submitted its GMP to the TWDB and received certification in September 1998. The revised GMP was certified by the TWDB in 2004. The plan outlines a ten-year program to achieve the Authority's mission.

Groundwater Conservation Plan – The Authority is required by statute to develop effective and enforceable conservation and reuse plans. The purpose of the Authority's Groundwater Conservation Plan (GCP) is to promote and document year-round conservation measures in the region and to guide the holders of water withdrawal permits in the development of their GCPs. The Authority's GCP was approved by the Authority's Board of Directors in February 2004. The final conservation rules were approved by the Board of Directors in December 2003.

Precipitation Enhancement Program – The Edwards Aquifer Authority has begun its 2004 Precipitation Enhancement Program. This is the sixth year of the program. The Southwest Texas Rain Enhancement Association (SWTREA) will perform cloud-seeding for the Authority over Uvalde County at a cost of $37,951 or 4 cents an acre. In addition, the Authority is currently in the third year of a three-year contract with the South Texas Weather Modification Association (STWMA), managed by the Evergreen Underground Water Conservation District. The STWMA will perform cloud-seeding for the Authority in Bandera, Bexar, and Medina counties at a cost of $86,825 or 4 cents an acre. The SWTREA and STWMA seasons began May 1 and will continue through October 31, 2004. In 2003, the fifth year of the program, the program showed that the number of seed days increased and the apparent benefit from increased rainfall over the target area also increased for the 2003 season. The Texas Weather Modification Association estimated rain increase from seeding activities in 2003 was 112,000 acre-feet.

Edwards Aquifer Optimization Program (EAOP) – The EAOP is a multi-year, comprehensive program consisting of 17 inter-related, mission-directed biologic studies and hydrogeologic research studies. Known as the Optimization Technical Studies (OTS), collectively the studies are designed to evaluate potential technical options for increasing the amount of water stored in the Edwards Aquifer and for optimizing the amount of water available for withdrawal.

3.0

Planning Area Description

EDWARDS AQUIFER
AUTHORITY

EDWARDS AQUIFER
AUTHORITY

3.0 PLANNING AREA DESCRIPTION

3.1 PLANNING AREA DEFINITION

For planning purposes, it is important to understand the various descriptions of the Edwards Aquifer and to agree on what is meant when referring to the Edwards Aquifer. Often the terms Edwards Aquifer Authority, Edwards Aquifer area, and the Edwards Aquifer are used interchangeably, creating confusion. The Edwards Aquifer Authority is a political subdivision of the state established by the Texas Legislature to manage the San Antonio segment of the Balcones Fault Zone Edwards Aquifer. The Edwards Aquifer area is a geologic delineation encompassing an area larger than that within the jurisdiction of the Authority. The term Edwards Aquifer is often a term of convenience and can have many meanings depending upon whom is using the term. For clarity, the various terminologies and descriptions are discussed below along with management implications.

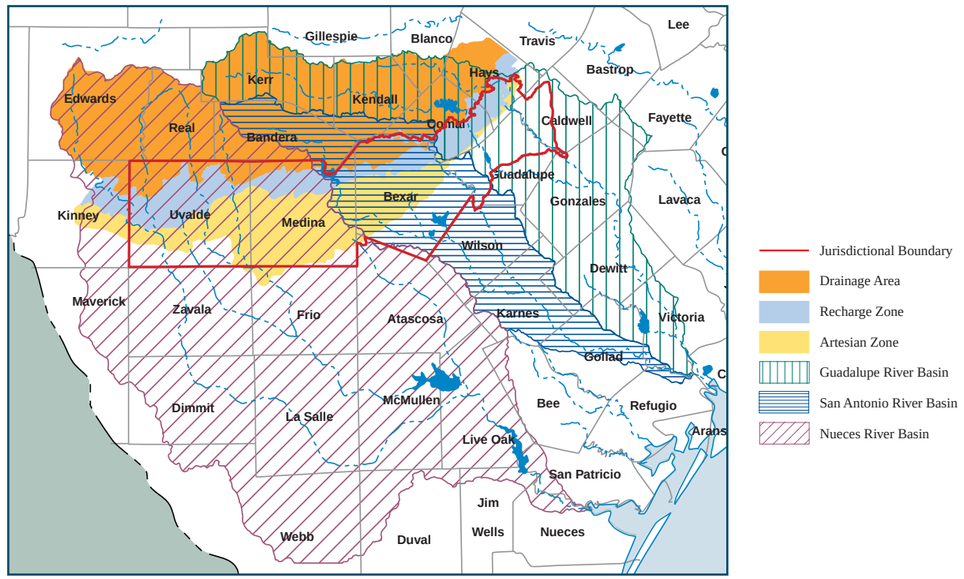
The **Edwards Aquifer Authority** (Authority) was established in 1993 by the Edwards Aquifer Authority enabling legislation (the Act) and subsequent amendments in 1995 (see Appendix A). Its purpose is to manage the San Antonio segment of the Balcones Fault Zone Edwards Aquifer within its jurisdictional boundaries. The Authority encompasses all or part of eight counties including Bexar, Medina, Uvalde, Atascosa, Caldwell, Comal, Guadalupe, and Hays counties. The boundaries established by the Texas Legislature do not precisely follow political subdivision boundaries (i.e., county boundaries) or the geologic boundaries of the Edwards Aquifer. Portions of the drainage area, recharge zone, artesian zone, and freshwater/saline water interface zone are included or excluded from the Authority's jurisdiction in varying degrees (see Figure 3.1). It is important to note that the Authority's policies and programs, including this Comprehensive Water Management Plan (CWMP), only affect the management of the San Antonio segment of the Balcones Fault Zone Edwards Aquifer within the Authority's jurisdictional area. For convenience, the Authority's jurisdictional area is referred to as the "planning area" throughout the remainder of this document.

Although the Authority's regulatory jurisdiction is contained within eight counties, the use and management of the San Antonio segment of the Balcones Fault Zone Edwards Aquifer affects a much larger area. In addition to being the primary water source for users within the planning area, the San Antonio segment of the Balcones Fault Zone Edwards Aquifer also supplies a portion of the flow to the San Antonio River and the Guadalupe River downstream of Comal Springs and San Marcos Springs. Also, water for the San Antonio segment of the Balcones Fault Zone Edwards Aquifer recharge emanates from the drainage area (contributing zone), which generally lies north of the planning area. Consequently, the area of interest for water resources planning purposes includes the drainage area, the recharge zone, the transition zone, the artesian zone, the freshwater/saline water interface zone, and provides streamflow for downstream areas in the Nueces, San Antonio, and Guadalupe River basins (see Figure 3.1). The

input and outputs of the entire Edwards Aquifer area, including water quantity and water quality, are essential elements in the CWMP developed for the planning area.

The term **"Edwards Aquifer"** should appropriately refer only to the recharge zone and the freshwater artesian zone of the aquifer. While the Authority does regulate the saline portion of the aquifer within its jurisdictional boundaries, there is little or no saline water withdrawn from the aquifer. Geologically, the Edwards Aquifer extends from Del Rio in Val Verde County to north of the Colorado River in Bell County. Differences in hydrogeologic characteristics and persistent groundwater-flow divides allow division of the Edwards Aquifer into three distinct regions: the San Antonio segment of the Balcones Fault Zone Edwards Aquifer; the Barton Springs segment, Austin area; and the northern segment, Austin to Waco area. As can be seen in Figure 3.1, the San Antonio segment extends about 180 miles from Brackettville in the west to Kyle in Hays County. This plan adheres to these descriptions. As noted previously, the CWMP pertains only to the portion of the Edwards Aquifer and its drainage area that is within the Authority's jurisdictional boundaries. A portion of the San Antonio segment of the Balcones Fault Zone Edwards Aquifer, lies outside the Authority's jurisdictional boundaries in Kinney, Zavala, and Frio counties. This portion of the San Antonio segment of the Balcones Fault Zone Edwards Aquifer is currently within the jurisdiction of a Kinney County Groundwater District established September 1, 2001, or in the Evergreen Underground Water District in Frio County. In this plan, reference to the Edwards Aquifer means the San Antonio segment of the Balcones Fault Zone Edwards Aquifer.

Figure 3.1: Edwards Aquifer Authority Jurisdictional Area (Planning Area) with Drainage and Downstream Area



3.2 SOCIO-ECONOMIC CHARACTERISTICS OF THE PLANNING AREA

The Edwards Aquifer is the primary water supply source for the 1.64 million people living within the Edwards Aquifer Authority's boundaries. In terms of the socioeconomic characteristics of the planning area, the region can be divided into three sub-regions, each of which relies directly on the aquifer to support different economies and interests. The delineations of these sub-regions are neither exact nor static. For example, urbanization is spreading from metropolitan San Antonio into surrounding areas blurring the distinction between the economies of the regions.

Within the **Western Sub-Region** (Medina, Uvalde, and a portion of Atascosa County), Medina and Uvalde counties together had approximately 65,230 residents in 2000, or about 3.9 percent of the population within the Authority's jurisdictional boundary. The economies of these counties are driven largely by farming, ranching, and related agricultural activities, of which irrigated farming is a significant component. From the years 1994 to 1997, Medina and Uvalde counties generated an average annual income of approximately $68 million from crops alone. Of this value, roughly 90 percent was derived from crops that were grown in irrigated fields. Total irrigated acreage is estimated to be 41,600 and 49,800 acres (1994 statistics) for Medina and Uvalde counties respectively. Major crops include cotton, corn, milo, wheat, and vegetables.

The **San Antonio Sub-Region**, herein defined as Bexar County, encompasses the majority of the San Antonio metropolitan area. In 2000, the population of Bexar County was determined to be 1.39 million people, which is approximately 85 percent of the population within the Authority's boundaries. The economy in the San Antonio region is diverse, and is supported by strong trade and service sectors, tourism, and the presence of large military bases. Other significant components of the San Antonio economy include medical research, biotechnology, and higher education. In 1994, total sales from San Antonio's major industries were estimated at over $29 billion. Total non-farm employment in the area was estimated at 644,100 in 1996, up nearly 15 percent from 1992. The presence of five local military bases serves as an anchor to the region and contributes roughly $4 billion to the local economy. This will change somewhat given the upcoming closure and/or conversion of some bases. Because of its high degree of urbanization, water use in the San Antonio metropolitan area is predominantly municipal and industrial.

In addition to the urban economy of San Antonio, the western portion of Bexar County relies on agricultural activity. From 1994 to 1997, approximately $48 million was generated by revenue from crops. In 1994, the Texas Water Development Board (TWDB) estimated that there are approximately 15,700 acres of irrigated crop land in Bexar County.

The **Eastern Sub-Region** consists of the portions of Comal, Hays, Guadalupe, and Caldwell counties that fall within Authority's jurisdictional boundaries. In 2000, the population of this sub-region was approximately 174,983, which represents approximately 11 percent of the

population within the Authority's boundaries. Unique to the eastern region is the significance of Comal and San Marcos springs to the local economy. Specifically, the springs are important attractions in the area's water-oriented tourism industry. In addition to their economic value, Comal and San Marcos springs are also the exclusive home to several endangered and threatened plant and animal species, and provide an important source of freshwater for downstream users of the Guadalupe River, as well as freshwater inflows to coastal bays and estuaries.

The **Downstream Area** refers to the cities and counties with representatives in the South Central Texas Water Advisory Committee (SCTWAC). Each of these communities shares a common bond with the Edwards Aquifer in that they are dependent to some degree on the Edwards Aquifer. Surface water uses by these communities vary widely and include municipal, industrial, irrigation, and recreation. Instream flows and freshwater inflows to coastal bays and estuaries, some of which are derived from Edwards Aquifer springflows, are also an important water use in the areas downstream of the Edwards Aquifer.

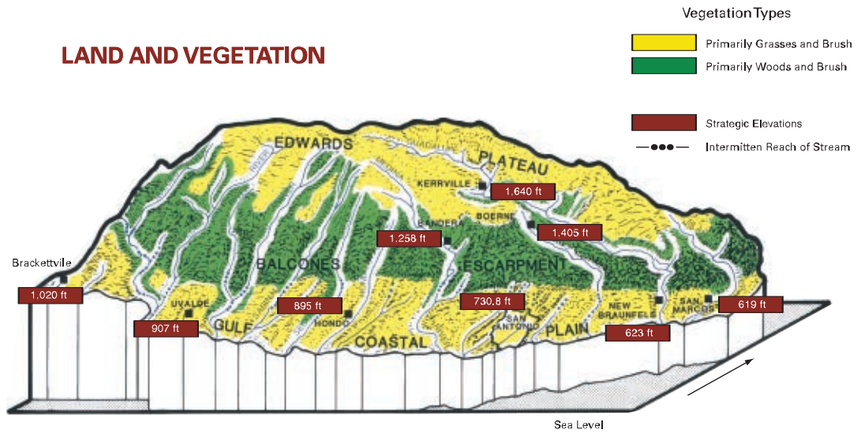
3.3 PHYSICAL DESCRIPTION OF EDWARDS AQUIFER AREA

The Edwards Aquifer influences, or is influenced by, various physical characteristics of the area. The following discusses the physical characteristics that affect the inputs and outputs to and from the Edwards Aquifer.

3.3.1 TOPOGRAPHY OF THE EDWARDS AQUIFER AREA

The topography of the area contributes to the rainfall runoff events that are critical to the recharge of the Edwards Aquifer. The topography of the land within the Edwards Aquifer area varies significantly from the higher elevations in the Edwards Plateau in the drainage area to the lower and flatter Gulf Coastal Plain that overlies the artesian part of the aquifer. The altitude of the area ranges from about 3,000 feet above mean sea level (msl) in the extreme western part of the plateau area to a little more than 500 feet msl in the extreme eastern part. Local relief on the Edwards Plateau is as much as 300 feet msl.

Figure 3.2: Edwards Aquifer Area Topography



The Balcones Escarpment defines the southern and eastern edges of the disected Edwards Plateau (see Figure 3.3). Here, the land surface is deeply dissected by the streams that flow across and down the escarpment. Throughout most of the plateau, the streams descend only a few feet per mile, but at the escarpment stream slopes increase to as much as 15 feet per mile. The streams descend several hundred feet through ravine-like valleys to the Gulf Coastal Plain downstream of the mouths of these valleys. The relief may vary as much as 200 feet from the streambed to the ridges above the valleys.

Figure 3.3: Balcones Escarpment

Except during floods, the streams flowing from the western part of the plateau lose most of their water through recharge to the Edwards Aquifer. With the exception of the Nueces River, they are generally dry when they reach the Gulf Coastal Plain. In the eastern part of the area, the major streams maintain flow a larger percentage of the time after they cross the recharge zone.

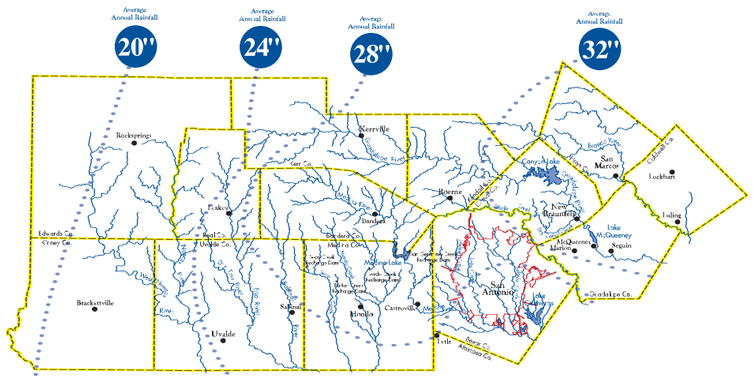
The Guadalupe River is an exception in that it does not appear to lose water in the aquifer, as it crosses the recharge zone. The Gulf Coastal Plain is a gently rolling landscape, with altitudes near the escarpment that vary from about 1,100 feet msl in the western part of the area to about 600 feet msl in the eastern part. Local relief is about 50 feet.

3.3.2 CLIMATE OF THE EDWARDS AQUIFER AREA

The planning area lies within two Texas climatic divisions: the Edwards Plateau division and the South Central division. The climate of the region is classified as humid subtropical with summers that are typically hot and humid and winters that are usually mild and dry. Precipitation varies across the region from an average of approximately 20 inches per year in the western portion to more than 32 inches per year in the eastern portion (see Figure 3.4).

May, June, and September are the months with the greatest average precipitation. December, March, and January have the lowest average precipitation. Only November, December, January, and February have an average temperature of less than 60 degrees Fahrenheit.

Figure 3.4: Average Annual Precipitation in the Edwards Aquifer Area



Average Annual Precipitation in inches 1934-2001

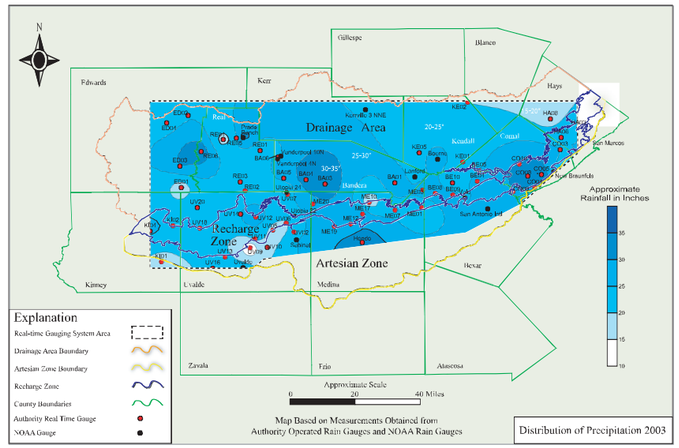
Precipitation is highly variable from year to year and across the region (see Table 3.1 and Figure 3.5). At Brackettville, in the western part of the area, average annual precipitation is 21.6 inches but ranges from a low of 7.6 inches to a high of 45.4 inches. Annual precipitation at San Marcos in the eastern part of the area has ranged from 13.4 inches to 58.5 inches with an average of 34.5 inches. Average precipitation at San Antonio is 30.4 inches per year.

Table 3.1: Precipitation in the Edwards Aquifer Area (in inches per year)

	Brackettville (year)	Uvalde (year)	Sabinal (year)	Hondo (year)	San Antonio (year)	Boerne (year)	New Braunfels (year)	San Marcos (year)
Years of Record	65	70	67	70	70	69	70	70
Low (in/yr)	7.58 (1956)	9.29 (1956)	11.29 (1956)	11.92 (1954)	13.70 (1954)	10.29 (1954)	10.12 (1954)	13.42 (1954)
High (in/yr)	45.37 (1958)	46.04 (1976)	48.21 (1935)	58.73 (1935)	52.28 (1973)	64.17 (1992)	61.60 (1946)	58.51 (1998)
Average (in/yr)	21.57	23.90	24.03	28.68	30.41	34.07	33.07	34.48

(Source: Edwards Aquifer Authority Hydrogeologic Date Report for 2003)

Figure 3.5: Distribution of Precipitation (2003)



Temperature variation is greater from the Edwards Plateau toward the Gulf Coastal Plain than it is from Brackettville to San Marcos. The area within the Edwards Plateau has an average annual temperature of about 65° F. The Gulf Coastal Plain area has an average annual temperature of about 69° F. The relatively high annual temperatures that occur throughout the entire region contribute to high evapotranspiration rates.

About 85 percent of the precipitation that falls on the region is lost to evapotranspiration. Evapotranspiration, as a percentage of total precipitation, is slightly greater in the western part of the area, although total evapotranspiration in the eastern part of the area is significantly greater because of higher rainfall amounts. Data recorded from the western part of the Edwards Plateau in the Nueces River Basin indicate about 18 of the 21 inches of the annual precipitation is lost to the atmosphere through evapotranspiration. Evapotranspiration in the eastern part of the area is about 28 inches per year.

Throughout the Edwards Aquifer area, evapotranspiration and streamflow vary with temperature and precipitation. In years with high precipitation and low temperature, greater percentages of precipitation in the drainage area become streamflow. Conversely, in years with low precipitation and high temperatures, more precipitation is lost to evapotranspiration and less water is available for streamflow to recharge the aquifer.

3.3.3 VEGETATION OF THE EDWARDS AQUIFER AREA

Evapotranspiration is partially a function of vegetation type. Some plant species intercept substantial amounts of precipitation and have high evapotranspiration rates due to large leaf areas. Shallow rooted herbaceous vegetation typically intercepts less precipitation and has less leaf area. The vegetation of the area is significant in that there is interest in vegetation management as a strategy to increase water yields (runoff and recharge) and to protect water

quality. Studies are currently being conducted to determine the feasibility of replacing deep-rooted wood species with grasses in selected areas. Additionally, vegetation can be an effective filter for removing sediments by reducing runoff velocity, and removing nutrients and heavy metals through plant adsorption and uptake.

Texas is divided into eleven natural regions. Each natural region is comprised of unique and differing physical characteristics including vegetation types. The planning area lies within three of these natural regions: South Texas Brush Country, Blackland Prairies, and the Edwards Plateau.

In the South Texas Brush Country Region, thorny brush is the predominant vegetation type. Plant species include mesquite, acacia, prickly pear, and mimosa. These plant species are adapted to the shallow clay and clay loam soils and rapid drainage of this region.

The Blackland Prairie Region is characterized as a tall-grass prairie dominated by bluestem, sideoats grama, and switchgrass. Tree species include Mesquite, Blackjack Oak, and Post Oak. Fairly uniform dark-colored alkaline soils often referred to as "black gumbo" are the characteristic soils of the area.

Scrub forest is the most characteristic plant association of the Edwards Plateau Region. Ash juniper (cedar), Texas Oak, and stunted Live Oak are dominant in the southern and eastern canyonlands of the region. Mesquite and Live Oak dominate the wood vegetation in the western portions of the region.

3.4 HYDROGEOLOGY OF THE EDWARDS AQUIFER AREA

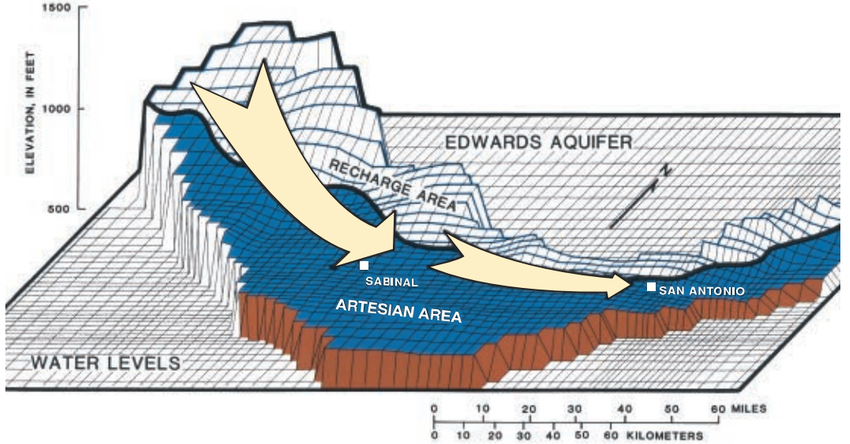
The Edwards Aquifer area was once part of a warm shallow sea. Offshore barrier reefs extended from present day Mexico across Texas. These reefs would be similar to the present-day Great Barrier Reef off the northeastern coast of Australia. The reefs separated the deep, ancestral Gulf of Mexico from the shallow lagoon seas that covered the area. The carbonate remains of marine plants and animals settled and accumulated on the sea bottom. The seas advanced and receded in a cyclic manner from 130 to 100 million years ago. During this time period, the carbonate material accumulated and later consolidated into the Edwards Limestone. Uplift of the area above sea level resulted in erosion that removed 100 feet or more of the deposits that were exposed to weathering. Younger sediments later covered the Edwards Limestone as the seas moved inland again. Subsidence of the Gulf of Mexico and uplift of the Edwards Plateau produced the Balcones Escarpment and fault zone. The Edwards Limestone once again became exposed to weathering action. The faulting, solution, and erosion caused voids to develop within the limestone and created the Edwards Aquifer in its present form.

3.4.1 DESCRIPTION OF THE EDWARDS AQUIFER

The Edwards Aquifer is approximately 180 miles long (east to west) and has a width varying from 5 to 40 miles wide (north to south). The total surface area overlying the aquifer is approximately 3,600 square miles. The Edwards Aquifer, San Antonio area, is bounded to the east by a groundwater divide in Kyle, Texas and in the west by another groundwater divide in Brackettville, Texas. To the north, the Edwards Aquifer begins where formations outcrop into the recharge zone within the Edwards Plateau. The southern extent of the Edwards Aquifer is marked by the "bad water line." This boundary, which is also referred to as the saline-water line or freshwater/saline water interface, marks the interface where total dissolved-solids concentrations reach 1,000 milligrams per liter.

From a regional perspective, the flow in the Edwards Aquifer appears to be simple. Precipitation on the drainage area is transported by streams to the Balcones Fault Zone (BFZ), where it recharges into the aquifer. The water, after entering the aquifer, moves downdip in a southerly direction toward the coast as shown in Figure 3.6. Before the water reaches the "bad water line," or downdip portion of the freshwater portion of the aquifer, its direction is deflected eastward and then northeastward toward the major springs at New Braunfels and San Marcos. In reality, the direction and rate of movement of water in the aquifer are affected by the extremely complicated physical characteristics of the Edwards Limestone. Solution openings vary in size and a complicated series of steep-angle faults interrupt the movement of water. In the western portions of the aquifer (Uvalde and Medina counties) igneous intrusions in the limestone also alter the flow paths, causing local deviations in the general flow direction.

Figure 3.6: General Groundwater Movement

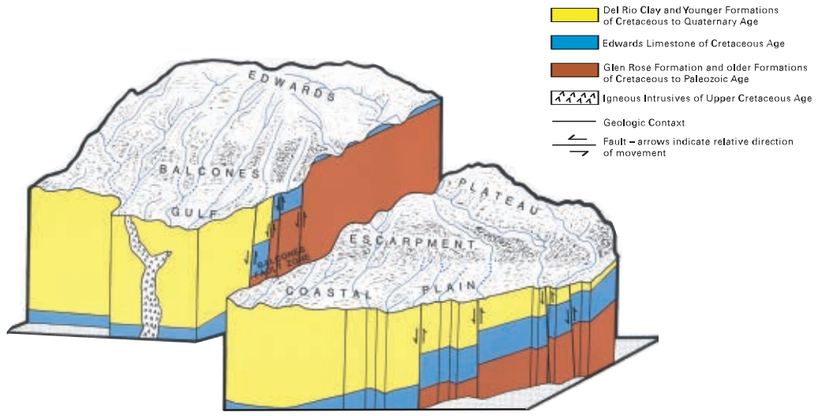


The Edwards Aquifer is contained within the Edwards Limestone and associated rock units. The Edwards Limestone forms two distinct aquifers in Texas: the Edwards Plateau Aquifer and the Balcones Fault Zone Edwards Aquifer. The Edwards Plateau forms the large elevated table land north of San Antonio and extends over much of south-central Texas. In the Edwards Plateau, the limestone is exposed at the land surface and receives direct recharge from precipitation. The limestone has high secondary porosity and permeability from dissolution along fractures, faults, bedding plane partings and sedimentary features, and readily stores and transmits groundwater. The Edwards Plateau Aquifer provides base flow to surface

streams flowing from the Edwards Plateau. The Texas Hill Country is the erosional remnants of the dissected Edwards Plateau.

The Glen Rose formation lies beneath the Edwards Limestone and is exposed along the margins of the Edwards Plateau in the Texas Hill Country. The Glen Rose is part of the Trinity Aquifer which is also an important water resource north of San Antonio. As surface streams flow from the Edwards Plateau to the Gulf Coastal Plain, they cross the Glen Rose Limestone where additional water from springs enters the streams. Both the Trinity Aquifer and the Edwards Plateau Aquifer comprise the drainage or contributing zone of the Balcones Fault Zone Edwards Aquifer.

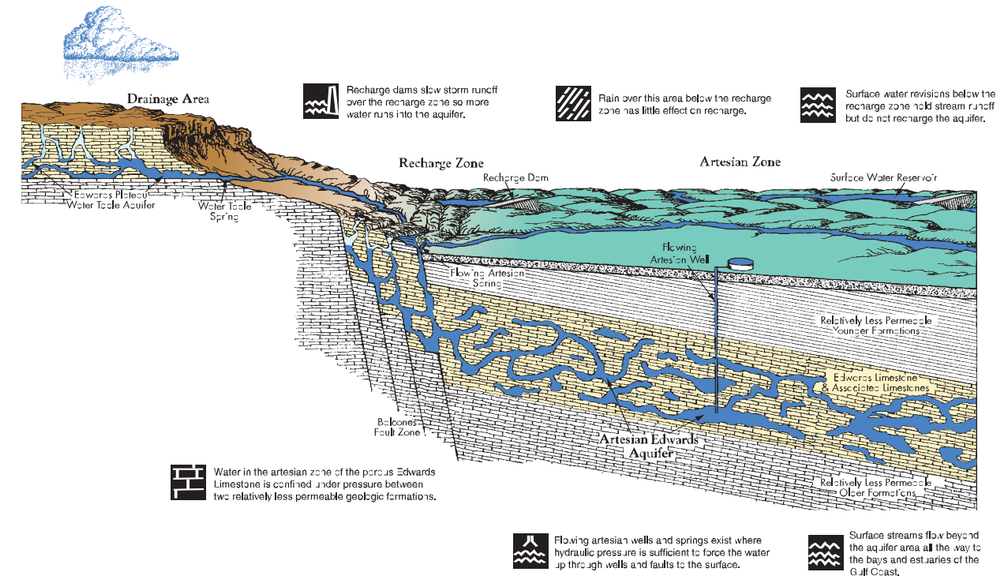
Figure 3.7: The Edwards Limestone



The Balcones Fault Zone Edwards Aquifer is generally defined as having two major components: the recharge zone and the artesian zone. On the southern boundary of the Texas Hill Country, north of San Antonio, the surface streams from the Edwards Plateau and the Texas Hill Country cross the Balcones Escarpment. Here, the Edwards Limestones are again exposed at the surface forming the recharge zone (unconfined zone). The recharge zone of the aquifer covers approximately 1,500 square miles. As surface streams cross the fault zone, they lose much, if not all, of their flow to the subsurface. The exception in the region is the Guadalupe River which does not appear to provide much recharge to the aquifer. During higher flows, when stream flows exceed the maximum recharge rate, much of the water flows past the recharge zone to the Gulf Coastal Plain.

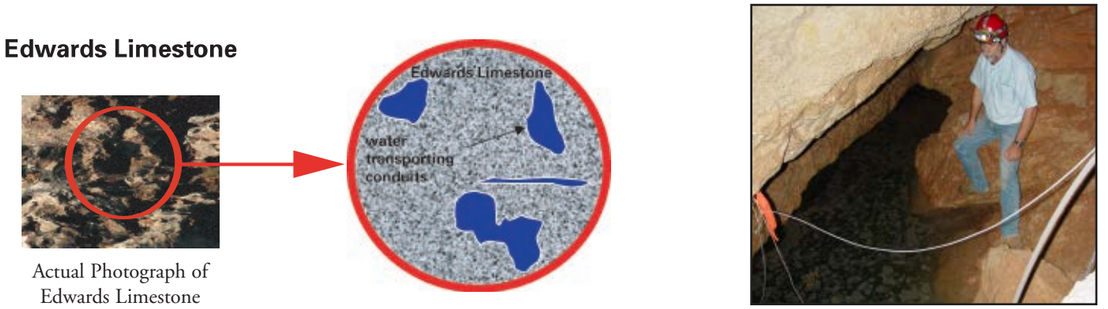
The artesian zone (or confined zone) of the Balcones Fault Zone Edwards Aquifer lies beneath the Gulf Coastal Plain. A confining layer of low permeability, known as the Del Rio Clay Formation, overlies this portion of the Edwards Limestone, while clay units in the Glen Rose Formation, which lie beneath the Edwards Limestone, form a lower confining layer (See Figure 3.7). The confined portion of the Edwards Limestone covers 2,100 square miles and is under artesian pressure, i.e. water in a well will rise above the top of the limestone formation. In some areas, the artesian pressure is sufficient to create flowing wells at the surface.

Figure 3.8: Cross Section of the Edwards Aquifer from Recharge Zone to Confining Zone



The Edwards Aquifer is a highly permeable, carbonate aquifer that is capable of producing large quantities of high-quality water. The aquifer's productivity is largely attributable to the occurrence and development of numerous faults, fractures, conduits, and caves that provide storage and facilitate the transmission of water throughout the aquifer. Water transmitting conduits or solution channels in the Edwards Limestone range in size from the diameter of a small child's finger to several feet or tens of feet in diameter (see Figure 3.9). This variability in conduit size and location makes it difficult to quantify the amount of water in the Edwards Aquifer. Methodologies used to determine the amount of water in karst aquifer systems are unique. Standard methodologies used for other formations are not applicable.

Figure 3.9: Conduits in the Edwards Aquifer



Actual Photograph of Edwards Limestone

Graphic Description

Ezell's Cave

Over the years, a number of researchers have tried to determine the amount of water in the Edwards Aquifer. For example, researchers with the Texas Bureau of Economic Geology (BEG) have estimated that the Edwards Aquifer contains 173 million acre-feet of fresh water. However, the amount of water in the aquifer does not equal the amount of water that can be recovered from the aquifer. There are many factors that determine how much water is available from the Edwards Aquifer. First, there are physical factors, such as depth and pressure, that limit how much groundwater can be recovered and withdrawn. Second, there are considerations such as economics, well depth and location, and impact of other wells. Third, there are the springflow issues related to the Federal Endangered Species Act (ESA), downstream water use in the Guadalupe River Basin, and withdrawal limits established by the Authority's enabling Act.

By statute, the region is currently limited to 450,000 acre-feet of withdrawals from the Edwards Aquifer. This limit can only be changed by the Authority's board on the basis of proper scientific evidence as well as the cooperation of other state and federal agencies.

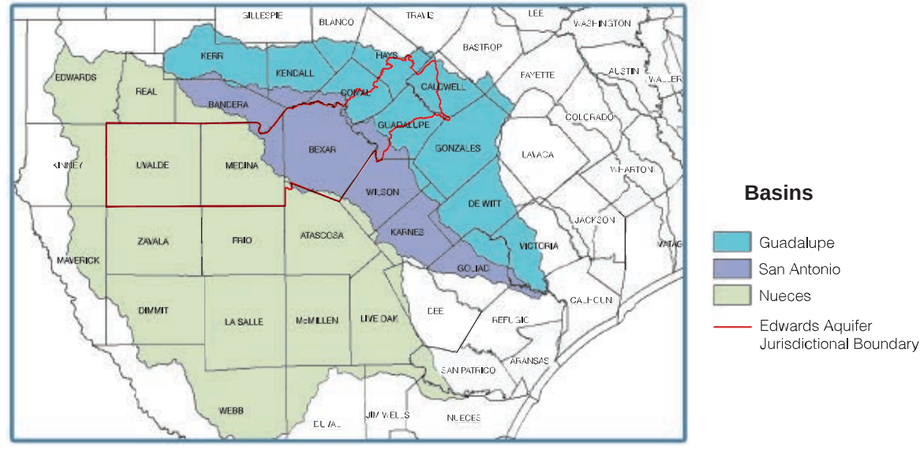
The origin of the 450,000 acre-foot withdrawal limit is believed to have originated with a 1988 Regional Water Plan and was subsequently incorporated into a regional water management plan adopted by the Texas Water Commission (TWC). The 1988 Regional Water Plan developed by the City of San Antonio and the former Edwards Underground Water District recommended that permitted withdrawals be set at 75 percent of average annual recharge. In 1987, average annual recharge was calculated to be 608,000 acre-feet, which suggested an annual withdrawal limit of 456,000 acre-feet. The TWC plan, which was ultimately invalidated by a state court, also included an initial withdrawal limit of 450,000 acre-feet per year, which would decrease to 400,000 acre-feet per year after about 10 years.

3.4.2 RECHARGE AND DISCHARGE

While a portion of recharge to the Edwards Aquifer occurs from precipitation directly on outcroppings in the unconfined portion of the aquifer, the majority of the aquifer's recharge originates from rainfall on the areas to the north of the aquifer on the Edwards Plateau. Recharge occurs when streams and rivers cross the exposed Edwards Limestone and lose flow to the unconfined portion of the aquifer.

