Blanco-Pedernales Groundwater Conservation District

This document provides specifications for hydrogeological testing being conducted within Blanco County in compliance with current District Rules, and may be incorporated in hydrogeological testing and Water Availability Reports required by Regulations promulgated by Blanco County or the TCEQ. Any requests for variances, modification of the testing procedures, use of alternative testing methods, or other special requests by persons involved in or planning hydrogeological testing must be pre-approved in writing by the General Manager of the Blanco-Pedernales Groundwater Conservation District.

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General Manager

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Overview

Upon the completion of production wells and aquifer monitoring wells (observation wells), a Texas Licensed Professional Engineer or a Texas Licensed Professional Geoscientist shall, if required by District, Blanco County, or the TCEQ, conduct a hydrogeological test to assess groundwater availability and quality by determining:

1. The maximum drawdown of the water level in the well at the requested pumping rate for the length of the test (To aid in projecting the maximum drawdown, the preliminary test required in 2.2 below should be run as long as necessary to project the maximum drawdown, usually about 2 hours);
2. The hydraulic properties of the production zone aquifer;
3. The degree of hydraulic connection between aquifers;
4. That the wells have been completed in the proper geological strata; and
5. To recognize the presence of hydraulic boundaries and recharge structures.

1. Test Procedure

1.1. Pre-Test Period

Approximately 48 hours before the initiation of the pump test, all controllable activities on the site which could possibly affect the aquifer such as drilling and pumping, should be stopped to allow the aquifer to normalize.

1.2. Preliminary Pump Test

The preliminary pump test is conducted to obtain data to project the maximum drawdown at the proposed pumping rate to ensure the drawdown will not drop below 10 feet above the pump depth. The test will also check equipment for any problems before the actual pump testing begins. Water levels should be measured according to the schedule found in 2.5.2. The test should run for about 2 hours or until enough data is obtained for calculating the approximate drawdown expected for a 24-hour test or the length of testing required by the TCEQ for a Public Water Supply well . The details of the preliminary pump test are to be included in the pump test report.

1.3. Observation Wells

1. One or more observation wells must be located at a reasonable distance from the pumped well. A minimum distance from the pumped well is 300 feet or greater, but less than 700 feet. A distance greater than 700 feet will require written, pre-approval from the District. The distance from the monitor well to the pumped well must be measured and reported in the pump test report.
2. Observation wells with a minimum diameter of four inches are required for all water level measurement including down-hole water level recorders.
3. All wells must be open to the same water bearing zone, remain open during the entire test, and penetrate the entire production interval so that the flow toward the pumping well is horizontal and drawdown values are not affected by partial penetration. If complete penetration of the production interval is not possible for all wells involved in the test, the District must be consulted and written pre-approval obtained prior to starting the testing.

4. Each producing zone (if more than one zone) of the aquifer, as determined from the resistivity log or grab samples, must be tested for water quality to prevent comingling of waters of different quality. To the greatest extent possible, if more than one production zone is incorporated in the well completion plan, the well should be completed in such a manner as to produce formation water of the comparable quality.
5. Well numbers and reference points for water level measurements should be clearly marked on each well casing used in the test.

1.4. Pumping Well

1. The well should be pumped at its proposed requested yield so that the hydraulic characteristics of the well and the aquifer can be evaluated.
2. The well must be equipped to allow a water level measuring line to be lowered into the well.
3. The water must be discharged in such a way that it cannot return to the water bearing formation.
4. A constant pumping rate is necessary. The discharge pipe should be equipped with a flow meter and a flow control valve to adjust the flow rate.
5. In the event of pump failure, recovery of water levels should be monitored to determine when the test can be repeated. Before repeating the test the well water shall recover to the original static water level or when it has stabilized to plus or minus 0.1 of a foot for 12 hours.
6.

1.5. Fluid Handling

Fluids pumped to the surface during hydrologic testing of a production area shall not be willfully or negligently released in a way that causes suffering, or allows groundwater to flow into any river, creek, natural watercourse, depression, lake, reservoir, drain, sewer, street, highway, road, or road ditch, or onto any land other than that of the owner of the well unless such discharge is authorized by permit, rule, or order issued by the Texas Commission on Environmental Quality under Texas Water Code.

