

How to Submit a Groundwater Availability Model Run or Aquifer Assessment for the Development of Modeled Available Groundwater

Background

Groundwater availability models are tools to help assess a variety of groundwater availability issues, including developing estimates of modeled available groundwater. The Texas Legislature tasked the Texas Water Development Board (TWDB) with obtaining or developing groundwater availability models (GAMs) for major and minor aquifers. To view a list of the groundwater availability models and TWDB approved alternative models currently available please see our web page: <http://www.twdb.texas.gov/groundwater/models>

The Texas Water Code §36.108 (d) states that groundwater conservation districts shall consider groundwater availability models and other data or information for the management area during the development of the desired future conditions for the relevant aquifers within the groundwater management areas. The districts are also required to prepare an explanatory report that includes a description of each desired future condition, provides policy and technical justifications for each desired future condition, and documents consideration of the various factors listed in Texas Water Code §36.108 (d). In most cases, groundwater model files will be generated by the districts to document the technical rationale for the selection of a desired future condition. These model files are an important component in the next step: the development of estimates of the modeled available groundwater. If the groundwater management area anticipates using a numerical groundwater flow modeling code other than MODFLOW for the desired future conditions development, please contact TWDB staff before proceeding with the model development or execution.

The TWDB recommends the following process to assist with the development of estimates for modeled available groundwater based on the submitted desired future conditions.

Who needs to submit the files?

If the files are delivered with the final submittal of the required desired future condition packet, the groundwater management area technical coordinator needs to submit the electronic files and/or paper copies to the TWDB Executive Administrator who will transmit this information to the Groundwater Availability Modeling manager and/or Groundwater Technical Assistance manager. However, we encourage draft submittals *prior to* the groundwater management areas deciding on their desired future conditions so that TWDB staff can assess if the files or approach matches the groundwater management areas expectations. These early draft submittals should be through the groundwater management area technical coordinator and directed to the TWDB Groundwater Resources director. Please note TWDB will accept the draft files and documentation for review until the point our workload shifts to processing final estimates of modeled available groundwater based on desired future condition submittals. We project this shift in workload will occur closer to the 5-year anniversary of the last round of the desired future condition process. Notification of this shift will be noted on our desired future condition web page: http://www.twdb.texas.gov/groundwater/management_areas/DFC.asp

If the groundwater conservation districts decide to use a MODFLOW model other than the approved groundwater availability models, we encourage the groundwater management area technical coordinator provide the model files and supporting documentation to the TWDB manager of the Groundwater Availability Modeling Section at least 6 months prior to submitting draft predictive runs or final desired future condition runs to TWDB for review. TWDB will review the MODFLOW model and determine if the model meets the Groundwater Availability Modeling Program standards.

What needs to be submitted for desired future condition model runs or analysis?

TWDB staff must be able to replicate the approach and assumptions used to develop the desired future conditions. Therefore, at minimum the following items will expedite the review process:

- 1) Summary report or sufficient supporting documentation that includes the following:
 - a) Administrative information—
 - i) Contact information. if clarification is needed,

- ii) Name of the requestor,
 - iii) Date and year of submittal,
 - iv) Groundwater management area,
 - v) Description of the desired future condition , including the name of the aquifer and description of the area, and
 - vi) Seal by Texas Professional Geoscientist or Engineer, if this is a final submittal.
- b) Approach:
- i) **Groundwater Availability Model** Approach. If an official groundwater availability model or a substitute model pre-approved by TWDB staff was used, then please include:
 - (1) Modeling Approach with parameters and assumptions such as:
 - (a) Groundwater availability model version/author(s) and version of acceptable pre-/post-processor used, if applicable;
 - (b) Summarization of the calibrated model including layer structure/stratigraphy (aquifer versus aquitard), type of model layers, type of stress periods and related years, type of calibration targets, and calibration results;
 - (c) Table or description of stress periods and corresponding years/months;
 - (d) Describe how reference conditions were determined. If the reference conditions are different from the end of the calibration, please describe assumptions for projecting model from end of calibration to reference stress period including pumping, recharge, and related surface water heads. Please include targets and hydrographs, as applicable, in appendix as well as electronic copies;
 - (e) Describe what assumptions were made for boundary conditions, surface water, recharge, pumping, and stress periods. For example if return flow from irrigation or other sources was also part of the groundwater recharge, please identify this from the groundwater recharge due to precipitation and provide all recharge data separately;
 - (f) Describe any exception in the well package files that do not represent actual assumed pumping;
 - (g) Version of TWDB “model grid” file that associates model grids with counties, groundwater conservation districts, river basins, groundwater management areas, and regional water planning areas within the model study area using a

centroid based approach. These files are available to download on each of the respective model web pages as noted above;

