

Texana Groundwater Conservation District Meeting Notice and Agenda

Notice is hereby given in accordance with the Open Meetings Act, Chapter 551, Government Code and Section 36.064 of the Texas Water Code that the Texana Groundwater Conservation District Board of Directors will hold a meeting on June 5, 2025, at 6:00 P.M. at the LNRA Headquarters, Building C, 4631 F.M. 3131, Edna, Texas.

AGENDA

1. Call the meeting to order and welcome guests.
2. Receive public comments.
3. Consideration of and possible action on matters related to groundwater resource planning including a proposal for the evaluation of the draft groundwater availability model developed by TWDB for the central and southern portions of the Gulf Coast aquifer.
4. Adjourn.

The Texana Groundwater Conservation District may close the meeting, if necessary, to conduct private consultation with legal counsel regarding matters protected by the attorney-client privilege pursuant to Section 551.071 of the Government Code or to discuss matters regarding personnel pursuant to Section 551.074 of the Government Code. The Texana Groundwater Conservation District will return to open meeting, if necessary, to take any action deemed necessary based on discussion in closed meeting pursuant to Section 551.102 of the Government Code.

In Accordance with Title III of the Americans with Disabilities Act, we invite all attendees to advise us of any special accommodations due to disability. Please submit your request as far as possible in advance of event you wish to attend.



April 22, 2025

Mr. Tim Andruss
Victoria County Groundwater Conservation District
2805 N. Navarro Street, Suite 210
Victoria, TX 77901

RE: Proposal to Review Draft Numerical Model Recalibration: Groundwater Availability Model (GAM) for the Central and Southern Portions of the Gulf Coast Aquifer System (Version 1.1)

Dear Tim,

INTERA Incorporated (INTERA) is submitting a proposal to evaluate the above-referenced draft GAM. The proposal is for Victoria County GCD's, Refugio GCD's, Texana GCD's, and Calhoun County GCD's consideration. The proposed tasks are described in **Appendix A**. The tasks are:

1. Assemble and evaluate field estimates of aquifer hydraulic properties used to calibrate the draft GAM
2. Evaluate whether the draft GAM has been adequately calibrated to provide an acceptable representation of hydrogeology of the Gulf Coast Aquifer in the vicinity of Victoria, Refugio, Calhoun, and Jackson counties.
3. Evaluate the reliability of GAM's predictions to support the Districts with accomplishing their goals including: a) developing drawdown-based Desired Future Conditions; b) assessing the potential for saltwater intrusion and land subsidence; c) differentiating between the impacts caused by pumping fresh groundwater and the impacts caused by pumping brackish groundwater
4. Prepare a Report that documents the findings from Tasks 1, 2, and 3
5. Optional Task. Describe approaches for constructing and calibrating future GAMs so they would have significantly better capability to address issues in Task 3 than does the draft GAM

The total budget for Task 1 through 4 is \$40,000. The cost for optional Task 5 is \$10,000. The project is estimated to require approximately 3 months to complete.

Sincerely,

INTERA Incorporated

A handwritten signature in black ink that reads "Steven C. Young".

Steven Young, PhD, PE, PG
Principal Geoscientist

Attachment A

Proposal to Review Draft Numerical Model Recalibration: Groundwater Availability Model for the Central and Southern Portions of the Gulf Coast Aquifer System (Version 1.1): Tasks

The proposal is being submitted in response to concerns raised by GMAs 15 and 16 regarding the usefulness of the draft numerical model for the Central and Southern Portions of the Gulf Coast Aquifer System Version 1.1 (“draft GAM”) (Dowlearn et al. 2025), which was developed by the Texas Water Development Board (TWDB). The draft GAM is a recalibration of a previous GAM (Shi and Boghici, 2023) that was adopted by the TWDB but later retracted after the GAM did not provide credible predictions of Desired Future Conditions (DFCs). Upon TWDB’s reevaluation of the GAM by Shi and Boghici (2023), the TWDB realized the low DFC values resulted from the GAM simulating unrealistically high flow rates. To address this problem, the TWDB developed the draft GAM (Dowlearn et al. 2025), which is currently under review by the public and GCDs. A preliminary review of the draft GAM by INTERA and GMA 16 (Young, 2024) indicates that the draft GAM has unrealistic spatial distributions of hydraulic conductivity values and therefore may not provide credible predictions of drawdowns caused by future pumping scenarios.

