



# Bore specifications in Otago

## A guide for drillers and service providers

Adapted from ORC Bore Specifications V2 (December 2020)



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# 1. Supplementary information

This guide touches on technical requirements for:

- **Bore sealing**
- **Frost pit installation**
- **Decommissioning of bores**
- **Providing Otago Regional Council (ORC) the right information**

This guide should be used alongside the following documents and technical specifications.

AS/NZS 2845.1:2022 Water Supply - Backflow Prevention Devices Part 1: Materials, Design and Performance Requirements

<https://www.standards.govt.nz/shop/asnzs-2845-12022/>

NZS 4411:2001 - Environmental Standard for Drilling of Soil and Rock.

<https://www.standards.govt.nz/shop/nzs-44112001/>

Boundary Backflow Prevention for Drinking Water Supplies (2019)

[https://www.waternz.org.nz/Article?Action=View&Article\\_id=48](https://www.waternz.org.nz/Article?Action=View&Article_id=48)

Health and Safety at Work 2015

<http://www.legislation.govt.nz/act/public/2015/0070/latest/DLM5976660.html>

Health and Safety at Work (General Risk and Workplace Management) Regulations 2016

<http://www.legislation.govt.nz/regulation/public/2016/0013/latest/DLM6727530.html>

Minimum Construction Requirements for Water Bores in Australia (2020)

<https://nzdrillersfederation.co.nz/wp-content/uploads/2022/07/MCR-Edition-4-reduced.pdf>

National Environmental Standard for Sources of Human Drinking Water (2007)

[http://www.legislation.govt.nz/regulation/public/2007/0396/latest/DLM1106901.html?search=ta\\_regulation\\_R\\_rc%40rinf%40rnif\\_an%40bn%40rn\\_25\\_a&p=3](http://www.legislation.govt.nz/regulation/public/2007/0396/latest/DLM1106901.html?search=ta_regulation_R_rc%40rinf%40rnif_an%40bn%40rn_25_a&p=3)

Taumata Arowai guidance and resources

<https://www.taumataarowai.govt.nz/home/guidance-and-resources/>

Water Services Act 2021

<https://www.legislation.govt.nz/act/public/2021/0036/latest/LMS374564.html>

Water Services (Drinking Water Standards for New Zealand) Regulations 2022

<https://www.legislation.govt.nz/regulation/public/2022/0168/latest/whole.html>

## 2. Bore drilling & sealing

The drilling, construction and alteration of “bores” requires a Land Use Permit from ORC (Regional Plan: Water, rules under section 14.1)<sup>1</sup>.

A bore is defined in the Regional Plan: Water as: “Every device or means, including any well or pit, which is drilled or constructed for the purpose of taking groundwater, or which results in groundwater being taken, other than piezometers or other monitoring devices used for water sampling purposes only.”

To apply for a Land Use Permit, complete Form 1<sup>2</sup> – Application for Resource Consent and Form 9A<sup>3</sup> – Land Use Consent to construct a bore or drill over an aquifer and return to ORC at [consents.applications@orc.govt.nz](mailto:consents.applications@orc.govt.nz). Further information on the consent application process can be found on the ORC website<sup>4</sup>.

The drilling of land, other than for the purpose of creating a bore, in some cases is permitted (Regional Plan: Water rule 14.2.1.1)<sup>5</sup>.

You must ensure that bores are cased and sealed to prevent aquifer cross-connection and leakage from the surface into groundwater. Failure to do so may result in the degradation of water quality that others depend on.

Generally, the part most vulnerable to contamination is the borehead because it provides the physical connection between the land surface and the underlying aquifer (Figure 1).

The bore must be constructed, maintained, tested, and records kept (drilling log), in accordance with NZS 4411:2001 - Environmental Standard for Drilling of Soil and Rock. The bore must be constructed and sealed to ensure the borehead casing and reticulation is suitably constructed and sealed to avoid ingress of surface water and other foreign matter at all times.

Provide adequate facility and access for measuring water levels and collecting water quality sample from the bore. The sample collection point must be before the reticulation encounters pressure tanks/reservoir/treatment plant.

