

# 2023 GROUNDWATER MANAGEMENT PLAN

Goliad County Groundwater Conservation District

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**GOLIAD COUNTY GROUNDWATER CONSERVATION DISTRICT**  
**MANAGEMENT PLAN**  
**2023**

The Goliad County Groundwater Conservation District (GCGCD) was created in 2001 by authority of HB3651 of the 77th Texas Legislature. The District was created to serve a public use and benefit, and is essential to accomplish the objectives set forth in Section 59, Article XVI, of the Texas Constitution. The District's boundary is coextensive with the boundary of Goliad County and contains 551,040 acres of land with approximately 90 percent of the acreage being utilized as rangeland for livestock production. The District is bounded on the north by DeWitt County, on the east by Victoria County, on the south by Refugio County, and on the west by Bee and Karnes Counties.

**DISTRICT MISSION**

The mission of the GCGCD is to develop rules to provide for the protection, preservation, and conservation of groundwater, and to prevent waste of groundwater from the Gulf Coast Aquifer System to the extent of which the District has jurisdiction.

The District is committed to manage and protect the groundwater resources within its jurisdiction and to work with others to ensure a sustainable, adequate, high quality and cost-effective supply of water, now and in the future. The District strives to develop, promote, and implement water conservation and management strategies to protect water resources for the benefit of the citizens, economy, and environment of the District. The preservation of this most valuable resource is achieved in a prudent and cost-effective manner through conservation, education, management, and cooperation

**STATEMENT OF GUIDING PRINCIPLES**

Goliad and surrounding counties have a large agriculturally based rural community, which relies heavily on groundwater and exclusively on groundwater during periods of drought. Therefore, groundwater resources are of vital importance to the continued vitality of the citizens, economy, and environment within the District area.

The Goliad County groundwater supply comes from the Gulf Coast Aquifer System. It is imperative that the Gulf Coast Aquifer System be managed on a sustainable basis to protect the domestic and livestock supply wells in the County. These drinking water supply wells are the lifeblood for the County population and agricultural economy.

**TIME PERIOD OF THIS PLAN**

This District's groundwater management plan becomes effective immediately following adoption by the GCGCD Board of Directors and is approved as administratively complete by the Texas Water Development Board (TWDB). This plan will remain in effect for a period of five years or until a revised or amended plan may be approved, whichever comes first.

**GROUNDWATER RESOURCES – GOLIAD COUNTY**

The primary groundwater supply comes from the Evangeline component of the Gulf Coast Aquifer System. The Chicot component only exists in the southern 1/3 of the County and supplies this area. The Jasper and Burkeville components underly the Evangeline and Chicot components and currently do not provide a significant domestic and livestock supply.

## **GULF COAST AQUIFER SYSTEM OVERVIEW**

The Gulf Coast Aquifer System forms a wide belt along the Gulf of Mexico from Florida to Mexico. In Texas, the aquifer provides water to all or parts of 54 counties and extends from the Rio Grande northeastward to the Louisiana-Texas border. Municipal and irrigation uses account for approximately 90 percent of the total pumpage from the aquifer. The aquifer consists of complex interbedded clays, silts, sands, and gravels of Cenozoic Era, which are hydrologically connected to form a large, leaky artesian aquifer system. This system comprises four major components consisting of the following generally recognized water-producing formations. The deepest is the Catahoula, which contains ground water near the outcrop in relatively restricted sand layers. Above the Catahoula is the Jasper Aquifer, primarily contained within the Oakville Sandstone. The Burkeville confining layer separates the Jasper from the overlying Evangeline Aquifer, which is contained within the Fleming and Goliad sands. The Chicot Aquifer, or upper component of the Gulf Coast Aquifer System, consists of the Lissie, Willis, Bentley, Montgomery, and Beaumont formations, and overlying alluvial deposits. Not all formations are present throughout the system, and nomenclature often differs from one end of the system to the other.