The proposed work has two primary objectives:

- Determine whether the draft GAM hydraulic properties and recharge for the Gulf Coast Aquifer are reasonable with respect to available field data and the professional literature.
- Determine whether the draft GAM is appropriate for developing and implementing groundwater planning, management, and regulation by Texana GCD, Victoria County GCD, Refugio GCD, and Calhoun County GCD.

The proposal consists of the following four tasks and one optional task, which are:

1. Assemble and evaluate field estimates of aquifer hydraulic properties used to calibrate the draft GAM
2. Evaluate whether the draft GAM has been adequately calibrated to provide an acceptable representation of hydrogeology of the Gulf Coast Aquifer in the vicinity of Victoria, Refugio, Calhoun, and Jackson counties.
3. Evaluate reliability of GAM’s predictions to support the Districts with accomplishing their goals including: a) developing drawdown-based Desired Future Conditions; b) assessing the potential for saltwater intrusion and land subsidence; c) differentiating between the impacts caused by pumping fresh groundwater and the impacts caused by pumping brackish groundwater
4. Prepare a Report that summarizes the findings of Tasks 1, 2, and 3
5. Optional Task. Describe approaches for constructing and calibrating future GAMs so they would have significantly better capability to address issues in Task 3 than the draft GAM

Task 1. Assemble and evaluate field estimates of aquifer hydraulic properties used to calibrate the model

INTERA will assemble and review the hydraulic conductivity and specific storage values in the conceptual model report (Shi et al. 2022) that were used to guide the calibration of the draft GAM. Shi et al. (2022) tabulated approximately 11,200 hydraulic conductivity values and 100 storage values. For Victoria,

Refugio, Calhoun, and Jackson counties, the conceptual model report (Shi et al. 2022) provides 1,677 hydraulic conductivity values and 25 storage values.

Shi et al. (2022) determined the of the majority of the tabulated hydraulic conductivity values by analyzing specific capacity data. However, Shi et al. (2022) neither explain the methodology used to determine hydraulic conductivity values from specific capacity measurements nor do they explained how they accounted for the numerous issues and challenges (described in Mace [2001] and Young et al. [2008]) which must be considered when determining hydraulic conductivity values from specific capacity values.

INTERA will test the validity of the methods used by Shi et al. (2022) by applying the methods used by Shi et al. (2022) to calculate transmissivity values from specific capacity values calculated from documented aquifer pumping tests for which values for transmissivity and specific capacity have been calculated. INTERA will also review the specific storage values used by Shi et al. (2022) to calibrate the draft GAM. The values for specific yield (unconfined aquifers) and specific storage (confined aquifers) will be validated against literature values for similar formations. Among the well-known relationships that have been documented and will be used to check TWDB values is the relationship between lithology and storage values and depth of burial and storage values (Young and Kelly, 2009; Loucks et al. 1986; Skestakov, 2002; Lv et al. 2021.)

Based on INTERA's review of Shi et al. (2022), there are relatively few hydraulic parameters calculated from aquifer pumping test data from Public Water Supply wells. Perhaps the best repository of aquifer pumping tests in Texas are the Texas Commission of Environmental Quality (TCEQ) files on Public Water Supply (PWS) wells that should include results from a 36-hour aquifer pumping tests. INTERA has access to many of the TCEQ files for PWS wells located in Victoria, Refugio, Calhoun, and Jackson counties. While reviewing PWS files, INTERA will perform a quality check on well information regarding: the length of the screened interval, the duration of the pumping and the stability of the pumping rate, and evidence of a positive skin effect. After the aquifer pumping test data have been properly checked, INTERA will determine specific capacity and transmissivity values for the Gulf Coast Aquifer. INTERA will also check TWDB reports including Myers (1969) for additional aquifer pumping test data.

Task 2. Evaluate whether the draft GAM has been adequately calibrated to provide an acceptable representation of hydrogeology of the Gulf Coast Aquifer in the vicinity of Victoria, Refugio, Calhoun, and Jackson counties

INTERA will compare the aquifer properties and recharge in the draft GAM (Dowlearn et al. 2025) with those from previous GAMs and conceptual models for the Gulf Coast Aquifer (Shi and Boghici, 2023; Chowdhury et al. 2004; Scanlon and others, 2012; Young and others, 2010), the hydraulic property values generated by Shi et al (2023), and hydraulic property values that were vetted by INTERA. INTERA will identify the regions in the vicinity of Victoria, Refugio, Jackson, and Calhoun counties where the draft GAM hydraulic properties and recharge values are in agreement and in the regions where they are in disagreement with field data and previous models. INTERA preliminary review of the draft GAM indicates that the draft GAM representation of the aquifer and recharge is not supported by field data and that the primarily caused of the discrepancy is process used to calibrate the model. If this preliminary analysis holds true then INTERA will identify possible causes for the observed discrepancy between field measured and model aquifer properties and for apparent biases in the recharge values.