- (h) Describe method used to calculate the desired future condition. For example for drawdown please describe the different aquifers/layers under consideration, any subdivision or geologic strata located in whole or in part within the groundwater management area, the stress period and year being used as initial heads—reference condition, the periods and years drawdown being calculated, and the method and assumptions if average drawdown was used. If dry cell exists, please include a description of how dry cells were treated;
- (i) Results Section with, but not limited to, appropriate tables of pumping consistent with the desired future condition statement;
- (j) Model limitations should be presented including those inherited from the calibrated model and other limitations related to predictive simulation; and
- (k) References.

(2) All related MODFLOW files:

- (a) If applicable, all input and output files related to an automatic parameter estimation program, such as PEST;
- (b) If a pre/post-processing program is included, please provide the source and executable code. If a graphic user interface program is presented to incorporate the MODFLOW model, please include all MODFLOW packages, targets, and basemap(s); and,
- (c) Read-me files shall be included to explain type and version of operation systems as well as instructions how to run the computer programs related to the model development.

ii) **Aquifer Assessment** Approach (Water Budget or Analytical Model Method).

If a groundwater availability model was not used please include:

- (1) Reason(s) why a groundwater availability model was not used if one or more official or alternative groundwater availability models exist;
- (2) Description of assessment methodology with any relevant technical or administrative information to help explain the approach;

- (3) Detailed calculations for the water budget or analytical model including all input data and calculation results. Provide reasoning and source regarding how input data were selected;
- (4) If Geographic Information System (GIS) files were used for assessment, please include metadata unless using a TWDB-sourced dataset; and
- (5) References.

If a groundwater flow model other than one of the official groundwater availability models or acknowledged alternative models was used or is being considered, TWDB staff must first verify that the model under consideration is equal to or better than existing model(s) acknowledged by the TWDB Groundwater Availability Modeling Program. It should be noted that any model submitted or approved would become publicly available. At a minimum the following items should be submitted before the deadline discussed in the previous section to expedite the review process:

- 1) All applicable MODFLOW files;
- 2) Documentation that includes modeling objectives, conceptual model, code description, model construction, model calibration, sensitivity analysis, model verification and prediction (if applicable), model limitation, and conclusions;
- 3) Any related field/laboratory test data and other supporting materials;
- 4) All related assumptions and calculations;
- 5) Table listing stress periods and associated time periods;
- 6) Description and figure(s) of boundary conditions (if one boundary condition includes more than one hydraulic process, please also provide all processes separately);
- 7) Calibration statistics and approach;
- 8) Grid shape files with projection file (prefer GAM projection) ;
- 9) Electronic files of targets with GAM coordinates or MODFLOW layer/row/column format (to verify calibration);
- 10) Appropriate base map(s) with GAM coordinates;
- 11) Any related electronic files of data used for starting heads and surface water features;
- 12) Sufficient metadata to understand units used;
- 13) Any known or perceived limitations; and
- 14) Any applicable read-me files to expedite the review process.

What happens after I submit my request?

- The TWDB will send written acknowledgment to the technical coordinator within two weeks of receipt of your request.
- Your request will be logged into the groundwater availability modeling request log or technical assistance queue.
- TWDB staff will contact you for more information and will give you an estimated time for completing the request.

How long will it take for my request to be completed?

The response time on a request will depend on the complexity of the request, other requests, and current TWDB workload. We will provide the requestor with an estimated schedule for completion of the review within two weeks of submittal of the request. TWDB will communicate with the technical coordinator about the progress and any possible change of the schedule.

For questions, contact:

- Cindy Ridgeway, Groundwater Availability Modeling manager (512-936-2386)
- Rima Petrossian, Groundwater Technical Assistance manager (512-936-2420)
- Larry French, Groundwater Resources Division director (512-463-5067)