

# Bluebonnet Groundwater Conservation District

## Guidelines for Preparation of Hydrogeologic Reports For Submission in Support of Applications for the Permitted Use of Groundwater

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### 1.0 Introduction

Under Rule 8.5F, the Bluebonnet Groundwater Conservation District requires the submittal of Phase I and Phase II hydrogeologic reports for non-exempt wells with an inside casing diameter of eight (8) inches or greater as part of the permit application process. These reports must include hydrogeologic information addressing, and specifically related to, the impacts of the proposed well (e.g. area of influence, drawdown, recovery time, subsidence).

In general, the Phase I report is intended to be a preliminary report that relies on existing regional information, and the Phase II report is intended to be a final report that relies on site specific data, information, test results and analyses. Phase I reports may be supplemented with information such as test-hole, monitor wells, and

aquifer tests. An applicant who incurs the cost to include such supplemental information in a Phase I report bears the risk that the Board may deny the permit application even with the supplemental data.

This guideline document is intended to set standards and expectations for the investigations and reports. The planning and implementation of investigations should be coordinated with BGCD to insure acceptability. BGCD may exercise discretion in the application of the guidelines on an individual and site specific basis in order to allow a practicable application of the guidelines while insuring a result yielding the information needed by BGCD to process the permit application. The exercise of this discretion by BGCD shall not be construed as limiting the authority of BGCD in any other matter. BGCD should be notified at least 24 hours in advance of the anticipated conduct of any test-hole drilling, well construction, or pumping test conducted as part of the hydrogeologic investigation performed to meet the requirements of these guidelines.

Hydrogeologic reports submitted with applications for the use of groundwater or applications for the increased use of groundwater must meet the standards set forth in these guidelines. Hydrogeologic reports must be sealed by a Professional Geoscientist (P.G.) or Professional Engineer (P.E.) licensed to practice in the State of Texas.

## **2.0 Phase I Report**

The Phase I report is intended to evaluate the impacts of pumping using existing data and the existing regional groundwater flow model of the area for the aquifer in which the well is to be completed.

### **2.1 Hydrogeologic Setting**

The report shall give a description of the hydrogeologic setting that includes descriptions of:

- The surface geology
- The depth interval of the proposed water bearing zone
- The anticipated thickness of the water bearing zone(s)
- A statement of whether the water bearing zone is anticipated to be in unconfined or confined condition
- A description of any existing wells, hydrologic features, or geologic features located within ½ mile of the proposed well site.

In addition, if the proposed well is to be completed in the Gulf Coast Aquifer, the regional clay thickness used by the USGS in the development of the Houston Area Groundwater Model (HAGM) shall be used to estimate the clay thickness and clay percentage of the proposed well site. The data are available from BGCD upon request, and come in four files:

- 1chclaythk.csv (Layer 1, Chicot Aquifer)
- 2evclaythk.csv (Layer 2, Evangeline Aquifer)
- 3bvclaythk.csv (Layer 3, Burkeville Confining Unit)
- 4jaclaythk.csv (Layer 4, Jasper Aquifer)

These files contain estimates of clay thickness for each active cell in the model. The applicant must include the estimated clay thickness and clay content (expressed as a percentage of layer thickness) for all layers in and above the proposed water bearing zone of the well.

## **2.2 Proposed Well Construction Diagram**

A diagram of well completion details must be included that shows, at a minimum, the well depth, borehole and casing diameter, depth interval of well screen, and gravel pack design.

## **2.3 Simulation of Proposed Pumping**

The report shall include the results of a simulation using the Groundwater Availability Model for the area that adds the proposed well to the then most recent model run that was used to establish the desired future condition. Results of the simulation must include:

- A drawdown hydrograph of the cell or cells in which pumping is proposed, including a comparison with the desired future condition drawdown of the subject cell or cells
- A time series graph that compares maximum subsidence under the DFC condition and the maximum subsidence with the additional proposed pumping in the immediate area of the pumping.
- A county-aquifer level water budget that includes a comparison with the water budget of the desired future condition simulation.
- Maps of drawdown and maximum subsidence
- Tables of drawdown and subsidence at the locations of existing registered and permitted wells contained in the BGCD database

## **2.4 Discussion of Results and Recommendations**

A discussion of the results of the simulations is required, and should include detailed recommendations regarding the design of a drilling and testing program that would be completed as part of the Phase II report.

