This page intentionally left blank.

2026 REGION E WATER PLAN
Prepared for
The Far West Texas Water Planning Group

March 3, 2025

Carollo Engineers, Inc.

Freese and Nichols, Inc.

This page intentionally left blank.

Contents

Tables

Figures

This page intentionally left blank.

EXECUTIVE SUMMARY

Far West Texas encompasses the most arid region of the State of Texas. Residents of this expansive desert environment recognize that water is a scarce and valuable resource that must be developed and managed with great care to ensure the area's long-term viability. The Region's economic health and quality of life are dependent on a sustainable water supply that is equitably managed.

Far West Texas is bounded on the north by New Mexico, on the south and west by the Rio Grande and the United Mexican States, and on the east by the Pecos River and incorporates the counties of Brewster, Culberson, El Paso, Hudspeth, Jeff Davis, Presidio and Terrell, all which lie solely within the Rio Grande River Basin. These Counties claim some of the most impressive topography and scenic beauty in Texas. The Region is home to the Guadalupe Mountains National Park, Big Bend National Park, and the contiguous Big Bend Ranch State Park. El Paso, the largest city in the Region, is also the nation's largest city on the U.S.-Mexico border. Ciudad Juarez, with an estimated population of over 1.5 million, is located across the Rio Grande from El Paso, and shares the same water sources with El Paso.

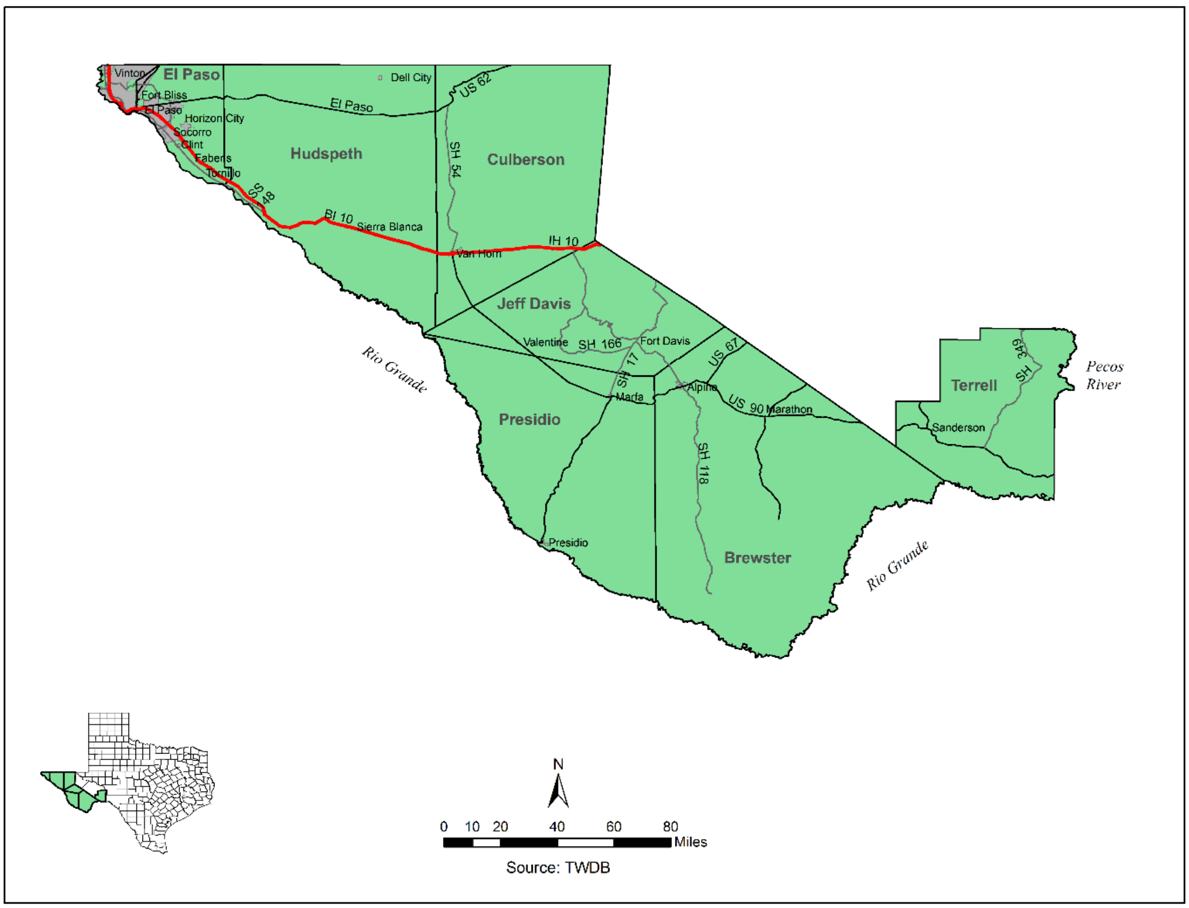


Figure ES-1. Far West Texas Region Water Planning Area Map

In January of 2021, the fifth round of regional water planning was concluded with the adoption of the *2021 Far West Texas Water Plan*. It is understood that this *Plan* is not a static plan but rather is intended to be revised as conditions change. For this reason, the current *2026 Far West Texas Water Plan* put forth in this document is not a new plan, but rather an evolutionary modification of the predecessor *Plan*. Only those parts of the original *Plan* that require updating, and there are many, have been revised.

The purpose of the *2026 Far West Texas Water Plan* is to provide a document that water planners and users can reference for long- and short-term water management recommendations. Equally important, this *Plan* serves as an educational tool to inform all citizens of the importance of properly managing and conserving the delicate water resources of this desert community.

The *2026 Far West Texas Water Plan* follows an identical format as the plans prepared by the other 15 water planning regions in the State as mandated by the Texas Legislature and overseen by the Texas Water Development Board (TWDB). The *Plan* provides an evaluation of current and future water demands for all water-use categories, and water supplies available during drought-of-record conditions to meet those demands. Where future water demands exceed an entity's ability to supply that need, water management strategies are considered to meet the potential water shortages. Water management strategies are also presented that reflects an entity's desire to upgrade their water supply system. In all cases, conservation practices are first considered in managing water supplies.

Because our understanding of current and future water demand and supply sources is constantly changing, it is intended for this *Plan* to be revised every five years or sooner if deemed necessary. This *Plan* fully recognizes and protects existing water rights, water contracts, and option agreements, and there are no known conflicts between this *Plan* and plans prepared for other regions.

This Executive Summary provides an overview of the 10 chapters of the 2026 Far West Texas Water Plan. All required TWDB DB27 reports used in the development of this *Plan* can be accessed on the TWDB's Database Reports application website. Please follow the instructions below to access specific reports in the application.

1. Navigate to the TWDB Database Reports application at TWDB Database Reports - Secure Agency Reporting Application.
2. Enter '2026 Regional Water Plan' into the "Report Name" field to filter to all DB27 reports associated with the 2026 Regional Water Plans.
3. Click on the report name hyperlink to load the desired report.
4. Enter planning region letter parameter, click view report.

POPULATION AND WATER DEMAND

Except for El Paso County, the counties of Far West Texas are among the least populated in the State. In the year 2030, approximately 98 percent (999,348) of the Region's 1,022,933 residents are projected to reside in El Paso County, where the population density is 914 persons per square mile. The population density of the six rural counties is 1.2 persons per square mile. Approximately 75 percent of the residents in the Region are Hispanic or Latinos.

El Paso, one of the fastest growing cities in Texas, is the largest city in the Region, with a year-2030 projected population of 790,511. This is 79 percent of the total population of El Paso County and 77 percent of the Region's total population.

The year-2030 projected county populations served by water-supply utilities (mostly representing cities) and representing county-other (rural domestic) in the six rural counties are as follows: Brewster County (10,021); Culberson County (2,561); El Paso County (999,348); Hudspeth County (3,157); Jeff Davis County (1,776); Presidio County (5,441); and Terrell County (629). Population of smaller communities such as Fort Hancock, Dell City, and Valentine are included in the "County-Other" (rural) population of each county.

The regional population is projected to increase from 1,022,933 in 2030, to 1,104,003 by the year 2080. Most of this increase is projected to occur in El Paso County.

Total projected year-2030 water demand (consumptive use) in Far West Texas is 598,338 acre-feet. The largest category of use is irrigation (404,049 acre-feet), followed by municipalities and county-other (162,873 acre-feet), mining (11,922 acre-feet), steam-electric power (8,880 acre-feet), manufacturing (7,920 acre-feet), and livestock (2,694 acre-feet). Sixty-seven percent of water use in the Region is by the agricultural sector in support of irrigation. Twenty-eight is used by municipalities and the remaining five percent supports manufacturing, steam-electric generation, livestock, and mining.

The potential role of conservation is an important factor in projecting future water supply requirements. In this *2026 Plan*, conservation is only included in the municipal projections as a measure of expected savings based on requirements of the State plumbing code. All other conservation practices are discussed in terms of water-supply strategies and as a component of drought management plans.

Environmental and recreational water use in Far West Texas is recognized as being an important consideration as it relates to the natural community in which the residents of this Region share and appreciate. In addition, for rural counties, tourism activities based on natural resources offer perhaps the best hope for modest economic growth to areas that have seen a long decline in traditional economic activities such as agriculture and mining.

Rural communities (outside of El Paso County) are relatively small and are generally reliant on self-provided water supplies. Water demand within these communities is related directly to their population trends and is thus relatively stable or moderately increasing over the next 50 years. Projected water-demand growth for the numerous communities within El Paso County is significantly greater and thus will require a level of coordinated intercommunity planning.

Water used for agricultural irrigation in Far West Texas is significantly greater (67 percent of total) than all other water-use categories. On a Regional basis, water used for the irrigation of crops is projected to remain constant over the 50-year planning horizon. However, as any irrigator can attest, climate, water availability, and the market play key roles in how much water is actually applied on a year-by-year basis.

Ciudad Juarez is located across the Rio Grande from El Paso, and currently is 100 percent dependent on the Hueco Bolson and Conejos Medanos Aquifers to satisfy all its municipal and industrial demands. With a growing population that is currently estimated to be over 1.5 million, Ciudad Juarez recognizes the limitations of the Hueco Bolson to supply future demands. In addition, plans are being developed to convert 38,000 acre-feet/year of surface water from the Rio Grande (Rio Bravo) for municipal supply use. Currently, Mexico's allocation from the Rio Grande Project of 60,000 acre-feet/year is used for irrigated agriculture. The conversion would involve supplying wastewater effluent to farmers in exchange for surface water.

WATER SUPPLY RESOURCES

Whether it flows in rivers and streams or percolates through underground rock formations, water sustains life and thus is our most important natural resource. In the Chihuahuan Desert environment of Far West Texas, water supply availability takes on a more significant meaning than elsewhere in the State. With evaporation far exceeding rainfall, planning for the most efficient management of limited water supplies is essential.

Water supply availability from each recognized source is estimated during drought-of record conditions. This allows each entity and water-use category to observe conditions when their supply source is at its most critical availability level. Specific assumptions used in estimating supply availability are listed below:

- Except for controlled flows in the Rio Grande, very little surface water can be considered as a reliable source of supply in Far West Texas, especially in drought-of-record conditions. In this chapter, two primary surface water sources are considered: the Rio Grande and the Pecos River. Other ephemeral creeks and springs (cienegas) are important sources for livestock supply, wildlife habitat, recreational resources and, to a limited extent, for irrigated agriculture. The availability of water in the Rio Grande and Pecos River to meet existing water rights, including municipal water rights, is determined by the TCEQ Rio Grande Water Availability Model (WAM). All permanent surface water rights are listed in Appendix 3A.
- The availability of groundwater is based on TWDB provided Modeled Available Groundwater (MAG) as developed through the Groundwater Management Area (GMA) process. For aquifers that MAG volumes have not been assigned, groundwater availability is calculated separately.
- Direct reuse refers to wastewater that is reused without first being discharged into a stream or other watercourse. Direct reuse of water for El Paso Water is based on recently reported direct reuse as reported by the TWDB and expected completion of the City's Advanced Purified Water Treatment project by 2030. Indirect reuse refers to wastewater that is first discharged to a stream or watercourse before being diverted for use. The indirect reuse supply is used primarily during the irrigation season.
- El Paso Water continues to assume the role as the designated "Regional Water Supply Planner" (see Chapter 1, Section 1.1.6). Under the El Paso County Priority Groundwater Management Area, promulgated by the El Paso County Commissioner's Court, there are currently no groundwater limitations or specific requirements detailing groundwater availability.
- Water supplies based upon contracts are assumed to be renewed if they expire during the planning horizon.

The Rio Grande originates in southwestern Colorado and northern New Mexico, where it derives its headwaters from snowmelt in the Rocky Mountains. The Elephant Butte Dam and Reservoir in New Mexico is approximately 125 miles north of El Paso and can store over two million acre-feet of water. Water in the reservoir is stored to meet irrigation demands in the Rincon, Mesilla, El Paso, and Juarez Valleys and is released in a pattern for power generation. Above El Paso, flow in the River is largely controlled by releases from Caballo Reservoir located below Elephant Butte; while downstream from El Paso to Fort Quitman, flow consists of treated municipal wastewater from El Paso, untreated municipal wastewater from Juarez, and irrigation return flow. Below the El Paso-Hudspeth County line, flow consists mostly of return flow and occasional floodwater and runoff from adjacent areas. Channel losses are significant enough that the Rio Grande is often dry from below Fort Quitman to the confluence with the Mexican river, the Rio Conchos, upstream of Presidio. There are no significant perennial tributaries, other than the Rio Conchos, in the 350 miles between Elephant Butte Reservoir and Presidio.

The Rio Grande is unique in its complexity of distribution management. Because the waters of the River must be shared between three U.S. states and Mexico, a system of Federal, State and local programs has been developed to oversee the equitable distribution of water. Compacts, treaties and projects currently provide the River's management framework.

The Pecos River is the largest Texas river basin that flows into the Rio Grande. Originating in New Mexico, the Pecos flows southerly into Texas, and discharges into the channel of the Rio Grande near Langtry in Val Verde County. The River forms the easternmost border of Far West Texas along the northeast corner of Terrell County. Flows of the Pecos River are controlled by releases from the Red Bluff Reservoir near the Texas - New Mexico State line. Storage in the reservoir is affected by the delivery of water from New Mexico. According to data of the IBWC, the Pecos River contributes an average of 11 percent of the annual streamflow into the Rio Grande near Amistad Reservoir. The Pecos also contributes more than 29 percent of the annual salt loading into the reservoir.

Other than irrigation use and a portion of City of El Paso municipal use from the Rio Grande, almost all other water use in Far West Texas is supplied from groundwater sources. Although not as large in areal extent as some aquifers in the State, individual aquifers in Far West Texas are more numerous (10 TWDB designated, and three Planning Group designated) than in any of the other planning regions.

El Paso has nearly 50 miles of reclaimed water lines (purple pipeline) in place in all areas of the City. Reclaimed water serves the landscape irrigation demand of golf courses, parks, schools, and cemeteries, and provides water supplies for steam electric plants and industries within the City. Currently EPWater is operating three reuse projects that provide 6,000 acre-feet per year. This *Plan* explores the potential of a significant increase in reuse of existing supplies by evaluating strategies of advanced treatment to produce purified water that meets state drinking water standards.

Springs and seeps are found in all seven of the Far West Texas counties and have played an important role in the development of the Region. Springs were important sources of water for Native Americans, as indicated by the artifacts and petroglyphs found near many of the springs. In the 18th and 19th centuries, locations of transportation routes including supply and stagecoach lines, military outposts, railroads, and early settlements and ranches were largely determined by the occurrence of springs that issued from locations in the mountains and along mountain fronts.

Springs contribute to the aesthetic and recreational value of private land and parkland in Far West Texas - especially in the Big Bend area, where many thermal springs discharge along the banks of the Rio Grande. Springs are significant sources of water for both aquatic and terrestrial wildlife as they form small wetlands that attract migratory birds and other fowl that inhabit the Region throughout the year. The FWTWPG recognizes the importance of all springs in this desert community for their contribution as a water supply source and as a natural habitat. However, the FWTWPG chooses to respect the privacy of private lands and therefore specifically identifies “Major Springs” occurring only on State, Federal, or privately owned conservation managed lands.

WATER MANAGEMENT STRATEGIES

Projected water-supply deficits in Far West Texas during the next 50 years are identified where anticipated water demands exceed available supplies. Available supplies represent the largest amount of water that can be diverted or pumped from a given source without violating the most restrictive physical, regulatory, or policy condition limiting use, under drought-of-record conditions. Water supply deficits are identified for specified municipal utilities, irrigation use, livestock use, and mining use.

Water supply strategy recommendations intended to meet the deficits are made for those water use groups that have projected water-supply shortages. In addition, strategies have been developed for entities that have expressed a desire for planned projects for which funding applications have been or will be made in the future to be included in the *Plan*. In the development of water management strategies, existing water rights, water contracts, and option agreements are recognized and fully protected.

A strategy evaluation procedure was designed to provide a side-by-side comparison such that all the strategies could be assessed based on the same factors. Specific factors considered were:

- Quantity of water supply generated
- Water quality considerations
- Reliability of supply
- Cost (total capital cost, annual cost, and cost per acre-foot)
- Environmental impacts
- Impacts to water, agricultural and natural resources, and to ecologically unique stream segments

To adequately consider the unique challenges faced by municipal and industrial water users in El Paso County, a conjunctive approach was used to establish feasible strategies capable of identifying sufficient future supplies to meet the water needs of El Paso Water, the largest wholesale water provider in the County. The following recommended projects are to be managed conjunctively to produce a mixed total distributed supply:

- Municipal conservation programs
- Water loss audit and main-line repair
- Expansion of the Kay Bailey Hutchison desalination plant
- Advanced water purification at the Bustamante WWTP
- Conjunctive treatment of groundwater and surface water at the Upper Valley WWTP
- Groundwater from Dell City area (Phase 1)

Recommended strategies for other entities in El Paso County include purchasing needed supplies from El Paso Water or developing needed self-supplied groundwater by drilling additional wells and expanding desalination facilities.

Irrigation shortages in El Paso County is the direct result of insufficient water in the Rio Grande during drought-of-record periods to meet anticipated needs. The quantity of water needed to meet the full demands cannot be realistically achieved and farmers in these areas have generally approached this situation by reducing irrigated acreage, changing types of crops planted, or possibly not planting crops until water becomes available during the following season.

In some cases, farmers may benefit from Best Management Practices (BMPs) for agricultural water users, which are a mixture of site-specific management, educational, and physical procedures that have proven to be effective and are cost-effective for conserving water. However, a local study of these practices found that very limited opportunities exist for significant additional water conservation in Far West Texas irrigated agriculture. Those practices that suggest economic efficient additional water conservation included lining or pipelining district canals and the very small potential for additional irrigation scheduling and tail water recovery systems. In nearly all cases, these practices have been adapted if applicable, further emphasizing the very limited opportunities for additional conservation. If these strategies were implemented, the water conserved would satisfy less than the projected unmet agricultural water demand in 2080 during drought-of-record conditions. Based on this evaluation, the FWTWPG recommends tail-water reuse, improvements to water district delivery systems, construction of a regulating reservoir, and the development of a new diversion point at the La Union canal to attempt to meet the estimated irrigation needs in El Paso County.

Although most of the communities in the rural counties do not project shortages, it is apparent that many of the communities have water issues that are appropriate for listing in this *Regional Plan*. Therefore, strategies have been evaluated and presented that will hopefully provide incentive for the future development of water resources to address these issues. The *2026 Far West Texas Water Plan* contains a total of 60 recommended water management strategies and eight alternate strategies with a total estimated capital cost for develop of $4,044,259,260.

WATER QUALITY

Water quality plays an important role in determining the availability of water supplies to meet current and future water needs in the Region. The quality of groundwater and surface water is evaluated to help determine the suitability of each source for use and the potential impacts on these sources that might result from the implementation of recommended water management strategies.

Groundwater quality issues in the Region are generally related to naturally high concentrations of total dissolved solids (TDS) or to the occurrence of elevated concentrations of individual dissolved constituents. High concentrations of TDS are primarily the result of the lack of sufficient recharge and restricted circulation. Together, these retard the flushing action of fresh water moving through the aquifers. Some aquifers, however, have a low TDS but may contain individual constituent levels that exceed safe drinking-water standards. For example, some wells in the Igneous Aquifer have exceptionally low TDS but contain unsatisfactory levels of fluoride.

Groundwater quality changes are often the result of man's activities. In agricultural areas, aquifers such as the Bone Spring-Victorio Peak have increased in TDS. Irrigation water applied on the fields percolates back to the aquifer carrying salts leached from the soil. Beneath El Paso and Ciudad Juarez, the average concentration of dissolved solids in the Hueco Bolson Aquifer has increased as the fresher water in the Aquifer is being consumed. Although local instances of groundwater quality degradation have occurred in the Region, there are no major trends that suggest a widespread water-quality problem due to the downward percolation of surface contaminants.

The Rio Grande and the Pecos River are the principal surface water sources in Far West Texas. Unlike groundwater, surface water quality can vary significantly depending on the amount of flow in the streambed and the rate and source of runoff from adjacent lands. Salinity is an issue associated with the Rio Grande, especially during drought conditions. River flows arriving at El Paso contain a substantial salinity contribution from irrigation return flow and municipal wastewater return in New Mexico. Under current conditions, approximately 25 percent of the applied irrigation water is needed to move through the project in El Paso County to keep the salt loading at reasonable and manageable levels given average surface flow rates. Studies have shown that salinities in the Rio Grande can increase to over 1,000 mg/l during May and September, depending on actual irrigation demands and releases from reservoirs.

Downstream from El Paso, most of the flow consists of irrigation return flow, and small amounts of treated and untreated municipal wastewater. Heavy metals and pesticides have been identified along this segment of the Rio Grande. Flow is intermittent downstream to Presidio, where the Rio Conchos augments flow. Fresh water springs contribute to the Rio Grande flow in the Big Bend and enhance the overall quality of the River through this reach.

The Pecos River is not a source of drinking water for communities in Far West Texas; however, it is the most prominent tributary to the Rio Grande on the Texas side of the River above Amistad Reservoir. According to IBWC data, the Pecos River contributes an average of 11 percent of the annual stream flow in the Rio Grande above the Reservoir and 29.5 percent of the annual salt load. Independence Creek's contribution in Terrell County increases the Pecos River water volume by 42 percent at the confluence and significantly reduces the total suspended solids, thus improving both water quantity and quality.

WATER CONSERVATION AND DROUGHT CONTINGENCY

Water conservation are those practices, techniques, programs, and technologies that will protect water resources, reduce the consumption of water, reduce the loss or waste of water, or improve the efficiency in the use of water. Recycling or reuse of water is also a creative method of managing water so that it can be used more than once or for alternative uses. Water conservation and drought contingency planning implemented by municipalities, water providers, and other water users supersede recommendations in this *Plan* and are considered consistent with this *Plan*. Texas Water Code §11.1271 requires water conservation plans for all municipal and industrial water users with surface water rights of 1,000 acre-feet per year or more and irrigation water users with surface water rights of 10,000 acre-feet per year or more.

El Paso Water is the largest supplier of municipal water in Far West Texas and has been implementing an aggressive water conservation program, which has reduced the per capita demand from about 225 gpcd in the late 1970s to a current level of 131 gpcd. The continuation of the conservation effort is a key component of the El Paso Water Integrated Water Management Strategy.

Drought is a frequent and inevitable factor in the climate of Texas. Therefore, it is vital to plan for the effect that droughts will have on the use, allocation, and conservation of water in the State. Far West Texas is perennially under drought or near-drought conditions compared with more humid areas of the State. Although residents of the Region are generally accustomed to these conditions, the low rainfall and the accompanying high levels of evaporation underscore the necessity of developing plans that respond to potential disruptions in the supply of groundwater and surface water caused by drought conditions. In the consideration of regional conservation and drought management issues, the FWTWPG reviewed active water conservation and drought management plans provided to the planning group by public water suppliers and irrigation districts.

The Texas Legislature has established a process for local management of groundwater resources through groundwater conservation districts (GCDs). The districts are charged with managing groundwater by providing for the conservation, preservation, protection, recharging and prevention of waste of groundwater within their jurisdictions. Six districts are currently in operation within Far West Texas.

- Brewster County Groundwater Conservation District
- Culberson County Groundwater Conservation District
- Hudspeth County Underground Water Conservation District No.1
- Jeff Davis County Underground Water Conservation District
- Presidio County Underground Water Conservation District
- Terrell County Groundwater Conservation District

PROTECTION OF WATER, AGRICULTURAL, AND NATURAL RESOURCES

The long-term protection of the Region's water, agricultural, and natural resources, and the environment is an important component of this *2026 Far West Texas Water Plan*. The first step in achieving long-term water resources protection was in the process of estimating each source's availability. Surface water estimates were developed through a water availability model process (WAM) and are based on the quantity of surface water available to meet existing water rights during a drought-of-record. The availability of groundwater is based on TWDB provided Modeled Available Groundwater (MAG) as developed through the Groundwater Management Area process. For aquifers that MAG volumes have not been assigned, groundwater availability is based on previous geohydrologic studies, groundwater data including historical use contained in State and Federal databases and groundwater availability models (GAMs). Also included are groundwater supplies that are made available by the desalination of brackish groundwater sources. Establishing conservative levels of water source availability thus results in less potential of overexploiting the supply.

The next step in establishing the long-term protection of water resources occurs in the water management strategies to meet potential water-supply shortages. Each strategy was evaluated for potential threats to water resources in terms of source depletion (reliability), quality degradation, and impact to environmental habitat. Water conservation strategies are also recommended for each entity with a supply deficit. When enacted, the conservation practices will diminish water demand and thus extend supplies over the stress period.

Agriculture includes the raising of crops and livestock, as well as a multitude of businesses that support this industry. Water is an absolute necessity to maintaining this industry and its use represents over three-fourths of all the water used in the Region. It is thus important to the economic health and way of life in the Region to protect water resources that have historically been used in the support of agricultural activities. The *2026 Far West Texas Water Plan* provides irrigation strategy recommendations that address water conservation management practices. If implemented, these practices will result in reduced water application per acre irrigated and diminished water losses due to canal leakage. All non-agricultural recommended water management strategies include an analysis of potential impact to agricultural interests. Any strategy that necessitates the conversion of water use from agricultural practices is voluntary at the current water right and landowner's discretion.

The FWTWPG has adopted a stance toward the protection of natural resources. The protection is closely linked with the protection of water resources as discussed above. Where possible, the methodology used to assess groundwater source availability is based on not significantly lowering water levels to a point where spring flows might be impacted. Thus, the intention to protect surface flows is directly related to those natural resources that are dependent on surface water sources or spring flows for their existence.

Environmental impacts were evaluated in the consideration of strategies to meet water-supply deficits. Of prime consideration was whether a strategy potentially could diminish the quantity of water currently existing in the natural environment and if a strategy could impact water quality to a level that would be detrimental to animals and plants that naturally inhabit the area under consideration. The FWTWPG has also recommended several "Ecologically Unique River and Stream Segments."

RECOMMENDATIONS

An important aspect of the regional water planning process is the opportunity to provide recommendations for the improvement of future water management planning in Texas. The recommendations are designed to present new and/or modified approaches to key technical, administrative, institutional, and policy matters that will help to streamline the planning process, and to offer guidance to future planners regarding specific issues of concern within the Region. The FWTWPG approves of the legislative intent of the regional water planning process and supports the continuance of water planning at the regional level. In further support of the planning process, the FWTWPG suggests that the Legislature and TWDB consider the following issues pertaining to water management policy, regional water planning process, and water research needs.

- Stormwater / flood planning that encourages retaining stormwater as a water-supply source
- Support of funding for rural areas
- Support of funding for Colonias projects
- Support of regionalization
- Encouragement of State legal rectification to protect Rio Grande Compact
- Re-emphasis of the planning function of the regional water planning group and need for more local planning initiatives
- Dissatisfaction with inter-period modification of contractual planning guidelines
- Dissatisfaction of unfunded mandates
- Suggestion of several specified water research and data needs that would support the local planning process

As a part of the planning process, each regional planning group may include recommendations for the designation of ecologically unique river and stream segments in their adopted regional water plan. The Texas Legislature may designate a river or stream segment of unique ecological value following the recommendations of a regional water planning group. As per §16.051(f) of the Texas Water Code, this designation solely means that a state agency or political subdivision of the State may not finance the actual construction of a reservoir in a specific river or stream segment designated by the legislature under this subsection. The Far West Texas Water Planning Group intends that no negative impact is to occur to upstream landowners as a result of these designations.

The FWTWPG chooses to respect the privacy of private lands and therefore recommends as "Ecologically Unique River and Stream Segments" the following three streams that lie within the boundaries of State-managed properties, four within National Park boundaries, and specified streams managed by the Texas Nature Conservancy and the Trans Pecos Water Trust.

- Rio Grande Wild and Scenic River (Big Bend National Park)
- McKittrick Canyon and Choza Creek (Guadalupe Mountains National Park)
- Cienega Creek (Chinati Mountains State Natural Area)
- Alamito and Cienega Creeks (Big Bend Ranch State Park)

- Alamito Creek (Trans Pecos Water Trust)
- Independence Creek (Texas Nature Conservancy - Independence Creek Preserve)
- Madera Creek, Canyon Headwaters of Limpia Creek, Little Aguja Creek, and Upper Cherry Creek (Texas Nature Conservancy - Davis Mountains Preserve)
- Terlingua Creek (Big Bend National Park)

The firm yield for any reservoirs constructed on even the most reliable Far West Texas watercourses is not likely to exceed 2,000 acre-feet per year. For this reason, the *2026 Far West Texas Water Plan* does not recommend any watercourse for designation as "Unique Sites for Reservoir Construction."

ES – APPENDIX
TWDB WATER PLANNING DATA REPORTS

This page is intentionally left blank

- Water User Group (WUG) Population
- WUG Demand
- Source Availability
- WUG Existing Water Supply
- WUG Needs / Surplus
- WUG Second-Tier Identified Water Needs
- WUG Data Comparison to 2021 Regional Water Plan
- Source Data Comparison to 2021 Regional Water Plan
- WUG Unmet Needs
- Recommended WUG Water Management Strategies
- Recommended Projects Associated with Water Management Strategies
- Alternative WUG Water Management Strategies
- Alternative Projects Associated with Water Management Strategies
- WUG Management Supply Factor
- Recommended Water Management Strategy Supply Associated with a New or Amended Inter-Basin Transfer Permit (No relevant data for the FWT Region)
- WUG Recommended WMS Supply Associated with a New or Amended Inter-Basin Transfer Permit and Total Recommended Conservation WMS Supply (No relevant data for the FWT Region)
- Sponsored Recommended WMS Supplies Unallocated to WUGs (No relevant data for the FWT Region)
- Major Water Provider (MWP) Existing Sales and Transfers
- Major Water Provider (MWP) Water Management Strategy Summary

This page intentionally left blank.

CHAPTER 1
FAR WEST TEXAS DESCRIPTION

This page intentionally left blank.

1 FAR WEST TEXAS

Far West Texas encompasses the most arid region of the State of Texas (Figure 1-1). Residents of this expansive desert environment recognize that water is a scarce and valuable resource that must be developed and managed with great care to ensure the area's long-term viability. The Region's economic health and quality of life are dependent on a sustainable water supply that is equitably managed.

Chapter 1 presents a broad descriptive overview of Far West Texas including currently existing water management facilities and international water issues. This chapter also summarizes specific planning components that are presented in more detail elsewhere in this *2026 Far West Texas Water Plan*, such as projected population and water demand and available water-supply sources to meet these anticipated demands. Also provided in this chapter is a listing of State and Federal agencies, universities, and private organizations that are involved in various aspects of water supply issues.

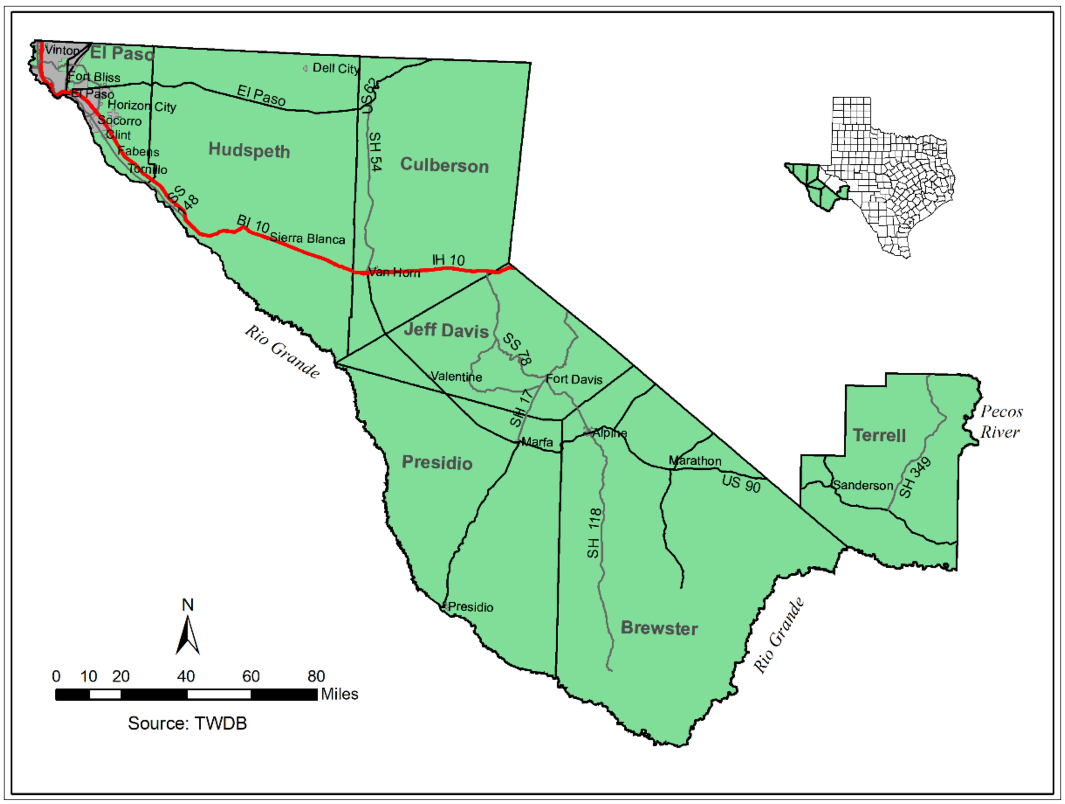


Figure 1-1. Location of Far West Texas

1.1 WATER PLANNING AND MANAGEMENT

1.1.1 Regional Water Planning

The *2026 Plan* follows an identical format as the plans prepared by the other 15 water planning regions in the State as mandated by the Texas Legislature and overseen by the Texas Water Development Board (TWDB). This *Plan* provides an evaluation of current and future water demands for all water-use categories and water supplies available during drought-of-record conditions to meet those demands. Where future water demands exceed an entity's ability to supply that need, alternative strategies are considered to meet the potential water shortages. Water management strategies are also presented that reflect an entity's desire to upgrade their water supply system. In all cases, conservation practices are first considered in managing water supplies.

In January of 2021, the fifth round of regional water planning was concluded with the adoption of the 2021 Far West Texas Water Plan. It is understood that this *Plan* is not a static plan, but rather is intended to be revised as conditions change. For this reason, the current *2026 Plan* put forth in this document is not a new plan, but rather an evolutionary modification of the preceding 2021 Plan. Only those parts of the previous *Plan* that require updating, and there are many, have been revised.

The purpose of the *2026 Far West Texas Water Plan* is to provide a document that water planners and users can reference for long and short-term water management recommendations. Equally important, this *Plan* serves as an educational tool to inform all citizens of the importance of properly managing and conserving the delicate water resources of this desert community.

During the fifth round of regional water planning, the 2021 Regional Water Plans and 2022 State Water Plan were modified to be aligned with water utility service areas, rather than political boundaries, such as city limits. This was due to TWDB rule revisions, that now define a municipal water user group (WUG) as being utility based. Some cities that were once included in the 2016 and older regional water plans are not represented in the 2021 and 2026 Plans because they do not have their own water and therefore no longer meet the TWDB WUG definition. For these entities, their population is represented through: (1) utility WUGs who provide water for them and meet the new WUG definition, or (2) county-other WUGs as aggregated rural population.

Because our understanding of current and future water demand and supply sources is constantly changing, it is intended for this *Plan* to be revised every five years or sooner if deemed necessary. This *Plan* fully recognizes and protects existing water rights, water contracts, and option agreements. There are no known conflicts between this *Plan* and plans prepared for other regions. Publicly available water plans of major agricultural, municipal, and commercial water users were considered in the development of this *Plan*, primarily as they relate to Chapter 5 and Chapter 7.

The Far West Texas Water Planning Group (FWTWPG) is a voluntary association comprised of voting and non-voting members who represent a minimum of 12 water-use categories. Since 1997, the planning group has been involved in a wide range of projects, programs, and the development of the Regional Water Plan. All meetings and activities of the FWTWPG met all requirements under the Texas Open Meetings Act.

Water supply availability under drought-of-record conditions is considered in the planning process to ensure that water demands can be met under the most challenging hydrologic circumstances. For surface water supplies, drought-of-record conditions relate to the quantity of water available to meet existing permits from the Rio Grande and the Pecos River as estimated by the TCEQ Rio Grande Full Authorization Run (Run 3) Water Availability Model (WAM). For this *Plan,* the assessment of surface water availability reflects updates to new water right permits and current operating policies and/or contractual agreements. The *2026 Plan* has no impact on navigation on these surface water courses.

The availability of groundwater during drought-of-record conditions is based on the Modeled Available Groundwater (MAG) volumes that may be produced on an average annual basis to achieve a Desired Future Condition (DFC) as adopted by Groundwater Management Areas (GMAs) (per Texas Water Code §36.001). Groundwater availability volumes for parts of the Region where MAGs are not determined by the TWDB are calculated separately. Chapter 3 contains a detailed analysis of water-supply availability in the Region.

Since the completion of the 2021 Far West Texas Water Plan, several changed conditions have occurred in the Region, which warrant this *2026* updated water *Plan*. The latest census (2020) is the baseline for estimates of population and municipal/rural water demand projections. During this cycle of regional water planning, the TWDB also established several key changes to the population projection methodology. This is outlined in more detail in Section 2.1.1. Groundwater and surface water availability models (GAMs and WAMs) have been updated and serve as tools for use in evaluating water-supply source availability.

This current *Plan* continues to rely on environmental data on the more prominent watercourses in the Region as contributed by the Texas Parks & Wildlife Department, the National Parks Service, and the Texas Nature Conservancy. This data was useful in the assessment and consideration of environmental flow needs, springs, and ecologically unique stream segments.

The FWTWPG strongly encourages all entities to participate in the planning process so that their specific concerns can be recognized and addressed. The Group also encourages the participation of Groundwater Conservation Districts (GCDs) and recognizes their management plans and rules. District management plans are specifically respected when establishing groundwater availability estimates.

Water quality is recognized as an important component in this 50-year water plan. Water supplies can be diminished or made costlier to prepare for distribution if water quality is compromised (Section 1.8). To ensure that this *Plan* fully considers water quality, the Federal Clean Water Act and the State Clean Rivers Program were reviewed and considered when developing water-supply availability estimates (Chapter 3), water management strategies' water quality impacts (Chapter 5), and recommendations (Chapter 8).

1.1.2 Interim Regional Water Supply Research Projects

Previous planning periods included research projects that provided important scientific data or water strategy analysis that was beyond the normal range of regional planning activities but provided important insight and accuracy to the overall planning process. Reports of the results of these studies listed below are available at the Rio Grande Council of Governments website or from the TWDB website. Information gained from these projects is also incorporated in specific water-supply management strategies discussed in Chapter 5.

- Igneous Aquifer System of Brewster, Jeff Davis and Presidio Counties, Texas (2001).
- West Texas Bolsons and Igneous Aquifer System Groundwater Availability Model Data Collection (2003).
- Conceptual Evaluation of Surface Water Storage in El Paso County (2008).
- Far West Texas Climate Change Conference (2008).
- Groundwater Data Acquisition in Far West Texas (2009).
- Evaluation of Irrigation Efficiency Strategies for Far West Texas: Feasibility, Water Savings and Cost Considerations (2009).
- Water Conservation Conference for Far West Texas Water Plan Region E (2009).
- Groundwater Data Acquisition and Analysis for the Marathon and Edwards-Trinity (Plateau) Aquifers (2010).

1.1.3 State Water Plan

The TWDB adopted Water for Texas 2022 as the latest official Texas State Water Plan. The Texas Water Code directs the TWDB to periodically update this comprehensive water plan, which is used as a guide to State water policy. The 2022 State Water Plan is the fifth water plan to incorporate water management and policy decisions made at the regional level as expressed in the 16 approved regional water plans.

1.1.4 Groundwater Conservation Districts

The Texas Legislature has established a process for local management of groundwater resources through Groundwater Conservation Districts (GCDs). GCDs are charged to manage groundwater by providing for the conservation, preservation, protection, recharging, and prevention of waste of groundwater within their jurisdictions. An elected or appointed board governs these districts and establishes rules, programs and activities specifically designed to address local problems and opportunities. Texas Water Code §36.0015 states, in part, "Groundwater Conservation Districts created as provided by this chapter are the State's preferred method of groundwater management." Six districts are currently in operation within Far West Texas (Figure 1-2) and their management goals are discussed in further detail in Chapter 6.

- Brewster County Groundwater Conservation District.
- Culberson County Groundwater Conservation District.
- Hudspeth County Underground Water Conservation District #1.
- Jeff Davis County Underground Water Conservation District.
- Presidio County Underground Water Conservation District.
- Terrell County Groundwater Conservation District.

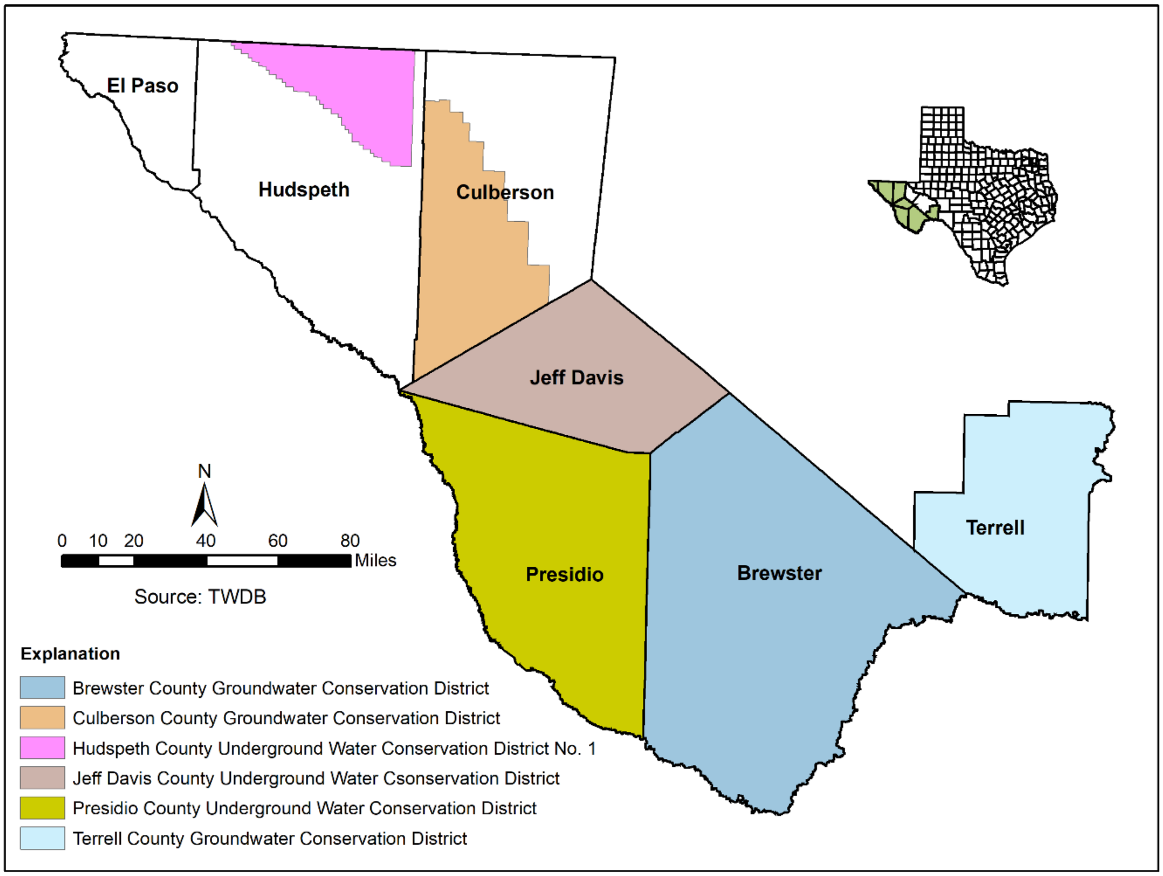


Figure 1-2. Groundwater Conservation Districts

1.1.5 Groundwater Management Areas

In previous sessions, the Texas Legislature has redefined the way groundwater is to be managed. Groundwater Management Areas were created in order to provide for the conservation, preservation, protection, recharging, and prevention of waste of the groundwater, and of groundwater reservoirs or their subdivisions, and to control subsidence caused by withdrawal of water from those groundwater reservoirs or their subdivisions. Senate Bill 2 of the 77th Texas Legislature (2001) authorized:

- The Texas Water Development Board to designate Groundwater Management Areas that would include all major and minor aquifers of the State.
- The requirement of Groundwater Conservation Districts to share groundwater plans with other districts in the Groundwater Management Area.
- A Groundwater Conservation District to call for joint planning among districts in a Groundwater Management Area.

The objective was to delineate areas considered suitable for management of groundwater resources. A Groundwater Management Area (GMA) should ideally coincide with the boundaries of a groundwater reservoir (aquifer) or a subdivision of a groundwater reservoir, but it may also be defined by other factors, including the boundaries of political subdivisions. In December 2002, the TWDB designated 16 GMAs covering the entire State.

In 2005, the Legislature once again changed the direction of groundwater management. The new requirements, codified in Texas Water Code Chapter 36.108, required joint planning in management areas among Groundwater Conservation Districts. The new requirements indicate that,

"Not later than September 1, 2010, and every five years thereafter, the districts shall consider groundwater availability models and other data or information for the management area and shall establish desired future conditions for the relevant aquifers within the management area."

Desired future conditions (DFCs), as described in Title 31, Part 10, §356.10 (6) of the Texas Administrative Code are "the desired, quantified condition of groundwater resources (such as water levels, spring flows, or volumes) within a management area at one or more specified future times as defined by participating groundwater conservation districts within a groundwater management area as part of the joint planning process." This description is a precursor to developing a volumetric number called Modeled Available Groundwater (MAG). The TWDB is responsible for providing each Groundwater Conservation District and regional water planning group, located wholly or partly in the management area, with MAG volumes. Once the MAG is determined, the districts begin issuing groundwater withdrawal permits to support the DFC of the aquifer up to the total amount of the MAG. These permits express DFCs by only allowing withdrawals that will support the conditions established by the groundwater management area. Regional water plans must also incorporate the MAG for each aquifer within their regions. The counties of Far West Texas are included in three Groundwater Management Areas:

- GMA 4 includes Brewster, Culberson, part of Hudspeth, Jeff Davis and Presidio.
- GMA 5 includes El Paso and part of Hudspeth.
- GMA 7 includes Terrell.

This *2026 Far West Texas Water Plan* includes a significant revision to groundwater source availability estimates based on MAG volumes. MAG volumes for the use of this *Plan* have increased by nine percent from those used within the previous regional water plan. Total groundwater availability is the sum of both the MAG and non-MAG volumes for a particular aquifer.

1.1.6 El Paso Water as the Declared Regional Water Supply Planner

In 1995, the Texas Legislature passed Senate Bill 450 designating the El Paso Water Utilities/Public Service Board (now El Paso Water, or EPWater) as the regional water and wastewater planner for El Paso County. The purpose of the Bill is to improve regional water and wastewater planning for El Paso County and encourage increased consultation, coordination, and cooperation in the management of regional water resources. The City of El Paso serves a pivotal role in all future planning and expansion projects. The City, through El Paso Water, receives priority consideration for public funding for the planning, design, and construction of water-supply and wastewater systems within the County. The intent of Senate Bill 450 is to address regional planning issues by the following seven actions:

- Coordinate water and wastewater management on a regional watershed basis.
- Address water quality and quantity conditions adversely affecting the public health and the environment.
- Provide efficient planning and management of water resources to mitigate existing and avoid future negative colonia conditions.

- Participate in water and wastewater planning with adjacent counties and the border states of New Mexico and Chihuahua, Mexico, to address transboundary water issues.
- Encourage conjunctive management for the protection and preservation of the limited surface water and groundwater resources.
- Maximize the amounts and provide for the efficient use of public funding to implement the purposes of Senate Bill 450.
- Provide intergovernmental cooperation with water utilities to encourage their planning to be consistent with the regional plan.

1.1.7 El Paso County Priority Groundwater Management Area

In 1985, the 69th Texas Legislature recognized that certain areas of the State were experiencing or were expected to experience critical groundwater problems. House Bill 2 directed the Texas Department of Water Resources (later to become the Texas Water Commission (TWC) and the TWDB) to identify the "critical" groundwater areas in the State, to conduct studies in those areas, and to make recommendations on whether a GCD should be established in critical areas. Senate Bill 1 changed the name of "Critical Area" to "Priority Groundwater Management Area" (PGMA) and mandated that the Texas Natural Resource Conservation Commission (TNRCC - successor agency to the TWC and later to be named TCEQ) complete reviews of all pending PGMA studies.

The PGMA process is initiated by TCEQ, who designates a PGMA when an area is experiencing critical groundwater problems or is expected to do so within 25-years. These problems include shortages of surface water or groundwater, land subsidence resulting from groundwater withdrawal, or contamination of groundwater supplies. Once an area is designated a PGMA, landowners have two years to create a GCD. Otherwise, the TCEQ is required to create a GCD or to recommend that the area be added to an existing district. The TWDB works with the TCEQ to produce a legislative report every two years on the status of PGMAs in the State. The PGMA process is completely independent of the current Groundwater Management Area process as each process has different goals. The goal of the PGMA process is to establish GCDs in these designated areas so that there will be a regulating entity to address the identified groundwater issues. PGMAs are still relevant if there remain portions within these designated areas without GCDs. A statewide map of the declared PGMA areas is available on the TWDB's website and is called Priority Groundwater Management Areas (PGMAs).

The TWC and TWDB evaluated groundwater supply conditions in El Paso County in 1990 as part of the PGMA program. An overview evaluation (TWDB Report 324) recognized that the Hueco Bolson Aquifer had a long history of water level decline and water quality deterioration, and the expected life of the aquifer, under then current understanding, was about 60-years at best. However, rather than declaring the area "Critical," the TWC placed a moratorium over the declaration until after the completion of a 50-year City of El Paso water management plan.

The TNRCC requested a technical update study of El Paso County, which was completed in the spring of 1998 (TWDB Open-File Report, Preston, 1998; and TPWD Report, El-Hage and Moulton, 1998). The TWDB report concluded that water level declines and quality deterioration are still present in the Hueco Bolson but did not address El Paso's plans to remedy the problems and provide long-term management. The TPWD reported no known effect on wildlife as a result of water level declines in the Hueco Bolson Aquifer. TNRCC staff then completed their analysis and recommended to their commissioners that the area identified by the TWDB as the Hueco Bolson Aquifer in El Paso County be declared a PGMA (TNRCC File Report, Musick, 1998). The Commissioners, subsequently, declared *"*the area of El Paso County overlying the Hueco Bolson Aquifer, including its subcrops and outcrops*"* as a PGMA. However, the Commissioners stated that,

> ***"El Paso has clearly demonstrated a significant effort toward regional cooperation, planning, and voluntary implementation of actions to address water supply problems" and that "it is not clear that creating a groundwater conservation district for the area of El Paso County overlying the Hueco Bolson Aquifer would be in the public interest, meet a public need, or benefit the property therein at this time."***
>
> ***(TNRCC Docket No. 98-0999-MLM, SOAH Docket No. 582-98-1540).***

Since the conclusion of this action, El Paso County Commissioner's Court has not promulgated any water availability requirements within the County.

1.1.8 Hudspeth County Priority Groundwater Management Area Consideration

In March 2005, Texas Commission on Environmental Quality (TCEQ) released a report titled "Evaluation for the Hudspeth County Priority Groundwater Management Study Area." The purpose of this evaluation was to determine if the Hudspeth County area is experiencing or is expected to experience within the next 25-years, critical groundwater problems, and whether a GCD should be created to address such problems. The study area included all of Hudspeth County; however, only the area outside of the Hudspeth County Underground Water Conservation District No. 1 was considered for PGMA designation.

For this report, TCEQ staff considered comments, data, and information provided by several different sources including water stakeholders from within the study area, the TWDB, the TPWD, the FWTWPG, and independent research by the staff. The report discusses the available authority and management practices of existing groundwater management entities within and adjacent to the study area and makes recommendations on appropriate strategies needed to conserve and protect local groundwater resources.

The water-supply problems identified in the study area include widespread total dissolved solids concentrations in groundwater and the lack of firm alternative supplies for irrigation use in the Rio Grande Valley during drought-of-record conditions. Groundwater concerns expressed by area stakeholders included sustainability, water quality, availability, access to alternative water supplies, and the possibility of water exportation.

The TCEQ concluded that the identified water supply and water quality issues are not presently critical problems and are not anticipated to be critical during the next 25-year planning horizon, and that the Hudspeth County study area should not be designated as a PGMA at this time. However, the TCEQ also acknowledges that the creation of a GCD is a feasible and practicable groundwater management option for citizens of the study area to consider.

1.2 FAR WEST TEXAS GEOGRAPHIC SETTING

Located in the westernmost region of the State, Far West Texas is bounded on the north by New Mexico, on the south and west by the Rio Grande and the United Mexican States, and on the east by the Pecos River; and incorporates the counties of Brewster, Culberson, El Paso, Hudspeth, Jeff Davis, Presidio and Terrell. These counties claim some of the most impressive topography and scenic beauty in Texas. The Region is home to the Guadalupe Mountains National Park, Big Bend National Park, and the contiguous Big Bend Ranch State Park. El Paso, the largest city in the Region, is also the Nation's largest city on the U.S.-Mexico border. Ciudad Juarez, with an estimated population of over 1.5 million, is located across the Rio Grande from the City of El Paso and shares the same water sources with El Paso.

All seven counties that comprise the planning Region lie solely within the Rio Grande River Basin. While the entire planning Region falls within the Rio Grande River Basin, the Region is occupied by several internally drained closed basins (bolsons). The Rio Grande not only forms the border between the United States and Mexico but is also a vital water-supply source for communities, industries, and agricultural activities adjacent to the River. Above Fort Quitman, use of water from the Rio Grande is controlled primarily by the operations of the Rio Grande Project, which was established to supply agricultural water in southern New Mexico and Far West Texas. Other than along the Rio Grande corridor, the Region is dependent on groundwater resources derived from several aquifer systems.

The counties of Far West Texas are among the largest in the State, occupying 24,069 square miles (mi^2), or nine percent of the total State area. Ranked by total area, the counties that make up the Region are Brewster (6,193 mi^2), Hudspeth (4,572 mi^2), Presidio (3,856 mi^2), Culberson (3,813 mi^2), Terrell (2,358mi^2), Jeff Davis (2,264 mi^2), and El Paso (1,013 mi^2).

1.2.1 Physiography

Far West Texas is in a topographically distinct area of North America known as the Basin and Range Physiographic Province and is characterized by higher elevations and greater local relief than is observed anywhere else in the State. Traversed from north to south by an eastern range of the Rocky Mountains, the Region contains all of Texas' true mountains (Figure 1-3). Widely spaced mountain ranges rise from 1,000 to more than 3,000 feet above the intervening basin lowlands.

Although most of Texas is generally flat and less than 2,500 feet above mean sea level, the floors of most of the basins in Far West Texas are at elevations greater than 3,000 feet. The basins (or bolsons) are filled with sediments eroded from the surrounding mountains. At the deepest points of the basins, deposits of basin-fill range in thickness from less than 1,000 feet to more than 9,000 feet. Except for the Rio Grande and its tributaries, the Rio Conchos (Chihuahua, Mexico) and the Pecos River (Texas), all surface water in the Region drains toward the lowest elevation within each basin. "Salt Flats" occur in northeastern Hudspeth and northwestern Culberson Counties where water, upwelling from shallow aquifers and collecting from rainfall runoff, rapidly evaporates leaving behind accumulations of mineral deposits. These lakes are dry during periods of low rainfall, exposing salt-incrusted basin flats. For years, this area was a source of commercial salt extraction.

Highest of the mountain ranges are the Guadalupe Mountains, which straddle the Texas-New Mexico state line. The highest elevations in the range are Guadalupe Peak (the highest surface elevation in Texas at 8,751 feet) and El Capitan, which overlook the Salt Basin to the west and south. Lying west of the Salt Basin and extending to the Hueco Mountains a short distance east of El Paso is the Diablo Plateau.

Other mountain ranges, including the Eagle, Quitman, Carrizo, Delaware, and Sierra Vieja Mountains, are located south and east of the Diablo Plateau in Culberson, Hudspeth, Jeff Davis, and Presidio Counties. These mountains overlook several intermountain basins from which there is no external drainage (e.g., Eagle Flat, Ryan Flat, Michigan Flat, and Wild Horse Flat). Two other basins, Red Light Draw and Green River Valley, are dissected by and drain to the Rio Grande.

The Davis Mountains are principally in Jeff Davis County; however, igneous rocks originating from volcanic vents that formed the Davis Mountains extend into Brewster, Hudspeth, and Presidio Counties. The Davis Mountains contain peaks with elevations greater than 7,000 feet, including Mount Livermore, which at 8,206 feet is one of the highest peaks in Texas. Mount Locke at 6,809 feet is home to the University of Texas McDonald Observatory. These peaks intercept moisture bearing winds and receive more precipitation than other locations in West Texas. The Davis Mountains are greener than other mountains of the Region with the growth of grass and forest trees.

The Big Bend country, which lies southeast of the Davis Mountains, is bounded on three sides by a great eastward swing of the Rio Grande, which gives it its name. It is a sparsely populated mountainous country with scant rainfall. Its principal mountains, the Chisos, rise to an elevation of 7,825 feet. Along the Rio Grande are the Santa Elena, Mariscal, and Boquillas Canyons, with rim elevations of 3,500 feet to 3,775 feet. Because of its remarkable topography and plant and animal life, the southern part of this Region along the Rio Grande is home to Big Bend National Park and Big Bend Ranch State Park.

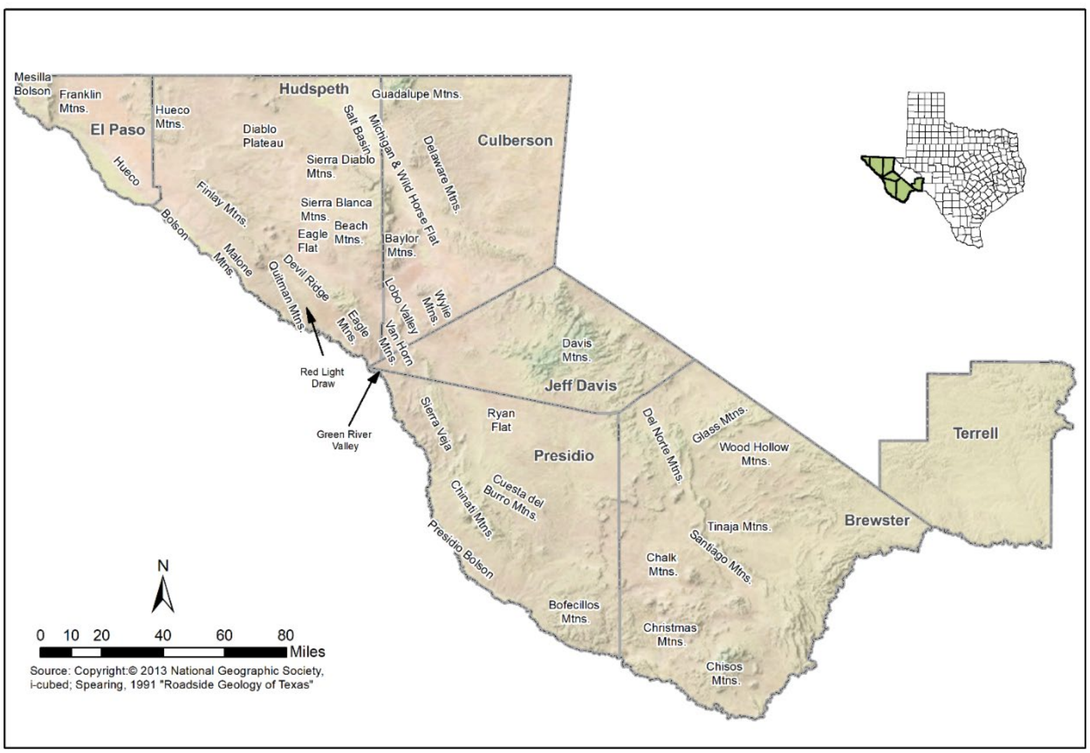


Figure 1-3. Mountains and Basins

In El Paso County, the Franklin Mountains rise 3,000 feet above the adjacent Rio Grande valley floor to an elevation of 7,192 feet and separate the "Upper and Lower Valleys" of the Rio Grande, as well as the Mesilla and Hueco Bolsons. The historic towns and missions of Ysleta, Socorro and San Elizario are located along the Lower Valley.

1.2.2 Population and Regional Economy

Apart from El Paso County, the counties of Far West Texas are among the least populated in the State. In the year 2030, approximately 98 percent (999,348) of the Region's 1,022,933 residents are projected to reside in El Paso County, where the population density is 914 persons per square mile (Figure 1-4). The population density of the six rural counties is approximately one person per square mile. Approximately 75 percent of the residents in the Region are Hispanic or Latinos.

The City of El Paso, one of the fastest growing cities in Texas, is the largest city in the Region, with a year 2030 projected population of 790,511. This is 79 percent of the total population of El Paso County and 77 percent of the Region's total population.

The year 2030 projected populations of cities in the six rural counties are as follows: Alpine, Brewster County (7,129); Van Horn, Culberson County (2,312); Sierra Blanca, Hudspeth County (1,663); Fort Davis, Jeff Davis County (945); Marfa, Presidio County (2,814); Presidio, Presidio County (2,279); Sanderson, Terrell County (477). Population of other smaller communities such as Fort Hancock, Del City, Marathon and Valentine are included in the "county-other" (rural) population of each county. The "county-other" rural population of the Region, projected in 2030 is 6,421, or one percent of the total Regional population. The current and projected population growth in Far West Texas is further discussed in Chapter 2.

The regional economy is predominantly comprised of agriculture, agribusiness, manufacturing, tourism, wholesale and retail trade, government, and military. According to TWDB's socio-economic analysis (provided in Appendix 6A), the Far West Texas Regional economy generates about $X billion in gross State product for Texas and supports roughly X jobs.

The dominant commercial land use throughout the rural areas of the Region is extensive cattle grazing. Aridity and historic land-tenure practices have combined to produce large ranches and low animal densities. Dairy operations in El Paso County represent the largest proportion of the market valuation for livestock, as El Paso County traditionally ranks in the top five dairy-production counties in Texas. Floodplain-irrigated agriculture is found along the Rio Grande extending above and below El Paso and into southern Hudspeth County. A much smaller irrigated strip also occurs along the River near Presidio. Currently, irrigated agriculture based on groundwater pumping is essentially limited to Dell Valley in northeastern Hudspeth County, Diablo Farms in northwestern Culberson County, and Wild Horse and Lobo Flats near Van Horn.

An innovative agricultural industry has developed in Jeff Davis and Presidio Counties where large greenhouse facilities have been constructed and successfully operated to produce hydroponically grown tomatoes. The Jeff Davis County and Presidio County Underground Water Conservation Districts permit well use for these two facilities and thus have records of their annual groundwater use. Although small compared to large-scale farming operations elsewhere in the Region, the Districts do strive to ensure that this innovative industry is recognized in the Regional Water Plan.

The Tornillo-Guadalupe International Bridge border crossing in El Paso County was completed in 2014 and replaces the existing Fabens-Caseta International Bridge. The crossing, capable of handling modern day commercial, automobile, and pedestrian traffic, supports the expansion of trade and economic growth on both sides of the border. In the El Paso area, the crossing allows continued expansion of jobs in related industries such as trucking, warehousing, transshipping, and manufacturing; and according to the border economic plan for El Paso County also allows expansion of employment opportunities along IH-10 near the intersection of traffic from Tornillo and Fabens. In Mexico, the project provides an additional crossing that accommodates the expansion of maquiladora plants eastward from Juarez. By 2025, total annual vehicle crossings, both north and south, are expected to be over 900 thousand. Commercial truck traffic that previously traveled through downtown El Paso and Juarez is now able to move through the crossing beyond the congested urban core, thus reducing air and noise pollution.

The Barnett Shale play has become the largest natural gas play in the State of Texas. This productive geologic formation has equivalent rock units (Woodford) that extend into West Texas. Although gas production from these formations in West Texas have not generally proven to be as prolific as those in the Fort Worth area, exploration interest has caused water planners to pay attention to an industry with potential high-water needs. In a concerted effort to derive meaningful water-use estimates for all mining applications, including the oil and gas industry, a TWDB report, "Water Use by the Mining Industry in Texas, 2022," estimates water-use for mining, (which includes water used for drilling operations such as rig supply), water flooding, and fracking in two reports. These estimates determined a water-use volume per oil and gas well. Estimates from these reports indicate that Culberson and Terrell Counties had the greatest demand by the oil and gas industry within the Far West Texas Region. None of the other counties in the Region have reported any significant usage by the industry.

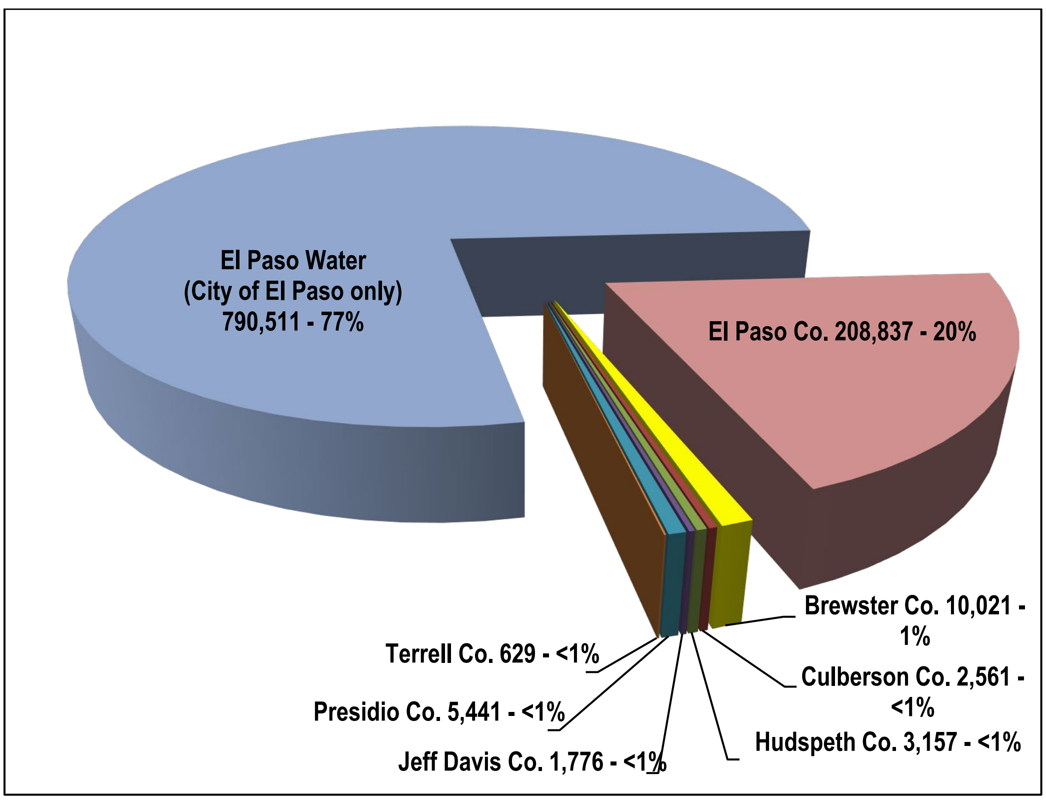


Figure 1-4. Year 2030 Projected Population

1.2.3 Land Use

Land use in the seven-county Region, as illustrated in Figure 1-5, is described here in terms of six categories:

- Urban (or developed).
- Cultivated agricultural.
- Rangeland.
- Forest.
- Waterways and Wetlands.
- Barren.

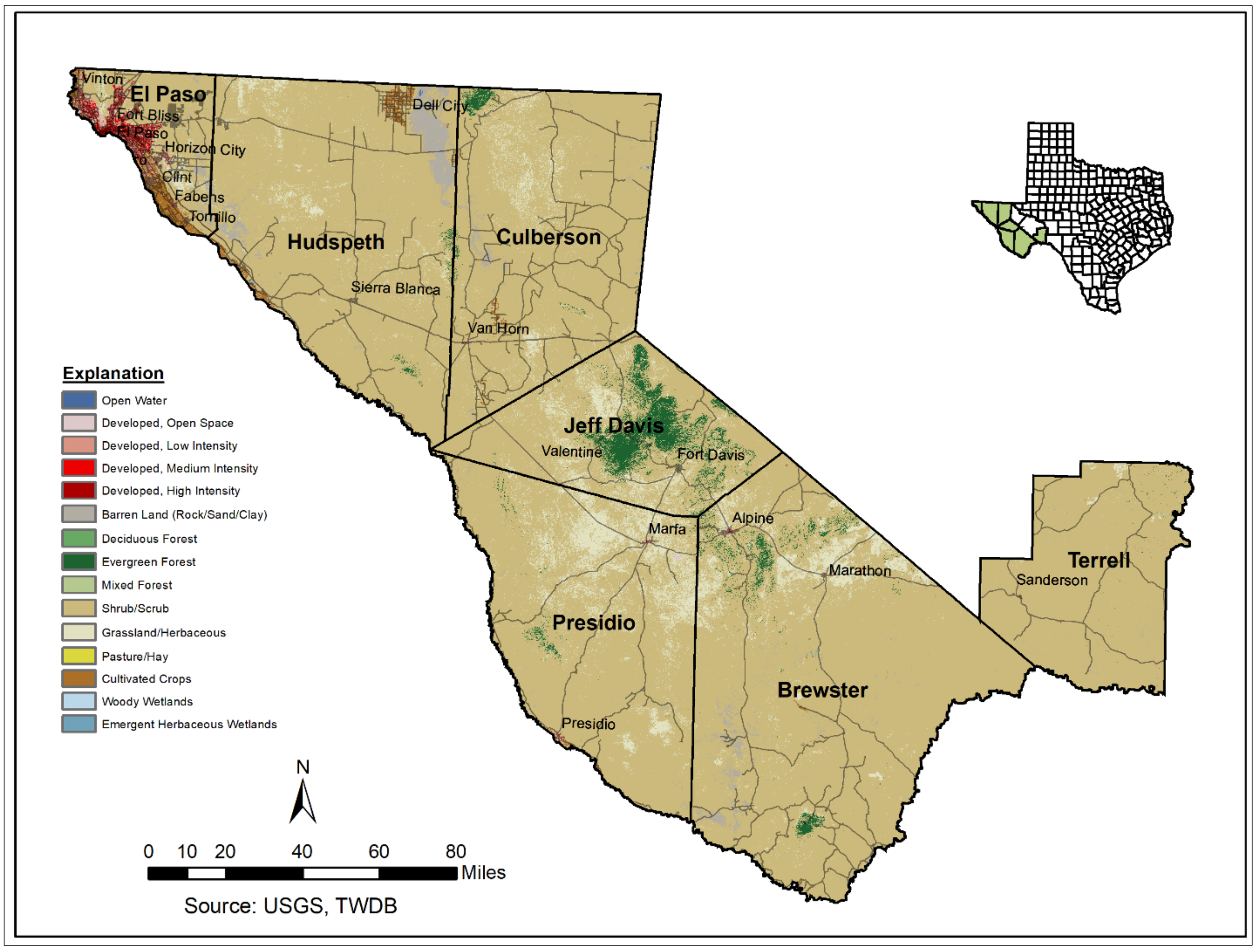


Figure 1-5. Land Use

Urban lands make up less than one percent of the total land area in Far West Texas. The largest concentration of urban land is in El Paso County, where 98 percent of the Region's residents live. Cultivated agricultural lands are identified as areas that support the cultivation of crops and occupy less than one percent of the total land area of the Region. These lands generally require access to high volumes of groundwater or surface water. Together, urban and cultivated agricultural lands comprise the two most significant water consumptive land use areas.

Rangeland is defined as all areas that are either associated with or are suitable for livestock production. Although this is the largest category of land use in the Region, rangeland accounts for one of the smallest sources of water demand. Forestland occurs where topography and climate support the growth of native trees. These are limited to highlands, such as the Davis, Guadalupe and Chisos Mountains. Forestlands rely exclusively on rainfall as a source of moisture.

Areas designated as either water or wetlands are mostly associated with the Rio Grande and the Pecos River and their tributaries. The Rio Grande is also a major source of irrigation water for agricultural lands in El Paso, Hudspeth and Presidio Counties. Most all other streams in the Region are ephemeral. In addition to the two rivers, wetlands formed by desert springs (cienegas) provide critical wildlife habitat. Finally, barren lands are defined as undeveloped areas with little potential for use for agriculture, rangeland, or forests.

1.2.4 Climate

Far West Texas, the most arid region in the State, is positioned in the northern part of the Chihuahuan Desert, a large arid zone that extends southward into Mexico. Only the highest altitudes occurring in the eastern part of the Region receive sufficient precipitation to be considered semiarid, rather than true desert.

The mean annual temperature of the Region is approximately 65°F. The average annual low temperature ranges between 45° F and 54° F, and the average high is 77°F to 80°F. During summer months, afternoon temperatures often exceed 100°F. In the winter, lows in the mountains and high desert plateaus can plummet to less than 10°F.

The Region usually reports the lowest annual precipitation (the regional average is 11.0 inches) and the highest lake-surface evaporation (the regional average is 70 inches) in Texas (Figure 1-6 and Figure 1-7). The combination of low rainfall and high evaporation creates what would be considered drought conditions in any other part of the State.

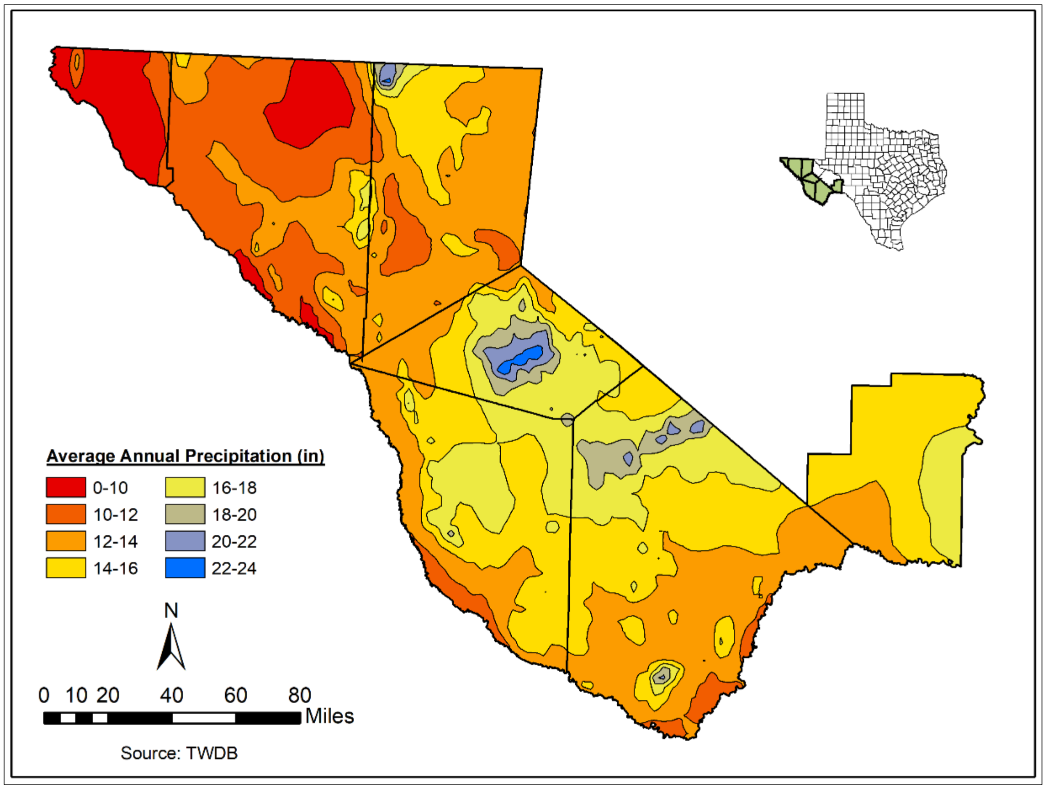


Figure 1-6. Variation of Precipitation

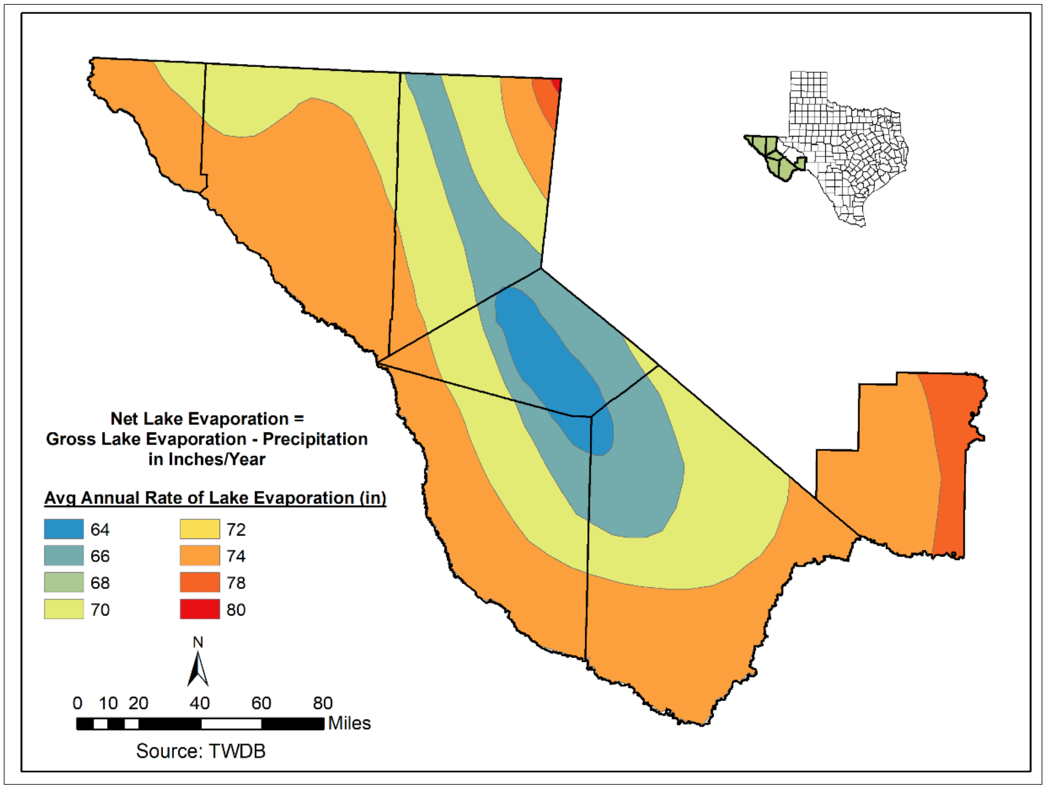


Figure 1-7. Net Lake Evaporation

Past climatic precipitation data was collected from National Oceanic and Atmospheric Administration (NOAA), for the purposes of calculating average monthly rainfall (1993-2023), for a total of 11 weather stations within the Region. These selected stations not only meet the 30-year record of service requirement, but accurately represent the average monthly rainfall amounts for each county. Tables 1-1 through 1-7 present monthly rainfall amounts by county, in inches based on these 31-year averages. From highest to lowest values, average annual rainfall by county is reported as follows:

- Jeff Davis County = 18.2 in.
  - Mount Locke, TX – USC004164104 (1993-2023).
- Brewster County = 13.3 in.
  - Alpine, TX – USC00410174 (1993-2008).
  - Alpine 7 NW, TX – USC00410176 (2009-2023).
- Terrell County = 12.2 in.
  - Sanderson, TX – USC00418022 (1993-2012).
  - Dryden Terrell CO Airport, TX - USW00003032 (2013-2023).
- Culberson County = 8.8 in.
  - Van Horn, TX – USC000419295 (1993-2023).
- El Paso County = 8.6 in.
  - El Paso International Airport, TX – USW00023044 (1993-2023).
- Presidio County = 8.3 in.
  - Marfa 2, TX – USC00415596 (1993-2008).
  - Presidio 2, TX – USC00417264 (2009-2017).
  - Presidio Lely International Airport, TX – USW00000471 (2018-2023).
- Hudspeth County = 7.7 in.
  - Fort Hancock 8 SSE, TX – USC00413266 (1993-2023).

According to the National Centers for Environmental Information (NCEI), most rainfall occurs between the months of June and October, as indicated by a graph of average monthly rainfall for selected stations (Figure 1-8). Rainfall during the spring and summer months is dominated by widely scattered thunderstorms. Because of the convective nature of thunderstorms, the amount of spring and summer precipitation in the Region increases with elevation.

Table 1-1. Brewster County Monthly Rainfall (1993-2023)
(inches)

Station Name	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total Average Annual Rainfall
Alpine, TX (USC00410174)	1993	0.83	0.04	0.08	0.47	1.55	1.08	7.30	2.50	0.53	0.39	0.00	0.95	
	1994	0.60	0.20	0.92	0.25	0.91	0.25	0.61	1.41	2.60	1.12	0.00	0.08	
	1995	0.11	0.20	0.21	n/a	n/a	2.51	0.28	0.66	4.98	1.66	0.35	0.71	
	1996	0.24	0.14	0.00	0.38	0.54	2.91	2.66	4.02	4.71	0.29	0.45	0.04	
	1997	0.32	1.99	0.10	1.01	1.88	4.00	3.13	2.50	1.33	0.40	0.63	0.9	
	1998	0.00	0.10	0.24	0.11	0.20	1.18	1.36	2.00	0.72	3.40	0.29	0.33	
	1999	0.00	0.00	1.35	0.02	1.04	4.39	6.15	1.36	0.93	0.22	0.00	0.21	
	2000	0.01	0.10	0.00	0.09	0.07	4.77	1.04	3.00	0.24	4.02	0.53	0.12	
	2001	0.50	0.70	0.26	0.16	0.57	0.46	2.04	1.37	1.84	0.02	1.08	0.19	
	2002	0.04	0.86	0.25	0.46	0.33	1.95	2.55	2.87	0.07	1.83	0.27	0.54	
	2003	0.00	1.16	0.30	0.00	0.85	3.40	1.79	n/a	0.77	2.21	0.06	0.00	
	2004	1.36	0.58	1.76	1.72	0.35	4.61	2.38	4.32	4.80	0.72	2.58	0.09	
	2005	0.33	1.64	0.19	0.03	0.91	1.52	n/a	6.21	0.1	n/a	n/a	0.08	
	2006	0.00	0.04	n/a	n/a	0.33	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
	2007	n/a	n/a	n/a	n/a	2.18	6.68	1.52	0.99	n/a	n/a	n/a	n/a	
	2008	n/a	n/a	n/a	n/a	n/a	n/a	3.95	5.85	4.41	0.41	0.02	0.10	
Alpine 7 NW, TX (USC00410176)	2009	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1.34	1.43	0.68	0.25	
	2010	1.47	0.54	0.06	0.30	0.15	2.60	5.65	3.59	1.16	0.02	0.00	0.00	
	2011	0.07	0.06	0.00	0.00	0.00	0.00	0.41	2.27	2.48	0.05	0.02	0.65	
	2012	0.33	0.28	0.00	0.50	2.29	1.59	6.16	2.29	3.11	0.78	0.46	0.10	
	2013	2.97	0.00	0.00	0.13	0.47	2.30	1.29	1.32	2.03	0.61	0.72	1.20	
	2014	0.00	0.08	0.35	0.21	0.01	2.68	1.49	4.54	5.44	1.04	2.91	0.38	
	2015	1.11	1.43	2.28	0.84	1.40	1.60	3.22	2.19	0.89	3.53	3.40	0.68	
	2016	0.37	0.04	0.02	0.25	2.14	0.85	2.88	4.05	1.46	0.29	0.46	0.70	
	2017	1.06	0.00	0.30	1.20	0.09	1.88	7.97	3.04	2.31	0.03	0.08	1.24	
	2018	0.02	0.06	0.05	0.02	1.33	1.67	2.42	1.90	2.83	3.49	0.06	0.53	
	2019	0.38	0.32	0.23	1.51	1.43	3.92	1.01	1.57	3.23	0.50	0.72	1.17	
	2020	0.53	1.31	0.38	0.00	0.29	0.04	0.20	0.29	2.22	0.11	0.00	1.41	
	2021	0.33	0.59	0.00	0.39	0.70	1.69	1.15	n/a	0.59	0.18	0.16	0.02	
	2022	0.18	0.08	0.00	0.01	0.29	1.92	2.83	7.57	2.75	2.39	0.71	0.16	
	2023	0.02	1.00	0.76	0.01	1.65	0.66	2.36	2.72	3.10	0.46	1.75		
Total Average Monthly Rainfall		**0.43**	**0.44**	**0.33**	**0.32**	**0.77**	**2.04**	**2.45**	**2.46**	**2.03**	**1.02**	**0.59**	**0.41**	**13.29**

Note: N/A represents no data was recorded.

Table 1-2. Culberson County Monthly Rainfall (1993-2023)
(inches)

Station Name	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total Average Annual Rainfall
Van Horn, TX (USC00419295)	1993	1.22	0.32	0.10	0.08	0.08	0.46	n/a	1.40	1.34	0.72	0.00	0.62	
	1994	0.07	0.05	0.07	0.16	1.67	0.46	0.40	0.38	1.49	0.81	0.49	0.69	
	1995	0.36	0.73	0.19	0.00	0.60	2.18	1.14	n/a	2.01	0.66	0.14	0.07	
	1996	n/a	0.00	0.00	0.53	0.00	5.62	2.34	4.83	2.41	0.03	0.26	0.00	
	1997	0.34	1.29	0.09	0.66	0.77	1.59	2.05	2.57	0.57	0.43	0.63	1.38	
	1998	0.06	0.12	0.11	0.00	0.08	0.42	3.57	1.63	0.65	1.71	0.42	0.42	
	1999	0.12	0.00	0.31	0.17	0.29	1.30	1.38	1.16	0.96	0.16	0.00	0.34	
	2000	0.00	0.09	0.00	0.00	0.00	2.63	n/a	n/a	0.00	1.39	0.60	0.28	
	2001	0.53	0.37	0.24	0.00	0.19	0.49	1.85	0.68	0.32	0.06	0.83	0.31	
	2002	0.17	1.15	0.19	0.12	0.08	1.95	1.84	1.23	0.42	1.56	0.27	0.68	
	2003	0.00	1.02	0.01	0.00	0.27	0.74	0.87	0.79	0.39	2.78	0.44	0.00	
	2004	0.56	0.19	0.46	1.35	0.30	0.96	0.85	4.22	3.25	3.21	3.22	0.31	
	2005	0.37	1.82	0.07	0.25	1.05	0.07	0.53	2.14	1.52	2.52	0.00	0.00	
	2006	0.00	0.25	0.50	0.00	0.11	0.20	3.15	n/a	2.77	1.07	0.08	0.35	
	2007	n/a	0.12	0.71	0.54	0.99	0.65	2.36	2.26	n/a	0.09	0.54	0.72	
	2008	n/a	0.02	0.03	0.00	0.40	0.02	1.93	1.30	2.56	0.00	0.00	0.28	
	2009	0.05	n/a	0.25	0.00	0.51	1.03	2.32	1.86	0.00	0.10	0.19	0.85	
	2010	1.59	1.65	0.10	1.22	0.00	0.17	4.68	2.23	1.45	0.08	0.00	0.00	
	2011	0.02	0.03	0.00	0.00	0.00	0.14	0.71	1.12	0.36	0.11	0.04	0.49	
	2012	0.61	0.11	0.24	0.00	0.77	0.10	1.51	1.14	1.74	0.00	0.03	0.00	
	2013	0.65	0.18	0.00	0.45	0.18	0.37	3.50	0.60	2.38	0.45	0.13	1.20	
	2014	0.00	0.06	0.31	0.26	0.01	1.54	1.42	4.04	2.34	0.91	0.44	0.40	
	2015	0.51	0.12	1.65	0.19	1.36	1.17	1.13	0.55	1.78	2.13	0.77	0.40	
	2016	0.05	0.00	0.02	0.05	0.80	1.98	0.91	4.53	1.20	1.31	0.27	0.79	
	2017	0.69	0.13	0.00	0.27	0.00	1.54	1.84	1.52	1.79	0.18	0.00	0.77	
	2018	0.00	0.04	0.04	0.00	0.18	0.06	1.02	1.38	1.03	0.89	0.32	0.40	
	2019	0.20	0.04	0.30	0.55	0.45	1.32	0.89	2.24	1.72	2.00	0.25	0.31	
	2020	0.02	0.77	1.37	0.00	0.43	0.25	1.02	0.56	1.02	0.00	0.00	0.18	
	2021	0.08	0.39	0.00	0.02	0.18	1.90	0.64	2.68	0.01	0.03	0.11	0.00	
	2022	0.20	0.25	0.00	0.06	0.03	0.88	1.65	3.77	0.84	1.23	0.60	0.02	
	2023	0.24	0.07	0.00	0.00	0.01	1.09	0.67	1.98	0.41	0.38	0.31	0.17	
Total Average Monthly Rainfall		**0.28**	**0.37**	**0.24**	**0.22**	**0.38**	**1.07**	**1.55**	**1.77**	**1.25**	**0.87**	**0.37**	**0.40**	**8.77**

Note: N/A represents no data was recorded.

Table 1-3. El Paso County Monthly Rainfall (1993-2023) (inches)

Station Name	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total Average Annual Rainfall
El Paso International Airport, TX (USW00023044)	1993	1.34	0.32	0.01	0.12	0.00	1.47	0.95	2.73	1.32	0.17	0.49	0.71	
	1994	0.03	0.23	0.37	0.65	0.80	0.67	0.18	0.02	0.03	0.35	0.54	1.61	
	1995	0.26	0.88	0.42	0.04	0.01	1.74	0.28	0.76	3.18	0.00	0.26	0.23	
	1996	0.11	0.19	0.00	0.49	0.00	2.36	1.97	1.87	1.24	0.00	0.16	0.00	
	1997	0.38	0.29	0.64	0.43	0.52	1.11	0.91	1.41	1.55	0.19	0.79	1.41	
	1998	0.05	0.15	0.18	0.04	0.00	0.27	2.07	0.53	0.66	2.14	0.34	0.34	
	1999	0.10	0.00	0.04	0.00	0.02	1.44	2.00	1.43	1.94	0.56	0.00	0.63	
	2000	0.00	0.03	0.06	0.28	0.00	2.45	1.59	0.70	0.00	0.82	1.06	0.42	
	2001	0.06	0.24	0.40	0.00	0.18	0.30	0.36	1.72	0.30	0.00	0.60	0.13	
	2002	0.00	1.22	0.00	0.00	0.00	0.35	1.34	0.76	0.48	1.09	0.00	1.65	
	2003	0.00	1.37	0.18	0.02	0.00	0.49	0.55	0.66	0.08	0.33	0.52	0.01	
	2004	0.36	0.05	0.80	1.06	0.50	0.93	1.70	3.04	0.89	0.39	2.01	0.36	
	2005	0.66	1.92	0.08	0.14	0.93	0.00	0.66	4.35	2.77	1.36	0.00	0.00	
	2006	0.02	0.28	0.00	0.01	0.89	0.27	3.17	6.85	4.99	0.92	0.06	0.05	
	2007	1.81	0.19	0.02	0.31	1.30	0.51	2.08	0.57	1.71	0.09	1.07	0.46	
	2008	0.14	0.15	0.00	0.00	0.03	0.48	4.34	2.61	1.52	0.15	0.17	0.27	
	2009	0.01	0.00	0.06	0.01	0.77	2.24	0.49	0.59	2.50	0.21	0.96	0.84	
	2010	0.66	1.43	0.02	0.13	0.01	1.08	1.07	0.31	1.62	0.18	0.00	0.16	
	2011	0.00	0.11	0.00	0.00	0.00	0.05	2.59	1.11	0.43	0.01	0.23	0.74	
	2012	0.66	0.02	0.08	0.09	0.53	0.00	2.39	0.65	1.41	0.10	0.02	0.09	
	2013	0.30	0.41	0.00	0.00	0.18	0.16	3.13	1.12	3.85	0.00	0.10	0.26	
	2014	0.00	0.00	0.18	0.45	0.01	0.01	0.69	1.79	4.23	0.98	0.11	0.12	
	2015	0.85	0.03	0.61	0.24	0.81	0.18	2.88	1.55	0.33	3.24	0.28	1.08	
	2016	0.46	0.07	0.01	0.04	0.06	0.33	0.24	4.76	2.12	0.00	0.39	0.86	
	2017	1.05	0.16	0.00	0.14	0.03	1.16	3.37	2.01	1.16	0.05	0.28	0.68	
	2018	0.10	0.67	0.21	0.00	0.41	0.37	1.36	1.16	1.21	2.44	0.01	0.43	
	2019	0.10	0.12	0.25	0.08	0.16	0.97	0.18	0.89	1.54	1.34	1.73	0.72	
	2020	0.27	0.78	2.02	0.00	0.21	0.25	1.47	0.05	0.59	0.18	0.00	0.02	
	2021	0.18	0.40	0.00	0.24	0.18	2.37	4.8	2.46	0.47	0.00	0.34	0.59	
	2022	0.03	0.40	0.15	0.00	0.00	1.24	0.24	2.84	1.65	1.91	0.12	0.34	
	2023	0.23	0.41	0.05	0.00	0.11	0.03	0.30	1.44	0.95	0.35	0.27	0.20	
Total Average Monthly Rainfall		**0.33**	**0.40**	**0.22**	**0.16**	**0.28**	**0.82**	**1.59**	**1.70**	**1.51**	**0.63**	**0.42**	**0.50**	**8.55**

Note: N/A represents no data was recorded.

Table 1-4. Hudspeth County Monthly Rainfall (1993-2023)
(inches)

Station Name	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total Average Annual Rainfall
Fort Hancock 8 SSE, TX (USC00413266)	1993	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.18	0.42	0.16	1.25	
	1994	0.00	0.00	0.59	0.00	0.50	0.00	0.31	0.65	1.40	n/a	0.34	0.00	
	1995	0.10	0.55	0.03	0.00	0.00	0.30	0.10	0.60	2.30	0.00	0.00	0.00	
	1996	0.10	0.00	0.00	0.42	0.00	1.40	0.55	1.73	0.90	0.00	0.00	0.00	
	1997	0.00	0.00	0.00	0.22	0.35	1.63	1.22	0.00	0.30	0.30	0.46	1.36	
	1998	0.00	0.24	0.00	0.00	0.44	0.23	1.36	0.44	0.05	1.53	0.00	0.00	
	1999	0.20	n/a	n/a	n/a	0.10	2.16	2.26	1.66	0.64	0.31	0.00	0.40	
	2000	0.00	0.08	0.00	0.10	0.00	2.12	0.98	1.12	0.00	1.58	1.25	0.19	
	2001	0.53	0.12	0.27	0.02	0.00	0.66	2.21	1.22	0.46	0.00	0.06	0.17	
	2002	0.17	1.20	0.00	0.00	0.10	0.73	0.48	0.21	0.42	1.31	0.00	0.85	
	2003	0.00	0.94	0.10	0.00	0.00	n/a	1.21	0.93	0.60	0.82	0.01	0.00	
	2004	0.95	0.78	0.85	1.49	0.49	1.95	1.37	1.86	2.03	1.80	2.51	0.18	
	2005	0.62	1.13	0.00	0.30	2.03	0.00	1.78	2.29	0.66	3.54	0.00	0.00	
	2006	0.00	0.09	0.19	0.00	0.00	0.09	2.95	3.16	1.25	1.50	0.04	0.15	
	2007	1.91	0.24	0.14	1.70	0.40	1.54	2.13	1.01	1.97	0.35	0.77	0.75	
	2008	0.00	0.00	0.00	0.00	0.30	0.06	3.88	2.18	1.79	0.70	0.00	0.00	
	2009	0.02	0.00	0.01	0.00	0.48	0.24	1.70	2.01	0.80	0.56	0.22	1.88	
	2010	0.67	0.99	0.00	0.97	0.00	0.40	2.22	1.60	0.66	0.33	0.00	0.06	
	2011	0.00	0.00	0.00	0.00	0.00	0.18	0.53	1.45	0.05	0.17	0.14	0.41	
	2012	0.67	0.03	0.66	0.33	0.45	0.00	2.33	1.73	0.74	0.00	0.11	0.01	
	2013	0.53	0.23	0.00	0.02	0.07	0.89	2.61	0.23	2.23	0.00	0.29	0.65	
	2014	0.00	0.07	0.00	0.78	0.00	0.58	2.47	2.05	0.98	0.55	1.16	0.40	
	2015	0.59	0.00	1.04	0.35	1.17	0.94	1.35	0.68	0.81	1.55	0.81	0.44	
	2016	0.24	0.00	0.00	0.28	0.85	0.46	0.54	3.30	1.61	1.85	0.00	0.75	
	2017	0.23	0.00	0.00	0.10	0.00	1.17	1.96	1.83	1.52	0.11	0.23	0.65	
	2018	0.03	0.15	0.22	0.00	0.02	1.83	0.81	0.97	1.30	2.18	0.48	0.76	
	2019	0.05	0.00	0.15	0.17	0.35	0.91	1.89	0.40	2.02	2.34	1.01	0.44	
	2020	0.05	0.45	1.76	0.00	0.11	0.43	1.78	0.00	0.97	0.01	0.00	0.20	
	2021	0.31	0.21	0.00	0.14	0.05	0.70	1.39	4.36	2.52	0.16	0.09	0.00	
	2022	0.43	0.17	0.00	0.00	0.00	2.17	1.49	6.70	0.54	1.58	0.28	0.15	
	2023	0.05	0.25	0.00	0.00	0.35	0.57	0.60	2.56	0.05	0.58	0.27	0.12	
Total Average Monthly Rainfall		**0.27**	**0.26**	**0.19**	**0.24**	**0.28**	**0.79**	**1.50**	**1.58**	**1.02**	**0.84**	**0.34**	**0.39**	**7.71**

Note: N/A represents no data was recorded.

Table 1-5. Jeff Davis County Monthly Rainfall (1993-2023)
(inches)

Station Name	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total Average Annual Rainfall
Mount Locke, TX (USC00416104)	1993	0.86	0.21	0.56	0.49	1.22	3.18	6.31	3.83	0.49	0.36	0.01	0.88	
	1994	0.47	0.19	0.62	0.27	3.27	1.01	2.48	1.66	2.40	1.06	0.07	0.47	
	1995	0.10	0.73	0.32	1.43	0.87	2.83	0.67	0.91	5.20	0.99	0.85	0.42	
	1996	0.52	0.17	0.10	0.09	0.14	1.46	2.98	4.05	6.95	0.31	0.91	0.04	
	1997	0.31	0.95	0.05	1.57	2.44	3.40	3.19	3.35	3.82	1.36	0.46	1.52	
	1998	0.00	0.04	0.06	0.06	0.58	0.25	3.70	3.36	0.12	2.19	0.33	0.39	
	1999	0.09	0.00	0.24	0.02	2.64	5.29	2.75	2.95	2.71	0.12	0.00	0.61	
	2000	0.04	0.16	0.00	0.29	0.13	7.38	0.96	1.80	0.00	2.66	0.64	0.04	
	2001	0.55	0.55	0.12	0.95	0.59	2.47	3.80	4.14	1.43	0.13	1.89	0.21	
	2002	0.17	1.21	0.38	0.28	0.01	1.86	5.43	3.86	1.13	2.70	0.35	0.23	
	2003	0.10	1.13	0.68	0.00	0.96	2.40	5.70	2.37	1.14	2.60	0.00	0.00	
	2004	1.54	n/a	1.88	3.00	1.90	2.33	3.58	5.74	6.10	3.58	4.78	0.25	
	2005	0.44	2.27	0.14	0.12	0.22	0.25	2.78	5.23	1.55	4.56	0.00	0.00	
	2006	0.00	0.07	0.20	0.00	0.23	1.16	3.00	n/a	1.90	2.01	0.04	0.77	
	2007	2.27	0.11	1.45	0.25	4.59	3.11	2.28	3.61	2.27	0.64	0.38	0.16	
	2008	0.20	0.03	0.09	0.00	0.16	2.82	5.53	3.92	4.23	0.59	0.00	n/a	
	2009	0.00	n/a	0.16	0.00	3.89	2.57	2.32	2.47	0.76	1.95	0.09	1.16	
	2010	1.77	0.72	0.23	1.10	0.50	3.61	7.93	4.74	3.82	0.00	0.00	0.00	
	2011	0.01	0.10	0.00	0.00	0.00	0.01	1.68	2.73	1.39	0.28	0.05	0.59	
	2012	0.54	0.17	0.59	0.28	2.64	1.63	3.96	3.80	3.55	0.30	0.03	0.10	
	2013	2.36	0.00	0.00	0.05	0.76	3.56	4.24	0.84	3.10	0.62	0.39	1.24	
	2014	0.00	0.00	0.68	0.71	0.00	3.03	3.84	3.51	4.02	1.26	1.44	0.44	
	2015	2.49	0.53	1.13	1.26	2.69	4.00	2.23	3.11	1.92	6.18	2.89	0.92	
	2016	0.12	0.00	0.06	0.19	2.08	2.99	1.16	7.80	2.51	0.71	1.21	0.39	
	2017	1.39	0.00	0.28	0.90	0.02	1.79	12.27	5.86	2.94	0.92	0.15	1.77	
	2018	0.00	0.02	0.05	0.09	1.38	1.97	5.55	2.74	3.44	2.84	0.00	0.66	
	2019	0.23	0.27	0.46	0.45	1.00	2.14	3.13	1.85	7.76	0.74	1.24	0.45	
	2020	0.92	0.95	1.22	0.02	0.84	2.50	2.30	1.26	1.62	0.00	0.00	0.6	
	2021	0.24	0.37	0.00	0.20	1.25	5.73	2.04	6.00	1.29	1.32	0.12	0.05	
	2022	0.25	0.33	0.02	0.00	0.05	2.28	5.44	6.94	3.12	3.63	0.44	0.28	
	2023	0.08	0.47	0.31	0.04	1.36	0.93	0.68	3.37	3.25	1.15	1.28	0.00	
Total Average Monthly Rainfall		**0.58**	**0.38**	**0.39**	**0.46**	**1.24**	**2.58**	**3.67**	**3.48**	**2.77**	**1.54**	**0.65**	**0.47**	**18.21**

Note: N/A represents no data was recorded.

Table 1-6. Presidio County Monthly Rainfall (1993-2023) (inches)

Station Name	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total Average Annual Rainfall
Marfa 2, TX (USC00415596)	1993	0.93	0.16	0.23	0.44	0.37	1.46	2.89	1.68	0.86	0.49	0.00	0.78	
	1994	1.38	0.16	1.10	0.10	2.66	0.63	0.91	1.74	0.79	0.82	0.02	0.50	
	1995	0.10	0.27	0.04	1.28	0.49	1.75	2.54	2.56	4.18	0.65	0.11	0.48	
	1996	0.14	0.20	0.07	0.00	0.12	1.37	2.33	5.52	6.00	0.10	0.61	0.03	
	1997	0.09	2.08	0.12	1.56	2.66	0.90	6.28	2.44	1.07	0.16	0.68	0.96	
	1998	0.03	0.12	0.20	n/a	n/a	0.07	2.79	2.80	1.04	1.77	0.22	0.11	
	1999	0.00	0.00	0.20	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
	2000	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
	2001	n/a	n/a	n/a	n/a	1.56	0.43	5.03	2.22	1.01	0.09	0.98	0.14	
	2002	0.03	0.81	0.23	0.67	0.64	1.55	3.43	3.57	0.55	2.02	0.57	0.34	
	2003	0.00	0.98	0.34	0.00	0.32	2.95	n/a	1.16	0.88	1.65	0.02	0.00	
	2004	1.80	0.30	2.12	1.16	0.53	3.17	3.16	4.26	4.07	0.93	3.79	0.28	
	2005	0.48	1.41	0.02	0.03	0.66	0.85	2.34	3.86	2.50	3.80	0.00	0.08	
	2006	0.01	n/a	0.00	n/a	0.02	0.54	1.46	n/a	3.26	n/a	0.00	n/a	
	2007	0.24	0.23	n/a	0.40	2.19	n/a	1.35	0.44	n/a	n/a	n/a	n/a	
	2008	n/a	n/a	0.00	n/a	n/a	n/a	n/a	n/a	n/a	0.00	n/a	n/a	
Presidio 2, TX (USC00417264)	2009	0.00	n/a	1.13	0.00	2.01	2.06	1.20	2.99	0.68	0.91	0.02	0.46	
	2010	0.95	0.95	0.08	1.75	0.25	0.32	1.37	1.43	1.41	0.00	0.00	0.00	
	2011	0.00	0.00	0.00	0.00	0.00	1.40	0.33	0.30	0.49	0.32	0.00	0.07	
	2012	0.00	0.18	0.00	0.30	1.83	0.69	0.79	0.41	2.09	0.50	0.27	0.00	
	2013	0.20	0.00	0.00	0.00	0.56	3.65	3.22	0.39	2.33	0.08	0.71	0.44	
	2014	0.00	0.03	0.00	0.17	0.00	0.71	0.67	3.50	5.19	0.28	2.04	0.00	
	2015	1.64	0.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
	2016	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
	2017	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Presidio Lely International Airport, TX (USW00000471)	2018	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1.56	0.00	0.62	
	2019	0.39	0.04	0.02	0.01	0.05	1.01	n/a	1.18	2.86	0.57	0.45	0.42	
	2020	0.17	0.22	0.16	0.09	0.12	0.01	0.38	0.01	2.18	0.07	n/a	0.43	
	2021	0.19	0.33	0.02	0.62	1.61	1.39	1.32	2.15	0.32	n/a	0.14	n/a	
	2022	0.01	n/a	n/a	n/a	0.09	0.75	1.15	5.89	0.13	1.37	0.03	0.10	
	2023	n/a	0.44	0.34	n/a	2.45	0.06	0.01	0.43	0.58	0.12	0.39	0.07	
Total Average Monthly Rainfall		**0.28**	**0.29**	**0.21**	**0.28**	**0.68**	**0.89**	**1.45**	**1.64**	**1.43**	**0.59**	**0.36**	**0.20**	**8.31**

Note: N/A represents no data was recorded.

Table 1-7. Terrell County Monthly Rainfall (1993-2023)
(inches)

Station Name	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total Average Annual Rainfall
Sanderson, TX (USC00418022)	1993	0.59	0.39	0.15	1.00	2.84	0.90	1.44	3.60	1.40	0.22	0.15	0.99	
	1994	1.21	0.41	1.07	0.70	0.21	0.42	1.01	0.82	1.66	0.98	0.21	n/a	
	1995	0.19	1.16	0.07	0.91	2.92	3.44	1.09	0.95	4.64	0.78	1.68	n/a	
	1996	n/a	0.23	n/a	0.76	0.73	0.50	0.31	3.81	3.27	0.59	1.11	0.05	
	1997	0.22	1.00	3.00	0.94	2.13	4.11	0.61	1.36	2.30	1.08	0.34	0.68	
	1998	0.16	0.27	0.08	n/a	0.20	2.72	0.02	4.63	0.08	1.74	1.29	4.11	
	1999	n/a	n/a	0.68	0.15	3.40	5.75	4.44	0.49	0.26	0.11	n/a	0.15	
	2000	0.04	0.33	0.01	0.17	n/a	2.57	1.15	0.01	0.20	5.25	2.55	0.23	
	2001	0.74	0.39	0.45	0.20	0.38	0.18	n/a	2.02	0.08	0.19	4.95	0.03	
	2002	n/a	0.41	0.20	1.91	0.44	0.25	3.30	0.42	0.91	3.04	0.13	0.90	
	2003	0.05	0.98	0.39	0.08	0.65	1.06	2.27	2.03	1.16	2.57	0.10	n/a	
	2004	0.81	0.98	3.42	2.91	0.44	4.51	6.63	1.11	2.23	0.66	2.86	0.08	
	2005	0.55	1.15	0.51	0.07	3.63	0.84	n/a	n/a	0.04	3.12	n/a	0.36	
	2006	0.04	0.38	0.05	n/a	0.09	1.64	0.13	n/a	n/a	1.17	n/a	n/a	
	2007	n/a	n/a	2.66	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
	2008	0.33	n/a	0.05	0.05	0.38	4.12	1.89	2.69	4.59	0.74	0.02	0.23	
	2009	n/a	n/a	1.90	0.02	1.90	3.25	1.38	0.09	0.58	1.65	0.09	2.71	
	2010	1.63	1.79	0.20	0.98	2.81	0.10	11.28	0.16	1.24	n/a	n/a	0.02	
	2011	0.37	0.06	n/a	0.11	0.03	n/a	0.03	0.28	0.35	1.07	0.05	0.52	
	2012	n/a	0.57	1.02	0.43	3.97	0.24	2.12	1.61	1.32	0.31	0.09	0.02	
Dryden Terrell CO Airport, TX (USW00003032)	2013	3.54	n/a	n/a	0.39	0.31	1.10	1.47	0.08	4.33	0.52	1.08	0.20	
	2014	n/a	0.02	n/a	0.34	0.30	1.64	0.07	0.70	1.74	0.70	0.26	0.06	
	2015	1.50	0.33	2.57	1.74	1.14	2.76	1.58	0.18	n/a	2.43	0.47	0.52	
	2016	0.24	0.52	1.87	0.33	2.22	0.62	0.33	3.30	0.45	0.05	0.55	0.57	
	2017	0.49	0.96	0.07	0.97	0.13	1.42	3.27	3.28	2.93	0.15	0.03	1.46	
	2018	n/a	0.02	1.40	n/a	1.17	0.21	0.55	2.56	5.35	2.71	n/a	1.23	
	2019	0.41	0.01	0.18	1.11	0.52	4.38	n/a	0.12	1.32	0.33	0.59	0.62	
	2020	0.23	0.70	0.37	0.02	1.10	0.88	n/a	0.01	0.41	n/a	n/a	1.15	
	2021	0.52	0.08	n/a	0.10	3.46	0.64	1.27	0.86	0.89	0.02	n/a	0.24	
	2022	0.13	0.39	n/a	0.03	0.54	0.05	n/a	7.94	0.86	3.17	0.53	0.21	
	2023	0.10	0.32	0.63	0.04	0.74	2.49	0.12	5.78	0.46	1.44	1.86	0.80	
Total Average Monthly Rainfall		**0.45**	**0.45**	**0.74**	**0.53**	**1.25**	**1.70**	**1.54**	**1.64**	**1.45**	**1.19**	**0.68**	**0.59**	**12.21**

Note: N/A represents no data was recorded.

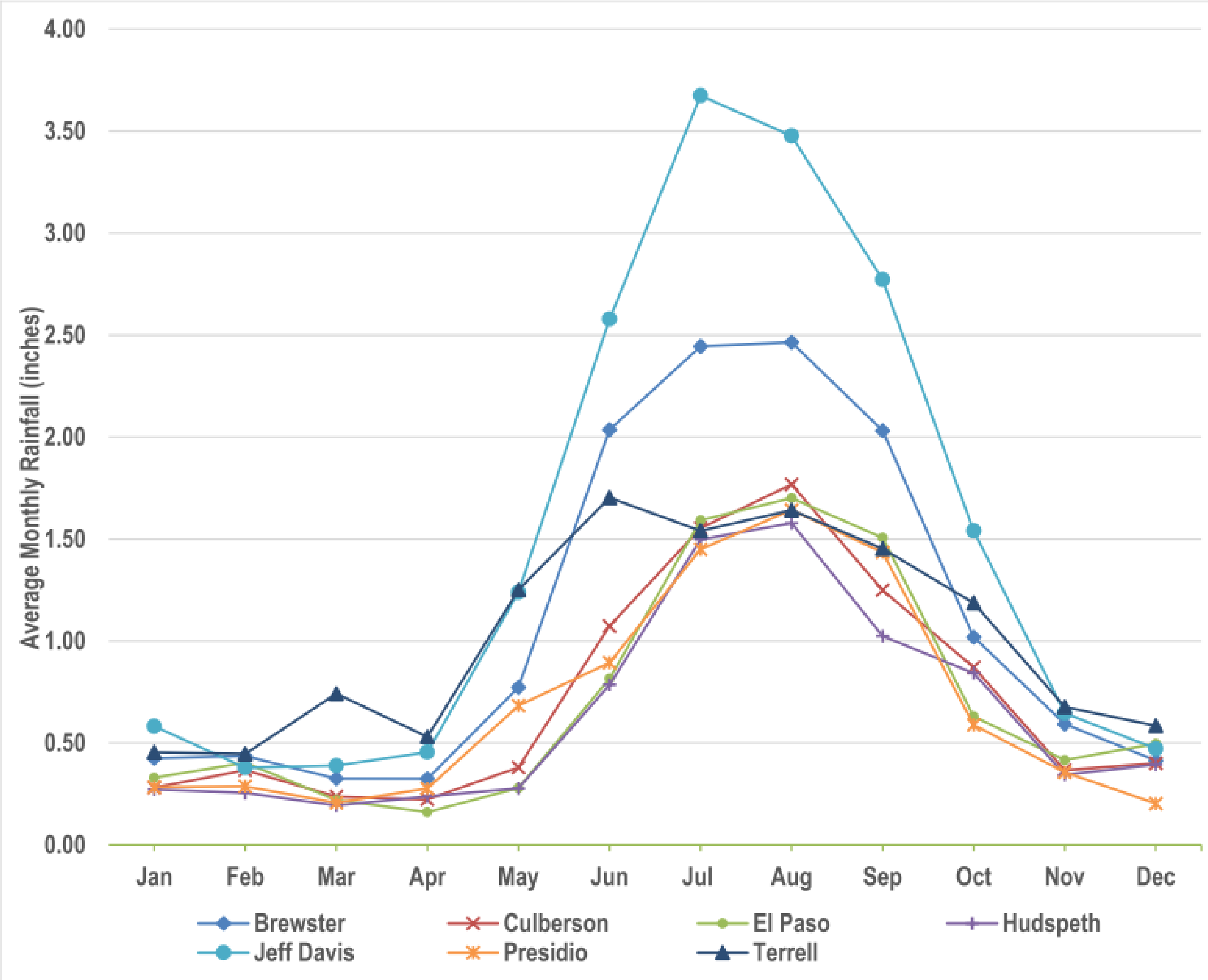


Figure 1-8. Average Monthly Rainfall for Selected Stations
Source: NCEI

1.2.5 Far West Texas Climate Change Conference

Far West Texas, like much of the western United States, has historically relied on large-scale infrastructure to store and deliver surface water supplies. These surface water supplies are particularly vulnerable to changes in weather patterns. With the realization that the regional climate may have been more variable in the past than indicated by the historical record and may be even harsher and more variable in the future, several western states have taken on initiatives to address the potential impacts of climate change on their natural resources.

Because of these and other considerations, State Senator Eliot Shapleigh authored Senate Bill 1762 during the 80th Texas Legislative Session. The bill directed the TWDB, in coordination with the FWTWPG, to conduct a study regarding the possible impact of climate change on surface water supplies from the portion of the Rio Grande in Texas subject to the Rio Grande Compact. Because of this legislation, the TWDB hosted the Far West Texas Climate Change Conference June 17, 2008, at the Carlos M. Ramirez Water Resources Learning Center in El Paso. Along with other related issues, conference participants reviewed:

- Current analyses of potential impacts of climate change on surface water resources in Texas and other Western states; and
- Recommendations for incorporating potential impacts of climate change into the Far West Texas Water Plan, including potential impacts to the Rio Grande in Texas subject to the Rio Grande Compact, and identifying feasible water management strategies to offset any potential impacts.

The entire report "Far West Texas Climate Change Conference – Study Findings and Conference Proceedings" can be accessed on the TWDB's website.

1.2.6 Drought

Drought conditions are assumed in the planning process to ensure that adequate infrastructure and planning is in place under severe water shortage conditions and is discussed in detail in Chapter 7 of this *Plan*. Drought in Far West Texas can be defined in the following operational definitions:

Meteorologic drought is an interval of time, usually over a period of months or years, during which precipitation cumulatively falls short of the expected supply.

Agricultural drought is that condition when rainfall and soil moisture are insufficient to support the healthy growth of crops and to prevent extreme crop stress. It may also be defined as a deficiency in the amount of precipitation required to support livestock and other farming or ranching operations.

Hydrologic drought is a long-term condition of abnormally dry weather that ultimately leads to the depletion of surface water and groundwater supplies, the drying up of lakes and reservoirs, and the reduction or cessation of spring flow or streamflow.

Although agricultural drought and hydrologic drought are consequences of meteorologic drought, the occurrence of meteorologic drought does not guarantee that either one or both of the others will develop. Regarding the upper segment of the Rio Grande, drought is more significantly influenced by the amount of snowmelt in southern Colorado and northern New Mexico that affects the amount of water in storage in Elephant Butte Reservoir shown in Figure 1-9. Historical data (1915-2020) provided by U.S. Department of Interior, Bureau of Reclamation. For Far West Texas and particularly those who rely on the Rio Grande, an operational drought definition is more appropriate.

The westernmost part of Texas, as well as the headwaters of the Rio Grande in Colorado and New Mexico, has been experiencing drought conditions for much of the past two decades, with only 1997, 2005, and 2008 experiencing above average spring runoff into Elephant Butte reservoir. According to the U.S. Bureau of Reclamation El Paso Office, July 2013 Elephant Butte reservoir was at only three percent of capacity. 2013 was the shortest irrigation season (less than six weeks) and supplied the least amount of water in the almost 100-year history of the Rio Grande Project. After a short period of recovery, the reservoir was again back down to 3.3 percent of capacity by October 2018. Per the TWDB Water Data for Texas, in May 2024 Elephant Butte Reservoir is 23 percent of a full reservoir. Approximately one-fourth of the water currently in storage is Rio Grande Compact Credit water, which is owned by upstream users and is not available for use in southern New Mexico, Texas, or Mexico.

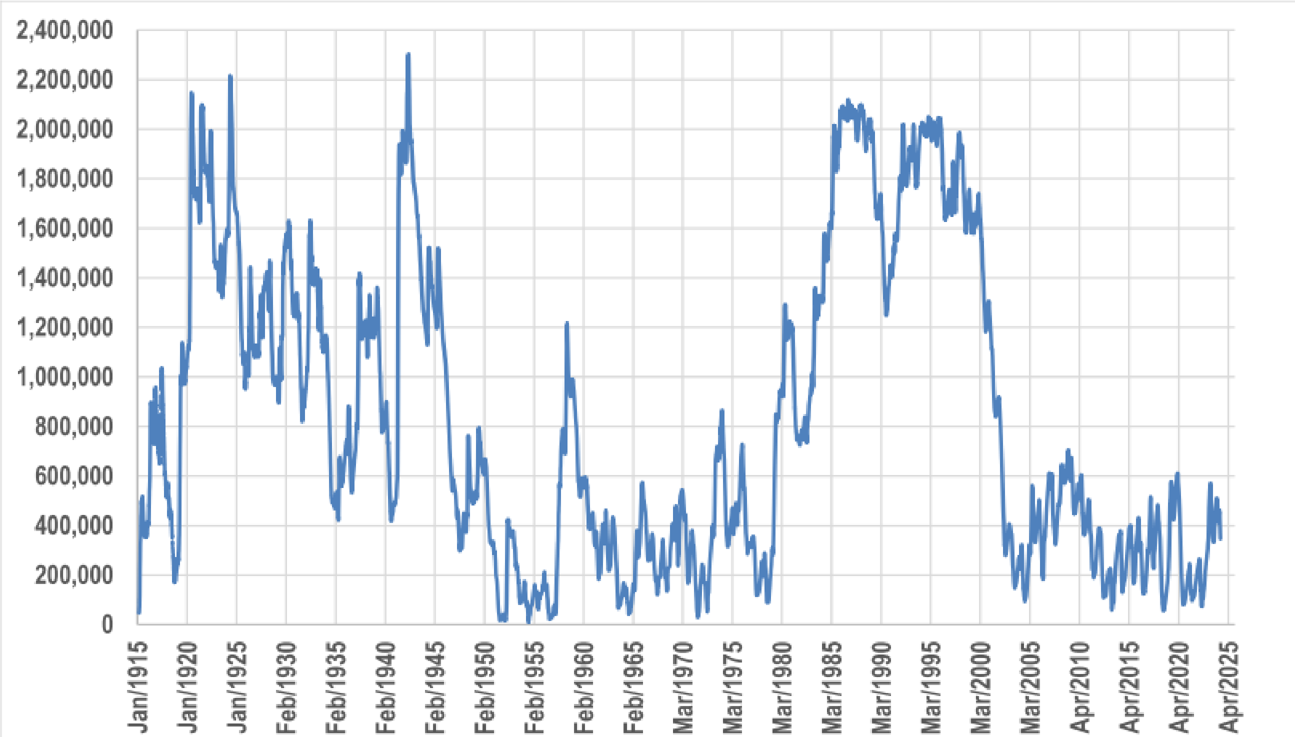


Figure 1-9. Elephant Butte Reservoir Storage in Acre-Feet
Source: U.S. Bureau of Reclamation

River drought above Fort Quitman is a period when the Rio Grande and its storage facilities (reservoirs) have reached a stage where water deliveries are less than full allocation. There may be a drought in all other definitions, but if there is adequate storage in the local reservoir (Elephant Butte), there is no "river drought" and no reduction in surface water deliveries.

River drought below confluence of Rio Conchos may be defined as any time the combined flows of the Rio Grande and Rio Conchos falls below 250 cubic feet per second (cfs) for more than 90 consecutive days.

Consistent flows of less than 250 cfs below Presidio have reduced to bare remnants an agricultural economy on land that has been continuously cultivated longer than anywhere else in Texas. Consistent low water flow threatens important wildlife habitat and river recreation resources that are essential building blocks for rural economies downstream of El Paso.

The 1950s drought-of-record, 2011 and the 2022 drought can be compared using historic precipitation, stream flow records, spring discharges and water level measurements in wells for locations that have accumulated data measurements since the 1940s. This is discussed further in Chapter 7. For this planning cycle, the drought of the 1950s is declared the drought-of-record. However, it is the intent of the current *2026 Plan*, to illustrate in Chapter 7 that although the 1950s drought is the historic drought-of-record, drought conditions experienced over the past decade are significant.

Far West Texas is perennially under drought or near-drought conditions compared with more humid areas of Texas. Although residents of the Region are generally accustomed to these conditions, the low rainfall and the accompanying high levels of evaporation underscore the necessity of developing plans that respond to potential disruptions in the supply of groundwater and surface water caused by drought conditions. Those entities that rely on surface water are most vulnerable to the impact of drought. Irrigators along the Rio Grande rely on projected allocations provided by the U.S. Bureau of Reclamation to anticipate their crop potential each year. El Paso Water has developed a conjunctive use plan in which it can shift supply emphasis to groundwater sources during periods of low surface water availability. Water management and drought contingency plans for regional entities are discussed in detail in Chapter 7.

1.2.7 Native Vegetation and Ecology

Vegetation native to the arid Chihuahuan Desert is closely tied to the Region's precipitation and evaporation potential. This area typically receives most of its precipitation in the summer in the form of convective storms, which are typically characterized by intense rainfall concentrated in small areas. When it occurs, winter precipitation comes from frontal systems, which are generally soaking rains covering larger areas. Due to their nature, the summer precipitation generally wets only the shallow subsurface soil layer, whereas winter rains are more likely to percolate deeper into the subsurface.

According to the Chihuahuan Desert Research Institute, vegetation native to Far West Texas can be classified into two groups: (1) intensive water users and (2) extensive water users. Intensive water users include short grasses and cacti, which have short root systems and respond quickly to small amounts of moisture that is available in the soil profile for only a limited time. Extensive water users have both shallow roots capable of capturing soil moisture as well as deep roots that penetrate further downward in the subsurface. Thus, summer rainfall favors grasslands, while winter rainfall favors scrubs. Although a shift in predominate precipitation patterns from summer to winter has not been clearly recognized, local observations indicate that scrubs are becoming more predominate. Likewise, it is becoming increasingly clear that ongoing drought conditions in Far West Texas are placing a serious strain on vegetation, especially the oak and conifer woodlands in the higher elevations.

1.2.8 Agricultural Resources

Agriculture, including both the beef industry and irrigated farming, is the most significant economic activity in Far West Texas. The raising of beef cattle occurs in all seven counties, with Brewster County accounting for the greatest number of range cattle. The dairy industry primarily operates in El Paso County.

With an average annual rainfall of 11 inches, the raising of crops in this Region requires irrigation. Most irrigated farming occurs along the flood plains of the Rio Grande in El Paso, Hudspeth, and Presidio Counties, where water is diverted from the River to grow vegetables, cotton, various grain crops, and orchards. Inland, groundwater sources are pumped to the surface to irrigate crops and pastures primarily in Hudspeth (Dell Valley), Culberson (Diablo Farms, Wild Horse Flat, and Lobo Flat), and Jeff Davis (Ryan Flat and Lobo Flat) Counties.

Agricultural activities in the Region that rely on surface water are designed to accommodate the intermittent nature of the supply. In some cases, this means that agricultural water-supply needs will be supplemented by groundwater sources, or that irrigation activities will cease until river supplies are replenished.

The only potential impacts to agricultural are identified with the possible change in water rights use from agricultural use to municipal use of Rio Grande water in El Paso County and groundwater in the Dell City and Diablo Farms areas of Hudspeth and Culberson Counties. As these strategies only potentially change the use of the water and not the volume of diversion, there is no significant impact to natural resources.

1.2.9 Natural Resources

Far West Texas boasts the highest and most scenic desert communities in Texas. The natural resources of the Region include the surface water and groundwater sources described in Sections 1.4 and 1.5 of this chapter, and in Chapter 3. Terrestrial and aquatic habitats that provide beautiful vistas, recreational opportunities, and unique wildlife habitats are also natural resources. Understandably, both residents and tourists make use of these resources in their enjoyment of the numerous public parks within the Region. Big Bend National Park, Guadalupe Mountains National Park, and Big Bend Ranch State Park are three of the largest protected areas in the Region.

Natural resources also include the great diversity of plant and animal wildlife that inhabit these environments. Texas Parks and Wildlife Department's Natural Diversity Database is a comprehensive source of information on species by county that are Federally listed, proposed to be Federally listed, have Federal candidate status, are State listed, or carry a global conservation status indicating a species is critically imperiled, very rare, vulnerable to extirpation, or uncommon. TPWD suggests that due to continuing updates that readers access the most current listing of the Rare, Threatened, and Endangered Species of Texas.

Both plant and animal species endemic to Far West Texas have developed a tolerance for the intermittent nature of surface water availability; however, significantly long drought conditions can have a severe effect on these species. Riparian water needs for birding habitat are particularly critical. Springs (cienegas) emanating from shallow groundwater sources often provide the most constant water supply available for aquatic habitat. "Major Springs" in the Region are listed in Section 1.6 of this chapter and are described in more detail in Appendix 1A, while "ecologically unique river and stream segments" are described in Chapter 8 of this *2026 Plan*.

Of recognized importance to the water planning process is the concern of the effect that future development of water supplies might have on the diversity of species in the Region. Water-supply deficit strategies developed in Chapter 5 of this *Plan* include an evaluation of each strategy's potential impact on the environment and natural resources.

1.3 REGIONAL WATER DEMAND

1.3.1 Major Demand Centers

Total projected year 2030 water consumptive use (demand) in Far West Texas is 598,338 acre-feet. The largest category of use is irrigation (404,049 acre-feet), followed by municipalities and county-other (162,873 acre-feet), mining (11,922 acre-feet), steam-electric power (8,880 acre-feet), manufacturing (7,920 acre-feet), and livestock (2,694 acre-feet) (Figure 1-10). Sixty seven percent of water used in the Region is by the agricultural sector in support of irrigation. Twenty seven percent is used by municipalities and county-other, and the remaining 6 percent supports manufacturing, steam-electric power generation, livestock, and mining. Current and projected water demand for all water-use types are discussed in detail in Chapter 2.

