

A Guide to Bores and Pumps

How Does a Bore Work?

When a groundwater formation (aquifer) is found and accessed by drilling a bore, the water pressure establishes a standing water level in the bore. This level may rise and fall naturally with the seasons.

In the Top End of the Northern Territory, groundwater is generally recharged in the wet season and discharged through the dry season. In drier areas there may be little movement of the water level and the water may be many thousands of years old.

When a bore is pumped, the water level in the bore drops, this is known as “drawdown”. Pumping lowers the pressure at the bore inlets and water flows into them from the cracks and spaces in the aquifer. It is important to note the rate at which water can be pumped from the bore depends on the rate it can flow through the aquifer, and on the available drawdown.

This ‘area of influence’ increases as you keep pumping. The size of the ‘area’ is also determined upon the length of time and the amount of rainfall. A short pump in the early dry season will have a small ‘area’ while a long pump late in the dry season will have a large ‘area’.

Once the bore is turned off, the ‘area’ decreases until the water level is flat again. However, as the ‘area’ gets refilled, the total water level also decreases.

Seasonal rains recharge the groundwater systems and where the inflow is equal to the outflow, and extractions are less than or equal to the recharge, recommended pumping rates are determined. Over pumping will gradually deplete the resource. If bores are constructed too close together, their areas of influence overlap. The result is that each bore will yield less than it should if it was operating alone. Hydrogeologists and groundwater engineers are professional experts who can test bores and determine their performance, recommended pumping rate and area of influence.

Bore Drilling

All water bore drilling conducted in the Northern Territory must be carried out by a licensed driller. There are three main methods of drilling; rotary drilling, cable tool drilling (mud punching) and jet drilling.

Rotary Drilling is the main type of drilling used throughout the Territory by government and the private industry. This type of drilling is faster than others and uses a rotating bit attached to the end of a drill pipe and continuous circulation of drilling fluid. The drilling fluid may be air, water or special mud, depending on the drilling conditions. The fluid is forced down the drill pipe and through the openings in the bit. As the bit cuts into the formation, the fluid is forced upward to the surface, bringing up rock chips or “cuttings”.

As a bore is drilled, it may intersect a number of aquifers with the supply of water often differing as drilling proceeds. There are, however, depths beyond which there is unlikely to be increases in supply. Because water is often obtained at different depths, it is necessary to construct the bore so that the inlets (slots) in the casing are adjacent to the aquifers. To ensure this, the driller keeps a log containing information of depths, type of rock and where increases in supply are found.

Fitting your Bore with a Pump

Pumps are devices that lift water, drawing it in at the bottom and pushing it up the bore, usually in a separate pipe, or pump column. To avoid drawing air, the pump, or its inlet must be safely below the drawdown level. It is also important to ensure the effective sealing at the top of your bore to prevent access by vermin, insects, snakes and various reptiles which can potentially enter the bore and contaminate the water.

Types of pumps commonly used in bores:

Piston Pumps - commonly called draw plunger pumps, use a piston in a cylinder and are often driven by windmills. On the downstroke a simple valve allows water to pass through the piston. On the upstroke, water is pushed up the pump column and is drawn through another valve into the cylinder below the piston. Rods to the surface operate the piston. These pumps are often used for stock bores.

Submersible Pumps - are electrically driven with the pump and motor combined to operate underwater. They are commonly used for domestic supplies, although large-capacity pumps are also available.

Turbine Pumps - are composed of a series of interconnected impellers on a common shaft, driven from the surface by a motor. Water is drawn into the bottom impeller and boosted in stages through each impeller. They are mainly used for high volume supplies.

What type of pump? What capacity pump? How much piping and cable to set the pump?

These vital questions can be answered following a pump test. Pump tests are expensive and are often not warranted for stock and domestic supplies. A rough estimate of supply and appropriate pump depth can be obtained from the drill rig at the time of drilling; this usually takes about one hour. This information can be supplied by your driller or by inspecting the drillers log held by the Department.

However for irrigation, industry and town supplies, where reliability and efficiency are paramount, a rigorous professionally supervised pumping test is recommended. This test consists of pumping the bore at a steady, accurately measured rate and observing the behaviour of the water levels in the pumped bore and neighbouring observation bores. The analysis of this information is quite complex but results in an accurate assessment of recommended pumping rate and pump setting.

NB; Before you consider having a bore drilled on your property, you may be required to have a bore construction permit and you must only employ an NT licensed driller. Contact our Water Management Branch for help in selecting a bore site, acquiring a bore permit and for a list of NT licensed drillers.

For assistance, contact the Water Management Branch:

- **Palmerston**
4th Floor Goyder Building, PO Box 496 Palmerston NT 0831, Ph: 8999 3678
- **Katherine**
Randazzo Arcade, 16 Katherine Terrace, Katherine NT 0850, Ph: 8973 8100
- **Alice Springs**
1st Floor Alice Plaza, Todd Mall, PO Box 1120, Alice Springs NT 0871, Ph: 8951 9215

Internet Site: www.nt.gov.au/nreta/naturalresources