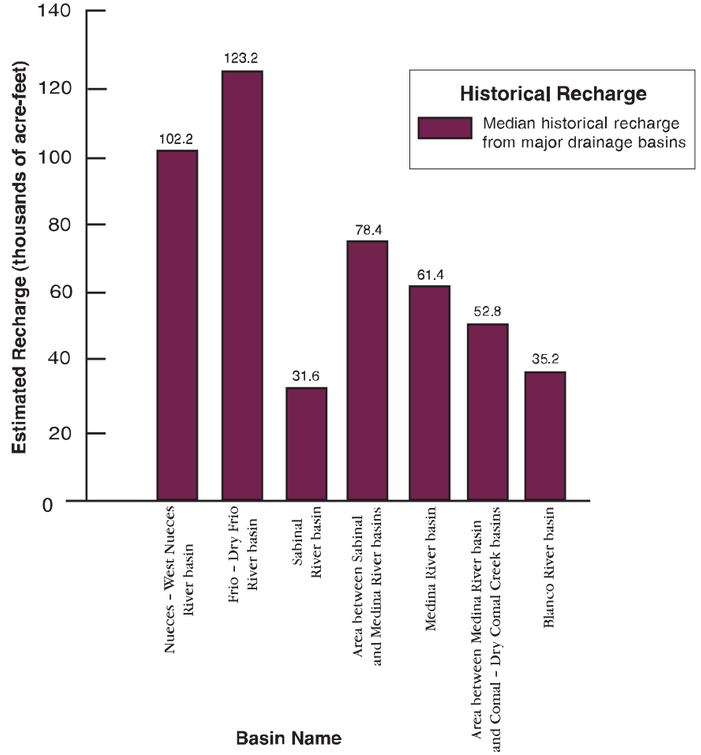
The Edwards Plateau's drainage basins channel and concentrate precipitation runoff in the Edwards Aquifer's recharge area. Without the concentrating effect of the aquifer's drainage area, recharge could be only about 20 percent of actual recharge amounts. The size of the drainage areas, precipitation in those areas, and the characteristics (e.g., topography, soils, vegetation) of the recharge areas all influence the amount of recharge to the Edwards Aquifer. Streamflow from the 1,464 square mile drainage area of the Nueces River Basin, the largest drainage basin in the area, is channeled to a recharge area of only 483 square miles. The Nueces River Basin, which includes the Frio-Sabinal and the Seco-Hondo-Medina sub-basins, supplies about 70 percent of the total annual recharge to the aquifer. Figure 3.10 identifies the major drainage basins that cross the Edwards Aquifer Recharge Zone.

Figure 3.10: Major Drainage Basins in the Edwards Aquifer Area



The U.S. Geological Survey (USGS) has been calculating groundwater recharge to the Edwards Aquifer since 1934. Figure 3.11 shows the median annual recharge for each drainage basin.

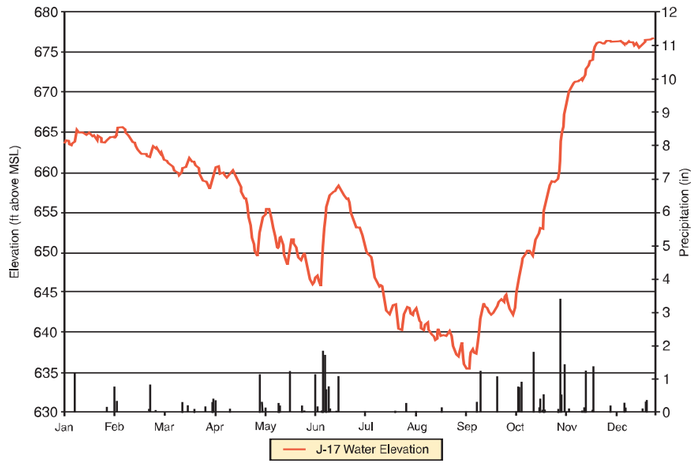
Figure 3.11: Median Annual Recharge (1934-2003)



The USGS estimates of annual recharge for the period of record (1934-2003) ranges from a low of only 43,700 acre-feet at the height of the drought of record in 1956 to 2,486,000 acre-feet in 1992. Median annual recharge for the entire period of record is 559,400 acre-feet. However, since 1994, the annual recharge median is approximately 641,700 acre-feet. Record high recharge in 1992 substantially increases the median for this period, as do several years with recharge in excess of one-million acre-feet since 1992. Recharge directly affects water levels in the aquifer. Water levels rise during years of higher-than-normal recharge, and generally decline during periods of lower-than-normal recharge. Since recharge is a direct result of precipitation, water levels in the aquifer are greatly affected by rainfall. Due to the high transmissivity in the aquifer, water levels rise rapidly in response to rainfall events and fall rapidly during drought from pumping and spring discharge.

Figure 3.12 shows the rise and fall of J-17 in 2000.

Figure 3.12: J-17 Water Levels in 2000



The Authority currently operates four recharge dams on the Edwards Aquifer Recharge Zone (see Figure 3.13). The Parker structure was built in 1974, the Verde in 1978, the San Geronimo in 1979, and the Seco in 1982. The USGS has estimated the enhanced recharge over the lives of the four projects to be 103,857 acre-feet. The estimated average annual recharge for each project ranges from 624 acre-feet per year to 3,244 acre-feet per year (see Table 3.2 below).

Table 3.2: Estimated Annual Enhanced Recharge from the Authority's Edwards Aquifer Recharge Projects (acre-feet)

Year	Parker	Verde	San Geronimo	Seco	Total-All
Total (# yrs)	(30) 18,705	(26) 21,284	(25) 19,493	(22) 71,375	130,857
Average (# yrs)	(30) 624	(26) 819	(25) 780	(22) 3,244	4,362
Median (# yrs)	(30) 217	(26) 371	(25) 603	(22) 643	1,028

(Source: Edwards Aquifer Authority Hydrogeologic Data Report for 2003)

Figure 3.13 Photographs of Edwards Aquifer Recharge Dams


Parker Recharge Dam


San Geronimo Recharge Dam


Verde Recharge Dam


Seco Recharge Dam

Table 3.3: Summary of Aquifer Recharge and Discharge – Period of Record (1934-2003)

	Record High (ac-ft, year)	*Record Low (ac-ft, year)*	*Median (ac-ft, period of record)*
Recharge *(source:stream losses)*	**2,486,000 (1992)**	**43,700 (1956)**	**559,400 (1934-2003)**
Discharge			
Springflow	**802,800 (1992)**	**69,800 (1956)**	**423,200 (1993-2003)**
Pumping from wells	**542,400 (1989)**	**101,900 (1934)**	**407,200 (1994-2003)**

Water is discharged from the Edwards Aquifer primarily through wells, seeps, and springs. A relatively small amount may discharge to the saline water zone. The major Edwards Aquifer springs are San Marcos Springs in San Marcos and Comal Springs in New Braunfels. The San Marcos and Comal springs are the two largest springs in Texas and the southwestern United States (see Figure 3.16). Smaller springs include the San Pedro, Hueco, Leona, and San Antonio springs. Other springs which are located outside of the Authority's jurisdiction but discharge from the Edwards Aquifer are Goodenough and San Felipe springs in Del Rio, Las Moras (Fort Clark) Springs in Brackettville, Barton Springs in Austin, and Salado Springs Complex in Bell County.

As with the variability of recharge, discharge from the aquifer is also subject to great variation. During drought conditions when recharge is low, urban and agricultural irrigation demand typically increase resulting in lower aquifer levels and reduced spring discharge. Conversely, during periods of above average rainfall and recharge, aquifer levels are typically higher, which correlates to higher springflow.

Discharges from wells increased steadily throughout the period of record. Total estimated discharge from Edwards Aquifer wells increased from 101,900 acre-feet in 1934 to 542,200 acre-feet in 1989. However, during the 1990s, average well discharge was 424,900 acre-feet, which represents a ten percent reduction from the previous decade. Coordinated conservation programs and drought reduction programs implemented during the 1990s may have contributed to this reduction. In addition, metering of industrial, municipal, and agricultural wells has provided a more refined estimate of use since 1999.

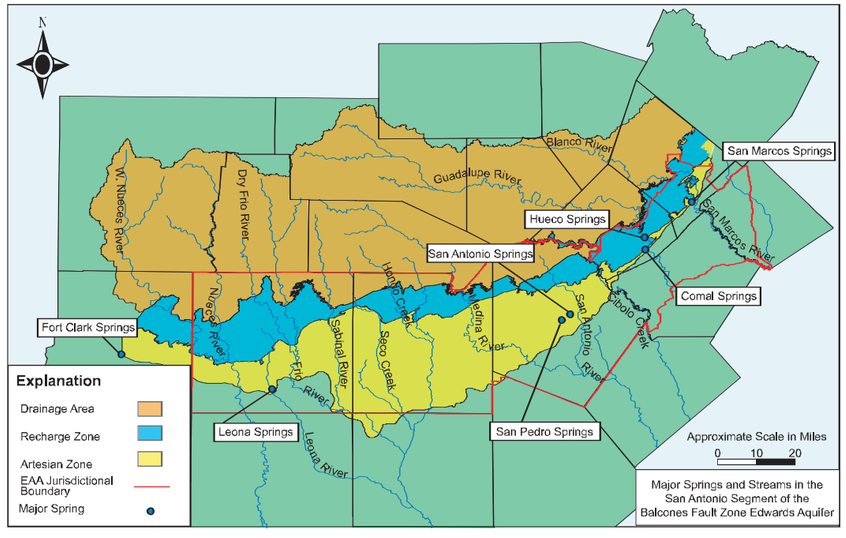
3.4.3 OTHER GROUNDWATER RESOURCES WITHIN THE PLANNING AREA

There are three major aquifers in addition to the Edwards Aquifer within the Authority's planning region – the Carrizo-Wilcox, the Trinity, and the Edwards Plateau. There are no minor aquifers within the Authority's jurisdictional boundaries. The Authority does not regulate any other groundwater resources that fall within the Authority's planning area. It is difficult to determine the amount of groundwater use from other non-Edwards aquifer sources within the Authority's boundaries.

3.4.4 SURFACE WATER RESOURCES WITHIN THE PLANNING AREA

As depicted in Figure 3.14, three major river basins transect the Edwards Aquifer area – from southwest to northeast, these basin are the Nueces, the San Antonio, and the Guadalupe. In addition to contributing recharge to the Edwards Aquifer, these basins are also an important source of water supply either through run-of-the-river diversions or through diversion from reservoir storage. Each basin is briefly described below.

Figure 3.14: Edwards Aquifer and Major Surface Water Features of the Planning Area



The **Nueces River Basin** drains 16,950 square miles. In 2000, the basin had a population of 143,000. The basin begins in Edwards County, outfalls into Nueces Bay, and crosses the Authority's jurisdictional boundary in Uvalde and part of Medina counties. Major streams within the Nueces Basin are the West Nueces, Nueces, Sabinal, Frio, Leona, and Atascosa rivers. Choke Canyon Reservoir and Lake Corpus Christi are the only major storage reservoirs. In addition to providing water supply directly through diversions from the river or reservoirs, the rivers in the Nueces Basin contribute approximately 70 percent of annual recharge to the Edwards Aquifer.

The **San Antonio River Basin**, which includes metropolitan San Antonio, drains 4,180 square miles and has a projected 2000 population of over 1.5 million. The northwestern extent of Bandera County marks the most upstream point in the basin's drainage area. The San Antonio Basin ultimately discharges into the Guadalupe River near the Gulf Coast. The portion of the Authority's area within the San Antonio River Basin includes the eastern portion of Medina, all of Bexar, and the western portions of Comal and Guadalupe counties. The major streams within the basin are Cibolo Creek and the Medina and San Antonio rivers. The basin's only existing storage reservoir is Medina Lake, which is approximately 30 miles northwest of downtown San Antonio. Medina Lake is believed to contribute significant recharge to the Edwards Aquifer. Two relatively small reservoirs – Braunig and Calaveras lakes – are also within the basin and supply cooling water for electric power generation. However, both of these lakes are located downstream of the recharge zone.

The **Guadalupe River Basin** drains 6,700 square miles and had a 2000 population of over 300,000. The basin's most upstream extent is the Kerr/Real County boundary and basin outfall is into San Antonio Bay. The Guadalupe River Basin crosses the Authority's jurisdictional boundary in portions of Comal, Hays, Guadalupe, and Caldwell counties. The Guadalupe, Comal, San Marcos, and Blanco rivers are the basin's principal streams, with the Blanco and possibly the Guadalupe rivers contributing to Edwards Aquifer recharge. In addition to run-of-the-river water rights, Canyon Lake and Coleto Creek Reservoir are major sources of surface water supply within the basin.

3.5 ENVIRONMENTAL FACTORS

The Authority is charged with managing the Edwards Aquifer to sustain the diverse interests of those dependant on the natural resource. Management of the aquifer is not solely for the benefit of those who withdraw water directly from aquifer wells. Rather, management is intended to extend benefits to the surface streams to which the aquifer provides springflow, to protect aquatic and wildlife habitats, to protect species that are subject to federal or state protection, and to provide for instream uses, bays, and estuaries. The broadest interpretation of natural resource protection is required. The Authority's CWMP and a cooperative effort

with state and federal natural resource agencies are important elements of a natural resource protection plan. This natural resource protection plan, known as the Habitat Conservation Plan (HCP) is currently under development by the Authority. The HCP's planning area includes the Authority's jurisdictional boundaries as well as the counties within the South Central Texas Water Advisory Committee (SCTWAC) (see Section 1.0). The purpose of the HCP is to identify regulatory and/or management measures for protecting endangered and/or threatened plant and animal species that depend on the Edwards Aquifer and the associated San Marcos and Comal springs. In addition, the HCP will include an assessment of the impact of these measures on human and other natural resources within the HCP planning area. The HCP is being developed in conjunction with a federal Environmental Impact Statement that is required by the National Environmental Policy Act. Also, the issuance of an Incidental Take Permit from the U.S. Fish & Wildlife Service (USFWS) is being sought in association with this environmental planning effort. However, pursuit of an Incidental Take Permit cannot begin until a thorough understanding of legal ramifications has been completed.

Regarding threatened and endangered species, the Act specifically requires the Authority to:

> ***"…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."***

It was the application of the ESA that catalyzed the initiation and implementation of Edwards Aquifer groundwater regulation. As a result of the ESA and a series of legal battles, the Authority is developing a HCP to comply with the ESA for the protection of threatened and endangered species. Historically, groundwater use has been governed by the "rule of capture," adopted by the Texas Supreme Court in 1904. This doctrine gives a landowner the unrestricted right to pump as much groundwater as desired, provided the water is not "willfully wasted, used maliciously to injure a third party, or pumped negligently." This rule provides that groundwater is the property of the owner of the overlying land and does not prevent the withdrawals of water that lie under separate adjoining properties. The "rule of capture" is currently the governing doctrine in areas of the state that do not have Groundwater Conservation Districts (GCD) established. In areas that do have a GCD the "rule of capture" is still the underlying principle, however modifications have been added to allow the groundwater resources to be managed through the granting of water use permits, appropriate regulatory systems, and monitoring programs.

3.5.1 WATER QUANTITY ISSUES

There are two primary issues of concern with regard to the quantity of water withdrawn from the Edwards Aquifer. The first major issue is the minimum required environmental flows from the Edwards Aquifer discharged through the various important springs that exist in the artesian zone. Increased pumping from the aquifer during drought conditions decreases all spring discharges, which can potentially impact the state and federally listed threatened and endangered species that depend on the springs for habitat.

Figure 3.15: Comal Springs and San Marcos Springs (Note: Photograph shows only portions of the many spring openings associated with each spring)

There are nine federally listed endangered and threatened species that occur at Comal and San Marcos springs who directly depend on Edwards Aquifer springflow to exist: the fountain darter, Comal Springs riffle beetle, Comal Springs dryopid beetle, Peck's cave amphipod, San Marcos salamander, San Marcos gambusia, Texas blind salamander, and Texas wild rice.

Figure 3.16: Federally Endangered and Threatened Species in the Edwards Aquifer

San Marcos Salamander
*(Eurycea nana)**

Texas Wild Rice
*(Zizania texana)***

Texas Blind Salamander
*(Typhlomolge rathbuni)***

San Marcos Gambusia
*(Gambusia georgei)***

Comal Springs Riffle Beetle
*(Heterelmis comalensis)***

Fountain Darter
*(Etheostoma fonticola)***

Comal Springs Dryopid Beetle
*(Stygoparnus comalensis)***

Peck's Cave Amphipod
*(Stygobromus pecki)***

* Threatened ** Endangered

Research studies are currently under way with the Edwards Aquifer Optimization Program (EAOP) and the HCP to determine the habitat requirements of these endangered species, especially concerning minimum springflows required to avoid habitat deterioration, species jeopardy, and/or the taking of a species. At present, estimated minimum flow requirements have been established by the U.S. Fish & Wildlife Service for five of the endangered species pending future research results (see Table 3.4). The take and jeopardy springflow amounts can be seen in Table 3.5.

Table 3.4: Take and Jeopardy Springflow Levels as Specified by the USFWS for Five Federally Listed Species.

Federally Listed Species	Spring System Case	To Avoid Take of Animal Species and Avoid Damage to and Destruction of Plant Species	To Avoid Appreciable Reduction of Survival and Recovery=Jeopardy	To Avoid Adverse Modification of Critical Habitat
		Minimum Springflow (cfs)	Minimum Springflow (cfs)	Minimum Springflow (cfs)
Texas Wild-Rice	San Marcos	100	100	100
Texas Wild-Rice	San Marcos		<100	<100
Fountain Darter	Comal	200		
Fountain Darter	Comal	150		
Fountain Darter	Comal		150	
Fountain Darter	Comal		60	
Fountain Darter	San Marcos	100	100	100
Fountain Darter	San Marcos		<100	<100
San Marcos Gambusia	San Marcos	100		
San Marcos Gambusia	San Marcos		100	100
San Marcos Gambusia	San Marcos		<100	<100
Texas Blind Salamander	Edwards Aquifer	50		
Texas Blind Salamander	Edwards Aquifer		50	
Texas Blind Salamander	San Marcos	60		
Texas Blind Salamander	San Marcos		60	60

15 April 1993 Letter
With control of snail *Marisa*
Currently, csf undefined
15 June 1993 Letter
With Edwards Aquifer Management Plan and Control of Exotics
For Short (Undefined) Periods of Time
Given Current (1993) Conditions
Refers to San Marcos Springflow

N.B. These determinations predate the listing of the Comal Springs riffle beetle, Comal Springs dryopid beetle, and Peck's cave amphipod. Source: USFWS 1999b (Guidance documents provided to Hicks and Company by Austin Ecological Services Office, U.S. Fish & Wildlife Service via letter dated 5 October, 1999.)

Table 3.5: Federal Springflow Requirements

	Take	Jeopardy
Comal Springs	200 c.f.s.	150 c.f.s.
San Marcos Springs	100 c.f.s.	100 c.f.s.

The second issue centers on the possibility of diminishing the freshwater supply in the aquifer by encouraging intrusion of lesser quality water into the freshwater zone. South of the artesian zone of the Edwards Aquifer exists an interface, or "bad water line," separating the good quality water from a layer of water not usable for human consumption because of the high dissolved solids content. This line, also referred to as the saline water line or freshwater/saline water interface, marks the interface where groundwater reaches a total dissolved-solids concentration of 1,000 milligrams per liter. Little is known about this interface and research is being conducted to delineate the "bad water line" and determine the effects pumping large quantities of aquifer water will have on its location. As part of the Edwards Aquifer Optimization Program and its cooperative efforts with the San Antonio Water System (SAWS), an ongoing investigation of the "bad water line" and its movements within the aquifer is taking place. These research efforts are discussed in subsequent sections of the CWMP. At present, there is concern and uncertainty regarding the intrusion of poor quality water into the freshwater zone. It is known that the "bad water line" is fairly close to Comal and San Marcos springs and movement of the saline interface could potentially impact threatened and endangered species that depend on the springs. There is anecdotal historical information reported during the severe drought of the 1950s that indicates highly mineralized water occurred in some freshwater wells on the southern edge of the Edwards Aquifer. However, there is no scientific data to support the movement or intrusion of saline water into freshwater portions of the aquifer. The current lack of scientific data makes the formulation of management strategies extremely difficult.

3.5.2 WATER QUALITY ISSUES

In addition to the concern regarding saline water intrusion into the freshwater zone discussed in the previous section, there are two other water quality concerns.

The Edwards Aquifer's primary water quality issue is the potential for groundwater contamination from point and nonpoint source pollution. The accidental release of chemicals over the Edwards Aquifer has occurred and resulted in the closure of public water supply wells in the aquifer. Karst aquifers are noted as one of the most vulnerable of all aquifer types to contamination and the continued urbanization of the recharge zone in Bexar County is of particular concern. Karst aquifers have rapid and direct recharge with a low capacity to filter out contaminants. Contaminated water can easily enter the aquifer through caves, sinkholes, faults, and fractures and can impact public or private water supply wells and the endangered species located in the springs.

Nonpoint source pollution is overland flow, or runoff that flows over the land, picks up various pollutants that adhere to plants, soils, and man-made objects and eventually infiltrates into groundwater or flows into a surface water stream. As land in the recharge zone and surrounding areas is developed, the likelihood increases that runoff from precipitation events will pick up increasing amounts of pollution. Historically, the water quality of the Edwards Aquifer has been exceptional. Public water supply groundwater wells currently only requires chlorination. Domestic groundwater wells generally do not treat the water before consumption. Both types of well users are sensitive to groundwater contamination. Additionally, the pristine habitat of the threatened and endangered species that live in and near the springs is very sensitive to changes in water quality.

Figure 3.17: Cave Opening and Spill on the Edwards Aquifer Recharge Zone

Cave Opening in Edwards Aquifer

Diesel Spill on Recharge Zone-2000

4.0

Population and Water Demand Projections

EDWARDS AQUIFER AUTHORITY

EDWARDS AQUIFER
AUTHORITY

4.0 POPULATION AND WATER DEMAND PROJECTIONS

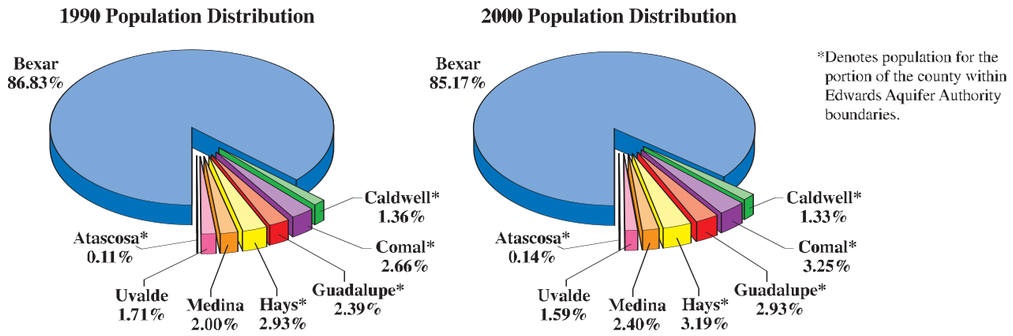
On September 17, 2003, the Texas Water Development Board (TWDB) approved final revised population and water demand projections, respectively, for the South Central Texas Regional Water Planning Area (herein referred to as Region L). These projections will be used in the 2006 update of the regional water supply plans – including the plan for Region L and the update of the new State Water Plan in 2007. The methodologies and assumptions used by the TWDB in the preparation of population and water demand projections are described in two documents: *Populations Projection Methodology* and *Water Demand Projections Methodology* (2002). Both are available online at **http://www.twdb.state.tx.us**.

In order to maintain consistency between the state and regional water supply planning processes and the ongoing water resources planning activities of the Edwards Aquifer Authority (the Authority), population and water demand projections for the Authority's jurisdictional area (the planning area) have also been updated and are presented in this section. The updated projections for the planning area are derived from the approved Region L projections using a "template" first developed for the Trans-Texas Water Program and presented in the report entitled, *"West Central Study Area Phase II Population, Water Demand, and Water Supply Projections"* (March 1998). For those counties that lie partially within the Edwards Aquifer Authority jurisdictional area, estimates were made of the portion of the county's population and the portion of the county's water demand that occurs within the planning area. For these counties, the relative proportion of population and water demand within the planning is assumed to have remained constant. Accordingly, a consistent approach has been applied to the development of population and water demand projections for the planning area since they were first developed in 1998.

4.1 CURRENT AND PROJECTED POPULATION

The population of the planning area has grown significantly since 1990. The area's 1990 population was reported to be more than 1.36 million and had increased nearly 21 percent to 1.64 million in 2000. As depicted in Figure 4.1, the majority of the population of the planning area resides within Bexar County. During the 1990s, the growth rates for Comal, Guadalupe, and Hays counties increased at a slightly faster rate than that of Bexar County. Accordingly, while the population of Bexar County increased significantly during the 1990s, the percentage of the population of the planning area that resides within Bexar County has decreased slightly. Relative population distributions remained essentially unchanged for Atascosa, Caldwell, Medina, and Uvalde counties for the same 10-year period.

Figure 4.1: Edwards Aquifer Authority Planning Area Population Distribution by County – 1990 and 2000



The sustained economic prosperity experienced during the decade of the 1990s, by the state in general, and the Central Texas area in particular, is projected to continue into the foreseeable future. As shown in Table 4.1 and Figure 4.2, the overall population of the planning area is projected to increase by approximately 90 percent from 1.36 million to 2.59 million between 1990 and 2030. Bexar County alone has a projected population gain of nearly 900,000 people over the 40-year planning period, due mostly to the growth of San Antonio and adjacent suburban communities. Comal, Guadalupe, and Hays counties are projected to have the largest percentage gains in population during this time period.

Of particular note is the updated population projections for the planning area which are significantly lower than previous projections. For example, the population of the planning area, previously projected to be approximately 1.72 million in 2000, has increased to 2.95 million in 2030 (see Figure 4.3). The updated population projections for the planning area are about five percent lower for the year 2000 (1.64 million) and 12 percent lower for 2030 (2.59 million). Nonetheless, meeting the water supply needs associated with this large increase in population will be one of the greatest challenges faced by the region in the coming years.

Table 4.1: Population Projections for the Edwards Aquifer Authority Jurisdictional Area

County	1990	2000	2010	2020	2030	Percent Increase*
Atascosa	1,567	2,314	2,698	3,050	3,380	115.70
Bexar	1,185,394	1,392,931	1,631,935	1,857,745	2,059,112	73.71
Caldwell	18,599	261,760	31,192	40,742	49,150	164.26
Comal	36,346	53,195	74,184	100,599	128,629	253.90
Guadalupe	32,642	47,930	60,529	75,395	92,061	182.03
Hays	39,992	52,098	86,014	125,724	159,019	297.63
Medina	27,312	39,304	46,675	54,815	62,416	128.53
Uvalde	23,340	25,926	28,616	31,443	38,802	44.82
TOTAL	**1,365,192**	**1,635,458**	**1,961,843**	**2,289,513**	**2,587,569**	**89.54**

* Percent increase is calculated from the total projected change in population from 1990 to 2030.

Figure 4.2: Population Projections for the Edwards Aquifer Authority Jurisdictional Area

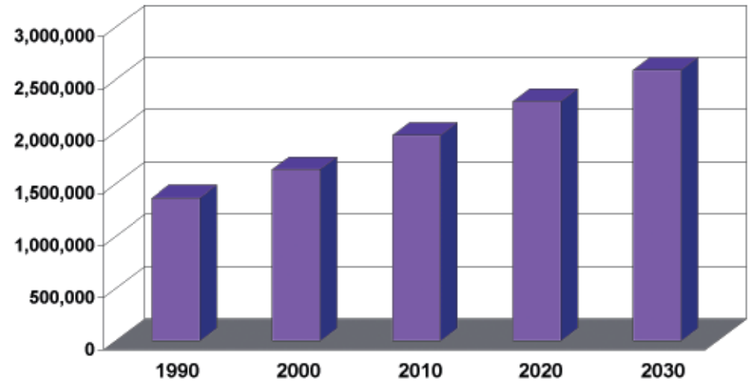
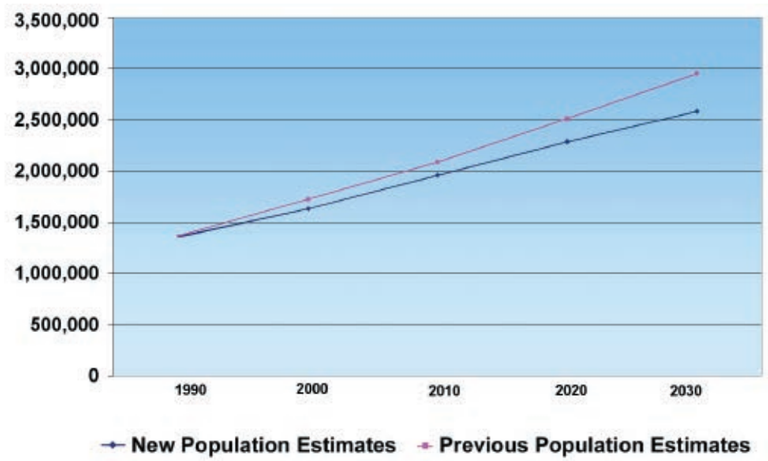


Figure 4.3: Comparison of New Population Estimates with Previous Estimates



4.2 CURRENT WATER DEMAND WITHIN THE PLANNING AREA

4.2.1 CATEGORIES OF WATER USE

Water use in the planning area can be categorized into six major types with a special category for springflow use. The following are descriptions of the water use categories as defined by the Authority and the Trans-Texas Water Program reports. The descriptions are consistent with the Brown-Lewis Water Plan and TWDB guidelines for reporting requirements.

Municipal Water Use – The water use within or outside of a municipality and its environs whether supplied by a person, privately owned utility, political subdivision, or other entity, including the use of treated effluent for certain purposes specified as follows. The term includes:

A. The water use for domestic use, the watering of lawns and family gardens, fighting fires, sprinkling streets, flushing sewers and drains, water parks and parkways, and recreation, including public and private swimming pools.

B. The water use in industrial and commercial enterprises supplied by a municipal distribution system without special construction to meet its demands.

C. The application of treated effluent on land under a permit issued under Chapter 26, Water Code, if:

(i) The primary purpose of the application is the treatment or necessary disposal of the effluent.

(ii) The application site is a park, parkway, golf course, or other landscaped area within the Authority's boundaries.

(iii) The effluent applied to the site is generated within an area for which the commission has adopted a rule that prohibits the discharge of the effluent.

Industrial Water Use – The water use for, or in connection with, commercial or industrial activities, including manufacturing; bottling; brewing; food processing; scientific research and technology; recycling; production of concrete, asphalt, and cement; commercial water use for tourism, entertainment, and hotel or motel lodging; generation of power other than hydroelectric; and other business activities.

Steam-Electric Power Water Use – Includes freshwater used for steam-electric power generation plants for condenser cooling, boiler feed makeup, sanitation, grounds maintenance, and pollution control.

Irrigation Water Use – The water use for irrigation of pastures and commercial crops, including orchards.

Mining Water Use – Includes fresh water used in the recovery of petroleum, sand, gravel, clay, and stone.

Livestock Water Use – Animals, beasts, or poultry collected or raised for pleasure, recreation use, or commercial use.

Springflow Use – While not explicitly defined by the TWDB, the Edwards Aquifer has a unique, additional use of supplying springflow for environmental and recreational use.

Domestic or Livestock Use – Water use for:

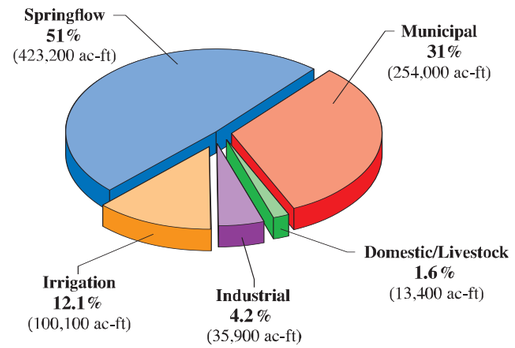
A. Drinking, washing, or culinary purposes.

B. Irrigation of a family garden or orchard the produce of which is for household consumption only.

C. Watering of animals.

It should be noted that both the TWDB and the Authority include "domestic" water use within the municipal category. Domestic use is difficult to measure because water use data is generally unavailable for those households that rely on individual domestic water wells, since there are currently no reporting or metering requirements for water wells equipped to produce less than 25,000 gallons per day.

Figure 4.4: Ten-year (1993-2003) Median Annual Edwards Groundwater Discharge Distribution Within the Edwards Aquifer Authority Jurisdictional Area



Note: Eastern Kinney County contains the western-most portion of the "San Antonio hydrologic region" of the Edwards Aquifer, which is outside of the Edwards Aquifer Authority's jurisdiction. However, the Authority does compile groundwater use data for this area. Data show that the total 2000 water demand for Kinney County was 1,900 ac-ft/yr.

Source: Edwards Aquifer Authority Hydrogeologic Report for 2003

4.2.2 CURRENT WATER DEMAND

During 1990, an estimated 648,185 acre-feet of water was used within the planning area. Approximately 80 percent was supplied from the Edwards Aquifer and 20 percent was supplied from other groundwater formations and from surface water sources. Based on the approved water demand projections for Region L, total water use during 2000 was approximately 461,885 or nearly 29 percent lower than in 1990. In part, this reduction reflects significant reductions in per capita water demand in the municipal category and significant reductions in irrigated agriculture. However, in interpreting this water use data it is important to note that 1990 was dryer than average years. During dry years, irrigation water demand

is typically significantly higher as compared to irrigation demand during a year with "normal" or above average rainfall. In particular, for Medina and Uvalde counties, which rely heavily on irrigation to support their agricultural-based economies, water use for 1990 was significantly higher than that typical for "normal" precipitation year.

According to the Edwards Aquifer Hydrogeologic Report for 2003, the 10-year (1991-2000) median (1991-2000) discharge and withdrawal from the aquifer within the planning area was 792,700 ac-ft/year. Of this amount, 52 percent is from withdrawals for various socioeconomic uses (see Figure 4.4). The relative contribution of each category of water use to total estimated water demand in the planning area during 2003, excluding spring flow, is depicted in Figure 4.5. Current distribution of total water demand for each county, or that part of a county located within the planning area is shown in Figure 4.6.

Figure 4.5: Current Distribution of (2003) Water Demand within the Edwards Aquifer Authority Jurisdictional Area by Type of Use

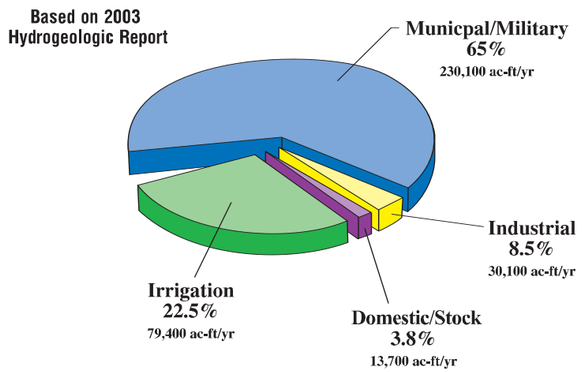
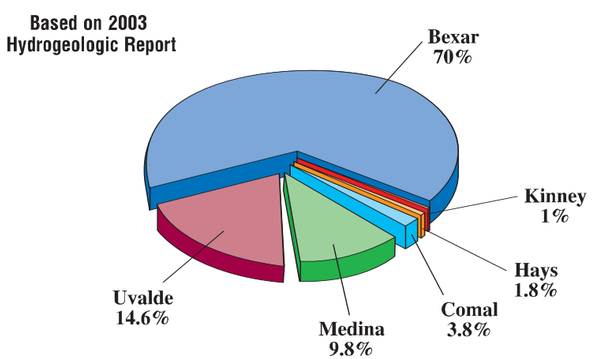


Figure 4.6: Current Distribution of Total (2003) Water Demand by County in the Planning Area



4.3 PROJECTED WATER DEMAND WITHIN THE PLANNING AREA

Water demand projections for the Authority's planning area have also been revised consistent with the approved revisions to the projections for Region L. For planning purposes, the water demand projections are separated into the following use categories: municipal, industrial, steam and electric power generation, irrigation, mining, and livestock. Excluding spring flow, municipal uses accounted for approximately 60 percent of total water demand for the planning area in 2000. Projections for the each of these water demand categories, as well as for domestic water demands, a subcategory of municipal, are presented below.