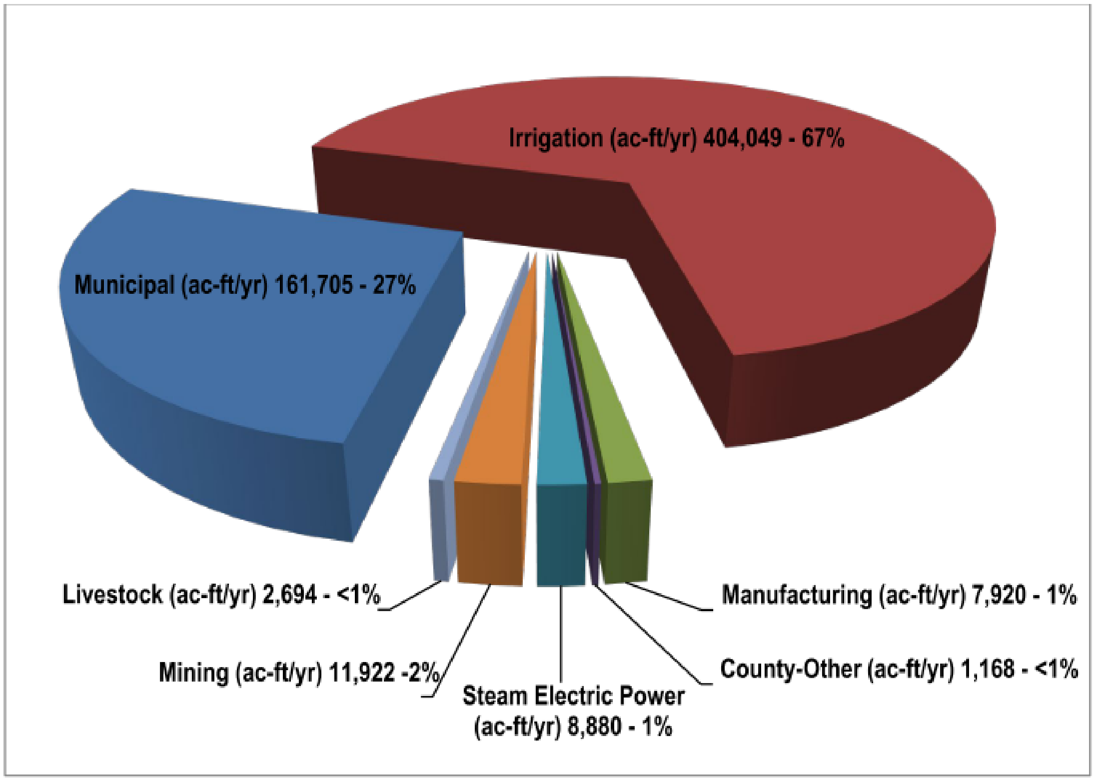


Figure 1-10. Year 2030 Projected Water Demand by Water-Use Category

1.3.2 Agriculture

The cultural and physical landscape of Far West Texas has more in common with the desert southwest than with other areas of Texas. The dominant commercial land use throughout the rural areas of the Region is extensive cattle grazing. Aridity and historic land-tenure practices have combined to produce large ranches and low animal densities. The projected total volume of water used in livestock production in the Region in the year 2030 is 2,694 acre-feet. Livestock water demand in 2030 ranges from a high of 533 acre-feet in Hudspeth County to a low of 183 acre-feet in Terrell County. The reduction of concentrated dairy farms has significantly reduced livestock water consumption in El Paso County. Cow and calf operations dominate the livestock industry in every county except Terrell, where sheep and goats predominate. In addition to livestock, many of the ranches supplement revenue through hunting leases.

There is virtually no rain-fed agriculture (dry-land farming) in Far West Texas, and even irrigated agriculture is confined to a small fraction of the Region. Floodplain-irrigated agriculture is found along the Rio Grande extending above and below El Paso (EPCWID#1) and into southern Hudspeth County (HCCRD#1). A much smaller irrigated strip also occurs along the Rio Grande near Presidio from Candelaria to Redford.

Currently, irrigated agriculture based on groundwater pumping is essentially limited to Dell Valley in northeastern Hudspeth County, Diablo Farms in northwestern Culberson County, and Wild Horse and Lobo Flats near Van Horn. High quality cotton, pecans, alfalfa, and vegetables such as tomatoes, onions, and chilies are the major crops of the Region.

Total projected irrigation use in the Region in the year 2030 is 404 049 acre-feet. El Paso and Hudspeth Counties accounted for the greatest amount of irrigation with 193,990 and 143,072 acre-feet of use, respectively. Along the Rio Grande corridor in these two counties, irrigation water is diverted from the Rio Grande River, except during years when flow is significantly below normal. In northeastern Hudspeth County, the Dell Valley farming area irrigates cropland with groundwater pumped from the underlying Bone Spring-Victorio Peak Aquifer.

Irrigation in El Paso and Hudspeth Counties represents 83 percent of total on-farm irrigation water use in the Region. Most of the remaining 17 percent of irrigation demand is centered in Culberson County, where 55,482 acre-feet is projected to be used in 2030 to support irrigated agriculture. Greenhouse farming operations near Fort Davis and Marfa have the highest crop (tomatoes) yield per volume of water applied.

El Paso County Water Improvement District #1 (District) boundary contains approximately 83,000 acres of land, of which 69,010 acres are irrigable land within the Federal Rio Grande Reclamation project. During a year with a full supply of Rio Grande water, the District provides water for approximately 50,000 acres of irrigated farmland, 6,000 acres of irrigated small tract property, and 13,000 acres for use by El Paso Water on behalf of the City of El Paso and Lower Valley Water District.

Crop production in Far West Texas is not sustainable without a source of irrigation water. A reduction in the quantity of water available for irrigation will cause a reduction in the number of acres that can be irrigated profitably. Similarly, cutbacks in the supply of water for livestock will cause a reduction in herd size. As water supplies are depleted, modifications will be required to use the available rangeland resource, and water hauling within a given ranch may be required to better distribute water to livestock.

Although drought-like conditions are a relative constant in the Region, extended periods of below normal rainfall can have significant and long-lasting harmful effects on the rangeland resource. Reduction of livestock numbers because of drought usually lags the impact of drought on the range-grass ecosystem. Extended periods of drought can lead to the depletion of grass species and to an increase in shrub species. This leads to a decrease in soil cover and increases the potential for erosion by water and wind.

A decrease in water quality has a greater impact on crop production than on livestock output. As the salinity of irrigation water increases, the amount of irrigation water applied must also increase. This satisfies the leaching requirement and keeps the root zone salinity at levels that allow for economic crop production. If salinity levels increase, the mixture of crops may change to include crops with greater tolerance to soil salinity.

Groundwater use for irrigated farming principally occurs in Dell Valley, Diablo Farms, and along the various flats that comprise the Salt Basin bolson valley. Principal aquifers from which irrigation water is withdrawn include the Rio Grande Alluvium, Bone Spring-Victorio Peak, Capitan Reef, and the Wild Horse/Michigan, Lobo, and Ryan Flats of the West Texas Bolson Aquifers. Characteristics of these aquifers are described in Chapter 3.

Future availability of water for agricultural use from these aquifers varies. During times of insufficient river flow farmers may use groundwater from the Rio Grande Alluvium to sustain crops. However, because of its high mineral content, this water can only be used on a short-term basis. In Dell Valley, groundwater from the Bone Spring-Victorio Peak Aquifer has deteriorated in quality, particularly in the central part of the valley as a result of repeated irrigation water return flow. The Aquifer should remain viable in the future as the Hudspeth County Underground Water District #1 limits permitted withdrawals to 101,400 acre-feet or less annually (MAG aquifer limit). Water levels have declined in the past in most parts of the Salt Basin aquifers but have generally recovered due to a decrease in pumpage in recent years.

1.3.3 Municipal and County-Other

The municipal and county-other category of demand consists of both urban-residential, rural-domestic, and commercial water uses. Commercial water consumption includes business establishments, public offices, and institutions, but does not include industrial water use. Residential and commercial uses are categorized together because they are similar types of uses, i.e., they both use water primarily for drinking, cleaning, sanitation, air conditioning, and landscape watering. Total projected municipal and county-other water demand in the seven counties in the year 2030 is projected to be 162,873 acre-feet.

The City of El Paso, with a projected water use of 120,789 acre-feet in the year 2030, represents 74 percent of the total municipal and county-other water use in the Region. The City's water demand has remained in check over the last several years due to diligent enforcement of conservation measures. Total projected municipal and county-other water use in El Paso County (155,088 acre-feet in 2030), which includes the City of El Paso, other communities, and rural domestic supply, represents 95 percent of the Regional total.

EPWater which serves the City of El Paso, obtains approximately half of its water from the Rio Grande in full river water supply allocation conditions. The remainder is groundwater pumped from wellfields in the Mesilla Bolson and Hueco Bolson Aquifers. The Utility also supplies water to other incorporated areas and to businesses within El Paso County. Other entities in El Paso County not served by EPWater rely exclusively on groundwater resources. All the cities and unincorporated areas of the six rural counties likewise depend entirely on groundwater resources from aquifers located in their respective areas.

Following necessary treatment, water supplies developed for municipal consumption are expected to meet “primary” and “secondary” safe drinking water standards mandated by the U.S. Environmental Protection Agency and the Texas Commission on Environmental Quality. “Primary standards” address dissolved particulates (e.g., heavy metals and organic contaminants) that are known to have adverse effects on human health. “Secondary standards” address factors that affect the aesthetic quality (e.g., taste and odor) of drinking water.

Water quality varies widely within the Region. In much of the rural counties, groundwater is of sufficient quality that only chlorination is required as a means of treatment. In other areas, various methods of treatment are required to bring the water into compliance with primary and secondary standards. For example, Dell City, El Paso, and Horizon Regional MUD operate desalination plants or wellhead facilities to reduce the concentration of total dissolved solids (TDS) in groundwater extracted from local aquifers.

EPWater actively treats available water supplies to meet drinking water standards. These operations include the blending of fresh water with marginally elevated TDS water to increase available supplies, and the tertiary treatment of wastewater to generate supplies for reuse. EPWater has updated its treatment facilities to accommodate the arsenic concentration standard. EPWater and Fort Bliss have jointly constructed the Kay Bailey Hutchison Desalination Facility, a 27.5 MGD desalination plant that makes use of brackish groundwater in the Hueco Bolson Aquifer, thus preserving fresh water in the Aquifer for drought protection and emergency use.

County-other is an aggregation of residential, commercial, and institutional water users in cities with less than 500 people or non-city utilities that provide less than 100 acre-feet per year, as well as unincorporated rural areas in each county. The 2030 county-other total water demand for the Region is 1,168 acre-feet/year (Figure 1-10).

1.3.4 Major Water Providers

A Major Water Provider (MWP) is defined as a significant public or private WUG or Wholesale Water Provider (WWP) whose significance is determined by the RWPG and provides water for any water-use category in a regional water planning area. Entities meeting this definition and entities to which they contract are as follows:

El Paso County Water Improvement District #1

- El Paso Water.

El Paso Water

- City of El Paso.
- Lower Valley Water District.
- Fort Bliss and East Biggs.
- Vinton Hills.
- Paseo Del Este MUD#1.
- East Montana Water System.
- Haciendas Del Norte WID.
- County-Other.
- El Paso Steam Electric.
- Manufacturing.
- Mining.

Lower Valley Water District

- Socorro.
- San Elizario.
- Clint.

Horizon Regional MUD

- Horizon City.
- County Other.

The El Paso County Water Improvement District #1 primarily delivers water from the Rio Grande to irrigators in El Paso County and sells water to El Paso Water. EPWater obtains raw surface water from the El Paso County Water Improvement District #1 and groundwater from its own wells in the Hueco and Mesilla Bolson Aquifers. While most of this water is used within the City of El Paso, significant volumes are also provided to manufacturing and power generating entities, as well as other public suppliers outside of the City. The Lower Valley Water District is a significant supplier of water to Socorro, San Elizario, Clint, and other retail customers and receives all its supply from EPWater. Horizon Regional MUD supplies water to Horizon City and other local retail customers.

1.3.5 Industrial, Manufacturing, Electric Power Generation, and Mining

Industrial and manufacturing companies, which represent a significant component of the economy of Far West Texas, are mostly located in El Paso County where all but five acre-feet of the total 7,920 acre-feet of water projected to be used in the Region in the year 2030 is used in El Paso County. The industrial, manufacturing, and power generation sectors purchase water from EPWater, or are self-supplied by water wells. In some cases, companies use treated wastewater provided by EPWater through the Utility's purple-pipe program.

El Paso Electric Company, located in El Paso County, is the only facility within the Region that uses water in the form of steam to generate electricity (8,880 acre-feet in 2030). Anticipated local population growth, as well as increasing commercial and manufacturing power needs, means that the quantity of water needed to produce electricity will likewise increase. El Paso Electric currently purchases most of its water supply from EPWater.

Chemical quality standards for water used for industrial purposes vary greatly with the type of industry utilizing the water. The primary concern with many industries is that the water does not contain constituents that are corrosive or scale forming. Also, of concern are those minerals that affect color, odor, and taste; therefore, water with a high concentration of dissolved solids is avoided in many manufacturing processes.

The livestock sector accounts for the smallest area of demand, with 2,694 acre-feet of projected total use in the Region in 2030.

1.3.6 Environmental and Recreational Water Needs

Environmental and recreational water use in Far West Texas is recognized as being an important consideration as it relates to the natural community in which the residents of this Region share and appreciate. In addition, for rural counties, tourism activities based on natural resources offer perhaps the best hope for modest economic growth.

Natural and environmental resources are often overlooked when considering the consequences of prolonged drought conditions. All living organisms require water. The amount and quality of water required to maintain a viable population, whether it be plant or animal, is highly variable. As water supplies diminish during drought periods, the balance between both human and environmental water requirements becomes increasingly competitive. A goal of this *Plan* is to provide for the health, safety, and welfare of the human community, with as little detrimental effect to the environment as possible. To accomplish this goal, the evaluation of strategies to meet future water needs includes a distinct consideration of the impact that each implemented strategy might have on the environment.

Recreation activities involve human interaction with the outdoor environment. Many of these activities are directly dependent on water resources such as fishing, swimming, and boating; while a healthy environment enhances many others, such as hiking and bird watching. Thus, it is recognized that the maintenance of the regional environmental community's water-supply needs serves to enhance the lives of citizens of Far West Texas as well as the tens of thousands of annual visitors to this Region. Environmental and recreational water needs are further discussed throughout the *Plan*.

1.4 SURFACE WATER SUPPLY SOURCES

1.4.1 Rio Grande

The Rio Grande originates in southwestern Colorado and northern New Mexico, where it derives its headwaters from snowmelt in the Rocky Mountains (Figure 1-11). The Elephant Butte Dam and Reservoir in New Mexico is approximately 125 miles north of El Paso and can store over two million acre-feet of water. Water in the reservoir is stored to meet irrigation demands in the Rincon, Mesilla, El Paso, and Juarez Valleys and is released in a pattern for power generation. Above El Paso, flow in the River is largely controlled by releases from Caballo Reservoir located below Elephant Butte; while downstream from El Paso to Fort Quitman, flow is dominated by treated municipal wastewater from El Paso, untreated municipal wastewater from Juarez, and irrigation return flow. Below the El Paso-Hudspeth County line, flow consists mostly of return flow and occasional floodwater and runoff from adjacent areas. Channel losses are significant enough that the Rio Grande is often dry from below Fort Quitman to the confluence with the Rio Conchos, which is entirely in Mexico and joins the Rio Grande upstream of Presidio. The Rio Conchos is the only significant perennial tributary in the 350 miles between Elephant Butte Reservoir and Presidio.

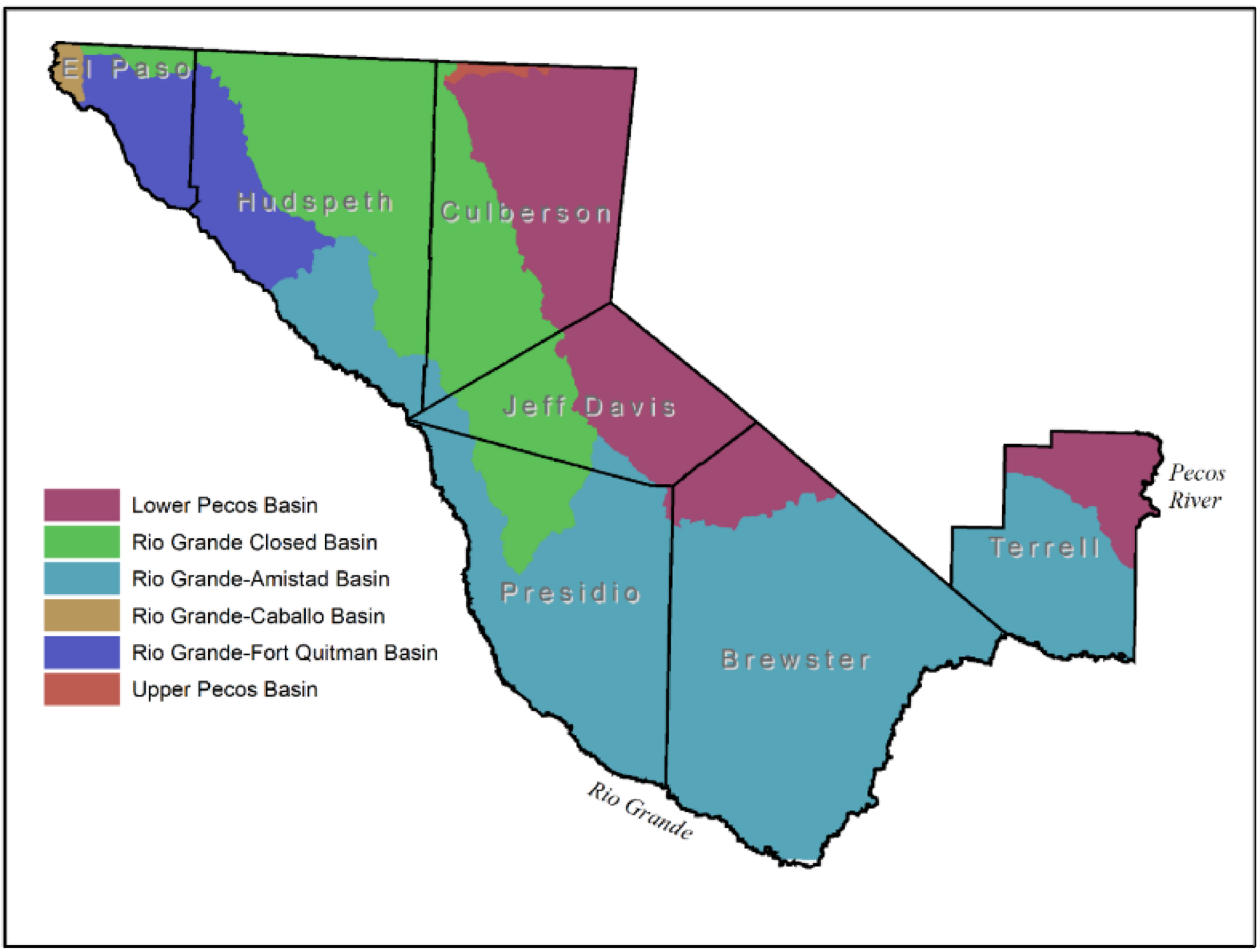


Figure 1-11. Rio Grande Drainage Basins Above Amistad Reservoir

The Rio Grande is unique in its complexity of distribution management. Because the waters of the River must be shared between three U.S. states (Colorado, New Mexico and Texas) and the nation of Mexico, a system of Federal, State and local programs has been developed to oversee the distribution of water. The compacts, treaties and projects that currently provide the River's management framework are discussed in Chapter 3.

1.4.2 Pecos River

The Pecos River forms the eastern boundary of Far West Texas only for a short distance at the northeast corner of Terrell County (Figure 1-11). As a major tributary to the Rio Grande, the headwaters of the Pecos River originate as snowmelt east of Santa Fe, New Mexico in the Sangre de Cristo Mountains. The River flows southward through eastern New Mexico, to where Red Bluff Lake impounds it at the Texas-New Mexico border. The Pecos River Compact defines the apportionment of Pecos River waters between New Mexico and Texas and is administered by the Pecos River Compact Commission. Although Pecos River water in Texas is typically too salty for human consumption, it has been a source for irrigation in Pecos, Reeves and Ward Counties. Downstream in Terrell County, water in the Pecos is mostly relegated to livestock use.

1.4.3 Ecologically Unique River and Stream Segments

As part of the planning process, regional water planning groups may include recommendations of ecologically unique river and stream segments in their adopted regional water plans (31 TAC 357.8), but only the Texas Legislature may designate a river or stream segment of unique ecological value based on the recommendations of a regional water planning group. As per §16.051(f) of the Texas Water Code, this designation solely means that a State agency or political subdivision of the State may not finance the actual construction of a reservoir in a specific river or stream segment designated by the legislature under this subsection.

The FWTWPG chooses to respect the privacy of private lands and therefore recommends as "Ecologically Unique River and Stream Segments" (Figure 1-12) three streams that lie within the boundaries of State-managed properties, four within National Park boundaries, and specified streams managed by the Texas Nature Conservancy and the Trans Pecos Water Trust. All the streams previously designated by the FWTWPG have been adopted by the Texas Legislature. These stream and river segments are described in Chapter 8.

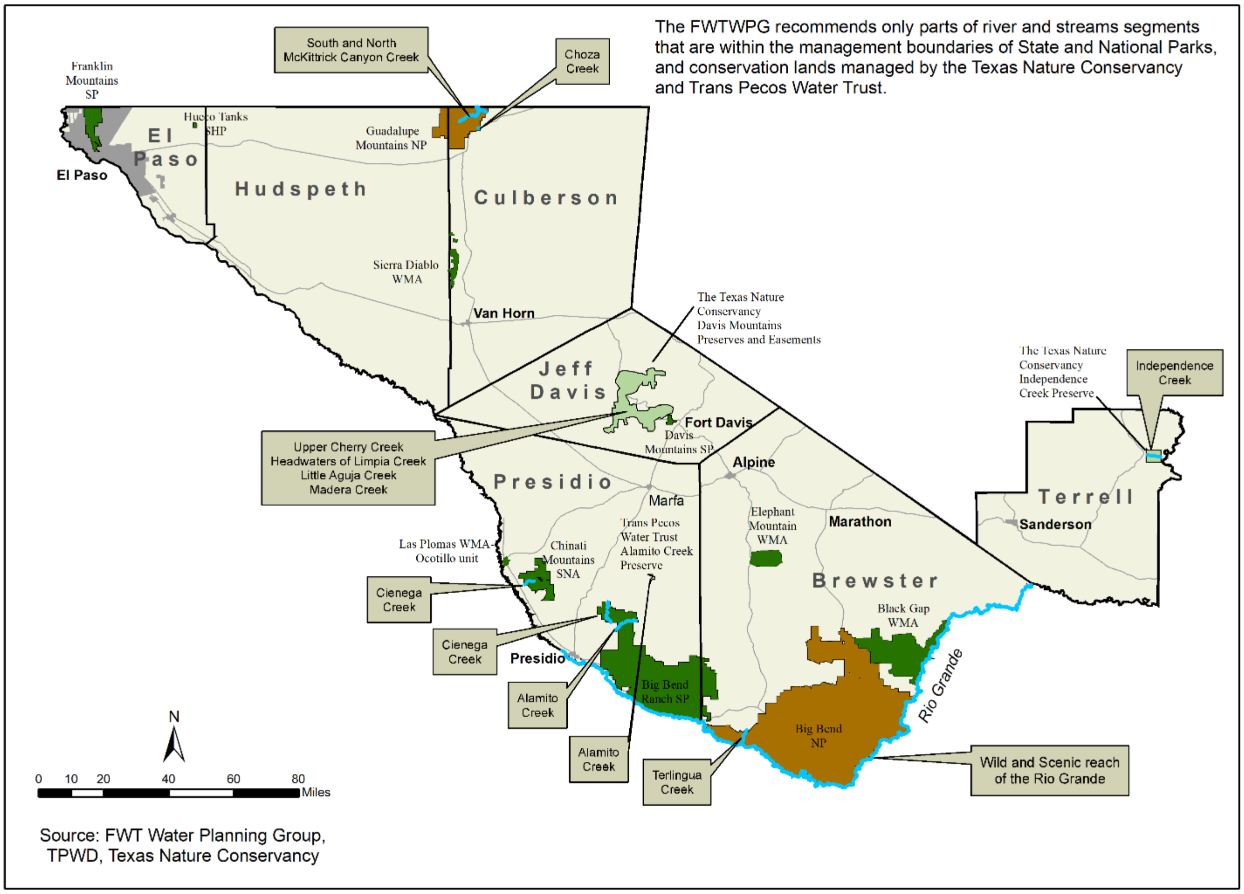


Figure 1-12. Recommended Ecologically Unique River and Stream Segments

1.5 GROUNDWATER SUPPLY SOURCES

Outside of the Rio Grande corridor, almost all water-supply needs are met with groundwater withdrawn from numerous aquifers in the Region (Figure 1-13). Depth to water, well yields, and chemical quality dictate how these resources are used. A more thorough discussion of the aquifers, especially as it relates to water-supply availability, can be found in Chapter 3. Aquifers recognized in the Region include the following:

- Hueco and Mesilla Bolson.
- West Texas Bolsons.
    - Salt Basin.
        - Upper Salt Basin.
        - Wild Horse and Michigan Flats.
        - Lobo Flat.
        - Ryan Flat.
    - Presidio / Redford.
    - Green River Valley.
    - Red Light Draw.
    - Eagle Flat.
- Bone Spring-Victorio Peak.
- Igneous (Davis Mountains Igneous).
- Edwards-Trinity (Plateau).
- Capitan Reef Complex.
- Marathon.
- Rustler.
- Pecos Valley (Balmorhea Alluvium).

Other locally recognized groundwater sources:

- Rio Grande Alluvium.
- Edwards-Trinity of Brewster County (Brewster Cretaceous).
- Diablo Plateau.

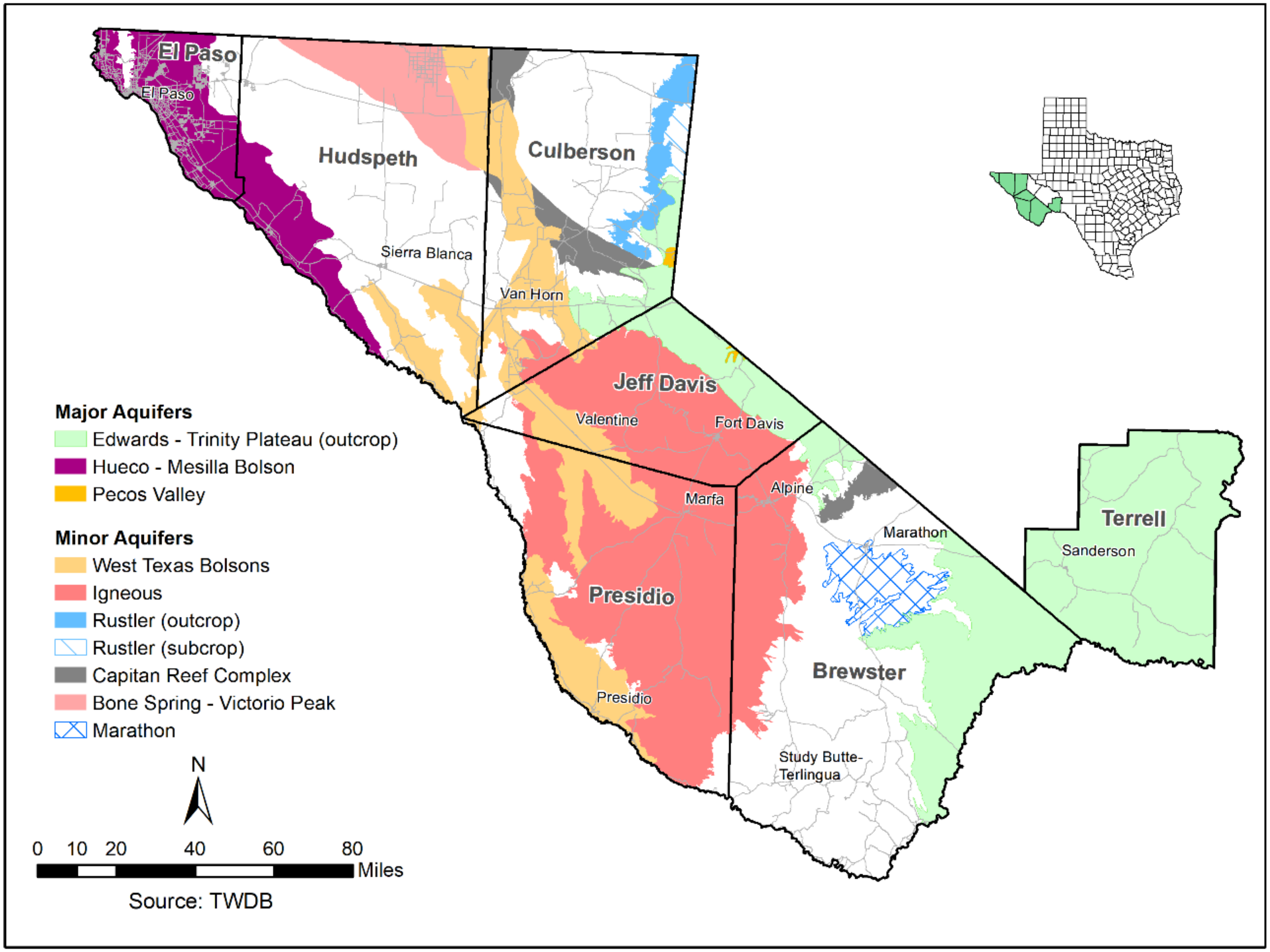


Figure 1-13. Major and Minor Aquifers of Far West Texas

1.5.1 Hueco and Mesilla Bolson Aquifers

The Hueco Bolson Aquifer extends from east of the Franklin Mountains in El Paso County southeastward into southern Hudspeth County and continues a short distance north into New Mexico and south into Mexico. The Hueco Bolson along with the Mesilla Bolson Aquifer provides approximately half of the municipal supply for the City of El Paso and is the principal source of municipal supply for Ciudad Juarez, Mexico.

The Mesilla Bolson Aquifer lies in the Upper Rio Grande Valley west of the Franklin Mountains and extends to the north into New Mexico where it is primarily used for agricultural and public supply purposes. In Texas, the agricultural use of this Aquifer is much less than in New Mexico. EPWater's Canutillo Wellfield is located in the Mesilla Bolson.

1.5.2 West Texas Bolsons Aquifer

Several deep bolsons, or basins, filled with sediments eroded from the surrounding highlands underlie Far West Texas. In places, the bolsons contain significant quantities of groundwater. These bolsons are referred to as Red Light Draw, Eagle Flat, Green River Valley, Presidio-Redford, and the Salt Basin. The Salt Basin is subdivided from north to south into the Upper Salt Basin and Wild Horse, Michigan, Lobo, Ryan Flats. The bolson aquifers provide variable amounts of water for irrigation and municipal water supplies in parts of Culberson, Hudspeth, Jeff Davis and Presidio Counties. The communities of Presidio, Sierra Blanca, Valentine and Van Horn rely on the bolson aquifers for municipal water supplies.

1.5.3 Bone Spring-Victorio Peak Aquifer

The Bone Spring-Victorio Peak Aquifer is in northeast Hudspeth County along the eastern edge of the Diablo Plateau, west of the Guadalupe Mountains, and extends northward into the Crow Flats area of New Mexico. The Aquifer is used primarily as a source of irrigation water. Dell City is the only municipality that relies on the Aquifer as a source of public supply; however, the City must filter the water through a desalination process to render the water supply potable. The Hudspeth County Underground Water Conservation District #1 regulates the quantity of water withdrawn from the Aquifer. The boundary of the District was recently extended to include the TWDB revised extent of the Aquifer. EPWater has purchased 66,000 acres of land and water rights overlying this Aquifer as a potential future water-supply source (see EPWater strategies in Chapter 5).

1.5.4 Igneous Aquifer

The Igneous Aquifer occurs in the Davis Mountains of Jeff Davis County and extends outward into Brewster and Presidio Counties. The Cities of Alpine, Fort Davis and Marfa rely on the Aquifer as a source of municipal supply.

1.5.5 Edwards-Trinity (Plateau) Aquifer

The Edwards-Trinity (Plateau) Aquifer underlies the Edwards Plateau east of the Pecos River and the Stockton Plateau west of the Pecos River and provides water to all or parts of 38 Texas counties. The Aquifer extends from the Hill Country of Central Texas to the Trans-Pecos region of Far West Texas, where it is a source of water in Brewster, Culberson, Jeff Davis and Terrell Counties. There is relatively little pumpage from the Aquifer over most of its extent in Far West Texas, with the City of Sanderson in Terrell County being the only municipality in the Region that pumps water from the State-designated potion of this Aquifer.

1.5.6 Capitan Reef Aquifer

The Capitan Reef Aquifer is contained within a relatively narrow strip of limestone formations (10 to 14 miles wide) that formed along the shelf edge of the ancestral Permian Sea. In Texas, the reef formations are exposed in the Guadalupe, Apache, and Glass Mountains and trend northward into New Mexico, where the Aquifer is a source of abundant fresh water for the City of Carlsbad. Within Far West Texas, the Aquifer underlies sections of Culberson County and a small area of northern Brewster County. EPWater owns approximately 29,000 acres overlying the Capitan Reef Aquifer in northwestern Culberson County and may tap this Aquifer for future needs (see EPWater strategies in Chapter 5).

1.5.7 Marathon Aquifer

The Marathon Aquifer is located entirely within north-central Brewster County and is used primarily as a municipal water-supply by the Community of Marathon and for rural domestic and livestock purposes.

1.5.8 Rustler Aquifer

The Rustler Formation is exposed in eastern Culberson County and plunges eastward into the subsurface of adjacent counties. The Aquifer is principally located beneath Loving, Pecos, Reeves and Ward Counties, where it yields water for irrigation, livestock and water-flooding operations in oil-producing areas. No communities in Far West Texas rely on this Aquifer as large concentrations of dissolved solids render the water unsuitable for human consumption.

1.5.9 Pecos Valley (Balmorhea Alluvium) Aquifer

The Pecos Valley Aquifer, locally referred to as the Balmorhea Alluvium Aquifer, is located in a small area along the Jeff Davis and Reeves County line and is composed of a relatively shallow layer of gravel that overlies Cretaceous limestone. The Balmorhea Alluvium Aquifer is recognized in this *Plan* due to its use as a municipal supply source for the City of Balmorhea and the Madera Valley WSC, both located in Reeves County in the adjacent Region F water planning area.

1.5.10 Other Groundwater Resources

Also shown in Figure 1-13 are large areas of Far West Texas that are not underlain by designated major or minor aquifers. The map, however, should not be interpreted as an indication that such areas are devoid of groundwater, but rather as a reflection of the current level of understanding of the extent of known groundwater resources in the Region.

Rio Grande Alluvium Aquifer

The Rio Grande Alluvium Aquifer consists of Quaternary floodplain sediments laid down by the Rio Grande as the River cut into the surface of the Hueco Bolson. The floodplain forms a narrow valley within the topographically lowest part of the Hueco Bolson and extends nearly 90 miles from El Paso to Fort Quitman, where the valley is constricted between the Sierra de la Cienguilla of Chihuahua and the Quitman Mountains of Hudspeth County. The Aquifer is hydrologically connected with the underlying Hueco Bolson and is occasionally a source of irrigation water for farms in El Paso and Hudspeth Counties.

Edwards-Trinity (Plateau) Aquifer of Brewster County

In southern Brewster County, the communities of Lajitas, Study Butte, and Terlingua, as well as much of Big Bend National Park, withdraw their municipal supplies from Cretaceous limestone aquifers that are equivalent to the Edwards-Trinity (Plateau) Aquifer. Further evaluation is needed to arrive at a better understanding of the water resource development potential in these areas.

Diablo Plateau Aquifer

Thick limestone beds that make up the subsurface of the Diablo Plateau of central and northern Hudspeth County (west of Dell City) may have significant volumes of groundwater in storage. Although relatively few exploration wells have been drilled on the Plateau, the Aquifer likely contains sufficient water to be considered as a potential source of groundwater.

1.6 MAJOR SPRINGS

Springs and seeps are found in all seven of the Far West Texas counties and have played an important role in the development of the Region. Springs were important sources of water for Native Americans as indicated by the artifacts and petroglyphs found near many of the springs. In the 18th and 19th centuries, locations of transportation routes including supply and stagecoach lines, railroads, military outposts, and early settlements and ranches were largely determined by the occurrence of springs that issued from locations in the mountains and along mountain fronts. Figure 1-14 shows the Regional distribution of documented springs in the Region that are currently in existence or are of historical significance.

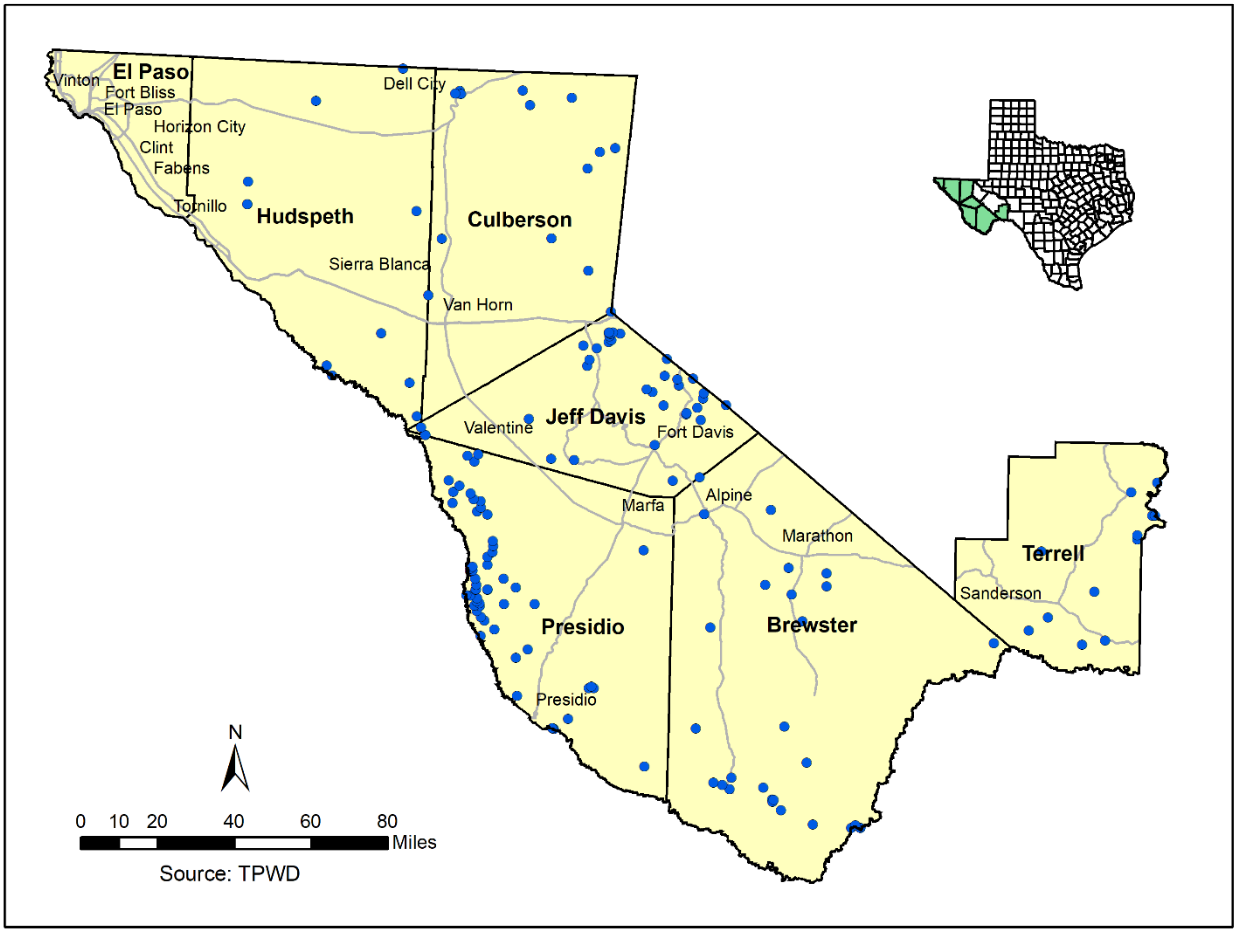


Figure 1-14. Location of Documented Springs

Springs contribute to the esthetic and recreational value of private land and parkland in Far West Texas, especially in the Big Bend area where thermal springs discharge along the banks of the Rio Grande. Springs are significant sources of water for both aquatic and terrestrial wildlife as they form small wetlands that attract migratory birds and other fowl that inhabit the Region throughout the year. As documented by the Texas Parks and Wildlife Department, springs also provide habitat for threatened and endangered species of fish (such as the Pecos and the Big Bend Gambusia).

The FWTWPG recognizes the importance of all springs in this desert community for their contribution as a water-supply source and as natural habitat. However, the FWTWPG chooses to respect the privacy of private lands and therefore specifically identifies the following "Major Springs" occurring only on State, Federal, or privately owned conservation managed lands (Figure 1-15). Many of these springs also are the primary source of flow to the "ecologically unique river and stream segments" described in Chapter 8. Descriptions of these springs are provided in Appendix 1A of this *Plan*.

La Baviza Spring, Chinati Mountains State Natural Area – Presidio County

Big Bend National Park / Rio Grande Wild and Scenic River Springs – Brewster County

- Gambusia Hot Springs Complex.
- Outlaw Flats Spring Complex.
- Las Palmas Spring Complex.
- Madison Fold Spring Complex.

Guadalupe Mountains National Park – Culberson County

- Bone Spring.
- Dog Canyon Spring.
- Frijole Spring.
- Goat Seep.
- Guadalupe Spring.
- Juniper Spring.
- Manzanita Spring.
- Smith Spring.
- Upper Pine Spring.

Texas Nature Conservancy – Independence Creek Preserve – Terrell County

- Caroline Spring.

Texas Nature Conservancy – Davis Mountains Preserve – Jeff Davis County

- Tobe Spring.
- Bridge Spring.
- Pine Spring.
- Limpia Spring.

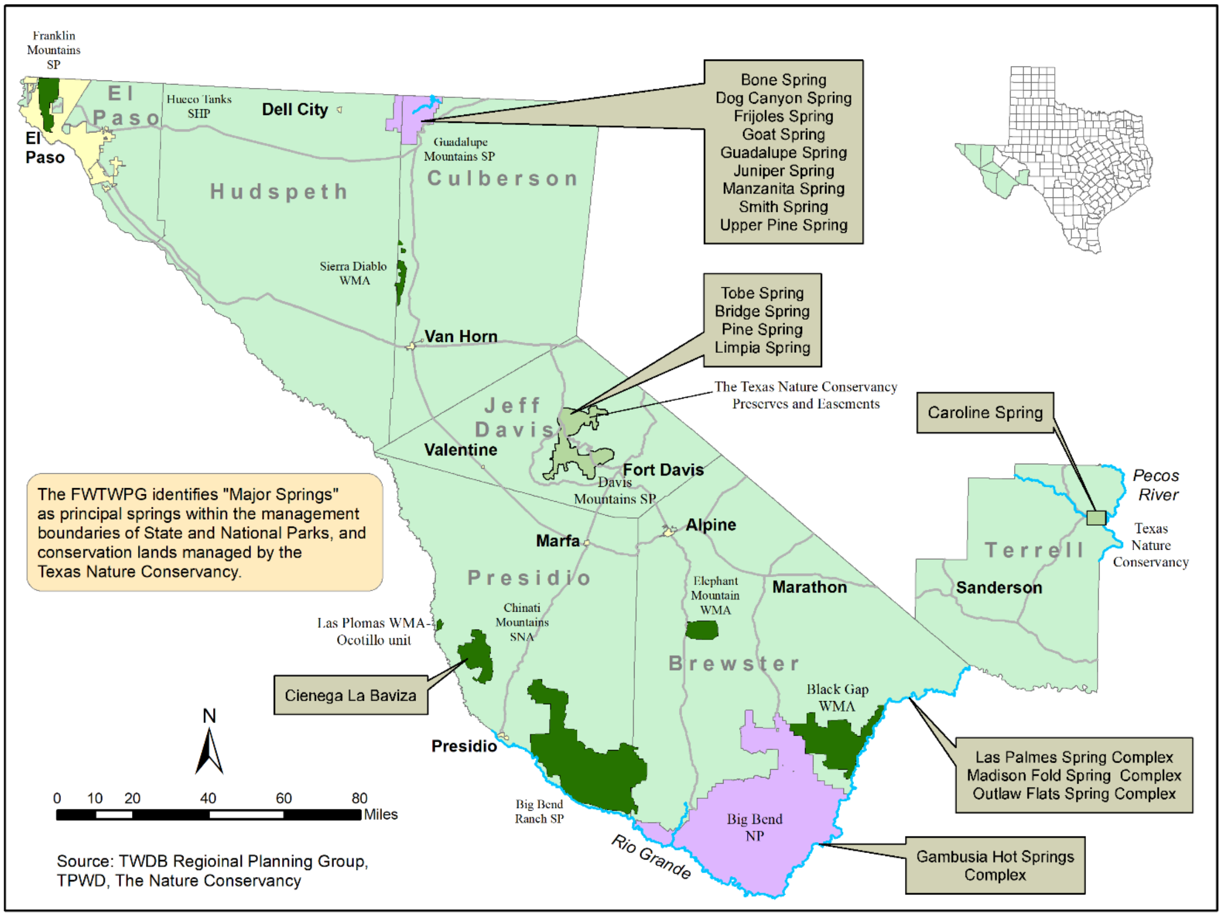


Figure 1-15. Location of Identified Major Springs

1.7 REUSE

El Paso water has nearly 40 miles of reclaimed-water (purple) pipelines throughout all areas of the City. Reclaimed (non-potable) water serves the landscape irrigation demand of golf courses, parks, schools, and cemeteries, and provides water supplies for steam-electric plants and industries within the City. EPWater does not plan on extending or growing the purple pipe infrastructure but will focus on maintaining existing purple pipe customers and work towards increasing the use of reclaimed water through additional purified water projects. EPWater also develops direct reuse supplies through its advanced water purification process producing potable public supply water. The City of Alpine in Brewster County is also reusing treated wastewater to irrigate city-owned park land.

Indirect reuse of treated non-potable municipal wastewater discharged into the Rio Grande occurs in El Paso and Hudspeth Counties where it is reapplied for irrigation use by the El Paso County Water Improvement District No.1 and the Hudspeth County Conservation and Reclamation District No.1.

1.8 IDENTIFIED WATER QUALITY PROBLEMS

Water quality plays an important role in determining the availability of water supplies to meet current and future water needs in the Region. The quality of groundwater and surface water is evaluated to help determine the suitability of each source for use and the potential impacts on these sources that might result from the implementation of recommended water management strategies.

1.8.1 Water Quality Issues

Groundwater quality issues in the Region are generally related to naturally high concentrations of total dissolved solids (TDS) or to the occurrence of elevated concentrations of individual dissolved constituents. High concentrations of TDS are primarily the result of the lack of sufficient recharge and restricted circulation. Together, these retard the flushing action of fresh water moving through the aquifers. Some aquifers, however, have a low TDS but may contain individual constituent levels that exceed safe drinking water standards. For example, some wells in the Davis Mountains Igneous Aquifer have exceptionally low TDS but contain unsatisfactory levels of fluoride. Also, freshwater wells in the Study Butte-Terlingua-Lajitas area have elevated levels of radioactivity.

Groundwater quality changes are often the result of human activities. In agricultural areas, aquifers such as the Bone Spring-Victorio Peak have increased in TDS. Irrigation water applied on the fields percolates back to the Aquifer carrying salts leached from the soil. Beneath El Paso and Ciudad Juarez, the average concentration of dissolved solids in the Hueco Bolson Aquifer has increased as the fresher water in the Aquifer is being consumed. Although local instances of groundwater quality degradation have occurred in the Region, there are no major trends that suggest a widespread water quality problem due to the downward percolation of surface contaminants.

Arsenic is a costly problem in El Paso County. Municipal utilities have been required to upgrade their treatment facilities in the last 20-years to meet the arsenic maximum contaminant level of 10 ppb.

The Rio Grande and the Pecos River are the principal surface water sources in Far West Texas. Unlike groundwater, surface water quality can vary significantly depending on the amount of flow in the streambed and the rate and source of runoff from adjacent lands. Salinity is an issue associated with the Rio Grande, especially during drought conditions. River flows arriving at El Paso contain a substantial salinity contribution from irrigation return flow and municipal wastewater return in New Mexico. Under current conditions, approximately 25 percent of the applied irrigation water is needed to move through the project in El Paso County to keep the salt loading at reasonable and manageable levels given average surface flow rates. Studies have shown that salinities in the Rio Grande can increase to over 1,000 mg/l during May and September, depending on actual irrigation demands and releases from reservoirs. Prolonged low flow increase salt storage in riverbanks and riparian zones, which can then be flushed out during high flows.

Downstream from El Paso, most of the flow consists of irrigation return flow and small amounts of treated and untreated municipal wastewater. Heavy metals and pesticides have been identified along this segment of the Rio Grande. Flow is intermittent downstream to Presidio, where the Rio Conchos augments flow. Fresh water springs contribute to the Rio Grande flow in the Big Bend and enhance the overall quality of the River through this reach.

The Pecos River is not a source of drinking water for communities in Far West Texas; however, it is the most prominent tributary to the Rio Grande on the Texas side of the River above Amistad Reservoir. Per IBWC data, the Pecos River contributes an average of 11 percent of the annual stream flow in the Rio Grande above the Reservoir and 29.5 percent of the annual salt load. Independence Creek's contribution in Terrell County increases the Pecos River water volume by about 50 percent at the confluence with consistently fresh water, thus improving both water quantity and quality.[1]

1.8.2 Supply Source Protection

According to the 1996 Safe Drinking Water Act Amendments, the Texas Commission on Environmental Quality (TCEQ) is required to assess every public drinking water source for susceptibility to certain chemical constituents. The Source Water Protection Program (SWPP) is a voluntary program designed to help public water systems identify and implement measures that will protect their sources of water from potential contamination. Assessment reports are provided to the public water systems and are often used to implement local source water protection projects. Table 1-8 lists Far West Texas public water systems that have historically been involved in the TCEQ's SWPP. Public water systems that are interested in learning about the SWPP, can access more detailed information on the TCEQ's website dedicated to Source Water Protection.

Table 1-8. Far West Texas Source Water Protection Participants

Utility Name	County	Report Date
Castolon Paint Area BBNP	Brewster	5/30/2000
Panther Junction PLT	Brewster	7/30/2000
Rio Grande Village BBNP	Brewster	5/31/2000
Big Bend National Park Chisos Basin Water	Brewster	5/31/2000
City of Van Horn	Culberson	7/31/1994
El Paso Water Utilities Public Service Board	El Paso	5/31/1990
El Paso County WCID 4 Fabens	El Paso	7/31/1999
El Paso County Tornillo WID	El Paso	7/31/1999
Fort Bliss Main Post Area	El Paso	7/31/1990
Dell City	Hudspeth	7/31/1994
Fort Davis WSC	Jeff Davis	7/31/1994
City of Marfa	Presidio	1/31/1995

[1] Basnet, Nabin et al: *TR1301 Pecos River Water Quality Data Analysis and Dissolved Oxygen Modeling,* prepared for Texas State Soil and Water Conservation Board, Texas Institute for Applied Environmental Research, Tarleton State University, Stephenville, TX, December 2023.

1.8.3 Water Supply Source Vulnerability

Following the events of September 11th, 2001, Congress passed the Bio-Terrorism Preparedness and Response Act. Drinking water utilities serving more than 3,300 people were required and have completed vulnerability preparedness assessments and response plans for their water, wastewater, and stormwater facilities. The U.S. Environmental Protection Agency (EPA) funded the development of three voluntary guidance documents, which provide practical advice on improving security in new and existing facilities of all sizes. The documents include:

- Interim Voluntary Security Guidance for Water Utilities.
- Interim Voluntary Security Guidance for Wastewater/Stormwater Utilities.
- Interim Voluntary Guidelines for Designing an Online Contaminant Monitoring System.

1.9 WATER LOSS AUDITS

Water is a precious and finite resource. Water loss control benefits utilities by conserving their water and diminishing their need for future acquisitions of additional water supply. Reducing water loss offers utilities the ability to increase their water-use efficiency, improve their financial status, and assist with long-term water sustainability.

In 2003, the 78th Texas Legislature, Regular Session, enacted House Bill 3338 to help conserve the State's water resources by reducing water loss occurring in the systems of drinking water utilities. This statute requires that all retail public utilities with more than 3,300 connections or a financial obligation to TWDB are required to submit a standardized water audit annually. All other retail public water suppliers are required to submit a water loss audit to TWDB every five years. The next five-year required submittal is due by May 1, 2026, for the 2025 audit year. However, it is strongly encouraged that all retail public water suppliers complete an audit annually to better track water loss and identify issues that need immediate addressing.

In response to the mandates of House Bill 3338, TWDB developed a water audit methodology for utilities that measures efficiency, encourages water accountability, quantifies water losses, and standardizes water loss reporting across the State. This standardized approach to auditing water loss provides utilities with a reliable means to analyze their water loss performance. Utilizing a methodology derived from the American Water Works Association (AWWA) and the International Water Association (IWA), the TWDB has published a manual that outlines the process of completing a water loss audit: "Water Loss Audit Manual for Texas Utilities" – TWDB Report 367 (2008).

Additionally, for the sixth cycle of regional water planning, the TWDB developed several helpful resource guides regarding water loss performance targets and water loss threshold values. These documents can be accessed on the TWDB's website page titled Conservation Resources for 2026 Regional Water Plan Development.

Historically, the AWWA recommended that entities with more than 10 percent water loss take corrective action. However, water loss industry standards have changed from recommending a one-size-fits-all target for water loss, to recommending water loss key performance indicators of apparent loss per connection per day, real loss per connection per day, and/or real loss per mile per day. Uses and limitations of key performance indicators have been developed by the AWWA's Water Loss Control Committee in their AWWA Water Loss Control Committee Report (2020).

The TWDB is required to evaluate the water loss of retail public utilities that request financial assistance for a water supply project using water loss thresholds as an indicator of whether a utility must include funds for mitigating water loss as part of their request for financial assistance. RWPGs must consider strategies to address any issues identified in the water loss audit information. In order to determine a water loss threshold, TWDB established benchmarking values detailed in the Conservation Resource Guide for Development of the 2026 Regional Water Plans, which uses six years of water loss audit data and finds the median for two distinct groups of utilities for real loss, which is defined as the physical leakage of water from the distribution system. The two distinct groups of utilities identified are as follows: (1) retail public utilities located in less dense communities (less than 32 connections per mile), for which the threshold or median is 57 gallons per connection per day, and (2) retail public utilities located in more dense communities (32 or more connections per mile), for which the threshold or median is 30 gallons per connection per day. These water loss thresholds are not a target but are only used for determining whether a utility may need to mitigate their water loss.

Table 1-9 provides a listing of reported utility audits performed in Far West Texas that meet the key performance indicators discussed above. More details regarding reported annual water loss audit data can be accessed on the TWDB's website page titled Conservation Resources for 2026 Regional Water Plan Development.

Table 1-9. Far West Texas 2018-2022 Public Water System Real Water Loss Report for Utilities that Exceed Water Loss Performance Targets (gallons per year)

Public Water Supply (PWS) Name	Report Year	Service Connection on Density	Water Loss per Connection per Day	Corrected Input Volume	Reported Breaks Leaks	Unreported Loss	Total Real Losses	Cost of Real Losses ($)
Candelaria WSC	2022	23	62.08	2,552,961	10,000	531,793	541,793	202
City of Alpine	2018	20.88	64.89	472,238,737	3,000,000	40,112,233	43,112,233	12,503
	2019	20.86	132.58	497,818,316	6,000,000	106,608,301	112,608,301	27,814
	2020	24.58	157.5	618,911,994	21,390,526	139,616,955	161,007,481	35,422
	2022	24.83	72.40	536,003,776	5,797,932	57,152,271	62,950,203	19,200
City of Van Horn	2020	52.18	74.84	319,619,462	1,043,013	63,387,587	64,430,600	43,426
East Montana WS	2021	34.35	38.26	0	0	26,175,000	26,175,000	120,143
	2022	36.03	51.57	0	0	42,863,130	42,863,130	202,271
El Paso County Tornillo WID	2022	40.03	37.97	127,701,381	5428101	10,119,593	15,547,694	9,344
El Paso County WCID #4 Fabens	2020	76.82	38.43	263,682,653	990,321	26,960,398	27,950,719	11,180
El Paso Water	2018	72.52	61.23	38,974,449,746	667,397,741	2,172,966,246	2,840,363,987	2,698,346
	2019	74.54	58.57	38,491,098,477	106,954,000	2,622,545,031	2,729,499,031	2,593,024
	2020	75.82	78.36	41,567,649,746	31,099,430	4,344,470,094	4,375,569,524	4,156,791
	2021	76.09	92.70	41,047,766,497	263,199,511	5,401,040,633	5,664,240,144	5,381,028
	2022	77.19	86.22	40,290,672,081	446,027,260	4,828,769,346	5,274,796,606	5,011,057
Esperanza WS	2020	2	117.16	53,912,630	81,711	11,889,811	11,971,522	71,829
Horizon Regional MUD	2018	300.69	107.23	1,965,909,588	120,000,000	234,046,371	354,046,371	318,642
	2020	374.66	70.10	2,368,066,893	28,255,344	223,621,330	251,876,674	226,689
	2021	366.03	86.49	1,645,723,330	100,000,000	212,368,849	312,368,849	281,132
Lajitas on the Rio Grande	2020	16	150.23	54,091,475	1,250,000	14,666,665	15,916,665	162,668
Lower Valley Water District	2021	50.1	67.73	0	24,148,365	225,686,343	249,834,708	73,451
Marathon WS	2020	54	114.75	39,054,737	400,000	11,062,541	11,462,541	57,313
Redford Water Supply	2018	13.33	58.53	6,743,367	150,000	42,663	192,663	87
Study Butte Terlingua WS	2019	8.79	250.97	72,719,694	1,500,000	21,071,520	22,571,520	45,143
	2020	9.17	158.70	53,574,669	1,200,000	13,491,415	14,691,415	29,383
Town of Anthony	2018	49.44	40.71	213,809,000	23	17,831,841	17,831,864	88,624
	2019	50	53.23	209,934,673	12,500,000	9,413,936	21,913,936	59,387
	2020	50.24	90.19	233,287,000	54	40,765,640	40,765,694	387,274
	2021	50.52	45.86	205,918,000	33	20,719,146	20,719,179	174,041
	2022	50.76	51.71	212,983,000	35,000	23,447,824	23,482,824	87,121

1.10 COLONIAS

1.10.1 Far West Texas Colonias

Colonias represent a special and growing subset of municipal water demand in the Region and present a challenge to water suppliers. While some colonias in the Region are centuries-old historic settlements, most are substandard subdivisions in unincorporated areas located along the United States/Mexico international border that have been illegally subdivided into small parcels characterized by a lack of basic services. These small parcels do not have a drinking water supply, wastewater services, paved roads, or proper drainage, and are typically sold to individuals of modest means who may be unaware of the negative consequences of purchasing illegally subdivided property. Public health problems are often associated with these colonias.

The office of the Attorney General of Texas created and maintains an extensive Colonia Geographic Database, which recognizes 312 subdivisions that qualify as colonias in the counties that make up the Far West Texas region (Table 1-10). Of these 312 colonias, 292 are concentrated in El Paso County.

Table 1-10. Far West Texas Colonias

Brewster County	Culberson County	El Paso County	Hudspeth County	Jeff Davis County	Presidio County	Terrell County
Marathon	Ranch Estates	292 Individual Colonias	Acala	Valentine	Candelaria	Dryden
Study Butte	Van Horn		Sierra Blanca		Pueblo Nuevo	Sanderson
Terlingua			Fort Hancock East		Shafter	
			Villa Alegre		Las Pamps	
			Loma Linda Estates		Redford	
					Loma Pelona	
					Ruidosa	

1.10.2 TWDB Economically Distressed Area Program

The Economically Distressed Area Program (EDAP) was created by the Texas Legislature in 1989 and is administered by the TWDB. The intent of the program is to provide local governments with financial assistance for bringing water supply and wastewater services to the colonias. An economically distressed area is defined as one in which water supply or wastewater systems are not adequate to meet minimal State standards, financial resources are inadequate to provide services to meet those needs, and there was an established residential subdivision on June 1, 2005. Affected areas are counties adjacent to the Texas/Mexico border, or that have per capita income 25 percent below the State median and unemployment rates 25 percent above the State average for the most recent three consecutive years for which statistics are available.

In 2019, the 86th Texas Legislature made changes to the program with the passage of Senate Bill 2452, which directed the TWDB to develop a system for prioritizing EDAP projects and consider projects that will have a "substantial effect." This includes projects serving areas determined to have a nuisance dangerous to public health and safety resulting from water supply and sanitation problems and projects for applicants' subject to an enforcement action related to water supply or sewer service violations. EDAP projects in Far West Texas are in Brewster, El Paso, Hudspeth, Presidio and Terrell Counties and are described in Table 1-11. There is a total of two active projects and 22 completed projects within the Region.

Data pertaining to all EDAP projects in the State can be found within the SFY 2023 EDAP Annual Report, which can be accessed through the TWDB website.

Table 1-11. Economically Distressed Area Program Projects (August 31, 2023)

County	Sponsor	Project	EDAP Funding ($)	Other TWDB Funding ($)	Status
Brewster	City of Alpine	Collection Systems Improvements	277,973.68		Completed
El Paso	City of El Paso	Canutillo Project	7,432,879.60		Completed
	City of El Paso	Colonia Assistance & Management Support	213,250.00		Completed
	City of El Paso	East Montana Water System (Phase 0)	441,941.88		Completed
	City of El Paso	Westway II	5,459,674.06	102,500.00	Completed
	City of El Paso	Westway Water Supply	1,437,540.80		Completed
	El Paso County	Colonia Plumbing Fixtures	1,368,392.29		Completed
	El Paso County	East Montana Water (Phase 2 & 3)	10,653,496.39	150,000.00	Completed
	El Paso County Tornillo WID	Tornillo Wastewater System	13,157,652.21		Completed
	El Paso Water	Canutillo Area Water & Wastewater	412,730.00		Completed
	El Paso Water	Montana Vista Wastewater System	44,633,112.00		Active
	El Paso Water	Canutillo Norma & Georgia	90,000.00		Completed
	El Paso Water	Turf Estates Water Line	895,919.70		Completed
	Homestead MUD #1	East Montana Water System (Phase 1)	6,321,453.00	1,700,000.00	Completed
	Lower Valley Water District	Cultural Resource Management - Socorro	1,200.00		Completed
	Lower Valley Water District	Las Azaleas Planning	50,000.00		Completed
	Lower Valley Water District	LVWD Phase I - Bauman Water Project	1,800,608.00		Completed
	Lower Valley Water District	LVWD Phase II - Socorro	17,793,361.00	3,857,000.00	Completed
	Lower Valley Water District	LVWD Phase III - San Elizario	44,726,710.66	8,245,000.00	Completed
	Vinton	Water & Wastewater Planning	39,100.00		Completed
Hudspeth	Fort Hancock WCID	Water Well & RO Treatment Facility	3,012,989.88		Completed
	Hudspeth County WCID #1	Sierra Blanca Wastewater System	2,146,966.16		Completed
Presidio	Presidio County	Presidio County Water & Wastewater Improvements	4,600,000.00		Active
Terrell	Terrell County WCID #1	Sanderson Wastewater System	4,232,175.00		Completed

1.10.3 El Paso County Colonias

Over the past two decades, EPWater has served as a program manager to assist outlying water districts in applying for funding, master planning, design, and construction management. As regional water planner for El Paso County, EPWater continues to work with various water districts and colonia residents to consolidate efforts in securing adequate water supplies and to capitalize on economies of scale. Efforts to provide water service to outlying areas have resulted in approximately 97 percent of the population within El Paso County having access to clean potable water.

Projects shown in Table 1-11 are in different stages of consideration. Funding has, and continues to be, the greatest challenge in moving forward with these projects. Given the limited number of residents (connections) and the large construction costs associated with each project, there are many areas where it is simply not feasible to construct needed facilities until either an increased number of connections are made and/or most importantly, increased amounts of State and Federal grant funding are available. In certain areas, it may be feasible to consider small onsite treatment systems, such as wellhead reverse osmosis systems. Such systems could be less expensive and allow for residents to obtain water until a more direct municipal supply is available. EPWater continues to take the lead in identifying funding and in managing the projects within and/or on behalf of El Paso County. Title 30, Texas Administrative Code, Chapter 285 and the Texas Health and Safety Code, Chapter 366, §366.032 requires residents in rural areas of the county who do not have piped sewer infrastructure to comply with septic tank installation standards and receive a certificate of compliance prior to receiving water, gas, and electric utility service. Known as the On-Site Septic Facility (OSSF) program, this program is intended to prevent unhealthy conditions and protect underground water and is enforced by the El Paso City/County Health and Environmental District.

1.11 INTERNATIONAL WATER ISSUES

1.11.1 Ciudad Juarez

Ciudad Juarez is located across the Rio Grande from the City of El Paso and currently is 100 percent dependent on the Hueco Bolson and Conejos Medanos Aquifers to satisfy all its municipal and industrial demands. Pumping from the Hueco by Ciudad Juarez since 2000 is summarized in Table 1-12. Based on these production trends, Ciudad Juarez pumps approximately 150,000 acre-feet per year from the Hueco Bolson and Conejos Medanos Aquifers.

Table 1-12. Ciudad Juarez Hueco Groundwater Pumping (Acre-Feet/Year)

Year	Groundwater Pumping
2000	126,172
2001	124,735
2002	124,676
2003	125,144
2004	119,234
2005	122,315
2006	126,655
2007	129,193
2008	132,889
2009	130,735
2010	131,055
2011	119,137
2012	117,709
2013	122,596
2014	128,823
2015	132,899
2016	135,844
2017	137,286
2018	141,896

Pumping continues to increase each year in response to the population rise. However, water conservation efforts in Ciudad Juarez have somewhat offset increased population and service connections. With a growing population that is currently estimated to be over 1.5 million, Ciudad Juarez recognizes the limitations of the Hueco Bolson to supply future demands. Future supplies are anticipated from the following "imported" groundwater sources:

- Bismark Mine (26,000 acre-feet/year).
- Mesilla (26,000 acre-feet/year).
- Somero (28,000 acre-feet/year).
- Profundo (31,000 acre-feet/year).

In addition, plans are also being developed to convert 38,000 acre-feet/year of surface water from the Rio Grande (Rio Bravo) for use as municipal supply. Currently, Mexico's allocation from the Rio Grande Project of 60,000 acre-feet/year is used for irrigated agriculture. The conversion would involve supplying wastewater effluent to farmers in exchange for surface water.

1.11.2 City of El Paso

The City of El Paso, through their water utility, El Paso Water, manages groundwater from the Hueco and Mesilla Bolson Aquifers as a drought supply. When surface water is not available (typically the winter and spring months) the Hueco Bolson Aquifer specifically is heavily pumped, becoming a major source of water for the east side of El Paso. However, when surface water is available, pumping from the Hueco decreases.

EPWater has consistently decreased its groundwater dependence on the Hueco Bolson with its increased use of surface water (Rio Grande), reclaimed water, and water conservation. However, during periods of severe river drought, groundwater pumpage from the Hueco Bolson including the KBH desalination plant will be increased dramatically to offset the limited river supply.

In 2013, surface water availability was only 10,000 acre-feet (from the Rio Grande) due to severe drought conditions. As a result, the Hueco production was maximized. Although drought conditions have improved, surface water is limited, causing the Hueco Bolson Aquifer, along with the Mesilla Bolson Aquifer, to remain a critical groundwater supply source.

1.11.3 Transboundary Effects of Groundwater Pumpage

Prior to 1960, up to 5,000 acre-feet/year of groundwater flowed underground from Mexico to Texas as a result of higher pumping in El Paso than in Ciudad Juarez. However, since 1960, groundwater has generally flowed from Texas into Mexico due to increases in Ciudad Juarez pumping. The rate of flow has been about 33,000 acre-feet/year over the last decade. With continuous pumping from both Ciudad Juarez and El Paso, both Cites have experienced extensive water level drawdowns and water quality degradation due to lateral brackish water intrusion into the freshwater zones. Brackish water intrusion from irrigation return flow drains continues to expand laterally and vertically, and to degrade water quality in the shallow alluvium along the Rio Grande.

1.11.4 Transboundary Aquifer Assessment Program

The Transboundary Aquifer Assessment Program (TAAP) is a joint effort between Mexico and the United States to evaluate shared priority aquifers is the product of US Public Law 109-448 (United States-Mexico Transboundary Aquifer Assessment Act of 2006). Parties involved included the International Boundary and Water Commission (IBWC/CILA), the Mexican National Water Commission (CONAGUA), the US Geological Survey (USGS), New Mexico State University and the Universities of Sonora, Texas, and Arizona. Project and research management in the Far West Texas region is conducted by Texas A&M AgriLife of El Paso.

The overall goal of the Program includes:

- Develop binational information and shared databases on groundwater quantity and quality;
- Identify and delineate transboundary aquifers of importance;
- Develop binational criteria for determination of priority transboundary aquifers;
- Assess the extent, availability, and movement of water in transboundary aquifers and the interaction with surface water;
- Develop and improve groundwater-flow information for binational aquifers to facilitate water-resource assessment and planning;
- Analyze trends in groundwater quality, including salinity and nutrients;
- Apply new data, models, and information to evaluate strategies to protect water quality and enhance supplies; and
- Provide useful information to decision makers, including assessments of groundwater management institutions and policies.

Fifteen transboundary aquifers have been identified between Mexico and Texas, though the mechanisms for hydrogeologic connection across the international boundary are known only for five. The transboundary groundwater resources shared by the two countries are largely uncharacterized due to lack of data, differences in aquifer boundary delineations and methodologies, and the limited cooperation and coordination among Federal, State, and local agencies within and between these countries to address groundwater issues from a binational perspective.

Four identified transboundary aquifers are categorized as priority aquifers: Hueco Bolson/Valle de Juarez, Mesilla/Conejos- Medanos, Santa Cruz, and San Pedro. In the general area of Far West Texas, the region of the bolsons (aquifers located southeast of the Conejos-Medanos/Mesilla Bolson, Valle de Juarez/Hueco-Tularosa Bolson Aquifer in northern Chihuahua, in southern New Mexico and western Texas) appear to be the most important areas for transboundary aquifer development.

Overall, the hydrogeological units along the Texas-Mexico border cover around 182,000 km^2 (approximately 110,000 km^2 on the Texas side and 72,000 km^2 on the Mexico side) (Sanchez et al. 2018). The total area considered to have good aquifer potential (defined as the favorable lithological properties that allow sustained and significant rates of pumpage) as well as good water quality ranges between 50 percent and 60 percent (60 percent of this in Texas). Some 20 to 25 percent of the hydrogeological units that cross the border area are considered to have poor aquifer potential and poor water quality, with the proportion of land being approximately equal on both sides of the border.

1.12 STATE AND FEDERAL AGENCIES WITH WATER RESPONSIBILITIES

1.12.1 Texas Water Development Board (TWDB)

The TWDB, especially the Water Supply Planning Division in the Office of Planning, is at the center of the Senate Bill 1 regional water planning effort. The agency has been given the responsibility of directing the effort to ensure consistency and to guarantee that all regions of the State submit plans in a timely manner. Results of the 16 regional water plans are then incorporated by the TWDB into a State Water Plan. The TWDB also administers financial grant and loan programs that provide funding for water research and facility planning projects.

1.12.2 Texas Commission on Environmental Quality (TCEQ)

The TCEQ strives to protect the State's natural resources, consistent with a policy of sustainable economic development. TCEQ's goal is clean air, clean water, and the safe management of waste, with an emphasis on pollution prevention. The TCEQ is the major State agency with regulatory authority over State waters in Texas. The TCEQ is also responsible for ensuring that all public drinking water systems are in compliance with the strict requirements of the State of Texas.

1.12.3 Texas Parks and Wildlife Department (TPWD)

The TPWD mission is to manage and conserve the natural and cultural resources of Texas and to provide hunting, fishing and outdoor recreation opportunities for the use and enjoyment of present and future generations. The agency currently has six program divisions: Wildlife, Coastal Fisheries, Inland Fisheries, Law Enforcement, State Parks, and Infrastructure.

1.12.4 Texas Department of Agriculture (TDA)

The TDA was established by the Texas Legislature in 1907. The TDA has marketing and regulatory responsibilities and administers more than 50 separate laws. The current duties of the department include: (1) promoting agricultural products locally, nationally, and internationally; (2) assisting in the development of the agribusiness in Texas; (3) regulating the sale, use and disposal of pesticides and herbicides; (4) controlling destructive plant pests and diseases; and (5) ensuring the accuracy of all weighing or measuring devices used in commercial transactions. The department also collects and reports statistics on all activities related to the agricultural industry in Texas.

1.12.5 Texas State Soil and Water Conservation Board (TSSWCB)

The TSSWCB is charged with the overall responsibility for administering the coordination of the State's soil and water conservation program with the State's soil and water conservation districts. The agency is responsible for planning, implementing, and managing programs and practices for abating agricultural and forest nonpoint source pollution. Currently, the agricultural/forest nonpoint source management program includes problem assessment, management program development and implementation, monitoring, education, and coordination.

1.12.6 International Boundary and Water Commission (IBWC) and Comisión Internacional de Límites y Aquas (CILA)

The IBWC and CILA provide binational solutions to issues that arise during the application of United States – Mexico treaties regarding boundary demarcation, national ownership of waters, sanitation, water quality, and flood control in the border region; the treaties are discussed in Chapter 3.

1.12.7 United States Bureau of Reclamation (USBR)

The stretch of the Rio Grande from Elephant Butte Dam (approximately 100 miles north of El Paso) to Fort Quitman, Texas, is within a Federal reclamation project known as the Rio Grande Project. The Bureau of Reclamation manages the Elephant Butte Dam and the Caballo Reservoir in New Mexico, and determines the amount and timing of all water releases to Texas, with the input of the El Paso County Water Improvement District #1. The Bureau is guided by the terms of the Rio Grande Compact. The Bureau has asserted title to all the water in the Project in a lawsuit styled United States v. EBID, et al, which is currently being litigated.

1.12.8 United States Geological Survey (USGS)

The USGS is responsible for fulfilling the Nation's needs for reliable, impartial scientific information to describe and understand the Earth. This information is used to minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect the quality of life. The USGS is the Federal Government's principal civilian map-making agency; the primary source of its data on the quality and quantity of the Nation's water resources; the Nation's primary provider of earth-science information on natural hazards, mineral and energy resources, and the environment; and the major partner in developing the Nation's understanding of the status and trends of biological resources and the ecological factors affecting living resources.

1.12.9 United States Environmental Protection Agency (EPA)

The mission of the EPA is to protect human health and the environment. Programs of the EPA are designed to (1) promote national efforts to reduce environmental risk, based on the best available scientific information; (2) ensure that Federal laws protecting human health and the environment are enforced fairly and effectively; (3) guarantee that all parts of society have access to accurate information sufficient to manage human health and environmental risks; and (4) guarantee that environmental protection contributes to making communities and ecosystems diverse, sustainable and economically productive.

1.12.10 United States Fish and Wildlife Service (USFWS)

The USFWS enforces Federal wildlife laws, manages migratory bird populations, restores nationally significant fisheries, conserves and restores vital wildlife habitat, protects and recovers endangered species, and helps other governments with conservation efforts. It also administers a Federal aid program that distributes money for fish and wildlife restoration, hunter education, and related projects across the country.

1.13 LOCAL ORGANIZATIONS AND UNIVERSITIES

The public and even those involved in water planning and management find it difficult to know about or keep track of the large number and wide array of organizations involved with water resource issues in Far West Texas. Following is a list of many of these organizations. Because of the hydrologic, cultural and economic connections of Far West Texas with Southern New Mexico and Mexico, this list includes water organizations in this expanded region. The list is likely incomplete as there are certainly other organizations deserving of being included.

- Alliance for the Rio Grande Heritage.
- Border Environmental Cooperation Commission.
- City of El Paso.
    - Water Conservation Advisory Board.
    - Rio Grande Riverpark Task Force.
    - El Paso Water – Consortium for Hi-Technology Investigations in Water and Wastewater.
    - El Paso water – TecH2O Learning Center.
- City of Las Cruces.
- Rio Grande Riparian Ecological Corridor Project.
- Consortium for Hi-Technology Investigations in Water and Waste Water.
- Environmental Defense.
- Forest Guardians.
- Hudspeth Directive for Conservation.
- New Mexico State University.
- New Mexico Lower Rio Grande Regional Water Users Organization.
- New Mexico Water Conservation Alliance.
- New Mexico Water Resources Research Institute.
- New Mexico Water Task Force.
- New Mexico Water Trust Board.
- New Mexico-Texas Water Commission.
- North American Commission for Environmental Cooperation.
- North American Development Bank.
- Paso Del Norte Watershed Council.
- Paso Del Norte Water Task Force.
- Project Del Rio.
- Rio Grande/Rio Bravo Basin Coalition.
- Rio Grande Council of Governments.
- Rio Grande Institute.
- Rio Grande Watershed Federal Coordinating Committee.
- Southwest Environmental Center.

- The Texas A&M University System.
  - Texas AgriLife Research Center in El Paso.
  - Transboundary Aquifer Assessment Program.
  - Texas Cooperative Extension.
  - Rio Grande Basin Initiative.
  - Texas Water Resources Institute.
- Texas State University System.
  - Sustainable Agricultural Water Conservation in the Rio Grande.
  - Basin Project.
- Texas Water Matters.
  - Lone Star Chapter of the Sierra Club.
  - National Wildlife Federation.
  - Environmental Defense.
- Tularosa Basin National Desalination Research Facility.
- University of Texas at El Paso.
  - Center for Environmental Resource Management.
  - Rio Bosque Wetlands Park.
  - Southwest Consortium for Environmental Research and Policy of the Southwest.
- U. S. Mexico Border Coalition of Resource Conservation and Development Councils.
- WERC: A Consortium for Environmental Education and Technology Development.
- World Wildlife Fund – Chihuahuan Desert Program.

This page intentionally left blank.

APPENDIX 1A
MAJOR SPRINGS

This page intentionally left blank.

MAJOR SPRINGS

The Far West Texas Water Planning Group recognizes the following "Major Springs" occurring on State, Federal, or privately-owned conservation-managed lands for their importance for natural resource protection.

CHINATI MOUNTAINS STATE NATURAL AREA – CIENEGA LA BAVIZA SPRING

Cienega Creek flows downstream from the spring-fed spring, La Baviza, in the 38,187-acre Chinati Mountains State Natural Area in west-central Presidio County. The spring (cienega) forms a fresh to slightly saline marsh with waters that are slightly geothermal. The habitat supports an intact, diverse marsh with saline grasses, rushes, sedges, and perennials. A high diversity of desert bats also use the area for feeding and watering. The adjacent Cienega Creek has very good examples of saline marsh and cottonwood gallery woodlands. It is an important wildlife area and is in the low Chihuahuan Desert where intact wetlands and riparian habitat are quite rare. Cienega Creek is recommended as an "Ecologically Unique River or Stream Segment" in Chapter 8.

BIG BEND NATIONAL PARK / RIO GRANDE WILD AND SCENIC RIVER SPRING COMPLEXES

River regulation, agricultural and municipal withdrawals and drought have diminished and altered the discharge patterns for the lower Rio Grande in Far West Texas. The physical and ecological system, once adapted to large and rapid fluctuations in flow, is now adapted to lower and more constant flows. The 250-mile reach of the Rio Grande managed by the National Park Service is the only free flowing reach in the lower Rio Grande. A significant portion of the base flows are provided by groundwater contributions from four spring complexes located in Big Bend National Park and along the Rio Grande Wild and Scenic River. Management Plans for both NPS entities list the protection of springs as critical management concerns. A portion of the Rio Grande Wild and Scenic River is recommended by the planning group as an "Ecologically Unique River and Stream Segment" and is discussed in Chapter 8. NPS staff has identified the following four spring complexes.

Gambusia Hot Springs Complex

- River miles: 804-814.
- UTM Coordinates N: 3233835, 3226468.
- UTM Coordinates E: 702647, 694388.
- Zone 13.

This reach includes hot springs between Mariscal Canyon and Boquillas Canyon. Easily delineated orifices with significant flow include: Gravel Pit, Langford Hot Springs, Lower Hot Springs (a.k.a. VD Springs or Leper Springs), Rio Grande Village Springs 3 and 4, and numerous unnamed springs. Springs on the Mexican side include Ojo Caliente and Boquillas Hot Springs. These springs issue from the upper Cretaceous rock units, the Boquillas and Santa Elena Limestones. Rio Grande Village currently gets its water supply from one of these springs. In addition, this same spring and another nearby spring feed two ponds that contain the world's only population of *Gambusia gaigei*.

Outlaw Flats Spring Complex

- River miles: 748-762.
- UTM Coordinates N: 3292773, 3296392.
- UTM Coordinates E: 725582, 716672.
- Zone 13.

Springs issue from the Glen Rose Limestone. Although generally of low volume, there is evidence of historical use at a spring on the Texas side near the confluence with Big Canyon. Historical use includes the remains of a spring box.

Las Palmas Spring Complex

- River miles: 735-742.
- UTM Coordinates N: 3293228, 3293608.
- UTM Coordinates E: 737565, 732013.
- Zone 13.

Large volume springs in Del Carmen Limestone. Historical use at Asa Jones waterworks, a withdrawal and distribution system for a candelilla wax camp located on the canyon rim east of Silver Canyon. The system includes pumps, piping, and several rock tanks, one of which is located over a spring emanating from a rock joint. Park Service personnel estimated the spring discharge at 300 gpm. This joint can be followed in both directions beyond the rock walls where additional water discharges. Water enters the river on both sides along a reach approximately 200 feet long. Undocumented Mexican emigrants use this area frequently, as indicated by the presence of discarded clothing and bedrolls. Directly below the Asa Jones Waterworks, on the Texas side is Spigot Spring. River runners use this spring as a water source. Two miles downstream on the Coahuila Mexico, side is Hot Springs, a very popular river camp due to the presence of several warm pools. A road on the Mexican side provides access to the area for the Mexican Army (reports from River District Ranger). Another spring below and on the Texas side is commonly used as a water source for river runners.

Madison Fold Spring Complex

- River miles: 720-723.
- UTM Coordinated N: 3298065.
- UTM Coordinates E: 753147, 751786.
- Zone 13.

Low volume springs discharging from the Del Carmen Limestone and the Maxon Sandstone. As these are the last discharges along the river, river runners commonly use the spring on the Texas side and below Lower Madison Falls as a water source.

GUADALUPE MOUNTAINS NATIONAL PARK SPRINGS COMPLEX

Springs in the Guadalupe Mountains National Park are crucial for maintenance of ecological stability and wildlife health within the Chihuahuan Desert environment. Loss or failure of any of these springs would cause significant environmental stress, even though discharge rates of most are relatively small. Most springs are also historic areas used by pioneers, early ranchers, and settlers. Remains of their homesteads and structures used to manage spring outflow and direct water usage are still visible in and near the springs. The National Park Service is directed to preserve these historic elements and cultural landscapes against unnatural impacts from continued human use, as well as to protect the spring's water quality and quantity from human induced impairment. Specific major natural resource springs are listed in the following table:

SPRINGS IN GUADALUPE MOUNTAINS NATIONAL PARK				
Name	**Discharge (gpm)**	**State Well Number**	**Position NAD 1927 Conus UTM 13 N northing**	**Position NAD 1927 Conus UTM 13 N easting**
Bone Spring	2-3	-	3527444	512087
Dog Canyon Spring	<1	-	3537770	514918
Frijole Spring	6-13	47-02-801	3530009	518842
Goat Spring	1	-	3529611	511370
Guadalupe Spring	6-10	47-02-701	3526606	514633
Juniper Spring	<1	47-02-502	3531081	519488
Manzanita Spring	10-38	47-02-802	3530317	519111
Smith Spring	13-55	47-02-501	3531248	518287
Upper Pine Spring	8-13	47-02-803	3529514	517274

TEXAS NATURE CONSERVANCY INDEPENDENCE CREEK PRESERVE – CAROLINE SPRING

Caroline Spring is located at the Texas Nature Conservancy's Independence Creek Preserve headquarters in northeastern Terrell County. The spring produces 3,000 to 5,000 gallons per minute and comprises about 25 percent of the creek's flow. Downstream, Independence Creek's contribution increases the Pecos River water volume by 42 percent and reduces the total dissolved solids by 50 percent, thus improving water quantity and quality. The preserve hosts a variety of bird and fish species, some of which are extremely rare. Caroline Spring, along with the entirety of the Independence Creek Preserve (19,740 acres), is a significant piece of West Texas natural heritage.

TEXAS NATURE CONSERVANCY DAVIS MOUNTAINS PRESERVE – TOBE, BRIDGE, PINE AND LIMPIA SPRINGS

The wild and remote Davis Mountains is considered one of the most scenic and biologically diverse areas in Texas. Rising above the Chihuahuan desert, the range forms a unique “sky island” surrounded by the lowland desert. Animals and plants living above 5,000 feet are isolated from other similar mountain ranges by vast distances. The Texas Nature Conservancy has established the 32,000-acre Davis Mountains Preserve (with conservation easements on 65,830 acres of adjoining property) in the heart of this Region. Tobe, Bridge, Pine and Limpia springs form critical wetland habitat and establish base flow to the downstream creeks.

CHAPTER 2
POPULATION AND WATER DEMAND

This page intentionally left blank.

2 POPULATION AND WATER DEMAND

Planning for the wise use of the existing water resources in Far West Texas requires a reasonable estimation of current and future water needs for all water-use categories. Regional population and water demand data were initially provided to the Far West Texas Water Planning Group (FWTWPG) at the beginning of the planning period. This information incorporated data from the Texas Demographic Center (TDC), the U.S. Bureau of the Census' 2020 census count, and the 2022 State Water Plan and is presented based on utility service areas. The FWTWPG reviewed the provided population projections and requested revisions to specific population and municipal water demand categories for use in the *2026 Far West Texas Water Plan*, which were subsequently approved by the TWDB.

As discussed in Section 2.1.1, in all counties except Jeff Davis, the half migration rate was utilized. Jeff Davis County requested the use of the full migration rate. In addition, the planning group decided to utilize the maximum historical GPCD (2010-2020) for 23 of the 29 water user groups (WUGs) within the Region. The remaining six WUGs calculated projected water demands by using the 2021 FWTWP GPCD values. Lastly, the non-municipal water demands were adjusted to reflect the maximum annual historical water-use estimates (2011-2020) for irrigation and livestock. The FWTWPG determined that the manufacturing, mining, and steam-electric power water-use categories would consist of a mix between the maximum annual historical water-use estimates (2011-2020) and the proposed 2026 TWDB water demand projections. The population and water demand projections shown in this chapter are derived from a combination of TWDB data and approved revisions.

The FWTWPG made available the draft population and water demand summary tables to municipalities, water providers, county judges, and non-municipal water-use representatives, and solicited all entities within the Region to submit desired changes to the projections. The planning group strongly feels that the data provided by the TWDB does not accurately represent the growth that many of the individual communities are experiencing. More detailed information regarding these desired changes is available in Section 2.1.1. However, after thoughtful consideration, the FWTWPG chose to accept the draft population and water demand estimates, to include the TWDB approved revision requests provided by the water utilities.

During the fifth round of regional water planning, the 2021 Regional Water Plans and 2022 State Water Plan were modified to be aligned with water utility service areas, rather than political boundaries, such as city limits. This was due to TWDB rule revisions, that now define a WUG as being utility based. Cities that were once included in the 2016 and older Regional Water Plans, that are not represented in the 2021 and 2026 Plans, are the result of those cities, who do not have their own water systems, which no longer meet the TWDB WUG definition. For these entities, their population is represented through: (1) utility WUGs who provide water for them and meet the new WUG definition, or (2) county-other WUGs as aggregated rural population.

2.1 POPULATION

2.1.1 Population Projection Methodology

The TWDB has updated their methodology for estimating population projections in this current sixth cycle of regional water planning. Details pertaining to the projection methodologies can be found within the Population and Municipal Water Demand Projections for the 2026 Regional and 2027 State Water Plans document.

County population projections are prepared by the Texas Demographic Center and are based on the 2020 decennial census data. Demographic trends are projected using the census data and includes birth and survival rates as well as net migration rates of population groups defined by age, gender, and race/ethnicity. The sixth cycle of regional water planning falls after a State-wide decennial census planning cycle, therefore the population projections are based on the TDC's 2020 population projections.

The TWDB established several key changes to the population projection methodology for the sixth cycle of regional water planning. These include the following: (1) Allowing for population declines in certain counties, as shown in the 2020 population projections from the TDC. In the past, the TWDB had altered the resulting regional plan population projections in certain counties by holding them constant in future periods to avoid projecting declining populations, and (2) Future savings from additional faucet and dishwater replacements were not considered necessary for inclusion in the draft plumbing code savings projections for this current planning cycle. Based on the effective year of the relevant plumbing code standards and the useful life of these items, the expected water efficiency savings by replacement and new growth would reasonably be fully realized by the first projected decade of 2030.

Population projections represent permanent residents, and not seasonal or transient populations. The population projection methodology is performed in two steps: (1) projections at the county level, and then, (2) projections at the Water User Group level. Rural "county-other" population is calculated as the difference between the total projected population of the utility service areas and the total projected county population. Population is then projected from the 2030 base year by decade to the 2080 decade.

The TDC generally develops county-level population projections under three migration scenarios:

1) Zero migration: no net migration (natural growth only)
2) 1.0 migration: net migration rates of 2010 to 2020 ("full-migration scenario"), and
3) 0.5 migration: 2010 to 2020 migration rates halved ("half-migration scenario").

The TDC recommends using the 0.5 migration scenario for long term-planning.

For the FWTWPG, the TWDB draft population projection values were based on the 1.0 migration scenario. However, the 0.5 migration scenario values were also provided by the TWDB from 2030-2080 for RWPGs to consider during the review process. When comparing the 1.0 migration scenario to the 0.5 migration scenario, a reverse relationship can be observed upon projecting population increase vs. population decline. In scenarios where population is projected to increase (i.e., large metropolitan areas) the population in the 1.0 migration scenario is usually observed *increasing* at a faster rate than the 0.5 migration scenario. In scenarios where population is expected to decrease (i.e., rural areas) the population in the 1.0 migration scenario is usually observed *decreasing* at a faster rate than the 0.5 migration scenario. However, there are exceptions to these observed trends.

The FWTWPG determined it was most appropriate to utilize the 0.5 migration scenario for all counties except Jeff Davis County. In the case for Jeff Davis County, the 0.5 migration scenario decreases at a faster rate than the 1.0 migration scenario. This anomaly to the observed trend is because of the population makeup of Jeff Davis County. As explained by the TWDB's Projections & Socioeconomics Analysis Team.

"Jeff Davis County has a mostly older population. According to the 2020 U.S. Census Population Estimates, the median age in Jeff Davis County is around 59. This is one of the oldest counties in the State. When population is projected to decline at a greater rate in the 0.5 scenario than in the 1.0 scenario, it can be assumed that the County has a significantly high mortality rate or low birth rate (or both) compared to the migration rate. When the migration rate is halved, the population moving into Jeff Davis County can't keep pace with the high mortality/low birth rate. Therefore the 0.5 migration scenario shows a greater decline in Jeff Davis County than the 1.0 migration scenario."

The 1.0 migration scenario maximizes the projected population in Jeff Davis County and will be used for projecting demand by the FWTWPG.

Counting people accurately is essential for planning, economic stability, and political representation. The United States Census Bureau revised the 2020 census count in the state of Texas to include a population of 547,968 of residents that were undercounted. This national undercount in population was applied demographically to the Region per WUG. The Hispanic population was under-represented by five percent, and the Black population was under-represented by 3.3 percent.

In addition, the FWTWPG identified that individual communities within the Region are growing at significantly different rates than was projected in the 2021 Regional Water Plan. To account for this growth, all WUGs were surveyed, soliciting more recent information on growth, water use and/or future demands. The TWDB approved revisions to the population projections, based on water-use survey data provided by both Town of Van Horn and El Paso Water. El Paso WCID #4, Haciendas Del Norte WID, and Federal Correctional Institution La Tuna, all in El Paso County, had population projections modified and approved by the TWDB based on annual WUG population growth data.

Lastly, the planning group sought a second opinion and contracted with Dr. Fullerton, professor at the University of Texas El Paso, to provide a report outlining key economic and policy factors within the Region that can result in projected growth rates not being considered in the TWDB's approved population projections (Appendix 2A). The FWTWPG has considered how to address planning for uncertainty and how such planning could be included for the purposes of the 2026 Far West Texas Water Plan (Section 7.2).

In the Far West Texas Region, the only county that is projected to increase in population throughout the planning horizon is El Paso County. All other counties, (Brewster, Culberson, Hudspeth, Jeff Davis, Presidio, and Terrell) are projected to decline in population. Overall, the total population in the Region is expected to increase throughout the planning horizon.

2.1.2 Current and Projected Population

In the year 2020, the U.S. Census Bureau performed a census count, which provides the base year for future population projections. Although the FWTWPG approved the 2020 census count, including the national undercount that was applied demographically and the approved requested revisions, members again expressed concern that the census does not recognize the key economic and policy factors within the Region that can result in projected growth rates not being considered in the census data.

In the case of El Paso County, the United States-Mexico-Canada Agreement (USMCA) is driving substantial volumes of investment on both sides of the international boarder. The resulting increases in business and employment opportunities are likely to increase the pace of net migration into El Paso County. Substantial volumes of investment are anticipated in areas such as manufacturing, transportation, warehousing, and healthcare services.

In the case of Hudspeth County, population growth is likely to exceed the slow rates of expansion projected by the TWDB. Three key factors that should accelerate demographic expansion in this County are: (1) economic expansion in El Paso County; (2) USMCA plus infrastructural-driven increases in merchandise trade through the Marcelino Serna (Tornillo) Port of Entry; and (3) space tourism in western Culberson County. Hudspeth County is designated as part of the El Paso MSA. Rapid expansion in the eastern reaches of El Paso County will eventually couple with lower land prices to spur growth in Fort Hancock and McNary. The major upgrades at the Marcelino Serna (Tornillo) Port of entry will catalyze substantial investment in the western portion of Hudspeth County once the highway upgrades are completed on the south side of the border in Guadalupe, Mexico. Relatively low land prices will also serve to attract industrial and transportation investments near Fort Hancock and McNary. Finally, space tourism is accelerating near Van Horn along the boundary between Culberson and Hudspeth Counties. As this and other space exploration activities expands, it will generate new business and employment opportunities in Sierra Blanca.

In the case of Culberson County, space tourism is already taking place. Blue Origin has already completed six manned tourism launches to the Karman Line of outer space. These sub-orbital space flights carry substantial ticket prices and have generated new business opportunities in Van Horn. Flight testing and other activities related to launches are anticipated north of Van Horn.

For Presidio County, USMCA is also propelling new business opportunities as merchandise and agriculture trade accelerates through the Presidio Texas Port of Entry. Much of the trade is routed to and from “maquiladora” (i.e., duty-and tariff-free) facilities in Chihuahua City, Mexico. As USMCA spurs additional manufacturing investment in that metropolitan economy, exports and imports via Presidio will swell, as this is the closet port to Chihuahua City. Presidio is likely to attract more warehousing, transportation and, energy infrastructure, agricultural processing, customs brokerage, banking, and healthcare investments in the near-term.

Brewster, Jeff Davis, and Terrell Counties are all expected to benefit from increased tourism to attractions such as Big Bend National Park, Fort Davis National Historic Site, Lajitas, Terlingua, and the Davis Mountains. Greater State and national populations will couple with higher incomes plus transportation advances to increase the flow of visitors to this Tri-County Region. Brewster County also has built-in advantage with Sul Ross State University as commerce expands in the Far West Texas Region in coming years.

All the above indicate that the planning group members strongly feel that the TWDB population projections understate the rates of demographic expansion likely to occur in the Far West Texas Region. The FWTWPG desires additional analysis of the population patterns in all seven counties and will focus on this analysis as the regional water planning process continues. This will ensure that water investments can keep pace with growth in these seven counties and do not unintentionally limit economic development.

Current and projected population by decade for water utilities and county rural areas in Far West Texas is listed in Table 2-1. The year 2030 projected population for the entire Region is 1,022,933, of which 98 percent reside in El Paso County and are either serviced by El Paso Water (77 percent) or by other, relatively smaller systems in the County (21 percent) (Figure 2-1). The regional population is projected to increase to 1,104,003 by the year 2080, which is an increase of 81,070 citizens. Most of this increase is projected to occur in El Paso County (Figure 2-2), while the distribution of projected population in the remaining counties is shown in Figure 2-3.

Table 2-1. Far West Texas Population Projections

	2030	2040	2050	2060	2070	2080
Brewster County - Rio Grande Basin						
Alpine	7,129	6,859	6,615	6,418	6,219	6,019
Lajitas Municipal Services	125	120	116	112	109	105
Marathon Water Supply & Sewer Service	374	359	347	336	326	315
Study Butte Terlingua Water System	542	522	503	488	473	458
County-Other	1,851	1,781	1,718	1,667	1,615	1,563
Brewster County Total Population	**10,021**	**9,641**	**9,299**	**9,021**	**8,742**	**8,460**
Culberson County - Rio Grande Basin						
Van Horn	2,312	2,179	2,079	1,982	1,884	1,785
County-Other	249	231	216	202	188	174
Culberson County Total Population	**2,561**	**2,410**	**2,295**	**2,184**	**2,072**	**1,959**
El Paso County - Rio Grande Basin						
Anthony	4,108	4,280	4,369	4,406	4,442	4,479
El Paso Water (City of El Paso ***only)***	790,511	815,858	829,931	839,949	850,135	860,485
El Paso County Tornillo WID	3,403	3,546	3,620	3,650	3,681	3,712
El Paso County WCID #4 (Fabens)	6,132	6,385	6,517	6,571	6,626	6,681
Fort Bliss and East Biggs Water Systems	40,791	42,504	43,388	43,751	44,116	44,484
Horizon Regional MUD	49,297	51,367	52,435	52,874	53,316	53,760
Lower Valley WD (Socorro, Clint, San Elizario)	67,684	70,526	71,992	72,595	73,202	73,812
East Montana Water System	14,756	15,376	15,696	15,827	15,959	16,092
Haciendas Del Norte WID	1,465	1,545	1,584	1,587	1,588	1,589
Paseo Del Este MUD #1	17,378	18,107	18,484	18,639	18,794	18,951
Federal Correctional Institution La Tuna	1,675	1,675	1,675	1,675	1,675	1,675
County-Other	2,148	2,238	2,285	2,304	2,323	2,343
El Paso County Total Population	**999,348**	**1,033,407**	**1,051,976**	**1,063,828**	**1,075,857**	**1,088,063**

Table 2-1. (continued) Far West Texas Population Projections

	2030	2040	2050	2060	2070	2080
Hudspeth County - Rio Grande Basin						
Hudspeth County WCID #1	1,663	1,502	1,381	1,271	1,161	1,050
Esperanza Water Service	652	588	541	498	455	411
County-Other	842	761	699	644	588	532
Hudspeth County Total Population	**3,157**	**2,851**	**2,621**	**2,413**	**2,204**	**1,993**
Jeff Davis County - Rio Grande Basin						
Fort Davis WSC	945	795	641	479	318	158
County-Other	831	700	564	422	280	139
Jeff Davis County Total Population	**1,776**	**1,495**	**1,205**	**901**	**598**	**297**
Presidio County - Rio Grande Basin						
Marfa	2,814	2,451	2,203	1,988	1,771	1,553
Presidio	2,279	1,986	1,785	1,610	1,435	1,258
County-Other	348	303	272	246	219	192
Presidio County Total Population	**5,441**	**4,740**	**4,260**	**3,844**	**3,425**	**3,003**
Terrell County - Rio Grande Basin						
Terrell County WCID #1	477	388	335	281	227	173
County-Other	152	123	106	89	72	55
Terrell County Total Population	**629**	**511**	**441**	**370**	**299**	**228**
Region E Total Population	**1,022,933**	**1,055,055**	**1,072,097**	**1,082,561**	**1,093,197**	**1,104,003**

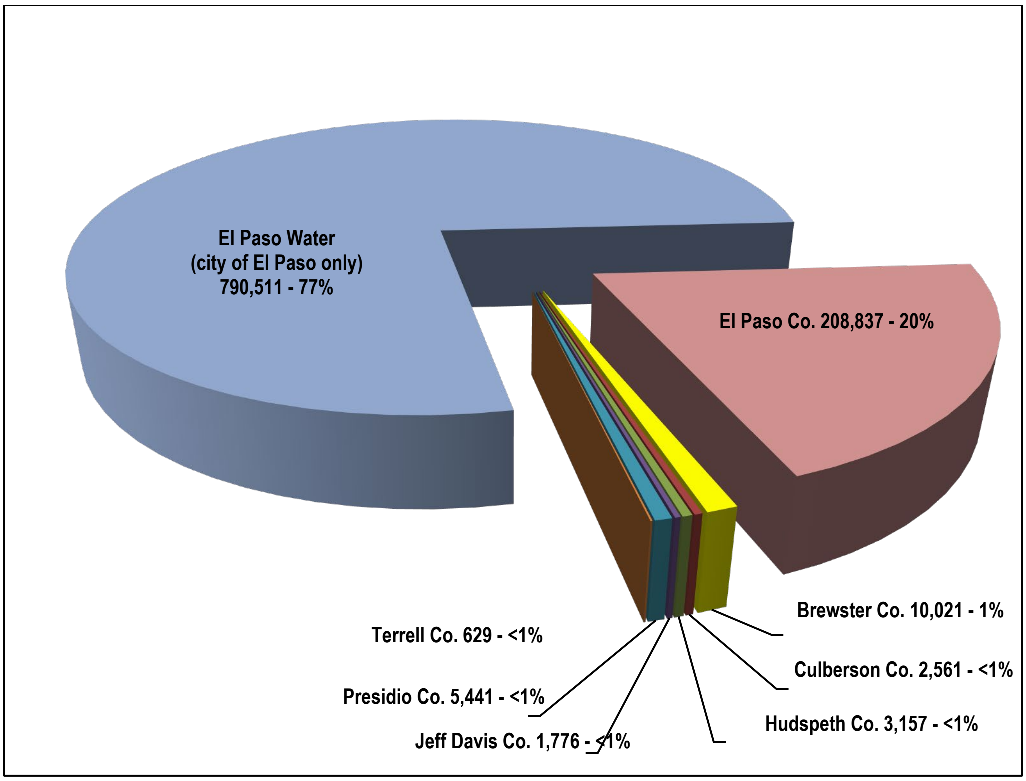


Figure 2-1. Year 2030 Projected Population

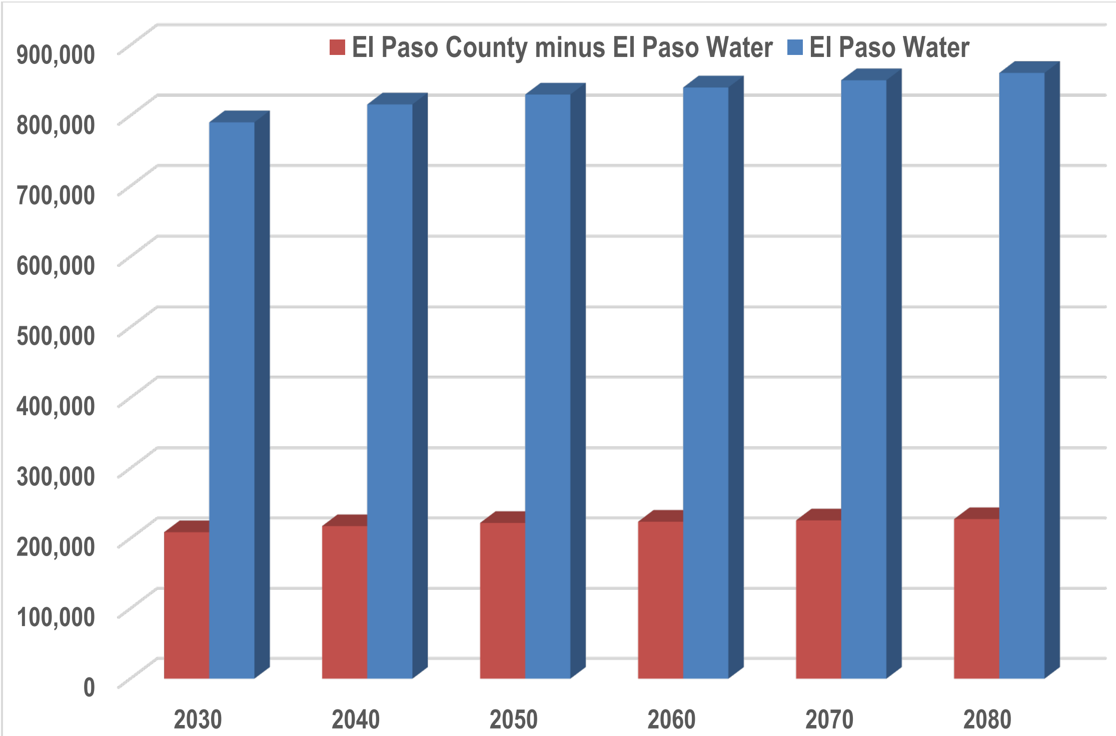


Figure 2-2. Population Projection Distribution in El Paso County

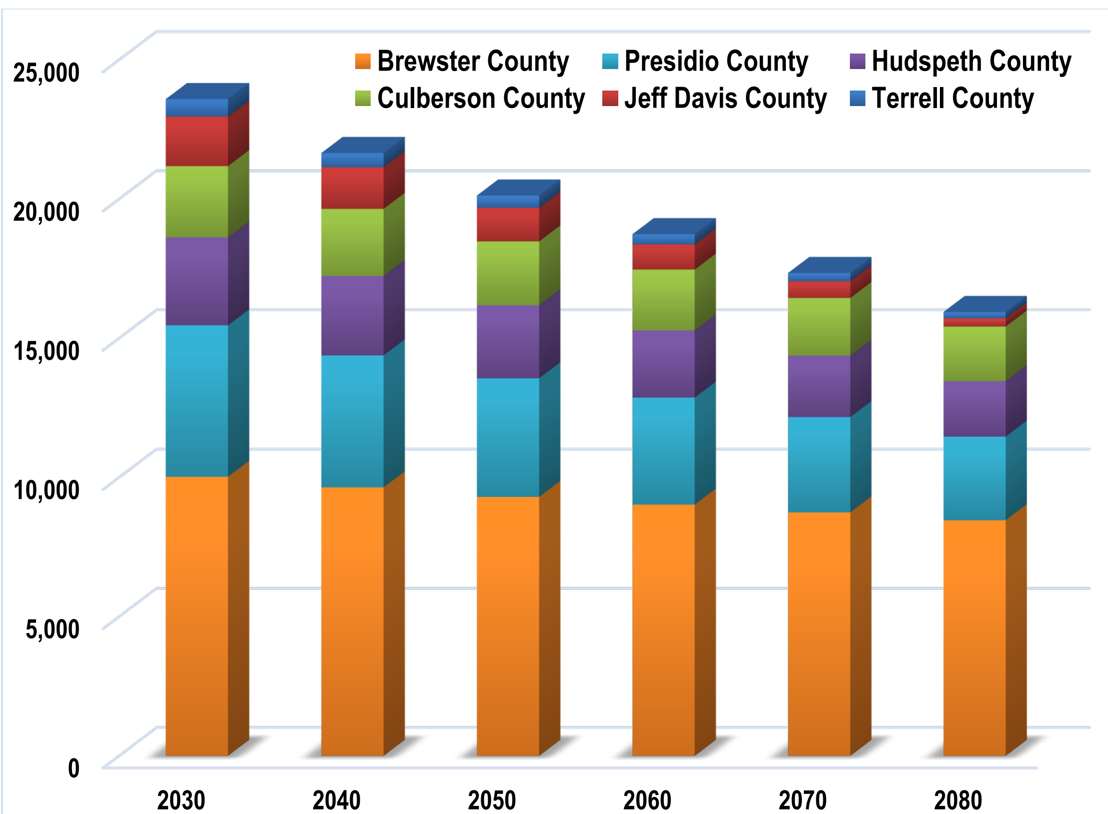


Figure 2-3. Population Projection Distribution in Rural Counties

2.2 WATER DEMAND

A major component of water planning is the establishment of accurate water demand estimates for all water-use categories. Categories of water use include: (1) municipal, (2) county-other (rural domestic), (3) manufacturing, (4) irrigation, (5) steam-electric power generation, (6) livestock, and (7) mining. Individual municipal utility-based are further identified as WUGs.

Municipal water demand projections are a function of population projections, baseline Gallons per Capita per Day (GPCD), and projected plumbing code savings. The following four steps are used in developing municipal water demand projections for WUGs: (1) develop population projections, (2) determine the baseline GPCD by WUG, (3) develop plumbing code savings projections by WUG, and (4) calculate municipal water demand projections.

In 2020 the TWDB was granted funding by the United States Geological Survey (USGS) to contract with the University of Texas Bureau of Economic Geology (UTBEG) to conduct a review of the projection methodology previously used for the mining category. The TWDB determined that the projections need to better reflect reported historical water use. The mining industry in Texas is critical to the State's and the Nation's economy, and the availability of adequate water is essential to many mining sectors. Accurate water-use estimates, and long-range projections associated with this industry are critical to the Texas water planning process. For more information, please read Water Use by Mining Industry in Texas Report.

Regardless of methodologies, the planning group anticipates that water demand is likely underestimated (see Section 2.1.2), and therefore, an emphasis is being made in this planning document to recognize a need for more water than is justified simply from the population-derived water demand quantities. More details regarding how the FWTWPG intends to plan for these uncertainties can be found in Chapter 7, Section 7.2.

Table 2-2 lists the current and future projected regional water demands by county and water-use category. The percent distribution of year 2030 projected regional water demand is shown by county in Figure 2-4 and by water-use category in Figure 2-5. Of concern to the FWTWPG in Table 2-2 is the demand projections for the Irrigation category in El Paso County. The planning group believes that irrigation demand in El Paso County will be atypical of irrigation demand in other regions across the State for a variety of reasons discussed in Section 2.2.4.

Other water-use categories that are not quantified in this *Plan* but are addressed (Section 2.3) include environmental and recreational needs. An additional use that is not quantified but may be of significance is water that is used in road construction for both compaction and dust suppression.

Figure 2-6 illustrates current and future projected regional water demand estimates by county, while Figure 2-7 illustrates water demand projections by water-use category. For the 2030 to 2080 decades the total water demand in the Region is projected to increase from 598,338 to 611,435 acre-feet per year.

The potential role of conservation is an important factor in projecting future water supply requirements. In this *Plan*, conservation is included in the municipal projections as a measure of expected savings based on requirements of the State plumbing code. All other conservation practices are discussed in terms of water-supply strategies in Chapter 5 and as a component of drought management plans in Chapter 7.

The planning group feels that conservation savings reduction to future water demands should not be imposed on rural entities. Counties have not historically been granted significant rule-making authority as compared to municipalities. As such, water-supply districts that are located wholly or primarily in unincorporated communities do not have the same potential to reduce consumption through conservation efforts, given that many of these efforts are established through a municipality's ordinances and/or subdivision standards/codes. Without a statutory mechanism affording counties, or water districts serving unincorporated areas, additional rule-making authority, conservation savings will be very difficult to reach in these communities.

The following sections present an overview of water-supply needs for major water providers (MWPs) and for each of the seven designated water-use categories and include methods and assumptions used in the State's consensus water planning process.

Table 2-2. Far West Texas Water Demand Projections (Rio Grande River Basin) (Acre-Feet per Year)

	2030	2040	2050	2060	2070	2080
Brewster County – Rio Grande Basin						
Alpine	3,019	2,900	2,797	2,713	2,629	2,545
Lajitas Municipal Services	244	234	226	218	212	205
Marathon Water Supply & Sewer Service	116	111	107	104	101	97
Study Butte Terlingua Water System	341	328	316	306	297	288
County-Other	294	281	271	263	255	247
Mining	56	56	57	57	57	57
Livestock	495	495	495	495	495	495
Irrigation	1,974	1,974	1,974	1,974	1,974	1,974
Brewster County Total Demand	**6,539**	**6,379**	**6,243**	**6,130**	**6,020**	**5,908**
Culberson County – Rio Grande Basin						
Van Horn	858	807	770	734	698	661
County-Other	44	41	38	36	33	31
Manufacturing	5	5	5	5	5	5
Mining	10,016	10,019	10,023	10,025	10,026	10,026
Livestock	294	294	294	294	294	294
Irrigation	55,482	55,482	55,482	55,482	55,482	55,482
Culberson County Total Demand	**66,699**	**66,648**	**66,612**	**66,576**	**66,538**	**66,499**

Table 2-2. (continued) Far West Texas Water Demand Projections (Rio Grande River Basin) (Acre-Feet per Year)

	2030	2040	2050	2060	2070	2080
El Paso County - Rio Grande Basin						
Anthony	858	891	909	917	924	932
East Montana Water System	2,583	2,685	2,741	2,764	2,787	2,810
El Paso County Tornillo WID	422	437	446	450	454	458
El Paso County WCID #4	973	1,009	1,030	1,038	1,047	1,056
El Paso Water (City of El Paso ***only)***	120,789	124,096	126,236	127,760	129,309	130,883
Federal Correctional Institution La Tuna	370	369	369	369	369	369
Fort Bliss and East Biggs Water Systems	6,431	6,656	6,794	6,851	6,908	6,966
Haciendas Del Norte WID	272	286	293	294	294	294
Horizon Regional MUD	9,548	9,914	10,121	10,205	10,291	10,376
Lower Valley WD (Socorro, Clint, Elizario)	7,176	7,434	7,588	7,652	7,716	7,780
Paseo Del Este MUD #1	5,188	5,396	5,508	5,554	5,600	5,647
County-Other	478	495	506	510	514	518
Manufacturing	7,915	8,208	8,512	8,827	9,154	9,493
Mining	1,591	1,755	1,917	2,071	2,217	2,351
Steam Electric Power	8,880	8,880	8,880	8,880	8,880	8,880
Livestock	194	194	194	194	194	194
Irrigation	193,990	193,990	193,990	193,990	193,990	193,990
El Paso County Total Demand	**367,658**	**372,695**	**376,034**	**378,326**	**380,648**	**382,997**
Hudspeth County – Rio Grande Basin						
Esperanza Water Service	124	111	103	94	86	78
Hudspeth County WCID #1	520	468	431	396	362	327
County-Other	146	132	121	111	102	92
Mining	68	70	71	72	72	72
Livestock	533	533	533	533	533	533
Irrigation	143,072	143,072	143,072	143,072	143,072	143,072
Hudspeth County Total Demand	**144,463**	**144,386**	**144,331**	**144,278**	**144,227**	**144,174**
Jeff Davis County – Rio Grande Basin						
Fort Davis WSC	286	240	193	145	96	48
County-Other	126	106	85	64	42	21
Mining	59	59	59	59	59	59
Livestock	503	503	503	503	503	503
Irrigation	1,225	1,225	1,225	1,225	1,225	1,225
Jeff Davis County Total Demand	**2,199**	**2,133**	**2,065**	**1,996**	**1,925**	**1,856**

Table 2-2. (continued) Far West Texas Water Demand Projections (Rio Grande River Basin) (Acre-Feet per Year)

Presidio County – Rio Grande Basin						
Marfa	816	709	638	575	513	449
Presidio	640	556	500	451	402	352
County-Other	61	52	47	43	38	33
Livestock	492	492	492	492	492	492
Irrigation	7,350	7,350	7,350	7,350	7,350	7,350
Presidio County Total Demand	**9,359**	**9,159**	**9,027**	**8,911**	**8,795**	**8,676**
Terrell County – Rio Grande Basin						
Terrell County WCID #1	131	106	92	77	62	47
County-Other	19	15	13	11	9	7
Mining	132	132	132	132	132	132
Livestock	183	183	183	183	183	183
Irrigation	956	956	956	956	956	956
Terrell County Total Demand	**1,421**	**1,392**	**1,376**	**1,359**	**1,342**	**1,325**
Region E Total Water Demand	**598,338**	**602,792**	**605,688**	**607,576**	**609,495**	**611,435**

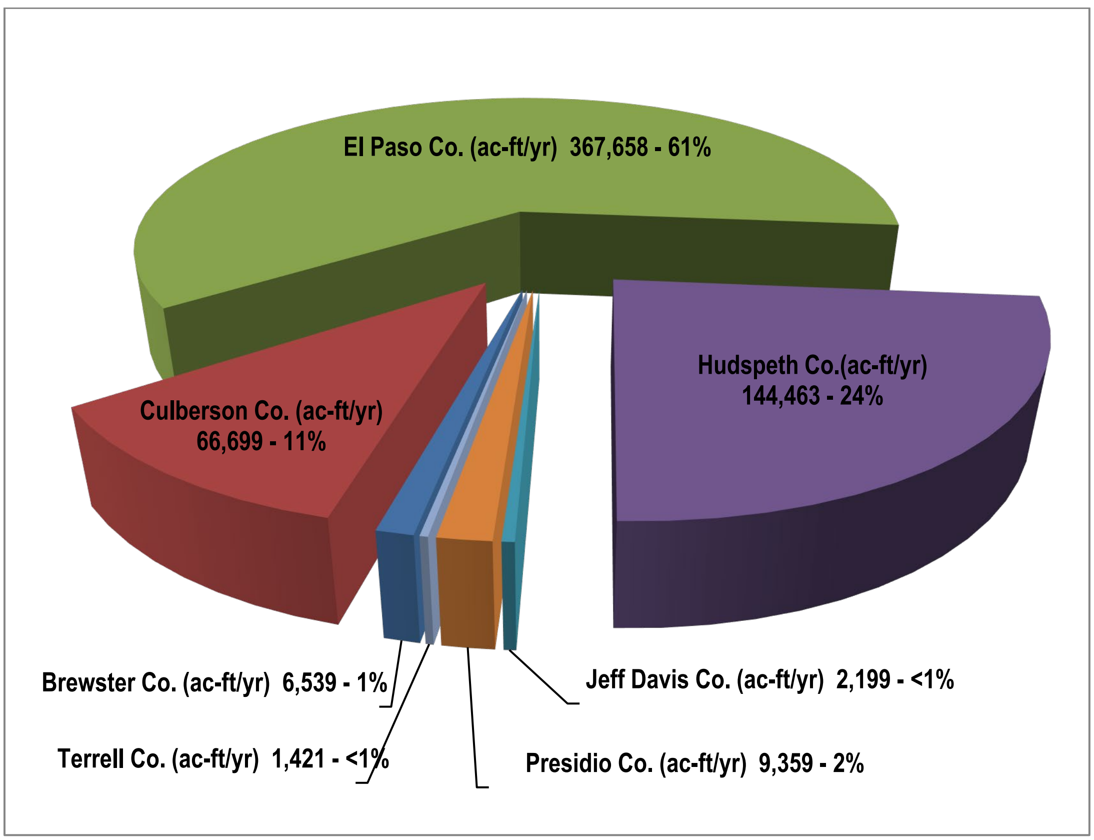


Figure 2-4. Year 2030 Projected Water Demand by County

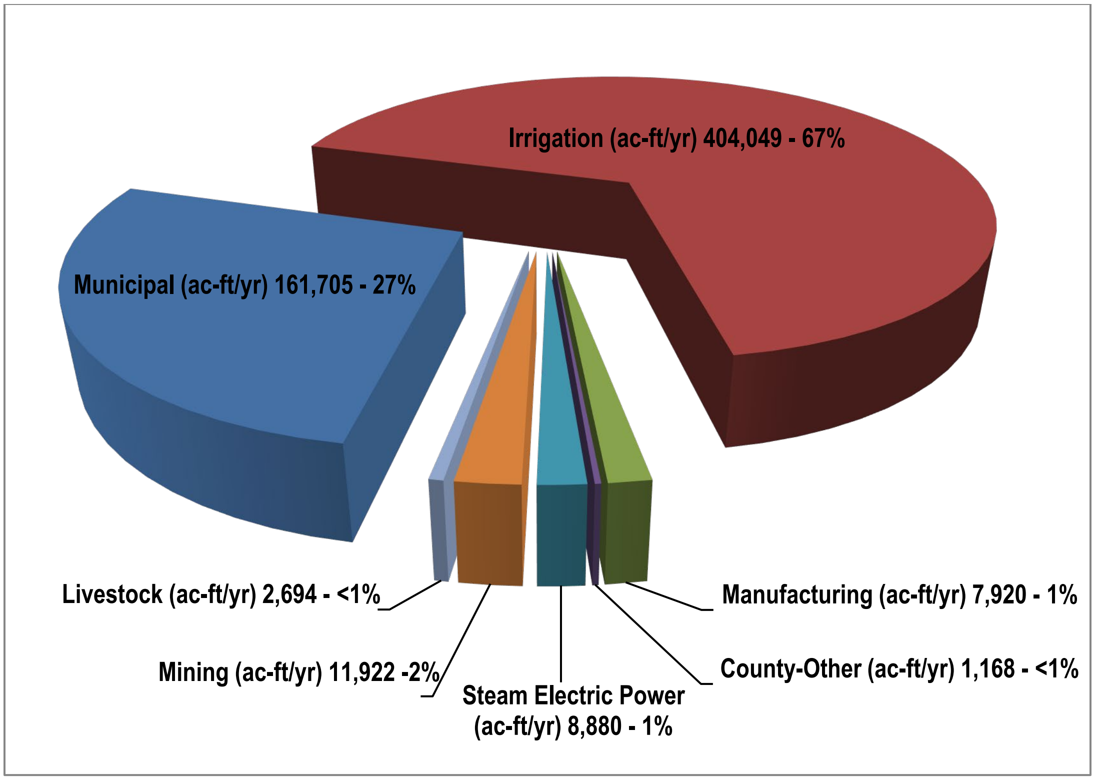


Figure 2-5. Year 2030 Projected Water Demand by Water Use Category

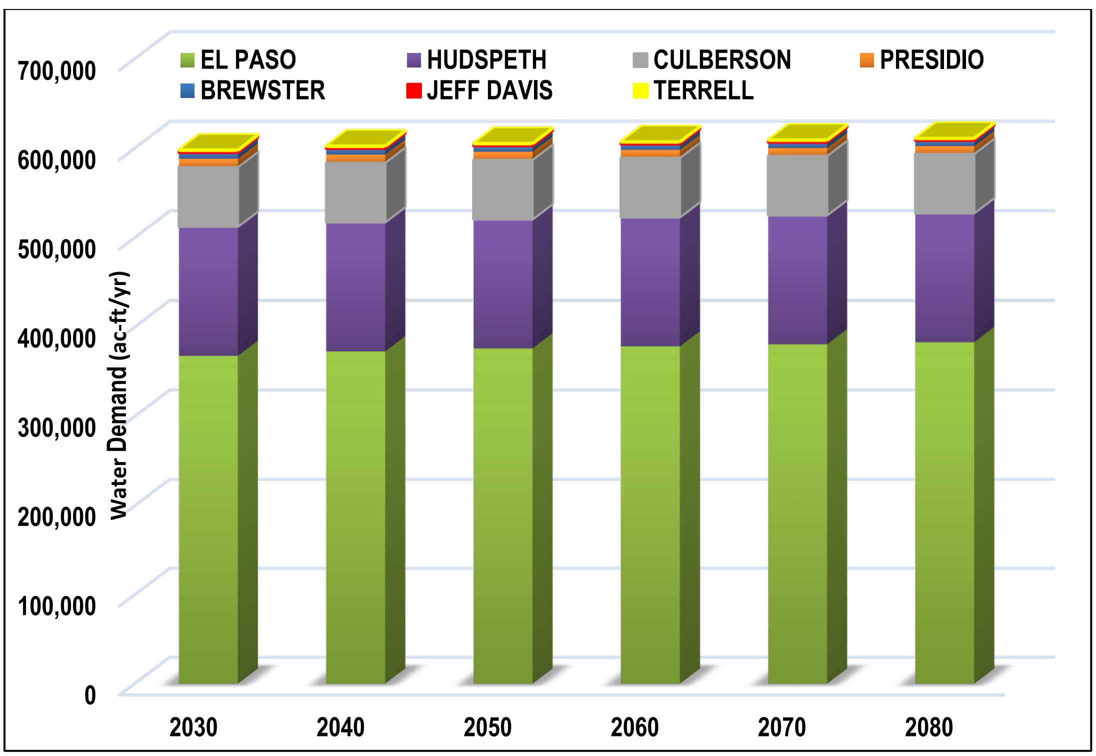


Figure 2-6. Regional Projected Water Demand by County

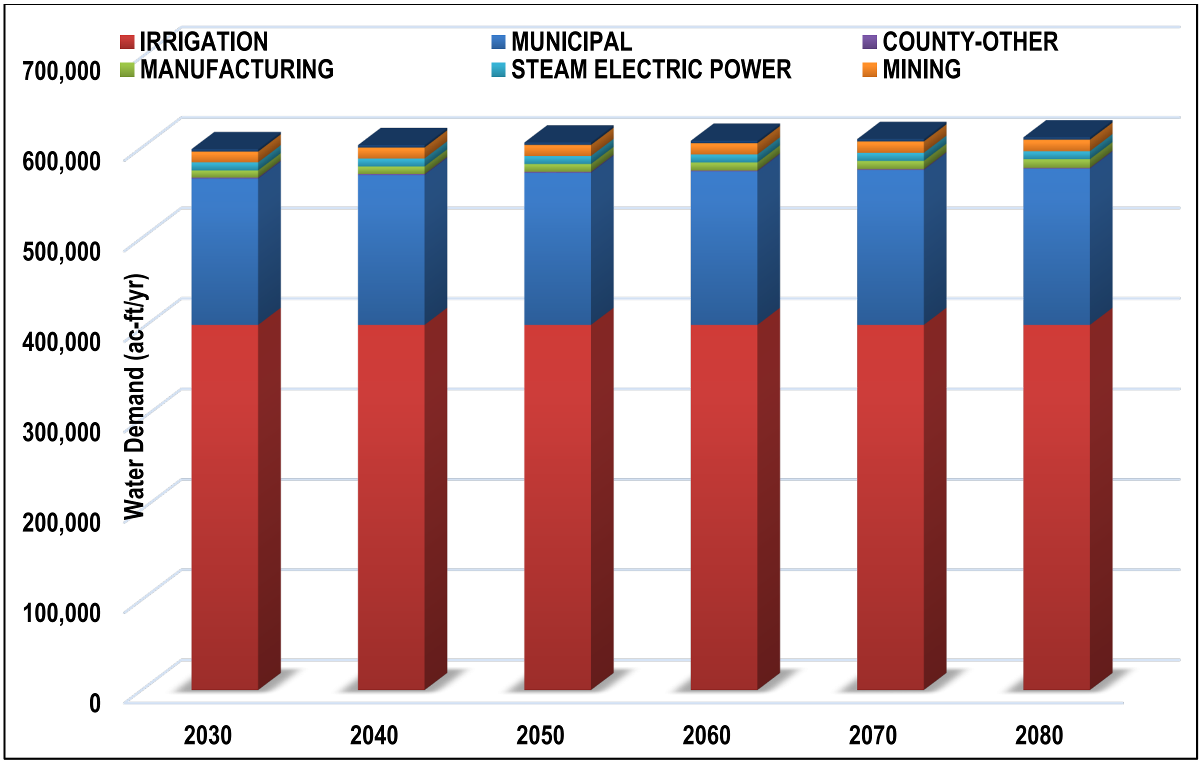


Figure 2-7. Regional Projected Water Demand by Water Use Category

2.2.1 Major Water Providers

TWDB rule changes have revised 31TAC §357.30(4), which requires regional water planning groups to identify "major water providers" as opposed to "wholesale water providers," as performed in previous plans. A major water provider (MWP) is defined as a significant public or private WUG or wholesale water provider (WWP) whose significance is determined by the RWPG and provides water for any water-use category in a regional water planning area. This rule revision gives regional water planning groups more flexibility in identifying which large water providers ought to be reported in their regional water plans.

The Far West Texas Planning Group has developed and adopted the following definition of a MWP, and feels that this definition captures all significant municipal WUGs or WWPs that provide water for other water-use categories within the Region:

> ***"An entity that currently provides significant water supplies (>5,000 acre-feet per year) to other users and which will continue to develop new supplies to meet future needs of those whom they supply during the period covered by this Plan."***

Table 2-3 lists the water demand for the major water providers in the Region and their customers.