INTERA will evaluate the draft GAM capability to provide credible prediction of pumping impacts in Victoria, Calhoun, Jackson, and Refugio counties based on the following criteria: (1) comparison of

simulated to measured water levels; (2) the draft GAM's representation of the Gulf Coast hydraulic properties; and (3) the draft GAM's representation of recharge. INTERA's assessment of recharge will be based on the draft GAM site conceptual report (Shi and others, 2022), the site conceptual model used by Chowdhury et al. (2004) to develop a GAM, and the report by TWDB to estimate recharge across the entire Gulf Coast Aquifer (Scanlon et al. 2012).

Task 3. Evaluate the utility of the draft GAM to support the District with accomplishing their goals including: a) developing drawdown-based Desired Future Conditions; b) assessing potential for saltwater intrusion and subsidence; c) differentiating between the impacts of fresh and brackish groundwater production

The ability of a groundwater model to provide useful predictions depends primarily on how well the model represents the aquifer hydraulic properties and the hydraulic boundary conditions. Aquifer hydraulic properties includes aquifer transmissive and storage properties. Hydraulic boundary conditions includes recharge, pumping, surface water-groundwater interactions, and evapotranspiration. Based an evaluation of how well the draft GAM represents the aquifer hydraulic properties and hydraulic boundary conditions in the area near and inclusive of Victoria, Calhoun, Refugio, and Jackson counties, INTERA will assess whether the draft GAM prediction's of drawdowns could be used to provide technical defensible evaluations of DFCs, saltwater intrusion, land subsidence, and impacts caused by brackish productions.

Task 4. Prepare Report that documents findings from Tasks 1, 2 and 3

INTERA will prepare a report that documents the findings of Tasks 1, 2, and 3. A draft version of the report will be provided to Texana GCD, Refugio GCD, Calhoun County GCD, and Victoria GCD for review and comment. The draft version of the report will be provided as an electronic copy. Upon receipt of comments on the draft report, INTERA will address the comments in the final version of the report. The final version of the report will be provided as both an electronic and hardcopy. The electronic copies will consist of a Word version and a PDF version. A hard copy the final report will be provided to each GCD.

Task 5. Describe approaches for constructing and calibrating future GAMs so they would have significantly better capability to address issues in Task 3 than the draft GAM (Optional)

INTERA will prepare an addendum to the Task 4 report that describes recommended approaches for constructing and calibrating future GAMs so they can better support GCDs located in GMA 15 than the draft GAM with groundwater management goals, policies, and rulemaking. Among the issues that are uniquely important to groundwater management along the Texas Gulf Coast is saltwater intrusion, land subsidence, and the production of brackish groundwater. Saltwater intrusion can be a concern because of proximity to the ocean and bays. Land subsidence can be a concern because of the large amount of clays in the relatively young sediments that comprise the Chicot and Evangeline aquifers. Production of brackish groundwater is a concern because of the large volume of brackish groundwater and its occurrence at depths less than 2,000 feet below ground surface near the shoreline and near some salt domes.

Recommendations for improving the Gulf Coast GAMs will begin with suggested changes to the GAM standards. The GAM standards were first developed more than 25 years ago and have undergone minor revisions since. When the TWDB developed the first GAM standards, GAMs were anticipated to be used to assist regional water planning with developing estimates of groundwater availability over 50-year

planning periods. The GAM standards address a wide range of issues regarding stakeholder participation, administrative responsibilities, model construction, model calibration, model documentation, software requirements, GIS deliverables, and reporting requirements. Since the first GAMs were developed in 2000, the use of GAMs has expanded and evolved such they are important in the development of Desired Future Conditions, Modeled Available Groundwater, GCD management plans, GCD permitting, and SOAH hearings. However, the GAM standards have not evolved to keep pace with the expanded use of the GAM's predictions that have become instrumental to: regional water planning, to TWDB funding for water projects, evaluating of GCD operational permits, and defining best available science. The two areas of the GAM standards that appear to have the greatest need of updating, and will be the focus of the Task 5 write-up, are model construction and model calibration.

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