

MANAGEMENT PLAN

OF THE

BREWSTER COUNTY

GROUNDWATER CONSERVATION DISTRICT

ADOPTED - JANUARY 31, 2002

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DISTRICT MISSION AND GOAL

The mission of the Brewster County Groundwater Conservation District is to manage, protect, and conserve the groundwater resources of Brewster County, Texas, while protecting private property rights and promoting constructive and sustainable development in Brewster County.

The goal of the Brewster County Groundwater Conservation District in pursuing its mission is the sustainability of the groundwater resources of Brewster County.

STATEMENT OF GUIDING PRINCIPLES

The groundwater resources of Brewster County (“the County”) are of vital importance to all citizens, and as the population of the County continues to increase, additional pressure will be placed on the groundwater resources of the County. The Brewster County Groundwater Conservation District (“the District”), managed and controlled locally, is the most practical means of directing development and preventing over-development of the natural resources of the County.

The District can achieve its mission and goals by increasing the quantity and quality of knowledge regarding the groundwater resources of the County, encouraging the most efficient use of groundwater, preserving and improving groundwater quality, and increasing public awareness and education of groundwater issues. Believing that local control of local resources is critical to the District’s mission and goal, the District will monitor the activities of the Texas Legislature and of the Far West Texas Water Planning Group, along with the rules and orders of state agencies which may affect the private ownership, use, and management of groundwater.

The District will work in cooperation with the Jeff Davis County Underground Water Conservation District, the Presidio County Underground Water Conservation District, the Middle Pecos Groundwater Conservation District, and the Culberson County Groundwater Conservation District to manage and protect those groundwater resources that are shared by any or all of the five counties.

A major threat to the mission of the District is management of the groundwater resources of Brewster County without a thorough understanding of the aquifers and their hydrogeologic properties. This Management Plan will be a tool for the directors of the District and for the managers of the District’s water resources, the landowners of Brewster County. The District’s directors regard all landowners as the District’s partners in managing our groundwater resources.

GENERAL DESCRIPTION OF THE DISTRICT

The District was created by the citizens of Brewster County through a confirmation election on November 6, 2001. The current Board of Directors (“the Board”) are Tom Beard (Chairman), Bud Coffey, Mike Davidson (Vice Chairman), Rob Dean, Leo Dominguez, Billito Donnell, and Roland Peña (Secretary-Treasurer). At the time of the adoption of this Management Plan, the District did

not have a General Manager. The boundaries of the District are coterminous with those of Brewster County, Texas. The economy of the County and the District is dominated by agriculture, tourism, and Sul Ross State University. Agricultural income is derived primarily from beef cattle production, hunting, and outdoor recreation.

LOCATION OF THE DISTRICT

Brewster County, containing 6,193 square miles or almost 4 million acres, is the largest county in Texas. According to the Far West Texas Water Plan, there were 10,330 residents in the County in 2000. The County is located on the Big Bend of the Rio Grande. It is bounded on the northeast by Terrell and Pecos Counties, on the northwest by Jeff Davis County, on the west by Presidio County, and on the south and southeast by the Republic of Mexico. Alpine, which is located in the northwest part of the County, is the county seat. Other population centers are Marathon, in the northeast part of the County, and Lajitas, Terlingua, and Study Butte, in the south part of the County. Because Brewster County contains Big Bend National Park, Black Gap Wildlife Management Area, and Elephant Mountain Wildlife Management Area, as well as a portion of Big Bend Ranch State Natural Area, almost 25% of the County is publically owned.

TOPOGRAPHY AND DRAINAGE

Topographically, the County consists of mountains, canyons, plateaus, valleys, and rolling plains. The altitude of the land surface ranges from 1,355 to 7,825 feet above mean sea level.

Brewster County lies within the drainage systems of the Rio Grande and the Pecos River, which is also a tributary of the Rio Grande.

