



## **PUMPING TESTS**

On Completion of drilling prior to any pumping test, a Driller may provide an estimate of water supply. This is an estimate only. However all wells should be pump tested to a greater or lesser extent dependent on the use to which the well is intended. There are a variety of reasons why it is important to carry out a Pumping Test:

- a) To determine maximum sustainable yield of well and assess general specifications of Source aquifer.
- b) To determine yield drawdown behaviour of the well at various pumping output rates.
- c) To assess the impact of the Pumping Well on nearby springs.
- d) To facilitate retrieval of water samples for chemical and bacteria analysis.

Prior to discussing the detail of an actual Pumping Test the following general comments should be made:-

1. **Summer Time**, when the water is low is the most ideal time to pump test a well. The water level in the well should be monitored for as long as practicable to establish water table fluctuations in the Aquifer prior to the test.
2. **Discharge of water away from a Pumping Test**. It is necessary in any pumping test that all necessary precautions are taken to avoid pumped water returning quickly back into the Aquifer. The minimum distance from the well to the discharge point will depend on subsurface conditions. The shallower the Aquifer, the greater the danger of the water being recycled (e.g a shallow grave aquifer or highly fissured limestone with little overburden). In general about 100mtrs gives a safety margin provided that the water is then discharged to a water source.
3. **Definition of Drawdown and Specific Capacity**. Drawdown in a well is the difference between the initial static water level (SWL) before pumping started and the pumping water level (PWL) (sometimes called dynamic water level) at any given time during the pumping. The specific capacity of a well is the sustainable yield of water per unit of drawdown produced in the well e.g. gallons per hour / per foot of drawdown OR litres per second / per metre of drawdown. Thus if a well produced 5000 g/ph for a drawdown of 20-ft, its specific capacity is 250gph/ft. In a 'good' well the specific capacity will decrease only slightly as the pumping rate rises. While in a 'poor' well the decrease will be much sharper. The specific capacity of a well is not a fixed value but decreases as the pumping rate (and therefore drawdown) increases. A well's threshold will normally mark the optimum yield of the

well, if the pumping rate is increased further i.e. beyond the well's threshold the efficiency of the well drops sharply.

4. **Pump Setting.** In general the pump should be set as high off the bottom of the well in all but the shallowest wells. Avoid setting the pump opposite known fissures zones avoiding aggravating silt discharge.

#### **ACTUAL PUMP TEST PROCEDURE:**

The following is a summary outline procedure for a pumping test:-

##### 1.ASSESSMENT AND INTERPRETATION OF ALL AVAILABLE DATA PRIOR TO A PUMPING TEST:

Well construction details, finished casing/screen diameters, slot sizes, drillers estimate of water yield etc., also hydrogeological log of well: borehole depth, water strikes, well survey of area, water courses, site security re operating generator to provide power supply to pump etc.

2.PRELIMINARY TEST: This is a short test giving an approximate indication of the well yield so that a more comprehensive test can be properly planned and resourced later. It will usually be carried out by either:

- a) Airlift facility of a pneumatic-powered Drill rig eg using a V-notch type weir (*See picture at the start of this Topic*) OR
- b) Installing an appropriate pump. The discharge rate should be measured as accurately as possible and the drawdown should be measured at intervals throughout the test

3.STEP TEST; From the results of the preliminary test, a pump of suitable capacity can be chosen for the STEP TEST and appropriate pumping rates decided on. The maximum drawdown in the well should not exceed 80% of the available drawdown i.e. 80% of the depth from the static water level to the pump intake. Regulating the pumping rate is best achieved by means of a gate-valve. Any experimentation to find correct settings of value for given pumping rates should proceed actual step testing. At least 3 to 4 steps should be used in roughly equal increments eg 1000, 2000, 3000, 4000/gls per hour. The steps maybe run consequently or discontinuously, ie. with or without breaks between each step test and normally in ascending incremental order. In general a step should be between 1 to 3 hours in length though this is not essential. The aim is to achieve or approach steady state conditions e.g. a stable water level. If steady state is not achieved be prepared to extend the period beyond 3 hours. The recovery after each Step should be carefully measured. Recovery often takes longer than the test itself. It is worthwhile measuring recovery until it is within a few centimetres of initial static water level.

4. CONSTANT RATE TEST: In Ireland 72 hours has become standard practice as an adequate period to pump test a well provided that the constant rate can be maintained without interruption for this period. This test should not be started until the water level in the well has recovered from previous testing. At a minimum the well should be pumped at a constant rate for at least 24 hours without interruption.

**Picture shows Flow Metre measuring Water output from a pumped well.**



A water sample could be taken towards the end of the test and sent for analysis. See pump test record sheet at end of this information leaflet as an example of a preliminary Pumping Test Data Recording Sheet.

**CONCLUSION:**

Records of pumping test results should be accurately logged throughout all pumping test procedures and referenced and filed appropriately. In addition a copy of all results and interpretation should be forwarded to Geological Survey of Ireland Office for their records.

Acknowledgements: Wright, G. GSI Information Circular 86/2; Pumping Tests; A Guide to the testing of Water Wells for Public, Industrial and Farm Supplies

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## PUMP TEST RECORD

LOCATION: \_\_\_\_\_

DATE: \_\_\_\_\_

Borehole Reference No: \_\_\_\_\_

Type of Test: \_\_\_\_\_

Commencement Time of Test: \_\_\_\_\_

Subcontractor: \_\_\_\_\_

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Static water level before test: \_\_\_\_\_

Weather \_\_\_\_\_

Pump Intake setting in well \_\_\_\_\_

Discharge Distance of layflat pipe from well \_\_\_\_\_

Date/Time	Meter Reading	Pumping well Drawdown	Monitoring well Drawdown	Water desc

REMARKS: \_\_\_\_\_