Table 2-3. Far West Texas Major Water Provider Water Demand

Major Water Provider	Receiving Entity	Water Demand (Acre-Feet/Year)					
		2030	2040	2050	2060	2070	2080
El Paso County WID#1	El Paso Water (33%)	64,017	64,017	64,017	64,017	64,017	64,017
	El Paso County Irrigation	129,973	129,973	129,973	129,973	129,973	129,973
	Total Demand	**193,990**	**193,990**	**193,990**	**193,990**	**193,990**	**193,990**
El Paso Water Utilities	City of El Paso	120,789	124,096	126,236	127,760	129,309	130,883
	Fort Bliss (73%)	4,695	4,859	4,960	5,001	5,043	5,085
	Lower Valley Water District	7,176	7,434	7,588	7,652	7,716	7,780
	Vinton (County-Other)	44	46	47	47	48	48
	Paseo Del Este MUD #1	5,188	5,396	5,508	5,554	5,600	5,647
	East Montana Water System	2,583	2,685	2,741	2,764	2,787	2,810
	Haciendas Del Norte WID	272	286	293	294	294	294
	Manufacturing	7,915	8,208	8,512	8,827	9,154	9,493
	Mining (12%)	191	211	230	249	266	282
	Steam Electric Power (75%)	6,660	6,660	6,660	6,660	6,660	6,660
	County Other	434	449	459	463	466	470
	Total Demand	**155,947**	**160,329**	**163,234**	**165,271**	**167,343**	**169,452**
Lower Valley Water District	Socorro (47%)	3,373	3,494	3,566	3,596	3,627	3,657
	Clint (1%)	72	74	76	77	77	78
	San Elizario (52%)	3,732	3,866	3,946	3,979	4,012	4,046
	Total Demand	**7,176**	**7,434**	**7,588**	**7,652**	**7,716**	**7,780**
Horizon Regional MUD	Horizon City	5,251	5,552	5,668	5,715	5,866	5,914
	Other Retail Customers	4,297	4,362	4,453	4,490	4,425	4,462
	Total Demand	**9,548**	**9,914**	**10,121**	**10,205**	**10,291**	**10,376**

2.2.2 Municipal and County-Other

Municipal water demand projections are a function of population projections (Section 2.1.1), baseline Gallons per Capita per Day ($GPCD_{base}$), and projected plumbing code savings. Municipal water demand projections are calculated per decade from 2030 through 2080. The municipal water demand for each decade is measured in acre-feet (AF) and the equation is as follows:

$$Demand\ per\ decade\ [AF] = \frac{Population\ projection \times (GPCD_{base} - Plumbing\ Code\ Savings) \times 365}{325{,}851}$$

For the *2026 Regional Water Plan*, the TWDB's draft baseline GPCDs represented historical 'dry-year' (2011) water use minus accumulated plumbing code savings ($GPCD_{base}$). The 2026 GPCD was drafted for each WUG by carrying over the GPCD from the 2021 Regional Water Plans minus estimated accumulated plumbing code savings. The GPCDs in the 2021 Regional Water Plans were carried over from the 2016 Regional Water Plans and mostly represented the historically dry year 2011, although some WUG GPCDs in the 2021 Regional Water Plans were revised by the planning groups to use more recent 'dry-year' utility-based water use (2010-2015). Ultimately, the FWTWPG decided upon using the historical maximum GPCD, per WUG, between 2010 and 2020 as their $GPCD_{base}$ value.

Table 2-4 presents municipal savings due to the natural installation of plumbing fixtures and appliances to more water-efficient fixtures and appliances. The conservation-adjusted per-capita water use is then applied to each of the decade population estimates to produce the projected water demand for each entity. Table 2-5 presents the municipal and county-other projected water demands for each decade in the current planning cycle.

Rural communities (outside of El Paso County) are relatively small and are generally reliant on self-provided water supplies. Water demand within these communities is related directly to their population trends and is thus projected to decrease within the next 50 years. Projected water demand growth, and projected population increase, for the numerous communities within El Paso County is significantly greater and thus will require a level of coordinated intercommunity planning.

Table 2-4. Municipal Savings Due to Plumbing Fixture Requirements (Acre-Feet per Year)

County	Entity Name	2030	2040	2050	2060	2070	2080
Brewster	Alpine	40	43	41	40	39	37
	Lajitas Municipal Services	1	1	1	1	1	1
	Marathon Water Supply & Sewer Services	2	2	2	2	2	2
	Study Butte Terlingua Water System	3	3	3	3	3	3
	County-Other	11	12	11	11	11	10
Culberson	Van Horn	12	13	12	12	11	11
	County-Other	2	2	2	2	1	1
El Paso	Anthony	21	25	25	26	26	26
	El Paso Water	4,064	4,761	4,843	4,902	4,961	5,022
	El Paso County Tornillo WID	17	19	20	20	20	20
	El Paso WCID #4	30	35	36	36	36	37
	Fort Bliss and East Biggs	194	248	253	255	257	259
	Horizon Regional MUD	226	270	275	278	280	282
	Lower Valley Water District	330	387	395	398	402	405
	East Montana Water System	61	71	72	73	73	74
	Haciendas Del Norte WID	7	8	9	9	9	9
	Paseo Del Este MUD #1	68	81	82	83	84	84
	Federal Correctional Institution La Tuna	5	6	6	6	6	6
	County-Other	17	21	22	22	22	22
Hudspeth	Hudspeth County WCID #1	9	9	9	8	7	7
	Esperanza Water Service	3	3	3	3	2	2
	County-Other	5	5	4	4	4	3

Table 2-4. (continued) Municipal Savings Due to Plumbing Fixture Requirements (Acre-Feet per Year)

County	Entity Name	2030	2040	2050	2060	2070	2080
Jeff Davis	Fort Davis	5	5	4	3	2	1
	County-Other	5	4	4	3	2	1
Presidio	Marfa	16	15	14	13	11	10
	Presidio	11	11	10	9	8	7
	County-Other	2	2	2	2	2	1
Terrell	Terrell County WCID #1	3	2	2	2	1	1
	County-Other	1	1	1	1	0	0
Total		**5,170**	**6,065**	**6,163**	**6,222**	**6,283**	**6,345**

Table 2-5. Municipal and County-Other Water Demand Projections - Rio Grande Basin (Acre-Feet per Year)

	2030	2040	2050	2060	2070	2080
Brewster County						
Alpine	3,019	2,900	2,797	2,713	2,629	2,545
Lajitas Municipal Services	244	234	226	218	212	205
Marathon Water Supply & Sewer Service	116	111	107	104	101	97
Study Butte Terlingua Water System	341	328	316	306	297	288
County-Other	294	281	271	263	255	247
Brewster County Total Demand	**4,014**	**3,854**	**3,717**	**3,604**	**3,494**	**3,382**
Culberson County						
Van Horn	858	807	770	734	698	661
County-Other	44	41	38	36	33	31
Culberson County Total Demand	**902**	**848**	**808**	**770**	**731**	**692**
El Paso County						
Anthony	858	891	909	917	924	932
East Montana Water System	2,583	2,685	2,741	2,764	2,787	2,810
El Paso County Tornillo WID	422	437	446	450	454	458
El Paso WCID #4	973	1,009	1,030	1,038	1,047	1,056
El Paso Water	120,789	124,096	126,236	127,760	129,309	130,883
Federal Correctional Institution La Tuna	370	369	369	369	369	369
Fort Bliss and East Biggs	6,431	6,656	6,794	6,851	6,908	6,966
Haciendas Del Norte WID	272	286	293	294	294	294
Horizon Regional MUD	9,548	9,914	10,121	10,205	10,291	10,376
Lower Valley WD	7,176	7,434	7,588	7,652	7,716	7,780
Paseo Del Este MUD #1	5,188	5,396	5,508	5,554	5,600	5,647
County-Other	478	495	506	510	514	518
El Paso County Total Demand	**155,088**	**159,668**	**162,541**	**164,364**	**166,213**	**168,089**

Table 2-5. (continued) Municipal and County-Other Water Demand Projections – Rio Grande Basin (Acre-Feet per Year)

	2030	2040	2050	2060	2070	2080
Hudspeth County						
Esperanza Water Service	124	111	103	94	86	78
Hudspeth County WCID #1	520	468	431	396	362	327
County-Other	146	132	121	111	102	92
Hudspeth County Total Demand	**790**	**711**	**655**	**601**	**550**	**497**
Jeff Davis County						
Fort Davis WSC	286	240	193	145	96	48
County-Other	126	106	85	64	42	21
Jeff Davis County Total Demand	**412**	**346**	**278**	**209**	**138**	**69**
Presidio County						
Marfa	816	709	638	575	513	449
Presidio	640	556	500	451	402	352
County-Other	61	52	47	43	38	33
Presidio County Total Demand	**1,517**	**1,317**	**1,185**	**1,069**	**953**	**834**
Terrell County						
Terrell County WCID #1	131	106	92	77	62	47
County-Other	19	15	13	11	9	7
Terrell County Total Demand	**150**	**121**	**105**	**88**	**71**	**54**
Region E Total Municipal Water Demand	**162,873**	**166,865**	**169,289**	**170,705**	**172,150**	**173,617**

A significant portion of the municipal water demand in Brewster, Jeff Davis, and Presidio Counties is assigned to the county-other category. This category represents the aggregation of utilities that provide less than an average of 100 acre-feet per year, as well as rural areas not served by a water utility in each county. Table 2-6 presents a listing of water systems that comprise the county-other category along with the corresponding annual water use survey data (2016-2020).

Table 2-6. County-Other Systems Reported Water Use From 2016 through 2020 (Acre-Feet per Year)

	2016	2017	2018	2019	2020
Brewster County-Other					
Panther Junction BBNP	23	23	23	20	16
Chisos Basin Water BBNP	-	-	-	-	-
Rio Grande Village BBNP	-	-	-	-	-
Castolon Maintenance Area BBNP	-	-	-	-	-
Big Bend Resort & Adventures	-	-	-	-	-
Brewster County-Other Total Water Use	**23**	**23**	**23**	**20**	**16**

Table 2-6. (continued) County-Other Systems Reported Water Use From 2016 through 2020 (Acre-Feet per Year)

	2016	2017	2018	2019	2020
Culberson County-Other					
Pine Springs GMNP	20	24	22	16	14
TX Dot Culberson County SRA US 62	-	-	-	-	-
TX Dot Culberson County SRA IH 10	-	-	-	-	-
Culberson County-Other Total Water Use	**20**	**24**	**22**	**16**	**14**
El Paso County-Other					
Gaslight Square Mobile Home Park	-	48	42	45	50
San Isidro Mobile Home Park	-	3	3	3	3
Vinton Mobile Home Park	-	4	15	15	8
Quail Run Mobile Home Park	-	2	3	3	3
Lee Limas Mobile Home Park	0	0	0	0	0
Vinton Hills Subdivision	75	71	72	73	78
Vinton Village Estates	36	33	33	31	35
Vinton Alegre Estates	10	11	12	10	10
River View Estates	24	24	29	29	22
Green Acres Mobile Home Park	21	22	19	19	14
El Paso County-Other					
Valley Acres Mobile Home Park	2	2	2	2	2
Hillside Water Works	0	0	0	0	13
Ponderosa and Western Village WSC	-	-	-	-	-
Fort Bliss Site Monitor	-	-	-	-	-
Hueco Tanks State Park TPWD	-	-	-	-	-
Chamizal National Memorial	-	-	-	-	-
East Montana Location	-	-	-	-	-
Hueco Club	-	-	-	-	-
El Paso County-Other Total Water Use	**168**	**220**	**230**	**230**	**238**
Hudspeth County-Other					
Fort Hancock WCID	82	88	83	95	100
Dell City	63	63	63	63	63
Cerro Alto Water System	41	42	42	42	34
Hudspeth County-Other Total Water Use	**186**	**193**	**188**	**200**	**197**

Table 2-6. (continued) County-Other Systems Reported Water Use From 2016 through 2020 (Acre-Feet per Year)

	2016	2017	2018	2019	2020
Jeff Davis County-Other					
City of Valentine	25	26	26	27	26
Fort Davis Estates	8	7	8	8	11
UT McDonald Observatory	11	13	13	11	13
TPWD Davis Mountains State Park Campground	29	18	15	19	19
Fort Davis National Historic Site	-	-	-	-	-
Bloys Campmeeting	4	5	5	5	5
Prude Ranch	17	17	21	19	19
The High Frontier	20	21	20	20	20
Village Farms of Texas	-	-	-	8	8
Jeff Davis County-Other Total Water Use	**77**	**69**	**67**	**65**	**121**
Presidio County-Other					
Shafter Mine	39	43	49	52	59
Candelaria WSC	5	5	5	5	5
Redford Water Supply	44	23	20	20	20
Big Bend Ranch State Park TPWD	-	-	-	-	-
Presidio County-Other Total Water Use	**88**	**71**	**74**	**77**	**84**
Region E Total Water Use	**562**	**600**	**604**	**608**	**670**

No survey data provided (-)

2.2.3 Manufacturing

Manufacturing water use is one of the three largest uses of water in Texas. In the 2022 State Water Plan, approximately 1.7 million acre-feet was reported within the 2020 planning decade. This represents 10% of total water use in the State. In the Far West Texas Region, manufacturing water use accounts for two percent of the total non-municipal water use. The use of water for manufacturing purposes only occurs in Culberson and El Paso Counties (Table 2-7). Use in Culberson County is minimal and is not anticipated to change significantly over time, however, manufacturing water use in El Paso County is expected to increase from 7,915 acre-feet in the year 2030 to 9,493 acre-feet by 2080.

Manufacturing self-supplied water demand projections for El Paso County are based on the highest county-aggregated manufacturing water use in the most recent five years (2015-2019) of reported annual water use survey data. Values from the water-use survey used in the max year calculation consist of gross intake (withdrawals and purchases) minus any sales to other entities. Fresh surface water and groundwater were included in this net use. Additionally, volumes of reuse water, such as treated effluent, and brackish groundwater used by manufacturing facilities were included in the historical water-use estimates and the water demand projections. Rather than holding projected demands constant from 2030 through 2080, as seen in the previous water plan, the TWDB projected water demands linearly using the County Business Patterns (CBP) historical number of manufacturing establishments.

The FWTWPG determined that for Culberson County, the manufacturing water demands would utilize the maximum annual historical water use estimate from 2011 through 2020. In 2030, a maximum water use estimate of five acre-feet was reported. This value is shown in the table below and will be held constant throughout the planning horizon.

The use of water for manufacturing purposes only occurs in Culberson and El Paso Counties (Table 2-7). Use in Culberson County is minimal and is not anticipated to change significantly over time, however, manufacturing water use in El Paso County is expected to increase from 7,915 acre-feet in the year 2030 to 9,493 acre-feet by 2080.

Table 2-7. Manufacturing Water Demand Projections (Acre-Feet per Year)

County	2030	2040	2050	2060	2070	2080
Brewster	0	0	0	0	0	0
Culberson	5	5	5	5	5	5
El Paso	7,915	8,208	8,512	8,827	9,154	9,493
Hudspeth	0	0	0	0	0	0
Jeff Davis	0	0	0	0	0	0
Presidio	0	0	0	0	0	0
Terrell	0	0	0	0	0	0

2.2.4 Irrigation

Irrigated agriculture is the biggest user of water in Texas. Approximately 7.5 million acre-feet was represented within the 2020 planning decade, of the 2022 State Water Plan. Irrigation water use represents 45 percent of total water use in the State. This is 10 percent greater than municipal water use, which ranks as the second largest use of water state-wide. On a Regional level, irrigation accounts for an estimated 281,318 acre-feet per year, approximately four percent of the total non-municipal water use.

Irrigation water demand projections utilize an average of TWDB's 2015 through 2019 irrigation water use estimates as a base. Those values were then held constant between 2030 and 2080. Annual water-use estimates are developed at the county level by applying a calculated evapotranspiration-based "crop water need" estimate to reported irrigated acreage from Farm Service Agency (FSA). These estimates are then adjusted based on surface water release data from TCEQ and Texas Water Masters and comments from Groundwater Conservation Districts. In counties where the total groundwater availability over the planning period is projected to be less than the groundwater portion of the baseline water demand projections, the irrigation water demand projections are held constant for 10 years beyond the point that the groundwater availability falls below the baseline demand, in most cases 2030 to 2040, after projected demands will begin to decline, to be compatible with the groundwater availability. However, this approach to a 'groundwater constrained' area presently does not occur in the Far West Texas Region.

In addition to the TWDB irrigation methodology described above, The FWTWPG reviewed annual historical water-use estimates spanning across the previous 10 years (2011-2020). These estimates are produced using information from the Annual Water-Use Survey and can be found on the TWDB's website.

The revised data shown on Table 2-8 include the maximum annual historical water-use estimates for all counties within the Far West Texas Region. These values will be held constant throughout the planning horizon (2030-2080). This approach was found satisfactory for use in this current regional water plan.

Statewide, irrigation water demands are expected to decline over time. More efficient canal delivery systems have improved water-use efficiencies of surface water irrigation. More efficient on-farm irrigation systems have also improved the efficiency of groundwater irrigation. Other factors that have contributed to decreased irrigation demands are declining groundwater supplies and the voluntary transfer of water rights historically used for irrigation to municipal uses.

Water used for agricultural irrigation in Far West Texas is significantly greater (67 percent of total) than all other water-use categories. On a Regional basis, water used for the irrigation of crops is projected to remain steady over the 50-year planning horizon. However, as any irrigator can attest, climate, water availability, and the market play key roles in how much water is applied on a year-by-year basis.

The quantity and quality of water needed for agricultural irrigation is dependent on the type of crop grown and on soil characteristics. Although a minimal amount of agriculture can persist on limited water supplies, most crops require significantly larger water applications to remain profitable. Irrigated farms along the Rio Grande corridor in El Paso and Hudspeth Counties are almost entirely dependent on water supplies derived from the Rio Grande River. When Rio Grande water is limited or not available, most farming temporarily ceases until water supplies once again become available. Irrigated farms in other areas within the Region are dependent on groundwater supplies. Availability of these supplies depends on local pumping regulatory limitations, aquifer hydrologic characteristics, and energy cost.

Irrigation strategies principally involve various forms of conservation. Irrigation application equipment has been developed to ensure that greater amounts of applied water reach the root system while minimizing loss to evaporation. Proper application timing is also critical in avoiding over-watering. The lining of canals that transport water from its source to the fields reduces losses due to seepage. Drought tolerant crop selection is also important when faced with limited water supplies.

Some farmers across the Region are using slightly saline water for irrigation. To maintain long-term soil productivity with saline waters, producers must over irrigate to maintain a leaching fraction that minimizes salt buildup in the crop root zone. In some areas, high levels of sodium have reduced soil infiltration rates. Producers often manage this problem through application of soil amendments (such as gypsum or organic residues) or through mechanical mixing of the soil. Table 2-8 presents the projected irrigation water use for all decades in the current water planning cycle.

Table 2-8. Irrigation Water Demand Projections (Acre-Feet per Year)

County	2030	2040	2050	2060	2070	2080
Brewster	1,974	1,974	1,974	1,974	1,974	1,974
Culberson	55,482	55,482	55,482	55,482	55,482	55,482
El Paso	193,990	193,990	193,990	193,990	193,990	193,990
Hudspeth	143,072	143,072	143,072	143,072	143,072	143,072
Jeff Davis	1,225	1,225	1,225	1,225	1,225	1,225
Presidio	7,350	7,350	7,350	7,350	7,350	7,350
Terrell	956	956	956	956	956	956

2.2.5 Steam Electric Power Generation

Steam-electric power ranks as the fourth largest water user in Texas. Steam-electric power water use is influenced by a variety of factors, including fuel prices, weather conditions, electricity demand, the cooling design of the facilities, and others. Total water use for all purposes in Texas in 2020 was approximately 938,782 acre-feet per year, representing six percent of total water use in the State. In the Far West Texas Region, steam-electric power only occurs in El Paso County and is approximately one percent of the total non-municipal water use.

Electricity demands within the Region are projected to be static across the planning horizon. In addition, the current regional water plan depicts a decrease in anticipated population growth from that of the 2021 Regional Water Plan. A decrease in population and anticipated improvements and shifts in generation technologies and water conservation strategies contribute to a projected water demand that is less in this current plan (8,880 acre-feet per year), compared to the projected 10,545 acre-feet per year in the previous Plan (Table 2-9).

As part of this planning cycle, the steam-electric power generation water demand projections in 2030 are based on the highest single year county water use from within the most recent five years (2015-2019) of annual water-use survey estimates. The anticipated water use of future facilities listed in the State and Federal reports was added to the demand projections from the anticipated operation date to 2080. Likewise, the reported water use of facilities scheduled for retirement was subtracted from the demand projections.

In previous plans, the volumes of reuse water, such as treated effluent, used by generating facilities have not been included in the historic water-use estimates or the water demand projections. However, reuse is becoming an increasingly valuable water supply State-wide and is an important part of meeting future water demands. In recognition of this critical water supply component, the TWDB for this planning cycle has developed the steam-electric water demand projections to include the relevant reuse volumes reported by the power facilities in both the 2026 Regional Water Plans and the 2027 State Water Plan.

El Paso Electric, located in El Paso County, is the only facility within the Region that uses water in the form of steam to generate electricity. Currently, El Paso Electric operates four different electric-generating stations, distributing electricity across a 10,000-square mile service area in the Rio Grande Valley of west Texas and south-central New Mexico. These stations are comprised of a variety of different electric generation technology systems (e.g. steam turbine, gas turbine, combined cycle, etc.), as well as having various cooling systems (once-through, cooling tower). These different generation technologies require various volumes of water use. El Paso Electric recommends that in addition to fuel type, the TWDB's methodology also considers the type of generation technology system as another significant component of water consumption rate.

Table 2-9 presents the steam-electric power water demand projections. The only steam-electric power water use in the Region is within El Paso County. El Paso Electric currently purchases most of its water supply from El Paso Water.

Table 2-9. Steam Electric Power Generation Water Demand Projections (Acre-Feet per Year)

County	2030	2040	2050	2060	2070	2080
Brewster	0	0	0	0	0	0
Culberson	0	0	0	0	0	0
El Paso	8,880	8,880	8,880	8,880	8,880	8,880
Hudspeth	0	0	0	0	0	0
Jeff Davis	0	0	0	0	0	0
Presidio	0	0	0	0	0	0
Terrell	0	0	0	0	0	0

2.2.6 Livestock

Texas leads the nation in the number of farms and ranches, with 248,416 farms and ranches covering 127 million acres (Texas Department of Agriculture, 2023). Although livestock production is an important component of the Texas economy, the industry consumes a relatively small amount of water. A total of 328,950 acre-feet per year, was the State-wide reported water use in 2020. This represents two percent of total water use in the State. Within the Far West Texas Region, livestock water use is less than one percent of the total non-municipal water use.

Livestock water demand projections are a combination of an average of the 2015 through 2019 water-use survey information provided by the TWDB and per head water use consumptions by animal class. The 2015 through 2019 water-use survey information is based on livestock inventory data from the National Agricultural Statistical Services (NASS) and the Texas Department of Agriculture. The per head water use consumptions by animal class is based on the TWDB 2022 non-surveyed annual livestock inventory and water-use estimates. County-level water-use estimates are calculated by applying a water-use coefficient for each livestock category to county level inventory estimates. The rate of change for projections from the 2021 Regional Water Plans was then applied to the new base. Many counties chose to hold the base constant throughout the planning horizon.

Table 2-10 presents livestock category and per head daily water use information. Data highlighted in grey within the *2026 RWP* column were updates made to the 2021 assumptions, to include the new water-use per head coefficients.

Table 2-10. Estimated per Head Daily Water Use Comparison, (2021 and 2026 RWP's) (in gallons)

TWDB category	Subcategory	2021 RWP water use (gal/head/day)	2026 RWP water use (gal/head/day)
Cattle	Milk	75	55
	Fed & other cattle	15	15
Chickens	Non-broilers	0.086	0.09
	Broilers	0.077	0.09
Turkeys	Turkeys	0.2	0.2
Equine	Horses, ponies, mules, burros, & donkeys	12	12
Hogs	Hogs	11	5
Sheep	Sheep	2	2
Goats	Milk	0.5	2

Source: TWDB Non-Surveyed Annual Livestock Inventory and Water Use Estimates, 2022

For water-supply planning purposes in the Far West Texas Plan, livestock water use is held constant throughout the 50-year planning period. However, reality dictates that during prolonged drought periods, when poor range conditions exist and/or during unfriendly market conditions, livestock herds are generally reduced thus resulting in significantly less water demand. Table 2-11 presents the projected livestock water demand for the Region. It is also important to point out that water consumed by wildlife is not a component of these livestock estimates and remains an unaccounted supply volume as described in Section 2.3 Environmental and Recreational Water Needs.

Table 2-11. Livestock Water Demand Projections (Acre-Feet per Year)

County	2030	2040	2050	2060	2070	2080
Brewster	495	495	495	495	495	495
Culberson	294	294	294	294	294	294
El Paso	194	194	194	194	194	194
Hudspeth	533	533	533	533	533	533
Jeff Davis	503	503	503	50 3	503	503
Presidio	492	492	492	492	492	492
Terrell	183	183	183	183	183	183

2.2.7 Mining

Total water use for all purposes in Texas in 2019 was approximately 14.1 million acre-feet per year. Water use by the mining industry is about 395,000 acre-feet per year, representing 2.8% of total water use in the State. In the Far West Texas Region, mining water use is approximately three percent of the total non-municipal water use. Mining water use is estimated to increase slightly over the planning horizon, primarily as a result of increased demand for aggregate industry products. However, it is anticipated that between 2060 and 2070, mining water use might decline slightly as major oil and gas play development matures.

Although the Texas mineral industry is foremost in the production of crude petroleum and natural gas in the United States, it also produces a wide variety of important nonfuel minerals. In all instances, water is required in the mining of these minerals either for processing, leaching to extract certain ores, controlling dust at the plant site, or for reclamation.

Mining water demand projections were reevaluated in this current cycle of regional water planning. United States Geological Survey (USGS) granted funding to the TWDB for a study on mining use and projections through the Water Use and Research Data Program. Through a contract between TWDB and University of Texas Bureau of Economic Geology, the 2011-2012 study was updated. The new report titled “Water Use by Mining Industry in Texas Report” was published in August of 2022. The goals of this report were to: (1) provide a comprehensive and quantitative assessment of mining water use across Texas, and (2) improve the development process and accuracy of water use estimates and water demand projections. For more information, please read Water Use by Mining Industry in Texas Report.

The FWTWPG requested revisions to the mining water demand for both Jeff Davis and Terrell Counties. In calculating these projected mining water demands; the planning group reviewed the maximum annual historical water-use estimates from 2011 through 2020. In Jeff Davis and Terrell Counties, the maximum annual water-use estimates are 59 acre-feet per year and 132 acre-feet per year respectively. No mining water demands are expected in Presidio County (Table 2-12).

A portion of the water used in the non-oil and gas mining industry in Far West Texas is related to its use in the quarrying of gravel and road base materials. However, the largest single water use occurs in Culberson County where it is employed in the mining of talc mineral aggregates.

Table 2-12. Mining Water Demand Projections (Acre-Feet per Year)

County	2030	2040	2050	2060	2070	2080
Brewster	56	56	57	57	57	57
Culberson	10,016	10,019	10,023	10,025	10,026	10,026
El Paso	1,591	1,755	1,917	2,071	2,217	2,351
Hudspeth	68	70	71	72	72	72
Jeff Davis	59	59	59	59	59	59
Presidio	0	0	0	0	0	0
Terrell	132	132	132	132	132	132

In recent years, increased oil and gas exploration activity has occurred in the Region, especially in Culberson County, where in September 2016 the Apache Corporation announced the discovery of a new oil and natural gas resource play, the Alpine High, in the southwest corner of the Permian Basin. The geographic outline of the play extends over 60 miles and is primarily in the southern half of Reeves County, but also falls within the boundaries of Culberson and Jeff Davis Counties. The acreage is estimated to hold approximately 75 trillion cubic feet of mostly wet gas and three billion barrels of oil in the Barnett and Woodford regions of the field. In addition, significant oil is potentially in the shallower Pennsylvanian, Bone Springs, and Wolfcamp formations.

Table 2-13 presents the total volume of water used as a carrier fluid for hydraulic fracturing in Culberson County from 2012-2023. In the 2021 Far West Texas Water Plan, the total volume of water used for hydraulic fracturing reported from 2012 through 2017, in Culberson County was 7,572 acre-feet per year. A significant increase in water used for hydraulic fracturing has occurred from 2018 through 2023. The total water used (2018-2023) is reported at 35,369 acre-feet per year. This is almost five times as much water from that being used during 2012 through 2017. In addition, the FWTWPG has expressed some concern regarding the amount of water being used for hydraulic fracturing, of which gets removed from the natural hydrological cycle and the downstream impacts of this.

Table 2-13. Total Volume of Water Used for Hydraulic Fracturing in Culberson County (Acre-Feet per Year)

Year	Total Base Water Volume
2012	34
2013	574
2014	1,651
2015	2,221
2016	1,715
2017	1,377
2018	2,136
2019	8,328
2020	5,806
2021	7,086
2022	5,417
2023	6,596

Source: FracFocus

The volume of water that is anticipated for this project is presently speculative, and therefore the Far West Texas Planning Group chooses not to include the estimates in the Table 2-12 mining projections until such time that their anticipated use becomes more established. Until then, the FWTWPG intends to closely monitor this potentially significant water use.

2.3 ENVIRONMENTAL AND RECREATIONAL WATER NEEDS

Environmental and recreational water use in Far West Texas is not quantified but is recognized as being an important consideration as it relates to the natural community in which the residents of this Region share and appreciate. In Chapter 1, environmental and eco-recreational resources are identified and described. In the following paragraphs, the water resources needed to maintain these functions is discussed. Water-supply sources that serve environmental needs, along with identified major springs, are characterized in Chapter 3, and potential water-supply strategy impacts on the environment are considered in Chapter 5. Chapter 8 contains a discussion and recommendations pertaining to "Ecologically Unique River and Stream Segments."

In terms of combined area, Far West Texas contains most of the Federal public land in Texas, and over half the land in the entire Texas State Park system. The presence of these protected public lands contributes greatly to the quality of life for area residents in a way that is not easily described in gallons, acre-feet, or dollars and cents. It has been amply demonstrated that to attract 21st century enterprise that pays top salaries for skilled workers, quality of life is a critical issue. The spectacular natural and cultural heritage of the Region not only attracts many hundreds of thousands of temporary visitors per year to Far West Texas (more than 850,000 per year just to Guadalupe Mountains and Big Bend National Parks), it also helps to attract new residents and businesses to the Region. Providing enough water for recreation and habitat in Far West Texas is critical to long-term economic health.

All living organisms require water. The amount and quality of water required to maintain a viable population, whether it be plant or animal, is highly variable. While some individuals can migrate long distances in search of water (birds, larger mammals, etc.), others are stationary (plants, fishes, etc.) and must rely on existing supplies. In both cases, endemic wildlife to this desert region of Texas has adapted to the harsh climatic conditions.

Because most available water-supply sources in Far West Texas are relatively small in areal extent and are generally separated by great distances, wildlife dependent on isolated sources exist at the mercy of that water supply. The loss of the supply source, even for a short time, may result in the loss or degradation of the resident species.

Quantifying minimum flows at upland water sources that support wildlife and game through the year is difficult in terms of gallons and acre-feet; however, it is an observable fact that wildlife populations flux wildly over the years due to relative abundance or scarcity of rainfall and related spring productivity. It has also been observed that even major springs that historically have never run dry can disappear when local aquifers are pumped beyond sustainable levels. Even minor aquifer depletion can have a profound effect on wildlife habitat and recreational opportunities in affected local areas.

Quantifying environmental and recreational water needs in some cases has been achieved. For the Rio Grande below Presidio, measured at the IBWC gage below Alamito Creek, a flow of 250 cubic feet per second is enough to support minimum needs. When flows fall below this point for any length of time, recreational, agricultural, and habitat values are seriously degraded.

Recreation includes those activities that involve human interaction with the outdoors environment. Many of these activities are directly dependent on water resources such as fishing, swimming, and boating; while a healthy environment enhances many others, such as hiking and bird watching. Thus, it is recognized that the maintenance of the regional environmental community's water supply needs serves to enhance the lives of citizens of Far West Texas as well as the thousands of annual visitors to this Region.

In terms of the regional planning process, discussion of environmental and recreational water needs has been largely considered a rural issue, and generally overlooked because of the perceived priority of other issues. However, every regional resident uses environmental and recreational water, be it for personal a lawn and garden, a golf course, a swimming pool, canoeing the Rio Grande, hunting deer, or watching birds. In urban areas and small towns, environmental and recreational needs can constitute a third or more of total use during hot months. The FWTWPG recognizes the importance of supplying adequate environmental and recreational water fairly to all users and supports the goal of better quantifying those needs in future planning cycle.

Natural and environmental resources are often overlooked when considering the consequences of prolonged drought conditions. As water supplies diminish during drought periods, the balance between both human and environmental water requirements becomes increasingly competitive. A goal of the *2026 Far West Texas Water Plan* is to provide for the health, safety, and welfare of the human community, with as little detrimental effect to the environment as possible. To accomplish this goal, the evaluation of strategies to meet future water needs includes a distinct consideration of the impact that each implemented strategy might have on the environment.

In Chapter 5, each water management strategy contains an environmental impact assessment. A review of this chapter reveals that while some strategies may contain variable levels of negative impact, other strategies may likely have a positive effect. Negative environmental impacts are generally associated with the lowering of aquifer water levels due to increased groundwater withdrawals and its potential to cause springs to cease flowing. Also, of concern is that lowered water levels could deplete supplies in shallow livestock wells that are often the only available source of water for some wildlife. The positive environmental aspect of the strategies is that during severe drought conditions when normal wildlife water supplies may naturally diminish, new supply sources might be developed such that wildlife could benefit.

APPENDIX 2A
UNIVERSITY OF TEXAS AT EL PASO POPULATION PROJECTIONS REPORT

This page intentionally left blank.

Executive Summary: Project 226621071A
Region E County Population Model Specification & Testing: El Paso, Hudspeth, Culberson, Brewster, Jeff Davis, Presidio, and Terrell Counties

Substantial population growth through 2075 is projected for the El Paso, Hudspeth, Culberson, Brewster, Jeff Davis, Presidio, and Terrell Counties of Region E. For a region with good overall economic prospects, this is to be expected. It is important for infrastructure planning efforts to take this projected growth into account. A summary of those population trends is presented below.

County	Hudspeth	Culberson	Brewster	Jeff Davis	Presidio	Terrell
2020	3,196	2,149	9,237	2,220	6,508	702
2025	3,506	2,457	9,511	1,865	5,866	665
2030	3,669	2,677	9,708	1,940	6,156	661
2035	3,847	2,941	9,919	2,005	6,355	639
2040	4,038	3,206	10,120	2,066	6,498	604
2045	4,242	3,473	10,316	2,125	6,621	576
2050	4,452	3,743	10,515	2,181	6,746	543
2055	4,674	4,020	10,727	2,234	6,896	511
2060	4,913	4,303	10,952	2,289	7,066	519
2065	5,173	4,593	11,191	2,352	7,246	538
2070	5,449	4,888	11,442	2,427	7,437	568
2075	5,744	5,190	11,705	2,512	7,637	610

Population growth in these 7 counties of Region E is determined by several demographic and economic trends. Hudspeth County is projected to reach a population of 5,744 persons by 2075. That growth is being driven by expanding international trade with Mexico, as well as metropolitan economic growth in nearby El Paso County. Culberson County is also projected to grow rapidly. That is partially due to the expansion of space tourism associated with Blue origin and with anticipated new mining projects. Brewster County is also forecast to experience steady expansion as tourism to Big Bend National Park continues to swell and as the County takes advantage of Sul Ross University and its ability to maintain labor force productivity for the Region.

Because of the geographic variability that characterizes Region E, population expansion follows different trends and is not uniform. Three counties, Jeff Davis, Presidio, and Terrell, face initial population declines followed by positive growth. Jeff Davis and Presidio are both projected to have higher populations at the end of the forecast period than what they currently have. In the former, tourism and natural resources position it well for future growth. Presidio County is projected to benefit from growing international commerce and quality of life advantages. The population of Terrell County is expected to resume growing by the latter stages of the planning period, but to still remain below its current level.

Region E also contains El Paso County. As noted above, much of the growth projected for Hudspeth County is catalyzed by economic expansion in El Paso County. Growth of the El Paso metropolitan economy is propelled by multiple factors including international commerce, an emerging domestic warehousing, distribution, and transportation node, regional and cross-border healthcare expansion, and defense related manufacturing advances. El Paso County is projected to eclipse the 1 million population threshold in late 2045. Population data for El Paso County are tabulated below for the 2020 -2075 period shown above for the eastern counties of Region E.

County	El Paso
2020	866,547
2025	875,103
2030	898,122
2035	929,300
2040	964,362
2045	998,372
2050	1,031,060
2055	1,061,631
2060	1,090,480
2065	1,117,335
2070	1,142,003
2075	1,164,277

CHAPTER 3
REGIONAL WATER SUPPLY SOURCES

This page intentionally left blank.

3 REGIONAL WATER SUPPLY SOURCES

Whether it flows in rivers or percolates through underground rock formations, water sustains life and thus is our most important natural resource. In the Chihuahuan Desert environment of Far West Texas, water supply availability takes on a more significant meaning than elsewhere in the State. With evaporation far exceeding rainfall, planning for the most efficient management of limited water supplies is essential.

Chapter 3 explores the current and future availability of all water-supply resources in the Region including surface water, groundwater, and reuse - all of which is contained within the Rio Grande River Basin. The water demand and supply availability analysis developed in Chapters 2 and 3, respectively, form the basis for identifying in Chapter 4 the areas within Far West Texas that potentially could experience supply shortages in future years. Water supply availability from each recognized source is estimated during drought-of-record conditions, which allows each entity and water-use category to evaluate conditions when their supply source is at its most critical availability level. The following are major considerations regarding water supply sources.

- Except for controlled flows in the Rio Grande, very little surface water can be considered as a reliable source of supply in Far West Texas, especially in drought-of-record conditions. In this chapter, two primary surface water sources are considered: the Rio Grande and the Pecos River. Other ephemeral creeks and springs (cienegas) are important sources for livestock supply, wildlife habitat, recreational resources and, to a limited extent, for irrigated agriculture. The availability of water in the Rio Grande and Pecos River to meet existing water rights, including municipal water rights, is determined by the TCEQ Rio Grande Water Availability Model (WAM). All permanent surface water rights are listed in Appendix 3A.
- The availability of groundwater is based on TWDB provided Modeled Available Groundwater (MAG) as developed through the Groundwater Management Area (GMA) process. For aquifers that MAG volumes have not been assigned, groundwater availability is calculated separately.
- Direct reuse refers to wastewater that is reused without first being discharged into a stream or other watercourse. Direct reuse of water for El Paso Water is based on recently reported direct reuse as reported by the TWDB and expected completion of the City's Advanced Purified Water Treatment project by 2030. Indirect reuse refers to wastewater that is first discharged to a stream or watercourse before being diverted for use. The indirect reuse supply is used primarily during the irrigation season.
- El Paso Water continues to assume the role as the designated "Regional Water Supply Planner" (see Chapter 1, Section 1.1.6). Under the El Paso County Priority Groundwater Management Area, promulgated by the El Paso County Commissioner's Court, there are currently no groundwater limitations or specific requirements detailing groundwater availability.
- Water supplies based upon contracts are assumed to be renewed if they expire during the planning horizon.

Water supplies available to meet projected demands are reported in Tables 3-1, 3-2, and 3-3. Table 3-1 indicates the maximum amount of water supply that can be obtained from each unique supply source. Table 3-2 lists water supplies that are available to municipal utilities and other water-user categories, based on current infrastructure, legal limitations, and the physical availability of water from each source. Table 3-3 lists supplies available to major/wholesale water providers. The amounts listed for municipal utilities and the "county-other" category (representing small communities and rural households) are based on TCEQ estimates of infrastructure capacities.

Table 3-1. Water Supply Source Availability (Rio Grande River Basin) (Acre-Feet per Year)

Groundwater	County	Salinity	2030	2040	2050	2060	2070	2080
Bone Spring-Victorio Peak Aquifer	Hudspeth	Fresh | Brackish	101,400	101,400	101,400	101,400	101,400	101,400
Capitan Reef Complex Aquifer	Brewster	Fresh | Brackish	583	583	583	583	583	583
Capitan Reef Complex Aquifer	Culberson	Fresh | Brackish	7,580	7,580	7,580	7,580	7,580	7,580
Capitan Reef Complex Aquifer | Non-Relevant	Hudspeth	Fresh | Brackish	5,408	5,408	5,408	5,408	5,408	5,408
Capitan Reef Complex Aquifer | Non-Relevant	Jeff Davis	Fresh	0	0	0	0	0	0
Edwards-Trinity (Plateau), Pecos Valley, Trinity Aquifer	Jeff Davis	Fresh	284	284	284	284	284	284
Edwards-Trinity (Plateau) Aquifer	Brewster	Fresh | Brackish	1,394	1,394	1,394	1,394	1,394	1,394
Edwards-Trinity (Plateau) Aquifer | Non-Relevant	Culberson	Fresh	399	399	399	399	399	399
Edwards-Trinity (Plateau), Pecos Valley, Trinity Aquifer	Terrell	Fresh	1,420	1,420	1,420	1,420	1,420	1,420
Hueco-Mesilla Bolson Aquifer	El Paso	Fresh | Brackish	435,000	435,000	435,000	435,000	435,000	435,000
Hueco-Mesilla Bolson Aquifer	Hudspeth	Fresh | Brackish	45,000	45,000	45,000	45,000	45,000	45,000
Igneous	Brewster	Fresh	2,587	2,586	2,583	2,582	2,582	2,582
Igneous	Culberson	Fresh	99	99	99	99	99	99
Igneous	Jeff Davis	Fresh	4,585	4,585	4,585	4,585	4,585	4,585
Igneous	Presidio	Fresh	4,065	4,065	4,065	4,065	4,065	4,065
Marathon Aquifer	Brewster	Fresh	7,327	7,327	7,327	7,327	7,327	7,327
Other Aquifer | Brewster Cretaceous	Brewster	Fresh	1,484	1,484	1,484	1,484	1,484	1,484
Other Aquifer | Rio Grande Alluvium	El Paso	Brackish	57,043	57,043	57,043	57,043	57,043	57,043
Other Aquifer | Rio Grande Alluvium	Hudspeth	Brackish	52,518	52,518	52,518	52,518	52,518	52,518
Other Aquifer | Diablo Plateau	Hudspeth	Fresh	26,400	26,400	26,400	26,400	26,400	26,400
Rustler Aquifer | Non-Relevant	Brewster	Brackish | Saline	0	0	0	0	0	0
Rustler Aquifer | Non-Relevant	Culberson	Brackish | Saline	53	53	53	53	53	53
Rustler Aquifer | Non-Relevant	Jeff Davis	Fresh	0	0	0	0	0	0
West Texas Bolsons Aquifer | Upper Salt Basin	Culberson	Brackish	16,851	16,851	16,851	16,851	16,851	16,851

Table 3-1. (continued) Water Supply Source Availability (Rio Grande River Basin) (Acre-Feet per Year)

Groundwater	County	Salinity	2030	2040	2050	2060	2070	2080
West Texas Bolsons Aquifer | Wild Horse, Michigan & Lobo	Culberson	Fresh | Brackish	35,678	35,601	35,551	35,509	35,419	35,347
West Texas Bolsons Aquifer | Upper Salt Basin | Non-Relevant	Hudspeth	Brackish	321	321	321	321	321	321
West Texas Bolsons Aquifer | Red Light Draw, Eagle Flat, Green River Valley	Hudspeth	Fresh | Brackish	4,582	4,582	4,582	4,582	4,582	4,582
West Texas Bolsons Aquifer | Green River Valley, Wild Horse, Michigan, Lobo, Ryan Flat	Jeff Davis	Fresh | Brackish	6,138	6,071	6,043	6,024	5,986	5,958
West Texas Bolsons Aquifer | Ryan Flat	Presidio	Fresh	8,983	8,835	8,711	8,642	8,586	8,503
West Texas Bolsons Aquifer | Green River Valley, Presidio-Redford	Presidio	Fresh | Brackish	7,743	7,743	7,743	7,743	7,743	7,743
Groundwater Total Source Availability			**834,925**	**834,632**	**834,427**	**834,296**	**834,112**	**833,929**
Reuse	**County**	**Salinity**	**2030**	**2040**	**2050**	**2060**	**2070**	**2080**
Direct Reuse	Brewster	Fresh	193	193	193	193	193	193
Direct Reuse	El Paso	Fresh	6,000	6,000	6,000	6,000	6,000	6,000
Indirect Reuse	El Paso	Fresh	29,289	30,569	31,372	31,881	32,398	32,922
Indirect Reuse	Hudspeth	Fresh	334	334	334	334	334	334
Reuse Total Source Availability			**35,816**	**37,096**	**37,899**	**38,408**	**38,925**	**39,449**
Surface Water	**County**	**Salinity**	**2030**	**2040**	**2050**	**2060**	**2070**	**2080**
Rio Grande Livestock Local Supply	Brewster	Fresh	25	25	25	25	25	25
Rio Grande Livestock Local Supply	Culberson	Fresh	15	15	15	15	15	15
Rio Grande Livestock Local Supply	El Paso	Fresh	19	19	19	19	19	19
Rio Grande Livestock Local Supply	Hudspeth	Fresh	80	80	80	80	80	80
Rio Grande Livestock Local Supply	Jeff Davis	Fresh	24	24	24	24	24	24
Rio Grande Livestock Local Supply	Presidio	Fresh	49	49	49	49	49	49
Rio Grande Livestock Local Supply	Terrell	Fresh	4	4	4	4	4	4
Rio Grande Run-of-River	Brewster	Fresh	7,759	7,759	7,759	7,759	7,759	7,759
Rio Grande Run-of-River	El Paso	Fresh	44,270	44,270	44,270	44,270	44,270	44,270
Rio Grande Run-of-River	Hudspeth	Fresh	916	916	916	916	916	916
Rio Grande Run-of-River	Jeff Davis	Fresh	19	19	19	19	19	19
Rio Grande Run-of-River	Presidio	Fresh	10,452	10,452	10,452	10,452	10,452	10,452
Rio Grande Run-of-River	Terrell	Fresh	432	432	432	432	432	432
Surface Water Total Source Availability	**Surface Water Total**		**64,064**	**64,064**	**64,064**	**64,064**	**64,064**	**64,064**
Region E Total Source Availability	**Region E Total**		**934,805**	**935,792**	**936,390**	**936,768**	**937,101**	**937,442**

New to the sixth cycle of regional water planning, plans must include a single table that lists each local surface water supply with a) an explanation for the basis of the supply itself, and b) the basis for the volume of supply. The table below lists all the local surface water supplies found within Table 3-1, for the Far West Texas region.

The FWTWPG acknowledges that the local supplies listed below are confirmed “firm” under Drought of Record (DOR). By utilizing the max. historical water use (2011-2021), the FWTWPG has accounted for availability during droughts. For example, the second worst and second-longest Statewide drought began in August 2010, of which the data below considers.

Surface Water	County	Salinity	2030	2040	2050	2060	2070	2080	Methodology
Rio Grande Livestock Local Supply	Brewster	Fresh	25	25	25	25	25	25	Supply data was derived from TWDB Historical Water Use Estimates. Volume of supply was derived by taking the max. 11-year historical water use (2011-2021).
Rio Grande Livestock Local Supply	Culberson	Fresh	15	15	15	15	15	15	Supply data was derived from TWDB Historical Water Use Estimates. Volume of supply was derived by taking the max. 11-year historical water use (2011-2021).
Rio Grande Livestock Local Supply	El Paso	Fresh	19	19	19	19	19	19	Supply data was derived from TWDB Historical Water Use Estimates. Volume of supply was derived by taking the max. 11-year historical water use (2011-2021).
Rio Grande Livestock Local Supply	Hudspeth	Fresh	80	80	80	80	80	80	Supply data was derived from TWDB Historical Water Use Estimates. Volume of supply was derived by taking the max. 11-year historical water use (2011-2021).
Rio Grande Livestock Local Supply	Jeff Davis	Fresh	24	24	24	24	24	24	Supply data was derived from TWDB Historical Water Use Estimates. Volume of supply was derived by taking the max. 11-year historical water use (2011-2021).
Rio Grande Livestock Local Supply	Presidio	Fresh	49	49	49	49	49	49	Supply data was derived from TWDB Historical Water Use Estimates. Volume of supply was derived by taking the max. 11-year historical water use (2011-2021).
Rio Grande Livestock Local Supply	Terrell	Fresh	4	4	4	4	4	4	Supply data was derived from TWDB Historical Water Use Estimates. Volume of supply was derived by taking the max. 11-year historical water use (2011-2021).
Region E Total Local Surface Water Supply			**216**	**216**	**216**	**216**	**216**	**216**	

Table 3-2. Water User Group Existing Water Supply (Rio Grande River Basin) (Acre-Feet per Year)

WUG Name	Source Description	2030	2040	2050	2060	2070	2080
Brewster County							
Alpine	Direct Reuse	193	193	193	193	193	193
Alpine	Igneous Aquifer | Brewster County	2,064	2,064	2,064	2,064	2,064	2,064
Alpine	Igneous Aquifer | Jeff Davis County	2,065	2,065	2,065	2,065	2,065	2,065
Lajitas Municipal Services	Other Aquifer | Brewster Cretaceous Alluvium	331	331	331	331	331	331
Marathon WSSS	Marathon Aquifer	242	242	242	242	242	242
Study Butte Terlingua Water System	Other Aquifer | Brewster Cretaceous Alluvium	387	387	387	387	387	387
County-Other	Edwards-Trinity Plateau Aquifer	10	10	10	10	10	10
County-Other	Igneous Aquifer	207	207	207	207	207	207
County-Other	Other Aquifer | Brewster Cretaceous Alluvium	301	301	301	301	301	301
Mining	Igneous Aquifer	52	52	52	52	52	52
Livestock	Capitan Reef Complex Aquifer	38	38	38	38	38	38
Livestock	Edwards-Trinity Plateau Aquifer	125	125	125	125	125	125
Livestock	Igneous Aquifer	144	144	144	144	144	144
Livestock	Local Surface Water Supply	25	25	25	25	25	25
Livestock	Marathon Aquifer	19	19	19	19	19	19
Livestock	Other Aquifer | Brewster Cretaceous Alluvium	144	144	144	144	144	144
Irrigation	Igneous Aquifer	120	119	116	115	115	115
Irrigation	Marathon Aquifer	128	128	128	128	128	128
Irrigation	Other Aquifer | Brewster Cretaceous Alluvium	321	321	321	321	321	321
Irrigation	Rio Grande Run-Of-River	7,759	7,759	7,759	7,759	7,759	7,759
Brewster County Total Existing Supply		**14,675**	**14,674**	**14,671**	**14,670**	**14,670**	**14,670**
Culberson County							
Van Horn	West Texas Bolsons Aquifer	1,218	1,218	1,218	1,218	1,218	1,218
County-Other	Edwards-Trinity Plateau Aquifer	1	1	1	1	1	1
County-Other	Rustler Aquifer	1	1	1	1	1	1
County-Other	West Texas Bolsons Aquifer	68	68	68	68	68	68
Manufacturing	West Texas Bolsons Aquifer	5	5	5	5	5	5
Mining	Capitan Reef Complex Aquifer	1,263	1,263	1,263	1,263	1,263	1,263
Mining	Rustler Aquifer	0	0	0	0	0	0
Mining	West Texas Bolsons Aquifer	2,045	2,045	2,045	2,045	2,045	2,045
Livestock	Capitan Reef Complex Aquifer	54	54	54	54	54	54
Livestock	Edwards-Trinity Plateau Aquifer	19	19	19	19	19	19
Livestock	Igneous Aquifer	82	82	82	82	82	82
Livestock	Local Surface Water Supply	15	15	15	15	15	15

Table 3-2. (continued) Water User Group Existing Water Supply (Rio Grande River Basin) (Acre-Feet per Year)

WUG Name	Source Description	2030	2040	2050	2060	2070	2080
Culberson County							
Livestock	Rustler Aquifer	31	31	31	31	31	31
Livestock	West Texas Bolsons Aquifer	158	158	158	158	158	158
Irrigation	Capitan Reef Complex Aquifer	1,263	1,263	1,263	1,263	1,263	1,263
Irrigation	West Texas Bolsons Aquifer	32,156	32,079	32,029	31,987	31,897	31,825
Culberson County Total Existing Supply		**38,379**	**38,302**	**38,252**	**38,210**	**38,120**	**38,048**
El Paso County							
Anthony	Hueco-Mesilla Bolson Aquifer	1,847	1,847	1,847	1,847	1,847	1,847
East Montana Water System	Hueco-Mesilla Bolson Aquifer	2,810	2,810	2,810	2,810	2,810	2,810
El Paso County Tornillo WID	Hueco-Mesilla Bolson Aquifer	629	629	629	629	629	629
El Paso County WCID 4	Hueco-Mesilla Bolson Aquifer	1,363	1,363	1,363	1,363	1,363	1,363
El Paso Water Utilities	Direct Reuse	6,000	6,000	6,000	6,000	6,000	6,000
El Paso Water Utilities	Hueco-Mesilla Bolson Aquifer	115,000	115,000	115,000	115,000	115,000	115,000
El Paso Water Utilities	Rio Grande Run-Of-River	10,000	10,000	10,000	10,000	10,000	10,000
Federal Correctional Institution La Tuna	Hueco-Mesilla Bolson Aquifer	2,017	2,017	2,017	2,017	2,017	2,017
Fort Bliss and East Biggs	Hueco-Mesilla Bolson Aquifer	5,503	5,503	5,503	5,503	5,503	5,503
Haciendas Del Norte WID	Hueco-Mesilla Bolson Aquifer	306	306	306	306	306	306
Horizon Regional MUD	Hueco-Mesilla Bolson Aquifer	4,828	4,828	4,828	4,828	4,828	4,828
Horizon Regional MUD	Other Aquifer | Rio Grande Alluvium	1,578	1,578	1,578	1,578	1,578	1,578
Lower Valley WD	Hueco-Mesilla Bolson Aquifer	4,356	4,356	4,356	4,356	4,356	4,356
Paseo Del Este MUD 1	Hueco-Mesilla Bolson Aquifer	5,647	5,647	5,647	5,647	5,647	5,647
County-Other	Hueco-Mesilla Bolson Aquifer	6,678	6,678	6,678	6,678	6,678	6,678
Manufacturing	Hueco-Mesilla Bolson Aquifer	9,493	9,493	9,493	9,493	9,493	9,493
Manufacturing	Rio Grande Run-Of-River	39	39	39	39	39	39
Mining	Hueco-Mesilla Bolson Aquifer	871	891	910	929	946	962
Mining	Other Aquifer | Rio Grande Alluvium	1,477	1,477	1,477	1,477	1,477	1,477
Steam Electric Power	Hueco-Mesilla Bolson Aquifer	8,880	8,880	8,880	8,880	8,880	8,880
Livestock	Hueco-Mesilla Bolson Aquifer	151	151	151	151	151	151
Livestock	Local Surface Water Supply	19	19	19	19	19	19
Livestock	Other Aquifer | Rio Grande Alluvium	24	24	24	24	24	24

Table 3-2. (continued) Water User Group Existing Water Supply (Rio Grande River Basin) (Acre-Feet per Year)

WUG Name	Source Description	2030	2040	2050	2060	2070	2080
El Paso County							
Irrigation	Hueco-Mesilla Bolson Aquifer	7,392	7,392	7,392	7,392	7,392	7,392
Irrigation	Other Aquifer | Rio Grande Alluvium	47,164	47,164	47,164	47,164	47,164	47,164
Irrigation	Rio Grande Indirect Reuse	29,289	30,569	31,372	31,881	32,398	32,922
Irrigation	Rio Grande Run-Of-River	34,231	34,231	34,231	34,231	34,231	34,231
El Paso County Total Existing Supply		**307,592**	**308,892**	**309,714**	**310,242**	**310,776**	**311,316**
Hudspeth County							
Esperanza Water Service	Hueco-Mesilla Bolson Aquifer	484	484	484	484	484	484
Hudspeth County WCID 1	West Texas Bolsons Aquifer	532	532	532	532	532	532
County-Other | Dell City	Bone Spring-Victorio Peak Aquifer	42	42	42	42	42	42
County-Other	Hueco-Mesilla Bolson Aquifer	14	14	14	14	14	14
County-Other | Fort Hancock WCID	Other Aquifer | Rio Grande Alluvium	179	179	179	179	179	179
Mining	Hueco-Mesilla Bolson Aquifer	56	56	56	56	56	56
Mining	Other Aquifer | Rio Grande Alluvium	5	5	5	5	5	5
Mining	West Texas Bolsons Aquifer	0	0	0	0	0	0
Livestock	Bone Spring-Victorio Peak Aquifer	83	83	83	83	83	83
Livestock	Capitan Reef Complex Aquifer	7	7	7	7	7	7
Livestock	Hueco-Mesilla Bolson Aquifer	10	10	10	10	10	10
Livestock	Local Surface Water Supply	80	80	80	80	80	80
Livestock	Other Aquifer | Diablo Plateau	277	277	277	277	277	277
Livestock	West Texas Bolsons Aquifer	69	69	69	69	69	69
Irrigation	Bone Spring-Victorio Peak Aquifer	68,495	68,495	68,495	68,495	68,495	68,495
Irrigation	Capitan Reef Complex Aquifer	401	401	401	401	401	401
Irrigation	Hueco-Mesilla Bolson Aquifer	1,683	1,683	1,683	1,683	1,683	1,683
Irrigation	Other Aquifer | Rio Grande Alluvium	52,187	52,187	52,187	52,187	52,187	52,187
Irrigation	Rio Grande Indirect Reuse	334	334	334	334	334	334
Irrigation	Rio Grande Run-Of-River	916	916	916	916	916	916
Hudspeth County Total Existing Supply		**125,854**	**125,854**	**125,854**	**125,854**	**125,854**	**125,854**
Jeff Davis County							
Fort Davis WSC	Igneous Aquifer	468	468	468	468	468	468
County-Other	Pecos Valley | Edwards-Trinity (Plateau) Aquifer	0	0	0	0	0	0
County-Other	Igneous Aquifer	233	233	233	233	233	233
County-Other | City of Valentine	West Texas Bolsons Aquifer	0	0	0	0	0	0

Table 3-2. (continued) Water User Group Existing Water Supply (Rio Grande River Basin) (Acre-Feet per Year)

WUG Name	Source Description	2030	2040	2050	2060	2070	2080
Jeff Davis County							
Mining	Igneous Aquifer	81	81	81	81	81	81
Livestock	Pecos Valley | Edwards-Trinity (Plateau) Aquifer	0	0	0	0	0	0
Livestock	Igneous Aquifer	227	227	227	227	227	227
Livestock	Local Surface Water Supply	24	24	24	24	24	24
Livestock	West Texas Bolsons Aquifer	63	63	63	63	63	63
Irrigation	Pecos Valley | Edwards-Trinity (Plateau) Aquifer	0	0	0	0	0	0
Irrigation	Igneous Aquifer	1,118	1,118	1,118	1,118	1,118	1,118
Irrigation	West Texas Bolsons Aquifer	315	315	315	315	315	315
Jeff Davis County Total Existing Supply		**2,529**	**2,529**	**2,529**	**2,529**	**2,529**	**2,529**
Presidio County							
Marfa	Igneous Aquifer	2,097	2,097	2,097	2,097	2,097	2,097
Presidio	West Texas Bolsons Aquifer	2,460	2,460	2,460	2,460	2,460	2,460
County-Other	Igneous Aquifer	58	58	58	58	58	58
County-Other	West Texas Bolsons Aquifer	39	39	39	39	39	39
Livestock	Igneous Aquifer	270	270	270	270	270	270
Livestock	Local Surface Water Supply	49	49	49	49	49	49
Livestock	West Texas Bolsons Aquifer	171	171	171	171	171	171
Irrigation	Igneous Aquifer	770	770	770	770	770	770
Irrigation	Rio Grande Run-Of-River	10,452	10,452	10,452	10,452	10,452	10,452
Irrigation	West Texas Bolsons Aquifer	1,477	1,477	1,477	1,477	1,477	1,477
Presidio County Total Existing Supply		**17,843**	**17,843**	**17,843**	**17,843**	**17,843**	**17,843**
Terrell County							
Terrell County WCID 1	Edwards-Trinity Plateau | Pecos Valley | Trinity Aquifers	476	476	476	476	476	476
County-Other	Edwards-Trinity Plateau | Pecos Valley | Trinity Aquifers	43	43	43	43	43	43
Mining	Edwards-Trinity Plateau | Pecos Valley | Trinity Aquifers	141	141	141	141	141	141
Livestock	Edwards-Trinity Plateau | Pecos Valley | Trinity Aquifers	179	179	179	179	179	179
Livestock	Local Surface Water Supply	4	4	4	4	4	4
Irrigation	Edwards-Trinity Plateau | Pecos Valley | Trinity Aquifers	473	473	473	473	473	473
Irrigation	Rio Grande Run-Of-River	432	432	432	432	432	432
Terrell County Total Existing Supply		**1,748**	**1,748**	**1,748**	**1,748**	**1,748**	**1,748**
Region E Existing Water Supply		**508,620**	**509,842**	**510,611**	**511,096**	**511,540**	**512,008**

Note: Water Supply capacity based on current infrastructure, existing contracts, and source supply availability under drought-of-record conditions. All WUGs and supplies are within the Rio Grande Basin.

Table 3-3. Far West Texas Major Water Provider Supplies (Rio Grande River Basin) (Acre-Feet per Year)

Major Water Provider	Source Supply	Existing Water Supply (Acre-Feet/Year)					
		2030	2040	2050	2060	2070	2080
El Paso County WID#1	Rio Grande Indirect Reuse	29,289	30,569	31,372	31,881	32,398	32,922
	Rio Grande Alluvium Aquifer	53,964	53,964	53,964	53,964	53,964	53,964
	Rio Grande Run-Of-River	34,231	34,231	34,231	34,231	34,231	34,231
	Hueco-Mesilla Bolson Aquifer	7,392	7,392	7,392	7,392	7,392	7,392
	Total Supply	**124,876**	**126,156**	**126,959**	**127,468**	**127,985**	**128,509**
El Paso Water	Direct Reuse	6,000	6,000	6,000	6,000	6,000	6,000
	Hueco-Mesilla Bolson Aquifer	115,000	115,000	115,000	115,000	115,000	115,000
	Rio Grande Run-Of-River	10,000	10,000	10,000	10,000	10,000	10,000
	Total Supply	**131,000**	**131,000**	**131,000**	**131,000**	**131,000**	**131,000**
Lower Valley Water District	Hueco-Mesilla Bolson Aquifer	4,356	4,356	4,356	4,356	4,356	4,356
	Total Supply	**4,356**	**4,356**	**4,356**	**4,356**	**4,356**	**4,356**
Horizon Regional MUD	Hueco-Mesilla Bolson Aquifer	4,828	4,828	4,828	4,828	4,828	4,828
	Rio Grande Alluvium Aquifer	1,578	1,578	1,578	1,578	1,578	1,578
	Total Supply	**6,406**	**6,406**	**6,406**	**6,406**	**6,406**	**6,406**

3.1 SURFACE WATER

Surface water supplies in the Far West Texas Region are obtained from the Rio Grande River and Pecos River, a tributary of the Rio Grande. During drought-of-record conditions, there is very little reliable surface water in the Region, except for controlled releases from the Rio Grande Project in New Mexico. In accordance with regional planning rules and guidelines, the Far West Texas Region used the Full Authorization Run (Run 3) of the TCEQ approved water availability model (WAM) of the Rio Grande Basin for determining surface water availability in the Region. The WAM is a computer model of the Rio Grande watershed that evaluates surface water availability based on Texas water rights. It is maintained by the TCEQ for the purpose of reviewing and granting new surface water right permits and required by TWDB to evaluate surface water availability for regional water planning purposes. The amount of water that can be diverted by a water right is referred to as the water availability and may be less than the permitted amount.

Model versions and input files for the development of this *Plan* are listed below.

Folder Name	Description	Use	Version Date*	Simulation Date
WAM Files	Rio Grande WAM Run 3, modified in accordance with approved Hydrologic Variance Request.	Used to determine run-of-river supplies.	10/27/2021	12/20/2023

* Identical to October 2023 version on TCEQ website.

The prior appropriation doctrine governs surface water law in Texas and can be summarized as "first in time is first in right." Each water right in the WAM is assigned a priority date that determines the order in which water is allocated among water rights in the Rio Grande Basin. In times when there are shortages, water rights with older priority dates are given preference when allocating water. The oldest water rights in the Rio Grande WAM date to the late 1800s and correspond to the date when water was first put to beneficial use under the laws of Texas.

In contrast to other regions, the available surface water supplies in Far West Texas consist almost entirely of run-of-river supplies except for small impoundments for domestic and livestock purposes and water provided through the Rio Grande Project. A run-of-river right is authorized to divert from a stream but does not have authorization for a large volume of storage. Such rights may have small volumes of storage to facilitate diversions. According to Texas law, water users with small impoundments up to 200 acre-feet for domestic and livestock purposes do not require a water right. The Bureau of Reclamation's Rio Grande Project includes releases from Elephant Butte and Caballo Reservoirs, which are large reservoirs located on the Rio Grande in New Mexico, as well as run-of-river flows entering Texas from New Mexico. These flows are governed by operating policies of the Bureau of Reclamations, Texas water rights and contractual agreements within the irrigation districts served by the Rio Grande Project.

As required by TWDB guidance, the assessment of surface water availability in the Far West Texas Region was conducted to reflect water supplies that are currently available for use. The available supply from a run-of-river irrigation water right is calculated as the minimum annual diversion during the period-of-record (1940-2018) as simulated in the WAM. Rights used for municipal or industrial purposes are evaluated individually. The water availability assessment includes updates to new water right permits, current operating policies and contractual agreements. The following changes were made to the WAM to more accurately reflect the current conditions and operations of the Region and are consistent with the assumptions used in previous Far West Texas water plans, except where noted.

- The supply from the Rio Grande Project is based on the lowest annual WAM supply delivered to the entities served by the Project, which occurred in 2013. The supply from the Project does not include return flows, which were evaluated separately. Entities served by the Rio Grande Project include El Paso Water, El Paso County Water Improvement District #1, and irrigators in Hudspeth County.
- The demand pattern for irrigation rights upstream of Fort Quitman, which are the water rights receiving water from the Rio Grande Project, was modified so that diversions only occur from March through October to be consistent with actual operation of the Project.
- Modeling proposed by Region F in the Balmorhea area of the Pecos Basin was incorporated into the modified WAM. These changes are related to San Solomon Springs and Giffin Springs flows, which in the unmodified TCEQ WAM were being passed downstream instead of being used by the water rights dependent on those springs. In reality, these flows would be lost before they reached the Pecos River, resulting in what is termed a futile call. This change had not been included in previous water plans for the Far West Texas Region.

These modifications were approved by the Executive Administrator (EA) of the Texas Water Development Board in a letter to the Chairman of the Far West Texas Water Planning Group, dated December 21, 2023. The results of the modified WAM indicate that the reliable surface water supply in Far West Texas totals 63,848 acre-feet per year throughout the planning period (2030 to 2080) (Table 3-1). Of that, the Rio Grande Project supplies 44,897 acre-feet per year (i.e. the minimum WAM diversion in 2013) to water users in El Paso and Hudspeth Counties. The apportionment of Rio Grande Run-of-River is explained below in Table 3-4. All surface water availability was determined using the WAM with the approved hydrologic variances. Alternative approaches for surface water availability were not used.

Table 3-4. Surface Water Source Availability Methodology

Water Supply Source	County	Annual Availability (Acre-Feet/Year)	Remarks
Rio Grande Run-of-River	Brewster	7,759	WAM Run 3
	El Paso	44,270	WAM Run 3 minimum annual by water rights in El Paso County. These water rights get their supplies from the Rio Grande Project.
	Hudspeth	916	Hudspeth County water rights upstream of Fort Quitman get 627 acre-feet of water from the Rio Grande Project.
			Hudspeth County irrigators also get 287 (WAM) below Fort Quitman that are not included in the Rio Grande Project totals.
	Jeff Davis*	19	WAM Run 3
	Presidio	10,452	WAM Run 3
	Terrell	432	WAM Run 3; Lower Rio Grande = 152 & Pecos River = 280. Total = 432

Note: Water used by the City of Balmorhea in Region F.

3.1.1 Rio Grande

Waters of the Rio Grande (Mexico's Rio Bravo) originate in the San Luis Valley, the principal drainage basin of the San Juan Mountains in southwestern Colorado, and in the mountain ranges of northern New Mexico. The river flows southward through New Mexico, and then forms the international boundary between the Mexican States of Chihuahua, Coahuila, Nuevo Leon, Tamaulipas, and the State of Texas. The Rio Grande's total length is approximately 1,896 miles, with approximately 1,248 making the international boundary between Texas and Mexico. Figure 3-1 illustrates the drainage basins of the Rio Grande within the Far West Texas Region.

The water supply available from the Upper Rio Grande is affected by climatic conditions in Colorado and northern New Mexico. Although dams have been built on the River in New Mexico to provide a degree of control, floods and droughts still take their toll in the Region. Most of the Rio Grande's flow upstream of Fort Quitman is diverted at the Mesilla Dam in New Mexico to support irrigation in Dona Ana County, New Mexico and at the American Dam in Texas to supply irrigation and municipal demands in Texas. Water is also diverted at the International Dam for delivery through the Acequia Madre to supply irrigation demand in Mexico as stipulated by Treaty. Downstream from El Paso, most of the flow in the River consists of irrigation return flow, and both treated and untreated municipal wastewater discharge from both sides of the border, and occasional rainfall runoff.

The flow from Fort Quitman to Presidio is often intermittent, leading this segment to be commonly referred to as the "Forgotten River." The River becomes a permanent stream again at the junction where the Mexican river, the Rio Conchos, enters the Rio Grande upstream of Presidio. From Presidio downstream through the Big Bend until it reaches the Amistad Reservoir, the Rio Grande often lacks sufficient flow to adequately support minimum recreational, environmental, or agricultural needs; and during dry periods, may fall significantly short of supplying such needs.

Under drought conditions in the upper catchment basin, flows in the Rio Grande are significantly reduced and are allotted by the United States Bureau of Reclamation (USBR) in accordance with a prearranged schedule. Low releases and diversions significantly affect downstream water users who are highly dependent on a steady source of river water. In addition, such low releases result in a degradation of the River's water and environmental quality.

American Heritage River Initiative – The Rio Grande, from El Paso to Laredo, is one of only 14 rivers in the United States, and the only river in Texas, to receive the American Heritage River designation. Established in 1997, the American Heritage River Initiative recognizes rivers, or segments of rivers, that have played a significant role in the history and culture of the region it traverses. The Initiative gives Federal support to voluntary community-led work that benefits riverfront communities. Some of the possible benefits of being designated an American Heritage River are increased opportunities in commerce and trade, recreational improvements along the River, incorporation of wildlife habitats, and cultural stimulation. The American Heritage River Initiative does not conflict with matters of State and local government jurisdiction, such as water rights, land-use planning and water-quality standards. Also, the initiative does not impair the authority of each state to allocate quantities of water within its jurisdiction.

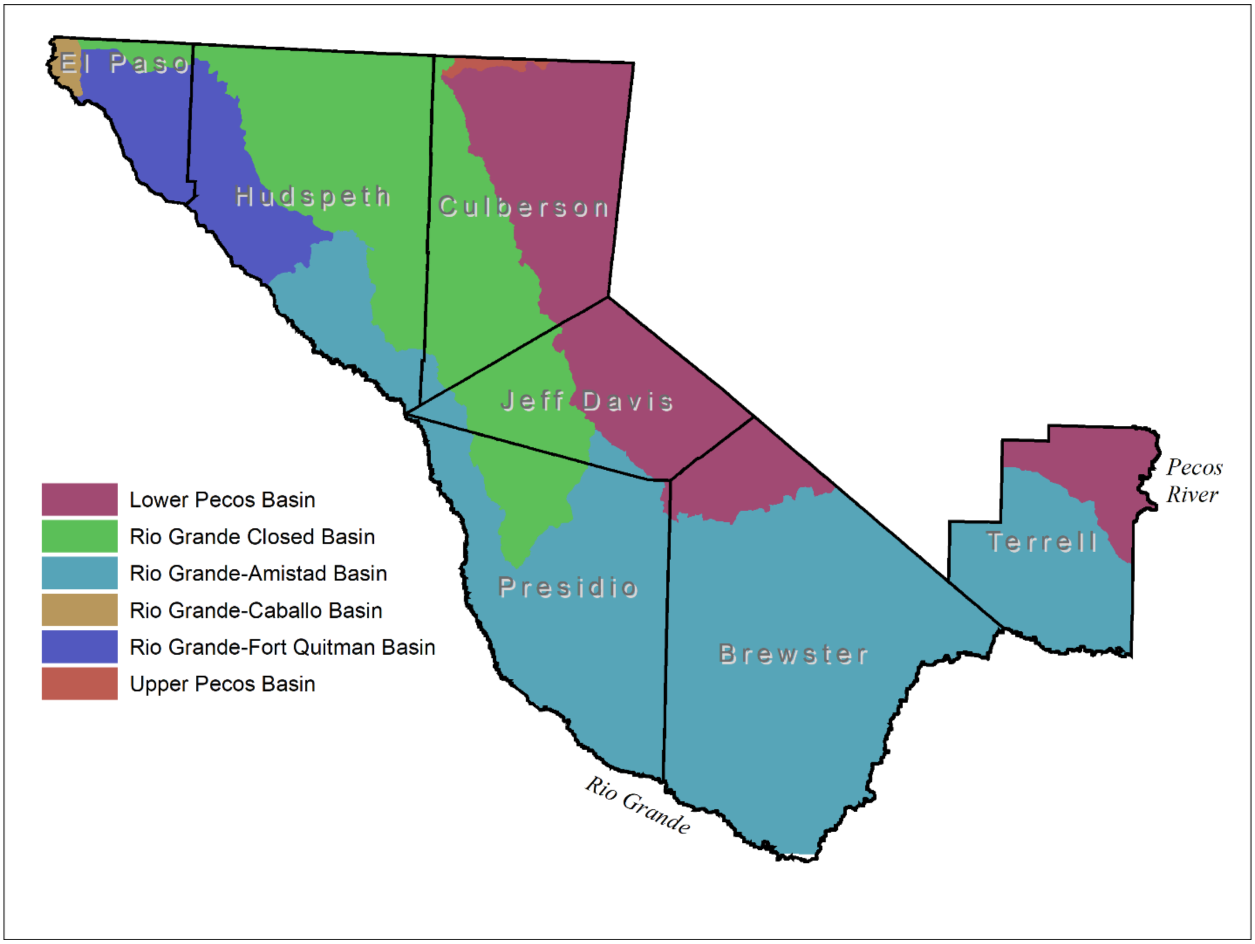


Figure 3-1. Rio Grande Drainage Basins within the Far West Texas Region

Rio Grande Wild and Scenic River – In 1978, Congress designated a 196-mile reach of the Rio Grande, from the Coahuila-Chihuahua State line, near Mariscal Canyon, to the Terrell-Val Verde County line, a "Wild and Scenic River." Approximately 69 miles of the designated River stretch is within Big Bend National Park. This segment of the River has been designated by the Texas Legislature, on the recommendation of the Far West Texas Water Planning Group (FWTWPG), as an "Ecologically Unique River Segment" and is discussed in further detail in Chapter 8.

3.1.1.1 Rio Grande Treaties and Compact

Water demand related to irrigation use and population growth has impacted the Rio Grande since the 1800s. Water appropriations and shortages have spawned lawsuits, as well as the involvement of the Federal government in the management of the River. The following sections describe efforts by State and national governments to address many of the complex management issues associated with the Rio Grande.

1906 International Treaty – Under the 1906 International Treaty, the United States is obligated to deliver 60,000 acre-feet of water annually from the Rio Grande to Mexico, except in case of extraordinary drought or serious accident to the irrigation system in the United States. The 60,000 acre-feet must be delivered, at no cost to Mexico and in accordance with a monthly distribution schedule from February through November, in the bed of the Rio Grande at the headworks of the Acequia Madre (International Dam). The International Boundary and Water Commission (IBWC)/Comisión International de Límites y Aguas (CILA) is the designated binational agency that oversees the yearly delivery of international waters to Mexico. The U.S. Bureau of Reclamation (USBR) calculates the allocations in coordination with the IBWC.

Rio Grande Compact – The Rio Grande Compact signed in 1938 is a Tri-State agreement, approved by the U.S. Congress and ratified by the states of Colorado, New Mexico and Texas. The Rio Grande Compact Commission, which administers the Compact, is comprised of a Commissioner from each of the states and a nonvoting chairman appointed by the President of the United States. The Compact encompasses the waters of the Rio Grande from the southern Colorado headwaters to above Fort Quitman, Texas and apportions them between the three states. It sets out a schedule of the water delivery obligation of Colorado at the Colorado/New Mexico state line and the obligation of New Mexico to deliver water to Texas via Rio Grande Project reservoirs at Elephant Butte and Caballo. Releases from the reservoirs are measured downstream of Caballo Reservoir.

1944 International Treaty – The 1944 International Treaty addresses the waters in the international segment of the Rio Grande from Fort Quitman, Texas to the Gulf of Mexico. The Treaty allocates water in the River based on percentage of flows in the River from each country's tributaries to the Rio Grande. The 1944 Treaty also stipulates that one-third of the flow of the Rio Conchos in Mexico is allotted to the United States. The Rio Conchos is the largest tributary of the Rio Grande. The treaty requires that the combined flow of the Rio Conchos and five other tributaries (San Diego, San Rodrigo, Escondido, Salado Rivers, and Las Vacas Arroyo) shall have an annual average of not less than 350,000 acre-feet. The IBWC/CILA is responsible for implementing the treaties between the United States and Mexico. In previous years, the required minimum flow was not met.

3.1.1.2 Rio Grande Project and the El Paso County Water Improvement District #1

The Rio Grande Project is an irrigation storage and flood control Federal reclamation project administered by the USBR. Elephant Butte and Caballo Reservoirs in southern New Mexico and the diversion dams at the headings of the main canals make up the Project's primary facilities. Built in 1915 and fed by the Rio Grande, Elephant Butte is the largest reservoir in New Mexico and provides water for approximately 90,000 acres of farmland. In the summer of 2013, Elephant Butte Reservoir dwindled to its lowest level in 40 years, and thus represents the drought of record in terms of irrigation-use impact.

The Project delivers water to the Elephant Butte Irrigation District (EBID) and the El Paso County Water Improvement District No. 1 (EPCWID#1). The EBID encompasses all the project lands in New Mexico south of the Caballo Reservoir and delivers water to farmlands in New Mexico. The Project also delivers water to Mexico in accordance with the Treaty of 1906. In 1979 and 1980, the two Irrigation Districts took over the operation and maintenance responsibilities of most of the respective irrigation works within the boundaries of each entity. Legal titles to the rights-of-way of irrigation canals and drains were transferred from the United States to the Districts in January 1996.

El Paso County Water Improvement District No. 1 – In Texas, the Rio Grande Project provides water for 69,010 acres of water-right lands (i.e. irrigated lands within the District that have a right to water from the Project), all of which are located within the boundaries of the EPCWID #1. The District contains 156 square miles, with over 350 miles of canals and laterals in the distribution system, and over 269 miles in the drainage system. Water is delivered through canals and laterals to more than 2,205 turnouts, irrigating crops of cotton, alfalfa, pecans, chilies, wheat, milo, vegetables, pastures and family gardens. Since 1941, EPCWID#1 has delivered water to the City of El Paso (El Paso Water) for municipal and industrial use through contracts among the District, the City, and the USBR. The City of El Paso also owns or leases farmland with water rights, which it uses for municipal purposes.

Project Water Allocation – Deliveries of Rio Grande Project water is based on irrigation requirements authorized for the Project and are agreed on by the two Irrigation Districts and the USBR. The annual allotment of Rio Grande Project water downstream of the Caballo Reservoir is determined by the USBR by the first of December for the following water year based on the estimated amount of usable water in storage on the first day of January and the predicted inflows for the following year. USBR projects the inflow to Elephant Butte Reservoir using snowpack and gauging stations data from the upper reaches of the Rio Grande.

Total releases from Project storage during a full-allotment year average approximately 764,000 acre-feet. Total diversions, however, average approximately 932,000 acre-feet per year, exceeding the releases by 168,000 acre-feet. The difference between the two is attributable to irrigation and municipal return flows, operation spills from upstream users, and rainfall runoff. During years of full supply allocation, the total diversions are 495,000 acre-feet to EBID in New Mexico, 376,000 acre-feet to EPCWID#1 in Texas, and 60,000 acre-feet to.

Currently, the City of El Paso's (El Paso Water) authority to use water from the Project arises from its ownership of 2,000 acres of land with rights to use water, approximately 5,542 acres of 50- and 75-year term City of El Paso Irrigation Water Assignments (Leases) for rights to use water from urbanized land parcels, and approximately 3,088 acres of Lower Valley Water District (LVWD) leases. The rights to use water from the LVWD leases are transferred to El Paso Water (EPWater) on an annual basis in exchange for a wholesale supply of water from the City utility. EPWater receives an annual allocation for water leased and land ownership categories based on the yearly allocation and the provisions of the respective contracts. During a full allocation year, EPWater has rights to divert 65,000 acre-feet of Rio Grande Project water from all contract sources. The conversion of rights to use water from agricultural to municipal and industrial use must be contracted with the EPCWID#1 and the USBR. EPWater has also finalized an agreement with EPCWID#1 to acquire additional raw water based on EPCWID#1's operation of new shallow wells intended for drought relief. The 2001 Third Party Implementing Contract with EPCWID#1 converts to municipal and industrial use Project water saved from canal lining, operational efficiencies, and other miscellaneous water sources. EPWater has also negotiated and agreed in principal on the terms of a Third-Party Implementing Contract that would allow it to contract for the conversion of rights to use water directly from farmers through the use of short-term "Forbearance Contracts."

In recent decades, the amount of water released from Caballo Reservoir for the Rio Grande Project has been trending downward (Figure 3-2). The year with the least amount of flow below Caballo Dam was 2013, also corresponds to the lowest available supply from WAM Run 3. 2021 and 2022 were also years of low water availability. Releases from Caballo Reservoir are used to meet the needs of water users in New Mexico, Texas and Mexico, and so are higher than the amounts shown in Table 3-1, which is only for Texas users. For the purposes of regional water planning, the 2013 availability can be thought of as the new drought-of-record for the Rio Grande Project.

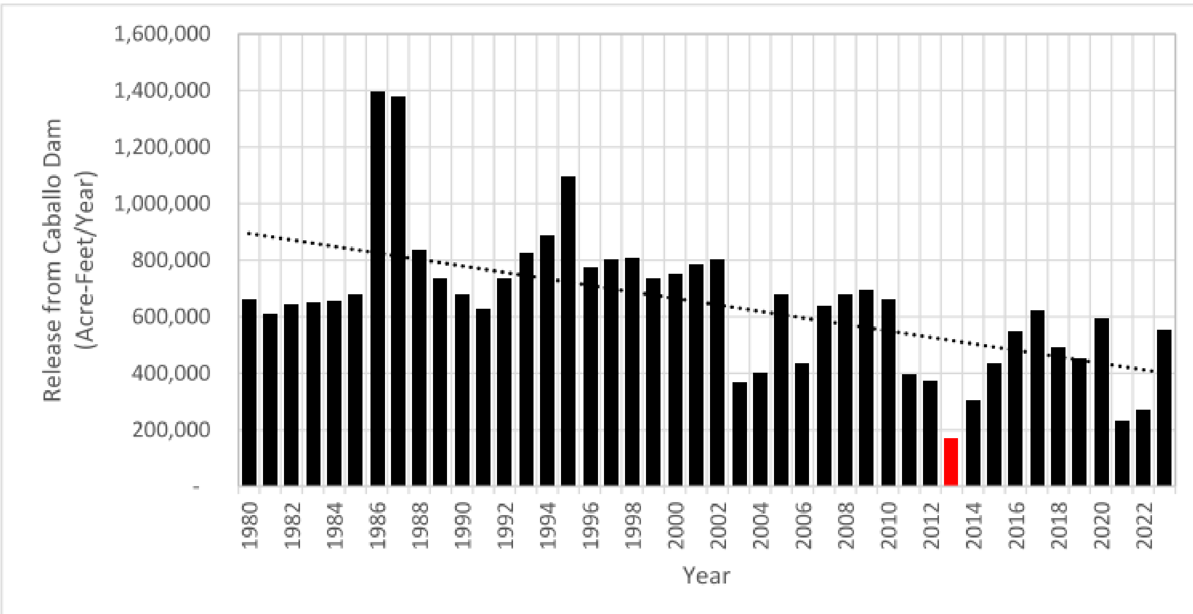


Figure 3-2. Annual Releases from Caballo Dam

(Data from 1980 to 2013 is from USGS Gage 08362500 Rio Grande Below Caballo Dam, NM. Data from 2014 to 2023 is from the USBR Water Information System)

The Rio Grande Water Availability Model (WAM) has a period of record from 1940 to 2018 and includes the recent drought. In 2013, the WAM shows 44,897 ac-ft of water available from the Rio Grande Project, which was divided between users in El Paso and Hudspeth Counties. Table 3-5 summarizes the allocation of water from the Rio Grande Project for water users in Far West Texas.

EPCWID#1 allocates the Rio Grande Project water to users in El Paso County and irrigators in Hudspeth County upstream of Fort Quitman. According to the WAM, users in El Paso County receive 98.6% of the Rio Grande Project water (44,270 acre-feet per year in 2013) and users in Hudspeth County upstream of Fort Quitman receive 10.4% of the allocation (627 acre-feet per year in 2013). Users in Hudspeth County downstream of Fort Quitman also receive water from the Rio Grande River, but not as part of the Rio Grande Project. This amount is 289 acre-feet per year according to the WAM, for a total of 916 acre-feet per year from the Rio Grande River for Hudspeth County (Table 3-1). In El Paso County, Rio Grande Project water is used by EPW and EPCWID#1. 10,000 acre-feet per year of the Rio Grande Project water reserved for El Paso County is allocated to EPW based on historical deliveries. The remaining 34,270 acre-feet per year stays with EPWID#1 for irrigation in El Paso County (Table 3-2 and Table 3-3).

Table 3-5. Supplies from Rio Grande Project (Acre-Feet per Year)

Water User Group	2030	2040	2050	2060	2070	2070
El Paso Water	10,000	10,000	10,000	10,000	10,000	10,000
El Paso County Irrigation	34,270	34,270	34,270	34,270	34,270	34,270
Hudspeth County Irrigation[1]	627	627	627	627	627	627
Total	**44,897**	**44,897**	**44,897**	**44,897**	**44,897**	**44,897**

[1.] Hudspeth County Irrigation also receives 289 acre-feet per year from water rights below Fort Quitman, which are not part of the Rio Grande Project.

3.1.1.3 Hudspeth County Conservation and Reclamation District No. 1

The HCCRD #1, headquartered in Fort Hancock, was created in 1924 to provide irrigation waters to 18,300 acres of Rio Grande bottomlands that are located downstream of the El Paso-Hudspeth County line to Fort Quitman. The District diverts tailwater, returns, and excess flows from the Rio Grande Project. Water reuse and recycling are its primary operations; the District does not provide potable water.

Water sources include untreated water from permitted Rio Grande diversions, drainage waters, return flows from farming operations, operational waste associated with the USBR's Rio Grande Project, and return flows from El Paso Water and wastewater treatment plants. The supply to the District is completely dependent on the EPCWID #1 annual operations, and therefore can be unpredictable. When flows are erratic, the District utilizes drought contingency planning. If a mild to moderate shortage is predicted, users are notified of the expected shortage. For severe shortages, when supply is less than half of demand, agricultural producers are asked to prioritize water requests based upon crop needs.

3.1.1.4 Rio Grande Watermaster

Rio Grande water below Ft. Quitman is stored in two reservoirs located in the middle (Amistad) and lower (Falcon) segments of the River. A binational commission determines the allocation of these international waters between Mexico and the U.S. (Texas). The TCEQ Rio Grande Watermaster administers Texas' share of the international water in this portion of the Rio Grande and its Texas tributaries, excluding the drainage basins of the Pecos and Devils Rivers.

3.1.1.5 Rio Grande Water Quality

The quality of water in the segment of the Rio Grande that flows through Far West Texas varies significantly from specific locations and season of the year. Of prime consideration is that there is little natural flow in the River. The TNRCC's (predecessor name of TCEQ) inventory of water quality in the State (TNRCC, 1996) cites drainage area and a wide range of geologic and climatic conditions in Far West Texas as factors responsible for water-quality conditions in the Rio Grande. Heavy metals and pesticides have been identified along the course of the Rio Grande. Elevated fecal coliform and nutrient levels occur in the River downstream of border cities, primarily because of untreated wastewater from Mexico. Table 3-6 shows the water quality status of water segments in the Region according to the 2022 303(d) list developed for Texas. Additional discussion on Rio Grande water quality is provided in Chapter 1, Section 1.8.

Table 3-6. Water Quality Status for Rio Grande Segments According to the 303(d) List

Segment ID	Segment Name	AU ID	Parameter	Category	Carry Forward
2306	Rio Grande Above Amistad Reservoir	2306_01	Sulfate in water	5b	N
		2306_02	Sulfate in water	5b	N
		2306_03	Sulfate in water	5b	N
		2306_04	Sulfate in water	5b	N
		2306_05	Sulfate in water	5b	N
		2306_06	Sulfate in water	5b	N
		2306_07	Sulfate in water	5b	N
		2306_08	Sulfate in water	5b	N
2307	Rio Grande Below Riverside Diversion Dam	2307_01	Chloride in water	5c	N
			Total dissolved solids in water	5c	N
		2307_02	Chloride in water	5c	N
			Total dissolved solids in water	5c	N
		2307_03	Bacteria in water (Recreation Use)	5c	Y
			Chloride in water	5c	N
			Total dissolved solids in water	5c	N
		2307_04	Bacteria in water (Recreation Use)	5c	N
			Chloride in water	5c	N
2307	Rio Grande Below Riverside Diversion Dam	2307_04	Total dissolved solids in water	5c	N
		2307_05	Bacteria in water (Recreation Use)	5c	N
			Chloride in water	5c	N
			Total dissolved solids in water	5c	N
2308	Rio Grande Below International Dam	2308_01	Bacteria in water (Recreation Use)	5c	N
2310	Lower Pecos River	2310_01	Sulfate in water	5c	N
			Total dissolved solids in water	5c	N
		2310_02	Sulfate in water	5c	N
			Total dissolved solids in water	5c	N
2311	Upper Pecos River	2311_03	Depressed dissolved oxygen in water	5b	N
2314	Rio Grande Above International Dam	2314_01	Bacteria in water (Recreation Use)	5c	N

Notes:
Category: One of seven subcategories assigned to each impaired parameter to provide information about water quality status and management activities on that water body. The categories are defined below:
Category 5: Available data and/or information indicate that at least one designated use is not being supported or is threatened, and a TMDL is needed.

Category 5a: A TMDL is underway, scheduled, or will be scheduled.
Category 5b: A review of the standards for the water body will be conducted before a management strategy is selected.
Category 5c: Additional data and information will be collected or evaluated before a management strategy is selected.
Category 5n: Water body does not meet its applicable Chl a criterion, but additional study is needed to verify whether exceedance is associated with causal nutrient parameters or impacts to response variables.

Carry Forward: Some previously listed impairments did not have adequate data to re-assess in 2022 and were carried forward from 2020 and remain impaired.

3.1.1.6 Long-Term Reliability of the Rio Grande

The long-term reliability of Rio Grande water is sporadic. Aside from the legal mechanisms governing allocation of the water from the Rio Grande Project and the allocation of water between the two nations of Mexico and the United States, the meteorologic and hydrologic reality is that the flows in the West Texas portion of the Rio Grande are dependent on climatic regions totally apart from the climatic regime of Far West Texas. If a drought occurs in Colorado, the El Paso area is essentially thrown into a drought-like scenario and flows downstream of Presidio are largely dependent on hydrologic conditions in northern Mexico. As the science of drought prediction matures, it could become a useful source of information for modeling the long-term availability of water in the Rio Grande headwaters.

3.1.1.7 Rio Grande Channelization

In 1933, the United States and Mexico signed a Convention entitled, “Rectification of the Rio Grande,” in which the two countries agreed to provide flood protection to urban, suburban and agricultural lands and stabilize the international boundary line. Construction work authorized by this Convention addressed channel aggrading due to the flat gradient and low velocities of the Rio Grande and the new channels that tended to form on lower ground during flood flows. The rectified channel between its upper end at Cordova Island, near El Paso, to its lower end reduced the original river channel length from 155.2 miles to 85.6 miles and increased the gradient from about two feet per mile to 3.2 feet per mile. The Rectification Project also included the construction of three toll-free bridges. Construction commenced in March 1934 and was completed in 1938.

The other important joint project with Mexico, the Rio Grande Boundary Preservation Project, carries out the provisions of Article IV of the 1970 “Treaty to Resolve Pending Boundary Differences and Maintain the Rio Grande and Colorado River as the International Boundary.” The Project covers the Rio Grande’s 194-mile reach between Fort Quitman and Haciendita, Texas and addresses sedimentation as well as the phenomenon of salt cedars choking the channel. In some places the channel is nearly obliterated, and lands on both sides of the River are subject to periodic flooding from flash floods of tributary arroyos. The final Environmental Impact Statement for the Boundary Preservation Project was completed in 1978. In the United States, the Boundary Preservation Project was constructed in reaches based on contracts issued and inspected by the IBWC’s United States Section.

Construction was completed for Reach I but was interrupted for other reaches by an extended period of flooding in 1981. Subsequent work done by IBWC’s United States Section was tied to the Mexican Section’s schedule; February of 1986 marked the end of U.S. Section construction work anywhere within the Boundary Preservation Project.

Funding to continue maintenance of the completed channel work has not been received since 1985; consequently, sediment plugs on the large tributary arroyos and high flows in the River have caused overtopping of the banks with the result that the channel has deviated from its original alignment. It is this deviation from channel alignment that concerns IBWC and which is properly termed “re-channelization.” IBWC’s perspective is that re-channelization of the Rio Grande is a treaty requirement, and that re-channelization offers some water salvage potential when combined with removal of salt cedar.

3.1.1.8 Forgotten River Reach of the Rio Grande

Reduced flows below Fort Quitman have resulted in a long stretch of the Rio Grande (known as the "Forgotten River") with no defined channel and riparian vegetation that has become a tamarisk thicket. The Rio Grande within this reach follows a sinuous channel for almost 200 river miles from about 13 miles downstream of Fort Quitman to about six miles upstream of Presidio. The high flows and periodic floods necessary to maintain the river channels have been reduced significantly over the past several decades.

In 2004, the TCEQ voiced concerns related to floodplain and riverine function, environmental resources, water quality, agriculture, and watershed hydrology. At the request of TCEQ, the Albuquerque Division of the US Army Corps of Engineers conducted a reconnaissance level investigation of the Forgotten River, which culminated in recommendations that the "Forgotten River Reach" study proceed into the feasibility phase to develop comprehensive watershed management recommendations. In response, several studies have been conducted that examine environmental resources, water supply, groundwater recharge, flooding and erosion, geology, cultural resources, and history. The latest feasibility study by the US Army Corps of Engineers, published in January 2008, provides recommendations pertaining to a needed systematic watershed approach to understanding the dynamics of the river environment. The study also presents an opportunity for local, State, and Federal agencies to work together in developing solutions to managing the varied resources of the Forgotten River Reach.

3.1.1.9 Rio Grande Interstate Litigation

The Rio Grande is an interstate and international river that originates in Colorado, flows in a southerly direction into and through New Mexico and into Texas, where the River is a significant water resource in Far West Texas with far reaching economic and social ties to the Region. To ensure an equitable divide and apportionment of Rio Grande water, Colorado, New Mexico and Texas signed the Rio Grande Compact in 1938, which a year later was approved by the United States pursuant to an Act of Congress.

In 2013, the State of Texas brought a complaint against the State of New Mexico and the State of Colorado in the Supreme Court of the United States contesting that:

> ***"New Mexico has, contrary to the purpose and intent of the Rio Grande Compact, allowed and authorized Rio Grande Project water intended for use in Texas to be intercepted and used in New Mexico. New Mexico's actions, in allowing and authorizing the interception of Rio Grande Project water intended for use in Texas, violates the purpose and intent of the Rio Grande Compact, causing grave and irreparable injury to Texas.***
> ***New Mexico, through the actions of its officers, agents and political subdivisions, has increasingly allowed the diversion of surface water, and has allowed and authorized the extraction of water from beneath the ground, downstream of Elephant Butte Dam, by individuals or entities within New Mexico for use within New Mexico. The excess diversion of Rio Grande surface water and the hydrologically connected underground water downstream of Elephant Butte Reservoir adversely affects the delivery of water that is intended for use within the Rio Grande Project in Texas."***

The FWTWPG recognizes the potential impact of diminished water-supply availability from the Rio Grande from this interstate issue and encourages the State of Texas to continue its pursuit of rectifying the problem through whatever action is deemed most appropriate.

3.1.2 Pecos River

Originating in the Sangre de Cristo Mountains of northern New Mexico, the Pecos River flows 926 miles south into Texas, and discharges into the channel of the Rio Grande near the upper reaches of Amistad Reservoir. The Pecos is the largest Texas tributary that flows into the Rio Grande (Figure 3-1), contributing an average of 9.5 percent of the average annual streamflow into the Rio Grande. The River forms the easternmost border of the Far West Texas planning region along the northeast corner of Terrell County.

Pecos River flow upstream of the Region is controlled by releases from Red Bluff Reservoir near the Texas–New Mexico state line, where storage in the reservoir is affected by the required delivery of water from New Mexico (see Section 3.1.2.1 below). Water from this portion of the watershed is high in salt content and is used by downstream irrigators growing salt-tolerant crops. The Pecos contributes 29.5 percent of the annual salt load into Amistad Reservoir. Independence Creek in northern Terrell County within the Far West Texas region contributes about half of the Pecos flow and its fresh quality improves salinity in the River.

3.1.2.1 Pecos River Compact

Signed by Texas and New Mexico in 1948 and approved by Congress the following year, the Pecos River Compact provides for a Commission to administer the apportionment and diversion of Pecos River waters. The Compact repeatedly refers to the "1947 Condition," which is a Pecos River Basin situation defined in the Compact Commission's Report of the Engineering Advisory Committee. The terms of the Pecos River Compact can be summarized by the following four points:

- New Mexico cannot decrease the Pecos flow at the New Mexico/Texas border to a point less than that of the 1947 condition. When determining the quantity of Texas water for the 1947 condition, waters of the Delaware River are apportioned to Texas.
- Of the beneficial consumptive use of water salvaged in New Mexico on the River, Texas shall receive 43 percent and New Mexico 57 percent.
- Any water salvaged by beneficial use, but which is not beneficially consumed, shall be apportioned to New Mexico. Any water salvaged in Texas shall go to Texas.
- Beneficial consumptive use of unappropriated floodwaters shall go equally to Texas and to New Mexico.

The Pecos River Compact allows Texas and New Mexico to build additional reservoir capacity to replace unusable reservoir capacity, for the utilization of salvaged water and unappropriated floodwaters as apportioned by the Compact and for making more efficient use of water. Each state shall work with agencies to solve the salinity problem in the Pecos, and each may construct and operate facilities to prevent flood damage.

Texas and New Mexico were involved in a lawsuit over New Mexico's obligation to deliver water to Texas was decided and ordered by the U.S. Supreme Court in 1988 (485 U.S. 388). The decree requires New Mexico to abide by the terms of the Pecos River Compact and resulted in the appointment of a Pecos River Master. This River Master has several duties, including but not limited to, calculating water obligations every year, delivering reports of these calculations, reviewing plans proposed by New Mexico and considering written objections by Texas, and modifying proposed plans as deemed necessary.

3.1.2.2 Water Allocation and Water Rights

Pecos water delivered to Texas is stored in Red Bluff Reservoir and is allocated by a master irrigation control district to seven other irrigation districts downstream; each district then apportions the waters to individual farmers. The irrigation districts are in Loving, Ward, Reeves, and Pecos Counties, which lie in Far West Texas' neighboring Region F.

Within the portion of the Pecos watershed within the borders of the Far West Texas planning region, the TCEQ water-rights master file lists five water rights on unnamed tributaries of the Pecos River (Certificates of Adjudication 5462 through 5466). These water-rights holders, located in Terrell County, are authorized to divert 873.25 acre-feet of water per year for irrigation purposes (Appendix 3A). There are also ten water rights located in Jeff Davis County on Limpia Creek and other streams in the Davis Mountains area. These water rights are not reliable during drought.

3.1.2.3 Significant Pecos River Basin Tributaries

Phantom Creek – Phantom Creek originates from groundwater discharging at Phantom Spring in Jeff Davis County in the Far West Texas region. The Creek flows northeastward into Reeves County (Region F), where it gains additional flow from San Solomon, Giffin, Saragosa, East Sandia, and West Sandia Springs. Surface flow in the Creek, however, does not reach the Pecos River, but rather infiltrates into the farmland south of the town of Pecos. Phantom Creek is a source of water for irrigation in southern Reeves County. The U.S. Bureau of Reclamation manages the spring property and holds two water rights for the annual diversion of as much as 18,900 acre-feet of water for irrigation, however, this volume is rarely available.

A study performed by the TWDB in 2003 reports that flow in Phantom Spring has experienced significant decline over the past several drought years, declining from more than 10 cubic feet per second (cfs) during the 1930s to less than one cfs during the recent drought period. Recently Phantom Spring has ceased flowing on several occasions and a pump has been installed into the spring pool to support species residing at the spring outfall.

Independence Creek – Independence Creek, a spring-fed creek in northern Terrell County, is the most important of the freshwater tributaries to the lower Pecos River. Caroline Spring flows at a rate of 3,000 to 5,000 gpm and comprises about 25 percent of the Creek's flow. The inflow of Independence Creek adds a vital source of fresh water that doubles the flow of the Pecos River and reduces the salinity by half or more.

Independence Creek hosts a variety of bird and fish species, some of which are extremely rare. For the Proserpine shiner, Rio Grande darter, headwater catfish, and several other native fishes, Independence Creek is an important refuge during stressful Pecos River conditions. Following periods of low-water quality and occasional algae blooms on the Pecos River, fish populations in the clear waters of the Creek help to repopulate the River after a fish kill. The Nature Conservancy of Texas manages a significant portion of Independence Creek, including Caroline Spring, as a natural preserve. The reach of Independence Creek managed by the Nature Conservancy is recommended as an Ecologically Unique Stream Segment by the FWTWPG.

3.1.2.4 Pecos River Watershed Protection Plan

The Pecos River is the lifeblood of many communities within its reaches, and serves as a major water source for irrigation, recreational uses, and recharge for underlying aquifers. However, the flows of the once great Pecos River have dwindled due to natural and man-induced causes. Because water quality and streamflow has declined, the aquatic community of the Pecos River has been drastically altered. To address these river issues, the Pecos River Basin Assessment Program was initiated in 2004 by the Texas Water Resources Institute of Texas A&M University. The project was funded by the Texas Soil and Water Conservation Board through the U.S. Environmental Protection Agency-Clean Water Act Grant. Components of the project include:

- A basin assessment of stream channel morphology, riparian vegetation, land use, salinity mapping, water inflows and outflows, aquatic habitats, historic perspectives, and economic modeling.
- Educational programs working with various state and local agencies to assemble a series of publications and organize a series of educational meetings targeted at landowners, stakeholders and policymakers in the watershed.
- Monitoring programs consisting of data collection, analysis, and water-use studies intended to estimate the effect of salt concentration and fate of water salvaged through salt cedar control.

"A Watershed Protection Plan for the Pecos River in Texas" was published in 2008 and updated in 2013. The WPP for the Pecos River in Texas recommends management strategies that typically address more than one concern. The Plan includes an in-depth overview that defines the watershed and its characteristics and provides some of the history behind the current issues. As a primer on management strategies, the WPP also discusses past and current uses of the River and watershed. Landowners' concerns about the Pecos River watershed are discussed, management strategies are recommended, costs are estimated, technical assistance is outlined, and timelines for implementing these strategies and a program to address each concern are included. The plan includes:

- Identification of the causes and sources of pollutants.
- Estimation of expected pollutant reductions.
- Identification of critical areas of the watershed.
- Description of the management measures needed.
- Estimation of the costs of technical assistance and sources of funding.
- Information and educational outreach component.
- Implementation schedule.
- Milestones to assess the effectiveness of plan implementation.
- Criteria for assessing success.
- Long-term monitoring efforts.

3.2 GROUNDWATER

Other than irrigation use and a portion of El Paso Water municipal use from the Rio Grande, almost all other water use in Far West Texas is supplied from groundwater sources. Although not as large in areal extent as some aquifers in the State, such as the Ogallala and the Carrizo-Wilcox, individual aquifers in Far West Texas are more numerous (10 TWDB designated and 3 FWTWPG designated listed below) than in any of the other planning regions State-wide (Figure 3-3).

TWDB designated groundwater sources:

- Hueco Bolson.
- Mesilla Bolson.
- West Texas Bolsons.
    - Salt Basin.
        - Upper Salt Basin.
        - Wild Horse and Michigan Flats.
        - Lobo Flat.
        - Ryan Flat.
    - Presidio / Redford.
    - Green River Valley.
    - Red Light Draw.
    - Eagle Flat.
- Bone Spring-Victorio Peak.
- Igneous (Davis Mountains Igneous).
- Edwards-Trinity (Plateau).
- Capitan Reef Complex.
- Marathon.
- Rustler.
- Pecos Valley (Balmorhea Alluvium).

FWTWPG designated groundwater sources:

- Rio Grande Alluvium.
- Edwards-Trinity of Brewster County (Brewster Cretaceous).
- Diablo Plateau.

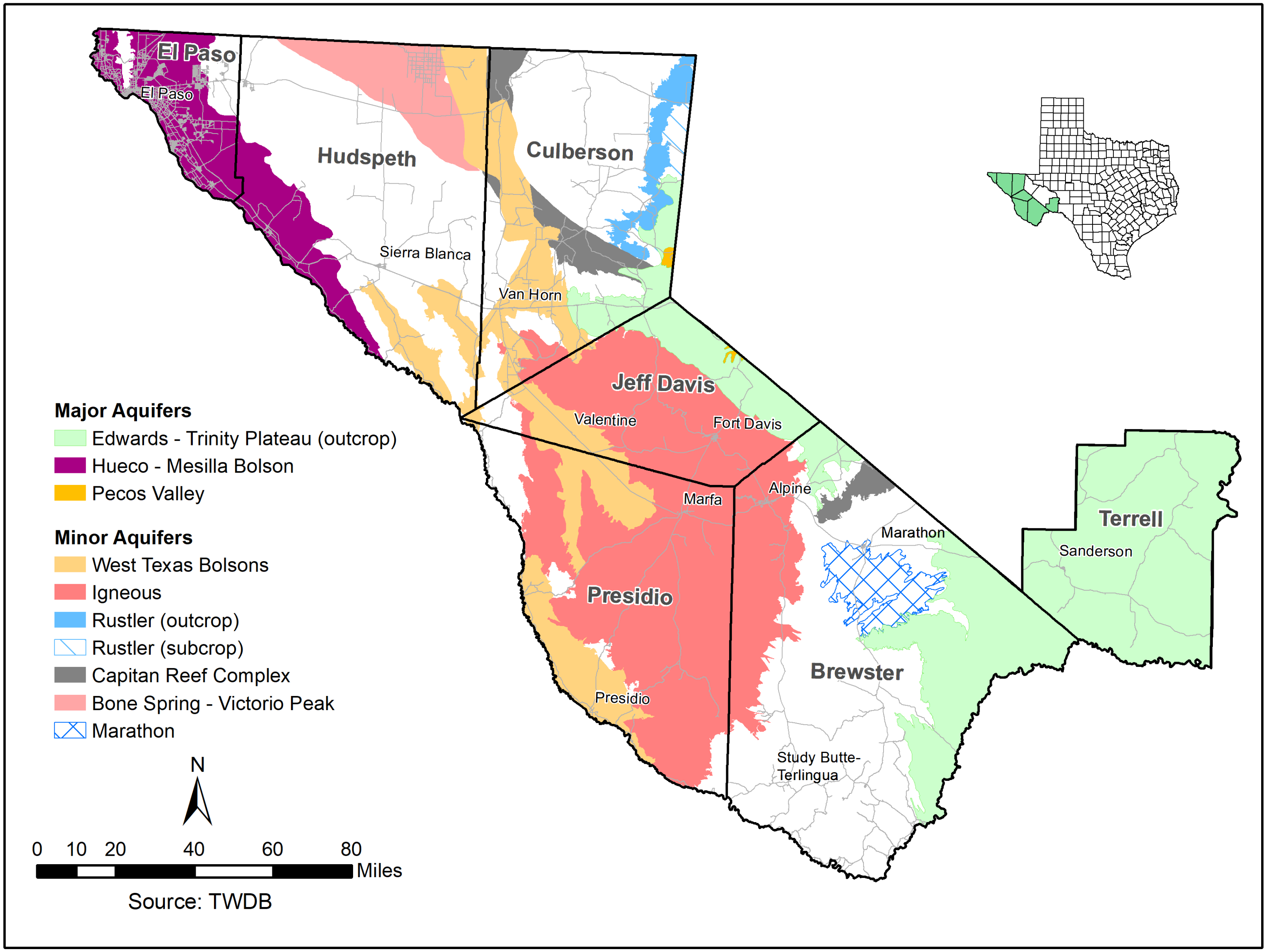


Figure 3-3. Major and Minor Aquifers

Aquifers in the Region can be categorized into three basic types; bedrock, bolson, and alluvium. Bedrock aquifers are those where groundwater flows through permeable fractures in hard-rock formations (limestone, dolomite, volcanic basalt, etc.). Aquifers of this type include the Bone Spring-Victorio Peak, Capitan Reef, Edwards-Trinity, Rustler, Marathon, and Igneous. Bolson aquifers occur in thick silt, sand, and gravel deposits that fill valleys between the numerous mountain ranges. Bolson aquifers in the Region include the Hueco, Mesilla, and the various individual aquifers that comprise the West Texas Bolson Aquifer group. Alluvial aquifers occur in the floodplain deposits adjacent to riverbeds and are often hydrologically connected to the surface water body. The Rio Grande Alluvium Aquifer is in this category. Water quality characteristics of these aquifers are discussed in Chapter 1, Section 1.8.

The FWTWPG has continuously acknowledged the need to increase the reliability of groundwater availability estimates by supporting the acquisition of additional data that can be used to characterize the many aquifers in the Region. Interim TWDB-funded projects were performed during previous planning periods in which new well data, water quality analyses, and aquifer parameters ascertained through pumping tests, were developed. Project reports are accessible on the Rio Grande Council of Government website and include:

- Igneous Aquifer System of Brewster, Jeff Davis and Presidio Counties, Texas (2001).
- West Texas Bolsons and Igneous Aquifer System Groundwater Availability Model Data Collection (2003).
- Groundwater Data Acquisition in Far West Texas (2009).
- Groundwater Data Acquisition and Analysis for the Marathon and Edwards-Trinity (Plateau) Aquifers (2010).

The evaluation of groundwater availability as reported in this *2026 Plan*, including MAG volumes and local analyses, is based on previous geohydrologic studies, groundwater data including historical use contained in State and Federal databases, and groundwater availability models (GAMs). Regardless of the specific method used to calculate groundwater supply availability, all analyses include the consideration of four basic components: (1) recharge to the aquifer, (2) recoverable storage capacity within the aquifer, (3) lateral movement into and out of the aquifer, and (4) withdrawals from the aquifer. Table 3-7 lists the methodologies used to estimate total groundwater source availability as reported in Table 3-1. Table 3-8 lists the Desired Future Conditions (DFCs) established by groundwater conservation districts for their assigned Groundwater Management Areas (GMAs). These aquifer conditions are used to assess the Modeled Available Groundwater (MAG) supply availability for designated aquifers. Groundwater availability is calculated separately for aquifers for which MAG volumes have not been assigned (Table 3-7).

Table 3-7. Groundwater Source Availability Methodology

Water Supply Source	County	Methodology
Hueco-Mesilla Bolson	El Paso	GMA Non-DFC process. RWPG approved values. Same as the *2021 Plan*. 90% of Hueco total from Hutchison model plus 25,000 acre-feet from Mesilla.
	Hudspeth	GMA Non-DFC process. RWPG approved values. Same as the *2021 Plan*. 10% of Hueco total based on Hutchison model.
Edwards-Trinity (Plateau)	Brewster	GMA 4 MAG
	Culberson	GCD Non-Relevant. TWDB modeled run compatible with DFC, which was provided to the FWTWPG for consideration.
	Jeff Davis	
	Terrell	GMA 7 MAG
Bone Spring - Victorio Peak	Hudspeth	GMA 4 MAG
Capitan Reef Complex	Brewster	GMA 4 MAG
	Culberson	
	Jeff Davis	GCD Non-Relevant TWDB-Null
	Hudspeth	GCD Non-Relevant (TWDB-Null). The average between the max. 8-year annual historical pumpage use (2008-2015) that was utilized in the *2021 Plan* (8,695 acre-feet = 2008); and the max. 11-year annual historical pumpage use (2011-2021) that was reviewed for the development of the *2026 Plan* (2,120 acre-feet = 2011). This data is provided by the TWDB groundwater historical pumpage use surveys.
Igneous	Brewster	GMA 4 MAG
	Culberson	
	Jeff Davis	
	Presidio	
Marathon	Brewster	GMA 4 MAG
Rustler	Brewster	GCD Non-Relevant. TWDB modeled run compatible with DFC, which was provided to the FWTWPG for consideration.
	Culberson	
	Jeff Davis	
West Texas Bolson (Red Light Draw)	Hudspeth	GCD Non-Relevant. GAM recharge from TWDB Contract Report (June 2004).
West Texas Bolson (Eagle Flat)	Hudspeth	
West Texas Bolson Green River Valley)	Hudspeth	
West Texas Bolson (Green River Valley)	Jeff Davis	
West Texas Bolson (Green River Valley)	Presidio	
West Texas Bolson (Presidio-Redford)	Presidio	GMA 4 MAG
West Texas Bolson (Upper Salt Basin)	Hudspeth	GCD Non-Relevant (TWDB-Null). The average between the max. 8-year annual historical pumpage use (2008-2015) that was utilized in the *2021 Plan* (429 acre-feet = 2008); and the max. 11-year annual historical pumpage use (2011-2021) that was reviewed for the development of the *2026 Plan* (212 acre-feet = 2011). This data is provided by the TWDB groundwater historical pumpage use surveys.
	Culberson	GCD Non-Relevant (TWDB-Null). TWDB Report AA 10-38 MAG.
West Texas Bolson (Wild Horse, Michigan and Lobo)	Culberson	GMA 4 MAG

Table 3-7. (continued) Groundwater Source Availability Methodology

Water Supply Source	County	Methodology
West Texas Bolsons (Ryan)	Jeff Davis	GMA 4 MAG
	Presidio	
Other Aquifer (Brewster Cretaceous)	Brewster	GCD Non-Relevant (TWDB-Null). The average between the max. 8-year annual historical pumpage use (2008-2015) that was utilized in the *2021 Plan* (1,896 acre-feet = 2008); and the max. 11-year annual historical pumpage use (2011-2021) that was reviewed for the development of the *2026 Plan* (1,071 acre-feet = 2011). This data is provided by the TWDB groundwater historical pumpage use surveys.
Other Aquifer (Diablo Plateau)	Hudspeth	RWPG Assigned. Recharge rate of 3% of average annual rainfall (11 inches/yr.) over 1,500 square miles of outcrop.
Other Aquifer (Balmorhea Alluvium)	Jeff Davis	RWPG Assigned. 2017 reported use by GCD.
Other Aquifer (Rio Grande Alluvium)	El Paso	GCD Non-Relevant (TWDB-Null). The average between the max. 8-year annual historical pumpage use (2008-2015) that was utilized in the *2021 Plan* (57,922 acre-feet = 2008); and the max. 11-year annual historical pumpage use (2011-2021) that was reviewed for the development of the *2026 Plan* (56,163 acre-feet = 2011). This data is provided by the TWDB groundwater historical pumpage use surveys.
	Hudspeth	GCD Non-Relevant (TWDB-Null). The average between the max. 8-year annual historical pumpage use (2008-2015) that was utilized in the *2021 Plan* (52,478 acre-feet = 2008); and the max. 11-year annual historical pumpage use (2011-2021) that was reviewed for the development of the *2026 Plan* (52,558 acre-feet = 2011). This data is provided by the TWDB groundwater historical pumpage use surveys.

Table 3-8. GMA Aquifer Desired Future Conditions

GMA	County	Aquifer	Desired Future Condition for the Period from 2010-2060
4	Brewster	Edwards-Trinity (Plateau)	3-ft drawdown
		Igneous	10-ft drawdown
		Marathon	0-ft drawdown
		Capitan Reef Complex	0-ft drawdown
	Culberson	Capitan Reef Complex	50-ft drawdown
		Salt Basin portion of the West Texas Bolsons	78-ft drawdown
		Igneous	66-ft drawdown
	Hudspeth	Bone Spring-Victorio Peak	0-ft drawdown for the period from 2010-2060, averaged across the portion of the aquifer within the boundaries of the district
	Jeff Davis	Igneous	20-ft drawdown
		Salt Basin portion of the West Texas Bolsons	72-ft drawdown
	Presidio	Igneous	14-ft drawdown
		Salt Basin portion of the West Texas Bolsons	72-ft drawdown
		Presidio-Redford Bolson	72-ft drawdown

Table 3-8. (continued) GMA Aquifer Desired Future Conditions

GMA	County	Aquifer	Desired Future Condition for the Period from 2010-2060
7	Kinney	Edwards-Trinity (Plateau)	Total net drawdown in Kinney County in 2070, as compared with 2010 aquifer levels, shall be consistent with maintenance of an annual average flow of 23.9 cfs and an annual median flow of 23.9 cfs at Las Moras Springs
	Val Verde	Edwards-Trinity (Plateau)	Total net drawdown in Val Verde County in 2070, as compared with 2010 aquifer levels, shall be consistent with maintenance of an average annual flow of 73-75 mgd at San Felipe Springs
	Edwards	Edwards-Trinity (Plateau), Pecos Valley and Trinity	Total net drawdown not to exceed 2 feet in 2070 as compared to 2010 aquifer levels
	Real	Edwards-Trinity (Plateau), Pecos Valley and Trinity	Total net drawdown not to exceed 4 feet in 2070 as compared to 2010 aquifer levels
	Terrell	Edwards-Trinity (Plateau), Pecos Valley and Trinity	Total net drawdown not to exceed 2 feet in 2070 as compared to 2010 aquifer levels

3.2.1 Hueco Bolson Aquifer

The Hueco Bolson Aquifer is a major source of groundwater for cities in El Paso and Hudspeth Counties, as well as Ciudad Juarez, Mexico. The Hueco Bolson extends southeastward from the Franklin Mountains in El Paso County to the southern end of the Quitman Mountains in Hudspeth County. The eastern boundary of the Bolson is established by the Diablo Plateau in El Paso and Hudspeth Counties and the Malone and Quitman Mountains in Hudspeth County. Northward, the Hueco extends into New Mexico, where it is hydrologically connected to the Tularosa Basin Aquifer. The Hueco Bolson also extends southward into the Mexican State of Chihuahua, where it is bounded by a series of mountain ranges that trend toward the southeast from Ciudad Juarez to near the southernmost point of the Quitman Mountains in Texas.

The Hueco Bolson consists of deposits of basin fill with a maximum thickness of approximately 10,000 feet along its western edge. The upper part of the basin fill consists of silt, sand and gravel. The lowermost deposits are made up largely of clay and silt. Only portions of the upper several hundred feet along the western edge of the Bolson fill are known to contain fresh to slightly saline water. East and below the freshwater zone, the Aquifer contains large volumes of brackish quality groundwater, which is currently being desalinated for public supply use by El Paso Water and Horizon MUD. Where Hueco Bolson sediments directly underlie Rio Grande alluvial sediments, the two units are hydrologically connected. Recent data analysis and computer modeling indicate that the Hueco Bolson Aquifer can continue to be sustainably developed well beyond previous estimates.

The TWDB officially designates the Hueco and Mesilla Bolsons as a single major-aquifer system (Figure 3-3) and reports its combined source availability in El Paso and Hudspeth Counties as a single volume of 480,000 acre-feet per year (Table 3-1). However, the two bolsons are not hydrologically connected. For this *2026 Plan*, The Hueco and Mesilla Bolsons Aquifer is subdivided as follows:

El Paso County:

Hueco Bolson – 410,000 af/y.

Mesilla Bolson – 25,000 af/y.

Hudspeth County:

Hueco Bolson – 45,000 af/y.

3.2.2 Mesilla Bolson Aquifer

The Mesilla Bolson Aquifer is located west of the Franklin Mountains and is part of a larger bolson that extends from southern New Mexico to northern Mexico. The Bolson deposits consist of approximately 2,000 feet of clay, silt, sand, and gravel. Three water-bearing zones have been identified based on water levels and quality. The shallow zone includes the overlying Rio Grande Alluvium. El Paso Water maintains a municipal wellfield in the Mesilla Bolson Aquifer near Canutillo. For the *2026 Plan*, Mesilla Bolson source availability is estimated to be approximately 25,000 acre-feet per year (see Hueco Bolson availability above).

3.2.3 West Texas Bolsons Aquifer

The West Texas Bolsons Aquifer is a minor aquifer in Far West Texas that's made up of several basins, or bolsons. The Aquifer is made up of eroded materials, such as clay, silt, volcanic rock, and limestone, that vary by location. The water quality varies by location, ranging from fresh to slightly or moderately saline.

3.2.3.1 Salt Basin Bolson

The Salt Basin is the largest of the West Texas Bolson Aquifers extending from the New Mexico state line on the western side of the Guadalupe Mountains southward to near Marfa in northern Presidio County. The basin is subdivided into five distinct, but hydrologically connected areas referred to as "flats" that contain significant quantities of groundwater that are being produced for municipal, irrigation, and livestock use. These sub-aquifers include, from north to south Upper Salt, Wild Horse, Michigan, Lobo, and Ryan Flats. Water supplies used by the oil and gas industry are derived from this Aquifer source.

Upper Salt Basin is not currently identified as part of the TWDB-designated West Texas Bolsons Minor Aquifer system but is listed here because it is recognized as a source supply for specified water-user categories in this *Plan*. The Upper Salt Basin is the northern extension of Wild Horse Flat and is described separately because of a difference in water quality and primary use. The Aquifer generally produces brackish to slightly saline groundwater to low-capacity wells primarily serving livestock needs.

Wild Horse Flat and Michigan Flat lie to the south of the Upper Salt Basin and are hydrogeologically interconnected with the northernmost part of Lobo Valley. Mountains bound the Wild Horse-Michigan Flat area along its western, eastern and southeastern margins. The Wild Horse-Michigan Flat watershed covers an area of approximately 1,000 mi^2 with a storage area of approximately 375 mi^2. The Wild Horse Flat area of the basin is a source of municipal supply for the Towns of Van Horn (Culberson County) and Sierra Blanca (Hudspeth County). The Wild Horse-Michigan Flat Aquifer is a major source of domestic and stock water for ranches and of irrigation water for farms in the valley.

Lobo Flat lies southwest of Wild Horse and Michigan Flats and is bound by mountains along its western and eastern margins. The Bolson watershed covers an area of 350 mi^2, with a groundwater storage area of 130 mi^2. The largest part of the storage area (75 mi^2) is in Culberson County, and a smaller part (55 mi^2) lies within Jeff Davis County. The Bolson is not a source of municipal supply; however, it is a source of domestic and stock water for ranches and a significant source of irrigation water.

Ryan Flat is the southernmost extension of the Salt Basin. The Bolson watershed covers an area of 1,410 mi^2, and the storage area is 525 mi^2. The largest part of the storage area (360 mi^2) is in Presidio County, and a smaller area (165 mi^2) extends northward into Jeff Davis County, where it is the source of municipal supply for the Town of Valentine. It is also the source of domestic water, stock water for ranches, and a source of irrigation water for farms. Well completion information and pumping records from the Antelope Valley Ranch, owned by El Paso Water, indicate that a zone of saturated, permeable, fractured volcanic rocks from 1,000 to as much as 3,000 feet thick underlies the bolson fill in Ryan Flat.

3.2.3.2 Presidio-Redford Bolson

In Texas, the Presidio-Redford Bolson extends along the Rio Grande from Candelaria to outcrops of volcanic rocks six to 10 miles southeast of Presidio. The Redford extension of the Bolson continues along the Rio Grande for another 12 miles. The Bolson is bounded along the northeast by the Chinati Mountains and along the southeast by the Cienega Mountains, the Black Hills, and the Bofecillos Mountains. This is an area of approximately 480 mi^2. Saturated thickness is conservatively estimated to be 500 feet beneath this area. The Presidio-Redford Bolson is the source of municipal supply water for the Town of Presidio and the Mexican community of Ojinaga. It is also the source supply for domestic, irrigation, and livestock use.

3.2.3.3 Green River Valley Bolson

The Green River Valley Bolson lies in parts of Hudspeth, Jeff Davis and Presidio Counties. It is bordered by the Eagle Mountains on the west, the Van Horn Mountains on the east, and the Rio Grande on the south. The Green River Valley watershed covers an area of 160 mi^2, however the storage area is only 40 mi^2. Green River Valley is the smallest of the West Texas Bolsons and is a source of water only for ranches in the basin. A few abandoned wells give witness to a history of irrigation.

3.2.3.4 Red-Light Draw Bolson

Red Light Draw, located in Hudspeth County, is situated between the Eagle Mountains along the north-northeast and the Quitman Mountains along the southwest. The Rio Grande is the southern border of the basin. The drainage area of the Red-Light Draw Bolson watershed is estimated to be 370 mi^2 and an aquifer area of 185 mi^2. The Red-Light Draw Bolson is a source of water only for ranches in the basin, and at its southern end for a research station operated by the University of Texas at El Paso.

3.2.3.5 Eagle Flat Bolson

The Eagle Flat Bolson, located in Hudspeth County, is situated between the Eagle Mountains along the south-southwest, the Diablo Plateau along the north, and the Carrizo and Van Horn Mountains along the east. The drainage area of the Bolson watershed is estimated to be 560 mi^2 and the basin-fill covers an area of 156 mi^2. Only the southeastern part of the Basin is regarded as having potential for the development of groundwater resources. The Eagle Flat Bolson is not a source of supply for municipalities in Hudspeth County. The unincorporated Town of Sierra Blanca, located in the western region of the Basin, obtains water from a wellfield operated by the Town of Van Horn in Wild Horse Flat.

3.2.4 Bone Spring-Victorio Peak Aquifer

The Bone Spring-Victorio Peak Aquifer underlies the Dell Valley area of northeastern Hudspeth County between the Salt Flat Basin and the Guadalupe Mountains on the east and the Diablo Plateau on the west. The Aquifer, which extends northward into the Crow Flats area of New Mexico, is used primarily for irrigation, but is also the public water supply source for Dell City. In 2007 the TWDB significantly enlarged the designated area of the Aquifer to a total of 710 mi^2 by extending its western and southern boundary.

The Aquifer consists of carbonate rocks (limestone and dolomite) of early Permian age. Groundwater in the Aquifer occurs under water-table conditions in interconnected solution cavities of variable size and dimension that formed along joints, fractures and bedding planes. Water-bearing zones have been encountered in wells as deep as 2,000 feet. The productivity of a well completed in the Aquifer is dependent on the number and size of cavities penetrated by the well bore. Well yields are reported to range from 150 gpm to as much as 4,000 gpm. The depth to groundwater within the irrigated region of Dell Valley ranges from approximately 35 feet along the eastern side of the valley to 325 feet on the west. Although the water table has declined since pre-development, static water levels have remained relatively constant since the late 1970s.

There are four principal components of recharge to the Bone Spring-Victorio Peak Aquifer:

- Precipitation that falls over watersheds that drain toward Dell Valley infiltrates rapidly along fractures and solution features such as sinkholes;
- The Sacramento River, which drains the Sacramento Mountains of New Mexico, discharges large volumes of water to the subsurface in the lowlands that border the mountain catchments;
- Lateral inflow of groundwater from areas to the north and the west; and
- Return flow from irrigation in Dell Valley.

During the irrigation season, the direction of groundwater flow is highly influenced by pumping wells, which create cones of depression in the water table. If pumping rates were not managed, significant water-level declines could result in highly saline water from the Salt Flats migrating westward into the fresher zones. However, chemical analyses of wells along the eastern border of the Valley have not indicated a significant influx of saline water. The Hudspeth County Groundwater Conservation District engages management rules to ensure the water table remains at a sustainable level.

3.2.5 Igneous Aquifer (Davis Mountains Igneous)

The Igneous Aquifer system comprises all contiguous Tertiary igneous (volcanic) formations underlying the Davis Mountains and adjacent areas primarily in Brewster, Jeff Davis and Presidio Counties. Most of the Aquifer's areal extent is underlain by a thickness ranging from 1,000 to 4,000 feet; however, most wells are less than 1,000 feet in depth. The Aquifer is not a single homogeneous aquifer but rather a system of complex water-bearing formations that are in varying degrees of hydrologic communication.

