

Guideline Document: For Owners of Flowing Artesian Bores



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1.0 Introduction

The Horizons Region contains groundwater resources which are accessed by thousands of bores.

Groundwater is used for drinking water supply, irrigating crops, supplying stock and servicing the needs of industry.

The majority of bores rely on pumps to lift water from below ground to the surface. However, some bores are artesian, with water pressures above ground level, meaning that water can flow from them naturally to the surface without the assistance of a pump.

This document has been prepared by Pattle Delamore Partners Ltd to provide owners of flowing artesian bores with general information on:

- An introduction to flowing artesian bores
- Reasons why flow may vary
- How to adapt to changes in flow



2.0 Flowing Artesian Bores

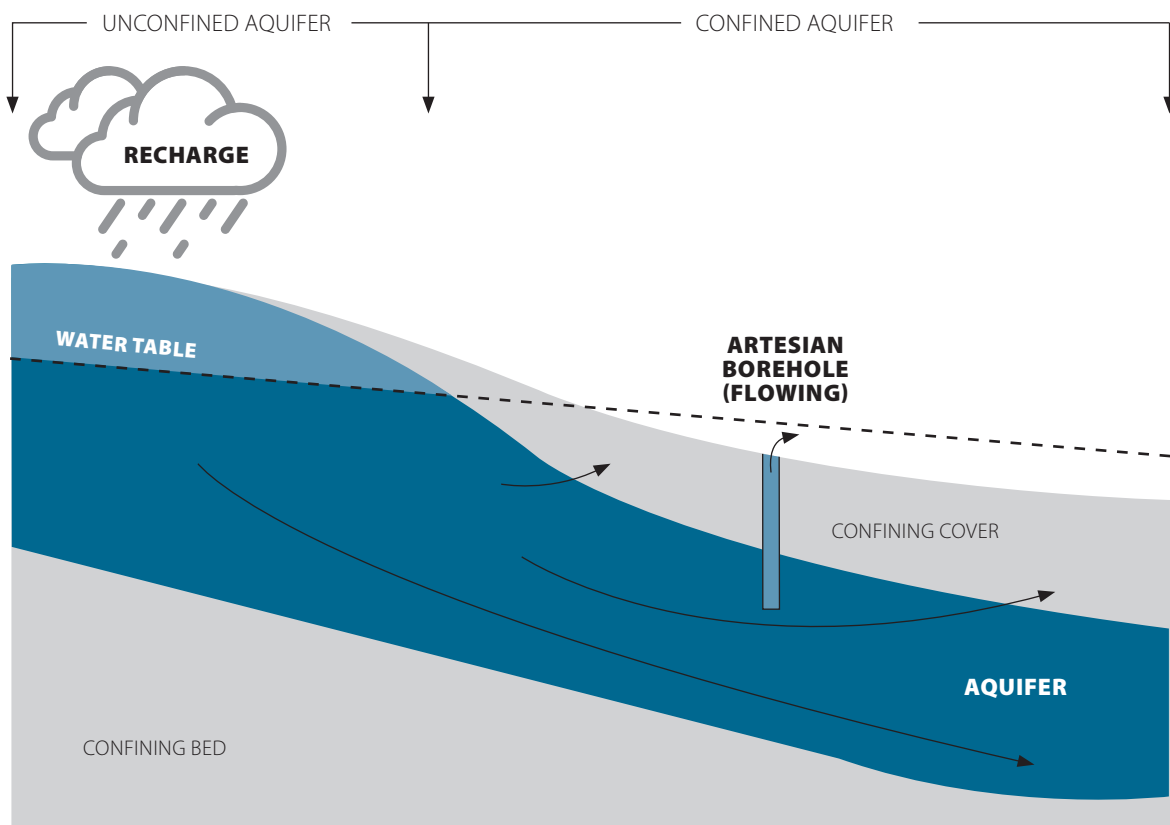
An aquifer is an underground layer of water-bearing permeable rock or sediments (e.g. gravel or sand), from which groundwater can be extracted using a bore.