4.3.1 MUNICIPAL WATER DEMAND

As demonstrated previously, there has been a steady increase in the population of the planning area since 1990; this trend is projected to continue through the planning period. Consequently, municipal water demands are projected to increase steadily from approximately 260,000 ac-ft/year in 1990 to more than 400,000 acre-feet by 2030 (see Table 4.2). By 2000, municipal water demand accounted for approximately 60 percent of total demand (see Figure 4.5), which is in part attributed to increased municipal water demand and to significant decreases in irrigation demand.

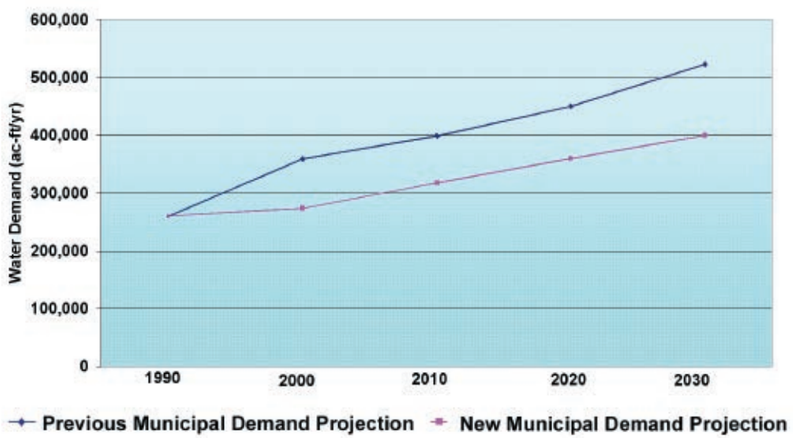
It is also important to note that the updated projections of municipal water demand are significantly lower than previous projections. Municipal water demand in the planning area was previously projected to reach nearly 360,000 ac-ft/year in 2000 and increase to approximately 524,000 ac-ft/year in 2030. As shown in Table 4.2 and Figure 4.7, the updated municipal water demand projections are approximately 24 percent lower through the planning period. This decrease in projected municipal water demand is largely the result of significant adjustments in per capita use rates, which are a key factor in the projections. These adjustments reflect actual per capita use rates during 2000, which was a "dry-year" throughout the state. By using the year 2000 as the basis for municipal water demand projections, the effects of state and federal plumbing fixture efficiency standards, which went into effect in the early 1990s, and the effects of utility-sponsored water conservation programs are "captured" in the projections. The downward revision of municipal water demand projections is also partially the result of lower population estimates and projections.

Table 4.2: Municipal Water Demand Projections for the Edwards Aquifer Authority Jurisdictional Area

Edwards Aquifer Area County	Municipal Water Demands and Projections (ac-ft/yr)					
	1990	2000	2010	2020	2030	Percent Increase**
Atascosa*	336	447	498	538	573	70.54
Bexar	225,626	229,694	262,106	290,071	316,423	40.24
Caldwell*	3,700	3,317	4,578	5,811	6,908	86.70
Comal*	7,613	10,208	13,519	17,483	22,185	191.41
Guadalupe*	4,375	7,325	8,625	10,372	12,455	184.69
Hays*	8,087	8,590	13,510	19,225	23,759	195.62
Medina	5,254	6,616	7,576	8,660	9,656	83.78
Uvalde	5,278	7,768	8,066	8,394	8,652	63.93
TOTAL	**260,219**	**273,965**	**318,478**	**360,554**	**400,611**	**53.95**

* Denotes portion of a county within Edwards Aquifer Authority boundaries.
** Percent increase is calculated from the total projected change in water demand between 1990 and 2030.

Figure 4.7 Comparison of New Municipal Demand Projections with Previous Projections



The San Antonio Metroplex is the major municipal water demand center within the planning area. Encompassing all of Bexar County, the metroplex is comprised of the City of San Antonio and 19 surrounding suburban communities with populations greater than 1,000:

- Alamo Heights
- Schertz
- Leon Valley
- Castle Hills
- Cibolo
- Olmos Park
- Shavano Park
- Garden Ridge
- Balcones Heights
- Hill Country Village
- Live Oak
- Hollywood Park
- Converse
- Lackland AFB
- Helotes
- St. Hedwig
- Terrell Hills
- Windcrest
- Kirby

Nine of these communities have populations of 5,000 or more – Alamo Heights, Converse, Kirby, Lackland AFB, Leon Valley, Live Oak, San Antonio, Terrel Hills, and Universal City. Within the entire planning area there are 31 cities with a population greater than 1,000.

The Brown-Lewis Water Plan legislation requires the Regional Water Planning Groups (RWPG) to designate certain water suppliers within each region as "major water providers." This term is defined by the TWDB as "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 South Central Texas Regional Water Planning Group has designated six entities as major water providers. These are San Antonio Water System (SAWS), Bexar Metropolitan Water District (BMWD), Canyon Regional Water Authority (CRWA), the Guadalupe-Blanco River Authority (GBRA), New Braunfels Utilities (NBU), and the City of San Marcos.

4.3.2 DOMESTIC WATER DEMAND

As stated in the Authority's enabling legislation (Act):

> ***"A well that produces 25,000 gallons of water a day or less for domestic or livestock use is exempt from metering requirements. Exempt wells must register with the authority or within an underground water conservation district in which that well is located."***

Typically, a domestic well serves a single residence. There is a lack of water use data on these wells because of their exempt status. The TWDB has traditionally accounted for domestic water use within the "county-other" municipal category, which is based on census population data. The municipal water demand data, discussed in the above section, includes this domestic user group as well. However, for the purposes of this planning document, additional information was collected from the United States Geological Survey (USGS), the TWDB, and the Authority, to estimate the current and projected domestic water demand through the year 2030 (see Table 4.3).

As noted previously, anecdotal information suggests growth is occurring in the rural areas outside the confines of municipalities. Many rural residents depend on water wells that produce less than 25,000 gallons per day. These types of wells are currently exempt from Authority regulation. There are few, if any, records for the amount of water used from these exempt wells. The fact that this water use segment appears to be growing necessitates an accounting of this water use in the final water balance.

Table 4.3: Domestic Population Projections for the Edwards Aquifer Authority Jurisdictional Area

Year	Domestic Population	Domestic Water Demand (ac-ft/yr)	Percent County-Other Population	Percent County-Other Water Demand	Percent Municipal Water Demand	Percent Total Water Demand
1990*	16,686	2,721	19.35	11.19	1.05	0.42
2000	21,755	3,955	14.53	9.70	1.10	0.50
2010	23,479	4,268	13.21	10.29	1.07	0.53
2020	25,831	4,696	11.86	9.45	1.04	0.55
2030	28,516	5,184	10.69	8.60	0.99	0.56

* 1990 domestic population estimation was extrapolated using the 1993-1995 compound annual growth rate.

All domestic water demand projections make up less than one percent of the total water demand for the planning area, and while this may seem to be an insignificant contribution, it is of concern to the Authority. Domestic use and its growth is part of the water balance and must be considered and addressed in regional water supply planning.

4.3.3 INDUSTRIAL WATER DEMAND

Industrial water demand accounts for approximately four percent of total water demand in the planning area (see figure 4.5). As shown in Table 4.4, most industrial water demand is located within Bexar and Comal counties. The portions of Atascosa and Caldwell counties that are within the planning area do not report any current or projected industrial water demand.

Table 4.4: Industrial Water Demand Projections for the Edwards Aquifer Authority Jurisdictional Area

Edwards Aquifer Area County	Industrial Water Demand Projections (ac-ft/yr)					
	1990	2000	2010	2020	2030	Percent Change**
Atascosa*	0	0	0	0	0	0
Bexar	14,049	21,252	25,951	29,497	32,775	133.29
Caldwell*	0	0	0	0	0	0
Comal*	3,248	6,283	7,729	8,563	9,314	186.76
Guadalupe*	831	1,049	1,319	1,479	1,625	95.55
Hays*	57	157	212	249	285	400.00
Medina	286	56	67	75	82	-71.33
Uvalde	557	378	432	455	473	-15.08
TOTAL	**19,028**	**29,175**	**35,710**	**40,318**	**44,554**	**134.15**

* Denotes portion of a county with Edwards Aquifer Authority boundaries.
** Percent increase is calculated from the total projected change in water demand from 1990 to 2030.

4.3.4 STEAM-ELECTRIC WATER DEMAND

The steam-electric power generation water demand category includes production facilities that supply private and public customers. At present, steam-electric water demand accounts for approximately six percent of total water demand in the planning area (see Figure 4.5) and nearly all of this demand is located within Bexar County. As shown in Table 4.5, steam electric water demand is projected to remain relatively constant in Bexar County, but the planning area as a whole will see a significant increase because of the addition of new power generation facilities in Guadalupe and Hays counties.

Table 4.5: Steam-Electric Water Demand Projections for the Edwards Aquifer Authority Jurisdictional Area

Edwards Aquifer Area County	Steam-Electric Water Demand Projections (ac-ft/yr)					
	1990	2000	2010	2020	2030	Percent Change**
Atascosa*	0	0	0	0	0	0
Bexar	24,263	17,399	17,309	17,275	20,196	-16.76
Caldwell*	0	0	0	0	0	0
Comal*	0	0	0	0	0	0
Guadalupe*	0	129	10,065	14,407	16,844	NA
Hays*	0	0	5,331	7,631	8,922	NA
Medina	0	0	0	0	0	0
Uvalde	0	0	0	0	0	0
TOTAL	**24,263**	**17,528**	**32,705**	**39,313**	**45,962**	**89.43**

* Denotes portion of a county with Edwards Aquifer Authority boundaries.
** Percent increase is calculated from the total projected change in water demand from 1990 to 2030.

4.3.5 IRRIGATION WATER DEMAND

Large-scale agricultural irrigation occurs in only four of the counties in the planning area and represents the second largest category of water use within the planning area at 28 percent (see Figure 4.5). Of note, is that irrigation water demand represented more than half of the total water demand in the planning area during 1990. However, rainfall during 1990 was well below normal during the irrigation season (April-July), which resulted in higher than normal water demand. Median irrigation use for the 10-year period from 1988-1998 was 100,100 ac-ft/yr.

Approximately 87 percent of total irrigation demand in the planning area occurs in Medina and Uvalde counties, as shown in Table 4.6. From 1990 to 2030, irrigation water demand is projected to decrease by approximately 65 percent. This decrease is largely attributed to the expected adoption of more efficient irrigation technologies and practices and to declines in irrigated agriculture.

According to the current water supply plan for Region L, irrigation demands are the only category of demand that will not be fully met in the future. Alternatives to provide additional water supply for irrigation are generally cost-prohibitive.

Table 4.6: Irrigation Water Demand Projections for the Edwards Aquifer Authority Jurisdictional Area

Edwards Aquifer Area County	Irrigation Water Demand Projections (ac-ft/yr)					
	1990	2000	2010	2020	2030	Percent Change**
Atascosa*	1,464	988	1,112	1,067	1,023	-30.12
Bexar	37,012	15,865	15,273	14,628	14,010	-62.15
Caldwell*	0	0	0	0	0	0
Comal*	0	0	0	0	0	0
Guadalupe*	0	0	0	0	0	0
Hays*	0	0	0	0	0	0
Medina	157,380	56,422	54,450	52,179	50,005	-68.23
Uvalde	140,669	58,061	55,791	53,609	51,513	-63.38
TOTAL	**336,525**	**131,336**	**126,626**	**121,483**	**116,551**	**-65.37**

* Denotes portion of a county with Edwards Aquifer Authority boundaries.
** Percent increase is calculated from the total projected change in water demand from 1990 to 2030.

4.3.6 MINING WATER DEMAND

Water use in mining operations currently represents only about one percent of total water demand in the planning area (see Figure 4.5). Most mining operations in the planning area are quarries, which excavate stone, gravel, sand, and clay used in the local construction industry and elsewhere in the state. Thus, water demand associated with the mining industry is driven largely by regional economic conditions. As shown in Table 4.7, by the year 2030 mining water demand is projected to increase significantly and will represent approximately 1.3 percent of the area's total water demand.

Table 4.7: Mining Water Demand Projections for the Edwards Aquifer Authority Jurisdictional Area

Edwards Aquifer Area County	Mining Water Demand Projections (ac ft/yr)					
	1990	2000	2010	2020	2030	Percent Change**
Atascosa*	0	0	0	0	0	0
Bexar	1,591	2,902	3,582	3,934	4,150	160.84
Caldwell*	0	0	0	0	0	0
Comal*	851	1,251	2,364	2,686	2,808	229.96
Guadalupe*	8	270	306	321	330	4,025.00
Hays*	0	129	142	151	157	NA
Medina	120	118	130	135	137	14.17
Uvalde	399	250	313	345	364	-8.77
TOTAL	**2,969**	**4,920**	**6,837**	**7,572**	**7,946**	**167.63**

* Denotes portion of a county with Edwards Aquifer Authority boundaries.
** Percent increase is calculated from the total projected change in water demand from 1990 to 2030.

4.3.7 LIVESTOCK WATER DEMAND

Livestock production in the planning area includes beef and dairy cattle, goats, horses, and poultry. At present, it is estimated that livestock watering accounts for one percent of the area's total water demand (see Figure 4.5). Water use by livestock is projected to remain constant through the planning period, as shown in Table 4.8.

Table 4.8: Livestock Water Demand Projections for the Edwards Aquifer Authority Jurisdictional Area

Edwards Aquifer Area County	Livestock Water Demand Projections (ac ft/yr)					
	1990	2000	2010	2020	2030	Percent Change**
Atascosa*	2	2	2	2	2	0
Bexar	1,376	1,319	1,319	1,319	1,319	4.14
Caldwell*	406	457	457	457	457	12.56
Comal*	158	149	149	149	149	-5.70
Guadalupe*	516	327	327	327	327	-36.63
Hays*	169	125	125	125	125	-26.04
Medina	1,560	1,298	1,298	1,298	1,298	-16.79
Uvalde	994	1,284	1,284	1,284	1,284	28.18
TOTAL	**5,181**	**4,961**	**4,961**	**4,961**	**4,961**	**-4.25**

* Denotes portion of a county with Edwards Aquifer Authority boundaries.
** Percent increase is calculated from the total projected change in water demand from 1990 to 2030.

4.3.8 PROJECTIONS OF TOTAL WATER DEMAND

As shown below in Table 4.9, overall water demand within the planning area is projected to increase approximately 34 percent from 2000 to 2030. As indicated, water demand in Atascosa, Medina, and Uvalde counties are projected to decrease significantly due to projected declines in irrigation water demand. Dramatic increases are projected elsewhere in the planning area as a result of continued population growth and growth in non-agricultural economic activity.

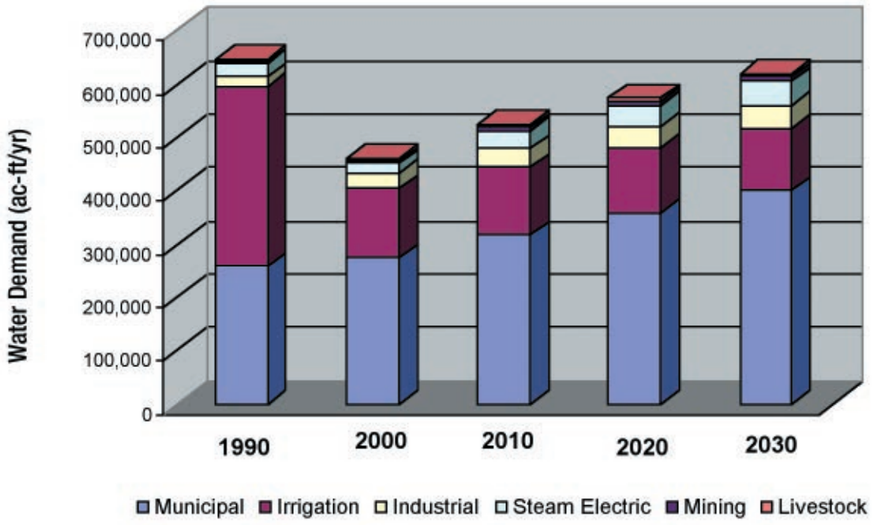
Table 4.9: Total Projected Water Demand for the Planning Area

Edwards Aquifer Area County	Total Projected Water Demand (ac ft/yr)					
	1990	2000	2010	2020	2030	Percent Change**
Atascosa*	1,802	1,437	1,612	1,607	1,598	-11.32
Bexar	303,917	288,431	325,540	356,724	388,873	27.95
Caldwell*	4,106	3,774	5,035	6,268	7,365	79.37
Comal*	11,870	17,891	23,761	28,881	34,456	190.28
Guadalupe*	5,730	9,100	20,642	26,906	31,581	451.15
Hays*	8,263	9,001	19,320	27,381	33,248	302.37
Medina	164,600	64,510	63,521	62,347	61,178	-62.83
Uvalde	147,897	67,741	65,886	64,087	62,286	-57.89
TOTAL	**648,185**	**461,885**	**525,317**	**574,201**	**620,713**	**-4.24**

* Denotes portion of a county with Edwards Aquifer Authority boundaries.
** Percent increase is calculated from the total projected change in water demand from 1990 to 2030.

Figure 4.8 below shows the contributions of each water use category to the total water demand of the planning area over the 30-year planning period. As indicated, municipal water demand now surpasses irrigation water demand. The ranking for the other water use categories will remain more or less constant over the planning period with the industrial category having the third highest use, followed by steam-electric power generation, mining, and livestock.

Figure 4.8: Water Demand and Projections Distribution for the Edwards Aquifer Authority Jurisdictional Area



5.0

Available Water Supply

EDWARDS AQUIFER AUTHORITY

EDWARDS AQUIFER
AUTHORITY

5.0 AVAILABLE WATER SUPPLY

This section provides estimates of the amount of water supply available for use within the planning area. These estimates are derived from the South Central Texas Regional Water Planning Group's (SCTRWPG) 2001 regional water supply plan, which was developed in accordance with Texas Water Development Board (TWDB) rules for regional water planning. Specifically, the Regional Water Planning Groups (RWPGs) were required to prepare estimates of the amount of water available within each region under drought-of-record hydrologic conditions and with no new water source development. The SCTRWPG is scheduled to revise the water supply estimates in late 2004. At that time, the approved revisions will be used to derive current water supply estimates for the Edwards Aquifer Area.

5.1 EDWARDS AQUIFER GROUNDWATER SUPPLY

For the development of the SCTRWPG regional water plan, the amount of water supply considered to be available from the Edwards Aquifer was set at 340,000 acre-feet per year. The following excerpt is from the SCTRWPG's regional water plan:

> ***"Pursuant to 31 TAC Section 357.7(a)(3), the South Central Regional Water Planning Group (SCTRWPG) has evaluated the amount of water available under current conditions. At the present time, SCTRWPG is unable to define the amount of water available from the Edwards Aquifer for use during each year of a drought of record. SCTRWPG estimates the amount of water available under current conditions is approximately 340,000 acre-feet per year. This estimate is a "placeholder" used by SCTRWPG for the Senate Bill 1 planning process. SCTRWPG acknowledges that a continuous annual pumpage of 340,000 acre-feet per year during a drought of record, without implementation of other alternative management practices, would result in Comal Springs going dry for a substantial period of time, and San Marcos Springs dropping below the currently published thresholds for both "take" and "jeopardy," if not also going dry. However, pursuant to Section 1.14(h) of S.B. No. 1477, the Authority will be required to implement and enforce throughout the drought, water management practices, procedures, and methods to ensure "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 is responsible for achieving protection for minimum springflows through pumpage reductions or other alternative management practices. The Authority's Comprehensive Management Plan and the SCTRWPG Regional Plan should include whatever measures necessary to ensure the required level of protection to the endangered species at San Marcos Springs and Comal Springs will be maintained during a drought of record. The amounts and timing of the reductions that might be required during drought of record have not yet been defined. SCTRWPG recognizes the U.S. Fish & Wildlife Service may initiate enforcement proceedings if springflow at Comal Springs or San Marcos Springs falls below the current published threshold for "take" at either spring, unless USFWS approves a Habitat Conservation Plan and issues an incidental take permit."***

Table 5.1 shows the estimated Edwards Aquifer groundwater supply available to each county or portion of a county within the planning area based on the "placeholder" estimate of 340,000 acre-feet per year that was adopted for the SCTRWPG. These calculations were based on the 1998 proposed initial regular permits, therefore, the actual amount and proportion for each county may change with the completion of issuance of initial regular permits.

Table 5.1: Currently Available Edwards Aquifer Groundwater Supplies

County	Available Water Supply (ac-ft/yr)			
	2000	2010	2020	2030
Atascosa*	2,543	2,543	2,543	2,543
Bexar	184,479	184,479	184,479	184,479
Caldwell*	161	161	161	161
Comal*	7,023	7,023	7,023	7,023
Guadalupe*	1,966	1,966	1,966	1,966
Hays*	5,748	5,748	5,748	5,748
Medina	59,357	59,357	59,357	59,357
Uvalde	78,694	78,694	78,694	78,694
TOTAL	**339,971**	**339,971**	**339,971**	**339,971**

* Denotes portion of county within Edwards Aquifer Authority boundaries.

Source: SCTRWPG November 22, 1999, draft report: South Central Texas Region Water Management Plan Task 3-Water Supplies and Task 4-Needs Analysis (& December 1999 updated tables).

5.2 NON-EDWARDS AQUIFER GROUNDWATER AND SURFACE WATER SUPPLIES

Table 5.2 provides estimates, by county, for all non-Edwards Aquifer groundwater, surface water, and reclaimed water supplies that are available within the planning area.

Table 5.2: Currently Available Non-Edwards Aquifer Water Supplies

County	Available Water Supply (ac-ft/yr)			
	2000	2010	2020	2030
Atascosa*	118	118	115	0
Bexar	110,612	110,612	110,612	103,214
Caldwell*	5,701	5,616	5,541	5,467
Comal*	10,732	10,732	10,732	10,732
Guadalupe*	35,394	35,394	35,394	33,718
Hays*	11,180	16,032	16,032	16,032
Medina	9,741	9,741	9,741	5,392
Uvalde	10,938	10,938	10,938	8,104
TOTAL	**194,416**	**199,183**	**199,105**	**182,659**

* Denotes portion of county within Edwards Aquifer Authority boundaries; non-Edwards Aquifer Supplies for these partial counties were estimated by applying the same percentage to the entire county non-Edwards supply that exists for water demand (WD) projections (EAA WD/SCT WD).

Source: SCTRWPG November 22, 1999, draft report: South Central Texas Region Water Management Plan Task 3-Water Supplies and Task 4-Needs Analysis (& December 1999 updated tables).

In addition to the Edwards Aquifer, other groundwater resources are available in limited amounts throughout the planning area. This includes groundwater supplied from the Carrizo-Wilcox, Trinity, and Edwards-Trinity (Plateau) aquifers. Most of the non-Edwards Aquifer groundwater used within the planning area is from the Carrizo-Wilcox Aquifer. There are no minor aquifers located within the planning area's boundary. However, two minor aquifers – the Queen City and Sparta aquifers – supply water to portions of Atascosa and Caldwell counties outside the Authority's boundaries.

Five categories of surface water supply were considered in the development of estimates of surface water supplies that are currently available within the planning area. These are:

- Reservoirs with a firm yield (i.e., the amount of water that can be withdrawn on an annual basis during a repeat of the drought-of-record).
- Storage reservoirs for steam-electric power cooling.
- Storage reservoirs for water supply management and recreation.
- Reclaimed water operations.
- Run-of-river water rights.

It should be noted that Medina Lake, located in the northeast corner of Medina County and owned by Bexar-Medina-Atascosa Counties Water Control and Improvement District #1, has a permit of 66,750 acre-feet per year for irrigation, municipal, domestic, and livestock purposes. This reservoir and areas downstream on the Medina River are a major source of recharge to the Edwards Aquifer. Additionally, the Medina Lake System provides a significant amount of irrigation in Medina County. During a repetition of drought-of-record conditions, the reservoir is expected to be empty. As there is no firm yield associated with Medina Lake, it was excluded from estimates of currently available water supply developed for the SCTRWPG and reported herein.

Reclaimed water is a relatively new source of dependable water supply that is currently being developed for use within the planning area. At present, both the San Antonio Water System (SAWS) and the City of San Marcos are developing large-scale water reclamation and reuse projects. The SAWS' reclaimed water project is operational and, when fully implemented, it will provide an estimated 35,000 acre-feet per year of additional water supply. Of the 35,000 acre-feet, about 24,941 acre-feet per year (71 percent) of this water supply will be used for consumptive purposes (e.g., golf course irrigation). This supply is included in estimates of water that are available during drought conditions. The remainder of SAWS' reclaimed water will be discharged directly into Salado Creek and the San Antonio River for maintenance of instream flows. Table 5.3 shows the intended allocation of the SAWS reclaimed water allocation plan.

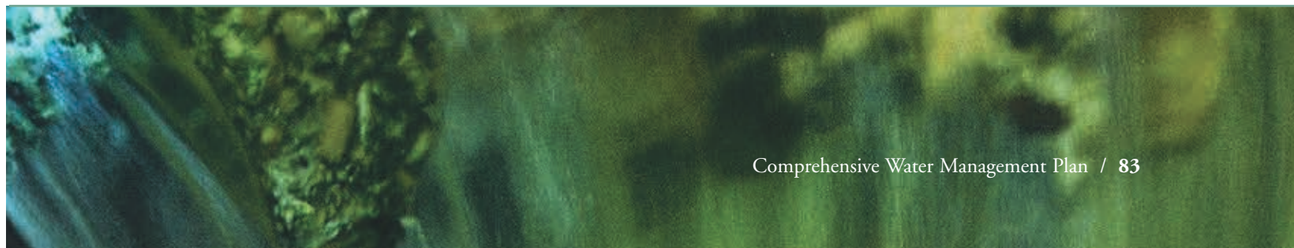


Table 5.3: SAWS Reclaimed Water Allocation Plan

The City of San Marcos has an application pending before the Texas Commission on Environmental Quality (TCEQ) for a permit to reclaim water originating from the Edwards Aquifer. The City's reclaimed water program is expected to provide a firm water supply by the year 2010.

Water Allocation	Water Demand (ac-ft/yr)*
Military Golf & Irrigation	2,309
Military Industrial	3,460
City Parks & Golf	2,150
Private Golf	3,010
Private Irrigation	10,724
Private Industrial	3,288
S.A. River Release	7,650
Salado Creek Release	850
TOTAL	**33,441**

Source: SAWS June 1998 summary of expected water utilization through their reclaimation program. These values are also currently in use by SCTRWPG.

*Anticipated available water supply is 35,000 ac-ft/yr. This table shows 1,559 ac-ft/yr currently unallocated.

5.3 TOTAL WATER SUPPLY AVAILABLE WITHIN THE PLANNING AREA

Combining the water supply data presented in Sections 5.1 and 5.2, the total dependable water supply that is currently available for use within the planning area is estimated to be 534,387 acre-feet per year. The Edwards Aquifer provides approximately 64 percent of the total water supply available within the planning area, with 36 percent provided from non-Edwards Aquifer sources.

Because groundwater availability data is reported on a countywide basis, it is difficult to accurately estimate the amount of groundwater use from non-Edwards Aquifer sources within the planning area. There are three counties that are wholly within the jurisdiction of the Authority and five counties that are partially within the Authority's jurisdiction. Estimates of currently available water supply within the boundaries of all eight counties are provided in Table 5.4. From all sources, the entire eight-county area has a current estimated firm annual water supply of 617,916 acre-feet.

Table 5.4: Currently Available Water Supply Within the Eight Counties of the Planning Area

Water Source [1,2]	2000	% Supply	2010	2020	2030
Edwards Aquifer	**339,971**	**55%**	**339,971**	**339,971**	**339,971**
Surface Water	**117,796**	**19%**	**120,260**	**120,260**	**120,260**
Run of River	24,378	4%	24,378	24,378	24,378
Canyon Lake (GBRA)	46,199	7%	48,663	48,663	48,663
Calaveras Lake	36,911	6%	36,911	36,911	36,911
Victor Braunig Lake	10,308	2%	10,308	10,308	10,308
Reclaimed Water	**24,941**	**4%**	**28,877**	**28,877**	**28,877**
Other Groundwater	**135,208**	**22%**	**135,062**	**134,930**	**97,866**
Carrizo-Wilcox Aquifer	100,634	16%	100,493	100,364	63,295
Trinity	5,628	1%	5,628	5,629	5,628
ETPlateau	3,185	1%	3,185	3,185	3,185
Local	9,297	2%	9,297	9,297	9,297
Queen City Aquifer	4,063	1%	4,059	4,055	4,061
Sparta Aquifer	12,400	2%	12,400	12,400	12,401
Total 8 County Water Supply	**617,916**	**100%**	**624,170**	**624,038**	**586,974**

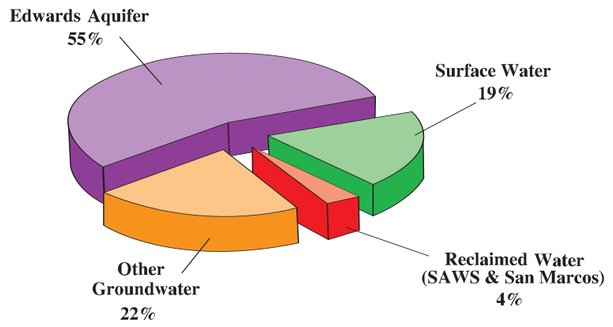
Source: SCTRWPG November 22, 1999, draft report: South Central Texas Region Water Management Plan Task 3-Water Supplies and Task 4-Needs Analysis (& Dec.1999 updated tables)

[1] These available water supply estimates are inclusive of each entire county for which the Edwards Aquifer Authority has partial regulatory jurisdiction. The regulatory powers of the Authority are exclusive to the Edwards Aquifer and portions of those counties that utilize EA groundwater.

[2] The two minor aquifers (Queen City & Sparta) are located completely outside of the Authority's planning area boundary and are not utilized as water supplies within this planning area.

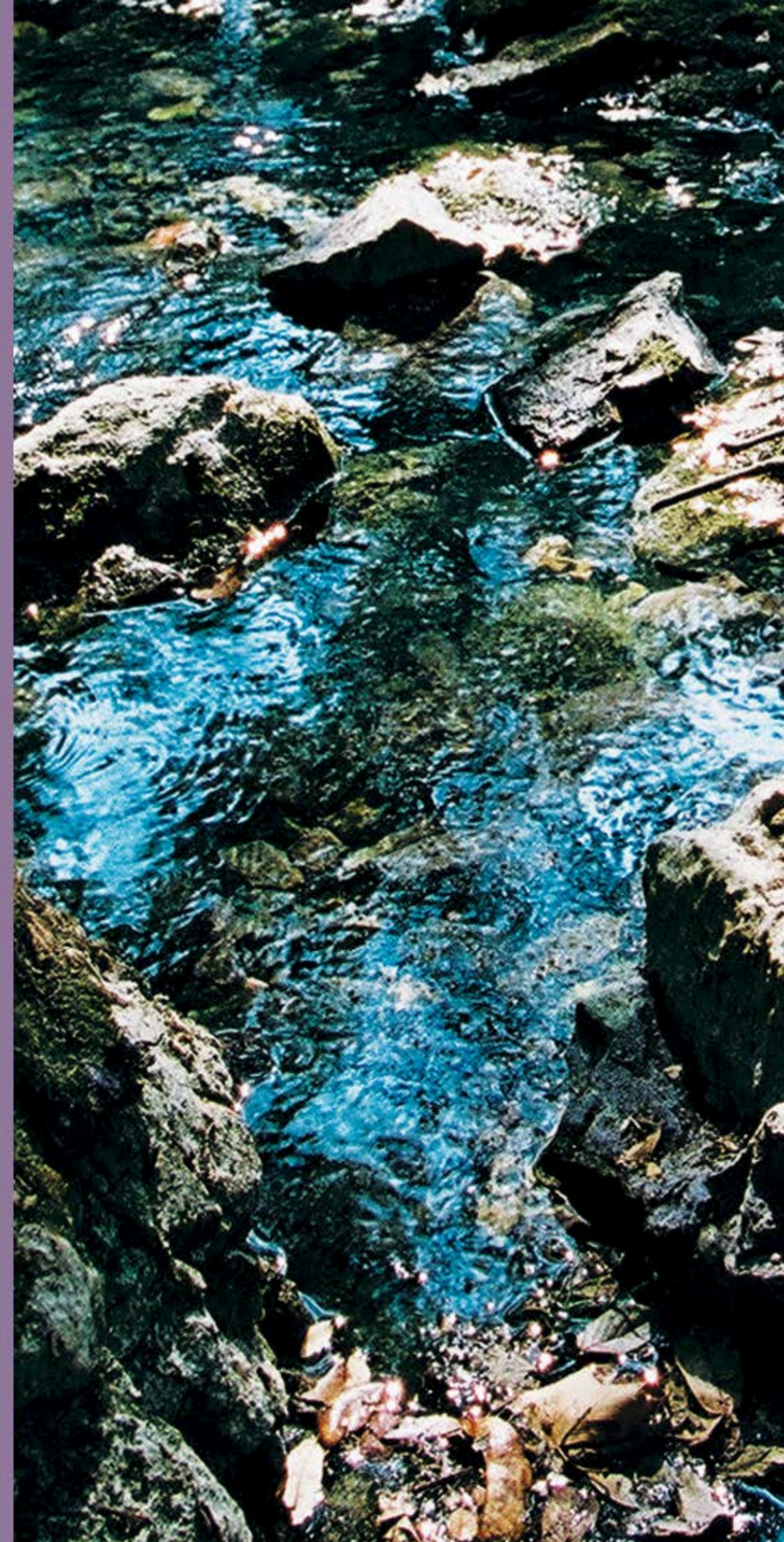
Figure 5.1 shows the relative magnitude of each major source category of water supply that is currently available within the eight-county area. As indicated, the Edwards Aquifer accounts for 55 percent of the total available water supplies, while other groundwater sources account for 22 percent and surface water accounts for 23 percent of the available water supply. As new supplies are developed in the future, the relative contribution of the Edwards Aquifer will decrease.

Figure 5.1: Currently Available Water Supply by Source



6.0

Current and Future Water Supply Needs in the Planning Area



EDWARDS AQUIFER
AUTHORITY

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6.0 CURRENT AND FUTURE WATER SUPPLY NEEDS IN THE PLANNING AREA

The Edwards Aquifer Authority Act (Act) sets specific limits on the quantities of water that can be withdrawn from the Edwards Aquifer. As previously noted, the statutory withdrawal limits are 450,000 acre-feet per year through 2007, decreasing to 400,000 acre-feet per year in 2008. Further decreases in withdrawals may be required beginning in 2012 to maintain flows at San Marcos and Comal springs to the extent required Federal law. Further reductions in Edwards Aquifer withdrawals can also be mandated in response to drought through the Authority's Demand Management Critical Period Management Plan.

For planning purposes, the Texas Water Development Board (TWDB), the South Central Texas Regional Water Planning Group (SCTRWPG), and the Edwards Aquifer Authority (Authority) have agreed that the maximum aquifer withdrawal during drought-of-record conditions is 340,000 acre-feet per year. Under this planning scenario, only 55 to 65 percent of the projected water demand for the planning area after 2010 can be met from the Edwards Aquifer (see Table 6.1). This underscores the increasing importance of non-Edwards Aquifer groundwater, surface water, and reclaimed water in meeting future water needs.

