

Drinking Water Acceptable Solution for Spring and Bore Drinking Water Supplies

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This document is a working draft of a proposed acceptable solution and is based on the requirements set out in the *Water Services Act 2021*.

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1. Drinking water acceptable solution under the Water Services Act 2021

Acceptable solutions offer ways for small suppliers to ensure they are providing safe drinking water in a practical and cost-effective way. Section 50 of the Water Services Act 2021 (the Act) provides that Taumata Arowai may, by notice in the Gazette, issue a drinking water acceptable solution for use in establishing compliance with legislative requirements in the Act.

A drinking water acceptable solution must be published in accordance with Part 3 of the Legislation Act 2019 (namely the drinking water acceptable solution is publicly available free of charge on an internet site maintained by Taumata Arowai).

A person who complies with a drinking water acceptable solution must, for the purposes of this Act, be treated as having complied with the legislative requirements to which the drinking water acceptable solution relates (other than the duties under sections 21 and 22).¹ This means that if you follow the requirements laid out in this acceptable solution you do not have to comply with the Drinking Water Quality Assurance Rules that relate to your supply. However, a water supplier has the choice of complying with an acceptable solution or complying with the Drinking Water Quality Assurance Rules.

As per section 53 of the Act, Taumata Arowai undertook public consultation before making the drinking water acceptable solution for Spring and Bore Drinking Water Supplies.

The commencement date of the drinking water acceptable solution for spring and bore drinking water supplies is **(to be determined)**; being the date of the Gazette notice.

For more information about drinking water acceptable solutions, please contact info@taumataarowai.govt.nz.

2. Purpose

This drinking water acceptable solution provides owners and operators of spring and bore drinking water supplies serving less than 500 people, with a method to achieve compliance with parts of the Act, Drinking Water Standards and Drinking Water Quality Assurance Rules prepared by Taumata Arowai. The drinking water acceptable solution does not provide recommendations but specified requirements and obligations that drinking water suppliers must follow.

¹ Section 21 is the duty to supply safe drinking water. Section 22 is the duty to comply with drinking water standards.

If the drinking water acceptable solution is not implemented in full, compliance with the requirements of the *Water Services Act 2021* specified in this drinking water acceptable solution will not be achieved.

3. Definitions

Term	Definition
Bore	A piped (cased) hole constructed to access groundwater for supply purposes.
Determinand	A constituent or property of water that may affect taste, odour, colour, clarity or safety.
Drinking water supplier	The person who supplies drinking water through a drinking water supply.
Drinking water supply	A single connected system of infrastructure and processes used to abstract (extract from a source), store, treat, transmit or transport drinking water.
FAC	Free available chlorine
Headworks	The infrastructure located near to the extraction point for source water. For groundwater, the headworks will be the bore, the bore head and the pump infrastructure required to extract the water.
Maximum Acceptable Value (MAV)	The maximum value of a determinand that is permitted in drinking water. The full range of MAVs for a range of determinands are set out in the <i>New Zealand Drinking Water Standards 202X</i> . <note the <i>New Zealand Drinking Water Standards 202X</i> are currently being consulted on>
Operations and Maintenance Manual	A hardcopy or electronic document that outlines how to operate and maintain the drinking water supply under this drinking water acceptable solution, to ensure that the water is safe.
Spring	Groundwater that emerges at the ground's surface.
Standards	<i>New Zealand Drinking Water Standards 202X</i> . <note the <i>New Zealand Drinking Water Standards 202X</i> are currently being consulted on>

Taumata Arowai	The New Zealand Water Services Regulator, established under the <i>Taumata Arowai—the Water Services Regulator Act 2020</i> .
Treatment system	A treatment system that complies with this drinking water acceptable solution.
UV	Ultraviolet light.
UVI	Ultraviolet light intensity

4. Applicable drinking water supplies

This drinking water acceptable solution defines what is required for the operation of drinking water supplies using spring and bore water for drinking water. It includes source water testing, specifications for treatment systems and requirements for distribution systems. It describes the design, configuration, installation, operation, maintenance, testing, monitoring, emergency management and auditing that is required.

