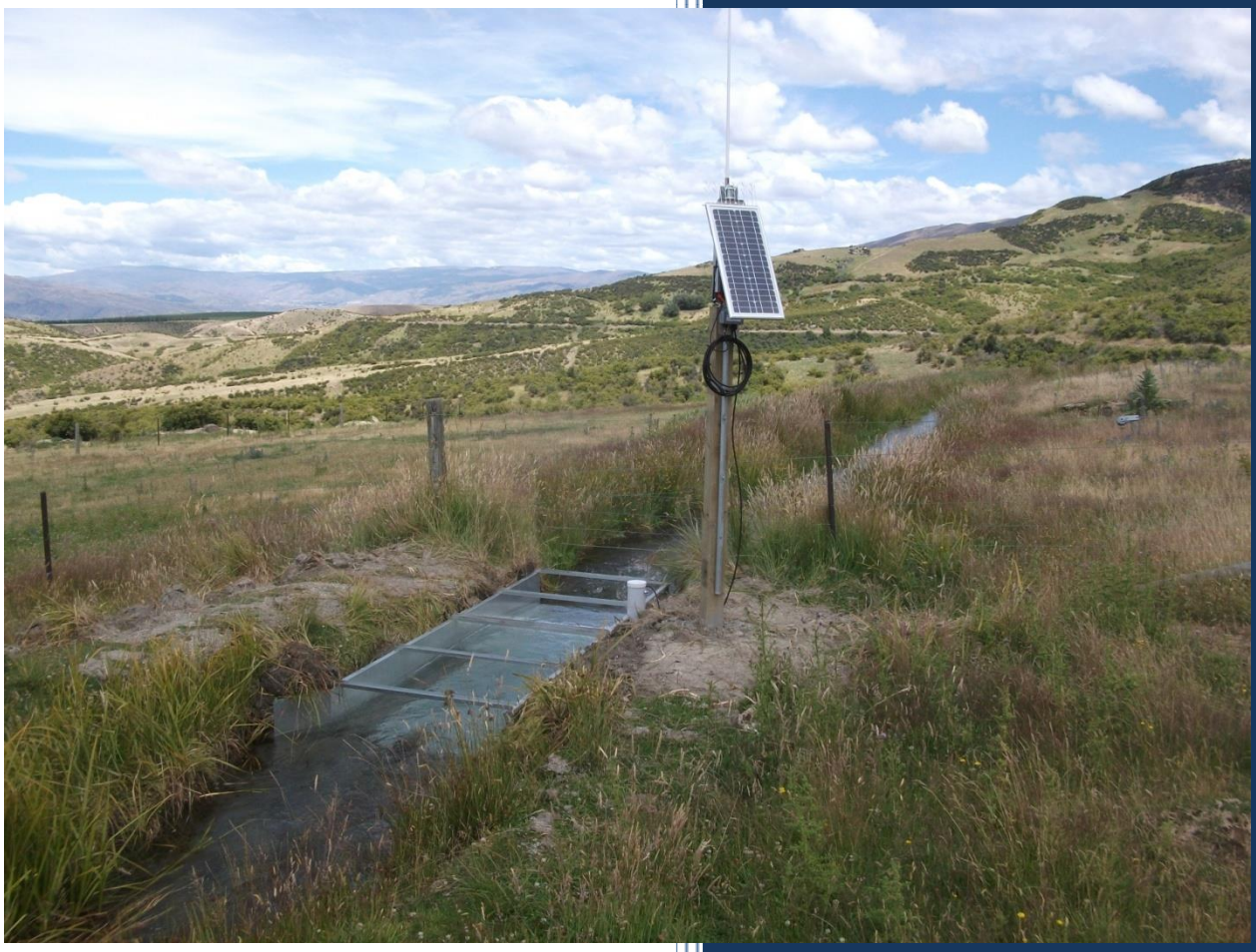
ORC MINIMUM REQUIREMENTS FOR THE MEASUREMENT AND REPORTING OF WATER TAKES



Otago Regional Council

Version 7

3.0 Full Pipes

3.1 Water Meter Requirements

For full pipe water take systems, the Regulations state that a water meter must measure the volume of water taken to within +/-5% of the actual volume taken. The meter used for monitoring the take **must be suited** to the qualities of the water that it is measuring.