Water quality is generally good in the shallower portion of the Gulf Coast Aquifer System. From the San Antonio River Basin southwestward to Mexico, quality deterioration is evident in the form of increased chloride concentration and saltwater encroachment along the coast. Little of this ground water is suitable for prolonged irrigation due to either high salinity or alkalinity, or both. In several areas at or near the coast, including Galveston Island and the central and southern parts of Orange County, heavy municipal or industrial pump age had previously caused an updip migration, or saltwater intrusion, of poor-quality water into the aquifer. Recent reductions in pumpage here have resulted in stabilization and, in some cases, even improvement of ground-water quality. Years of heavy pumpage for municipal and manufacturing use in portions of the aquifer have resulted in areas of significant water-level decline. Declines of 200 feet to 300 feet have been measured in some areas of eastern and southeastern Harris and northern Galveston counties. Other areas of significant water-level declines include the Kingsville area in Kleberg County and portions of Jefferson, Orange, and Wharton counties. Some of these declines have resulted in compaction of dewatered clays and significant land surface subsidence. Subsidence is generally less than 0.5 foot over most of the Texas coast, but has been as much as nine feet in Harris and surrounding counties. As a result, structural damage and flooding have occurred in many low-lying areas along Galveston Bay in Baytown, Texas City, and Houston. Conversion to surface-water use in many of the problem areas has reversed the decline trend. The portion of the Gulf Coast Aquifer System in the Goliad County area contains generally good quality water. The aquifer depth ranges from approximately 450 feet in north Goliad County to approximately 1200 feet in south Goliad County. Reference: Baker, E.T., Jr., 1979, Stratigraphic and hydrologic framework of part of the Coastal Plain of Texas: TWDB Report 236. [http://www.twdb.texas.gov/publications/reports/numbered\\_reports/doc/R236/Report236.asp](http://www.twdb.texas.gov/publications/reports/numbered_reports/doc/R236/Report236.asp)

## **GROUNDWATER RECHARGE IN GOLIAD COUNTY**

Groundwater recharge in Goliad County has become a very critical issue. Surface land use has changed significantly since the drought of the 1950s. Prior to the 1950s, much of the land use was for row crops such as cotton, corn, and milo. Since the 1950s, there has been a steady transition phasing out row crops to pasture land. This change in land use greatly changed the surface recharge characteristics. Land use for row crops provides for much greater opportunity for rainwater to percolate into the soil. Row crops are seasonal and so water use is less. With untilled pastures, there is a greater percentage of rainfall runoff and brush and the tree cover requires additional moisture and therefore higher transeaporation. The Development of an EDYS (Ecological DYnamics Simulation) Model for Goliad County, Texas brush management study validates this change in recharge. This EDYS model can be found on the District website at [www.goliadcogcd.org](http://www.goliadcogcd.org).

GCGCD in conjunction with Texas Tech University (TTU) since 2018, has been recording surface soil moisture down to 10 feet. Four years of data has shown that only minimum amounts of moisture have occasionally been detected at the lower probes (see the District website <http://www.goliadcogcd.org>). Recharge values used in modeling the Central Gulf Coast Aquifer System may have been valid historically but are no longer valid.

GCGCD has an extensive water level monitoring program that has gathered data from approximately 60 wells since 2003. A steady decline of groundwater level has been recorded (see Appendix A).

The EDYS brush management study, the TTU soil moisture data, and the measured water level decline (Appendix A) recorded by GCGCD provides proof that very little, if any, recharge occurs in Goliad County. Only during a year with above average rainfall is there a possibility for some recharge.

Current modeling needs to take into consideration the scientific data that GCGCD has provided. Previous estimates of 0.25” to 1” per year presented by the Bureau of Economic Geology study for TWDB in 2011 and one percent of rainfall estimated recharge do not represent current scientific recharge data presented by GCGCD. Historic recharge values do not support the steady drop in groundwater levels recorded starting in 1980.

### **AMOUNT OF GROUNDWATER BEING USED WITHIN THE DISTRICT ANNUALLY**

There are two sets of data provided for groundwater use. In Appendix B, TWDB Estimated Historic Water Use Survey (WUS) Data from 2004 through 2019 is shown. The TWDB Estimated Historic Water Use shows municipal use that includes the La Bahia, Fannin, and Berclair water supply corporations in Goliad County. In Appendix C, Documented Water Use data prepared by GCGCD is shown. Data provided by GCGCD is based on Historic Use Allocations on file, estimated exempt use, and permitted water use.

The 2022 regional water plan water demand projections for Goliad County from 2020 – 2070 are shown in Appendix D.