## **3.0 Phase II Report**

Phase II reports are to be completed after an approved program of drilling and aquifer testing have been completed. The data obtained from the drilling and aquifer testing shall be used in the analyses of the Phase II report.

### **3.1 Results of Borehole Drilling and Well Construction**

The following data and analyses must be included in the report:

- Geologist logs of all boreholes
- Geophysical logs of all boreholes
- Estimates of clay thickness and clay percentage for each borehole calculated based

on model layer intervals for comparison to regional data

### **3.2 Results of Aquifer Tests**

In general, the aquifer tests shall consist of a pre-test phase where the static water levels of the test and monitor wells are measured on a regular basis for 24 hours prior to the test, a constant pumping phase of not less than 24 hours and a recovery phase of a period sufficient for a 90% recovery of beginning water levels the test and monitor well locations or at least a 24 hour period, unless an alternative procedure is found acceptable by BGCD. Existing private wells within ¼ mile of the test location or otherwise acceptable to BGCD may be used as monitor wells for the pumping test.

The following data and analyses must be included in this report:

- A map giving the location and elevation above mean sea level (NGVD 1929 or NAVD 1988) of the test well, any existing or newly constructed monitor wells and all surrounding wells that exist within a ½ mile radius of the test well. The map shall include streets, roads and the bounds of land tracts sufficient to determine the location of the test well within the tract of land on which it is located. The map shall also include recharge features, geologic features, other water system features (e.g. storage tanks, existing wells), and potential sources of contamination.
- Narrative describing the aquifer test (dates and times run, pumping rate, wells monitored during test, method of data collection, etc.).
- A discussion of the conduct of the test giving details of the significant events of the test, any equipment failures and any contingency measures that may have been employed.
- Analyses of the test results, including the method(s) of analysis, the calculated aquifer parameters should include the transmissivity, hydraulic conductivity and storage coefficient (storativity) values.
- A table giving the water-level drawdown and recovery data from the test and monitor wells, and figures giving the water level recovery curves from which the aquifer parameters were calculated.
- A discussion of the conclusions drawn from the analytical results of the calculation of the aquifer parameters at the test location including and the effects of any boundary conditions identified during the test.

In addition, electronic versions of all test data shall be submitted to BGCD as part of the report.

### **3.3 Well Construction Diagram**

A diagram of the as-built completion details of all production and monitoring wells must be included that shows, at a minimum, well depths, borehole and casing diameters, depth interval of well screens, and gravel pack design. The State of Texas Water Well Report (Drillers Log) shall also be included, but should not be used as a substitute for the more detailed requirements listed above.

### **3.4 Updated Simulation of Pumping**

The objective of the updated simulations the impacts of the proposed pumping is to update the Phase I simulation with the local scale information developed from the drilling and testing program. Depending on the results of the aquifer test analyses, this updated simulation may be run using analytical methods or numerical methods. The time frame of the analysis should be the same as the time frame of the simulation completed in Phase I.

The report shall include the results of a simulation using a local scale analytical or numerical model, and the results compared to the results from the Phase I report simulation using the Groundwater Availability Model for the area. Results of the simulation must include:

- A discussion of the specific method used and the associated assumptions associated with the method
- A drawdown hydrograph at the location of the pumping well(s)
- A time series graph at the location of the pumping well(s) of subsidence
- Maps of drawdown and maximum subsidence
- Tables of drawdown and subsidence at the locations of existing registered and permitted wells contained in the BGCD database

### **3.5 Water Quality**

The report shall include:

- A table of specific conductance, temperature, and pH measurements taken at regular intervals during the aquifer test giving the measured value and time of the measurement.
- Laboratory analysis of a water sample taken at the end of the pumping phase of the aquifer test.
- A discussion of the water quality analysis stating whether the sample was of a quality to meet Texas Commission on Environmental Quality Primary Drinking Water Standards.
- A discussion of expected changes in water quality that may be anticipated from future pumping either at the proposed well or any existing registered or permitted well within 1 mile of the proposed well