

DRILLING & CONSTRUCTION TECHNIQUES

Drilling should be carried out with an appropriate tool preferably rotary drilling machine using bentonite.

Geological rock samples should be collected at 2 meter intervals. Struck and rest water levels and if possible, estimates of the yield of individual aquifers encountered, should also be noted. Water quality of the drilling mud should be monitored for every 1 meter penetrated to assist determine the salinity of individual aquifer.

Well Design

The design of the well should ensure that screens are placed against the optimum FRESH aquifer zones. An experienced hydrogeologist should supervise the drilling and make the final design.

Casing and Screens

The well should be cased and screened with 8 inch diameter good quality PVC casings.

Well Construction

Once the design has been agreed, construction can proceed. In installing screen and casing, centralizers at 6 meter intervals should be used to ensure centrality within the borehole. This is particularly important for correct insertion of artificial gravel pack all around the screen.

Well Development

Well should be developed, Development aims at repairing the damage done to the aquifer during the course of drilling by removing additives from the borehole walls. Secondly, it alters the physical characteristics of the aquifer around the screen and removes fine particles.

We do not advocate the use of over pumping as a means of development since it only increases permeability in zones, which are already permeable. Instead, we would recommend the use of air or water jetting. This is an extremely efficient method of developing and cleaning wells.

Well development is an expensive element in the completion of a well, but is usually justified in longer well-life, greater efficiencies, lower operational and maintenance costs and a more constant yield. Within this frame the pump should be installed at least 2 m above the screen, certainly not at the same depth as the screen.

Well Testing

After development and preliminary tests, a long duration well test should be carried out. Well tests have to be carried out on all newly completed wells, because apart from giving an indication of the quality of drilling, design and development, it also yields information on aquifer parameters, which are vital to the hydrogeologist.

A well test consists of pumping a well from a measured start level (Water Rest Level - (WRL) at a known or measured yield, and simultaneously recording the discharge rate and the resulting drawdown as a function of time. Once a dynamic water level (DWL) is reached, the rate of inflow to the well equals the rate of pumping. Usually the rate of pumping is increased stepwise during the test each time equilibrium has been reached (Step Drawdown Test). Towards the end of the test a water sample of 2 liters should be collected for chemical analysis.

The duration of the test should be 24 hours, followed by a recovery test of more than 70%, or alternatively until the initial WRL has been reached (during which the rate of recovery to WRL is recorded). The results of the test will enable a hydrogeologist to calculate the optimum pumping rate, the pump installation depth, and the drawdown for a given discharge rate.