### **TWDB GROUNDWATER AVAILABILITY MODEL (GAM) RUN 12-018 V2 DATA**

Estimated annual amount of recharge from precipitation to the District is shown in Appendix E.

Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers is shown in Appendix E.

Estimated annual volume of flow into the District, out of the District, and estimated net volume of flow between each aquifer in the district, is shown in Appendix E.

GCGCD has reviewed the new draft GAM and has chosen not to use it when it becomes available. The GCGCD Board is using the water budget data from GAM Run 12-018 Version 2 (Appendix E). See Appendix F for a recalibrated model run done for GCGCD by LRE Water. This recalibrated model used a recharge value of zero and provides results that match GCGCD field data.

### **2022 TEXAS STATE WATER PLAN DATA**

PROJECTED SURFACE WATER SUPPLIES 2020 – 2070 within the District is shown in Appendix G.

PROJECTED WATER DEMANDS 2020 – 2070 for water within the District is shown in Appendix G.

PROJECTED WATER SUPPLY NEEDS is shown in Appendix G.

The District has considered the projected water supply needs and water management strategies included in the adopted 2022 State Water Plan. For Goliad County, a water supply need exists for the Goliad Irrigation water user group (WUG). The projected need is 338 acre-feet for each of years 2020, 2030, 2040, 2050, 2060, 2070. There are no other needs in the county.

PROJECTED WATER MANAGEMENT STRATEGIES is shown in Appendix G.

For Goliad County the proposed water management strategy is demand reduction in the form of Goliad WUG municipal water conservation. Reduction in demand is projected to increase from 15 acre-feet in 2020 to 135 acre-feet in 2070.

### **GCGCD's HISTORIC WATER USAGE INFORMATION**

GOLIAD COUNTY ESTIMATED HISTORIC MUNICIPAL AND DOMESTIC GROUNDWATER USE for 1980 – 2019 is shown in Appendix H. Groundwater use is based on total county population multiplied by 127 gallons per person per day. This value is used by Region L.

GOLIAD COUNTY ESTIMATED HISTORIC OIL, GAS, AND URANIUM GROUNDWATER USE for 2004 – 2019 is shown in Appendix H. Mining use is based on the number of oil and gas wells drilled multiplied by an average of five-acre feet per well. Water use reported by DCP Midstream at the Berclair oil and gas processing facility and Uranium Energy Corp in Goliad County are also included in total usage.

GOLIAD COUNTY HISTORIC USE ALLOCATIONS for domestic/municipal, industrial, livestock, wildlife, other, and irrigation use are shown in Appendix H.

In Appendix B, TWDB 2019 estimated historic use for irrigation is 3,872-acre feet per year. GCGCD anticipates this demand to continue to rise. 2020 and forward projected demand should be no less than use in 2019. Therefore, the projected water demands for irrigation from 2020 – 2070 should be at least 3,872-acre feet per year. In Appendix G, TWDB projected water demands for 2020 - 2070 irrigation is 2,839-acre feet.

For mining, In-Situ uranium mining is permitted at a site in the Guadalupe basin. The projected waste water disposal, which is contaminated groundwater, is 323-acre feet per year.

### **MANAGEMENT OF GROUNDWATER SUPPLIES**

The district will manage and conserve the supply of groundwater within the District in order to maintain the economic viability of the District, county, and region. This will be done through coordination with and cooperation with Groundwater Conservation Districts in GMA 15.

A monitor well observation network is established to track any changes in water level or quality. The District will make a regular assessment of findings and report those findings to the public.

The District has adopted and will update rules to regulate groundwater withdrawals by means of well spacing and production limits. The District may deny a well construction permit or limit groundwater withdrawals in accordance with district rules.

GCGCD's water level monitoring program has been recording data since 2003. This program consists of approximately 60 unused wells that are measured one to two times annually. Results of these measurements are shown in Appendix A.

One permit for in-situ mining of uranium has been approved in Goliad County. Chapter 36 Texas Water Code does not address groundwater contamination and loss of supply associated with uranium exploration and mining.

A necessary ingredient in the management of groundwater supplies is an accurate identification of historic, current, and future use. GCGCD has determined that historic pumping has been greatly understated primarily for oil and gas exploration and for irrigation.