The extent of the Igneous Aquifer as illustrated in Figure 3-3. Major and Minor Aquifers represents a new boundary established in recent studies of the Aquifer system. Groundwater is stored in the fissures and fractures of intrusive and extrusive rocks of volcanic origin. The chemical quality of the Aquifer is generally good to excellent and well yields generally range from small to moderate.

Over 40 separately named volcanic units have been identified, each of which are highly variable in nature. Water quality of the Aquifer is relatively good and generally meets safe drinking water standards. Alpine, Marfa, and Fort Davis, along with a growing rural population, derive their municipal supplies from this Aquifer.

3.2.6 Edwards-Trinity (Plateau) Aquifer

The Edwards-Trinity (Plateau) Aquifer in Far West Texas is the westernmost extension of a vast groundwater system that underlies the Edwards Plateau east of the Pecos River and the Stockton Plateau west of the River. The Aquifer is exposed over an area of 4,690 mi^2 in Terrell (2,350 mi^2), Brewster (1,460 mi^2), Jeff Davis (530 mi^2) and Culberson (350 mi^2) Counties. It is the source of municipal water for the City of Sanderson (Terrell County); a source of domestic water in Brewster, Culberson, and Terrell Counties; a source of irrigation water in Brewster and Terrell Counties; a source of stock water in all four counties; and a source of water for oil and gas operations in Terrell County.

The Aquifer consists of saturated sediments of the Cretaceous age Trinity Group formations and the overlying carbonate rocks (limestone and dolomite) of the Comanche Peak, Edwards, and Georgetown formations. Groundwater occurs under water-table conditions in the four Far West Texas counties.

The hydrogeology of the Edwards-Trinity (Plateau) Aquifer in Far West Texas is not understood as well as in areas to the east, where the Aquifer is a major source of supply for the municipal, industrial and agricultural sectors of the economy.

3.2.7 Capitan Reef Complex Aquifer

The Capitan Reef formed along the margins of the Delaware Basin, a Late Paleozoic sea. In Texas, the reef formed along the western and eastern edges of the basin in arcuate strips 10 to 14 miles wide. The reef is exposed in the Guadalupe and Apache Mountains of Culberson County and in the Glass Mountains of Brewster County. In other areas, the Reef is found only in the subsurface. It extends northward into New Mexico, where it is a source of fresh water for the City of Carlsbad. The Capitan Reef Aquifer is composed of up to 2,000 feet of massive to cavernous dolomite and limestone, bedded limestone, and reef talus. In many areas of Culberson and Hudspeth Counties, the yields of wells are commonly more than 1,000 gpm. Further to the south, in the Apache Mountains of Culberson County, well yields appear to be in the range of 400 gpm. There is no reported production data for the Glass Mountains portion of the Capitan Reef.

The Aquifer is not currently a source of municipal supply; however, El Paso Water owns land over the Aquifer in Culberson County and may tap the Aquifer for municipal supply in the future. Most of the groundwater pumped from the Aquifer in Far West Texas is used for irrigation in Culberson and Hudspeth Counties.

3.2.8 Marathon Aquifer

The Marathon Aquifer is located entirely within the north-central area of Brewster County, where it is the source of municipal supply for the Town of Marathon, and of domestic and stock water for ranches in the area. The Marathon area is underlain by complexly faulted and folded Paleozoic rocks having a total thickness of 21,000 feet and occupying an area of approximately 390 mi^2. The most significant water-bearing formation of the Aquifer is the Marathon Limestone (early Ordovician age).

Groundwater in the Marathon Aquifer generally occurs under unconfined conditions in crevices, joints and cavities; however artesian conditions are common in areas where the Paleozoic rocks are buried beneath younger formations. Existing water wells have penetrated up to 900 feet, however most wells are generally less than 250 feet deep. Many of the shallow wells in the area actually produce water from alluvial deposits that overlie rocks of the Marathon Aquifer. The depth to groundwater is generally less than 150 feet, and depths of less than 50 feet are not uncommon. Groundwater in the Aquifer is typically of good quality but hard.

3.2.9 Rustler Aquifer

The Rustler Aquifer, located in eastern Culberson County, is exposed in a southwest-trending belt that begins at the northeast corner of the County. The Aquifer dips toward the east and is found in the subsurface in easternmost Culberson County and Jeff Davis County. Approximately 803 mi^2 of land in Far West Texas are underlain by the Rustler Aquifer. The Rustler Aquifer is a source of water for irrigation and livestock. High concentrations of dissolved solids render the formation unsuitable as a source of municipal and domestic supply. The Rustler Aquifer consists mainly of dolomite, limestone, and gypsum of the Rustler Formation (Permian age). Groundwater is produced primarily from solution channels, caverns and collapsed breccia zones. The Aquifer is under water-table conditions in the outcrop recharge zone in eastern Culberson County and is under artesian conditions elsewhere.

3.2.10 Pecos Valley Aquifer (Balmorhea Alluvium)

The Balmorhea Alluvium Aquifer, located in a small area along the Jeff Davis and Reeves county line, is recognized in this *Plan* due to its use as a municipal supply source for the City of Balmorhea and the Madera Valley WSC. The TWDB classifies this area as belonging to the Pecos Valley Aquifer; however, the erosion-derived gravel sequence is unlike the sand and silts of the Pecos Valley Alluvium, and recharge is also unique to runoff from the slopes of the Davis Mountains.

3.2.11 Other Groundwater Resources

Also shown in Figure 3-3. Major and Minor Aquifers, are large areas of Far West Texas that are depicted as not underlain by major or minor aquifers. The map, however, should not be interpreted as an indication that such areas are devoid of groundwater, but rather as a reflection of the current level of understanding of the extent of known groundwater resources in the Region.

Rio Grande Alluvium Aquifer

The Rio Grande Alluvium forms the flood plain of the Rio Grande in El Paso and Hudspeth Counties. Averaging approximately 200 feet in thicknesses, the alluvial aquifer is hydrologically connected to the underlying Hueco Bolson. TWDB Report 246 states that the Rio Grande Alluvium Aquifer within El Paso County contains about 1.4 million acre-feet of theoretically recoverable groundwater having less than 2,500 mg/l dissolved solids. Groundwater contained within the Rio Grande alluvial sediments generally has high concentrations of dissolved solids (typically greater than 2,000 mg/l) and requires desalination to meet drinking-water standards. However, it is a source of irrigation water in El Paso and Hudspeth Counties whenever flow in the Rio Grande is insufficient to support agricultural operations. These irrigation wells are capable of annually producing approximately 80,000 acre-feet in El Paso County and 15,000 acre-feet in Hudspeth County from the Aquifer. In addition, the Horizon Regional MUD pumps alluvial groundwater for municipal use, which must be desalinated to meet safe drinking water standards.

For this *Plan*, groundwater availability from the Rio Grande Alluvial Aquifer in El Paso County is 130,380 acre-feet per year, calculated as 89,330 acre-feet per year effective recharge plus five percent of water in storage to a depth of 200 feet and with a salinity range of 1,000 to 2,000 mg/l (TWDB Report 246). Groundwater availability from the Aquifer in Hudspeth County is estimated at approximately 11.5 percent of that in El Paso County, or 15,000 acre-feet per year.

Edwards-Trinity Aquifer of Brewster County (Brewster Cretaceous)

In southern Brewster County, the small communities of Study Butte and Terlingua, as well as the Lajitas Golf Resort, obtain groundwater from underlying Cretaceous formations that are geologically equivalent to the Edwards-Trinity (Plateau) Aquifer. Wells recently drilled to supply water for the Lajitas golf courses have demonstrated that groundwater of likely significant quantity is present in this Aquifer system. However, very little data has been collected pertaining to this Aquifer. The Lajitas' wells are relatively deep, the temperature of the water is warm, and the water contains elevated radioactivity. The FWTWPG recommends that this Aquifer be studied in more detail.

Diablo Plateau Aquifer

The Permian and Cretaceous rock formations that make up the subsurface of the Diablo Plateau of central and northern Hudspeth County may have large volumes of groundwater in storage. Although the Aquifer system has not been adequately researched, Hutchison (2008) included a portion of this Aquifer system in a flow simulation model of the Bone Springs-Victorio Peak Aquifer. Also, several wells have been drilled that testify to the existence of an underground supply.

For this *Plan*, groundwater availability for the eastern and southern portion of the Diablo Plateau is conservatively calculated as 26,400 acre-feet per year effective recharge based on three percent (drought rate) of average annual rainfall (11 inches) times the areal extent of the designated portion of the Aquifer (1,500 mi^2 or 960,000 acres).

3.2.12 Groundwater Conditions in Municipal Wellfields

All communities in the Far West Texas Region rely partially or completely on groundwater supply sources. This section presents groundwater conditions in municipal wellfields within the Region.

3.2.12.1 Brewster County

City of Alpine – The City of Alpine operates 13 active and four backup municipal supply wells in three wellfields (the Musquiz, Sunny Glen, and Town wellfields). Approximately 65 percent of the City's water comes from the Musquiz wellfield located 10 miles to the north. Another 30 percent comes from the Sunny Glen wellfield, which is regarded as having greater storage capacity, located eight miles to the northwest. The remaining five percent is produced by several small wells located around the City. While official reports indicate that water levels have remained relatively stable, there have been notable fluctuations in recent years, particularly in the Sunny Glen and Town wells. Volcanic aquifers, like those supplying Alpine, generally have low storage capacity, making effective monitoring and management crucial.

The Brewster County Groundwater Conservation District (BCGCD) actively monitors these aquifers as part of its broader mission to manage, protect, and conserve groundwater resources. Their efforts include measuring water levels through metered wells and issuing production permits that ensure sustainable water usage across the Region. Additionally, the District coordinates with other regional water planning groups to establish desired future conditions (DFCs) for groundwater management.

It is locally understood that the water table has been drawn down on the decadal timeframe of intensive urban development since the 1880s, from historical accounts of artesian springs and hand dug wells in town. Recent efforts to deepen wells within the Sunny Glen field increased yields from less than 100 gpm to as much as 500 gpm. In response to periodic drops in water levels, especially during droughts, the City has activated its Drought Contingency Plan (DCP), instituting voluntary conservation measures like limiting lawn watering. Upgrades to both the wellfields and the distribution system are actively underway to ensure long-term water security and better manage these fluctuations.

Community of Marathon – The Marathon Water and Sewer Service Corporation provides water to the Community of Marathon from two wells screened in the Marathon Aquifer. Water levels have remained stable in the vicinity of the Community, and there are no reported major water quality problems. There are no other sources of groundwater near the Community.

Communities of Terlingua and Study Butte – The Study Butte Water Supply Corporation (WSC), which provides water to the towns of Study Butte and Terlingua, has developed two wells in the Cretaceous Santa Elena Limestone and the capacity of either well can sufficiently supply daily needs. Water levels have remained relatively stable, but little is known about how high-production wells into the same formation 10 miles away might affect local static water levels. Radiological activity in the untreated water consists mainly of Radon gas and radium 226, which are present in levels barely above detection limits. Radon levels are drastically reduced by mechanically assisted gassing, and the particulate R226 can be filtered out in such a quantity as to leave both an excellent product water and to pose no problems for disposal. This water system has one of the most sophisticated rural public water treatment facilities in West Texas, combining reverse osmosis desalination and other more traditional technologies to produce a product of superior taste and quality. The Study Butte WSC has been approved for TWDB funding and is currently working to install 250 radio-read meters, 10 system check valves, and 4,500 feet of 4-inch and 8-inch water line.

Resort of Lajitas – The Resort of Lajitas currently relies on two deep, large-bore wells of varying water quality drilled into Cretaceous formations. Depending on location, wells have demonstrated artesian characteristics, with completed static level as much as 700 feet above the level where the formation was entered. The water is chemically similar to that found 10 miles away by the Terlingua-Study Butte WSC and poses similar treatment problems. Most water produced by the Lajitas Resort water system is for golf course and turf irrigation from a combination of sources. A state-of-the-art electro-dialysis desalination plant provides high quality product for municipal use by residents, employees, and resort guests. No change in aquifer levels has been reported since the onset of high-volume pumping in 2000, but little reliable data is available for either recharge rates or total pumping volumes.

3.2.12.2 Culberson County

Town of Van Horn – Municipal supply for the Town of Van Horn is derived from four active city-owned wells in the Wild Horse Flat Aquifer. Water levels near Van Horn have remained stable. Other than fluoride concentrations that have been reported to range from 2.3 to 3.1 mg/l, all other dissolved constituents are within their respective safe drinking-water standards. The current wellfield has significant expansion capability if additional production is needed to meet increased demand. The City is replacing all water meters to better monitor water use.

3.2.12.3 El Paso County

City of El Paso (El Paso Water) and Vicinity – The production of groundwater from wellfields in the vicinity of El Paso and in Ciudad Juarez has created a large cone of depression in the potentiometric surface beneath each city. El Paso Water has made considerable efforts in its water resources management to help stabilize groundwater levels and controlling the intrusion of brackish groundwater into fresh portions of the Hueco Bolson Aquifer.

Use of two surface water treatment plants (Jonathan Rogers and Canal Water Treatment) have allowed El Paso Water to maximize its production of renewable surface water and reduce the amount of groundwater pumping. This coupled with the Aquifer Recharge program using highly treated wastewater effluent (to drinking water standards) has allowed El Paso Water to better manage the groundwater resources for long- term sustainability.

Brackish groundwater in the Hueco is now considered an important source of water supply for El Paso Water through the use of reverse osmosis technology at the Kay Bailey Hutchison Desalination plant and with 10 well head reverse osmosis units.

El Paso Water will continue to manage the Aquifer for long-term sustainability by maximizing use of river water when available. This will help reduce the heavy long-term pumping of the Aquifer, and thus reduce the excessive depletion of the Aquifer.

3.2.12.4 Hudspeth County

Community of Sierra Blanca – Water provided to the Community of Sierra Blanca by the Hudspeth County Water Control and Improvement District #1 is from a well located near the airport northwest of the Town of Van Horn in Culberson County. The well produces groundwater from the Wild Horse Flat Aquifer where water levels near the well have remained relatively constant and water quality has been acceptable. Groundwater from the well feeds into the Van Horn water supply and from there is diverted by pipeline to Sierra Blanca under a contract between the District and the City of Van Horn. There is substantial room for expansion if an additional well is needed to meet increased demand. Also, a larger diameter pipeline is being considered for transporting this water to Sierra Blanca. Since 1970, Sierra Blanca has drilled as many as five wells near the town in unsuccessful attempts to develop local sources of groundwater.

City of Dell City – Dell City relies on three wells (only one of which is currently active) completed in the Bone Spring-Victorio Peak Aquifer for municipal water, which is brackish and must be desalinated. The Bone Spring-Victorio Peak Aquifer is capable of supporting production from additional municipal supply wells if needed.

Communities of Fort Hancock and McNary – Fort Hancock and McNary have relied on groundwater provided by one well owned by the Fort Hancock WCID and on 11 wells owned by the Esperanza FWSD#1. All production is from the Rio Grande Alluvium Aquifer. Water levels fall in response to extended drought conditions in the Region, but the owner of the Esperanza FWSD #1 reports that water levels usually recover quickly after periods of rainfall. Water quality is a problem in the area, as TDS ranges from approximately 1,000 mg/l to as much as 2,500 mg/l. Other dissolved solids in excess of drinking water standards are fluoride and manganese. The possibilities for expansion are limited by the occurrence of saline groundwater in both the Rio Grande Alluvium and the Hueco Bolson Aquifer.

3.2.12.5 Jeff Davis County

Community of Fort Davis – The Fort Davis Water Supply Corporation (FDWSC) provides water to the Community of Fort Davis and the surrounding area from three wells completed in the Igneous Aquifer. Water levels in the vicinity of the wells have remained stable, and other than elevated fluoride, there are no reported problems with water quality. FDWSC is considering connecting to a private public-supply well east of town in the future.

Town of Valentine – The Town of Valentine relies on one municipal water-supply well completed in the Ryan Flat Aquifer. The well produces an average rate of 59 gpm with 201 feet of water level drawdown. An emergency backup well owned by the Valentine Independent School District can provide water to the school and to a small number of residences if the City well goes down; however, this will not keep up with normal usage. Water levels near Valentine have remained stable, and there are no reported problems with water quality. Under consideration is a proposal to drill a second municipal water-supply well. The Ryan Flat Aquifer appears to have ample capacity to support additional well development for Valentine.

3.2.12.6 Presidio County

City of Marfa – The City of Marfa depends on three city-owned wells for all its municipal water needs. Two of the wells can produce as much as 1,100 gpm, and the third well yields an additional 450 gpm. The Tertiary volcanic formations of the Igneous Aquifer are the source of groundwater. Other than fluoride, which has been reported at concentrations ranging from 2.5 to 3 mg/l, all other dissolved solids are below their respective safe drinking-water standards, and TDS are typically less than 400 mg/l. The City of Marfa recently drilled a new well to replace an older well that was no longer functioning.

City of Presidio – The City of Presidio derives its municipal water from four wells located east of the City along Alamito Creek, which tap into the Presidio Bolson Aquifer at depths of approximately 530 feet. The Presidio Bolson Aquifer, composed primarily of alluvial and lacustrine sediments, provides relatively good water quality, as reflected by the total dissolved solids level of 374 mg/l, well below EPA limits for safe drinking water. However, groundwater availability in the area can be sensitive to both drought and over-extraction, given the Aquifer's limited recharge rate and semi-arid climate.

The design of the City's water system focuses on addressing these challenges. Groundwater is pumped from the Aquifer to serve the City's 1,783 residential connections, producing approximately 800,000 gallons per day. However, the system has faced issues related to high water pressure, which causes frequent line breaks and water loss. To mitigate these problems, the City implemented improvements such as the construction of a dedicated transmission line between storage tanks, allowing for better pressure management and reduced water losses. Additionally, expansion efforts have extended service northward along Highway 67 to meet growing demand.

3.2.12.7 Terrell County

Community of Sanderson – The Terrell County WCID#1 provides municipal water to the Community of Sanderson from 14 active public supply wells that produce groundwater from the Edwards-Trinity (Plateau) Aquifer. The wells are in three fields; four in the north field, three in the middle field, and seven in the south field. Water levels have remained stable; and water quality is not reported to be a problem for the Community.

3.2.13 Groundwater Exports

Jeff Davis is the only county from which water is exported to other areas outside of its borders. As shown by Table 3-9 below, in 2023 the City of Alpine pumped 511 acre-feet from four wells in the Musquiz well field in southeastern Jeff Davis County. All other exports go to Reeves County. In 2023 the City of Balmorhea and the Madera Valley WSC extracted 101 and 183 acre-feet respectively, from the Edwards-Trinity (Plateau) & Pecos Valley Alluvium Aquifers in northeastern Jeff Davis County.

Table 3-9. Far West Texas 2023 Groundwater Exports (Acre-Feet per Year)

Exporting County	Receiving County	Received By	Source	Amount in 2023	Remarks
Jeff Davis	Brewster	City of Alpine	Igneous Aquifer	511	Pumpage from four wells in Musquiz wellfield
	Reeves	City of Balmorhea	Pecos Valley	101	Pumpage from one well
		Madera Valley WSC	Pecos Valley	183	Pumpage from two wells

Source: Jeff Davis County Underground Water Conservation District
Note: See Region F Water Plan for future water use projections for the Reeves County water user entities.

Also, the U.S. Bureau of Reclamation has water rights for diversions of up to 18,936 acre-feet per year of surface water from Phantom Creek for irrigation use in Reeves County.

3.3 LOCAL SUPPLY

"Local Supplies" refers to limited water supplies that occur within stock tanks that catch precipitation runoff and are used primarily for livestock watering, but at times may be available for other local needs such as mining and irrigation. For planning purposes, the volume of runoff water in these catchment basins is significantly reduced during drought-of-record conditions and does not include any groundwater that might be pumped into them.

For the purposes of the *2026 Far West Texas Water Plan,* the historical water-use estimates (2011-2021) for irrigation, livestock, manufacturing, mining, and steam-electric, generated directly from the TWDB's Water Use Database, was considered in determining existing local surface water supply volumes. These reports reflect the most current and accurate data made available to the State agency. New to this *Plan,* is the "Livestock Local Surface Water Supply" category found on Table 3-2, which provides an additional 216 acre-feet per decade of existing surface water supply to the Region throughout the planning horizon.

3.4 REUSE

Reuse refers to the utilization of return flows from municipal wastewater treatment plants and other water users. Reuse water can be broadly characterized as one of two types: (1) direct reuse, or wastewater that is reused without first being discharged into a stream or watercourse, and (2) indirect reuse, in which wastewater is discharged to a stream or other watercourse prior to being diverted for use.

Direct Reuse

El Paso Water's direct reuse project involves wastewater treatment from four facilities with a combined treatment capacity of 107,758 acre-feet per year and has nearly 40 miles of reclaimed water lines (purple pipeline) in place in all areas of the City. Reclaimed water serves the landscape irrigation demand of golf courses, parks, schools, and cemeteries, and provides water supplies for steam electric plants and industries within the City. EPWater does not plan on extending or growing the purple pipe infrastructure but will focus on maintaining existing purple pipe customers and work towards increasing the use of reclaimed water through additional purified water projects (see EPWater strategies in Chapter 5). For planning purposes, the current use of treated wastewater as reported by the Texas Water Development Board, available to EPWater is about 6,000 acre-feet per year (Table 3-2). It is expected that the Advanced Water Purification Project will come online by 2030, increasing the direct reuse supply amount by 11,210 acre-feet per year, bringing the total volume to approximately 17,210 acre-feet per year.

The City of Alpine in Brewster County is also reusing treated wastewater to irrigate City public spaces. Direct reuse supply available to the City utility (Table 3-1) is 193 acre-feet per year. The City reports that it treats an average of 448 acre-feet of wastewater per year and discharges approximately 109 acre-feet per year (Table 3-2).

Indirect Reuse

Indirect reuse in the form of municipal return flow is an important source of supply for irrigators in El Paso and Hudspeth Counties during the irrigation season from March through September. Supplies currently available in El Paso County are estimated to be 34,169 acre-feet per year. Irrigators in Hudspeth County utilize irrigation return flows from Rio Grande Project water, which is estimated to total 334 acre-feet per year.

APPENDIX 3A
AUTHORIZED SURFACE WATER RIGHTS

This page intentionally left blank

APPENDIX 3A. Authorized Surface Water Rights as Extracted from TCEQ's Active Water Rights Master File

Water Right Number	Application Number	Type	Owners	Diversion Amount (ac-ft/yr.)	Use Type	Priority Date	Storage Amount (ac-ft/yr.)	Basin	County
121	121	Permit	Clajon Production Corporation Williams, Clayton W Jr	124	Domestic and Livestock	09/13/1915	16	Rio Grande	Jeff Davis
375	375	Cert Filing	Us Department of The Interior Bureau of Reclamation	900	Agriculture - Irrigation	06/25/1914		Rio Grande	Jeff Davis
899	899	Cert of Adj	C. and L. Company, Inc.	60	Agriculture - Irrigation	02/12/1925		Rio Grande	Presidio
900	900	Cert of Adj	Darwin Ray Nilsson Regina Marie Nilsson	700	Agriculture - Irrigation	01/01/1909		Rio Grande	Hudspeth
900	900	Cert of Adj	Darwin Ray Nilsson Regina Marie Nilsson	800	Agriculture - Irrigation	01/28/1924	395	Rio Grande	Hudspeth
901	901	Cert of Adj	Roth, Allen L Roth, Anita L Roth, Sheila J Roth, William N	507	Agriculture - Irrigation	01/01/1932		Rio Grande	Hudspeth
902	902	Cert of Adj	Gilberto Morales Patricia Rosales	287.5	Agriculture - Irrigation	12/31/1925		Rio Grande	Hudspeth
902	902	Cert of Adj	Estate of Sidney W. Cowan	42.5	Agriculture - Irrigation	12/31/1925		Rio Grande	Hudspeth
903	903	Cert of Adj	Johnston, Douglas A	63	Agriculture - Irrigation	01/01/1925		Rio Grande	Hudspeth
904	904	Cert of Adj	Bean, J B Bean, Jim B Engle, Vivian Stubbs, Judy	831	Agriculture - Irrigation	01/01/1925		Rio Grande	Hudspeth
905	905	Cert of Adj	Lopez, Kathryne Alice G Villarreal, Marisela	330	Agriculture - Irrigation	01/01/1925		Rio Grande	Hudspeth
906	906	Cert of Adj	Tom H. Neely Trust	164	Agriculture - Irrigation	01/01/1925		Rio Grande	Hudspeth
906	906	Cert of Adj	Betsy W. Whetstone Raymond R. Whetstone	82	Agriculture - Irrigation	01/01/1925		Rio Grande	Hudspeth
907	907	Cert of Adj	Foix, Louis M Sr	150	Agriculture - Irrigation	01/01/1925		Rio Grande	Hudspeth
908	908	Cert of Adj	Talley, Lester Ray Jr	138	Agriculture - Irrigation	01/01/1919		Rio Grande	Hudspeth
909	909	Cert of Adj	Talley, Lester Ray Jr	144	Agriculture - Irrigation	01/01/1947		Rio Grande	Hudspeth
910	910	Cert of Adj	Talley, Lester Ray Jr	126	Agriculture - Irrigation	01/01/1948		Rio Grande	Hudspeth
911	911	Cert of Adj	Talley, Lester Ray	216	Agriculture - Irrigation	01/01/1952		Rio Grande	Hudspeth

APPENDIX 3A. (continued) Authorized Surface Water Rights as Extracted from TCEQ's Active Water Rights Master File

Water Right Number	Application Number	Type	Owners	Diversion Amount (ac-ft/yr.)	Use Type	Priority Date	Storage Amount (ac-ft/yr.)	Basin	County
912	912	Cert of Adj	Autry C. Stephens	15	Agriculture - Irrigation	1920		Rio Grande	Hudspeth
912	912	Cert of Adj	Autry C. Stephens	162	Agriculture - Irrigation	1948		Rio Grande	Hudspeth
913	913	Cert of Adj	Addington, Gloria Guerra	582	Agriculture - Irrigation	01/01/1912		Rio Grande	Hudspeth
914	914	Cert of Adj	Texas Parks and Wildlife Department	219	Agriculture - Irrigation Instream	01/01/1939		Rio Grande	Hudspeth
915	915	Cert of Adj	Rancho Pensado Properties, LLC	291.6	Agriculture - Irrigation	01/01/1902		Rio Grande	Presidio
915	915	Cert of Adj	Oscar B. Jackson	291.6	Agriculture - Irrigation	01/01/1902		Rio Grande	Presidio
915	915	Cert of Adj	Rancho Pensado Properties, LLC	291.6	Agriculture - Irrigation	01/01/1902		Rio Grande	Presidio
915	915	Cert of Adj	Kenneth R. Matthews	291.6	Agriculture - Irrigation	01/01/1902		Rio Grande	Presidio
915	915	Cert of Adj	Harry Miller	291.6	Agriculture - Irrigation	01/01/1902		Rio Grande	Presidio
915	915	Cert of Adj	Andrew H. Jackson	194.4	Agriculture - Irrigation	01/01/1902		Rio Grande	Presidio
915	915	Cert of Adj	C. B. Fields	291.6	Agriculture - Irrigation	01/01/1902		Rio Grande	Presidio
916	916	Cert of Adj	Texas Parks and Wildlife Department	714	Agriculture - Irrigation	01/01/1932		Rio Grande	Presidio
917	917	Cert of Adj	Carlye Pavlas Pavlas, Leo J	405	Agriculture - Irrigation	11/11/1924		Rio Grande	Presidio
918	918	Cert of Adj	Walker, Billy O Walker, Darline L	29.19	Agriculture - Irrigation	01/01/1932		Rio Grande	Presidio
918	918	Cert of Adj	Bishop, B J	18.81	Agriculture - Irrigation	01/01/1932		Rio Grande	Presidio
919	919	Cert of Adj	Joel Terry	243	Agriculture - Irrigation	01/01/1949		Rio Grande	Presidio
920	920	Cert of Adj	United Farms of Oasis, LLC	495	Agriculture - Irrigation	03/20/1917		Rio Grande	Presidio
921	921	Cert of Adj	AC&L Armendariz Partnership	270	Agriculture - Irrigation	01/01/1917		Rio Grande	Presidio
922	922	Cert of Adj	Garcia, Margarita O Garcia, Merced O Garcia, Ricardo Garcia, Viola O Garcia, Ysidro Jr	90	Agriculture - Irrigation	01/01/1924		Rio Grande	Presidio Terrell
924	924	Cert of Adj	La Haciendita Pecan Company, LLC	174	Agriculture - Irrigation	03/20/1917		Rio Grande	Presidio

APPENDIX 3A. (continued) Authorized Surface Water Rights as Extracted from TCEQ's Active Water Rights Master File

Water Right Number	Application Number	Type	Owners	Diversion Amount (ac-ft/yr.)	Use Type	Priority Date	Storage Amount (ac-ft/yr.)	Basin	County
925	925	Cert of Adj	Bauernfeind, Victorina S Chavez, Ernestina Lof, Valentina Rodriguez, Rudolfo Saldivar, Aida Soza, Carlos Soza, Evangelina Soza, Francisco Soza, Jesusita Soza, Jose Jr Soza, Lupe Soza, Wilfredo Urias, Maria Dolores Zavala, Natalia S	42	Agriculture - Irrigation	03/26/1917		Rio Grande	Presidio
926	926	Cert of Adj	Soza, Robert L	66	Agriculture - Irrigation	03/26/1917		Rio Grande	Presidio
927	927	Cert of Adj	Lajitas Capital Partners LLC	72	Agriculture - Irrigation	03/26/1917		Rio Grande	Presidio
928	928	Cert of Adj	Lajitas Capital Partners LLC	57	Agriculture - Irrigation	03/26/1917		Rio Grande	Presidio
929	929	Cert of Adj	Baeza, Alfredo S	48	Agriculture - Irrigation	03/26/1917		Rio Grande	Presidio
930	930	Cert of Adj	Soza & Company, Ltd.	114	Agriculture - Irrigation	03/26/1917		Rio Grande	Presidio
931	931	Cert of Adj	Jose A. Spencer Dr. Roberto R. Spencer	111	Agriculture - Irrigation Instream	03/26/1917		Rio Grande	Presidio
932	932	Cert of Adj	Armendariz, Frank Armendariz, Martha R	606	Agriculture - Irrigation	03/26/1917		Rio Grande	Presidio
933	933	Cert of Adj	Armendariz, Luz S	321	Agriculture - Irrigation	03/26/1917		Rio Grande	Presidio
936	936	Cert of Adj	Rodriguez, Jose Natividad	33.994	Agriculture - Irrigation	01/01/1914		Rio Grande	Presidio
936	936	Cert of Adj	Rodriguez, Salvador S	33.166	Agriculture - Irrigation	01/01/1914		Rio Grande	Presidio
936	936	Cert of Adj	Rodriguez, Jose Natividad	113.806	Agriculture - Irrigation	03/26/1917		Rio Grande	Presidio
936	936	Cert of Adj	Rodriguez, Salvador S	111.034	Agriculture - Irrigation	03/26/1917		Rio Grande	Presidio
937	937	Cert of Adj	Rodriguez, Jose A	114	Agriculture - Irrigation	03/26/1917		Rio Grande	Presidio
938	938	Cert of Adj	Rodriguez, Jose A	120	Agriculture - Irrigation	03/26/1917		Rio Grande	Presidio
939	939	Cert of Adj	Hernandez, Lorenzo	45	Agriculture - Irrigation	03/26/1917		Rio Grande	Presidio

APPENDIX 3A. (continued) Authorized Surface Water Rights as Extracted from TCEQ's Active Water Rights Master File

Water Right Number	Application Number	Type	Owners	Diversion Amount (ac-ft/yr.)	Use Type	Priority Date	Storage Amount (ac-ft/yr.)	Basin	County
939	939	Cert of Adj	Hernandez, Lorenzo	45	Agriculture - Irrigation	03/26/1917		Rio Grande	Presidio
940	940	Cert of Adj	Rodriguez, Jesus M Jr	180	Agriculture - Irrigation Instream	01/01/1914		Rio Grande	Presidio
941	941	Cert of Adj	RCS, Inc.	164	Agriculture - Irrigation	03/26/1917		Rio Grande	Presidio
942	942	Cert of Adj	Crosson, Pauline Juarez	25.98	Agriculture - Irrigation	01/01/1914		Rio Grande	Presidio
942	942	Cert of Adj	Rcs, Inc.	145.32	Agriculture - Irrigation	01/01/1914		Rio Grande	Presidio
942	942	Cert of Adj	Sanchez, Edmundo	28.7	Agriculture - Irrigation	01/01/1914		Rio Grande	Presidio
943	943	Cert of Adj	RCS, Inc.	420	Agriculture - Irrigation	01/01/1927		Rio Grande	Presidio
944	944	Cert of Adj	Santa Cruz Land & Cattle, Inc.	743	Agriculture - Irrigation	02/12/1925		Rio Grande	Presidio
946	946	Cert of Adj	RCS, Inc.	61	Agriculture - Irrigation	02/12/1925		Rio Grande	Presidio
947	947	Cert of Adj	RCS, Inc.	800	Agriculture - Irrigation	02/12/1925		Rio Grande	Presidio
948	948	Cert of Adj	C. and L. Company, Inc.	880	Agriculture - Irrigation	02/12/1925		Rio Grande	Presidio
949	949	Cert of Adj	C. and L. Company, Inc.	267	Agriculture - Irrigation	12/12/1924		Rio Grande	Presidio
950	950	Cert of Adj	Spencer, Oscar Miguel	39	Agriculture - Irrigation	02/12/1925		Rio Grande	Presidio
952	952	Cert of Adj	City of Eagle Pass Water Works System	4,600	Municipal/Domestic	02/12/1925		Rio Grande	Presidio
952	952	Cert of Adj	City of Laredo	2,818	Municipal/Domestic	02/12/1925		Rio Grande	Presidio
952	952	Cert of Adj	Maverick County	641	Municipal/Domestic	02/12/1925		Rio Grande	Presidio
953	953	Cert of Adj	C F and L Enterprises Rcs, Inc.	407	Agriculture - Irrigation	02/12/1925		Rio Grande	Presidio
954	954	Cert of Adj	C F and L Enterprises Rcs, Inc.	684	Agriculture - Irrigation	02/12/1925		Rio Grande	Presidio
955	955	Cert of Adj	C F and L Enterprises Rcs, Inc.	172	Agriculture - Irrigation	02/12/1925		Rio Grande	Presidio
956	956	Cert of Adj	Rubio, Manuel M Rubio, Roberto M	84	Agriculture - Irrigation	01/01/1925		Rio Grande	Presidio
957	957	Cert of Adj	Nieto, Edmundo M Nieto, Eva Maria Nieto, Lucy Spencer, Delpha Nieto	536	Agriculture - Irrigation	01/01/1932		Rio Grande	Presidio
958	958	Cert of Adj	Oscar Carnero	48.28	Agriculture - Irrigation	01/01/1932		Rio Grande	Presidio

APPENDIX 3A. (continued) Authorized Surface Water Rights as Extracted from TCEQ's Active Water Rights Master File

Water Right Number	Application Number	Type	Owners	Diversion Amount (ac-ft/yr.)	Use Type	Priority Date	Storage Amount (ac-ft/yr.)	Basin	County
958	958	Cert of Adj	Covos, Manuel Covos, Olivia R	43.72	Agriculture - Irrigation	01/01/1932		Rio Grande	Presidio
960	960	Cert of Adj	Alfonso C. Brito Laurencio C. Brito	140	Agriculture - Irrigation	12/31/1932		Rio Grande	Presidio
961	961	Cert of Adj	Brito, Laurencio	24.415	Agriculture - Irrigation	12/31/1925		Rio Grande	Presidio
961	961	Cert of Adj	Alfonso C. Brito Laurencio C. Brito	47.585	Agriculture - Irrigation	12/31/1925		Rio Grande	Presidio
962	962	Cert of Adj	Hernandez, Reynaldo	96	Agriculture - Irrigation	01/01/1925		Rio Grande	Presidio
963	963	Cert of Adj	Rcs, Inc.	160	Agriculture - Irrigation	01/01/1900		Rio Grande	Presidio
964	964	Cert of Adj	Rcs, Inc.	376	Agriculture - Irrigation	01/01/1927		Rio Grande	Presidio
965	965	Cert of Adj	Hernandez, Consuelo Hernandez, George	60	Agriculture - Irrigation	01/01/1900		Rio Grande	Presidio
966	966	Cert of Adj	Hernandez, Hector A	80	Agriculture - Irrigation	01/01/1918		Rio Grande	Presidio
967	967	Cert of Adj	Mccall, Herminia M	80	Agriculture - Irrigation	01/01/1932		Rio Grande	Presidio
967	967	Cert of Adj	Geral Mead McCall Mccall, Herminia M	180	Agriculture - Irrigation	01/01/1932		Rio Grande	Presidio
969	969	Cert of Adj	Texas Mountain Cattle Company, LLC		Recreation	10/13/1910	18,700	Rio Grande	Presidio
971	971	Cert of Adj	Patrick W Daly Mark C Morrison	35	Agriculture - Irrigation	01/01/1918		Rio Grande	Presidio
972	972	Cert of Adj	Lucia H Russell Estate	80	Agriculture - Irrigation	10/13/1927		Rio Grande	Presidio
973	973	Cert of Adj	Hernandez, Jose A	96	Agriculture - Irrigation	01/01/1948		Rio Grande	Presidio
974	974	Cert of Adj	Presidio County Water Improvement District 1	2,780	Agriculture - Irrigation Instream	01/01/1978		Rio Grande	Presidio
975	975	Cert of Adj	Lajitas Capital Partners LLC	380	Agriculture - Irrigation	01/01/1908		Rio Grande	Presidio
976	976	Cert of Adj	Madrid, Ruben H	56	Agriculture - Irrigation	01/01/1952		Rio Grande	Presidio
977	977	Cert of Adj	Madrid, Lydia	40	Agriculture - Irrigation	01/01/1945		Rio Grande	Presidio
978	978	Cert of Adj	Margarita C. Madrid	32	Agriculture - Irrigation	01/01/1953		Rio Grande	Presidio
978	978	Cert of Adj	Margarita C. Madrid	304	Agriculture - Irrigation	08/12/1974		Rio Grande	Presidio
979	979	Cert of Adj	Travis Tucker	52	Agriculture - Irrigation	01/01/1953		Rio Grande	Presidio
980	980	Cert of Adj	Travis Tucker	52	Agriculture - Irrigation	01/01/1953		Rio Grande	Presidio

APPENDIX 3A. (continued) Authorized Surface Water Rights as Extracted from TCEQ's Active Water Rights Master File

Water Right Number	Application Number	Type	Owners	Diversion Amount (ac-ft/yr.)	Use Type	Priority Date	Storage Amount (ac-ft/yr.)	Basin	County
981	981	Cert of Adj	Nadine Pineda Mata	84	Agriculture - Irrigation	01/01/1921		Rio Grande	Presidio
981	981	Cert of Adj	Leo N. Pineda	84	Agriculture - Irrigation	01/01/1921		Rio Grande	Presidio
982	982	Cert of Adj	Madrid, Enrique Rede Madrid, Jaime Rede Madrid, Lydia	80	Agriculture - Irrigation	01/01/1947		Rio Grande	Presidio
983	983	Cert of Adj	Mallan, Thomas A	84	Agriculture - Irrigation	01/01/1947		Rio Grande	Presidio
985	985	Cert of Adj	Adan Madrid Ninfa Madrid	20	Agriculture - Irrigation	01/01/1921		Rio Grande	Presidio
986	986	Cert of Adj	Lajitas Capital Partners LLC	224.26	Agriculture - Irrigation	03/26/1917		Rio Grande	Brewster
986	986	Cert of Adj	Lajitas Municipal Services Company LLC	144	Municipal/Domestic	03/26/1917		Rio Grande	Brewster
986	986	Cert of Adj	Frank W. Howard	0.74	Agriculture - Irrigation	03/26/1917		Rio Grande	Brewster
987	987	Cert of Adj	US Department of The Interior National Park Service	530	Municipal/Domestic	11/17/1915		Rio Grande	Brewster
987	987	Cert of Adj	US Department of The Interior National Park Service	1,000	Agriculture - Irrigation	11/17/1915		Rio Grande	Brewster
988	988	Cert of Adj	El Carmen Land and Conservation Company, LLC	20	Agriculture - Irrigation	01/01/1932		Rio Grande	Brewster
989	989	Cert of Adj	El Carmen Land and Conservation Company, LLC	180	Agriculture - Irrigation	01/01/1932		Rio Grande	Brewster
990	990	Cert of Adj	Combs, Susan David K Combs Trust	1,520	Agriculture - Irrigation	07/02/1925		Rio Grande	Brewster
991	991	Cert of Adj	Jordan, W N Chris	3,800	Agriculture - Irrigation	07/02/1925		Rio Grande	Brewster
991	991	Cert of Adj	Basse, E A Iii	3,800	Agriculture - Irrigation	07/02/1925		Rio Grande	Brewster
992	992	Cert of Adj	Anale W Hodge Trustee Hodge, Byron W Hodge, Lauralee	152	Agriculture - Irrigation	01/01/1956		Rio Grande	Terrell
1172	1172	Cert of Adj	Scott Locke McIvor	15	Agriculture - Irrigation Recreation	04/01/1963	20	Rio Grande	Jeff Davis
1173	1173	Cert of Adj	Tanner Fulton Whitesell	13.8	Agriculture - Irrigation	01/01/1923		Rio Grande	Jeff Davis
1173	1173	Cert of Adj	Trent Mccann Whitesell	13.8	Agriculture - Irrigation	01/01/1923		Rio Grande	Jeff Davis
1173	1173	Cert of Adj	Stephanie Sproul Rentfro	13.8	Agriculture - Irrigation	01/01/1923		Rio Grande	Jeff Davis
1173	1173	Cert of Adj	Johnathan Mccann Rentfro	13.8	Agriculture - Irrigation	01/01/1923		Rio Grande	Jeff Davis

APPENDIX 3A. (continued) Authorized Surface Water Rights as Extracted from TCEQ's Active Water Rights Master File

Water Right Number	Application Number	Type	Owners	Diversion Amount (ac-ft/yr.)	Use Type	Priority Date	Storage Amount (ac-ft/yr.)	Basin	County
1173	1173	Cert of Adj	Zachary Everett Rentfro	13.8	Agriculture - Irrigation	01/01/1923		Rio Grande	Jeff Davis
1174	1174	Cert of Adj	Sproul, H E	224	Agriculture - Irrigation Recreation	01/01/1992	3	Rio Grande	Jeff Davis
1175	1175	Cert of Adj	Thompson, Isabel Cecilia	5	Agriculture - Irrigation	01/01/1916		Rio Grande	Jeff Davis
1176	1176	Cert of Adj	Higgins, Bessie J Higgins, Jimmy G	4	Agriculture - Irrigation	01/01/1985		Rio Grande	Jeff Davis
1177	1177	Cert of Adj	Hoffman, George A MD Teague, Anna Maria Hoffman	50	Agriculture - Irrigation	11/04/1907		Rio Grande	Jeff Davis
1178	1178	Cert of Adj	Sharp, Estelle Langham	15	Agriculture - Irrigation	01/01/1896		Rio Grande	Jeff Davis
1392	1491	Permit	US Bureau of Reclamation	18,000	Agriculture - Irrigation	06/18/1946		Rio Grande	Jeff Davis
2926	2926	Claim	Leoncita Land Company		Agriculture - Irrigation	08/28/1969	900	Rio Grande	Brewster
3002	3245	Permit	Brown, Joe Russell	312	Agriculture - Irrigation	06/15/1974		Rio Grande	Hudspeth
3003	3246	Permit	Brown, Joe Russell	156	Agriculture - Irrigation	07/15/1974		Rio Grande	Hudspeth
3005	3255	Permit	Laura P Haefeli Thomas E Haefeli	108	Agriculture - Irrigation	08/12/1974		Rio Grande	Presidio
3006	3256	Permit	Lajitas Capital Partners LLC	132	Agriculture - Irrigation	08/12/1974		Rio Grande	Presidio
3032	3295	Permit	Pope Ranch	140.7	Agriculture - Irrigation	11/04/1974		Rio Grande	Brewster
3032	3295	Permit	Pope Ranches, Lp	1,119.3	Agriculture - Irrigation	11/04/1974		Rio Grande	Brewster
3033	3326	Permit	Combs, Susan David K Combs Trust	80	Agriculture - Irrigation	12/16/1974	10	Rio Grande	Brewster
3033	3326	Permit	Combs, Susan David K Combs Trust	20	Agriculture - Irrigation Recreation	12/16/1974		Rio Grande	Brewster
3034	3327	Permit	Combs, Susan David K Combs Trust	450	Agriculture - Irrigation	12/16/1974		Rio Grande	Brewster
3041	3314	Permit	Texas Parks and Wildlife Department	1,017	Agriculture - Irrigation Instream	12/09/1974		Rio Grande	Hudspeth
3092	3392	Permit	Lucia H Russell Estate	100	Agriculture - Irrigation	01/12/1970		Rio Grande	Presidio
3112	3393	Permit	Texas Parks and Wildlife Department	156	Agriculture - Irrigation	02/10/1975		Rio Grande	Presidio
3113	3402	Permit	Potter, Walter Travis	200	Agriculture - Irrigation	02/24/1975		Rio Grande	Brewster
3133	3369	Permit	Green, Elinor Frances	162	Agriculture - Irrigation	01/20/1975	9	Rio Grande	Brewster
3133	3369	Permit	Neville Ranch	18	Agriculture - Irrigation	06/24/1975		Rio Grande	Brewster

APPENDIX 3A. (continued) Authorized Surface Water Rights as Extracted from TCEQ's Active Water Rights Master File

Water Right Number	Application Number	Type	Owners	Diversion Amount (ac-ft/yr.)	Use Type	Priority Date	Storage Amount (ac-ft/yr.)	Basin	County
3144	3405	Permit	Love, Ben Love, Jackson B Love, Jackson B Jr Orr, Kathleen Love	400	Agriculture - Irrigation	03/03/1975		Rio Grande	Brewster
3153	3404	Permit	Woodward, J Frank Jr	12.5	Agriculture - Irrigation	03/03/1975		Rio Grande	Brewster
5375	5375	Permit	Brewster County		Recreation	08/16/1991	7	Rio Grande	Brewster
5439	5439	Cert of Adj	City of Balmorhea	644	Municipal/Domestic	01/29/1930	109	Rio Grande	Jeff Davis
5440	5440	Cert of Adj	James P. Espy Mandy Lynn Espy Sally Hardy Espy Josiah Winchester	45	Agriculture - Irrigation	12/31/1939	2	Rio Grande	Jeff Davis
5451	5451	Cert of Adj	Union Pacific Railroad Company		Agriculture - Irrigation	06/16/1914	597	Rio Grande	Jeff Davis
5451	5451	Cert of Adj	Union Pacific Railroad Company		Agriculture - Irrigation	07/25/1960	327	Rio Grande	Jeff Davis
5451	5451	Cert of Adj	Davis, J L	223	Agriculture - Irrigation	07/25/1960		Rio Grande	Jeff Davis
5452	5452	Cert of Adj	Beal, Barry A	50	Agriculture - Irrigation	11/13/1915	2	Rio Grande	Jeff Davis
5462	5462	Cert of Adj	Chandler, Charlena J Estate of Joe B. Chandler	125.09	Agriculture - Irrigation	02/17/1920	14	Rio Grande	Terrell
5462	5462	Cert of Adj	Chandler, Charlena J Jobeth Elrod	10.72	Agriculture - Irrigation	02/17/1920		Rio Grande	Terrell
5462	5462	Cert of Adj	The Nature Conservancy	4.19	Agriculture - Irrigation	02/17/1920		Rio Grande	Terrell
5463	5463	Cert of Adj	The Nature Conservancy	530	Agriculture - Irrigation Instream	12/31/1900	192	Rio Grande	Terrell
5464	5464	Cert of Adj	Banner Residual Trust Sandra K Banner	150	Agriculture - Irrigation	12/31/1919		Rio Grande	Terrell
5465	5465	Cert of Adj	Clark, John Robbins, John Edward	8.25	Agriculture - Irrigation	07/12/1919		Rio Grande	Terrell
5466	5466	Cert of Adj	Banner Residual Trust Sandra K Banner	44.4	Agriculture - Irrigation	12/31/1917	15	Rio Grande	Terrell
5466	5466	Cert of Adj	Bell, Mattie Banner	0.6	Agriculture - Irrigation	12/31/1917		Rio Grande	Terrell

APPENDIX 3A. (continued) Authorized Surface Water Rights as Extracted from TCEQ's Active Water Rights Master File

Water Right Number	Application Number	Type	Owners	Diversion Amount (ac-ft/yr.)	Use Type	Priority Date	Storage Amount (ac-ft/yr.)	Basin	County
5467	5467	Cert of Adj	C L Ranch A Partnership Connecticut Mutual Life Insurance Company Lynch, James Jr Lynch, Mary	2,200	Agriculture - Irrigation	09/15/1980	775	Rio Grande	Hudspeth
5468	5468	Cert of Adj	C L Machinery Company Connecticut Mutual Life Insurance Company	2,400	Agriculture - Irrigation	09/15/1980	458	Rio Grande	Hudspeth
5469	5469	Cert of Adj	C L Ranch A Partnership	2,100	Agriculture - Irrigation	09/15/1980	588	Rio Grande	Hudspeth
5940	5940	Cert of Adj	El Paso County Water Improvement District 1 United States of America	376,000	Agriculture - Irrigation Industrial Mining Municipal/Domestic Recreation	07/06/1889	2,638,860	Rio Grande	El Paso
5941	5941	Cert of Adj	Cemex El Paso, Inc	178	Industrial	01/01/1910	178	Rio Grande	El Paso
5942	5942	Cert of Adj	City of El Paso	11,000	Flood Control Municipal/Domestic	11/01/1948		Rio Grande	El Paso
5943	5943	Cert of Adj	Indian Cliffs Ranch, Inc.		Recreation	10/11/1977	52	Rio Grande	El Paso
5944	5944	Cert of Adj	United States of America	26,600	Agriculture - Irrigation	11/22/1917		Rio Grande	El Paso
5944	5944	Cert of Adj	Hudspeth County Conservation & Reclamation District 1	26,600	Agriculture - Irrigation Industrial Mining Recreation	11/22/1917		Rio Grande	El Paso
13727	13727	Permit	El Paso Water Utilities Public Service Board		Flood Control	09/28/2020	122	Rio Grande	El Paso

Cert of Adj – Certificate of Adjudication
Cert Filing – Certified Filing

This page intentionally left blank

CHAPTER 4
IDENTIFICATION OF WATER NEEDS

This page intentionally left blank.

4 IDENTIFICATION OF WATER NEEDS

Chapter 4 provides projections (Table 4-1) of water-supply surpluses or deficits for all water-user groups (WUGs) by decade based on a comparison of projected water demands by decade for each water-use entity from Chapter 2 (Table 2-2) with water supplies available to meet those demands from Chapter 3 (Table 3-2). A water-supply deficit may develop for individual water-use entities for numerous reasons including supply availability limits, infrastructure limitations, or legal limits. Major Water Provider (MWP) needs by water-use category are provided in Table 4-2. Similarly, Table 4-3 provides the needs/surpluses analysis for all MWPs and by category of use.

Water-supply deficits are identified for several municipalities, in El Paso County; for irrigation supply use in Culberson, El Paso, Hudspeth, and Terrell Counties; for livestock supply use in Hudspeth, Jeff Davis, and Presidio Counties; and for mining supply in Brewster, Culberson, and Hudspeth Counties.

A secondary water needs analysis by all water-user groups and by category of use for which conservation or direct reuse water management strategies are recommended is provided in Table 4-5 and 4-6. This secondary water needs analysis calculates the water needs that would remain after assuming all recommended conservation and reuse water management strategies are fully implemented. Tables 4-7 provides similar data by Major Water Providers.

Water-supply strategy recommendations are then made in Chapter 5 for those water users that have projected water-supply deficits based on the comparison between demand and supply. In addition, strategies are also developed for specific entities that although they are not projected to have future shortages, they do have anticipated water-supply projects that deserve to be recognized in the *Regional Plan.* A socioeconomic impact of unmet water needs analysis prepared by the Texas Water Development Board is provided in Chapter 6, Appendix 6A.

Table 4-1. Identified Water (Needs)/Surpluses (Acre-Feet per Year)

	2030	2040	2050	2060	2070	2080
Brewster County - Rio Grande Basin						
Alpine	1,303	1,422	1,525	1,609	1,693	1,777
Lajitas Municipal Services	87	97	105	113	119	126
Marathon Water Supply	126	131	135	138	141	145
Study Butte Terlingua Water System	46	59	71	81	90	99
County-Other	224	237	247	255	263	271
Mining	(4)	(4)	(5)	(5)	(5)	(5)
Livestock	0	0	0	0	0	0
Irrigation	6,354	6,353	6,350	6,349	6,349	6,349
Culberson County - Rio Grande Basin						
Van Horn	360	411	448	484	520	557
County-Other	26	29	32	34	37	39
Manufacturing	0	0	0	0	0	0
Mining	(6,708)	(6,711)	(6,715)	(6,717)	(6,718)	(6,718)
Livestock	65	65	65	65	65	65
Irrigation	(22,063)	(22,140)	(22,190)	(22,232)	(22,322)	(22,394)

Table 4-1. (continued) Identified Water (Needs)/Surpluses (Acre-Feet per Year)

	2030	2040	2050	2060	2070	2080
El Paso County - Rio Grande Basin						
Anthony	989	956	938	930	923	915
East Montana Water System	227	125	69	46	23	0
El Paso County Tornillo WID	207	192	183	179	175	171
El Paso County WCID #4	390	354	333	325	316	307
El Paso Water	10,211	6,904	4,764	3,240	1,691	117
Federal Correctional Institution La Tuna	1,647	1,648	1,648	1,648	1,648	1,648
Fort Bliss and East Biggs	(928)	(1,153)	(1,291)	(1,348)	(1,405)	(1,463)
Haciendas Del Norte WID	34	20	13	12	12	12
Horizon Regional MUD	(3,142)	(3,508)	(3,715)	(3,799)	(3,885)	(3,970)
Lower Valley Water District	(2,820)	(3,078)	(3,232)	(3,296)	(3,360)	(3,424)
Paseo Del Este MUD 1	459	251	139	93	47	0
County-Other	6,200	6,183	6,172	6,168	6,164	6,160
Manufacturing	1,617	1,324	1,020	705	378	39
Mining	757	613	470	335	206	88
Steam Electric Power	0	0	0	0	0	0
Livestock	0	0	0	0	0	0
Irrigation	(75,914)	(74,634)	(73,831)	(73,322)	(72,805)	(72,281)
Hudspeth County - Rio Grande Basin						
Esperanza Water Service	360	373	381	390	398	406
Hudspeth County WCID 1	12	64	101	136	170	205
County-Other	89	103	114	124	133	143
Mining	(7)	(9)	(10)	(11)	(11)	(11)
Livestock	(7)	(7)	(7)	(7)	(7)	(7)
Irrigation	(19,056)	(19,056)	(19,056)	(19,056)	(19,056)	(19,056)
Jeff Davis County - Rio Grande Basin						
Fort Davis WSC	182	228	275	323	372	420
County-Other	107	127	148	169	191	212
Mining	22	22	22	22	22	22
Livestock	(189)	(189)	(189)	(189)	(189)	(189)
Irrigation	208	208	208	208	208	208
Presidio County - Rio Grande Basin						
Marfa	1,281	1,388	1,459	1,522	1,584	1,648
Presidio	1,820	1,904	1,960	2,009	2,058	2,108
County-Other	36	45	50	54	59	64
Livestock	(2)	(2)	(2)	(2)	(2)	(2)
Irrigation	5,349	5,349	5,349	5,349	5,349	5,349

Table 4-1. (continued) Identified Water (Needs)/Surpluses (Acre-Feet per Year)

	2030	2040	2050	2060	2070	2080
Terrell County - Rio Grande Basin						
Terrell County WCID 1	345	370	384	399	414	429
County-Other	24	28	30	32	34	36
Mining	9	9	9	9	9	9
Livestock	0	0	0	0	0	0
Irrigation	(51)	(51)	(51)	(51)	(51)	(51)

Table 4-2. Identified Water (Needs)/Surpluses by Category of Use (Acre-Feet per Year)

WUG County	WUG Category	2030	2040	2050	2060	2070	2080
Brewster	Municipal	1,786	1,946	2,083	2,196	2,306	2,418
	Mining	(4)	(4)	(5)	(5)	(5)	(5)
	Livestock	0	0	0	0	0	0
	Irrigation	6,354	6,353	6,350	6,349	6,349	6,349
Culberson	Municipal	386	440	480	518	557	596
	Manufacturing	0	0	0	0	0	0
	Mining	(6,708)	(6,711)	(6,715)	(6,717)	(6,718)	(6,718)
	Livestock	65	65	65	65	65	65
	Irrigation	(22,063)	(22,140)	(22,190)	(22,232)	(22,322)	(22,394)
El Paso	Municipal	13,474	8,894	6,021	4,198	2,349	473
	Manufacturing	1,617	1,324	1,020	705	378	39
	Mining	757	613	470	335	206	88
	Steam Electric Power	0	0	0	0	0	0
	Livestock	0	0	0	0	0	0
	Irrigation	(75,914)	(74,634)	(73,831)	(73,322)	(72,805)	(72,281)
Hudspeth	Municipal	461	540	596	650	701	754
	Mining	(7)	(9)	(10)	(11)	(11)	(11)
	Livestock	(7)	(7)	(7)	(7)	(7)	(7)
	Irrigation	(19,056)	(19,056)	(19,056)	(19,056)	(19,056)	(19,056)
Jeff Davis	Municipal	289	355	423	492	563	632
	Mining	22	22	22	22	22	22
	Livestock	(189)	(189)	(189)	(189)	(189)	(189)
	Irrigation	208	208	208	208	208	208
Presidio	Municipal	3,137	3,337	3,469	3,585	3,701	3,820
	Livestock	(2)	(2)	(2)	(2)	(2)	(2)
	Irrigation	5,349	5,349	5,349	5,349	5,349	5,349
Terrell	Municipal	369	398	414	431	448	465
	Mining	9	9	9	9	9	9
	Livestock	0	0	0	0	0	0
	Irrigation	(51)	(51)	(51)	(51)	(51)	(51)

Table 4-3. Major Water Provider (Needs)/Surpluses (Acre-Feet per Year)

		2030	2040	2050	2060	2070	2080
El Paso County WID#1	Total Supply	124,876	126,156	126,959	127,468	127,985	128,509
	Total Demand	193,990	193,990	193,990	193,990	193,990	193,990
	Surplus / (Need)	(69,114)	(67,834)	(67,031)	(66,522)	(66,005)	(65,481)
El Paso Water Utilities	Total Supply	131,000	131,000	131,000	131,000	131,000	131,000
	Total Demand	120,789	124,096	126,236	127,760	129,309	130,883
	Surplus / (Need)	10,211	6,904	4,764	3,240	1,691	117
Lower Valley Water District	Total Supply	4,356	4,356	4,356	4,356	4,356	4,356
	Total Demand	7,176	7,434	7,588	7,652	7,716	7,780
	Surplus / (Need)	(2,820)	(3,078)	(3,232)	(3,296)	(3,360)	(3,424)
Horizon MUD	Total Supply	1,578	1,578	1,578	1,578	1,578	1,578
	Total Demand	9,548	9,914	10,121	10,205	10,291	10,376
	Surplus / (Need)	(7,970)	(8,336)	(8,543)	(8,627)	(8,713)	(8,798)

Table 4-4. Major Water Provider (Needs)/Surpluses by Category of Use (Acre Feet per Year)

MWP Use Category	Major Water Provider	2030	2040	2050	2060	2070	2080
Municipal	El Paso Water	10,211	6,904	4,764	3,240	1,691	117
	Lower Valley Water District	(2,820)	(3,078)	(3,232)	(3,296)	(3,360)	(3,424)
	Horizon Regional MUD	(7,970)	(8,336)	(8,543)	(8,627)	(8,713)	(8,798)
Irrigation	El Paso County WID #1	(69,114)	(67,834)	(67,031)	(66,522)	(66,005)	(65,481)

Table 4-5. Second Tier Identified Water Needs (Acre Feet per Year)

	2030	2040	2050	2060	2070	2080
Brewster County - Rio Grande Basin						
Alpine	0	0	0	0	0	0
Lajitas Municipal Services	0	0	0	0	0	0
Marathon Water Supply	0	0	0	0	0	0
Study Butte Terlingua Water System	0	0	0	0	0	0
County-Other	0	0	0	0	0	0
Mining	0	0	0	0	0	0
Livestock	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0
Culberson County - Rio Grande Basin						
Van Horn	0	0	0	0	0	0
County-Other	0	0	0	0	0	0
Manufacturing	0	0	0	0	0	0
Mining	(5,206)	(5,208)	(5,212)	(5,213)	(5,214)	(5,214)
Livestock	0	0	0	0	0	0
Irrigation	(9,325)	(9,402)	(9,452)	(9,494)	(9,584)	(9,656)

Table 4-5. (continued) Second Tier Identified Water Needs
(Acre Feet per Year)

	2030	2040	2050	2060	2070	2080
El Paso County - Rio Grande Basin						
Anthony	0	0	0	0	0	0
East Montana Water System	0	0	0	0	0	0
El Paso County Tornillo WID	0	0	0	0	0	0
El Paso County WCID #4	0	0	0	0	0	0
El Paso Water	0	0	0	0	0	0
Federal Correctional Institution La Tuna	0	0	0	0	0	0
*Fort Bliss and East Biggs	(928)	(1,153)	(1,291)	(1,348)	(1,405)	(1,463)
Haciendas Del Norte WID	0	0	0	0	0	0
Horizon Regional MUD	(2,865)	(3,227)	(3,432)	(3,515)	(3,600)	(3,684)
Lower Valley Water District	(2,671)	(2,927)	(3,079)	(3,142)	(3,206)	(3,269)
Paseo Del Este MUD 1	0	0	0	0	0	0
County-Other	0	0	0	0	0	0
Manufacturing	0	0	0	0	0	0
Mining	0	0	0	0	0	0
Steam Electric Power	0	0	0	0	0	0
Livestock	0	0	0	0	0	0
Irrigation	(2,417)	(1,137)	(334)	0	0	0
Hudspeth County - Rio Grande Basin						
Esperanza Water Service	0	0	0	0	0	0
Hudspeth County WCID 1	0	0	0	0	0	0
County-Other	0	0	0	0	0	0
Mining	0	0	0	0	0	0
Livestock	0	0	0	0	0	0
Irrigation	(18,552)	(18,552)	(18,552)	(18,552)	(18,552)	(18,552)
Jeff Davis County - Rio Grande Basin						
Fort Davis WSC	0	0	0	0	0	0
County-Other	0	0	0	0	0	0
Mining	0	0	0	0	0	0
Livestock	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0
Presidio County - Rio Grande Basin						
Marfa	0	0	0	0	0	0
Presidio	0	0	0	0	0	0
County-Other	0	0	0	0	0	0
Livestock	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0

Table 4-5. (continued) Second Tier Identified Water Needs
(Acre Feet per Year)

	2030	2040	2050	2060	2070	2080
Terrell County - Rio Grande Basin						
Terrell County WCID 1	0	0	0	0	0	0
County-Other	0	0	0	0	0	0
Mining	0	0	0	0	0	0
Livestock	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0

Table 4-6. Second Tier Identified Water Needs by Category of Use
(Acre Feet per Year)

WUG County	WUG Category	2030	2040	2050	2060	2070	2080
Brewster	Municipal	0	0	0	0	0	0
	Mining	0	0	0	0	0	0
	Livestock	0	0	0	0	0	0
	Irrigation	0	0	0	0	0	0
Culberson	Municipal	0	0	0	0	0	0
	Manufacturing	0	0	0	0	0	0
	Mining	(5,206)	(5,208)	(5,212)	(5,213)	(5,214)	(5,214)
	Livestock	0	0	0	0	0	0
	Irrigation	(9,325)	(9,402)	(9,452)	(9,494)	(9,584)	(9,656)
El Paso	Municipal	(6,464)	(7,307)	(7,802)	(8,005)	(8,211)	(8,416)
	Manufacturing	0	0	0	0	0	0
	Mining	0	0	0	0	0	0
	Steam Electric Power	0	0	0	0	0	0
	Livestock	0	0	0	0	0	0
	Irrigation	(2,417)	(1,137)	(334)	0	0	0
Hudspeth	Municipal	0	0	0	0	0	0
	Mining	0	0	0	0	0	0
	Livestock	0	0	0	0	0	0
	Irrigation	(18,552)	(18,552)	(18,552)	(18,552)	(18,552)	(18,552)
Jeff Davis	Municipal	0	0	0	0	0	0
	Mining	0	0	0	0	0	0
	Livestock	0	0	0	0	0	0
	Irrigation	0	0	0	0	0	0
Presidio	Municipal	0	0	0	0	0	0
	Livestock	0	0	0	0	0	0
	Irrigation	0	0	0	0	0	0
Terrell	Municipal	0	0	0	0	0	0
	Mining	0	0	0	0	0	0
	Livestock	0	0	0	0	0	0
	Irrigation	0	0	0	0	0	0

Table 4-7. Second Tier Identified Water Needs by Major Water Provider (Acre Feet per Year)

	2030	2040	2050	2060	2070	2080
El Paso County WID#1	(2,417)	(1,137)	(334)	0	0	0
El Paso Water Utilities	0	0	0	0	0	0
Lower Valley Water District	(2671)	(2927)	(3079)	(3142)	(3206)	(3269)
Horizon MUD	(2,865)	(3,227)	(3,432)	(3,515)	(3,600)	(3,684)

This page intentionally left blank.

CHAPTER 5

WATER MANAGEMENT STRATEGIES AND CONSERVATION RECOMMENDATIONS

This page intentionally left blank.

5 WATER MANAGEMENT STRATEGIES AND CONSERVATION RECOMMENDATIONS

A water management strategy is a plan to meet an identified water need for additional water by an entity, which can mean increasing the total water supply or maximizing an existing supply, including through reducing demand. When a water management strategy project is implemented, it is intended to develop, deliver, and/or treat additional water-supply volumes, or conserve water for an entity (TWDB-Exhibit C Second Amended General Guidelines-September2023).

The Far West Texas Water Planning Group (FWTWPG) has identified and evaluated a total of 68 water management strategies. Of this total, 60 strategies are recommended and eight are designated as alternate strategies. Water management strategies are developed for entities where future water-supply needs exist (as required by statute and administrative rules 31 TAC §357.34; 357.35). A need for water is identified when existing water supplies are less than projected water demands for that same water-user group (WUG) within any planning decade. In addition, water management strategies were developed for other entities requesting specific water supply projects, even though these entities did not have a projected water supply shortage. The FWTWPG considered non-trivial flood mitigation benefits during the evaluation of all potentially feasible water management strategies for the *2026 Plan.* Currently, there are no water management strategies identified that could provide flood mitigation benefits. However, the FWTWPG will continue to consider these very important strategies.

All planning analyses applied, and recommendations made in the development of this *Plan* honor all existing water rights, contracts, and option agreements; and have no impact on navigation on any of the Region's surface water streams and rivers.

5.1 IDENTIFICATION OF POTENTIALLY FEASIBLE WATER MANAGEMENT STRATEGIES

The first step in developing a list of recommended water management strategies is to take a "big picture" look at possible projects that could reasonably be expected to result in water-supply improvements. As required by TWC §16.053(d)(5) and TAC §357.34(c) the regional water plan shall consider, but not be limited to, the following potentially feasible water management strategies:

1. Conservation.
2. Drought management.
3. Reuse.
4. Management of existing water supplies.
5. Conjunctive use.
6. Acquisition of available existing water supplies.
7. Development of new water supplies.
8. Developing regional water supply facilities or providing regional management of water supply facilities.
9. Developing large-scale desalination facilities for seawater or brackish groundwater that serve local or regional brackish groundwater production zones identified and designated under TWC §16.060(b)(5)34.
10. Developing large-scale desalination facilities for marine seawater that serve local or regional entities.
11. Voluntary transfer of water within the region using, but not limited to, contracts, water marketing, regional water banks, sales, leases, options, subordination agreements, and financing agreements.
12. Emergency transfer of water under TWC §11.139.
13. Interbasin transfers of surface water.
14. System optimization.
15. Reallocation of reservoir storage to new uses.
16. Enhancements of yields.
17. Improvements to water quality.
18. New surface water supply.
19. New groundwater supply.
20. Brush control.
21. Precipitation enhancement.
22. Aquifer storage and recovery.

23. Cancellation of water rights.
24. Rainwater harvesting.

Other potential projects considered for the initial list included:

- appropriate strategies from the *2021 Plan.*
- water-loss audits and line replacement.
- projects suggested by municipalities through a survey.
- projects that are currently or have recently applied to the TWDB for funding.

The following process was used by the FWTWPG to identify potentially feasible water management strategies.

Needs Analysis

1. Receive a Needs Analysis Report from the TWDB, which provides a comparison of existing water supplies and projected water demands for each water user group (WUG) and wholesale water provider (WWP) in the Region. Based on this comparison, the report identifies WUGs and WWPs that are expected to experience needs for additional water supplies within the 50-year time frame of the regional water plan.

Identification and Selection Process

1. Review the potential infeasibility and implementation status identifying:
    - If strategy contemplates permitting and/or construction;
    - If strategy is near-term or necessitates significant time for implementation;
    - If the potential sponsor(s) have taken, or have indicated they will take, affirmative steps towards the strategy's implementation. Affirmative steps may include, but not be limited to:
        a. Spending money on the strategy or project;
        b. Voting to spend money on the strategy or project;
        c. Applying for a Federal or State permit for the strategy or project.
2. Review and consider recommended water management strategies adopted by the water planning group for the 2021 Far West Texas Water Plan.
3. Review and consider any issues identified in the most current TWDB Water Loss Audit Report, including leak detection and supply side analysis.
4. Solicit current water planning information, including specific water management strategies of interest from WUGs and WWPs with identified needs.
5. Review and consider the most recent Water Supply Management, Water Conservation, and/or Drought Contingency Plans, where available, from WUGs and WWPs with identified needs.
6. Consider potentially feasible water management strategies that may include, but are not limited to (Chapter 357 Subchapter C §357.34):
    - Extended use of existing supplies including:
        a. System optimization and conjunctive use of water resources.
        b. Reallocation of reservoir storage to new uses.
        c. Voluntary redistribution of water resources including contracts, water marketing, regional water banks, sales, leases, options, subordination agreements, and financing agreements.
        d. Subordination of existing water rights through voluntary agreements.
        e. Enhancement of yields of existing sources.
        f. Improvement of water quality including control of naturally occurring chlorides.
        g. Drought management.

- New supply development including:
    a. Construction and improvement of surface water and groundwater resources.
    b. Brush control.
    c. Precipitation enhancement.
    d. Desalination.
    e. Water supply that could be made available by cancellation of water rights.
    f. Rainwater harvesting.
    g. Aquifer storage and recovery.
- Conservation and drought management measures including demand management.
- Reuse of wastewater.
- Interbasin transfers of surface water.
- Emergency transfers of surface water.

7. Consider other potentially feasible water management strategies suggested by planning group members, stakeholders, and the public.
8. Based on the above reviews and considerations, establish a preliminary list of potentially feasible water management strategies. At a discussion level, consider the following feasibility concerns for each strategy:
    - Water supply source availability during drought-of-record conditions.
    - Cost/benefit.
    - Water quality.
    - Threats to agriculture and natural resources.
    - Impacts to the environment, other water resources, and basin transfers.
    - Socio-economic impacts.
9. Based on the above discussion level analysis, select a final list of potentially feasible water management strategies for further technical evaluation using detailed analysis criteria.

Using the above criteria and process, the FWTWPG selected the initial potentially feasible water management strategies listed in Table 5-1 for further detailed analysis. As the water management strategy analysis progressed, it became evident that the initial list would require modification of project descriptive names, and the possible addition of new strategies and the elimination or transfer of others. Much time was spent in communication with individual WUGs (municipalities, irrigation districts, etc.) to ensure that the strategies discussion met with their approval. The evaluation and final recommendation of water management strategies are provided in the following Section 5.2.

Although these strategy types were considered by the FWTWPG, not all of them were considered viable options for addressing long-term needs in the Region. The FWTWPG does not consider drought management as a feasible strategy to meet long-term growth in demands or current needs. This strategy is considered a temporary measure aimed at conserving available water supplies during times of drought or emergencies. Drought management is most adequately addressed in the Region through the implementation of local drought contingency plans. The FWTWPG is supportive of the development and use of these plans during periods of drought or emergency water needs.

Table 5-1. Far West Texas Potentially Feasible Water Management Strategies

County	Water User Group	Strategy	Source	Strategy ID
Brewster	City of Alpine	Modification to wastewater treatment facility & irrigation system	Direct Non-Potable Reuse	E-1
		Irrigation and recharge application of captured rainwater runoff	Demand Reduction	E-2
	Marathon WSSService	Water loss audit and main-line repair	Demand Reduction	E-3
	Lajitas Municipal Services	Water loss audit and main-line repair	Demand Reduction	E-4
	Brewster County Other (Study Butte Terlingua WS)	Water loss audit and main-line repair	Demand Reduction	E-5
Culberson	*Culberson County Irrigation	Irrigation scheduling	Demand Reduction	E-6
		Additional groundwater wells	West Texas Bolsons Aquifer / Upper Salt Flat	E-7
El Paso	Town of Anthony	Arsenic treatment facility	Mesilla Bolson Aquifer	E-8
		Additional groundwater well	Hueco-Mesilla Bolson Aquifer	E-9
	*El Paso Water	Municipal conservation programs	Demand Reduction	E-10
		Advanced water purification at the Bustamante WWTP	Direct Potable Reuse	E-11
		Hueco Bolson artificial recharge	Hueco Bolson Aquifer	E-14
		Groundwater from Dell City Area (Phase 1)	Capitan Reef Complex Aquifer	E-16
		Groundwater from Dell City Area (Phase 2)	Bone Spring-Victorio Peak Aquifer	E-17
	*El Paso Water **ALTERNATE STRATEGIES**	Treatment and reuse of agricultural drain water	Agricultural drain water	E-18
		Expansion of the Kay Bailey Hutchison Desal Plant	Hueco Bolson Aquifer	E-13
		Expansion of Canutillo Mesilla Bolson Well Field	Hueco-Mesilla Bolson Aquifer	E-19
		Riverside Regulating Reservoir	Rio Grande & Stormwater Run-off	E-15
		Lower Valley well head RO	Rio Grande Alluvium Aquifer	E-20
		Expansion of Jonathan Rogers WTP	Rio Grande	E-21
		Conjunctive treatment of groundwater and surface water at the Upper Valley WWTP	Rio Grande	E-22
		Advanced water purification at the Haskell Street RWP	Direct Potable Reuse	E-12
		Advanced water purification at the Fred Hervey WWTP	Direct Potable Reuse	E-23

Table 5-1. (continued) Far West Texas Potentially Feasible Water Management Strategies

County	Water User Group	Strategy	Source	Strategy ID
El Paso	*Lower Valley Water District	Public conservation education	Demand Reduction	E-24
		Purchase water from EPW	EPW Blended Source	E-26
		Surface water treatment plant & transmission line	Rio Grande	E-27
		Groundwater from proposed Well field	Rio Grande Alluvium Aquifer	E-28
		Groundwater from proposed Well field	Hueco Bolson Aquifer	E-29
		Wastewater treatment facility and ASR	Reuse Treated Wastewater	E-30
	*Horizon Regional MUD	Water loss audit and main-line repair	Demand Reduction	E-31
		Public conservation education	Demand Reduction	E-32
		Additional wells & expansion of desalination plant	Hueco Bolson & Rio Grande Alluvium Aquifers	E-33
	Haciendas Del Norte WID	Water loss audit and main-line repair	Demand Reduction	E-34
	East Montana WS	Water loss audit and main-line repair	Demand Reduction	E-35
	El Paso County Tornillo WID	Additional groundwater well & transmission line	Hueco Bolson Aquifer	E-36
	*El Paso County Other (Vinton Hills)	Public conservation education	Demand Reduction	E-37
		Purchase water from EPW	EPW Blended Source	E-38
	*El Paso County Irrigation (EPCWID #1)	Irrigation scheduling	Demand Reduction	E-40
		Tailwater reuse	Demand Reduction	E-41
		Improvements to water district delivery system	Demand Reduction	E-42
		Riverside Regulating Reservoir	Rio Grande & Stormwater Run-off	E-43
		New Wasteway 32 River Diversion Pumping Point	Rio Grande	E-44
	*El Paso County Manufacturing	Purchase water from EPW	EPW Blended Source	E-46
	*El Paso County Mining	Additional groundwater wells	Hueco-Mesilla Bolson Aquifer	E-48
	*El Paso County Steam Electric Power	Purchase water from EPW	EPW Blended Source	E-50
Hudspeth	Hudspeth County Other (Dell City)	Brackish groundwater desal facility	Bone Spring-Victorio Peak Aquifer	E-51
	*Hudspeth County Other (City of Sierra Blanca - Hudspeth Co. WCID #1)	Public conservation education	Demand Reduction	E-52
		Replace water-supply line from Van Horn	West Texas Bolsons Aquifer / Wild Horse Flat	E-53
		Local groundwater well	Diablo Plateau Aquifer	E-54
		Groundwater well NE of Van Horn	West Texas Bolsons Aquifer / Wild Horse Flat	E-55
		Groundwater well West of Van Horn	Diablo Plateau Aquifer	E-56
	*Hudspeth County Mining	Additional groundwater well	West Texas Bolsons Aquifer / Eagle Flat	E-58

Table 5-1. (continued) Far West Texas Potentially Feasible Water Management Strategies

County	Water User Group	Strategy	Source	Strategy ID
Jeff Davis	Fort Davis WSC	Additional groundwater well	Igneous Aquifer	E-59
		Transmission line to connect Fort Davis WSC to Fort Davis Estates	Igneous Aquifer	E-60
	Jeff Davis County Other (Town of Valentine)	Additional groundwater well	West Texas Bolsons Aquifer / Salt Basin	E-61
Presidio	City of Presidio	Water loss audit and main-line repair	Demand Reduction	E-62
		Additional groundwater well	West Texas Bolsons Aquifer / Presidio-Redford	E-63
Terrell	*Terrell County Mining **ALTERNATE STRATEGY**	Additional groundwater wells	Edwards-Trinity (Plateau) Aquifer	E-65

* WUGs with supply needs

5.2 EVALUATION AND RECOMMENDATION OF WATER MANAGEMENT STRATEGIES

5.2.1 Strategy Evaluation Procedure

The strategy evaluation procedure is designed to provide a side-by-side comparison such that all strategies can be assessed based on the same quantifiable factors as shown in Tables 5-2, 5-3 and 5-4. An explanation of the qualitative and quantifiable rankings is provided in Appendix 5B. All strategy analyses recognize and protect existing water rights, water contracts, and option agreements. For planning purposes, it is assumed that all strategies experience a two percent water loss over the life of the strategy project. Specific factors considered in each Table were:

Table 5-2

- Quantity of new water supply produced.
- Total capital cost.
- Chemical quality.
- Reliability of supply.
- Impacts to water, agricultural, and natural resources, and to ecologically unique stream segments.

Table 5-3

- Financial cost (total capital cost, annual cost, and cost per acre-foot).

Table 5-4

- Environmental impacts:
    - Environmental water needs.
    - Wildlife habitat.
    - Cultural resources.
    - Environmental water quality.
    - Inflows to bays and estuaries.

Cost evaluations for all strategies include capital cost, debt service, and annual operating and maintenance (O&M) expenses and are estimated based on September 2023 US dollars. Capital costs consider construction costs, engineering and feasibility studies, legal assistance, financing, bond counsel and contingencies, permitting and mitigation, land purchase not associated with mitigation, easement costs, and purchase of water rights. The length of debt service is 20 years unless otherwise stated. An annual unit cost is also calculated based on the O&M cost per acre-foot of water supplied. The TWDB Unified Costing Tool was used for all strategy evaluations except for when specific municipalities provided engineering design studies that included cost estimates.

Water quality is recognized as an important component in this 50-year water plan. To ensure that this *Plan* fully considers water quality, the Federal Clean Water Act and the State Clean Rivers Program were reviewed and considered when developing water management strategies and water quality impacts. Development of water management strategies were also guided by the principal that the designated water quality and related water uses described in the Water Quality Management Plans (WQMPs) of TCEQ and the Texas State Soil and Water Conservation Board (TSSWCB) were improved or maintained. TCEQ's WQMP is tied to the State's water quality assessments that identify and direct planning for implementation measures that control and/or prevent priority water quality problems. Elements contained in the WQMP include effluent limitations of wastewater facilities, total maximum daily loads (TMDLs), nonpoint source management controls, identification of designated management agencies, and ground water and source water protection planning. TSSWCB's WQMP is a site-specific plan developed through and approved by soil and water conservation districts for agricultural or sylvicultural lands. The plan includes appropriate land treatment practices, production practices, management measures, and technologies.

The FWTWPG relied on Management Supply Factors calculated by the FWTWPG in the consideration of water-supply needs to be generated in the development of water management strategies. A Management Supply Factor is the combined total of existing and future supply divided by the total projected demand and may be used to consider uncertainties in population, water supply and demand, and other impactful conditions. Management Supply Factors were calculated by the FWTWPG for all WUGs, for each decade, to plan for uncertainties in projections of population. This methodology is described in more detail in Chapter 7 (Section 7.2).

The development of water management strategies is intended to assist entities with their future water supply needs based on drought-of-record conditions. Recommendations of the Drought Preparedness Council for the 2026 Plans consisted of three new recommendations: (1) The regional water plans and State water plan shall serve as water supply plans under drought of record conditions; (2) Drought Contingency Plans (DCP) encourages regional water planning groups to incorporate projected future reservoir evaporation rates in their assessments of future surface water availability; and (3) DCP encourages regional water planning groups to identify in their plans utilities within their boundaries that reported having less than 180 days of available water supply to the TCEQ. Also, WUGs conservation and drought management plans (see Chapters 5 and 7) were reviewed to identify potential strategies that are currently under consideration by the entity.

El Paso Water's water management strategies (E-16 through E-21) are described as "Integrated Strategies" meaning that the operation of the entire water supply system is not dependent on any one or more individual facilities, but rather draws from each source at a rate that is optimal for the entire system under the existing circumstances. Although the strategy facilities will work together to provide necessary supplies, each strategy is independent of the others and does not rely on or mutually exclude any other strategy. All other strategies in this *Plan* likewise do not rely on or mutually exclude any other strategies.

5.2.2 Emphasis on Conservation and Reuse

In terms of recommending strategies to meet future water needs, it is most practical and often most economical to consider potential conservation and reuse projects. Conservation generally includes best management practices that are undertaken either voluntarily by water customers or as mandated by a water supplier. Conservation savings are the result of “active” water conservation strategies that conserve water over and beyond what would happen anyway because of “passive” water conservation measures that stem from Federal and State legislation requiring more efficient plumbing fixtures in new building construction. Existing WUG conservation and drought management plans were reviewed, and conservation strategies selected for this *Plan* were often identified from these plans.

Reported municipal use generally includes a variable amount of water that does not reach the intended consumer due to water leaks in the distribution lines, unauthorized consumption, storage tank overflows, and other wasteful factors. For some communities, attending to these issues can be a proactive conservation strategy that may result in significant water savings.

Over the last few years, the TWDB has seen a growing number of requests from municipalities throughout Texas to finance smart meters and advanced metering infrastructure (AMI). This technology allows meters to be read electronically via a fixed network that enables two-way communication with the utility system. More importantly, AMI’s biggest advancement is the ability to monitor meters in real time to obtain more accurate data on water usage throughout the system. With the distribution network in constant communication, leaks and water loss can be detected earlier. This technological upgrade is more efficient than its counterpart, the automatic meter readers (AMR), that are still widely used and require meters to be manually read.

Reuse of treated wastewater is also an excellent strategy for producing additional water supplies from existing developed sources, or for use in areas where drinking water is not required such as irrigation. Reuse strategies were particularly considered for El Paso Water.

5.2.3 Water Loss Audit Strategies

To address the lack of information on water loss, the 78th Texas Legislature passed House Bill 3338, which requires retail public utilities that provide potable water to perform and file with the TWDB a water audit computing the utility's most recent annual system water loss every five years (see further discussion in Chapter 1 Section 1.9). Entities that meet the key performance indicators discussed in Chapter 1, Section 1.9 were selected to receive a water-loss audit and main-line replacement strategy.

Across Far West Texas, it is estimated that around 2,688 acre-feet of supply could be obtained through a water loss audits and leak repairs program in 2030. The reliability of this supply is low due to uncertainty associated with estimated savings and the extent to which this strategy relies on individual utilities to adopt a water loss audits and leak repairs program, which can be costly and time intensive, especially for smaller users. Due to the relatively high costs of implementing this strategy, especially for smaller or rural water user groups, this strategy may not be feasible.

System water audits and water loss programs are effective methods of accounting for all water usage by a public utility within its service area. The structured approach of a water audit allows a utility to reliably track water uses and provide the information to address unnecessary water and revenue losses. The resulting information from a water audit will be valuable in setting performance indicators and in establishing goals and priorities for cost-effectively reducing water losses. By adopting this Best Management Practice (BMP), utilities will more frequently implement water auditing and loss reduction techniques than required by HB 3338. A more detailed description of this best management practice is available in TWDB Report 362, Water Conservation Best Management Practices Guide, and in the TWDB Water Loss Manual. The reliability of this water savings is contingent on the aggressive implementation of this BMP and the public's willingness to do their part.

5.2.4 Assessment of ASR Potential

Texas Water Code §16.053(e)(10) requires that "if a RWPA has significant identified water needs, the RWPG shall provide a specific assessment of the potential for aquifer storage and recovery (ASR) projects to meet those needs." The FWTWPG considers municipal utilities as the only WUGs in the Far West Texas Region that would have the resources available to initiate an ASR project; and that the threshold for "significant" identified water needs are defined by the FWTWPG as any municipal utility with greater than 20,000 acre-feet per year need over the 50-year planning horizon. This horizon only occurs with El Paso Water. All other municipal water needs are at a less significant level. El Paso Water is currently exercising an ASR project, and an expansion of this project is a recommended water management strategy in this *Plan*.

5.2.5 Direct Reuse Strategies

Direct reuse strategies are developed for the City of Alpine, El Paso Water, and Lower Valley Water District. The City of Alpine will generate a 30 percent increase in the total allowable direct-reuse volume (25 acre-feet per year). El Paso Water's two "advanced water purification" projects come online during varying decades and will generate new supplies at rates calculated into their facility engineering design. Likewise, the Lower Valley Water District strategy includes a new treatment facility capable of generating the specified volume of direct-reuse supply. The volumes of new water supply made available by these projects are intended to satisfy a significant portion of new water demands generated from population growth.

5.2.6 Recommended Water Management Strategies

The strategy evaluation procedure, as described in Section 5.2.1 above, was followed on each of the potentially feasible strategies selected in Table 5-1. Some potential strategies were determined to not meet guideline standards and were thus eliminated. Also, several new strategies were introduced and were subsequently evaluated. Upon completion of the evaluation phase, the FWTWPG reviewed evaluation criteria and selected the final water management strategies listed in Table 5-2.

Seawater desalination, a major alternative water management solution for the coastal portion of Texas, was not selected for consideration in the Far West Texas Water Planning Region as the nearest direct point of origin for a seawater source is more than 300 miles from the easternmost border of the Far West Texas Region and is thus not rationally economically feasible.

Third-party social and economic impacts resulting from voluntary redistributions of water, including impacts of moving water from rural and agricultural areas were considered. There are only two strategies (E-21 and E-22) owned by El Paso Water that are impacted by this analysis. Strategy E-21 moves water from currently irrigated farmland in Culberson County to El Paso to El Paso County. This farmland is currently owned by El Paso Water and, therefore, the conversion of use from irrigation to municipal is El Paso Water's decision. Strategy E-22 moves water from the Dell City area of Hudspeth County to El Paso County. El Paso Water is purchasing land and water rights from willing landowners, and therefore the conversion of use from irrigation to municipal is voluntary.

A comparative listing of all water management strategies that the FWTWPG subsequently recommends in total for inclusion in the *2026 Far West Texas Water Plan* is provided in Table 5-2. Table 5-3 provides a breakdown of the cost estimate for each strategy, and Table 5-4 shows potential impacts of enacting each strategy. Strategy evaluations are presented in Appendix 5A. The total capital cost for development of all water management strategies is $4,044,259,260. Appendix 5B provides a matrix procedure for measuring the quantitative and qualitative potential for each water management strategy.

To adequately consider the unique challenges faced by municipal and industrial water users in El Paso County, a conjunctive approach was used to establish feasible strategies capable of identifying sufficient future supplies to meet the needs of El Paso Water, the largest wholesale water provider in the County.

The evaluation of some irrigation strategies for El Paso and Hudspeth Counties differs slightly in that these strategies consider recommended management practices and are discussed in detail in a regional planning study titled, "Evaluation of Irrigation Efficiency Strategies for Far West Texas: Feasibility, Water Savings and Cost Considerations (2009)."

5.2.7 Alternate Water Management Strategies

Alternate water management strategies are projects that are not part of the package of recommended strategies but can be substituted for any recommended strategy that is later determined to be non-viable. Alternate water management strategies are evaluated in the same way as recommended strategies based on criteria specified in [31 TAC §357.7(a) (7-9, 12)] and are tabulated along with "recommended" strategies in Tables 5-2, 5-3 and 5-4. Upon conclusion of a thorough evaluation process, the FWTWPG identified seven alternate water management strategies for El Paso Water and one for Lower Valley Water District.

5.2.8 Unmet Needs

Sufficient water management strategy supplies are recommended to meet the identified projected needs of all water user groups (WUGs) in the Region except for the irrigation category in Hudspeth, El Paso, and Culberson Counties, and for the mining category in Culberson County.

	WUG Unmet Needs (Acre-Feet per Year)					
Water User Group	**2030**	**2040**	**2050**	**2060**	**2070**	**2080**
Culberson County Irrigation	(8,659)	(8,736)	(8,786)	(8,828)	(8,918)	(8,990)
Culberson County Mining	(5,206)	(5,208)	(5,212)	(5,213)	(5,214)	(5,214)
El Paso County Irrigation (EPCWID #1)	(42,451)	37,921)	(37,118)	(36,609)	(36,092)	(35,568)
Hudspeth County Irrigation	(18,552)	(18,552)	(18,552)	(18,552)	(18,552)	(18,552)

The El Paso County WID#1 depends on flow in the Rio Grande as its primary irrigation supply source, and during drought-of-record conditions this source is significantly diminished or nonexistent. There are no other supply sources that can be tapped to make up the total needed volume of supply when the Rio Grande is at this stage. Culberson and Hudspeth Counties irrigation unmet needs appear starting in the 2030 decade even with conservation considerations. The local groundwater conservation districts (GCDs) are monitoring water levels in the aquifers and will support local irrigators in realizing potential future shortage potentials.

Mining unmet needs in Culberson County are projected to begin in 2030, and result from pumping limitations set by the Culberson County Groundwater Conservation District. A change in DFC and MAG availabilities in future planning cycles, or by a rule modification by the District could make more water supplies available in the future.

5.2.9 Unqualified Strategies

The TWDB requires that water management strategies listed in regional water plans develop "new" water supplies to be applicable for SWIFT funding. Projects that involve items such as replacing and/or repairing old infrastructure, and wastewater collection and treatment do not qualify. However, the TWDB offers many other types of financing options. Additional details pertaining to the different types of grants and loans offered can be accessed on the TWDB's Financial Assistance webpage.

Table 5-2. Summary of Recommended and Alternate Water Management Strategy Evaluations (All strategies are in the Rio Grande River Basin)

County	Water User Group	Strategy	Source	Strategy ID	Strategy Supply (Acre-Feet/Year)						Total Capital Cost (Table 5-3)	Quantity[1]	Quality[2]	Reliability[3]	Strategy Impacts[4] Water Resources	Agricultural Resources	Natural Resources	Ecologically Unique Stream Segments
					2030	2040	2050	2060	2070	2080					(1-5)	(1-5)	(1-5)	(1-5)
Brewster	City of Alpine	Water loss audit and main-line repair	Demand Reduction	E-1	23	23	23	23	23	23	$17,042,000	NA	NA	NA	1	2	2	2
		Irrigation and recharge application of captured rainwater runoff	Rainwater Harvesting | Demand Reduction	E-2		70	70	70	70	70	$1,580,000	NA	3	1	1	2	1	2
		Modification to wastewater treatment facility & irrigation system	Direct Non-Potable Reuse	E-3		25	25	25	25	25	$2,128,000	NA	3	1	1	2	1	2
	Lajitas Municipal Services	Water loss audit and main-line repair	Demand Reduction	E-4	14	14	14	14	14	14	$6,392,000	NA	NA	NA	1	2	2	2
	Marathon WSSService	Water loss audit and main-line repair	Demand Reduction	E-5	10	10	10	10	10	10	$2,130,000	NA	NA	NA	1	2	2	2
	Study Butte Terlingua WS	Water loss audit and main-line repair	Demand Reduction	E-6	12	12	12	12	12	12	$8,520,000	NA	NA	NA	1	2	2	2
	*Brewster County Mining	Mining Conservation	Demand Reduction	E-7	8	8	9	9	9	9	$0	3	NA	NA	1	1	1	2
Culberson	City of Van Horn	Water loss audit and main-line repair	Demand Reduction	E-8	57	57	57	57	57	57	$15,977,000	NA	NA	NA	1	2	2	2
		Additional groundwater well	West Texas Bolsons Aquifer	E-9	320	320	320	320	320	320	$1,541,000	NA	1	1	3	2	2	2
	**Culberson County Irrigation	Irrigation scheduling	Demand Reduction	E-10	12,738	12,738	12,738	12,738	12,738	12,738	$0	3	NA	NA	1	1	1	2
		Additional groundwater wells	West Texas Bolsons Aquifer / Upper Salt Flat	E-11	666	666	666	666	666	666	$2,169,000	1	3	1	3	1	2	2
	**Culberson County Mining	Mining Conservation	Demand Reduction	E-12	1,502	1,503	1,503	1,504	1,504	1,504	$0	3	NA	NA	1	1	1	2
El Paso	Town of Anthony	Water loss audit and main-line repair	Demand Reduction	E-13	8	8	8	8	8	8	$3,196,000	NA	NA	NA	1	2	2	2
		Arsenic treatment facility	Mesilla Bolson Aquifer	E-14	2,800	2,800	2,800	2,800	2,800	2,800	$12,179,000	NA	1	1	NA	NA	NA	2
		Additional groundwater well	Hueco-Mesilla Bolson Aquifer	E-15	960	960	960	960	960	960	$2,821,000	NA	2	1	3	2	2	2
	El Paso Water	Municipal conservation programs	Demand Reduction	E-16	4,950	5,530	5,080	9,950	13,140	17,820	$0	2	NA	NA	1	NA	NA	2
		Water loss audit and main-line repair	Demand Reduction	E-17	2,266	2,266	2,266	2,266	2,266	2,266	$428,162,000	NA	NA	NA	1	2	2	2
		Expansion of the Kay Bailey Hutchison Desal Plant	Hueco Bolson Aquifer	E-18	2,500	2,500	2,500	2,500	2,500	2,500	$101,045,000	3	1	1	2	2	2	2
		Advanced water purification at the Bustamante WWTP	Direct Potable Reuse	E-19	8,500	9,200	9,900	10,600	10,600	10,600	$295,417,000	3	1	1	2	2	2	2
		Conjunctive treatment of groundwater and surface water at the Upper Valley WWTP	Rio Grande	E-20		3,000	3,000	3,000	3,000	3,000	$188,174,000	3	1	2	2	2	2	2
		Groundwater from Dell City Area (Phase 1)	Capitan Reef Complex Aquifer	E-21			10,000	10,000	10,000	10,000	$1,022,184,000	3	1	1	2	5	2	2
	El Paso Water **ALTERNATE STRATEGIES**	Groundwater from Dell City Area (Phase 2)	Bone Spring-Victorio Peak Aquifer	E-22						10,000	$546,423,000	3	1	1	2	5	2	2
		Hueco Bolson artificial recharge	Hueco Bolson Aquifer	E-23	15,000	15,000	15,000	15,000	15,000	15,000	$66,906,000	3	2	2	1	2	3	2
		Brackish groundwater at the Jonathan Rogers WTP	Rio Grande Alluvium Aquifer	E-24		11,000	11,000	11,000	11,000	11,000	$167,902,000							
		Treatment and reuse of agricultural drain water	Indirect Reuse | Agricultural drain water	E-25		2,700	2,700	2,700	2,700	2,700	$15,139,000	3	2	2	1	2	2	2
		Riverside Regulating Reservoir	Rio Grande & Stormwater Run-off	E-26			3,250	3,250	3,250	3,250	$9,922,500	3	2	2	2	2	1	2
		Expansion of Jonathan Rogers WTP	Rio Grande	E-27					6,500	6,500	$106,178,000	3	1	2	2	2	2	2

This page intentionally left blank.

Table 5-2. (continued) Summary of Recommended and Alternate Water Management Strategy Evaluations (All strategies are in the Rio Grande River Basin)

County	Water User Group	Strategy	Source	Strategy ID	Strategy Supply (Acre-Feet/Year)						Total Capital Cost (Table 5-3)	Quantity[1]	Quality[2]	Reliability[3]	Strategy Impacts[4] Water Resources	Strategy Impacts[4] Agricultural Resources	Strategy Impacts[4] Natural Resources	Strategy Impacts[4] Ecologically Unique Stream Segments
					2030	2040	2050	2060	2070	2080					(1-5)	(1-5)	(1-5)	(1-5)
El Paso	El Paso Water **ALTERNATE STRATEGIES**	Advanced water purification at the Haskell Street RWP	Direct Potable Reuse	E-28						8,900	$180,820,000	3	1	1	2	2	2	2
	*Fort Bliss & East Biggs	Public conservation education	Demand Reduction	E-29	64	67	68	69	69	70	$59,991	3	NA	NA	1	NA	NA	2
		Purchase water from El Paso Water	EPW Blended Source	E-30	864	1,086	1,223	1,279	1,336	1,393	$0	2	1	1	2	2	2	2
	*Lower Valley Water District	Public conservation education	Demand Reduction	E-31	72	74	76	77	77	78	$239,563	3	NA	NA	1	NA	NA	2
		Water loss audit and main-line repair	Demand Reduction	E-32	77	77	77	77	77	77	$42,603,000	NA	NA	NA	1	2	2	2
		Purchase water from El Paso Water	EPW Blended Source	E-33	2,820	3,078	3,232	3,296	3,360	3,424	$0	2	1	1	2	2	2	2
		Surface water treatment plant & transmission line	Rio Grande	E-34		5,000	5,000	5,000	5,000	5,000	$128,073,000	2	1	2	2	5	2	2
		Groundwater from proposed Well field **ALTERNATE**	Rio Grande Alluvium Aquifer	E-35		6,800	6,800	6,800	6,800	6,800	$53,652,000	1	1	1	3	2	2	2
		Groundwater from proposed Well field	Hueco Bolson Aquifer	E-36		6,800	6,800	6,800	6,800	6,800	$53,229,000	1	1	1	3	2	2	2
		Wastewater treatment facility and ASR	Reuse Treated Wastewater	E-37		5,589	5,589	5,589	5,589	5,589	$54,303,000	1	2	1	1	2	2	2
	*Horizon Regional MUD	Water loss audit and main-line repair	Demand Reduction	E-38	182	182	182	182	182	182	$6,392,000	NA	NA	NA	1	2	2	2
		Public conservation education	Demand Reduction	E-39	95	99	101	102	103	104	$119,970	3	NA	NA	1	NA	NA	2
		Additional wells & expansion of desalination plant	Hueco Bolson & Rio Grande Alluvium Aquifers	E-40	16,786	16,786	16,786	16,786	16,786	16,786	$158,399,000	2	1	1	3	2	2	2
	East Montana WS	Water loss audit and main-line repair	Demand Reduction	E-41	14	14	14	14	14	14	$9,587,000	NA	NA	NA	1	2	2	2
	El Paso County Tornillo WID	Water loss audit and main-line repair	Demand Reduction	E-42	6	6	6	6	6	6	$4,261,000	NA	NA	NA	1	2	2	2
		Additional groundwater well & transmission line	Hueco Bolson Aquifer	E-43	333	333	333	333	333	333	$2,731,000	NA	1	1	3	2	2	2
	El Paso County WCID #4 (Fabens)	Water loss audit and main-line repair	Demand Reduction	E-44	9	9	9	9	9	9	$4,261,000	NA	NA	NA	1	2	2	2
	**El Paso County Irrigation (EPCWID #1)	Irrigation scheduling	Demand Reduction	E-45	1,740	1,740	1,740	1,740	1,740	1,740	$0	3	NA	NA	1	1	2	2
		Tailwater reuse	Demand Reduction	E-46	1,723	1,723	1,723	1,723	1,723	1,723	$0	3	NA	NA	1	1	2	2
		Improvements to water district delivery system	Demand Reduction	E-47	25,000	25,000	25,000	25,000	25,000	25,000	$231,933,341	1	NA	NA	1	1	2	2
		Riverside Regulating Reservoir	Rio Grande & Stormwater Run-off	E-48		3,250	3,250	3,250	3,250	3,250	$9,922,500	3	3	2	2	1	1	2
		New Wasteway 32 River Diversion Pumping Point	Rio Grande	E-49	5,000	5,000	5,000	5,000	5,000	5,000	$4,896,835	3	3	2	1	1	2	2
	El Paso County (Steam Electric Power)	Purchase Water from El Paso Water	EPW Blended Source	E-50	7,260	7,260	7,260	7,260	7,260	7,260	$0	2	1	1	2	2	2	2
		Treatment and reuse of wastewater	Reuse Treated Wastewater	E-51	1,680	1,680	1,680	1,680	1,680	1,680	$33,647,000	3	2	2	1	2	2	2

This page intentionally left blank.

Table 5-2. (continued) Summary of Recommended and Alternate Water Management Strategy Evaluations
(All strategies are in the Rio Grande River Basin)

County	Water User Group	Strategy	Source	Strategy ID	Strategy Supply (Acre-Feet/Year)						Total Capital Cost (Table 5-3)	Quantity[1]	Quality[2]	Reliability[3]	Strategy Impacts[4]			
					2030	2040	2050	2060	2070	2080					Water Resources (1-5)	Agricultural Resources (1-5)	Natural Resources (1-5)	Ecologically Unique Stream Segments (1-5)
Hudspeth	Esperanza WS	Water loss audit and main-line repair	Demand Reduction	E-52	8	8	8	8	8	8	$35,148,000	NA	NA	NA	1	2	2	2
	Hudspeth County Other (Dell City)	Brackish groundwater desal facility	Bone Spring-Victorio Peak Aquifer	E-53		111	111	111	111	111	$3,227,000	NA	1	1	2	2	2	2
	Hudspeth Co. WCID #1 (City of Sierra Blanca)	Replace water-supply line from Van Horn	West Texas Bolsons Aquifer / Wild Horse Flat	E-54		39	39	39	39	39	$4,420,000	NA	NA	NA	1	2	2	2
		Groundwater well West of Van Horn	Diablo Plateau Aquifer	E-55	39	39	39	39	39	39	$1,171,000	NA	2	1	3	2	2	2
Hudspeth	**Hudspeth County Irrigation	Irrigation scheduling	Demand Reduction	E-56	504	504	504	504	504	504	$0	3	NA	NA	1	1	1	2
	*Hudspeth County Livestock	Livestock Conservation	Demand Reduction	E-57	715	715	715	715	715	715	$0	3	NA	NA	1	1	1	2
	*Hudspeth County Mining	Mining Conservation	Demand Reduction	E-58	10	11	11	11	11	11	$0	3	NA	NA	1	1	1	2
		Additional groundwater well	West Texas Bolsons Aquifer / Eagle Flat	E-59	219	219	219	219	219	219	$384,000	1	3	1	3	2	2	2
Jeff Davis	Fort Davis WSC	Additional groundwater well	Igneous Aquifer	E-60	274	274	274	274	274	274	$833,000	NA	1	1	3	2	2	2
		Transmission line to connect Fort Davis WSC to Fort Davis Estates	Igneous Aquifer	E-61		114	114	114	114	114	$2,226,000	NA	NA	NA	NA	2	2	2
	Jeff Davis County Other (City of Valentine)	Additional groundwater well	West Texas Bolsons Aquifer / Salt Basin	E-62	129	129	129	129	129	129	$754,000	NA	1	1	3	2	2	2
	*Jeff Davis County Livestock	Livestock Conservation	Demand Reduction	E-63	208	208	208	208	208	208	$0	3	NA	NA	1	1	1	2
Presidio	City of Presidio	Additional groundwater well	West Texas Bolsons Aquifer / Presidio-Redford	E-64	120	120	120	120	120	120	$10,889,000	NA	1	1	3	2	2	2
	Presidio County Other (Candelaria WSC)	Water loss audit and main-line repair	Demand Reduction	E-65	1	1	1	1	1	1	$1,065,000	NA	NA	NA	1	2	2	2
	Presidio County Other (Redford WS)	Water loss audit and main-line repair	Demand Reduction	E-66	1	1	1	1	1	1	$1,065,001	NA	NA	NA	1	2	2	2
	*Presidio County Livestock	Livestock Conservation	Demand Reduction	E-67	6	6	6	6	6	6	$0	3	NA	NA	1	1	1	2
Terrell	*Terrell County Irrigation	Irrigation scheduling	Demand Reduction	E-68	2,190	2,190	2,190	2,190	2,190	2,190	$0	3	NA	NA	1	1	1	2

* WUG with a projected future supply deficit. (*See Table 4-1 for list of shortages) and See Appendix 5B for quantification description of impact ranges.*

**WUGs with an unmet need.

This page intentionally left blank.

Table 5-3. Summary of Recommended and Alternate Water Management Strategy Cost

County	Water User Group	Strategy	Source	2026 Strategy ID	Total Capital Cost	Total Annual Cost						Cost per Acre-Foot/Year					
						2030	2040	2050	2060	2070	2080	2030	2040	2050	2060	2070	2080
Brewster	City of Alpine	Water loss audit and main-line repair	Demand Reduction	E-1	$17,042,000	$1,199,000	$1,199,000	$1,199,000	$1,199,000	$1,199,000	$1,199,000	$52,130	$52,130	$52,130	$52,130	$52,130	$52,130
		Irrigation and recharge application of captured rainwater runoff	Demand Reduction	E-2	$1,580,000		$128,000	$128,000	$17,000	$17,000	$17,000		$1,829	$1,829	$243	$243	$243
		Modification to wastewater treatment facility & irrigation system	Direct Non-Potable Reuse	E-3	$2,128,000		$185,000	$185,000	$35,000	$35,000	$35,000		$7,400	$7,400	$1,400	$1,400	$1,400
	Lajitas Municipal Services	Water loss audit and main-line repair	Demand Reduction	E-4	$6,392,000	$450,000	$450,000	$450,000	$450,000	$450,000	$450,000	$32,143	$32,143	$32,143	$32,143	$32,143	$32,143
	Marathon WSSService	Water loss audit and main-line repair	Demand Reduction	E-5	$2,130,000	$150,000	$150,000	$150,000	$150,000	$150,000	$150,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000
	Study Butte Terlingua WS	Water loss audit and main-line repair	Demand Reduction	E-6	$8,520,000	$600,000	$600,000	$600,000	$600,000	$600,000	$600,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000
	*Brewster County Mining	Mining Conservation	Demand Reduction	E-7	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Culberson	City of Van Horn	Water loss audit and main-line repair	Demand Reduction	E-8	$15,977,000	$1,124,000	$1,124,000	$1,124,000	$1,124,000	$1,124,000	$1,124,000	$19,719	$19,719	$19,719	$19,719	$19,719	$19,719
		Additional groundwater well	West Texas Bolsons Aquifer	E-9	$1,541,000	$155,000	$155,000	$47,000	$47,000	$47,000	$47,000	$484	$484	$147	$147	$147	$147
	**Culberson County Irrigation	Irrigation scheduling	Demand Reduction	E-10	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
		Additional groundwater wells	West Texas Bolsons Aquifer / Upper Salt Flat	E-11	$2,169,000	$193,000	$193,000	$40,000	$40,000	$40,000	$40,000	$290	$290	$60	$60	$60	$60
	**Culberson County Mining	Mining Conservation	Demand Reduction	E-12	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
El Paso	Town of Anthony	Water loss audit and main-line repair	Demand Reduction	E-13	$3,196,000	$225,000	$225,000	$225,000	$225,000	$225,000	$225,000	$28,125	$28,125	$28,125	$28,125	$28,125	$28,125
		Arsenic treatment facility	Mesilla Bolson Aquifer	E-14	$12,179,000	$2,240,000	$2,240,000	$1,383,000	$1,383,000	$1,383,000	$1,383,000	$800	$800	$494	$494	$494	$494
		Additional groundwater well	Hueco-Mesilla Bolson Aquifer	E-15	$2,821,000	$331,000	$331,000	$132,000	$132,000	$132,000	$132,000	$345	$345	$138	$138	$138	$138
	El Paso Water	Municipal conservation programs	Demand Reduction	E-16	$0	$1,997,000	$2,206,000	$2,437,000	$2,692,000	$2,974,000	$3,285,000	$218	$134	$125	$119	$116	$113
		Water loss audit and main-line repair	Demand Reduction	E-17	$428,162,000	$30,126,000	$30,126,000	$30,126,000	$30,126,000	$30,126,000	$30,126,000	$13,295	$13,295	$13,295	$13,295	$13,295	$13,295
		Expansion of the Kay Bailey Hutchison Desal Plant	Hueco Bolson Aquifer	E-18	$101,045,000	$20,369,000	$20,369,000	$13,259,000	$13,259,000	$13,259,000	$13,259,000	$3,249	$3,249	$2,115	$2,115	$2,115	$2,115
		Advanced water purification at the Bustamante WWTP	Direct Potable Reuse	E-19	$295,417,000	$22,555,000	$22,555,000	$1,769,000	$1,769,000	$1,769,000	$1,769,000	$2,128	$2,128	$167	$167	$167	$167
		Conjunctive treatment of groundwater and surface water at the Upper Valley WWTP	Rio Grande	E-20	$135,000,000		$14,590,000	$14,590,000	$1,350,000	$1,350,000	$1,350,000		$4,863	$4,863	$450	$450	$450
		Groundwater from Dell City Area (Phase 1)	Capitan Reef Complex Aquifer	E-21	$1,022,184,000			$83,563,000	$83,563,000	$11,747,000	$11,747,000			$8,356	$8,356	$1,175	$1,175
	El Paso Water **ALTERNATE STRATEGIES**	Groundwater from Dell City Area (Phase 2)	Bone Spring-Victorio Peak Aquifer	E-22	$546,423,000						$68,102,000						$6,810
		Hueco Bolson artificial recharge	Hueco Bolson Aquifer	E-23	$66,906,000	$5,188,000	$5,188,000	$480,000	$480,000	$480,000	$480,000	$346	$346	$32	$32	$32	$32
		Brackish groundwater at the Jonathan Rogers WTP		E-24	$167,902,000		$25,964,000	$25,964,000	$14,155,000	$14,155,000	$14,155,000		$2,360	$2,360	$1,287	$1,287	$1,287
		Treatment and reuse of agricultural drain water	Agricultural drain water	E-25	$15,139,000		$2,015,000	$2,015,000	$950,000	$950,000	$950,000		$746	$746	$352	$352	$352
		Riverside Regulating Reservoir	Rio Grande & Stormwater Run-off	E-26	$9,922,500			$348,800	$348,800	$348,800	$348,800			$107	$107	$107	$107
		Expansion of Jonathan Rogers WTP	Rio Grande	E-27	$106,178,000					$10,804,000	$10,804,000					$1,662	$1,662

This page intentionally left blank.

Table 5-3. (continued) Summary of Recommended and Alternate Water Management Strategy Cost

County	Water User Group	Strategy	Source	2026 Strategy ID	Total Capital Cost	Total Annual Cost						Cost per Acre-Foot/Year					
						2030	2040	2050	2060	2070	2080	2030	2040	2050	2060	2070	2080
El Paso	El Paso Water **ALTERNATE STRATEGIES**	Advanced water purification at the Haskell Street RWP	Direct Potable Reuse	E-28	$180,820,000						$25,339,000						$2,847
	*Fort Bliss & East Biggs	Public conservation education	Demand Reduction	E-29	$59,991	$9,858	$10,255	10,059	$9,940	$9,940	$9,940	$153	$154	$148	$145	$144	$143
		Purchase water from El Paso Water	EPW Blended Source	E-30	$0	$809,000	$1,016,000	$1,145,000	$1,197,000	$1,250,000	$1,304,000	$936	$936	$936	$936	$936	$936
	*Lower Valley Water District	Public conservation education	Demand Reduction	E-31	$239,563	$39,366	$40,952	$40,168	$39,693	$39,692	$39,691	$549	$551	$529	$519	$514	$510
		Water loss audit and main-line repair	Demand Reduction	E-32	$42,603,000	$2,998,000	$2,998,000	$2,998,000	$2,998,000	$2,998,000	$2,998,000	$38,935	$38,935	$38,935	$38,935	$38,935	$38,935
		Purchase water from El Paso Water	EPW Blended Source	E-33	$0	$3,204,000	$3,497,000	$3,672,000	$3,744,000	$3,817,000	$3,890,000	$1,136	$1,136	$1,136	$1,136	$1,136	$1,136
		Surface water treatment plant & transmission line	Rio Grande	E-34	$128,073,000	$12,724,000	$12,724,000	$3,719,000	$3,719,000	$3,719,000	$3,719,000		$2,545	$2,545	$744	$744	$744
		Groundwater from proposed Well field **(ALTERNATE)**	Rio Grande Alluvium Aquifer	E-35	$53,652,000		$12,887,000	$12,887,000	$9,114,000	$9,114,000	$9,114,000		$1,895	$1,895	$1,340	$1,340	$1,340
		Groundwater from proposed Well field	Hueco Bolson Aquifer	E-36	$53,229,000		$12,789,000	$12,789,000	$9,046,000	$9,046,000	$9,046,000		$1,881	$1,881	$1,330	$1,330	$1,330
		Wastewater treatment facility and ASR	Reuse Treated Wastewater	E-37	$54,303,000		$6,678,000	$6,678,000	$2,857,000	$2,857,000	$2,857,000		$1,195	$1,195	$511	$511	$511
	*Horizon Regional MUD	Water loss audit and main-line repair	Demand Reduction	E-38	$6,392,000	$450,000	$450,000	$450,000	$450,000	$450,000	$450,000	$2,473	$2,473	$2,473	$2,473	$2,473	$2,473
		Public conservation education	Demand Reduction	E-39	$119,970	$19,714	$20,508	$20,116	$19,878	$19,877	$19,877	$206	$207	$199	$195	$193	$192
		Additional wells & expansion of desalination plant	Hueco Bolson & Rio Grande Alluvium Aquifers	E-40	$158,399,000	$32,323,000	$32,323,000	$21,178,000	$21,178,000	$21,178,000	$21,178,000	$1,926	$1,926	$1,262	$1,262	$1,262	$1,262
	East Montana WS	Water loss audit and main-line repair	Demand Reduction	E-41	$9,587,000	$675,000	$675,000	$675,000	$675,000	$675,000	$675,000	$48,214	$48,214	$48,214	$48,214	$48,214	$48,214
	El Paso County Tornillo WID	Water loss audit and main-line repair	Demand Reduction	E-42	$4,261,000	$300,000	$300,000	$300,000	$300,000	$300,000	$300,000	$50,000	$50,000	$50,000	50,000	50,000	50,000
		Additional groundwater well & transmission line	Hueco Bolson Aquifer	E-43	$2,731,000	$279,000	$279,000	$87,000	$87,000	$87,000	$87,000	$838	$838	$261	$261	$261	$261
	El Paso County WCID #4 (Fabens)	Water loss audit and main-line repair	Demand Reduction	E-44	$4,261,000	$300,000	$300,000	$300,000	$300,000	$300,000	$300,000	$33,333	$33,333	$33,333	$33,333	$33,333	$33,333
	**El Paso County Irrigation (EPCWID #1)	Irrigation scheduling	Demand Reduction	E-45	$0	$151,163	$151,163	$151,163	$151,163	$151,163	$151,163	$87	$87	$87	$87	$87	$87
		Tailwater reuse	Demand Reduction	E-46	$0	$1,434,157	$1,434,157	$1,434,157	$1,434,157	$1,434,157	$1,434,157	$832	$832	$832	$832	$832	$832
		Improvements to water district delivery system	Demand Reduction	E-47	$231,933,341	$317,748	$317,748	$317,748	$317,748	$317,748	$317,748	$13	$13	$13	$13	$13	$13
		Riverside Regulating Reservoir	Rio Grande & Stormwater Run-off	E-48	$9,922,500		$348,800	$348,800	$348,800	$348,800	$348,800		$107	$107	$107	$107	$107
		New Wasteway 32 River Diversion Pumping Point	Rio Grande	E-49	$5,682,394	$198,884	$198,884	$198,884	$198,884	$198,884	$198,884	$40	$40	$40	$40	$40	$40
	El Paso County (Steam Electric Power)	Purchase Water from El Paso Water	EPW Blended Source	E-50	$0	$11,798,000	$11,798,000	$11,798,000	$11,798,000	$11,798,000	$11,798,000	$1,625	$1,625	$1,625	$1,625	$1,625	$1,625
		Treatment and reuse of wastewater	Reuse Treated Wastewater	E-51	$33,647,000	$4,661,000	$4,661,000	$2,294,000	$2,294,000	$2,294,000	$2,294,000	$2,774	$2,774	$1,365	$1,365	$1,365	$1,365
Hudspeth	Esperanza WS	Water loss audit and main-line repair	Demand Reduction	E-52	$35,148,000	$2,473,000	$2,473,000	$2,473,000	$2,473,000	$2,473,000	$2,473,000	$309,125	$309,125	$309,125	$309,125	$309,125	$309,125
	Hudspeth County Other (Dell City)	Brackish groundwater desal facility	Bone Spring-Victorio Peak Aquifer	E-53	$3,227,000		$648,000	$648,000	$421,000	$421,000	$421,000		$5,838	$5,838	$3,793	$3,793	$3,793

This page intentionally left blank.

Table 5-3. (continued) Summary of Recommended and Alternate Water Management Strategy Cost

County	Water User Group	Strategy	Source	2026 Strategy ID	Total Capital Cost	Total Annual Cost						Cost per Acre-Foot/Year					
						2030	2040	2050	2060	2070	2080	2030	2040	2050	2060	2070	2080
Hudspeth	Hudspeth Co. WCID #1 (City of Sierra Blanca)	Replace water-supply line from Van Horn	West Texas Bolsons Aquifer / Wild Horse Flat	E-54	$4,420,000		$343,000	$343,000	$32,000	$32,000	$32,000		$8,795	$8,795	$821	$821	$821
		Groundwater well West of Van Horn	Diablo Plateau Aquifer	E-55	$1,171,000	$94,000	$94,000	$12,000	$12,000	$12,000	$12,000	$2,410	$2,410	$308	$308	$308	$308
	**Hudspeth County Irrigation	Irrigation scheduling	Demand Reduction	E-56	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	*Hudspeth County Livestock	Livestock Conservation	Demand Reduction	E-57	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	*Hudspeth County Mining	Mining Conservation	Demand Reduction	E-58	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
		Additional groundwater well	West Texas Bolsons Aquifer / Eagle Flat	E-59	$384,000	$36,000	$36,000	$9,000	$9,000	$9,000	$9,000	$164	$164	$41	$41	$41	$41
Jeff Davis	Fort Davis WSC	Additional groundwater well	Igneous Aquifer	E-60	$833,000	$102,000	$102,000	$43,000	$43,000	$43,000	$43,000	$372	$372	$157	$157	$157	$157
		Transmission line to connect Fort Davis WSC to Fort Davis Estates	Igneous Aquifer	E-61	$2,226,000		$175,000	$175,000	$18,000	$18,000	$18,000		$1,535	$1,535	$158	$158	$158
	Jeff Davis County Other (City of Valentine)	Additional groundwater well	West Texas Bolsons Aquifer / Salt Basin	E-62	$754,000	$72,000	$72,000	$19,000	$19,000	$19,000	$19,000	$558	$558	$147	$147	$147	$147
	*Jeff Davis County Livestock	Livestock Conservation	Demand Reduction	E-63	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Presidio	City of Presidio	Additional groundwater well	West Texas Bolsons Aquifer / Presidio-Redford	E-64	$10,889,000	$906,000	$906,000	$140,000	$140,000	$140,000	$140,000	$7,550	$7,550	$1,167	$1,167	$1,167	$1,167
	Presidio County Other (Candelaria WSC)	Water loss audit and main-line repair	Demand Reduction	E-65	$1,065,000	$75,000	$75,000	$75,000	$75,000	$75,000	$75,000	$75,000	$75,000	$75,000	$75,000	$75,000	$75,000
	Presidio County Other (Redford WS)	Water loss audit and main-line repair	Demand Reduction	E-66	$1,065,000	$75,000	$75,000	$75,000	$75,000	$75,000	$75,000	$75,000	$75,000	$75,000	$75,000	$75,000	$75,000
	*Presidio County Livestock	Livestock Conservation	Demand Reduction	E-67	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Terrell	*Terrell County Irrigation	Irrigation scheduling	Demand Reduction	E-68	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0

*WUGs with a projected future supply deficit. (*See Table 4-1 for list of shortages).*

**WUGs with an unmet need.

This page intentionally left blank.

Table 5-4. Summary of Recommended and Alternate Water Management Strategy Environmental Assessments (Rio Grande River Basin)

County	Water User Group	Strategy	Strategy ID	Environmental Impact Factors ** Water Needs (1-5)	Habitat (1-5)	Cultural Resources (1-5)	Water Quality (1-5)	Rays & Estuaries *** (1-5)	Area Impacted and Resulting Conditions
Brewster	City of Alpine	Water loss audit and main-line repair	E-1	2	2	2	2	NA	Intended to reduce water loss.
		Irrigation and recharge application of captured rainwater runoff	E-2	1	1	2	1	NA	Intended to reduce water use. Temporary land disturbance during construction of facilities.
		Modification to wastewater treatment facility & irrigation system	E-3	2	2	2	2	NA	Intended to reduce water loss.
	Lajitas Municipal Services	Water loss audit and main-line repair	E-4	2	2	2	2	NA	Intended to reduce water loss.
	Marathon WSSService	Water loss audit and main-line repair	E-5	2	2	2	2	NA	Intended to reduce water loss.
	Study Butte Terlingua WS	Water loss audit and main-line repair	E-6	2	2	2	2	NA	Intended to reduce water loss.
	*Brewster County Mining	Mining Conservation	E-7	2	2	2	2	NA	Intended to reduce water loss.
Culberson	City of Van Horn	Water loss audit and main-line repair	E-8	2	2	2	2	NA	Intended to reduce water loss.
		Additional groundwater well	E-9	2	3	2	2	NA	Temporary land disturbance during drilling of well and construction of connecting pipeline.
	**Culberson County Irrigation	Irrigation scheduling	E-10	2	2	2	2	NA	Intended to reduce water loss.
		Additional groundwater wells	E-11	2	3	2	2	NA	Temporary land disturbance during drilling of well and construction of connecting pipeline.
	**Culberson County Mining	Mining Conservation	E-12	2	2	2	2	NA	Intended to reduce water loss.
El Paso	Town of Anthony	Water loss audit and main-line repair	E-13	2	2	2	2	NA	Intended to reduce water loss.
		Arsenic treatment facility	E-14	2	3	2	2	NA	Temporary land disturbance during construction of facilities.
		Additional groundwater well	E-15	2	3	2	2	NA	Temporary land disturbance during drilling of well and construction of connecting pipeline.
	El Paso Water	Municipal conservation programs	E-16	2	2	2	2	NA	Intended to reduce water use.
		Water loss audit and main-line repair	E-17	2	2	2	2	NA	Intended to reduce water use.
		Expansion of the Kay Bailey Hutchison Desal Plant	E-18	2	3	2	2	NA	Temporary land disturbance during drilling of well and construction of connecting pipeline and plant expansion.
		Advanced water purification at the Bustamante WWTP	E-19	2	3	2	2	NA	Temporary land disturbance during construction of facilities.
		Conjunctive treatment of groundwater and surface water at the Upper Valley WWTP	E-20	2	3	2	2	NA	Temporary land disturbance during construction of facilities.
		Groundwater from Dell City Area (Phase 1)	E-21	2	3	2	2	NA	Temporary land disturbance during drilling of well and construction of connecting pipeline.
	El Paso Water **ALTERNATE STRATEGIES**	Groundwater from Dell City Area (Phase 2)	E-22	2	3	2	2	NA	Temporary land disturbance during drilling of well and construction of connecting pipeline.
		Hueco Bolson artificial recharge	E-23	2	1	2	2	NA	Six spreading basins will be excavated on EPWU property, which will temporarily hold surface water for infiltration.
		Brackish groundwater at the Jonathan Rogers WTP	E-24	2	3	2	2	NA	Temporary land disturbance during construction of facilities.
		Treatment and reuse of agricultural drain water	E-25	2 and 3	2	2	2	NA	Temporary land disturbance during construction of facilities. Reduced water in drains may occur.
		Riverside Regulating Reservoir	E-26	1 and 3	1 and 3	2	2	NA	Construction of a 4,100-acre-foot ring levy regulating reservoir. Formally the location of several wastewater disposal ponds. Surface water impoundment habitat will be created; however, a minor amount of flood overflow will be diverted from downstream flow.

This page intentionally left blank.

Table 5-4. (continued) Summary of Recommended and Alternate Water Management Strategy Environmental Assessments (Rio Grande River Basin)

County	Water User Group	Strategy	Strategy ID	Environmental Impact Factors **					Area Impacted and Resulting Conditions
				Water Needs (1-5)	Habitat (1-5)	Cultural Resources (1-5)	Water Quality (1-5)	Rays & Estuaries *** (1-5)	
El Paso	El Paso Water **ALTERNATE STRATEGIES**	Expansion of Jonathan Rogers WTP	E-27	2	3	2	2	NA	Temporary land disturbance during construction of facilities.
		Advanced water purification at the Haskell Street RWP	E-28	2	3	2	2	NA	Temporary land disturbance during construction of facilities.
	*Fort Bliss & East Biggs	Public conservation education	E-29	2	2	2	2	NA	Intended to reduce water use.
		Purchase water from El Paso Water	E-30	2	2	2	2	NA	Causes no change in existing conditions.
	*Lower Valley Water District	Public conservation education	E-31	2	2	2	2	NA	Intended to reduce water use.
		Water loss audit and main-line repair	E-32	2	2	2	2	NA	Intended to reduce water use.
		Purchase water from El Paso Water	E-33	2	2	2	2	NA	Causes no change in existing conditions.
		Surface water treatment plant & transmission line	E-34	2	3	2	2	NA	Temporary land disturbance during construction of facilities.
		Groundwater from proposed Well field **ALTERNATE**	E-35	2	3	2	2	NA	Temporary land disturbance during drilling of well and construction of connecting pipeline.
		Groundwater from proposed Well field	E-36	2	3	2	2	NA	Temporary land disturbance during drilling of well and construction of connecting pipeline.
		Wastewater treatment facility and ASR	E-37	2	2	3	2	NA	Temporary land disturbance during construction of facilities.
	*Horizon Regional MUD	Water loss audit and main-line repair	E-38	2	2	2	2	NA	Intended to reduce water use.
		Public conservation education	E-39	2	2	2	2	NA	Intended to reduce water use.
		Additional wells & expansion of desalination plant	E-40	2	3	2	2	NA	Temporary land disturbance during drilling of nine well and construction of connecting pipeline and plant expansion.
	East Montana WS	Water loss audit and main-line repair	E-41	2	2	2	2	NA	Intended to reduce water use.
	El Paso County Tornillo WID	Water loss audit and main-line repair	E-42	2	2	2	2	NA	Intended to reduce water use.
		Additional groundwater well & transmission line	E-43	2	3	2	2	NA	Temporary land disturbance during drilling of well and construction of connecting pipeline.
	El Paso County WCID #4 (Fabens)	Water loss audit and main-line repair	E-44	2	2	2	2	NA	Intended to reduce water use.
	**El Paso County Irrigation (EPCWID #1)	Irrigation scheduling	E-45	2	3	2	2	NA	Intended to reduce water use.
		Tailwater reuse	E-46	2	2	2	2	NA	Intended to reduce water use.
		Improvements to water district delivery system	E-47	2	3	2	2	NA	Minor land disturbance will occur as existing canals are concrete lined.
		Riverside Regulating Reservoir	E-48	1 and 3	1 and 3	2	2	NA	Construction of a 4,100-acre-foot ring levy regulating reservoir. Formally the location of several wastewater disposal ponds. Surface water impoundment habitat will be created; however, a minor amount of flood overflow will be diverted from downstream flow.
		New Wasteway 32 River Diversion Pumping Point	E-49	2	3	2	2	NA	Intended to reduce water loss. Minor land disturbance will occur as existing canals are concrete lined.
	El Paso County (Steam Electric Power)	Purchase Water from El Paso Water	E-50	2	2	2	2	NA	Causes no change in existing conditions.
		Treatment and reuse of wastewater	E-51	2 and 3	2	2	2	NA	Temporary land disturbance during construction of facilities.
Hudspeth	Esperanza WS	Water loss audit and main-line repair	E-52	2	2	2	2	NA	Intended to reduce water use.
	Hudspeth County Other (Dell City)	Brackish groundwater desal facility	E-53	2	2	2	2	NA	Causes no change in existing conditions.