This drinking water acceptable solution applies to spring and bore drinking water supplies where all the following criteria are met:

- Water abstracted from a bore or spring is treated, then supplied to a distribution system.
- Water is provided to a consumers point of supply (toby).
- The population served by the entire drinking water supply is less than 500 people.
- All water provided is treated by a treatment system which meets the requirements set out in this drinking water acceptable solution.
- An adequate quantity of drinking water is provided to all connections at peak demand.

5. What does this drinking water acceptable solution cover?

Spring and bore drinking water suppliers who comply with this drinking water acceptable solution will be deemed to comply with the following sections of the Act:

- *Section 24 Duty to take reasonable steps to supply aesthetically acceptable drinking water*
- *Section 27 Duty to protect against risk of backflow*
- *Section 30 Owner must have drinking water safety plan*
- *Section 49(3) Duty to comply with any operational compliance rules prepared by Taumata Arowai*

To comply with all their obligations under the Act, spring and bore drinking water suppliers adopting this drinking water acceptable solution must also:

- register the supply with Taumata Arowai (sections 23 and 54)
- ensure the drinking water they supply is safe (section 21(1))
- exercise due diligence to ensure duties under the Act are met (section 29(1))
- comply with the notification requirements (sections 35 and 36)
- comply with the record-keeping requirements (section 37).

The water supplier must notify Taumata Arowai if any of the following events happen:

- Any determinand is detected in a sample exceeding the MAV (section 22(2)).
- Any treatment failure occurs that may make the drinking water unsafe.

6. Design, configuration and installation

These requirements must be met for every drinking water supply from a bore or spring where this drinking water acceptable solution has been adopted.

6.1. Requirements before the drinking water acceptable solution can be adopted

Before use of this drinking water acceptable solution can be considered, the water supplier must test the source water to determine suitability for cartridge filtration and UV disinfection. Water must not exceed the limits that manufacturers indicate for their equipment. Samples must represent a range of different environmental conditions such as heavy rainfall and dry periods. If the testing indicates that the source water is unsuitable for cartridge filtration and/or UV disinfection, the drinking water acceptable solution cannot be used.

Source water testing must include:

Parameter	Limit	Minimum number of samples
Iron	<ul style="list-style-type: none"> • Must not compromise the effectiveness of UV disinfection. • Must not be at a level that will form a precipitate when oxidised by chlorine. 	3
Manganese	<ul style="list-style-type: none"> • Must not compromise the effectiveness of UV disinfection. • Must not be at a level that will form a precipitate when oxidised by chlorine. 	3
Alkalinity	<ul style="list-style-type: none"> • Must not form a scale that reduces the effectiveness of UV disinfection. 	3
UV transmittance	<ul style="list-style-type: none"> • Must meet the requirements of the UV unit manufacturer. 	3
Turbidity	<ul style="list-style-type: none"> • Must not exceed 1NTU at any time. 	5

6.2. Bore or spring requirements

The bore or spring source for the drinking water supply must meet the following requirements:

- Springs and bores must be protected by headworks which minimise the risk of contamination from nearby surface water.
- Farm animals must be excluded (e.g. with a fence) from within 5 metres of the headworks and the headworks must be constructed so water cannot flow towards the bore casing or pond around a spring.
- Springs and bores must not provide geothermal water (which is not suitable for drinking) or groundwater from limestone (karst) terrain.
- Springs and bores must not provide water of variable quality, particularly with regard to pH and turbidity.
- Springs and bores must not be located within 50 metres of:
 - a sewage disposal field or effluent discharge (e.g. a septic tank or other wastewater treatment system)
 - an underground storage tank (such as at a petrol station)
 - a waste pond
 - a landfill
 - an offal pit
 - areas where pesticides or animal effluent is applied to land
 - urban aquifers contaminated with, or at risk of contamination with, sewage from exfiltration and/or pump station overflows.