**It is important to note that a Land Use Permit remains with the land, and not the person. Meaning, it cannot be transferred.**

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1 <https://www.orc.govt.nz/media/1220/14-rules-land-use-other-than-in-lake-or-river-beds.pdf>

2 <https://www.orc.govt.nz/media/9559/form-1-application-for-resource-consent.pdf>

3 <https://www.orc.govt.nz/media/8745/form-9a-land-use-consent-to-construct-a-bore-or-drill-over-an-aquifer.pdf>

4 <https://www.orc.govt.nz/consents-and-compliance/ready-to-apply-for-a-consent>

5 [https://www.orc.govt.nz/media/8900/regional-plan\\_water-for-otago-chapter-12.pdf](https://www.orc.govt.nz/media/8900/regional-plan_water-for-otago-chapter-12.pdf)

# How to minimise the risk

The best way to manage your drinking water supply is to avoid likely sources of contamination.

This diagram provides a few tips for best practice.

- 1** The well casing should be elevated above ground and above stormwater and flood levels. The top of the well should be securely capped, and hoses or cables going into the well should be securely sealed.
- 2** There should be a sample point to analyse the water if a problem is suspected.
- 3** A backflow preventer should be installed to make sure no contaminants can siphon back into the bore.
- 4** The area immediately around the bore casing should be sealed with a concrete apron that slopes away from the bore. This helps minimise any surface water flowing into the bore.
- 5** A bentonite seal should be installed around the casing and should extend below ground level.