- The meter and any essential external components are required under the Regulations to be **sealed and as secure** against tampering as practical.
- The meter is required to be **located at the point of take.** If it cannot be located at the point of take, an exemption to measure near rather than at the point of take is required.
- The **water meter must have an onsite display** to provide a visual indication of the real time measurement display for verification purposes. It must be capable of displaying the cumulative volume in cubic metres (m^3) and the rate of take in litres per second (l/s).
- The water meter must be capable of output to a datalogger and/or telemetry unit.

3.2 Water Meter Installation

Standardisation of installations is necessary to facilitate verification. Therefore the following framework has been adopted to achieve this:

- The water meter must be installed as per the manufacture's specifications, or as below.
- New and retrofit installations are to have a minimum 10 diameters of pipe above the meter and 5 diameters below (unless approval is given by the ORC for a non-standard installation);
- Where mechanical meters are operated an unobstructed length of pipe 15 diameters length must be provided for verification meters.
- Ultrasonic and electromagnetic meters in most cases are considered non-obstructive in the pipe run and therefore the 10:5 installation will provide the required 15 diameter lengths; and
- Where an existing installation occurs, and on verification it meets the required minimum +/-5% accuracy threshold, then the pipe head works do not need to be changed to meet the required 10:5 diameter lengths.
- Variations from standard installation requirements must be approved in writing, on the non standard installation approval form, by the Regional Council **before** proceeding.

3.2 Flow Verification Frequency

Verification is a snap-shot of meter performance: it does not guarantee ongoing accuracy within the required 5% margin, particularly in highly variable conditions. **All flow measurement devices are to be verified in situ** initially after commissioning, but before the end of the first water year, or as otherwise specified in a consent.

Many factors can cause a water measuring device to lose accuracy, including:

- The buildup of deposits, minerals, oils, and solvents.
- Wearing, breakage, or failure of internal mechanical parts

- Electronic drift.
- Improper installation.
- Modified pipe configurations.

The installed meter must be independently verified initially after installation, then every 5 years as stipulated in the Regulations unless consent conditions specify otherwise. Where mechanical meters are installed consent conditions usually specify that the meter is verified annually.

3.3 Flow Verification

Best practice denotes that the equipment used for verification must be suitable for the use of verifying the accuracy of water meters. The verification device must have a greater or equal accuracy to the meter being verified.

Verifications should be conducted for the typical flow rate of the system. If practicable it is also recommended that the verification be undertaken for a range of different flow rates (low, typical, high). If it is not possible to test at the different flow rates, a minimum of three replicates of the verification test must be performed at the same flow rate.

3.3.1 Verification of Flows <5 l/s

This can be undertaken using the volumetric method by measuring how much time $\blacktriangle t$ it takes to fill a container of known volume, and calculate $V=V/\blacktriangle t$ and compare with this with that recorded by the flow meter.

3.3.2 Verification of Flows >5 l/s

There are a number of methods available for verifying flow meter accuracy for flows greater than 5l/s however verification using an ultrasonic clamp on meter is the preferred method for the Otago Region. Other methods will be considered by the Council when and if they become available. Should an installer be able to provide an alternative method, approval must be sought from the Council prior to its use.