This page intentionally left blank.

Table 5-4. (continued) Summary of Recommended and Alternate Water Management Strategy Environmental Assessments (Rio Grande River Basin)

County	Water User Group	Strategy	Strategy ID	Environmental Impact Factors **					Area Impacted and Resulting Conditions
				Water Needs	Habitat	Cultural Resources	Water Quality	Rays & Estuaries ***	
				(1-5)	(1-5)	(1-5)	(1-5)	(1-5)	
Hudspeth	Hudspeth Co. WCID #1 (City of Sierra Blanca)	Replace water-supply line from Van Horn	E-54	2	2	2	2	NA	Temporary land disturbance during construction of connecting pipeline.
		Groundwater well West of Van Horn	E-55	2	2	2	2	NA	Temporary land disturbance during drilling of well and construction of connecting pipeline.
	**Hudspeth County Irrigation	Irrigation scheduling	E-56	2	3	2	2	NA	Intended to reduce water use.
	*Hudspeth County Livestock	Livestock Conservation	E-57	2	3	2	2	NA	Intended to reduce water use.
	*Hudspeth County Mining	Mining Conservation	E-58	2	3	2	2	NA	Intended to reduce water use.
		Additional groundwater well	E-59	2	3	2	2	NA	Temporary land disturbance during drilling of well and construction of connecting pipeline.
Jeff Davis	Fort Davis WSC	Additional groundwater well	E-60	2	3	2	2	NA	Temporary land disturbance during drilling of well and construction of connecting pipeline.
		Transmission line to connect Fort Davis WSC to Fort Davis Estates	E-61	2	2	2	2	NA	Temporary land disturbance during construction of connecting pipeline.
	Jeff Davis County Other (City of Valentine)	Additional groundwater well	E-62	2	3	2	2	NA	Temporary land disturbance during drilling of well and construction of connecting pipeline.
	*Jeff Davis County Livestock	Livestock Conservation	E-63	2	3	2	2	NA	Intended to reduce water use.
Presidio	City of Presidio	Additional groundwater well	E-64	2	3	2	2	NA	Temporary land disturbance during drilling of well and construction of connecting pipeline.
	Presidio County Other (Candelaria WSC)	Water loss audit and main-line repair	E-65	2	2	2	2	NA	Intended to reduce water use.
	Presidio County Other (Redford WS)	Water loss audit and main-line repair	E-66	2	2	2	2	NA	Intended to reduce water use.
	*Presidio County Livestock	Livestock Conservation	E-67	2	2	2	2	NA	Intended to reduce water use.
Terrell	*Terrell County Irrigation	Irrigation scheduling	E-68	2	2	2	2	NA	Intended to reduce water use.

*WUGs with a projected future supply deficit. (*See Table 4-1 for list of shortages).*

**WUGs with an unmet need.

This page intentionally left blank.

5.3 WATER CONSERVATION

Water conservation is one of the most important components of water supply management. According to the 2022 State Water Plan, the State's existing water supply is not sufficient to meet all future demands during times of drought. To meet the water demand in the year 2070, Texas would need to provide 6.9 million acre-feet of additional supplies, including water savings through conservation. Conservation was by far the most recommended strategy in all 16 regional water plans that formed the basis of the 2022 State Water Plan. Recognizing its impact, setting realistic goals, and aggressively enforcing implementation may significantly extend the time when new supplies and associated infrastructure are needed. This Chapter explores conservation opportunities and provides a road map for integrating conservation planning into long-range water supply management goals.

5.3.1 Water Conservation Overview

The Texas Water Development Board (TWDB) defines 'conservation' as those practices, techniques, programs, and technologies that will protect water resources, reduce the consumption of water, reduce the loss or waste of water, improve the efficiency in the use of water, or increase the recycling or reuse of water so that a water supply is made available for future or alternative uses. The mission of the water conservation staff is to provide leadership, planning, financial assistance, information, and education for water conservation processes in Texas.

Effective conservation programs implement best management practices to try to meet the targets and goals identified within the plan and are important to water conservation planning for all entities such as: municipal, agricultural, industrial, and commercial. Water conservation management planning implemented by municipalities, water providers, and other water users supersede recommendations in this *Plan* and are considered consistent with this *Plan*.

The TWDB and the Texas State Soil and Water Conservation Board (TSSWCB) jointly conducted a study of ways to improve or expand water conservation efforts in Texas. The results of that study are available in a joint 2018 report titled "An Assessment of Water Conservation in Texas, Prepared for the 85th Texas Legislature" and contains the following:

- An assessment of both agricultural and municipal water conservation issues;
- Information on existing conservation efforts by the TWDB and the TSSWCB;
- Information on existing conservation efforts by municipalities receiving funding from the TWDB, as specified in water conservation plans submitted by the municipalities as part of their applications for assistance;
- A discussion of future conservation needs;
- An analysis of programmatic approaches and funding for additional conservation efforts;
- An assessment of existing statutory authority and whether changes are needed to more effectively promote and fund conservation projects; and
- An assessment of the TWDB's agricultural water conservation program.

In addition, the TWDB in 2015 received funding from the Texas Legislature and hired a firm to perform a research project with the intent of measuring and quantifying the municipal water conservation efforts Statewide. Interviews were conducted in each of the 16 regional planning areas with two primary goals: (1) Assist regional planners and the TWDB to quantify ongoing municipal conservation activities throughout the State and estimate regional water savings from activities adopted by the utilities; and (2) To provide individual utilities with detailed reports and recommendations that will assist them to meet their own water conservation goals.

The TWDB Statewide Municipal Water Conservation Quantification Project surveyed two of the 22 municipalities within the Far West Texas region. Surveyed entities were El Paso Water and Horizon Regional MUD. Although only two entities were surveyed, these participating utilities portion of the recommended conservation supply accounts for approximately 94 percent of the annual savings to meet the 2070 supply volume for municipal water conservation Region wide.

The report highlights a variety of conservation activities these two utilities have implemented and made recommendations to continue the effort, however it is not required by statute and administrative rules (31 TAC §357.34; 357.35) to develop strategies based on the findings of this report.

The Far West Texas water planning group considers the Statewide Water Conservation Quantification Project Report document to be a valid resource for integrating conservation planning into long-range water supply management goals.

Texas Water Code §11.1271 requires water conservation plans for all municipal and industrial water users with surface water rights of 1,000 acre-feet per year or more and irrigation water users with surface water rights of 10,000 acre-feet per year or more. Also, all entities with 3,300 or more connections and/or a financial obligation with TWDB greater than $500,000 are required to submit water conservation plans. Water conservation plans of three entities in Far West Texas that meet these criteria were reviewed for this *Plan* including El Paso Water, El Paso County Water Improvement District No.1, and Hudspeth County Conservation and Reclamation District No.1. Water conservation plans are also required for all other water users applying for a State water right and may also be required for entities seeking State funding for water supply projects.

5.3.2 Model Water Conservation Plans

Water Conservation Plan forms are available from TCEQ in WordPerfect and PDF formats. The forms for the following entity types listed below are available either on the TWDB's Water Conservation Plans webpage or on the TCEQ's Water Conservation website.

You can receive a print copy of a form by calling 512/239-4691 or by email to wras@tceq.texas.gov.

Municipal Use – Utility Profile and Water Conservation Plan Requirements for Municipal Water Use by Public water Suppliers (TCEQ-10218) Word

Wholesale Public Water Suppliers – Profile and Water Conservation Plan Requirements for Wholesale Public Water Suppliers (TCEQ-20162) Word

Industrial Use – Industrial Water Conservation Plan (TCEQ-20839) Word

Mining Use – Mining Water Conservation Plan (TCEQ-20840) Word

Agricultural Uses – Agriculture Water Conservation Plan-Non-Irrigation (TCEQ-10541) Word

System Inventory and Water Conservation Plan for Individually-Operated Irrigation System (TCEQ-10238) Word

System Inventory and Water Conservation Plan for Agricultural Water Suppliers Providing Water to More Than One User (TCEQ-10244) Word

5.3.3 State Water Conservation Programs and Guides

The TWDB provides a significant amount of information and services pertaining to water conservation that can be accessed at TWDB Water Conservation.

Likewise, water conservation tips developed by the TCEQ and made available through their Take Care of Texas educational campaign can be accessed at TCEQ's Water Conservation webpage.

Water-Saving Plumbing Fixture Program

The Texas Legislature created the Water-Savings Plumbing Fixture Program in 1992 to promote water conservation. Manufacturers of plumbing fixtures sold in Texas must comply with the Environmental Performance Standards for Plumbing Fixtures, which requires all plumbing fixtures such as showerheads, toilets and faucets sold in Texas to conform with specific water use efficiency standards.

As of January 1, 2014, Texas (HB 2667) mandates all toilets and urinals sold in Texas must meet new efficiency standards.

- Bath faucets cannot exceed 2.2 gallons per minute (GPM).
- Showerheads cannot exceed 2.5 gallons per minute (GPM).
- Kitchen faucets cannot exceed 2.2 gallons per minute (GPM).
- Toilets cannot exceed 1.28 gallons per flush (GPF).
- Urinals cannot exceed 0.5 gallons per flush (GPF).

Since more water is used in the bathroom than any other place in the home, water-efficient plumbing fixtures play an integral role in reducing water consumption, wastewater production, and consumers' water bills. It is estimated that switching to water-efficient fixtures can save the average household between $50 and $100 per year on water and sewer bills. Many hotels and office buildings find that water-efficient fixtures can save 20 percent on water and wastewater costs.

The EPA's WaterSense program labels water-efficient products that meet most of the criteria above, and on average are certified to use at 20 percent less water than legacy fixtures. Their website also provides a product search tool and a rebate finder.

Water Conservation Best Management Practices

The 78th Texas Legislature under Senate Bill 1094 created the Texas Water Conservation Implementation Task Force and charged the group with reviewing, evaluating, and recommending optimum levels of water use efficiency and conservation for the State. The TWDB and TCEQ in coordination with the Water Conservation Advisory Council prepared TWDB Report 362, Water Conservation Best Management Practices Guides for agricultural, commercial, institutional, and industrial water users. In addition, guides were developed for both municipal and wholesale water providers. These suggested BMPs are structured for delivering a conservation measure or series of measures that are useful, proven, cost-effective, and generally accepted among conservation experts. Each BMP structure has several elements that describe the efficiency measures, implementation techniques, schedule of implementation, scope, water savings estimating procedures, cost effectiveness considerations, and references to assist end-users in implementation. These documents can be accessed here:

Texas Water Development Board Report 362 - Water Conservation Implementation Task Force: Water Conservation Best Management Practices Guide

An update to the introduction in TWDB Report 362 can be found here: Water Conservation Best Management Practices - Understanding Best Management Practices

Public Water Conservation Education

Public education may be one of the most productive actions that can result in the greatest amount of water savings. Most citizens are willing to actively do their part to conserve water once the need is communicated and how to accomplish the most benefit is explained. Numerous state, county, and academic agencies provide educational material and demonstrations. Groundwater conservation districts also provide water conservation activities.

The TWDB provides a significant amount of information and services pertaining to water conservation that can be accessed at: TWDB Water Conservation.

Likewise, water conservation tips developed by the TCEQ and made available through their Take Care of Texas educational campaign can be accessed at the following website: Take Care of Texas: Conserve & Keep Water Clean.

TPWD also offers programs geared toward the appreciation and conservation of the State's outdoor natural resources which include:

- Freshwater Inflows and Estuaries.
- Coastal Studies.
- River Studies.
- Texas Gulf Ecological Management Sites.

Education of our youth may be one of the best ways to spread the word about conservation of water. The TWDB provides excellent educational programs for all grade levels K-12th. Information pertaining to this program can be accessed at: TWDB Kids.

The Groundwater Conservation Districts in the Far West Texas Region have water conservation management goals that include:

- Publishing conservation articles in local newspapers;
- Providing conservation presentations and demonstrations at county shows;
- Conducting school programs relating to conservation issues; and
- Working with river authorities to promote the clean rivers program.

5.3.4 Regional Conservation Water Management Strategies

Many of the recommended water management strategies listed in Table 5-2 are classified as “Conservation”. Conservation strategies are considered the first method of management when considering meeting future water needs. Conservation strategies include:

- Water loss audit and main-line repair.
- Public conservation awareness.
- Municipal supply conservation distribution.
- Specified Irrigation, livestock, manufacturing and mining conservation practices.

The *2026 Far West Texas Water Plan* recommends the following 32 conservation related strategies presented in Table 5-5. New to this planning cycle, the TWDB requires that regional water plans separate conservation strategies and their projects into either a *Conservation – water loss mitigation* or *Conservation – water use reduction* water management strategy type. Table 5-6 presents the breakout of those two different types of water management strategies.

Table 5-5. **Summary of Recommended Conservation Water Management Strategy Evaluations**

County	Water User Group	Strategy	2026 Strategy ID	Strategy Supply (Acre-Feet/Year)					
				2030	2040	2050	2060	2070	2080
Brewster	City of Alpine	Water loss audit and main-line repair	E-1	23	23	23	23	23	23
		Irrigation and recharge application of captured rainwater runoff	E-2	70	70	70	70	70	70
	Lajitas Municipal Services	Water loss audit and main-line repair	E-4	14	14	14	14	14	14
	Marathon WSSService	Water loss audit and main-line repair	E-5	10	10	10	10	10	10
	Study Butte Terlingua WS	Water loss audit and main-line repair	E-6	12	12	12	12	12	12
	Brewster County Mining	Mining Conservation	E-7	8	8	9	9	9	9

Table 5-5. (continued) Summary of Recommended Conservation Water Management Strategy Evaluations

County	Water User Group	Strategy	2026 Strategy ID	Strategy Supply (Acre-Feet/Year)					
				2030	2040	2050	2060	2070	2080
Culberson	City of Van Horn	Water loss audit and main-line repair	E-8	57	57	57	57	57	57
	Culberson County Irrigation	Irrigation scheduling	E-10	12,738	12,738	12,738	12,738	12,738	12,738
	Culberson County Mining	Mining Conservation	E-12	1,502	1,503	1,503	1,504	1,504	1,504
El Paso	Town of Anthony	Water loss audit and main-line repair	E-13	8	8	8	8	8	8
	City of El Paso (EPW)	Municipal conservation programs	E-16	4,950	5,530	5,080	9,950	13,140	17,820
		Water loss audit and main-line repair	E-17	2,266	2,266	2,266	2,266	2,266	2,266
	Fort Bliss & East Biggs	Public conservation education	E-29	64	67	68	69	69	70
	Lower Valley Water District	Public conservation education	E-31	72	74	76	77	77	78
El Paso	Lower Valley Water District	Water loss audit and main-line repair	E-32	77	77	77	77	77	77
	Horizon Regional MUD	Water loss audit and main-line repair	E-38	182	182	182	182	182	182
		Public conservation education	E-39	95	99	101	102	103	104
	East Montana WS	Water loss audit and main-line repair	E-41	14	14	14	14	14	14
	El Paso County Tornillo WID	Water loss audit and main-line repair	E-42	6	6	6	6	6	6
	El Paso County WCID #4 (Fabens)	Water loss audit and main-line repair	E-44	9	9	9	9	9	9
	*El Paso County Irrigation (EPCWID #1)	Irrigation scheduling	E-45	29,099	29,099	29,099	29,099	29,099	29,099
		Tailwater reuse	E-46	19,399	19,399	19,399	19,399	19,399	19,399
		Improvements to water district delivery system	E-47	25,000	25,000	25,000	25,000	25,000	25,000
Hudspeth	Esperanza WS	Water loss audit and main-line repair	E-52	8	8	8	8	8	8
	Hudspeth County Irrigation	Irrigation scheduling	E-56	504	504	504	504	504	504
	Hudspeth County Livestock	Livestock Conservation	E-57	715	715	715	715	715	715
	Hudspeth County Mining	Mining Conservation	E-58	10	11	11	11	11	11
Jeff Davis	Jeff Davis County Livestock	Livestock Conservation	E-63	208	208	208	208	208	208
Presidio	Presidio County Other (Candelaria WSC)	Water loss audit and main-line repair	E-65	1	1	1	1	1	1
	Presidio County Other (Redford WS)	Water loss audit and main-line repair	E-66	1	1	1	1	1	1
	Presidio County Livestock	Livestock Conservation	E-67	6	6	6	6	6	6
Terrell	Terrell County Irrigation	Irrigation scheduling	E-68	2,190	2,190	2,190	2,190	2,190	2,190

Table 5-6. Summary of Recommended Conservation Water Management Strategy Evaluations by Type

County	Water User Group	Strategy	Strategy Type	2026 Strategy ID	Strategy Supply (Acre-Feet/Year)					
					2030	2040	2050	2060	2070	2080
Brewster	City of Alpine	Water loss audit and main-line repair	Water loss mitigation	E-1	23	23	23	23	23	23
		Irrigation and recharge application of captured rainwater runoff	Water use reduction	E-2	70	70	70	70	70	70
	Lajitas Municipal Services	Water loss audit and main-line repair	Water loss mitigation	E-4	14	14	14	14	14	14
	Marathon WSSService	Water loss audit and main-line repair	Water loss mitigation	E-5	10	10	10	10	10	10
	Study Butte Terlingua WS	Water loss audit and main-line repair	Water loss mitigation	E-6	12	12	12	12	12	12
	Brewster County Mining	Mining Conservation	Water use reduction	E-7	8	8	9	9	9	9
Culberson	City of Van Horn	Water loss audit and main-line repair	Water loss mitigation	E-8	57	57	57	57	57	57
	Culberson County Irrigation	Irrigation scheduling	Water use reduction	E-10	12,738	12,738	12,738	12,738	12,738	12,738
	Culberson County Mining	Mining Conservation	Water use reduction	E-12	1,502	1,503	1,503	1,504	1,504	1,504
El Paso	Town of Anthony	Water loss audit and main-line repair	Water loss mitigation	E-13	8	8	8	8	8	8
	City of El Paso (EPW)	Municipal conservation programs	Water use reduction	E-16	4,950	5,530	5,080	9,950	13,140	17,820
		Water loss audit and main-line repair	Water loss mitigation	E-17	2,266	2,266	2,266	2,266	2,266	2,266
	Fort Bliss & East Biggs	Public conservation education	Water use reduction	E-29	64	67	68	69	69	70
	Lower Valley Water District	Public conservation education	Water use reduction	E-31	72	74	76	77	77	78
		Water loss audit and main-line repair	Water loss mitigation	E-32	77	77	77	77	77	77
	Horizon Regional MUD	Water loss audit and main-line repair	Water loss mitigation	E-38	182	182	182	182	182	182
		Public conservation education	Water use reduction	E-39	95	99	101	102	103	104
	East Montana WS	Water loss audit and main-line repair	Water loss mitigation	E-41	14	14	14	14	14	14
	El Paso County Tornillo WID	Water loss audit and main-line repair	Water loss mitigation	E-42	6	6	6	6	6	6
	El Paso County WCID #4 (Fabens)	Water loss audit and main-line repair	Water loss mitigation	E-44	9	9	9	9	9	9
	*El Paso County Irrigation (EPCWID #1)	Irrigation scheduling	Water use reduction	E-45	29,099	29,099	29,099	29,099	29,099	29,099
		Tailwater reuse	Water use reduction	E-46	19,399	19,399	19,399	19,399	19,399	19,399
		Improvements to water district delivery system	Water use reduction	E-47	25,000	25,000	25,000	25,000	25,000	25,000

Table 5-6. (continued) Summary of Recommended Conservation Water Management Strategy Evaluations by Type

County	Water User Group	Strategy	Strategy Type	2026 Strategy ID	Strategy Supply (Acre-Feet/Year)					
					2030	2040	2050	2060	2070	2080
Hudspeth	Esperanza WS	Water loss audit and main-line repair	Water loss mitigation	E-52	8	8	8	8	8	8
	Hudspeth County Irrigation	Irrigation scheduling	Water use reduction	E-56	504	504	504	504	504	504
	Hudspeth County Livestock	Livestock Conservation	Water use reduction	E-57	715	715	715	715	715	715
Hudspeth	Hudspeth County Mining	Mining Conservation	Water use reduction	E-58	10	11	11	11	11	11
Jeff Davis	Jeff Davis County Livestock	Livestock Conservation	Water use reduction	E-63	208	208	208	208	208	208
Presidio	Presidio County Other (Candelaria WSC)	Water loss audit and main-line repair	Water loss mitigation	E-65	1	1	1	1	1	1
	Presidio County Other (Redford WS)	Water loss audit and main-line repair	Water loss mitigation	E-66	1	1	1	1	1	1
	Presidio County Livestock	Livestock Conservation	Water use reduction	E-67	6	6	6	6	6	6
Terrell	Terrell County Irrigation	Irrigation scheduling	Water use reduction	E-68	2,190	2,190	2,190	2,190	2,190	2,190

5.3.5 Gallons Per Capita Daily Goals

Effective municipal conservation can best be monitored in terms of reduction in gallons per day per capita (GPCD). The FWTWPG decided to utilize the maximum historical GPCD (2010-2020) for 23 of the 29 water user groups (WUGs) within the Region. The remaining six WUGs calculated projected water demands by using the 2021 Plan values. In addition, the TWDB established several key changes to the water demand projection methodology for the sixth cycle of regional water planning. One of the key changes assumes that the expected water efficiency savings by replacement and new growth would reasonably be fully realized by the first projected decade of 2030, based on the effective year of the relevant plumbing code standards and the useful life of these items. Therefore, future savings beyond 2030 from additional faucet and dishwater replacements were not considered necessary for inclusion the in the plumbing code savings projections for this current planning cycle. Plumbing code savings from 2040 through 2080 are held constant.

Table 5-7 presents the FWTWPG approved 2020 base GPCDs, along with the projected GPCD reductions in 2030 which includes plumbing code savings. The planning group recommends conservation water management strategies (water loss audit & main-line repair) for 14 entities listed on Tables 5-5 and 5-6. More details related to those water management strategies can be found in Appendix 5A. It is highly recommended that these entities take advantage of a water loss audit to guide needed repairs.

Table 5-7. Gallons Per Capita Daily Goals

Water User Group	Base 2020 GPCD	Adjusted 2030 GPCD	Adjusted 2040 GPCD	Adjusted 2050 GPCD	Adjusted 2060 GPCD	Adjusted 2070 GPCD	Adjusted 2080 GPCD
*Alpine	383	378	377	377	377	377	377
*Anthony	191	186	186	186	186	186	186
County-Other, Brewster	147	142	141	141	141	141	141
County-Other, Culberson	164	158	157	157	157	157	157
County-Other, El Paso	206	199	198	198	198	198	198
County-Other, Hudspeth	160	155	154	154	154	154	154
County-Other, Jeff Davis	141	136	135	135	135	135	135
*County-Other Presidio	161	155	155	155	155	155	155
County-Other, Terrell	118	113	112	112	112	112	112
*East Montana Water System	160	156	156	156	156	156	156
*El Paso County Tornillo WID	115	111	110	110	110	110	110
*El Paso County WCID #4	146	142	141	141	141	141	141
*El Paso Water	144	125	123	118	115	112	109
*Esperanza Water Service	174	170	169	169	169	169	169
Federal Correctional Institution La Tuna	200	197	197	197	197	197	197
Fort Bliss & East Biggs Water System	145	141	140	140	140	140	140
Fort Davis WSC	275	270	269	269	269	269	269
Hacienda Del Norte WID	170	166	165	165	165	165	165
*Horizon Regional MUD	177	173	172	172	172	172	172
Hudspeth County WCID #1	284	279	278	278	278	278	278
*Lajitas Municipal Services	1,745	1,741	1,740	1,740	1,740	1,740	1,740
*Lower Valley Water District	107	103	102	102	102	102	102
*Marathon Water Supply & Sewer Services	282	277	276	276	276	276	276
Marfa	250	245	244	244	244	244	244
Paseo Del Este MUD #1	270	267	266	266	266	266	266
Presidio	255	251	250	250	250	250	250
*Study Butte Terlingua Water System	566	561	561	561	561	561	561
Terrell County WCID #1	232	227	227	227	227	227	227
*Van Horn	336	331	331	331	331	331	331

*Entities that have water loss audit & main-line repair strategies.

El Paso Water decadal projection is provided by the Utility as illustrated in El Paso Water Strategy E-16 in Appendix 5A. All other utilities in the *Plan* have acceptable GPCDs considering implementation of recommended water management strategies.

Significantly more restrictive measures should be initiated in response to varying degrees of drought conditions such as:

- Mild Drought (Stage 1) – 10% reduction.
- Moderate Drought (Stage 2) – 20% reduction.
- Severe Drought (Stage 3) – 30% reduction.
- Extreme Drought (Stage 4) – 40% reduction.

5.3.6 Municipal Conservation

El Paso Water (EPWater) is the largest supplier of municipal water in Far West Texas, supplying approximately 72 percent of all municipal needs in 2030. The City of El Paso through EPWater has been implementing an aggressive water conservation program for the past two decades and has reduced the per capita demand from 225 gpcd in the late 1970s to a current level of 131 gpcd. The overall per capita potable water-use for EPWater and its wholesale customers, including steam electric and industrial use, was about 131 gpcd in 2023. EPWater intends to continue its aggressive water conservation efforts and estimates that demand can be further reduced through conservations efforts to approximately 110 gpcd by 2080. The continuation of the conservation effort is a key component of the El Paso Integrated Water Management Strategy discussed in Chapter 5.

El Paso Water maintains a robust Conservation website that provides conservation tips, a guide to native plants, a step-by-step guide on how to use your water meter to check for leaks, a water use calculator, and several other topics that focus on conservation.

El Paso's TecH2O Learning Center has numerous educational exhibits geared towards school-aged students that focus on conservation, groundwater, desalination, xeriscape and several other topics. They maintain a conservation website, provide classroom activities for elementary, middle, and high school, and offer Water Smart workshops for the public and for educators.

5.3.7 Irrigation Conservation

Irrigated agriculture is the biggest user of water in Texas. Approximately 7.5 million acre-feet was represented within the 2020 planning decade, of the 2022 State Water Plan. Irrigation water use represents 45 percent of total water use in the State. This is 10 percent greater than municipal water use, which ranks as the second largest use of water State-wide.

On a Regional level, irrigation represents approximately 68 percent of all the water used in Far West Texas. Most of this water is diverted from the Rio Grande and is applied to crops on farms located along the Rio Grande floodplain in El Paso, Hudspeth, and Presidio Counties. During significantly dry periods, insufficient water is available in upstream reservoirs to meet the full permitted allotments, and farmers in these areas have generally approached this situation by reducing acreage irrigated, changing types of crops planted, or possibly not planting crops until water becomes available during the following season. In some cases, farmers may benefit from management practices described in Chapter 5, which are a mixture of site-specific management, educational, and physical procedures that have proven to be effective and are cost-effective for conserving water.

The implementation of water conservation programs that are cost effective, meet State mandates, and result in permanent real reductions in water use will be a challenge for the citizens of Far West Texas. Smaller communities that lack financial and technical resources will be particularly challenged and will look to the State for assistance. Irrigation conservation may result in significant reductions in water use. However, without financial and technical assistance, it is unlikely that aggressive irrigation conservation programs will be implemented.

Staff of the Texas AgriLife Research Center at El Paso evaluated the applicability, water savings potential, implementation feasibility, and cost effectiveness of seventeen irrigated agriculture water conservation practices in Far West Texas during both drought and full water supply conditions. Agricultural, hydrologic, engineering, economic, and institutional conditions are identified and examined for the three largest irrigated agricultural areas which account for over 90 percent of total irrigated agricultural acreage in Far West Texas. Factors considered in evaluating conservation strategies included water sources, use, water quality, cropping patterns, current irrigation practices, delivery systems, technological alternatives, market conditions and operational constraints.

The overall conclusion is that very limited opportunities exist for significant additional water conservation in Far West Texas irrigated agriculture. The primary reasons can be summarized by:

- the most effective conservation practices have already been implemented and associated water savings realized throughout the Region;
- reduced water quality and the physical nature of gravity flow delivery limit or prohibit implementation of higher efficiency pressurized irrigation systems;
- increased water use efficiency upstream has the net effect of reducing water supplies and production of downstream irrigators; and,
- water conservation implementation costs for many practices exceed the agricultural value and benefits of any water saved.

Those practices that suggest economic efficient additional water conservation included lining or pipelining district canals and the very small potential for additional irrigation scheduling and tail water recovery systems. In nearly all cases, these practices have been adopted if applicable, further emphasizing the very limited opportunities for additional conservation. If these strategies were implemented, the water conserved would satisfy a small percentage of the projected unmet agricultural water demand projected in Culberson, El Paso and Hudspeth Counties during drought-of-record conditions.

The full report on the irrigation conservation analysis, titled "Evaluation of Irrigation Efficiency Strategies for Far West Texas: Feasibility, Water Savings, and Cost Considerations" can be found on the TWDB's website.

5.3.8 Manufacturing Conservation

Manufacturing water use is one of the three largest uses of water in Texas. In the 2022 State Water Plan, approximately 1.7 million acre-feet was reported within the 2020 planning decade. This represents 10% of total water use in the State. In the Far West Texas Region, manufacturing water use accounts for two percent of the total non-municipal water use. The use of water for manufacturing purposes only occurs in Culberson and El Paso Counties (Table 2-7). Use in Culberson County is minimal and is not anticipated to change significantly over time, however, manufacturing water use in El Paso County is expected to increase from 7,915 acre-feet in the year 2030 to 9,493 acre-feet by 2080.

Most groundwater used for manufacturing in El Paso County is for petroleum refining. Refinery water consumption depends primarily on which of three configurations (cracking, light coking, and heavy coking) is utilized. These processes consume 14 to 20 gallons of water per barrel of crude processed.

Water consumption at most refineries includes cooling water evaporation loss, water embedded with product, steam trap losses, steam vent losses firewater main leaks to ground, evaporation from usage during maintenance, and evaporation from open water ponds in the wastewater treatment plant.

Recent improved practices across the industry include the following:

- Monitoring of steam used to purge and disperse flare tips;
- Replacing turbines that vent steam to the atmosphere with non-vented options;
- Capturing blowdown water from boilers in lower-pressure drum and cooling before sending to WWTP;
- Identifying and minimizing steam leaks;
- Rerouting steam traps that vent to ground to condensate recovery headers, and
- Capturing steam lost through top of de-aerators.

5.3.9 Water Loss Audit and Main-line Repair

Reported municipal use generally includes a variable amount of water that does not reach the intended consumer due to water leaks in the distribution lines, unauthorized consumption, storage tank overflows, and other wasteful factors. For some communities, attending to these issues can be a proactive conservation strategy that may result in significant water savings.

To address the lack of information on water loss, the 78th Texas Legislature passed House Bill 3338, which required retail public utilities that provide potable water to perform and file with the TWDB a water audit computing the utility's most recent annual system water loss every five years. In response to the mandate of House Bill 3338, TWDB developed a water audit methodology for utilities to quantify water losses, standardize water loss reporting and help measure water efficiency. This standardized approach to auditing water loss provides utilities with a reliable means to analyze their water loss performance. Utilizing a methodology derived from the American Water Works Association (AWWA) and the International Water Association (IWA), the TWDB has published a manual that outlines the process of completing a water loss audit: "Water Loss Audit Manual for Texas Utilities" – TWDB Report 367 (2008).

Additionally, for the sixth cycle of regional water planning, the TWDB developed several helpful resource guides regarding water loss performance targets and water loss threshold values. These documents can be accessed on the TWDB's website page titled Conservation Resources for 2026 Regional Water Plan Development.

Table 1-9 in Chapter 1, Section 1.9 provides a listing of utilities that exceed the water loss performance targets according to the AWWA standards.

Water Loss Audit Resources

The TWDB provides a significant amount of information and Water Loss Audit Resources pertaining to water loss audit. Additional resources and appropriate forms provided by TWDB include:

WUS and WLA Checklist for Retail Utilities

Troubleshooting for Negative Water Loss Components

Water Loss Audit Worksheet Instructions

Guidance for Assessment Scale

Assessment Scale Table

Guidelines for Setting a Target Infrastructure Leakage Index (ILI)

Water Loss Manual for Texas Utilities

Main-Line Loss Calculator

TWDB Equipment Loan Form

Water Loss Control Planning Guide

Water Loss Threshold Information Sheet

Over the last few years, smart meters, and advanced metering infrastructure (AMI) have become quite popular. AMI meters allow real-time monitoring of water usage. The AMI systems can help pinpoint water loss and allows for more interactive and responsive water management by the water provider. A growing number of cities (including Dallas and Granbury) are requesting SWIFT funding to help with the installation of updated AMI.

5.3.10 Water User Group Conservation Management Plans

In the consideration of regional conservation, the Far West Texas Water Planning Group reviewed active water conservation management plans provided to the planning group by the following entities.

Public Supply Entities

- City of Alpine.
- Dell City – Water Conservation and Drought Contingency Plan
- El Paso County WCID #4 (Fabens)
- El Paso Water.
- Esperanza Water Service Company – Drought Contingency Plan
- Fort Bliss WSC – Water Conservation Management Plan
- Fort Davis WSC – Drought Contingency Plan
- Horizon Regional MUD
- Lajitas Utility Company – Drought Contingency Plan
- Lower Valley Water District
- City of Marfa
- City of Presidio
- Study Butte WSC – Drought Contingency Plan
- Terrell County WCID No.1 – Water Conservation Management Plan
- Town of Anthony
- Town of Valentine – Drought Contingency Plan
- City of Van Horn
- City of Vinton (drought plan same as EPWater)

Irrigation Districts

- El Paso County Water Improvement District No.1 – Management Plan
- Hudspeth County Conservation and Reclamation District No.1 – Management Plan

5.3.11 Groundwater Conservation Districts Management Plans

The Texas Legislature has established a process for local management of groundwater resources through Groundwater Conservation Districts. The districts are charged with managing groundwater by providing for the conservation, preservation, protection, recharging and prevention of waste of groundwater within their jurisdictions. An elected board governs these districts and establishes rules, programs and activities specifically designed to address local problems and opportunities. Texas Water Code §36.0015 states, in part, "Groundwater Conservation Districts created as provided by this chapter are the State's preferred method of groundwater management." Six districts are currently in operation within the planning Region.

- Brewster County GCD
- Culberson County GCD
- Hudspeth County UWCD #1
- Jeff Davis County UWCD
- Presidio County UWCD
- Terrell County GCD

In recent sessions, the Texas Legislature has redefined the way groundwater is to be managed by Groundwater Management Areas. The TWDB provides more information regarding Groundwater Management Areas. The joint planning process is summarized in Chapter 1, Section 1.1.5.

As part of the joint planning process, groundwater conservation districts are responsible for determining the desired future conditions within a management area. Desired future conditions are defined in Title 31, Part 10, §35601. (6) of the Texas Administrative Code as "the desired, quantified condition of groundwater resources (such as water levels, spring flows, or volumes) within a management area at one or more specified future times as defined by participating groundwater conservation districts." Desired future conditions are implemented to help meet the planning goal for the conservation of water that is to be used for future uses. More information regarding Desired Future Conditions can be found on the TWDB's website.

The Brewster, Culberson, Hudspeth, Jeff Davis, and Presidio districts are in GMA 4. Terrell County Groundwater Conservation District is in GMA 7. As of May 1, 2021, *desired future conditions* have been adopted for the following aquifers: Capitan Reef, Edwards Trinity, Marathon, Rustler, Igneous, Upper Salt Basin, Bone Springs-Victorio Peak, West Texas Bolsons, and Presidio-Redford Bolson.

5.3.11.1 Brewster County Groundwater Conservation District

The Brewster County Groundwater Conservation District was confirmed in 2001 and serves all of Brewster County, the largest county in the State. The mission of the District is to manage, protect, and conserve the groundwater resources of Brewster County, while protecting private property rights and promoting constructive and sustainable development in the county. The table below presents the adopted DFCs for the aquifers in Brewster County. The approved 2022 Management Plan is available on their website, or by following the above link.

Adopted Desired Future Conditions for Brewster County

Aquifer	Capitan Reef Complex	Edwards-Trinity (Plateau)	Igneous	Marathon	Rustler
DFC	0-foot drawdown	3-foot drawdown	10-foot drawdown	0-foot drawdown	Aquifer non-relevant

5.3.11.2 Culberson County Groundwater Conservation District

The Culberson County Groundwater Conservation District was confirmed in May 1998 and occupies the southwestern half of Culberson County. Aquifers managed by the District primarily include the Wild Horse Flat, Michigan Flat, and Lobo Flat of the West Texas Bolsons, and the Capitan Reef. The table below presents the adopted DFCs for the aquifers in Culberson County. The approved 2019 2021 Management Plan is available on their website, or by following the above link.

Adopted Desired Future Conditions for Culberson County

Aquifer	Capitan Reef Complex	Edwards-Trinity (Plateau)	Igneous	West Texas Bolsons	Upper Salt Basin
DFC	50-foot drawdown	Aquifer non-relevant	66-foot drawdown	78-foot drawdown	Aquifer non-relevant

5.3.11.3 Hudspeth County Underground Water Conservation District #1

The Hudspeth County Underground Water Conservation District #1 was created in 1956 and is in the Dell Valley irrigation area of northeast Hudspeth County, with the Community of Dell City lying approximately in the center of the District. The principal aquifer in the District is the Bone Spring-Victorio Peak. The table presents the adopted DFCs for the aquifer in Hudspeth County. The approved 2024 Management Plan is available following the previous link.

Adopted Desired Future Conditions for Hudspeth County

Aquifer	Bone Spring – Victorio Peak	Capitan Reef Complex
DFC	0-foot drawdown	Aquifer non-relevant

5.3.11.4 Jeff Davis County Underground Water Conservation District

The Jeff Davis County Underground Water Conservation District was formed in August 1994 (HB 2866) and includes all of Jeff Davis County. Primary aquifers managed by the District include the Ryan Flat and Lobo Flat of the West Texas Bolsons and the Davis Mountains Igneous. District activities include the registration of all new wells and the permitting of wells that can produce 25,000 gallons per day or more. State well-construction standards are enforced, and water levels are monitored in 28 observation wells located in high use areas. The District is involved in a wellhead protection program with the Fort Davis Water Supply Corp. and provides educational programs for schools and the public. The table presents the adopted DFCs for the Aquifers in Jeff Davis County. The approved 2024 Management Plan is available following the previous link.

Adopted Desired Future Conditions for Jeff Davis County

Aquifer	Edwards-Trinity (Plateau)	Igneous	West Texas Bolsons	Pecos Valley	Capitan Reef Complex	Rustler
DFC	Aquifer non-relevant	20-foot drawdown	72-foot drawdown	Aquifer non-relevant	Aquifer non-relevant	Aquifer non-relevant

5.3.11.5 Presidio County Underground Water Conservation District

Presidio County residents approved the formation of the Presidio County Underground Water Conservation District in an election held August 31, 1999. Primary aquifers to be managed in the District include the Presidio-Redford Bolson, the Ryan Flat West Texas Bolson, and the Davis Mountains Igneous. District activities include well permitting, recharge enhancement, and public education. The table presents the adopted DFCs for the aquifers in Presidio County. The approved 2020 Management Plan is available on their website, or by following the link above.

Adopted Desired Future Conditions for Presidio County

Aquifer	Igneous	Presidio – Redford Bolsons	West Texas Bolsons
DFC	14-foot drawdown	72-foot drawdown	72-foot drawdown

5.3.11.6 Terrell County Groundwater Conservation District

The creation of the Terrell County Groundwater Conservation District was approved and confirmed by the voters of Terrell County at the confirmation election held on November 6, 2012. The Edwards-Trinity (Plateau) Aquifer is the primary aquifer managed by the District. The District accomplishes its objectives by working to lessen interference between water wells, minimize drawdown of groundwater levels, prevent the waste of groundwater, and reduce the degradation of groundwater quality. The District is focused on helping the local economy maintain and improve its current condition. District activities include the protection of existing wells, permitting of new wells and public education. The table presents the adopted DFCs for the Aquifer in Terrell County. The approved 2023 Management Plan is available on their website, or by following the link above.

Adopted Desired Future Conditions for Terrell County

Aquifer	Edwards-Trinity (Plateau)
DFC	2-foot drawdown

This page intentionally left blank.

APPENDIX 5A
RECOMMENDED AND ALTERNATE WATER MANAGEMENT STRATEGIES

This page intentionally left blank.

INTRODUCTION

"A water management strategy is a plan to meet an identified water need for additional water by an entity, which can mean increasing the total water supply or maximizing an existing supply, including through reducing demand. When a water management strategy project is implemented, it is intended to develop, deliver, and/or treat additional water-supply volumes, or conserve water for an entity," (TWDB Exhibit C Second Amended General Guidelines - Sept. 2023). The Far West Texas Regional Water Planning Group (FWTRWPG) has identified and evaluated a total of 68 water management strategies. Of this total, eight are "alternate" strategies, which can be substituted for "recommended" strategies that are later determined to be non-viable.

Water management strategies described in this Appendix are proposed recommended and alternate projects to meet projected water-supply shortages in future decades, and projects of specific interest by water-user entities participating in this planning process. Appendix 5C provides a copy of the costing tool's standardized, automated cost output report for each water management strategy evaluated.

Section 5.2 of this Chapter provides an explanation of the strategy evaluation procedure and Tables 5-2, 5-3, and 5-4 provide a side-by-side comparison such that all strategies can be assessed based on the same quantifiable factors.

Table 5-2

- Quantity of new water produced
- Chemical quality
- Reliability of supply
- Impacts to water, agricultural, and natural resources, and to ecologically unique stream segments

Table 5-3

- Financial cost (total capital cost, annual cost, and cost per acre-foot)

Table 5-4

- Environmental impacts
    - Environmental water needs
    - Wildlife habitat
    - Cultural resources
    - Environmental water quality
    - Inflows to bays and estuaries

Water management strategies recommended for this *2026 Plan* include specific projects or programs related to conservation and reuse, water-loss audit and main-line repair for entities that exceed water loss performance targets set by AWWA, and projects requiring infrastructure construction, upgrades, or modifications.

5A-1 WATER MANAGEMENT STRATEGIES FOR BREWSTER COUNTY

5A 1.1 Management Strategies for City of Alpine

The City of Alpine relies on groundwater from the Davis Mountains Igneous Aquifer, which is significantly impacted by local pumping during drought years. The City's water is provided by two primary well fields and several individual wells. Approximately 65 percent of the City's water comes from the Musquiz Well Field located 10 miles north of Alpine. Another 30 percent comes from the Sunny Glen Well Field located eight miles northwest of Alpine. The remaining five percent is produced by several small wells located around the City. The following three strategies bulleted below are intended to:

1. Repair several miles of main-line to reduce a portion of the total reported loss;
2. Utilize all available water (rainwater runoff and treated effluent) for restoration of Alpine Creek, which will improve wildlife habitat, and increase outdoor recreation in the area;
3. To develop a water source that is available to recharge the underlying aquifer system (ASR);
4. To diminish the amount of treated groundwater that is currently used for landscape irrigation;
5. To provide for more reuse-efficient landscape irrigation of the Country Club golf course, baseball fields, Kokernot Park (pool and picnic areas), and Poets Grove.

- (E-1) Water loss audit and main-line repair
- (E-2) Irrigation and recharge application of captured rainwater runoff
- (E-3) Modification to wastewater treatment facility & irrigation system

E-1 Water Loss Audit and Main-Line Repair

According to the 2022 TWDB Public Water System Water Loss Survey, the City of Alpine had real water losses (as opposed to apparent "paper" losses) of 193 acre-feet in 2022 (12 percent) due to leaking infrastructure. This amount of water loss is the sum of reported breaks and leaks, and unreported loss. The water-supply system can reduce water losses and get a more accurate look at water consumption by taking the proper measures to identify and repair old infrastructure and inaccurate water meters. This strategy will provide a savings of only a portion of the total reported loss and assumes that a leak testing program would be implemented prior to possibly replacing portions of the existing leaking pipe.

Quantity, Reliability and Cost - The strategy assumes 16 miles of six-inch diameter pipe will be replaced, at a total estimated project capital cost of $17,042,000. The strategy is estimated to generate a potential savings of 23 acre-feet of water per year throughout the planning period.

E-2 Irrigation and Recharge Application of Captured Rainwater Runoff

In a good year, the City of Alpine receives approximately 17 inches of rain, much of which is lost to runoff. High-intensity thunderstorms contribute to greater runoff into nearby Alpine Creek, causing higher peak flooding. This prevents the creek from functioning properly as evidenced by the scoured, cut and straightened channel that exists today which must be armored with engineered banks. Additionally, runoff transports pollutants into the creek, which eventually flows into the Rio Grande. As with many towns in West Texas, the streets act as a storm water drainage system. These water catchments take that storm water and turn it into an asset.

This strategy proposes constructing rainwater catchment basins at three locations around Kokernot Park, which will drain neighboring streets. Impounding a large volume of water from the roads will allow the captured water time to infiltrate the soil, recharge the underlying aquifer, and remediate pollutants. These basins will also be landscaped with water-efficient plants without tapping into the City's aquifer water for irrigation. These catchments will also demonstrate how residents can reduce water use and cost by capturing rainwater and landscaping with water-efficient native plants. This project will also help reduce down-stream flooding.

Quantity, Reliability and Cost - The three catchment basins (approximately 70 acres in combined size) are calculated to capture approximately 70 acre-feet during an average drought (12 inches or 75% of average annual rainfall) year. The project is planned for construction within the 2040 decade and come online prior to 2040. The estimated capital cost to construct the three catchment basins and retention dams is $1,580,000.

E-3 Modification to Wastewater Treatment Facility & Irrigation System

The City of Alpine Wastewater Treatment Plant receives up to 400,000 gallons per day and discharges 75,000 gallons per day. Currently the WWTP treated effluent can irrigate the north section of the *project area* (Golf Course) from a 35,000-gallon surface storage tank. This strategy project will increase the availability of non-potable water and thus reduce the demand for fresh water. The project includes modifications to the WWTP, installation of an additional 50,000-gallon storage tank (for a total of 85,000-gallon storage capacity) and extension of the main transmission pipeline to supply additional irrigation to the south side of the Golf Course.

Beneficial biproducts of this project (but not a part of the strategy project) include a proposed irrigation system to use the additional treated effluent to irrigate around the baseball fields, Kokernot Park (pool, picnic areas), and Poets Grove, all located in the project area. This would allow the City to efficiently reuse all the treated effluent available for irrigation, with any surplus supplied to Alpine Creek in the vicinity of the project area, enhancing bird habitat by establishing native trees and vegetation as well as providing a water feature for a nature trail along the creek between the golf course and the loop road.

Quantity, Reliability and Cost - The project will allow the City to use 100 percent of treated wastewater discharge, an increase of 30 percent or 25 acre-feet per year to irrigate project properties that were previously irrigated with fresh water. The project is planned for completion and delivery of water by the start of the 2040 decade and the estimated capital cost of infrastructure modification and irrigation system is $2,128,000.

5A 1.2 Management Strategy for Lajitas Municipal Services

Lajitas Municipal Services provides water and sewer utilities, road and drainage improvements and public service projects to the Town of Lajitas which lies in southwestern Brewster County. Located on the western edge of Big Bend National Park, this town is known for its name which means "small flat rocks" in Spanish, its location on a bluff overlooking the Rio Grande, and for its proximity to Big Bend National Park and Big Bend Ranch State Park.

Although the supply-demand analysis (Chapter 4) does not project a future water-supply deficit for Lajitas Municipal Services, the following water management strategy is recommended to enhance the reliability of the future water-supply availability for residents.

- (E-4) Water loss audit and main-line repair

E-4 Water Loss Audit and Main-line Repair

According to the 2020 TWDB Public Water System Water Loss Survey, the Lajitas Municipal Services Company had real water losses (as opposed to apparent "paper" losses) of 49 acre-feet in 2020 (29 percent) due to leaking infrastructure. This amount of water loss is the sum of reported breaks and leaks, and unreported loss. The water-supply system can reduce water losses and get a more accurate look at water consumption by taking the proper measures to identify and repair old infrastructure and inaccurate water meters. This strategy will provide a savings of only a portion of the total reported loss and assumes that a leak testing program would be implemented prior to possibly replacing portions of the existing leaking pipe.

Quantity, Reliability and Cost - The strategy assumes six miles of six-inch diameter pipe will be replaced, at a total estimated project capital cost of $6,392,000. The strategy is estimated to generate a potential savings of 14 acre-feet of water per year throughout the planning period.

5A 1.3 Management Strategy for Marathon Water Supply & Sewer Service Company

The Marathon Water Supply and Sewer Service Company is a utility company primarily focused on providing water and sewage services to residents of the community of Marathon. The Town of Marathon draws its water supply from the local Marathon Aquifer. The key goals of the utility company are to: (1) deliver potable water to homes and businesses in Marathon and collecting and treating wastewater from the same area, (2) operate a wastewater treatment plant to process sewage before discharge and (3) serve the residents of the area with exceptional service all the while managing the groundwater resources responsibly and sustainably.

Although the supply-demand analysis (Chapter 4) does not project a future water-supply deficit for Marathon Water Supply & Sewer Service Company, the following water management strategy is recommended to enhance the reliability of the future water-supply availability for residents.

- (E-5) Water loss audit and main-line repair

E-5 Water Loss Audit and Main-line Repair

According to the 2020 TWDB Public Water System Water Loss Survey, the Marathon Water Supply & Sewer Service Company had real water losses (as opposed to apparent "paper" losses) of 35 acre-feet in 2020 (29 percent) due to leaking infrastructure. This amount of water loss is the sum of reported breaks and leaks, and unreported loss. The water-supply system can reduce water losses and get a more accurate look at water consumption by taking the proper measures to identify and repair old infrastructure and inaccurate water meters. This strategy will provide a savings of only a portion of the total reported loss and assumes that a leak testing program would be implemented prior to possibly replacing portions of the existing leaking pipe.

Quantity, Reliability and Cost - The strategy assumes two miles of six-inch diameter pipe will be replaced, at a total estimated project capital cost of $2,130,000. The strategy is estimated to generate a potential savings of 10 acre-feet of water per year throughout the planning period.

5A 1.4 Management Strategy for Study Butte Terlingua Water System

The Study Butte Terlingua Water System is a rural water-supply system serving the small Texas town of Terlingua, primarily managed by the Study Butte Water Supply Corporation. This water system relies on deep wells (averaging 1,100 feet below surface) to access groundwater within the Brewster Cretaceous Aquifer, which is then treated with a reverse osmosis system due to its high mineral content. The water is distributed through a 29-mile water line network across the rugged terrain.

Although the supply-demand analysis (Chapter 4) does not project a future water-supply deficit for Study Butte Terlingua Water System, the following water management strategy is recommended to enhance the reliability of the future water-supply availability for residents. According to the TWDB's project funding information report, Study Butte Terlingua Water System has been awarded State funding and is actively repairing leaking pipe.

- (E-6) Water loss audit and main-line repair

E-6 Water Loss Audit and Main-line Repair

According to the 2020 TWDB Public Water System Water Loss Survey, the Study Butte Water Supply System, had real water losses (as opposed to apparent "paper" losses) of 45 acre-feet in 2020 (27 percent) due to leaking infrastructure. This amount of water loss is the sum of reported breaks and leaks, and unreported loss. The water-supply system can reduce water losses and get a more accurate look at water consumption by taking the proper measures to identify and repair old infrastructure and inaccurate water meters. This strategy will provide a savings of only a portion of the total reported loss and assumes that a leak testing program would be implemented prior to possibly replacing portions of the existing leaking pipe.

Quantity, Reliability and Cost - The strategy assumes eight miles of six-inch diameter pipe will be replaced, at a total estimated project capital cost of $8,520,000. The strategy is estimated to generate a potential savings of 12 acre-feet of water per year throughout the planning period.

5A 1.5 Management Strategy for Brewster County Mining

Much of the water needs for mining operations within Brewster County are self-supplied from private/company water wells. Projected mining water-supply shortages in Brewster County begin in 2030 with a four acre-feet per year deficit held constant throughout the planning horizon. The following water management strategy is recommended to enhance the Mining industry's future water-supply availability.

- (E-7) Mining Conservation

E-7 Mining Conservation

Mining groundwater use in Far West Texas is primarily associated with oil and gas production. Water is needed for well drilling activities, formation fracing, and sand (proppant) mining plants. The FWTWPG encourages the use of alternative water sources when and where it is economically feasible to do so. For conservation of freshwater resources associated with fracing, on-site treatment of produced and/or flowback water allows for reuse of the water stream. There are numerous third-party vendors who offer mobile produced water recycling systems.

In 2018, approximately 10 percent of fracwater supply in the Permian Basin was recycled produced water. Conservation of 15 percent of Brewster County mining needs in 2030 would reduce mining needs by eight acre-feet in 2030, increasing to nine acre-feet per year by 2080. This strategy provides enough water supply to absorb the projected water-supply deficit.

5A-2 WATER MANAGEMENT STRATEGIES FOR CULBERSON COUNTY

5A 2.1 Water Management Strategies for the City of Van Horn

Van Horn is a small town in West Texas, situated at the intersection of Interstate 10 and US Highway 90, knows as “crossroads” due to its location and historical significance as a railroad hub. The City of Van Horn is primarily recognized for its proximity to the Guadalupe Mountains and its connection to the early stagecoach routes through the region. Van Horn is the County seat of Culberson County and is often considered a pitstop for travelers heading to nearby attractions like Carlsbad Caverns in New Mexico.

Van Horn Utilities provides water, sewer, and garbage services to residents. The water provided comes from several wells within the West Texas Bolsons Aquifer. This Aquifer consists of varying sediment layers from eroded materials like volcanic rock, limestone, silt, and clay, with groundwater quality depending on the basin, ranging from freshwater to slightly saline, and is primarily used for municipal water supply, livestock, and some irrigations.

Although the supply-demand analysis (Chapter 4) does not project a future water-supply deficit for the City of Van Horn, the following water management strategies are recommended to enhance the reliability of the future water-supply availability for residents.

- (E-8) Water loss audit and main-line repair
- (E-9) City of Van Horn – Additional groundwater well

E-8 Water Loss Audit and Main-Line Repair

According to the 2020 TWDB Public Water System Water Loss Survey, the City of Van Horn had real water losses (as opposed to apparent “paper” losses) of 198 acre-feet in 2020 (29 percent) due to leaking infrastructure. This amount of water loss is the sum of reported breaks and leaks, and unreported loss. The water-supply system can reduce water losses and get a more accurate look at water consumption by taking the proper measures to identify and repair old infrastructure and inaccurate water meters. This strategy will provide a savings of only a portion of the total reported loss and assumes that a leak testing program would be implemented prior to possibly replacing portions of the existing leaking pipe.

Quantity, Reliability and Cost - The strategy assumes 15 miles of six-inch diameter pipe will be replaced, at a total estimated project capital cost of $15,977,000. The strategy is estimated to generate a potential savings of 57 acre-feet of water per year throughout the planning period.

E-9 City of Van Horn – Additional Groundwater Well

This strategy assumes that one new municipal well is needed to provide an additional water supply for the City of Van Horn. This new groundwater well, likewise, completed in the West Texas Bolsons, would be located near the existing well field, and drilled to a depth of approximately 1,300 feet below the surface. In addition, 1,000 feet of six-inch diameter connection pipeline will be necessary. Minimal treatment will be required, such as chlorination disinfection for municipal use.

Quantity, Reliability, and Cost – The well is expected to reliably yield approximately 200 gpm and produce 320 acre-feet per year. Water quality of the Aquifer is relatively good and generally meets safe drinking water standards. Minimal advanced treatment will be required for municipal purposes. The total estimated project capital cost is approximately $1,541,000.

5A 2.2 Water Management Strategies for Culberson County Irrigation

Culberson County has a water-supply deficit for irrigation use projected at 22,063 acre-feet per year in 2030, increasing to 22,394 acre-feet per year by 2080. The demand for irrigation water in Culberson County has been increasing due to a combination of factors including expanding agricultural practices, particularly in high-value crops like pecans, coupled with a changing climate leading to more frequent and severe droughts, which are requiring farmers to rely more heavily on irrigation to maintain crop yields. This increased demand puts pressure on the local groundwater aquifers, which are already facing concerns regarding sustainability. The projected water demands exceed what the two recommended water management strategies below will be able to meet.

The following water management strategies are recommended to enhance the reliability of the future water-supply availability for the irrigation water-supply shortages within Culberson County but will leave an unmet need of 8,659 acre-feet per year in 2030; increasing to 8,990 acre-feet per year by 2080.

- (E-10) Irrigation Scheduling
- (E-11) Additional wells in the West Texas Bolsons Aquifer (Upper Salt Basin)

E-10 Irrigation Scheduling

This strategy is intended for producers with an adequate supply of water throughout the growing season. It involves scheduling the time and amount of water that is applied to a crop based on the amount of water present in the crop root zone, the amount of water consumed by the crop since the last irrigation, and other considerations. Water savings are difficult to quantify and vary from year to year based on cropping practices, water quality, and quantity. It is estimated that 0.3 to 0.5 acre-feet of water per acre may be saved, according to Best Management Practices for Agricultural Water Users, found on the TWDB's website.

Quantity, Reliability and Cost - According to the 2022 U.S. Ag Census, Culberson County had 16 farms with irrigated land in 2022 and 679,352 acres of irrigated land, which gives an average of 42,460 acres per farm. Assuming that scheduling would conserve 0.3 acre-feet per acre, this results in a conservation savings of approximately 12,738 acre-feet per farm. The reliability of this supply is low due to uncertainty associated with estimated implementation of BMPs. There is no capital cost associated with implementing this strategy.

E-11 Additional Wells in the West Texas Bolsons Aquifer (Upper Salt Basin)

This strategy assumes that two new wells will need to be drilled to approximately 400 feet below the surface. Historical agriculture use indicates that the Upper Salt Basin Aquifer is a viable source. The Upper Salt Basin Aquifer is the northern most aquifer of the West Texas Bolsons Aquifer System and is a potential source of water to meet irrigation supply shortages within Culberson County. Groundwater within the Upper Salt Basin varies from fresh to moderately saline ranging between 1,000 and 4,000 milligrams per liter of total dissolved solids.

Quantity, Reliability, and Cost – Two new wells are assumed to supply 666 acre-feet per year. The reliability of this supply is medium to high, based on competing demands. The total capital cost of this project is approximately $2,169,000.

5A 2.3 Water Management Strategies for Culberson County Mining

Much of the water needs for mining operations within Culberson County are self-supplied from private/company water wells. Projected mining water-supply shortages in Culberson County begin in 2030 with a 6,708 acre-feet per year deficit, increasing to 6,718 in 2080. The following water management strategy is recommended to enhance the Mining industry's future water-supply availability, with the assumption that it only meets a portion of the projected water-supply deficit. The Culberson County Groundwater Conservation District does maintain a mining permit for a maximum amount of 6,000 acre-feet that may be of support to the Mining Industry's future water-supply need.

- (E-12) Mining Conservation

E-12 Mining Conservation

Mining groundwater use in Far West Texas is primarily associated with oil and gas production. Water is needed for well drilling activities, formation fracing, and sand (proppant) mining plants. The FWTWPG encourages the use of alternative water sources when and where it is economically feasible to do so. For conservation of freshwater resources associated with fracing, on-site treatment of produced and/or flowback water allows for reuse of the water stream. There are numerous third-party vendors who offer mobile produced water recycling systems.

In 2018, approximately 10 percent of fracwater supply in the Permian Basin was recycled produced water. Conservation of 15 percent of Culberson County mining needs in 2030 would reduce mining needs by 1,502 acre-feet in 2030, increasing to 1,504 acre-feet per year by 2080. This strategy provides some additional water supply to meet a portion of the mining demand but will leave an unmet need of approximately 5,206 acre-feet per year in 2030; increasing to 5,214 acre-feet per year by 2080.

5A-3 WATER MANAGEMENT STRATEGIES FOR EL PASO COUNTY

5A 3.1 Water Management Strategies for the Town of Anthony

The Town of Anthony and many other residents of El Paso County rely on the Hueco-Mesilla Bolson Aquifer for municipal, domestic, livestock, and irrigation water-supply needs. The Town's population is projected to increase from 4,108 in 2030 to 4,479 by 2080. As the population increases, water demands increase. This creates a significant amount of strain on the Hueco-Mesilla Bolson Aquifer. Continued withdrawals from the Aquifer may negatively impact the Aquifer's ability to meet the long-term water supply needs of the area.

The Town of Anthony does not have a projected water supply deficit this planning cycle. The following water management strategies are recommended to enhance the reliability of the City's future water supply availability:

- (E-13) Water loss audit and main-line repair
- (E-14) Arsenic treatment facility
- (E-15) Additional groundwater well

The City of Anthony is currently being funded for a wholesale water treatment plant replacement and expansion through the TWDB's Clean Water State Revolving Fund (CWSRF).

E-13 Water Loss Audit and Main-Line Repair

According to the 2022 TWDB Public Water System Water Loss Survey, the Town of Anthony had real water losses (as opposed to apparent "paper" losses) of 72 acre-feet in 2022 (11 percent) due to leaking infrastructure. This amount of water loss is the sum of reported breaks and leaks, and unreported loss. The water-supply system can reduce water losses and get a more accurate look at water consumption by taking the proper measures to identify and repair old infrastructure and inaccurate water meters. This strategy will provide a savings of only a portion of the total reported loss and assumes that a leak testing program would be implemented prior to possibly replacing portions of the existing leaking pipe.

Quantity, Reliability and Cost - The strategy assumes three miles of six-inch diameter pipe will be replaced, at a total estimated project capital cost of $3,196,000. The strategy is estimated to generate a potential savings of eight acre-feet of water per year throughout the planning period.

E-14 Arsenic Treatment Facility

Naturally occurring arsenic is found in the groundwater relied upon by the residents of the Town of Anthony. The community's groundwater supply from the Mesilla Bolson Aquifer hovers around the maximum contaminant limit of 10 ppb. Aided by financial assistance from the TWDB, utilizing the Drinking Water State Revolving Fund, the Town has plans to install an arsenic treatment system to meet the State's water supply and public safety standards.

Capital cost is derived from taking the total project cost reported in the 2024 TWDB Drinking Water State Revolving Fund Intended Use Plan ($8,779,306) and incorporating it into the TWDB Costing Tool to add contingencies and develop annual costs.

Quantity, Reliability, and Cost - The new arsenic treatment facility is assumed to supply 2,800 acre-feet per year of potable water. Reliability of the project is high since the Mesilla Bolson Aquifer has historically been found as a reliable source. The total capital cost for this project is estimated to be $12,179,000.

E-15 Additional Groundwater Well

Due to ongoing drought resulting in lower aquifer water levels and condition of existing wells because of age, the Town of Anthony has experienced a decrease in water production from their three existing municipal water wells. However, based on existing and future water demands, in addition to the condition of the Town's existing wells, a new municipal water well is required to reliably supply additional water. Anticipated depth of the well is 800 feet and a capacity of 1,200 GPM.

Quantity, Reliability and Cost – The well is anticipated to reliably provide an additional supply of 960 acre-feet per year from the Mesilla Bolson Aquifer, even though some long-term water level decline can be expected. The estimated capital cost of a new well for the Town of Anthony is $2,821,000.

5A 3.2 El Paso Water Integrated Strategies

El Paso Water (EPWater) is the City's municipal water-supply utility as well as wholesale water-supply provider for several other municipal entities and industries. EPWater supply sources include both surface water (Rio Grande) and groundwater (Hueco and Mesilla Bolson Aquifers), which are managed in an "integrated" approach that balances each source's availability throughout the year. EPWater further manages these primary sources with innovative approaches including advanced purification treatment, reuse of previously used water, and desalination of brackish groundwater. And of critical importance, the various management practices are all preceded by one of the State's most successful conservation programs.

The projected demand for water provided by EPWater, including the City of El Paso and all wholesale clients, is projected to increase from 120,789 acre-feet per year in 2030 to 130,883 acre-feet per year in 2080. With current infrastructure and supply availability, EPWater is projected to see a need for the development of additional supplies by the 2040 decade.

To meet the future need for additional water supply, EPWater continues to update its Integrated Water Management Plan. The Plan involves the design of new project strategies to be implemented at appropriate time periods to ensure that EPWater maintains sufficient water supplies in advance of projected need. The Integrated Water Management Plan evolved from an analysis of integrated water-development strategies for the City and County of El Paso in the *2006 Far West Texas Water Plan*, which was subsequently updated in the *2011, 2016 and 2021 Plans*. The strategies considered are termed "integrated" because they represent combinations of individual sources due to the unique nature of water management in El Paso. Taken separately, each source can be evaluated and analyzed. However, combining all sources into an integrated strategy provides an opportunity to evaluate the interrelationship of the individual components and provides a regional context to the *Regional Plan*. For this *2026 Far West Texas Plan*, the recommended Integrated Water Management Strategy in the *2021 Plan* has again been updated and several new component strategies have been added. The recommended Integrated Strategy adopted to meet the needs for additional water supply for EPWater is comprised of the following individual projects listed below. The first six strategies are "recommended" to meet EPWater's future demand needs, while the remaining seven are considered as "alternate" strategies available to be considered if any of the "recommended" strategies fail to fully meet future projected needs.

El Paso Water Integrated Water Management Strategies

Strategy Number	Strategy Name
Recommended Strategies	
E-16	Municipal conservation programs
E-17	Water loss audit and main-line repair
E-18	Expansion of the Kay Bailey Hutchison Desal Plant
E-19	Advanced water purification at the Bustamante WWTP
E-20	Conjunctive treatment of groundwater and surface water at the Upper Valley WWTP
E-21	Groundwater from Dell City area (Phase 1)
Alternate Strategies	
E-22	Groundwater from Dell City area (Phase 2)
E-23	Hueco Bolson Artificial Recharge
E-24	Brackish groundwater at the Jonathan Rogers WTP
E-25	Treatment and reuse of agricultural drain water
E-26	Riverside regulating reservoir
E-27	Expansion of Jonathan Rogers WTP
E-28	Advanced water purification at the Haskell WWTP

E-16 Municipal Conservation Programs

Reduction of municipal water consumption may be achieved with the implementation of conservation programs that reduce per capita usage and prevent water waste. El Paso Water (EPWater) has been implementing an aggressive water conservation program for nearly 30 years and is an integral part of EPWater's long-term water supply plan. The table below is based on El Paso Water's 2024 Water Conservation Plan and shows the water conservation measures that EPWater has implemented using the Texas Water Development Board's Best Management Practices (BMPs). The table illustrates the extensive implementation of water conservation measures by EPWater.

TWDB BMPs for Water Conservation as Implemented by El Paso Water

TWDB BMP Reference	Best Management Practice Title	Previous, Current, or Planned Implementation Date
BMP 2.1	Conservation Coordinator	Current, since 1990
BMP 2.2	Cost Effective Analysis	Current
BMP 2.3	Water Survey for Single- Family & Multi-Family	Current
BMP 2.4	Customer Characterization	Current
BMP 3.1	Water Conservation Pricing	Current
BMP 3.2	Wholesale Agency Assistance Programs	Not Implemented
BMP 4.1	Metering of All New Connections and Retrofit of Existing Connections	Current
BMP 4.2	Measuring and Accounting for Water Loss; System-wide Leak Detection & Repair	Current

TWDB BMPs for Water Conservation as Implemented by El Paso Water (continued)

TWDB BMP Reference	Best Management Practice Title	Previous, Current, or Planned Implementation Date
BMP 5.1	Athletic Field Conservation	Past BMP
BMP 5.2	Golf Course Conservation	Past BMP
BMP 5.3	Landscape Irrigation Conservation and Incentives	Current (restarted 2023)
BMP 5.4	Parks Conservation	Current
BMP 5.5	Residential Landscape Irrigation Evaluations	Current (Rare)
BMP 5.6	Outdoor Watering Schedule	Current
BMP 6.1	Public Information	Current
BMP 6.2	Education/ School Information	Current
BMP 6.3	Public Outreach and Education	Current
BMP 6.4	Partnership with Nonprofit Organizations	Current
BMP 7.1	Conservation Programs for Industrial, Commercial (including Multi-family), and Institutional Accounts – ICI Audits	Current
BMP 7.2	Residential Washing Machine Rebates	Past BMP
BMP 7.3	Residential Toilet Rebates	Current
BMP 7.4	Residential Showerhead and Aerator Distribution	Current
BMP 7.5	Water Wise Landscape Design & Conversion Program	Past BMP
BMP 7.6	Custom Conservation Rebates	Current
BMP 7.7	Plumbing Assistance for Economically Disadvantaged Customers	Pilot 2024
BMP 8.1	New Construction Greywater	Pilot 2025
BMP 8.2	Rainwater Harvesting & Condensate Reuse	Pilot 2025
BMP 8.3	Water Reuse	Current
BMP 9.1	Prohibition on Water Waste	Current
BMP 9.2	Conservation Ordinance	Current
BMP 9.3	Customer Characterization: Analysis to Prioritize BMP Selection	Current

Since 1990, the City has had a water conservation department with at least seven full time staff members overseen by a Water Conservation Manager. The department develops and oversees the City's conservation program, collects data, provides enforcement, and develops public outreach programs.

Reuse is an important component of EPWater's water-supply management program. The City currently has a 'purple pipe' water reuse program that provides treated wastewater for irrigation of golf courses, city parks, school grounds, and apartment landscapes, construction and industrial use, as well as indirect reuse for artificial recharge. The City is also in the process of implementing a direct reuse strategy, which is evaluated separately.

EPWater's water conservation efforts have reduced per capita municipal use in El Paso from about 225 gallons per capita per day (gpcd) in the late 1970s to a current level of 131 gpcd. Residential per capita consumption was 69 gpcd in 2023. The overall per capita potable water use for EPWater and its wholesale customers, including steam electric and industrial use, was about 131 gpcd in 2023. This strategy assumes the continuation of EPWater's aggressive water conservation efforts and estimates that demand can be further reduced through conservation efforts to approximately 110 gpcd by 2080. The five and 10-year target reduction goals (through 2034) from EPWater's 2024 Water Conservation Plan are shown in the table below.

EPWater's 2024 Water Conservation Plan Targets for GPCD and Water Loss

Description	Historic 5-year average in gpcd	Baseline (2023)	5-year goal for year 2029	10-year goal for 2034
Total gpcd	137	131	126	121
Residential gpcd	76	69	66	63
Water loss	17%	19%	14%	9.9%

Quantity, Reliability, and Cost – The table below presents the additional supplies that would result from this strategy's projected level of conservation.

Projected Conservation Supply (Acre-Feet)

	2030	2040	2050	2060	2070	2080
Projected Population Served by El Paso Water WUG	790,511	815,858	829,931	839,949	850,135	860,485
TWDB Projected gpcd[1]	136	136	136	136	136	136
EPW Expected gpcd[2]	125	118	116	114	112	110
Savings above TWDB Projections (acre-feet/year)	9,740	16,500	18,590	20,750	22,860	25,130

1. TWDB Project gpcd includes savings from plumbing code
2. Expected gpcd goals are based on conversations with EPW and are equal to or lower than the 2024 Water Conservation Plan (WCP) goals

Projected Cost of El Paso Water Utilities Conservation Strategy

	2030	2040	2050	2060	2070	2080
Annual Cost	$1,997,000	$2,206,000	$2,437,000	$2,692,000	$2,974,000	$3,285,000
Cost per Acre-Foot	$205	$134	$131	$130	$130	$131
Cost per 1,000 gallons	$0.63	$0.41	$0.40	$0.40	$0.40	$0.40

EPWater has successfully reduced per capita demands resulting in considerable water savings. Water demand projections prepared by TWDB already account for water efficiency savings through time due primarily to plumbing code savings. The savings reported in the table above are the result of "active" water conservation strategies that conserve water above and beyond results stemming from Federal and State legislation requiring more efficient plumbing fixtures in new building construction. The trend in expected gpcd is consistent with EPWater's 2024 Water Conservation Plan (WCP) through the 2040 decade. EPWater has aggressive water conservation goals and continually implements policies to help meet those conservation goals.

EPWater’s estimated 2025 budget for water conservation programs is $1,900,000. Based on information provided by EPWater, it was assumed that EPWater will increase the budgeted amount for water conservation programs by one percent per year throughout the planning period. The projected annual costs for water conservation are shown in the table above.

E-17 Water Loss Audit and Main-Line Repair

According to the 2022 TWDB Public Water System Water Loss Survey, El Paso Water had real water losses (as opposed to apparent “paper” losses) of 16,188 acre-feet in 2022 (14 percent) due to leaking infrastructure. This amount of water loss is the sum of reported breaks and leaks, and unreported loss. The water-supply system can reduce water losses and get a more accurate look at water consumption by taking the proper measures to identify and repair old infrastructure and inaccurate water meters. This strategy will provide a savings of only a portion of the total reported loss and assumes that a leak testing program would be implemented prior to possibly replacing portions of the existing leaking pipe.

Quantity, Reliability and Cost - The strategy assumes 402 miles of six-inch diameter pipe will be replaced, at a total estimated project capital cost of $428,162,000. The strategy is estimated to generate a potential savings of 2,266 acre-feet of water per year throughout the planning period.

E-18 Expansion of the Kay Bailey Hutchison Desalination Plant

The Kay Bailey Hutchison (KBD) Desalination Plant is, at present, the world’s largest inland desalination facility. The facility is a joint project of El Paso Water (EPWater) and Fort Bliss and currently has the capacity to treat 27.5 MGD of brackish groundwater. Disposal of brine concentrate from the facility is accomplished through deep well injection. The project not only provides a safe and reliable supply of water for the City of El Paso and Fort Bliss, but it also protects fresh groundwater supplies by intercepting the flow of brackish groundwater toward the freshwater wells. This project will increase the capacity of the plant by 6.0 MGD for a total of 33.5 MGD. This strategy is expected to produce an additional 2,500 acre-feet per year of supply by the year 2030.

This strategy involves adding a new brackish water supply parallel pipeline from source water to the KBH Plant. This portion of the project is now complete. A sixth treatment unit has been designed and will be added within the footprint of the current desalination treatment plant. A partial concentrate pipeline replacement will be needed to allow for increased volume and pressures from the expanded concentrate disposal. It is anticipated that this strategy will be producing new water by the 2030 decade.

Quantity, Reliability, and Cost – This project will provide additional water supply in EPWater’s conjunctive use portfolio. The combination of new wells and another 6.0 MGD of capacity will provide approximately 6,270 acre-feet of water per year. This supply is assumed to be very reliable. The project is expected to cost approximately $101,045,000.

E-19 Advanced Water Purification at the Bustamante WWTP

The Roberto R. Bustamante Wastewater Treatment Plant (Bustamante WWTP) is in southern El Paso near the community of Socorro. The plant is adjacent to the Jonathan Rogers Water Treatment Plant and the Rio Bosque wetlands. The wastewater plant currently discharges approximately 27 million gallons per day (MGD) into the Riverside Irrigation canal and 1.5 MGD to reclaimed water "purple pipe" customers as part of the Mission Valley Reclaimed Water Project.

Advanced Water Purification Facility (AWPF) will treat effluent from the Bustamante WWTP to drinking water standards and send the purified water directly into the distribution system, making this facility the first large-scale, direct-to-distribution potable reuse project in the United States. With the AWPF in place, EPWater will reduce groundwater usage in both non-drought and drought years and continue to meet summer water demand in drought years. Treatment will include microfiltration/ultrafiltration, nanofiltration or reverse osmosis, ultraviolet/advanced oxidation process, and activated carbon and chlorine disinfection and storage. The purified water will be placed directly into the distribution system.

Carollo estimates that the amount produced by the advanced purification facility would be 10 MGD.

Currently, most of the wastewater from the Bustamante WWTP that is not being reused is discharged into a canal system, much of which is then used for downstream irrigation. Some of the flow may also serve to maintain environment functions, albeit to a small degree. The current conceptual design for this project uses deep well injection to dispose of the brine waste stream, which should have minimal environmental impact. If this was to change the brine was released to a stream, impacts to the receiving body of water would need to be evaluated.

The Advanced Water Purification strategy will treat only part of the effluent from the Bustamante WWTP. EPWater will continue to meet its contractual obligations to purple pipe customers and to provide a portion of the wastewater that originates as surface water for downstream irrigators. There may be other impacts from reducing the amount of wastewater that is not covered by contractual obligations, which have not yet been evaluated.

It is anticipated that this strategy will be fully implemented by 2030. After reviewing data from a pilot facility, the Texas Commission on Environmental Quality (TCEQ) gave EPWater approval to proceed with design of the of the full-scale facility. EPWater officials hope to break ground on the Advanced Water Treatment Facility in early 2025.

This project is part of EPWater's Integrated Water Strategy and is inherently related to other EPWater strategies and sources of supply. The availability of water from this strategy is largely determined by the portion of the treated effluent that originates as surface water, a portion of which is dedicated by contract to downstream irrigators. Cost table below has been provided by El Paso Water.

GMP COST ELEMENT	AMOUNT	
1. Contractors General Conditions (See note 1)	$	41,119,239
2. Cost of Work		
2.1. Early Work Packages	$	-
2.2. Balance of Work	$	176,893,674
2.3. Contractors Contingency	$	8,844,684
2.4 Design Contingency @ 5% Balance of Work	$	8,844,684
2.5 Estimate Contingency @ 5% Balance of Work	$	8,844,684
2.6 Electrical Contingency	$	3,156,258
2.7 Unforeseen Utility Allowance	$	500,000
2.8 Unforeseen Debris Allowance	$	250,000
2.9 Art Allowance	$	1,000,000
2.10 Security Allowance	$	1,500,000
2.11 Contractors Fee (see note 3)	$	21,707,454
GMP Subtotal (Items 1 + 2)	**$**	**272,660,675**
3. Allowances (See note 4)		
3.1. Escalation Allowance	$	10,939,365
3.2. Owners Contingency	$	11,816,668
Allowance Subtotal (Item 3)	$	22,756,033
GMP Total (Items 1 + 2 + 3)	**$**	**295,416,708**

Quantity, Reliability, and Cost – Based on estimates, this strategy would initially provide approximately 8,500 acre-feet per year in 2028, stepping up by 2 MGD per decade, and expanding to approximately 10,600 acre-feet per year by 2080. Because of the quantity of wastewater treated at the plant, the supply should be very reliable, even after accounting for the portion of the supply committed to irrigators and purple pipe customers. The capital cost for this strategy is estimated at $295,417,000.

E-20 Conjunctive Treatment of Groundwater and Surface Water at the Upper Valley WTP

The Upper Valley Water Treatment Plant (WTP) located north of Vinton is one of the largest arsenic water-treatment facilities in the nation built as a direct result of the EPA revision to the Federal regulation of arsenic levels in drinking water. The areas served by the plant include Upper Valley, West Side, Canutillo, Vinton and Westway. This project's benefits are threefold in that they will: (1) protect Texas water allocations by maximizing use of the current Rio Grande allocation; (2) protect the Mesilla Bolson via more efficient management of groundwater pumping; and (3) improve water reliability for Northwest El Paso by adding redundancy and interoperability to increase water resiliency.

The existing plant removes arsenic occurring within groundwater pumped from wells in the Canutillo Wellfield (see strategyE-26) and treats up to 30 MGD of this groundwater for blending with up to 30 MGD of untreated groundwater to produce a finished product with an arsenic concentration of 8 ppm or less. For this strategy, the project adds additional treatment components to facilitate treatment of surface water from the Rio Grande and other agricultural drain water resources to meet State and Federal drinking requirements.

Quantity, Reliability, and Cost - Water available for this project is based on the availability of surface water that is subject to drought like conditions. On average it is anticipated that this project will produce an additional 3,000 acre-feet per year of additional water supply for EPWater. The improvement to the plant will have the capacity to produce 10,000 acre-feet per year of additional water supply. Actual plant production each year is based on the availability of surface water which is subject to drought conditions. This project is planned to go into operation in 2040. The estimated total capital cost for this strategy is approximately $188,174,000.

E-21 Groundwater from Dell City Area (Phase I)

Importation of groundwater from the Dell City area has been part of the Far West Texas Water Plan since 2006. This strategy includes the acquisition of about 70,000 acres of land with associated water rights, as well as easements for most of the path of the proposed pipeline to bring water to El Paso. It also includes drilling and completion of public supply permitted water wells, construction of a desalination water treatment facility, and installation of a pipeline to El Paso. The desalination plant, as well as the concentrate disposal will be in the Dell City area. Groundwater for Phases 1 and 2 will be extracted from the Capitan Reef (Phase 1; E-21) and Bone Springs-Victorio Peak (Phase 2, E-22) Aquifers, respectively.

Phase One – Supply from Diablo Farms

In 2003 and 2004, EPWater purchased about 28,000 acres of land (Diablo Farms) overlying the Capitan Reef Aquifer. The property straddles the Hudspeth and Culberson County lines adjacent to the Salt Basin southeast of Dell City. The property is currently leased out for irrigated agricultural use and will continue to be used for this purpose until the construction phase is started. The proposed strategy calls for production of up to 10,000 acre-feet per year for the first decade beginning in 2050. In subsequent decades, it is anticipated that up to 20,000 acre-feet per year could be produced from both Aquifers (based on need).

EPWater is in process of evaluating groundwater availability in the area and estimates that recharge to this portion of the Capitan Reef Aquifer ranges from 10,000 to 20,000 acre-feet per year. TDS concentrations in the area range from 850 to 1,500 mg/L. All the currently operating irrigation wells on Diablo Farms have TDS values near 1,000 mg/L. However, it is expected that increases in pumping amounts would result in intrusion of higher salinity groundwater into the area.

The evaluation concluded that pumping less than 10,000 acre-feet per year would not require desalination. Pumping between 10,000 and 25,000 acre-feet per year would not result in mining of the Aquifer, but the groundwater would likely have to be desalinated over time as the intrusion of higher salinity water into the wellfield area increases salinity.

It is assumed that the transmission facilities for this project would be shared with the Dell City Groundwater Project - Phase 2 (Strategy E-22), and that the pipeline will have sufficient capacity to carry the volume of water at full development of both projects (10,000 acre-feet per year from Diablo Farms and 10,000 acre-feet per year from Dell City). EPWater already owns the property at Diablo Farms, so land acquisition will be limited to easements required for the pipeline right-of-way.

Quantity, Reliability, and Cost – The improvement to the plant will produce 10,000 acre-feet per year of additional water supply and is planned to go into operation in 2070. The estimated total capital cost for this strategy is approximately $1,022,184,000.

E-22 Groundwater from Dell City Area (Phase II) (ALTERNATE)

Dell City is located approximately 75 miles east of El Paso, near the New Mexico-Texas border. The Bone Spring-Victorio Peak Aquifer lies underneath, covering 130 square miles on the Texas side of the State border. Importation of 10,000 acre-feet per year from the Bone Spring-Victorio Peak Aquifer is proposed by 2050.

Approximately 45 acre-feet per year are withdrawn from the Aquifer for municipal use by the community of Dell City, with the remainder used for irrigated agriculture. Water from this Aquifer has concentrations of iron, chloride, nitrate, sulfate, and aluminum that exceed water quality standards for municipal supply. With total dissolved solids ranging from 1,810 to 3,900 mg/l, desalination would be required before the source could be used for municipal purposes.

The first decade of the Dell City Project (Phase 1), is set to begin in 2070. Dell City Phase 2 is expected to come online in the year 2080. Phase 2 would be listed as an “alternate” water management strategy, which would include the rehabilitation of several wells with accompanying pumps, pipelines and other appurtenances, a pump station, 12 miles of 42-inch pipeline, expansion of the existing pump stations on the Diablo Farms (Phase 1) to El Paso pipeline, and an 18 MGD desalination facility with disposal wells. The water from the desalination facility will be blended with untreated water to produce the desired water quality.

The second decade (2080) of the project adds drilling of additional wells with the associated facilities, another expansion of the pump stations on the pipeline to El Paso, and an 18 MGD expansion of the desalination facility. Also included is $55 million for purchase of additional property, for a total of $110 million between the two decades of the project

Quantity, Reliability, and Cost - The volume of water generated from this strategy will be 10,000 acre-feet per year beginning in the 2080 decade. The capital cost for this strategy is estimated at $546,423,000.

E-23 Hueco Bolson Artificial Recharge (ALTERNATE)

Water treatment plant capacity and the timing of demand for water currently limit the use of surface water by EPWater. Early in the irrigation season, the water available from the Rio Grande exceeds the demand that can be supplied by surface water. Later in the irrigation season, the demand can exceed the treatment plant capacity. To make use of the available surface water early in the irrigation season, EPWater plans to develop a project to recharge the Hueco Bolson Aquifer with treated surface water.

The Hueco Bolson Aquifer is the primary source of water for the City of El Paso, Fort Bliss, Ciudad Juarez, and private industries in the area. Since 1903 groundwater levels have declined by as much as 150 feet in some areas of the Aquifer, thus developing a cone-of-depression around a major pumping center serving the City of El Paso. This project aims to make use of an area that is located over an ancient watercourse of the Rio Grande and is well suited for both short- and long-term groundwater storage due to the high porosity and permeability of the de-saturated vertical portion of the Aquifer formation. The substantial depression in the water table surface in this area thus affords ample underground storage space and some assurances of long-term recovery of stored water. The recharge basin area described in this strategy is in the northern portion of the cone-of-depression and water percolating downward through the basins will naturally utilize gravity to drain water into the subsurface toward the existing production wells located approximately two miles away.

Previous projects and studies have shown the practicality of aquifer recharge in the El Paso area. The Hueco Bolson Aquifer has been successfully recharged with tertiary treated wastewater from the Fred Hervey Water Reclamation Plant that is treated to drinking water quality standards. Injection rates of up to about 10,000 acre-feet per year through deep injection wells and spreading basins have occurred since the mid-1980s. Aquifer recharge using both treated wastewater effluent and available surface water provide an opportunity to mitigate aquifer overdraft and potentially restore groundwater supplies for continued use.

The proposed El Paso Aquifer Storage and Recharge Project will confer drought resiliency to the region and help address groundwater declines by providing up to 15,000 acre-feet per year of water supply to the Hueco Bolson Aquifer. Naturally occurring infiltration properties of an existing arroyo (length of 1.9 miles) will be enhanced to enable Aquifer recharge through infiltration. Following completion of the enhanced arroyo, the Nevins Pump Station will be expanded and will have piping added to convey a combination of river water and desalinated impaired source water for recharge. Reclaimed water from the Fred Hervey Reclamation Plant and stormwater runoff from the Franklin Mountains will continue to provide source water. It is anticipated that this strategy will be delivering water around 2027.

Quantity, Reliability, and Cost - This strategy is estimated to provide up to 15,000 acre-feet of water supply per year from the Hueco Bolson Aquifer during years when the river supply is plentiful; however, the supply is contingent on surface water supplies availability. Capital costs for this project is approximately $66,906,000.

E-24 Brackish Groundwater at the Jonathan Rogers WTP (ALTERNATE)

The Rio Grande Alluvium Aquifer has been identified by EPWater as a potential source for the development of additional groundwater supplies. This strategy assumes that 10 new wells will be drilled to provide an additional 11,000 acre-feet per year. The 10 new wells will be connected to a central desalination facility located at or near the Jonathan Rogers Water Treatment Plant. The brine concentrate from the EPWater wells will be disposed of using deep well injection. For planning purposes, a 12-inch diameter, 10-mile brine disposal pipeline was assumed. One 1,000 gpm deep brine injection well was also included. This strategy presumes that most of the new wells and the treatment facility will be developed on property currently owned by EPWater. It is anticipated that this strategy will be implemented by 2040.

Quantity, Reliability and Cost – For this *Plan*, the 10 new wells are assumed to be drilled at a depth of 500 feet to provide an additional supply of 11,000 acre-feet per year. Historical municipal, agricultural and industrial use indicates that the Rio Grande Alluvium Aquifer may be a viable source. The reliability of water from this source is expected to be medium to high based on competing demands. The water supply from this strategy is assumed to be part of EPWater's portfolio of sources that are used conjunctively. The total capital cost of this project will be approximately $167,902,000. This cost estimate includes the 10 new wells, associated pipelines, storage, pumps and power, and 8 MGD RO treatment facility, and 10 miles of transmission pipeline to convey brine concentrate to the disposal well.

E-25 Treatment and Reuse of Agricultural Drain Water (ALTERNATE)

The 2011 Far West Texas Water Plan included a strategy to develop two 5 MGD desalination plants at the Rogers and Canal Water Treatment Plants to treat agricultural drain water for municipal use. Hazen and Sawyer, P.C. have since completed a study on the treatment of drain water near the Upper Valley Water Treatment Plant using conventional treatment and blending with other sources to meet water quality standards. In the 2016 Plan this strategy proposed using the same combination of conventional treatment and blending at the Rogers and Canal Plants for the facility at the Upper Valley WTP examined in the Hazen and Sawyer study. This current 2026 strategy now assumes that a 2.41 MGD (2,700 acre-feet per year) plant renovation will be built at the Upper Valley WTP in the 2030 decade.

The use of conventional treatment eliminates the need for brine disposal. However, it does require the availability of lower TDS treated water source in sufficient quantity for blending. The Hazen and Sawyer study found that hardness was a controlling factor, along with TDS, in determining blending ratios with treated water from the Upper Valley WTP. Blend ratios varied from approximately 4 to 1 to more than 14 to 1, depending on target water quality. If additional treatment such as desalination becomes necessary, the strategy's cost estimate will be impacted. This strategy assumes that the treatment waste stream will most likely be discharged directly into the sewer system with solids going to a landfill.

Quantity, Reliability, and Cost - The volume of water generated from this strategy will be 2,700 acre-feet per year beginning in the 2040 decade. The total capital cost for the water treatment plant is estimated to be approximately $15,139,000.

E-26 Riverside Regulating Reservoir (ALTERNATE)

To make more efficient use of surface water supplies, EPCWID#1 has purchased the City of El Paso's former Socorro Pond Sewage Treatment Facility located near the Bustamante Wastewater Facility. The project will develop a Riverside Regulating Reservoir with project water and share the cost equally between EPWater and the EPCWID#1

The regulating reservoir will allow more efficient release of stored water from the Rio Grande Project storage reservoirs, as well as flows that originate as stormwater runoff below Caballo Reservoir. The primary source of water stored in the reservoir would be from excess flows diverted at the American Dam and conveyed to the heading of the Riverside Canal. These excess flows primarily consist of storm runoff and operation spills from upstream water users. The temporary stored water would either be used by downstream irrigators or be pumped to the nearby Jonathan Rogers Water Treatment Plant for municipal use. All Rio Grande water is authorized through existing State and Federal contracts, agreements, and water rights.

The primary benefits of the project are: (1) Improved farm delivery scheduling and flows; (2) Conservation of water stored in the upstream storage reservoirs to meet downstream demands; and (3) A five-day supply of raw water for use by the City of El Paso in case of an emergency such as a failure or contamination of the American Canal system.

Portions of the project have already been completed, including improvements to the Riverside Franklin Feeder Check Structure; a concreate bridge to the Jonathan Rogers WTP; a canal lining; and a flood waste-way to the river.

EPCWID#1 is collaborating with municipalities in El Paso County to make capacity upgrades to existing irrigation drain infrastructure for mitigating flooding while facilitating the capture and reuse of stormwater from local storm events. Stormwater capture and reuse would lead to the development of a new water source for EPCWID#1. Additional studies are needed to determine the quantity and quality of the stormwater that can be captured and the upgrades that are necessary for reuse. EPCWID#1 intends to pursue braided funding to develop stormwater capture and reuse infrastructure, such as opportunities resulting from flood-related legislation passed by the 86th Texas Legislature, including Senate Bill (SB)7, SB 8, SB 500, and House Joint Resolution 4. While the project through EPCWID#1 (Strategy E-48) is scheduled to come online in the 2040 decade, EPWater does not intend to draw water from the project until the 2050 decade.

Quantity, Reliability, and Cost - The primary benefit of this strategy is allowing for more efficient use of existing supplies of water. Previous studies of this project have estimated that the project could provide 6,500 acre-feet of water per year. However, there may be some years where the strategy could provide more or less water, depending on available river supplies and the amount of excess water in the canal. The total capital cost of approximately $19,845,000 and supply of 6,500 acre-feet per year developed from this project is equally split between EPW and the EPCWID#1 ($9,922,500 and 3,250 acre-feet per year each). The strategy supply for EPWater is anticipated to come online in 2050.

E-27 Expansion of Jonathan Rogers WTP (ALTERNATE)

EPWater currently obtains surface water from the Rio Grande in accordance with a series of contracts with EPCWID #1, the U.S. Bureau of Reclamation, and the Lower Valley Water District. These contracts allow the conversion of water allocated for irrigation of lands owned or leased by EPWater into municipal supply. Over time, EPWater may increase the annual diversion from surface water by converting additional water allocated to irrigated lands in El Paso County. The conversion of water for municipal supply will require amendments to contracts or agreements with the U.S. Bureau of Reclamation and EPCWID #1.

This strategy assumes that the increased surface water supply will require additional treatment capacity. Currently, the Jonathan Rogers Water Treatment Plant capacity is 60 MGD. The proposed strategy will increase the capacity to 80 MGD by replacing and enhancing existing treatment facilities. A preliminary design of the plant expansion by CH2M Hill Engineers, Inc. is the basis for the cost estimates for this strategy. Costs associated with the acquisition of irrigation rights are not included.

Quantity, Reliability, and Cost - This strategy to be implemented by 2070 will provide up to 6,500 acre-feet of treated water per year, based on a seven-month irrigation season and assuming a peaking factor of 2. The actual quantity of water is dependent on new irrigation properties acquired by EPWater and the availability of surface water from the Rio Grande Project, which varies from year to year. The estimated total capital cost for this strategy is approximately $106,178,000.

E-28 Advanced Water Purification at the Haskell Street WRP (ALTERNATE)

The Haskell R. Street Wastewater Treatment Plant (WRP) is in south central El Paso on the Rio Grande and has a capacity of 27.7 MGD. A portion of the treated wastewater effluent from this plant is the source for the Central Reclaimed Water Project (purple pipe reuse), which is used to irrigate several central El Paso schools and parks, including Ascarete Park and Golf Course. Currently most of the remaining effluent from the Haskell Plant is discharged into either the American Canal, which may then be used for irrigation downstream, or the Rio Grande.

This strategy is assumed to treat additional wastewater effluent to potable safe drinking water standards. The purified water would flow directly into the EPWater distribution system, while the remaining brine will be disposed by deep-well injection. EPWater will continue to meet its contractual obligations to provide a portion of the wastewater that originates as surface water for downstream irrigators. It is anticipated that this strategy will be implemented in the 2070 decade.

The conceptual design and cost for the strategy were based on the Bustamante Advanced Purified Water Plant. The Haskell R. Street WRP Advanced Water Purification strategy includes additional conventional wastewater treatment at the existing plant to remove nutrients, and advanced treatment facility (microfiltration/ultrafiltration, nanofiltration or reverse osmosis, ultraviolet/advanced oxidation process, activated carbon and chlorine disinfection). Disposal wells and pump stations, assumed to be 30% of the amount treated, were added to expansion phases as needed. The purified water will be placed directly into the public supply distribution system.

Quantity, Reliability, and Cost – For this strategy analysis, it is assumed that the initial capacity of the project would be approximately 12 MGD, with the project on-line in 2080. Assuming a peaking factor of 1.5, this would provide a supply of approximately 8,900 acre-feet per year. The capital cost to build the project is approximately $180,820,000.

5A 3.3 Water Management Strategies for Fort Bliss and East Biggs

The water supply at Fort Bliss and East Biggs comes from both groundwater wells located within the base property, drawing from the Hueco Mesilla Bolson Aquifer, and through a purchase agreement with El Paso Water. While the main post and Biggs Army Airfield areas rely solely on self-supplied groundwater wells, East Biggs purchases a portion of its water from the El Paso Water Utilities system in case of insufficient supply from their wells. All water sources are monitored for contaminants according to Federal and State regulations.

Fort Bliss and East Biggs are proposing several sources of water that will help the entities obtain additional supply needed for growth. Fort Bliss and East Biggs are reported together as one unit for accounting purposes and have a projected water-supply deficit of 928 acre-feet per year in 2030; increasing to 1,463 by 2080. The following water management strategies are recommended to enhance the reliability of the Fort Bliss and East Biggs' future water-supply availability.

- (E-29) Public conservation education
- (E-30) Purchase water from El Paso Water

E-29 Public Conservation Education

Public information programs, even though they may not be directly related to any equipment or operational change, can result in both short- and long-term water savings. Behavioral changes by customers will only occur if a reasonable yet compelling cause can be presented with sufficient frequency to be recognized and absorbed by the customers. There are many resources that can be consulted to provide insight into implanting effective information programs. Like any marketing or public information program, to be effective, water conservation public information should be planned out and implemented in a consistent and continual manner. A more detailed description of conservation BMPs that might be encouraged is available in TWDB Report 362, Water Conservation Best Management Practices Guide.

Fort Bliss and East Biggs are encouraged to emphasize conservation through public information programs. A total of one percent reduction in demand is anticipated, which would result in a water savings of 64 acre-feet per year in 2030; increasing to 70 acre-feet per year in 2080. The annual cost for implementing a public information conservation program is estimated at $9,858 in 2030, increasing to $9,940 in 2080. The total capital cost for this strategy is assumed to be $59,991.

E-30 Purchase Water from El Paso Water

Fort Bliss and East Biggs have historically purchased its water supply from EPWater. This strategy provides for the purchase of additional water supplies from EPWater to meet the projected future supply needs. The total volume of treated water available for purchase from EPWater is contingent on the Rio Grande water-right volume transferred to EPWater. The purchased supply is also reliant on EPWater maintaining its blended water supply and implementation of its Integrated Strategies (5B 3.2).

Quantity, Reliability and Cost -This strategy assumes that Fort Bliss and East Biggs would purchase an additional 864 acre-feet per year of water in 2030; increasing to 1,393 acre-feet per year by 2080 from EPWater at a cost of $936 per acre-foot. The annual cost for the water purchase increases from $809,000 in 2030 to $1,304,000 in 2080. The estimated quantity of supply for this strategy is dependent on EPWater maintaining its blended water supply and implementing its Integrated Strategies. The reliability of this supply is high, assuming EPWater successfully implements their Integrated Strategies. In contrast to many other water management strategies, there are no capital costs associated with the purchase of water from El Paso Water.

5A 3.4 Water Management Strategies for the Lower Valley Water District

The Lower Valley Water District (LVWD) is in the southeastern portion of El Paso County and currently offers water, wastewater and solid waste services to residents within a distribution system of 210 square miles east of the City of El Paso city limits. The City of Socorro, the community of San Elizario, the Town of Clint, El Paso County Sparks Addition, Sand Hills and other El Paso County Colonias are located within the LVWD's boundaries. The LVWD's sole source of water is purchased from the combined (blended) El Paso Water (EPWater) sources developed in the previously described EPWater Integrated Strategy (5B 3.2). The LVWD transfers its Rio Grande water rights to EPWater and, in exchange, receives treated water ready for distribution. The LVWD is proposing several new sources of water that will help limit the supplies delivered by EPWater to roughly current levels, and obtain additional supply needed for growth independently. The LVWD has a projected water-supply deficit of 2,820 acre-feet per year in 2030 increasing to 3,424 by 2080. The following water management strategies are recommended to enhance the reliability of the LVWD's future water-supply availability.

- (E-31) Public conservation education
- (E-32) Water loss audit and main-line repair
- (E-33) Purchase water from El Paso Water
- (E-34) Surface water treatment plant and transmission line
- (E-35) Groundwater from proposed wellfield – Rio Grande Alluvium Aquifer
- (E-36) Groundwater from proposed wellfield – Hueco Bolson Aquifer
- (E-37) Wastewater treatment facility and ASR

The LVWD active projects, which are currently being funded through other financial measures offered by the TWDB, include extension of its collection system and a water main replacement. The District is also very interested in addressing an issue of low pressure in its distribution system. Several lines dead end, which results in low pressure at the distal end of the lines. Low pressure is resulting in excessive use of water due to the need to flush toilets more than once to clear the sanitary lines. By looping the dead-end lines, adequate pressure can be maintained, thus conserving a significant volume of water.

E-31 Public Conservation Education

Public information programs, even though they may not be directly related to any equipment or operational change, can result in both short- and long-term water savings. Behavioral changes by customers will only occur if a reasonable yet compelling cause can be presented with sufficient frequency to be recognized and absorbed by the customers. There are many resources that can be consulted to provide insight into implanting effective information programs. Like any marketing or public information program, to be effective, water conservation public information should be planned out and implemented in a consistent and continual manner. A more detailed description of conservation BMPs that might be encouraged is available in TWDB Report 362, Water Conservation Best Management Practices Guide.

The LVWD is encouraged to emphasize conservation through public information programs. A total of one percent reduction in demand is anticipated, which would result in a water savings of 72 acre-feet per year in 2030; increasing to 78 acre-feet per year in 2080. The annual cost for implementing a public information conservation program is estimated at $39,366 in 2030, increasing to $39,691 in 2080. The total capital cost for this strategy is assumed to be $239,563.

E-32 Water Loss Audit and Main-Line Repair

According to the 2021 TWDB Public Water System Water Loss Survey, Lower Valley Water District had real water losses (as opposed to apparent "paper" losses) of 767 acre-feet in 2021 (10 percent) due to leaking infrastructure. This amount of water loss is the sum of reported breaks and leaks, and unreported loss. The water-supply system can reduce water losses and get a more accurate look at water consumption by taking the proper measures to identify and repair old infrastructure and inaccurate water meters. This strategy will provide a savings of only a portion of the total reported loss and assumes that a leak testing program would be implemented prior to possibly replacing portions of the existing leaking pipe.

Quantity, Reliability and Cost - The strategy assumes 40 miles of six-inch diameter pipe will be replaced, at a total estimated project capital cost of $42,603,000. The strategy is estimated to generate a potential savings of 77 acre-feet of water per year throughout the planning period.

E-33 Purchase Water from El Paso Water

The LVWD has historically purchased its water supply from EPWater and furnishes this supply to its wholesale and retail customers. This strategy provides for the purchase of additional water supplies from EPWater to meet the projected future supply needs of its customers. The total volume of treated water available for purchase from EPWater is contingent on the Rio Grande water-right volume transferred to EPWater. The purchased supply is also reliant on EPWater maintaining its blended water supply and implementation of its Integrated Strategies (5B 3.2).

Quantity, Reliability and Cost -This strategy assumes that LVWD would purchase an additional 2,820 acre-feet per year of water in 2030; increasing to 3,424 acre-feet per year by 2080 from EPWater at a cost of $1,136 per acre-foot. The annual cost for the water purchase increases from $3,204,000 in 2030 to $3,890,000 in 2080. The estimated quantity of supply for this strategy is dependent on EPWater maintaining its blended water supply and implementing its Integrated Strategies. The reliability of this supply is high, assuming EPWater successfully implements their Integrated Strategies. In contrast to many other water management strategies, there are no capital costs associated with the purchase water from El Paso Water.

E-34 Surface Water Treatment Plant and Transmission Lines

The canals that serve as the primary surface water source in the El Paso area divert water from the Rio Grande upstream of El Paso wastewater discharges. Currently, the flows in the Rio Grande in the vicinity of the Lower Valley Water District (LVWD) contains a large percentage of wastewater discharges, originating from both the City of El Paso and the Mexican City of Juarez. The most feasible surface water supply alternative available to the LVWD is to build an intake on the American Canal upstream of the intake for the Jonathan Rogers Water Treatment Plant (WTP), which is owned by El Paso Water (EPWater). This strategy assumes that the LVWD and the El Paso County WID #1 come to an agreement to deliver the water to the proposed intake location. Furthermore, this strategy assumes that the LVWD will hold all necessary future Rio Grande Project (RGP) leased water rights. In addition, the LVWD will need to inform EPWater that they will be providing their own supplemental water supplies in the future. The obligation of EPWater to provide water via the Jonathan Rogers WTP would be limited to the pro rata share of the plant capital costs paid by the LVWD. From that point on, future RGP water rights obtained via lease from agricultural properties would not be traded to EPWater, but rather the LVWD would utilize them directly. This source is currently used for agricultural purposes, and thus this strategy will reduce the amount of water currently available to agricultural users. It is assumed that the transfer of water rights will be between a willing buyer and a willing seller, and therefore minimal impact to agricultural users is anticipated.

This strategy assumes that the surface water supplies are only available seasonally, and therefore water will only be provided during the irrigation season (approximately March through October). The LVWD will need to either purchase water from EPWater during the winter months, utilize a groundwater supply source, or construct an Aquifer Storage and Recovery (ASR) project to provide the balance of supplies needed to meet future system demands.

The Surface Water Treatment Plant and Transmission Lines Strategy has been studied in detail by the LVWD. Project components include the purchase of 24 acres, construction of a new intake and pump station on the American Canal, a 1.6 mile 24-inch pipeline to a new 10 MGD water treatment plant, a ground storage tank providing four hours of storage at peak flow and a pump station at the WTP, and finally a 0.4 mile 24-inch pipeline to transport water from the WTP to the existing distribution system. Exact locations for these facilities are presently undetermined. Engineering preliminary studies are recommended to determine the best location for these facilities. It is anticipated that the new treatment plant will be designed to treat approximately 10 MGD and be similar in design to the Jonathan Rogers WTP as it is important to produce water that is not significantly different in pH or corrosiveness in order to blend well with EPW water.

Quantity, Reliability, and Cost – This strategy will supply an additional 5,000 acre-feet per year of treated water. The proposed plant has a maximum operating capacity of 10 MGD. However, the plant will only provide water seasonally (approximately March through October). The new supply would go directly into customer distribution. The reliability of this project is medium to high depending on available river supplies. The total estimated capital cost for this strategy is $128,073,000.

E-35 Groundwater from Proposed Wellfield – Rio Grande Alluvium Aquifer (ALTERNATE)

For the LVWD to provide a balance of supplies needed to meet future system demands, the Surface Water Treatment Plant (Strategy E-37) will operate in conjunction with a groundwater project. Groundwater supply sources from both the Rio Grande Alluvium (E-38) and Hueco Bolson Aquifers (E-39) are being considered to acquire water supply for the four months that surface water is not available.

This strategy assumes that the wellfield will produce a supply of 10 MGD. A desalination facility (8.3 MGD) utilizing deep-well injection (1.5 MGD) for concentrate disposal will be required. It is recommended that the location of the wellfield be close to the existing distribution system to reduce the costs of transmission line. A three-mile pipeline will transport the new supply to the storage facilities. Since the Rio Grande Alluvium Aquifer is high in total dissolved solids (TDS), advanced treatment will be required for municipal purposes, which includes a 2 MGD ground-storage tank and the purchase of 80 acres of land for the plant and another 280 acres for the wellfield.

Seven new wells, with approximately 2,200 feet of well-spacing, will be drilled to produce water from 150 feet below the surface. Each water well will have a capacity of approximately 1,000 gpm. The design of the wellfield is to operate in conjunction with the Surface Water Treatment Plant (Strategy E-37) during the winter period when surface water is limited.

Quantity, Reliability, and Cost – The quantity of water produced from seven wells over a four-month period is approximately 6,800 acre-feet per year. Capital costs for public supply wells completed in the Rio Grande Alluvium Aquifer are based on 1,000 gpm wells with 16-inch production casing, drilled to an average total depth of 150 feet, pumping equipment and site improvement. The total estimated capital cost for this project is $53,652,000, which includes the desalination facility.

The Rio Grande Alluvium Aquifer has shown that it can be considered reliable as a water supply if properly developed and is not compromised by additional water demands. This strategy could potentially compete for groundwater that at times is used for agricultural purposes; however, the Aquifer is currently being used at less than sustainable capacity.

E-36 Groundwater from Proposed Wellfield – Hueco Bolson Aquifer

Production from a wellfield completed in the Hueco Bolson Aquifer is a second groundwater alternative being considered by the LVWD as a feasible strategy to help supplement the proposed Surface Water Treatment Plant (Strategy E-37). In winter, surface water supplies cannot provide the water supply needed to accommodate the growing water demands. To acquire water supply for the four months that surface water is not available, the LVWD has studied in detail the feasibility of developing a new wellfield in the Hueco Bolson Aquifer.

This strategy assumes six new wells with approximately 2,500 feet of well spacing will be drilled to produce water from 650 feet below the surface. Each water well will have a capacity of approximately 1,000 gpm. It is assumed that the wellfield will produce a supply of 10 MGD. A desalination facility (8.3 MGD) utilizing deep-well injection (1.5 MGD) for concentrate disposal will be required. It is recommended that the location of the wellfield be close to the existing distribution system to reduce the costs of transmission line. A three-mile pipeline will transport the new supply to the storage facilities. This strategy also includes a 2 MGD ground storage tank and the purchase of 80 acres of land for the plant and another 367 acres for the proposed wellfield.

Quantity, Reliability, and Cost –The LVWD is proposing to use this strategy in conjunction with the Surface Water Treatment Plant (Strategy E-37), only during the winter period when the availability of surface water is limited. The supply yield during this designated period of production will provide an additional supply of approximately 6,800 acre-feet per year.

The capital costs associated with this strategy are based on six 1,000 gpm wells with 16-inch production casing drilled to an average total depth of 650 feet, pumping equipment and site improvement. The total estimated capital cost for this project is approximately $50,303,000. The Hueco Bolson Aquifer has shown that it can be considered reliable as a water supply if properly developed and is not compromised by additional water demands.

E-37 Wastewater Treatment Facility and ASR

To provide the balance of supplies needed to meet future system demands, along with strategies E-37, E-38, and E-39), the LVWD is also considering the possibility of constructing a wastewater treatment facility and an aquifer storage and recovery (ASR) project similar to El Paso Water's Fred Hervey Water Reclamation Plant and aquifer recharge project. The concept of this strategy is to tertiary treat wastewater to near drinking-water standards, inject specified volumes into the distribution system, and store the surplus amount into the Hueco Bolson Aquifer for later recovery.

There are three potential sources of water that could be stored and recovered in the ASR project: (1) excess treated surface water (Strategy E-37), (2) treated wastewater provided by EPWater, or (3) excess LVWD treated wastewater. The first option would include pumping water from the American Canal at a rate equivalent to taking the full 6.8 MGD over eight months instead of the twelve and deposit the excess in the ASR for use in the winter. The second option would require that EPWater modify its treatment train to produce water to a quality suitable for ASR. The third option requires the LVWD build its own wastewater treatment facility. It is recommended that additional studies be conducted to better determine the feasibility of each of these options.

The Hueco Bolson Aquifer is considered as the ASR repository as it has more potential storage volume and is less subject to outside pumping that might pirate a portion of the injected supply. However, the Rio Grande Alluvium may also be an option for the ASR if the Hueco Bolson is determined to be infeasible.

For this strategy, the third option is chosen for consideration in this strategy and thus considers the construction of a new 3 MGD tertiary wastewater treatment facility, an ASR facility consisting of two 650-foot wells capable of both injection and withdrawal, and 5,280 feet of 12-inch diameter wellfield piping.

Quantity, Reliability, and Cost – The strategy assumes that an estimated 5,589 acre-feet per year of treated water will be injected into the Hueco Bolson Aquifer. It is anticipated that at least, approximately 70 percent of the water injected is recoverable. The total capital cost is approximately $54,305,000. Reuse of existing supplies makes this treated supply reliable.

5A 3.5 Water Management Strategies for Horizon Regional Municipal Utility District (MUD)

The Horizon Regional MUD's mission is to provide affordable, high quality drinking water and environmentally sound wastewater treatment and disposal. The Utility District operates a state-of-the-art reverse osmosis water treatment plant servicing residents within an area of approximately 91,000 acres. The District relies on the Hueco Bolson Aquifer and the Rio Grande Alluvium Aquifer for its municipal water supply needs. Drawing from the Rio Grande Alluvium Aquifer, the District converts brackish groundwater into six million gallons of drinking water per day. The District has plans to expand production by an additional two million gallons per day.

Horizon Regional MUD has a projected water supply deficit of 3,142 in 2030, increasing to 3,970 by 2080. The following water management strategies are recommended to enhance the reliability of the Utility District's future water supply availability.

- (E-38) Water Loss Audit and Main-line Repair
- (E-39) Public conservation education
- (E-40) Drill additional wells and expansion of desalination plant

E-38 Water Loss Audit and Main-line Repair

According to the 2021 TWDB Public Water System Water Loss Survey, the Horizon Regional Municipal Utility District had real water losses (as opposed to apparent "paper" losses) of 959 acre-feet in 2022 (19 percent) due to leaking infrastructure. This amount of water loss is the sum of reported breaks and leaks, and unreported loss. The water-supply system can reduce water losses and get a more accurate look at water consumption by taking the proper measures to identify and repair old infrastructure and inaccurate water meters. This strategy will provide a savings of only a portion of the total reported loss and assumes that a leak testing program would be implemented prior to possibly replacing portions of the existing leaking pipe.

Quantity, Reliability and Cost - The strategy assumes six miles of 6-inch diameter pipe will be replaced, at a total estimated capital cost of $6,392,000. The strategy is estimated to generate a potential savings of 182 acre-feet of water per year throughout the planning period.

E-39 Public Conservation Education

Public information programs, even though they may not be directly related to any equipment or operational change, can result in both short- and long-term water savings. Behavioral changes by customers will only occur if a reasonable yet compelling cause can be presented with sufficient frequency to be recognized and absorbed by the customers. There are many resources that can be consulted to provide insight into implanting effective information programs. Like any marketing or public information program, to be effective, water conservation public information should be planned out and implemented in a consistent and continual manner. A more detailed description of conservation BMPs that might be encouraged is available in TWDB Report 362, Water Conservation Best Management Practices Guide.

Horizon Regional MUD is encouraged to emphasize conservation through public information programs. A total of one percent reduction in demand is anticipated, which would result in a water savings of 95 acre-feet per year in 2030; increasing to 104 acre-feet per year in 2080. The annual cost for implementing a public information conservation program is estimated at $19,714 in 2030, increasing to $319,877 in 2080. The total capital cost for this strategy is assumed to be $119,970.

E-40 Additional Wells and Expansion of Desalination Plant

Currently, Horizon Regional MUD is supplied with brackish groundwater from wells in the Rio Grande Alluvium Aquifer that is desalinated through a 6.0 MGD plant. The MUD also has wells in the Hueco Bolsons Aquifer that do not require desalination. The Horizon Regional MUD will require additional infrastructure to produce the needed supply in the decade beginning with the year 2030. This strategy assumes that five additional wells will be drilled in the Rio Grande Alluvium and four in the Hueco Bolsons Aquifer. The five wells in the Rio Grande Alluvium will need to be drilled at approximately 150 feet below the surface. The four wells in the Hueco Bolsons Aquifer will be produced at a depth of 500 feet. These wells combined are anticipated to have an average capacity of 1,200 gpm. This strategy also includes expanding the desalination plant from the 6.0 MGD to 21.4 MGD.

Quantity, Reliability, and Cost – The nine proposed wells will have a total production capacity of 16,786 acre-feet per year. The groundwater source will continue to be brackish and will be converted to fresh quality through the desalination facility. The capital cost for this project is estimated at $158,399,000. There is a significant quantity of brackish quality water in the Rio Grande Alluvium Aquifer; therefore, the source is considered very reliable. Since this strategy relies on brackish supplies that are only occasionally used for agricultural irrigation users, competition for the water is expected to be minimal.

5A 3.6 Water Management Strategy for East Montana Water System

East Montana Water System provides a reliable supply of clean, treated groundwater sourced from local aquifers, consistently meeting all Federal and State drinking water standards. East Montana Water System obtains all their water through a purchase agreement with El Paso. The following water management strategy is recommended to enhance the reliability of the East Montana Water System future water-supply availability.

- (E-41) Water loss audit and main-line repair

E-41 Water Loss Audit and Main-line Repair

According to the 2022 TWDB Public Water System Water Loss Survey, the East Montana Water System had real water losses (as opposed to apparent “paper” losses) of 132 acre-feet in 2022 (11 percent) due to leaking infrastructure. This amount of water loss is the sum of reported breaks and leaks, and unreported loss. The water supply system can reduce water losses and get a more accurate look at water consumption by taking the proper measures to identify and repair old infrastructure and inaccurate water meters. This strategy will provide a savings of only a portion of the total reported loss and assumes that a leak testing program would be implemented prior to possibly replacing portions of the existing leaking pipe.

Quantity, Reliability and Cost - The strategy assumes nine miles of 6-inch diameter pipe will be replaced, at a total estimated project capital cost of $9,587,000. The strategy is estimated to generate a potential savings of 14 acre-feet of water per year throughout the planning period.

5A 3.7 Water Management Strategies for El Paso County Tornillo WID

The township of Tornillo is an unincorporated community in El Paso County with a current population of 3,403 people and has been designated as a "Colonia." The El Paso County Tornillo Water Improvement District provides water services to approximately 1,014 connections, mostly residential, within the community. The District is self-supplied and relies on the Hueco Bolson Aquifer for municipal water supply needs. Although the supply-demand analysis does not project a future water supply deficit for El Paso County Tornillo WID, the following water management strategies are recommended to enhance the reliability of the District's future water supply availability.

- (E-42) Water loss audit and main-line repair
- (E-43) Additional groundwater well and transmission line

E-42 Water Loss Audit and Main-Line Repair

According to the 2022 TWDB Public Water System Water Loss Survey, El Paso County Tornillo WID had real water losses (as opposed to apparent "paper" losses) of 48 acre-feet in 2022 (12 percent) due to leaking infrastructure. This amount of water loss is the sum of reported breaks and leaks, and unreported loss. The water supply system can reduce water losses and get a more accurate look at water consumption by taking the proper measures to identify and repair old infrastructure and inaccurate water meters. This strategy will provide a savings of only a portion of the total reported loss and assumes that a leak testing program would be implemented prior to possibly replacing portions of the existing leaking pipe.

Quantity, Reliability and Cost - The strategy assumes four miles of 6-inch diameter pipe will be replaced, at a total estimated project capital cost of $4,261,000. The strategy is estimated to generate a potential savings of six acre-feet of water per year throughout the planning period.

E-43 Additional Groundwater Well and Transmission Line

The District is expecting to need an additional well in the future to meet local population growth. Water produced from these wells will be treated in the arsenic treatment facility.

This strategy assumes the development of one new well at a depth of 400 feet. The well is assumed to be operating at a capacity of 310 gpm. In addition, this strategy includes 0.25 miles of 6-diameter transmission line. Minimal treatment, such as chlorine disinfection, will be required for municipal purposes.

Quantity, Reliability, and Cost – This strategy will yield an additional water supply of 333 acre-feet per year. The estimated total capital cost for this project is $2,731,000. Reliability of this source is high due to the Hueco Bolson Aquifer being a prolific aquifer. Modeling indicates that the Aquifer can be sustainably developed beyond previous estimates. However, development of Hueco Bolson groundwater may have a minor impact on other wells used for agricultural and rural purposes.

5A 3.8 Water Management Strategies for El Paso County WCID #4 (FABENS)

El Paso County WCID #4 is committed to providing safe, high-quality water and wastewater services to the community of Fabens, while maintaining a standard of excellence in customer service and environmental conservation. El Paso County WCID #4 serves a growing community with a population currently of 6,132 individuals: increasing to 6,681 in 2080. Although the supply-demand analysis does not project a future water supply deficit for El Paso County Tornillo WCID #4, the following water management strategy is recommended to enhance the reliability of the District's future water supply availability.

- (E-44) Water loss audit and main-line repair

E-44 Water Loss Audit and Main-Line Repair

According to the 2020 TWDB Public Water System Water Loss Survey, El Paso County WCID #4 had real water losses (as opposed to apparent "paper" losses) of 86 acre-feet in 2020 (11 percent) due to leaking infrastructure. This amount of water loss is the sum of reported breaks and leaks, and unreported loss. The water supply system can reduce water losses and get a more accurate look at water consumption by taking the proper measures to identify and repair old infrastructure and inaccurate water meters. This strategy will provide a savings of only a portion of the total reported loss and assumes that a leak testing program would be implemented prior to possibly replacing portions of the existing leaking pipe.

Quantity, Reliability and Cost - The strategy assumes four miles of 6-inch diameter pipe will be replaced, at a total estimated project capital cost of $4,261,000. The strategy is estimated to generate a potential savings of nine acre-feet of water per year throughout the planning period.

5A 3.9 Water Management Strategies for El Paso County Irrigation (EPCWID #1)

Irrigation shortages in El Paso County are the direct result of insufficient water in the Rio Grande during drought-of-record periods to meet anticipated needs. Thus, the quantity of water needed to meet the full demands cannot be realistically achieved during drought conditions and farmers in these areas have generally approached this situation by supplementing supplies with Rio Grande Alluvium Aquifer groundwater, reducing irrigated acreage, changing types of crops planted, or possibly not planting crops until water becomes available during the following season.

In some cases, farmers may benefit from Best Management Practices (BMPs) for agricultural water users, which are a mixture of site-specific management, educational, and physical procedures that have proven to be effective and are cost-effective for conserving water. The Texas Water Development Board (TWDB), through the Water Conservation Implementation Task Force has published Report 362, Water Conservation Best Management Practices Guide, which in part contains numerous BMPs for agricultural water users.

During previous planning periods, the FWTWPG sponsored and the TWDB funded an interim project to evaluate the effectiveness of previously recommended irrigation BMP strategies. The evaluation was conducted by the Texas AgriLife Research Center in El Paso. The entire report can be found on the TWDB's website and is titled, "Evaluation of Irrigation Efficiency Strategies for Far West Texas: Feasibility, Water Savings and Cost Considerations.

The overall conclusion is that very limited opportunities exist for significant additional water conservation in Far West Texas irrigated agriculture. Those practices that suggest economic efficient additional water conservation include lining or pipelining district canals and the very small potential for additional irrigation scheduling and tail water recovery systems. In nearly all cases, these practices have been largely adopted if applicable, further emphasizing the very limited opportunities for additional conservation.

Based on this evaluation, the FWTWPG recommends the following conservation and reuse strategies: irrigation scheduling, tailwater reuse, and improvements to water district delivery systems. These strategies are intended for irrigation practices within the El Paso County Water Improvement District #1 (EPCWID#1). The potential water savings under both drought and full supply conditions is shown in the table below.

Potential Water Savings for EPCWID #1

BMP Strategy	Drought	Full
Scheduling (subtotal)	1,740	5,070
Pivot Sprinkler	-	-
Surface Irrigation	-	-
Pipeline / Lining District Canals	25,000	50,000
Tailwater Reuse	1,723	6,274
Total	**28,463**	**61,344**

El Paso County has approximately 75,914 acre-feet per year of an irrigation shortage in 2030, which decreases to 72,281 acre-feet per year by 2080. The following water management strategies are recommended to enhance the reliability of the future water-supply availability for the irrigation needs within El Paso County.

- (E-45) Irrigation scheduling
- (E-46) Tailwater reuse
- (E-47) Improvements to water district delivery systems
- (E-48) Riverside Regulating Reservoir
- (E-49) New Rio Grande diversion point at La Union Canal

E-45 Irrigation Scheduling

This strategy is intended for producers with an adequate supply of water throughout the growing season. It involves scheduling the time and amount of water that is applied to a crop based on the amount of water present in the crop root zone, the amount of water consumed by the crop since the last irrigation, and other considerations. Water savings are difficult to quantify and vary from year to year based on cropping practices, water quality, and quantity. It is estimated that 0.3 to 0.5 acre-feet of water per acre may be saved.

Due to recent droughts, EPCWID #1 has made several changes to aid the agricultural sector. Farmland is currently being irrigated with effluent (sewer treated) water. In 2015, 10,000 acres were irrigated in this manner. Also, modifications have been made to the local irrigation schedule. Farmers will now wet their lands for planting starting in February (irrigating as much as possible), up until the beginning of the irrigation season starting June 1st. This strategy assumes that upon the release of the Rio Grande project water, the project water will be mixed with well water and the effluent water in order to produce more supply to be allocated to other users including El Paso Water.

Quantity, Reliability, and Cost - Costs vary depending upon which scheduling method is used, number of fields scheduled, type of program and technical assistance. Based upon existing research conducted on surface water delivery through a series of canals, laterals, and on-farm distribution system, irrigation scheduling offers the potential to reduce water deliveries between 10 and 25 percent and more depending upon the capabilities of the individual district and producer. The project would have a benefit of 1,740 acre-feet per year. This strategy assumes an annual cost of approximately $151,163.

E-46 Tailwater Reuse

This strategy is applicable to any irrigated system in which significant water quantity runs off the end of the irrigated field. This strategy consists of ditches or pipelines to collect tailwater and deliver it to a storage reservoir or small field pump. The water is then pumped to the upper end of the field and applied with the irrigation water. Water savings from the installation of tailwater reuse systems are highly dependent upon the local water supply (groundwater or surface water) and the current on-farm water management practices of the grower. Water savings will typically vary between five and 25 percent of the water applied to the head (upper) end of the field. This may range from a few to several inches (0.5 to 1.5 acre-foot per acre per year).

Quantity, Reliability, and Cost – Reservoirs or pumps costs range between $51 and $103 per acre per year for pump systems and between $88 and $176 per acre per year for reservoir systems. This project will deliver approximately 1,723 acre-feet of water per year and has an estimated annual cost of $1,434,157.

E-47 Improvements to Water District Delivery Systems

EPCWID #1 continues to implement meaningful irrigation conservation measures. The District provides irrigation water for 69,010 acres, includes 350 miles of canals and 269 miles of drains, and supplies raw water to El Paso Water. Improvements to the water district delivery system include but are not limited to lining of District irrigation canals, replacement of District canals and lateral canals with pipelines.

Lining of District irrigation canals involves the installation of a fixed lining impervious material in an existing or newly constructed canal. Concrete lining of canals and replacement of headgates has been a critical component of irrigation conservation for the District. EPCWID #1 has lined 15 miles of canals within the last seven years and strives to continue lining approximately one to five miles each upcoming year. This allows for water to be delivered more efficiently to the farms. In addition, in 2015 a joint project between EPCWID #1 and EPWU for $120,000 was implemented to repair and upgrade the canal infrastructure at the headgates.

In 2002, EPCWID #1 received State funding from the TWDB to perform a water and energy conservation feasibility study on lining three canal segments to reduce seepage, construction of check structures and storage, and equalization structures to increase the efficiency and flexibility of water delivery. Funds were available through oil overcharge fees collected by the State Energy Conservation Office and deposited in the Water Bank Account. Water savings involve reduced seepage from the installation of a lining material. Concrete liners are estimated to salvage 80 percent of the original seepage. Costs vary by lining method.

This strategy assumes that replacement of District canals and lateral canals with pipelines involves replacing open canals with buried pipeline that is generally 72 inches in diameter or less. PVC Plastic Irrigation Pipe (PIP) and Reinforced Concrete Pipe (RCP) are the two most used pipelines. Two primary limitations involve cost and water capacity. Water savings stem from reduced seepage. Costs vary and depend on pipe diameter, transportation of pipes, trenching, and other site-specific considerations. Federal funds, State funds and local funds have contributed to the success of this strategy. With the purchase of the proper equipment, the goal is to eventually control the headgates of the system through both the dispatch office and the telemetry system.

Quantity, Reliability, and Cost – The estimated total capital cost for this project is approximately $231,933,341 and will deliver approximately 25,000 acre-feet per year.

E-48 Riverside Regulating Reservoir

To make more efficient use of surface water supplies, EPCWCID #1 has purchased the City of El Paso former Socorro Pond Sewage Treatment Facility located in the city limits of El Paso near the Bustamante Wastewater Facility.

The regulating reservoir will allow more efficient use of stored water releases from the Rio Grande Project storage reservoirs, as well as flows that originate as stormwater runoff below Caballo Reservoir. The primary source of water stored in the reservoir would be from excess flows diverted at American Dam and conveyed to the heading of the Riverside Canal. These excess flows primarily consist of storm runoff and operation spills from upstream water users. The temporary stored water would be used either from downstream irrigators or be pumped to the nearby Jonathan Rogers Water Treatment Plant for municipal use. All of the water sources are already authorized through existing state and federal contracts, agreements and water rights. The supply volume is EPCWCID#1's estimate based on increased delivery efficiency in the canal delivery system after diversion from the river, and therefore, environmental flow consideration is not required for this evaluation.

The primary benefits of the project are: (1) Improved farm delivery scheduling and flows; (2) Conservation of water stored in upstream storage reservoir through using water captured in regulating reservoirs to meet downstream demands; and (3) A five-day supply of raw water for use by City of El Paso in case of an emergency such as failure or contamination of American Canal system.

Portions of the project have already been completed, including improvements to the Partidor Check Structure; concreate lining for the Riverside Canal upstream and downstream of the reservoir and reconstruction of Riverside Canal Wasteway #1, a flood waste-way to the river.