Groundwater in aquifers is topped up (or recharged) by infiltration from rainfall and seepage from rivers and streams. The flow of groundwater through an aquifer is affected by the layering of different materials such as gravel, silt and sand. Groundwater generally flows from inland areas towards the coast and discharges into streams, lakes or directly to the sea.

If an aquifer lies beneath a layer of very low permeability material such as silt, the aquifer is often described as being confined, or semi-confined. The water pressure in confined aquifers is able to build up beneath the less permeable material. Aquifers which are exposed to the atmosphere and don't have a low permeability layer above them are called unconfined aquifers.

Groundwater is accessed by wells or bores that are drilled down into the aquifer. A bore pump is usually required to lift groundwater from an aquifer to the surface. However, in some places, the groundwater pressure in confined aquifers is high enough for the groundwater to rise up to the surface and flow freely from the bore (if the bore is uncapped or when in use). These are called free-flowing artesian bores, or simply artesian bores.

Artesian bores should be constructed so that water cannot flow out in an uncontrolled manner. This is important to ensure that the water does not get wasted and that aquifers are not unnecessarily depleted.



3.0 Variability in Flow from Artesian Bores

The amount of water that flows from an artesian bore depends on the amount of pressure in the aquifer and the permeability of the strata making up the aquifer system. When the pressure “head” is above ground level, water can freely flow from the bore.

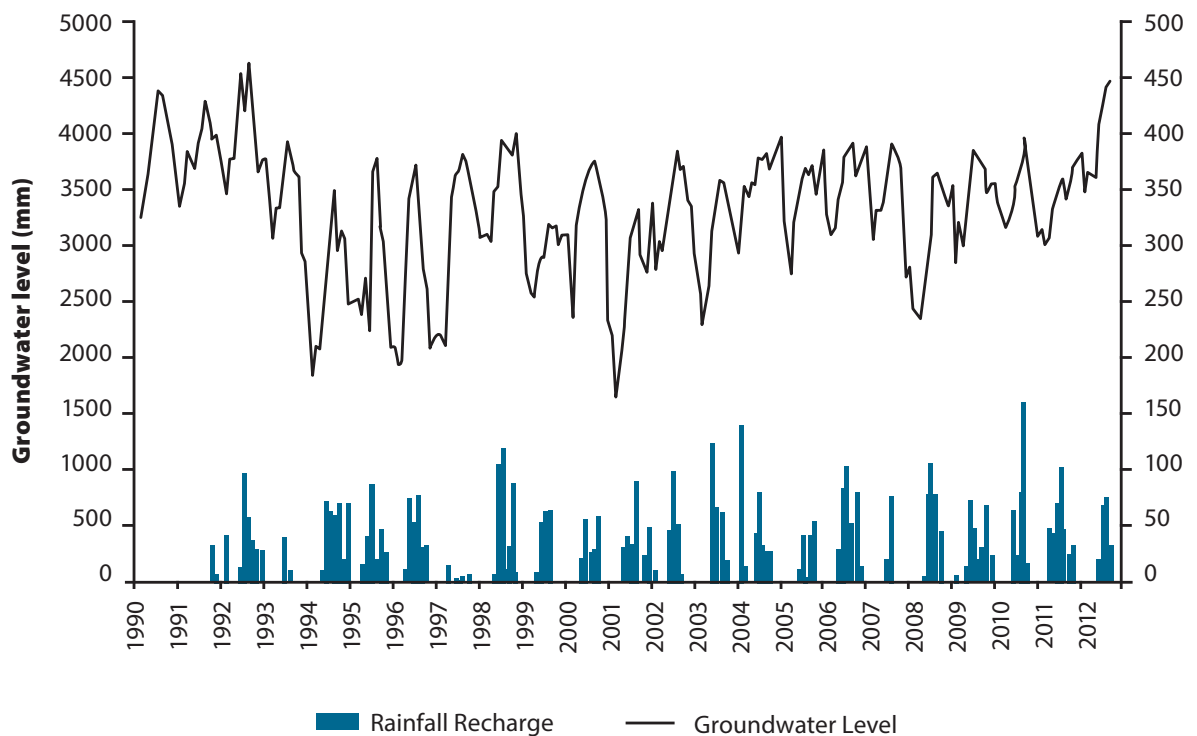
If the pressure in an aquifer where an artesian bore is drilled declines, the flow rate from the bore will also reduce. If the water level in the bore drops below the top of the bore, the bore will stop flowing.