Table 6.1: Edwards Aquifer Water Supply vs. Authority Planning Area Water Demand

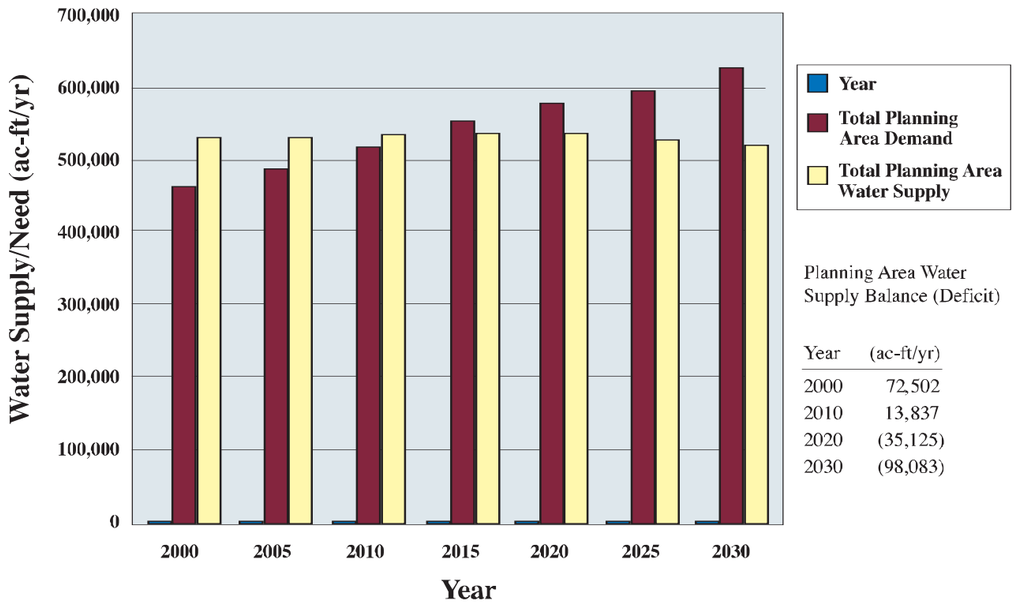
Year	Water Demand	% Demand Met by Edwards Aquifer Supply		
		450,000	400,000	340,000
1990	648,185	69%		52%
2000	461,885	97%		74%
2010	525,317		76%	65%
2020	574,201		70%	59%
2030	620,713		64%	55%

A comparison of projected water demands to estimates of currently available water supplies is presented in Table 6.2 and Figure 6.1. As indicated, under drought-of-record hydrologic conditions, it is estimated that the planning area will experience a water supply deficit around the year 2015. With continued population growth and economic development, the projected water shortage increases steadily throughout the planning period, reaching more than 98,000 acre-feet per year by 2030. This analysis indicates that the region faces a substantial challenge ahead in developing water supply strategies to meet current and projected needs. A summary of recommended strategies for meeting current and future water needs is provided in Section 7.0.

Table 6.2: Projected Water Shortages in the Planning Area During Drought Conditions

Water Category	Water Demand/Supply/Need (ac-ft/yr)						
	2000	2005	2010	2015	2020	2025	2030
Total Edwards Aquifer Water Supply	339,971	339,971	339,971	339,971	339,971	339,971	339,971
Total Non-Edwards Aquifer Water Supply	194,416	196,800	199,183	199,144	199,105	190,882	182,659
Total Planning Area Water Supply	534,387	536,771	539,154	539,115	539,076	530,853	522,630
Total Planning Area Water Demand	461,885	493,601	525,317	549,759	574,201	597,457	620,713
Demand Balance	**72,502**	**43,170**	**13,837**	**-10,644**	**-35,125**	**-66,604**	**-98,083**

Figure 6.1: Projected Water Shortages in the Planning Area During Drought Conditions

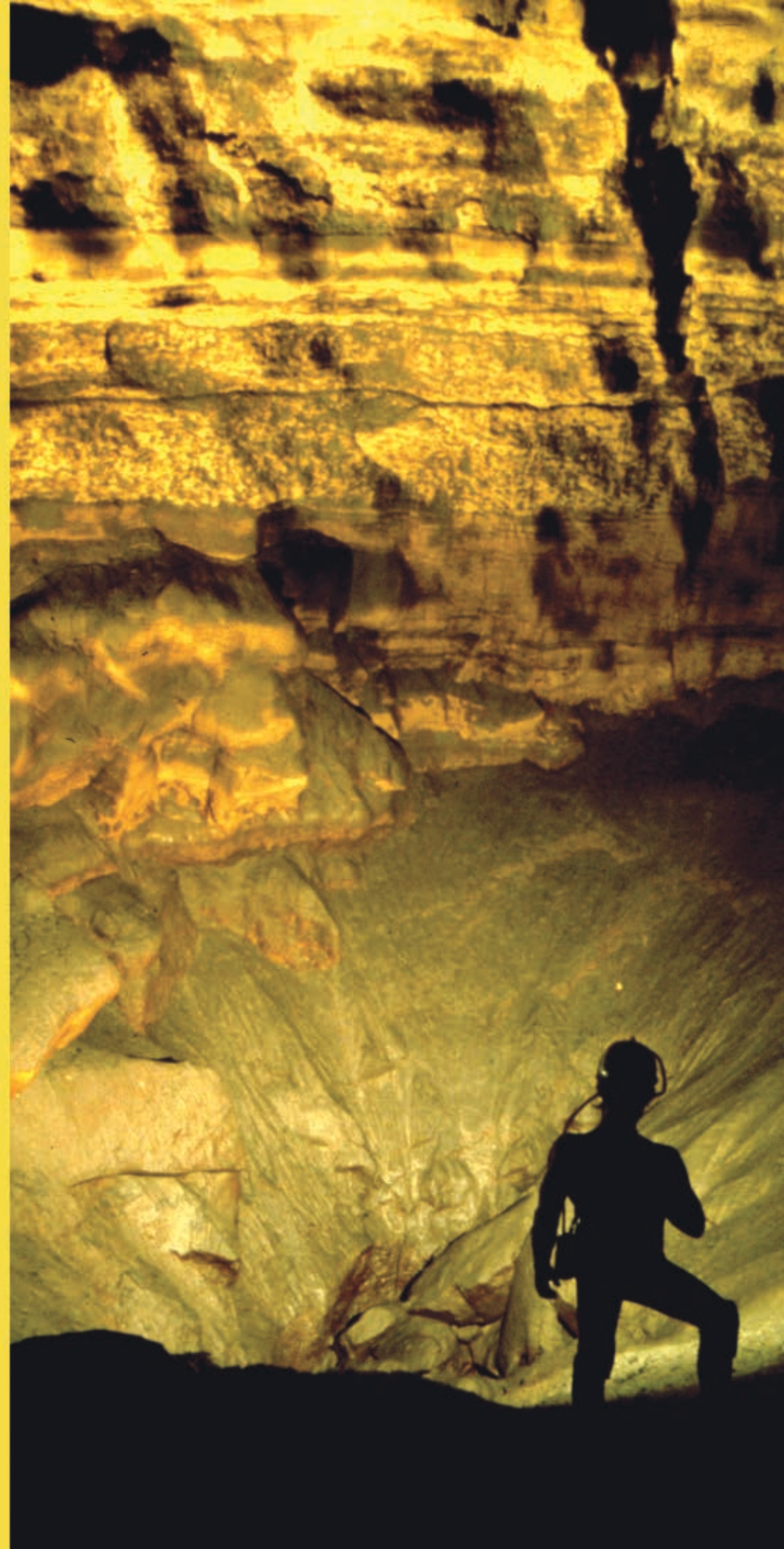


Planning Area Water Supply Balance (Deficit)

Year	(ac-ft/yr)
2000	72,502
2010	13,837
2020	(35,125)
2030	(98,083)

7.0

Management Strategies



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7.0 MANAGEMENT STRATEGIES

The Edwards Aquifer Authority (Authority) has developed or is developing plans and programs to manage the Edwards Aquifer. The plans and programs are described below. Copies of completed and approved programs can be obtained by contacting the Authority's office.

7.1 WATER QUALITY PROTECTION PROGRAM

Article 1, Section 1.08 (a) of the Edwards Aquifer Authority enabling legislation (Act) requires the Edwards Aquifer Authority (Authority) to preserve and protect the Edwards Aquifer and prevent the pollution to the aquifer. The Authority's Water Quality Protection Program (WQPP) serves to achieve these mandates of the Act.

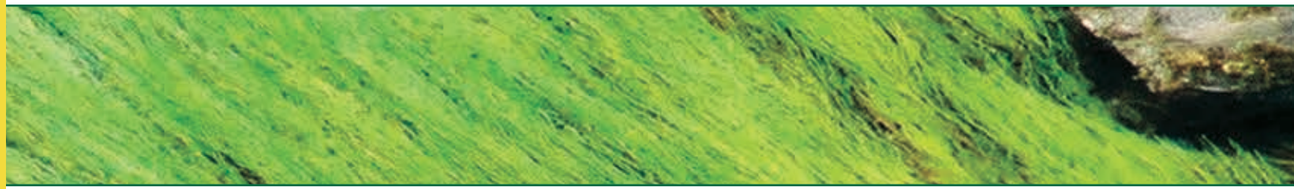
7.1.1 PROGRAM PURPOSE

The Authority's WQPP purpose is to preserve and protect the excellent water quality of the Edwards Aquifer for current and future generations. The development and implementation of a regional WQPP assists the Authority in controlling activities that can potentially negatively impact aquifer water quality.

7.1.2 PROGRAM COMPONENTS

The WQPP defines the requirements for regulated activities within the Authority's boundaries and in certain situations, within a 5-mile buffer zone immediately outside the Authority's boundaries, to preserve and protect water quality and prevent pollution of groundwater in the aquifer. Regulated activities under existing Authority rules include well construction, operation, maintenance, well plugging, and the prohibition of new aboveground and underground storage tanks on the recharge zone.

The Authority currently monitors Edwards Aquifer water quality by sampling wells, springs, surface water streams that recharge the aquifer. The water samples are analyzed for standard ions, bacteria, metals, pesticides and herbicides, and other organic chemicals. The results of sample analysis are included in a water quality database and are reported in an annual hydrologic data report.



7.1.3 FUTURE DIRECTION AND/OR ACTION

While numerous water quality protection and monitoring programs are active, the Authority's WQPP continues to evolve. The rule making process for water quality protection-related rules has been initiated. Rules regulating well construction and well plugging and aboveground and underground storage tanks have been finalized. With assistance from a citizen's advisory task force, the board of directors is currently considering the Authority's role in the regulation of other water quality protection activities over the aquifer system. Other WQPP programs include sensitive land acquisition, hazardous materials awareness and spill prevention, and spill response advisement.

7.2 GROUNDWATER CONSERVATION AND REUSE PLAN

The Act requires the Authority to prepare and implement a regional Groundwater Conservation Plan (GCP). The Act also states that the Authority may require permittees to submit conservation plans. The Authority's GCP serves as a guidance document through which applicants and permittees must develop and implement individual GCPs.

7.2.1 PLAN PURPOSE

The purpose of the Authority's GCPs is to encourage, promote, and document year-round conservation measures in the region. The development and implementation of regional and individual GCPs assist the Authority and its applicants with successful groundwater consumption management. Increasing water demands, extreme weather variability, and mandated water usage reductions make year-round conservation a necessary component of regional and individual planning efforts.

7.2.2 PLAN COMPONENTS

The Authority's GCP sets forth requirements for development and implementation of individual GCPs, which must be submitted by each municipal, industrial, and irrigation user within the Authority's boundaries.

Conservation is achieved through the implementation of Best Management Practices (BMPs). BMPs are proven conservation practices, demonstrated through research and documented implementation, to achieve measurable water savings. The Authority's GCP provides three distinctive BMP groupings designed to meet the user-specific needs of each applicant type. Every applicant must implement a minimum number of BMPs, and must provide evidence that the practice is being applied sufficiently to provide water savings.

Many of the BMPs can be achieved through the use of Authority conservation programs, including the Agricultural Water Conservation Loan Program and the Water Wise Program.

All of the Authority's conservation programs are designed to promote water conservation throughout the region and to educate and inform Edwards Aquifer users of the importance of efficient water use. The GCP provides information on current Authority conservation programs and prospective future conservation programs.

The Authority has opted not to require a separate reuse plan from appropriate applicants or permittees, but rather, list reuse as one of the optional BMPs that can be implemented by municipal and industrial applicants. If this option is selected, appropriate documentation must be furnished to the Authority indicating successful implementation.

7.2.3 FUTURE DIRECTION AND/OR ACTION

Authority directors approved the GCP in September 2000, adopted rules to implement the GCP in December 2003, and made slight modifications to the GCP in February 2004. A significant modification to the GCP was the ability of irrigators to document the fact that they are achieving the required application efficiency (60%) and thereby, avoid the requirement to submit a GCP. Individual GCPs are due on the following deadlines:

Municipal users: March 31, 2004

Industrial users: June 30, 2004

Irrigation users: September 30, 2004

Individual GCPs must be updated annually to reflect the progress of BMP implementation. The Authority will review individual GCPs and status reports in order to determine estimated water savings achieved through conservation practices. This information will be compiled and provided to the legislature biennially on odd-numbered years. Individual GCPs have a term of six years. In June 2004, the Authority approved proposed changes to the DM/CPM rules that, if approved, would provide the following modifications:

Users that are authorized to withdraw three (3) acre-feet or less do not have to submit groundwater conservation plans.

7.3 DEMAND MANAGEMENT/CRITICAL PERIOD MANAGEMENT PLAN

Article 1, Section 1.26 of the Act requires the Authority to develop and implement a critical period management plan. The Act also references a demand management plan and a drought management plan. The Authority has eliminated the term drought management and combined the demand management and critical period management into a single set of rules referred to as the Demand Management/Critical Period Management rules (DM/CPM). The DM/CPM is an aquifer management strategy to reduce demands on the aquifer during low aquifer water level conditions.

7.3.1 PLAN PURPOSE

The DM/CPM is intended to reduce withdrawals from the Edwards Aquifer. These rules are intended to authorize the maximum aggregate withdrawals from the aquifer from wells with groundwater withdrawal permits, interim authorization status, or exempt well status balanced against the Authority's aquifer management strategy to slow the rate of decline of springflows in Comal or San Marcos springs. Slowing the rate of decline of springflows will allow more time for the return of normal precipitation events, resulting in the maintenance or increase of aquifer levels which would concomitantly result in the maintenance or increase in springflow levels. The DM/CPM program is an integral component of the Authority's Habitat Conservation Plan. However, the DM/CPM is not guaranteed to maintain springflow under drought of record conditions.

7.3.2 PLAN COMPONENTS

Major components of the DM/CPM program are:

- An applicant or permittee has the right to produce their authorized amount for the year as long as the aquifer is not in DM/CPM.
- Quarterly Allocation Program – Permittees must submit the volume of water they propose to pump on a quarterly basis during DM/CPM for the upcoming year. The date is December 1 municipal and industrial users, and February 1 for irrigation users.
- During DM/CPM, permittees are limited to the amount scheduled for that quarter.
- There will be two pools, the Uvalde Pool and the San Antonio Pool. The boundary between the two pools will be the Uvalde/Medina County line.
- During DM/CPM, permittees may purchase water allocated within their pool for a given quarter but may not utilize water outside of their pool during critical period.
- During DM/CPM, all permittees will collect water usage on a weekly basis and report the data to the Authority on a monthly basis.
- Reductions will be verified by water meter reporting requirement and spot inspections.
- During DM/CPM, water not used during one quarter can not be used in any subsequent quarter; except that an irrigator may carry forward unused water from the second to the third quarters and from the third to the fourth quarters for the purpose of completing an existing crop planted during the year.
- The current DM/CPM stage will be maintained for a minimum of 30 days unless suspended by the Authority's General Manager.

Table 7.1: Pools, Stages, Triggers, and Reductions for Demand Management/Critical Period Rules

Aquifer Level		Stage	Reductions		
J-17	J-27		Alternative 1 500,000 AF/YR	Alternative 2 450,000 AF/YR	Alternative 3 400,000 AF/YR
650 ft	N/A	I	10%	5%	5%
640 ft	N/A	II	15%	10%	10%
630 ft	845 ft	III	20%	15%	15%
<630 ft for 30 days or 627 ft	<845 ft for 30 days or 842 ft	IV	30%	23%	15%

7.3.3 FUTURE DIRECTION AND/OR ACTION

The DM/CPM rules were adopted in November 2002. Quarterly Allocation forms have been required in 2003 and 2004 and enforcement actions have been pursued for individuals that are non-compliant with the rules. The actions in December 2003 to adopt temporary rules for withdrawals referred to as interruptible and uninterruptible (see 7.4.3 below) affect DM/CPM in that a portion of a water right may be subject to complete cessation at a particular water level and then, further reduced during stages of the DM/CPM rules. In June 2004, the Authority approved proposed changes to the DM/CPM rules that, if approved, would provide the following modifications:

- Users that are authorized to withdraw three (3) acre-feet or less do not have to submit quarterly allocation reports or make the required reductions in the rules.
- Irrigators that intend to carry water forward into the 3rd or 4th quarters must notify the Authority during the last month of the quarter from which the groundwater is to be carried forward.
- Rules relating to transfers (715.206) are moved to Chapter 711, subchapter L (Transfers).
- All reductions.

7.4 PERMIT PROGRAM

One of the stated Authority goals is to "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." The permitting program is the primary mechanism for achieving this goal.

7.4.1 PROGRAM PURPOSE

The Act empowers the Authority to manage all withdrawals and withdrawal points from the Edwards Aquifer through a comprehensive permitting program. This program includes interim authorization to continue pumping during the permit application process, initial regular, additional regular, term and emergency groundwater withdrawal permits, permits for new well construction or for major modification to existing wells, withdrawal reduction, and permit retirement. The Authority requires all Edwards Aquifer (aquifer) well owners, including those exempt from permitting requirements, to register their wells with the Authority. The program also requires all permitted withdrawals from the aquifer to be flow metered, and that the Authority will pay the costs of purchasing, installing, and maintaining water flow metering devices for irrigation wells in existence before September 1, 1993. Exempt wells do not require well water flow meters. Finally, the Authority has the power to ensure the proper closure of abandoned wells to prevent the waste of water or to protect water quality.

7.4.2 PROGRAM COMPONENTS

Initial Regular Permits

Initial regular permits (IRP) were the first regular groundwater withdrawal permits the Authority issued. IRPs are for those aquifer users that withdrew groundwater from the aquifer during the historical period from June 1, 1972, through May 31, 1993. Aquifer users that withdrew groundwater during the historical period are called existing users. Existing users applied for initial regular permits by filing a permit application and declaration of historical use on or before December 30, 1996, on a form prescribed by the Authority. An applicant for a permit was required to timely pay all application fees required by the board. An owner of a well used for irrigation was required to provide additional documentation of the number of acres irrigated during the historical period.

Owners of wells used exclusively for domestic or livestock purposes were not required to file an application and a declaration of historical use.

Authority staff completed technical review on approximately 1085 initial regular permit applications. The General Manager proposed IRPs for permit applicants in November 2000 in the following amounts:

Municipal	227,000 acre-feet
Industrial	58,000 acre-feet
Irrigation	247,000 acre-feet
Total	**532,000 acre-feet**

The Act requires the Authority to grant an initial regular permit to an existing user that:

1) Files a declaration and pays appropriate fee.

2) Establishes by convincing evidence beneficial use of underground water from the aquifer.

To the extent water is available for permitting, the Authority will issue the existing user an initial regular groundwater withdrawal permit of an amount of water equal to the user's maximum beneficial use of water without waste during any one calendar year of the historical period. If an existing user does not have historical use for a full year, then the Authority will issue a permit for withdrawal based on an amount of water that would normally be beneficially used without waste for the intended purpose for a calendar year. If the total amount of water determined to have been beneficially used without waste exceeds the amount of water available for permitting, the Authority shall adjust the amount of water authorized for withdrawal under the permits proportionately to meet the amount available for permitting. An existing irrigation user shall receive a permit for not less than two acre-feet a year for each acre of land the user actually irrigated in any one calendar year during the historical period. An existing user who has operated a well for three or more years during the historical period shall receive a permit for at least the average amount of water withdrawn annually during the historical period.

The Authority will consider the equitable treatment of a person whose historic use has been affected by a requirement of or participation in a federal program. The initial regular permit will be issued without a term, and the permit remains in effect until the permit is abandoned, canceled, or retired, and is subject to limitation of the Act. The Authority began issuing initial regular permits January 2001 and is scheduled to complete the issuance of all initial regular permits by the end of 2004.

The Authority, through June 2004, has issued 750 IRPs representing 520,802 acre-feet groundwater withdrawal amounts. The board also issued final denial of 193 IRP applications. The remaining contested applications have been forwarded to the State Office of Administrative Hearing (SOAH) for administrative hearing. IRPs become effective the January following the date of issuance. Authority staff estimates that the total amount of all IRPs issued will be 562,000 acre-feet.

Interim Authorization

Initial regular permit applicants are authorized to continue groundwater withdrawal while their permit application is being processed. Interim authorization for a well under this section ends on entry of a final order by the Authority acting on the application for the well or December 30, 1996, if the well owner has not filed a declaration of historical use.

An applicant who, on the effective date of the Act, owned a producing well that withdraws water from the aquifer may continue to withdraw and beneficially use water without waste until final action on permits by the Authority, if:

1) The well is in compliance with all statutes and rules relating to well construction, approval, location, spacing, and operation.

2) By December 30, 1996, the applicant filed a declaration of historical use on a form as required by the Authority.

Groundwater withdrawals under interim authorization may not exceed on an annual basis the historical, maximum, beneficial use of water without waste during any one calendar year as evidenced by the applicant's declaration of historical unless that amount is otherwise determined by the Authority. Groundwater withdrawals under interim authorization are subject to the Authority's comprehensive management plan and rules adopted by the Authority. Staff anticipates the interim authorization for all remaining permit applications will cease January 1, 2005, because all permits will be issued in 2004.

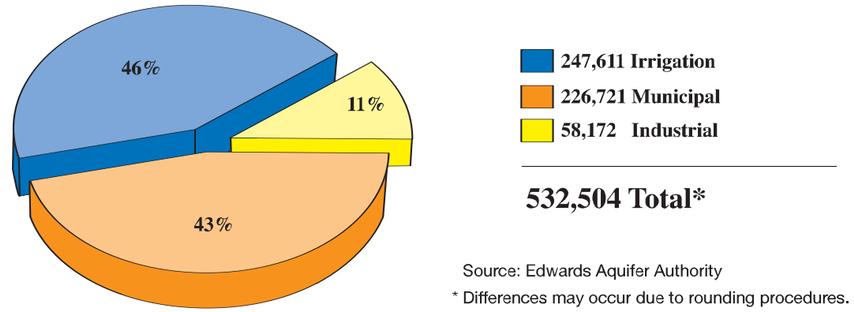
Additional Regular Permits

To the extent water is available for permitting after the initial regular permits are issued to existing users, the Authority may issue additional regular permits, subject to limits on the total amount of permitted withdrawals determined under the Act. The Authority may not consider or take action on an application relating to a proposed or existing well of which there is no evidence of actual beneficial use before June 1, 1993, until a final determination has been made on all initial regular permit applications submitted on or before the initial application date of December 30, 1996. Authority staff does not anticipate any additional regular permits will be issued until additional groundwater supplies are secured.

Term Permits

The Authority may issue interruptible term permits for withdrawal for any period the Authority considers feasible, but may not issue a term permit for a period of more than ten years. A term permit holder may not withdraw water from the San Antonio Pool unless the level of the aquifer is higher than 665 feet above sea level, as measured at Well J-17, or may not withdraw water from the Uvalde Pool unless the level of the aquifer is higher than 865 feet above sea level, as measured at Well J-27. Term permits may have utility as a water source for aquifer storage and recovery projects, or for other uses where sustain yield is not necessary.

Figure 7.1: Proposed Groundwater Permits Acre-Feet (by type)



Source: Edwards Aquifer Authority

* Differences may occur due to rounding procedures.

Emergency Permits

The Authority may issue emergency permits only to prevent the loss of life or to prevent severe, imminent threats to the public health or safety. The term of an emergency permit may not exceed 30 days. The board may renew an emergency permit. The emergency permit holder may withdraw water from the aquifer without regard to its effect on other permit holders.

7.4.3 FUTURE DIRECTION AND/OR ACTION

In 2003, the Authority recognized that permitted withdrawals of Initial Regular Permits (IRPs) would exceed the 450,000 af "cap" effective January 1, 2004. Rules adopted by the Authority required mandatory reductions with compensation to avoid exceeding 450,000 af. Therefore, the Authority adopted revised rules for groundwater water withdrawals in December 2003 that made the following modifications:

- Rather than implementing mandatory reductions, permittees were allowed to withdraw their full permit under specific aquifer conditions (referred to as the interruptible portion) and the remainder of their water right is subject to demand management/critical period management reductions (referred to as the uninterruptible portion). The trigger levels for availability are the same as for term permits stated above.
- References to financial compensation were removed.
- These rules are in effect through December 31, 2007.

7.5 ALTERNATIVE WATER SUPPLY PLAN (30-YEAR WATER SUPPLY PLAN)

A future water supply plan is referenced in Article 1, Section 1.25 of the Act. The Authority developed the water supply plan as a component of the CWMP. The water supply plan was developed consistent with the Texas Water Development Board's (TWDB) guidelines and requirements for regional water supply planning under the Brown-Lewis Water Plan.

7.5.1 PLAN PURPOSE

The Authority's CWMP development concentrated on two efforts, the Edwards Aquifer groundwater supply portion of the CWMP and non-Edwards Aquifer groundwater supply sources. The Authority worked with the South Central Texas Regional Water Planning Group (SCTRWPG) to identify water supply sources for the area. The Authority agreed to develop a 30-year water supply plan to remain consistent with the SCTRWPG's regional water supply plan. The Authority extracted the relevant Edwards Aquifer groundwater supply sources from the SCTRWPG's regional water supply plan. These strategies were designed to develop the Authority's 30-year water supply plan.

7.5.2 PLAN COMPONENTS

The components of the water supply plan are:

- Population and water demand projections for the Edwards Aquifer Authority jurisdiction for a 30-year period (2000-2030).
- Estimates of currently available water supplies from both the Edwards Aquifer and from other surface and groundwater sources available to the region.
- A comparison of currently available water supplies to projected water demands to determine the future water supply needs of the Edwards Aquifer Authority jurisdiction.
- An evaluation of various alternative strategies for increasing the sustained yield of the Edwards Aquifer for water supply purposes.
- A review of potentially feasible aquifer management strategies requiring further analysis.

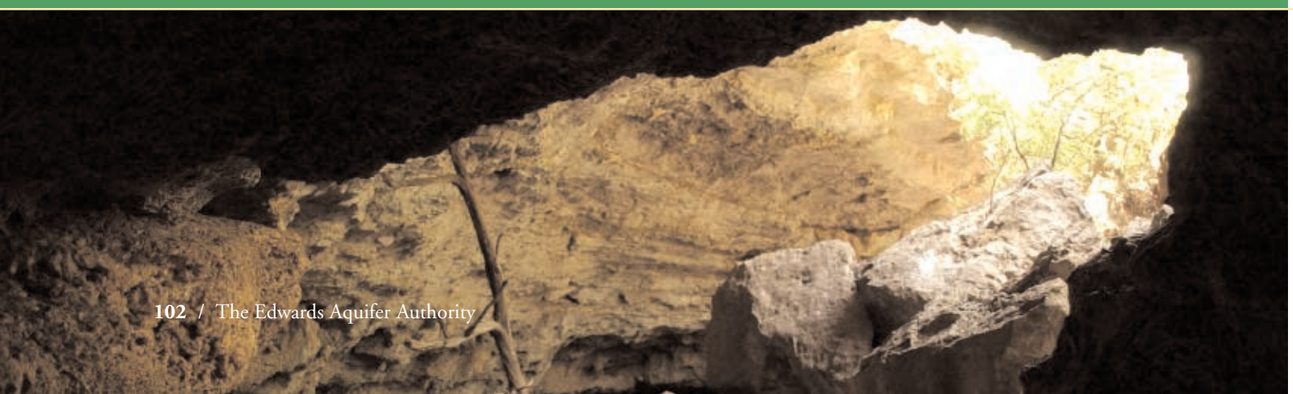


Table 16 from the Authority's 30-year water supply plan (shown below) lists recommended water management strategies for meeting the planning area's future water supply needs.

Table 16: Recommended Water Management Strategies

Strategy (SCTRWP Identifier)	2000	2010	2020	2030
Municipal Water Conservation (L-10 Municipal)	NA	44,669	43,660	38,291
Irrigation Conservation (L-10 Municipal and L-15))	NA	27,314	27,314	27,314
Transfers of Edwards Irrigation Rights to Municipal Use (L-15)	NA	40,486	40,486	41,486
Edwards Aquifer Recharge Enhancement (L-18A)	NA	13,451	21,577	21,577
Canyon Reservoir–River Diversion (G-15C)	NA	10,500	15,700	15,700
Lower Guadalupe River Diversion (SCTN-16)	NA	94,500	94,500	94,500
Lower Colorado River Diversion (LCRA)	NA	0	66,000	138,000
Carrizo Aquifer–Wilson and Gonzales (CZ-10C)	NA	16,000	16,000	16,000
Carrizo Aquifer–Gonzales and Bastrop (CZ-10D)	NA	900	4,950	13,450
Simsboro Aquifer (SCTN-3C)	NA	55,000	55,000	55,000
SAWS Recycled Water Program (SAWS)	NA	19,826	26,737	35,824
Purchase Water from a Major Water Provider	NA	10,000	10,500	12,500
TOTAL	**NA**	**332,646**	**406,424**	**509,642**

Table 28 from the Authority's 30-year water supply plan (shown below) shows the water supply and water demand balance for the planning area. Note that the 30-year water supply plan was approved prior to new population and demand projections developed from the 2000 census by the Texas Water Development Board.

Table 28: Water Supply and Demand Balance for the Edwards Aquifer Region with Strategies Recognized in the SCTRWP (ac-ft/yr)

	2000	2010	2020	2030
Projected Water Demand	765,127	802,372	848,588	918,118
Currently Available Water Supply	523,604	522,244	521,055	505,495
Supply from Strategies in Progress	NA	38,390	33,190	33,190
Supply from Recommended Strategies	NA	345,672	435,396	509,642
Shortage/Surplus	-241,523	103,934	141,053	130,209

Note: Excludes irrigation water conservation applied to irrigation shortages.

7.5.3 FUTURE DIRECTION AND/OR ACTION

The board approved the 30-year water supply plan in March 2001. The Act states that the alternative water supply plan is to be implemented and reviewed annually by the appropriate state agencies and the Edwards Aquifer Legislative Oversight Committee. The 30-year water supply plan will be updated at the completion of the 2007 State Water Plan.

7.6 HABITAT CONSERVATION PLAN

The U.S. Fish & Wildlife Service (USFWS) listed one threatened and seven endangered species in the Comal and San Marcos springs and the Comal and San Marcos rivers. Federal and state laws require that the threatened and endangered species and their critical habitat be protected to prevent "take" or "jeopardy" of the species. The responsibility of maintaining the aquatic habitat that supports these threatened and endangered species falls on the Authority as the regional regulatory agency.

7.6.1 PLAN PURPOSE

The Edwards Aquifer Authority Act provides the Authority with the ability to hold permits under the Endangered Species Act. The common permit issued related to endangered species is an Incidental Take Permit (ITP). An ITP can only be issued if a Habitat Conservation Plan (HCP), a specific set of management protections that will protect endangered species, is developed and approved by the U. S. Fish & Wildlife Service. On December 8, 1998, the board voted to authorize the staff to prepare a request for proposals to secure a consultant to assist with the preparation of a HCP for the protection of the species that are listed or may become listed at Comal and San Marcos springs.

The Authority has addressed this power by opting to pursue development of a Habitat Conservation Plan (HCP). In July of 1999, the Authority selected firms to develop an HCP to provide for the long-term protection of aquatic species at Comal and San Marcos springs. The Authority's effort to develop an HCP has been modified by passage of state legislation in 1999. SB 1272 requires the formation of a Citizens Advisory Committee (CAC) to provide input from landowners on development of the HCP. A CAC that includes twenty-six persons or organization was formed and has met periodically since to review information related to the HCP. SB 1272 also requires the formation of a Biologic Advisory Team (BAT), whose purpose is to consider the size of any habitat reserves contemplated for a regional HCP and to estimate the harm to the species resulting from a proposed regional HCP. The BAT was also created in the fall of 1999 and has met periodically since to review information related to the HCP.

The development of the effort was divided into two phases. Phase 1 is Data Collection and Analysis; Phase 2 is Development of the Habitat Conservation Plan and Environmental Impact Statement. Phase 1 concluded in April 2000 and Phase 2 is expected to be complete in 2005 or early 2006.

7.6.2 PLAN COMPONENTS

An initial draft HCP was submitted to the Authority in November 2002. The document was delayed, pending resolution on two important issues – pumping limits and DM/CPM reductions. The draft contained five management alternatives that included the following general characteristics:

The Authority considered numerous comments to the draft document and also made a policy decision in December 2003 regarding withdrawal limits (see 7.4.3 above). Therefore, a revised draft document was prepared in accordance with the response to the comments and the policy change on permitted withdrawals. The revised draft HCP was submitted to the Authority in July 2004 and contains four management alternatives, generally described as follows:

Alternative 1: No Action

1) This alternative does not include a Habitat Conservation Plan (HCP), or Section 10(a) Incidental Take Permit (ITP) coverage.

2) Under this alternative, actions mandated by state law would be implemented. The Authority would function as a political subdivision of the State of Texas to manage the

Management Alternative	Normal Withdrawals (acre/ft)	DM/CPM Reduction (%)	Mitigation Measures	Biological Impact	Economic Impact
1	• 450,000 thru 2007 • 400,000 beginning 2008	• 5, 10, 15, 23 • 5, 10, 15	None	High to moderate	Low to moderate
2	• 450,000 thru 2007 • 175,000 beginning 2008	• 10, 15, 25, 40 • None	Lowest	Minimal	Highest
3	• 450,000 thru 2007 • 400,000 beginning 2008	• 5, 10, 15, 23 • 5, 10, 15	High	High to moderate	Low to moderate
4	• 500,000 thru 2007 • Only drops to 400,000 if additional supplies are not developed	• 10, 15, 20, 30 • 5, 10, 15 if withdrawals are reduced to 400,000	High	High to moderate	Minimal to low
5	• 550,000 thru 2007 • Only drops to 400,000 if additional supplies are not developed	• 10, 15, 20, 30 • 5, 10, 15 if withdrawals are reduced to 400,000	Highest	High	Minimal

southern portion of the Edwards Aquifer as mandated by the Act. Such management would require phased reductions in annual permitted aquifer withdrawals through the year 2012. The Act directs the Authority to reduce annual withdrawals from the aquifer to no more than 450,000 acre-feet through the year 2007, and to 400,000 acre-feet by 2008, unless the Board of Directors, in consultation with appropriate state and federal agencies, determines that additional aquifer supplies are available. Further, by the end of 2012, aquifer withdrawals would be limited to a presently undetermined level, which would ensure that continuous minimum springflows at Comal Springs and San Marcos springs are maintained to protect endangered and threatened species to the extent required by federal law.

3) The No Action Alternative includes a DM/CPM program as summarized in 7.3 above: at 450,000 acre-feet per year withdrawals, reductions for Stages 1-4 are 5%, 10%, 15%, and 23% respectively; and at 400,000 acre-feet per year withdrawals, reductions for Stages 1-3 are 5%, 10%, and 15% respectively.

4) As there would be no HCP, there would be no biological studies or funding for species refugia, or adaptive management strategies.

Alternative 2: Regional Permit, Highly Restricted Aquifer Pumping

1) Reduction in permitted withdrawals by January 1, 2008, to 175,000 acre-feet per year, then remaining at this level through the 50-year life of ITP.

2) Includes DM/CPM reductions for Stages 1-4 of 10%, 15%, 25%, and 40% respectively for 450,000 acre-feet per year withdrawals through December 31, 2007.

3) This alternative includes minimal HCP measures. As springflow would be assured, no refugia would be required, and no adaptive management strategies would be needed.

Alternative 3: Propose Authority HCP Alternative

1) Projected pumping under Regular Permits will not exceed 450,000 acre-feet per year through 2007. After January 1, 2008, Regular Permits would be limited to 400,000 acre-feet per year.

2) During Demand Management/Critical Period Management, pumping will not exceed 350,000 acre-feet per year during worst drought conditions (Stage IV for an entire year).