6.3. Treatment System Requirements

The treatment system must include filtration, UV disinfection and chlorination and meet the following requirements:

- Cartridge filtration must include five micron or less nominal pore size.
- Differential pressure measurement must be installed across the cartridge filters. The minimum size for pressure gauges is 100mm with accuracy of 1% of readable scale as per EN837.1 European standard.
- A UV disinfection unit must provide a minimum reduction equivalent dose of 40 mJ/cm² and have an UVI sensor or dose meter installed.
- The UV disinfection unit must be validated against one of the following:
 - NSF/ANSI 55 for Class A systems
 - UV Disinfection Guidance manual (USEPA)
 - DVGW Technical Standard W294
 - ÖNORM M5873.
- Flow control must be installed to ensure flow is within the specification of the UV unit.
- Lamp status indication must be included with the UV unit.
- Flow through the UV unit must shutdown automatically on low UVI or dose reading (as per the manufacturer's specification).
- Flow through the UV unit must be physically stopped in the following situations:
 - a low UVI or dose reading
 - a power cut
 - during the lamp warm up period until the required UVI level or dose is achieved.
- A chlorination system must be installed that maintains a chlorine residual of at least 0.5 mg/L in water leaving the treatment plant.

- If sodium hypochlorite is used for chlorination, it must be used within three months of manufacture.
- Chlorine residual must be measured before reaching the first consumer, after a contact time of at least 30 minutes.
- The system must be configured to ensure that treatment processes cannot be bypassed.

The distribution network shall be provided with:

- testable backflow prevention devices on all high-risk connections including (but not limited to):
 - horticultural and commercial gardens
 - agricultural connections
 - food preparation facilities
 - wastewater facilities
 - industrial and trade waste customers
 - pest control businesses.
- non-testable backflow protection devices (including air gaps) on all medium risk connections.
- testable backflow protection devices must be tested annually, and the water supplier must retain testing records.

The treatment system, distribution network and all required fixtures (including backflow protection devices) must be installed according to the designer's and/or manufacturer's instructions and by a qualified person. All pipework and fixtures must be products suitable for use in contact with drinking water (AS/NZS 2020:2018).

7. Operation and maintenance

The drinking water supplier is responsible for the operation and maintenance of the bore or spring drinking water supply, including the headworks and the treatment system installed under this drinking water acceptable solution.

7.1. Operations and maintenance manual

The water supplier must prepare an Operations and Maintenance Manual for the drinking water supply that includes requirements for the treatment system. This must include (but is not limited to):

- a description of the water supply and key components
- process and instrumentation diagrams for all the components in the treatment system, including all valves, pumps and bypasses
- standard operating procedures including the restart procedures listed in Section 7.2
- incident and emergency response procedures listed in Section 9
- key contacts including:
 - operations and maintenance personnel
 - manufacturers and suppliers
 - regulators

- consumers
- maintenance schedules
- monitoring and activity schedules, procedures and records
- a quick reference troubleshooting section for operators and water suppliers.

The drinking water supplier is responsible for ensuring that all personnel who undertake any operations involved with the drinking water supply are qualified and trained in the use of the Operations and Maintenance Manual. The competencies associated with the training must be validated for each staff member at least once every three years.

Training records must demonstrate that training and competency validation has been completed.

7.2. Standard operating procedures

The Operations and Maintenance Manual must contain standard operating procedures for the following (but not limited to):

- restarting the treatment plant
- regular inspections
- routine maintenance
- replacing equipment
- operating individual treatment system units, flow restrictors, pumps and valves
- calibrating relevant sensors and analysers.

7.3. Inspection procedures

Inspection procedures should ensure that:

- headworks including bore heads and abstraction infrastructure are secure, watertight and in good condition and do not allow the ingress of surface water
- treatment processes are operating effectively
 - Cartridge filter systems have the correct cartridge types installed.
 - UV systems are installed correctly and are operating according to the manufacturers requirements
- backflow prevention devices (including air gaps) are in place and operating effectively
- storage tanks are secure with:
 - intact roofs that do not allow contaminants to enter
 - intact walls and screening to prevent access of vermin or ingress of faecal material
 - overflow pipes and ventilation holes with 1.5mm mesh screening
- calibration of any process monitoring or control equipment, has been carried out according to the manufacturer's specifications.

7.4. Maintenance, inspection and calibration

The minimum frequency of operation and maintenance visits by the water supplier to the spring or bore drinking water supply is:

- quarterly if the supplier continuously monitors FAC, turbidity and pH and an alarm system is installed to alert the supplier when levels exceed limits
- daily if monitoring is undertaken by grab sample.