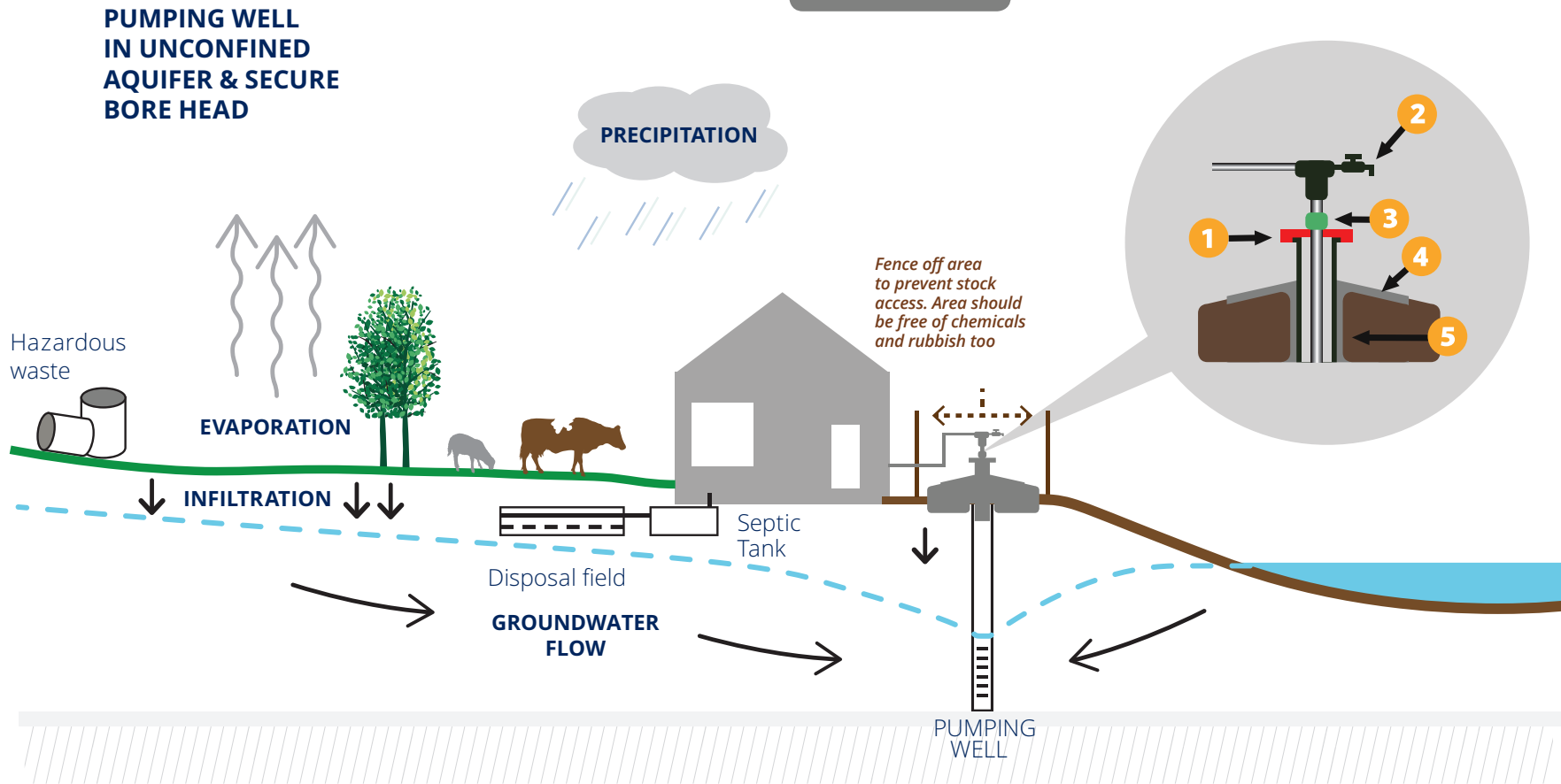


Figure 1: risks to groundwater quality and maintenance of a secure borehead

The following is expected for the sealing of a bore or well in Otago:

1. The top of the bore/well casing shall extend at least 300 mm above ground level and above any potential flood and/or ponding level.
2. The casing must be sealed to prevent the entry of contaminants:
  - Properly seal holes through which cables/hoses are inserted into the casing.
  - Ensure the cap completely covers the borehead, is secure and preferably lockable.
3. A concrete seal (apron) is to be placed at ground level around the outside of the casing. The seal must be sufficient to prevent foreign material, surface water, spillage or other leakage entering the space between the casing and the wall of the borehole. A seal with a minimum of 250mm radius and 100mm thickness around the borehead is recommended. The concrete apron needs to slope away from the bore in order to divert surface water away from the borehead (Figure 1).
4. The concrete apron is to be located at ground level above the bentonite seal. The bentonite seal (typically bentonite pellets) must be placed above the filter pack (point 5) to prevent ingress of water via the bore annulus. The bentonite seal shall typically extend >2 m above the filter pack and extend up to ground level.
5. A filter pack comprising of clean, washed sand (typically 2-4mm) shall be placed around the screened interval. The filter pack shall extend at least 200 mm above the screened interval while allowing point 4 (bentonite seal).
6. Where more than one aquifer is encountered during drilling, the bore/well shall be constructed so that groundwater is drawn from only one primary aquifer. Ensure that any leakage between zones of differing pressure or water quality is prevented.
7. Flowing artesian bores/wells shall be fitted with headworks to control artesian pressures and avoid the uncontrolled discharge of water.
8. A sampling tap should be installed to sample water quality.
9. A backflow preventer should be installed to make sure no contaminants can siphon back into the bore.

### 3. Bore chamber or frost pit

*The Department of Internal Affairs Havelock North Water Supply Inquiry found that “below-ground boreheads are undesirable and introduce additional and unnecessary risk, and therefore that no new below-ground bores should be permitted”.*

ORC is undertaking work to improve its understanding of borehead design, security and functionality. The installation of a bore chamber or frost pit below ground is not best practice and ORC does not condone this. Best practice is to have the casing and all associated borehead works **above** ground.

The following is expected for the installation of a bore chamber/frost pit if it is unavoidable:

1. The **top of the chamber** should be at least **300mm** above ground level. The ground surrounding the chamber should slope away from the chamber.
2. If point 1 cannot be met **the borehead inside the chamber** must be at least **300mm** above the bottom of the chamber.
3. The whole bore chamber needs to be lined with concrete or brick, with the exception of the chamber floor. The chamber floor is to have a 250mm radius concrete apron around the bore casing.

The use of wood is not recommended. Wood could compromise the security of the bore.

