

Outline of the Requirements for Hydrogeologic Assessment Reports Required for Select Production Permit Applications to Northern Trinity Groundwater Conservation District

1. Introduction

The rules of Northern Trinity Groundwater Conservation District (“the District”) list the minimum requirements for permit applications. Pursuant to District Rule 5.10, certain applicants are required to produce a report that assesses and demonstrates the potential impact of the existing or proposed well and/or the proposed additional production on existing permit holders and the overall aquifer.

This document provides clarifications and additional details concerning the requirements for the preparation of the hydrogeologic impact assessment report (hereafter referred to as “the Report”) required by the district rules.

2. Report Author Qualifications

The Report, and all technical work presented therein, needs to be prepared by a specialist with experience in general hydrogeology, aquifer drawdown calculations, and groundwater modeling. The report needs to be signed and sealed by a professional engineer (PE) or professional geoscientist (PG) that holds a current license issued by the state of Texas. Please visit engineers.texas.gov and www.tbpg.state.tx.us for more information about PE and PG licensing requirements and procedures for properly sealing and signing reports.

3. Objective of the Report

The purpose of preparing the Report is to demonstrate to the District the potential impact of the proposed well on nearby permit holders, other nearby well owners, and the aquifer(s) as a whole. The assessment must be performed in a manner that is consistent with the District’s management strategies; specifically, the report should address potential local-scale and regional-scale drawdowns associated with the proposed pumping. Potential local-scale drawdowns should be evaluated relative to current permitted or registered wells within a quarter (1/4) mile of the proposed well. See the following section for specific details concerning these technical demonstrations.

4. Required Information and Technical Demonstrations

A) Basic Information

The Report should present the following information:

- 1) A map or maps showing:
 - a. The location of the well
 - b. The location of the applicant's property boundaries
 - c. The locations of any off-site wells completed in the target aquifer(s) within one quarter (1/4) mile. Wells permitted by the District should be identified and distinguished from exempt wells.
 - d. The Area of Influence (AOI) of the well(s) associated with the permit. The AOI is described in greater detail in Section 4.B.
- 2) Information on the proposed well, including:
 - a. Lat-Long coordinates (decimal degree) and surface elevation (in feet above sea level) at the well location,
 - b. proposed total depth and screened interval (in feet below ground surface),
 - c. proposed target aquifer(s),
 - d. maximum requested annual production rate in millions of gallons and in acre-feet,
 - e. maximum requested short-term pumping rate in gallons per minute.

The Report should also present an evaluation of drawdowns associated with pumping from the proposed well. All permit applications and permit renewals require an evaluation of local-scale drawdowns caused by the well, with an emphasis on demonstrating the impacts of the well on existing wells in the same aquifer(s). All drawdown calculations and model runs should include constant pumping at the maximum rate or rates for the required time periods to provide a worst-case scenario for impact. If the applicant expects that the well(s) will not be operated continuously, the applicant may include additional language and, if possible, reasonable estimates concerning the actual expected pumping durations, annual production rates, and resulting reduction in estimated drawdowns.

Additional details are provided below in Section 4.B.

B) Local Drawdown Estimates

Local-scale drawdowns should be estimated using an analytical solution, such as the Theis equation, that calculates transient drawdowns in an aquifer that result from pumping in a well. Assumptions concerning aquifer parameters (e.g., thickness, transmissivity and storativity) for the calculations should be clearly presented in the report. Drawdowns should be calculated at the production well(s) and at the locations of any other wells in the target aquifer(s) within one quarter (1/4) mile. If the permit application is for two or more production wells, the drawdown calculations should be done assuming all wells pumping simultaneously. The calculations should only assume pumping from the well(s) associated with the permit. Examples of tabulated drawdown data are presented in **Tables 1 through 3**.

Drawdown Estimates for New Operating Permits

For each pumping well associated with the application, the following should be presented:

- 1) A set of drawdown calculations assuming continuous pumping at the maximum annual production rate for 1 year, 5 years, and 10 years. These drawdowns should be presented as the change in hydraulic head relative to the start of pumping. Results should be presented in a table similar to **Table 1** below.
- 2) The expected Area of Influence (AOI) of the well presented in map-view. The AOI is defined as the radial distance from the production well at which drawdowns after 10 years of pumping are negligible (i.e., less than 1.0 ft).

Table 1. Example results table for an Operating Permit drawdown analysis.

