

Having a water bore drilled?

A practical guide to water bore drilling provided by
Australian Drilling Industry Association

Water bores are constructed for a wide variety of applications and for some users this is a new experience!

This booklet is designed to cover many of the important aspects to constructing a bore and some of the obstacles to be aware of.



There are three main phases in the construction of a water bore, having determined what it is to be used for:

- **Permits/licences required**
- **Location of a suitable site, and**
- **Drilling, development and pumping tests.**

The use of the bore

Australia is the driest continent in the world and water is a vital resource that has to be protected.

In all states and territories the taking and use of water from underground is strictly regulated and controlled by the respective government.

It is the responsibility of all parties (including the land owner and the driller) to understand and comply with the regulations in their particular state or territory.

What permits and licences are required?

In all states and territories most water bore drillers are required to be licensed.

This ensures that all bores are constructed to a minimum standard, and should function trouble-free for many years. It also ensures that the driller complies with any local requirements or regulations.

It is essential that you sight the drillers licence before they commence work. It may be a condition of the permit to drill the bore, usually called a bore construction permit/licence, that the driller is licensed.

Generally, a bore construction permit is required before drilling can commence. It is issued by the relevant water authority in your state or territory, and usually identifies the level of driller's licence required. Bores must be constructed in accordance with the Minimum Construction Requirements for Water Bores in Australia. The bore construction permit may also contain other specific design or construction details, which must be adhered to. All these requirements are for everybody's protection – yours included!

A copy of this document can be obtained from the authority which issued the bore construction permit.

The use of an unlicensed driller, and drilling without the appropriate bore permit, can lead to irreparable damage to aquifers and the environment, and prosecution will ensue.

Once an aquifer is polluted, the damage is usually permanent.

Location of the bore site

It is the responsibility of the land owner to site the bore and to ensure suitable access. It may be necessary to re-site your bore due to the proximity of other bores or nearby buildings, roads etc.

There are strict requirements regarding the proximity of the bore to septic systems, effluent trenches, and waste disposal points.

If unsure, advice may be available from local government through hydrogeological services who offer site assessments for a modest fee. This can often preclude the unnecessary expense of drilling 'dry' holes.

Your local driller may be able to provide a wealth of information on bores already drilled in your area, but even the most competent hydrogeologist or driller is not infallible; they can only be guided by the available evidence, which is often incomplete.

It is important to remember that no driller can guarantee the quality or quantity of water located. A good bore only 500 meters away, for example, does not mean you will be able to access the same quality or quantity of water!

Nevertheless, proper scientific methods in locating groundwater have generally proved far more successful than divining and like methods.

Apart from the geological aspects of the site selection and considerations such as distance from power and the proximity to where the water is to be used, access to the area must allow heavy equipment to reach the site, work without restriction, and leave the site, bearing in mind that it is sometimes difficult to back over an existing bore.

Any site restrictions must be advised to the driller when seeking quotations.

You should also advise the driller of the nearest source of water, any charges for it, or difficulty getting to it. Water is often used in part of the drilling process.

If you are not sure about the location, ask the driller to inspect the site – a fee may be charged for this inspection service. A site visit by the drilling contractor before they confirm their quotation is strongly recommended. This will avoid many unexpected costs later!

LEFT: **Cementing operation underway.**
(Courtesy of Wade Media)

Request a written quotation

Whilst most drilling contractors will be able to supply you with an indicative price initially, there are aspects that cannot be determined until the hole is drilled and acceptable water intercepted.

It is wise, therefore, to ask the contractor to give you a written quote including the various rates for drilling, casing, screens, and development.

There is an old saying: "What you haven't got in writing, you haven't got!"

Drilling, development and pumping tests

The landowner is not expected to know or be able to recommend the type of drilling equipment or design of the bore.

However, any information on nearby bores – including geological strata, water quality and levels – is of immense value to the drilling contractor preparing a quotation.

In many instances, a driller may recommend the drilling of a pilot hole – a small diameter test hole from which they can interpret the results – before reaming the hole to a larger diameter and deciding on the final design/construction of the bore.