GROUNDWATER RESOURCES

Water-supply resources available to meet the needs of most water-use categories in the County (such as agricultural, municipal, recreational, industrial, manufacturing, and mining) occur almost exclusively as groundwater in the various water-bearing rock formations (aquifers) that underlie the County. These aquifers, as delineated by the Texas Water Development Board (“the TWDB”), include the Igneous, Edwards-Trinity (Plateau), Marathon, and Capitan Reef Complex. Although these aquifers, as delineated by the TWDB, only occupy approximately a quarter of the County, additional groundwater of variable quantity and quality exists in other or related aquifers throughout much of the rest of the County. The following description of each of the aquifers, including both quantity and quality, also addresses management needs required to prevent over-development of the resources:

A. IGNEOUS AQUIFER

The Igneous aquifer may be the most important groundwater source in the County since it serves the largest population, the City of Alpine and the surrounding community. The aquifer occurs in igneous (volcanic) rocks of Tertiary age that underlie and extend beyond the Davis Mountain region of Brewster, Jeff Davis, and Presidio Counties.

In the vicinity of Alpine, the aquifer occurs in the Cottonwood Springs Basalt rock unit where it extends several hundred feet below the land surface. Within the aquifer the water occurs in cracks, fractures, and vesicular zones in generally the upper segment of these volcanic rocks. Typically the top of lava flows is the most permeable because it often is a rubble zone caused by rapid cooling after the lava was deposited. The lower zone of a lava flow cools much slower, becomes very dense, and exhibits lower permeability. Wells located in Alpine's Sunny Glen and Musquiz Canyon well fields, with yields ranging up to 250 gallons per minute, probably benefit from a combination of higher fracture density along faulted zones, focused recharge, and overlying alluvial cover. The freshness of the water quality, as exhibited by its typically low total dissolved solids content, indicates that water is transmitted relatively rapidly from the surface to the aquifer.

Continuous water-level records in the Musquiz well field demonstrate the aquifer's rapid response to recharge derived from precipitation events. Higher water levels were evident in the early 1990s during a period of higher rainfall and then dropped in following years as less rainfall occurred. Recent water-level declines, such as those being experienced in the Sunny Glen well field, are the result of withdrawals exceeding recharge. Average annual rainfall for the past few years has been below normal, which has exacerbated the water depletion conditions in the well field by creating increased water demand and less recharge. At the same time, the water-supply needs of Alpine are increasing.

B. EDWARDS-TRINITY (PLATEAU) AQUIFER

The Edwards-Trinity (Plateau) aquifer occurs in the eastern one third and extreme northern part of the County and is used primarily for livestock and rural domestic supply. 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. Water in the aquifer generally occurs under water-table conditions and contains total dissolved solids of less than 1,000 milligrams per liter ("mg/l"). Water-level trends have not been monitored in this aquifer in Brewster County.

C. MARATHON AQUIFER

The Marathon aquifer occurs entirely within the north-central part of the County and is primarily used to supply municipal, domestic, and livestock water in and near the community of Marathon. Water of typically good quality, generally containing between 500 and 1,000 mg/l of total dissolved solids, occurs in numerous crevices, joints, and cavities within rock formations that have undergone complex folding and faulting.

Although most wells in the area are less than 250 feet in depth, groundwater may extend to depths of several hundred feet. Well yields of the local municipal wells are approximately 300 gallons per minute, while yields from smaller domestic wells are significantly less. Like the Igneous aquifer, well yield is enhanced in areas where wells penetrate more densely fractured rock.

D. CAPITAN REEF COMPLEX AQUIFER

The Capitan Reef formed along the margin of the ancestral Delaware Basin, an embayment covered by a shallow Permian sea. In the northern part of Brewster County, rocks that compose this

reef formation are exposed in the Glass Mountains. Although significant quantities of groundwater are withdrawn elsewhere from this aquifer, few wells exist in the Glass Mountains to attest to its production capability. Because the Glass Mountains are elevated above the surrounding area, it is likely that most of the water that penetrates the formation from rainfall probably leaks back to the surface along the slopes of the mountain. Therefore, other than for a few small-yielding wells, the Capitan Reef Complex aquifer is not likely to be a reliable source within Brewster County.

E. OTHER AQUIFERS

As mapped by the Texas Water Development Board, the aquifers that have been described above occur only over approximately one quarter of Brewster County. Except for the Big Bend National Park, very few groundwater characterization investigations have been conducted throughout the remainder of the mostly remote and sparsely populated parts of the County. Limited available well data does suggest that groundwater is often present but at varying depths and quality, and often not at dependable rates of yield.