3) If Index Well J-17 is above 665 msl or Index Well J-27 is above 865 msl, the Authority may authorize withdrawals pursuant to the conditions prescribed for term permits in 7.4 above.

4) The activities covered under the ITP will include all pumping authorized by the Authority, implementation of aquifer management strategies by the Authority, and actions associated with the Adaptive Management Plan, a component of the HCP.

5) Alternative 3 would include a high number of HCP measures including continuing ecological studies of the spring ecosystems, feasibility studies, or implementation of in-situ refugia, and funding of ex-situ refugia.

Alternative 4: Regional Permit, Least Restricted Aquifer Pumping

1) Permitted withdrawals up to 600,000 acre-feet per year through the life of the ITP.

2) Includes DM/CPM reductions for Stages 1-4 of 10%, 15%, 20%, and 30%.

3) The highest number of HCP measures would be required under this alternative including funding of feasibility/implementation of in-situ refugia, and funding of ex-situ refugia.

7.6.3 FUTURE DIRECTION AND/OR ACTION

A public comment period will open in September 2004 for the HCP. Approval of the draft revised HCP is scheduled for the November 2004 board meeting. Following board approval, the HCP will be submitted to the USFWS for consideration and review. USFWS typically needs six to twelve months to complete their HCP review.

7.7 GROUNDWATER MANAGEMENT PLAN (NEW)

In 1997 the 75th Texas Legislature enacted Senate Bill No.1 (the Brown-Lewis Water Plan). Among the provisions in the bill is a requirement that groundwater districts develop and submit Groundwater Management Plans (GMP) to the Texas Water Development Board (TWDB) for review and certification. The Edwards Aquifer Authority (the Authority) complied with the TWDB requirement and the Authority's first GMP was certified by the TWDB on September 17, 1998. Additional TWDB rules require that the GMPs be revised or readopted every five years. In order to alleviate potential confusion among the Authority's several planning efforts, the Strategic Plan, the Comprehensive Water Management Plan mandated by the Authority's enabling legislation, and the TWDB-required GMP, staff significantly revised the Authority's initial GMP. The board approved the revised GMP in November 2003 and the TWDB subsequently certified the GMP in March 2004.

quently certified the GMP in March 2004.

7.7.1 PLAN PURPOSE

Significant revisions begin with the concept for the GMP. In developing the initial GMP, the Authority visualized an all-encompassing management plan including water resources management and district operations. The Authority's initial GMP served as a precursor to the Authority's Strategic Plan; it contained goals and objectives for both the management and operation of the Authority and the management of water resources. Recent clarification from TWDB staff indicates that they are primarily interested in water resource management goals and objectives; therefore, the revised GMP does not contain goals and objectives for the management and operation of the Authority.

Another change involves an attempt to correlate all the Authority's plans with the TWDB-required GMP. To assist GCDs in preparing the GMPs, the TWDB provided a template to use in developing the GMP. The template contains seven goals that must be included in the plan. These goals can be seen below:

TWDB Goals

1) Providing the most efficient use of groundwater.

2) Controlling and preventing waste of groundwater.

3) Addressing conjunctive surface water management issues.

4) Addressing natural resource issues which impact the use and availability of groundwater, and which are impacted by the use of groundwater.

5) Addressing drought conditions.

6) Addressing conservation.

7) Addressing subsidence (not applicable).

Staff found that several of the goals overlapped and did not jive with the goals approved in the Authority's Strategic Plan. Consequently, staff prepared a table (Attachment A) that attempts to correlate the TWDB goals with the Strategic Plan goals. In creating the table, it became necessary to define four management objectives that would correlate with both the TWDB goals and the Strategic Plan goals. The four management objectives defined for the revised GMP can be seen below:

Revised GMP Management Objectives

1) Manage all withdrawals from the Edwards Aquifer.

2) Monitor and protect the quality of groundwater in the Edwards Aquifer.

3) Address future water supply needs with the Edwards Aquifer.

4) Develop plan to support threatened and endangered species dependent on the Edwards Aquifer.

A final change can be seen in the "action steps" in the revised GMP. Many of the action steps are listed as management objectives in the Strategic Plan. This anomaly occurs because of the template mandated by the TWDB. The GMP can be seen in its entirety on the Authority's website.

7.7.2 FUTURE DIRECTION AND/OR ACTION

The GMP requires an annual review to consider amendments and revisions by September 1 of each year, and a progress report is due to the board of directors by the last regular board meeting of the year, beginning 2001. With the completion of the Authority's Strategic Plan, the revised GMP will include only elements relating to water management.

7.8 APPLIED RESEARCH

The Authority's research program is comprised of four components, identified as such for convenience. The components include the Edwards Aquifer Optimization Studies, Alternative Technology, Data Acquisition and Analysis, and Other Research.

7.8.1 PROGRAM PURPOSE

Research is the cornerstone for decision making. The Edwards Aquifer Optimization Program (EAOP) is the most extensive research endeavor undertaken on the Edwards Aquifer. The EAOP includes a series of 17 interrelated, mission-directed biologic and hydrogeologic research studies known as the Optimization Technical Studies (OTS). The OTS are designed to evaluate potential technical options for increasing the amount of water stored in the Edwards Aquifer and to identify various methods for optimizing the amount of water available for withdrawal. Data and information obtained from the OTS will provide aquifer managers with the tools necessary to make scientifically-sound decisions to benefit aquifer users and preserve the environment supported by the aquifer, including the Comal and San Marcos springs and downstream aquatic habitats.

7.8.2 PROGRAM COMPONENTS

The following OTS have been completed or are currently funded and underway:

- Texas wild-rice reproduction.
- Comprehensive and Critical Period Monitoring Program to Evaluate the Effects of Variable Flow on Biological Resources in the Comal and San Marcos Springs Ecosystems.

- Improved aquifer parameter estimation for MODFLOW model in-put data sets.
- Development of management modules for MODFLOW model.
- Karst aquifer model research.
- Synoptic water level measurements and well surveying to support MODFLOW model.
- Edwards Aquifer freshwater/saline water interface studies.
- Hydrologic budget analysis of Medina Lake and Diversion Lake for the North Medina County Flow Path Study.
- Tracer testing in the Edwards Aquifer in the area of Comal and San Marcos springs.
- Geophysical survey and aquifer testing of the Leona Aquifer south of Uvalde.
- Analysis of structural controls on the Trinity and Edwards aquifers interface in northern Bexar County.
- Airborne geophysical mapping of the Edwards Aquifer in northwestern Medina County, northeastern Uvalde County, and northern Bexar County.
- Development of updated methods for calculating recharge to the Edwards Aquifer.
- Statistical analysis of hydrologic data.
- Edwards Aquifer fracture/conduit study.
- Evaluation of water quality and water quantity benefits of woody species best management practices on selected watersheds in the Edwards Aquifer region.
- Augmenting groundwater recharge through brush control: a feasibility study.
- Analysis of recharge and recirculation.
- Springflow augmentation in support of in-situ refugia: a feasibility study.

7.8.3 FUTURE DIRECTION AND/OR ACTION

Table 8.2 details the OTS schedule. Section 9 provides a complete discussion of the Authority's research program.

7.9 WITHDRAWAL REDUCTION AND PERMIT RETIREMENT PLANS

Article 1, Section 1.14 (b) and (c) of the Act requires the Authority to limit maximum annual withdrawals to 450,000 acre-feet through December 31, 2007, and 400,000 acre-feet beginning January 1, 2008, respectively.

7.9.1 PLAN PURPOSE

Aquifer withdrawals affect aquifer levels, springflow discharges, and uses and conditions of the Guadalupe River basin downstream from Comal and San Marcos springs. The Withdrawal Reduction and Permit Retirement Plans are intended for the purpose of protecting the quality of the aquifer and the streams that receive aquifer discharge, achieving water conservation, maximizing beneficial use from the aquifer, protecting aquatic and wildlife habitats and the protected species that reside in them, and to provide for instream uses and bays and estuaries.

7.9.2 PLAN COMPONENTS

The reduction to 450,000 acre-feet annually is known as withdrawal reduction or the "buy-down." All costs of achieving the 450,000 acre-feet limitation are to be borne by aquifer users. The Authority may acquire two types of water rights: unrestricted water rights and base irrigation water rights. Unrestricted water rights can be transferred with Authority approval from person to person on the open market without regard to location or proposed point of withdrawal, place of use, or purpose of use. Base irrigation water rights, on the other hand, must remain with the land, can not be freely transferred on the open market, and therefore have less financial value than unrestricted water rights. Consequently, the Authority is planning to primarily purchase base irrigation water rights so that the limit on permitted withdrawals can be met in the most cost-effective manner.

Beginning January 1, 2008, the overall volume of water authorized to be withdrawn annually from the aquifer under regular permits can not exceed 400,000 acre-feet. The Authority will reduce the authorized withdrawal amount of each regular permit by an equal percentage to achieve the 400,000 acre-feet cap. This process is known as the permit retirement.

The Act provides that downstream water right holders (primarily municipalities, power plants, and other industrial interests that use water from the Guadalupe River) pay half the cost of the second buydown (400,000 acre-feet by 2008). The Authority is required to develop rules pertaining to this second buydown and to develop a fee schedule. The Texas Commission on Environmental Quality (TCEQ) will assess the fees.

7.9.3 FUTURE DIRECTION AND/OR ACTION

Although the Authority has studied the buydown issue, a specific plan of action to meet the state-imposed withdrawal limits has not been developed. The exact cost of the buydown is not known at this time for several reasons:

- The total amount of water rights to be purchased will not be known until all permits have been issued. In November 2000, the Authority proposed permits for qualified applicants in the amount of 532,875 acre-feet. Many of the proposed permits have been involved in contested case hearings; however, none of the applicants have settled

for less than the amount originally proposed. The Authority, through June 2004, has issued 750 IRPs representing 520,802 acre-feet groundwater withdrawal amounts. The board has also issued final denial of 193 IRP applications. The remaining contested applications have been forwarded to the State Office of Administrative Hearing (SOAH) for administrative hearing. IRPs become effective the January following the date of issuance. Authority staff estimates the total amount of all IRPs will be 562,000 acre-feet.

- The cost of the buydown is not known and will be determined by the total amount of water rights required for purchase and the type of water rights purchased (base or unrestricted). The Authority estimated in 2003 the total cost of a buydown to be between $250,000,000 and $417,000,000.

- A funding mechanism is not in place. General Counsel has determined the Authority may not issue revenue bonds for the acquisition of water rights. Therefore, the best budget option is contracting directly with permit holders and the viability of that option is undetermined.

- The Authority adopted revised rules for groundwater water withdrawals in December 2003 that made the following modifications:

  – Rather than implementing mandatory reductions, permittees were allowed to withdraw their full permit under specific aquifer conditions (referred to as the interruptible portion) and the remainder of their water right is subject to demand management/critical period management reductions (referred to as the uninterruptible portion). The trigger levels for availability are the same as for term permits stated above.

  – References to financial compensation were removed.

  – These rules are in effect through December 31, 2007.

7.10 RECHARGE, STORAGE, AND RECOVERY PROGRAM

Since 1998, Authority staff has been developing the technical concept for rules that will promote development of enhanced water supply through recharge projects. In 2002, the Board adopted rules to implement the Authority's Aquifer Recharge, Storage, and Recovery Program. These rules established a method for an entity constructing recharge structures to receive a credit in the form of a permit to pump additional water. The board also directed staff to develop a streamlined program for small recharge structures. In 2004, the staff began exploring other methods of developing recharge projects in addition to recharge credits.

7.10.1 PLAN PURPOSE

The intent of the recharge program is to increase the water available from the Edwards Aquifer by encouraging the development of recharge structures. Originally, the plan was to develop the technical basis for recharge credits. In addition to recharge credits, the Authority is exploring development of programs that would assist in the construction of conservation structures and flood control structures that also could serve as vehicles for recharge.

7.10.2 PLAN COMPONENTS

Recharge credits will be used to allocate groundwater recharged and stored in the aquifer. The recharge credits may be used for springflow discharge and/or for the beneficial uses of groundwater, such as municipal, industrial, and agricultural uses. In addition to recharge credits, the Authority may assist in the construction on conservation and flood control structures that have recharge as a secondary benefit.

7.10.3 FUTURE DIRECTION AND/OR ACTION

Staff began developing the rules in 2001. The Authority finalized the recharge credit rules in late 2002. In 2003, the Authority began investigating other methods of recharge that would allow the construction of small recharge structures.

8.0

Implementation

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8.0 IMPLEMENTATION

The Comprehensive Water Management Plan (CWMP) is a composite plan comprised of issue specific plans and programs. The implementation of the CWMP relies on the implementation of the individual component plans and programs through rules development. The rules development schedule is shown in Table 8.1. The CWMP is implemented as its component plans and programs, along with supporting rules, are implemented. The rules development schedule provides a guideline for implementation, but final implementation depends on the Edwards Aquifer Authority (Authority) Board approval of plan/programs and associated rules.

Ongoing research undergirds the other plans and programs that comprise the CWMP. The Authority is a regulatory agency charged with preserving and protecting the Edwards Aquifer in an eight-county region including all of Uvalde, Medina, and Bexar counties, plus portions of Atascosa, Caldwell, Guadalupe, Comal, and Hays counties. In order for the Authority to make and enforce fair and just regulations, it must have the best science from which to build. The Authority's research program provides the basis for sound decision making. Completion dates for current research initiatives underway and for initiatives scheduled for future investigation are shown in Table 8.2. The results from ongoing research may provide the basis for updating and modifying the CWMP. See Section 9.0 for details of the Authority's research programs.

Table 8.1: Comprehensive Water Management Plan Rules Development Schedule

Rule #	Rules	Committee	PR Date to Cmte/Bd	RA Assessment	Notice Schedule	FR Date to Comte/Bd
2004						
709	**Fees:** Subchapter D: Aquifer Management Fees *Federal Facilities (non-substantive change)*	Finance/Administrative	Sept 03 Cmte Oct 03 Board	No	August 2004	Oct 04 Cmte Nov 04 Board
702 709 711 715	**General Definitions** **Fees** **Groundwater Withdrawals** **Comprehensive Water Management Plan Implementation** *Junior/Senior Implementation*	Permits/Enforcement	April 04 Cmte May 04 Board	Yes	August 2004	Oct 04 Cmte Nov 04 Board
702 707 709 711 715	**General Definitions** **Procedure Before the Authority** **Fees** **Groundwater Withdrawals** **Comprehensive Water Management Plan Implementation** *Amendments*	Permits/Enforcement AMP	May 04 Cmte June 04 Board	No	August 2004	Oct 04 Cmte Nov 04 Board
717	**Enforcement**	Permits/Enforcement	May 04 Cmte June 04 Board	No	August 2004	Oct 04 Cmte Nov 04 Board
713	**Water Quality** *Amendments*	Research & Technology	04 Cmte 04 Board	*To Be Determined*	*To Be Determined*	04 Cmte 04 Board
711	**Groundwater Withdrawals:** Subchapter J: Aquifer Recharge, Storage and Recovery Projects *Small Recharge Projects*	Permits/Enforcement	04 Cmte 04 Board	Yes	*To Be Determined*	04 Cmte 04 Board
713	**Water Quality:** Subchapter G: Recharge Zone Protection (Phase II)	Research & Technology	04 Cmte 04 Board	Yes	*To Be Determined*	04 Cmte 04 Board
2005						
709	**Fees:** Subchapter E: Special Permit Retirement Fees	Finance/Administrative	05 Cmte 05 Board	*To Be Determined*	*To Be Determined*	05 Cmte 05 Board
715	**Comprehensive Water Management Plan Implementation:** Subchapter E: Withdrawal Reduction	Permits/Enforcement	05 Cmte 05 Board	Yes	*To Be Determined*	05 Cmte 05 Board
715	**Comprehensive Water Management Plan Implementation:** Subchapter F: Regular Permit Retirement	Permits/Enforcement	05 Cmte 05 Board	*To Be Determined*	*To Be Determined*	05 Cmte 05 Board
715	**Comprehensive Water Management Plan Implementation:** Subchapter G: Alternative Water Supply	Aquifer Management & Planning	05 Cmte 05 Board	*To Be Determined*	*To Be Determined*	05 Cmte 05 Board

Table 8.2: Edwards Aquifer Optimization Program Schedule

OPTIMIZATION TECHNICAL STUDY	Project Duration	Year 1 (1999)	Year 2 (2000)	Year 3 (2001)	Year 4 (2002)	Year 5 (2003)	Year 6 (2004)	Year 7 (2005)	Year 8 (2006)
BIOLOGICAL ASSESSMENTS:									
Texas Wild-rice Mapping (3)	1 year								
Texas Wild-rice Growth and Reproduction (1,2)	4 years			X	X	X	X		
Assessment of Baseline Water Quality Data for Biological Resources Leading to Evaluation of Aquifer Optimization Strategies and Effects of Variable Flow on Biological Resources (1)	7 years +		X	X	X	X	X	X	X
Cagle's Map Turtle Flow Requirements (4)	2 years		X	X	X				
Well Sampling of Aquifer Biota (3)	3 years			X					
FLOWPATH/MODELING STUDIES:									
Management Model/GIS Data Sets (1)	3.5 years		X	X	X	X	X		
Model Blue Ribbon Panel (1)	4 years		X	X	X	X	X		
Model Parameter Estimation (4)	2 years		X	X	X				
Model Recalibration	1 year							X	
Saline Water Study (1)	10 years	X	X	X	X	X	X	X	X
Recharge/Flowpath Study in North Medina County (1)	5 years		X	X	X	X	X		
Focused Flowpath Studies: Knippa Gap, San Marcos Springs, and Comal Springs (1)	6 years				X	X	X	X	X
Recharge Methodology (1)	4 years			X	X	X	X	X	
Statistical Analysis of Hydrologic Data (4)	0.25 years		X						
Fracture/Conduit Study (4)	2 years			X	X	X	X		
3-D Interactive Visualization (Phase I)	1 year							X	
RECHARGE ENHANCEMENT STUDIES:									
Range Management of Woody Species (1)	8 years	X	X	X	X	X	X	X	X
Springflow Recirculation/Recharge Enhancement (1)	2 years						X	X	X
Springflow Augmentation (1)	1.5 years				X	X	X		

Notes:

1) Projects in progress.

2) Texas wild-rice reproduction study is underway; Texas wild-rice growth study not underway because growth chambers not available.

3) The Authority is not providing funding to this project. The Texas Parks and Wildlife Department is working to document historical Texas wild-rice mapping data. A work plan was developed for the Well Sampling for Aquifer Biota project but the Authority's board voted not to perform the project.

4) Project complete.

9.0

Ongoing Planning Process of the Edwards Aquifer Authority

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9.0 ONGOING PLANNING PROCESS OF THE EDWARDS AQUIFER AUTHORITY

Research, as discussed in Section 8.0, supports the Edwards Aquifer Authority's (Authority) planning process. The research results are important in the ongoing planning process by providing the basis for change or modification. Linkages or relationships among the various plans and programs are other aspects considered in the ongoing planning process. For detailed discussions on linkages see the Edwards Aquifer Authority Strategic Plan. The Comprehensive Water Management Plan (CWMP) is flexible in order to incorporate changes identified through research and to honor linkages. Changes in any of the CWMP's component plans or programs can be made without degrading the integrity of the CWMP.

9.1 APPLIED RESEARCH

Article 1, Section 1.27 (a) of the Edwards Aquifer Authority enabling legislation (Act) requires the Authority to complete research on the technological feasibility of springflow enhancement and yield enhancement. Section 1.27 (b) indicates that the Authority may conduct research to:

1) Augment the springflow, enhance the recharge, and enhance the yield of the aquifer.

2) Monitor and protect water quality.

3) Manage water resources, including water conservation, water use and reuse, and drought management measures.

4) Develop alternative supplies of water for users.

The Authority's research program is designed to be consistent with these statutory mandates and is divided into four general categories: Edwards Aquifer Optimization, Alternative Technology, Data Acquisition and Analysis, and Other Research. These research categories are described below.

9.1.1 EDWARDS AQUIFER OPTIMIZATION PROGRAM

In April 1999, the Authority's Board of Directors approved the Edwards Aquifer Optimization Program (EAOP). The EAOP is a comprehensive program for the study and management of the Edwards Aquifer. It includes a series of 17 interrelated, mission-directed biologic and hydrogeologic research studies known as the Optimization Technical Studies (OTS). The OTS are designed to evaluate potential technical options for increasing the amount of water stored in the Edwards Aquifer and identify various methods for optimizing the amount of water available for withdrawal. Data and information obtained from the OTS will provide aquifer managers with the tools necessary to make scientifically-sound decisions to benefit aquifer users and preserve the environment supported by the aquifer, including the Comal and San Marcos springs and downstream aquatic habitats.

In November 2001, the Authority approved adding three study areas to the OTS. The added study areas are:

- Focused flowpath studies regarding Hueco Springs.
- Focused flowpath studies regarding the Edwards Aquifer/Trinity Aquifer interface.
- Water quality characterization on the recharge zone.

The biologic OTS studies were designed to better understand the potential effects of Edwards Aquifer optimization strategies on species and habitats that depend on Comal and San Marcos springs and to study species that are listed, or potentially will be listed, as endangered. Biological studies that are currently being conducted include:

- The effects of variable springflow and potential water quality impacts on biological resources resulting from aquifer optimization strategies.
- Assessment of instream flow and habitat requirements of Cagle's Map Turtle (completed study).
- Physical factors influencing Texas Wild-rice vegetative growth and sexual reproduction (reproduction portion is underway and nearing completion).

The hydrogeologic studies were designed to augment the hydrogeologic understanding of the Edwards Aquifer while supporting the development of a state-of-the-art computer model of the aquifer. The development of a scientifically correct computer model is essential for the evaluation of future aquifer management scenarios. Each hydrologic study will contribute to the computer model by providing improved input data sets or improved conceptual understandings that will aid in model calibration. Edwards Aquifer hydrogeologic studies that are currently being conducted or have been completed include:

- Texas wild-rice reproduction.
- Comprehensive and Critical Period Monitoring Program to Evaluate the Effects of Variable Flow on Biological Resources in the Comal and San Marcos Springs Ecosystems.
- Cagle's Map Turtle instream flow and habitat requirements.
- Edwards Aquifer computer model (MODFLOW) development.
- Improved aquifer parameter estimation for MODFLOW model in-put data sets.
- Development of management modules for MODFLOW model.
- Karst aquifer model research.
- Synoptic water level measurements and well surveying to support MODFLOW model.
- Edwards Aquifer freshwater/saline water interface studies.
- Hydrologic budget analysis of Medina Lake and Diversion Lake for the North Medina County Flow Path Study.
- Tracer testing in the Edwards Aquifer in the area of Comal and San Marcos springs.
- Geophysical survey and aquifer testing of the Leona Aquifer south of Uvalde.
- Analysis of structural controls on the Trinity and Edwards aquifers interface in northern Bexar County.
- Airborne geophysical mapping of the Edwards Aquifer in northwestern Medina County, northeastern Uvalde County, and northern Bexar County.
- Development of updated methods for calculating recharge to the Edwards Aquifer.
- Statistical analysis of hydrologic data.
- Edwards Aquifer fracture/conduit study.
- Evaluation of water quality and water quantity benefits of woody species best management practices on selected watersheds in the Edwards Aquifer region.
- Augmenting groundwater recharge through brush control: a feasibility study.
- Analysis of recharge and recirculation.
- Springflow augmentation in support of in-situ refugia: a feasibility study.

Hydrogeologic studies that may be performed in the future include:

- Continued focused flowpath studies at Knippa Gap, Comal Springs, San Marcos Springs, and Hueco Springs.
- Continued focused flowpath studies regarding the Edwards Aquifer/Trinity Aquifer interface.
- 3-D interactive visualization.
- MODFLOW model recalibration.

9.1.2 ALTERNATIVE TECHNOLOGY

Alternative technologies include those technologies that have the potential to provide the region with additional water available for municipal, industrial, and irrigation use and for springflow maintenance. Alternative technology investigation is an ongoing process. For example, the Authority is currently a cooperator in one alternative technology study and is applying alternative technology in one program. In future years the Authority will seek to participate in additional alternative technology research studies.

The Authority is currently a cooperator with the U.S. Department of Agriculture – Natural Resource Conservation Service (NRCS), the U.S. Geological Survey (USGS), and others in a study designed to assess aquifer recharge enhancement through range management of woody species. The study is primarily focused on the control of Ash Juniper on the Edwards Aquifer Recharge Zone.

Beginning in April 1999, the Authority began a regional weather modification program pursuant to a permit issued by the Texas Commission on Environmental Quality (TCEQ) formerly known as the Texas Natural Resource Conservation Commission (TNRCC). In 2002 the Authority completed the 4th year of the TCEQ program The program utilizes two aircraft, a dedicated radar facility, project meteorologist, and other personnel to perform precipitation enhancement in the Edwards Aquifer region. Injecting silver iodide crystals into specific types of weather systems to increase effective precipitation performs precipitation enhancement.

Other alternative technology research that the Authority may perform or support include:

- Wastewater reuse.
- Water conservation research.
- Landscape and agricultural irrigation technology.
- Demand management alternatives.
- Recharge enhancement methods.
- Recharge and Recirculation.

9.1.3 DATA ACQUISITION AND ANALYSIS

The Authority's data acquisition and analysis program has been ongoing since the agency was formed in 1996. The Authority's predecessor agency, the Edwards Underground Water District, was conducting the program. Authority staff perform the majority of the agency's data collection and analysis activities (see Figure 9.1 for locations). The Authority also has a cooperative agreement with the USGS to perform surface water gauging and aquifer recharge calculations.

The Authority acquires Edwards Aquifer water level and water quality data as well as stream flow and precipitation data. The components of the data acquisition program are summarized as follows:

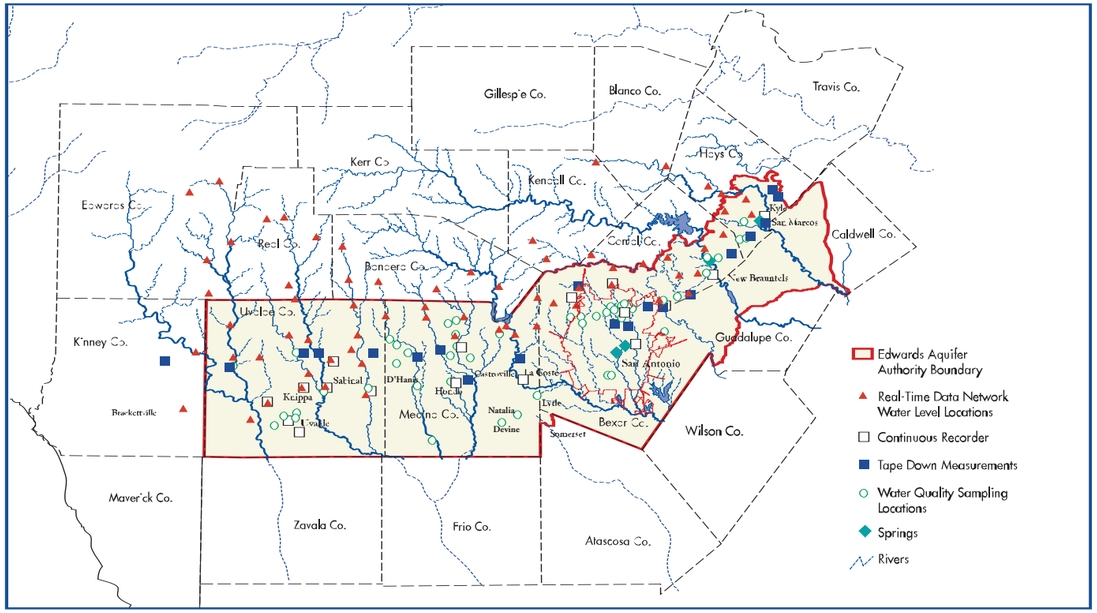
Water Level Data	
Continuous digital water level recorders	45
Periodic manual water level measurements	15 to 20
Water Quality Data	
Edwards Aquifer wells sampled per year	70 to 80
Wells sampled for general water chemistry	70 to 80
Wells sampled for metals	45 to 50
Wells sampled for pesticides and herbicides	15 to 20
Wells sampled for volatile organic compounds	15 to 20
Edwards Aquifer spring groups sampled per year	4
Springs sampled for general water chemistry	5
Springs sampled for metals	5
Springs sampled for pesticides and herbicides	5
Springs sampled for volatile organic compounds	5
Streams (that recharge the Edwards Aquifer) sampled per year	
Streams sampled for general water chemistry	8
Streams sampled for metals	8
Streams sampled for pesticides and herbicides	8
Stream Flow Data	
Continuous recording stream flow stations (USGS)	11
Precipitation Data	
Continuous digital precipitation recorders	65

Authority and USGS personnel perform analysis of the acquired data. The Authority's annual hydrologic data report contains a summary and discussion of the available data. Copies of the complete data sets are maintained in Authority files and are available upon request.

Future plans for the Authority's data acquisition and analysis program include:

- Upgrade data storage and management software.
- Increase the number of continuous water level recorders and the number of periodic water level measurement sites.
- Maintain the water quality, precipitation, and stream flow data dictionaries.

Figure 9.1: Water Sampling Locations



9.1.4 OTHER RESEARCH

From time to time, ideas and/or concepts are suggested that warrant investigation. They may not fall under aquifer optimization or alternative technology studies. This category, other research, is devoted to the analysis of ideas and concepts that are not directly related to aquifer optimization and alternative technologies.

10.0

Performance Evaluation and Update

EDWARDS AQUIFER AUTHORITY

EDWARDS AQUIFER
AUTHORITY

10.0 PERFORMANCE EVALUATION AND UPDATE

The Edwards Aquifer Authority (Authority) is charged with managing the Edwards Aquifer to sustain the diverse interests and uses of this natural resource. Management of the aquifer is not solely for the benefit of those who withdraw water directly from the aquifer. Rather, management is also intended to extend benefits to the surface streams to which the aquifer provides springflow, to protect aquatic and wildlife habitats, to protect species that are subject to federal or state protection, and to provide for instream uses and freshwater flows to bays and estuaries.

This Comprehensive Water Management Plan (CWMP) incorporates all of the programs and plans identified by the Authority to manage and protect the Edwards Aquifer system. It will be used to ensure the entire region of a sustainable, adequate, high quality and cost effective supply of water, now and in the future.

On a micro-level, each plan and program will have its own unique set of performance evaluation criteria. These plans and programs will each be evaluated on a "stand alone" basis. Additionally, the Authority's strategic plan provides designated reporting and completion timelines for all the Authority plans and programs. These evaluations from the plan specific criteria and strategic plan timelines will then be compiled and used in a broader sense to assess the effectiveness and to evaluate the performance of the CWMP.

The CWMP will be evaluated by Authority staff with respect to Objective 2.3 of the Authority's Strategic Plan. Section 2.3.6 of the Strategic Plan Objective 2.3 states, "Evaluate the effectiveness of the comprehensive plan, and amend the plan, if necessary." The task further states that the plan should be reviewed and modified, if necessary, before December 31 each year.

EDWARDS AQUIFER
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EDWARDS AQUIFER AUTHORITY ACT

(includes amendments through September 1, 2003 effective date)

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, 1993 Tex. Gen. Laws 2350; as amended by Act of May 29, 1995, 74th Leg., R.S., ch. 261, 1995 Tex. Gen. Laws 2505; Act of May 16, 1995, 74th Leg., R.S., ch. 524, 1995 Tex. Gen. Laws 3280; Act of May 6, 1999, 76th Leg., R.S., ch. 163, 1999 Tex. Gen. Laws 634; Act of May 28, 2001, 77th Leg., R.S., ch. 966, §§ 2.60 - 2.62 and 6.01 - 6.05, 2001 Tex. Gen. Laws 1880, 1910 and 1961 - 62; Act of May 23, 2001, 77th Leg., R.S., ch. 1192, 2001 Tex. Gen. Laws 2552; and Act of June 1, 2003, 78th Leg., R.S., ch. 1112, § 6.01(4), 2003 Tex. Gen. Laws 3193.

11212.01011/DFRO/MISC-5/811430.8

EDWARDS AQUIFER AUTHORITY ACT

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CHAPTER 626

S.B. No. 1477

AN ACT

relating to the creation, administration, powers, duties, operation, and financing of the Edwards Aquifer Authority and the management of the Edwards Aquifer; granting the power of eminent domain; authorizing the issuance of bonds; providing civil and administrative penalties; and validating the creation of the Uvalde County Underground Water Conservation District.

Be it enacted by the Legislature of the State of Texas:

ARTICLE 1

SECTION 1.01 FINDINGS AND DECLARATION OF POLICY. The legislature finds that the Edwards Aquifer is a unique and complex hydrological system, with diverse economic and social interests dependent on the aquifer for water supply. In keeping with that finding, the Edwards Aquifer is declared to be a distinctive natural resource in this state, a unique aquifer, and not an underground stream. To sustain these diverse interests and that natural resource, a special regional management district is required for the effective control of the resource to protect terrestrial and aquatic life, domestic and municipal water supplies, the operation of existing industries, and the economic development of the state. Use of water in the district for beneficial purposes requires that all reasonable measures be taken to be conservative in water use.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1.01, 1993 Tex. Gen. Laws 2350.

SECTION 1.02 CREATION. (a) A conservation and reclamation district, to be known as the Edwards Aquifer Authority, is created in all or part of Atascosa, Bexar, Caldwell, Comal, Guadalupe, Hays, Medina, and Uvalde counties. A confirmation election is not necessary. The authority is a governmental agency and a body politic and corporate.

(b) The authority is created under and is essential to accomplish the purposes of Article XVI, Section 59, of the Texas Constitution.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1.02, 1993 Tex. Gen. Laws 2350.

SECTION 1.03 DEFINITIONS. In this article:

(1) "Aquifer" means the Edwards Aquifer, which is that portion of an arcuate belt of porous, water-bearing, predominately carbonate rocks known as the Edwards and Associated Limestones in the Balcones Fault Zone extending from west to east to northeast from the hydrologic division near Brackettville in Kinney County that separates underground flow toward the Comal Springs and San Marcos Springs from underground flow to the Rio Grande Basin, through Uvalde, Medina, Atascosa, Bexar, Guadalupe, and Comal counties, and in Hays County south of the hydrologic division near Kyle that separates flow toward the San Marcos River from flow to the Colorado River Basin.

(2) "Augmentation" means an act or process to increase the amount of water available for use or springflow.

(3) "Authority" means the Edwards Aquifer Authority.

(4) "Beneficial use" means the use of the amount of water that is economically necessary for a purpose authorized by law, when reasonable intelligence and reasonable diligence are used in applying the water to that purpose.

(5) "Board" means the board of directors of the authority.

(6) "Commission" means the Texas Natural Resource Conservation Commission.

(7) "Conservation" means any measure that would sustain or enhance water supply.

(8) "Diversion" means the removal of state water from a watercourse or impoundment.

(9) "Domestic or livestock use" means use of water for:

(A) drinking, washing, or culinary purposes;

(B) irrigation of a family garden or orchard the produce of which is for household consumption only; or

(C) watering of animals.

(10) "Existing user" means a person who has withdrawn and beneficially used underground water from the aquifer on or before June 1, 1993.

(11) "Industrial use" means the use of water for or in connection with commercial or industrial activities, including manufacturing, bottling, brewing, food processing, scientific research and technology, recycling, production of concrete, asphalt, and cement, commercial uses of water for tourism, entertainment, and hotel or motel lodging, generation of power other than hydroelectric, and other business activities.

(12) "Irrigation use" means the use of water for the irrigation of pastures and commercial crops, including orchards.

(13) "Livestock" means animals, beasts, or poultry collected or raised for pleasure, recreational use, or commercial use.

(14) "Municipal use" means the use of water within or outside of a municipality and its environs whether supplied by a person, privately owned utility, political subdivision, or other entity, including the use of treated effluent for certain purposes specified as follows. The term includes:

(A) the use of water for domestic use, the watering of lawns and family gardens, fighting fires, sprinkling streets, flushing sewers and drains, water parks and parkways, and recreation, including public and private swimming pools;

(B) the use of water in industrial and commercial enterprises supplied by a municipal distribution system without special construction to meet its demands; and

(C) the application of treated effluent on land under a permit issued under Chapter 26, Water Code, if:

(i) the primary purpose of the application is the treatment or necessary disposal of the effluent;

(ii) the application site is a park, parkway, golf course, or other landscaped area within the authority's boundaries; or

(iii) the effluent applied to the site is generated within an area for which the commission has adopted a rule that prohibits the discharge of the effluent.