In 2018, GCGCD contracted Daniel B. Stephens and Associates to do an assessment of water levels, recharge, desired future conditions, and historic pumpage. This report dated February 26, 2018 continues to be very helpful to GCGCD in the management of groundwater supplies. See Appendix I for the report.

### **SURFACE WATER SUPPLIES**

The San Antonio River runs through Goliad County. The only use of river water in the District is for irrigation. There is one major surface water lake in the District. Coletto Creek Reservoir is located at the boundary of Victoria and Goliad counties in the lower Guadalupe River Basin, and is a cooling reservoir for steam electric power generation. This constructed reservoir supplies water for steam-electric power generation at Coletto Creek Power Station located in Goliad County. Because the predominant agriculture product is the raising of livestock, there are numerous stock tanks located within the District. These stock tanks provide surface water for livestock and wildlife consumption and provide some aquifer recharge. Many of these stock tanks go dry during drought periods requiring additional pumping of groundwater. The District has participated in two programs with USGS and others to qualify and quantify interface between the Gulf Coast Aquifer System and the San Antonio River and between the Gulf Coast Aquifer System and the Coletto Creek Basin. Both studies concluded that the Aquifer provides a gaining stream to the two listed surface streams. The reports of these two studies can be accessed at [www.goliadcogcd.org](http://www.goliadcogcd.org).

### **REGIONAL (L) WATER PLAN**

As required by Texas Water Code Chapter 36.1071(b) this management plan and any amendments thereon shall be considered in the development of the regional water plan. Considering this local management plan will meet the intent of Senate Bill #1 and therefore, result in a regional management plan, which is consistent with this local management plan, resulting in the protection of the local control of groundwater management by the local people who elected the Board of Directors to manage the District.

### **ACTIONS, PROCEDURES, PERFORMANCE, AND AVOIDANCE FOR PLAN IMPLEMENTATION**

The District will implement the provisions of this plan and will utilize the provisions of this plan as a guidepost for determining the direction of priority for District activities. Operations of the District, agreements entered into by the District and planning efforts in which the District may participate will be consistent with the provisions of this plan. A copy of the Rules of Goliad County Groundwater Conservation District may be found at [www.goliadcogcd.org](http://www.goliadcogcd.org).

The District will update and adopt rules relating to the permitting of wells and the production of groundwater. The rules adopted by the District shall be pursuant to the Texas Water Code Chapter 36 and the provisions of this plan. All rules will be adhered to and enforced. The promulgation and enforcement of the rules will be based on the best technical evidence available.

The District shall treat all citizens with equality. Citizens may apply to the District for discretion in enforcement of the rules on grounds of adverse economic effect or unique local conditions. In granting of



discretion to any rule, the Board shall consider the potential for adverse effect on adjacent landowners. The exercise of said discretion by the Board shall not be construed as limiting the power of the Board.

The District may amend the District rules as necessary to comply with changes to Chapter 36 of the Texas Water Code and to insure the best management practices of the groundwater in the District. The implementation of the rules of the District will be based on the best available scientific and technical data, and on fair and reasonable evaluation.

The District has encouraged and will continue to encourage public cooperation in the continued implementation of the management plan for the District.

### **ESTABLISHMENT OF DESIRED FUTURE CONDITIONS (DFC) AND ESTIMATE OF THE MODELED AVAILABLE GROUNDWATER**

The district is a member of groundwater management area 15 (GMA 15) composed wholly or in part of 14 groundwater districts. On October 14, 2021, GMA 15 members adopted the desired future conditions (DFC) to manage the groundwater resource in such a way as to achieve no more than 13 feet of average drawdown in the Gulf Coast Aquifer System in 2080 within the GMA 15 boundary relative to model grid file dated June 26, 2020 conditions based on results presented in Groundwater Availability Model (GAM) Run 21-020 Modeled Available Groundwater (MAG) (Appendix J). The GMA 15 Resolution, Transmittal Letter, and Explanatory Report are included in Appendix K.

For the District, the modeled drawdown is:

Chicot: 4ft rise +/-17ft

Evangeline: 2ft rise +/- 36ft

Burkeville: 7ft decline +/-14ft

Jasper: 14ft decline +/- 7ft

The modeled available groundwater is 6,972-acre feet in 2080.