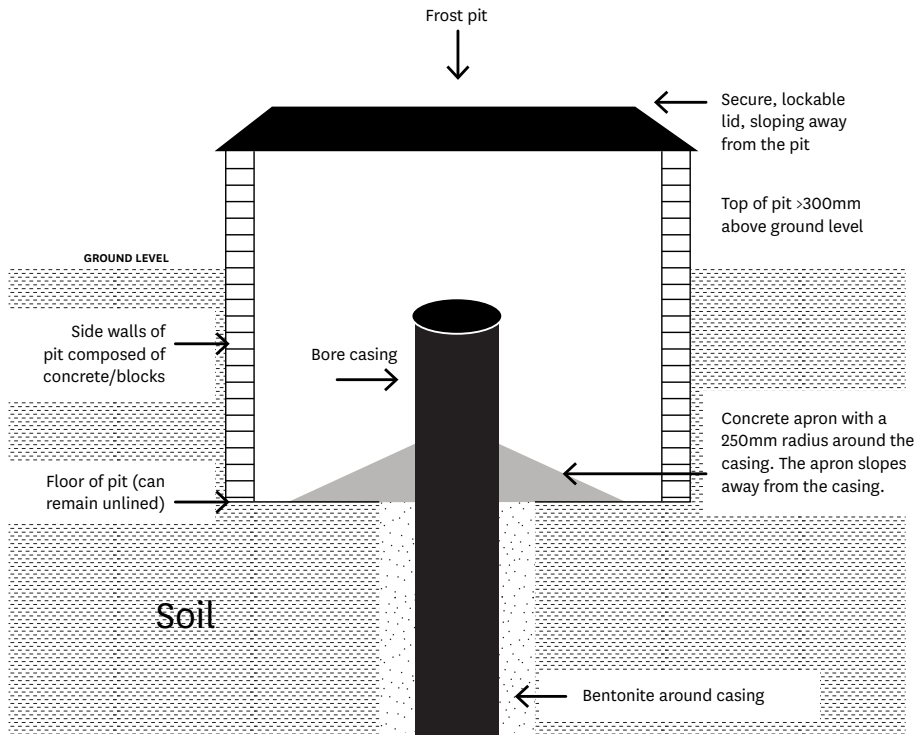
4. The **top of the chamber** must be sealable (and preferably lockable) to prevent surface water from entering the bore directly.
5. The **top of the casing** within the chamber must be sealed to prevent the entry of contaminants:
  - Properly seal holes through which cables/hoses are inserted into the casing.
  - Ensure the cap completely covers the borehead.
6. The lid preferably has a side lipped edge.
7. A sampling tap should be installed to sample water quality.
8. A backflow preventer should be installed to make sure no contaminants can siphon back into the bore.



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### Situation 1

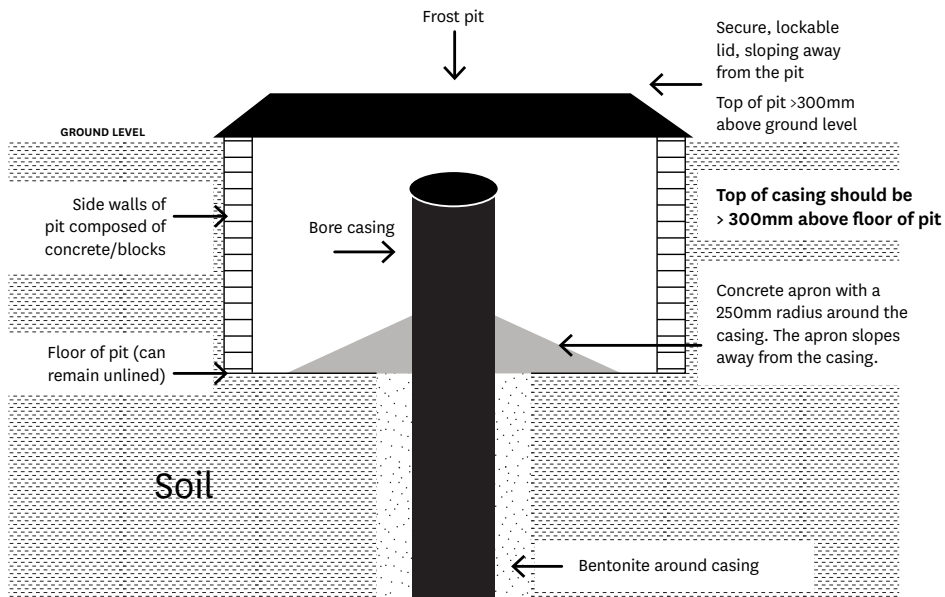
Frost pit **MORE** than 300mm above ground level



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### Situation 2

Frost pit **LESS** than 300mm above ground level



## 4. Records for the drilling, construction or alteration of a bore

### *Bore tags*

Any bore tag provided to the consent holder by ORC must be attached to the bore within two weeks of the bore construction being completed.