Well Name	Drawdown in 1 year (ft)	Drawdown in 5 years (ft)	Drawdown in 10 years (ft)
Production Well	40	51.5	59.4
Nearby Well #1	24	28.7	32.3
Nearby Well #2	9	12.3	15.5

Drawdown Estimates for Grandfathered Use Permits

For each pumping well associated with the Grandfathered Use Permit, the following should be presented:

- 1) A set of drawdown calculations which estimate the total drawdown the well has incurred during its time of production and the additional drawdown it is estimates to cause as it continues to produce. Details on these calculations are provided below:
 - a. The first timestep of the simulation should represent when the well *initially* started production. Drawdowns should be calculated at the timesteps which represent 1, 5, and 10 years from the *date of analysis*.
 - b. The simulation should assume the current production rate at the well for its entirety unless the historical pumping is known to be different. If this is the case, the historical pumping rate should be used during the appropriate timesteps in the simulation.
 - c. The “Historical Drawdown” is the difference in hydraulic head between the start of the simulation and the timestep which represents the *date of analysis*. All results should be presented in a table similar to **Table 2**.
- 2) The expected AOI of the well presented in map-view. The AOI is defined as the radial distance from the production well at which drawdowns representing continuous maximum production 10 years from the date of analysis are negligible (i.e., less than 1.0 ft).

Table 2. Example results table for a Grandfathered Use Permit drawdown analysis. Well began production in 2002.

Well Name	Historical Drawdown (ft) (2002 – present)	Drawdown in 1 year (ft)	Drawdown in 5 years (ft)	Drawdown in 10 years (ft)
Production Well	30	31.4	34.5	38.9
Nearby Well #1	21	22	24.2	27.2
Nearby Well #2	15	15.7	17.3	19.4

Drawdown Estimates for Permit Amendments

For each pumping well associated with the permit amendment, the following should be presented:

- 1) A set of drawdown calculations which show the additional drawdown which will be incurred due to increasing the production rate of a well which has already been producing for an extended period of time. Details on these calculations are described below:
 - a. Additional drawdown will be assessed as the difference in hydraulic head between pumping at the original permitted rate and pumping at the amended rate. This requires two separate simulations: one which assumes production at the original rate, and the other assuming production at the original rate until the date of analysis, at which point production is increased to the amended rate.
 - b. The first timestep of both simulations should represent when the well *initially* started production. Drawdowns should then be calculated at the timesteps which represent 1, 5, and 10 years from the *date of analysis*.
 - c. The simulation assuming production at the original permitted rate should remain at a constant production rate throughout the duration. **The other simulation should assume production at the original permitted rate until the timestep which represents the date of analysis**, at which point production should increase to the amended rate.
 - d. Results of both simulations should be presented in the Hydrogeological Report in a table similar to **Table 3**.
- 2) The expected AOI of the well presented in map-view. The AOI is defined as the radial distance from the production well at which drawdowns representing continuous maximum amended production 10 years from the date of analysis are negligible (i.e., less than 1.0 ft).

Table 3. Example results table for a Permit Amendment drawdown analysis. Well began production in 2010.

Well Name	Historical Drawdown (ft) (2010 – present)	Drawdown in 1 year (ft)	Drawdown in 5 years (ft)	Drawdown in 10 years (ft)
Production Well (current rate)	25	26.4	31.4	37.5
Production well (amended rate after historical period)	25	28.6	34.9	42
Nearby Well #1 (current rate)	13	14.3	18.2	22.4
Nearby Well #1 (amended rate after historical period)	13	15.2	19.8	24.3

C) Presentation of Results

The calculated local drawdowns described in Section 4.B should be presented in a set of tables similar to **Tables 1 through 3**. The AOI as described in Section 4.B, and all known wells in the target aquifer(s) within a quarter (1/4) mile, should be presented on a map. All nearby wells should be numbered and keyed to a separate table that contains the well owner's name, their respective target aquifer(s), and production rates (if available). Supporting information such as the pumping rate(s) used in each simulation should also be included.

5. Summary of Required Items

Below is a list summarizing the requirements for submitting a Hydrogeological Assessment Report to the District. The items below serve only as a checklist, as the preceding sections present these items in greater detail.

1. Signature of PE or PG
2. Map or maps showing:
 - a. Well location relative to District boundaries
 - b. Applicant's property boundaries
 - c. the locations of any off-site wells completed in the target aquifer(s) within one quarter (1/4) mile. Wells permitted by the District should be identified and distinguished from exempt wells. All nearby wells should be numbered by TWDB State Well ID and keyed to a table (#5 below).
 - d. the Area of Influence (AOI) of the well(s) associated with the permit
3. Table of proposed well/aquifer information including:
 - a. Well name(s)
 - b. Latitude and longitude of proposed well(s)
 - c. Surface elevation of proposed well(s)
 - d. Proposed total depth of well(s) (feet below ground surface)
 - e. Proposed screened interval(s) (feet below ground surface)
 - f. Proposed target aquifer(s)
 - g. Maximum requested annual production in millions of gallons and in acre-feet
 - h. Maximum requested short-term pumping rate in gallons per minute
 - i. Transmissivity and storativity assumptions for each target aquifer
4. Drawdown Estimates (as detailed in Section 4.B)
 - a. Tabulated drawdown estimates at the pumping well(s) and nearby wells, specific requirements depend on the permit type as described above.
5. Table of Nearby Well Information (Detailed in Section 4.C) including:
 - a. TWDB State Well IDs
 - b. Well Owner's names
 - c. Target Aquifer(s)
 - d. Production Rates (if available)