(15) "Order" means any written directive carrying out the powers and duties of the authority under this article.

(16) "Person" means an individual, corporation, organization, government or governmental subdivision or agency, business trust, estate, trust, partnership, association, and any other legal entity.

(17) "Pollution" means the alteration of the physical, thermal, chemical, or biological quality of any water in the state, or the contamination of any water in the state, that renders the water harmful, detrimental, or injurious to humans, animal life, vegetation, property, or public health, safety, or welfare or that impairs the usefulness of the public enjoyment of the water for any lawful or reasonable purpose.

(18) "Recharge" means increasing the supply of water to the aquifer by naturally occurring channels or artificial means.

(19) "Reuse" means authorized use for one or more beneficial purposes of use of water that remains unconsumed after the water is used for the original purpose of use and before the water is discharged or otherwise allowed to flow into a watercourse, lake, or other body of state-owned water.

(20) "Underground water" has the meaning assigned by Section 52.001, Water Code.

(21) "Waste" means:

(A) withdrawal of underground water from the aquifer at a rate and in

an amount that causes or threatens to cause intrusion into the reservoir of water unsuitable for agricultural, gardening, domestic, or stock raising purposes;

(B) the flowing or producing of wells from the aquifer if the water produced is not used for a beneficial purpose;

(C) escape of underground water from the aquifer to any other reservoir that does not contain underground water;

(D) pollution or harmful alteration of underground water in the aquifer by salt water or other deleterious matter admitted from another stratum or from the surface of the ground;

(E) willfully or negligently causing, suffering, or permitting underground water from the aquifer to escape into any river, creek, natural watercourse, depression, lake, reservoir, drain, sewer, street, highway, road, or road ditch, or onto any land other than that of the owner of the well unless such discharge is authorized by permit, rule, or order issued by the commission under Chapter 26, Water Code;

(F) underground water pumped from the aquifer for irrigation that escapes as irrigation tailwater onto land other than that of the owner of the well unless permission has been granted by the occupant of the land receiving the discharge; or

(G) for water produced from an artesian well, "waste" has the meaning assigned by Section 11.205, Water Code.

(22) "Well" means a bored, drilled, or driven shaft or an artificial opening in the ground made by digging, jetting, or some other method where the depth of the shaft or opening is greater than its largest surface dimension, but does not include a surface pit, surface excavation, or natural depression.

(23) "Well J-17" means state well number AY-68-37-203 located in Bexar County.

(24) "Well J-27" means state well number YP-69-50-302 located in Uvalde County.

(25) "Withdrawal" means an act or a failure to act that results in taking water from the aquifer by or through man-made facilities, including pumping, withdrawing, or diverting underground water.

(26) "Agricultural use" means any use or activity involving any of the following activities:

(A) cultivating the soil to produce crops for human food, animal feed, or planting seed or for the production of fibers;

(B) the practice of floriculture, viticulture, silviculture, and horticulture, including the cultivation of plants in containers or nonsoil media, by a nursery grower;

(C) raising, feeding, or keeping animals for breeding purposes or for the production of food or fiber, leather, pelts, or other tangible products having a commercial value;

(D) wildlife management;

(E) raising or keeping equine animals; and

(F) planting cover crops, including cover crops cultivated for transplantation, or leaving land idle for the purpose of participating in any governmental program or normal crop or livestock rotation procedure.

(27) "Nursery grower" means a person who grows more than 50 percent of the products that the person either sells or leases, regardless of the variety sold, leased, or grown. For the purpose of this definition, "grow" means the actual cultivation or propagation of the product beyond the mere holding or maintaining of the item before sale or lease and typically includes activities associated with the production or multiplying of stock, such as the development of new plants from cuttings, grafts, plugs, or seedlings.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1.03, 1993 Tex. Gen. Laws 2350; as amended by Act of May 28, 2001, 77th Leg., R.S., ch. 966, § 2.60, 2001 Tex. Gen. Laws 1880, 1910.

SECTION 1.04 BOUNDARIES. The authority includes the territory contained within the following area:

(1) all of the areas of Bexar, Medina, and Uvalde counties;

(2) all of the area of Comal County, except that portion of the county that lies North of the North line through the county of Subdivision No. 1 of the Underground Water Reservoir in the Edwards Limestone, Balcones escarpment area, as defined by the order of the Board of Water Engineers dated January 10, 1957;

(3) the part of Caldwell County beginning with the intersection of Hays County Road 266 and the San Marcos River;

THENCE southeast along the San Marcos River to the point of intersection of Caldwell, Guadalupe, and Gonzales counties;

THENCE southeast along the Caldwell-Gonzales County line to its intersection with U.S. Highway 183;

THENCE north along U.S. Highway 183 to its intersection with State Highway 21;

THENCE southwest along State Highway 21 to its intersection with Hays County Road 266;

THENCE southwest along Hays County Road 266 to the place of beginning;

(4) the part of Hays County beginning on the northwest line of the R. B. Moore Survey, Abstract 412, in Comal County where it crosses the Comal County-Hays County line northeast along the northwest line of said Survey to the northeast corner of said Survey in Hays County, Texas;

THENCE southeast in Hays County, Texas across the Jas. Deloach Survey, Abstract 878, to the most westerly northwest corner of the Presidio Irrigation Co. Survey, Abstract 583;

THENCE northeast along the northwest line of said Survey to its most northerly northwest corner;

THENCE continuing in the same line across the R.S. Clayton Survey 2, Block 742, to the west line of the H. & G. N. RR. Co. Survey 1, Abstract 668;

THENCE north along the west line of said Survey to its northwest corner;

THENCE east along the north line of said Survey to its northeast corner;

THENCE northeast across the David Wilson Survey 83, Abstract 476, to the southeast corner of the F. W. Robertson Survey 71, Abstract 385;

THENCE north along the east line of said Survey to the southwest corner of the Benjamin Weed Survey 72, Abstract 483;

THENCE east along the south line of said Survey to its southeast corner;

THENCE northeast across the William Gray Survey 73, Abstract 92, and the Murray Bailey Survey 75, Abstract 42, to the southwest corner of the D.Holderman Survey 33, Abstract 225;

THENCE north along the west line of said Survey to its northwest corner;

THENCE continuing in the same line to the north line of the Day Land & Cattle Co. Survey 672;

THENCE west along said north line of said Survey to its northwest corner, which is in the east line of the Jesse Williams Survey 4 to the northeast corner of said Survey;

THENCE west along the north line of said Survey to the Southwest corner of the Amos Singleton Survey 106, Abstract 410;

THENCE north along the west lines of said Amos Singleton Survey 106 and the Watkins

Nobles Survey 107, Abstract 346, to the northwest corner of said Watkins Nobles Survey 107;

THENCE east along the north line of said Survey to the southwest corner of the Jesusa Perez Survey 14, Abstract 363;

THENCE north along the west line of said Jesusa Perez Survey 14 to its northwest corner;

THENCE east along the north line of said Survey to its northeast corner;

THENCE, south along the east line of said Survey for a distance of approximately 10,000 feet to its intersection with Ranch Road 150;

THENCE, east by southeast along Ranch Road 150 approximately 24,500 feet to its intersection with the southern boundary line of the Andrew Dunn Survey 9, Abstract 4;

THENCE, east along the south line of said survey as it extends and becomes the southern boundary line of the Morton M. McCarver Survey 4, Abstract 10, for a distance of approximately 7,000 feet to its intersection with Ranch Road 2770;

THENCE, south on Ranch Road 2770 for a distance of approximately 400 feet to its intersection with Farm-to-Market Road 171;

THENCE, east along Farm-to-Market Road 171 for a distance of approximately 10,500 feet to its intersection with Farm-to-Market Road 25;

THENCE, north by northeast along Farm-to-Market Road 25 for a distance of approximately 3,100 feet to its intersection with Farm-to-Market Road 131;

THENCE, east by southeast along Farm-to-Market Road 131 for a distance of approximately 3,000 feet to its intersection with the east line of the Thomas G. Allen Survey, Abstract 26;

THENCE south along the east line of said Thomas G. Allen Survey to the most northerly northwest corner of the Elisha Pruett Survey 23, Abstract 376;

THENCE southwest along a west line of said Elisha Pruett Survey 23 to the west corner of said Survey;

THENCE southeast along the southwest line of said Survey to the north corner of the John Stewart Survey, Abstract 14;

THENCE southwest along the northwest line of said John Stewart Survey to its west corner;

THENCE continuing in the same line to the most northerly southwest line of the John Jones Survey, Abstract 263;

THENCE southeast along said southwest line to an interior corner of said John Jones Survey;

THENCE southwest along the most southerly northwest line of said Survey to the southwest corner of said Survey;

THENCE southeast along the south line of said Survey to the north corner of the James W. Williams Survey 11, Abstract 473;

THENCE southwest along the northwest line of said James W. Williams Survey 11 to its west corner;

THENCE southeast along the southwest line of said Survey to the north right-of-way line of the I. & G. N. RR.;

THENCE southwest along said right-of-way of said I. & G. N. RR. to the Hays County-Comal County line;

THENCE south along said county line to the northwest line of the R. B. Moore Survey, Abstract 412, in Hays County where it crosses the Hays County-Comal County line;

(5) all of the territory of Hays County contained within the following described area:

Beginning on the most southern point of Hays County at the intersection of Hays, Comal, and Guadalupe Counties; then continuing in a northeasterly direction along the Hays-Guadalupe county line to its intersection with the Hays-Caldwell county line; then continuing along the Hays-Caldwell county line to an intersection with Farm-to-Market Road 150; then continuing in a northwesterly direction along Farm-to-Market Road 150 to the intersection with the existing southern boundary of the part of Hays County described in Subdivision (4) of this section; then continuing in a southwesterly direction along the existing southern boundary of the part of Hays County described in Subdivision (4) of this section to the intersection with the Hays-Comal county line; then continuing in a southerly direction along the Hays-Comal county line to the point of beginning;

(6) the part of Guadalupe County beginning at the Guadalupe County-Caldwell County-Hays County line at the San Marcos River in the northeast corner of Guadalupe County, Texas.

THENCE southwest along the Guadalupe County-Hays County line to the intersect of the Guadalupe County-Hays County-Comal County line.

THENCE southwest along the Guadalupe County-Comal County line to the intersect of the Guadalupe County-Comal County-Bexar County intersect at the Cibolo creek.

THENCE south along the Guadalupe County-Bexar County line along the Cibolo creek to the intersect of the Guadalupe County-Bexar County-Wilson County line.

THENCE south along the Guadalupe County-Wilson County line along the Cibolo creek to the intersect and crossing of Guadalupe County Road 417.

THENCE east along Guadalupe County Road 417 to the intersect of Guadalupe County Road 417 and Guadalupe County Road 412.

THENCE northeast along Guadalupe County Road 412 to the intersect of Guadalupe County Road 412 and Guadalupe County Road 411 A.

THENCE east along Guadalupe County Road 411 A to the intersect of Guadalupe County Road 411 A and Farm-to-Market road number 725.

THENCE north along Farm-to-Market Road 725 to the intersect of Farm-to-Market Road 725 and Interstate Highway 10.

THENCE east along Interstate Highway 10 to the intersect of Interstate Highway 10 and State Highway 90.

THENCE east along State Highway 90 to the Guadalupe County-Caldwell County line at the San Marcos river.

THENCE northwest along the Guadalupe County-Caldwell County line along the San Marcos river to the place of beginning; and

(7) the part of Atascosa County beginning on the north line of the Robt. C. Rogers Survey, at the Bexar County-Atascosa County line, to its northwest corner, which is the northeast corner of the F. Brockinzen Survey, Abstract 86;

THENCE south along the east line of said Survey passing through its southeast corner and continuing south along the east line of the F. Brockinzen Survey, Abstract 90, to its southeast corner;

THENCE west along the south line of said survey to its southwest corner;

THENCE north along the west line of said F. Brockinzen Survey to the southeast corner of the B. Bonngartner Survey, Abstract 87;

THENCE west along the south line of said B. Bonngartner Survey passing through its southwest corner and continuing along the south line of the J. B. Goettlemann Survey, Abstract 309, to the Atascosa County-Medina County line;

THENCE north along the Atascosa County-Medina County line to the Bexar County line;

THENCE east along the Atascosa County-Bexar County Line to the place of beginning.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1.04, 1993 Tex. Gen. Laws 2350.

SECTION 1.05 FINDINGS RELATING TO BOUNDARIES. The legislature finds that the boundaries and field notes of the authority form a closure. A mistake in the field notes or in copying the field notes in the legislative process does not affect the organization, existence, or validity of the district or the legality or operation of the district or its governing body.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1.05, 1993 Tex. Gen. Laws 2350.

SECTION 1.06 FINDING OF BENEFIT. (a) The legislature finds that the water in the unique underground system of water-bearing formations known as the Edwards-Balcones Fault Zone Aquifer has a hydrologic interrelationship to the Guadalupe, San Antonio, San Marcos, Comal, Frio, and Nueces river basins, is the primary source of water for the residents of the region, and is vital to the general economy and welfare of this state. The legislature finds that it is necessary, appropriate, and a benefit to the welfare of this state to provide for the management of the aquifer through the application of management mechanisms consistent with our legal system and appropriate to the aquifer system.

(b) The legislature further finds that the state will be benefited by exercise of the powers of the authority and by the works and projects that are to be accomplished by the authority under powers conferred by Article XVI, Section 59, of the Texas Constitution. The authority is created to serve a public use and benefit.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1.06, 1993 Tex. Gen. Laws 2350.

SECTION 1.07 OWNERSHIP OF UNDERGROUND WATER. The ownership and rights of the owner of the land and the owner's lessees and assigns, including holders of recorded liens or other security interests in the land, in underground water and the contract rights of any person who purchases water for the provision of potable water to the public or for the resale of potable water to the public for any use are recognized. However, action taken pursuant to this Act may not be construed as depriving or divesting the owner or the owner's lessees and assigns, including holders of recorded liens or other security interests in the land, of these ownership rights or as impairing the contract rights of any person who purchases water for the provision of potable water to the public or for the resale of potable water to the public for any use, subject to the rules adopted by the authority or a district exercising the powers provided by Chapter 52, Water Code. The legislature intends that just compensation be paid if implementation of this article causes a taking of private property or the impairment of a contract in contravention of the Texas or federal constitution.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1.07, 1993 Tex. Gen. Laws 2350.

SECTION 1.08 GENERAL POWERS. (a) The authority has all of the powers, rights, and privileges necessary to manage, conserve, preserve, and protect the aquifer and to increase the recharge of, and prevent the waste or pollution of water in, the aquifer. The authority has all of the rights, powers, privileges, authority, functions, and duties provided by the general law of this state, including Chapters 50, 51, and 52, Water Code, applicable to an authority created under Article XVI, Section 59, of the Texas Constitution. This article prevails over any provision of general law that is in conflict or inconsistent with this article regarding the area of the authority's jurisdiction.

(b) The authority's powers regarding underground water apply only to underground water within or withdrawn from the aquifer. This subsection is not intended to allow the authority to regulate surface water.

(c) The authority and local governments with pollution control powers provided under Subchapters D and E, Chapter 26, Water Code, in order to prevent pollution and enforce water quality standards in the counties included within the authority's boundaries and within a buffer zone that includes all of the area less than five miles outside of those counties, shall apply pollution control regulations equally and uniformly throughout the area within the counties and the buffer zone. The buffer zone does not include the territory within a water management district created under Chapter 654, Acts of the 71st Legislature, Regular Session, 1989.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1.08, 1993 Tex. Gen. Laws 2350.

SECTION 1.09 BOARD OF DIRECTORS; ELECTIONS; TERMS. (a) The authority is governed by a board of directors composed of 15 directors elected from the single-member election districts described by Section 1.093 of this article and two directors appointed as provided by Section 1.091 of this article. The elected directors serve staggered four-year terms with as near as possible to one-half of the members' terms expiring December 1 of each even-numbered year.

(b) The board shall order elections of the appropriate number of directors to replace directors holding elected offices whose terms are nearest expiration to be held on the uniform election date in November of each even-numbered year.

(c) If a director's position becomes vacant for any reason, the board shall appoint a qualified person to serve until the first election of directors following the appointment. If the position is not scheduled to be filled at that election, the board shall provide for a director to be elected at that election to serve in the position for the remainder of the unexpired term.

(d) Sections 41.003 and 41.008, Election Code, do not apply to an election held under this article.

(e) At the initial meeting of the board following an election of new directors, the directors shall elect a presiding officer and other necessary officers. Officers serve terms set by rule of the board not to exceed two years.

(f) An act of the board is not valid unless adopted by the affirmative vote of a majority of the directors who are entitled to vote when a quorum is present. For purposes of this subsection, eight directors who are entitled to vote constitute a quorum.

(g) A director receives no compensation for service on the board but is entitled to reimbursement for actual and necessary expenses incurred in the performance of the director's duties.

(h) An elected director shall hold office until a successor has been elected and has qualified by taking the oath of office.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1.09, 1993 Tex. Gen. Laws 2350; as amended by Act of May 29, 1995, 74th Leg., R.S., ch. 261, § 1, 1995 Tex. Gen. Laws 2505.

SECTION 1.091 NONVOTING MEMBERS OF BOARD. (a) In addition to the directors provided by Section 1.09 of this article, the board includes two nonvoting directors appointed as provided by this section.

(b) One nonvoting director shall be appointed by a majority vote of the South Central Texas Water Advisory Committee from among the members of the committee.

(c) One nonvoting director shall be appointed by the Commissioners Court of Medina County or Uvalde County as provided by this subsection. A nonvoting director appointed by the Commissioners Court of Medina County must be a resident of Medina County, and a nonvoting director appointed by the Commissioners Court of Uvalde County must be a resident of Uvalde County. The Commissioners Court of Medina County shall appoint the nonvoting director for the term beginning December 1, 1996, and the Commissioners Court of Uvalde County shall appoint the nonvoting director for the term beginning December 1, 2000. Subsequent directors shall be appointed under this subsection by the Commissioners Courts of Medina County and Uvalde County in alternation.

(d) A director appointed under this section serves a four-year term. The terms of the initial directors appointed under this section begin December 1, 1996, and expire December 1, 2000. Subsequent regular appointments under this section shall be made on or before the date of the directors election held for the even-numbered election districts described by Section 1.093 of this article. Subsequently appointed directors' terms expire December 1 following the appointment of the directors' successors. If the office of a director appointed under this section becomes vacant for any reason, the office shall be filled by appointment as provided by Subsection (b) or (c) of this section, as appropriate, for the unexpired portion of the term.

(e) A director appointed under this section is entitled to participate in and comment on any matter before the board in the same manner as a voting director, except that a director appointed under this section may not vote on any matter before the board.

(f) A director appointed under this section is not entitled to compensation for service on the board but is entitled to reimbursement for actual and necessary expenses incurred in performing the director's duties.

Act of May 29, 1995, 74th Leg., R.S., ch. 261, § 1, 1995 Tex. Gen. Laws 2505.

SECTION 1.092 TEMPORARY BOARD AND INITIAL ELECTION OF DIRECTORS. (a) Until a board is elected as provided by this section and takes office, the authority is governed by a temporary board that consists of:

(1) Mr. Phil Barshop;
(2) Mr. Ralph Zendejas;
(3) Mr. Mike Beldon;
(4) Ms. Rosa Maria Gonzales;
(5) Mr. John Sanders;

(6) Ms. Sylvia Ruiz Mendelsohn;
(7) Mr. Joe Bernal;
(8) Mr. Oliver R. Martin;
(9) Mr. A. O. Gilliam;
(10) Mr. Bruce Gilleland;
(11) Mr. Rogelio Munoz;
(12) Mr. Doug Miller;
(13) Ms. Paula DiFonzo;
(14) Mr. Mack Martinez;
(15) Ms. Jane Houghson;
(16) one temporary director appointed by the South Central Texas Water Advisory Committee from among the members of the committee; and
(17) one temporary director appointed jointly by the Commissioners Courts of Medina County and Uvalde County who must be a resident of one of those counties.

(b) A temporary director appointed by the South Central Texas Water Advisory Committee or by the Commissioners Courts of Medina County and Uvalde County is a nonvoting member of the temporary board. The temporary director appointed by the South Central Texas Water Advisory Committee serves until the first nonvoting director appointed under Section 1.091(b) takes office. The temporary director appointed by the Commissioners Courts of Medina County and Uvalde County serves until the first nonvoting director appointed under Section 1.091(c) of this article takes office.

(c) If a vacancy occurs in a temporary director's office, except for the two nonvoting temporary directors, the remaining directors shall appoint a person to fill the vacancy. If a vacancy occurs in the office of one of the nonvoting temporary directors, the body that made that director's appointment shall appoint a person to fill the vacancy.

(d) As soon as is practicable, the temporary board shall:

(1) meet to elect a presiding officer and other necessary officers; and

(2) adopt rules governing the authority and board procedures.

(e) A temporary director receives no compensation for service on the board but is entitled to reimbursement for actual and necessary expenses incurred in the performance of the director's duties.

(f) A temporary director is not personally liable for any action the director takes within the scope of the director's office and under color of authority granted by this article.

(g) The temporary board shall order an election of directors to be held on the uniform election date in November 1996. Notwithstanding Section 1.09 of this article, the initial directors elected from odd-numbered election districts described by Section 1.093 of this article serve terms expiring December 1, 1998, and the initial directors elected from even-numbered districts described by that section serve terms expiring December 1, 2000.

(h) The temporary board has all of the authority granted to the permanent board by

this article and by general law.

Act of May 29, 1995, 74th Leg., R.S., ch. 261, § 1, 1995 Tex. Gen. Laws 2505.

SECTION 1.093 SINGLE-MEMBER ELECTION DISTRICTS. (a) District 1 is composed of Bexar County tracts 1203, 1204, 1205.02, 1206, 1208, 1209.02, 1211.03, 1211.04, 1211.05, 1211.06, 1211.07, 1211.08, 1212.01, 1212.02, 1218.01, 1218.03, 1218.04, 1218.05, 1219.02, 1914.02, 1917, 1918.01, and 1918.02; and that part of Bexar County tract 1205.01 included in block groups 6, 7, 8, and blocks 104, 105, 106, 107, 310, 501, and 504; and that part of Bexar County tract 1207 included in block groups 2 and 3 and blocks 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 120, 121, 122, 123, 124, 125, 407, 408, 409, 410, 411, 412, 413, 414, 415, 417, 418, 419, 502, 503, 504, 505, and 506; and that part of Bexar County tract 1209.01 included in block groups 2 and 3 and blocks 102, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, and 132; and that part of Bexar County tract 1210 included in block groups 4, 5, and 6; and that part of Bexar County tract 1213 included in block groups 1 and 2; and that part of Bexar County tract 1214.01 included in blocks 102A, 102B, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, and 113; and that part of Bexar County tract 1215.01 included in blocks 101, 102, 103, 104, 105A, 105B, 106, 108, 109, 110, 118, 119, 120, 121, 122, 123, 124, 125, 126, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, and 231; and that part of Bexar County tract 1216.03 included in block groups 3, 4, 5, 6, and blocks 101, 102, 103A, 103B, 103C, 104, 105A, 105B, 107, 108, 109, 201B, 201C, 201E, 202, 204, 205, and 206; and that part of Bexar County tract 1217 included in blocks 101A, 101B, 101C, 101D, 111A, 111B, and 112; and that part of Bexar County tract 1218.02 included in block groups 1 and 3; and that part of Bexar County tract 1219.01 included in blocks 202, 203, 204, 205, 206A, 206B, 207A, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, and 318; and that part of Bexar County tract 1903 included in blocks 132A, 133, 134A, 134B, 134C, 134D, 135A, and 135B; and that part of Bexar County tract 1904 included in blocks 101A, 101B, 103, 104, and 105; and that part of Bexar County tract 1908 included in blocks 101, 102, 103, 105, 106, 107, 108, 110, 111, 112, 113, 118, 120, 122, 125, 127, 130, 201, 202, 204, 205, 208, 210, 211, 212, 216, 217, 218, 219, 220, 221, 225, 301, 302, 304, 305, 306, 307, 311, 313, 314, 315, 316, 317, 318, 319, 320, 321, and 334; and that part of Bexar County tract 1909 included in blocks 313, 317, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, and 329; and that part of Bexar County tract 1912 included in block groups 1, 2, 6, 7, and blocks 301, 302, 303, 304, 305, 306, 309, 310, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, and 511; and that part of Bexar County tract 1913 included in block groups 1, 4, 5, and blocks 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 215, 216, 217, 218, 219, 220, 221, 222, 236, 237, 244, 301, 302, 303, 304, 305, 306, 307, 308, and 310; and that part of Bexar County tract 1914.01 included in block group 1; and that part of Bexar County tract 1914.03 included in block groups 3 and 4.

(b) District 2 is composed of Bexar County tracts 1102, 1201.85, 1214.02, 1301, 1302, 1303, 1305, 1306, 1307.85, 1308, 1308.84, 1309, 1310, 1311, 1312, 1313, 1314, 1315.01, 1315.02, and 1316.04; and that part of Bexar County tract 1101 included in block groups 2, 3, 4, 5, 6, 7, and blocks 102, 103, 104, 105, 106, 107, 110, 111, 112, 113, 114, 118, 119, 120, 121, 122, 124, 125, 126, 127, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 142, and 144; and that part of Bexar County tract 1109 included in blocks 126, 130, 201, 202, 203, 204, 209, 210, 211, 212, 213, 214, 217, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, and 249; and that part of Bexar

County tract 1110 included in block group 1 and blocks 201, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231A, 231B, 232, 233, 234, 235, 236, 237, 238, 239, 401, 406, 407, 408, 409, 410, 415, 416, and 417; and that part of Bexar County tract 1202.85 included in block groups 1, 2, 3, 4, 5, 9, and blocks 601, 602, 603, 604, 605, 606, 607, 608A, 608B, 610, 613, 614, 615, and 617; and that part of Bexar County tract 1205.01 included in block groups 2 and 4 and blocks 101, 102, 103, 108, 109, 110, 111, 301, 302, 303, 304, 305, 306, 307, 308, 309, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 502, 503, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, and 520; and that part of Bexar County tract 1214.01 included in block groups 4, 5, 6, and 7; and that part of Bexar County tract 1215.02 included in block groups 4 and 5; and that part of Bexar County tract 1215.03 included in block groups 3 and 4; and that part of Bexar County tract 1304 included in block groups 1 and 8 and blocks 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214B, 701, 704B, 705, 706, and 707; and that part of Bexar County tract 1404 included in blocks 408, 409, and 411; and that part of Bexar County tract 1902 included in blocks 317 and 318; and that part of Bexar County tract 1903 included in blocks 101A, 101B, 102, 103, 104, 105, 106, 107, 108, 112, 121, 122, 123, 126, 127, 132B, and 138; and that part of Bexar County tract 1904 included in blocks 102, 106, 107, 108, 109, 110, 111, 118, 122, 201, 202, 209, 210B, 301, 309, 310, 311, and 404.

(c) District 3 is composed of Bexar County tracts 1105, 1106, 1107, 1108, 1601, 1701, 1702, 1704, 1705, 1809.01, 1809.02, 1810.01, 1811, 1901, 1905, 1906, 1907, 1910.01, 1910.02, 1911.01, and 1911.02; and that part of Bexar County tract 1101 included in blocks 101, 108, and 109; and that part of Bexar County tract 1104 included in block groups 3 and 4 and blocks 106, 202, 203, 204, and 205; and that part of Bexar County tract 1109 included in blocks 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 127, 128, 139, 140, 205, 206, 207, 208, 215, 216, 218, 219, 230A, 230B, 231, 232, 233, and 234; and that part of Bexar County tract 1110 included in block group 3 and blocks 202, 203, 204, 205, 402, 403, 404, 405, 411, 412, 413, 414, 418, 419, and 420; and that part of Bexar County tract 1202.85 included in blocks 609, 611, 612, and 616; and that part of Bexar County tract 1207 included in block groups 6, 7, 8, and blocks 101, 102, 103, 119, 401A, 401B, 402, 403, 404, 405, 406, 416, 420, 421, and 501; and that part of Bexar County tract 1209.01 included in blocks 101 and 140; and that part of Bexar County tract 1210 included in block groups 1, 2, and 3; and that part of Bexar County tract 1501 included in blocks 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 624, 625, and 626; and that part of Bexar County tract 1602 included in blocks 214, 303, and 310; and that part of Bexar County tract 1605 included in block groups 2 and 3 and blocks 117, and 118; and that part of Bexar County tract 1703 included in block groups 1, 2, 7, 8, and blocks 301, 302, 303, 304, 305, 306, 307, 308, 311, 312, 321, 322, 323, 324, 327, 399, 405, 406, 414, 415, 505, 506, 513, 514, 605, 606, 612, 613, 614, and 615; and that part of Bexar County tract 1802 included in block groups 1, 2, 3, 4, 7, 8, and 9; and that part of Bexar County tract 1808 included in blocks 110B and 111; and that part of Bexar County tract 1812 included in blocks 401, 402, 408, 409, 410, 411, and 412; and that part of Bexar County tract 1813 included in block groups 1, 2, 3, 4, and 5; and that part of Bexar County tract 1902 included in block groups 1, 2, 4, 5, 6, 7, and blocks 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 316, 319, 320, and 323; and that part of Bexar County tract 1903 included in blocks 109, 110, and 111; and that part of Bexar County tract 1904 included in blocks 203, 204, 205, 206, 207, 208, 210A, 211, 212, 213, 214, 215, 303, 304, 305, 306, 307, 308, 312, 313, 314, 401, 402, 403, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, and 417; and that part of Bexar County tract 1908

included in blocks 104, 109, 124, 126, 128, 129, 206, 207, 213, 214, 215, 222, 303, 308, 309, 310, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 335, and 336; and that part of Bexar County tract 1909 included in block groups 1, 2, 4, 5, 6, 7, 8, 9, and blocks 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 314, 315, 316, and 318; and that part of Bexar County tract 1912 included in block group 4 and blocks 307, 308, 311, 312, 313, 314, 315, and 512; and that part of Bexar County tract 1913 included in blocks 211, 212, 213, 214, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 238, 239, 240, 241, 242, 243, 309, 311, 312, and 313; and that part of Bexar County tract 1914.04 included in blocks 202, 203, 204, 205, 206, 207, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, and 317.

(d) District 4 is composed of Bexar County tracts 1617, 1719.01, 1719.02, 1719.03, 1719.04, 1719.05, 1719.06, 1817.01, 1817.03, 1817.04, 1817.05, 1817.06, 1817.07, 1817.08, 1817.09, 1817.10, 1818.01, 1818.05, 1819, 1820, 1821, 1914.05, 1915.01, 1915.02, 1916, and 1918.03; and that part of Bexar County tract 1614.01 included in block 913B; and that part of Bexar County tract 1616 included in block groups 1 and 2 and blocks 304, 305, and 306; and that part of Bexar County tract 1618 included in block groups 1, 2, and 3; and that part of Bexar County tract 1720 included in block group 1 and blocks 201, 202, 203A, 203B, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292A, 292B, 293, 294, 295A, 295B, and 296; and that part of Bexar County tract 1812 included in block groups 1, 2, 3, 5, and blocks 403, 404, 405, 406, and 407; and that part of Bexar County tract 1815.02 included in block groups 5, 6, and 7; and that part of Bexar County tract 1816 included in block group 2 and blocks 101A, 101B, 101C, 102A, 102B, 103, 104A, 104B, 105A, 105B, 106, 107, 108A, 109A, 110A, 111A, 112, 113, 114, 122, 136A, 136B, 143A, 143B, 305, 306, 601, and 602; and that part of Bexar County tract 1818.02 included in block groups 2, 3, 4, 5, and blocks 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, and 113; and that part of Bexar County tract 1818.03 included in blocks 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 120A, 120B, and 301; and that part of Bexar County tract 1818.04 included in block groups 2, 3, 4, 5, 6, 7, and block 101; and that part of Bexar County tract 1914.01 included in block groups 2 and 3; and that part of Bexar County tract 1914.03 included in block groups 1 and 2; and that part of Bexar County tract 1914.04 included in block group 1 and blocks 201 and 301.

(e) District 5 is composed of Bexar County tracts 1216.01, 1317, 1416, 1418, 1511, 1512, 1513, 1514, 1515, 1516, 1517, 1518, 1519, 1520, 1521, 1522, 1606, 1607.85, 1610.85, 1611, 1612, 1613, 1614.85, 1615.01, 1615.02, 1619, and 1620; and that part of Bexar County tract 1216.03 included in blocks 106A, 106B, 201D, 201F, and 203; and that part of Bexar County tract 1216.04 included in block groups 1 and 2 and blocks 301A, 301B, 302, 303, 304, and 305; and that part of Bexar County tract 1217 included in block groups 2, 3, 4, 5, 6, and blocks 102A, 102B, 103, 104A, 104B, 105, 106, 107, 108, 109, 110A, and 110B; and that part of Bexar County tract 1218.02 included in block group 2; and that part of Bexar County tract 1219.01 included in block group 1 and blocks 201, 207B, 208, 209, 210, 319, and 320; and that part of Bexar County tract 1316.01 included in blocks 101, 102, 103A, 103B, 103C, 103D, 103E, 104A, 104B, 104C, 105A, 105B, 106, 107A, 107B, 108A, 108B, 109, 110, 113, 114, 117, 118A, 118B, 119A, 119B, 119C, 119D, 119E, 119F, 119G, 121A, 121B, 121C, 121D, 121E, 122, 124, 133, 134, 135, 136, 137, 138A, and 138B; and that part of Bexar County tract 1316.03 included

in blocks 201 and 204; and that part of Bexar County tract 1318 included in block group 3 and blocks 214, 215, 216, 218, 401, 411, 412, 413, 414, 415, 416, 417, 418, 424, 425, 426, 427, 428, 429, and 430; and that part of Bexar County tract 1415 included in block 901A; and that part of Bexar County tract 1417 included in blocks 101, 102, 103, 104, 105, 106, 107, 108A, 108B, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119A, 119B, 120, 121, 122, 124, 125, 126, 132A, 132B, 133, 134, 135, 136, 139, 140, 141, 142, 143, and 199; and that part of Bexar County tract 1419 included in block group 2 and blocks 101, 102, 103A, 103B, 104, 105, 106, 107, 108, 109, 110, 111A, 111B, 112A, 112B, 301A, 301B, 302, 309A, 310, 311, 312, 314, 315, 316, 317, 318, 319, 320A, 320B, 321, 322, 323, 324, 325, 326, 327, 328, 329A, 329B, 330A, 330B, 331, 332, and 399; and that part of Bexar County tract 1605 included in block groups 6, 7, 8, and blocks 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, and 116; and that part of Bexar County tract 1609 included in block groups 3, 4, 5, and blocks 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, and 618; and that part of Bexar County tract 1614.01 included in blocks 913A, 913C, and 913D; and that part of Bexar County tract 1616 included in blocks 302, 303, 307A, 307B, and 308; and that part of Bexar County tract 1618 included in block group 4; and that part of Bexar County tract 1703 included in blocks 313, 314, 315, 316, 317, 318, 319, 401, 402, 403, 404, 407, 408, 409, 410, 411, 412, 413, 416, 417, 418, 419, 501, 502, 503, 504, 507, 508, 509, 510, 511, 512, 515, 516, 517, 518, 601, 602, 603, 604, 607, 608, 609, 610, 611, 616, and 617; and that part of Bexar County tract 1710 included in block groups 4, 5, and 6; and that part of Bexar County tract 1720 included in block 297.