Maintenance (including replacement and cleaning) schedules are to include:

- replacing cartridge filters at least every 12 months and when differential pressure across the filters reaches the manufacturer’s recommended maximum pressure
- replacing mercury-based UV lamps within 12 months, unless the manufacturer guarantees and can demonstrate that performance requirements are maintained over a longer life span
- replacing UV LED lamps at the frequency recommended by the manufacturer to achieve the certified UV dose at the end of lamp life. An alternative UV lamp must be available as a replacement
- replacing (or calibrating) UVI sensors or dose meters every two years, unless the manufacturer recommends an alternative period to maintain validation status
- calibrating turbidimeters every three months or at the frequency recommended by the manufacturer
- checking the operation of chlorine dosing systems and chlorine storage
- testing testable backflow prevention devices each year.

All activities undertaken according to the maintenance, inspection and calibration schedules are to be recorded in relevant logs and records including the findings or outcomes of these activities. Records and logs are to be retained to demonstrate the activities have been completed.

8. Monitoring and testing

The water supplier must undertake water quality testing and keep records including (but not limited to) the following requirements:

Source water monitoring requirements

Rule Number	Requirement	Limits
SB1	All testing is to be undertaken by a laboratory accredited by International Accreditation New Zealand (IANZ) and listed on the Taumata Arowai register of laboratories.	N/A
SB2	All microbiological samples must be provided to a laboratory within 24 hours of collection and must be transported at a temperature of less than 6 degrees Celsius.	N/A
SB3	Source water turbidity must be measured after the point of abstraction and before treatment either continuously or daily.	<20 NTU at all times

SB4	<p>Source water must be tested for the following determinands once when this drinking water acceptable solution is adopted and every three years thereafter.</p> <ul style="list-style-type: none"> • Arsenic • Boron • Bromide • Calcium • Iron • Magnesium • Manganese • Nitrate • Potassium • Total organic carbon. 	Must not exceed the MAV
SB5	<p>Source water must be tested for any other determinands or parameters that the water supplier considers may be present when this drinking water acceptable solution is adopted. Water must also be tested whenever there is a risk that the determinand or parameter is present.</p>	Must not exceed the MAV
SB6	<p>Testing for any determinand that has a level exceeding 50% of the MAV must be undertaken monthly.</p>	Must not exceed the MAV

Treated water monitoring requirements

Rule Number	Requirement	Limits
SB7	One sample for <i>E. coli</i> is to be taken from a tap post-treatment after 30 minutes chlorine contact time each month.	Not present
SB8	One sample for FAC residual is to be taken after 30 minutes chlorine contact time each day.	0.5mg/L
SB9	One sample for pH is to be taken after 30 minutes chlorine contact time each day.	Between 6.5 and 8.0
SB10	One sample for turbidity is to be taken after 30 minutes chlorine contact time each day.	Must not exceed 1NTU
SB11	One sample for UV transmittance is to be taken each week.	Must not be less than 80%

Alternative treated water monitoring requirements

Rule Number	Requirement	Limits
SB12	Continuous monitoring of the UV unit for dose with an alarm to an operator	Must be at least 40 mJ/cm ²
SB13	Continuous monitoring of turbidity post treatment.	Must not exceed 1NTU
SB14	One sample for FAC residual is to be taken after 30 minutes chlorine contact time each day.	0.5mg/L
SB15	One sample for pH is to be taken after 30 minutes chlorine contact time each day.	Between 6.5 and 8.0

Distribution system monitoring requirements

Rule Number	Requirement	Limits
SB16	One sample for <i>E. coli</i> is to be taken from a tap installed in the distribution network for monitoring purposes (or a representative tap nominated by the water supplier) each month.	Not present
SB17	One sample for FAC residual each day.	0.2mg/L
SB18	One sample for pH each day.	Between 6.5 and 8.0
SB19	One sample for turbidity each day.	Must not exceed 5NTU
SB20	Water from the distribution network must be monitored for the following determinands annually: <ul style="list-style-type: none"> • Antimony • Cadmium • Chromium • Copper • Lead • Mercury • Nickel • Zinc 	Must not exceed the MAV

9. Incident and emergency management

An incident or emergency is where there is a reasonable likelihood that a supplier's drinking water is unsafe.