They may recommend drilling the bore by any of the following methods:

Cable tool drilling

Generally slow, but cost effective in alluvials, gravels and softer rocks

Mud rotary

Softer formations, or deep bores

Air rotary

Hard rock bores

Reverse circulation

Large diameters

Auger or bucket

Shallow, large diameter bores in soft rock

Jetting

Shallow bores in sandy areas

Sonic

In soft and unconsolidated formations

These are guidelines only, and the drilling contractor will usually utilise a method that has previously proven successful in the area.

Bore construction

To ensure a long life, a bore must be carefully designed and properly constructed.

All state and territory groundwater acts require the bore to be constructed in accordance with the Minimum Construction Requirements for Water Bores in Australia. Water bores must have adequate casing installed and properly grouted to prevent contaminated ground water seeping into the bore.

Where a bore contains more than one aquifer, grouting the entire length of casing also minimises the chances of poor quality aquifers polluting good ones.

Construction materials

Materials to be used in bore construction should be given due consideration.

Casing

PVC-U casing is relatively inexpensive and resistant to corrosion, but is easily damaged by careless pump installation or service work.

NOTE: There are several types of PVC piping available, but not all are suitable for use in water bores. Any PVC materials must be manufactured in accordance with AS/NZS 1477, clearly marked with the standard, and must be rated in accordance with the application.

Fibreglass reinforced plastic (FRP) and fibreglass reinforced epoxy (FRE) are more expensive and stronger than u-PVC and are usually specified on large diameter and deeper bores.

Steel is the strongest casing material, but it is more expensive and subject to corrosion in some areas. It is the material generally used in deep bores to withstand construction and installation stresses.

When corrosion is a known factor, stainless steel can be preferred, and is available in different grades and wall thickness.

Bore screens

If your water comes from a sand aquifer, a good quality bore screen is recommended. Whilst these can be expensive, they are a long-term investment. A well-chosen screen will increase the yield of the bore, and help reduce pump wear and maintenance over the life of the bore.

Screens which offer maximum open area reduce entrance velocities, thus reducing corrosion, encrustation, and sand pumping. Bores which have high quality bore screens installed generally require less development.

Stainless steel wire wound screens are the most commonly used today. They can be manufactured



in a variety of grades, including 316 for corrosive environments.

Slotted PVC or mild steel screens may also be suitable, usually limited to low yield requirements or 'neutral' water (in the case of mild steel).

Where very fine sand is encountered, a gravel pack filter envelope may be recommended. This allows a screen with larger apertures to be used and therefore better yields to be obtained.

Bacteria

Bacteria can enter a bore via poor sealing of the surface casing, improper capping when not in use, or the introduction of contaminants during the construction phase. A bore should be disinfected before commissioning.

Bore testing

There are several simple tests you can reasonably ask the driller to perform at little or no cost to yourself. These are:

- Measurement of static water levels, and
- Yield estimation by bailing or airlift

However, very accurate results can only be provided at considerable cost after conducting a pumping test.

A pumping test will allow the performance of the

aquifer and the bore to be assessed. This is an additional cost to the landowner, and will vary depending on the time required to complete the process properly. This process is considered essential for most commercial bores.

It is also prudent to request an analysis of the bore water.

Ultimate yields can be calculated by performing constant and variable yield tests over a period of several hours pumping, whilst measuring drawdown closely.

Hydrogeologists can analyse pumping test results and give expected performances and efficiencies for your bore.

Before drilling a bore, you should have some idea of the pump diameter you may want to install and ask the driller to run a 'dummy' of similar diameter in the bore to demonstrate the bore is straight enough to accept the pump before they leave the site.

References/licence

The driller should be able to provide references and produce a licence endorsed to cover the procedures to complete your bore.

The bore owner, or their representative, should be on site a substantial amount of the construction period and be fully aware of each operation carried out on the bore.



Other considerations

Drilling a bore is not a simple process.

Differing geological formations encountered may provide difficulties that even the most experienced driller may find challenging!

Decisions made initially can be found to be problematic, but this does not necessarily demonstrate incompetence or malpractice. Drilling is a profession where practical problems require practical solutions and skilled drillers will be able to apply a range of possible solutions to meet a myriad of downhole problems as they occur.

Despite the best endeavours of the drilling contractor, a bore may not produce the quality or quantity of water you require. It may, therefore, be necessary to enlarge the existing bore, provided it has not already been cased, or drill another one close by.