Wells in the Big Bend National Park area have been adequate in the past but long-term reliability may be somewhat uncertain. Groundwater supplies in the Terlingua-Study Butte area have also been studied to a limited degree, although the Study Butte Water Supply Corporation is now in operation and gathering data on wells which are believed to be primarily in the Santa Elena formation and which have contained varying levels of radioactivity. Wells in both of these areas — Big Bend National Park and Terlingua-Study Butte — penetrate various formations of Cretaceous age.

SURFACE WATER RESOURCES

The only surface water in Brewster County is the Rio Grande, and, being fully permitted and subject several treaties with the Republic of Mexico, except to a limited extent it is largely unavailable for use in the County.

PROJECTED WATER SUPPLIES

According to the *Far West Texas Water Plan, 2000*, the supply of available groundwater in Brewster County will be inadequate to meet projected needs in some water use categories within fifty years unless additional water resources are developed (Chapter 4, Table 4.1). However, as the following table shows, sufficient supplies of groundwater are believed to be available for development:

Aquifer	Recharge (Acre-Feet/Year)	Storage (Acre-Feet)	Supplies: 2000 (AF/Year)	Supplies: 2010 (AF/Y)
Igneous	5,800	3,122,000	5,627	5,642
Edwards-Trinity	9,400	1,123,000	980	980
Marathon	7,280	1,498,000	130	130

Capitan Reef Complex	2,100	2,000	0	0
Other Aquifers	U/K	10,000	162	162

Additional Natural/Artificial Recharge

The additional amount of natural or artificial recharge that could be realized from implementation of feasible weather modification could be an 8% increase in rainfall, based on the evidence of the High Plains Water District in their weather modification program. This might result in an increase of 1,431 acre-feet in recharge, based on the following assumptions: (1) there are roughly 3.9 million acres in the District; (2) 11 inches is reasonable as an average annual rainfall for the District (ranging from 7 to 15 inches, across the District); (3) 8% of 11 inches times 3.9 million acres theoretically increases the available rainfall by 286,293 acre-feet; (3) the frequently-used rule-of-thumb recharge rate of 1% of average annual rainfall is too high and should be reduced to ½ of 1% (cf. the *Far West Texas Water Plan, 2000*, §3.7.2.1 “Recharge”). Similarly, retention structures on some of the ephemeral streams in the District could also increase recharge, although the amount is difficult to quantify.

GROUNDWATER USAGE AND DEMAND

Over the next fifty years, according to the *Far West Texas Water Plan, 2000* (Table 2.2) groundwater usage in the County is expected to increase steadily, rising from 3,574 acre-feet per year in 1996 to 6,072 acre-feet/year in 2050 as follows:

2000	4,419 acre feet per year
2010	4,706 acre feet per year
2020	5,083 acre feet per year
2030	5,407 acre feet per year
2040	5,766 acre feet per year
2050	6,072 acre feet per year

MANAGEMENT OF GROUNDWATER SUPPLIES

This Management Plan (“the Plan” or “this Plan”) has been adopted by the Board in accordance with Section 36.1071 of the Texas Water Code (“the Water Code”) and will remain in effect for a period of ten years unless modified by the Board prior to the end of the planning period. The District, in partnership with the landowners of the District, will manage the groundwater within the District in accordance with its mission and goal while seeking to maintain the economic viability of all resource user groups, public and private. With due consideration to the economic, cultural, historical, and environmental activities occurring within the District, the District will identify and engage in such activities and practices, which, if implemented, would result the sustainability of the groundwater

resources within the District, including reductions of groundwater use where necessary for that result.

A network of observation wells will be established and maintained in cooperation with private landowners in order to monitor changing storage conditions of groundwater within the District. The District will make regular assessments of water supply and groundwater storage conditions and will report those conditions to the public. The District will undertake and cooperate with investigations of the groundwater resources within the District and will make the results of investigations available to the public.

The District will have Rules from time to time (“the District Rules”) which may regulate groundwater withdrawals by means of production limits and fees, spacing regulations, and export fees and requirements. The District may deny a well construction permit or limit groundwater withdrawals in accordance with the District Rules. In making a determination to deny a permit or limit groundwater withdrawals or export, the District will weigh the public benefit against individual hardship after considering all appropriate testimony. The relevant factors to be considered in making a determination to deny a permit or limit groundwater withdrawals will include:

- (1) the projected effect on other wells, landowners, and groundwater users in the District;
- (2) the projected environmental and economic effects of the water use;
- (3) the projected effects on aquifer conditions;
- (4) any projected subsidence resulting from the proposed water use;
- (5) relationship of the proposed water use to historical uses of water in the district;
- (6) the availability of water in the district and in the area of the well being considered;
- (7) the availability of feasible and practicable alternative supplies to the applicant;
- (8) the amount and purposes of use for water;
- (9) any projected public benefit of the proposed use;
- (10) the approved regional water plan and certified district management plan.