(f) District 6 is composed of Bexar County tracts 1103, 1215.04, 1401, 1402, 1403, 1405, 1406, 1407, 1408, 1409, 1410, 1411, 1412, 1413, 1414, 1502, 1503, 1504, 1505, 1506, 1507, 1508, 1509, 1510, 1603, 1604, and 1608; and that part of Bexar County tract 1104 included in blocks 101, 102, 103, 104, 105, 107, 108, 109, 110, 111, 112, 113, 114, 115, 201, 206, 207, 208, 209, 210, 211, 212, 213, 214, and 215; and that part of Bexar County tract 1213 included in block groups 3, 4, and 5; and that part of Bexar County tract 1214.01 included in block groups 2 and 3 and block 101; and that part of Bexar County tract 1215.01 included in block group 3 and blocks 107, 111, 112, 113, 114, 115, 116, 117, 127, 128, 129, 130, 131, 232, 233, 234, 235, and 236; and that part of Bexar County tract 1215.02 included in block groups 1, 2, and 3; and that part of Bexar County tract 1215.03 included in block groups 1, 2, 5, 6, 7, and 8; and that part of Bexar County tract 1216.03 included in block 201A; and that part of Bexar County tract 1216.04 included in block group 4 and blocks 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, and 321; and that part of Bexar County tract 1304 included in block groups 3, 4, 5, 6, and blocks 214A, 215, 220, 221, 702, 703, 704A, 720, 726, 734, 735, 736, 737, 738, 739, and 740; and that part of Bexar County tract 1316.01 included in blocks 111, 112, 115A, 115B, 116, 120A, 120B, 120C, 123A, 123B, 125, 126, 127, 128A, 128B, 128C, 129A, 129B, 130, 131A, 131B, 131C, 131D, 132, 139, 140, 141, 142, and 143; and that part of Bexar County tract 1316.03 included in block groups 1, 3, 4, and blocks 202, 203A, 203B, 203C, 203D, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214A, 214B, 214C, 214D, 214E, 215A, 215B, 216A, 216B, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, and 227; and that part of Bexar County tract 1318 included in block group 1 and blocks 201, 202, 203A, 203B, 204A, 204B, 205, 206A, 206B, 206C, 207A, 207B, 208, 209, 210, 211, 212, 213, 217, 219, 220, 221, 222A, 222B, 223A, 223B, 224, 225, 226, 227, 228, 229, 230, 402, 403, 404, 405, 406, 407, 408, 409, 410, 419, 420, 421, 422, and 423; and that part of Bexar County tract 1404 included in block groups 1, 2, 3, and blocks 401, 402, 403, 404, 405, 406, 407, 410, 414, 415, 423, 424, 425, 426, 428, 429, and 430; and that part of Bexar County tract 1415 included in blocks 901B and

902; and that part of Bexar County tract 1417 included in block group 2 and blocks 123A, 123B, 127A, 127B, 127C, 128A, 128B, 129A, 129B, 130A, 130B, 131, 137A, 137B, 138A, and 138B; and that part of Bexar County tract 1419 included in blocks 113A, 113B, 113C, 114, 115, 303A, 303B, 304A, 304B, 305A, 305B, 306A, 306B, 307, 308, 309B, and 313; and that part of Bexar County tract 1501 included in block groups 1, 2, 3, 4, 5, and blocks 620, 621, 622, 623, 627, 628, and 629; and that part of Bexar County tract 1602 included in block group 1 and blocks 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 301, 302, 304, 305, 306, 307, 308, 309, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, and 321; and that part of Bexar County tract 1605 included in block groups 4 and 5; and that part of Bexar County tract 1609 included in block groups 1 and 7 and blocks 201, 202, 203, 204, 205, 206, 614, 615, 616, 617, 621, and 622.

(g) District 7 is composed of Bexar County tracts 1706, 1707, 1708, 1709, 1711, 1712, 1713, 1714, 1715, 1716, 1717, 1718, 1801, 1803, 1804, 1805.01, 1805.02, 1806, 1807.01, 1807.02, 1810.03, 1810.04, 1810.05, 1814.01, 1814.02, and 1815.01; and that part of Bexar County tract 1616 included in block 301; and that part of Bexar County tract 1710 included in block groups 1, 2, 3, 7, and 8; and that part of Bexar County tract 1802 included in block groups 5 and 6; and that part of Bexar County tract 1808 included in block groups 2 and 3 and blocks 101, 102, 103, 104, 105, 106, 107, 108, 109, 110A, 110C, 112, 113, 114, and 115; and that part of Bexar County tract 1813 included in block group 6; and that part of Bexar County tract 1815.02 included in block groups 1, 2, 3, and 4; and that part of Bexar County tract 1816 included in block groups 4 and 5 and blocks 108B, 109B, 110B, 111B, 301, 302, 303, 304, 603, 604, 605, 606, 607, and 608; and that part of Bexar County tract 1818.02 included in block 101; and that part of Bexar County tract 1818.03 included in block group 2 and blocks 101, 102A, 102B, 102C, 103, 104, 105, 106, 107, 119, 302, 303, 304, 305, 306, and 307; and that part of Bexar County tract 1818.04 included in blocks 102, 103, 104, 105, 106, 107, 108, 109, and 110.

(h) District 8 is composed of that part of Comal County tract 3101 included in block group 5 and blocks 101, 102A, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113A, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 130, 131, 132, 133, 134, 135, 142, 143, 144, 145, 146, 147, 148, 149, 150, 201, 202, 211, 212, 213, 214, 225, 226, 243, 244, 245, 301, 302, 303, 304, 305, 309, 310, 312, 315, 316, 317, 318, 319, 320, 321, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, and 499; and that part of Comal County tract 3102 included in block group 2 and blocks 110, 111, 118, 125, 127A, 145, 146, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, and 325; and that part of Comal County tract 3103 included in blocks 112B, 212, and 520; and that part of Comal County tract 3104.01 included in block groups 3, 4, 5, 6, and blocks 102, 103, 104, 115, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220A, 220B, 220C, 221, 222, 223, 224, and 225; and that part of Comal County tract 3104.02 included in blocks 201, 206, 207, 208, 302, 401, 402, 403, 404, 405, 406, 407, 408, 410, 411, 412, and 413; and that part of Comal County tract 3105 included in blocks 110, 111, 113, 114, 115, 116, 117, 122, 123, 124, 125, 126, 127, 128, 129, 130, 135, 136, 137, 138, 139, 140, 141, 142, 144, 145, 146, 147, 148, 149, 199X, 199Y, 210, 211, 212, 218, 219, 220, and 222; and that part of Comal County tract 3108 included in blocks 141, 142, 144, 145, 201, 202, 204, 205, 208, 212A, 212B, 214, 217, 218, 219, 220A, 220B, 220C, 221A, 221B, 222, 223A, 223B, 225, 226, 227, 228A, 228B, 228C, 229A, 229B, 230A, 230B, 231B, 232B, 251A, 251B, 252A, and 252B.

(i) District 9 is composed of that part of Comal County tract 3101 included in blocks 102B, 103, 113B, 114, 127, 128, 129, 136, 137, 138, 139, 140, 141, 203, 204, 205, 206, 207, 208, 209, 210, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 227, 306, 307, 308, 311, 313, 314, 322, 323, 324, 325, 326, 327, 431, and 432; and that part of Comal County tract 3102 included in blocks 101, 102, 103, 104, 105, 106, 107, 108, 109, 112, 113, 114, 115, 116, 117, 119, 120, 121, 122, 123, 124, 126, 127B, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 147, 199, and 324; and that part of Comal County tract 3103 included in block groups 3 and 4 and blocks 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112A, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 213, 214, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 521, 522, 523, 599, 599Y, and 599Z; and that part of Comal County tract 3104.01 included in blocks 101, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 199, and 220D; and that part of Comal County tract 3104.02 included in block group 1 and blocks 202, 203, 204, 205, 209, 210, 211, 212, 213, 301, 303, 304A, 304B, 305, 306, 307, 308, 309, 310, 311, 312, 313A, 313B, 314, 409, 414, 415, 416A, 416B, and 417; and that part of Comal County tract 3105 included in block groups 3 and 4 and blocks 101, 102, 103, 104, 105, 106, 107, 108, 109, 112, 118, 119, 120, 121, 131, 132, 133, 134, 143, 199Z, 201, 202, 203, 204, 205, 206, 207, 208, 209, 213, 214, 215, 216, 217, and 221; and that part of Comal County tract 3106.01 included in blocks 189 and 190; and that part of Comal County tract 3107 included in blocks 330, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342A, 342B, 343, 344A, 344B, 345, 346, 347, 348, 349, 350, 351, and 352; and that part of Comal County tract 3108 included in block group 3 and blocks 101A, 101B, 102, 103, 104, 105, 106A, 106B, 106C, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116A, 116B, 117, 118, 119A, 119B, 120, 121, 122, 123, 124A, 124B, 124C, 124D, 124E, 125A, 125B, 126A, 126B, 127, 128, 129, 130, 131, 132, 133, 134A, 134B, 134C, 135, 136, 137, 138, 139, 140, 143, 199, 203, 206, 207, 209, 210, 211, 213A, 213B, 215A, 215B, 216A, 216B, 216C, 224, 231A, 232A, 233A, 233B, 234A, 234B, 235, 236A, 236B, 237A, 237B, 238, 239A, 239B, 239C, 240, 241, 242, 243, 244A, 244B, 244C, 245A, 245B, 246, 247, 248, 249A, 249B, 250A, 250B, 253, 254A, 254B, 255A, 255B, 256A, 256B, 257A, 257B, and 258; and that part of Comal County tract 3109 included in block group 3 and blocks 101, 102, 103, 104, 105, 106, 108, 110, 136, 137, 142, 143, 144, 145, 146, 147, 148, 149A, 149B, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165A, 165B, 166, 167A, 167B, 168, 169A, 169B, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180A, 180B, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277A, 277B, 277C, 277D, 277E, 278, 279A, 279B, 280, 281, 282, 283A, 283B, 284, 285, 286, 287, 288A, 288B, 289, 290, 291A, 291B, 292, 293, 294A, 294B, 295, 296, and 297; Guadalupe County tracts 2105.01, 2106.01, 2106.02, 2107.01, and 2107.03; and that part of Guadalupe County tract 2105.02 included in block groups 1 and 4 and blocks 201A, 201B, 201C, 202A, 202B, 203, 204, 205, 206, 207, 208, 209, 210A, 210B, 211A, 211B, 212, 213A, 213B, 213C, 213D, 214, 215A, 215B, 216A, 216B, 217A, 217B, 218A, 218B, 218C, 219, 220, 221, 222, 223, 224, 225, 226, 227A, 227B, 227C, 227D, 228, 229, 230A, 230B, 231, 232, 233, 234, 235A, 235B, 236, 237, 238, 239, 240, 241, 243, 299Y, 299Z, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318A, 318B, 319, 320, 321, 322, 323, 324A, 324B, 324C, 325A, 325B, 325C, 327A, 327B, 328A, 328B, 329, 330, 331, 332, 333, 334, and 335; and that part of Guadalupe County tract 2107.04 included in block groups 1, 2, 4, 5, 6, and blocks 301, 302, 303,

304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315A, 315B, 315C, 315D, 316, 317, and 318; and that part of Guadalupe County tract 2108 included in block groups 6 and 7 and blocks 415, 416A, 416B, 419, 501A, 501B, 502A, 502B, 503, 504, 505, 506, 507A, 507B, 508A, 508B, 509A, 509B, 510A, 510B, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529A, 529B, 529C, 529D, 530, 531, 532, 533, 534A, 534B, 534C, 534D, 535A, 535B, 536A, 536B, 536C, 537A, 537B, 538, 539, 555, 556A, 556B, 557, 558A, 558B, 558C, 559, 560A, 560B, 561A, 561B, 562A, 562B, 563A, 563B, and 564. District 9 also includes that part of Comal County tract 3106.01 included in block 194; that part of Comal County tract 3107 included in block 331; that part of Comal County tract 3109 included in block 141; that part of Guadalupe County tract 2105.02 included in block 242; and that part of Guadalupe County tract 2107.04 included in block 319.

(j) District 10 is composed of that part of Hays County tract 0101 included in blocks 137, 138, 142, 148, 237, 238, 239, 240, 241, 242, 243, 244, and 245; and that part of Hays County tract 0103.01 included in blocks 301, 302, 303, 304, 305, 306, 307, 402, 408, 409, 410, 411, 413, 503A, 503B, 504, 505, 506, 510B, 513, 514, 517A, 517B, 518, 519A, 519B, 519C, 520A, 520B, 521A, 521B, 522, 523, 525, 526A, 526B, 527, 528, 529, and 530; and that part of Hays County tract 0103.02 included in blocks 101, 102, 103, 104, 107, 109, 110, 111, 112, 113, 114, 201, 202A, 202B, 203A, 203B, 204, 205, 207, 208, 209, 210, 211, 212, 213, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228A, 228B, 229, 230, 231, 232, 233A, 233B, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, and 251; and that part of Hays County tract 0104 included in block group 1 and blocks 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 301, 302, 303, 304, 305, 306B, 307, 308, 309A, 309B, 316A, 316B, 317A, 317B, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330A, 330B, 331A, 331B, 332, 333, 334, 335, 336, 337A, 337B, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, and 399R; and that part of Hays County tract 0105 included in block group 2 and blocks 113, 114, 115, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 313, 314, 408, 409A, 409B, 411, 412, 413A, 413B, 414, 415, 416A, 416B, and 417; and that part of Hays County tract 0106 included in blocks 332, 333, 334, 335, and 337.

(k) District 11 is composed of Caldwell County BNA 9605 and that part of Caldwell County BNA 9601 included in blocks 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 348, 349, 350, 354, 355, 356, 357, 358, 359, 360, 361, 362, 405A, 405B, 405C, 405D, 405E, 406, 407A, 407B, 408, 409, 410A, 410B, 410C, 410D, 410E, 411A, 411B, 412A, 412B, 412C, 412D, 413A, 413B, 413C, 414A, 414B, 415B, 416A, 416B, 416C, 417, 418A, 418B, 419A, 419B, 420, 421, 422A, 422B, 423, 424, 425, 426, 427, 428, 429, 430A, 430B, 431A, 431B, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441A, 441B, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, and 499; and that part of Caldwell County BNA 9602 included in blocks 209, 217, 218, 308, 309A, 309B, 309C, 310, 311, 312, 313, 314A, 314B, 314C, 314D, 315A, 315B, 316, 317, 318A, 318B, 319A, 319B, 319C, 320, 328, 329, 332, 333, and 334; and that part of Caldwell County BNA 9603 included in block groups 3 and 4 and blocks 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 217, and 218;

and that part of Caldwell County BNA 9604 included in block group 3 and blocks 102, 103, 106, 107, 108, 109, 110, 119, 120, 121, 122, 123, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238A, 238B, 239, 240, 241, 242, 243, 244, and 245; and that part of Caldwell County BNA 9606 included in blocks 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 246, 288, 293, and 294; and that part of Caldwell County BNA 9607 included in block groups 4 and 5 and blocks 103, 104, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120A, 120B, 134, 137, 138, 139, 140, 141, 142A, 142B, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 204, 205, 206, 207, 208, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 258, 259, 260, 261, 262, 263, 264, 265, 266, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313A, 313B, 314, 315, 320, 321, 322, 323, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, and 347; Hays County tract 0102; and that part of Hays County tract 0101 included in blocks 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 139, 140, 141, 143, 144, 145, 146, 147, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, and 236; and that part of Hays County tract 0103.01 included in block groups 1 and 2 and blocks 308, 309, 310, 311, 401, 403, 404, 405, 406, 407, 412, 414, 415, 416, 417, 418, 501A, 501B, 501C, 501D, 502A, 502B, 507A, 507B, 508A, 508B, 509A, 509B, 510A, 511, 512, 515, 516, and 524; and that part of Hays County tract 0103.02 included in blocks 105, 106, 108A, 108B, 206, 214A, 214B, 215, and 216; and that part of Hays County tract 0104 included in blocks 216, 217, 218, 219A, 219B, 220, 221A, 221B, 306A, 310A, 310B, 311, 312, 313, 314, and 315; and that part of Hays County tract 0105 included in blocks 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 116, 134, 135, 136, 137, 312, 401, 402A, 402B, 403A, 403B, 404, 405, 406, 407, 410A, 410B, 418, 419A, 419B, 420A, 420B, 421, 422, and 423; and that part of Hays County tract 0106 included in block groups 1 and 2 and blocks 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 336, 401A, 401B, 401C, 401D, 401E, 401F, 402, 403, 404, 405, 406, 407, 408, 411, 412, 413, 414, 415, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435A, 435B, 436, 437, 438, 439A, 439B, 440, 441, 442A, 442B, 442C, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, and 477; and that part of Hays County tract 0107 included in block groups 1, 3, 4, and blocks 201, 202, 203, 204, 205, 206, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255A, 255B, 256, 257, 258, 259, 260, 261, 262A, 262B, 262C, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293A, 293B, 294, 295, and 296; and that part of Hays County tract 0108.02 included in blocks 130, 137, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 501, 502, 524, 525, 532, 533, 534, 655, 656, 657, 663, 664, 673, 674, 675, and 676; and that part of Hays County tract 0109.02 included in blocks 123, 126, 127, 132B, 312, 313A, 313B, and 399; and that part of Hays County tract 0109.04 included in block groups 2, 4, 5, and blocks 101, 102A, 102B, 102C, 102D, 112, 113A, 113B, 113C, 114A, 114B, 114C, 115A, 115B, 301A, 301B, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 317, 318A, 318B,

319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333A, 333B, 334, 335, 336, 337, 338, 339, 340, 341, and 342. District 11 also includes that part of Caldwell County BNA 9601 included in block 415A; that part of Hays County tract 0106 included in block 409; that part of Hays County tract 0108.02 included in blocks 526 and 601; that part of Hays County tract 0109.02 included in block 125; that part of Hays County tract 0109.03 included in block 223; and that part of Hays County tract 0109.04 included in block 104.

(l) District 12 is composed of Medina County BNA 9902 and that part of Medina County BNA 9903 included in blocks 201A, 201B, 201C, 202, 203, 204A, 204B, 204C, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223A, 223B, 223C, 224, 225A, 225B, 226A, 226B, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242A, 243, 244, 245, 247, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 358, 359A, 362A, 362B, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 401, 402A, 402B, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, and 435; and that part of Medina County BNA 9905 included in blocks 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153A, 153B, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173A, 173B, 174, 175, 176, 177, 178, 181A, 181B, 182, 201, 202, 203, 215, 222, 223, 224, 225, 235, 301, 302, 303, 307, 308, 315, 338, 350, 351, 353, 362, 430, 431, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 461, 462, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, and 499; and that part of Medina County BNA 9906 included in blocks 152, 153, 154, 155, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 226, 227, 228, 229, 230, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, and 274; and that part of Medina County BNA 9907 included in blocks 101, 111, 112, 113, 114, 115, 116, 117, 118, 133, 134, 135, 136, 137, 138, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 165, 211A, 212, 213, 214, 215, 219A, 219B, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 340A, 340B, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358A, 358B, 359, 360A, 360B, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371A, 371B, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, and 413A.

(m) District 13 is composed of that part of Atascosa County BNA 9602 included in blocks 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146A, 146B, 147A, 147B, 207, 208, 209, 210, 211, 501A, 501B, 502, 503, 504, 505A, 505B, 506, 507A, 507B, 508A, 508B, 509, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531A,

531B, 532A, 532B, 533, 534A, 534B, 535, and 536; Medina County BNAs 9901 and 9904; and that part of Medina County BNA 9903 included in block group 1 and blocks 242B, 242C, 246A, 246B, 246C, 246D, 248, 249, 250, 251, 357A, 357B, 359B, 360, 361, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 436A, 436B, and 437; and that part of Medina County BNA 9905 included in blocks 179, 180, 183A, 183B, 184A, 184B, 185, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 216, 217, 218, 219, 220, 221, 226, 227, 228, 229, 230, 231, 232, 233, 234, 236, 237, 238, 239, 240, 241, 242, 243, 244, 304, 305, 306, 309, 310, 311, 312, 313, 314, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 352, 354, 355, 356, 357, 358, 359, 360A, 360B, 361, 363, 364, 365, 366, 367, 368, 369A, 369B, 370, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 432, 433, 434, 435, 436, 458, 459, 460, 463, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, and 497; and that part of Medina County BNA 9906 included in blocks 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 156, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 231, 232, 233, 275, 276, 277, 278, 279, 280, and 281; and that part of Medina County BNA 9907 included in blocks 102, 103, 104, 105, 106, 107A, 107B, 107C, 108, 109, 110, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 139, 140, 141, 142, 143, 144, 145, 146, 157, 158, 159, 160, 161, 162, 163, 164, 166, 167, 201, 202, 203, 204, 205, 206A, 206B, 207, 208, 209, 210, 211B, 216, 217A, 217B, 218, 232A, 232B, 233, 234, 235, 236, 237, 238, 301, 302A, 302B, 303, 304, 305, 306, 307, 308, 309A, 309B, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 333, 334, 335, 336, 337, 338, 339, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413B, 414, 415, 416, 417, 418, 419, 420A, 420B, 420C, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, and 448. District 13 also includes that part of Atascosa County BNA 9602 included in block 510.

(n) District 14 is composed of that part of Uvalde County BNA 9502 included in block groups 3 and 4 and blocks 102, 103, 106, 117, 140, 142, 201, 202, 203, 204, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216A, 216B, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239A, 239B, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 278, 279, 280, 281, 282, 283, 284, 285, 286, 288, 296, 297, 299, 299R, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, and 541; and that part of Uvalde County BNA 9503 included in block groups 2, 3, 4, 5, 6, and blocks 101B, 101C, 102, 103, 104, 105, 106, 107, 108, 109A, 109B, 110, 111, 112, 113, 114, 115, 116A, 116B, 116C, 117A, 117B, 118, 119, 120, 121, 122, 123, 124, 126, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 164A, 164B, 165, 166, 167, 168, 169, 170, 171, 172, 173, and 174; and that part of Uvalde County BNA 9504 included in block group 4 and blocks 314, 316, and 319; and that part of Uvalde County BNA 9505 included in block groups 2 and 3 and blocks 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126A, 126B, 126C, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139A, 139B, 140, 141, 142A, 142B, 143A, 143B, 144, 145, 146, 147, 148, 149A, 149B, 150, 151, and 152.

(o) District 15 is composed of Uvalde County BNA 9501 and that part of Uvalde

County BNA 9502 included in block group 6 and blocks 101, 104, 105, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 141, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195A, 195B, 196A, 196B, 197, 205, 275, 276, 277, 287, 289, 290, 291, 292, 293, 294, 295, 501, 502, 503, 504, 505, 506, 507A, 507B, 508, 509A, 509B, 509C, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, and 597; and that part of Uvalde County BNA 9503 included in blocks 101A, 101D, 125, 127, 128, 129, 130, 131, 132, 157A, 157B, 158, 159, 160, 161, 162, 163, 175A, and 175B; and that part of Uvalde County BNA 9504 included in block groups 1 and 2 and blocks 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 315, 317, 318, 320, 321, 322, 323, 324, 325, 326, 327, and 328; and that part of Uvalde County BNA 9505 included in blocks 101A, 101B, 102, 103, 104, 105, 106, 107, 108, 109, 110A, 110B, 110C, 111, and 112.

(p) Each district described by this section includes only the part of the described geographic area that is included in the boundaries of the authority as provided by Section 1.04 of this article.

(q) In this section, the terms "tract," "block," "block group," and "BNA" (block numbering area) mean the geographic areas identified by those terms in the Redistricting Map Data Base for the State of Texas prepared by the Texas Legislative Council and distributed by the council to the State Data Center, Texas Department of Commerce, on March 22, 1991, for public distribution by the State Data Center.

Act of May 29, 1995, 74th Leg., R.S., ch. 261, § 1, 1995 Tex. Gen. Laws 2505.

SECTION 1.094 MODIFICATION OF DISTRICT LINES AFTER DECENNIAL CENSUS. (a) After each federal decennial census, or as needed, the board may modify the district lines described in Section 1.093 of this article. During March or April of an even-numbered year, the board by order may modify the district lines described in Section 1.093 of this article to provide that the lines do not divide a county election precinct except as necessary to follow the authority's jurisdictional boundaries.

(b) Modifications under this section may not result in:

(1) the dilution of voting strength of a group covered by the federal Voting Rights Act (42 U.S.C. Section 1973c et seq.), as amended;

(2) a dilution of representation of a group covered by the federal Voting Rights Act (42 U.S.C. Section 1973c et seq.), as amended;

(3) discouraging participation by a group covered by the federal Voting Rights Act (42 U.S.C. Section 1973c et seq.), as amended; or

(4) increasing or decreasing the number of districts in any county.

(c) A county election precinct established by a county in accordance with Chapter 42, Election Code, may not contain territory from more than one authority district.

Act of May 6, 1999, 76th Leg., R.S., ch. 163, § 1, 1999 Tex. Gen. Laws 634.

SECTION 1.10 SOUTH CENTRAL TEXAS WATER ADVISORY COMMITTEE. (a) The South Central Texas Water Advisory Committee shall advise the board on downstream water rights and issues. The advisory committee consists of one member appointed by the governing body of each of the following counties and municipalities, except that Atascosa County may not have a representative on the advisory committee when the county has a representative member on the board:

(1) Atascosa;
(2) Caldwell;
(3) Calhoun;
(4) Comal;
(5) DeWitt;
(6) Goliad;
(7) Gonzales;
(8) Guadalupe;
(9) Hays;
(10) Karnes;
(11) Medina;
(12) Nueces;
(13) Refugio;
(14) San Patricio;
(15) Uvalde;
(16) Victoria;
(17) Wilson;
(18) the City of San Antonio;
(19) the City of Victoria; and
(20) the City of Corpus Christi.

(b) A member must be a resident or qualified voter of or engaged in business in a county all or part of which is included in the member's area of representation.

(c) The reimbursement of an advisory committee member for expenses is on the same terms as the reimbursement of board members. An advisory committee member is not entitled to compensation.

(d) An advisory committee member holds office until a successor is appointed.

(e) The authority shall send to each advisory committee member all the communications of the authority that are extended to board members and may participate in board meetings to represent downstream water supply concerns and assist in solutions to those concerns. Advisory committee members may not vote on a board decision.

(f) The advisory committee by resolution may request the board to reconsider any board action that is considered prejudicial to downstream water interests. If the board review does not result in a resolution satisfactory to the advisory committee, the advisory committee by resolution may request the commission to review the action. The commission shall review the action and may make a recommendation to the board. If the board determines that the board's action is contrary to an action of the commission affecting downstream interests, the board shall reverse itself.

(g) The advisory committee shall meet to organize and elect a presiding officer.

(h) The presiding officer of the advisory committee shall submit a report assessing the effectiveness of the authority to the commission and the authority by March 31 of each even - numbered year. The report must assess the effect on downstream water rights of the management of the aquifer. The authority shall consider the report in managing the authority's affairs.

(i) The advisory committee's duties include:

(1) assisting the authority in developing the authority's demand management plan for the county that the representative represents;

(2) assisting the authority to implement the demand management plan; and

(3) performing other duties requested by the board that the representative may practicably perform.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1.10, 1993 Tex. Gen. Laws 2350.

SECTION 1.11 GENERAL POWERS AND DUTIES OF THE BOARD AND AUTHORITY. (a) The board shall adopt rules necessary to carry out the authority's powers and duties under this article, including rules governing procedures of the board and authority.

(b) The authority shall ensure compliance with permitting, metering, and reporting requirements and shall regulate permits.

(c) The authority may issue orders to enforce this article or its rules.

(d) The authority may:

(1) issue or administer grants, loans, or other financial assistance to water users for water conservation and water reuse;

(2) enter into contracts;

(3) sue and be sued in its own name;

(4) receive gifts, grants, awards, and loans for use in carrying out its powers

and duties;

(5) hire an executive director to be the chief administrator of the authority and other employees as necessary to carry out its powers and duties;

(6) delegate the power to hire employees to the executive director of the authority;

(7) own real and personal property;

(8) close abandoned, wasteful, or dangerous wells;

(9) hold permits under state law or under federal law pertaining to the Endangered Species Act of 1973 (16 U.S.C. Section 1531 et seq.) and its amendments;

(10) enforce Chapter 32, Water Code, and commission rules adopted under that Act within the authority's boundaries; and

(11) require to be furnished to the authority water well drillers' logs that are required by Chapter 32, Water Code, to be kept and furnished to the commission.

(e) The authority shall make a good faith effort to award to minority-owned and women-owned businesses contracts issued under the powers and duties granted under this section in the amount of 20 percent of the total amount of those contracts. Not later than October 31 of every even-numbered year, the authority shall file with the governor and each house of the legislature a written report containing the following information for the previous two years for all businesses, for minority-owned and women-owned businesses classified by minority group and within each minority group classification, by gender, the total number of contracts issued by the authority; the total dollar amount of those contracts; and the total number of businesses submitting bids or proposals relating to such contracts and to the purpose of such contracts. In this subsection:

(1) "Minority-owned business" means a business entity at least 51 percent of which is owned by members of a minority group or, in the case of a corporation, at least 51 percent of the shares of which are owned by members of a minority group, and that is managed and controlled by members of a minority group in its daily operations.

(2) "Minority group" includes:

(A) African Americans;
(B) American Indians;
(C) Asian Americans; and
(D) Mexican Americans and other Americans of Hispanic origin.

(3) "Women-owned business" means a business entity at least 51 percent of which is owned by women or, in the case of a corporation, at least 51 percent of the shares of which are owned by women, and that is managed and controlled by women in its daily operations.

(f) The authority may contract with a person who uses water from the aquifer for the authority or that person to construct, operate, own, finance, and maintain water supply facilities. Management fees or special fees may not be used for purchasing or operating these facilities. For the purpose of this subsection, "water supply facility" includes a dam, reservoir, treatment facility, transmission facility, or recharge project.

(g) The authority has the power of eminent domain. The authority may not acquire rights to underground water by the power of eminent domain.

(h) *Repealed by Act of May 28, 2001, 77th Leg., R.S., ch. 966, § 6.03, 2001 Tex. Gen. Laws 1880, 1962.*

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1.11, 1993 Tex. Gen. Laws 2350; as amended by Act of May 28, 2001, 77th Leg., R.S., ch. 966, § 6.03, 2001 Tex. Gen. Laws 1880, 1962.

SECTION 1.115 RULEMAKING PROCEDURES. (a) The authority shall comply with the procedures provided by this section in adopting rules.

(b) The authority shall provide, by using the United States mail, notice of a proposed rule to all applicants and permit holders. The authority shall publish in a newspaper of general circulation within the boundaries of the authority notice of a public hearing on a proposed rule at least 14 days before the date of the public hearing on the rule. The notice must include:

(1) the date, time, and place of the public hearing;

(2) a statement of the general subject matter of the proposed rule;

(3) the procedures for obtaining copies of the proposed rule and for submitting comments; and

(4) the deadline for submitting comments.

(c) The board shall allow at least 45 days for comment on a proposed rule, other than an emergency rule, before the board adopts the rule. The board shall consider all written comments and shall, in the order adopting the rule, state the reasons and justification for the rule and the authority's responses to the written comments.

(d) The meeting at which a proposed rule is adopted as a final rule must be an open meeting, and the public must be allowed to make comments on the proposed rule and the agency responses. A proposed rule becomes final and effective on the 10th day after the date the rule is adopted by the board.

(e) Notwithstanding Subsections (b) - (d) of this section, the board may adopt emergency rules in anticipation of imminent harm to human health, safety, or welfare, or if compliance with the procedures provided in Subsections (b) - (d) of this section would prevent an effective response to emergency aquifer or springflow conditions. The board may adopt emergency rules five days after providing public notice. Emergency rules are effective

immediately on adoption for a period of 120 days and may be renewed once for not more than 60 days.

(f) Subsections (b) - (d) of this section do not apply to the adoption of bylaws or internal procedures of the board and authority.

Act of May 28, 2001, 77th Leg., R.S., ch. 966, § 6.01, 2001 Tex. Gen. Laws 1880, 1961.[1]

SECTION 1.12 SUNSET COMMISSION REVIEW. (a) *Repealed by Act of June 1, 2003, 78th Leg., R.S., ch. 1112, § 6.01(4), 2003 Tex. Gen. Laws 3193.*

(b) *Repealed by Act of June 1, 2003, 78th Leg., R.S., ch. 1112, § 6.01(4), 2003 Tex. Gen. Laws 3193.*

(c) *Repealed by Act of June 1, 2003, 78th Leg., R.S., ch. 1112, § 6.01(4), 2003 Tex. Gen. Laws 3193.*

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1, 1993 Tex. Gen. Laws 2350; as amended by Act of June 1, 2003, 78th Leg., R.S., ch. 1112, § 6.01(4), 2003 Tex. Gen. Laws 3193.

SECTION 1.13 REUSE AUTHORIZED. Any regulation of the withdrawal of water from the aquifer must allow for credit to be given for certified reuse of the water. For regulatory credit, the authority or a local underground water conservation district must certify:

(1) the lawful use and reuse of aquifer water;

(2) the amount of aquifer water to be used; and

(3) the amount of aquifer withdrawals replaced by reuse.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1, 1993 Tex. Gen. Laws 2350.

SECTION 1.14 WITHDRAWALS. (a) Authorizations to withdraw water from the aquifer and all authorizations and rights to make a withdrawal under this Act shall be limited in accordance with this section to:

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[1] Although not codified as an amendment to the Act, §6.04 and 6.05 of ch. 966 are relevant to the Rulemaking Procedures of the Authority and provide as follows:

> **SECTION 6.04** A rule adopted by the Edwards Aquifer Authority before the effective date of this Act remains in effect until repealed, amended, or readopted. Nothing contained in this article shall be construed as repealing the applicability of the open meetings law, Chapter 551, Government Code, or the public information law, Chapter 552, Government Code, to the Edwards Aquifer Authority.
>
> **SECTION 6.05** The rules in 31 T.A.C. Part 20 shall continue in effect until replaced by rules adopted pursuant to this article. The secretary of state shall delete 31 T.A.C. Part 20.

(1) protect the water quality of the aquifer;

(2) protect the water quality of the surface streams to which the aquifer provides springflow;

(3) achieve water conservation;

(4) maximize the beneficial use of water available for withdrawal from the aquifer;

(5) protect aquatic and wildlife habitat;

(6) protect species that are designated as threatened or endangered under applicable federal or state law; and

(7) provide for instream uses, bays, and estuaries.

(b) Except as provided by Subsections (d), (f), and (h) of this section and Section 1.26 of this article, for the period ending December 31, 2007, the amount of permitted withdrawals from the aquifer may not exceed 450,000 acre-feet of water for each calendar year.

(c) Except as provided by Subsections (d), (f), and (h) of this section and Section 1.26 of this article, for the period beginning January 1, 2008, the amount of permitted withdrawals from the aquifer may not exceed 400,000 acre-feet of water for each calendar year.

(d) If, through studies and implementation of water management strategies, including conservation, springflow augmentation, diversions downstream of the springs, reuse, supplemental recharge, conjunctive management of surface and subsurface water, and drought management plans, the authority determines that additional supplies are available from the aquifer, the authority, in consultation with appropriate state and federal agencies, may review and may increase the maximum amount of withdrawals provided by this section and set a different maximum amount of withdrawals.

(e) The authority may not allow withdrawals from the aquifer through wells drilled after June 1, 1993, except additional water as provided by Subsection (d) and then on an interruptible basis.

(f) If the level of the aquifer is equal to or greater than 650 feet above mean sea level as measured at Well J-17, the authority may authorize withdrawal from the San Antonio pool, on an uninterruptible basis, of permitted amounts. If the level of the aquifer is equal to or greater than 845 feet at Well J-27, the authority may authorize withdrawal from the Uvalde pool, on an uninterruptible basis, of permitted amounts. The authority shall limit the additional withdrawals to ensure that springflows are not affected during critical drought conditions.

(g) The authority by rule may define other pools within the aquifer, in accordance with hydrogeologic research, and may establish index wells for any pool to monitor the level of the aquifer to aid the regulation of withdrawals from the pools.

(h) To accomplish the purposes of this article, by June 1, 1994, 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.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1, 1993 Tex. Gen. Laws 2350.

SECTION 1.15 PERMIT REQUIRED. (a) The authority shall manage withdrawals from the aquifer and shall manage all withdrawal points from the aquifer as provided by this Act.