A perfectly drilled bore may not yield sufficient or large quantities of water. No water, or poor yield, is not sufficient reason to withhold payment, unless the contract between both parties has such a clause incorporated.

Guarantees

It must be understood that no driller can guarantee the quantity or quality of water that may come from a bore.

You are entitled to be assured that the bore is constructed properly and any aquifer(s) located have been evaluated and developed accordingly. Due to the very nature of ground water, dry bores will occur from time to time.

Though a driller should be prepared to offer a warranty on their workmanship, you must recognise that improper installation of a pump by others, for example, may void any such warranty.

For deep and/or large diameter bores, it might be worthwhile running a camera down the hole prior to the pump being installed. Downhole cameras are also commonly used to help identify problems where the bore performance has dropped off significantly over a period of time.

Bores can be easily damaged and should not be left uncapped, even momentarily.

You may be responsible for additional service charges if the driller is called back to check a bore which is not performing satisfactorily for reasons not related to their workmanship.

You should consider the design of your bore carefully, as bores normally have a long life. Increased drawdown in a bore – due to insufficient diameter, poor quality screens, or utilising shallow aquifers – may lead to increased pumping costs in the long term.

Additional fuel or power costs can quickly exceed the initial cost of a poorly designed or constructed bore.

If you have any complaints about the way your bore was drilled, discuss these with the driller first.

Your best guarantee is to use a driller who is a member of the Australian Drilling Industry Association and who holds a current waterwell drillers' licence.

ABOVE: **Completed bore and headworks.**
(Courtesy of Austral Drilling Services)

Reports

Upon completion of drilling, construction, development, or pump testing of a bore, the drilling contractor should provide the owner with a signed detailed report which states:

- The geological strata penetrated – in regular increments;
- A record of static water level measurements;
- A complete casing and screen location record, showing length, diameters, and apertures for each section, plus details of any plugs or seals inserted in the bore;
- Pumping test data – if required as part of the contract; and
- A water sample analysis from a recognised laboratory.

The bore owner or driller is generally required by state or territory law to provide this information to the relevant authority, on forms provided, within a specified period upon completion of the bore.

This is commonly referred to as the bore log.

Geological conditions permitting, upon completion a bore should be sand free, produce the desired yield, have the highest specific capacity obtainable, and provide long service life at an acceptable operational and maintenance cost.

Need more information?

If you need additional information, refer to the Minimum Construction Requirements for Water Bores in Australia or contact one of the water authorities listed below.

Information can also be obtained through the Australian Drilling Industry Association.

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adia.com.au

State and Territory Contacts

NEW SOUTH WALES

New South Wales Department of Primary Industries
Locked Bag 5123
Parramatta, NSW 2124
dpi.nsw.gov.au

WaterNSW
PO Box 1018
Dubbo, NSW 2830
watnsw.com.au

NORTHERN TERRITORY

Department of Environment and Natural Resources
PO Box 496
Palmerston, NT 0831
denr.nt.gov.au

QUEENSLAND

Department of Natural Resources, Mines and Energy
PO Box 156
Mareeba, Qld 4880
dnrme.qld.gov.au

SOUTH AUSTRALIA

Department for Environment and Water
GPO Box 1047
Adelaide, SA 5001
environment.sa.gov.au

TASMANIA

Water Management and Assessment Branch
Department of Primary Industries, Parks, Water & Environment
GPO Box 44
Hobart, Tas 7001
dpipwe.tas.gov.au

VICTORIA

Department of Environment, Land, Water and Planning
8 Nicholson Street
East Melbourne, Vic 3002
www2.delwp.vic.gov.au

Goulburn Murray Water Corporation
PO Box 165
Tatura, Vic 3616
g-mwater.com.au

Grampians Wimmera Mallee Water Corporation
PO Box 481
Horsham, Vic 3402
gwmwater.org.au

Southern Rural Water Corporation
Box 153
Maffra, Vic 3860
srw.com.au

WESTERN AUSTRALIA

Department of Water and Environmental Regulation
Locked Bag 10
Joondalup DC
Perth, WA 6919
dwer.wa.gov.au

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DISCLAIMER

The information contained in this brochure is designed to provide a general overview of bore construction, development and testing, as well as guidelines for those considering having a bore.