1.6. Water Level Measurements

1. Antecedent Conditions – Water level measurements should be taken, either with continuous water level recorders or periodically with tape or sonic tool, in the pumping well and in all observation wells 24 hours prior to the test to establish the initial static water level. Water levels must be measured to the nearest tenth (0.1) of a foot. All possible outside influences such as pumpage of nearby wells, barometric changes, and changes in stream flow, should be observed, recorded, and if possible, controlled to the extent that they have little or no influence on the groundwater level during the test. If the water levels fluctuate during this time interval, observations should be continued until the local usage trends are clearly established. These data should be used to adjust the actual test data to approximate equilibrium conditions. Water level measurements made using an electrical (E-line) and

sonic meter are to be made according to the schedule found in number 2 of this section. The sonic meter must be calibrated using an E-line before and after the test.

2. Test Measurements – Rapid changes in the initial static water level occur when the pump test is started. Therefore, readings should be taken as often as possible in as many observation wells as possible. Data points shall be recorded and reported as outlined in the table below.

Time Interval (minutes)	Measuring Frequency
0 – 2	Every 30 seconds
2 – 5	Every minute
6 – 10	Every two (2) minutes
11 – 30	Every five (5) minutes
31 – 60	Every ten (10) minutes
61 – 120	Every twenty (20) minutes
121 – End of Test	Every thirty (30) minutes
The same schedule should be used during the recovery period.	

1.7. Duration of the Test

Ideally, the well is pumped at a constant discharge rate until the radius of influence ceases to expand. The minimum pumping time recommended is 1,440 minutes, or 24 hours, at a constant discharge rate (Duration of testing may need to be longer in order to satisfy TCEQ testing requirements for public water supply wells).

1. Data should be plotted graphically in the field to detect accurately the onset of any recharge boundary conditions.
2. If such effects begin to appear, the duration of the test should be increased until a definite straight line appears on the field plot of drawdown vs time and drawdown vs log of time.
3. Pumping may be discontinued if the pumping rate remains constant for at least four hours and a straight-line trend is observed on a plot of water level vs a logarithm of time during pumping. This provision may not be accepted by the TCEQ when testing is part of their requirements for public water supply well approval.
4. Recovery data must be collected for 24 hours following the test or until water levels have recovered to within 90% of the pretesting level.
5. Near the completion of the test, water samples must be collected for laboratory analyses in containers furnished by the laboratory. The required parameters can be found in the District Rules, Chapter 36 Rules, and/or TCEQ public water supply well requirements.
6. Field tests should be made at several intervals during the pump test for pH, TDS, and water temperature. These values should be reported to the District with other pump test data.

2. Reporting Results, Analysis, and Summary of Pump Test Data

Data collected shall be analyzed using generally established and accepted methods to determine transmissivity and permeability of the production zone aquifer. The following shall be submitted with any hydrogeological report submitted to the District in compliance with current District Rules:

1. One hard copy and one copy on a USB drive containing the data listed below. The hard copy must be spiral bound or in a three-ring binder so it will lay flat when opened.
2. Map locating the monitor and pumped wells, with Production Area acreage indicated;
3. USGS topographic map of the area at a scale suitable show the well location and property boundaries;
4. Discussion of local geology and hydrogeology, with maps, cross sections, or other graphics;
5. Pumped well and observation well construction information including any available Driller's well reports, complete with total depth, bore hole diameters and depths, casing size, casing information with screened intervals, pump depth, etc.
6. Hydrographs for the pump test including arithmetic graph (time in min vs drawdown in feet), a plot of drawdown vs logarithm of time, and recovery. All graphs must contain pumping rates, time of pump start and finish, and recovery start and finish;
7. A table providing the following;
   a. hydraulic conductivity in gpd/ft^2
   b. transmissivity in gpd/ft
   c. specific capacity in gpm/ft
   d. storage coefficient
8. Electric logs from the pumped well and observation wells if run (3 copies each)
9. All pump test raw data with name and well no, aquifer thickness assumed, and pumping rate average used.
10. Hydrologic boundaries and recharge areas if known and/or located (graphics preferred).
11. A chart of the drawdown in feet for 10 and 30 years of pumping at the well, the property lines, the nearest affected water well, and at one and 2 miles radius from the pumping well. Calculations shall not include recharge to the aquifer.
12. Weather conditions during the test, including rainfall, temperature, and barometric pressure.
13. Water quality testing results.

Credits:

These specifications were developed with the cooperation and input from the Bandera County River Authority and Groundwater District Staff, including General Manager Dave Mauk and Geologist David Jeffery, PG. They graciously provided a draft version of a BCRAGD Technical Guideline for Hydrologic Testing in Bandera County.

Ron Fieseler, PG, a consulting geologist for the Blanco-Pedernales Groundwater Conservation District, reviewed and modified the BCRAGD document to address the specific needs of the BPGCD Rules, Policies, and local hydrological and geological characteristics.