

Groundwater and Bores

■ Introduction

Bores are an important alternative water supply to streams, rivers and lakes in the Auckland region. Groundwater can often satisfy the demand for water where there isn't enough surface water or it isn't available.

This fact sheet provides information about drilling, maintaining and abandoning bores and the permits involved as well as water use and quality monitoring for groundwater users.

■ What is groundwater?

Groundwater is the water held in spaces within rocks under the ground. These spaces can be between the grains that make up the rock (pore space) or in cracks or fissures.

Groundwater is generally replenished from rainfall. Some evaporates straight away, some is taken up by plants and some runs off into rivers and lakes. The rest soaks through the soil and moves deeper into the ground under the force of gravity.

The movement down through the rock, referred to as infiltration, can reach depths of more than 1000 metres. The replenishing of underground water reserves in this way is called "recharge".

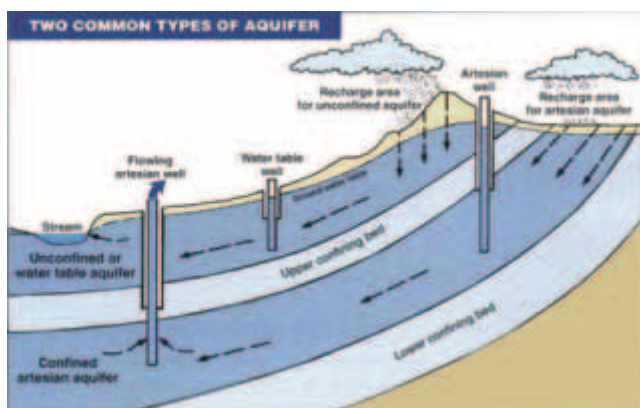
The volume of water held underground depends on the amount of pore space (its porosity) in the rock and the cracks through which it travels (its permeability). The porosity and permeability of the rock determines how easy it is to get water out with a bore.



Variations in rock type and differences in landform make groundwater more plentiful in some areas than in others. Layers of rock that hold water and allow it to move easily are called aquifers, meaning “water bearing”.

In terms of managing how much groundwater we can use, the level of recharge is more important than the amount of waters stored in the aquifer. To sustain this resource, we must not take out more in any year than has been recharged.

■ The two main types of aquifer



■ Unconfined or water table aquifers

These are recharged by rainwater dripping down from the land directly above them, as shown in the diagram over. The water level in the bore lies below the top of the aquifer.

■ Confined or artesian aquifers

The elevated recharge area for confined aquifers may be far from where bores tap into the aquifer. Water in confined aquifers is under pressure and may result in artesian or free-flowing bores, because pressure will force the water level in the bore up above the top of the aquifer and sometimes, above ground level, as the diagram shows.

■ Drilling your bore

■ Do I need a permit to put down a bore on my own land?

Yes, the Resource Management Act (1991) (RMA 1991) requires anyone who drills or alters a bore to get a bore permit. Phone the Auckland Regional Council (ARC) on 09 366 2000 and press 1 or visit www.arc.govt.nz for an application form.

Your driller may apply for the permit on your behalf.

■ What is involved in drilling a bore?

There is a New Zealand Standard for drilling bores (NZS4411:2001). The ARC requires all bores to comply with the standard, so make sure your driller is aware of it.

■ Will I be guaranteed to get water?

The ARC, local drillers, and groundwater hydrologists can provide feedback on where to drill and the likelihood of obtaining an adequate supply.

There is no evidence that divining is better at finding water than scientific methods.

Because variations in rock type mean volumes can vary over short distances, each drilling operation is to some degree exploratory and an adequate water supply cannot be guaranteed.

Bore constructions often depend on how much water is required so you may have to employ a hydrogeologist for large quantities.

The depth of drilling is important: A bore that only just enters an aquifer may be less satisfactory in a dry summer than one that extends further in.

Where to locate a bore

- Think about ease of access for the drilling rig, not only for the initial drilling, but also for maintenance later on
- Proximity to other bores should be investigated, particularly if a water permit is required. Discuss this with the ARC
- Proximity to power and where the reticulation system will go may also be an issue. Locate other underground utilities such as power and phone lines

Significance to Tāngata Whenua

Check if your proposed bore is located on a site of cultural and spiritual significance to Tāngata Whenua or affects traditional associations with water. The ARC can help you find the appropriate Tāngata Whenua to contact and the advise on the best means of consultation.

Cultural heritage

Have you considered the potential effects your proposed bore may have on historic places and areas?

If it is located on a recorded archaeological site, you will require an authority from the New Zealand Historic Places Trust to modify it.

Information relating to historic places and areas can be obtained from your district or city council, the New Zealand Historic Places Trust or the ARC.

Your driller

The driller's skill and experience is important to ensure that your bore is properly constructed and meets the NZ Standard.