The drinking water supplier must be prepared to instigate a controlled response to an incident or emergency, by developing appropriate incident and emergency response plans. The plan must:

- outline the most likely incidents or emergencies. While it is not possible to identify all situations, the drinking water supplier must identify any situations reasonably expected, for example:
 - damage to untreated water storage
 - power failure
 - a positive *E. coli* test in treated water
 - a failure of a component in the UV system
 - a low chlorine reading.
- establish a response plan for each possible incident or emergency situation identified, including:
 - who is responsible for responding to the incident or emergency
 - details of every step of the response from investigating the source or cause of the problem to taking remedial action to rectify it
 - pre-prepared communications such as *boil water* notices, *do not drink water* notices and other key messages
 - details on how communications should be issued
 - increased monitoring if a monitoring or test result exceeds a MAV set out in the Standards
 - details of alternative water sources to top up a supply. For example:
 - names and contact details of registered tankered drinking water suppliers
 - information about the quality of the alternative sources and whether additional treatment is required
 - advice to be given to consumers if the quality of the alternative source is known to be poor
- include contact details for relevant personnel, other agencies that may potentially be involved and external stakeholders like Taumata Arowai, local authorities and consumers.
- confirms how the drinking water supplier intends to:
 - take immediate action to ensure that public health is protected
 - notify Taumata Arowai that the drinking water is or may be unsafe
 - identify and implement measures required to ensure that the problem does not reoccur
 - train staff in emergency and incident response practices.

One of the aims in drafting the plan, is to avoid reliance on particular personnel for key steps and the release of key communications.

Suppliers must review incident and emergency response plans after every major incident and at least every two years. All boil water notice incidents need to be recorded for review and audit.

10. Training and awareness

The drinking water supplier is responsible for ensuring that all people who work on the supply and undertake any operations, maintenance or testing have been trained in the use of the Operations and Maintenance Manual. The competencies associated with the training must be validated for each staff member at least once every three years.

Training records must demonstrate that training and competency validation has been completed.

11. Auditing

Audit purpose

Audits will monitor whether the drinking water supplier is complying with the requirements of this drinking water acceptable solution.

These audits check that the initial installation and document development meets the requirements (adequacy-style audit), and that ongoing operation and maintenance is carried out according to the documentation that was developed (implementation-style audit).

Internal audit

All drinking water suppliers using this drinking water acceptable solution are to undertake their own internal audits every 12 months and make the audit results available to Taumata Arowai.

External audit

Taumata Arowai, or a third party on their behalf, may carry out an audit of how a drinking water supplier has applied this drinking water acceptable solution.

Audit checklist

Where this drinking water acceptable solution is used, the internal audit may confirm:

- The Operations and Maintenance Manual complies with the drinking water acceptable solution and includes but is not limited to:
 - the status and the date of its last update
 - the operations and maintenance requirements of the equipment used in the treatment systems
 - records to show that operations and maintenance for all treatment systems was carried out according to the Operations and Maintenance Manual
 - evidence that operators have been trained to use the Operations and Maintenance Manual and/or by manufacturers if relevant
 - records of maintenance including cartridge filter replacement, lamp changes, and sleeve and UVI sensor cleaning

- whether the UVI alarms are operational (including remote signalling if appropriate)
- whether the visual indication of the UV reactor operation is working
- whether the chlorine system is maintained, and sodium hypochlorite (if used) is less than 3 months old.
- Maintenance and testing records are present for each treatment system including:
 - inspection records for the headworks, storage tank and testing of backflow preventers
 - cartridge filter replacement
 - UV sleeve cleaning
 - UV lamp replacements
 - UVI sensor replacement or calibration
 - chlorine maintenance.
- Water quality testing has been carried out in accordance with this drinking water acceptable solution.
- The supplier has responded to instances of non-compliant water, equipment failures or consumer complaints where appropriate and as per the Incident and Emergency Response Plan in the Operations and Maintenance Manual.