### *Information to send to ORC*

The following information must be supplied to ORC within the timeframe specified in the resource consent on completion of drilling of the bore:

Bore log(s) containing:

- a. Bore number (ORC bore tag number: refer to resource consent or yellow tag)
- b. Owner's or occupiers name
- c. Driller's name
- d. Date and method of drilling
- e. GPS reference points for the bore/well location(s) in NZ Transverse Mercator (NZTM) format.
- f. A bore construction report for each bore/well drilled. This report shall include details of bore/well construction including:
  - drilled depth;
  - casing depth and diameter;
  - screened intervals;
  - casing and screen materials; and
  - any water level records and information related to the development of the bore.
- g. Geological logs, including water table depth (as per NZS 4411:2001, Environmental Standard for Drilling of Soil and Rock, Section 4).

A photograph of the bore with a measuring device to show the bore diameter and/or installer certificate confirming bore diameter;

Clear photographs showing compliance with the sealing of the bore carried out in accordance with NZS 4411:2001 – close up photographs as well as those showing the surrounding area;

An annotated map, or aerial photograph, that accurately and clearly shows site access and the physical location and coordinates for the bore and bore tag number(s);

Copies of the results of any pumping tests carried out;

Copies of the results of groundwater water quality analyses carried out;

The photographs must have adequate resolution and sharpness. The picture should minimally consist of around 900\*1600 pixels with a file size (in JPEG/PNG format) between 0.5 and 1Mb.

Email information to **[compliance@orc.govt.nz](mailto:compliance@orc.govt.nz)**

### *Water quality*

The ORC Land Use resource consent often requires you to provide adequate facility to sample water quality directly from the borehead. This facility, often a tap/valve sourced directly from the direct pump outlet should be before any pressure tanks/reservoirs/treatment plants.

It is the responsibility of the consent holder to ensure that the water from this bore is of suitable quality for its intended use. Where water is to be used for human consumption, the consent holder should have the water tested prior to use and should discuss these requirements with a representative of the Ministry of Health.

The following Drinking Water Standards (or amendments) should be considered:

<https://www.health.govt.nz/system/files/documents/publications/dwsnz-2005-revised-mar2019.pdf>

Due to the prevalence of naturally occurring arsenic in groundwater in parts of Otago it is strongly recommended that water quality samples are specifically analysed for arsenic.

### **Water meter, verification and backflow considerations**

All headworks must be designed to enable a compliance assessment of accuracy of the water meter to take place.

The consent holder should consider that the borehead is constructed to provide for the installation of a water meter and/or a backflow prevention device.

Fittings required on borehead works such as water meters and backflow preventers require straight lengths of pipe either side in order to function properly and for the accuracy of the water meter to be tested. Please refer to manufacturer's specifications for the specific minimum dimensions necessary for each device before any modifications are made to borehead works.

ORC recommends that the design of the headworks includes at least 10 diameters length of straight pipe above and 5 diameters length below the water meter (10/5 ratio) to safeguard accuracy and to have flexibility if another meter is chosen later. If a new meter doesn't verify within 5% accuracy it is most likely that the headworks are at fault (10/5 ratio not met, or obstructions and bends).

During the design phase of a headworks, consider how the water meter can be verified. There are three methods with varying provisions. These are outlined in order of expected accuracy:

#### **Verification Rig:**

Some water meter verifiers have a "verification rig". This is a regularly calibrated reference meter that is installed in a straight piece of pipe that is temporarily connected to the headworks and measures the same water (flow) as the installed meter. For quick and easy verification, a connection point somewhere in the system, as close as possible to the headworks, is required. This means the permanent installation of an extra valve/pipe/connector socket where the verification rig can attach to.

**Reservoir volume/time:**

This method requires a large reservoir in the system (tank in the order of 10-30m<sup>3</sup>) that can be filled from a low level by pumping through the water meter (without leaks or usage), with enough time to measure a significant water level rise (0.5 m+) in at least ~10-30 minutes. A longer period of time with more of a level difference will lead to a more accurate verification.

Comparison to the (volumetric) meter reading at start and end will allow the verifier to calculate the accuracy of the meter being verified. An assessment of the error in measurement of time and level (twice) must be taken into account for the overall estimate calculation of the accuracy. In principle, a volumetric verification is more accurate and valid for this purpose rather than a few instant flow rate verifications (instant readings). This method is good for smaller takes (with smaller mobile tanks).

