Water Bores—Testing Yield

Establishing a water supply bore often involves a large financial outlay. However, this expense may be small in comparison to the total cost of your water-related infrastructure.

The cost of a well-designed and constructed bore is even less significant in comparison to its end worth. The viability of a whole enterprise can hinge on how reliably the bore can produce the required supply.

Proper testing of a bore's capacity to meet long-term demand is valuable insurance—protecting your investment in a scheme dependent on that bore.

Why test a bore?

One of the basic reasons for testing is to find out just how much a bore will produce in the long term. This allows you to determine if the bore is capable of supplying the requirements of your proposed scheme.

There are many other questions which arise when planning the construction and equipping of a bore. What about a pump? What size and type of pump is suitable for that bore? How much pump shaft will be needed? Will the bore pump air after a while? Are there likely to be effects from interference between neighbouring bores? How efficient is the bore?

All these questions can be answered if you properly test your bore.

What happens when you pump a bore?

There is a misconception that the water level in the bore becomes stationary shortly after pumping commences. This is not the case unless the aquifer is directly connected to a source of recharge.

When you begin pumping water, the water level in the bore falls immediately so that there is a difference in the water level from outside to inside the bore. This difference allows water to move under gravity.

From then on, the water level will continue to fall with time in response to friction losses as water moves through the aquifer.

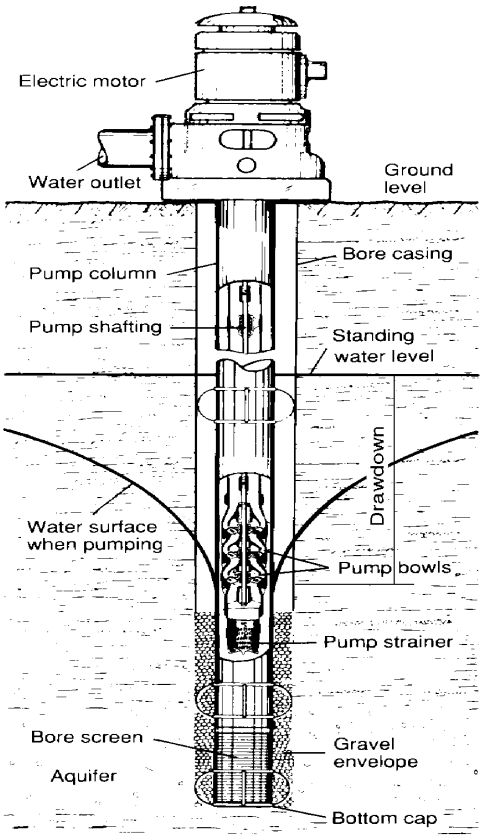

Figure 1—Bore and pump section

The distance the water level falls below the standing water level is called the drawdown. How far the water level will fall for a given pumping rate and time, will depend on a number of factors including the:

- areal extent of the aquifer
- ability of the aquifer to drain water freely
- bore diameter
- bore design
- pumping interference from other bores.

The effect of all of these factors can be determined by carrying out a proper test on the bore. This cannot be determined if the test consists simply of pumping the bore and noting how much it produces after the short period of pumping. Remember, it will be operating for a much longer period than the length of any test.

Types of tests

There are quite a number of tests that can be carried out on bores and each is useful in a particular application.

Some of these are:

- bailer test—water removed from the bore in a cylindrical pipe dropped from the drilling rig mast. Useful for low yield bores
- air test—compressed air injected into the bore to cause a mixture of air and water to rise out of the bore. Can give an indication of the amount of water available, but is not accurate
- pumping test—pump used to extract water from the bore. There are a number of types of pumping tests carried out, but to be useful they must include a number of specific measurements
- flow/pressure test—this is a test that is particular to artesian bores.

Test requirements

To enable the analysis of a pumping test, measurements of time, discharge or pumping rate and drawdown must be made. In addition, measurements of the rate at which the water level recovers when pumping ceases are required.

Depending on the proposed use of the bore, the following times are recommended for the pumping cycle of a test:

- stock/domestic—4 to 6 hours
- irrigation—24 hours
- town water supply—100 hours
- industrial—24 to 100 hours.

Equipment needed

The following equipment is needed to carry out a bore test:

- discharge measuring device, usually a drum or a meter designed for this application
- tape measure
- stop watch
- water level measuring device, such as an electrical depth gauge or an air line. The method used to measure the water level will differ depending on the bore setup.

Test procedure

Prior to pumping, measure the depth to water level from a reference point. Start the pump and record the time pumping commenced.

Measure the drawdown and pumping rate throughout the pumping cycle, noting the times at which measurements are made. Recommended times in minutes that measurements should be taken for a four hour test are: 1, 2, 3, 5, 10, 15, 20, 30, 45, 60, 90, 120, 150, 180, 210, 240. Take water samples soon after pumping starts and towards the end of pumping.

After the recommended pumping time has elapsed, stop the pump. During the recovery period, record the water level against time until it has recovered to near its level before pumping commenced.

Analysis

A trained analyst can plot the test data and determine for the bore:

- the stability of the aquifer
- its maximum capacity
- the design pumping rate for a particular scheme
- the optimum pump inlet level
- its long-term reliability.

Test analyses should be carried out by someone experienced in the hydraulic behaviour of pumped bores. A proper analysis will also take into account details such as location of water beds and bore construction. However, the analysis can only be as good as the test data on which it is based.

Further information

Should you require assistance or advice on this topic, please contact a local groundwater consultant. You will find their contact details in the yellow pages under 'Natural Resources Consultants' or 'Boring and Drilling Contractors.'

More information on groundwater or other natural resource management topics is available from the Department of Environment and Resource Management's website at <www.derm.qld.gov.au>.

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