Bore holes are lined with casing pipe to stabilise the hole and protect groundwater conditions.

Your driller must seal the casing in position. Where necessary, screens are installed in the bore to stabilise the area from where the water is taken while allowing water into the bore. Screens may consist of stainless steel mesh or slotted pipe.

Good bore construction is essential to:

- Stop contaminants from getting down the bore and into the aquifer
- Stop water leaking from the bore onto the ground or into other subsurface layers
- Stop undesirable mixing of water from different aquifers with different water quality

Water bore drillers are listed under 'Drillers' in the Yellow Pages.

Bore logs

The rock removed by the drilling process shows all the different rock types the drill has gone through. This information tells us where groundwater is found and improves our understanding of aquifers in order to sustain them.

The ARC needs a copy of your bore log to help us improve our predictions about where people should drill and how the bores should be constructed.

Your bore permit requires you or your driller to forward us a copy of your bore log.

■ **Pumping tests**

Pumping tests work out the safe and sustainable long-term yield from your bore. They also show if taking water from your bore will affect nearby bores.

The ARC sometimes asks people to test their bore before a permit to take water is granted. Pumping tests are also a useful tool to help you select a suitable sized pump.

■ **Monitoring**

Your bore should have the facility to measure the water level and to take samples to check water quality. It is cheaper and easier to build these features during construction, rather than after .

■ **Fitting your water flow meter**

If you hold a water permit to take water from your bore, you will be required to measure how much water you use by fitting a flow meter. Meters must be fitted correctly to ensure accuracy and reduce wear and tear.

See the ARC fact sheet “Why you have to fit a water meter” for further information. Your local supplier should also be able to help.

You need to read your meter accurately and send returns to us for analysis.

Water use records can also help you – patterns in your records may help you increase the effectiveness of your irrigation schedule.

■ **Can you get unlimited supplies of groundwater from an aquifer?**

No. Uncontrolled pumping runs the risk of using groundwater faster than it recharges. This is unsustainable.

Taking too much groundwater can lower groundwater levels, affecting other bore water supplies and water flows in spring-fed rivers and streams.

In coastal areas, over-pumping of groundwater may cause sea-water to move into the aquifer. This saline water can contaminate the aquifer for other users, and takes a long time to eliminate.

That is why permits to take groundwater are set to a maximum daily and annual allocation, and require a meter to be fitted to allow monitoring of actual use.

This information helps the ARC keep track of the total demand on an aquifer and ensure it doesn't exceed the total quantity allocated.

■ **How good is underground water?**

Most groundwater in its natural state is of good quality. You should still test it for elements from the rocks in the aquifer that would make it unsuitable for use. The water in your bore could also contain contaminants from other sources such as septic tanks, pesticides or herbicides, fertilisers or waste dumps.

Some groundwater is high in iron or other minerals and can be naturally corrosive. This can cause maintenance problems for bores, pumps and distribution systems. High concentrations of boron, sodium and chloride can be toxic to sensitive plants so you should test your bore water if you want to use the water for horticulture.

For the best water quality, bores must be cased to seal out shallow aquifers that have poor quality water because of high iron concentrations.

Modern drilling techniques reduce the risk of poor quality water and improve the longevity of bores.

■ **Do you need a water permit to take water from your own bore?**

You don't need a water permit to take water for individual use, drinking water for stock and water fire-fighting.

This is established by the Resource Management Act (1991) (RMA 1991) and is based on the quantity used and the likelihood of it causing adverse effects.

You may not need a permit in some areas, irrespective of use if a small amount of water is required.

Otherwise a water permit to take groundwater is required. Contact the ARC on 09 366 2000 and press 1 for further information.

Remember – regardless of what the water is used for, you require a permit to drill a water bore.

■ **Maintaining your bore**

Regular inspection of bores, pumps, water meters and distribution systems is vital to ensure a continued efficient yield of water from your bore. For example, screens installed in some bores may become clogged with fine particles and may need cleaning periodically. Often, complaints about a reduced yield or local water shortages stem not from problems with the local aquifer, but from faults in old or poorly maintained bores and equipment. Bores don't last forever, but regular maintenance will keep them going longer.

■ **Abandoning your bore**

If you have abandoned your bore, it must be properly sealed by an experienced driller. Decommissioning a bore is permitted subject to conditions. Sealing abandoned bores is essential to:

- Eliminate physical hazards and accidents
- Prevent pollutants getting into the aquifer through the unused bore
- Stop the waste of water from flowing artesian bores
- Prevent mixing of waters from different aquifers

■ For more information

The ARC can answer questions and advise how to upgrade existing bores or construct new ones. We also have a range of fact sheets about taking, using or diverting groundwater. Copies are available online at www.arc.govt.nz or upon request. Topics include:

- Complying with your water permit
- What's all this about dams?
- Geothermal water
- Using water wisely
- Why you have to fit a water meter

How do I contact the ARC?

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