EPCWID #1 is collaborating with municipalities in El Paso County to make capacity upgrades to existing irrigation drain infrastructure to mitigate flooding while facilitating the capture and reuse of stormwater from local storm events. Stormwater capture and reuse would lead to the development of a new water source for EPCWID #1. Additional studies are needed to determine the quantity and quality of the stormwater that can be captured and the upgrades that are necessary for reuse.

Quantity, Reliability, and Cost - The primary benefit of this strategy is allowing for increased delivery efficiency in the canal delivery system after diversion from the river. Previous studies of this project have estimated that the project could provide 6,500 acre-feet of water per year. However, there may be some years where the strategy could provide more or less water, depending on available river supplies and the amount of excess water in the canal. The total capital cost of approximately $19,845,000 and supply of 6,500 acre-feet per year developed from this project is equally split between EPW and the EPCWID#1 ($9,922,500 and 3,250 acre-feet per year each).

E-49 New Wasteway 32 River Diversion Pumping Plan

EPCWID #1 is planning to develop a new diversion point at the Rio Grande at the El Paso Upper Valley. The new diversion pint will make irrigation water deliveries to agricultural water users via the La Union East Canal more efficient. In collaboration with El Paso Water, the new diversion point will allow the delivery of surface water to the Upper Valley Water Treatment Plant. The details for collaboration between EPCWID #1 and EPWater for this option have yet to be determined and are outside the scope of regional water planning.

Diversions for irrigation water deliveries in the El Paso Upper Valley are currently made in collaboration with Elephant butte Irrigation District at the Mesilla Dam near Las Cruces, New Mexico. Water for EPCWID #1 is diverted at Mesilla Dam into the Westside Canal and conveyed approximately 20 miles to the heading of the La Union East and West canals and near the Rio Grande Project Wasteway 32. This Wasteway canal conveys bypass water from the La Union East Canal to the Rio Grande.

The proposed conversion of Wasteway 32 into a diversion point on the Rio Grande will reduce the amount of water lost to seepage in the Westside Canal and provide EPCWID #1 and EPWater access to surface water during times when no water is or can be diverted at Mesilla Dam.

Portions of the project are already in progress, including concrete lining sections of the La Union East Canal and making sediment control upgrades at Wasteway 32. Additional costs for the Wasteway 32 La Union East River Pumping Plant are included as part of this water management strategy. Further agreements and possible re-routing may be required for surface water deliveries to the Upper Valley Water Treatment Plant.

Quantity, Reliability, and Cost – The primary benefit of this strategy is to increase the resiliency of existing supplies of water, reduction to seepage losses, and increased flexibility in operating the Rio Grande Project. The estimated total capital cost of this project is approximately $5,682,394 and will deliver approximately 5,000 acre-feet per year additional water supply because of delivery efficiencies.

5A 4.0 Water Management Strategies for El Paso County Steam Electric Power

Steam Electric Power (El Paso Electric Company) primarily utilizes water for the cooling of the power generation plants and for pollution control. El Paso Electric Company focuses on minimizing usage through water reuse and recycling, often utilizing reclaimed wastewater where possible. The Company actively seeks new strategies to maximize water conservation.

Water supply is obtained partly by EPWater's blended source along with obtaining self-supplied groundwater from the Hueco-Mesilla Bolson Aquifer. Although the supply-demand analysis does not project a future water supply deficit for Steam Electric Power in El Paso County, the following water management strategies are recommended to enhance the reliability of the El Paso Electric Company's future water supply.

- (E-50) Purchase water from El Paso Water
- (E-51) Treatment and reuse of wastewater

E-50 Purchase Water from El Paso Water

Steam Electric Power (El Paso Electric Company) has historically purchased its water supply from EPWater. This strategy provides for the purchase of additional water supplies from EPWater to meet any projected future supply needs. Although no water deficits have been projected for the sixth round of regional water planning, El Paso Electric Company did confirm that the two water management strategies listed above are still applicable and necessary for the inclusion of the 2026 regional water plan. However, the total volume of treated water available for purchase from EPWater is contingent on the Rio Grande water-right volume transferred to EPWater. The purchased supply is also reliant on EPWater maintaining its blended water supply and implementation of its Integrated Strategies (5B 3.2).

Quantity, Reliability and Cost - This strategy assumes that El Paso County Steam Electric Power would purchase 7,260 acre-feet of additional water per year from EPWater starting in 2030 at a cost of $1,625 per acre-foot. The total annual cost for the water purchase is approximately $11,798,000. The purchased supply is reliant on EPWater maintaining its blended water supply and implementation of its Integrated Strategies.

E-51 Treatment and Reuse of Wastewater

In addition to maximizing cooling tower cycles of concentration, treating cooling tower blowdown and plant wastewater is a critical component of an effective water management strategy. This approach promotes sustainability and conserves resources. By treating wastewater for reuse within the plant, the demand for freshwater withdrawals from local wells is significantly reduced.

A Zero Liquid Discharge (ZLD) facility enables power plants to treat all waste streams to the quality required for cooling tower makeup and, in some cases, as feedwater for demineralized water production used in steam generation. All wastewater can be treated, reused, and recycled back into industrial processes. By viewing wastewater as a resource rather than a waste product, the ZLD system supports efficient water use and sustainable industrial water management.

As part of a new water management strategy prompted by the elimination of wastewater discharge options due to a highway project intersecting the irrigation path, El Paso Electric Company began construction of a ZLD treatment system in February 2024. The facility is expected to be completed by the third quarter of 2025. With a processing capacity of 1.5 million gallons per day (MGD), the ZLD system will significantly reduce reliance on water from local wells and reclaimed water supplied by the municipal water system. Its treatment technologies include clarification, multi-filtration, deionization, and sludge dewatering for disposal.

Improvements to the existing site water and wastewater systems include optimizing operations to increase cooling tower cycles and maximize wastewater evaporation and concentration using current equipment. Additionally, selected wastewater flows will be redirected for reuse as cooling tower makeup, reducing the total volume of wastewater generated. Any sitewide wastewater that cannot be recycled will be processed in the ZLD system.

The ZLD facility reinforces a commitment to sustainability by demonstrating responsible stewardship of the area's natural resources. The system will reduce overall water usage by recycling wastewater within the plant, thereby decreasing freshwater withdrawals from local wells. The ZLD facility is also projected to reduce grey water usage by 35% through enhanced wastewater recovery and improved cycles of concentration for the cooling towers.

Quantity, Reliability and Cost - The volume of water generated from this strategy will be 1,680 acre-feet per year beginning in the 2030 decade. The total capital cost is estimated to be approximately $33,647,000.

5A-4 WATER MANAGEMENT STRATEGIES FOR HUDSPETH COUNTY

5A 4.1 Water Management Strategies for Esperanza Water Service

Esperanza Water Service provides groundwater sourced drinking water that is consistently tested and meets all Federal health-based drinking water standards, ensuring it is safe for consumption by residents of Hudspeth County. Although the supply-demand analysis does not project a future water supply deficit for Esperanza Water Service, the following water management strategy is recommended to enhance the reliability of the Utilities' future water supply.

- (E-52) Water loss audit and main-line repair

E-52 Water Loss Audit and Main-Line Repair

According to the 2020 TWDB Public Water System Water Loss Survey, the Esperanza Water Service had real water losses (as opposed to apparent "paper" losses) of 37 acre-feet in 2020 (22 percent) due to leaking infrastructure. This amount of water loss is the sum of reported breaks and leaks, and unreported loss. The water supply system can reduce water losses and get a more accurate look at water consumption by taking the proper measures to identify and repair old infrastructure and inaccurate water meters. This strategy will provide a savings of only a portion of the total reported loss and assumes that a leak testing program would be implemented prior to possibly replacing portions of the existing leaking pipe.

Quantity, Reliability and Cost - The strategy assumes 33 miles of 6-inch diameter pipe will be replaced, at a total estimated project capital cost of $35,148,000. The strategy is estimated to generate a potential savings of eight acre-feet of water per year throughout the planning period.

5A 4.2 Water Management Strategies For Hudspeth County-Other (Dell City)

Dell City relies on the Bone Spring-Victorio Peak Aquifer for its municipal supply. While the supply availability is adequate, water from the Aquifer must be desalinated to make it potable for public drinking water use. Although the supply-demand analysis does not project a future water supply deficit for Dell City, the maintenance and upgrade of the City's desalination facility is recommended to enhance the reliability of its future water-supply availability.

- (E-53) Brackish groundwater desalination facility

E-53 Brackish Groundwater Desalination Facility

Aided by financial assistance from the TWDB, Dell City has plans to replace the City's water treatment facility with a reverse osmosis system. The existing ionic filtration system is outdated, and replacement parts are difficult to obtain. In addition, the City's groundwater source exceeds water quality standards for total dissolved solids and fluoride. This strategy incorporates Dell City's funding application from the TWDB Drinking Water State Revolving Fund (DWSRF) for an amount of $244,450. It is assumed that all other necessary infrastructure (e.g., piping, concentrate disposal) is currently in place for the existing facility and will not need to be updated.

Quantity, Reliability, and Cost – This strategy assumes an additional supply of 111 acre-feet of water per year. The reliability of this strategy is high due to the sufficient amounts of brackish groundwater. It is estimated that the total capital cost for this project is $3,227,000.

5A 4.3 Water Management Strategies For Hudspeth County-Other (Sierra Blanca-Hudspeth County WCID#1)

The Hudspeth County WCID#1 provides water to the Community of Sierra Blanca and the surrounding area. The Utility is under contract with the Town of Van Horn for delivery of water obtained from wells in the Wild Horse Flat Aquifer north of Van Horn near the airport. Since 1970, Sierra Blanca has drilled several wells near the town in unsuccessful attempts to develop local sources of groundwater. Although the supply-demand analysis does not project a future water supply deficit for the Utility, the following water management strategies are recommended to enhance the reliability of the Utility's future water supply availability.

- (E-54) Replace water-supply line from Van Horn
- (E-55) Groundwater well west of Van Horn

E-54 Replace Water-Supply Line from Van Horn

Water supply generated by the Town of Van Horn is delivered to the Hudspeth County WCID#1 (Sierra Blanca) through an old pipeline that needs repair or replacement. This strategy describes the replacement of three miles of eight-inch transmission pipeline along existing right of way that will be capable of generating 39 acre-feet of water per year more than was previously achieved.

Quantity, Reliability, and Cost – This strategy assumes an additional supply of 39 acre-feet of water per year. The supply from the Van Horn wellfield is very reliable. It is estimated that the total capital cost for this project is $4,420,000.

E-55 Groundwater Well West of Van Horn

One new well is proposed for the Hudspeth County WCID #1 near the Allamoore industrial site along IH10 west of Van Horn. Groundwater availability at this location is uncertain; however, likely host aquifer formations include shallow Eagle Flat alluvium, Permian and Pre-Cambrian limestones and breccia, which for this strategy will be referred to as the Diablo Plateau Aquifer. This strategy describes the construction and completion of one well to supply the increased future need for the District. The well is proposed to be 500 feet deep with an average pumping capability of 100 GPM. A half-mile pipeline is proposed to connect the new well to the main Utility transmission line.

Quantity, Reliability, and Cost – This strategy assumes an additional supply of 39 acre-feet of water per year. The reliability of this strategy is uncertain as few wells have been drilled in this vicinity. It is estimated that the total capital cost for this project is $1,171,000.

5A 4.4 Water Management Strategies for Hudspeth County Irrigation

Irrigation water-supply shortages in Hudspeth County are projected at 19,056 acre-feet per year in all decades throughout the planning horizon. The demand for irrigation water in Hudspeth County has been increasing due to a combination of factors including expanding agricultural practices, particularly in high-value crops, coupled with a changing climate leading to more frequent and severe droughts, which are requiring farmers to rely more heavily on irrigation to maintain crop yields. This increased demand puts pressure on the local groundwater aquifers, which are already facing concerns regarding sustainability. Irrigation water-supply needs within the County obtain supplies from both surface and groundwater sources.

The following water management strategy is recommended to enhance the reliability of the future water-supply availability for the irrigation water-supply needs within Hudspeth County. However, due to the factors mentioned above, irrigation within the County has an unmet need of 18,552 in all decades throughout the planning horizon.

- (E-56) Irrigation scheduling

E-56 Irrigation Scheduling

This strategy is intended for producers with an adequate supply of water throughout the growing season. It involves scheduling the time and amount of water that is applied to a crop based on the amount of water present in the crop root zone, the amount of water consumed by the crop since the last irrigation, and other considerations. Water savings are difficult to quantify and vary from year to year based on cropping practices, water quality, and quantity. It is estimated that 0.3 to 0.5 acre-feet of water per acre may be saved, according to Best Management Practices for Agricultural Water Users, found on the TWDB's website.

Quantity, Reliability and Cost - According to the 2022 U.S. Ag Census, Hudspeth County had 56 farms with irrigated land in 2022 and 94,041 acres of irrigated land, which gives an average of 1,679 acres per farm. Assuming that scheduling would conserve 0.3 acre-feet per acre, this results in a conservation savings of approximately 504 acre-feet per farm. The reliability of this supply is low due to uncertainty associated with estimated implementation of BMPs. There is no capital cost associated with implementing this strategy.

5A 4.5 Water Management Strategies for Hudspeth County Livestock

Livestock water-supply shortages in Hudspeth County are projected at seven acre-feet per year in 2080. Livestock water supply needs within the County obtain supplies primarily from surface water sources such as local supply (stock ponds), which is common but limited during drought conditions. The following water management strategy is recommended to enhance the reliability of the future water-supply availability for the livestock water-supply needs within Hudspeth County.

- (E-57) Livestock conservation

E-57 Livestock Conservation

The University of Arkansas (Division of Agriculture) published in 2006 protect soil, water and air resources for generations to come. One such recommendation for farmers with livestock to consider, is alternative watering, which is designed to deliver water to livestock at multiple places on a farm, which enhances a rotational grazing system. Water savings are difficult to quantify and vary from year to year based on livestock practices, water quality, and quantity. It is estimated that 0.3 to 0.5 acre-feet of water per acre may be saved, according to Best Management Practices for Agricultural Water Users, found on the TWDB's website.

Quantity, Reliability and Cost - According to the 2022 U.S. Ag Census, Hudspeth County had 13 farms with pastureland in 2022 and 30,986 acres of irrigated land, which gives an average of 2,384 acres per farm. Assuming that scheduling would conserve 0.3 acre-feet per acre, this results in a conservation savings of approximately 715 acre-feet per farm. The reliability of this supply is low due to uncertainty associated with estimated implementation of BMPs. There is no capital cost associated with implementing this strategy.

5A 4.6 Water Management Strategies for Hudspeth County Mining

Mining water-supply shortages in Hudspeth County are projected at 11 acre-feet per year in 2080. Mining water-supply needs within the County obtain supplies from both surface and groundwater sources. Surface water such as local supply is commonly used but limited during drought conditions. Groundwater from the Rio Grande Alluvium Aquifer and West Texas Bolsons Aquifer are more reliable sources. The following water management strategies are recommended to enhance the reliability of the future water supply availability for the mining water-supply needs within Hudspeth County.

- (E-58) Mining Conservation
- (E-59) Additional groundwater well in the West Texas Bolsons (Eagle Flat) Aquifer

E-58 Mining Conservation

Mining groundwater use in Far West Texas is primarily associated with oil and gas production. Water is needed for well drilling activities, formation fracing, and sand (proppant) mining plants. The FWTWPG encourages the use of alternative water sources when and where it is economically feasible to do so.

For conservation of freshwater resources associated with fracing, on-site treatment of produced and/or flowback water allows for reuse of the water stream. There are numerous third-party vendors who offer mobile produced water recycling systems.

In 2018, approximately 10 percent of fracwater supply in the Permian Basin was recycled produced water. Conservation of 15 percent of Hudspeth County mining needs in 2030 would reduce mining needs by 10 acre-feet in 2030, increasing to 11 acre-feet per year by 2080. This strategy provides enough water supply to absorb the projected water-supply deficit.

E-59 Additional Groundwater Well in the West Texas Bolsons (Eagle Flat) Aquifer

The West Texas Bolsons Aquifer has been identified as a potential source of water to meet the mining shortages within Hudspeth County. The Eagle Flat Bolson is situated between the Eagle Mountains along the south-southwest, the Diablo Plateau along the north, and the Carrizo and Van Horn Mountains along the east. Groundwater underlying the Eagle Flat area is not a source of supply for municipalities in Hudspeth County due to water quality and quantity limitations. However, the Eagle Flat is a sufficient source for mining purposes. This strategy assumes that one new well will be drilled to a depth of 375 feet.

Quantity, Reliability, and Cost – The one new well is assumed to produce at a rate of 240 GPM or 219 acre-feet per year. Historical industrial and agricultural use indicates that the West Texas Bolsons Aquifer may be a viable source, with a reliability range medium to high, based on competing demands and water quality issues. Total cost of this project will be approximately $384,000.

5A-5 WATER MANAGEMENT STRATEGIES FOR JEFF DAVIS COUNTY

5A 5.1 Water Management Strategies for Fort Davis WSC

Fort Davis Water Supply Corporation (Fort Davis WSC) provides water to the Community of Fort Davis and the surrounding area from three wells completed in the Davis Mountains Igneous Aquifer and continues to consider the feasibility of future water well development in surrounding areas. Although the supply-demand analysis does not project a future water-supply deficit for the Fort Davis WSC, the following water management strategies are recommended to enhance the reliability of the future water supply availability.

- (E-60) Additional groundwater well in the Igneous Aquifer
- (E-61) Transmission line to connect Fort Davis WSC to Fort Davis Estates

E-60 Additional Groundwater Well – Igneous Aquifer

This strategy assumes that one new well would need to be drilled into the Igneous Aquifer to provide approximately 274 acre-feet per year. The Aquifer is not a single homogeneous aquifer but rather a system of complex water-bearing formations that are in varying degrees of hydrologic communication. Most wells developed are less than 1,000 feet in depth.

This well would be located on the opposite end of the existing storage facility and produce water from approximately 300 feet below the surface. In addition, 500 feet of six-inch diameter connection pipeline will be necessary to connect to the storage facility. Minimal treatment will be required, such as chlorination disinfection for municipal use.

Quantity, Reliability, and Cost – The quantity and reliability of water from this source is expected to be approximately 255 gpm. Water quality of the Aquifer is relatively good and generally meets safe drinking water standards. Minimal advanced treatment will be required for municipal purposes. The reliability of this supply is medium to high, based on competing demands. The total estimated project cost is approximately $833,000.

E-61 Transmission Line to Connect Fort Davis WSC to Fort Davis Estates

Fort Davis WSC provides water to the Community of Fort Davis and the surrounding area which includes Fort Davis Estates. Fort Davis WSC has plans to construct an additional transmission line to connect Fort Davis WSC to the Fort Davis Estates subdivision, which has its own well. This strategy assumes the connection of 20 houses, with a two-mile, six-inch diameter transmission pipeline. Conveyance of water would flow both directions depending on peak demand. This pipeline would only be used for emergency purposes to meet the peak demand during summer months. The evaluation does not include additional storage. Funding is expected to be provided solely by Fort Davis WSC.

Quantity, Reliability, and Cost – This strategy would supply 114 acre-feet per year and is considered reliable. The total estimated capital cost for this project is $2,226,000.

5A 5.2 Water Management Strategies for Jeff Davis County-Other (City of Valentine)

The City of Valentine, a small community in western Jeff Davis County, currently derives its entire water supply from one groundwater well completed in the Ryan Flat portion of the Salt Basin Aquifer, a subdivision of the West Texas Bolson Aquifers. A second well is needed as a supplemental and backup supply for the community. Although the supply-demand analysis does not project a future water-supply deficit for the City of Valentine, the following water management strategy is recommended to enhance the reliability and security of the community's future water supply availability.

- (E-62) Additional groundwater well in the Ryan Flat Aquifer

E-62 Additional Groundwater Well in the Ryan Flat Aquifer

This strategy assumes that one new municipal well is needed to provide an additional water supply for the City of Valentine. This new groundwater well, likewise, completed in the Ryan Flat Aquifer, would be located near the existing well and drilled to a depth of approximately 870 feet below the surface. In addition, 500 feet of six-inch diameter connection pipeline will be necessary. Minimal treatment will be required, such as chlorination disinfection for municipal use.

Quantity, Reliability, and Cost – The well is expected to reliably yield approximately 80 gpm and produce 129 acre-feet per year. Water quality of the Aquifer is relatively good and generally meets safe drinking water standards. Minimal advanced treatment will be required for municipal purposes. The total estimated project capital cost is approximately $754,000.

5A 5.3 Water Management Strategies for Jeff Davis County Livestock

Livestock water-supply shortages in Jeff Davis County are projected at 189 acre-feet per year in all decades throughout the planning horizon. Livestock water-supply needs within the County obtain supplies primarily from surface water sources such as local supply (stock ponds), which is common but limited during drought conditions. The following water management strategy is recommended to enhance the reliability of the future water-supply availability for the livestock water-supply needs within Jeff Davis County. This recommended strategy covers all unmet needs.

- (E-63) Livestock conservation

E-63 Livestock Conservation

The University of Arkansas (Division of Agriculture) published in 2006 Report FSA9527, Best Management Practices for Livestock Farms, where it outlines several effective practices to conserve and protect soil, water and air resources for generations to come. One such recommendation for farmers with livestock to consider, is alternative watering, which is designed to deliver water to livestock at multiple places on a farm, which enhances a rotational grazing system. Water savings are difficult to quantify and vary from year to year based on livestock practices, water quality, and quantity. It is estimated that 0.3 to 0.5 acre-feet of water per acre may be saved, according to Best Management Practices for Agricultural Water Users, found on the TWDB's website.

Quantity, Reliability and Cost - According to the 2022 U.S. Ag Census, Jeff Davis County had 11 farms with pastureland in 2022 and 7,614 acres of irrigated land, which gives an average of 692 acres per farm. Assuming that scheduling would conserve 0.3 acre-feet per acre, this results in a conservation savings of approximately 208 acre-feet per farm. The reliability of this supply is low due to uncertainty associated with estimated implementation of BMPs. There is no capital cost associated with implementing this strategy.

5A-6 WATER MANAGEMENT STRATEGIES FOR PRESIDIO COUNTY

5A 6.1 Water Management Strategies for The City Of Presidio

The City of Presidio is located on the Rio Grande adjacent from Ojinaga, Chihuahua on the U.S.-Mexico Border. The City and many other border residents of Presidio County rely on the West Texas Bolsons – Presidio-Redford Bolson Aquifer for municipal, domestic, livestock and irrigation water-supply needs. The following water management strategy is recommended to enhance the reliability of the City's future water-supply availability.

- (E-64) Additional groundwater well in the Presidio Bolson Aquifer

In addition to the recommended water management strategy below, the City is very active in addressing long-term water management needs by exploring the following items:

- Comprehensive System Assessment: Conduct a thorough evaluation of the entire water/wastewater/stormwater system to identify areas for improvement, including reuse, infrastructure upgrades, operational efficiencies, and potential water loss reduction measures.
- Water Efficiency Program: Implement a city-wide water efficiency program, incorporating the findings from previous water loss audits as well as reuse and green infrastructure planning and demonstration projects, to optimize water use across all sectors.
- Groundwater Resource Investigation: Explore and assess potential future groundwater sources to ensure long-term water security, including hydrogeological studies and sustainable production assessments.
- Infrastructure Modernization: Develop a phased plan for upgrading and modernizing water infrastructure, focusing on improving reliability, reducing water loss, and increasing overall system efficiency and resiliency.

E-64 Additional Groundwater Well in the Presidio Bolsons Aquifer

The City of Presidio has plans to develop new water supplies to meet growing water demands within the community. Currently, the Border Environment Cooperation Commission is working with the City of Presidio to develop several improvements to the City's existing water infrastructure. One such project is to extend water services along Highway 67 as far as the airport five miles north of town to provide services to Las Pampas Colonia. The new water line will benefit approximately 12 existing residences and an equal number of businesses. This strategy assumes that one new well will be drilled into the West Texas Bolsons Aquifer (Presidio-Redford Bolson) to a depth of 90 feet to generate approximately 150 gpm. The project includes five miles of eight-inch diameter transmission pipeline, one pump station, one 50,000-gallon storage tank and minimal treatment such as chlorine disinfection.

Quantity, Reliability, and Cost – The quantity and reliability of water from this source is expected to be approximately 120 acre-feet of water per year. The combined supplies from strategies using water from the Presidio Bolson Aquifer do not exceed the MAG value, indicating there are sufficient supplies for these strategies. Minimal advanced treatment will be required for municipal purposes. The reliability of this supply is low to medium based on finding a good location for a productive well. The total estimated project cost is approximately $10,889,000.

5A 6.2 Water Management Strategies for County-Other Presidio (Candelaria WSC)

Candelaria Water Supply Corporation (WSC) is a water supply corporation located in the small town of Candelaria, Texas, which sits on the north bank of the Rio Grande River in the Chihuahuan Desert, directly across from the Mexican town of San Antonio Del Bravo. The water supplied by the Candelaria WSC is typically described as groundwater sourced from a local aquifer within the region, considered to be clean, clear and with a naturally moderate mineral content. Although the supply-demand analysis does not project a future water-supply deficit for Candelaria WSC, the following water management strategy is recommended to enhance the reliability of the Utilities' future water supply.

- (E-65) Water loss audit and main-line repair

E-65 Water Loss Audit and Main-Line Repair

According to the 2022 TWDB Public Water System Water Loss Survey, the Candelaria WSC had real water losses (as opposed to apparent "paper" losses) of two acre-feet in 2022 (21 percent) due to leaking infrastructure. This amount of water loss is the sum of reported breaks and leaks, and unreported loss. The water supply system can reduce water losses and get a more accurate look at water consumption by taking the proper measures to identify and repair old infrastructure and inaccurate water meters. This strategy will provide a savings of only a portion of the total reported loss and assumes that a leak testing program would be implemented prior to possibly replacing portions of the existing leaking pipe.

Quantity, Reliability and Cost - The strategy assumes one mile of six-inch diameter pipe will be replaced, at a total estimated project capital cost of $1,065,000. The strategy is estimated to generate a potential savings of one acre-foot of water per year throughout the planning period.

5A 6.3 Water Management Strategies for County-Other Presidio (Redford WS)

The Redford Water Supply (WS) is in the southern part of Presidio County, along the Rio Grande. Redford WS has two wells that draw water from the Presidio-Redford Bolson Aquifer. The water from this Aquifer is typically fresh and primarily serves municipal, livestock and irrigation users. Although the supply-demand analysis does not project a future water-supply deficit for the Redford WS, the following water management strategy is recommended to enhance the reliability of the Utilities' future water supply.

- (E-66) Water loss audit and main-line repair

E-66 Water Loss Audit and Main-Line Repair

According to the 2022 TWDB Public Water System Water Loss Survey, the Redford WS had real water losses (as opposed to apparent "paper" losses) of three acre-feet in 2022 (16 percent) due to leaking infrastructure. This amount of water loss is the sum of reported breaks and leaks, and unreported loss. The water supply system can reduce water losses and get a more accurate look at water consumption by taking the proper measures to identify and repair old infrastructure and inaccurate water meters. This strategy will provide a savings of only a portion of the total reported loss and assumes that a leak testing program would be implemented prior to possibly replacing portions of the existing leaking pipe.

Quantity, Reliability and Cost - The strategy assumes one mile of six-inch diameter pipe will be replaced, at a total estimated project capital cost of $1,065,000. The strategy is estimated to generate a potential savings of one acre-foot of water per year throughout the planning period.

5A 6.4 Water Management Strategies For Presidio County Livestock

Livestock water-supply shortages in Presidio County are projected at two acre-feet per year in 2080. Livestock water-supply needs within the County obtain supplies primarily from surface water sources such as local supply (stock ponds), which is common but limited during drought conditions. The following water management strategy is recommended to enhance the reliability of the future water-supply availability for the livestock water-supply needs within Presidio County. This strategy meets all identified water supply deficits.

- (E-67) Livestock conservation

E-67 E-67 Livestock Conservation

The University of Arkansas (Division of Agriculture) published in 2006 Report FSA9527, Best Management Practices for Livestock Farms, where it outlines several effective practices to conserve and protect soil, water and air resources for generations to come. One such recommendation for farmers with livestock to consider, is alternative watering, which is designed to deliver water to livestock at multiple places on a farm, which enhances a rotational grazing system. Water savings are difficult to quantify and vary from year to year based on livestock practices, water quality, and quantity. It is estimated that 0.3 to 0.5 acre-feet of water per acre may be saved, according to Best Management Practices for Agricultural Water Users, found on the TWDB's website.

Quantity, Reliability and Cost - According to the 2022 U.S. Ag Census, Presidio County had four farms with pastureland in 2022 and 86 acres of irrigated land, which gives an average of 22 acres per farm. Assuming that scheduling would conserve 0.3 acre-feet per acre, this results in a conservation savings of approximately six acre-feet per farm. The reliability of this supply is low due to uncertainty associated with estimated implementation of BMPs. There is no capital cost associated with implementing this strategy.

5A-7 WATER MANAGEMENT STRATEGIES FOR TERRELL COUNTY

5A 7.1 Water Management Strategies for Terrell County Irrigation

Irrigation water-supply shortages in Terrell County are projected at 51 acre-feet per year throughout the planning horizon. The demand for irrigation water in Terrell County has been increasing due to a combination of factors including expanding agricultural practices, particularly in high-value crops, coupled with a changing climate leading to more frequent and severe droughts, which are requiring farmers to rely more heavily on irrigation to maintain crop yields. This increased demand puts pressure on the local groundwater aquifers, which are already facing concerns regarding sustainability. Irrigation water-supply needs within the County obtain supplies from both surface and groundwater sources.

The following water management strategy is recommended to enhance the reliability of the future water-supply availability for the irrigation water-supply needs within Terrell County.

- (E-68) Irrigation scheduling

E-68 Irrigation Scheduling

This strategy is intended for producers with an adequate supply of water throughout the growing season. It involves scheduling the time and amount of water that is applied to a crop based on the amount of water present in the crop root zone, the amount of water consumed by the crop since the last irrigation, and other considerations. Water savings are difficult to quantify and vary from year to year based on cropping practices, water quality, and quantity. It is estimated that 0.3 to 0.5 acre-feet of water per acre may be saved, according to Best Management Practices for Agricultural Water Users, found on the TWDB's website.

Quantity, Reliability and Cost - According to the 2022 U.S. Ag Census, Terrell County had three farms with irrigated land in 2022 and 21,900 acres of irrigated land, which gives an average of 7,300 acres per farm. Assuming that scheduling would conserve 0.3 acre-feet per acre, this results in a conservation savings of approximately 2,190 acre-feet per farm. The reliability of this supply is low due to uncertainty associated with estimated implementation of BMPs. There is no capital cost associated with implementing this strategy.

This page intentionally left blank.

APPENDIX 5B
STRATEGY EVALUATION
QUANTIFICATION MATRIX

This page intentionally left blank.

STRATEGY EVALUATION QUANTIFICATION MATRIX

The practicality of an implemented water management strategy may be measured in terms of quantity, quality and reliability of water produced and the varying degree of impact (positive or negative) on pre-existing local conditions. The Far West Texas Water Planning Group has adopted a standard procedure for ranking potential water management strategies. Quantitative and qualitative measurements are tabulated in Chapter 5 Tables 5-2 and 5-4. This procedure classifies the strategies using the TWDB's following standard categories developed for regional water planning:

Table 5-2

- Quantity
- Quality
- Reliability
- Impact of Water, Agricultural, and Natural Resources
- Impact on Ecologically Unique Stream Segments

Table 5-4

- Environmental Impact
  - Environmental water needs
  - Wildlife habitat
  - Cultural resources
  - Environmental water quality
  - Bays and estuaries

Quantity, Quality and Reliability

Quantity, quality, and reliability are quantitatively assessed and assigned a ranking from 1 to 3 as listed in the Table 5B-1 below, which shows the correlation between the category and the ranking.

Table 5B-1. Quantity, Quality and Reliability Category Ranking Matrix

Rank	Quantity	Quality	Reliability
1	Meets 100% of shortage	Meets safe drinking water standards	Sustainable
2	Meets 50-99% of shortage	Must be treated or mixed to meet safe drinking water standards	Interruptible
3	Meets < 50% of shortage	Usable for intended non-drinking use only	Un-sustainable

Quantity adequacy is measured as a percent of the volume of water needed to meet the specified water user group's (WUG's) shortage as calculated in Table 4-1 of Chapter 4 that is produced by the water management strategy. Percent volumes are only analyzed for WUGs with projected supply shortages.

Quality adequacy is measured in terms of meeting TCEQ Safe Drinking Water Standards. However, not all strategies are intended for use requiring SDWSs.

Reliability is evaluated based on the expected or potential for the water to be available during drought. Strategies that use water from a source that would not exceed permits or MAGs even during droughts are rated as sustainable. Strategies that use water from a source that is available during normal meteorological conditions but may not be 100% available during drought are rated as interruptible. Strategies in which 100% of the supply cannot be maintained even during normal meteorological conditions are rated as un-sustainable.

Impact on Water, Agricultural and Natural Resources, and Ecologically Unique Stream Segments

Impacts are quantitatively assessed and assigned a ranking from 1 to 5 as listed in Table 5B-2 below, which shows the correlation between the category and the ranking.

Table 5B-2. Strategy Impact Category Ranking Matrix

Rank	Water Resources	Agricultural Resources	Natural Resources	Ecologically Unique Streams
1	Positive	Positive	Positive	Positive
2	None	None	None	None
3	Low	Low	Low	Low
4	Medium	Medium	Medium	Medium
5	High	High	High	High

Water Resources impacts refer to the potential for the implemented strategy to compete for water sources shared with adjacent properties. The matrix ranking depicts the potential range of water-level drawdown induced across property boundaries during the life of the strategy project.

1. Positive - No aquifer drawdown; increased surface water flow
2. None – No new aquifer drawdown; no change to surface water flow
3. Low – <10 feet of aquifer drawdown; < 10% reduction in average surface flows
4. Medium – 10 to 50 feet of aquifer drawdown; 10 to 30% reduction in average surface flows
5. High - > 50 feet of aquifer drawdown; > 30% reduction in surface flows

Agricultural Resources impacts refer to the agricultural economic impact resulting from the loss or gain of water supplies currently in use by the agricultural user as the result of the implementation of a strategy. See Section 1.2.8 in Chapter 1 for a detailed discussion on the Agricultural Resources of Far West Texas.

1. Positive – provides water to agricultural users
2. None – does not impact agricultural supplies
3. Low – reduces agricultural activity by less than 10%
4. Medium – reduces agricultural activity by more than 10%
5. High – water rights use changes from agricultural to some other use thus elimination agricultural activity

Natural Resources impacts are those that impact the terrestrial and aquatic habitat of native plant and animal wildlife, as well as the scenic beauty of the Region that is critical to the tourism industry. See Section 1.2.9 in Chapter 1 for a detailed discussion on the Natural Resources of Far West Texas.

1. Positive – provides water to natural resources
2. None – does not impact natural resources
3. Low – reduces natural resources water supply by less than 10%
4. Medium – reduces natural resources water supply by more than 10%
5. High – reduces natural resources water supply by more than 50%

Ecologically Unique Stream Segments impacts are those that impact the natural habitat of portions of streams that have been identified by the Far West Texas Water Planning Group as "ecologically unique stream segments." See Chapter 8 of both the 2016 and 2021 Far West Texas Water Plan for a location and description of designated stream segments.

1. Positive – provides water to designated stream segments
2. None – does not impact designated stream segments
3. Low – reduces designated stream segment water supply by less than 10%
4. Medium – reduces designated stream segment water supply by more than 10%
5. High – reduces designated stream segment water supply by more than 50%

Environmental Impacts are quantitatively assessed and assigned a ranking from 1 to 5 as listed in the Table 5B-3 below, which shows the correlation between the category and the ranking. The Environmental Matrix takes into consideration the following categories.

- Environmental Water Needs
- Wildlife Habitat
- Cultural Resources
- Environmental Water Quality
- Bays and Estuaries

Table 5B-3. Environmental Impact Category Ranting Matrix

Rank	Environmental Water Needs	Wildlife Habitat	Cultural Resources	Environmental Water Quality	Bays and Estuaries
1	Positive	Positive	Positive	Positive	Not applicable
2	No new	No new	No new	No new	
3	Minimal negative	Minimal negative	Minimal negative	Minimal negative	
4	Moderate negative	Moderate negative	Moderate negative	Moderate negative	
5	Significant negative	Significant negative	Significant negative	Significant negative	

Environmental Water Needs impacts refer to how the strategy will impact the area's overall environmental water needs. Water is vital to the environmental health of a region, and so it is important to take into account how strategies will impact the amount of water that will be available to the environment.

1. Positive – additional water will be introduced for environmental use
2. No new – no additional water will be introduced for environmental use
3. Minimal negative – environmental water needs will be reduced by <10%
4. Moderate negative – environmental water needs will be reduced by 10 to 30%
5. Significant negative - environmental water needs will be reduced by >30%

Wildlife Habitat impacts refer to how the strategy will impact the wildlife habitat of the local area. The more area that is impacted due to the implementation of the strategy, the more the area's habitat will be disrupted.

1. Positive – additional habitat area for wildlife use will be created
2. No new – no additional habitat area for wildlife use will be created or destroyed
3. Minimal negative – wildlife habit will be reduced by < 100 acres
4. Moderate negative – wildlife habit will be reduced by 100 to 1,000 acres
5. Significant negative - wildlife habit will be reduced by > 1,000 acres

Cultural Resources impacts refer to how the strategy will impact cultural resources located within the area. Cultural resources are defined as the collective evidence of the past activities and accomplishments of people. Locations, buildings and features with scientific, cultural or historic value are considered to be cultural resources.

1. Positive – cultural resources will be identified and protected
2. No new – no impact will occur to local cultural resources
3. Minimal negative – disturbance to cultural resources will be < 10%
4. Moderate negative – disturbance to cultural resources will be 10 to 20%
5. Significant negative - disturbance to cultural resources will be > 20%

<u>Environmental Water Quality</u> impacts refer to the impact that the implementation of the strategy will have on the local area's natural water quality. Negative impacts could include the introduction of poorer quality water, the reduction of the natural flow of water of native quality source water, or the introduction of detrimental chemical elements into the natural water ways.

1. Positive – water quality of area streams will be enhanced for existing environmental use
2. No new – water quality characteristics of existing environmental habitat will not be changed
3. Minimal negative – water quality characteristics of existing environmental habitat will be negatively altered by < 10%
4. Moderate negative – water quality characteristics of existing environmental habitat will be negatively altered by < 10 to 30%
5. Significant negative - water quality characteristics of existing environmental habitat will be negatively altered by > 30%

<u>Bays and Estuaries</u> - Far West Texas is located too far away from any bays and estuaries of the Texas coastline to have a quantifiable impact. Therefore, this category was assumed to be non-applicable for every strategy.

This page intentionally left blank.

APPENDIX 5C
UNIFORM COSTING MODEL STANDARDIZED COST OUTPUT REPORTS

This page intentionally left blank.

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices

E-1 City of Alpine - Water Loss Audit and Main-Line Repair

Item	***Estimated Costs for Facilities***
Conservation (Leaking Pipe/Meter Replacement)	$12,899,000
TOTAL COST OF FACILITIES	**$12,899,000**
- Planning (3%)	$387,000
- Design (7%)	$903,000
- Construction Engineering (1%)	$129,000
Legal Assistance (2%)	$258,000
Fiscal Services (2%)	$258,000
Pipeline Contingency (15%)	$1,935,000
Interest During Construction (3.5% for 0.5 years with a 0.5% ROI)	$273,000
TOTAL COST OF PROJECT	**$17,042,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$1,199,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$0
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.09 $/kW-hr)	$0
Purchase of Water (0 acft/yr @ 0 $/acft)	$0
TOTAL ANNUAL COST	**$1,199,000**
Available Project Yield (acft/yr)	23
Annual Cost of Water ($ per acft), based on PF=0	$52,130
Annual Cost of Water After Debt Service ($ per acft), based on PF=0	$0
Annual Cost of Water ($ per 1,000 gallons), based on PF=0	$159.96
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=0	$0.00

JKJ *12/4/2024*

E-2 City of Alpine - Irrigation and Recharge Application of Captured Rainwater Runoff	
Cost based on ENR CCI 13485.67 for September 2023 and a PPI of 278.502 for September 2023	
Item	***Estimated Costs for Facilities***
Three (3) Rainwater Catchment Basins	$1,122,000
TOTAL COST OF FACILITIES	**$1,122,000**
- Planning (3%)	$34,000
- Design (7%)	$79,000
- Construction Engineering (1%)	$11,000
Legal Assistance (2%)	$22,000
Fiscal Services (2%)	$22,000
All Other Facilities Contingency (20%)	$224,000
Environmental & Archaeology Studies and Mitigation	$19,000
Surveying (70 acres)	$4,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$43,000
TOTAL COST OF PROJECT	**$1,580,000**
ANNUAL COST	
Reservoir Debt Service (3.5 percent, 20 years)	$111,000
Operation and Maintenance	
Dam and Reservoir (1.5% of Cost of Facilities)	$17,000
TOTAL ANNUAL COST	**$128,000**
Available Project Yield (acft/yr)	70
Annual Cost of Water ($ per acft), based on PF=0	$1,829
Annual Cost of Water After Debt Service ($ per acft), based on PF=0	$243
Annual Cost of Water ($ per 1,000 gallons), based on PF=0	$5.61
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=0	$0.75
Note: One or more cost element has been calculated externally	
KEK, Freese and Nichols	*11/18/2024*

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices

E-3 City of Alpine - Modifications to WWTP and Irrigation Infrastructure

Cost based on ENR CCI 13485.67 for September 2023 and
a PPI of 278.502 for September 2023

Item	*Estimated Costs for Facilities*
Transmission Pipeline (6 in. dia., 0.2 miles)	$130,000
Storage Tanks	$1,062,000
Advanced Water Treatment Facility (0.03 MGD)	$342,000
TOTAL COST OF FACILITIES	**$1,534,000**
- Planning (3%)	$46,000
- Design (7%)	$107,000
- Construction Engineering (1%)	$15,000
Legal Assistance (2%)	$31,000
Fiscal Services (2%)	$31,000
Pipeline Contingency (15%)	$20,000
All Other Facilities Contingency (20%)	$281,000
Environmental & Archaeology Studies and Mitigation	$6,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$57,000
TOTAL COST OF PROJECT	**$2,128,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$150,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$12,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$23,000
Pumping Energy Costs (1690 kW-hr @ 0.09 $/kW-hr)	$0
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$185,000**
Available Project Yield (acft/yr)	25
Annual Cost of Water ($ per acft), based on PF=1	$7,400

Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$1,400
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$22.71
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$4.30

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices

E-4 Lajitas Municipal Services - Water Loss Audit and Main-Line Repair

Item	*Estimated Costs for Facilities*
Conservation (Leaking Pipe/Meter Replacement)	$0
TOTAL COST OF FACILITIES	**$4,837,000**
- Planning (3%)	$145,000
- Design (7%)	$339,000
- Construction Engineering (1%)	$48,000
Legal Assistance (2%)	$97,000
Fiscal Services (2%)	$97,000
All Other Facilities Contingency (20%)	$0
Interest During Construction (3.5% for 0.5 years with a 0.5% ROI)	$103,000
TOTAL COST OF PROJECT	**$6,392,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$450,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$0
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.09 $/kW-hr)	$0
Purchase of Water (0 acft/yr @ 0 $/acft)	$0
TOTAL ANNUAL COST	**$450,000**
Available Project Yield (acft/yr)	14
Annual Cost of Water ($ per acft), based on PF=0	$32,143
Annual Cost of Water After Debt Service ($ per acft), based on PF=0	$0
Annual Cost of Water ($ per 1,000 gallons), based on PF=0	$98.63
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=0	$0.00

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices

E-5 Marathon WSSService - Water Loss Audit and Main-Line Repair

Item	*Estimated Costs for Facilities*
Conservation (Leaking Pipe/Meter Replacement)	$0
TOTAL COST OF FACILITIES	**$1,612,000**
- Planning (3%)	$48,000
- Design (7%)	$113,000
- Construction Engineering (1%)	$16,000
Legal Assistance (2%)	$32,000
Fiscal Services (2%)	$32,000
All Other Facilities Contingency (20%)	$0
Interest During Construction (3.5% for 0.5 years with a 0.5% ROI)	$35,000
TOTAL COST OF PROJECT	**$2,130,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$150,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$0
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.09 $/kW-hr)	$0
Purchase of Water (0 acft/yr @ 0 $/acft)	$0
TOTAL ANNUAL COST	**$150,000**
Available Project Yield (acft/yr)	10
Annual Cost of Water ($ per acft), based on PF=0	$15,000
Annual Cost of Water After Debt Service ($ per acft), based on PF=0	$0
Annual Cost of Water ($ per 1,000 gallons), based on PF=0	$46.03
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=0	$0.00

JKJ *12/4/2024*

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices

E-6 Study Butte Terlingua Water System - Water Loss Audit and Main-Line Repair

Item	*Estimated Costs for Facilities*
Conservation (Leaking Pipe/Meter Replacement)	$0
TOTAL COST OF FACILITIES	**$6,450,000**
- Planning (3%)	$193,000
- Design (7%)	$451,000
- Construction Engineering (1%)	$64,000
Legal Assistance (2%)	$129,000
Fiscal Services (2%)	$129,000
All Other Facilities Contingency (20%)	$0
Interest During Construction (3.5% for 0.5 years with a 0.5% ROI)	$137,000
TOTAL COST OF PROJECT	**$8,520,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$600,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$0
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.09 $/kW-hr)	$0
Purchase of Water (0 acft/yr @ 0 $/acft)	$0
TOTAL ANNUAL COST	**$600,000**
Available Project Yield (acft/yr)	12
Annual Cost of Water ($ per acft), based on PF=0	$50,000
Annual Cost of Water After Debt Service ($ per acft), based on PF=0	$0
Annual Cost of Water ($ per 1,000 gallons), based on PF=0	$153.42
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=0	$0.00

JKJ *12/4/2024*

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices

E-8 City of Van Horn - Water Loss Audit and Main-Line Repair

Item	***Estimated Costs for Facilities***
Conservation (Leaking Pipe/Meter Replacement)	$0
TOTAL COST OF FACILITIES	**$12,093,000**
- Planning (3%)	$363,000
- Design (7%)	$846,000
- Construction Engineering (1%)	$121,000
Legal Assistance (2%)	$242,000
Fiscal Services (2%)	$242,000
All Other Facilities Contingency (20%)	$0
Interest During Construction (3.5% for 0.5 years with a 0.5% ROI)	$256,000
TOTAL COST OF PROJECT	**$15,977,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$1,124,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$0
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.09 $/kW-hr)	$0
Purchase of Water (0 acft/yr @ 0 $/acft)	$0
TOTAL ANNUAL COST	**$1,124,000**
Available Project Yield (acft/yr)	57
Annual Cost of Water ($ per acft), based on PF=0	$19,719
Annual Cost of Water After Debt Service ($ per acft), based on PF=0	$0
Annual Cost of Water ($ per 1,000 gallons), based on PF=0	$60.51
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=0	$0.00

JKJ *12/4/2024*

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices
E-9 City of Van Horn - Additional Groundwater Well

Cost based on ENR CCI 13485.67 for September 2023 and
a PPI of 278.502 for September 2023

Item	*Estimated Costs for Facilities*
Well Fields (Wells, Pumps, and Piping)	$1,096,000
TOTAL COST OF FACILITIES	**$1,096,000**
- Planning (3%)	$33,000
- Design (7%)	$77,000
- Construction Engineering (1%)	$11,000
Legal Assistance (2%)	$22,000
Fiscal Services (2%)	$22,000
All Other Facilities Contingency (20%)	$219,000
Environmental & Archaeology Studies and Mitigation	$12,000
Interest During Construction (3.5% for 1 years with a 0.5% ROI)	$49,000
TOTAL COST OF PROJECT	**$1,541,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$108,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$11,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (396849 kW-hr @ 0.09 $/kW-hr)	$36,000
Purchase of Water (0 acft/yr @ 0 $/acft)	$0
TOTAL ANNUAL COST	**$155,000**
Available Project Yield (acft/yr)	320
Annual Cost of Water ($ per acft), based on PF=1	$484
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$147
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$1.49
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.45

JKJ *1/28/2025*

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices

E-11 Culberson County Irrigation - Additional Groundwater Wells - West Texas Bolsons Aquifer

Item	***Estimated Costs for Facilities***
Well Fields (Wells, Pumps, and Piping)	$1,542,000
TOTAL COST OF FACILITIES	**$1,542,000**
- Planning (3%)	$46,000
- Design (7%)	$108,000
- Construction Engineering (1%)	$15,000
Legal Assistance (2%)	$31,000
Fiscal Services (2%)	$31,000
All Other Facilities Contingency (20%)	$308,000
Environmental & Archaeology Studies and Mitigation	$18,000
Land Acquisition and Surveying (1 acres)	$1,000
Interest During Construction (3.5% for 1 years with a 0.5% ROI)	$69,000
TOTAL COST OF PROJECT	**$2,169,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$153,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$15,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (281207 kW-hr @ 0.09 $/kW-hr)	$25,000
Purchase of Water (0 acft/yr @ 0 $/acft)	$0
TOTAL ANNUAL COST	**$193,000**
Available Project Yield (acft/yr)	666
Annual Cost of Water ($ per acft), based on PF=1	$290
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$60
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$0.89
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.18

JKJ *12/5/2024*

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices

E-13 Town of Anthony - Water Loss Audit and Main-Line Repair

Item	***Estimated Costs for Facilities***
Conservation (Leaking Pipe/Meter Replacement)	$0
TOTAL COST OF FACILITIES	**$2,419,000**
- Planning (3%)	$73,000
- Design (7%)	$169,000
- Construction Engineering (1%)	$24,000
Legal Assistance (2%)	$48,000
Fiscal Services (2%)	$48,000
All Other Facilities Contingency (20%)	$0
Interest During Construction (3.5% for 0.5 years with a 0.5% ROI)	$52,000
TOTAL COST OF PROJECT	**$3,196,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$225,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$0
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.09 $/kW-hr)	$0
Purchase of Water (0 acft/yr @ 0 $/acft)	$0
TOTAL ANNUAL COST	**$225,000**
Available Project Yield (acft/yr)	8
Annual Cost of Water ($ per acft), based on PF=0	$28,125
Annual Cost of Water After Debt Service ($ per acft), based on PF=0	$0
Annual Cost of Water ($ per 1,000 gallons), based on PF=0	$86.30
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=0	$0.00

JKJ *12/5/2024*

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices

Town of Anthony - E-14 Arsenic Treatment Facility

Cost based on ENR CCI 13485.67 for September 2023 and a PPI of 278.502 for September 2023

Item	***Estimated Costs for Facilities***
Water Treatment Plant (3.8 MGD)	$8,779,000
TOTAL COST OF FACILITIES	**$8,779,000**
- Planning (3%)	$263,000
- Design (7%)	$615,000
- Construction Engineering (1%)	$88,000
Legal Assistance (2%)	$176,000
Fiscal Services (2%)	$176,000
All Other Facilities Contingency (20%)	$1,756,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$326,000
TOTAL COST OF PROJECT	**$12,179,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$857,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$0
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$1,383,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.09 $/kW-hr)	$0
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$2,240,000**
Available Project Yield (acft/yr)	2,800
Annual Cost of Water ($ per acft), based on PF=0	$800
Annual Cost of Water After Debt Service ($ per acft), based on PF=0	$494
Annual Cost of Water ($ per 1,000 gallons), based on PF=0	$2.45
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=0	$1.52

Note: One or more cost element has been calculated externally

KEK, Freese and Nichols *11/26/2024*

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices

E-15 Town of Anthony - Additional Groundwater Well

Cost based on ENR CCI 13485.67 for September 2023 and a PPI of 278.502 for September 2023

Item	***Estimated Costs for Facilities***
Well Fields (Wells, Pumps, and Piping)	$1,941,000
Water Treatment Plant (0.9 MGD)	$91,000
TOTAL COST OF FACILITIES	**$2,032,000**
- Planning (3%)	$61,000
- Design (7%)	$142,000
- Construction Engineering (1%)	$20,000
Legal Assistance (2%)	$41,000
Fiscal Services (2%)	$41,000
All Other Facilities Contingency (20%)	$406,000
Environmental & Archaeology Studies and Mitigation	$1,000
Land Acquisition and Surveying (1 acres)	$1,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$76,000
TOTAL COST OF PROJECT	**$2,821,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$199,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$19,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$55,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (639381 kW-hr @ 0.09 $/kW-hr)	$58,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$331,000**
Available Project Yield (acft/yr)	960
Annual Cost of Water ($ per acft), based on PF=2	$345
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$138

Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$1.06
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$0.42

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices

E-17 El Paso Water - Water Loss Audit and Main-Line Repair

Item	***Estimated Costs for Facilities***
Conservation (Leaking Pipe/Meter Replacement)	$0
TOTAL COST OF FACILITIES	**$324,088,000**
- Planning (3%)	$9,723,000
- Design (7%)	$22,686,000
- Construction Engineering (1%)	$3,241,000
Legal Assistance (2%)	$6,482,000
Fiscal Services (2%)	$6,482,000
All Other Facilities Contingency (20%)	$0
Interest During Construction (3.5% for 0.5 years with a 0.5% ROI)	$6,847,000
TOTAL COST OF PROJECT	**$428,162,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$30,126,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$0
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.09 $/kW-hr)	$0
Purchase of Water (0 acft/yr @ 0 $/acft)	$0
TOTAL ANNUAL COST	**$30,126,000**
Available Project Yield (acft/yr)	2,266
Annual Cost of Water ($ per acft), based on PF=0	$13,295
Annual Cost of Water After Debt Service ($ per acft), based on PF=0	$0
Annual Cost of Water ($ per 1,000 gallons), based on PF=0	$40.79
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=0	$0.00

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices

E-18 El Paso Water - Expansion of the Kay Bailey Hutchison Desal Plant

Cost based on ENR CCI 13485.67 for September 2023 and
a PPI of 278.502 for September 2023

Item	*Estimated Costs for Facilities*
CAPITAL COST	
Dam and Reservoir (Conservation Pool acft, acres)	$0
Off-Channel Storage/Ring Dike (Conservation Pool acft, acres)	$0
Terminal Storage (Conservation Pool acft, acres)	$0
Intake Pump Stations (0 MGD)	$0
Transmission Pipeline (None)	$0
Transmission Pump Station(s) & Storage Tank(s)	$0
Well Fields (Wells, Pumps, and Piping)	$17,794,000
Storage Tanks (Other Than at Booster Pump Stations)	$0
Water Treatment Plant (6 MGD)	$54,534,000
Advanced Water Treatment Facility (MGD)	$0
Conservation (Leaking Pipe/Meter Replacement)	$0
Integration, Relocations, Backup Generator & Other	$0
TOTAL COST OF FACILITIES	**$72,328,000**
Engineering:	
- Planning (3%)	$2,170,000
- Design (7%)	$5,063,000
- Construction Engineering (1%)	$723,000
Legal Assistance (2%)	$1,447,000
Fiscal Services (2%)	$1,447,000
Pipeline Contingency (15%)	$0
All Other Facilities Contingency (20%)	$14,466,000
Environmental & Archaeology Studies and Mitigation	$199,000
Land Acquisition and Surveying (27 acres)	$21,000
Interest During Construction (3.5% for 1 years with a 0.5% ROI)	$3,181,000
TOTAL COST OF PROJECT	**$101,045,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$7,110,000

Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$178,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$10,225,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (31733345 kW-hr @ 0.09 $/kW-hr)	$2,856,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$20,369,000**
Available Project Yield (acft/yr)	6,270
Annual Cost of Water ($ per acft), based on PF=0	$3,249
Annual Cost of Water After Debt Service ($ per acft), based on PF=0	$2,115
Annual Cost of Water ($ per 1,000 gallons), based on PF=0	$9.97
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=0	$6.49

JMP *1/27/2025*

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices

E-19 El Paso Water - Advanced Water Purification at the Bustamante WWTP

Cost based on ENR CCI 13485.67 for September 2023 and
a PPI of 278.502 for September 2023

Item	*Estimated Costs for Facilities*
Interest During Construction (3.5% for 1 years with a 0.5% ROI)	$0
TOTAL COST OF PROJECT	**$295,416,708**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$20,786,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$1,769,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.09 $/kW-hr)	$0
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$22,555,000**
Available Project Yield (acft/yr)	10,600
Annual Cost of Water ($ per acft), based on PF=0	$2,128
Annual Cost of Water After Debt Service ($ per acft), based on PF=0	$167
Annual Cost of Water ($ per 1,000 gallons), based on PF=0	$6.53
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=0	$0.51

JKJ *1/30/2025*

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices

E-20 El Paso Water - Conjunctive Treatment of GW & SW at Upper Valley WWTP

Cost based on ENR CCI 13485.67 for September 2023 and
a PPI of 278.502 for September 2023

Item	*Estimated Costs for Facilities*
CAPITAL COST	
Dam and Reservoir (Conservation Pool acft, acres)	$0
Off-Channel Storage/Ring Dike (Conservation Pool acft, acres)	$0
Terminal Storage (Conservation Pool acft, acres)	$0
Intake Pump Stations (0 MGD)	$0
Transmission Pipeline (None)	$0
Transmission Pump Station(s) & Storage Tank(s)	$0
Well Fields (Wells, Pumps, and Piping)	$0
Storage Tanks (Other Than at Booster Pump Stations)	$0
Water Treatment Plant (0 MGD)	$0
Advanced Water Treatment Facility (MGD)	$0
Conservation (Leaking Pipe/Meter Replacement)	$0
Integration, Relocations, Backup Generator & Other	$135,000,000
TOTAL COST OF FACILITIES	**$135,000,000**
Engineering:	
- Planning (3%)	$4,050,000
- Design (7%)	$9,450,000
- Construction Engineering (1%)	$1,350,000
Legal Assistance (2%)	$2,700,000
Fiscal Services (2%)	$2,700,000
Pipeline Contingency (15%)	$0
All Other Facilities Contingency (20%)	$27,000,000
Environmental & Archaeology Studies and Mitigation	$0
Land Acquisition and Surveying (0 acres)	$0
Interest During Construction (3.5% for 1 years with a 0.5% ROI)	$5,924,000
TOTAL COST OF PROJECT	**$188,174,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$13,240,000

Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$1,350,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.09 $/kW-hr)	$0
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$14,590,000**
Available Project Yield (acft/yr)	3,000
Annual Cost of Water ($ per acft), based on PF=0	$4,863
Annual Cost of Water After Debt Service ($ per acft), based on PF=0	$450
Annual Cost of Water ($ per 1,000 gallons), based on PF=0	$14.92
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=0	$1.38
Note: One or more cost element has been calculated externally	
JKJ	*1/30/2025*

Upper Valley Treatment Plant Surface Water Augmentation Project

El Paso Water (EPWater) is planning an innovative project at its Upper Valley Water Treatment Plant (WTP), located in Northwest El Paso, that will enable the plant to treat and produce water from surface water sources in addition to the current groundwater capability.

PROJECT BENEFITS


Upper Valley Water Treatment Plant

1 Protecting the Mesilla Bolson for long-term sustainability

When surface water is available for treatment from the Rio Grande, the Upper Valley WTP can reduce the amount of groundwater it uses, which protects the aquifer for the future.

2 Protecting Texas water allocations

In the future, a Rio Grande flow gauge down-stream of the plant will be used to determine New Mexico water deliveries to Texas. The flow captured at this gauge can be impacted by groundwater withdrawals for operation of the Upper Valley WTP. Reduced reliance on groundwater at the Upper Valley WTP through the Surface Water Augmentation project will help ensure that the plant operation does not reduce Texas water allocations.

3 Reliability for Northwest El Paso

Surface water treatment capabilities at the Upper Valley WTP enable the plant to have more redundancy and interoperability to increase water reliability and resiliency for customers in Northwest El Paso.

PROJECT DETAILS

1 Existing Facility

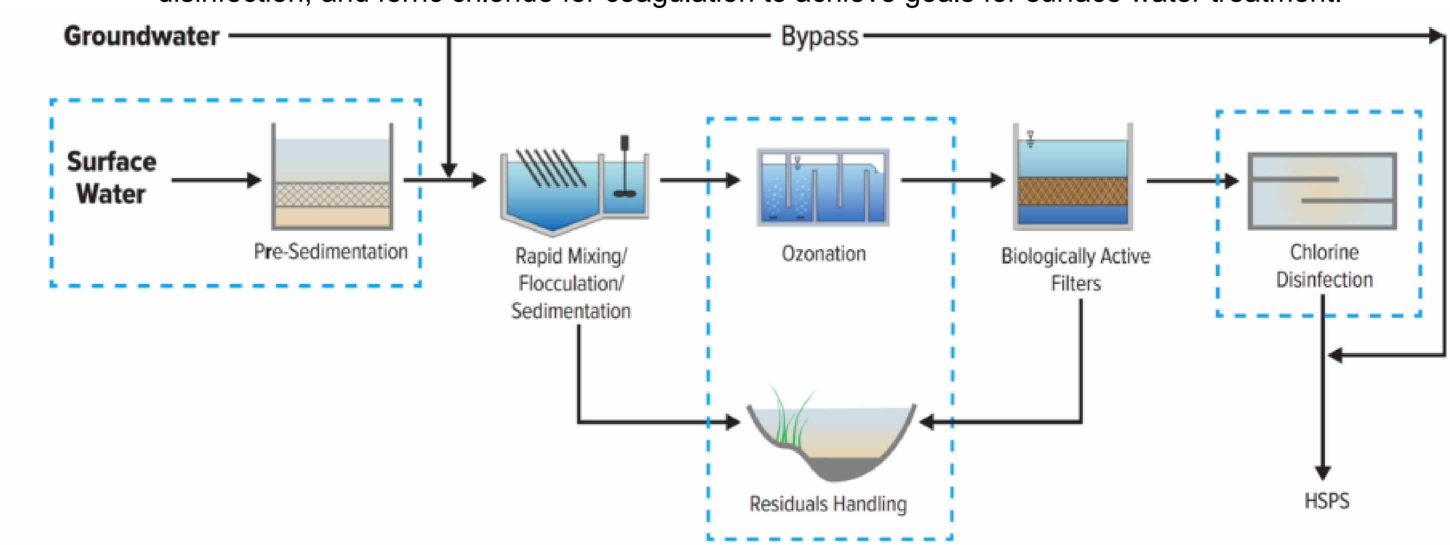
The Upper Valley WTP has been operational since 2005 and supplies the northwest area of El Paso. While it was originally designed to treat 30 million gallons per day (mgd) of groundwater from the Mesilla Bolson, EPWater's vision for the plant included planning for a possible future conversion to a surface water treatment plant. Because of this vision, the plant already includes the core treatment processes that are typically used to treat surface water, and space to add additional treatment.

- The Surface Water Treatment Rule (SWTR) promulgated by the U.S. Environmental Protection Agency in 1989 establishes requirements for particle removal and disinfection to achieve treatment goals for pathogens that may be present in surface water.
- The Upper Valley WTP includes coagulation, flocculation, sedimentation, and granular media filtration, core treatment processes conventionally used to remove particles and pathogens from surface water.

- A few additional treatment components are required to convert the Upper Valley WTP to facilitate treatment of surface water from the Rio Grande, to meet state and federal drinking water requirements.

2 Capital improvements to convert to surface water treatment

- Surface water will have a higher particle loading than the groundwater that is currently used as the source for the plant. While the sedimentation basins can readily accommodate for this, the WTP will require additional solids removal facilities to deal with the higher volume of solids removed from surface water. The required additional facilities will include pre-sedimentation basins at the head of the plant and augmented residual handling (such as engineered lagoons).
- Chlorine disinfection is needed to meet SWTR requirements. The plant will need a new chlorine contact basin to ensure sufficient inactivation of pathogens found in the new water source.
- The plant will require additional chemical feed capacity, including sodium hypochlorite for disinfection, and ferric chloride for coagulation to achieve goals for surface water treatment.



3 Project components

The table below illustrates the phases and costs to complete the Surface Water Augmentation Project. The anticipated outcomes include: improved supply resiliency for EPWater, protection of surface water allocations along with preservation of the Mesilla Bolson, and an augmentation of the supply to Northwest El Paso. Since groundwater can be blended with treated surface water from the Upper Valley WTP, the overall capacity of the WTP will increase through this project, while meeting goals for source protection.

PROJECT FUNDING & PHASING

Phase	Timing	Cost
Phase 1: Design Initial project design, environmental assessments, piloting	2026	$14 million
Phase 2: Construction Plant modifications to treat surface water to drinking water standards	2027-2029	$121 million

Cost Estimate Summary *Water Supply Project Option* *September 2023 Prices* *E-21 El Paso Water - Groundwater from Dell City Area Phase I*	
Cost based on ENR CCI 13485.67 for September 2023 and a PPI of 278.502 for September 2023	
Item	*Estimated Costs for Facilities*
CAPITAL COST	
Dam and Reservoir (Conservation Pool acft, acres)	$0
Off-Channel Storage/Ring Dike (Conservation Pool acft, acres)	$0
Terminal Storage (Conservation Pool acft, acres)	$0
Intake Pump Stations (13.4 MGD)	$24,021,000
Transmission Pipeline (30-54 in. dia., 111 miles)	$643,234,000
Transmission Pump Station(s) & Storage Tank(s)	$39,624,000
Well Fields (Wells, Pumps, and Piping)	$44,379,000
Storage Tanks (Other Than at Booster Pump Stations)	$0
Water Treatment Plant (13.4 MGD)	$918,000
Advanced Water Treatment Facility (MGD)	$0
Conservation (Leaking Pipe/Meter Replacement)	$0
Integration, Relocations, Backup Generator & Other	$1,511,000
TOTAL COST OF FACILITIES	**$753,687,000**
Engineering:	
- Planning (3%)	$22,611,000
- Design (7%)	$52,758,000
- Construction Engineering (1%)	$7,537,000
Legal Assistance (2%)	$15,074,000
Fiscal Services (2%)	$15,074,000
Pipeline Contingency (15%)	$96,485,000
All Other Facilities Contingency (20%)	$22,091,000
Environmental & Archaeology Studies and Mitigation	$3,606,000
Land Acquisition and Surveying (764 acres)	$1,133,000
Interest During Construction (3.5% for 1 years with a 0.5% ROI)	$32,128,000
TOTAL COST OF PROJECT	**$1,022,184,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$71,816,000

Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$6,960,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$1,420,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$551,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (31287735 kW-hr @ 0.09 $/kW-hr)	$2,816,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$83,563,000**
Available Project Yield (acft/yr)	10,000
Annual Cost of Water ($ per acft), based on PF=1.5	$8,356
Annual Cost of Water After Debt Service ($ per acft), based on PF=1.5	$1,175
Annual Cost of Water ($ per 1,000 gallons), based on PF=1.5	$25.64
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1.5	$3.60
Note: One or more cost element has been calculated externally	
JMP	*1/27/2025*

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices

E-22 El Paso Water - Groundwater from Dell City Area Phase II

Cost based on ENR CCI 13485.67 for September 2023 and
a PPI of 278.502 for September 2023

Item	*Estimated Costs for Facilities*
CAPITAL COST	
Dam and Reservoir (Conservation Pool acft, acres)	$0
Off-Channel Storage/Ring Dike (Conservation Pool acft, acres)	$0
Terminal Storage (Conservation Pool acft, acres)	$0
Intake Pump Stations (0 MGD)	$0
Transmission Pipeline (18-48 in. dia., 22 miles)	$77,846,000
Transmission Pump Station(s) & Storage Tank(s)	$78,948,000
Well Fields (Wells, Pumps, and Piping)	$114,599,000
Storage Tanks (Other Than at Booster Pump Stations)	$5,851,000
Water Treatment Plant (18 MGD)	$115,190,000
Advanced Water Treatment Facility (MGD)	$0
Conservation (Leaking Pipe/Meter Replacement)	$0
Integration, Relocations, Backup Generator & Other	$2,339,000
TOTAL COST OF FACILITIES	**$394,773,000**
Engineering:	
- Planning (3%)	$11,843,000
- Design (7%)	$27,634,000
- Construction Engineering (1%)	$3,948,000
Legal Assistance (2%)	$7,895,000
Fiscal Services (2%)	$7,895,000
Pipeline Contingency (15%)	$11,677,000
All Other Facilities Contingency (20%)	$63,386,000
Environmental & Archaeology Studies and Mitigation	$4,000
Land Acquisition and Surveying (313 acres)	$241,000
Interest During Construction (3.5% for 1 years with a 0.5% ROI)	$17,127,000
TOTAL COST OF PROJECT	**$546,423,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$38,282,000

Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$2,041,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$1,888,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$21,811,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (45333898 kW-hr @ 0.09 $/kW-hr)	$4,080,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$68,102,000**
Available Project Yield (acft/yr)	10,000
Annual Cost of Water ($ per acft), based on PF=1.6	$6,810
Annual Cost of Water After Debt Service ($ per acft), based on PF=1.6	$2,982
Annual Cost of Water ($ per 1,000 gallons), based on PF=1.6	$20.90
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1.6	$9.15
Note: One or more cost element has been calculated externally	
JMP	*1/27/2025*

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices
E-23 El Paso Water - Hueco Bolson Artificial Recharge

Cost based on ENR CCI 13485.67 for September 2023 and a PPI of 278.502 for September 2023

Item	*Estimated Costs for Facilities*
Integration, Relocations, Backup Generator & Other	$48,000,000
TOTAL COST OF FACILITIES	**$48,000,000**
- Planning (3%)	$1,440,000
- Design (7%)	$3,360,000
- Construction Engineering (1%)	$480,000
Legal Assistance (2%)	$960,000
Fiscal Services (2%)	$960,000
All Other Facilities Contingency (20%)	$9,600,000
Interest During Construction (3.5% for 1 years with a 0.5% ROI)	$2,106,000
TOTAL COST OF PROJECT	**$66,906,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$4,708,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$480,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.09 $/kW-hr)	$0
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$5,188,000**
Available Project Yield (acft/yr)	15,000
Annual Cost of Water ($ per acft), based on PF=0	$346
Annual Cost of Water After Debt Service ($ per acft), based on PF=0	$32
Annual Cost of Water ($ per 1,000 gallons), based on PF=0	$1.06
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=0	$0.10

Note: One or more cost element has been calculated externally

JKJ *1/30/2025*

Cost Estimate Summary Water Supply Project Option September 2023 Prices E-24 El Paso Water - Brackish Groundwater at the Jonathan Rogers WTP (Alternate)	
Cost based on ENR CCI 13485.67 for September 2023 and a PPI of 278.502 for September 2023	
Item	***Estimated Costs for Facilities***
CAPITAL COST	
Dam and Reservoir (Conservation Pool acft, acres)	$0
Off-Channel Storage/Ring Dike (Conservation Pool acft, acres)	$0
Terminal Storage (Conservation Pool acft, acres)	$0
Intake Pump Stations (0 MGD)	$3,518,000
Transmission Pipeline (12 in. dia., 10 miles)	$14,898,000
Transmission Pump Station(s) & Storage Tank(s)	$0
Well Fields (Wells, Pumps, and Piping)	$23,263,000
Storage Tanks (Other Than at Booster Pump Stations)	$11,178,000
Water Treatment Plant (8 MGD)	$67,723,000
Advanced Water Treatment Facility (MGD)	$0
Conservation (Leaking Pipe/Meter Replacement)	$0
Integration, Relocations, Backup Generator & Other	$63,000
TOTAL COST OF FACILITIES	**$120,643,000**
Engineering:	
- Planning (3%)	$3,619,000
- Design (7%)	$8,445,000
- Construction Engineering (1%)	$1,206,000
Legal Assistance (2%)	$2,413,000
Fiscal Services (2%)	$2,413,000
Pipeline Contingency (15%)	$2,235,000
All Other Facilities Contingency (20%)	$21,149,000
Environmental & Archaeology Studies and Mitigation	$442,000
Land Acquisition and Surveying (70 acres)	$53,000
Interest During Construction (3.5% for 1 years with a 0.5% ROI)	$5,284,000
TOTAL COST OF PROJECT	**$167,902,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$11,809,000

Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$494,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$88,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$12,947,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (6950056 kW-hr @ 0.09 $/kW-hr)	$626,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$25,964,000**
Available Project Yield (acft/yr)	11,000
Annual Cost of Water ($ per acft), based on PF=1.5	$2,360
Annual Cost of Water After Debt Service ($ per acft), based on PF=1.5	$1,287
Annual Cost of Water ($ per 1,000 gallons), based on PF=1.5	$7.24
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1.5	$3.95

JMP *1/30/2025*

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices

E-25 El Paso Water - Treatment and Reuse of Agricultural Drain Water

Cost based on ENR CCI 13485.67 for September 2023 and
a PPI of 278.502 for September 2023

Item	***Estimated Costs for Facilities***
CAPITAL COST	
Dam and Reservoir (Conservation Pool acft, acres)	$0
Off-Channel Storage/Ring Dike (Conservation Pool acft, acres)	$0
Terminal Storage (Conservation Pool acft, acres)	$0
Intake Pump Stations (0 MGD)	$0
Transmission Pipeline (None)	$0
Transmission Pump Station(s) & Storage Tank(s)	$0
Well Fields (Wells, Pumps, and Piping)	$0
Storage Tanks (Other Than at Booster Pump Stations)	$0
Water Treatment Plant (2.4 MGD)	$10,859,000
Advanced Water Treatment Facility (MGD)	$0
Conservation (Leaking Pipe/Meter Replacement)	$0
Integration, Relocations, Backup Generator & Other	$0
TOTAL COST OF FACILITIES	**$10,859,000**
Engineering:	
- Planning (3%)	$326,000
- Design (7%)	$760,000
- Construction Engineering (1%)	$109,000
Legal Assistance (2%)	$217,000
Fiscal Services (2%)	$217,000
Pipeline Contingency (15%)	$0
All Other Facilities Contingency (20%)	$2,172,000
Environmental & Archaeology Studies and Mitigation	$1,000
Land Acquisition and Surveying (1 acres)	$1,000
Interest During Construction (3.5% for 1 years with a 0.5% ROI)	$477,000
TOTAL COST OF PROJECT	**$15,139,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$1,065,000

Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$0
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$950,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.09 $/kW-hr)	$0
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$2,015,000**
Available Project Yield (acft/yr)	2,700
Annual Cost of Water ($ per acft), based on PF=0	$746
Annual Cost of Water After Debt Service ($ per acft), based on PF=0	$352
Annual Cost of Water ($ per 1,000 gallons), based on PF=0	$2.29
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=0	$1.08

JMP *1/30/2025*

E-26 ROM COST ESTIMATE

External cost provided by Ari Michelson in the 2021 Plan was $13,508,072. This is split equally between El Paso Water and EPCWID #1. I have indexed the cost up to the Sept. 2023 values. Total capital cost = $19,846,866. Split equally - $9,928,433.

		Crest El.		3669
		Water El.		**3665**
		Bot. Res.		3655
		Storage (AF)		**3,000**
		Perimeter	11824	11,824
Item	**UOM**	**Unit Price**		
Laser Leveling - Reservoir Area				
Cut	CY	$1.50	472,267	$708,401
Leveling Fill (compacted)	CY	$2.00	282,899	$565,798
To Embankment	CY	$5.00	147,127	$735,636
Line exposed cut slope in reservoir (3 ft)	CY	$6.50	21,113	$137,235
Net Excess Excavation	CY	$1.50	21,128	$31,692
Borrow Area Exc. To Embankment Fill			0	
(i.e. Fill required in excess of available fill from laser leveling)	CY	$6.50	183,831	$1,194,902
Toe Drain	CY	$95	11,586	$1,100,669
Slope Protection (12" x 24" rip-rap)	CY	$40	25,335	$1,013,388
Canal To & From Reservoir				
	LF	$350	500	$175,000
Inflow/Outflow Gate Structure				
	Table 1			$467,000
Reservoir Pumping Plant to Fill Reservoir				
	Table 1			$1,100,250
Misc. Items not Estimated				
	LS	5%		$361,499
SUBTOTAL				$7,591,470
Mobilization, Indirects, Bonds & Ins.	LS	8%		$607,318
Quality Control Testing	LS	1.5%		$113,872
TOTAL (w/o Contingency)				$8,312,660
Contingency	LS	20%		$1,662,532
TOTAL Opinion of Probable Construction Cost (Class 5)				**$9,975,192**

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices

E-27 El Paso Water - Expansion of Jonathan Rogers WTP

Cost based on ENR CCI 13485.67 for September 2023 and
a PPI of 278.502 for September 2023

Item	***Estimated Costs for Facilities***
Water Treatment Plant (20 MGD)	$76,163,000
TOTAL COST OF FACILITIES	**$76,163,000**
- Planning (3%)	$2,285,000
- Design (7%)	$5,331,000
- Construction Engineering (1%)	$762,000
Legal Assistance (2%)	$1,523,000
Fiscal Services (2%)	$1,523,000
All Other Facilities Contingency (20%)	$15,233,000
Environmental & Archaeology Studies and Mitigation	$7,000
Land Acquisition and Surveying (10 acres)	$8,000
Interest During Construction (3.5% for 1 years with a 0.5% ROI)	$3,343,000
TOTAL COST OF PROJECT	**$106,178,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$7,471,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$0
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$3,333,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.09 $/kW-hr)	$0
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$10,804,000**
Available Project Yield (acft/yr)	6,500
Annual Cost of Water ($ per acft), based on PF=0	$1,662
Annual Cost of Water After Debt Service ($ per acft), based on PF=0	$513
Annual Cost of Water ($ per 1,000 gallons), based on PF=0	$5.10

Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=0	$1.57
Note: One or more cost element has been calculated externally	

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices

E-28 El Paso Water - Advanced Water Purification at the Haskell Street RWP

Cost based on ENR CCI 13485.67 for September 2023 and
a PPI of 278.502 for September 2023

Item	***Estimated Costs for Facilities***
Intake Pump Stations (0 MGD)	$5,440,000
Transmission Pipeline (36 in. dia., 2 miles)	$14,858,000
Well Fields (Wells, Pumps, and Piping)	$20,690,000
Advanced Water Treatment Facility (12 MGD)	$88,648,000
Integration, Relocations, Backup Generator & Other	$137,000
TOTAL COST OF FACILITIES	**$129,773,000**
- Planning (3%)	$3,893,000
- Design (7%)	$9,084,000
- Construction Engineering (1%)	$1,298,000
Legal Assistance (2%)	$2,595,000
Fiscal Services (2%)	$2,595,000
Pipeline Contingency (15%)	$2,229,000
All Other Facilities Contingency (20%)	$22,983,000
Environmental & Archaeology Studies and Mitigation	$673,000
Land Acquisition and Surveying (22 acres)	$9,000
Interest During Construction (3.5% for 1 years with a 0.5% ROI)	$5,688,000
TOTAL COST OF PROJECT	**$180,820,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$12,713,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$357,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$136,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$11,569,000
Pumping Energy Costs (6268283 kW-hr @ 0.09 $/kW-hr)	$564,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$25,339,000**

Available Project Yield (acft/yr)	8,900
Annual Cost of Water ($ per acft), based on PF=1.5	$2,847
Annual Cost of Water After Debt Service ($ per acft), based on PF=1.5	$1,419
Annual Cost of Water ($ per 1,000 gallons), based on PF=1.5	$8.74
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1.5	$4.35
Note: One or more cost element has been calculated externally	

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices

E-30 Fort Bliss & East Biggs - 2030 Purchase Water from El Paso Water

Cost based on ENR CCI 13485.67 for September 2023 and
a PPI of 278.502 for September 2023

Item	***Estimated Costs for Facilities***
Interest During Construction (3.5% for 1 years with a 0.5% ROI)	$0
TOTAL COST OF PROJECT	**$0**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$0
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$0
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.09 $/kW-hr)	$0
Purchase of Water (864 acft/yr @ 936 $/acft)	$809,000
TOTAL ANNUAL COST	**$809,000**
Available Project Yield (acft/yr)	864
Annual Cost of Water ($ per acft), based on PF=0	$936
Annual Cost of Water After Debt Service ($ per acft), based on PF=0	$936
Annual Cost of Water ($ per 1,000 gallons), based on PF=0	$2.87
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=0	$2.87

JKJ *12/9/2024*

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices

E-30 Fort Bliss & East Biggs - 2040 Purchase Water from El Paso Water

Cost based on ENR CCI 13485.67 for September 2023 and
a PPI of 278.502 for September 2023

Item	***Estimated Costs for Facilities***
Interest During Construction (3.5% for 1 years with a 0.5% ROI)	$0
TOTAL COST OF PROJECT	**$0**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$0
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$0
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.09 $/kW-hr)	$0
Purchase of Water (1086 acft/yr @ 936 $/acft)	$1,016,000
TOTAL ANNUAL COST	**$1,016,000**
Available Project Yield (acft/yr)	1,086
Annual Cost of Water ($ per acft), based on PF=0	$936
Annual Cost of Water After Debt Service ($ per acft), based on PF=0	$936
Annual Cost of Water ($ per 1,000 gallons), based on PF=0	$2.87
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=0	$2.87

JKJ *12/9/2024*

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices

E-30 Fort Bliss & East Biggs - 2050 Purchase Water from El Paso Water

Cost based on ENR CCI 13485.67 for September 2023 and
a PPI of 278.502 for September 2023

Item	***Estimated Costs for Facilities***
Interest During Construction (3.5% for 1 years with a 0.5% ROI)	$0
TOTAL COST OF PROJECT	**$0**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$0
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$0
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.09 $/kW-hr)	$0
Purchase of Water (1223 acft/yr @ 936 $/acft)	$1,145,000
TOTAL ANNUAL COST	**$1,145,000**
Available Project Yield (acft/yr)	1,223
Annual Cost of Water ($ per acft), based on PF=0	$936
Annual Cost of Water After Debt Service ($ per acft), based on PF=0	$936
Annual Cost of Water ($ per 1,000 gallons), based on PF=0	$2.87
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=0	$2.87

JKJ *12/9/2024*

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices

E-30 Fort Bliss & East Biggs - 2060 Purchase Water from El Paso Water

Cost based on ENR CCI 13485.67 for September 2023 and
a PPI of 278.502 for September 2023

Item	***Estimated Costs for Facilities***
Interest During Construction (3.5% for 1 years with a 0.5% ROI)	$0
TOTAL COST OF PROJECT	**$0**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$0
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$0
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.09 $/kW-hr)	$0
Purchase of Water (1279 acft/yr @ 936 $/acft)	$1,197,000
TOTAL ANNUAL COST	**$1,197,000**
Available Project Yield (acft/yr)	1,279
Annual Cost of Water ($ per acft), based on PF=0	$936
Annual Cost of Water After Debt Service ($ per acft), based on PF=0	$936
Annual Cost of Water ($ per 1,000 gallons), based on PF=0	$2.87
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=0	$2.87

JKJ *12/9/2024*

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices

E-30 Fort Bliss & East Biggs - 2070 Purchase Water from El Paso Water

Cost based on ENR CCI 13485.67 for September 2023 and
a PPI of 278.502 for September 2023

Item	***Estimated Costs for Facilities***
Interest During Construction (3.5% for 1 years with a 0.5% ROI)	$0
TOTAL COST OF PROJECT	**$0**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$0
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$0
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.09 $/kW-hr)	$0
Purchase of Water (1336 acft/yr @ 936 $/acft)	$1,250,000
TOTAL ANNUAL COST	**$1,250,000**
Available Project Yield (acft/yr)	1,336
Annual Cost of Water ($ per acft), based on PF=0	$936
Annual Cost of Water After Debt Service ($ per acft), based on PF=0	$936
Annual Cost of Water ($ per 1,000 gallons), based on PF=0	$2.87
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=0	$2.87

JKJ *12/9/2024*

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices

E-30 Fort Bliss & East Biggs - 2080 Purchase Water from El Paso Water

Cost based on ENR CCI 13485.67 for September 2023 and
a PPI of 278.502 for September 2023

Item	***Estimated Costs for Facilities***
Interest During Construction (3.5% for 1 years with a 0.5% ROI)	$0
TOTAL COST OF PROJECT	**$0**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$0
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$0
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.09 $/kW-hr)	$0
Purchase of Water (1393 acft/yr @ 936 $/acft)	$1,304,000
TOTAL ANNUAL COST	**$1,304,000**
Available Project Yield (acft/yr)	1,393
Annual Cost of Water ($ per acft), based on PF=0	$936
Annual Cost of Water After Debt Service ($ per acft), based on PF=0	$936
Annual Cost of Water ($ per 1,000 gallons), based on PF=0	$2.87
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=0	$2.87

JKJ *12/9/2024*

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices
E-32 Lower Valley Water District - Water Loss Audit and Main-Line Repair

Cost based on ENR CCI 13485.67 for September 2023 and
a PPI of 278.502 for September 2023

Item	***Estimated Costs for Facilities***
Conservation (Leaking Pipe/Meter Replacement)	$0
TOTAL COST OF FACILITIES	**$32,248,000**
- Planning (3%)	$967,000
- Design (7%)	$2,257,000
- Construction Engineering (1%)	$322,000
Legal Assistance (2%)	$645,000
Fiscal Services (2%)	$645,000
All Other Facilities Contingency (20%)	$0
Interest During Construction (3.5% for 0.5 years with a 0.5% ROI)	$682,000
TOTAL COST OF PROJECT	**$42,603,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$2,998,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$0
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.09 $/kW-hr)	$0
Purchase of Water (0 acft/yr @ 0 $/acft)	$0
TOTAL ANNUAL COST	**$2,998,000**
Available Project Yield (acft/yr)	77
Annual Cost of Water ($ per acft), based on PF=0	$38,935
Annual Cost of Water After Debt Service ($ per acft), based on PF=0	$0
Annual Cost of Water ($ per 1,000 gallons), based on PF=0	$119.47
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=0	$0.00

JKJ *12/5/2024*

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices

E-33 Lower Valley Water District - 2030 Purchase Water from El Paso Water

Cost based on ENR CCI 13485.67 for September 2023 and
a PPI of 278.502 for September 2023

Item	***Estimated Costs for Facilities***
Interest During Construction (3.5% for 1 years with a 0.5% ROI)	$0
TOTAL COST OF PROJECT	**$0**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$0
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$0
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.09 $/kW-hr)	$0
Purchase of Water (2820 acft/yr @ 1136 $/acft)	$3,204,000
TOTAL ANNUAL COST	**$3,204,000**
Available Project Yield (acft/yr)	2,820
Annual Cost of Water ($ per acft), based on PF=0	$1,136
Annual Cost of Water After Debt Service ($ per acft), based on PF=0	$1,136
Annual Cost of Water ($ per 1,000 gallons), based on PF=0	$3.49
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=0	$3.49

JKJ *12/9/2024*

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices

E-33 Lower Valley Water District - 2040 Purchase Water from El Paso Water

Cost based on ENR CCI 13485.67 for September 2023 and
a PPI of 278.502 for September 2023

Item	*Estimated Costs for Facilities*
Interest During Construction (3.5% for 1 years with a 0.5% ROI)	$0
TOTAL COST OF PROJECT	**$0**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$0
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$0
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.09 $/kW-hr)	$0
Purchase of Water (3078 acft/yr @ 1136 $/acft)	$3,497,000
TOTAL ANNUAL COST	**$3,497,000**
Available Project Yield (acft/yr)	3,078
Annual Cost of Water ($ per acft), based on PF=0	$1,136
Annual Cost of Water After Debt Service ($ per acft), based on PF=0	$1,136
Annual Cost of Water ($ per 1,000 gallons), based on PF=0	$3.49
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=0	$3.49

JKJ *12/9/2024*

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices

E-33 Lower Valley Water District - 2050 Purchase Water from El Paso Water

Cost based on ENR CCI 13485.67 for September 2023 and
a PPI of 278.502 for September 2023

Item	***Estimated Costs for Facilities***
Interest During Construction (3.5% for 1 years with a 0.5% ROI)	$0
TOTAL COST OF PROJECT	**$0**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$0
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$0
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.09 $/kW-hr)	$0
Purchase of Water (3232 acft/yr @ 1136 $/acft)	$3,672,000
TOTAL ANNUAL COST	**$3,672,000**
Available Project Yield (acft/yr)	3,232
Annual Cost of Water ($ per acft), based on PF=0	$1,136
Annual Cost of Water After Debt Service ($ per acft), based on PF=0	$1,136
Annual Cost of Water ($ per 1,000 gallons), based on PF=0	$3.49
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=0	$3.49

JKJ *12/9/2024*

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices

E-33 Lower Valley Water District - 2060 Purchase Water from El Paso Water

Cost based on ENR CCI 13485.67 for September 2023 and
a PPI of 278.502 for September 2023

Item	***Estimated Costs for Facilities***
Interest During Construction (3.5% for 1 years with a 0.5% ROI)	$0
TOTAL COST OF PROJECT	**$0**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$0
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$0
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.09 $/kW-hr)	$0
Purchase of Water (3296 acft/yr @ 1136 $/acft)	$3,744,000
TOTAL ANNUAL COST	**$3,744,000**
Available Project Yield (acft/yr)	3,296
Annual Cost of Water ($ per acft), based on PF=0	$1,136
Annual Cost of Water After Debt Service ($ per acft), based on PF=0	$1,136
Annual Cost of Water ($ per 1,000 gallons), based on PF=0	$3.49
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=0	$3.49

JKJ *12/9/2024*

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices

E-33 Lower Valley Water District - 2070 Purchase Water from El Paso Water

Cost based on ENR CCI 13485.67 for September 2023 and
a PPI of 278.502 for September 2023

Item	*Estimated Costs for Facilities*
Interest During Construction (3.5% for 1 years with a 0.5% ROI)	$0
TOTAL COST OF PROJECT	**$0**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$0
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$0
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.09 $/kW-hr)	$0
Purchase of Water (3360 acft/yr @ 1136 $/acft)	$3,817,000
TOTAL ANNUAL COST	**$3,817,000**
Available Project Yield (acft/yr)	3,360
Annual Cost of Water ($ per acft), based on PF=0	$1,136
Annual Cost of Water After Debt Service ($ per acft), based on PF=0	$1,136
Annual Cost of Water ($ per 1,000 gallons), based on PF=0	$3.49
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=0	$3.49

JKJ *12/9/2024*

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices

E-33 Lower Valley Water District - 2080 Purchase Water from El Paso Water

Cost based on ENR CCI 13485.67 for September 2023 and
a PPI of 278.502 for September 2023

Item	Estimated Costs for Facilities
Interest During Construction (3.5% for 1 years with a 0.5% ROI)	$0
TOTAL COST OF PROJECT	**$0**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$0
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$0
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.09 $/kW-hr)	$0
Purchase of Water (3424 acft/yr @ 1136 $/acft)	$3,890,000
TOTAL ANNUAL COST	**$3,890,000**
Available Project Yield (acft/yr)	3,424
Annual Cost of Water ($ per acft), based on PF=0	$1,136
Annual Cost of Water After Debt Service ($ per acft), based on PF=0	$1,136
Annual Cost of Water ($ per 1,000 gallons), based on PF=0	$3.49
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=0	$3.49

JKJ *12/9/2024*

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices

E-34 Lower Valley Water District - Surface Water Treatment Plant and Transmission Lines

Cost based on ENR CCI 13485.67 for September 2023 and
a PPI of 278.502 for September 2023

Item	***Estimated Costs for Facilities***
Intake Pump Stations (10.5 MGD)	$6,460,000
Transmission Pipeline (30 in. dia., 2 miles)	$8,647,000
Storage Tanks (Other Than at Booster Pump Stations)	$2,292,000
Water Treatment Plant (10 MGD)	$71,845,000
Integration, Relocations, Backup Generator & Other	$96,000
TOTAL COST OF FACILITIES	**$89,340,000**
- Planning (3%)	$2,680,000
- Design (7%)	$6,254,000
- Construction Engineering (1%)	$893,000
Legal Assistance (2%)	$1,787,000
Fiscal Services (2%)	$1,787,000
Pipeline Contingency (15%)	$1,297,000
All Other Facilities Contingency (20%)	$16,138,000
Environmental & Archaeology Studies and Mitigation	$70,000
Land Acquisition and Surveying (24 acres)	$16,000
Interest During Construction (3.5% for 2 years with a 0.5% ROI)	$7,811,000
TOTAL COST OF PROJECT	**$128,073,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$9,005,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$110,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$161,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$3,354,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (1046098 kW-hr @ 0.09 $/kW-hr)	$94,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$12,724,000**

Available Project Yield (acft/yr)	5,000
Annual Cost of Water ($ per acft), based on PF=1.5	$2,545
Annual Cost of Water After Debt Service ($ per acft), based on PF=1.5	$744
Annual Cost of Water ($ per 1,000 gallons), based on PF=1.5	$7.81
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1.5	$2.28

Note: One or more cost element has been calculated externally

JKJ *12/10/2024*

Cost Estimate Summary ***Water Supply Project Option*** ***September 2023 Prices*** ***E-35 Lower Valley Water District - Groundwater from proposed wellfield (Rio Grande Alluvium)***	
Cost based on ENR CCI 13485.67 for September 2023 and ***a PPI of 278.502 for September 2023***	
Item	***Estimated Costs for Facilities***
Intake Pump Stations (0 MGD)	$1,859,000
Transmission Pipeline (24 in. dia., 3 miles)	$8,900,000
Well Fields (Wells, Pumps, and Piping)	$15,362,000
Storage Tanks (Other Than at Booster Pump Stations)	$2,545,000
Advanced Water Treatment Facility (8.3 MGD)	$9,659,000
Integration, Relocations, Backup Generator & Other	$35,000
TOTAL COST OF FACILITIES	**$38,360,000**
- Planning (3%)	$1,151,000
- Design (7%)	$2,685,000
- Construction Engineering (1%)	$384,000
Legal Assistance (2%)	$767,000
Fiscal Services (2%)	$767,000
Pipeline Contingency (15%)	$1,335,000
All Other Facilities Contingency (20%)	$5,892,000
Environmental & Archaeology Studies and Mitigation	$379,000
Land Acquisition and Surveying (447 acres)	$244,000
Interest During Construction (3.5% for 1 years with a 0.5% ROI)	$1,688,000
TOTAL COST OF PROJECT	**$53,652,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$3,773,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$268,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$33,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$8,493,000
Pumping Energy Costs (3550174 kW-hr @ 0.09 $/kW-hr)	$320,000
Purchase of Water (acft/yr @ $/acft)	$0

TOTAL ANNUAL COST	**$12,887,000**
Available Project Yield (acft/yr)	6,800
Annual Cost of Water ($ per acft), based on PF=1.2	$1,895
Annual Cost of Water After Debt Service ($ per acft), based on PF=1.2	$1,340
Annual Cost of Water ($ per 1,000 gallons), based on PF=1.2	$5.82
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1.2	$4.11
JKJ	*12/10/2024*

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices

E-36 Lower Valley Water District - Groundwater from proposed wellfield (Hueco Bolson)

Cost based on ENR CCI 13485.67 for September 2023 and
a PPI of 278.502 for September 2023

Item	***Estimated Costs for Facilities***
Intake Pump Stations (0 MGD)	$1,695,000
Transmission Pipeline (24 in. dia., 2 miles)	$5,934,000
Well Fields (Wells, Pumps, and Piping)	$15,998,000
Storage Tanks (Other Than at Booster Pump Stations)	$2,545,000
Advanced Water Treatment Facility (8.3 MGD)	$9,659,000
Integration, Relocations, Backup Generator & Other	$30,000
TOTAL COST OF FACILITIES	**$35,861,000**
- Planning (3%)	$1,076,000
- Design (7%)	$2,510,000
- Construction Engineering (1%)	$359,000
Legal Assistance (2%)	$717,000
Fiscal Services (2%)	$717,000
Pipeline Contingency (15%)	$890,000
All Other Facilities Contingency (20%)	$5,986,000
Environmental & Archaeology Studies and Mitigation	$360,000
Land Acquisition and Surveying (447 acres)	$244,000
Interest During Construction (3.5% for 1 years with a 0.5% ROI)	$1,583,000
TOTAL COST OF PROJECT	**$50,303,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$3,537,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$245,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$33,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$8,493,000
Pumping Energy Costs (3501001 kW-hr @ 0.09 $/kW-hr)	$315,000
Purchase of Water (acft/yr @ $/acft)	$0

TOTAL ANNUAL COST	**$12,623,000**
Available Project Yield (acft/yr)	6,800
Annual Cost of Water ($ per acft), based on PF=1.2	$1,856
Annual Cost of Water After Debt Service ($ per acft), based on PF=1.2	$1,336
Annual Cost of Water ($ per 1,000 gallons), based on PF=1.2	$5.70
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1.2	$4.10
JKJ	*12/10/2024*

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices

E-37 Lower Valley Water District - Wastewater Treatment Facility and ASR

Cost based on ENR CCI 13485.67 for September 2023 and
a PPI of 278.502 for September 2023

Item	***Estimated Costs for Facilities***
Well Fields (Wells, Pumps, and Piping)	$6,355,000
Water Treatment Plant (3 MGD)	$32,557,000
TOTAL COST OF FACILITIES	**$38,912,000**
- Planning (3%)	$1,167,000
- Design (7%)	$2,724,000
- Construction Engineering (1%)	$389,000
Legal Assistance (2%)	$778,000
Fiscal Services (2%)	$778,000
All Other Facilities Contingency (20%)	$7,782,000
Environmental & Archaeology Studies and Mitigation	$63,000
Land Acquisition and Surveying (3 acres)	$2,000
Interest During Construction (3.5% for 1 years with a 0.5% ROI)	$1,710,000
TOTAL COST OF PROJECT	**$54,305,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$3,821,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$64,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$2,777,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (178861 kW-hr @ 0.09 $/kW-hr)	$16,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$6,678,000**
Available Project Yield (acft/yr)	5,589
Annual Cost of Water ($ per acft), based on PF=0	$1,195
Annual Cost of Water After Debt Service ($ per acft), based on PF=0	$511

Annual Cost of Water ($ per 1,000 gallons), based on PF=0	$3.67
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=0	$1.57

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices
E-38 Horizon Regional MUD - Water Loss Audit and Main-Line Repair

Cost based on ENR CCI 13485.67 for September 2023 and
a PPI of 278.502 for September 2023

Item	***Estimated Costs for Facilities***
Conservation (Leaking Pipe/Meter Replacement)	$0
TOTAL COST OF FACILITIES	**$4,837,000**
- Planning (3%)	$145,000
- Design (7%)	$339,000
- Construction Engineering (1%)	$48,000
Legal Assistance (2%)	$97,000
Fiscal Services (2%)	$97,000
All Other Facilities Contingency (20%)	$0
Interest During Construction (3.5% for 0.5 years with a 0.5% ROI)	$103,000
TOTAL COST OF PROJECT	**$6,392,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$450,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$0
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.09 $/kW-hr)	$0
Purchase of Water (0 acft/yr @ 0 $/acft)	$0
TOTAL ANNUAL COST	**$450,000**
Available Project Yield (acft/yr)	182
Annual Cost of Water ($ per acft), based on PF=0	$2,473
Annual Cost of Water After Debt Service ($ per acft), based on PF=0	$0
Annual Cost of Water ($ per 1,000 gallons), based on PF=0	$7.59
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=0	$0.00

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices

E-40 Horizon Regional MUD - Additional Wells and Expansion of Desalination Plant

Cost based on ENR CCI 13485.67 for September 2023 and
a PPI of 278.502 for September 2023

Item	***Estimated Costs for Facilities***
Well Fields (Wells, Pumps, and Piping)	$10,931,000
Water Treatment Plant (15.4 MGD)	$103,195,000
TOTAL COST OF FACILITIES	**$114,126,000**
- Planning (3%)	$3,424,000
- Design (7%)	$7,989,000
- Construction Engineering (1%)	$1,141,000
Legal Assistance (2%)	$2,283,000
Fiscal Services (2%)	$2,283,000
All Other Facilities Contingency (20%)	$22,825,000
Environmental & Archaeology Studies and Mitigation	$70,000
Land Acquisition and Surveying (18 acres)	$18,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$4,240,000
TOTAL COST OF PROJECT	**$158,399,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$11,145,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$109,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$19,387,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (18684733 kW-hr @ 0.09 $/kW-hr)	$1,682,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$32,323,000**
Available Project Yield (acft/yr)	16,786
Annual Cost of Water ($ per acft), based on PF=2	$1,926
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$1,262

Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$5.91
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$3.87

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices
E-41 East Montana WS - Water Loss Audit and Main-Line Repair

Cost based on ENR CCI 13485.67 for September 2023 and
a PPI of 278.502 for September 2023

Item	*Estimated Costs for Facilities*
Conservation (Leaking Pipe/Meter Replacement)	$0
TOTAL COST OF FACILITIES	**$7,256,000**
- Planning (3%)	$218,000
- Design (7%)	$508,000
- Construction Engineering (1%)	$73,000
Legal Assistance (2%)	$145,000
Fiscal Services (2%)	$145,000
All Other Facilities Contingency (20%)	$0
Interest During Construction (3.5% for 0.5 years with a 0.5% ROI)	$154,000
TOTAL COST OF PROJECT	**$9,587,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$675,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$0
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.09 $/kW-hr)	$0
Purchase of Water (0 acft/yr @ 0 $/acft)	$0
TOTAL ANNUAL COST	**$675,000**
Available Project Yield (acft/yr)	14
Annual Cost of Water ($ per acft), based on PF=0	$48,214
Annual Cost of Water After Debt Service ($ per acft), based on PF=0	$0
Annual Cost of Water ($ per 1,000 gallons), based on PF=0	$147.94
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=0	$0.00

JKJ *12/5/2024*

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices
E-42 El Paso County Tornillo WID - Water Loss Audit and Main-Line Repair

Cost based on ENR CCI 13485.67 for September 2023 and
a PPI of 278.502 for September 2023

Item	*Estimated Costs for Facilities*
Conservation (Leaking Pipe/Meter Replacement)	$0
TOTAL COST OF FACILITIES	**$3,225,000**
- Planning (3%)	$97,000
- Design (7%)	$226,000
- Construction Engineering (1%)	$32,000
Legal Assistance (2%)	$64,000
Fiscal Services (2%)	$64,000
All Other Facilities Contingency (20%)	$0
Interest During Construction (3.5% for 0.5 years with a 0.5% ROI)	$69,000
TOTAL COST OF PROJECT	**$4,261,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$300,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$0
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.09 $/kW-hr)	$0
Purchase of Water (0 acft/yr @ 0 $/acft)	$0
TOTAL ANNUAL COST	**$300,000**
Available Project Yield (acft/yr)	6
Annual Cost of Water ($ per acft), based on PF=0	$50,000
Annual Cost of Water After Debt Service ($ per acft), based on PF=0	$0
Annual Cost of Water ($ per 1,000 gallons), based on PF=0	$153.42
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=0	$0.00

JKJ *12/5/2024*

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices

E-43 El Paso Tornillo WID - Additional Groundwater Well and Transmission Line

Cost based on ENR CCI 13485.67 for September 2023 and
a PPI of 278.502 for September 2023

Item	*Estimated Costs for Facilities*
Primary Pump Stations (0.4 MGD)	$743,000
Well Fields (Wells, Pumps, and Piping)	$930,000
Water Treatment Plant (0.4 MGD)	$58,000
Integration, Relocations, Backup Generator & Other	$4,000
TOTAL COST OF FACILITIES	**$1,953,000**
- Planning (3%)	$59,000
- Design (7%)	$137,000
- Construction Engineering (1%)	$20,000
Legal Assistance (2%)	$39,000
Fiscal Services (2%)	$39,000
All Other Facilities Contingency (20%)	$347,000
Environmental & Archaeology Studies and Mitigation	$22,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$74,000
TOTAL COST OF PROJECT	**$2,731,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$192,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$12,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$19,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$35,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (230793 kW-hr @ 0.09 $/kW-hr)	$21,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$279,000**
Available Project Yield (acft/yr)	333
Annual Cost of Water ($ per acft), based on PF=1.5	$838

Annual Cost of Water After Debt Service ($ per acft), based on PF=1.5	$261
Annual Cost of Water ($ per 1,000 gallons), based on PF=1.5	$2.57
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1.5	$0.80

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices
E-44 El Paso County WCID #4 - Water Loss Audit and Main-Line Repair

Cost based on ENR CCI 13485.67 for September 2023 and
a PPI of 278.502 for September 2023

Item	***Estimated Costs for Facilities***
Conservation (Leaking Pipe/Meter Replacement)	$0
TOTAL COST OF FACILITIES	**$3,225,000**
- Planning (3%)	$97,000
- Design (7%)	$226,000
- Construction Engineering (1%)	$32,000
Legal Assistance (2%)	$64,000
Fiscal Services (2%)	$64,000
All Other Facilities Contingency (20%)	$0
Interest During Construction (3.5% for 0.5 years with a 0.5% ROI)	$69,000
TOTAL COST OF PROJECT	**$4,261,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$300,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$0
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.09 $/kW-hr)	$0
Purchase of Water (0 acft/yr @ 0 $/acft)	$0
TOTAL ANNUAL COST	**$300,000**
Available Project Yield (acft/yr)	9
Annual Cost of Water ($ per acft), based on PF=0	$33,333
Annual Cost of Water After Debt Service ($ per acft), based on PF=0	$0
Annual Cost of Water ($ per 1,000 gallons), based on PF=0	$102.28
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=0	$0.00

JKJ *12/5/2024*

El Paso County Irrigation (EPCWID #1)

- Listed below are the details regarding how costs have been historically developed.

E-47 Improvements to Water District Delivery System

- John Ashworth sent email to Chuy on March 3, 2015, asking for updated information. John noted that during the 2011 Plan, the capital and annual costs were developed by Ari Michelson during an interim project.

- To calculate updated cost, technical consultant used the CCI costs in the look-up table within the TWDB Uniformed Costing Model, to make a ratio for how much costs have increased between plans, and then multiplied that to the capital and annual costs listed in the previous (2021 Plan).

    - Example:
      (Part 1)
        - Sept. 2011 CCI = 9153
        - Sept. 2023 CCI = 13486
        - 13486/9153 = 1.4733967

      (Part 2)

        - 1.47 X (Capital Cost in 2021 Plan)
        - 1.47 X $157,777,783 = $231,933,341

      (Part 3)

        - 1.47 X (Annual cost in 2021 Plan)
        - 1.47 X $216,155 = $317,748

      (Part 4)

        - Cost per Acre-Foot = $317,748 / (project yield)
        - $317,748 / 25,000 = $12.71 (rounded to $13)

E-48 ROM COST ESTIMATE

External cost provided by Ari Michelson in the 2021 Plan was $13,508,072.
This is split equally between El Paso Water and EPCWID #1.
I have indexed the cost up to the Sept. 2023 values. Total capital cost = $19,846,866. Split equally - $9,928,433.

		Crest El.		3669
		Water El.		**3665**
		Bot. Res.		3655
		Storage (AF)		**3,000**
		Perimeter	11824	11,824
Item	**UOM**	**Unit Price**		
Laser Leveling - Reservoir Area				
Cut	CY	$1.50	472,267	$708,401
Leveling Fill (compacted)	CY	$2.00	282,899	$565,798
To Embankment	CY	$5.00	147,127	$735,636
Line exposed cut slope in reservoir (3 ft)	CY	$6.50	21,113	$137,235
Net Excess Excavation	CY	$1.50	21,128	$31,692
Borrow Area Exc. To Embankment Fill			0	
(i.e. Fill required in excess of available fill from laser leveling)	CY	$6.50	183,831	$1,194,902
Toe Drain	CY	$95	11,586	$1,100,669
Slope Protection (12" x 24" rip-rap)	CY	$40	25,335	$1,013,388
Canal To & From Reservoir				
	LF	$350	500	$175,000
Inflow/Outflow Gate Structure				
	Table 1			$467,000
Reservoir Pumping Plant to Fill Reservoir				
	Table 1			$1,100,250
Misc. Items not Estimated				
	LS	5%		$361,499
SUBTOTAL				$7,591,470
Mobilization, Indirects, Bonds & Ins.	LS	8%		$607,318
Quality Control Testing	LS	1.5%		$113,872
TOTAL (w/o Contingency)				$8,312,660
Contingency	LS	20%		$1,662,532
TOTAL Opinion of Probable Construction Cost (Class 5)				**$9,975,192**

E-49 New Wastewater 32 River.
External costs provided by Al
Blair.

Table 3: Annual Cost of Pump O&M

Item	Quantity	unit	Years between maintenance	Unit Cost	Times per 40 Years	Total
Drip Oil	100	gallons	1	$8.00	40	$ 32,000
Bushings	2	ea pump	5	$10,000	20	$ 400,000
Impellers	2	ea pump	5	$ 50,000	20	$ 2,000,000
Painting	2	ea pump	5	$1,000	20	$ 40,000
					Total:	$ 2,472,000
					Annual:	$ 32,960

Table 4: Annual Cost of Gate O&M

Item	Quantity	unit	Years	Unit Cost	Times Per 40 Years	Total
Bushings	4	ea gate	10	$ 250.00	4	$ 4,000
Operators	4	ea gate	20	$ 4,000	2	$ 32,000
Painting	4	ea gate	10	$ 500.00	4	$ 8,000
					Total:	$ 44,000
					Annual:	$ 587

Table 5: Energy Cost

acre-feet	cfs days	ays @120c	GPM	Pump eff	Motor Eff	
10,000	5,042	42	56,125	0.75	0.94	
TDH	HP	KW	KWHR	$/KWHR	$/yr	$/ac-ft
12	241.24	179	180,734	0.12	$ 21,688	$ 2.17
						$ 43,328.45

Table 6: Summary of Annual Costs

	Mowing ($/yr)	Pump O&M ($/yr)	Gate O&M ($/yr)	Energy ($/yr)	Total ($/yr)
	$ 47,349	$ 9,200	$ 940	$ 7,320	$ 64,809

project yield	19978	

Total construction cost		3,865,574
Debt Service (3.5%, 20 yrs)		271,986
Total Annual Cost (With Debt)		348,861
Total Annual Cost (After Debt)	$	55,235
Annual cost of water before debt:		17.46
Annual cost of water after debt:	$	2.76

		CCI Index Ratio Sept. 2023
2026 Plan Updated Calculations		
Total construction cost	3,865,574	1.47
Debt Service (3.5%, 20 yrs)		
Total Annual Cost (With Debt)		
Total Annual Cost (After Debt)		
	$3,865,574 * 1.47 = $5,682,394	
Annual cost of water before debt:		
Annual cost of water after debt:		

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices

E-50 Steam Electric Power - 2030 Purchase Water from El Paso Water

Cost based on ENR CCI 13485.67 for September 2023 and
a PPI of 278.502 for September 2023

Item	***Estimated Costs for Facilities***
Interest During Construction (3.5% for 1 years with a 0.5% ROI)	$0
TOTAL COST OF PROJECT	**$0**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$0
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$0
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.09 $/kW-hr)	$0
Purchase of Water (7260 acft/yr @ 1625 $/acft)	$11,798,000
TOTAL ANNUAL COST	**$11,798,000**
Available Project Yield (acft/yr)	7,260
Annual Cost of Water ($ per acft), based on PF=0	$1,625
Annual Cost of Water After Debt Service ($ per acft), based on PF=0	$1,625
Annual Cost of Water ($ per 1,000 gallons), based on PF=0	$4.99
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=0	$4.99

JKJ *12/9/2024*

Cost Estimate Summary Water Supply Project Option September 2023 Prices E-51 El Paso (SEP) - Treatment and Reuse of Wastewater	
Cost based on ENR CCI 13485.67 for September 2023 and a PPI of 278.502 for September 2023	
Item	***Estimated Costs for Facilities***
CAPITAL COST	
Dam and Reservoir (Conservation Pool acft, acres)	$0
Off-Channel Storage/Ring Dike (Conservation Pool acft, acres)	$0
Terminal Storage (Conservation Pool acft, acres)	$0
Intake Pump Stations (0 MGD)	$0
Transmission Pipeline (None)	$0
Transmission Pump Station(s) & Storage Tank(s)	$0
Well Fields (Wells, Pumps, and Piping)	$0
Storage Tanks (Other Than at Booster Pump Stations)	$0
Water Treatment Plant (1.5 MGD)	$24,138,000
Advanced Water Treatment Facility (MGD)	$0
Conservation (Leaking Pipe/Meter Replacement)	$0
Integration, Relocations, Backup Generator & Other	$0
TOTAL COST OF FACILITIES	**$24,138,000**
Engineering:	
- Planning (3%)	$724,000
- Design (7%)	$1,690,000
- Construction Engineering (1%)	$241,000
Legal Assistance (2%)	$483,000
Fiscal Services (2%)	$483,000
Pipeline Contingency (15%)	$0
All Other Facilities Contingency (20%)	$4,828,000
Environmental & Archaeology Studies and Mitigation	$0
Land Acquisition and Surveying (1 acres)	$0
Interest During Construction (3.5% for 1 years with a 0.5% ROI)	$1,060,000
TOTAL COST OF PROJECT	**$33,647,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$2,367,000

Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$0
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$2,294,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.09 $/kW-hr)	$0
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$4,661,000**
Available Project Yield (acft/yr)	1,680
Annual Cost of Water ($ per acft), based on PF=0	$2,774
Annual Cost of Water After Debt Service ($ per acft), based on PF=0	$1,365
Annual Cost of Water ($ per 1,000 gallons), based on PF=0	$8.51
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=0	$4.19

JMP *1/28/2025*

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices
E-52 Esperanza Water System - Water Loss Audit and Main-Line Repair

Cost based on ENR CCI 13485.67 for September 2023 and
a PPI of 278.502 for September 2023

Item	*Estimated Costs for Facilities*
Conservation (Leaking Pipe/Meter Replacement)	$0
TOTAL COST OF FACILITIES	**$26,604,000**
- Planning (3%)	$798,000
- Design (7%)	$1,862,000
- Construction Engineering (1%)	$266,000
Legal Assistance (2%)	$532,000
Fiscal Services (2%)	$532,000
All Other Facilities Contingency (20%)	$0
Interest During Construction (3.5% for 0.5 years with a 0.5% ROI)	$563,000
TOTAL COST OF PROJECT	**$35,148,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$2,473,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$0
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.09 $/kW-hr)	$0
Purchase of Water (0 acft/yr @ 0 $/acft)	$0
TOTAL ANNUAL COST	**$2,473,000**
Available Project Yield (acft/yr)	8
Annual Cost of Water ($ per acft), based on PF=0	$309,125
Annual Cost of Water After Debt Service ($ per acft), based on PF=0	$0
Annual Cost of Water ($ per 1,000 gallons), based on PF=0	$948.53
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=0	$0.00

JKJ *12/5/2024*

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices
E-53 Hudspeth County-Other (Dell City) - Brackish Groundwater Desal Facility

Cost based on ENR CCI 13485.67 for September 2023 and
a PPI of 278.502 for September 2023

Item	*Estimated Costs for Facilities*
Water Treatment Plant (0.1 MGD)	$2,316,000
TOTAL COST OF FACILITIES	**$2,316,000**
- Planning (3%)	$69,000
- Design (7%)	$162,000
- Construction Engineering (1%)	$23,000
Legal Assistance (2%)	$46,000
Fiscal Services (2%)	$46,000
All Other Facilities Contingency (20%)	$463,000
Interest During Construction (3.5% for 1 years with a 0.5% ROI)	$102,000
TOTAL COST OF PROJECT	**$3,227,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$227,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$0
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$421,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.09 $/kW-hr)	$0
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$648,000**
Available Project Yield (acft/yr)	111
Annual Cost of Water ($ per acft), based on PF=0	$5,838
Annual Cost of Water After Debt Service ($ per acft), based on PF=0	$3,793
Annual Cost of Water ($ per 1,000 gallons), based on PF=0	$17.91
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=0	$11.64

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices
E-54 Hudspeth Co WCID #1 (City of Sierra Blanca) - Water Supply Line from Van Horn

Cost based on ENR CCI 13485.67 for September 2023 and
a PPI of 278.502 for September 2023

Item	*Estimated Costs for Facilities*
Transmission Pipeline (8 in. dia., 3 miles)	$3,239,000
TOTAL COST OF FACILITIES	**$3,239,000**
- Planning (3%)	$97,000
- Design (7%)	$227,000
- Construction Engineering (1%)	$32,000
Legal Assistance (2%)	$65,000
Fiscal Services (2%)	$65,000
Pipeline Contingency (15%)	$486,000
Environmental & Archaeology Studies and Mitigation	$90,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$119,000
TOTAL COST OF PROJECT	**$4,420,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$311,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$32,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.09 $/kW-hr)	$0
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$343,000**
Available Project Yield (acft/yr)	39
Annual Cost of Water ($ per acft), based on PF=1.5	$8,795
Annual Cost of Water After Debt Service ($ per acft), based on PF=1.5	$821
Annual Cost of Water ($ per 1,000 gallons), based on PF=1.5	$26.99
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1.5	$2.52

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices
E-55 Hudspeth County WCID 1 (City of Sierra Blanca) - Groundwater Well West of Van Horn

Cost based on ENR CCI 13485.67 for September 2023 and
a PPI of 278.502 for September 2023

Item	***Estimated Costs for Facilities***
Well Fields (Wells, Pumps, and Piping)	$832,000
TOTAL COST OF FACILITIES	**$832,000**
- Planning (3%)	$25,000
- Design (7%)	$58,000
- Construction Engineering (1%)	$8,000
Legal Assistance (2%)	$17,000
Fiscal Services (2%)	$17,000
All Other Facilities Contingency (20%)	$166,000
Environmental & Archaeology Studies and Mitigation	$16,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$32,000
TOTAL COST OF PROJECT	**$1,171,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$82,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$8,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (44085 kW-hr @ 0.09 $/kW-hr)	$4,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$94,000**
Available Project Yield (acft/yr)	39
Annual Cost of Water ($ per acft), based on PF=0	$2,410
Annual Cost of Water After Debt Service ($ per acft), based on PF=0	$308
Annual Cost of Water ($ per 1,000 gallons), based on PF=0	$7.40
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=0	$0.94

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices

E-59 Hudspeth County Mining - Additional Groundwater Well

Cost based on ENR CCI 13485.67 for September 2023 and
a PPI of 278.502 for September 2023

Item	***Estimated Costs for Facilities***
Well Fields (Wells, Pumps, and Piping)	$274,000
TOTAL COST OF FACILITIES	**$274,000**
- Planning (3%)	$8,000
- Design (7%)	$19,000
- Construction Engineering (1%)	$3,000
Legal Assistance (2%)	$5,000
Fiscal Services (2%)	$5,000
All Other Facilities Contingency (20%)	$55,000
Environmental & Archaeology Studies and Mitigation	$1,000
Land Acquisition and Surveying (1 acres)	$1,000
Interest During Construction (3.5% for 1 years with a 0.5% ROI)	$13,000
TOTAL COST OF PROJECT	**$384,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$27,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$3,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (62246 kW-hr @ 0.09 $/kW-hr)	$6,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$36,000**
Available Project Yield (acft/yr)	219
Annual Cost of Water ($ per acft), based on PF=0	$164
Annual Cost of Water After Debt Service ($ per acft), based on PF=0	$41
Annual Cost of Water ($ per 1,000 gallons), based on PF=0	$0.50

Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=0	$0.13
JKJ	*12/9/2024*

Cost Estimate Summary *Water Supply Project Option* *September 2023 Prices* *E-60 Fort Davis WSC - Additional Groundwater Well*	
Cost based on ENR CCI 13485.67 for September 2023 and a PPI of 278.502 for September 2023	
Item	***Estimated Costs for Facilities***
Well Fields (Wells, Pumps, and Piping)	$539,000
Water Treatment Plant (0.4 MGD)	$55,000
TOTAL COST OF FACILITIES	**$594,000**
- Planning (3%)	$18,000
- Design (7%)	$42,000
- Construction Engineering (1%)	$6,000
Legal Assistance (2%)	$12,000
Fiscal Services (2%)	$12,000
All Other Facilities Contingency (20%)	$119,000
Environmental & Archaeology Studies and Mitigation	$3,000
Interest During Construction (3.5% for 1 years with a 0.5% ROI)	$27,000
TOTAL COST OF PROJECT	**$833,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$59,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$5,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$33,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (57981 kW-hr @ 0.09 $/kW-hr)	$5,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$102,000**
Available Project Yield (acft/yr)	274
Annual Cost of Water ($ per acft), based on PF=0	$372
Annual Cost of Water After Debt Service ($ per acft), based on PF=0	$157
Annual Cost of Water ($ per 1,000 gallons), based on PF=0	$1.14

Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=0	$0.48
JKJ	*12/9/2024*

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices
E-61 Fort Davis WSC - Transmission Line to Connect Fort Davis WSC to Fort Davis Estates

Cost based on ENR CCI 13485.67 for September 2023 and a PPI of 278.502 for September 2023

Item	*Estimated Costs for Facilities*
Transmission Pipeline (6 in. dia., 2 miles)	$1,612,000
TOTAL COST OF FACILITIES	**$1,612,000**
- Planning (3%)	$48,000
- Design (7%)	$113,000
- Construction Engineering (1%)	$16,000
Legal Assistance (2%)	$32,000
Fiscal Services (2%)	$32,000
Pipeline Contingency (15%)	$242,000
Environmental & Archaeology Studies and Mitigation	$60,000
Interest During Construction (3.5% for 1 years with a 0.5% ROI)	$71,000
TOTAL COST OF PROJECT	**$2,226,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$157,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$16,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (21002 kW-hr @ 0.09 $/kW-hr)	$2,000
Purchase of Water (0 acft/yr @ 0 $/acft)	$0
TOTAL ANNUAL COST	**$175,000**
Available Project Yield (acft/yr)	114
Annual Cost of Water ($ per acft), based on PF=2	$1,535
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$158
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$4.71
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$0.48

JKJ *12/9/2024*

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices
E-62 City of Valentine (County-Other) - Additional Groundwater Well

Cost based on ENR CCI 13485.67 for September 2023 and
a PPI of 278.502 for September 2023

Item	*Estimated Costs for Facilities*
Well Fields (Wells, Pumps, and Piping)	$538,000
TOTAL COST OF FACILITIES	**$538,000**
- Planning (3%)	$16,000
- Design (7%)	$38,000
- Construction Engineering (1%)	$5,000
Legal Assistance (2%)	$11,000
Fiscal Services (2%)	$11,000
All Other Facilities Contingency (20%)	$108,000
Environmental & Archaeology Studies and Mitigation	$3,000
Interest During Construction (3.5% for 1 years with a 0.5% ROI)	$24,000
TOTAL COST OF PROJECT	**$754,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$53,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$5,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (159325 kW-hr @ 0.09 $/kW-hr)	$14,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$72,000**
Available Project Yield (acft/yr)	129
Annual Cost of Water ($ per acft), based on PF=1	$558
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$147
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$1.71
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.45

JKJ *12/9/2024*

Cost Estimate Summary ***Water Supply Project Option*** ***September 2023 Prices*** ***E-64 City of Presidio - Additional Groundwater Well***	
Cost based on ENR CCI 13485.67 for September 2023 and ***a PPI of 278.502 for September 2023***	
Item	***Estimated Costs for Facilities***
Intake Pump Stations (0 MGD)	$708,000
Transmission Pipeline (8 in. dia., 5 miles)	$5,240,000
Transmission Pump Station(s) & Storage Tank(s)	$1,747,000
Well Fields (Wells, Pumps, and Piping)	$118,000
Water Treatment Plant (0.4 MGD)	$55,000
Integration, Relocations, Backup Generator & Other	$4,000
TOTAL COST OF FACILITIES	**$7,872,000**
- Planning (3%)	$236,000
- Design (7%)	$551,000
- Construction Engineering (1%)	$79,000
Legal Assistance (2%)	$157,000
Fiscal Services (2%)	$157,000
Pipeline Contingency (15%)	$786,000
All Other Facilities Contingency (20%)	$526,000
Environmental & Archaeology Studies and Mitigation	$155,000
Land Acquisition and Surveying (35 acres)	$27,000
Interest During Construction (3.5% for 1 years with a 0.5% ROI)	$343,000
TOTAL COST OF PROJECT	**$10,889,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$766,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$64,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$35,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$33,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (91267 kW-hr @ 0.09 $/kW-hr)	$8,000
Purchase of Water (acft/yr @ $/acft)	$0

TOTAL ANNUAL COST	**$906,000**
Available Project Yield (acft/yr)	120
Annual Cost of Water ($ per acft), based on PF=2	$7,550
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$1,167
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$23.17
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$3.58
JKJ	*12/10/2024*

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices
E-65 Candelaria WSC - Water Loss Audit and Main-Line Repair

Cost based on ENR CCI 13485.67 for September 2023 and
a PPI of 278.502 for September 2023

Item	***Estimated Costs for Facilities***
Conservation (Leaking Pipe/Meter Replacement)	$0
TOTAL COST OF FACILITIES	**$806,000**
- Planning (3%)	$24,000
- Design (7%)	$56,000
- Construction Engineering (1%)	$8,000
Legal Assistance (2%)	$16,000
Fiscal Services (2%)	$16,000
All Other Facilities Contingency (20%)	$0
Interest During Construction (3.5% for 0.5 years with a 0.5% ROI)	$18,000
TOTAL COST OF PROJECT	**$1,065,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$75,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$0
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.09 $/kW-hr)	$0
Purchase of Water (0 acft/yr @ 0 $/acft)	$0
TOTAL ANNUAL COST	**$75,000**
Available Project Yield (acft/yr)	1
Annual Cost of Water ($ per acft), based on PF=0	$75,000
Annual Cost of Water After Debt Service ($ per acft), based on PF=0	$0
Annual Cost of Water ($ per 1,000 gallons), based on PF=0	$230.13
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=0	$0.00

Cost Estimate Summary
Water Supply Project Option
September 2023 Prices
E-66 Redford Water Supply - Water Loss Audit and Main-Line Repair

Cost based on ENR CCI 13485.67 for September 2023 and
a PPI of 278.502 for September 2023

Item	***Estimated Costs for Facilities***
Conservation (Leaking Pipe/Meter Replacement)	$0
TOTAL COST OF FACILITIES	**$806,000**
- Planning (3%)	$24,000
- Design (7%)	$56,000
- Construction Engineering (1%)	$8,000
Legal Assistance (2%)	$16,000
Fiscal Services (2%)	$16,000
All Other Facilities Contingency (20%)	$0
Interest During Construction (3.5% for 0.5 years with a 0.5% ROI)	$18,000
TOTAL COST OF PROJECT	**$1,065,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$75,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$0
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.09 $/kW-hr)	$0
Purchase of Water (0 acft/yr @ 0 $/acft)	$0
TOTAL ANNUAL COST	**$75,000**
Available Project Yield (acft/yr)	1
Annual Cost of Water ($ per acft), based on PF=0	$75,000
Annual Cost of Water After Debt Service ($ per acft), based on PF=0	$0
Annual Cost of Water ($ per 1,000 gallons), based on PF=0	$230.13
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=0	$0.00

JKJ *12/5/2024*

CHAPTER 6

REGIONAL WATER PLAN IMPACTS AND CONSISTENCY WITH PROTECTION OF WATER, AGRICULTURAL AND NATURAL RESOURCES

This page intentionally left blank.

6 REGIONAL WATER PLAN IMPACTS AND CONSISTENCY WITH PROTECTION OF WATER AGRICULTURAL AND NATURAL RESOURCES

Chapter 6 describes how this *2026 Far West Texas Plan* is consistent with the long-term protection of water resources, agricultural resources, and natural resources that are important to Far West Texas. All planning analyses applied, and recommendations made in the development of this *Plan* honor all existing water rights, contracts, and option agreements; and have no impact on navigation on any of the Region's surface water streams and rivers. Sufficient water management strategy supplies are recommended to meet the identified projected needs of all water user groups (WUGs) in the Region except for the irrigation category in El Paso, Culberson, and Hudspeth Counties, and for the mining category in Culberson County. Chapter 4 Table 4-2 provides a list of the anticipated shortages (needs) for these entities.

Third-party social and economic impacts resulting from voluntary redistributions of water, including impacts of moving water from rural and agricultural areas were considered. There are only two strategies (E-21 and E-22) owned by El Paso Water that are impacted by this analysis. Strategy E-21 moves water from currently irrigated farmland in Culberson County to El Paso to El Paso County. This farmland is currently owned by El Paso Water and, therefore, the conversion of use from irrigation to municipal is El Paso Water's decision. Strategy E-22 moves water from the Dell City area of Hudspeth County to El Paso County. El Paso Water is purchasing land and water rights from willing landowners, and therefore the conversion of use from irrigation to municipal is voluntary.

The socioeconomic impact of not meeting water supply needs within the Region is discussed in an analysis report prepared by the Texas Water Development Board and presented in Appendix 6A at the end of this Chapter. Based on projected water demands and existing water supplies, the Region identified water needs (potential shortages) that could occur under a repeat of the drought of record for 13 water use categories (municipal, irrigation, livestock, manufacturing, mining, and steam-electric power). The TWDB then estimated the annual socioeconomic impacts of those needs—if they are not met—for each water use category and as an aggregate for the Region.