The water pressure in an aquifer is dependent both on the amount of recharge, primarily from rainfall or seepage from streams, rivers and lakes and also from pumping effects from bores. The quantity of rainfall and aquifer recharge varies seasonally, from year

to year and due to longer term climatic variations. Groundwater levels reflect this natural variability.

The majority of recharge normally occurs during the winter and spring months when rainfall is higher and evaporation is lower. Groundwater pressures (and water levels in bores) fluctuate seasonally as a result. During the summer, groundwater levels steadily decline before the aquifer is topped up again by winter recharge. However, a series of dry winters may cause groundwater levels to decline year on year.

Both unconfined and confined aquifers respond to changes in rainfall recharge. In some areas land use changes can also affect groundwater levels by affecting the amount of rainfall that enters the aquifer.



Graph shows seasonal variations in groundwater level and rainfall recharge

4.0 Adapting to Changes in Flow

When the water pressure in an aquifer declines to a point where an artesian bore no longer flows freely, a pump will be required to extract water from the bore. Installing a pump to provide the required supply will mean that the water can continue to be accessed, even if the groundwater level falls below the top of bore.

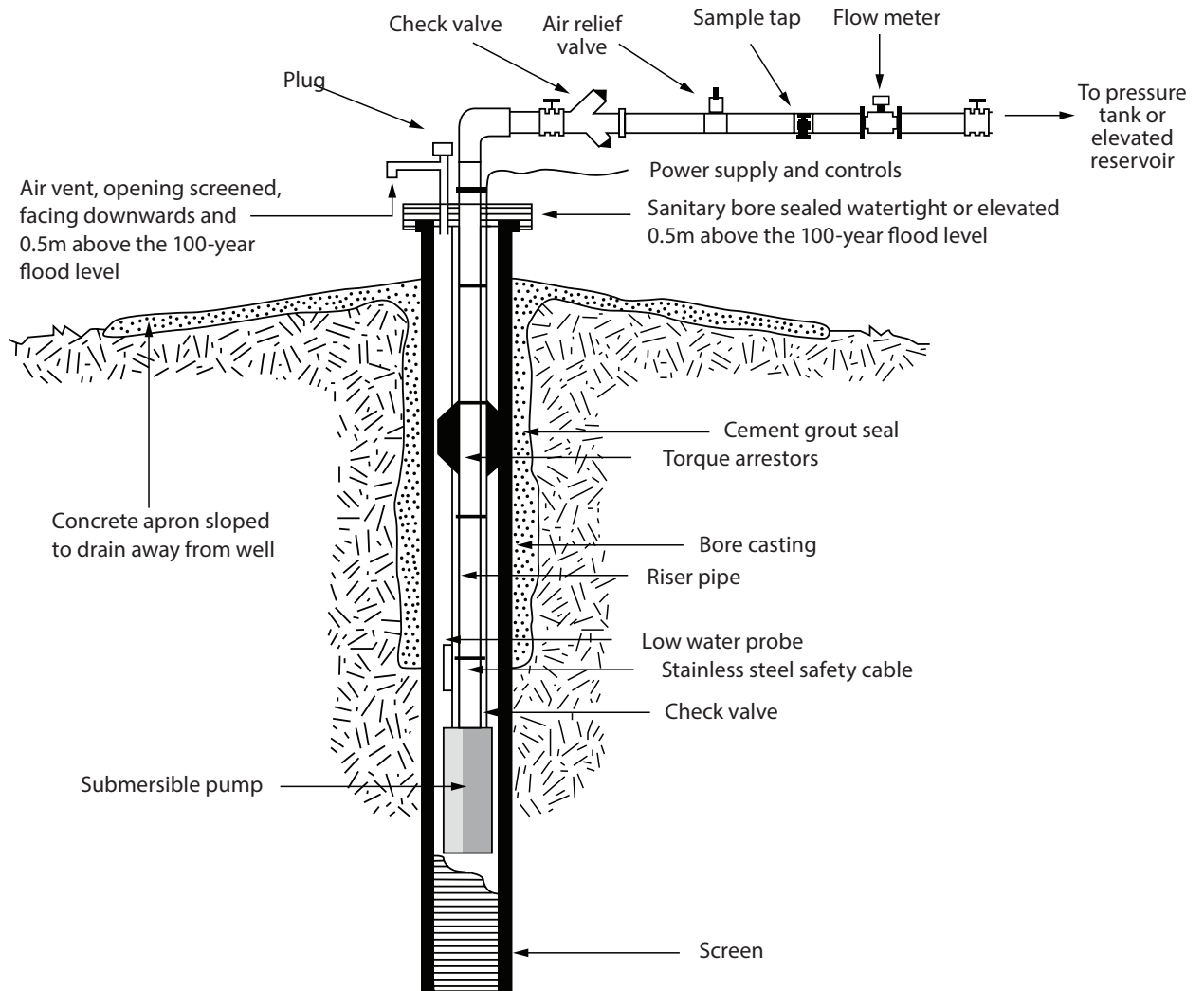
Surface mounted pumps tend to be limited to up to 5 to 7m of lift depending on the pump suction and