In pursuit of the District’s mission of managing, protecting, and conserving the resource, while protecting private property rights and promoting constructive and sustainable development in Brewster County, the District may be forced to require reductions of groundwater withdrawals from existing commercial or non-exempt wells. The District will not regulate domestic or livestock wells. To achieve this purpose, the District may, at the Board’s discretion, amend or revoke any permit after notice and hearing. The determination to seek the amendment or revocation of a permit by the District will be based on aquifer conditions observed by the District from time to time, as well as those factors listed above in relation to initial permits. If necessary, the District will enforce the terms and conditions of the permits and the District Rules by enjoining the permit holder in a court of competent jurisdiction as provide for in TWC 36.102.

ACTIONS, PROCEDURES, PERFORMANCE

The District will implement the provisions of this Plan and will utilize the provision of this Plan as guidelines for determining the direction or priority for all District activities. All operations of the

District, all agreements entered into by the District, and any additional planning efforts in which the District may participate will be consistent with the provisions of this Plan.

The District has adopted or will adopt the District Rules relating to the permitting of wells and the production of groundwater. The District Rules shall be as required by the Water Code and the provisions of this Plan. All District Rules will be enforced. The promulgation and enforcement of the District Rules will be based on the best technical evidence available.

The District shall treat all citizens equally. Citizens may apply to the District for a waiver in the enforcement of one or more of the District Rules on grounds of adverse economic effects or unique local conditions. In granting or denying any waiver to any District Rule, the Board shall consider the potential for adverse effects on adjacent landowners. The exercise of discretion in the granting or denying of any waiver by the Board, shall not be construed as limiting the power of the Board.

In the implementation of this Plan and in the management of groundwater resources within the District, the District will seek the cooperation of all residents, landowners, and well owners of the District. All activities of the District will be undertaken in cooperation and coordination with any appropriate state, regional, or local water management entity.

ANNUAL REPORT

The General Manager of the District (or, in the absence of a General Manager, the Chairman of the Board) will prepare and present an annual report to the Board of Directors (“the Annual Report”) evaluating the impact of the District’s activities on its goals, management objectives, and performance standards (as enumerated below). The Annual Report will be presented at the last meeting of the Board of Directors in each fiscal year. The Annual Report will include the number of instances that each activity of the District occurred during the year (such as the monitoring of wells for water quality and levels, permitting, inspecting for permit compliance, securing abandoned wells), together with an estimate of the expenditure of staff time and cost so that the effectiveness and efficiency of each activity may be evaluated.

The annual report will be maintained on file at the District office.

GOALS, MANAGEMENT OBJECTIVES, PERFORMANCE STANDARDS

The goals, management objectives, and performance standards of the District are:

- 1. GOAL:** Implement a system to improve the understanding of groundwater in the District.
 - 1.1. MANAGEMENT OBJECTIVE:** On an annual basis, obtain all the new information gathered or generated on wells in Brewster County by the Texas Water Development