### **METHODOLOGY FOR TRACKING DISTRICT PROGRESS IN ACHIEVING MANAGEMENT GOALS**

A Performance Review is prepared annually by the general manager and staff of the District. The annual Performance Review covers the activities of the District including information on the District's performance in regards to achieving management goals and objectives. The presentation of the report occurs during a monthly Board meeting in the first quarter of the next fiscal year beginning October 1, 2022. The report will include the number of instances in which each of the activities specified in the District's management objectives was engaged in during the fiscal year. Each activity will be referenced to the estimated expenditure of staff time and budget in accomplishment of the activity. The notations of activity frequency, staff time and budget will be referenced to the appropriate performance standard for each management objective describing the activity, so that the effectiveness and efficiency of the District's operations may be evaluated. The Board will maintain the report on file, for public inspection at the District's offices upon adoption and on the District website at [www.goliadcogcd.org](http://www.goliadcogcd.org).

### **GOAL 1.0 PROVIDING THE MOST EFFICIENT USE OF GROUNDWATER**

**Management Objective** - The District maintains an aquifer water level program monitoring a minimum of 50 wells in the District annually.

**Performance Standard** - The District includes water level monitoring data on its website and in the Annual Performance Review Report.

**Management Objective** - The District will continue to require the registration and location of all new and replacement wells drilled within the boundary of the District.

**Performance Standard** - The number of wells drilled each year will be included in the Performance Review. The wells are to be reported by category as replacement, new exempt, and new permitted.

**GOAL 2.0**  
**CONTROLLING AND PREVENTING WASTE OF GROUNDWATER**

**Management Objective** - Each year, the District will sample the water quality in at least five (5) selected wells in order to monitor water quality trends and identify if contamination of groundwater is occurring. The District will also make available to well owners a service for well water quality analysis, to be paid for by the well owner.

**Performance Standard** – 1. Annual report of wells sampled for water quality by the District. 2. Annual report of wells sampled by the District upon request.

**Management Objective** - When processing an application for a production permit, the District will evaluate and recommend selection of efficient pumping and distribution equipment. For process applications, the District will evaluate reprocessing and recovery options.

**Performance Standard** - Recommendations will be included in the approved application.

**GOAL 3.0**  
**CONTROLLING AND PREVENTING SUBSIDENCE**

The GCGCD has reviewed the TWDB subsidence risk report that can be found at <http://www.twdb.texas.gov/groundwater/models/research/subsidence/subsidence.asp>. This report is the best available science on the matter of subsidence in Texas. According to Figure 4.23 of the subsidence report, Goliad County is in the medium risk category trending slightly higher in the northern part of the county. As shown in Figure 4.22, clay thickness trends higher in the northern part of the county which is consistent with the report that lower clay thickness provides a lower risk for subsidence. The GCGCD will work diligently to review signs of subsidence and will respond to any signs or reports of potential subsidence. GCGCD has not physically observed any subsidence. This goal is not applicable to the District.

**GOAL 4.0**  
**ADDRESSING CONJUNCTIVE SURFACE WATER MANAGEMENT ISSUES**

**Management Objectives** - Each year the District will participate in the regional water planning process by attending at least one meeting of Region L Planning Group where we will encourage the development of surface water supplies to meet the needs of WUGs in the district.

**Performance Standard** – The district will, in each annual report, document the participation of district representation in Region L meetings and the number of meetings where GCGCD participated.

**GOAL 5.0**  
**ADDRESSING NATURAL RESOURCE ISSUES THAT IMPACT THE USE AND AVAILABILITY OF GROUNDWATER AND WHICH ARE IMPACTED BY THE USE OF GROUNDWATER**

**Management Objectives** - Each year the District will locate all of the wells drilled that year for compliance of well spacing including minimum distance from septic systems or other defined potential contamination.

**Performance Standard** - The District will include in the Performance Review a record of any deficiencies found and the corrective action that was taken.

**GOAL 6.0**  
**ADDRESSING DROUGHT CONDITIONS**

**Management Objectives** - Semiannually the District will update the rainfall values for the District for the previous six months.