The report describes that Far West Texas generated more than $X billion in gross domestic product (2023 dollars) and supported roughly X jobs in 2023. It is estimated that not meeting the identified water needs in Far West Texas would result in an annually combined lost income impact of approximately $X million in 2030, increasing to $X billion in 2080. In 2030, the Region would lose approximately X jobs, and by 2080 job losses would increase to approximately X if anticipated needs are not mitigated.

6.1 PROTECTION OF WATER RESOURCES

Water resources in Far West Texas as described in Chapter 3 include groundwater in numerous aquifers and surface water occurring in the Rio Grande and Pecos River basins. The numerous springs, which represent a transition point between groundwater and surface water, are also recognized in Chapter 1, Section 1.6 for their major importance.

The first step in achieving long-term water resources protection was in the process of estimating each source's availability. Surface water estimates were developed through a water availability model process (WAM) and are based on the quantity of surface water available to meet existing water rights during a drought-of-record.

Groundwater availability estimates are based on the Modeled Available Groundwater (MAG) volumes that may be produced on an average annual basis to achieve a Desire Future Condition (DFC) as adopted by Groundwater Management Areas (GMAs). Establishing conservative levels of water source availability thus results in less potential of over exploiting the supply.

The next step in establishing the long-term protection of water resources occurs in the water management strategies developed in Chapter 5 to meet potential water-supply shortages. Each strategy was evaluated for potential threats to water resources in terms of source depletion (reliability), quality degradation, and impact to environmental habitat.

Water conservation strategies are also recommended for each entity with a supply deficit. Conservation reduces the impact on water supplies by reducing the actual water demand for the supply. Chapter 5 provides an overview of these impact evaluations.

Chapters 5 and 7 contain information and recommendations pertaining to water conservation and drought management practices. When enacted, the conservation practices will diminish water demand, the drought management practices will extend supplies over the stress period, and the land management practices will potentially increase aquifer recharge.

Key parameters of water quality are discussed in Chapter 1 Section 1.8.1, while anticipated water quality of water supplies generated from water management strategies (Chapter 5) are analyzed and reported in Table 5-2. Many of the recommended strategies result in water quality improvement of delivered water. Desalination strategies generate a concentrated waste stream; however, it is disposed of in an appropriate and permitted procedure. No degradation of existing water quality occurs because of recommended strategies.

6.2 PROTECTION OF AGRICULTURAL RESOURCES

Agriculture in Far West Texas, as described in Chapter 1, Sections 1.2.8 and 1.3.2, includes the raising of crops and livestock, as well as a multitude of businesses that support this industry. Water is an absolute necessity to maintaining the agricultural industry and its use represents approximately 67 percent of all the water used in the Region. Many of the communities in the Region depend on various forms of the agricultural industry for a significant portion of their economy. It is thus important to the economic health and way of life in these communities to protect water resources that have historically been used in the support of agricultural activities.

TWDB's socio-economic analysis (Appendix 6A) reports that a projected water shortage in the irrigated agriculture water use category for one or more decades within the water planning horizon (Chapter 4, Table 4-1) occurs in Culberson, El Paso, Hudspeth, and Terrell Counties. Water shortages are projected for livestock use in Hudspeth, Jeff Davis, and Presidio Counties. Per the TWDB's socio-economic analysis, a negative tax impact was surmised, primarily due to past subsidies from the Federal government. Income and job losses are shown in the Table below.

Impacts of Water Shortages on Irrigation

WUG	2030	2040	2050	2060	2070	2080
Income Losses ($ millions) *						
Job Losses						

* Year 2023 dollars rounded.

The *2026 Far West Texas Water Plan* provides irrigation strategy recommendations in Chapter 5 that address water conservation management practices. If implemented, these practices will result in reduced water application per acre irrigated. Also, non-agricultural strategies provided in Chapter 5 include an analysis of potential impact to agricultural interests.

An interim project was performed in 2009 to evaluate the effectiveness of previously recommended irrigation practices. A summary of this report titled " Evaluation of Irrigation Efficiency Strategies for Far West Texas: Feasibility, Water Savings and Cost Considerations" is available on the Far West Texas Water Planning Group website.

6.3 PROTECTION OF NATURAL RESOURCES

The Far West Texas Water Planning Group has adopted a stance toward the protection of natural resources. Natural resources are defined in Chapter 1, Section 1.2.9 as including terrestrial and aquatic habitats that support a diverse environmental community as well as provide recreational and economic opportunities. Environmental and recreational water needs are discussed in Chapter 2, Section 2.3. Chapter 8 describes recommended ecologically unique river and stream segments.

The protection of natural resources is closely linked with the protection of water resources as discussed in Section 6.1 above. Where possible, the methodology used to assess groundwater source availability is based on not significantly lowering water levels to a point where spring flows might be impacted. Thus, the intention to protect surface flows is directly related to those natural resources that are dependent on surface water sources or spring flows for their existence.

Environmental impacts were evaluated in the consideration of strategies to meet water-supply deficits. Chapter 5 provides a comparative analysis of all selected strategies. Of prime consideration was whether a strategy potentially could diminish the quantity of water currently existing in the natural environment and if a strategy could impact water quality to a level that would be detrimental to animals and plants that naturally inhabit the area under consideration.

The Far West Texas Water Planning Group continues to recommend as “Ecologically Unique River and Stream Segments” three streams that lie within the boundaries of State-managed properties, four within National Park boundaries, and specified streams managed by the Texas Nature Conservancy. A quantitative analysis conducted to assess potential impacts of the *Plan* on these segments found that all recommended strategies listed in Chapter 5 have no influence on water resources in the vicinity of these segments. Although the Planning Group chooses to respect the privacy of private lands by not recommending stream segments on these properties, the Group recognizes and applauds the conservation work that is undertaken daily by many of these private landowners.

6.4 PROTECTION OF PUBLIC HEALTH AND SAFETY

The public health and safety of meeting municipal water supply needs is of significant concern of the FWTWPG in preparing this *2026 Plan*. Sufficient water management strategy supplies are recommended in this *2026 Plan* to meet the identified projected needs of all municipal water user groups (WUGs) in the Region. The only unmet needs occur for irrigation and mining categories, which do not pose a health and safety concern on the public.

- Culberson, El Paso, and Hudspeth County Irrigation
- Culberson County Mining

Chapter 5 Section 5.2.8 discusses the cause and entities impacted by the non-municipal unmet needs in the Region. The FWTWPG does not anticipate amending the *2026 Plan* to address unmet needs but is prepared to do so if conditions cause a WUG to request such a change.

This page intentionally left blank.

APPENDIX 6A
SOCIOECONOMIC IMPACT OF UNMET WATER NEEDS

This page intentionally left blank.

CHAPTER 7
DROUGHT RESPONSE INFORMATION, ACTIVITIES, AND RECOMMENDATIONS

This page intentionally left blank.

7 REGIONAL DROUGHT RESPONSE, INFORMATION, ACTIVITIES, AND RECOMMENDATIONS

Drought is a frequent and inevitable factor in the climate of Texas. The seven-year drought of record in the 1950s was a turning point in Texas history that led to the development of the Texas Water Development Board. Since then, Texas has faced numerous droughts, including the second worst and second-longest Statewide drought that began in August 2010 and lasted through October 2014. Widespread drought returned to much of the State in 2022, rivaling 2011 conditions and again illustrating drought's reoccurring threat to cause significant harm. Therefore, it is vital to plan for the effect that droughts will have on the use, allocation, and conservation of water in the State.

Drought management measures have been incorporated as an increasingly important part of water planning at the local, regional and Statewide levels. In 2009, the Texas Water Development Board (TWDB) published Drought Management in the Texas Regional and State Water Planning Process, which examines the potential benefits and drawbacks of including drought management as a regional water management strategy.

Through the regional water planning process, requirements for drought management planning are found in Title 31 of the Texas Administrative Code (TAC), Part 10, Chapter 357, Subchapter D. Texas Statute reference §357.42 includes requirements regarding drought response information, activities, and recommendations. This Chapter examines these specific requirements and identifies drought impacts within the Region.

7.1 DROUGHTS OF RECORD IN FAR WEST TEXAS

The severity of the 2022 drought significantly impacted the lives of water users, providers and water managers who were hard-pressed to find solutions to critical supply and demand issues. The severity of the impacts varied, but the overriding sense of urgency to create workable strategies and solutions was acknowledged and acted upon Statewide. Therefore, it is critical in this planning cycle to continue to address the impact that drought has had and will continue to have on the future use, allocation, and conservation of water in Far West Texas.

There are different types of droughts that have been defined in various ways; however, these definitions fall into four primary categories: (1) meteorological, (2) agricultural, (3) hydrological and (4) socioeconomic drought. According to the American Meteorological Society, drought is a period of abnormally dry weather sufficiently long enough to cause a serious hydrological imbalance. The State Drought Preparedness Plan provides more specific and detailed definitions.

Meteorological drought is quantified by how dry it is (for example, a rain deficit) compared to normal conditions as well as the duration of the dry period. This is typically a region-specific metric, since factors affecting meteorological drought can vary so much in different regions. This type of drought does not necessarily impact water supply.

Agricultural drought looks at the effects of meteorological drought in terms of agricultural impacts. For example, evapotranspiration, soil moisture and plant stress are measures of agricultural drought, which account for vulnerability of crops through the various growth stages. This type of drought often leads to drought disaster declarations and, in many cases, is an indicator of an impending hydrological drought.

Hydrological drought is measured in terms of effects on surface and subsurface waters, such as reservoir stage and capacity, stream flow or groundwater levels in wells. Hydrological drought is usually defined on a river-basin or watershed scale. Hydrological droughts typically lag behind meteorological and agricultural droughts because it takes more time for the evidence of basin-wide impacts to manifest. This type of drought typically always impacts water supplies and is the focus of the TWDB's water planning process.

Socioeconomic drought occurs when physical water needs affect the health, safety, and quality of life of the general public or when the drought affects the supply and demand of an economic product. An example of socioeconomic drought is when the demand for an economic product (such as hydroelectric power) exceeds supply due to a weather-related deficit. Typically, demand for a product increases with population growth and per capita consumptions. Supply increases due to efficiency technology and the construction of new water projects. If both are increasing, the rate of change between supply and demand determines the level of socioeconomic drought. However, regardless of the rate of change, when demand exceeds supply, vulnerability is magnified by water shortages during drought.

Several climatological drought indicators have been formulated to quantify drought. The Palmer Drought Severity Index (PDSI) was developed in 1965 and is currently used by many Federal and State agencies. The PDSI attempts to measure the duration and intensity of the long-term drought-inducting circulation patterns. Long-term drought is cumulative, so the intensity of drought during the current month is dependent on the current weather patterns plus the cumulative patterns of previous months. PDSI values can lag oncoming drought by several months. The PDSI quantifies drought using values ranging between -6.0 (driest) to 6.0 (wettest), and the TWDB uses the PDSI to monitor State drought conditions. “Extreme drought” conditions have a PDSI between -6.0 and -4.0, and “severe drought” conditions have a PDSI between -3.99 and -3.0.

An accumulated area graph of the weekly PDSI categories for the Trans-Pecos Region of Texas is included as Figure 7-1.

Since 2000, the Far West Texas Region experienced recurring extreme drought conditions in 2000 through 2004, 2006 through 2008, 2011 through 2014, 2018, 2020 through 2022, and in 2023. The Far West Texas Region experienced the longest sustained periods of extreme drought between January 2011 and September 2012, and between May 2020 and September 2022.

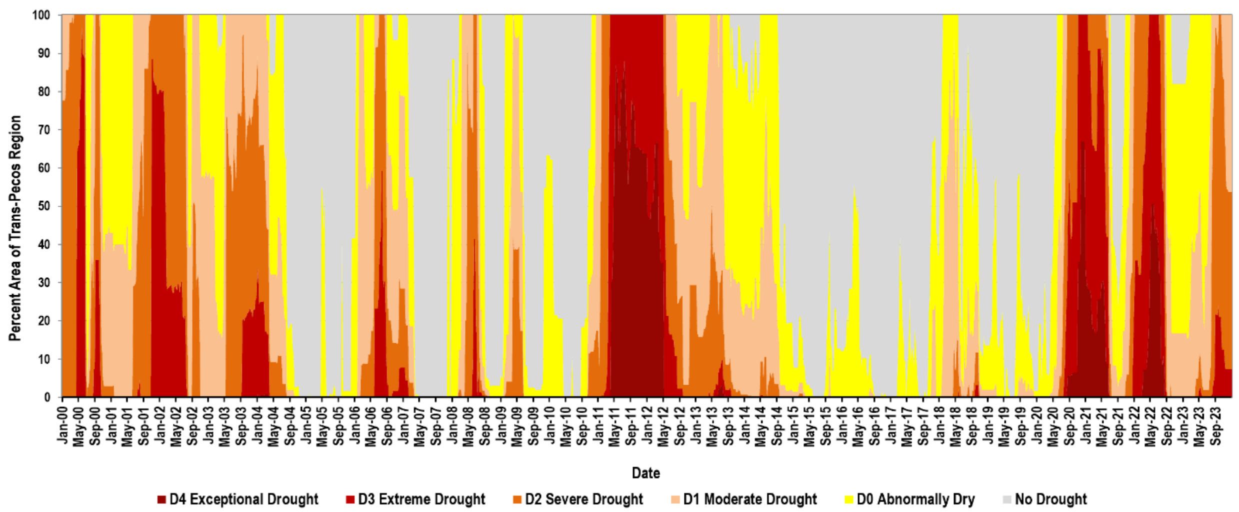


Figure 7-1. Drought in the Texas Trans-Pecos Region, 2000-2023
Source: U.S. Drought Monitor

Far West Texas, including the Trans-Pecos Region is perennially under drought or near drought conditions compared with more humid areas of the State. Citizens of the Region experience a wide range of weather conditions due to the Region being in the middle latitudes and northwest of the Gulf of Mexico. Although residents of the Region are generally accustomed to these conditions, the low rainfall and the accompanying high levels of evaporation underscore the necessity of developing plans that respond to potential disruptions in the supply of groundwater and surface water caused by drought conditions.

7.1.1 Precipitation Indicator

Although residents are generally accustomed to drought conditions within the Region, the relatively low rainfall underscore the necessity of developing plans that respond to potential disruptions in the supply of groundwater and surface water caused by drought.

For this planning cycle, the drought of the 1950s is considered the drought of record (DOR). The DOR and recent droughts can be compared using historic precipitation, stream flow records, spring discharge, and water level measurements in wells for locations that have accumulated data measurements since the 1940s.

Precipitation data for quadrangles 602 (portions of El Paso and Hudspeth Counties) and 704 (portions of Brewster, Presidio and Jeff Davis Counties) from 1940 through 2023 are shown in Figure 7-2. Average annual rainfall for these quadrangles is 14.3 and 15.0 inches, respectively. These data indicate that the DOR in the 1950s was associated with seven years of below average rainfall. The most recent drought of 2022 indicates a trend toward below average annual rainfall that rivals that of the 2011 drought.

The greatest precipitation impact to the Region comes further north in New Mexico and southern Colorado. Along the Rio Grande lies New Mexico's largest reservoir, Elephant Butte Reservoir. In terms of Far West Texas' surface water availability, it is the annual volume of water released from the Elephant Butte that must try to meet a portion of the growing water demands of the Region. However, severe drought has recently driven the storage levels of the Elephant Butte Reservoir to record lows of less than six percent full, similar to the record lows of the 2022 drought and even lower than the 2011 drought. This is one of the many problems in a series of drought-related challenges facing the Region.

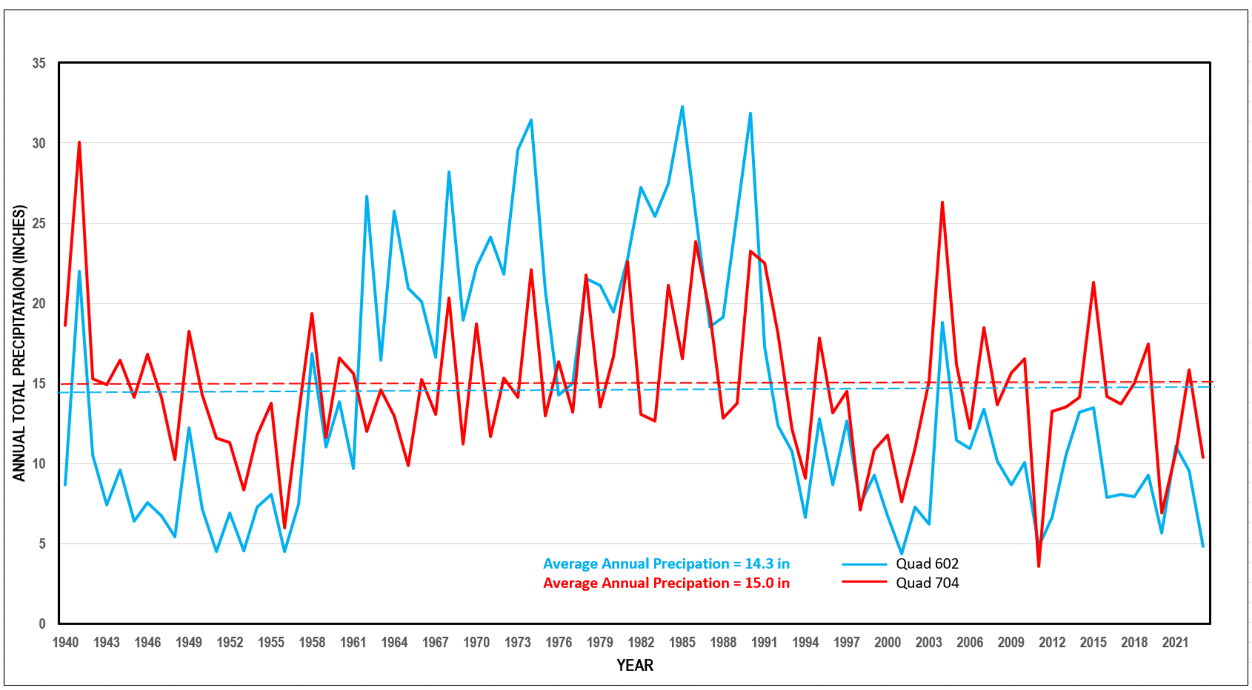


Figure 7-2. Annual Precipitation, 1940-2023
Source: TWDB

Figure 7-3 presents the water stored within Elephant Butte Reservoir from 1915 through 2023. The graph illustrates that the most significant declines in capacity due to drought impacting the reservoir occurred between 1951 and 1957. Recurring cycles of low capacity are evident between 1963 and 1965, 1971 and 1973, 1977 and 1979, 2003 and 2005, 2011 and 2019, 2021, and 2023. The longest sustained period of very low capacity occurred between 1953 and 1957.

Although water users located near the Rio Grande are more significantly impacted by precipitation that falls within the upper reaches of the Rio Grande Basin in New Mexico and southern Colorado, this is not the case for water users who are located further from the River. Precipitation in these areas provides important recharge to aquifers that are annually diminished by pumping withdrawals.

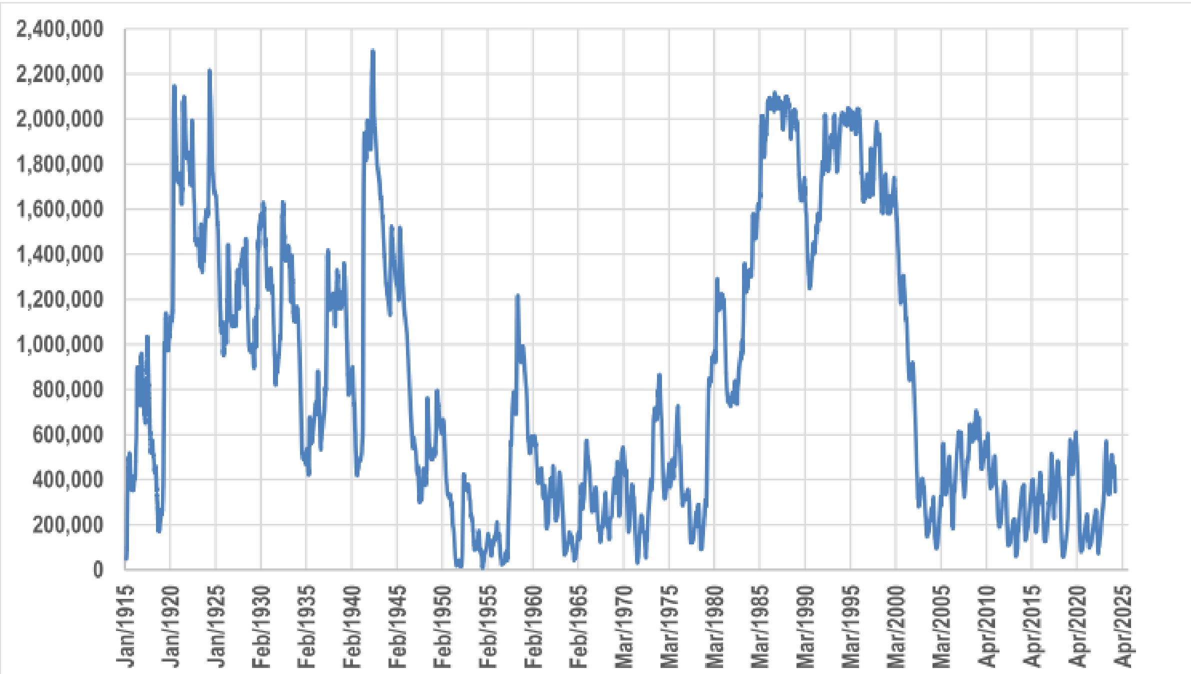


Figure 7-3. Elephant Butte Reservoir Storage in Acre-Feet
Source: U.S. Bureau of Reclamation

7.1.2 Stream Flow Indicator

The monitoring of streamflow of a river can generally provide a reliable indication of drought conditions throughout much of the State. However, gaging streamflow of the Rio Grande must be performed with knowledge of other factors that impact the supply of water in the River. Depending on the location of the stream gage, releases from Elephant Butte Reservoir and reservoirs on the Rio Conchos in Mexico have a large influence on streamflow at any given time.

A graph of streamflow at IBWC gaging station #8374200 located on the Rio Grande just below the confluence with the Rio Conchos is included as Figure 7-4. The top graph illustrates peak events. The bottom graph focuses on low flow/no flow events. The construction and filling of Elephant Butte Reservoir accounts for the data gap between 1914 and 1930. The Luis L. Leon Reservoir (on the Rio Conchos) was completed in 1968.

Peak flows since 1900 have decreased after the construction of Elephant Butte Reservoir. The most current extreme peak occurred in 2008. The late spring and summer of 2008 was an abnormally wet season from the monsoonal rainfall over Mexico and southwest Texas (Hurricane Dolly in July, followed by tropical storm Julio in late August, followed by tropical storm Lowell in September). The peak flow of 51,206 cfs (gaging station #8374200) occurred on September 19, 2008. Levees failed at Presidio, Texas and Ojinaga, Mexico causing extensive, devastating flooding in the area. The levees were designed for 42,000 cfs. In addition, the western end of the Region (El Paso County), also was severely impacted with breaches in levees, causing the Corps of Engineers to undertake a massive re-assessment of the elevations of all levees along the Texas portion of the Rio Grande down to Presidio. That work has now moved into actual levee reconstruction and expansion, bridge abutment reinforcement, and head gate re-building along the beginnings of the irrigation laterals. Further, FEMA flood zone maps are proposed to be amended to include a larger swath of adjacent real estate being designated as “flood prone” areas, requiring more property owners to secure coverage under the National Flood Insurance Program.

Low-flow events appear to have occurred with relatively high frequency between 1900 and 1904, between 1952 and 1958, between 1996 and 2005, between 2007 and 2008, and between 2010 to current. No flow was recorded between December 2011 and October 2014, and between October 2021 and December 2023.

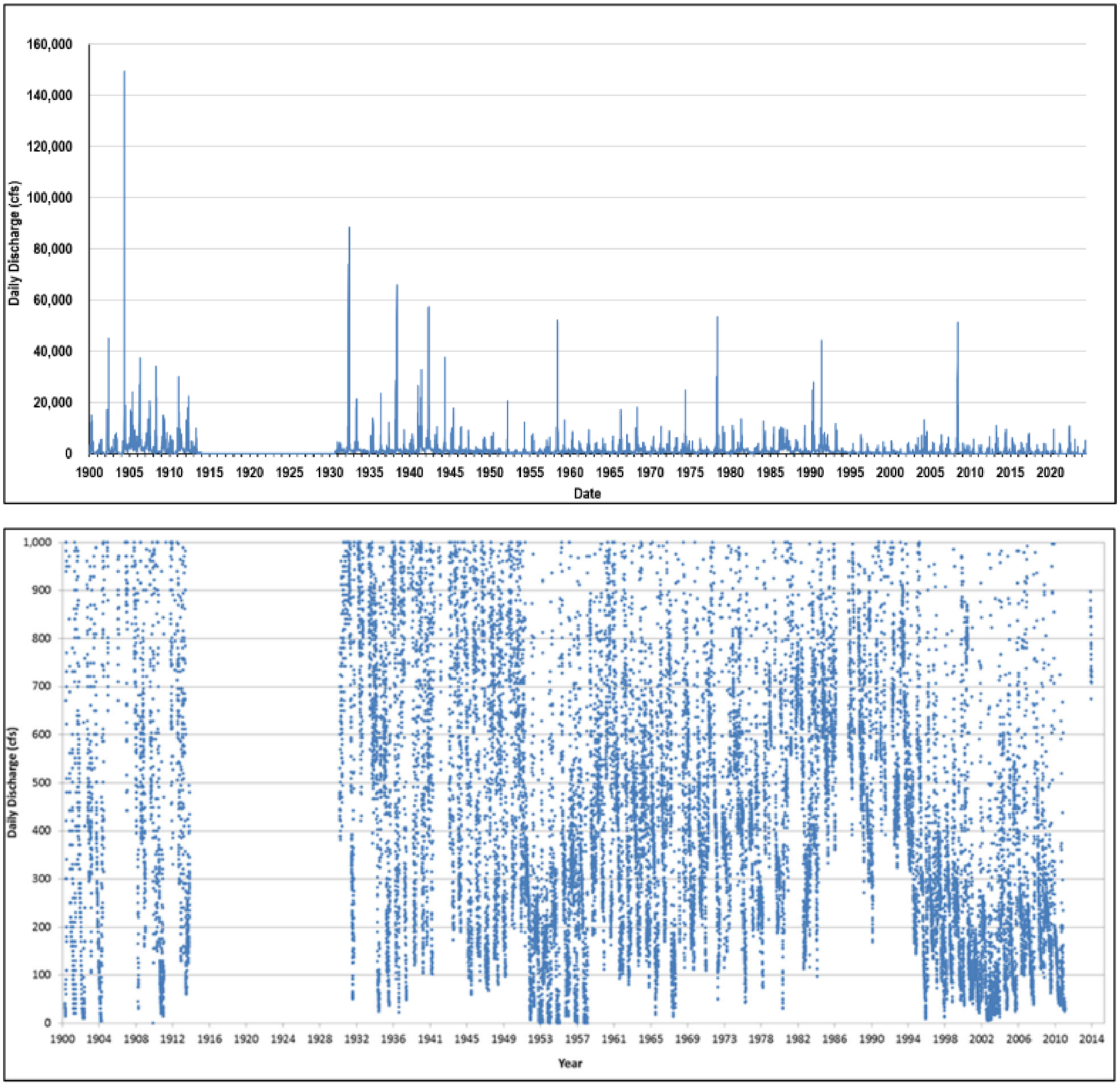


Figure 7-4. Streamflow below Rio Conchos Confluence 1900-2023
Source: IBWC

7.1.3 Spring Discharge Indicator

The San Solomon Spring System includes several springs that discharge to the Toyahville Basin near Toyahville, Texas. This group of springs includes Phantom Lake, San Solomon, Giffin, Saragosa, West and East Sandia springs.

The only spring in this system that has a gaging station with a continuous period of record from the 1940s through today is Giffin Springs (Figure 7-5). The period of record extends back to 1930; however, measurements were sporadic prior to 1941. The average discharge for all measurements between 1941 and December 2023 is 4.2 cfs. The graph indicates that the longest period of below average flow within this period of record occurred between 1964 and 1981. Note that most of these years had between two and four discharge measurements recorded.

Some of the springs within this system have ceased to flow. For example, Phantom Lake Springs in Jeff Davis County are the highest in elevation of all the springs in the San Solomon Spring System. This spring stopped flowing naturally in 2001. This is partially attributed to groundwater extraction along the flow path.

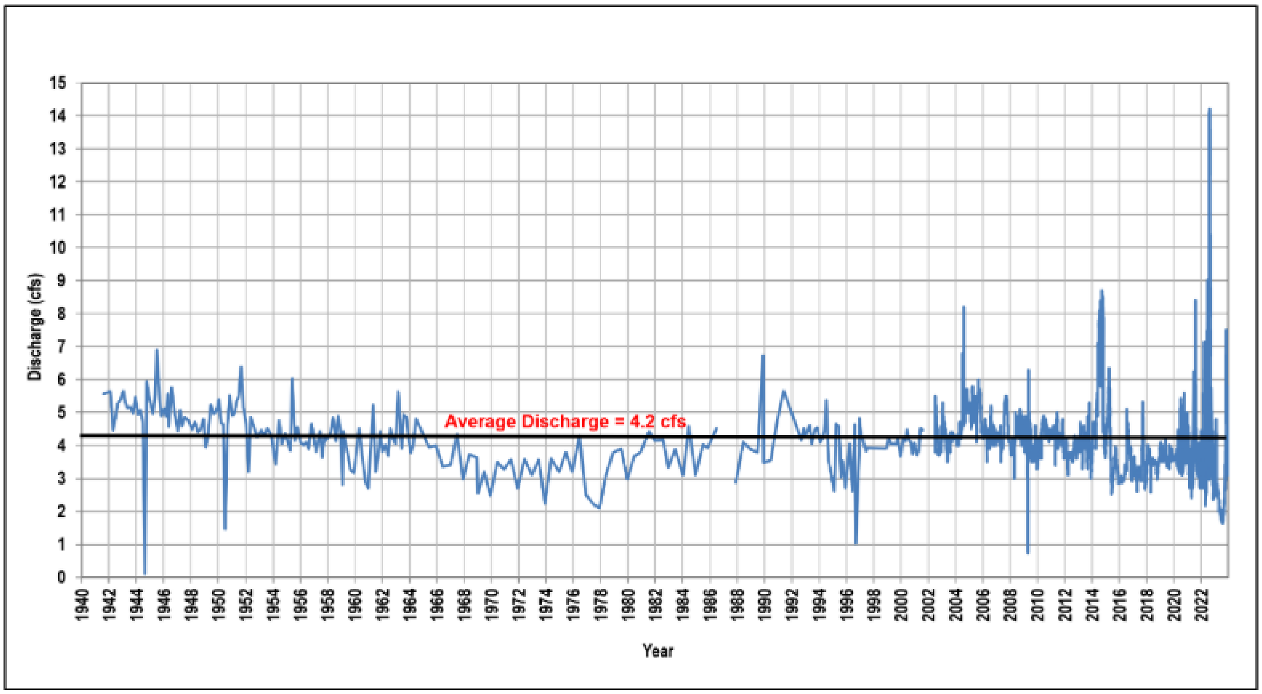


Figure 7-5. Giffin Springs Discharge, 1941-2023
Source: USGS

7.1.4 Groundwater Level Indicator

Figure 7-6 compares daily water level data from an existing real-time monitoring well with daily precipitation data from two weather stations within Brewster County (USC00410174 and USC00410176) to collect the full period of record, in order to illustrate aquifer response to precipitation events. This graph represents State well #7347404 at Panther Junction, in Brewster County. The data suggests that response time in the Aquifer is quite rapid and occurs within a few days. Not all wells can be so readily correlated to rainfall events. Out of the nine pairs of wells and weather stations that were investigated within the Region, only this well showed an obvious response to rainfall occurring near the well.

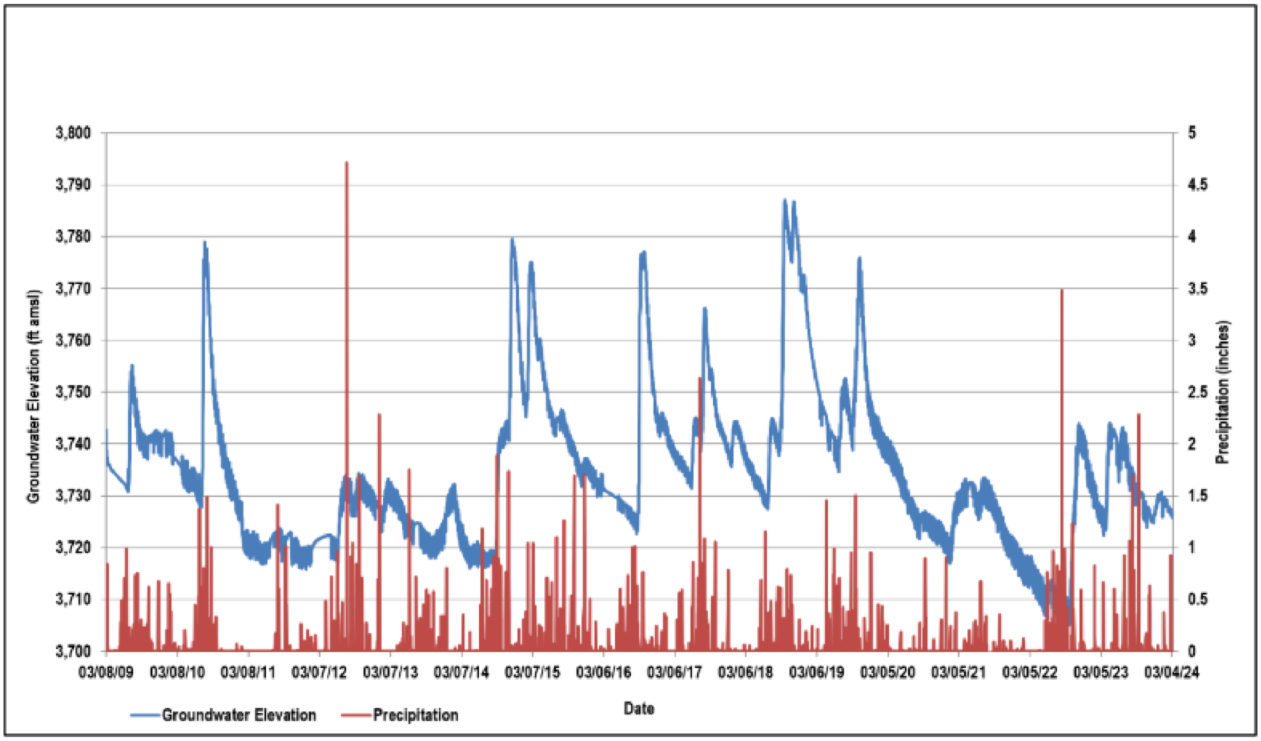


Figure 7-6. Daily Groundwater Elevation and Daily Precipitation, Igneous Aquifer
Source: Water Data for Texas

7.1.5 Far West Texas Drought of Record

The South-Central Climate Science Center prepared a report on the drought history for the Trans-Pecos of Texas in 2021. In this report, they determined that the period from February 1943 to November 1967 is the Drought of Record (DOR) for the Texas Trans-Pecos. The study points out that they consider the drought with the worst environmental conditions to outweigh the drought with the worst recorded impacts. They stated that a shorter less severe drought with high monetary losses (such as in 2011) does not outweigh a long and severe drought that occurred earlier in history. The study looked at data between 1895 and 2021. For this planning cycle, the drought of the 1950s is declared the DOR.

The catalyst for the recent drought can be attributed primarily to rainfall deficit (meteorological drought). The hydrological drought that has occurred because of rainfall deficit is evident in the decreased storage water levels of the Elephant Butte Reservoir, along with the decrease in the stream flow and spring discharge data that has been presented. However, the greatest unknown factor that these data collectively point to is the impact that can be attributed to anthropological factors.

The hydrological drought (impact on surface waters and groundwater) is a result of both meteorological and socioeconomic drought. To reiterate, socioeconomic drought occurs when demand exceeds supply due to a weather-related deficit. Typically, demand for a product increases with population growth and per capita consumptions, and supply increases due to efficiency technology and the construction of new water projects. If both are increasing, the rate of change between supply and demand determines the level of socioeconomic drought. However, regardless of the rate of change, when demand exceeds supply, vulnerability is magnified by water shortages during drought.

7.2 UNCERTAINTY AND DROUGHTS WORSE THAN THE DROUGHT OF RECORD

As mandated by TAC 357.42, the RWPGs must address water supply needs during a repeat of the drought of record. During plan development, the generated values of planning factors (supplies, demands, population) all have associated ranges of uncertainty. RWPGs may choose to consider scenarios and/or qualitatively address uncertainty and Drought Worse than the Drought of Record (DWDOR) in their region. This section discusses the scenarios and/or qualitative assessments that can be used to more explicitly recognize the relative planning uncertainties and options to help mitigate those risks.

Texas's strategy of planning for a repeat of the 1950s drought is no longer enough. While historic evidence identifies droughts that were longer and more severe than the Drought of Record, contemporary data points to a likely future of increasing drought severity. A report by Texas 2036 and the Office of the State Climatologist at Texas A&M University projects that rising average temperatures and greater rainfall variability will contribute to a future with more severe droughts. Given this lengthy history and projected future, Texas needs to think differently about how we plan and prepare for drought.

During this current planning cycle, the Drought Preparedness Council (DPC) encourages regional water planning groups to consider planning for drought conditions worse than the drought of record, including scenarios that reflect greater rainfall deficits and/or higher surface temperatures. A DWDOR will inflict greater economic damage on industries critical to our continued prosperity.

The Far West Texas Water Planning Group (FWTWPG) recognizes that the failure to plan for uncertainties invites economic devastation and therefore they have chosen to evaluate several options to help mitigate risks that may be associated with the DWDOR: (1) use of the Management Supply Factor (MSF), (2) information from water providers that have developed long-range plans that have assessed their system's capacity under conditions worse than the drought of record, and (3) demand reductions achieved through the implementation of drought contingency plans.

Variability related to population and water demand projections is a major area of concern for the Far West Texas Region. The planning group made available the draft population and water demand summary tables to municipalities, water providers, county judges, and non-municipal water-use representatives and solicited all entities within the Region to submit desired changes to the projections. Based on the survey responses, draft projections were revised and sent to the TWDB for review. The TWDB approved only those revision requests based on survey results within Culberson and El Paso Counties. The final population projections for the Region (to include all revisions) are in Chapter 2, Section 2.1.2, and 2.2.

In addition to the survey engagement effort, the planning group sought a second opinion and contracted with Dr. Tom Fullerton, professor at the University of Texas El Paso, to provide a report outlining key economic and policy factors within the Region that can result in projected growth rates not being considered in the TWDB's approved population projections (Appendix 2X). The FWTWPG has considered how to address planning for uncertainty and how such planning could be included for the purposes of the 2026 Far West Texas Water Plan.

For the purposes of this *Plan*, there are no long-range plans and/or studies available that have been performed to inform upon uncertainties in water needs and water availability within the Region. However, the planning group supports the funding and development of such studies.

This *Plan* does include several identified potential emergency interconnects that could be useful for informing on decisions of supply availability should DWDOR occur (Section 7.4).

In addition, the FWTWPG has calculated management supply factors for each Water User Group (WUG) and Major Water Providers (MWPs), for each decade, to plan for uncertainties in projections of population. The TWDB requires that the MSF for each WUG and MWP be calculated as follows and is for reporting purposes only:

$$MSF = (Ve + Vr) \div D$$

Where:

MSF = management supply factor
Ve = total volume of all decadal existing water supplies associated with a WUG
Vr = total volume of all decadal recommended WMS supplies associated with a WUG
D = total identified decadal water demand volume for a WUG to be met by (*Ve + Vr)*

To ensure that the WUGs and MWPs plan towards anticipated growth within the Region, the MSF calculation utilized the largest total volume of all decadal existing supplies (Table 3-2), largest total volume of all decadal WMS supplies (Table 5-2), and largest total identified decadal water demand volume (Table 2-2) within the planning horizon.

El Paso Water has historically planned for uncertainties, and in addition to the approach outlined above, their Board members request an additional 20,000 acre-feet per year to be developed into their future water supplies when developing recommended water management strategies. This is their preferred way of responsibly planning for a growing community.

Table 7-1 lists the identified management supply factors by WUG/MWP for each decade within the planning horizon.

Table 7-1. Water Management Supply Factor by WUG/MWP (acre-feet per year)

				WUG Management Supply Factor (MSF)					
WUG Name	**Largest Volume of Existing Supplies (Ve)**	**Largest Volume of Recommended 2021 WMSs Supplies (Vr)**	**Largest Volume of Water Demand (D)**	**2030**	**2040**	**2050**	**2060**	**2070**	**2080**
Brewster County									
Alpine	4,322	95	3,019	1.5	1.5	1.5	1.5	1.5	1.5
Lajitas Municipal Services	331	51	244	1.6	1.6	1.6	1.6	1.6	1.6
Marathon Water Supply & Sewer Service	242	12	116	2.2	2.2	2.2	2.2	2.2	2.2
Study Butte Terlingua Water System	387	25	341	1.2	1.2	1.2	1.2	1.2	1.2
County-Other	518	0	294	1.8	1.8	1.8	1.8	1.8	1.8
*Mining	52	0	57	0.9	0.9	0.9	0.9	0.9	0.9
Livestock	495	0	495	1.0	1.0	1.0	1.0	1.0	1.0
Irrigation	8,328	0	1,974	4.2	4.2	4.2	4.2	4.2	4.2

Table 7-1. (continued) Water Management Supply Factor by WUG/MWP (acre-feet per year)

WUG Name	Largest Volume of Existing Supplies (Ve)	Largest Volume of Recommended 2021 WMSs Supplies (Vr)	Largest Volume of Water Demand (D)	WUG Management Supply Factor (MSF) 2030	2040	2050	2060	2070	2080
Culberson County									
Van Horn	1,218	0	858	1.4	1.4	1.4	1.4	1.4	1.4
County-Other	70	0	44	1.6	1.6	1.6	1.6	1.6	1.6
Manufacturing	5	0	5	1.0	1.0	1.0	1.0	1.0	1.0
*Mining	4,045	0	10,026	0.4	0.4	0.4	0.4	0.4	0.4
Livestock	359	0	294	1.2	1.2	1.2	1.2	1.2	1.2
*Irrigation	37,682	440	55,482	0.7	0.7	0.7	0.7	0.7	0.7
El Paso County									
Anthony	1,847	3,760	932	6.0	6.0	6.0	6.0	6.0	6.0
East Montana Water System	2,810	63	2,810	1.0	1.0	1.0	1.0	1.0	1.0
El Paso County Tornillo WID	629	333	458	2.1	2.1	2.1	2.1	2.1	2.1
El Paso County WCID #4 (Fabens)	1,363	0	1,056	1.3	1.3	1.3	1.3	1.3	1.3
El Paso Water (City of El Paso ***only)***	131,000	73,420	130,883	1.6	1.6	1.6	1.6	1.6	1.6
Federal Correctional Institution La Tuna	2,017	0	370	5.5	5.5	5.5	5.5	5.5	5.5
*Fort Bliss and East Biggs Water Systems	5,503	0	6,966	0.8	0.8	0.8	0.8	0.8	0.8
Haciendas Del Norte WID	306	19	294	1.1	1.1	1.1	1.1	1.1	1.1
*Horizon Regional MUD	6,406	17,559	10,376	2.3	2.3	2.3	2.3	2.3	2.3
*Lower Valley WD (Socorro, Clint, San Elizario)	4,356	29,921	7,780	4.4	4.4	4.4	4.4	4.4	4.4
Paseo Del Este MUD #1	5,647	0	5,647	1.0	1.0	1.0	1.0	1.0	1.0
County-Other	6,678	0	518	12.9	12.9	12.9	12.9	12.9	12.9
Manufacturing	9,532	860	9,493	1.1	1.1	1.1	1.1	1.1	1.1
Mining	2,439	4,251	2,351	2.8	2.8	2.8	2.8	2.8	2.8
Steam Electric Power	8,880	7,260	8,880	1.8	1.8	1.8	1.8	1.8	1.8
Livestock	194	0	194	1.0	1.0	1.0	1.0	1.0	1.0
*Irrigation	128,509	36,713	193,990	0.9	0.9	0.9	0.9	0.9	0.9
Hudspeth County									
Esperanza Water Service	484	0	124	3.9	3.9	3.9	3.9	3.9	3.9
Hudspeth County WCID #1	532	135	520	1.3	1.3	1.3	1.3	1.3	1.3
County-Other	235	111	146	2.4	2.4	2.4	2.4	2.4	2.4
*Mining	61	219	72	3.9	3.9	3.9	3.9	3.9	3.9
*Livestock	526	0	533	1.0	1.0	1.0	1.0	1.0	1.0
*Irrigation	127,828	0	143,072	0.9	0.9	0.9	0.9	0.9	0.9

Table 7-1. (continued) Water Management Supply Factor by WUG/MWP (acre-feet per year)

				WUG Management Supply Factor (MSF)					
WUG Name	Largest Volume of Existing Supplies (Ve)	Largest Volume of Recommended 2021 WMSs Supplies (Vr)	Largest Volume of Water Demand (D)	2030	2040	2050	2060	2070	2080
Jeff Davis County									
Fort Davis WSC	468	388	286	3.0	3.0	3.0	3.0	3.0	3.0
County-Other	233	129	126	2.9	2.9	2.9	2.9	2.9	2.9
Mining	153	0	59	2.6	2.6	2.6	2.6	2.6	2.6
*Livestock	386	0	503	0.8	0.8	0.8	0.8	0.8	0.8
Irrigation	1,433	0	1,225	1.2	1.2	1.2	1.2	1.2	1.2
Presidio County									
Marfa	2,097	0	816	2.6	2.6	2.6	2.6	2.6	2.6
Presidio	2,460	165	640	4.1	4.1	4.1	4.1	4.1	4.1
County-Other	97	0	61	1.6	1.6	1.6	1.6	1.6	1.6
*Livestock	490	0	492	1.0	1.0	1.0	1.0	1.0	1.0
Irrigation	12,699	0	7,350	1.7	1.7	1.7	1.7	1.7	1.7
Terrell County									
Terrell County WCID #1	476	0	131	3.6	3.6	3.6	3.6	3.6	3.6
County-Other	43	0	19	2.3	2.3	2.3	2.3	2.3	2.3
Mining	141	0	132	1.1	1.1	1.1	1.1	1.1	1.1
Livestock	183	0	183	1.0	1.0	1.0	1.0	1.0	1.0
*Irrigation	905	0	956	0.9	0.9	0.9	0.9	0.9	0.9

Note: WUG with a projected water need/deficit (*)

Table 7-2 below lists the water user groups most likely associated with measures that may provide some additional water supply capacity in the event of a near-term DWDOR. The table is divided into two parts: (1) key assumptions, analyses, strategies, and projects that are already incorporated directly into this *Plan*, which provide recommendations that go beyond just meeting identified water needs anticipated during drought of record conditions, and (2) potential additional types of measures and responses that are not part of the recommendations in this *Plan*, but that would likely be available to certain water providers/users in the event of the near-term onset of a DWDOR and that would be capable of providing additional, potential capacity for those water providers and user to withstand a DWDOR.

The FWTWPG is considering stream restoration as a future drought adaptation strategy. Stream restoration reconnects annual flows to floodplains and increases distributed natural storage of groundwater. These strategies have the added benefit of attenuating flood flows. Currently, there are several groups within Brewster and Presidio Counties that are engaged in stream restoration, some at the watershed scale. These types of projects can be described as “managed recharge”.

Table 7-2. WUGs/WWPs Most Likely Associated with Measures of Additional Water Supply During Drought Worse Than Drought-of-Record

		Included in the adopted RWP											Measures that may be available beyond the recommended strategies identified in the adopted RWP								
		Built-in conservative modeling or other assumptions						Additional recommendations for additional supplies beyond those needed to meet needs					Demand-management measures				Water supply measures				
WUG/WWP Name	Applicable water supplies	1-year safe yield used in surface water modeling	Utilizing MAG based upon a DFC developed under drought conditions	No return flows	Maximum permitted amounts	90% of Hueco total from Hutchison model plus 25,000 acre-feet from Mesilla	10% of Hueco total from Hutchison model	Certain WMSs include 'management supply'	Other	Other	Other	Other	Implement drought management (not a recommended WMS)	Drought adaptation strategies that focus on stream restoration that reconnects annual flows to floodplains & increases distributed natural storage of groundwater	Other	Other	Implement recommended GW WMSs but earlier than shown in the plan	Pursue new direct potable reuse to extend existing supplies	Pursue new brackish desalination	Other	Other
Alpine	Igneous Aquifer		▪					▪					▪	▪							
Lajitas Municipal Services	Brewster Cretaceous (other aquifer)		▪					▪					▪	▪			▪				
Marathon WSSS	Marathon Aquifer		▪					▪					▪	▪			▪				
Study Butte Terlingua Water System	Brewster Cretaceous (other aquifer)		▪					▪					▪	▪			▪				
City of Van Horn	West Texas Bolson Aquifer		▪					▪					▪								

Table 7-2. (continued) WUGs/WWPs Most Likely Associated with Measures of Additional Water Supply During Drought Worse Than Drought-of-Record

		Included in the adopted RWP											Measures that may be available beyond the recommended strategies identified in the adopted RWP								
		Built-in conservative modeling or other assumptions						Additional recommendations for additional supplies beyond those needed to meet needs					Demand-management measures				Water supply measures				
WUG/WWP Name	Applicable water supplies	1-year safe yield used in surface water modeling	Utilizing MAG based upon a DFC developed under drought conditions	No return flows	Maximum permitted amounts	90% of Hueco total from Hutchison model plus 25,000 acre-feet from Mesilla	10% of Hueco total from Hutchison model	Certain WMSs include 'management supply'	Other	Other	Other	Other	Implement drought management (not a recommended WMS)	Drought adaptation strategies that focus on stream restoration that reconnects annual flows to floodplains & increases distributed natural storage of groundwater	Other	Other	Implement recommended GW WMSs but earlier than shown in the plan	Pursue new direct potable reuse to extend existing supplies	Pursue new brackish desalination	Other	Other
Anthony	Hueco-Mesilla Bolson Aquifer		▪					▪					▪				▪				
East Montana Water System	Hueco-Mesilla Bolson Aquifer		▪					▪					▪				▪		▪		
El Paso County Tornillo WID	Hueco-Mesilla Bolson Aquifer		▪					▪					▪				▪		▪		
El Paso WCID #4 (Fabens)	Hueco-Mesilla Bolson Aquifer		▪					▪					▪						▪		
El Paso Water	Blended Supply					▪		▪					▪				▪		▪		

Table 7-2. (continued) WUGs/WWPs Most Likely Associated with Measures of Additional Water Supply During Drought Worse Than Drought-of-Record

		Included in the adopted RWP											Measures that may be available beyond the recommended strategies identified in the adopted RWP								
		Built-in conservative modeling or other assumptions						Additional recommendations for additional supplies beyond those needed to meet needs					Demand-management measures				Water supply measures				
WUG/WWP Name	Applicable water supplies	1-year safe yield used in surface water modeling	Utilizing MAG based upon a DFC developed under drought conditions	No return flows	Maximum permitted amounts	90% of Hueco total from Hutchison model plus 25,000 acre-feet from Mesilla	10% of Hueco total from Hutchison model	Certain WMSs include 'management supply'	Other	Other	Other	Other	Implement drought management (not a recommended WMS)	Drought adaptation strategies that focus on stream restoration that reconnects annual flows to floodplains & increases distributed natural storage of groundwater	Other	Other	Implement recommended GW WMSs but earlier than shown in the plan	Pursue new direct potable reuse to extend existing supplies	Pursue new brackish desalination	Other	Other
Federal Correctional Institution La Tuna	Hueco-Mesilla Bolson Aquifer					▪		▪					▪						▪		
Haciendas Del Norte WID	Hueco-Mesilla Bolson Aquifer					▪		▪					▪				▪		▪		
Horizon Regional MUD	Hueco-Mesilla Bolson Aquifer					▪		▪					▪				▪		▪		
Lower Valley Water District	Hueco-Mesilla Bolson Aquifer					▪		▪					▪				▪		▪		
Paseo Del Este MUD 1	Hueco-Mesilla Bolson Aquifer					▪		▪					▪						▪		

Table 7-2. (continued) WUGs/WWPs Most Likely Associated with Measures of Additional Water Supply During Drought Worse Than Drought-of-Record

		Included in the adopted RWP											Measures that may be available beyond the recommended strategies identified in the adopted RWP								
		Built-in conservative modeling or other assumptions						Additional recommendations for additional supplies beyond those needed to meet needs					Demand-management measures				Water supply measures				
WUG/WWP Name	Applicable water supplies	1-year safe yield used in surface water modeling	Utilizing MAG based upon a DFC developed under drought conditions	No return flows	Maximum permitted amounts	90% of Hueco total from Hutchison model plus 25,000 acre-feet from Mesilla	10% of Hueco total from Hutchison model	Certain WMSs include 'management supply'	Other	Other	Other	Other	Implement drought management (not a recommended WMS)	Drought adaptation strategies that focus on stream restoration that reconnects annual flows to floodplains & increases distributed natural storage of groundwater	Other	Other	Implement recommended GW WMSs but earlier than shown in the plan	Pursue new direct potable reuse to extend existing supplies	Pursue new brackish desalination	Other	Other
Esperanza Water Service	Hueco-Mesilla Bolson Aquifer						▪	▪					▪								
Hudspeth County WCID 1	West Texas Bolson Aquifer		▪					▪					▪				▪				
Fort Davis WSC	Igneous Aquifer		▪					▪					▪				▪				
City of Marfa	Igneous Aquifer		▪					▪					▪								
City of Presidio	West Texas Bolson Aquifer		▪					▪					▪				▪				
Terrell County WCID 1 (Sanderson)	ETP, PV & Trinity Aquifers		▪					▪					▪						▪		

7.3 CURRENT DROUGHT PREPARATIONS AND RESPONSE

As mandated by 31 TAC 357.42(a)&(b), this section of the *Plan* summarizes and assesses all preparations and Drought Contingency Plans (DCPs) that have been adopted by utilities and Groundwater Conservation Districts (GCDs) within the Far West Texas Region. The summary includes what specific triggers are used to determine the onset of each defined drought stage and the associated response actions developed by local entities to decrease water demand during the drought stage.

Because of the range of conditions that affected the more than 4,000 water utilities throughout the State in 1997, the Texas Legislature directed the TCEQ to adopt rules establishing common drought plan requirements for water suppliers. Thus, TCEQ requires all wholesale public water providers, retail public water suppliers serving 3,300 connections or more, and irrigation districts to submit DCPs every five years. The deadline for these plans to be submitted to TCEQ was May 1, 2024. In addition, many GCDs also have DCPs that provide education and voluntary action recommendations.

Wholesale water providers and retail public water suppliers serving less than 3,300 connections are required to prepare and adopt updated DCPs. Plans are required to be made available for inspection upon request but are not required to be submitted to the TCEQ. Guidelines as to what should be included in each DCP can be found on TCEQ's website.

DCPs are intended to establish criteria to identify when water supplies may be threatened and the actions that should be taken to ensure these potential threats are minimized. A common feature of DCPs is a structure that allows increasingly stringent drought response measures to be implemented in successive stages as water supply decreases and water demand increases. This measured or gradual approach allows for timely and appropriate action as a water shortage develops. The onset and termination of each implementation stage should be defined by specific "triggering" criteria. Triggering criteria are intended to ensure that: (1) timely action is taken in response to a developing situation, and (2) the response is appropriate to the level of severity of the situation. Each water-supply entity is responsible for establishing its own DCP that includes appropriate triggering criteria and responses.

Figure 7-1 illustrates that drought conditions during this current planning period (2021 - 2025) were more severe than during the previous planning period (2016 - 2020). As a result, water utilities and conservation districts implemented stringent measures during this recent period. Most entities declared severe or critical stages of drought throughout the warmer/dryer part of the year and escalating to moderate drought declarations during the dryer than normal summer months of 2024.

7.3.1 Drought Response Triggers

Drought response triggers should be specific to each water supplier and should be based on an assessment of the water user's vulnerability. In some cases, it may be more appropriate to establish triggers based on a supply source volumetric indicator such as a lake surface elevation or an aquifer static water level. Similarly, triggers might be based on supply levels remaining in an elevated or ground storage tank within the water distribution system; this is not a recommended approach, as the warning of supply depletion would be only three to four days. Triggers based on demand levels can also be effective, if the demands are very closely and frequently monitored. Whichever method is employed, trigger criteria should be defined on well-established relationships between the benchmark and historical experience. If historical observations have not been made, then common sense must prevail until such time that more specific data can be presented.

7.3.2 Surface Water Triggers

Surface water sources are among the first reliable indicators of the onset of hydrologic drought. The annual allotment of Rio Grande Project water is determined by the U.S. Bureau of Reclamation (USBR) based on the amount of usable water in storage in Elephant Butte and Caballo Reservoirs. Based on the amount of storage remaining in Elephant Butte and Caballo Reservoirs at the end of the primary irrigation season (early- to mid-October), the USBR determines the amount of water that will be delivered the following year. In general, a one-year drought in the Upper Rio Grande drainage basin will have little effect on overall storage in the reservoirs. However, a long-term drought would have a significant effect on water releases downstream. Downstream users, both irrigation and municipal, are thus aware in advance of coming surface water-supply shortages and can react accordingly.

The City of El Paso's Drought Contingency Plan (2024) is administered through EPWater and is based on four Drought Stages and one Emergency Event Stage: (1) The criteria for initiation of Stage 1 Drought is when water demand has reached or exceeded 85 percent of delivery capacity for four consecutive days; (2) Stage 2 Drought is initiated when water demand has reached or exceeded 90 percent of delivery capacity for three consecutive days; (3) Stage 3 Drought occurs when water demand has reached or exceeded 95 percent of delivery capacity for two consecutive days, and (4) Stage 4 Drought is the same criteria as Stage 3 but for five consecutive days. A water Emergency Event may be declared based on a water system failure due to weather, electrical or mechanical failure or contamination of source. Once any stage is declared, the General Manager of EPWater can implement a variety of response measures designed to conserve water. These range from use restrictions to citations for noncompliance.

Most of the other communities in El Paso County receive their water supplies from EPWater or from other water-supply entities including the Horizon Regional MUD, El Paso County WCID No.4, and the Lower Valley Water District. Because of their reliance on supply provided by EPWater, the Lower Valley Water District drought contingency triggers and responses are like the triggers and responses developed by EPWater. The other wholesale water providers rely on groundwater, which is discussed under the following Groundwater Triggers section.

Irrigation districts depend on runoff from watersheds in the Upper Rio Grande drainage basins of New Mexico and southern Colorado to provide surface water to support irrigation in El Paso and Hudspeth Counties. Hence, drought triggers for the EPCWID #1 and the Hudspeth County Conservation and Reclamation District No.1 (HCCRD #1) are established based on storage levels in Elephant Butte and Caballo Reservoirs, which are in turn dependent on meteorological and hydrological conditions in these watersheds.

Drought conditions, which impact the EPCWID #1, are those that affect the headwaters of the Rio Grande and its tributaries, such that Rio Grande Compact water deliveries into Elephant Butte Reservoir are reduced. The District's board of directors determines when a drought exists and establishes the yearly delivery allotment to its water users based on its diversion allocation from the USBR. Generally, when water storage in Elephant Butte Reservoir is less than 0.9 million acre-feet during the irrigation season (March through September), the USBR declares drought conditions and sets its diversion allocations (using the D1 and D2 curves) to the irrigation districts based on a delivery allotment of less than its normal (non-drought) three acre-feet per acre. During times of drought, the District will lower its delivery allotment based on the amount of its reduced diversion allocation from the USBR and its delivery commitments to its users. The extent of the reductions in the water allotments will be dependent on the severity of the drought conditions and will remain in effect until the conditions that triggered the drought contingency no longer exist.

The HCCRD #1 bases drought contingency planning on evaluation of the water supply projected and received by the EPCWID #1, since all waters received by HCCRD #1 are return flows and operational spills for El Paso County. Since conditions, to a degree, can be predicted prior to a crop season, the drought mitigation plan largely affects agricultural producers cropping plan. When a mild or moderate predicted shortage occurs, the HCCRD #1 will notify its clientele of the amount of the expected shortage. For a severe shortage, where the water supply will provide less than 50 percent of the expected demand, agricultural producers will be asked to prioritize their water requests based upon crop needs.

Water in the Lower Rio Grande segment is used principally for irrigation, recreation, and environmental needs. A drought trigger for this segment of the river is based on flows of less than 34,231 acre-feet. The TCEQ Rio Grande Watermaster administers the allocation of Texas' share of the international water and is responsible for informing water-rights users of expected diversions during drought years.

7.3.3 Groundwater Triggers

Groundwater triggers that indicate the onset of drought in Far West Texas are not as easily identifiable as relative to surface-water triggers. This is attributable to (1) the rapid response of stream discharge and reservoir storage to short-term changes in climatic conditions within a region and within adjoining areas where surface drainage originates, and (2) the typically slower response of groundwater systems to recharge processes. Although climatic conditions over a period of one or two years might have a significant impact on the availability of surface water, aquifers of the same area might not show comparable levels of response for much longer periods of time, depending on the location and size of recharge areas in a basin, the distribution of precipitation over recharge areas, the amount of recharge, and the extent to which aquifers are developed and exploited by major users of groundwater.

Several groundwater basins are identified in Chapter 3 as aquifers that will likely not experience consistent water-level decline, based on comparisons between projected demand, recharge and storage. In these areas, water levels might be expected to remain constant or relatively constant over the 2030 to 2080 planning period. Because of minimal water-level changes in these aquifers, water levels are not recommended as a drought-condition trigger. Atmospheric conditions are a better indicator for these areas.

Basins that do not receive enough recharge to offset natural discharge and pumpage may be depleted of groundwater (e.g., mined). The rate and extent of groundwater mining are related to the timeframe and the extent to which withdrawals exceed recharge. In such basins, water levels may fall over long periods of time, eventually reaching a point at which the cost of lifting water to the surface becomes uneconomic. Thus, water levels in such areas may not be a satisfactory drought trigger. Instead, communities might consider the rate at which water levels decline in response to increased demand during drought as a sufficient indicator.

Water levels in observation wells in and adjacent to municipal wellfields, especially where wells are completed in aquifers that respond relatively quickly to recharge events, may be established as drought triggers for municipal utilities in the future providing a sufficient number of measurements are made annually to establish a historical record. Water levels below specified elevations for a pre-determined period might be interpreted to be reasonable groundwater indicators of drought conditions. Until such historical water-level trends are established, municipal utilities will likely continue to depend on demand as a percentage of production capacity as their primary drought trigger. Twelve water-supply entities were listed in Table 6-1 in the 2011 Plan. Drought triggers of all entities are structured around system production capacity and daily demand, except for El Paso, which is structured upon surface-water allotment stages. None of the entities used groundwater triggers. However, while most of the entities rely on a system capacity trigger of some kind, they also have groundwater wells that they pump from and monitor.

7.3.4 System Capacity Triggers

Because of the above-described problems with using water levels as drought-condition indicators, several municipal water-supply entities in the Far West Texas Region that rely on groundwater generally establish drought-condition triggers based on levels of demand that exceed a percentage of the systems production capacity. Alpine, Van Horn (and Sierra Blanca), Anthony, Vinton, Horizon Regional MUD (Horizon City), Dell City, Fort Davis WSC (Fort Davis), Marfa, Presidio, and Terrell County WCID #1 (Sanderson) have adopted system capacity triggers. Several entities have drought responses triggered when daily water demand exceeds 75 percent of production capacity.

El Paso (EPWater) receives surface water allocations from the local irrigation district, El Paso County Water Improvement District No.1 (EPCWID#1) via the Rio Grande Project. Currently, El Paso has water rights to about 65,000 ac-ft/yr. EPWater initiates the various drought triggers based on the amount of surface water being provided by the EPCWID #1 as described in Section 7.3.2 above.

7.3.5 Municipal and Wholesale Water Provider Drought Contingency Plans

The TCEQ requires all retail public water suppliers serving 3,300 connections or more and wholesale public water providers to submit a drought contingency plan as a way to prepare and respond to water shortages. The amended *Title 30, Texas Administrative Code, Chapter 288* became effective on December 6, 2012, addressing TCEQ's guidelines and plan requirements. The forms for wholesale public water providers, retail public water suppliers and irrigation districts are available on the TCEQ's website.

Drought contingency plans for municipal uses by public water suppliers must document coordination with the regional water planning groups to ensure consistency with the regional water plans. The following entities have prepared drought contingency plans which are accessible at the specified websites:

- City of Alpine.
- City of Van Horn.
- Town of Anthony.
- City of El Paso.
- El Paso County Tornillo WID.
- El Paso County WCID #4 (Fabens).
- Fort Bliss and East Biggs.
- Horizon Regional MUD.
- Lower Valley Water District.
- City of Clint (drought plan same as LVWD).
- City of San Elizario (drought plan same as LVWD).
- City of Socorro (drought plan same as LVWD).
- City of Vinton (drought plan same as EPWater).
- Fort Davis WSC.
- City of Marfa.
- City of Presidio.
- Terrell County WCID #1.

A list of entities, their supply source, specific triggers, and actions for each drought stage is provided in Table 7-3.

Table 7-3. Municipal Mandated Drought Triggers and Actions

Water Supply Entity	Water Supply Source	Drought Trigger	Drought Stage and Response				
			Mild	Moderate	Severe	Critical	Emergency
City of Alpine	Igneous (Merriweather #1 & #2 wells)	Demand-based triggers include the following components: 1) percent of water treatment capacity, 2) total daily demand as percent of pumping capacity, 3) storage capcity and 4) well pump run time.	Demand reaches 90% of production capacity; system failure that would limit the capacity of the system below 85% during peak demand periods.	Demand reaches 95% of production capacity; system failure that would limit the capacity of the system below 75% during peak demand periods.	Demand reaches 100% of production capacity; system failure that would limit the capacity of the system below 70% during peak demand periods.	Extended period of severe condition or any natural catastrophic situation.	N/A
			Reduced watering of public places. Additionally, voluntary lawn watering schedule and water reductions of major commercial water users.	Mandatory - lawn watering schedule instated, water for public use limited to essential practices	Mandatory - prohibit use of water for outdoor activities, water consumption limits with monetary fines for noncompliance.	N/A	N/A
City of El Paso (EPWater)	Hueco-Mesilla Bolson, Rio Grande River	Surface water allotment from El Paso Co. WID #1; system capacity limits.	Water demand has reached or exceeded 85% of delivery capacity for 4 consecutive days.	Water demand has reached or exceeded 90% of delivery capacity for 3 consecutive days.	Water demand has reached or exceeded 95% of delivery capacity for 2 consecutive days.	Water demand has reached or exceeded 95% of delivery capacity for 5 consecutive days.	Water demand exceeds a reduced delivery capacity for all or part of the system, or the water line breaks/systems failure, or contamination of the water supply source
			Voluntary - 10% reduction in total gallons per capita per day (GPCD).	Voluntary - 15% reduction in total GPCD for residential and commercial customers. Mandatory - reduce non-essential water consumption by 15% for city, county, and institutional customers for non-essential water uses.	Mandatory - 15% reduction in total GPCD	Mandatory - 20% reduction in total GPCD	Mandatory - restrictions on non-essential water uses, dependent on nature of emergency.

Table 7-3. (continued) Municipal Mandated Drought Triggers and Actions

Water Supply Entity	Water Supply Source	Drought Trigger	Drought Stage and Response				
			Mild	Moderate	Severe	Critical	Emergency
City of Marfa	Igneous	Base on water supply and/or demand conditions.	Demand exceeds 90% of production capacity for 3 consecutive days; system disruption occurs that limits the capacity of the system below 85% during peak demand periods.	Demand exceeds 95% of production capacity for 3 consecutive days; system disruption occurs that limits the capacity of the system below 75% during peak demand periods.	Demand exceeds 98% of production capacity for 3 consecutive days; system disruption occurs that limits the capacity of the system below 70% during peak demand periods.	Extended period of severe condition or any natural catastrophic situation.	N/A
			Voluntary- reduce water demand by 1-5%.	Reduce water demand by 5-10%.	Reduce water demand by10-15%.	Reduce water demand by15-20%.	Reduce water usage as deemed necessary.
City of Presidio	West Texas Bolson	Base on system capacity limits.	Total daily water demand equals or exceeds 2 million gallons on a single day.	Total daily water demand equals or exceeds 2 million gallons for 3 consecutive days.	Total daily water demand equals or exceeds 2 million gallons for 7 consecutive days.	Total daily water demand equals or exceeds 2 million gallons for 14 consecutive days.	Major system failures or supply contamination.
			Voluntary- reduce water use below 2 million gallons per day.	Mandatory- reduce water use below 2 million gallons per day.	Mandatory- reduce water use below 2 million gallons per day by restricting non-essential water use.	Mandatory- reduce water use below 2 million gallons per day by restricting irrigation of landscaped areas.	Mandatory- reduce water use below 2 million gallons per day by allocating water according to the water allocation plan.
City of Van Horn	West Texas Bolson	Demand exceeds production or storage capability measured over a 24-hr. period, and refilling the storage facilities is rendered impossible, or extreme drought causing normal use patterns to deplete water levels.	Triggers were not provided in the DCP	Triggers were not provided in the DCP	Triggers were not provided in the DCP	Demand exceeds 80% of production capacity.	Demand exceeds 90% of production capacity.
			Voluntary- reduce water use.	Limit water usage determined by the plant's capability to provide continuous service in direct proportion to the loss of production/refill capability of the storage facility.	All outdoor water usage is prohibited.	Allocate water: a fixed percentage of each customer's average use in the prior month or a max number of gallons per week.	All uses of public water supply will be banned except in cases of emergency.

Table 7-3. (continued) Municipal Mandated Drought Triggers and Actions

Water Supply Entity	Water Supply Source	Drought Trigger	Drought Stage and Response				
			Mild	Moderate	Severe	Critical	Emergency
El Paso County Tornillo WID	Hueco-Mesilla Bolson	Based on system capacity limits and known water levels in the groundwater well(s).	Customers shall be requested to voluntarily conserve water.	Treated water reservoir levels do not fill above 70% overnight.	Treated water reservoir levels do not fill above 50% overnight and/or static water level in the EPCTWID well is less than previous month.	EPCTWID well capacity is equal to or less than 80% of the well's original specific capacity.	Major system failures or supply contamination.
			Voluntary- reduce water demand by 3%.	Reduce water demand by 10%.	Reduce water demand by 30%.	Reduce water demand by 40%.	Reduce water demand by 50%.
El Paso County WCID #4	Hueco-Mesilla Bolson	Base on system capacity limits.	Average daily water use reaches 80% for 3 consecutive days.	Average daily water use reaches 90% for 3 consecutive days.	Average daily water use reaches 100% for 3 consecutive days.	Failure of system components is reduced to only one well.	Major system failures or supply contamination.
			Voluntary- reduce water demand by 15%.	Reduce water demand by 25%.	Reduce water demand by 50%.	Reduce water demand by 75%.	Reduce water demand by 75%.
Fort Bliss	Hueco-Mesilla Bolson	Base on system capacity limits.	N/A	When average daily water demand for at least a two-day period is found to exceed 90% (but less than 95%) of available capacity	When average daily water demand for at least a two-day period is found to exceed 95% (but less than 100%) of available capacity.	When average daily water demand for at least a two-day period is found to exceed 100% of available capacity.	Major system failures or supply contamination.
			N/A	Achieve a 20 percent reduction in indoor and outdoor water use.	Achieve a 30 percent reduction in indoor and outdoor water use.	Achieve a greater than 40 percent reduction in indoor and outdoor water use.	Achieve a greater than 50 percent reduction in water use.
Fort Davis WSC	Igenous	Base on system capacity limits.	Annually, May 1 through August 31	Total daily water demand ranges from 60-70% of production capacity.	Total daily water demand exceeds 75% of production capacity.	Total daily water demand exceeds 75% of production capacity for more than 5 consecutive days.	Major system failures or supply contamination.
			Raise public awareness of need to conserve water on a continuing basis.	Reduce water demand by 60% for 3 consecutive days.	Reduce water demand by 75% for 4 consecutive days.	Reduce water demand by 75% for 4 consecutive days.	Reduce water demand by less than 75% for 3 consecutive days.

Table 7-3. (continued) Municipal Mandated Drought Triggers and Actions

Water Supply Entity	Water Supply Source	Drought Trigger	Drought Stage and Response				
			Mild	Moderate	Severe	Critical	Emergency
Horizon Regional MUD	Hueco-Mesilla Bolson	Base on system capacity limits and water levels in District's well(s).	Total daily water demands reach 80% of the District's capacity for 5 consecutive days.	Total daily water demands reach 90% of the District's capacity for 5 consecutive days.	Demand equals or exceeds 95% of the District's capacity for 3 consecutive days.	Demand meets 100% of capacity for 3 consecutive days.	Major system failures or supply contamination.
			Voluntary- reduce water demand by 10%.	Mandatory- reduce water demand by 15%.	Reduce water usage to a point the District can revert to the previous stage and continue to reduce usage until 20% reduction is secured.	Reduce water usage to a point the District can revert to the previous stage and continue to reduce usage until 25% reduction is secured.	Water rationing may be put into effect.
Hudspeth County WCID #1 (Sierra Blanca)	West Texas Bolson	Based on the District's two elevated ground storage tank recharge rates and the operating conditions of the Van Horn water supply pipeline.	Storage tanks are unable to recover to full capacity over a 24-hour period.	Storage tanks are unable to recover to full capacity over a 120-hour period.	N/A	Water shortage conditions threaten public health, safety, and welfare	
			Voluntary - reduce water use	Mandatory - Reduce and maintain daily water demand at or below 90% of system capacity	Mandatory - Reduce and maintain daily water demand at or below 90% of system capacity	Mandatory - water allocation	
Lower Valley Water District	Hueco-Mesilla Bolson	Based on reductions in surface water allotment from the Rio Grande Federal Reclamation Project to water coming from El Paso Water or as a result of the inability to satisfy system water demands for any other reason.	Surface water allotment less than 0.5 acre-ft./acre; or water demand is projected to exceed available capacity as determined by El Paso Water.	Surface water allotment less than 1.0 acre-ft./acre; or water demand is projected to exceed available capacity projected by LVWD.	Surface water allotment less than 1.5 acre-ft./acre; or water demand is projected to exceed available capacity projected by LVWD.	N/A	Major system failures or supply contamination.
			Voluntary reduction of water use of 25% both indoor and outdoor use	Voluntary reduction of water use of 25% both indoor and outdoor use	All non-essential water use is prohibited.	N/A	Water rationing may be put into effect.

Table 7-3. (continued) Municipal Mandated Drought Triggers and Actions

Water Supply Entity	Water Supply Source	Drought Trigger	Drought Stage and Response				
			Mild	Moderate	Severe	Critical	Emergency
Terrell County WCID #1 (Sanderson)	Edwards-Trinity (Plateau)	Base on system capacity limits.	Daily water demand reaches or exceeds 80% of the system's capacity for 5 consecutive days.	Daily water demand reaches or exceeds 90% of the system's capacity for 5 consecutive days.	Daily water demand reaches or exceeds 100% of the system's capacity for 2 consecutive days.	N/A	N/A
			Inform the public.	All non-essential water use is prohibited.	Prohibit outside water use.	N/A	N/A
Town of Anthony	Hueco-Mesilla Bolson	Base on system capacity limits.	Daily water demand exceeds 90% of the system's capacity for 3 consecutive days; equipment or system failure occurs that limits the capacity of the system below 85% during high demand periods.	Daily water demand exceeds 90% of the system's capacity for 3 consecutive days; equipment or system failure occurs that limits the capacity of the system below 75% during high demand periods.	Daily water demand exceeds 98% of the system's capacity for 3 consecutive days; equipment or system failure occurs that limits the capacity of the system below 70% during high demand periods.	N/A	Major system failures or supply contamination.
			Voluntary- reduce water demand by 1-5%	Reduce water demand by 5-10%	Reduce water demand by 10-15%	N/A	Water rationing may be put into effect.

7.3.6 Groundwater Conservation District Drought Management

A discussion of the creation and the goals of the six GCDs formed in Far West Texas are discussed in more detail in Chapter 5, Section 5.3. This section will focus on summarizing drought management by the Districts.

Six districts are currently in operation within the planning region:

- Brewster County GCD.
- Culberson County GCD.
- Hudspeth County UWCD #1.
- Jeff Davis County UWCD.
- Presidio County UWCD.
- Terrell County GCD.

Groundwater Conservation Districts are required to define management goals that specifically address drought conditions within their groundwater management plans. These are delineated via management objectives and performance standards.

Brewster County Groundwater Conservation District

Management Objective – File and discuss at each meeting of the Board, drought emergency contingency plans received since the previous meeting.

The District, in partnership with the landowners of the District, hopes to monitor changing storage conditions of groundwater due to drought conditions.

Culberson County Groundwater Conservation District

Management Objective – The District will monitor the PDSI and the TWDB drought page and report findings and actions to the District Board on a quarterly basis. If the PDSI indicates that the District will experience severe drought conditions, the District will notify all public water suppliers within the District.

Hudspeth County Underground Water Conservation District No. 1

Management Objective – The annual amount of groundwater permitted by the District for withdrawal from the portion of the Bone Spring-Victorio Peak aquifer located within the District may be curtailed during periods of extreme drought in the recharge zone of the aquifer or because of other conditions that cause significant declines in groundwater levels. Such curtailment may be triggered by the District's Board based on the groundwater levels measured in the District's monitoring well(s).

Jeff Davis County Underground Water Conservation District

Management Objective – The District will monitor the PDSI and report to the Board, the number of times the District experiences PDSI of less than one (mild drought). If PDSI indicates that the District will experience severe drought conditions, the District will notify all public water suppliers within the District.

Presidio County Underground Water District

Management Objective – The District will monitor the PDSI at least once quarterly. If the PDSI indicates that the District will experience severe drought conditions, the District will notify all public water suppliers within the District.

Terrell County Groundwater Conservation District

Management Objective – The District will access the PDSI map and will check for updates to the Drought Preparedness Council Situation Report and discuss current drought conditions during at least one Board meeting a year.

7.3.7 Description of Current Preparations for Drought in the Region Including Unnecessary or Counterproductive Drought Response

The following discussion is new to the sixth cycle of regional water planning, as it was added late during the fifth cycle by House Bill 807. Within this new subsection, the Region must consolidate and present: (1) a description of how water suppliers in the Region identify and respond to drought conditions (this may include information from local drought contingency plans), and (2) a summary of drought response efforts that the Region has identified as unnecessary or counterproductive.

Table 7-3 is a list of entities, their supply source, specific triggers, and actions for each drought stage found within a total of 17 collected drought contingency plans within the Region. These plans are also accessible at their specified websites. In addition, Section 7.3.6 summarizes drought management by the six GCDs formed within the Far West Texas Region. The information provided within Table 7-3 and Section 7.3.6 informs upon how water suppliers within the Region identify and respond to drought conditions.

The Far West Texas Water Planning Area is comprised mainly of rural communities, where neighboring communities are miles apart, if not often in separate counties. Fort Bliss and El Paso Water are the closest entities in proximity to one another (five miles apart). Fort Bliss receives much of their water supply from El Paso Water through an agreement and has included language in their DCP that aligns with the drought triggers found within the neighboring El Paso Water's DCP. This coordination respects the reduction of surface water allotments from the Rio Grande Federal Reclamation Project to water coming from El Paso Water. If neighboring DCPs were to cause confusion or impede drought response efforts, the FWTWPG agrees that it would be identified first between these two entities, based on their proximity from one another.

However, the planning group has not identified any unnecessary or counterproductive drought responses within the Region between neighboring communities or otherwise. The FWTWPG does not feel that any of the DCPs within the Region cause public confusion or impede any drought response efforts at this time.

7.4 EXISTING AND POTENTIAL EMERGENCY INTERCONNECTS

According to Texas Statute §357.42(d)(e) regional water planning groups are to collect information on existing major water infrastructure facilities that may be used in the event of an emergency shortage of water. Pertinent information includes identifying the potential user(s) of an interconnected facility, the potential supplier(s), the estimated potential volume of supply that could be provided, and a general description of the facility. Texas Water Code §16.053(c) requires more specific information regarding facility locations to remain confidential. This section provides general information regarding existing and potential emergency interconnects among water user groups within Far West Texas.

El Paso Water provides water to several entities (see Chapter 2 Table 2-3) and has the connection to supply additional emergency supplies if needed. Additional water supply is also available to EPWater during an emergency shortage of water via the Desalination Plant and from EPCWID#1 if supply from the Rio Grande is available. Major water infrastructure facilities with the potential to interconnect with other utilities were identified through a survey process to better evaluate existing and potentially feasible emergency interconnects (Table 7-4).

Table 7-4. Existing and Potential Emergency Interconnects to Major Water Facilities

Entity Providing Supply	Entity Receiving Supply
Lower Valley Water District	El Paso WCID #4 Fabens
	El Paso County Tornillo WID
	Horizon Regional MUD
	Clint
EPWater	Town of Anthony
	Lower Valley Water District
	Fort Bliss & East Biggs
	Town of Vinton
	Paseo Del Este MUD #1
	East Montana WS
	Hacienda Del Norte WID
Fort Davis Estates	Fort Davis WSC
El Paso County WID #1	EPWater

7.5 EMERGENCY RESPONSES TO LOCAL DROUGHT CONDITIONS OR LOSS OF MUNICIPAL SUPPLY

Texas Statute §357.42(g) requires regional water planning groups to evaluate potential temporary emergency water supplies for all county-other WUGs and municipalities that have 2030 projected populations less than 7,500 that rely on a sole source of water. The purpose of this evaluation is to identify potential alternative water sources that may be considered for temporary emergency use if the existing water-supply sources become temporarily unavailable due to extreme hydrologic conditions such as emergency water right curtailment, unanticipated loss of reservoir conservation storage, or other localized drought impacts.

This section provides potential solutions that should act as a guide for municipal water users that are most vulnerable in the event of a loss of supply. Entities evaluated for emergency responses to local drought conditions or loss of municipal supply were assumed to have 180 days or less of remaining supply. This review was limited and did not require technical analyses or evaluations following in accordance with 31 TAC §357.34.

There are 17 municipal and county-other entities in the Region that have a 2030 Census population of less than 7,500 and rely upon a sole source of water. Sixteen entities rely on groundwater and one (City of Clint) relies on water purchased from another entity. Potential emergency water-supply sources that might be used by these small sole-source municipal or county-other entities include the following:

- New local groundwater well.
- Emergency interconnect.
- Use of other named local supply.
- Trucked-in water delivery.
- Brackish groundwater limited treatment.
- Brackish groundwater desalination.
- Release from upstream reservoir.
- Curtailment of upstream and/or downstream water rights.

Based upon personal communication with the entities, the addition of a new local groundwater well along with trucking in water was identified by all entities as a potential emergency water supply source. The City of Clint and the City of Presidio would also consider the curtailment of proximal water rights as a feasible option under emergency conditions. The entities along with feasible potential emergency water supply options have been included in Table 7-5.

Table 7-5. Emergency Responses to Local Drought Conditions

Entity						Implementation Requirements									
Water User Group Name	**County**	**2024 Population Served by Water System (per TCEQ)**	**2024 Service Connections (per TCEQ)**	**2030 Population**	**2030 Demand (AF/year)**	**Curtailment of upstream/downstream water rights**	**Additional groundwater well**	**Brackish groundwater limited treatment**	**Brackish groundwater desalination**	**Emergency interconnect**	**Trucked - in water**	**Type of infrastructure required**	**Entity providing supply**	**Other local entities required to participate**	**Emergency agreements already in place**
Alpine	Brewster	6,000	2,980	7,129	3,019		▪				▪				
Anthony	Brewster	5,423	1,193	4,108	858		▪			▪	▪	Pipeline; Truck	EPWater		General
Clint (county-other)	El Paso	Data Not Available		1,356 (2021 Plan)	92 (2021 Plan)	▪	▪			▪	▪	Pipeline; Truck	LVWD; EPWater	LVWD	
East Montana Water System	El Paso	6,513	2,171	14,756	2,583						▪				
El Paso County Tornillo WID	El Paso	3,600	987	3,403	422		▪				▪				
El Paso WCID #4 (Fabens)	El Paso	8,257	2,726	6,132	973		▪				▪				
Esperanza Water Service	Hudspeth	849	283	652	124		▪				▪				
Federal Correctional Institution - La Tuna	El Paso	1,400	170	1,675	370		▪				▪				
Fort Davis WSC	Jeff Davis	1,201	821	945	286		▪			▪	▪	Pipeline; Truck	Fort Davis Estates		
Haciendas Del Norte WID	El Paso	1,074	358	1,465	272		▪				▪				
Hudspeth County WCID 1	Hudspeth	2,045	871	1,663	520		▪				▪				
Lajitas Municipal Services	Brewster	942	309	125	244		▪				▪				
Marathon WSSS	Brewster	430	477	374	116		▪				▪				
City of Marfa	Presidio	1,820	1,705	2,814	816		▪				▪				
Paseo Del Este MUD 1	El Paso	36,773	9,677	17,378	5,188						▪				
City of Presidio	Presidio	5,514	2,143	2,279	640	▪	▪				▪	Trucks			

Table 7-5. (continued) Emergency Responses to Local Drought Conditions

Entity						Implementation Requirements									
Water User Group Name	**County**	**2024 Population Served by Water System (per TCEQ)**	**2024 Service Connections (per TCEQ)**	**2030 Population**	**2030 Demand (AF/year)**	**Curtailment of upstream/downstream water rights**	**Additional groundwater well**	**Brackish groundwater limited treatment**	**Brackish groundwater desalination**	**Emergency interconnect**	**Trucked - in water**	**Type of infrastructure required**	**Entity providing supply**	**Other local entities required to participate**	**Emergency agreements already in place**
Terrell County WCID 1 (Sanderson)	Terrell	800	471	477	131		▪				▪	Trucks			
Sierra Blanca (county-other)	Hudspeth	Data Not Available		609 (2021 Plan)	58 (2021 Plan)		▪		▪	▪	▪	Trucks		Hudspeth Co. WCID 1	General
City of Van Horn	Culberson	2,063	1,376	2,312	858		▪				▪	Trucks			
City of Valentine (county-other)	Jeff Davis	190	81	198 (2021 Plan)	28 (2021 Plan)		▪				▪				

In order to qualify for emergency funds that are earmarked for emergency groundwater supply wells, entities must have a drought plan in place and be currently listed as an entity that is limiting water use to avoid shortages. This list is updated weekly by the TCEQ's Drinking Water Technical Review and Oversight Team and can be found on the TCEQ's website.

There is some assistance available through the Texas Department of Agriculture and the Texas Water Development Board. There are requirements, deadlines, and a specific application process. Contact the TWDB by e-mail at Financial_Assistance@twdb.texas.gov, or call 512-463-0991. Contact the Texas Department of Agriculture, Community Development Block Grants, or call 512-463-7476. Funding is limited.

TCEQ offers a variety of resources pertaining to drought, current priority calls, current drought conditions, water conservation and more. Those TCEQ Guidance resources are located on their website.

7.6 REGION-SPECIFIC MODEL DROUGHT RESPONSE RECOMMENDATIONS AND MODEL CONTINGENCY PLANS

As mandated by TAC 357.42(c)&(i), the RWPGs shall develop drought response recommendations regarding the management of existing groundwater and surface water sources in the RWPA designated in accordance with §357.32. The RWPGs shall make drought preparation and response recommendations regarding the development of, content contained within, and implementation of local drought contingency plans. The RWPGs shall develop region-specific model drought contingency plans that shall be presented in the RWP which shall be consistent with 30 TAC Chapter 288 requirements.

Regional drought planning expands the conceptualization and application of drought planning by specific entities to encompass the entire Far West Texas Region. The approach utilized in developing a region-specific drought plan considers the following: (1) all regional groundwater and surface water sources, (2) current drought plans that are being utilized by user entities within the Region, and (3) current monitoring stations within the Region that have evolved since the previous planning cycle.

The goals of this approach are: (1) to gain a comprehensive view of what particular resources are being monitored by entities within the Region, (2) determine which resources are not being monitored, (3) determine which users do not fall under the umbrella of existing DCPs, (4) identify potential monitoring stations with publicly accessible real-time data that currently exist, (5) determine how these data can be utilized for the water user groups that do are not subject to existing DCPs, and ultimately (6) development of a regional model drought contingency plan.

As discussed in Section 7.3, numerous groundwater conservation districts, irrigation districts, municipalities, and various public supply systems have written drought management plans or drought contingency plans and have provided them for inclusion in this *Plan*.

7.6.1 Regional Groundwater Resources and Monitoring

Nine groundwater sources identified within Far West Texas and their contribution to total regional groundwater supply, are:

- Bone Spring-Victorio (12%).
- Capitan Reef Complex (2%).
- Edwards-Trinity (Plateau) (less than 1%).
- Hueco-Mesilla (57%).
- Igneous (1%).
- Marathon (less than 1%).
- Rustler (less than 1%).
- West Texas Bolson (10%).
- Other (16%).

The aquifer contribution to the regional supply calculation is based upon Table 3-1. Water Source Availability. This data is provided by the TWDB for regional planning purposes.

Current drought contingency plans are detailed in Section 7.3.5 and Table 7-3. State well numbers of the monitoring wells used by municipal entities that utilize groundwater triggers are shown in Table 7-6. A map of these locations is included as Figure 7-7.

Table 7-6. Current Municipal Trigger Monitoring Wells

Water Supply Entity	County	Water Supply Source	Well ID
City of Marfa	Presidio	Igneous	51-48-603
City of Marfa	Presidio	Igneous	51-48-602
Terrell County WCID #1	Terrell	Edwards-Trinity (Plateau)	53-53-804
Terrell County WCID #1	Terrell	Edwards-Trinity (Plateau)	53-53-806
Terrell County WCID #1	Terrell	Edwards-Trinity (Plateau)	53-53-809
Terrell County WCID #1	Terrell	Edwards-Trinity (Plateau)	53-53-903

The previous *Far West Texas Water Plans* identified wells that could potentially be used for drought monitoring. Table 7-7 provides a selection of groundwater trigger wells with an updated status and history of measurements.

Table 7-7. RWP Groundwater Trigger Monitoring Wells

Aquifer	County	Well ID	Monitoring Agency	Period of Record & Measurement Count	Current Status
Igneous	Brewster	52-35-709 (Cartwright Well)	TWDB	1958-2024 (100 measurements)	Active
Marathon	Brewster	52-55-106	Registered Driller	2008 (1 measurement)	Inactive
Lobo	Culberson	51-02-903	TWDB	1950-2024 (66 measurements)	Active
Wild Horse	Culberson	47-59-106	TWDB	1953-2024 (64 measurements)	Active
Hueco Bolson	El Paso	49-13-710 (EPWU #67)	City	1968-2009 (50 measurements)	Inactive (plugged in 2009)
Mesilla Bolson	El Paso	49-04-138 (JL-EPWU #117)	USGS	1952-2010 (46 measurements)	Monitoring discontinued in 2010
Rio Grande Alluvium	El Paso	49-04-701	U.S. Bureau of Reclamation	1946-1990 (532 measurements)	Unknown
Bone Spring-Victorio	Hudspeth	48-07-516	TWDB	1966-2024 Recorder well	Active
Ryan Flat	Jeff Davis	51-19-902 (2 Section Well)	TWDB	1955-2024 (61 measurements)	Active
Edwards-Trinity (Plateau)	Terrell	53-53-601	Terrell County WCID #1	1986 (no measurements)	Unknown

The TWDB maintains a component of their website called Water Data for Texas that is a collective of real-time monitoring data from both groundwater wells and reservoir stage-capacity gages. Table 7-8 is a summary of the 12 groundwater wells located within Far West Texas, with their locations included on Figure 7-7.

Table 7-8. Currently Active (Real-Time) Monitoring Wells
Source: Water Data for Texas

County	State Well Number	Aquifer	Aquifer Type	Entity/Cooperator	Data Transmission	Start Date - Period of Record
Brewster	7347404	Other	Unconfined	Texas Water Development Board	Satellite	10/8/2024
Culberson	4759123	Salt Bolson and Cretaceous	Unconfined	Texas Water Development Board	Satellite	10/7/2024
El Paso	4904476	Hueco-Mesilla Bolson	Unconfined	U.S. Geological Survey	Satellite	10/8/2024
El Paso	4913301	Hueco-Mesilla Bolson	Unconfined	Texas Water Development Board	Satellite	9/3/2024
El Paso	4931201	Hueco-Mesilla Bolson	Unconfined	Texas Water Development Board	Cellular	9/30/2024
El Paso	4940104	Hueco-Mesilla Bolson	Unconfined	Texas Water Development Board	Satellite	10/8/2024
Hudspeth	4807516	Bone Spring-Victorio Peak	Unconfined	Texas Water Development Board	Satellite	10/7/2024
Jeff Davis	5225209	Igneous	Unconfined	Texas Water Development Board	Satellite	10/7/2024
Presidio	5129805	West Texas Boslon	Unconfined	Texas Water Development Board	Satellite	10/6/2024
Presidio	5156902	Igenous	Unconfined	Texas Water Development Board	Satellite	10/5/2024
Presidio	5164401	Igenous	Unconfined	Texas Water Development Board	Satellite	10/7/2024
Presidio	5249402	Igenous	Unconfined	Texas Water Development Board	Satellite	10/7/2024

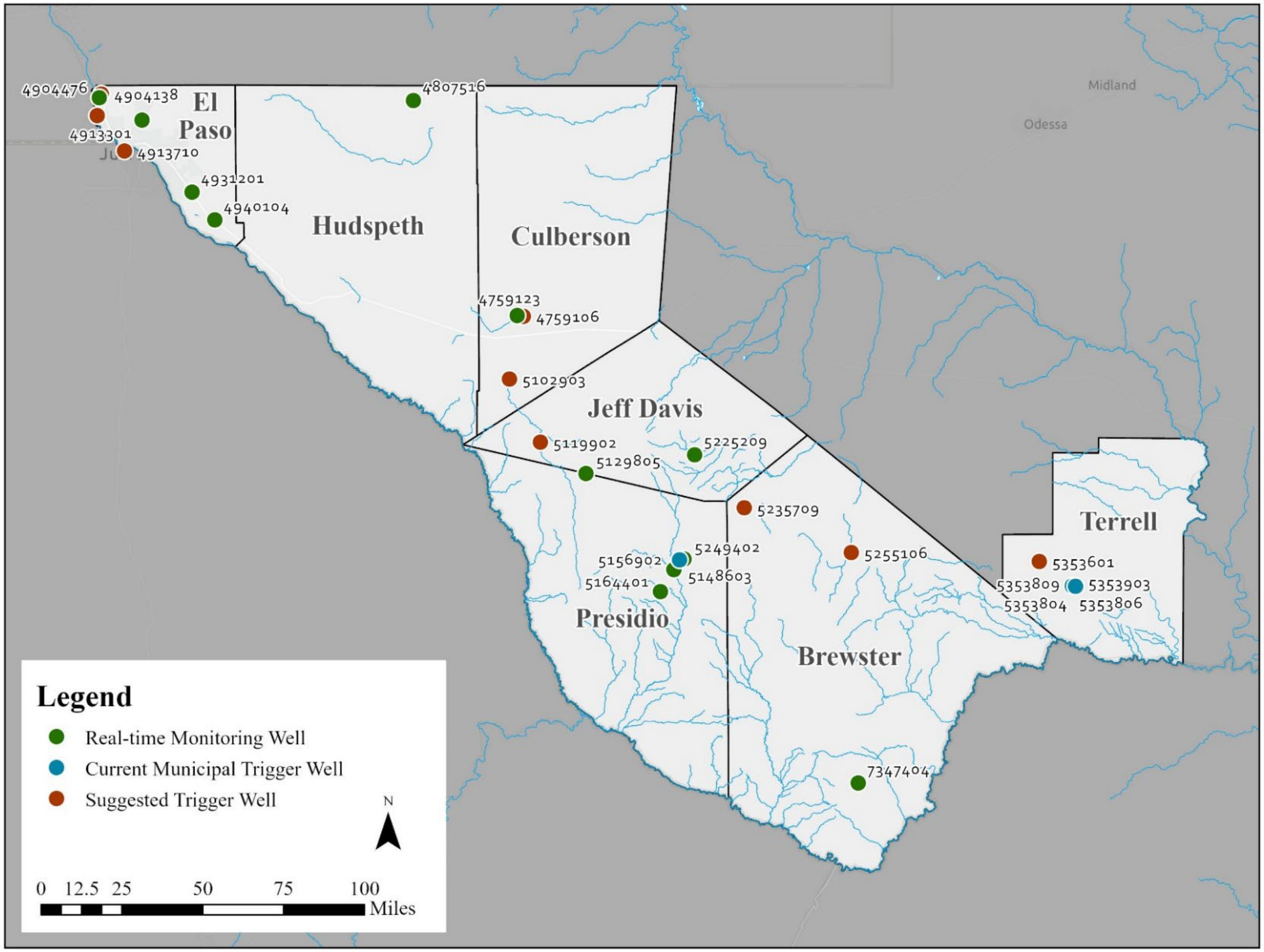


Figure 7-7. Regional Monitoring and Trigger Wells

7.6.2 Regional Surface Water Resources

Surface water sources identified within Far West Texas and their contribution to total regional surface water supply are:

- Rio Grande (99%).
- Pecos River (less than 1%).

The basin contribution to the regional supply calculation is based upon the WAM Run 3 (Full Authorization) availability numbers.

A list of selected currently active stream flow and spring flow and gauging stations are listed in Table 7-9. International Boundary Water Commission (IBWC) and U.S. Geological Survey (USGS) gauging stations located along the Rio Grande between the Rio Conchos and the Pecos River are presented on Figure 7-8. There are five stations that are currently operating in this reach of the Rio Grande. The IBWC and USGS stations have real-time data that is publicly accessible online.

Table 7-9. Currently Active Surface Water Gauging Locations, USGS, IBWC

County	Station ID	Station Name	Agency	Period of Record	Measurement Frequency
Presidio	08-3650.00	Rio Grande below American Dam at El Paso, Texas	IBWC	1938-2024	15 minutes
Presidio	08-3705.00	Rio Grande at Old Fort Quitman, Texas	IBWC	1923-2024	15 minutes
Presidio	08-3712.00	Rio Grande near Candelaria, Texas	IBWC	1976-2024	15 minutes
Presidio	08-3715.00	Rio Grande above Rio Conchos near Presidio, Texas	IBWC	1900-2024	15 minutes
Presidio	08-3742.00	Rio Grande below Rio Conchos near Presidio, Texas	IBWC	1900-2024	15 minutes
Presidio	08-3743.00	Rio Grande below Mulato Dam near Redford, Texas	IBWC	2014-2024	15 minutes
Val Verde	08-4474.10	Pecos River near Langtry, Texas	IBWC	1967-2024	15 minutes
Brewster	08-3745.00	Terlingua Creek near Terlingua, Texas	IBWC	1932-2024	15 minutes
Brewster	08-3750.00	Rio Grande at Johnson Ranch near Castolon, Texas	IBWC	1936-2024	15 minutes
Brewster	08374550	Rio Grande near Castolon, Texas	USGS	2007-2024	Daily
Brewster	08375300	Rio Grande at Rio Grande Village, BBNP, Texas	USGS	2007-2024	Daily
Terrell	08447020	Independence Creek near Sheffield, Texas	USGS	1974-2024	Daily

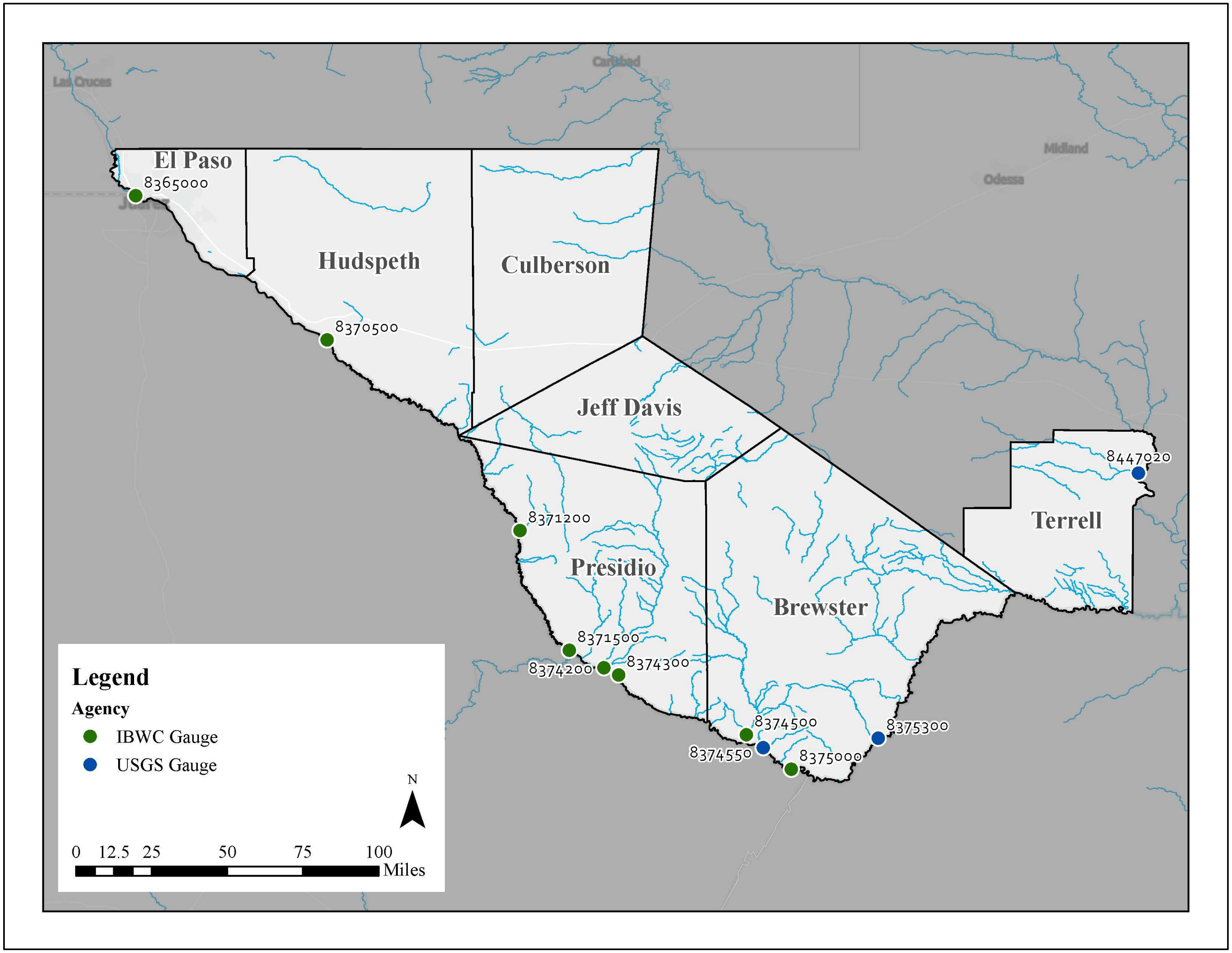


Figure 7-8. Selected Active Surface Water Gaging Locations

7.6.3 Regional Model Drought Contingency Plan

The Regional Model DCP summary Table 7-10 provides an overview of all existing regional water sources, WUGs, monitoring wells, and gaging stations as well as recommended drought triggers and actions. The intent of including the monitoring wells and stations is to provide a comprehensive Region-wide assessment of what current tools are available to WUGs and districts to monitor resources within the Region.

The Regional Model DCP will undoubtedly change over time to address particular needs and issues of the Region's users. The version of the model in this *Plan* will primarily focus on identifying all sources, users and monitoring tools to find the specific components within the Region that are not currently incorporated into any existing drought plan but could potentially utilize existing data resources. Another focus of this model plan will consider consistency of existing plans within the Region. Entities that have adopted drought plans will only be assessed to this end, therefore fine-tuning existing triggers of existing municipal drought plans is not a goal of the model plan beyond an effort toward achieving consistent responses/actions to drought across the Region. No triggers have been recommended for modification; however, an effort has been made to make the percent reduction of demand/use a little more aggressive and more equitable across the board. Additionally, 'voluntary conservation' has been removed as a stage 1 action. Conservation is a Best Management Practice (BMP) that ideally will ultimately be practiced on a daily basis, and not merely as a reaction to drought conditions, therefore it has been removed as an action in the Regional Model DCP.

Smaller PWS entities (county-other), manufacturing, steam-electric power, and irrigation water wells that exceed GCD exempt well-production thresholds are subject to drought actions imposed by the conservation districts. Exempt well users are requested to voluntarily follow the actions specified by the Districts for non-exempt users. Generally, the water user groups within the Region that are not included in these plans (or included on a voluntary basis) are: (1) exempt water wells in counties with established GCDs, (2) users in Culberson and Hudspeth County outside of GCD boundaries, and (3) El Paso County users outside of EPWater distribution system.

This page intentionally left blank.

Table 7-10. Recommended Regional Drought Plan Triggers and Actions

Source Name	Source Type	Source User Entity	Current WUG Monitoring	Real-time Source Monitoring	Triggers	Recommendations	Specific Actions (Percent Reduction Demand/ Use)							
							Source Manager				Users			
							1	2	3	4	1	2	3	4
							Mild	Mod	Severe	Critical	Mild	Mod	Severe	Critical
Bone Spring - Victorio Peak	GW	*County Other* *Irrigation* *Livestock*	TWDB	48-07-516 (TWDB)	Trigger and monitoring wells in GCD Management Plan	Create a formal DCP with wells, triggers and responses	20	30	40	50	20	30	40	50
Capitan Reef Complex	GW	*Irrigation* *Mining* *Livestock*	N/A	N/A	Non-potable supply.	N/A	20	30	40	50	20	30	40	50
Edwards-Trinity (Plateau)	GW	Terrell County WCID #1 (Sanderson)	TWDB 53-53-804, 53-53-806, 53-53-809, 53-53-903	N/A	See Table 7-3	Create a formal DCP with wells, triggers and responses. Make stage 1 a mandatory 20% demand reduction.	20	30	40	50	20	30	40	50
		County Other - (Brewster, Culberson, Jeff Davis, Terrell) *Irrigation* *Livestock* *Mining*	N/A	N/A	Trigger and monitoring wells in GCD Management Plan	N/A	20	30	40	50	20	30	40	50
Hueco-Mesilla Bolson	GW	City of El Paso	N/A	49-04-476 (USGS), or 49-13-301 (TWDB)	See Table 7-3	Remove voluntary conservation as a stage. Make stage 1 a mandatory 20% demand reduction.	20	30	40	50	20	30	40	50
		City of Vinton			See Table 7-3 (EPWater)	Follow El Paso triggers and actions.								
		Lower Valley Water District			See Table 7-3	Remove voluntary conservation as a stage. Make stage 1 a mandatory 20% demand reduction.	20	30	40	50	20	30	40	50
		Town of Clint			See Table 7-3 (LVWD)	Follow LVWD triggers and actions.	20	30	40	50	20	30	40	50
		City of San Elizario					20	30	40	50	20	30	40	50
		City of Socorro					20	30	40	50	20	30	40	50
		El Paso County Tornillo WID			See Table 7-3	Remove voluntary conservation as a stage. Make stage 1 a 20% demand reduction.	20	30	40	50	20	30	40	50
		El Paso County WCID #4			See Table 7-3	Remove voluntary conservation as a stage. Make stage 1 a 20% demand reduction.	20	30	40	50	20	30	40	50
Hueco-Mesilla Bolson	GW	Fort Bliss	N/A	49-04-476 (USGS), or 49-13-301 (TWDB)	See Table 7-3	Add triggers and actions for Stage 1 to achieve 20% demand reduction.	20	30	40	50	20	30	40	50
		Horizon Regional MUD			See Table 7-3	Remove voluntary conservation as a stage. Make stage 1 a 20% demand reduction.	20	30	40	50	20	30	40	50
		Town of Anthony			See Table 7-3	Remove voluntary conservation as a stage. Make stage 1 a 20% demand reduction.	20	30	40	50	20	30	40	50
		County Other *Manufacturing* *Mining* *Power* *Livestock*			N/A	N/A	20	30	40	50	20	30	40	50

This page intentionally left blank.

Table 7-10. (continued) Recommended Regional Drought Plan Triggers and Actions

Source Name	Source Type	Source User Entity	Current WUG Monitoring	Real-time Source Monitoring	Triggers	Recommendations	Specific Actions (Percent Reduction Demand/ Use)							
							Source Manager				Users			
							1	2	3	4	1	2	3	4
							Mild	Mod	Severe	Critical	Mild	Mod	Severe	Critical
Igneous	GW	City of Alpine	N/A	not needed	See Table 7-3	Remove voluntary conservation as a stage. Make stage 1 a 20% demand reduction.	20	30	40	50	20	30	40	50
		City of Marfa	51-48-602, 51-48-603	not needed	See Table 7-3	Remove voluntary conservation as a stage. Make stage 1 a 20% demand reduction.	20	30	40	50	20	30	40	50
		Fort Davis WSC	N/A	52-25-209 (TWDB)	See Table 7-3	Add triggers and actions for Stage 1 to achieve 20% demand reduction.	20	30	40	50	20	30	40	50
		County Other			Subject to GCD management plans.	N/A	Follow GCD recommendations.							
		Irrigation												
		Mining												
		Livestock												
Marathon	GW	Marathon WSSS	N/A	N/A	Subject to GCD management plans.	N/A	Follow GCD recommendations.							
		County Other												
		Livestock												
West Texas Bolsons	GW	City of Presidio	N/A	47-59-123 (TWDB)	See Table 7-3	Remove voluntary conservation as a stage. Make stage 1 a 20% demand reduction.	20	30	40	50	20	30	40	50
		City of Van Horn			See Table 7-3	Remove voluntary conservation as a stage. Make stage 1 a 20% demand reduction. Add triggers to DCP.	20	30	40	50	20	30	40	50
		Hudspeth County WCID #1 (Sierra Blanca)			No DCP submitted.	N/A	20	30	40	50	20	30	40	50
		County Other	N/A	51-29-805 (TWDB)	Subject to GCD management plans except in Hudspeth County	N/A	20	30	40	50	20	30	40	50
		Irrigation												
		Mining												
		Livestock												
Other - Rio Grande Alluvium (El Paso, Hudspeth)	GW	Horizon Regional MUD	N/A	N/A	See Table 7-3	Remove voluntary conservation as a stage. Make stage 1 a 20% demand reduction.	20	30	40	50	20	30	40	50
		Mining	N/A	N/A	N/A	N/A	20	30	40	50	20	30	40	50
		Irrigation												
Other - Volcanics (Brewster)	GW	*Mining*	N/A	73-47-404	Subject to GCD management plans.	N/A	Follow GCD recommendations.							
		Irrigation												
		Livestock												

This page intentionally left blank.

Table 7-10. (continued) Recommended Regional Drought Plan Triggers and Actions

Source Name	Source Type	Source User Entity	Current WUG Monitoring	Real-time Source Monitoring	Triggers	Recommendations	Specific Actions (Percent Reduction Demand/ Use)							
							Source Manager				Users			
							1	2	3	4	1	2	3	4
							Mild	Mod	Severe	Critical	Mild	Mod	Severe	Critical
Upper Rio Grande	SW	City of El Paso	EPCWID#1	USBR Elephant Butte Reservoir Dam	Subject to requirements mandated by the Rio Grande Project	No recommendations.	No recommendations.							
Lower Rio Grande	SW	Hudspeth County Irrigation		08-3705.00 Rio Grande at Old Fort Quitman, Texas	Subject to local mandates by irrigation district	No recommendations.	No recommendations							
		Presidio County Irrigation		IBWC 08-3742.00 Rio Grande below Rio Conchos near Presidio, TX USGS 08375300 Rio Grande at Rio Grande Village, BBNP, Texas	Subject to local mandates by irrigation district	No recommendations.								
Terlingua Creek	SW			IBWC 08-3745.00 Terlingua Creek near Terlingua, TX	N/A	No recommendations.								
Pecos River	SW			IBWC 08-4474.10 Pecos River near Langtry, TX	N/A	No recommendations.								
Independence Creek	SW			USGS 08447020 Independence Creek near Sheffield, TX	N/A	No recommendations.								
Toyahville Springs	SW			USGS 08427000 Giffin Springs at Toyahville, TX	N/A	No recommendations.								

This page intentionally left blank.

7.6.4 Model Drought Contingency Plans

Model drought contingency plans were developed for the Far West Texas region and are included in Table 7-3. Each plan identifies four drought stages: mild, moderate, severe, and emergency. The recommended responses range from notification of drought conditions and voluntary reductions in the "mild" stage to mandatory restrictions during an "emergency" stage. Entities using the model plan can select the trigger conditions for the different stages and appropriate responses for each stage.

Historically, the Drought Preparedness Council recommended that a model DCP be in place for any water user group that exceeds ten percent of the Region's water demands. However, water loss industry standards have changed from recommending a one-size-fits-all target for water loss, to recommending water loss key performance indicators of apparent loss per connection per day, real loss per connection per day, and/or real loss per mile per day. Uses and limitations of key performance indicators have been developed by the AWWA's Water Loss Control Committee in their AWWA Water Loss Control Committee Report (2020). For Far West Texas, these user groups include irrigation and municipal. Based on this recommendation, model DCPs for municipal and irrigation users have been added.

Public Water Supplier

Drought contingency plans have previously been adopted by the majority public suppliers and municipalities in Far West Texas, although some suppliers did not provide any adopted plans. Current triggers and response actions for participating entities are summarized in Table 7-3. Recommended changes to existing response actions are detailed in Table 7-10.

Irrigation

Irrigation wells located within a municipality are subject to the triggers and response actions designated by the city's drought plan. Non-exempt irrigation wells located outside of a municipality but within a GCD are subject to the triggers and response actions of the GCD. Exempt irrigation wells located within a GCD are requested to comply voluntarily with response actions that have been mandated for non-exempt well owners. No response actions have been designated for irrigators located in El Paso County except for those located within the City of El Paso's jurisdictional boundary.

Major Water Provider

There are two major municipal water providers in the Far West Texas region:

- El Paso Water.
- Lower Valley Water District.

Currently adopted triggers and response actions for these providers are summarized in Table 7-11.

Table 7-11. Major Water Provider Drought Triggers and Response Actions

		Stage & Description				
MWP		**1 - Mild**	**2 - Moderate**	**3 - Severe**	**4 - Extreme**	**5 - Emergency**
El Paso Water	Trigger	Water demand has reached or exceeded 85% of delivery capacity for 4 consecutive days.	Water demand has reached or exceeded 90% of delivery capacity for 3 consecutive days.	Water demand has reached or exceeded 95% of delivery capacity for 3 consecutive days.	Water demand has reached or exceeded 95% of delivery capacity for 5 consecutive days.	Water demand exceeds a reduced delivery capacity for all or part of the system, or the water line breaks/systems failure, or contamination of the water supply source.
El Paso Water	Conservation Goal (percent reduction in pumpage)	Voluntary reduce water demand by 10%, public education and outreach.	Voluntary reduce water demand by 15%; Mandatory reduce non-essential water consumption by 15%.	Mandatory 15% reduction in total GPCD.	Mandatory 20% reduction in total GPCD.	Mandatory restrictions on non-essential water uses, dependent on nature of emergency.
Lower Valley Water District	Trigger	Surface water allotment less than 0.5 acre-ft./acre; or water demand is projected to exceed available capacity as determined by El Paso Water.	Surface water allotment less than 1.0 acre-ft./acre; or water demand is projected to exceed available capacity projected by LVWD.	Surface water allotment less than 1.5 acre-ft./acre; or water demand is projected to exceed available capacity projected by LVWD.	N/A	Major system failures or supply contamination.
Lower Valley Water District	Conservation Goal (percent reduction in pumpage)	Voluntary reduction of water use of 25% both indoor and outdoor use.	Voluntary reduction of water use of 25% both indoor and outdoor use.	All non-essential water use is prohibited.	N/A	Water rationing may be put into effect.

7.7 DROUGHT MANAGEMENT WATER MANAGEMENT STRATEGIES

Far West Texas does not consider drought management as a feasible strategy to meet long-term growth in demands or current needs. This strategy is considered a temporary measure aimed at conserving available water supplies during times of drought or emergencies. Drought management is most adequately addressed in the Region through the implementation of local drought contingency plans. Far West Texas is supportive of the development and use of these plans during periods of drought or emergency water needs.

Average annual precipitation in Far West Texas varies from about eight inches a year in El Paso County to nearly 15 inches in Jeff Davis County. As a result, the Region is accustomed to managing water supplies in a dry environment. Thus, Far West Texas is probably the best prepared Regional Water Planning Area in in the State to manage their water resources during drought conditions.

7.8 OTHER DROUGHT-RELATED CONSIDERATIONS AND RECOMMENDATIONS

7.8.1 Texas Drought Preparedness Council and Drought Preparedness Plan

In accordance with TWDB rules, all relevant recommendations from the Drought Preparedness Council were considered in the writing of this Chapter. The Texas Drought Preparedness Council is composed of representatives from multiple State agencies and plays an important role in monitoring drought conditions, advising the governor and other groups on significant drought conditions, and facilitating coordination among local, State, and Federal agencies in drought-response planning. The Council meets regularly to discuss drought indicators and conditions across the State and releases Situation Reports summarizing their findings. Additionally, the Council has developed the State Drought Preparedness Plan, which sets forth a framework for approaching drought in an integrated manner to minimize impacts to people and resources. Far West Texas supports the ongoing efforts of the Texas Drought Preparedness Council and recommends that water providers and other interested parties regularly review the Situation Reports as part of their drought monitoring procedures. The Council provided three new recommendations in 2024 to all RWPGs which are addressed in this chapter.

- The regional water plans and state water plan shall serve as water supply plans under drought of record conditions. The DPC encourages regional water planning groups to consider planning for drought conditions worse than the drought of record, including scenarios that reflect greater rainfall deficits and/or higher surface temperatures.
- The DPC encourages regional water planning groups to incorporate projected future reservoir evaporation rates in their assessments of future surface water availability.
- The DPC encourages regional water planning groups to identify in their plans utilities within their boundaries that reported having less than 180 days of available water supply to the Texas Commission on Environmental Quality during the current or preceding planning cycle. For systems that appeared on the 180-day list, RWPGs should perform the evaluation required by Texas Administrative Code Section 357.42(g), if it has not already been completed for that system.

To meet these recommendations, Far West Texas has developed this Chapter to correspond with the sections of the outline template and has provided model DCPs for both municipal and irrigation users.

7.8.2 Other Drought Recommendations

The Far West Texas Water Planning Group recognizes that while drought preparedness, including drought contingency plans (DCPs), are an important tool, in some instances, drought cannot be prepared for, it must be responded to. The Planning Group maintains that DCPs developed by the local, individual water providers are the best available tool for drought management and fully supports the use and implementation of individual DCPs during times of drought. The Planning Group has reviewed provided DCPs and specific drought response strategies proposed in this *Plan* and find no unnecessary or counterproductive variations to exist.

Drought in Far West Texas can be defined in three operational definitions; meteorologic, agricultural and hydrologic (see Chapter 1, Section 1.2.6). Because Far West Texas already exists in a meteorological environment that is significantly drier than the rest of the State, it is more logical to consider management strategies that address a diminished or lost water supply source. Primary sources include Rio Grande surface water and groundwater from numerous aquifers.

Rio Grande drought supply is largely the result of meteorological conditions in southern Colorado and New Mexico. Surface water drought management recommendations are:

- Continue to support the US Bureau of Reclamation - Rio Grande Project administration.
- Continue to financially support El Paso County WID#1 projects intended to prevent loss of water due to seepage in canals.
- Continue to legally support the justifiable delivery of apportioned water (Rio Grande Compact) across the New Mexico state line.
- Continue to legally support the justifiable delivery of apportioned water (Rio Grande International Treaty) across the international boundary.

Rural communities other than those in El Paso County are reliant on groundwater sources. Groundwater in Far West Texas is generally not immediately impacted by intermittent drought conditions as does surface water. Therefore, loss of supply is more of an infrastructure issue. Communities in these counties can mostly be classified as small to very small, with limited financial revenues. Thus, the biggest threat to a water-supply loss is the lack of a back-up source. Some communities have only one water-supply well and no interconnect options. The Far West Texas Water Planning Group thus recommends that State and Federal agencies with rural-community relief functions provide grant funding opportunities to address this potential water-shortage predicament.

This page intentionally left blank.

APPENDIX 7A
MODEL DROUGHT CONTINGENCY PLANS

This page intentionally left blank.

Far West Texas
Model Drought Contingency Plan
for an Irrigation District

(adapted from TCEQ)

Irrigation District:	Click to add text
Address:	
Telephone Number:	( ) Fax: ( )
Water Right No.(s):	
Regional Water Planning Group:	
Form Completed by:	
Title:	
Person responsible for implementation:	Phone: ( )
Signature:	Date: / /

Section I: Declaration of Policy, Purpose, and Intent

The Board of Directors of the _____ (*name of irrigation district*) deems it to be in the interest of the District to adopt Rules and Regulations governing the equitable and efficient allocation of limited water supplies during times of shortage. These Rules and Regulations constitute the District's drought contingency plan required under Section 11.1272, Texas Water Code, *Vernon's Texas Codes Annotated*, and associated administrative rules of the Texas Commission on Environmental Quality (Title 30, Texas Administrative Code, Chapter 288).

Section II: User Involvement

Opportunity for users of water from the _____ (*name of irrigation district*) was provided by means of _____ (*describe methods used to inform water users about the preparation of the plan and opportunities for input; for example, scheduling and providing notice of a public meeting to accept user input on the plan*).

Section III: User Education

The _____ (*name of irrigation district*) will periodically provide water users with information about the Plan, including information about the conditions under which water allocation is to be initiated or terminated and the district's policies and procedures for water allocation. This information will be provided by means of _____ (*example: describe methods to be used to provide water users with information about the Plan; for example, by providing copies of the Plan and by posting water allocation rules and regulations on the district's public bulletin board*).

Section IV: Authorization

The _____ (*example: general manager*) is hereby authorized and directed to implement the applicable provision of the Plan upon determination by the Board that such implementation is necessary to ensure the equitable and efficient allocation of limited water supplies during times of shortage.

Section V: Application

The provisions of the Plan shall apply to all persons utilizing water provided by the _____ (*name of irrigation district*). The term "person" as used in the Plan includes individuals, corporations, partnerships, associations, and all other legal entities.

Section VI: Initiation of Water Allocation

The _____ (*designated official*) shall monitor water supply conditions on a _____ (*example: weekly, monthly*) basis and shall make recommendations to the Board regarding irrigation of water allocation. Upon approval of the Board, water allocation will become effective when _____ (*describe the criteria and the basis for the criteria*):

Below are examples of the types of triggering criteria that might be used; singly or in combination, in an irrigation district's drought contingency plan:

Example 1: Water in storage in the _____ (*name of reservoir*) is equal to or less than _____ (*acre-feet and/or percentage of storage capacity*).

Example 2: Combined storage in the _____ (*name or reservoirs*) reservoir system is equal to or less than _____ (*acre-feet and/or percentage of storage capacity*).

Example 3: Flows as measured by the U.S. Geological Survey gage on the _____ (*name of reservoir*) near _____, Texas reaches _____ cubic feet per second (cfs).

Example 4: The storage balance in the district's irrigation water rights account reaches _____ acre-feet.

Example 5: The storage balance in the district's irrigation water rights account reaches an amount equivalent to _____ (*number*) irrigations for each flat rate acre in which all flat rate assessments are paid and current.

Example 6: The _____ (*name of entity supplying water to the irrigation district*) notifies the district that water deliveries will be limited to _____ acre-feet per year (*i.e. a level below that required for unrestricted irrigation*).

Section VII: Termination of Water Allocation

The district's water allocation policies will remain in effect until the conditions defined in Section IV of the Plan no longer exist and the Board deems that the need to allocate water no longer exists.

Section VIII: Notice

Notice of the initiation of water allocation will be given by notice posted on the District's public bulletin board and by mail to each _____ (*example: landowner, holders of active irrigation accounts, etc.*).

Section IX: Water Allocation

(a) In identifying **specific, quantified targets** for water allocation to be achieved during periods of water shortages and drought, each irrigation user shall be allocated _____ irrigations or _____ acre-feet of water each flat rate acre on which all taxes, fees, and charges have been paid. The water allotment in each irrigation account will be expressed in acre-feet of water.

Include explanation of water allocation procedure. For example, in the Lower Rio Grande Valley, an "irrigation" is typically considered to be equivalent to eight (8) inches of water per irrigation acre; consisting of six (6) inches of water per acre applied plus two (2) inches of water lost in transporting the water from the river to the land. Thus, three irrigations would be equal to 24 inches of water per acre or an allocation of 2.0 acre-feet of water measured at the diversion from the river.

(b) As additional water supplies become available to the District in an amount reasonably sufficient for allocation to the District's irrigation users, the additional water made available to the District will be equally distributed, on a pro rata basis, to those irrigation users having _____.

Example 1: An account balance of less than _____ irrigations for each flat rate acre (*i.e.* _____ *acre-feet*).

Example 2: An account balance of less than _____ acre-feet of water for each flat rate acre.

Example 3: An account balance of less than _____ acre-feet of water.

(c) The amount of water charged against a user's water allocation will be _____ (*example: eight inches*) per irrigation, or one allocation unit, unless water deliveries to the land are metered. Metered water deliveries will be charges based on actual measured use. In order to maintain parity in charging use against a water allocation between non-metered and metered deliveries, a loss factor of _____ percent of the water delivered in a metered situation will be added to the measured use and will be charged against the user's water allocation. Any metered use, with the loss factor applied, that is less than eight (8) inches per acre shall be credited back to the allocation unit and will be available to the user. It shall be a violation of the Rules and Regulations for a water user to use water in excess of the amount of water contained in the user's irrigation account.

(d) Acreage in an irrigation account that has not been irrigated for any reason within the last two (2) consecutive years will be considered inactive and will not be allocated water. Any landowner whose land has not been irrigated within the last two (2) consecutive years, may, upon application to the District expressing intent to irrigate the land, receive future allocations. However, irrigation water allocated shall be applied only upon the acreage to which it was allocated and such water allotment cannot be transferred until there have been two consecutive years of use.

Section X: Transfers of Allotments

(a) A water allocation in an active irrigation account may be transferred within the boundaries of the District from one irrigation account to another. The transfer of water can only be made by the landowner's agent who is authorized in writing to act on behalf of the landowner in the transfer of all or part of the water allocation from the described land of the landowner covered by the irrigation account.

(b) A water allocation may not be transferred to land owned by a landowner outside the District boundaries.

or

A water allocation may be transferred to land outside the District's boundaries by paying the current water charge as if the water was actually delivered by the District to the land covered by an irrigation account. The amount of water allowed to be transferred shall be stated in terms of acre-feet and deducted from the landowner's current allocation balance in the irrigation account. Transfers of water outside the District shall not affect the allocation of water under Section VII of these Rules and Regulations.

(c) Water from outside the District may not be transferred by a landowner for use within the District.

or

Water from outside the District may be transferred by a landowner for use within the District. The District will divert and deliver the water on the same basis as District water is delivered, except that a _____ percent conveyance loss will be charged against the amount of water transferred for use in the District as the water is delivered.

Section XI: Penalties

Any person who willfully opens, closes, changes or interferes with any headgate or uses water in violation of these Rules and Regulations, shall be considered in violation of Section 11.0083, Texas Water Code, *Vernon's Texas Codes Annotated*, which provides for punishment by fine of not less than $10.00 nor more than $200.00 or by confinement in the county jail for not more than thirty (30) days, or both, for each violation, and these penalties provided by the laws of the State and may by enforced by complaints filed in the appropriate court jurisdiction in _____ County, all in accordance with Section 11.083; and in addition, the District may pursue a civil remedy in the way of damages and/or injunction against the violation of any of the foregoing Rules and Regulations.

Section XII: Severability

It is hereby declared to be the intention of the Board of Directors of the _____ (*name of irrigation district*) that the sections, paragraphs, sentences, clauses, and phrases of this Plan shall be declared unconstitutional by the valid judgment or decree of any court of competent jurisdiction, such unconstitutionality shall not affect any of the remaining phrases, clauses, sentences, paragraphs, and sections of this Plan, since the same would not have been enacted by the Board without the incorporation into this Plan of any such unconstitutional phrase, clause, sentence, paragraph, or section.

Section XIII: Authority

The foregoing rules and regulations are adopted pursuant to and in accordance with Sections 11.039, 11.083, 11.1272; Section 49.004; and Section 58.127-130 of the Texas Water Code, *Vernon's Texas Codes Annotated.*

Section XIV: Effective Date of Plan

The effective date of this Rule shall be five (5) days following the date of Publication hereof and ignorance of the Rules and Regulations is not a defense for a prosecution for enforcement of the violation of the Rules and Regulations.

This page intentionally left blank.