pipng arrangements. Alternatively, a submersible pump could be installed. After a pump has been installed, it is still possible to use the artesian pressure.

Ideally, both the bore design and the pump type should be selected to ensure that water can be accessed from the bore in the long term.



Example of a submersible pump in a bore



Source: Ministry of Health. 2010. *Design and Operation of Bores for Small drinking-Water Supplies: Resources for Drinking-water Assistance Programme*. Wellington: Ministry of Health.

5.0 Artesian Bores and the One Plan

The Horizons One Plan describes how the natural and physical resources of the Region will be cared for and managed by Horizons in partnership with territorial authorities and the community.

Chapter 16 of the One Plan covers Takes, Uses and Diversions of Water, and Bores. In this section there are two policies relevant to artesian bores.

Policy 16-4 covers how bores should be constructed and managed. This policy says that “new bores must...wherever practicable... avoid adverse effects on the reliability of supply from properly-constructed, efficient and fully-functioning existing bores”.

Similarly, Policy 16-5 (b) says that “...a properly constructed bore...has a pump capable of drawing water from its base to the land surface”.

This means that while artesian pressures can be a great benefit, you cannot necessarily rely on them to obtain a water supply from a bore at all times.

If you are having problems with a reduction in flow, you may need to install a pump to ensure that your bore continues to function in the long term.

Horizons consents the right to take and use water and is not necessarily concerned with how that water is abstracted (i.e. flowing artesian or pumped).

If an artesian bore stops flowing, any existing rights to take the water will continue but some infrastructure may be required to access it.

If a neighbour wishes to install a new bore that causes your artesian pressure to reduce, it may be considered as a minor adverse effect on your bore, meaning you would still be notified of their application.

Policy 16-5 (c) of the One Plan would apply, meaning that short term restrictions may be applied to their take to limit the effects on your bore allowing time for you to install a pump or upgrade your bore. This is because a bore with a pump can still provide a viable means to access the groundwater in a way that is commonly used throughout the Region.

6.0 Bore Maintenance

It is the bore owner's responsibility to ensure that artesian bores are properly capped and do not leak. This is to prevent unnecessary water wastage and aquifer depletion.

*Policy 16-4 (d) says
“Bores must be used in a manner that prevents:
(i). contaminants from entering the bore from the land surface
(ii). the wastage of water in artesian situations.”*

7.0 Further Information

For further information, contact the groundwater team at groundwater@horizons.govt.nz or on freephone **0508 800 800**.



CONTACT

11-15 Victoria Avenue
Private Bag 11 025
Manawatu Mail Centre
Palmerston North, 4442

T 0508 800 800
F 06 952 2929
help@horizons.govt.nz
www.horizons.govt.nz