**Clamp-on meter:**

This requires a permanent long piece of pipe in the system. The pipe is to have a length of 15 times the diameter of the pipe with minimal bends, valves, mechanical meters and other obstructions **before and after** the straight piece of pipe. Only a magflow meter with the same diameter as the pipe can count as 'no obstruction'. Obstructions disturb the flow patterns. This can make a clamp on meter inaccurate. Clamp on meters are harder to operate and often less accurate than the meter a person is verifying.

Contact your consultant to discuss appropriate alternatives to ensure that your application will be accepted.

## 5. Bore decommissioning

Bores that are abandoned, no longer wanted or required must be properly decommissioned or sealed.

The bore is to be backfilled with inert material (such as bentonite) and sealed at the surface to prevent any contaminants or surface water from entering the bore or drill hole at any level. Decommissioning and filling must be in accordance with NZS 4411:2001.

Within five working days of completing this work, the consent holder must provide ORC the bore tag number and photographs showing that the bore has been sealed/grouted and backfilled. Bore log(s) are to be supplied also.

The photographs must have adequate resolution and sharpness. The picture should minimally consist of around 900\*1600 pixels with a file size (in JPEG/PNG format) between 0.5 and 1Mb.

If a bore is decommissioned, and the Land Use Permit to construct the bore is of an 'unlimited term', consider surrendering the resource consent to avoid unnecessary ongoing performance monitoring cost. The consent holder can apply for a cancellation of Land Use Permit/resource consent by filling out Form 20 'Notice of Surrender of a Resource Consent' which can be found at:

<https://www.orc.govt.nz/media/4475/form-20-surrender-of-resource-consent.pdf>

The completed form can be emailed to [public.enquiries@orc.govt.nz](mailto:public.enquiries@orc.govt.nz) or posted to:

Otago Regional Council  
70 Stafford Street  
Private Bag 1954  
Dunedin 9054

## 6. Bore maintenance

The Department of Internal Affairs Havelock North Water Supply Inquiry found that “The Regional Council imposed a generic condition on the water take permits it granted to the District Council, related to the safe and serviceable state of the Brookvale Road bores. This condition failed to meet the necessary standard. It then failed adequately to monitor compliance with the conditions of the permits.”

*ORC has conditions such as: “The bore integrity shall be maintained at all times unless abandoned.”*

In ensuring a bore is maintained to a safe and serviceable standard, the consent holder or service provider may consider checking the following at a borehead regularly and ORC would see it as good practice to do so:

- Flange gaskets in place and in good condition.
- Top plate cable IP glands in place, sealed and in good condition.
- Other top plate penetrations sealed and secure.
- Are all flange bolts installed?
- Welded connections in good condition.
- Surface coating of all pipe work in good condition.
- Tamper tags in place (where applicable).
- Pipework supports in place (where required).
- Condition of concrete apron or seal.
- Height of bore casing above ground level to top of casing flange.
- Is a backflow prevention device installed? If so, is it in good working order?
- Is borehead security above and at ground level secure or not secure?
- No agrichemicals/fuels/other hazardous material is stored near the borehead.
- No cracks in the ground around the borehead.
- Overall comments including additional information regarding the borehead such as potential contamination issues that might arise due to location of the bore. E.g. spray sheds, septic tanks, animals, diesel tanks.

Some of the above items may not be applicable, it depends on the borehead and associated infrastructure system set up.

ORC resource consents conditions contain advisory notes that the consent holder should consider at all times:

*“It is the responsibility of the Consent Holder to ensure that the water from this bore is of suitable quality for its intended use. Where water is to be used for human consumption, the Consent Holder should have the water tested prior to use and should discuss these requirements with a representative of the Ministry of Health and should consider following the Drinking Water Standards”*

*“If there is a discharge of contaminants, including human sewage, onto land within 50 metres of a bore used to supply water for domestic purposes or drinking water for livestock, a resource consent may be required for the discharge under the Regional Plan: Water for Otago.”*

*“If there is a discharge of contaminants, including contaminants from offal pits, farm landfills, silage production and greenwaste landfills, onto land within 100 metres of a bore used to supply water for domestic purposes or drinking water for livestock, a resource consent may be required for the discharge under the Regional Plan: Waste.”*