**Performance Standard** - The District will issue one report semiannually, listing the rainfall values for the county. This report will be entered on the District website and included in the Performance Review. The following link has much useful information and includes links to major drought reporting websites:  
<https://waterdatafortexas.org/drought>

**GOAL 7.0**  
**ADDRESSING CONSERVATION, RECHARGE ENHANCEMENT, RAINWATER HARVESTING, PRECIPITATION ENHANCEMENT AND BRUSH CONTROL**

**CONSERVATION**

**Management Objective** - The District will at least on two occasions each year provide public information on water conservation and waste prevention through presentations at public schools, civic organizations, newspaper articles, or articles posted on the District website.

**Performance Standard** - The District will report the number of speaking appearances made by the District each year and the number of newspaper articles published in the local newspaper and on the District website each year addressing conservation.

**RECHARGE ENHANCEMENT**

**Management Objective** - The District recommends that the most efficient method for increasing recharge is continued brush and weed control.

**Performance Standard** - See “Brush Control” Goal.

**RAINWATER HARVESTING**

**Management Objectives** - The District will continually provide current information on rainwater harvesting on both the District web site and through literature in the office.

**Performance Standard** - The District will include the number of persons receiving literature from the office on rainwater harvesting and report any known District application in the annual Performance Review.

**PRECIPITATION ENHANCEMENT**

The District has evaluated a precipitation enhancement program and has determined that it is not appropriate or cost effective. Therefore, the District has determined that a precipitation enhancement goal is not applicable at this time.

**BRUSH CONTROL**

**Management Objective** - Brush control is extensively practiced in the county and the practice is encouraged by the Farm Service Agency Program and the GCGCD. The District will continually support an educational program to inform the stakeholders of the benefits of controlling brush on their property. The educational program will consist of current information on brush control available on both the District web site and through literature in the office.

**Performance Standard** – GCGCD initiated a soil moisture measurement program with Texas Tech University (TTU) in 2018. The results of this ongoing study are published on the district website. This study has shown that the presence of brush greatly reduces the possibility of recharge. The results of this study are available on the GCGCD website: <http://www.goliadcogcd.org/>.

**GOAL 8.0**  
**ADDRESSING THE DESIRED FUTURE CONDITIONS (DFC)**

**Management Objective** - At the end of each fiscal year, the District will prepare an updated data sheet of the estimated total groundwater use in the District for the past year. The District Board of Directors will review the total groundwater use data along with the water level data from Goal 1 and make an evaluation of the current status in reference to the drawdown and the modeled water availability determined by the current DFC.

The District will maintain annual water level data in spread sheet and graphic form and do an annual assessment of this data to track results in relation to achieving the desired future conditions.

**Performance Standard** – The District’s annual report will include the water level measurements taken each year to assess the District’s progress towards achieving its desired future conditions. The District will include a discussion of current water levels to historic data in order to track its progress in achieving its desired future conditions. A review of existing rules will be included to determine if changes need to be considered.

**Goliad County Groundwater Conservation District Management Plan Appendices**

- Appendix A -** Water Level Monitoring Data 2003-2022: Goliad County Groundwater Conservation District
- Appendix B -** TWDB Estimated Historical Water Use Survey (WUS) Data
- Appendix C -** 2011-2021 Documented Water Use: Goliad County Groundwater Conservation District
- Appendix D -** 2022 Region L Water Plan, Goliad County Water Demand Projections 2020-2070
- Appendix E -** GAM Run 12-018 (Version 2): Goliad County Groundwater Conservation District Management Plan
- Appendix F -** GCGCD's and LRE's Comments on New Model and Recalibrated Model Report
- Appendix G -** 2022 State Water Plan Data sets
- Appendix H -** GCGCD's Historic Water Use: Goliad County Estimated Historic Municipal and Domestic Groundwater Use; Estimated Historic Oil, Gas, and Uranium Groundwater Use; and Historic Use Allocations
- Appendix I -** Daniel B. Stephens and Associates, Inc. Memorandum 2018 Report on Recharge, DFCs, Pumpage
- Appendix J -** Gam Run 21-020 MAG: Modeled Available Groundwater
- Appendix K -** GMA 15 Resolution, Transmittal Letter and Explanatory Report
- Appendix L -** Administrative Items