3.3.2.1 Verification using Ultrasonic Clamp on Meter

The ultrasonic clamp on flow meter is a non invasive device used to measure full pipe flow in closed conduits. These meters are unique in their ability to measure flow with little or no modification to existing pipe configuration. They are used extensively in the water industry to provide measurements where there is no permanently installed meter and to verify the accuracy of permanently installed meters. Verification using ultrasonic meters:

- Must be at a location where the pipe is new or free of imperfections and unlined and where accurate pipe dimension data is available.
- Best practice requires 10 straight diameters of pipe free of obstructions upstream and at least 5 straight diameters free of obstructions downstream from the meter.
- Should not be used on downward flowing vertical pipes.
- Apply sufficient gel to ensure good signal transmission between pipe surface and transducer.
- Avoid positioning transducers at the top or bottom of the pipe as air or debris may be present.
- Mark position of transducers to reduce repeatability error for subsequent tests.

The ultrasonic clamp on method has numerous advantages, making it the common choice for many full pipe meter installations. However it also has disadvantages, the three key potential sources of error are:

- The pipes internal diameter
- The flow velocity profile (turbulent flow)
- Acoustic interference (caused by sediment or other build up in the pipe)

If these are carefully managed, this method is the quickest, easiest and the most cost effective full pipe verification method available.

Service providers conducting verifications using a reference meter must supply a calibration certification to the Regional Council **annually**.

3.3.2.2 Verification of Magflow Meters

Magflow meters are inherently accurate. They do not have moving parts in the flow stream, are not easily damaged by water of poor quality, there is no (or very little) head loss across the meter, and the meters can be used on a wide range of pipe sizes. The main disadvantage of magflow meters is that they can be sensitive to 'electrical noise' therefore careful attention needs to be made during installation and subsequent inspections.

Meter specific portable testing and verification devices ('Black Box") are slowly becoming available in New Zealand and are acceptable to the ORC. These devices are easy to handle and enable complete functionality and accuracy verification of electromagnetic flowmeter's flow head, converter and cables without removal from the pipeline. The precision of electromagnetic flow meters is not only a function of accuracy of electric data, but is also dependant on the mechanical installation of the flowhead and converter. **Faulty installation**, either mechanical and/or electrical, **may not be detected** by these devices therefore it is critical that the device is installed correctly to the manufacturers specifications or better (10/5 diameters recommended).

Best practice states that the verification device must have a greater or equal accuracy to the meter being verified. This would require a meter of greater accuracy than that of a magflow meter to conduct a verification. As meter specific portable testing and verification devices for magflow meters are not widely available and are currently cost prohibitive, the following methods for verifying a magflow meter are acceptable to the ORC.

- In situ verification using a portable ultrasonic flow meter
- Other meter specific portable testing & verification devices (eg Krohne MagCheck, Siemens Sitrans FM Verificator, ABB CalMaster2)

Any other methods are to be approved by the Council prior to use.

The meter's calibration certificate should be submitted with the relevant commissioning verification documentation.

3.4 General Inspection

In addition to best practice, many permits issued by the Otago Regional Council require annual inspections of the water meter. In many cases this can be conducted in conjunction with a verification. To ensure the meter measurements are reliable it is recommended that (at a minimum) the following be checked annually:

- That the meter is used in an appropriate manner
- That the totaliser is non-resettable
- Maintenance records are current
- That the readings on the display are clearly visible and unambiguous
- Check for evidence of interruption of signal transfer between the measurement component and the recording component
- That the power supply is reliable
- That the tamper proof seals are in place and unbroken
- That there are no leaks that bypass the measuring point
- That earthing and lightning arrestors are installed and are sound
- Check for scaling or build-up of calcium, iron oxide or iron bacteria
- That filters/screens are clean
- That the meter and all external components are sufficiently protected from environmental elements.

3.5 Verification Report

A verification report shall be issued by the installer/verifier to the consent holder with a copy supplied to the Regional Council. To ensure the relevant information is recorded The Otago Regional Council requires that verification information be supplied on the relevant ORC form. Verification forms (and any supporting information) should be supplied to the Council within one month of the verification taking place (watermetering@orc.govt.nz).

Verification forms are available from the ORC website and are included in the appendix of this document.