- 3.2. **MANAGEMENT OBJECTIVE:** Publish a District newsletter at least twice per year to discuss and publicize conservation and the efficient use of groundwater.
 - 3.2.1. **PERFORMANCE STANDARD:** Maintain copies of the District newsletter in the District Office and report to the Board annually the number of occasions the newsletter was distributed.
- 3.3. **MANAGEMENT OBJECTIVE:** The District will register and permit all new wells, unless exempt by the District Rules.
 - 3.3.1. **PERFORMANCE STANDARD:** Report to the Board annually on the number of wells registered to be drilled and permitted in the District.
- 3.4. **MANAGEMENT OBJECTIVE:** The District will file a drilling log or acceptable alternative for each new well drilled within the District that is submitted by the driller.
 - 3.4.1. **PERFORMANCE STANDARD:** Report to the Board annually on the number of driller's records and reports filed by the District since the previous year.
- 3.5. **MANAGEMENT OBJECTIVE:** Beginning January 1, 2003, file reports on static levels provided by well service operators.
 - 3.5.1. **PERFORMANCE STANDARD:** Report to the Board annually the number of static level reports filed by the District based on reports received from well service operators.
- 4. **GOAL:** Recommend management strategies that will protect and enhance the quantity and quality of recoverable water by controlling and preventing waste.
 - 4.1. **MANAGEMENT OBJECTIVE:** File all reports of wasteful practices within the District that are reported to the District.
 - 4.1.1. **PERFORMANCE STANDARDS:** Provide a report to the Board annually indicating the number and location of wasteful practices reported
 - 4.2. **MANAGEMENT OBJECTIVE:** Encourage voluntary metering of non-exempt wells and apply for a grant to provide meters by August 1, 2002.
 - 4.2.1. **PERFORMANCE STANDARD:** Provide a report to the Board at the first meeting after August 1, 2002, and then annually indicating that an application was made and the number of meters installed on wells in the District.
- 5. **GOAL:** Minimize the degradation of the aquifers in the District and ensure that the citizens of the District will have adequate water in the future by considering regulations for (1) the spacing of wells from each other and from a well owner's property lines and (2) the production of water from wells based on tract size.
 - 5.1. **MANAGEMENT OBJECTIVE:** Develop proposed regulations on spacing and production to include private and public wells and supply lines by January 1, 2003.
 - 5.1.1. **PERFORMANCE STANDARD:** Report to the Board annually that proposed spacing and production regulations are in place.
- 6. **GOAL:** Determine definitions of aquifer conditions to be used as trigger mechanisms to assist water suppliers in implementing emergency drought management plans by January 1, 2003.
 - 6.1. **MANAGEMENT OBJECTIVE:** Compare static levels of wells in the District's database with historical rainfall to determine a correlation.
 - 6.1.1. **PERFORMANCE STANDARD:** Report the correlation to the Board and to water suppliers as often as necessary, but at least annually, to assist water suppliers in implementing their drought management plans.
- 7. **GOAL:** Minimize the potential for contamination of groundwater by new or existing wells.

- 7.1. **MANAGEMENT OBJECTIVE:** Consider initiating a program to identify the location of all abandoned wells by January 1, 2004, that will include a survey of landowners, well drillers, and the Texas Railroad Commission regarding any known abandoned wells.
 - 7.1.1. **PERFORMANCE STANDARD:** Report to the Board at the first meeting after January 1, 2004, that the program is in place.
- 7.2. **MANAGEMENT OBJECTIVE:** Each year, budget at least \$1,000 to cap or plug at least one abandoned or unused well that the a landowner is unable or unwilling to cap or plug.
 - 7.2.1. **PERFORMANCE STANDARD:** Report annually to the Board whether the budget for plugging abandoned wells was adequate and the number of wells that have been plugged and the cost per well.
- 8. **GOAL:** Prevent damage or degradation to the aquifers of the District by the export of water from the District.
 - 8.1. **MANAGEMENT OBJECTIVE:** Each year, monitor all wells from which water is being exported out of the District, together with adjacent wells.
 - 8.1.1. **PERFORMANCE STANDARD:** Report annually to the Board any decline or degradation of water levels or water quality in wells from which water being exported out of the District is produced or in adjacent wells.

SENATE BILL 1 MANAGEMENT GOALS DETERMINED TO BE INAPPLICABLE IN THIS DISTRICT

- 1. **GOAL:** Control and prevention of subsidence.
 - 1.1. **RATIONALE FOR DETERMINATION OF INAPPLICABILITY:** The rigid geologic framework of the region precludes significant subsidence from occurring.
- 2. **GOAL:** Cooperative resolution of natural resource management issues.
 - 2.1. **RATIONALE FOR DETERMINATION OF INAPPLICABILITY:** The District has no documented occurrences of endangered or threatened species dependent upon groundwater resources.
- 3. **GOAL:** Conjunctive Surface Management Issues.
 - 3.1. **RATIONALE FOR DETERMINATION OF INAPPLICABILITY:** There is no surface water in the District except for the Rio Grande and water in creeks and impoundments within the District from rains, runoff from rains, and springs.