Far West Texas
Drought Contingency Plan
for a Retail Public Water Supplier

(Adapted from TCEQ)

Name:	Click to add text	
Address:		
Telephone Number:	( )	Fax: ( )
Water Right No.(s):		
Regional Water Planning Group:		
Form Completed by:		
Title:		
Person responsible for implementation:		Phone: ( )
Signature:		Date: / /

Section I: Declaration of Policy, Purpose, and Intent

In order to conserve the available water supply and protect the integrity of water supply facilities, with particular regard for domestic water use, sanitation, and fire protection, and to protect and preserve public health, welfare, and safety and minimize the adverse impacts of water supply shortage or other water supply emergency conditions, the _____ (*name of your water supplier*) hereby adopts the following regulations and restrictions on the delivery and consumption of water.

Water uses regulated or prohibited under this Drought Contingency Plan (the Plan) are considered to be non-essential and continuation of such uses during times of water shortage or other emergency water supply condition are deemed to constitute a waste of water which subjects the offender(s) to penalties as defined in Section X of this Plan.

Section II: Public Involvement

Opportunity for the public to provide input into the preparation of the Plan was provided by the _____ (*name of your water supplier*) by means of _____ (*describe methods used to inform the public about the preparation of the plan and provide opportunities for input; for example, scheduling and providing public notice of a public meeting to accept input on the Plan*).

Section III: Public Education

The _____ (*name of your water supplier*) will periodically provide the public with information about the Plan, including information about the conditions under which each stage of the Plan is to be initiated or terminated and the drought response measures to be implemented in each stage. This information will be provided by means of _____ (*describe methods to be used to provide information to the public about the Plan; for example, public events, press releases or utility bill inserts*).

Section IV: Coordination with Regional Water Planning Groups
The service area of the _____ (*name of your water supplier*) is located within the _____ (*name of regional water planning area or areas*) and _____ (*name of your water supplier*) has provided a copy of this Plan to the _____ (*name of your regional water planning group or groups*).

Section V: Authorization
The _____ (*designated official; for example, the mayor, city manager, utility director, general manager, etc.*), or his/her designee is hereby authorized and directed to implement the applicable provisions of this Plan upon determination that such implementation is necessary to protect public health, safety, and welfare. The _____ (*designated official*) or his/her designee shall have the authority to initiate or terminate drought or other water supply emergency response measures as described in this Plan.

Section VI: Application
The provisions of this Plan shall apply to all persons, customers, and property utilizing water provided by the _____ (*name of your water supplier*). The terms “person” and “customer” as used in the Plan include individuals, corporations, partnerships, associations, and all other legal entities.

Section VII: Definitions
For the purposes of this Plan**,** the following definitions shall apply:

Aesthetic water use: water use for ornamental or decorative purposes such as fountains, reflecting pools, and water gardens.

Commercial and institutional water use: water use which is integral to the operations of commercial and non-profit establishments and governmental entities such as retail establishments, hotels and motels, restaurants, and office buildings.

Conservation: those practices, techniques, and technologies that reduce the consumption of water, reduce the loss or waste of water, improve the efficiency in the use of water or increase the recycling and reuse of water so that a supply is conserved and made available for future or alternative uses.

Customer: any person, company, or organization using water supplied by _____ (*name of your water supplier*).

Domestic water use: water use for personal needs or for household or sanitary purposes such as drinking, bathing, heating, cooking, sanitation, or for cleaning a residence, business, industry, or institution.

Even number address: street addresses, box numbers, or rural postal route numbers ending in 0, 2, 4, 6, or 8 and locations without addresses.

Industrial water use: the use of water in processes designed to convert materials of lower value into forms having greater usability and value.

Landscape irrigation use: water used for the irrigation and maintenance of landscaped areas, whether publicly or privately owned, including residential and commercial lawns, gardens, golf courses, parks, and rights-of-way and medians.

Non-essential water use: water uses that are not essential nor required for the protection of public, health, safety, and welfare, including:

(a) irrigation of landscape areas, including parks, athletic fields, and golf courses, except otherwise provided under this Plan;
(b) use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle;
(c) use of water to wash down any sidewalks, walkways, driveways, parking lots, tennis courts, or other hard-surfaced areas;
(d) use of water to wash down buildings or structures for purposes other than immediate fire protection;
(e) flushing gutters or permitting water to run or accumulate in any gutter or street;
(f) use of water to fill, refill, or add to any indoor or outdoor swimming pools or Jacuzzi-type pools;
(g) use of water in a fountain or pond for aesthetic or scenic purposes except where necessary to support aquatic life;
(h) failure to repair a controllable leak(s) within a reasonable period after having been given notice directing the repair of such leak(s); and
(i) use of water from hydrants for construction purposes or any other purposes other than fire fighting.

Odd numbered address: street addresses, box numbers, or rural postal route numbers ending in 1, 3, 5, 7, or 9.

Section VIII: Criteria for Initiation and Termination of Drought Response Stages

The _____ (*designated official*) or his/her designee shall monitor water supply and/or demand conditions on a _____ (*example: daily, weekly, monthly*) basis and shall determine when conditions warrant initiation or termination of each stage of the Plan, that is, when the specified "triggers" are reached.

The triggering criteria described below are based on:
_____.
(*Provide a brief description of the rationale for the triggering criteria; for example, triggering criteria / trigger levels based on a statistical analysis of the vulnerability of the water source under drought of record conditions, or based on known system capacity limits*).

Utilization of alternative water sources and/or alternative delivery mechanisms:

Alternative water source(s) for _____ (*name of utility*) is/are: _____.
(Examples: Other well(s), Inter-connection with other system, Temporary use of a non-municipal water supply, Purchased water, Use of reclaimed water for non-potable purposes, etc.).

Stage 1 Triggers -- MILD Water Shortage Conditions

Requirements for initiation
Customers shall be requested to voluntarily conserve water and adhere to the prescribed restrictions on certain water uses, defined in Section VII Definitions, when _____.
(*Describe triggering criteria / trigger levels; see examples below*).

Following are examples of the types of triggering criteria that might be used in one or more successive stages of a drought contingency plan. The public water supplier may devise other triggering criteria and an appropriate number of stages tailored to its system. One or a combination of the criteria selected by the public water supplier must be defined for each drought response stage, but usually not all will apply.

Example 1: *Annually, beginning on May 1 through September 30.*

Example 2: *When the water supply available to the _____ (name of your water supplier) is equal to or less than _____ (acre-feet, percentage of storage, etc.).*

Example 3: *When, pursuant to requirements specified in the _____ (name of **your** water supplier) wholesale water purchase contract with _____ (name of your wholesale water supplier), notification is received requesting initiation of Stage 1 of the Drought Contingency Plan.*

Example 4: *When flows in the _____ (name of stream or river) are equal to or less than _____ cubic feet per second.*

Example 5: *When the static water level in the _____ (name of your water supplier) well(s) is equal to or less than _____ feet above/below mean sea level.*

Example 6: *When the specific capacity of the _____ (name of your water supplier) well(s) is equal to or less than _____ percent of the well's original specific capacity.*

Example 7: *When total daily water demand equals or exceeds _____ million gallons for _____ consecutive days of _____ million gallons on a single day (example: based on the safe operating capacity of water supply facilities).*

Example 8: *Continually falling treated water reservoir levels which do not refill above _____ percent overnight (example: based on an evaluation of minimum treated water storage required to avoid system outage).*

<u>Requirements for termination</u>
Stage 1 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of _____ (*example: 3*) consecutive days.

Stage 2 Triggers – MODERATE Water Shortage Conditions

<u>Requirements for initiation</u>
Customers shall be required to comply with the requirements and restrictions on certain non-essential water uses provided in Section IX of this Plan when _____ (*describe triggering criteria; see examples in Stage 1*).

<u>Requirements for termination</u>
Stage 2 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of _____ (*example: 3*) consecutive days. Upon termination of Stage 2, Stage 1, or the applicable drought response stage based on the triggering criteria, becomes operative.

Stage 3 Triggers – SEVERE Water Shortage Conditions

<u>Requirements for initiation</u>
Customers shall be required to comply with the requirements and restrictions on certain non-essential water uses for Stage 3 of this Plan when _____ (*describe triggering criteria; see examples in Stage 1*).

Requirements for termination
Stage 3 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of _____ (*example: 3*) consecutive days. Upon termination of Stage 3, Stage 2, or the applicable drought response stage based on the triggering criteria, becomes operative.

Stage 4 Triggers – CRITICAL Water Shortage Conditions

Requirements for initiation
Customers shall be required to comply with the requirements and restrictions on certain non-essential water uses for Stage 4 of this Plan when _____ (*describe triggering criteria; see examples in Stage 1*).

Requirements for termination
Stage 4 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of _____ (*example: 3*) consecutive days. Upon termination of Stage 4, Stage 3, or the applicable drought response stage based on the triggering criteria, becomes operative.

Stage 5 Triggers – EMERGENCY Water Shortage Conditions

Requirements for initiation
Customers shall be required to comply with the requirements and restrictions for Stage 5 of this Plan when _____ (*designated official*), or his/her designee, determines that a water supply emergency exists based on:

1. Major water line breaks, or pump or system failures occur, which cause unprecedented loss of capability to provide water service; **or**

2. Natural or man-made contamination of the water supply source(s).

Requirements for termination
Stage 5 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of _____ (*example: 3*) consecutive days.

Stage 6 Triggers – WATER ALLOCATION

Requirements for initiation
Customers shall be required to comply with the water allocation plan prescribed in Section IX of this Plan and comply with the requirements and restrictions for Stage 5 of this Plan when _____ (*describe triggering criteria, see examples in Stage 1*).

<u>Requirements for termination</u> - Water allocation may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of _____ (*example: 3*) consecutive days.

Note: The inclusion of WATER ALLOCATION as part of a drought contingency plan may not be required in all cases. For example, for a given water supplier, an analysis of water supply availability under drought of record conditions may indicate that there is essentially no risk of water supply shortage. Hence, a drought contingency plan for such a water supplier might only address facility capacity limitations and emergency conditions (example: supply source contamination and system capacity limitations).

Section IX: Drought Response Stages

The _____ (*designated official*), or his/her designee, shall monitor water supply and/or demand conditions on a daily basis and, in accordance with the triggering criteria set forth in Section VIII of this Plan, shall determine that a mild, moderate, severe, critical, emergency or water shortage condition exists and shall implement the following notification procedures:

Notification

<u>Notification of the Public</u>:

The _____ (*designated official*) or his/ her designee shall notify the public by means of:

Examples:
publication in a newspaper of general circulation,
direct mail to each customer,
public service announcements,
signs posted in public places
take-home fliers at schools.

<u>Additional Notification</u>:

The _____ (*designated official*) or his/ her designee shall notify directly, or cause to be notified directly, the following individuals and entities:

Examples:
Mayor / Chairman and members of the City Council / Utility Board
Fire Chief(s)
City and/or County Emergency Management Coordinator(s)
County Judge & Commissioner(s)
State Disaster District / Department of Public Safety
TCEQ *(required when* mandatory *restrictions are imposed)*
Major water users
Critical water users, i.e. hospitals
Parks / street superintendents & public facilities managers

Note: The plan should specify direct notice only as appropriate to respective drought stages.

Stage 1 Response – MILD Water Shortage Conditions

<u>Target</u>: **Achieve a voluntary _____ percent reduction in _____ (*example: total water use, daily water demand, etc.*).**

<u>Best Management Practices for Supply Management</u>:

D*escribe additional measures, if any, to be implemented directly by (name of your water supplier) to manage limited water supplies and/or reduce water demand. Examples include: system water loss control, activation and use of an alternative supply source(s); use of reclaimed water for non-potable purposes.*

Voluntary Water Use Restrictions for Reducing Demand:

(a) Water customers are requested to voluntarily limit the irrigation of landscaped areas to Sundays and Thursdays for customers with a street address ending in an even number (0, 2, 4, 6 or 8), and Saturdays and Wednesdays for water customers with a street address ending in an odd number (1, 3, 5, 7 or 9), and to irrigate landscapes only between the hours of midnight and 10:00 a.m. and 8:00 p.m. to midnight on designated watering days.

(b) All operations of the _____ (*name of your water supplier*) shall adhere to water use restrictions prescribed for Stage 1 of the Plan.

(c) Water customers are requested to practice water conservation and to minimize or discontinue water use for non-essential purposes.

Stage 2 Response – MODERATE Water Shortage Conditions

Target: Achieve a _____ percent reduction in _____ (*example: total water use, daily water demand, etc.*).

Best Management Practices for Supply Management:

Describe additional measures, if any, to be implemented directly by _____ (name of your water supplier) to manage limited water supplies and/or reduce water demand. Examples include: system water loss control, reduced or discontinued irrigation of public landscaped areas; use of an alternative supply source(s); use of reclaimed water for non-potable purposes.

Water Use Restrictions for Demand Reduction:
Under threat of penalty for violation, the following water use restrictions shall apply to all persons:

(a) Irrigation of landscaped areas with hose-end sprinklers or automatic irrigation systems shall be limited to Sundays and Thursdays for customers with a street address ending in an even number (0, 2, 4, 6 or 8), and Saturdays and Wednesdays for water customers with a street address ending in an odd number (1, 3, 5, 7 or 9), and irrigation of landscaped areas is further limited to the hours of 12:00 midnight until 10:00 a.m. and between 8:00 p.m. and 12:00 midnight on designated watering days. However, irrigation of landscaped areas is permitted at anytime if it is by means of a hand-held hose, a faucet filled bucket or watering can of five (5) gallons or less, or drip irrigation system.

(b) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle is prohibited except on designated watering days between the hours of 12:00 midnight and 10:00 a.m. and between 8:00 p.m. and 12:00 midnight. Such washing, when allowed, shall be done with a hand-held bucket or a hand-held hose equipped with a positive shutoff nozzle for quick rises. Vehicle washing may be done at any time on the immediate premises of a commercial car wash or commercial service station. Further, such washing may be exempted from these regulations if the health, safety, and welfare of the public is contingent upon frequent vehicle cleansing, such as garbage trucks and vehicles used to transport food and perishables.

(c) Use of water to fill, refill, or add to any indoor or outdoor swimming pools, wading pools, or Jacuzzi-type pools is prohibited except on designated watering days between the hours of 12:00 midnight and 10:00 a.m. and between 8 p.m. and 12:00 midnight.

(d) Operation of any ornamental fountain or pond for aesthetic or scenic purposes is prohibited except where necessary to support aquatic life or where such fountains or ponds are equipped with a recirculation system.

(e) Use of water from hydrants shall be limited to fire fighting, related activities, or other activities necessary to maintain public health, safety, and welfare, except that use of water from designated fire hydrants for construction purposes may be allowed under special permit from the _____ (*name of your water supplier*).

(f) Use of water for the irrigation of golf course greens, tees, and fairways is prohibited except on designated watering days between the hours 12:00 midnight and 10:00 a.m. and between 8 p.m. and 12:00 midnight. However, if the golf course utilizes a water source other than that provided by the _____ (*name of your water supplier*), the facility shall not be subject to these regulations.

(g) All restaurants are prohibited from serving water to patrons except upon request of the patron.

(h) The following uses of water are defined as non-essential and are prohibited:

1. wash down of any sidewalks, walkways, driveways, parking lots, tennis courts, or other hard-surfaced areas;
2. use of water to wash down buildings or structures for purposes other than immediate fire protection;
3. use of water for dust control;
4. flushing gutters or permitting water to run or accumulate in any gutter or street; and
5. failure to repair a controllable leak(s) within a reasonable period after having been given notice directing the repair of such leak(s).

Stage 3 Response – SEVERE Water Shortage Conditions

Target: Achieve a _____ percent reduction in _____ (*example: total water use, daily water demand, etc.*).

Best Management Practices for Supply Management:

Describe additional measures, if any, to be implemented directly by _____ (name of your water supplier) to manage limited water supplies and/or reduce water demand. Examples include: system water loss control, reduced or discontinued irrigation of public landscaped areas; use of an alternative supply source(s); use of reclaimed water for non-potable purposes.

Water Use Restrictions for Demand Reduction:
All requirements of Stage 2 shall remain in effect during Stage 3 except:

(a) Irrigation of landscaped areas shall be limited to designated watering days between the hours of 12:00 midnight and 10:00 a.m. and between 8 p.m. and 12:00 midnight and shall be by means of hand-held hoses, hand-held buckets, drip irrigation, or permanently installed automatic sprinkler system only. The use of hose-end sprinklers is prohibited at all times.

(b) The watering of golf course tees is prohibited unless the golf course utilizes a water source other than that provided by the _____ (*name of your water supplier*).

(c) The use of water for construction purposes from designated fire hydrants under special permit is to be discontinued.

Stage 4 Response – CRITICAL Water Shortage Conditions

Target: Achieve a _____ percent reduction in _____ (*example: total water use, daily water demand, etc.*).

Best Management Practices for Supply Management:

Describe additional measures, if any, to be implemented directly by _____ (name of your water supplier) to manage limited water supplies and/or reduce water demand. Examples include: system water loss control, reduced or discontinued irrigation of public landscaped areas; use of an alternative supply source(s); use of reclaimed water for non-potable purposes.

Water Use Restrictions for Reducing Demand:
All requirements of Stage 2 and 3 shall remain in effect during Stage 4 except:

(a) Irrigation of landscaped areas shall be limited to designated watering days between the hours of 6:00 a.m. and 10:00 a.m. and between 8:00 p.m. and 12:00 midnight and shall be by means of hand-held hoses, hand-held buckets, or drip irrigation only. The use of hose-end sprinklers or permanently installed automatic sprinkler systems are prohibited at all times.

(b) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle not occurring on the premises of a commercial car wash and commercial service stations and not in the immediate interest of public health, safety, and welfare is prohibited. Further, such vehicle washing at commercial car washes and commercial service stations shall occur only between the hours of 6:00 a.m. and 10:00 a.m. and between 6:00 p.m. and 10 p.m.

(c) The filling, refilling, or adding of water to swimming pools, wading pools, and Jacuzzi-type pools is prohibited.

(d) Operation of any ornamental fountain or pond for aesthetic or scenic purposes is prohibited except where necessary to support aquatic life or where such fountains or ponds are equipped with a recirculation system.

(e) No application for new, additional, expanded, or increased-in-size water service connections, meters, service lines, pipeline extensions, mains, or water service facilities of any kind shall be approved, and time limits for approval of such applications are hereby suspended for such time as this drought response stage or a higher-numbered stage shall be in effect.

Stage 5 Response – EMERGENCY Water Shortage Conditions

<u>Target</u>: Achieve a _____ percent reduction in _____ (*example: total water use, daily water demand, etc.*).

<u>Best Management Practices for Supply Management</u>:

Describe additional measures, if any, to be implemented directly by _____ (name of your water supplier) to manage limited water supplies and/or reduce water demand. Examples include: system water loss control, reduced or discontinued irrigation of public landscaped areas; use of an alternative supply source(s); use of reclaimed water for non-potable purposes.

<u>Water Use Restrictions for Reducing Demand:</u>
All requirements of Stage 2, 3, and 4 shall remain in effect during Stage 5 except:

(a) Irrigation of landscaped areas is absolutely prohibited.

(b) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle is absolutely prohibited.

Stage 6 Response – WATER ALLOCATION

In the event that water shortage conditions threaten public health, safety, and welfare, the _____ (*designated official*) is hereby authorized to allocate water according to the following water allocation plan:

Single-Family Residential Customers

The allocation to residential water customers residing in a single-family dwelling shall be as follows:

Persons per Household	Gallons per Month
1 or 2	6,000
3 or 4	7,000
5 or 6	8,000
7 or 8	9,000
9 or 10	10,000
11 or more	12,000

"Household" means the residential premises served by the customer's meter. "Persons per household" include only those persons currently physically residing at the premises and expected to reside there for the entire billing period. It shall be assumed that a particular customer's household is comprised of two (2) persons unless the customer notifies the _____ (*name of your water supplier*) of a greater number of persons per household on a form prescribed by the _____ (*designated official*). The _____ (*designated official*) shall give his/her best effort to see that such forms are mailed, otherwise provided, or made available to every residential customer. If, however, a customer does not receive such a form, it shall be the customer's responsibility to go to the _____ (*name of your water supplier*) offices to complete and sign the form claiming more than two (2) persons per household. New customers may claim more persons per household at the time of applying for water service on the form prescribed by the _____ (*designated official*). When the number of persons per household increases so as to place the customer in a different allocation category, the customer may notify the _____ (*name of water supplier*) on such form and the change will be implemented in the next practicable billing period.

If the number of persons in a household is reduced, the customer shall notify the _____ (*name of your water supplier*) in writing within two (2) days. In prescribing the method for claiming more than two (2) persons per household, the _____ (*designated official*) shall adopt methods to insure the accuracy of the claim. Any person who knowingly, recklessly, or with criminal negligence falsely reports the number of persons in a household or fails to timely notify the _____ (*name of your water supplier*) of a reduction in the number of person in a household shall be fined not less than $_____.

Residential water customers shall pay the following surcharges:

$_____ for the first 1,000 gallons over allocation.
$_____ for the second 1,000 gallons over allocation.
$_____ for the third 1,000 gallons over allocation.
$_____ for each additional 1,000 gallons over allocation.

Surcharges shall be cumulative.

Master-Metered Multi-Family Residential Customers

The allocation to a customer billed from a master meter which jointly measures water to multiple permanent residential dwelling units (example: apartments, mobile homes) shall be allocated 6,000 gallons per month for each dwelling unit. It shall be assumed that such a customer's meter serves two dwelling units unless the customer notifies the _____ (*name of your water supplier*) of a greater number on a form prescribed by the _____ (*designated official*). The _____ (*designated official*) shall give his/her best effort to see that such forms are mailed, otherwise provided, or made available to every such customer. If, however, a customer does not receive such a form, it shall be the customer's responsibility to go to the _____ (*name of your water supplier*) offices to complete and sign the form claiming more than two (2) dwellings. A dwelling unit may be claimed under this provision whether it is occupied or not. New customers may claim more dwelling units at the time of applying for water service on the form prescribed by the _____ (*designated official*). If the number of dwelling units served by a master meter is reduced, the customer shall notify the _____ (*name of your water supplier*) in writing within two (2) days. In prescribing the method for claiming more than two (2) dwelling units, the _____ (*designated official*) shall adopt methods to insure the accuracy of the claim. Any person who knowingly, recklessly, or with criminal negligence falsely reports the number of dwelling units served by a master meter or fails to timely notify the _____ (*name of your water supplier*) of a reduction in the number of person in a household shall be fined not less than $_____. Customers billed from a master meter under this provision shall pay the following monthly surcharges:

$_____ for 1,000 gallons over allocation up through 1,000 gallons for each dwelling unit.
$_____, thereafter, for each additional 1,000 gallons over allocation up through a second 1,000 gallons for each dwelling unit.
$_____, thereafter, for each additional 1,000 gallons over allocation up through a third 1,000 gallons for each dwelling unit.
$_____, thereafter for each additional 1,000 gallons over allocation.

Surcharges shall be cumulative.

Commercial Customers

A monthly water allocation shall be established by the _____ (*designated official*), or his/her designee, for each nonresidential commercial customer other than an industrial customer who uses water for processing purposes. The non-residential customer's allocation shall be approximately _____ (*example: 75%*) percent of the customer's usage for corresponding month's billing period for the previous 12 months. If the customer's billing history is shorter than 12 months, the monthly average for the period for which there is a record shall be used for any monthly period for which no history exists. Provided, however, a customer, _____ percent of whose monthly usage is less than _____ gallons, shall be allocated _____ gallons. The _____ (*designated official*) shall give his/her best effort to see that notice of each non-residential customer's allocation is mailed to such customer. If, however, a customer does not receive such notice, it shall be the customer's responsibility to contact the _____ (*name of your water supplier*) to determine the allocation. Upon request of the customer or at the initiative of the _____ (*designated official*), the allocation may be reduced or increased if, (1) the designated period does not accurately reflect the customer's normal water usage, (2) one nonresidential customer agrees to transfer part of its allocation to another nonresidential customer, or (3) other objective evidence demonstrates that the designated allocation is inaccurate under present conditions. A customer may appeal an allocation established hereunder to the _____ (*designated official or alternatively, a special water allocation review committee*). Nonresidential commercial customers shall pay the following surcharges:

Customers whose allocation is _____ gallons through _____ gallons per month:

$_____ per thousand gallons for the first 1,000 gallons over allocation.
$_____ per thousand gallons for the second 1,000 gallons over allocation.
$_____ per thousand gallons for the third 1,000 gallons over allocation.
$_____ per thousand gallons for each additional 1,000 gallons over allocation.

Customers whose allocation is _____ gallons per month or more:

_____ times the block rate for each 1,000 gallons in excess of the allocation up through 5 percent above allocation.
_____ times the block rate for each 1,000 gallons from 5 percent through 10 percent above allocation.
_____ times the block rate for each 1,000 gallons from 10 percent through 15 percent above allocation.
_____ times the block rate for each 1,000 gallons more than 15 percent above allocation.

The surcharges shall be cumulative. As used herein, "block rate" means the charge to the customer per 1,000 gallons at the regular water rate schedule at the level of the customer's allocation.

Industrial Customers

A monthly water allocation shall be established by the _____ (*designated official*), or his/her designee, for each industrial customer, which uses water for processing purposes. The industrial customer's allocation shall be approximately _____ (*example: 90%*) percent of the customer's water usage baseline. Ninety (90) days after the initial imposition of the allocation for industrial customers, the industrial customer's allocation shall be further reduced to _____ (*example: 85%*) percent of the customer's water usage baseline. The industrial customer's water use baseline will be computed on the average water use for the _____ month period ending prior to the date of implementation of Stage 2 of the Plan. If the industrial water customer's billing history is shorter than _____ months, the monthly average for the period for which there is a record shall be used for any monthly period for which no billing history exists. The _____ (*designated official*) shall give his/her best effort to see that notice of each industrial customer's allocation is mailed to such customer. If, however, a customer does not receive such notice, it shall be the customer's responsibility to contact the _____ (*name of your water supplier*) to determine the allocation, and the allocation shall be fully effective notwithstanding the lack of receipt of written notice. Upon request of the customer or at the initiative of the _____ (*designated official*), the allocation may be reduced or increased, (1) if the designated period does not accurately reflect the customer's normal water use because the customer had shutdown a major processing unit for repair or overhaul during the period, (2) the customer has added or is in the process of adding significant additional processing capacity, (3) the customer has shutdown or significantly reduced the production of a major processing unit, (4) the customer has previously implemented significant permanent water conservation measures such that the ability to further reduce water use is limited, (5) the customer agrees to transfer part of its allocation to another industrial customer, or (6) if other objective evidence demonstrates that the designated allocation is inaccurate under present conditions. A customer may appeal an allocation established hereunder to the _____ (*designated official or alternatively, a special water allocation review committee*). Industrial customers shall pay the following surcharges:

Customers whose allocation is _____ gallons through _____ gallons per month:

> $_____ per thousand gallons for the first 1,000 gallons over allocation.
> $_____ per thousand gallons for the second 1,000 gallons over allocation.
> $_____ per thousand gallons for the third 1,000 gallons over allocation.
> $_____ per thousand gallons for each additional 1,000 gallons over allocation.

Customers whose allocation is _____ gallons per month or more:

> _____ times the block rate for each 1,000 gallons in excess of the allocation up through 5 percent above allocation.
> _____ times the block rate for each 1,000 gallons from 5 percent through 10 percent above allocation.
> _____ times the block rate for each 1,000 gallons from 10 percent through 15 percent above allocation.
> _____ times the block rate for each 1,000 gallons more than 15 percent above allocation.

The surcharges shall be cumulative. As used herein, "block rate" means the charge to the customer per 1,000 gallons at the regular water rate schedule at the level of the customer's allocation.

Section X: Enforcement

(a) No person shall knowingly or intentionally allow the use of water from the _____ (*name of your water supplier*) for residential, commercial, industrial, agricultural, governmental, or any other purpose in a manner contrary to any provision of this Plan, or in an amount in excess of that permitted by the drought response stage in effect at the time pursuant to action taken by _____ (*designated official*), or his/her designee, in accordance with provisions of this Plan.

(b) Any person who violates this Plan is guilty of a misdemeanor and, upon conviction shall be punished by a fine of not less than _____ dollars ($_____) and not more than _____ dollars ($_____). Each day that one or more of the provisions in this Plan is violated shall constitute a separate offense. If a person is convicted of three or more distinct violations of this Plan, the _____ (*designated official*) shall, upon due notice to the customer, be authorized to discontinue water service to the premises where such violations occur. Services discontinued under such circumstances shall be restored only upon payment of a re-connection charge, hereby established at $ _____, and any other costs incurred by the _____ (*name of your water supplier*) in discontinuing service. In addition, suitable assurance must be given to the _____ (*designated official*) that the same action shall not be repeated while the Plan is in effect. Compliance with this plan may also be sought through injunctive relief in the district court.

(c) Any person, including a person classified as a water customer of the _____ (*name of your water supplier*), in apparent control of the property where a violation occurs or originates shall be presumed to be the violator, and proof that the violation occurred on the person's property shall constitute a rebuttable presumption that the person in apparent control of the property committed the violation, but any such person shall have the right to show that he/she did not commit the violation. Parents shall be presumed to be responsible for violations of their minor children and proof that a violation, committed by a child, occurred on property within the parents' control shall constitute a rebuttable presumption that the parent committed the violation, but any such parent may be excused if he/she proves that he/she had previously directed the child not to use the water as it was used in violation of this Plan and that the parent could not have reasonably known of the violation.

d) Any employee of the _____ (*name of your water supplier*), police officer, or other _____ employee designated by the _____ (*designated official*), may issue a citation to a person he/she reasonably believes to be in violation of this Ordinance. The citation shall be prepared in duplicate and shall contain the name and address of the alleged violator, if known, the offense charged, and shall direct him/her to appear in the _____ (*example: municipal court*) on the date shown on the citation for which the date shall not be less than 3 days nor more than 5 days from the date the citation was issued. The alleged violator shall be served a copy of the citation. Service of the citation shall be complete upon delivery of the citation to the alleged violator, to an agent or employee of a violator, or to a person over 14 years of age who is a member of the violator's immediate family or is a resident of the violator's residence. The alleged violator shall appear in _____ (*example: municipal court*) to enter a plea of guilty or not guilty for the violation of this Plan. If the alleged violator fails to appear in _____ (*example: municipal court*), a warrant for his/her arrest may be issued. A summons to appear may be issued in lieu of an arrest warrant. These cases shall be expedited and given preferential setting in _____ (*example: municipal court*) before all other cases.

Section XI: Variances

The _____ (*designated official*), or his/her designee, may, in writing, grant temporary variance for existing water uses otherwise prohibited under this Plan if it is determined that failure to grant such variance would cause an emergency condition adversely affecting the health, sanitation, or fire protection for the public or the person requesting such variance and if one or more of the following conditions are met:

(a) Compliance with this Plan cannot be technically accomplished during the duration of the water supply shortage or other condition for which the Plan is in effect.
(b) Alternative methods can be implemented which will achieve the same level of reduction in water use.

Persons requesting an exemption from the provisions of this Ordinance shall file a petition for variance with the _____ (*name of your water supplier*) within 5 days after the Plan or a particular drought response stage has been invoked. All petitions for variances shall be reviewed by the _____ (*designated official*), or his/her designee, and shall include the following:

(a) Name and address of the petitioner(s).
(b) Purpose of water use.
(c) Specific provision(s) of the Plan from which the petitioner is requesting relief.
(d) Detailed statement as to how the specific provision of the Plan adversely affects the petitioner or what damage or harm will occur to the petitioner or others if petitioner complies with this Ordinance.
(e) Description of the relief requested.
(f) Period of time for which the variance is sought.
(g) Alternative water use restrictions or other measures the petitioner is taking or proposes to take to meet the intent of this Plan and the compliance date.
(h) Other pertinent information.

This page intentionally left blank.

Far West Texas Drought Contingency Plan for a Wholesale Public Water Supplier

(Adapted from TCEQ)

Name:	Click to add text	
Address:		
Telephone Number:	( )	Fax: ( )
Water Right No.(s):		
Regional Water Planning Group:		
Form Completed by:		
Title:		
Person responsible for implementation:		Phone: ( )
Signature:		Date: / /

Section I: Declaration of Policy, Purpose, and Intent

In order to conserve the available water supply and/or to protect the integrity of water supply facilities, with particular regard for domestic water use, sanitation, and fire protection, and to protect and preserve public health, welfare, and safety and minimize the adverse impacts of water supply shortage or other water supply emergency conditions, the _____ (*name of your water supplier*) adopts the following Drought Contingency Plan (the Plan).

Section II: Public Involvement

Opportunity for the public and wholesale water customers to provide input into the preparation of the Plan was provided by _____ (*name of your water supplier*) by means of _____ (*describe methods used to inform the public and wholesale customers about the preparation of the plan and opportunities for input; for example, scheduling and proving public notice of a public meeting to accept input on the Plan*).

Section III: Wholesale Water Customer Education

The _____ (*name of your water supplier*) will periodically provide wholesale water customers with information about the Plan, including information about the conditions under which each stage of the Plan is to be initiated or terminated and the drought response measures to be implemented in each stage. This information will be provided by means of _____ (*example: describe methods to be used to provide customers with information about the Plan; for example, providing a copy of the Plan or periodically including information about the Plan with invoices for water sales*).

Section IV: Coordination with Regional Water Planning Groups

The water service area of the _____ (name of your water supplier) is located within the _____ (*name of regional water planning area or areas*) and the _____ (*name of your water supplier*) has provided a copy of the Plan to the _____ (*name of your regional water planning group or groups*).

Section V: Authorization

The _____ (*designated official; for example, the general manager or executive director*), or his/her designee, is hereby authorized and directed to implement the applicable provisions of this Plan upon determination that such implementation is necessary to protect public health, safety, and welfare. The _____ or his/her designee, shall have the authority to initiate or terminate drought or other water supply emergency response measures as described in this Plan.

Section VI: Application

The provisions of this Plan shall apply to all customers utilizing water provided by the _____ (*name of your water supplier*). The terms "person" and "customer" as used in the Plan include individuals, corporations, partnerships, associations, and all other legal entities.

Section VII: Criteria for Initiation and Termination of Drought Response Stages

The _____ (*designated official*), or his/her designee, shall monitor water supply and/or demand conditions on a (*example: weekly, monthly*) basis and shall determine when conditions warrant initiation or termination of each stage of the Plan. Customer notification of the initiation or termination of drought response stages will be made by mail or telephone. The news media will also be informed.

The triggering criteria described below are based on:
_____.
(*provide a brief description of the rationale for the triggering criteria; for example, triggering criteria are based on a statistical analysis of the vulnerability of the water source under drought of record conditions).*

Utilization of alternative water sources and/or alternative delivery mechanisms:

Alternative water source(s) for _____ (*name of utility*) is/are: _____.
(Examples: Other well(s), Inter-connection with other system, Temporary use of a non-municipal water supply, Purchased water, Use of reclaimed water for non-potable purposes, etc.).

Stage 1 Triggers -- MILD Water Shortage Conditions

Requirements for initiation – The _____ (*name of your water supplier*) will recognize that a mild water shortage condition exists when _____ (*describe triggering criteria, see examples below).*

> ***Below are examples of the types of triggering criteria that might be used in a wholesale water supplier's drought contingency plan.*** *The wholesale water supplier may devise other triggering criteria and an appropriate number of stages tailored to its system; however, the plan must contain a minimum of three drought stages.* ***One or a combination of such criteria may be defined for each drought response stage:***
>
> > ***Example 1: Water in storage in the _____ (name of reservoir) is equal to or less than _____ (acre-feet and/or percentage of storage capacity).***

Example 2: When the combined storage in the _____ (name of reservoirs) is equal to or less than _____ (acre-feet and/or percentage of storage capacity).

Example 3: Flows as measured by the U.S. Geological Survey gage on the _____ (name of river) near _____, Texas reaches _____ cubic feet per second (cfs).

Example 4: When total daily water demand equals or exceeds _____ million gallons for _____ consecutive days or _____ million gallons on a single day.

Example 5: When total daily water demand equals or exceeds _____ percent of the safe operating capacity of _____ million gallons per day for _____ consecutive days or _____ percent on a single day.

Requirements for termination - Stage 1 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of _____ (*example: 30*) consecutive days. The _____ (*name of water supplier*) will notify its wholesale customers and the media of the termination of Stage 1.

Stage 2 Triggers -- MODERATE Water Shortage Conditions

Requirements for initiation – The _____ (*name of your water supplier*) will recognize that a moderate water shortage condition exists when _____ (*describe triggering criteria*).

Requirements for termination - Stage 2 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of _____ (*example: 30*) consecutive days. Upon termination of Stage 2, Stage 1, or the applicable drought response stage based on the triggering criteria, becomes operative. The _____ (*name of your water supplier*) will notify its wholesale customers and the media of the termination of Stage 2.

Stage 3 Triggers -- SEVERE Water Shortage Conditions

Requirements for initiation – The _____ (*name of your water supplier*) will recognize that a severe water shortage condition exists when _____ (*describe triggering criteria; see examples in Stage 1*).

Requirements for termination - Stage 3 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of _____ (*example: 30*) consecutive days. Upon termination of Stage 3, Stage 2, or the applicable drought response stage based on the triggering criteria, becomes operative. The _____ (*name of your water supplier*) will notify its wholesale customers and the media of the termination of Stage 3.

Stage 4 Triggers -- CRITICAL Water Shortage Conditions

Requirements for initiation - The _____ (*name of your water supplier*) will recognize that an emergency water shortage condition exists when _____ (*describe triggering criteria*; *see examples below*).

Example 1. ***Major water line breaks, or pump or system failures occur, which cause unprecedented loss of capability to provide water service; or***

Example 2. ***Natural or man-made contamination of the water supply source(s).***

Requirements for termination - Stage 4 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of _____ (*example: 30*) consecutive days. The _____ (*name of your water supplier*) will notify its wholesale customers and the media of the termination of Stage 4.

Section VIII: Drought Response Stages

The _____ (*designated official*), or his/her designee, shall monitor water supply and/or demand conditions and, in accordance with the triggering criteria set forth in Section VII, shall determine that mild, moderate, severe, or critical water shortage conditions exist or that an emergency condition exists and shall implement the following actions:

Stage 1 Response -- MILD Water Shortage Conditions

Target: Achieve a voluntary _____ percent reduction in _____ (*example: total water use, daily water demand, etc.*).

Best Management Practices for Supply Management:

Describe additional measures, if any, to be implemented directly by _____ (designated official), or his/her designee(s), to manage limited water supplies and/or reduce water demand. Examples include modifying reservoir operations procedures, interconnection with another water system, and use of reclaimed water for nonpotable purposes.

Water Use Restrictions for Reducing Demand:

(a) The _____ (*designated official*), or his/her designee(s), will contact wholesale water customers to discuss water supply and/or demand conditions and will request that wholesale water customers initiate voluntary measures to reduce water use (*example: implement Stage 1 or appropriate stage of the customer's drought contingency plan*).

(b) The _____ (*designated official*), or his/her designee(s), will provide a weekly report to news media with information regarding current water supply and/or demand conditions, projected water supply and demand conditions if drought conditions persist, and consumer information on water conservation measures and practices.

Stage 2 Response -- MODERATE Water Shortage Conditions

Target: Achieve a _____ percent reduction in _____ (*example: total water use, daily water demand, etc.*).

Best Management Practices for Supply Management:

Describe additional measures, if any, to be implemented directly by _____ (designated official), or his/her designee(s), to manage limited water supplies and/or reduce water demand. Examples include modifying reservoir operations procedures, interconnection with another water system, and use of reclaimed water for non-potable purposes.

Water Use Restrictions for Reducing Demand:

(a) The _____ (*designated official*), or his/her designee(s), will request wholesale water customers to initiate mandatory measures to reduce non-essential water use (*example: implement Stage 2 or appropriate stage of the customer's drought contingency plan*).

(b) The _____ (*designated official*), or his/her designee(s), will initiate weekly contact with wholesale water customers to discuss water supply and/or demand conditions and the possibility of pro rata curtailment of water diversions and/or deliveries.

(c) The _____ (*designated official*), or his/her designee(s), will further prepare for the implementation of pro rata curtailment of water diversions and/or deliveries by preparing a monthly water usage allocation baseline for each wholesale customer.

(d) The _____ (*designated official*), or his/her designee(s), will provide a weekly report to news media with information regarding current water supply and/or demand conditions, projected water supply and demand conditions if drought conditions persist, and consumer information on water conservation measures and practices.

Stage 3 Response -- SEVERE Water Shortage Conditions

Target: Achieve a _____ percent reduction in _____ (*example: total water use, daily water demand, etc.*).

Best Management Practices for Supply Management:

Describe additional measures, if any, to be implemented directly by _____ (designated official), or his/her designee(s), to manage limited water supplies and/or reduce water demand. Examples include modifying reservoir operations procedures, interconnection with another water system, and use of reclaimed water for non-potable purposes.

Water Use Restrictions for Reducing Demand:

(a) The _____ (*designated official*), or his/her designee(s), will contact wholesale water customers to discuss water supply and/or demand conditions and will request that wholesale water customers initiate additional mandatory measures to reduce non-essential water use (example: implement Stage 3 or appropriate stage of the customer's drought contingency plan).

(b) The _____ (*designated official*), or his/her designee(s), will initiate pro rata curtailment of water diversions and/or deliveries for each wholesale customer.

(c) The _____ (*designated official*), or his/her designee(s), will provide a weekly report to news media with information regarding current water supply and/or demand conditions, projected water supply and demand conditions if drought conditions persist, and consumer information on water conservation measures and practices.

Stage 4 Response -- EMERGENCY Water Shortage Conditions

Whenever emergency water shortage conditions exist as defined in Section VII of the Plan, the _____ (*designated official*) shall:

1. Assess the severity of the problem and identify the actions needed and time required to solve the problem.
2. Inform the utility director or other responsible official of each wholesale water customer by telephone or in person and suggest actions, as appropriate, to alleviate problems (*example: notification of the public to reduce water use until service is restored*).
3. If appropriate, notify city, county, and/or state emergency response officials for assistance.
4. Undertake necessary actions, including repairs and/or clean-up as needed.

5. Prepare a post-event assessment report on the incident and critique of emergency response procedures and actions.

Section IX: Pro Rata Curtailment

In the event that the triggering criteria specified in Section VII of the Plan for Stage 3 – Severe Water Shortage Conditions have been met, the _____ (*designated official*) is hereby authorized to initiate allocation of water supplies on a pro rata basis in accordance with Texas Water Code, §11.039.

Section X: Contract Provisions

The _____ (*name of your water supplier*) will include a provision in every wholesale water contract entered into or renewed after adoption of the plan, including contract extensions, that in case of a shortage of water resulting from drought, the water to be distributed shall be divided in accordance with Texas Water Code, §11.039.

Section XI: Enforcement

During any period when pro rata allocation of available water supplies is in effect, wholesale customers shall pay the following surcharges on excess water diversions and/or deliveries:

Example of surcharge:

_____ times the normal water charge per acre-foot for water diversions and/or deliveries in excess of the monthly allocation from _____ percent through _____ percent above the monthly allocation.

Section XII: Variances

The _____ (*designated official*), or his/her designee, may, in writing, grant a temporary variance to the pro rata water allocation policies provided by this Plan if it is determined that failure to grant such variance would cause an emergency condition adversely affecting the public health, welfare, or safety and if one or more of the following conditions are met:

(a) Compliance with this Plan cannot be technically accomplished during the duration of the water supply shortage or other condition for which the Plan is in effect.
(b) Alternative methods can be implemented which will achieve the same level of reduction in water use.

Persons requesting an exemption from the provisions of this Plan shall file a petition for variance with the _____ (*designated official*) within 5 days after pro rata allocation has been invoked. All petitions for variances shall be reviewed by the _____ (*governing body*), and shall include the following:

(a) Name and address of the petitioner(s).
(b) Detailed statement with supporting data and information as to how the pro rata allocation of water under the policies and procedures established in the Plan adversely affects the petitioner or what damage or harm will occur to the petitioner or others if petitioner complies with this Ordinance.
(c) Description of the relief requested.
(d) Period of time for which the variance is sought.
(e) Alternative measures the petitioner is taking or proposes to take to meet the intent of this Plan and the compliance date.
(f) Other pertinent information.

Variances granted by the _____ (*governing body*) shall be subject to the following conditions, unless waived or modified by the _____ (*governing body*) or its designee:

(a) Variances granted shall include a timetable for compliance.
(b) Variances granted shall expire when the Plan is no longer in effect, unless the petitioner has failed to meet specified requirements.

No variance shall be retroactive or otherwise justify any violation of this Plan occurring prior to the issuance of the variance.

Section XIII: Severability

It is hereby declared to be the intention of the _____ (*governing body of your water supplier*) that the sections, paragraphs, sentences, clauses, and phrases of this Plan are severable and, if any phrase, clause, sentence, paragraph, or section of this Plan shall be declared unconstitutional by the valid judgment or decree of any court of competent jurisdiction, such unconstitutionality shall not affect any of the remaining phrases, clauses, sentences, paragraphs, and sections of this Plan, since the same would not have been enacted by the _____ (*governing body of your water supplier*) without the incorporation into this Plan of any such unconstitutional phrase, clause, sentence, paragraph, or section.

This page intentionally left blank

CHAPTER 8

POLICY RECOMMENDATIONS AND UNIQUE SITES

This page intentionally left blank.

8 POLICY RECOMMENDATIONS AND UNIQUE SITES

An important aspect of the regional water planning process is the opportunity for the Far West Texas Water Planning Group (FWTWPG) to discuss water policy issues that are important to this Region and provide recommendations for the improvement of future water management planning in Texas. The recommendations are designed to present new and/or modified approaches to key technical, administrative, institutional, and policy matters that will help to streamline the planning process, and to offer guidance to future planners regarding specific issues of concern within the Region. This chapter also addresses recommendations of “Ecologically Unique River and Stream Segments” and consideration of “Unique Sites for Reservoir Construction”. The FWTWPG approves of the legislative intent of the regional water planning process and supports the continuance of water planning at the regional level.

8.1 WATER MANAGEMENT POLICY

1. **Stormwater / Flood Planning**. In July 2023 the Regional Flood Plans were adopted by the regional flood planning groups and approved by the TWDB. During the first cycle (2020-2023), additional funding was allocated to the Regional Flood Planning Groups in late 2022, enabling them to perform additional outreach, complete select flood mitigation evaluations, and recommend additional flood mitigation projects, and flood mitigation strategies in the plans. The 2023 Amended Regional Flood Plans were approved by the TWDB on March 5, 2024 and supersede the January 2023 Final Plans.

   The Far West Texas Region lies within Flood Planning Region 14 (Upper Rio Grande). This Region is by far the largest of the flood planning regions. A handful of the flood planning voting members also actively participate in the Far West Texas Regional Water Planning process. This representation is critical and provides consistency in representing the Region holistically.

   Chapter 8 of the 2023 Upper Rio Grande Regional Flood Plan outlines legislative recommendations developed by the Regional Flood Planning Group, necessary to facilitate floodplain management and flood mitigation planning and implementation. The FWTWPG looks forward to coordinating with the Regional Flood Planning group on water related issues.

2. **Needed Funding for Data Collection in Rural Areas**. Rural areas need to be able to access State funding to gather the information needed to draft a substantive regional plan. This funding is needed for test wells, monitoring equipment, observation wells, modeling, and to obtain more data on the West Texas aquifers. The FWTWPG should be allowed to request additional funding for the data needs and contract for the studies.

3. **Colonias**. Far West Texas contains a significant portion of the colonias in the State of Texas. While much effort has gone into rectifying the substandard water and wastewater conditions in the Region (see Section 1.10 in Chapter 1 of this *Plan*), many of these economically distressed neighborhoods continue to exist. The FWTWPG encourages State and Federal agencies to continue their financial programs so that all citizens, regardless of their social and economic status, can be provided with a safe and healthy living environment. The FWTWPG is specifically appreciative of the reestablishment of the TWDB Economically Distressed Area Program (EDAP) and encourages the legislature to properly fund this vital program.

4. **Rio Grande Interstate Litigation**. The FWTWPG recognizes the potential impact of diminished water-supply availability from the Rio Grande resulting from excess diversion of Rio Grande surface water and the hydrologically connected underground water downstream of Elephant Butte Reservoir that is intended for use within the Rio Grande Project. The FWTWPG considers this action contrary to the purpose and intent of the Rio Grande Compact and encourages the State of Texas to continue its pursuit of rectifying the action through whatever action is deemed most appropriate.

5. **Regionalization.** Participants (municipal utilities) in the FWTWPG continue to maintain a robust regional relationship by helping unserved or underserved water systems become sustainable and resilient. Funding policies may impede this effort by suggesting regionalization through consolidation of water districts. The FWPWPG finds that entities in unserved or underserved areas should still be eligible for financial assistance. The grant or loan eligibility for unserved or underserved service area should be treated independently from the provider of some services through interlocal agreements.

   The FWTWPG finds that many unserved or underserved rural areas lack technical, financial, managerial, or funding to operate some field or administrative aspect required by funding agencies to maintain or provide safe affordable water or wastewater services in a sustainable manner. However, water utilities contiguous to the local utilities have the capacity to assist as many do through interlocal agreements between the utilities. The FWTWPG promotes these efforts and finds that funding mechanisms should account for regionalized relationships other than consolidation when considering funding for projects. The utilities by virtue of interlocal agreements may be able to satisfy eligibility requirements regarding experience, capacity, and sustainability, which demonstrate the capacity to provide essential and sustainable water and sewer service to the areas in need.

8.2 REGIONAL WATER PLANNING PROCESS

1. **Re-emphasis of the Planning Function of the Regional Water Planning Group and Need for More Local Planning Initiatives**. The planning process increasingly focuses too heavily on meeting the technical requirements of the regional water planning process and the TAC rules, to the detriment of allowing for local planning initiatives. The role of the Regional Water Planning Group no longer seems to include "planning;" rather, it meets primarily to ratify deadlines and requirements of the TWDB. Certainly, this seems to contradict the goal of Senate Bill 1. Providing for more local influence of the process and reducing the numerous, standardized checklists of the requirements of the *Plan* would help. The planning process and the ultimate *Plan* must be flexible because of the unique characteristics of the border region. The FWTWPG should have the legal ability to consider all water resources available to the Region, regardless of whether or not they are located within Texas.
2. **Modification of Demand Numbers**. Modification of demand numbers should be allowed further into the planning process. Demand errors may not be discovered until the supply-demand analysis is performed. The manner in which the irrigation and livestock demand numbers increase during drought scenarios is inappropriate because other factors influence the demand. For example, during a drought in Far West Texas, livestock are sold, thus reducing the overall demand on groundwater. There needs to be a better understanding of the process of how livestock, drought and water demand interact, and this understanding needs to be reflected in the demand numbers.
3. **El Paso County Irrigation Demand Projection.** Chapter 2 of this *Plan* includes a value of 193,990 acre-feet per year as estimated irrigation water demand for El Paso County, but the value is based on historical water use during an extreme drought. A more accurate estimate is the one included in the Water Demand Projection in Table 2-2 of the 2016 Far West Texas Water Plan, showing estimated irrigation water demand of 242,798 acre-feet per year based on years with an adequate supply of surface water. The latter value is more accurate than the former value because the methodology used by TWDB, as documented in the February 2017 TWDB Water Demand Project Methodologies report, uses average irrigation water use over the most recent five years (2010-2014), instead of during a period of adequate surface water supply, as the basis for estimating future surface water irrigation demands in El Paso and Hudspeth Counties.
4. **Plan Implementation**. Implementation of the *Plan's* recommendations must be the responsibility of the local governments, entities, and individuals within the Region. The Water Planning Group is not intended to assume a supervisory or command-and-control role. The Water Planning Group's function will be to monitor implementation and assist the local governments, entities, and individuals within the Region as requested.
5. **State Mandated Water Planning**. State mandated water planning for this Region began in 1999. The water plan to be completed in 2026 will be the sixth round of planning. The details of water planning in this Region are not changing dramatically over five-year periods. Funding is needed for the implementation of the water supply projects presented in the Water Plan.

6. **Contractual Guidelines.** Contractual guidelines for the performance of regional water planning should be established at the beginning of each five-year planning period, and not modified, especially without added funding, during that planning period. Inter-period modifications result in unscheduled distractions, time and expense, in performing the required planning procedures in which the contracts are based. Legislative modifications thus should only be implemented at the beginning of the existing planning period.
7. **Coordination with Municipal Utility Districts (MUDs).** To better inform 50-year water supply estimates, the FWTWPG recommends that all Municipal Utility Districts (MUDs) be required to coordinate with regional water planning. Ideally, this coordination would be included in this checklist: Summary of Application Requirements for the Creation of Municipal Utility Districts.

8.3 WATER RESEARCH NEEDS

1. There is a concern that some historical irrigation pumpage reported by the TWDB is inaccurate. The TWDB should continue its irrigation surveys and attempt to improve the estimates with the assistance of local irrigation and groundwater districts.
2. A study should be performed to evaluate the feasibility and potential benefits of rechanneling a segment of the Rio Grande below Fort Quitman.
3. A significant amount of groundwater is produced from Cretaceous limestone formations in southern Brewster County that exist outside the boundary of the Edwards-Trinity (Plateau) Aquifer. The communities of Lajitas, Terlingua, and Study Butte, along with other rural users rely on this sole source of water to meet their daily needs. An aquifer characterization study is needed to estimate its vertical and lateral extent, sustainable yield, and water quality.
4. Provide funding for the development of the Transboundary Aquifer Model of the Mesilla Bolson. Ciudad Juarez has built the infrastructure needed to capture groundwater from the Conejos Medanos Aquifer, which is the southern extension of the Mesilla Bolson. Development of this regional model will allow water quantity and quality impacts to be evaluated.
5. An Integrated Rio Grande Data Management System allowing for regional coordination of the Rio Grande for better management and decision making of irrigation releases and flood control is needed. Also, the Rio Grande Project delivery system needs a real-time water quantity and water quality monitoring system so that agriculture, municipal and regulatory agencies can better manage and account for the water. The benefits would improve efficiency, flood control management and warnings of contaminant releases. Thus, information systems analysis and hydrologic operations modeling are recommended.
6. Provide research funding for the Rio Grande Salinity Management Coalition (RGSMC). The goal of the coalition is to ultimately reduce salinity concentrations in the Rio Grande, which will allow increased beneficial use of the water for agriculture, urban and environmental purposes.

8.4 ECOLOGICALLY UNIQUE RIVER AND STREAM SEGMENTS

As a part of the planning process, each regional planning group may include recommendations for the designation of Ecologically Unique River and Stream Segments in their adopted regional water plan (31 TAC 357.8). The Texas Legislature may designate a river or stream segment of unique ecological value following the recommendations of a regional water planning group. As per §16.051(f) of the Texas Water Code, this designation solely means that a State agency or political subdivision of the State may not finance the actual construction of a reservoir in a specific river or stream segment designated by the legislature under this subsection.

Stream segment designation is to be supported by a recommendation package that includes a physical description, maps, photographs, literature citations, and data pertaining to each candidate stream segment. In accordance with the TWDB's rules, the following criteria are to be used when recommending a river or stream segment as being of unique ecological value:

1. **Biological Function –** Segments which display significant overall habitat value including both quantity and quality considering the degree of biodiversity, age, and uniqueness observed and including terrestrial, wetland, aquatic, or estuarine habitats;
2. **Hydrologic Function –** Segments which are fringed by habitats that perform valuable hydrologic functions relating to water quality, flood attenuation, flow stabilization, or groundwater recharge and discharge;
3. **Riparian Conservation Areas –** Segments which are fringed by significant areas in public ownership including state and federal refuges, wildlife management areas, preserves, parks, mitigation areas, or other areas held by governmental organizations for conservation purposes under a governmentally approved conservation plan;
4. **High Water Quality/Exceptional Aquatic Life/High Aesthetic Value –** Segments and spring resources that are significant due to unique or critical habitats and exceptional aquatic life uses dependent on or associated with high water quality; or
5. **Threatened or Endangered Species/Unique Communities –** Sites along segments where water development projects would have significant detrimental effects on state or federally listed threatened and endangered species, and sites along segments that are significant due to the presence of unique, exemplary, or unusually extensive natural communities.

A quantitative assessment of how recommended water management strategies (Chapter 5) potentially could affect flows deemed important by the FWTWPG to the Ecologically Unique River and Stream Segments (EURSS) was performed by considering the following criteria:

- Distance from the strategy supply source to the EURSS
- Does the strategy groundwater supply source (aquifer) contribute flow to the EURSS
- Does the strategy surface water supply source (Rio Grande) contribute flow to the EURSS
- Percent diminished flow to the EURSS resulting from implementation of the strategy

The FWTWPG chooses to respect the privacy of private landowners and therefore recommends only parts of river and stream segments that are within the management boundaries of State and National Parks, and conservation lands managed by the Texas Nature Conservancy and the Dixon Water Foundation at their request. Notification was given to the public that the FWTWPG would consider river and stream segments on private property only if requested by the landowner.

In previous planning periods, the FWTWPG has recommended three streams that lie within the boundaries of state-managed properties, four within National Park boundaries, and specified streams managed by the Texas Nature Conservancy and Texas Pecos Land Trust as listed below (Figure 8-1). All segments are recommended by the TWDB in the 2017 State Water Plan, and all recommended segments except the Alamito Creek (Texas Pecos Land Trust) and Terlingua Creek (Big Bend National Park) have been designated by the Texas Legislature. Recommendation packages for these two remaining segments were included in the *2011 (Alamito Creek – Appendix 8F) and 2016 (Terlingua Creek – Appendix 8A) Far West Texas Water Plans*, and their continued recommended status is consistent with this *2026 Plan*. Appendix 8A of this *Plan* provides the TPWD response to the continued recommendation of Alamito and Terlingua Creeks as Ecologically Unique Stream Segments in Far West Texas.

- **Rio Grande Wild and Scenic River (Big Bend National Park)** primarily depends on flows from the Rio Conchos and from springs and spring-fed tributaries along the Big Bend stretch of the River. No strategies occur in the aquifers that feed the springs and tributaries. Historically, the Upper Rio Grande (El Paso and Hudspeth Counties) flowed almost unabated through the Far West Texas stretch of the River. However, with today's upstream water demands on the River, only a minor flow from the Upper Rio Grande segment manages to periodically contribute to the Lower Rio Grande segment (Presidio, Brewster and Terrell Counties). Strategies presented in this *Plan* do not significantly reduce this downstream contribution.
- **Terlingua Creek (Big Bend National Park)** flows six miles within Big Bend National Park to its confluence with the Rio Grande immediately downstream of Santa Elena Canyon, an area of exceptional aesthetic value. The National Park Service has declared Terlingua Creek to have exceptional aesthetic value. The Proserpine shiner is a desert fish with a limited geographic range and is threatened primarily by decreased spring flows, habitat loss and alteration of flow regimes. The species only occurs in Texas and was designated as critically threatened by TPWD in 1977. Terlingua Creek is within the natural habitat of this species.
- **McKittrick Canyon and Chosa Creek (Guadalupe Mountains National Park)** are spring fed at high elevations of the Capitan Reef Aquifer within the Park. Potential groundwater pumped and transported from the Diablo Farms section of the Capitan Reef Aquifer (Strategy E-21) is separated from the spring sources by distance, faulting, and elevation. Also, pumping and transport of groundwater from the Bone Spring – Victorio Peak Aquifer in the Dell City area (Strategy E-22) is also separated from the spring sources by distance, faulting and elevation. Thus, pumping from these aquifers should have no impact on aquifer sources that contribute to springflow.
- **Cienega Creek (Chinati Mountains State Natural Area)** is spring fed from high elevation exposures of the Davis Mountains Igneous Aquifer. Only strategy E-63 in Fort Davis considers a pumping project in the Igneous Aquifer. However, the pumping location is distant from this designated stream and thus will have no water flow impact.

- **Alamito and Cienega Creeks (Big Bend Ranch State Park)** are spring fed from high elevation exposures of the Davis Mountains Igneous Aquifer. Only strategy E-63 in Fort Davis considers a pumping project in the Igneous Aquifer. However, the pumping location is distant from this designated stream and thus will have no water flow impact.
- **Alamito Creek (Alamito Creek Preserve & Dixon Water Foundation)** is spring fed from high elevation exposures of the Davis Mountains Igneous Aquifer. Only strategy E-63 in Fort Davis considers a pumping project in the Igneous Aquifer. However, the pumping location is distant from this designated stream and thus will have no water flow impact.
- **Independence Creek (Texas Nature Conservancy – Independence Creek Preserve)** is spring fed from the Edwards-Trinity (Plateau) Aquifer.
- **Madera Creek, Canyon Headwaters of Limpia Creek, Little Aguja Creek, and Upper Cherry Creek (Texas Nature Conservancy – Davis Mountains Preserve)** are spring fed from high elevation exposures of the Davis Mountains Igneous Aquifer. Only strategy E-63 in Fort Davis considers a pumping project in the Igneous Aquifer. However, the pumping location is distant from this designated stream and thus will have no water flow impact.

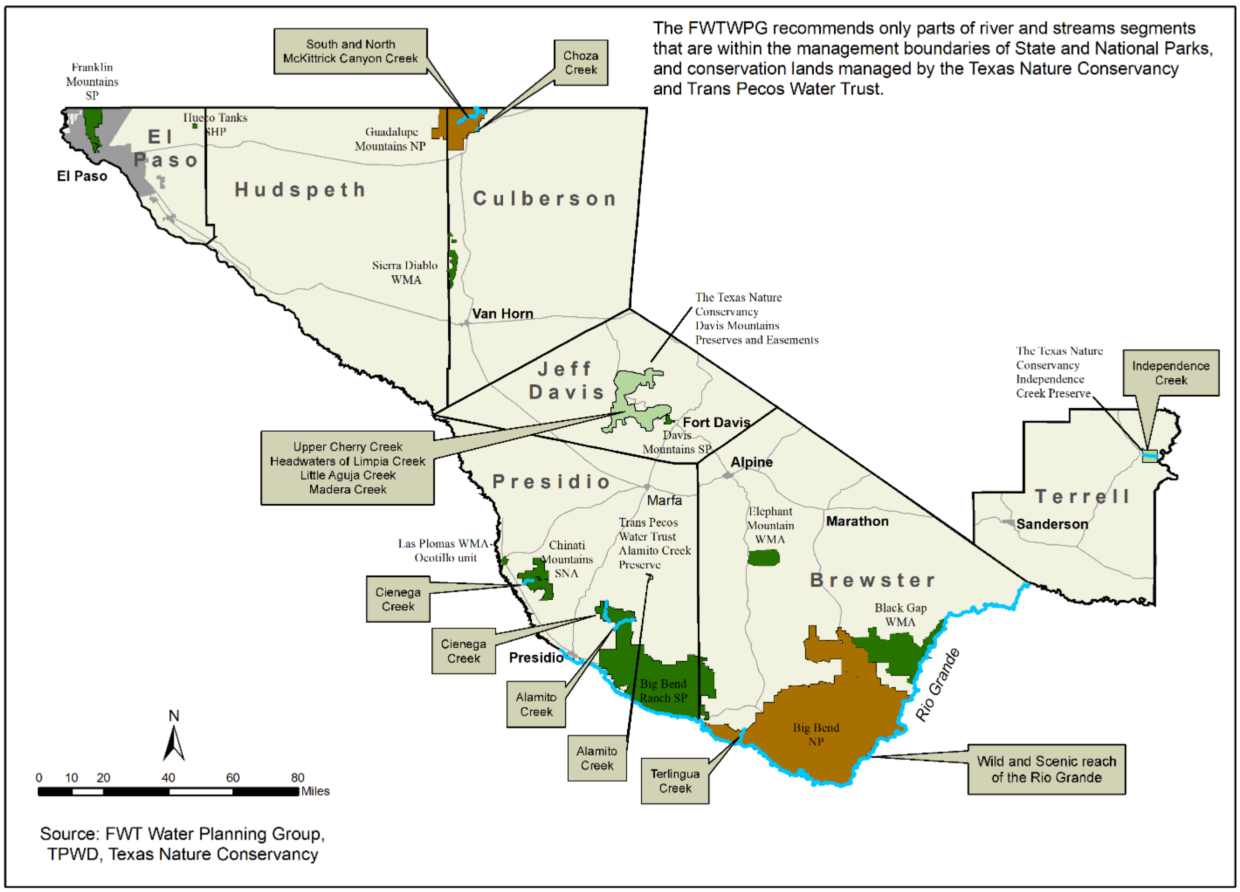


Figure 8-1. Recommended Ecologically Unique River and Stream Segments

8.5 CONSIDERATION OF UNIQUE SITES FOR RESERVOIR CONSTRUCTION

The regional water planning process gives each of the 16 regional water planning groups the opportunity to recommend stream locations for designation as “Unique Sites for Reservoir Construction". The regional water planning process legislation and rules list many criteria to determine if a site is qualified for such designation.

The availability of water is one of the most important criteria in the selection of a reservoir site, if not the most important criterion. The low rainfall totals and the spotty nature of precipitation in Far West Texas limit the potential for sufficient runoff to maintain desired water levels in reservoirs.

Many canyons in the mountainous areas of Far West Texas might not retain large volumes of water because of the fractured and often highly permeable bedrock that forms the walls and floors of these topographic features. Any attempt to develop a reservoir in Far West Texas will require extensive and costly geological, geotechnical, and hydrological investigations to determine whether a site is suitable. The program of work would also require detailed State and Federal environmental impact assessments. Regarding the Rio Grande, the 1944 International Treaty between the United States and Mexico specifies that a reservoir project considered by one country have the other country’s permission. Furthermore, the treaty stipulates that international reservoirs are to be operated by both countries.

On watercourses other than the Rio Grande, the water use reported to the TCEQ by surface water right holders gives some clues as to which watercourses are the most reliably used and therefore could be investigated for potential reservoir sites. Reported water use data, provided by the Rio Grande Watermaster and by TCEQ, have been examined to identify holders of surface water rights who can divert water in amounts greater than 1,000 acre-feet per year. The analysis indicates that Musquiz and Maravillas Creeks in Brewster County are probably the most reliable surface water sources.

On Alamito Creek in Presidio County, there is an existing recreational reservoir authorized to impound 18,700 acre-feet, but diversions are not authorized and therefore no use amounts are reported. Whether this reservoir stays reliably full is unknown, and the reliability of Alamito Creek in general is unknown.

A feasibility study for a recreational lake site near Alpine was previously conducted and consideration was given to its municipal water supply potential. The project was abandoned because of its high cost-to-yield potential.

Additional off-channel reservoir sites, as well as flood protection dam sites on major arroyos have been studied by the Hudspeth County Conservation and Reclamation District #1, El Paso-Hudspeth County Soil Conservation District, and the Hudspeth County Commissioners Court. None of these sites have been selected for construction. Additional flood retention dams have been considered for the El Paso area. These retention dams would have the added benefit of increasing recharge of the local aquifer by increasing infiltration of the retained water into the bolson deposits.

The firm yield for any reservoirs constructed on even the most reliable Far West Texas watercourses is not likely to exceed 2,000 acre-feet per year. For this reason, the *2026 Far West Texas Water Plan* does not recommend any watercourse for designation as “Unique Sites for Reservoir Construction.”

APPENDIX 8A

TPWD RESPONSE TO UNIQUE STREAM SEGMENT RECOMMENDATION

This page intentionally left blank.

Life's better outside.®

October 27, 2020

John Ashworth
Far West Texas Water Planning Group Consultant
LBG-Guyton Associates
1101 Capital of Texas Highway
Suite B-220
Austin, Texas 78746

Dear Mr. Ashworth,

Thank you for forwarding the Far West Texas Regional Water Planning Group's nomination package for the segment of Alamito Creek in Presidio County owned by the Trans Pecos Water Trust and the segment of Terlingua Creek within the boundaries of Big Bend National Park in Brewster County. As per the Texas Administrative Code (TAC), TPWD staff has reviewed the package and offers the following comments.

TPWD staff agree that the segment of Alamito Creek in Presidio County owned by the Trans Pecos Water Trust and the segment of Terlingua Creek within the boundaries of Big Bend National Park in Brewster County meet one or more of the ecologically significant criteria set out in TAC Chapter 357.43: 1) biological function, 2) hydrologic function, 3) riparian conservation area, 4) high water quality/exceptional or high aquatic life use/high aesthetic value and, 5) presence of threatened or endangered species or unique communities. The recommendation package for Terlingua Creek includes required descriptions, documentation and citations to support the selection of this segment. The recommendation package for Alamito Creek includes the required description and a map but not citations. However, the nomination package did include TPWD's March 2016 letter (attached) describing species of greatest conservation need found there.

Alamito Creek downstream of the FM 169 crossing to the confluence with the Rio Grande is included in TPWD's list of ecologically significant stream segments (http://tpwd.texas.gov/landwater/water/conservation/water_resources/water_quantity/sigsegs/regione.phtml). Alamito Creek exhibits high water quality, exceptional aquatic life and high aesthetic value, and diverse benthic macroinvertebrate and fish communities. The creek provides habitat for the state threatened Mexican Stoneroller and historically supported a population of the Conchos Pupfish, also a state threatened species, but it has not been collected from the creek recently. In addition, the portion of Alamito Creek owned by the Trans Pecos Water Trust contains Mixed Hardwood-Cottonwood Gallery that provides suitable habitat for numerous Chihuahuan desert riparian species of greatest conservation need (SGCN) including Black bear, Common Black-Hawk, Gray Hawk, Zone-tailed Hawk, Yellow-billed cuckoo, Summer Tanager, Painted Bunting, and Chihuahuan mudturtle. Species of greatest conservation need include species that are declining or rare and in need of attention to recover or to prevent the need to list under state or federal regulation. TPWD staff believe the segment of Alamito Creek upstream of the FM 169 crossing also meets the criteria for high water quality and presence of threatened or endangered species or unique ecological communities.

4200 SMITH SCHOOL ROAD
AUSTIN, TEXAS 78744-3291
512.389.4800

www.tpwd.texas.gov

The segment of Terlingua Creek within the boundaries of Big Bend National Park in Brewster County is also included in TPWD's list of ecologically significant stream segments. This segment meets criteria for Riparian conservation area, High water quality/exceptional aquatic life/high aesthetic value and threatened or endangered species/unique communities. Terlingua Creek supports a unique fish community composed SGCN species including listed species. Please note TPWD's information to support the unique community criteria for this segment of Terlingua Creek is being updated to read:

Threatened or endangered species/unique communities: The fish community of Terlingua Creek includes the following fish species: Chihuahua shiner (SGCN/St.T), Tamaulipas shiner (SGCN/St.T), Speckled chub (SGCN/St.T), Longnose dace (SGCN) and Rio Grande silvery minnow (St. E., Fed. E.). Terlingua Creek historically supported a population of the Conchos pupfish (St. T), but none have been collected recently.

TPWD appreciates the opportunity to review the information provided recommending designation by the Legislature as ecologically unique the two stream segments located on Alamito Creek and Terlingua Creek. TPWD also appreciates the Far West Regional Water Planning Group's earlier efforts that have successfully led to designation of Ecologically Unique Streams within the planning region.

Please do not hesitate to contact me if you have any questions. I can be reached at 512/389-7015 or cindy.loeffler@tpwd.texas.gov.

Sincerely,

Cindy Loeffler

Cindy Loeffler, Chief
Water Resources Branch

Enclosures: 1

CHAPTER 9

IMPLEMENTATION AND COMPARISON TO THE PREVIOUS REGIONAL WATER PLAN

This page intentionally left blank.

9 IMPLEMENTATION AND COMPARISON TO THE PREVIOUS REGIONAL WATER PLAN

Chapter 9 provides a survey of the level of implementation and identified impediments to the development of previously (*2021 Plan*) recommended Water Management Strategies that have affected progress in meeting projected water-supply needs. To best appreciate the continued improvements to the Far West Texas water planning process, this Chapter also offers a comparison of key components in the *2021 Far West Texas Water Plan* to those in this current *2026 Far West Texas Water Plan*. This Chapter also assesses the progress of the Far West Texas planning area in encouraging cooperation between Water User Groups (WUGs) for the purpose of achieving economies of scale and otherwise incentivizing strategies that benefit the entire Region.

9.1 IMPLEMENTATION OF PREVIOUS REGIONAL WATER PLAN

Information needed to report on the level of implementation and identified impediments to the development of previously (*2021 Plan*) recommended Water Management Strategies that have affected progress in meeting projected water-supply needs was collected through a survey conducted by the Far West Texas Planning Group. Additional methods that were considered for identifying projects that may potentially have been implemented include:

- Identification of Potentially Infeasible WMSs scope-of-work
- Tracking changes since the last Plan;
- Using TWDB funding records; and
- Using conservation implementation reports submitted to the TWDB.

Survey results are provided in Table 9-1.

Table 9-1. 2026 Far West Texas Strategy Implementation Survey

WMS or WMS Project Name	Database Online Decade	Related Sponsor Entity and/or Benefitting WUGs	Has Sponsor taken affirmative vote or action? (TWC 16.053(h)(10))	What is the status of the WMS project or WMS recommended in the 2022 SWP?	If the project has not been started or no longer is being pursued, please explain why.	Project Impediment(s)	Other Project Impediments (not shown in Column G)	What funding type(s) are being used for the project?	Optional Comments
Modification to wastewater treatment facility & irrigation system [City of Alpine]	2030	City of Alpine	Yes	Not Started	Future Project According to Online Decade	Other	No Impediments - Future Project According to Online Decade	N/A	
Irrigation & recharge application of captured rainwater runoff [City of Alpine]	2030	City of Alpine	Yes	Not Started	Future Project According to Online Decade	Other	No Impediments - Future Project According to Online Decade	N/A	
Water loss audit & main-line repair [Marathon WSS Service]	2020	Brewster | county-other	Yes	Started	N/A	N/A	N/A	Unknown	
Water loss audit & main-line repair [Lajitas Municipal Services]	2020	Brewster | county-other	Yes	Started	N/A	N/A	N/A	Unknown	
Water loss audit & main-line repair [Study Butte Terlingua WS]	2020	Brewster | county-other	Yes	Started	N/A	N/A	N/A	State	TWDB Project #62844
Irrigation scheduling [Culberson County | Irrigation]	2020	Culberson | Irrigation	No	Not Started	Project Sponsor Not Identified	Project Sponsor Not Identified	N/A	N/A	
Additional groundwater wells [Culberson County | Irrigation]	2020	Culberson | Irrigation	No	Not Started	Project Sponsor Not Identified	Project Sponsor Not Identified	N/A	N/A	
Arsenic treatment facility [Town of Anthony]	2020	Town of Anthony	Yes	Started	N/A	N/A	N/A	State	TWDB Project #62611
Additional groundwater well [Town of Anthony]	2020	Town of Anthony	Yes	Completed	N/A	N/A	N/A	N/A	

Table 9-1. (continued) 2026 Far West Texas Strategy Implementation Survey

WMS or WMS Project Name	Database Online Decade	Related Sponsor Entity and/or Benefitting WUGs	Has Sponsor taken affirmative vote or action? (TWC 16.053(h)(10))	What is the status of the WMS project or WMS recommended in the 2022 SWP?	If the project has not been started or no longer is being pursued, please explain why.	Project Impediment(s)	Other Project Impediments (not shown in Column G)	What funding type(s) are being used for the project?	Optional Comments
Municipal conservation programs [El Paso Water]	2020	El Paso Water	Yes	Started	N/A	N/A	N/A	Private	
Advanced water purification at the Bustamante WWTP [El Paso Water]	2020	El Paso Water	Yes	Started	N/A	N/A	N/A	State	
Hueco Bolson artificial recharge [El Paso Water]	2030	El Paso Water	Yes	Started	N/A	N/A	N/A	State	
Groundwater from Dell City Area (Phase 1) [El Paso Water]	2040	El Paso Water	Yes	Started	N/A	N/A	N/A	State	TWDB Project #51012
Groundwater from Dell City Area (Phase 2) [El Paso Water]	2050	El Paso Water	Yes	Started	N/A	N/A	N/A	State	TWDB Project #51012
Public conservation education [LVWD]	2020	LVWD	Yes	Started	N/A	N/A	N/A	Private	
Purchase water from El Paso Water [LVWD]	2020	LVWD	Yes	Started	N/A	N/A	N/A	Private	
Surface water treatment plant & transmission line [LVWD]	2030	LVWD	Yes	Started	N/A	N/A	N/A	Private	
Groundwater from proposed wellfield Rio Grande Alluvium Aquifer [LVWD]	2030	LVWD	Yes	Started	N/A	N/A	N/A	Private	
Groundwater from proposed wellfield Hueco Bolson Aquifer [LVWD]	2030	LVWD	Yes	Started	N/A	N/A	N/A	Private	
Wastewater treatment facility & ASR [LVWD]	2030	LVWD	Yes	Started	N/A	N/A	N/A	Private	

Table 9-1. (continued) 2026 Far West Texas Strategy Implementation Survey

WMS or WMS Project Name	Database Online Decade	Related Sponsor Entity and/or Benefitting WUGs	Has Sponsor taken affirmative vote or action? (TWC 16.053(h)(10))	What is the status of the WMS project or WMS recommended in the 2022 SWP?	If the project has not been started or no longer is being pursued, please explain why.	Project Impediment(s)	Other Project Impediments (not shown in Column G)	What funding type(s) are being used for the project?	Optional Comments
Water loss audit & main-line repair [Horizon Regional MUD]	2020	Horizon Regional MUD	Yes	Started	N/A	N/A	N/A	Unknown	
Public conservation education [Horizon Regional MUD]	2020	Horizon Regional MUD	Yes	Started	N/A	N/A	N/A	Private	
Additional wells & expansion of desalination plant [Horizon Regional MUD]	2020	Horizon Regional MUD							
Water loss audit & main-line repair Haciendas Del Norte WID]	2020	Haciendas Del Norte WID	Yes	Started	N/A	N/A	N/A	Private	
Water loss audit & main-line repair [East Montana WS]	2020	East Montana WS	Yes	Started	N/A	N/A	N/A	Private	
Additional groundwater well & transmission line [El Paso County Tornillo WID]	2020	El Paso County Tornillo WID	Yes	Completed	N/A	N/A	N/A	Unknown	
Public conservation education [Vinton Hills | El Paso county-other]	2050	Vinton Hills | El Paso county-other	Yes	Started	N/A	N/A	N/A	Private	
Purchase water from El Paso Water [Vinton Hills | El Paso county-other]	2050	Vinton Hills | El Paso county-other	Yes	Started	N/A	N/A	N/A	Unknown	
Irrigation scheduling [EPCWID #1 | El Paso County Irrigation]	2020	EPCWID #1	Yes	Started	N/A	N/A	N/A	Private	
Tailwater reuse [EPCWID #1 | El Paso County Irrigation]	2020	EPCWID #1	Yes	Started	N/A	N/A	N/A	Private	

Table 9-1. (continued) 2026 Far West Texas Strategy Implementation Survey

WMS or WMS Project Name	Database Online Decade	Related Sponsor Entity and/or Benefitting WUGs	Has Sponsor taken affirmative vote or action? (TWC 16.053(h)(10))	What is the status of the WMS project or WMS recommended in the 2022 SWP?	If the project has not been started or no longer is being pursued, please explain why.	Project Impediment(s)	Other Project Impediments (not shown in Column G)	What funding type(s) are being used for the project?	Optional Comments
Improvements to water district delivery system [EPCWID #1 | El Paso County Irrigation]	2020	EPCWID #1	Yes	Started	N/A	N/A	N/A	State	TWDB Project #40202
Riverside regulating reservoir [EPCWID #1 | El Paso County Irrigation]	2030	EPCWID #1	Yes	Started	N/A	N/A	N/A	State	TWDB Project #40196
New wasteway 32 river diversion pumping point [EPCWID #1 | El Paso County Irrigation]	2020	EPCWID #1	Yes	Not Started	Economic Feasibility/Financing	Economic Feasibility/Financing	N/A	N/A	
Purchase water from El Paso Water [El Paso County | Manufacturing]	2030	El Paso County | Manufacturing	No	Not Started	Project Sponsor Not Identified	Project Sponsor Not Identified	N/A	N/A	
Additional groundwater wells [El Paso County | Mining]	2020	El Paso County | Mining	No	Not Started	Project Sponsor Not Identified	Project Sponsor Not Identified	N/A	N/A	
Purchase water from El Paso Water [El Paso County | SEP]	2020	El Paso County | SEP	No	Not Started	No Water Supply Need	Shift in Timeline	N/A	N/A	
Brackish groundwater desalination facility [Dell City | Hudspeth county-other]	2030	Dell City | Hudspeth county-other	Yes	Started	N/A	N/A	N/A	State	TWDB Project #62554
Public conservation education [City of Sierra Blanca - Hudspeth Co. WCID #1 | Hudspeth county-other]	2020	City of Sierra Blanca | Hudspeth county-other	Yes	Started	N/A	N/A	N/A	Private	

Table 9-1. (continued) 2026 Far West Texas Strategy Implementation Survey

WMS or WMS Project Name	Database Online Decade	Related Sponsor Entity and/or Benefitting WUGs	Has Sponsor taken affirmative vote or action? (TWC 16.053(h)(10))	What is the status of the WMS project or WMS recommended in the 2022 SWP?	If the project has not been started or no longer is being pursued, please explain why.	Project Impediment(s)	Other Project Impediments (not shown in Column G)	What funding type(s) are being used for the project?	Optional Comments
Replace water-supply line from Van Horn [City of Sierra Blanca - Hudspeth Co. WCID #1 | Hudspeth county-other]	2030	City of Sierra Blanca | Hudspeth county-other	Yes	Started	N/A	N/A	N/A	Private	
Local groundwater well [City of Sierra Blanca - Hudspeth Co. WCID #1 | Hudspeth county-other]	2020	City of Sierra Blanca | Hudspeth county-other	No	No Longer Being Pursued	Not Ideal Well Location	N/A	N/A	N/A	
Groundwater well NE of Van Horn [City of Sierra Blanca - Hudspeth Co. WCID #1 | Hudspeth county-other]	2020	City of Sierra Blanca | Hudspeth county-other	No	No Longer Being Pursued	Not Ideal Well Location	N/A	N/A	N/A	
Groundwater well West of Van Horn [City of Sierra Blanca - Hudspeth Co. WCID #1 | Hudspeth county-other]	2020	City of Sierra Blanca | Hudspeth county-other	Yes	Started	N/A	N/A	N/A	Private	
Additional groundwater well [Hudspeth County | Mining]	2020	Hudspeth | Mining	No	Not Started	Project Sponsor Not Identified	Project Sponsor Not Identified	N/A	N/A	
Additional groundwater well [Fort Davis WSC | Jeff Davis County]	2020	Fort Davis WSC	Yes	Started	N/A	N/A	N/A	Private	
Transmission line to connect Fort Davis to Fort Davis Estates [Fort Davis WSC | Jeff Davis County]	2030	Fort Davis WSC	Yes	Started	N/A	N/A	N/A	Private	
Additional groundwater well [Town of Valentine | Jeff Davis County]	2020	Town of Valentine	Yes	Started	N/A	N/A	N/A	Private	

Table 9-1. (continued) 2026 Far West Texas Strategy Implementation Survey

WMS or WMS Project Name	Database Online Decade	Related Sponsor Entity and/or Benefitting WUGs	Has Sponsor taken affirmative vote or action? (TWC 16.053(h)(10))	What is the status of the WMS project or WMS recommended in the 2022 SWP?	If the project has not been started or no longer is being pursued, please explain why.	Project Impediment(s)	Other Project Impediments (not shown in Column G)	What funding type(s) are being used for the project?	Optional Comments
Water loss audit & main-line repair [City of Presidio | Presidio County]	2020	City of Presidio	Yes	Completed	N/A	N/A	N/A	N/A	
Additional groundwater well [City of Presidio | Presidio County]	2020	City of Presidio	Yes	Started	N/A	N/A	N/A	Private	

9.2 RWPA'S PROGRESS IN ACHIEVING ECONOMIES OF SCALE

As a result of statutory requirements from HB 807 (86th Legislative Session) the planning rules (31 TAC §357.45(b)) require that each region must include an assessment of the region's efforts to encourage cooperation between WUGs for the purpose of achieving economies of scale and incentivizing WMSs that benefit the entire region. This assessment of regionalization shall include: (1) the number of recommended WMSs in the previously adopted and current RWPs that serve more than one WUG, (2) the number of recommended WMSs in the previously adopted RWP that serve more than one WUG and have been implemented since the previously adopted RWP, and (3) a description of efforts the RWPG has made to encourage WMSs and WMSPs that serve more than one WUG, and that benefit the entire region.

According to the TWDB's data, there are currently no WMSs in the previously adopted and/or current RWP that serve more than one WUG. However, the FWTWPG recognizes and encourages efforts related to the coordination of developing water management strategies between WUGs where it makes sense. This community-based development is liked by the planning group because it fosters the following key strategies: (1) ensures water solutions are not only practical but also culturally and socially appropriate, (2) embraces the uniqueness of each communities' resources and challenges, advocating for water solutions tailored to specific needs, (3) active community participation instills a sense of ownership and responsibility towards water resources and (4) provides an emphasis on knowledge transfer and helps to empower local communities in becoming good stewards of the water resources.

The FWTWPG will continue to look for ways to develop shared water management strategies in this *Plan* and for all future regional water plans.

9.3 COMPARISON TO PREVIOUS PLAN

The following section includes a summary of how the *2026 Plan* differs from the *2021 Plan*. Comparisons include:

- Water demand projections;
- Drought of record and the hydrologic and modeling assumptions on which the *2026 Plan* is based;
- Source water availability;
- Existing water supplies of WUGs and MWPs;
- WUG and MWP needs; and
- Recommended and alternative water management strategies.

Comparisons include an explanation for the changes that occurred regarding each of the categories.

9.3.1 Water Demand Projections

The following Table 9-2 provides a comparison between *2021 and 2026 Plan* water demand projections by county, while Table 9-3 compares water demand projections by water-use category. The overall increase in water demand in the *2026 Plan* is mostly the result of significantly higher irrigation, livestock, manufacturing and mining use projections.

Table 9-2. Water Demand Projections Comparison by County (Acre-Feet/Year)

County	Plan	2030	2040	2050	2060	2070	2080
Brewster	2021	4,925	4,958	4,950	4,952	4,960	4,966
	2026	6,539	6,379	6,243	6,130	6,020	5,908
Culberson	2021	40,984	41,772	41,953	41,695	41,443	41,250
	2026	66,699	66,648	66,612	66,576	66,538	66,499
El Paso	2021	307,830	324,380	339,295	355,288	371,529	387,190
	2026	367,658	372,695	376,034	378,326	380,648	382,997
Hudspeth	2021	116,959	119,960	116,979	116,996	117,008	117,022
	2026	144,463	144,386	144,331	144,278	144,227	144,174
Jeff Davis	2021	1,687	1,677	1,669	1,664	1,664	1,664
	2026	2,199	2,133	2,065	1,996	1,925	1,856
Presidio	2021	6,265	5,953	6,046	6,170	6,287	6,400
	2026	9,359	9,159	9,027	8,911	8,795	8,676
Terrell	2021	1,774	1,877	1,840	1,705	1,582	1,484
	2026	1,421	1,392	1,376	1,359	1,342	1,325
Total	**2021**	**480,424**	**497,577**	**512,732**	**528,470**	**544,473**	**559,976**
	2026	**598,338**	**602,792**	**605,688**	**607,576**	**609,495**	**611,435**

Table 9-3. Water Demand Projections Comparison by Water-User Category (Acre-Feet/Year)

Water Use Category	Plan	2030	2040	2050	2060	2070	2080
Municipal	2021	139,241	153,458	167,131	181,839	196,770	211,047
	2026	161,705	165,743	168,208	169,667	171,157	172,668
County-Other	2021	3,266	4,048	4,760	5,506	6,214	6,885
	2026	1,168	1,122	1,081	1,038	993	949
Manufacturing	2021	7,033	8,163	8,163	8,163	8,163	8,163
	2026	7,920	8,213	8,517	8,832	9,159	9,498
Mining	2021	8,859	9,629	9,913	10,277	10,832	10,832
	2026	11,922	12,091	12,259	12,416	12,563	12,697
Steam Electric Power	2021	10,545	10,545	10,545	10,545	10,545	10,545
	2026	8,880	8,880	8,880	8,880	8,880	8,880
Livestock	2021	2,101	2,101	2,101	2,101	2,101	2,101
	2026	2,694	2,694	2,694	2,694	2,694	2,694
Irrigation	2021	310,403	310,403	310,403	310,403	310,403	310,403
	2026	404,049	404,049	404,049	404,049	404,049	404,049

9.3.2 Drought of Record and Hydrologic and Modeling Assumptions

The drought of record consideration for water-supply analysis for both the *2021 and 2026 Plans* is the drought of the 1950s. However, the *2026 Plan* does recognize that the current drought conditions as particularly witnessed in the summer of 2011 and 2022 with a significantly low lake level at Elephant Butte Reservoir and corresponding cutback on irrigation allocations is having a significant impact on local water-supply sources. The *2026 Plan* continues to recognize that, compared to the rest of the State, Far West Texas is perennially under drought or near-drought conditions. The *Plan* also recognizes that consistent flows of the Rio Grande of less than 250 cfs below Presidio has detrimental impacts on the local agricultural economy as well as threatens important wildlife habitat.

9.3.3 Source Water Availability

Surface water availability for both the *2021 and 2026 Plans* is based on Run 3 of the TCEQ Water Availability Models (WAMs) for the Rio Grande and Pecos Rivers. Rio Grande flows entering Texas from New Mexico are subject to the requirements set forth in the Rio Grande Compact and administered through the Rio Grande Project.

Groundwater availability in both the *2021 and 2026 Plans* is based on the Modeled Available Groundwater (MAG) volumes that may be produced on an average annual basis to achieve a Desired Future Condition (DFC) as adopted by Groundwater Management Areas (GMAs) (per Texas Water Code §36.001). Groundwater availability volumes for parts of the Region where MAGs are not determined by the TWDB are calculated separately based on science-based aquifer hydrologic characteristics.

Surface water source availability differs between the two *Plans* as a result of an updated running of the WAM. Likewise, changes in groundwater availability results from updated GMA criteria and MAG runs. Compared to 2021 source-supply volumes, 2026 surface water volumes decreased, groundwater volumes decreased, and reuse volumes decreased. In total, projected source-availability volumes decreased by approximately three percent from the *2021 Plan* to the *2026 Plan*. A Source Data Comparison table is provided in the Executive Summary of this *Plan*.

9.3.4 Existing Water Supplies of WUGs and WWPs

A WUG Data Comparison table is provided in the Executive Summary of this *Plan*, which compares water supplies available to WUGs based on the current infrastructure ability of each to obtain water supplies. These abilities primarily include existing infrastructure, water-rights limitations, and groundwater conservation district permit limitations.

9.3.5 WUG and MWP Needs

Water-supply needs occur when a WUG's projected water demand exceeds its supply availability. Table 9-4 and Table 9-5 compare those entities in the *2021 and 2026 Plans* that are projected to experience a water-supply need/deficit at some decade in the next 50-years. Also listed on both tables, are the water management strategies that have been recommended to meet those water needs. The dramatic difference between WUG needs in the two *Plans* is primarily the result of the decreased source supply availability shown in the *2026 Plan*.

Table 9-4. 2021 WUG and MWP With Needs (Acre-Feet/Year)

County	2020	2030	2040	2050	2060	2070	Strategy ID	Recommended Strategy to Meet Needs
Culberson County								
Irrigation	333	333	5,858	5,858	5,858	5,858	E-6	Irrigation Scheduling
							E-7	Additional Groundwater Wells
El Paso County								
El Paso Water	0	0	0	8,978	19,601	29,792	E-10	Municipal Conservation Programs
							E-11	Advanced Water Purification at the Bustamante WWTP
							E-14	Hueco Bolson Artificial Recharge
							E-16	Groundwater from Dell City Area (Phase 1)
							E-17	Groundwater from Dell City Area (Phase 2)
Horizon Regional MUD	2,709	5,816	8,735	11,641	14,403	17,008	E-31	Water Loss Audit & Main-Line Repair
							E-32	Public Conservation Education
							E-33	Additional Wells & Expansion of Desal Plant
Lower Valley Water District	1,358	2,207	3,042	3,934	4,833	5,689	E-24	Public Conservation Education
							E-26	Purchase Water from EPW
							E-27	Surface Water Treatment Plant & Transmission Line
							E-28	Groundwater from Proposed Wellfield
							E-29	Groundwater from Proposed Wellfield
							E-30	Wastewater Treatment Facility and ASR

Table 9-4 (continued) . 2021 WUG and MWP With Needs
(Acre-Feet/Year)

County	2020	2030	2040	2050	2060	2070	Strategy ID	Recommended Strategy to Meet Needs
County-Other | Vinton Hills Estates	0	0	0	4	24	42	E-37	Public Conservation Education
County-Other | Vinton Hills Subdivision							E-38	Purchase Water from EPW
Manufacturing	0	0	0	10	54	96	E-46	Purchase Water from EPW
Mining	1,851	2,469	3,105	3,791	4,536	5,382	E-48	Additional Groundwater Wells
Steam Electric Power	7,260	7,260	7,260	7,260	7,260	7,260	E-50	Purchase Water from EPW
Irrigation	46,404	46,404	46,404	46,404	46,404	46,404	E-40	Irrigation Scheduling
							E-41	Tailwater Reuse
							E-42	Improvements to Water District Delivery System
							E-43	Riverside Regulating Reservoir
							E-44	New Wasteway 32 River Diversion Pumping Point
Hudspeth County								
County-Other	35	38	38	38	38	39	E-51	Brackish Groundwater Desal Facility
Mining	196	168	185	200	209	219	E-58	Additional Groundwater Well
Terrell County								
Mining	483	586	550	416	293	195	E-65	Additional Groundwater Wells

Table 9-5. 2026 WUG and MWP With Needs
(Acre-Feet/Year)

County	2030	2040	2050	2060	2070	2080	Strategy ID	Recommended Strategy to Meet Needs
Brewster County								
Mining	4	4	5	5	5	5	E-7	Mining Conservation
Culberson County								
*Irrigation	(22,063)	(22,140)	(22,190)	(22,232)	(22,322)	(22,394)	E-10	Irrigation Scheduling
							E-11	Additional Groundwater Wells
*Mining	(6,708)	(6,711)	(6,715)	(6,717)	(6,718)	(6,718)	E-12	Mining Conservation
El Paso County								
Fort Bliss & East Biggs	(928)	(1,153)	(1,291)	(1,348)	(1,405)	(1,463)	E-29	Public Conservation Education
							E-30	Purchase Water from El Paso Water
Lower Valley Water District	(2,820)	(3,078)	(3,232)	(3,296)	(3,360)	(3,424)	E-31	Public Conservation Education
							E-32	Water Loss Audit & Main-Line Repair
							E-33	Purchase Water from El Paso Water
							E-34	Surface Water Treatment Plant & Transmission Line
							E-35	Groundwater from Proposed Wellfield **ALTERNATE**
							E-36	Groundwater from Proposed Wellfield
							E-37	Wastewater Treatment Facility and ASR

Table 9-5. (continued) 2026 WUG and MWP With Needs (Acre-Feet/Year)

County	2030	2040	2050	2060	2070	2080	Strategy ID	Recommended Strategy to Meet Needs
Horizon Regional MUD	(3,142)	(3,508)	(3,715)	(3,799)	(3,885)	(3,970)	E-38	Water Loss Audit & Main-Line Repair
							E-39	Public Conservation Education
							E-40	Additional Groundwater Wells & Expansion of Desalination Plant
*EPCWID #1 | Irrigation	(75,914)	(74,634)	(73,831)	(73,322)	(72,805)	(72,281)	E-45	Irrigation Scheduling
							E-46	Tailwater Reuse
							E-47	Improvements to Water District Delivery System
							E-48	Riverside Regulating Reservoir
							E-49	New Wasteway 32 River Diversion Pumping Point
Hudspeth County								
Irrigation	(19,056)	(19,056)	(19,056)	(19,056)	(19,056)	(19,056)	E-56	Irrigation Scheduling
Livestock	(7)	(7)	(7)	(7)	(7)	(7)	E-57	Livestock Conservation
Mining	(7)	(9)	(10)	(11)	(11)	(11)	E-58	Mining Conservation
							E-59	Additional Groundwater Well
Jeff Davis County								
Livestock	(189)	(189)	(189)	(189)	(189)	(189)	E-63	Livestock Conservation
Presidio County								
Livestock	(2)	(2)	(2)	(2)	(2)	(2)	E-67	Livestock Conservation
Terrell County								
Irrigation	(51)	(51)	(51)	(51)	(51)	(51)	E-68	Irrigation Scheduling

*WUGs with unmet need.

9.3.6 Recommended and Alternate Water Management Strategies and Projects

A total of 48 recommended and 10 alternate water management strategies/projects (Table 9-6) for 24 WUGs occur in the *2021 Plan*, with a total capital cost of $2,110,409,105. The *2026 Plan* contains a total of 60 recommended and eight alternate strategies/projects (Table 9-7) for 32 WUGs with a total capital cost of $4,044,259,260.

Table 9-6. Summary of 2021 Plan Recommended Water Management Strategies and Projects (Acre-Feet per Year)

County	Water User Group	Strategy	Strategy ID	Strategy Supply (Acre-Feet/Year)						Total Capital Cost (Table 5-3)
				2020	2030	2040	2050	2060	2070	
Brewster	City of Alpine	Modification to wastewater treatment facility & irrigation system	E-1		25	25	25	25	25	$2,318,000
		Irrigation and recharge application of captured rainwater runoff	E-2		70	70	70	70	70	$1,296,000
	Marathon WSSService	Water loss audit and main-line repair	E-3	12	12	12	12	12	12	$255,000
	Lajitas Municipal Services	Water loss audit and main-line repair	E-4	51	51	51	51	51	51	$2,545,000
	Brewster County Other (Study Butte Terlingua WS)	Water loss audit and main-line repair	E-5	25	25	25	25	25	25	$3,054,000
Culberson	*Culberson County Irrigation	Irrigation scheduling	E-6	107	107	107	107	107	107	$0
		Additional groundwater wells	E-7	333	333	333	333	333	333	$510,000
El Paso	Town of Anthony	Arsenic treatment facility	E-8	2,800	2,800	2,800	2,800	2,800	2,800	$10,334,000
		Additional groundwater well	E-9	960	960	960	960	960	960	$1,913,000
	*El Paso Water	Municipal conservation programs	E-10	4,950	5,530	5,080	9,940	13,140	17,820	$1,070,000
		Advanced water purification at the Bustamante WWTP	E-11	8,500	9,200	9,900	10,600	10,600	10,600	$100,361,400
		Hueco Bolson artificial recharge	E-14		5,000	5,000	5,000	5,000	5,000	$38,003,000
		Groundwater from Dell City Area (Phase 1)	E-16			4,475	4,475	4,475	4,475	$569,357,000

Table 9-6. (continued) Summary of 2021 Plan Recommended and Alternate Water Management Strategies (Acre-Feet per Year)

County	Water User Group	Strategy	Strategy ID	Strategy Supply (Acre-Feet/Year)						Total Capital Cost (Table 5-3)
				2020	2030	2040	2050	2060	2070	
El Paso	*El Paso Water	Groundwater from Dell City Area (Phase 2)	E-17				10,000	10,000	10,000	$320,226,000
	*El Paso Water ALTERNATE STRATEGIES	Treatment and reuse of agricultural drain water	E-18			2,700	2,700	2,700	2,700	$21,466,000
		Expansion of the Kay Bailey Hutchison Desal Plant	E-13					5,000	5,000	$26,490,000
		Expansion of Canutillo Mesilla Bolson Well Field	E-19		7,760	11,640	15,520	19,400	23,280	$6,444,000
		Riverside Regulating Reservoir	E-15			3,250	3,250	3,250	3,250	$6,754,036
		Lower Valley well head RO	E-20			5,000	5,000	5,000	5,000	$52,681,000
		Expansion of Jonathan Rogers WTP	E-21			6,500	6,500	6,500	6,500	$88,679,000
		Conjunctive treatment of groundwater and surface water at the Upper Valley WWTP	E-22		10,000	10,000	10,000	10,000	10,000	$72,873,000
		Advanced water purification at the Haskell Street RWP	E-12						10,000	$189,356,000
		Advanced water purification at the Fred Hervey WWTP	E-23			10,000	10,000	10,000	10,000	$140,394,000
	*Lower Valley Water District	Public conservation education	E-24	57	66	74	83	92	100	$0
		Purchase water from EPW	E-26	1,344	2,185	3,012	3,895	4,785	5,632	$0
		Surface water treatment plant & transmission line	E-27		5,000	5,000	5,000	5,000	5,000	$74,338,000

Table 9-6. (continued) Summary of 2021 Plan Recommended and Alternate Water Management Strategies (Acre-Feet per Year)

County	Water User Group	Strategy	Strategy ID	Strategy Supply (Acre-Feet/Year)						Total Capital Cost (Table 5-3)
				2020	2030	2040	2050	2060	2070	
El Paso	*Lower Valley Water District	Groundwater from proposed Well field	E-28		6,800	6,800	6,800	6,800	6,800	$39,236,000
		Groundwater from proposed Well field	E-29		6,800	6,800	6,800	6,800	6,800	$36,110,000
		Wastewater treatment facility and ASR	E-30		5,589	5,589	5,589	5,589	5,589	$23,509,000
	*Horizon Regional MUD	Water loss audit and main-line repair	E-31	197	274	346	418	487	551	$255,000
		Public conservation education	E-32	79	110	140	169	196	222	$0
		Additional wells & expansion of desalination plant	E-33	16,786	16,786	16,786	16,786	16,786	16,786	$71,809,000
	Haciendas Del Norte WID	Water loss audit and main-line repair	E-34	12	13	15	16	17	19	$764,000
	East Montana WS	Water loss audit and main-line repair	E-35	41	46	50	54	59	63	$1,018,000
	El Paso County Tornillo WID	Additional groundwater well & transmission line	E-36	333	333	333	333	333	333	$2,060,000
	*El Paso County Other (Vinton Hills)	Public conservation education	E-37	0	0	0	4	5	5	$0
		Purchase water from EPW	E-38				10	73	133	$0
	*El Paso County Irrigation (EPCWID #1)	Irrigation scheduling	E-40	1,740	1,740	1,740	1,740	1,740	1,740	$102,595
		Tailwater reuse	E-41	1,723	1,723	1,723	1,723	1,723	1,723	$973,368
El Paso	*El Paso County Irrigation (EPCWID #1)	Improvements to water district delivery system	E-42	25,000	25,000	25,000	25,000	25,000	25,000	$157,777,783
		Riverside Regulating Reservoir	E-43		3,250	3,250	3,250	3,250	3,250	$6,754,036
		New Wasteway 32 River Diversion Pumping Point	E-44	5,000	5,000	5,000	5,000	5,000	5,000	$4,055,887
	*El Paso County Manufacturing	Purchase water from EPW	E-46		860	860	860	860	860	$0
	*El Paso County Mining	Additional groundwater wells	E-48	4,251	4,251	4,251	4,251	4,251	4,251	$1,208,000
	*El Paso County Steam Electric Power	Purchase water from EPW	E-50	7,260	7,260	7,260	7,260	7,260	7,260	$0

Table 9-6. (continued) Summary of 2021 Plan Recommended and Alternate Water Management Strategies (Acre-Feet per Year)

County	Water User Group	Strategy	Strategy ID	Strategy Supply (Acre-Feet/Year)						Total Capital Cost (Table 5-3)
				2020	2030	2040	2050	2060	2070	
Hudspeth	Hudspeth County Other (Dell City)	Brackish groundwater desal facility	E-51		111	111	111	111	111	$1,636,000
	*Hudspeth County Other (City of Sierra Blanca - Hudspeth Co. WCID #1)	Public conservation education	E-52	1	2	2	2	2	2	$0
		Replace water-supply line from Van Horn	E-53		39	39	39	28	0	$18,432,000
		Local groundwater well	E-54	16	16	16	16	16	16	$940,000
		Groundwater well NE of Van Horn	E-55	39	39	39	39	39	0	$2,132,000
		Groundwater well West of Van Horn	E-56	39	39	39	39	39	39	$636,000
	*Hudspeth County Mining	Additional groundwater well	E-58	219	219	219	219	219	219	$306,000
Jeff Davis	Fort Davis WSC	Additional groundwater well	E-59	274	274	274	274	274	274	$584,000
		Transmission line to connect Fort Davis WSC to Fort Davis Estates	E-60		114	114	114	114	114	$1,671,000
	Jeff Davis County Other (Town of Valentine)	Additional groundwater well	E-61	129	129	129	129	129	129	$783,000
Presidio	City of Presidio	Water loss audit and main-line repair	E-62	35	37	38	41	43	45	$509,000
		Additional groundwater well	E-63	120	120	120	120	120	120	$5,509,000
Terrell	*Terrell County Mining ALTERNATE STRATEGY	Additional groundwater wells	E-65	470	470	470	470	470	470	$921,000

Table 9-7. Summary of 2026 Plan Recommended and Alternate Water Management Strategies (Acre-Feet per Year)

County	Water User Group	Strategy	Strategy ID	Strategy Supply (Acre-Feet/Year)						Total Capital Cost (Table 5-3)
				2030	2040	2050	2060	2070	2080	
Brewster	City of Alpine	Water loss audit and main-line repair	E-1	23	23	23	23	23	23	$17,042,000
		Irrigation and recharge application of captured rainwater runoff	E-2		70	70	70	70	70	$1,580,000
		Modification to wastewater treatment facility & irrigation system	E-3		25	25	25	25	25	$2,128,000
	Lajitas Municipal Services	Water loss audit and main-line repair	E-4	14	14	14	14	14	14	$6,392,000
	Marathon WSSService	Water loss audit and main-line repair	E-5	10	10	10	10	10	10	$2,130,000
	Study Butte Terlingua WS	Water loss audit and main-line repair	E-6	12	12	12	12	12	12	$8,520,000
	*Brewster County Mining	Mining Conservation	E-7	8	8	9	9	9	9	$0
Culberson	City of Van Horn	Water loss audit and main-line repair	E-8	57	57	57	57	57	57	$15,977,000
		Mark to provide project details	E-9	320	320	320	320	320	320	$1,541,000
	**Culberson County Irrigation	Irrigation scheduling	E-10	12,738	12,738	12,738	12,738	12,738	12,738	$0
		Additional groundwater wells	E-11	666	666	666	666	666	666	$2,169,000
	**Culberson County Mining	Mining Conservation	E-12	1,502	1,503	1,503	1,504	1,504	1,504	$0
El Paso	Town of Anthony	Water loss audit and main-line repair	E-13	8	8	8	8	8	8	$3,196,000
		Arsenic treatment facility	E-14	2,800	2,800	2,800	2,800	2,800	2,800	$12,179,000
		Additional groundwater well	E-15	960	960	960	960	960	960	$2,821,000
	El Paso Water	Municipal conservation programs	E-16	9,160	16,500	19,520	22,640	25,710	29,000	$0
		Water loss audit and main-line repair	E-17	2,266	2,266	2,266	2,266	2,266	2,266	$428,162,000
		Expansion of the Kay Bailey Hutchison Desal Plant	E-18	2,500	2,500	2,500	2,500	2,500	2,500	101,045,000
		Advanced water purification at the Bustamante WWTP	E-19	8,500	9,200	9,900	10,600	10,600	10,600	295,417,000

Table 9-7. (continued) Summary of 2026 Plan Recommended and Alternate Water Management Strategies (Acre-Feet per Year)

County	Water User Group	Strategy	Strategy ID	Strategy Supply (Acre-Feet/Year)						Total Capital Cost (Table 5-3)
				2030	2040	2050	2060	2070	2080	
El Paso	El Paso Water	Conjunctive treatment of groundwater and surface water at the Upper Valley WWTP	E-20		3,000	3,000	3,000	3,000	3,000	$188,174,000
		Groundwater from Dell City Area (Phase 1)	E-21			10,000	10,000	10,000	10,000	$1,022,184,000
	El Paso Water **ALTERNATE STRATEGIES**	Groundwater from Dell City Area (Phase 2)	E-22						10,000	$546,423,000
		Hueco Bolson artificial recharge	E-23	15,000	15,000	15,000	15,000	15,000	15,000	$66,906,000
		Brackish groundwater at the Jonathan Rogers WTP	E-24		11,000	11,000	11,000	11,000	11,000	$167,902,000
		Treatment and reuse of agricultural drain water	E-25		2,700	2,700	2,700	2,700	2,700	$15,139,000
		Riverside Regulating Reservoir	E-26			3,250	3,250	3,250	3,250	$9,922,500
		Expansion of Jonathan Rogers WTP	E-27					6,500	6,500	$106,178,000
		Advanced water purification at the Haskell Street RWP	E-28						10,000	$180,820,000
	*Fort Bliss & East Biggs	Public conservation education	E-29	64	67	68	69	69	70	$59,991
		Purchase water from El Paso Water	E-30	864	1,086	1,223	1,279	1,336	1,393	$0
	*Lower Valley Water District	Public conservation education	E-31	72	74	76	77	77	78	$239,563
		Water loss audit and main-line repair	E-32	77	77	77	77	77	77	$42,603,000
		Purchase water from El Paso Water	E-33	2,820	3,078	3,232	3,296	3,360	3,424	$0
		Surface water treatment plant & transmission line	E-34		5,000	5,000	5,000	5,000	5,000	$128,073,000
		Groundwater from proposed Well field **ALTERNATE**	E-35		6,800	6,800	6,800	6,800	6,800	$53,652,000
		Groundwater from proposed Well field	E-36		6,800	6,800	6,800	6,800	6,800	$50,303,000
		Wastewater treatment facility and ASR	E-37		5,589	5,589	5,589	5,589	5,589	$54,305,000

Table 9-7. (continued) Summary of 2026 Plan Recommended and Alternate Water Management Strategies (Acre-Feet per Year)

County	Water User Group	Strategy	Strategy ID	Strategy Supply (Acre-Feet/Year)						Total Capital Cost (Table 5-3)
				2030	2040	2050	2060	2070	2080	
El Paso	*Horizon Regional MUD	Water loss audit and main-line repair	E-38	182	182	182	182	182	182	$6,392,000
El Paso	*Horizon Regional MUD	Public conservation education	E-39	95	99	101	102	103	104	$119,970
El Paso	*Horizon Regional MUD	Additional wells & expansion of desalination plant	E-40	16,786	16,786	16,786	16,786	16,786	16,786	$158,399,000
El Paso	East Montana WS	Water loss audit and main-line repair	E-41	14	14	14	14	14	14	$9,587,000
El Paso	El Paso County Tornillo WID	Water loss audit and main-line repair	E-42	6	6	6	6	6	6	$4,261,000
El Paso	El Paso County Tornillo WID	Additional groundwater well & transmission line	E-43	333	333	333	333	333	333	$2,731,000
El Paso	El Paso County WCID #4 (Fabens)	Water loss audit and main-line repair	E-44	9	9	9	9	9	9	$4,261,000
El Paso	**El Paso County Irrigation (EPCWID #1)	Irrigation scheduling	E-45	1,740	1,740	1,740	1,740	1,740	1,740	$0
El Paso	**El Paso County Irrigation (EPCWID #1)	Tailwater reuse	E-46	1,723	1,723	1,723	1,723	1,723	1,723	$0
El Paso	**El Paso County Irrigation (EPCWID #1)	Improvements to water district delivery system	E-47	25,000	25,000	25,000	25,000	25,000	25,000	$231,933,341
El Paso	**El Paso County Irrigation (EPCWID #1)	Riverside Regulating Reservoir	E-48		3,250	3,250	3,250	3,250	3,250	$9,922,500
El Paso	**El Paso County Irrigation (EPCWID #1)	New Wasteway 32 River Diversion Pumping Point	E-49	5,000	5,000	5,000	5,000	5,000	5,000	$5,682,394
El Paso	El Paso County (Steam Electric Power)	Purchase Water from El Paso Water	E-50	7,260	7,260	7,260	7,260	7,260	7,260	$0
El Paso	El Paso County (Steam Electric Power)	Treatment and reuse of wastewater	E-51	1,680	1,680	1,680	1,680	1,680	1,680	$33,647,000
Hudspeth	Esperanza WS	Water loss audit and main-line repair	E-52	8	8	8	8	8	8	$35,148,000
Hudspeth	Hudspeth County Other (Dell City)	Brackish groundwater desal facility	E-53		111	111	111	111	111	$3,227,000

Table 9-7. (continued) Summary of 2026 Plan Recommended and Alternate Water Management Strategies (Acre-Feet per Year)

County	Water User Group	Strategy	Strategy ID	Strategy Supply (Acre-Feet/Year)						Total Capital Cost (Table 5-3)
				2030	2040	2050	2060	2070	2080	
Hudspeth	Hudspeth Co. WCID #1 (City of Sierra Blanca)	Replace water-supply line from Van Horn	E-54		39	39	39	39	39	$4,420,000
		Groundwater well West of Van Horn	E-55	39	39	39	39	39	39	$1,171,000
	**Hudspeth County Irrigation	Irrigation scheduling	E-56	504	504	504	504	504	504	$0
	*Hudspeth County Livestock	Livestock Conservation	E-57	715	715	715	715	715	715	$0
	*Hudspeth County Mining	Mining Conservation	E-58	10	11	11	11	11	11	$0
		Additional groundwater well	E-59	219	219	219	219	219	219	$384,000
Jeff Davis	Fort Davis WSC	Additional groundwater well	E-60	274	274	274	274	274	274	$833,000
		Transmission line to connect Fort Davis WSC to Fort Davis Estates	E-61		114	114	114	114	114	$2,226,000
	Jeff Davis County Other (City of Valentine)	Additional groundwater well	E-62	129	129	129	129	129	129	$754,000
	*Jeff Davis County Livestock	Livestock Conservation	E-63	208	208	208	208	208	208	$0
Presidio	City of Presidio	Additional groundwater well	E-64	120	120	120	120	120	120	$10,889,000
	Presidio County Other (Candelaria WSC)	Water loss audit and main-line repair	E-65	1	1	1	1	1	1	$1,065,000
	Presidio County Other (Redford WS)	Water loss audit and main-line repair	E-66	1	1	1	1	1	1	$1,065,001
	*Presidio County Livestock	Livestock Conservation	E-67	6	6	6	6	6	6	$0
Terrell	*Terrell County Irrigation	Irrigation scheduling	E-68	2,190	2,190	2,190	2,190	2,190	2,190	$0

*WUGs with a projected future supply deficit.
**WUGs with an unmet need.

9.4 PROGRESS OF REGIONALIZATION

Six of the seven counties that comprise Far West Texas are highly rural with each county containing only one or two communities of significant size. Generally, these rural communities are totally self-supportive without need or justification for regional / shared water supply projects. The one variable in this scenario is the shared supply between the communities of Van Horn and Sierra Blanca.

Sierra Blanca (Hudspeth County WCID #1) 40 miles to the west of Van Horn has yet to locate and develop a local water supply and has historically relied on groundwater from the Wild Horse Flat (West Texas Bolsons) Aquifer in the same well-field region as Van Horn's well-field. Van Horn has assisted Sierra Blanca by transporting water from this shared well-field to a pipeline that moves the water to Sierra Blanca. While this arrangement has worked adequately in the past, the community of Sierra Blanca is motivated to become less reliant on the existing groundwater supply from the Wild Horse Flat Aquifer by attempting to locate and develop a supply source closer to town. This *2026 Far West Texas Water Plan* provides strategy recommendations for both enhancing the existing water-supply source and repairing the transmission pipeline, as well as addressing the search for a water source that is less dependent on Van Horn.

The greatest population density in the Region occurs in El Paso County (98 percent of total regional population) along the Rio Grande corridor, with El Paso Water (EPWater) providing 77 percent of the water to this area of rapid population expansion. Thus, regionalization has been and will continue to be an important aspect of water-management planning. EPWater provides water to the City of El Paso and to six other communities including Fort Bliss military reservation and to the Lower Valley Water District (LVWD). EPWater also provides water to manufacturing, steam-electric, mining, and numerous colonias in the County. To meet the growing water-supply needs for EPWater's service area, the utility plans to maximize local sources and eventually import additional supplies from the Dell City area.

Regionalization begins with the cooperative agreements between EPWater and the El Paso County Water Improvement District #1 (EPCWID#1) that controls almost all the Rio Grande water rights in the County primarily for irrigation use. Shared projects and agreements allow a portion of Rio Grande supply to be used for municipal supply, while the Irrigation District makes use of return flows. The LVWD currently receives all its treated water supply from EPWater and in turn redirects this water to its own customers.

Another regional cooperative project occurs with the Kay Bailey Hutchison Desalination Facility between EPWater and Fort Bliss. Project facilities, including brackish groundwater source wells, treatment plant, and disposal wells, are located on Fort Bliss property, while EPWater owns and maintains the facility. Fort Bliss receives a large portion of their supply needs from this project, while EPWater is provided with a drought-proof resource to blend in with their other supply sources.

Regionalization thus plays a key role in moving both surface water and groundwater supplies to the numerous end-users in the County. This *2026 Far West Texas Water Plan* continues to support regionalization by recognizing that future water supplies can best be shared in this desert community through cooperative management.

The FWTWPG would like to offer another perspective on regionalization. Participants in the FWTWPG continue to maintain a robust regional relationship by helping affected water systems become sustainable and resilient. However, funding policies may impede this effort by suggesting regionalization through consolidation of water districts. The FWPWPG finds that entities in unserved or underserved areas should still be eligible for financial assistance. The grant or loan eligibility and need to the unserved or underserved service area should be treated independently from the provider of some services through the interlocal agreements. This perspective is further discussed in Recommendation Chapter 8, Section 8.1, Number 5.

CHAPTER 10
PUBLIC PARTICIPATION AND PLAN ADOPTION

This page intentionally left blank.

10 PUBLIC PARTICIPATION AND PLAN ADOPTION

The Far West Texas Water Planning Group (FWTWPG) members recognized from the beginning the importance of involving the public in the planning process. Chapter 10 contains an overview of the FWTWPG representation, the Group's commitment to public involvement, rural outreach and specific activities that insured that the public was informed and involved in the planning process and the implementation of the Plan. Chapter 10 appendices contain responses to comments on the Initially Prepared Plan by the Public (Appendix 10A), TWDB (Appendix 10B), TPWD (Appendix 10C), and TSSWCB (Appendix 10D).

10.1 REGIONAL WATER PLANNING GROUP

The TWDB initially appointed a coordinating body for Far West Texas, based on names submitted by the public for consideration. Senate Bill 1 provisions mandate that one or more representatives of the following Water User Groups (WUGs) be seated on each water planning group: agriculture, counties, electric generating utilities, environment, industries, municipalities, river authorities, GMAs, public, small business, water districts, and water utilities. The FWTWPG has since expanded its membership based on familiarity with persons who could appropriately represent industries, tourism, real estate and economic development. Because there is no river authority in Far West Texas, this sector is not represented; however, its function is maintained by El Paso County Water Improvement District #1, who is the primary representative of the Rio Grande Project. New to this planning period, additional voting members have been appointed to represent Rural and Urban Economic Development.

In addition to these required interest groups, the FWTWPG added the following: travel and tourism, groundwater conservation districts, building and real estate, Fort Bliss Garrison Command and legislative representatives. The voting members of the FWTWPG are only compensated for allowable travel expenses and have voluntarily devoted considerable amounts of their time and talent to develop the regional water plan. Current Planning Group members and their positions are listed in Table 10-1.

Table 10-1. Current Group Members and Their Positions

Water Use Category	Committee Member
Agriculture	Rick Tate
Agriculture	Tim Leary
Real Estate	David Etzold
Counties	Teresa Todd
Counties	Avi Nash
Economic Development - Urban	Roberto Ransom
Economic Development - Rural	John T. Kennedy
Economic Development - Rural	Thomas Black
Environment	Jeff Bennett
Electric Generating Utilities	Raquel Onsurez
Groundwater District	Summer Webb
Groundwater Management Areas	Haley Davis
Industries	Sean Woodard
Municipalities	Becky Brewster
Public	Arlina Palacios
Public	Dave Hall
Public	Sterry Butcher
Small Business	Daniel Dunlap

Table 10-1. (continued) Current Group Members and Their Positions

Water Use Category	Committee Member
Water Districts	Omar Martinez
Water Districts	Gerald Grijalva
Water Districts	Jay Ornelas
Water Utilities	Albert Miller
Water Utilities	Randy Barker
Water Utilities	Scott Reinert

In addition to the FWTWPG members, three non-voting members are appointed. Their function is to provide advice and guidance, based on their respective areas of expertise or geographic areas. Two non-voting liaisons were assigned from Regions F and J adjacent to Far West Texas. The non-voting members are listed in Table 10-2, while Officers and Executive Committee Members are listed in Table 10-3.

Table 10-2. Non-Voting Members and Their Organization

Non-Voting Member	Agency/Organization
Woody Irving	USBR
Joel Lawrence	Texas Department of Agriculture
William Finn	IBWC

Table 10-3. Officers and Executive Committee Members and Their Position

Member	Position
Scott Reinert	Chairman
Dave Hall	Vice-Chairman
Teresa Todd	Secretary
Rebecca Brewster	Executive Committee Member
David Etzold	Executive Committee Member
Tom Beard	Executive Committee Member

10.1.1 Interregional Planning Council

The TWDB is required by Texas Water Code Section 16.052 to appoint an Interregional Planning Council made up of one member from each regional water planning group (RWPG). The purpose of the Council is to:

- Improve coordination among the RWPGs, and between the RWPGs and the TWDB in meeting goals of the State water planning process;
- Facilitate dialogue regarding regional water management strategies; and
- Share operational best practices of the regional water planning process.

The FWTWPG has appointed Scott Reinert and Dave Hall (alternate) as the appointed members.

10.1.2 Rural Outreach Efforts

The majority of the Far West Texas Planning Area encompasses a multitude of rural communities. Engagement with these communities has always been a critical component of regional water planning for the FWTWPG. Rural outreach has helped to improve data accuracy, promote sustainable practices, build stronger relationships which has increased participation, provide opportunities for learning, better understand the unique needs and priorities of the communities, and help to spread knowledge, connecting people with resources.

This *Plan* is largely supported by information provided by WUGs based on numerous survey results. For example, information needed to report on population and water demand projection revisions were collected through a survey (Section 2.1.1 and 2.1.2). Information needed to report on existing supplies and supply capacity (Chapter 3), infeasible water management strategies (WMSs) (Chapter 5), implementation and timing of the WMSs (Chapter 9) and drought information, activities and responses (Chapter 7) are all examples of where rural outreach and engagement were performed for the development of this *Plan.*

Surveys were distributed to all the identified WUGs within the Region. In addition, telephone follow-up calls were conducted to ensure responses from each WUG had been received. The results of these surveys are presented in multiple tables throughout the *Plan.*

10.2 PROJECT MANAGEMENT

During the first planning cycle, work on the *Far West Texas Water Plan* was divided along two parallel tracks; (1) an urban track representing the metropolitan portion of El Paso County, and (2) a rural track representing the other six rural counties and the eastern portion of El Paso County. Work developed along the two-track approach was integrated at appropriate intervals to ensure a unified, coherent regional plan. During subsequent planning cycle, this approach was augmented, and the entire FWTWPG worked together on the *Regional Plan* from start to finish. However, the two tracks are still considered to ensure that voting membership is equally represented.

The planning decisions and recommendations made in the *Far West Texas Water Plan* will have far-reaching and long-lasting social, economic, and political repercussions on each community involved in this planning effort and on individuals throughout the Region. Therefore, involvement of the public is a key factor for the success and acceptance of the *Plan*. Open discussion and citizen input are encouraged throughout the planning process and helps planners develop a *Plan* that reflects community values and concerns. Some members of the public participate almost as non-voting members.

To ensure public involvement, notice of all Planning Group and subcommittee meetings was posted in advance, mailed and/or e-mailed to a list of over 200 interested parties including mayors, county judges, water rights holders, public school superintendents, water districts, and concerned citizens. All meetings had the "hybrid" option where members could join virtually or attend in-person. Meetings were held in publicly accessible locations with sites rotating among rural and urban locations throughout the counties in the Region. Special public meetings were held to gather input on the development of specific aspect of the *Plan*. Prior to submittal of the *Initially Prepared Plan* to the TWDB, a copy of the *Draft 2026 Far West Texas Water Plan* was provided for inspection in the county clerk's office and in at least one library in each county, and online on the Rio Grande COG website. Following public inspection of the *Initially Prepared Plan*, one public meeting was conducted to present results of the planning process and gather public input and comments.

To provide a public access point, an internet website called the Far West Texas Water Planning Group contains timely information that includes names of planning group members, bylaws, meeting schedules, agendas, minutes, meeting backup materials, and important documents, including groundwater conservation district management plans, technical reports, draft chapters for review, planning schedules and budgets, and links to water-related sites. Summaries of most of the planning group meetings were e-mailed to the full list of interested parties, to enable persons who were unable to attend to stay up to date on the planning process. Every document that was e-mailed or mailed to Planning Group Members for their review was also e-mailed to the interested parties list, made available on the FWTWPG website, and provided in hard copy at all public meetings. In addition, news stories concerning water planning-related issues were regularly distributed to all interested parties.

10.3 PLANNING GROUP MEETINGS AND PUBLIC HEARINGS

All activities associated with the Regional Water Planning Process were performed in accordance with the State Open Meetings Act and in compliance with the Texas Public Information Act. All meetings of the FWTWPG, including committee meetings, were open to the public and visitors were encouraged to express their opinions and concerns, or to make suggestions regarding the planning process. The locations of the meetings were originally rotated between all seven counties so that all citizens within the Region would have an equal opportunity to attend. However, because of increased public attendance, the meetings were held predominantly in Alpine, El Paso, Marfa, Van Horn and Clint, where adequate facilities could be arranged.

Meeting notices were posted in the following newspapers and were reported by the following radio stations:

- El Paso Inc.
- West Texas County Courier
- Hudspeth County Herald
- Van Horn Advocate
- Alpine Avalanche
- Jeff Davis County News/Mountain Dispatch
- Presidio International
- Big Bend Sentinel
- Terrell County News Leader
- KALP FM (Alpine)
- KVLF AM (Alpine)

A final public hearing was held in El Paso on February 27, 2025, to receive comments on the *Initially Prepared Plan*. Responses to all public, TWDB and TPWD comments are included in this Chapter as Appendix 10A, Appendix 10B and Appendix 10C.

A hard copy of the *Initially Prepared Plan* was provided to RGCOG, made available at the front desk. An electronic copy was made available on the Rio Grande Council of Governments website. In addition, electronic copies were made available at the following locations:

County Clerk's Office:

- Brewster County
- Culberson County
- El Paso County
- Hudspeth County
- Jeff Davis County
- Presidio County
- Terrell County

Public Libraries:

- Alpine Public Library, 805 W. Ave E, Alpine
- Marathon Public Library, 106 N. 3rd, Marathon
- Big Bend High School Library, 550 Roadrunner, Terlingua
- Van Horn City-County Library, 410 Crockett St., Van Horn
- El Paso Public Library, 501 N. Oregon, El Paso
- Law Library, El Paso County Courthouse, 500 E. San Antonio
- Clint ISD/Public Library, 12625 Alameda, Clint
- Grace Grebing Public Library, 110 N. Main, Dell City
- Ft. Hancock ISD/Public Library, 101 School Drive, Ft. Hancock
- Jeff Davis County Library, 100 Memorial Square, Ft. Davis
- Marfa Public Library, 115 E. Oak, Marfa
- City of Presidio Library, 2440 O'Reilly St., Presidio
- Valentine Public Library, Valentine
- Terrell County Public Library, 105 E. Hackberry, Sanderson

The final *2026 Far West Texas Water Plan* was adopted by the FWTWPG on X and was delivered to the TWDB by X. The *Plan* is posted on the Planning Group's Rio Grande Council of Governments website.

10.4 COORDINATION WITH OTHER REGIONS

The FWTWPG has historically exchanged liaisons with adjoining Region F and the Plateau Region (Region J). The responsibility of the liaisons is to report on any issues of common interest between adjoining regions. Currently, the planning group does not have a liaison for Region J.

The FWTWPG also coordinated with Region F on groundwater supplies in Jeff Davis County that were exported to Reeves County for municipal and county-other use.

10.5 PLAN IMPLEMENTATION

Following final adoption of the *2026 Far West Texas Water Plan*, copies of the *Plan* were provided to each municipality and county commissioner's court in the Region. An electronic copy of the *Plan* is also available on the RGCOG and TWDB websites.

This page intentionally left blank.

APPENDIX 10A

PUBLIC COMMENTS AND RESPONSES

This page intentionally left blank.

PUBLIC COMMENTS AND RESPONSES

This page intentionally left blank.

APPENDIX 10B
TWDB COMMENTS AND RESPONSES

This page intentionally left blank.

APPENDIX 10C
TPWD COMMENTS AND RESPONSES

This page intentionally left blank.

RESPONSE TO TPWD COMMENTS

This page intentionally left blank.

APPENDIX 10D
TSSWCB COMMENTS AND RESPONSES

This page intentionally left blank.

RESPONSE TO TSSWCB COMMENTS

This page intentionally left blank.