(b) Except as provided by Sections 1.17 and 1.33 of this article, a person may not withdraw water from the aquifer or begin construction of a well or other works designed for the withdrawal of water from the aquifer without obtaining a permit from the authority.

(c) The authority may issue regular permits, term permits, and emergency permits.

(d) Each permit must specify the maximum rate and total volume of water that the water user may withdraw in a calendar year.

(e) The authority shall conduct a contested case hearing on a permit application if a person with a personal justiciable interest related to the application requests a hearing on the application.

(f) The authority shall adopt rules establishing procedures for contested case hearings consistent with Subchapters C, D, and F, Chapter 2001, Government Code.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1.15, 1993 Tex. Gen. Laws 2350; as amended by Act of May 28, 2001, 77th Leg., R.S., ch. 966, § 6.02, 2001 Tex. Gen. Laws 1880, 1961.

SECTION 1.16 DECLARATIONS OF HISTORICAL USE; INITIAL REGULAR PERMITS. (a) An existing user may apply for an initial regular permit by filing a declaration of historical use of underground water withdrawn from the aquifer during the historical period from June 1, 1972, through May 31, 1993.

(b) An existing user's declaration of historical use must be filed on or before March 1, 1994, on a form prescribed by the board. An applicant for a permit must timely pay all application fees required by the board. An owner of a well used for irrigation must include additional documentation of the number of acres irrigated during the historical period provided by Subsection (a) of this section.

(c) An owner of a well from which the water will be used exclusively for domestic use or watering livestock and that is exempt under Section 1.33 of this article is not required to file a declaration of historical use.

(d) The board shall grant an initial regular permit to an existing user who:

(1) files a declaration and pays fees as required by this section; and

(2) establishes by convincing evidence beneficial use of underground water from the aquifer.

(e) To the extent water is available for permitting, the board shall issue the existing user a permit for withdrawal of an amount of water equal to the user's maximum beneficial use of water without waste during any one calendar year of the historical period. If a water user does not have historical use for a full year, then the authority shall issue a permit for withdrawal based on an amount of water that would normally be beneficially used without waste for the intended purpose for a calendar year. If the total amount of water determined to have been beneficially used without waste under this subsection exceeds the amount of water available for permitting, the authority shall adjust the amount of water authorized for withdrawal under the permits proportionately to meet the amount available for permitting. An existing irrigation user shall receive a permit for not less than two acre-feet a year for each acre of land the user actually irrigated in any one calendar year during the historical period. An existing user who has operated a well for three or more years during the historical period shall receive a permit for at least the average amount of water withdrawn annually during the historical period.

(f) The board by rule shall consider the equitable treatment of a person whose historic use has been affected by a requirement of or participation in a federal program.

(g) The authority shall issue an initial regular permit without a term, and an initial regular permit remains in effect until the permit is abandoned, cancelled, or retired.

(h) The board shall notify each permit holder that the permit is subject to limitations as provided by this article.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1.16, 1993 Tex. Gen. Laws 2350.

SECTION 1.17 INTERIM AUTHORIZATION. (a) A person who, on the effective date of this article, owns a producing well that withdraws water from the aquifer may continue to withdraw and beneficially use water without waste until final action on permits by the authority, if:

(1) the well is in compliance with all statutes and rules relating to well construction, approval, location, spacing, and operation; and

(2) by March 1, 1994, the person files a declaration of historical use on a form as required by the authority.

(b) Use under interim authorization may not exceed on an annual basis the historical, maximum, beneficial use of water without waste during any one calendar year as evidenced by the person's declaration of historical use calculated in accordance with Subsection (e) of Section 1.16 of this article, unless that amount is otherwise determined by the authority.

(c) Use under this section is subject to the authority's comprehensive management

plan and rules adopted by the authority.

(d) Interim authorization for a well under this section ends on:

(1) entry of a final and appealable order by the authority acting on the application for the well; or

(2) March 1, 1994, if the well owner has not filed a declaration of historical use.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1.17, 1993 Tex. Gen. Laws 2350.

SECTION 1.18 ADDITIONAL REGULAR PERMITS. (a) To the extent water is available for permitting after the issuance of permits to existing users, the authority may issue additional regular permits, subject to limits on the total amount of permitted withdrawals determined under Section 1.14 of this article.

(b) The authority may not consider or take action on an application relating to a proposed or existing well of which there is no evidence of actual beneficial use before June 1, 1993, until a final determination has been made on all initial regular permit applications submitted on or before the initial application date of March 1, 1994.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1.18, 1993 Tex. Gen. Laws 2350.

SECTION 1.19 TERM PERMITS. (a) The authority may issue interruptible term permits for withdrawal for any period the authority considers feasible, but may not issue a term permit for a period of more than 10 years.

(b) A holder of a term permit may not withdraw water from the San Antonio pool of the aquifer unless the level of the aquifer is higher than 665 feet above sea level, as measured at Well J-17.

(c) A holder of a term permit may not withdraw water from the Uvalde pool of the aquifer unless the level of the aquifer is higher than 865 feet above sea level, as measured at Well J-27.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1.19, 1993 Tex. Gen. Laws 2350.

SECTION 1.20 EMERGENCY PERMITS. (a) Emergency permits may be issued only to prevent the loss of life or to prevent severe, imminent threats to the public health or safety.

(b) The term of an emergency permit may not exceed 30 days, unless renewed.

(c) The board may renew an emergency permit.

(d) The holder of an emergency permit may withdraw water from the aquifer without regard to its effect on other permit holders.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1.20, 1993 Tex. Gen. Laws 2350.

SECTION 1.21 PERMIT RETIREMENT. (a) The authority shall prepare and implement a plan for reducing, by January 1, 2008, the maximum annual volume of water authorized to be withdrawn from the aquifer under regular permits to 400,000 acre-feet a year or the adjusted amount determined under Subsection (d) of Section 1.14 of this article.

(b) The plan must be enforceable and must include water conservation and reuse measures, measures to retire water rights, and other water management measures designed to achieve the reduction levels or appropriate management of the resource.

(c) If, on or after January 1, 2008, the overall volume of water authorized to be withdrawn from the aquifer under regular permits is greater than 400,000 acre-feet a year or greater than the adjusted amount determined under Subsection (d) of Section 1.14 of this article, the maximum authorized withdrawal of each regular permit shall be immediately reduced by an equal percentage as is necessary to reduce overall maximum demand to 400,000 acre-feet a year or the adjusted amount, as appropriate. The amount reduced may be restored, in whole or in part, as other appropriate measures are implemented that maintain overall demand at or below the appropriate amount.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1.21, 1993 Tex. Gen. Laws 2350.

SECTION 1.22 ACQUISITION OF RIGHTS. (a) The authority may acquire permitted rights to use water from the aquifer for the purposes of:

(1) holding those rights in trust for sale or transfer of the water or the rights to persons within the authority's jurisdiction who may use water from the aquifer;

(2) holding those rights in trust as a means of managing overall demand on the aquifer;

(3) holding those rights for resale or retirement as a means of complying with pumping reduction requirements under this article; or

(4) retiring those rights, including those rights already permitted.

(b) The authority may acquire and hold permits or rights to appropriate surface water or groundwater from sources inside or outside of the authority's boundaries.

(c) Notwithstanding any other provisions of law, the authority's acquisition of permitted rights to use water from the aquifer is eligible for financial assistance from:

(1) the water supply account of the Texas Water Development Fund under Subchapter D, Chapter 17, Water Code;

(2) the water loan assistance fund under Subchapter C, Chapter 15, Water Code; and

(3) the revenue bond program under Subchapter I, Chapter 17, Water Code.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1.22, 1993 Tex. Gen. Laws 2350.

SECTION 1.23 CONSERVATION AND REUSE PLANS. (a) The authority may require holders of regular permits and holders of term permits to submit water conservation plans and, if appropriate, reuse plans for review and approval by the authority. The board by rule shall require a plan to be implemented after a reasonable time after a plan's approval.

(b) The board shall assist users in developing conservation or reuse plans.

(c) The authority biennially shall prepare and update enforceable and effective conservation and reuse plans as required by this article. Not later than January 1 of each odd-numbered year the authority shall submit the plan to the legislature.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1.23, 1993 Tex. Gen. Laws 2350.

SECTION 1.24 LOANS AND GRANTS. (a) Notwithstanding any other provision of law, the authority is eligible as a lender district to receive loans from the Texas Water Development Board under the agricultural water conservation bond program under Subchapter J, Chapter 17, Water Code.

(b) The authority may apply for, request, solicit, contract for, receive, and accept gifts, grants, and other assistance from any source for the purposes of this article.

(c) The authority may issue grants or make loans to finance the purchase or installation of equipment or facilities. If the authority issues a grant for a water conservation, reuse, or water management project, the authority may require the beneficiary to transfer to the authority permitted rights to aquifer water equal to a portion of the water conserved or made available by the project.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1.24, 1993 Tex. Gen. Laws 2350.

SECTION 1.25 COMPREHENSIVE MANAGEMENT PLAN. (a) Consistent with Section 1.14 of this article, the authority shall develop, by September 1, 1995, and implement a comprehensive water management plan that includes conservation, future supply, and demand management plans. The authority may not delegate the development of the plan under Section 1.42 of this article.

(b) The authority, in conjunction with the South Central Texas Water Advisory Committee, the Texas Water Development Board, and underground water conservation districts within the authority's boundaries, shall develop a 20-year plan for providing alternative supplies of water to the region, with five-year goals and objectives, to be implemented by the authority and reviewed annually by the appropriate state agencies and the Edwards Aquifer Legislative Oversight Committee. The authority, advisory committee, Texas Water Development Board, and districts, in developing the plan, shall:

(1) thoroughly investigate all alternative technologies;

(2) investigate mechanisms for providing financial assistance for alternative supplies through the Texas Water Development Board; and

(3) perform a cost-benefit and an environmental analysis.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1.25, 1993 Tex. Gen. Laws 2350.

SECTION 1.26 CRITICAL PERIOD MANAGEMENT PLAN. The authority shall prepare and coordinate implementation of a plan for critical period management on or before September 1, 1995. The mechanisms must:

(1) distinguish between discretionary use and nondiscretionary use;

(2) require reductions of all discretionary use to the maximum extent feasible;

(3) require utility pricing, to the maximum extent feasible, to limit discretionary use by the customers of water utilities; and

(4) require reduction of nondiscretionary use by permitted or contractual users, to the extent further reductions are necessary, in the reverse order of the following water use preferences:

(A) municipal, domestic, and livestock;
(B) industrial and crop irrigation;
(C) residential landscape irrigation;
(D) recreational and pleasure; and
(E) other uses that are authorized by law.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1.26, 1993 Tex. Gen. Laws 2350.

SECTION 1.27 RESEARCH. (a) The authority shall complete research on the technological feasibility of springflow enhancement and yield enhancement that, immediately before September 1, 1993, is being conducted by the Edwards Underground Water District.

(b) The authority may conduct research to:

(1) augment the springflow, enhance the recharge, and enhance the yield of the aquifer;

(2) monitor and protect water quality;

(3) manage water resources, including water conservation, water use and reuse, and drought management measures; and

(4) develop alternative supplies of water for users.

(c) The authority may schedule demonstration projects for purposes of Subsection (b)(1) of this section.

(d) The authority may contract with other persons to conduct research.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1.27, 1993 Tex. Gen. Laws 2350.

SECTION 1.28 TAX; BONDS. (a) The authority may not levy a property tax.

(b) The authority may issue revenue bonds to finance the purchase of land or the purchase, construction, or installation of facilities or equipment. The authority may not allow for any person to construct, acquire, or own facilities for transporting groundwater out of Uvalde County or Medina County.

(c) Bonds issued by the authority are subject to review and approval of the attorney general and the commission. If the attorney general finds that the bonds have been authorized in accordance with the law, the attorney general shall approve them, and the comptroller of public accounts shall register the bonds. Following approval and registration, the bonds are incontestable and are binding obligations according to their terms.

(d) The authority board may organize proceeds of the bonds into funds and accounts and may invest the proceeds as the authority board determines is appropriate.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1.28, 1993 Tex. Gen. Laws 2350.

SECTION 1.29 FEES. (a) The cost of reducing withdrawals or permit retirements must be borne:

(1) solely by users of the aquifer for reducing withdrawals from the level on the effective date of this article to 450,000 acre-feet a year, or the adjusted amount determined under Subsection (d) of Section 1.14 of this article for the period ending December 31, 2007; and

(2) equally by aquifer users and downstream water rights holders for permit retirements from 450,000 acre-feet a year, or the adjusted amount determined under Subsection (d) of Section 1.14 of this article for the period ending December 31, 2007, to 400,000 acre-feet a year, or the adjusted amount determined under Subsection (d) of Section 1.14 of this article, for the period beginning January 1, 2008.

(b) The authority shall assess equitable aquifer management fees based on aquifer use under the water management plan to finance its administrative expenses and programs authorized under this article. Each water district governed by Chapter 52, Water Code, that is within the authority's boundaries may contract with the authority to pay expenses of the authority through taxes in lieu of user fees to be paid by water users in the district. The contract must provide that the district will pay an amount equal to the amount that the water users in the district would have paid through user fees. The authority may not collect a total amount of fees and taxes that is more than is reasonably necessary for the administration of the authority.

(c) The authority shall also assess an equitable special fee based on permitted aquifer water rights to be used only to finance the retirement of rights necessary to meet the goals provided by Section 1.21 of this article. The authority shall set the equitable special fees on permitted aquifer users at a level sufficient to match the funds raised from the assessment of equitable special fees on downstream water rights holders.

(d) The commission shall assess equitable special fees on all downstream water rights holders in the Guadalupe River Basin to be used solely to finance the retirement of aquifer rights necessary to meet the goals provided by Section 1.21 of this article. Fees assessed under this subsection may not exceed one-half of the cost of permit retirements from 450,000 acre-feet a year, or the adjusted amount determined under Subsection (d) of Section 1.14 of this article, for the period ending December 31, 2007, to 400,000 acre-feet a year for the period beginning January 1, 2008. The authority shall report to the commission the estimated costs of the retirements. The amount of fees assessed under this subsection shall be determined in accordance with rules adopted by the commission for fees under the South Texas watermaster program with adjustments as necessary to ensure that fees are equitable between users, including priority and nonpriority hydroelectric users. A downstream water rights holder shall pay fees assessed under this subsection to the authority. A fee may not be assessed by the commission under this subsection on contractual deliveries of water stored in Canyon Lake that may be diverted downstream of the San Marcos Springs or Canyon Dam. A person or entity making a contractual sale of water stored upstream of Canyon Dam may not establish a systemwide rate that requires purchasers of upstream-stored water to pay the special fee assessed under this subsection.

(e) In developing an equitable fee structure under this section, the authority may establish different fee rates on a per acre-foot basis for different types of use. The fees must be equitable between types of uses. The fee rate for agricultural use shall be based on the volume of water withdrawn and may not be more than $2 per acre-foot. The authority shall assess the fees on the amount of water a permit holder is authorized to withdraw under the permit.

(f) The authority shall impose a permit application fee not to exceed $25.

(g) The authority may impose a registration application fee not to exceed $10.

(h) Special fees collected under Subsection (c) or (d) of this section may not be used to finance a surface water supply reservoir project.

(i) The authority shall provide money as necessary, but not to exceed five percent of the money collected under Subsection (d) of this section, to finance the South Central Texas Water Advisory Committee's administrative expenses and programs authorized under this article.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1.29, 1993 Tex. Gen. Laws 2350; as amended by Act of May 28, 2001, 77th Leg., R.S., ch. 966, § 2.61, 2001 Tex. Gen. Laws 1880, 1910.

SECTION 1.30 RIVER DIVERSIONS. (a) The commission may issue to an applicant a special permit to divert water from the Guadalupe River from a diversion point on the river downstream of the point where the river emerges as a spring.

(b) A permit issued to a person under this section must condition the diversion of water from the Guadalupe River on a limitation of withdrawals under the person's permit to withdraw water from the aquifer.

(c) A permit issued under this section must provide that the permit holder may divert water from the Guadalupe River only if:

(1) the diversion is made instead of a withdrawal from the aquifer to enhance the yield of the aquifer; and

(2) the diversion does not impair senior water rights or vested riparian rights.

(d) A permit issued in accordance with this section is subordinate to permitted water rights for which applications were submitted before May 31, 1993, and vested riparian rights.

(e) Sections 11.028 and 11.033, Water Code, do not apply to a permit issued under this section.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1.30, 1993 Tex. Gen. Laws 2350.

SECTION 1.31 MEASURING DEVICES. (a) The owner of a nonexempt well that withdraws water from the aquifer shall install and maintain a measuring device approved by the authority designed to indicate the flow rate and cumulative amount of water withdrawn by that well. This requirement may be waived by the authority on written request by a well owner to use an alternative method of determining the amount of water withdrawn.

(b) The authority is responsible for the costs of purchasing, installing, and maintaining measuring devices, if required, for an irrigation well in existence on September 1, 1993.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1.31, 1993 Tex. Gen. Laws 2350.

SECTION 1.32 REPORTS. Not later than March 1 of each year, and on a form prescribed by the authority, each holder of a permit shall file with the authority a written report of water use for the preceding calendar year.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1.32, 1993 Tex. Gen. Laws 2350.

SECTION 1.33 WELL METERING EXEMPTION. (a) A well that produces 25,000 gallons of water a day or less for domestic or livestock use is exempt from metering requirements.

(b) Exempt wells must register with the authority or with an underground water conservation district in which the well is located.

(c) A well within or serving a subdivision requiring platting does not qualify for an exempt use.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1.33, 1993 Tex. Gen. Laws 2350.

SECTION 1.34 TRANSFER OF RIGHTS. (a) Water withdrawn from the aquifer must be used within the boundaries of the authority.

(b) The authority by rule may establish a procedure by which a person who installs water conservation equipment may sell the water conserved.

(c) A permit holder may lease permitted water rights, but a holder of a permit for irrigation use may not lease more than 50 percent of the irrigation rights initially permitted. The user's remaining irrigation water rights must be used in accordance with the original permit and must pass with transfer of the irrigated land.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1.34, 1993 Tex. Gen. Laws 2350.

SECTION 1.35 PROHIBITIONS. (a) A person may not withdraw water from the aquifer except as authorized by a permit issued by the authority or by this article.

(b) A person holding a permit issued by the authority may not violate the terms or conditions of the permit.

(c) A person may not waste water withdrawn from the aquifer.

(d) A person may not pollute or contribute to the pollution of the aquifer.

(e) A person may not violate this article or a rule of the authority adopted under this article.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1.35, 1993 Tex. Gen. Laws 2350.

SECTION 1.36 ENFORCEMENT. (a) The authority may enter orders to enforce the terms and conditions of permits, orders, or rules issued or adopted under this article.

(b) The authority by rule shall provide for the suspension of a permit of any class for a failure to pay a required fee or a violation of a permit condition or order of the authority or a rule adopted by the authority.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1.36, 1993 Tex. Gen. Laws 2350.

SECTION 1.37 ADMINISTRATIVE PENALTY. (a) The authority may assess an administrative penalty against a person who violates this article or a rule adopted or order issued under this article in an amount of not less than $100 or more than $1,000 for each violation and for each day of a continuing violation.

(b) In determining the amount of the penalty, the authority shall consider:

(1) the history of previous violations;

(2) the amount necessary to deter future violations;

(3) efforts to correct the violation;

(4) enforcement costs relating to the violation; and

(5) any other matters that justice may require.

(c) If after an examination of the facts the authority concludes that the person did commit a violation, the authority may issue a preliminary report stating the facts on which it based its conclusion, recommending that an administrative penalty under this section be imposed, and recommending the amount of the proposed penalty.

(d) The authority shall give written notice of the report to the person charged with committing the violation. The notice must include a brief summary of the facts, a statement of the amount of the recommended penalty, and a statement of the person's right to an informal review of the occurrence of the violation, the amount of the penalty, or both.

(e) Not later than the 10th day after the date on which the person charged with committing the violation receives the notice, the person may either give the authority written consent to the report, including the recommended penalty, or make a written request for an informal review by the authority.

(f) If the person charged with committing the violation consents to the penalty recommended by the authority or fails timely to request an informal review, the authority shall assess the penalty. The authority shall give the person written notice of its action. The person shall pay the penalty not later than the 30th day after the date on which the person receives the notice.

(g) If the person charged with committing a violation requests an informal review as provided by Subsection (e) of this section, the authority shall conduct the review. The authority shall give the person written notice of the results of the review.

(h) Not later than the 10th day after the date on which the person charged with committing the violation receives the notice prescribed by Subsection (g) of this section, the person may make to the authority a written request for a hearing.

(i) If, after informal review, a person who has been ordered to pay a penalty fails to request a formal hearing in a timely manner, the authority shall assess the penalty. The authority shall give the person written notice of its action. The person shall pay the penalty not later than the 30th day after the date on which the person receives the notice.

(j) Within 30 days after the date the authority's order is final as provided by Subsection (c), Section 16, Administrative Procedure and Texas Register Act (Article 6252-13a, Vernon's Texas Civil Statutes), the person shall:

(1) pay the amount of the penalty;

(2) pay the amount of the penalty and file a petition for judicial review contesting the occurrence of the violation, the amount of the penalty, or both the occurrence of the violation and the amount of the penalty; or

(3) without paying the amount of the penalty, file a petition for judicial review contesting the occurrence of the violation, the amount of the penalty, or both the occurrence of the violation and the amount of the penalty.

(k) Within the 30-day period, a person who acts under Subdivision (3) of Subsection (j) of this section may:

(1) stay enforcement of the penalty by:

(A) paying the amount of the penalty to the court for placement in an escrow account; or

(B) giving to the court a supersedeas bond approved by the court for the amount of the penalty and that is effective until all judicial review of the authority's order is final; or

(2) request the court to stay enforcement of the penalty by:

(A) filing with the court a sworn affidavit of the person stating that the person is financially unable to pay the amount of the penalty and is financially unable to give the supersedeas bond; and

(B) giving a copy of the affidavit to the authority by certified mail.

(l) If the authority receives a copy of an affidavit under Subdivision (2) of Subsection (k) of this section, it may file with the court within five days after the date the copy is received a contest to the affidavit. The court shall hold a hearing on the facts alleged in the affidavit as soon as practicable and shall stay the enforcement of the penalty on finding that the alleged facts are true. The person who files an affidavit has the burden of proving that the person is financially unable to pay the amount of the penalty and to give a supersedeas bond.

(m) If the person does not pay the amount of the penalty and the enforcement of the penalty is not stayed, the authority may refer the matter to the attorney general for collection of the amount of the penalty.

(n) Judicial review of the order of the authority:

(1) is instituted by filing a petition as provided by Section 19, Administrative Procedure and Texas Register Act (Article 6252-13a, Vernon's Texas Civil Statutes); and

(2) is under the substantial evidence rule.

(o) If the court sustains the occurrence of the violation, the court may uphold or

reduce the amount of the penalty and order the person to pay the full or reduced amount of the penalty. If the court does not sustain the occurrence of the violation, the court shall order that no penalty is owed.

(p) When the judgment of the court becomes final, the court shall proceed under this subsection. If the person paid the amount of the penalty and if that amount is reduced or is not upheld by the court, the court shall order that the appropriate amount plus accrued interest be remitted to the person. The rate of the interest is the rate charged on loans to depository institutions by the New York Federal Reserve Bank, and the interest shall be paid for the period beginning on the date the penalty was paid and ending on the date the penalty is remitted. If the person gave a supersedeas bond and if the amount of the penalty is not upheld by the court, the court shall order the release of the bond. If the person gave a supersedeas bond and if the amount of the penalty is reduced, the court shall order the release of the bond after the person pays the amount.

(q) A penalty collected under this section shall be remitted to the authority.

(r) All proceedings under this section are subject to the Administrative Procedure and Texas Register Act (Article 6252-13a, Vernon's Texas Civil Statutes).

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1.37, 1993 Tex. Gen. Laws 2350.

SECTION 1.38 INJUNCTION BY AUTHORITY. The authority may file a civil suit in a state district court for an injunction to enforce this article. The authority may recover reasonable attorney fees in a suit under this section.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1.38, 1993 Tex. Gen. Laws 2350.

SECTION 1.39 SUIT FOR MANDAMUS. The commission may file a civil suit for an order of mandamus against the authority to compel the authority to perform its duties under this article or to compel the authority to enforce this article against a violator. The commission may recover attorney fees from the authority in a suit under this section.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1.39, 1993 Tex. Gen. Laws 2350.

SECTION 1.40 CIVIL PENALTY. (a) The commission or authority may file a civil action in state district court for a civil penalty for a violation of this article or a rule adopted or permit or order issued under this article.

(b) The commission or authority may recover a civil penalty of not less than $100 or more than $10,000 for each violation and for each day of violation and attorney fees.

(c) A civil penalty or attorney fees collected by the authority under this section shall be paid to the authority.

(d) A civil penalty or attorney fees collected by the commission under this section shall be deposited to the credit of the general revenue fund.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1.40, 1993 Tex. Gen. Laws 2350.

SECTION 1.41 REPEALER; TRANSFERS; RULES. (a) Chapter 99, Acts of the 56th Legislature, Regular Session, 1959 (Article 8280-219, Vernon's Texas Civil Statutes), is repealed, and the Edwards Underground Water District is abolished.

(b) All files and records of the Edwards Underground Water District pertaining to control, management, and operation of the district are transferred from the Edwards Underground Water District to the authority on the effective date of this article.

(c) All real and personal property, leases, rights, contracts, staff, and obligations of the Edwards Underground Water District are transferred to the authority on the effective date of this article.

(d) On September 1, 1993, all unobligated and unexpended funds of the Edwards Underground Water District shall be transferred to the authority.

(e) *Repealed by Act of May 28, 2001, 77th Leg., R.S., ch. 966, § 6.03, 2001 Tex. Gen. Laws 1880, 1962.*

(f) The authority shall be automatically substituted for the Edwards Underground Water District in any judicial or administrative proceeding to which, on the effective date of this article, the Edwards Underground Water District is a party.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1.41, 1993 Tex. Gen. Laws 2350; as amended by Act of May 28, 2001, 77th Leg., R.S., ch. 966, § 6.03, 2001 Tex. Gen. Laws 1880, 1962.

SECTION 1.42 EFFECT ON OTHER DISTRICTS. (a) An underground water conservation district other than the authority may manage and control water that is a part of the aquifer after the effective date of this article only as provided in this section. This article does not affect a water reclamation or conservation district that manages and controls only water from a resource other than the aquifer.

(b) An underground water conservation district other than the authority may manage and control water that is a part of the aquifer to the extent that those management activities do not conflict with and are not duplicative of this article or the rules and orders of the authority.

(c) Except as otherwise provided by this article, the board may delegate the powers and duties granted to it under this article. The board shall delegate all or part of its powers or duties to an underground water conservation district on the district's request if the district demonstrates to the satisfaction of the board that:

(1) the district has statutory powers necessary for full enforcement of the rules and orders to be delegated;

(2) the district has implemented all rules and policies necessary to fully implement the programs to be delegated; and

(3) the district has implemented a system designed to provide the authority with adequate information with which to monitor the adequacy of the district's performance in enforcing board rules and orders.

(d) In making the determination under Subsection (c) of this section, the board may consider the district's past performance and experience in enforcing powers and duties delegated to it by the board. The board may deny a request for delegation of powers or duties by a district if the district has previously had a delegation terminated under Subsection (e) of this section.

(e) If the authority determines that a district has failed adequately to enforce or implement any rules or orders delegated under this section, the authority immediately shall provide to the district notice that sets forth the reasons for its determination and the actions that the district must take to retain the delegated authority. Not later than the 10th day after the date the notice is given, the district must demonstrate its commitment and ability to take the actions set forth in the notice. If, at the end of the 10-day period, the authority does not find that the district will adequately enforce its rules and orders, the authority immediately shall resume full responsibility for implementation and enforcement of those rules and orders. The authority shall provide to the district notice that the delegation of authority to it has been terminated. After the termination notice is given, the authority of the district to manage or control water in the aquifer is limited to the authority granted by Subsection (b) of this section.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1.42, 1993 Tex. Gen. Laws 2350.

SECTION 1.43 CREATION OF UNDERGROUND WATER CONSERVATION DISTRICT. An underground water conservation district may be created in any county affected by this article as provided by Subchapter B, Chapter 52, Water Code.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1.43, 1993 Tex. Gen. Laws 2350.

SECTION 1.44 COOPERATIVE CONTRACTS FOR ARTIFICIAL RECHARGE. (a) The authority may contract with any political subdivision of the state under Chapter 791, Government Code, to provide for artificial recharge of the aquifer, through injection wells or with surface water subject to the control of the political subdivision, for the subsequent retrieval of the water by the political subdivision or its authorized assignees for beneficial use within the authority.

(b) The authority may not unreasonably deny a request to enter into a cooperative contract under this section if the political subdivision agrees to:

(1) file with the authority records of the injection or artificial recharge of the aquifer; and

(2) provide for protection of the quality of the aquifer water and of the rights of aquifer users in designating the location of injection wells or recharge dams, the methods of injection or recharge, and the location and type of retrieval wells.

(c) The political subdivision causing artificial recharge of the aquifer is entitled to withdraw during any 12-month period the measured amount of water actually injected or

artificially recharged during the preceding 12-month period, as demonstrated and established by expert testimony, less an amount determined by the authority to:

(1) account for that part of the artificially recharged water discharged through springs; and

(2) compensate the authority in lieu of users' fees.

(d) The amounts of water withdrawn under this section are not subject to the maximum total permitted withdrawals provided by Section 1.14 of this article.

(e) The authority may contract for injection or artificial recharge under this section only if provision is made for protecting and maintaining the quality of groundwater in the receiving part of the aquifer, and:

(1) the water used for artificial recharge is groundwater withdrawn from the aquifer; or

(2) the water is recharged through a natural recharge feature.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1.44, 1993 Tex. Gen. Laws 2350; as amended by Act of May 28, 2001, 77th Leg., R.S., ch. 966, § 2.62, 2001 Tex. Gen. Laws 1880, 1910.

SECTION 1.45 RECHARGE DAMS. (a) The authority may build or operate recharge dams in the recharge area of the aquifer if the recharge is made to increase the yield of the aquifer and the recharge project does not impair senior water rights or vested riparian rights.

(b) The commission shall determine the historic yield of the floodwater to the Nueces River basin. The historic yield is equal to the lesser of:

(1) the average annual yield for the period from 1950 to 1987; or

(2) the annual yield for 1987.

(c) Only the amount of floodwater in excess of the historic yield as determined by the commission may be impounded by a recharge dam built or operated under this section.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 1.44, 1993 Tex. Gen. Laws 2350.

ARTICLE 2

SECTION 2.01 DEFINITION. In this article, "district" means the Uvalde County Underground Water Conservation District.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 2.01, 1993 Tex. Gen. Laws 2350.

SECTION 2.02 VALIDATION. The creation of the district and all resolutions, orders, and other acts or attempted acts of the board of directors of the district are validated in all

respects. The creation of the district and all resolutions, orders, and other acts or attempted acts of the board of directors of the district are valid as though they originally had been legally authorized or accomplished.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 2.02, 1993 Tex. Gen. Laws 2350.

SECTION 2.03 BOUNDARIES. Pursuant to the petition to the Commissioners Court of Uvalde County, Texas, requesting the creation of the district, the district includes the territory contained within the boundaries of Uvalde County.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 2.03, 1993 Tex. Gen. Laws 2350.

SECTION 2.04 FINDING OF BENEFIT. All the land and other property included within the boundaries of the district will be benefitted by the validation of the district.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 2.04, 1993 Tex. Gen. Laws 2350.

SECTION 2.05 POWERS. (a) The district has all of the rights, powers, privileges, authority, functions, and duties provided by the general law of the state, including Chapters 50 and 52, Water Code, applicable to underground water conservation districts created under Article XVI, Section 59, of the Texas Constitution. This article prevails over any provision of general law that is in conflict or inconsistent with this article.

(b) The district may develop and implement a drought response plan, with reasonable rules, using water levels as observed in the Uvalde Index Well YP-69-50-302.

(c) The rights, powers, privileges, authority, functions, and duties of the district are subject to the continuing right of supervision of the state to be exercised by and through the Texas Water Commission.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 2.05, 1993 Tex. Gen. Laws 2350.

SECTION 2.06 LEVY OF TAXES. The levy and collection of taxes by the district are governed by Subchapter H, Chapter 52, Water Code, except that the district may not levy a maintenance and operating tax at a rate that exceeds two cents per $100 assessed valuation unless an election held in the district authorizes a higher rate.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 2.06, 1993 Tex. Gen. Laws 2350.

SECTION 2.07 PENDING LITIGATION. This article does not apply to or affect litigation pending on the effective date of this article in any court of competent jurisdiction in this state to which the district is a party.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 2.07, 1993 Tex. Gen. Laws 2350.

ARTICLE 3

SECTION 3.01 LEGISLATIVE OVERSIGHT. (a) The Edwards Aquifer Legislative Oversight Committee is composed of:

(1) three members of the senate appointed by the lieutenant governor; and

(2) three members of the house of representatives appointed by the speaker of the house of representatives.

(b) The committee shall examine and report to the legislature on the effectiveness of the state and local governmental entities in meeting the purposes of the Edwards Aquifer Authority.

(c) The board shall continually oversee and review:

(1) the activities of the Edwards Aquifer Authority and the implementation of that authority's enabling legislation;

(2) the activities of the South Central Texas Water Advisory Committee;

(3) compliance with federal law relating to threatened or endangered species related to management of underground or surface water in the Edwards Aquifer region;

(4) water pollution control activities in the Edwards Aquifer region; and

(5) the activities of soil and water conservation districts and river authorities in the Edwards Aquifer district that affect the management of the aquifer.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 3.01, 1993 Tex. Gen. Laws 2350.

SECTION 3.02 NOTICE OF AVAILABLE WATER. The Texas Natural Resource Conservation Commission shall notify the Edwards Aquifer Authority of any water available for appropriation in the Guadalupe-Blanco River Basin as the commission discovers the available water.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 3.02, 1993 Tex. Gen. Laws 2350.

SECTION 3.03 SUNSET COMMISSION REVIEW OF GUADALUPE-BLANCO RIVER AUTHORITY.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 3.03, 1993 Tex. Gen. Laws 2350; repealed by Act of May 16, 1995, 74th Leg., R.S., ch. 524, § 1, 1995 Tex. Gen. Laws 3280.

SECTION 3.04 COOPERATION. All state and local governmental entities are hereby directed to cooperate with the authority to the maximum extent practicable so that the authority can best be able to accomplish the purposes set forth under Article 1. The authority shall, on or before January 1, 1995, submit a report to the governor, lieutenant governor, and speaker of the

house of representatives evaluating the extent to which other entities have cooperated with and assisted the authority.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 3.04, 1993 Tex. Gen. Laws 2350.

ARTICLE 4

SECTION 4.01 FINDINGS RELATED TO PROCEDURAL REQUIREMENTS. (a) The proper and legal notice of the intention to introduce this Act, setting forth the general substance of this Act, has been published as provided by law, and the notice and a copy of this Act have been furnished to all persons, agencies, officials, or entities to which they are required to be furnished by the constitution and other laws of this state, including the governor, who has submitted the notice and Act to the Texas Water Commission.

(b) The Texas Water Commission has filed its recommendations relating to this Act with the governor, lieutenant governor, and speaker of the house of representatives within the required time.

(c) All requirements of the constitution and laws of this state and the rules and procedures of the legislature with respect to the notice, introduction, and passage of this Act are fulfilled and accomplished.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 4.01, 1993 Tex. Gen. Laws 2350.

SECTION 4.02 EFFECTIVE DATES. This Act takes effect September 1, 1993, except Section 1.35 of Article 1 takes effect March 1, 1994.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 4.02, 1993 Tex. Gen. Laws 2350.

SECTION 4.03 EMERGENCY. The importance of this legislation and the crowded condition of the calendars in both houses create an emergency and an imperative public necessity that the constitutional rule requiring bills to be read on three several days in each house be suspended, and this rule is hereby suspended.

Act of May 30, 1993, 73rd Leg., R.S., ch. 626, § 4.03, 1993 Tex. Gen. Laws 2350.

EDWARDS AQUIFER AUTHORITY ACT

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