Drinking Water Acceptable Solution for Roof Water Supplies

January 2022

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*.

Document location: <insert Pataka Arawai link>

Contents

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

Acceptable solutions offer ways for small suppliers to ensure that 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 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 required by section 53 of the Act, Taumata Arowai undertook public consultation before making the drinking water acceptable solution for roof water supplies.

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

For more information in relation to drinking water acceptable solutions contact info@taumataarowai.govt.nz.

2. Purpose

This drinking water acceptable solution provides owners and operators of roof water supplies, with an approved solution for achieving 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.

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.

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

3. Definitions

Term	Definition
Appropriate roof	A clean, impervious roof made from non-toxic materials.
Building Code	Schedule 1 of the Building Regulations 1992.
Calmed inlet	An inlet to a storage tank that delivers water to the bottom of the tank through a U-bend, minimising any disturbance of sediment at the bottom of the tank.
Determinand	A constituent or property of the water that can be present in water and may affect taste, odour, colour, clarity or safety.
Drinking water supplier	The person who supplies drinking water by operating a drinking water supply.
Drinking water supply	A single connected system of infrastructure and processes used to abstract, store, treat, transmit or transport drinking water.
First flush diverter	A device used to prevent contaminated roof water from entering a storage tank after the first rainfall following a dry period.
Floating outtake	An outlet from a storage tank through a flexible pipe attached to a float, allowing water to be drawn from the top of the tank.
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 *New Zealand Drinking Water Standards 202X*. *<note the New Zealand Drinking Water Standards 202X 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 safe water is provided.
End point treatment	Treatment systems that are installed at the end point of a supply, including at a household or building supplied by the supply.
Roof water	Rainwater obtained from the roof of the building.
Standards	*New Zealand Drinking Water Standards 202X. <note the New Zealand Drinking Water Standards 202X are currently being consulted on>*
Taumata Arowai	The New Zealand Water Services Regulator, established under the *Taumata Arowai–the Water Services Regulator Act 2020*.
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 roof water. It includes source water testing and specifications for end point treatment 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 roof water supplies where *all* the following criteria are met:

Drinking water use criteria

- Water is supplied to a building, or group of buildings, which share the same roof water source.
- A networked community drinking water supply is not available to the building(s) i.e. the drinking water acceptable solution does not apply to building(s) which is located within the supply area of a reticulated water supply.
- All buildings that require drinking water, and are served by the roof water supply, must receive treated water.
- All water used within a building or buildings fitted with a treatment system, must be treated by that system. Water provided for outdoor water use may be untreated but must be marked as non-potable in accordance with the Building Code.

Water supply size criteria

- The population served by the entire drinking water supply must be less than 500 people.
- There are compliant treatment systems installed such that each building is serviced with treated drinking water.

Treatment system size criteria

- Any treatment system must be designed to meet the peak instantaneous demand for treated water.

5. What does this drinking water acceptable solution cover?

Roof water suppliers who comply with the entirety of 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, roof 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 determinand is detected in a sample that exceeds the MAV (section 22(2)).

6. Design, configuration and installation

These requirements must be met for every serviced building that receives water from a roof water supply.

6.1. Roof water system requirements

The roof water supply must meet the following requirements:

- The roof used for the collection of drinking water must have no trees or other vegetation overhanging it.
- The installed leaf screen must have a maximum mesh size of 1.5mm.
- The installed first flush diverter must be sized appropriately for the roof area prior to the untreated water storage.

6.2. End point treatment system requirements

Each treatment system must have (as a minimum):

- untreated water storage next to the building upstream of the treatment components to hold a minimum of 96 hours average demand
- secured lids on storage tanks
- inlets, overflows and any other small gaps in tanks must be screened by mesh with a maximum mesh size of 1.5mm
- an installed calmed inlet and floating outtake within the untreated water storage tank
- two stage cartridge filtration with 20 micron and 5 micron or less, nominal pore sizes
- a UV disinfection unit that delivers a minimum reduction equivalent dose of 40 mJ/cm^2, with an UVI or dose sensor
- flow control to ensure flow is within the specification of the UV unit
- lamp status indication
- air release valves to allow air to be removed from the system on start up

- manual isolation valves fitted upstream and downstream of the treatment system to allow for maintenance.

Each treatment system must:

- be designed so that all electrical components are connected to mains power through a standard 3-pin 240 volt plug and can be disconnected from mains power if required
- be sized to ensure flow rates comply with *clause G12 Water supplies of the Building Code* and are adequate for the correct functioning of fixtures and appliances within the building. Probable instantaneous flow rates for dwellings can be found in *AS/NZS 3500:2018 (Part 1 Water Services, Table 3.2.3*)
- have the UV disinfection unit validated against:
  - NSF/ANSI 55 for Class A systems
  - UV Disinfection Guidance manual (USEPA)
  - DVGW Technical Standard W294, or
  - öNORM M5873Design
- shutdown flow automatically on a low UVI or dose reading (as per the manufacturer's specification).

6.3. End point treatment system configuration

All treatment systems must be configured according to the following:

- Any building using the roof water drinking water acceptable solution must only use treated water.
- The water supplier is only allowed to augment (top up) the roof water with water from a registered water carrier or a bore or spring that meets the following requirements:
  - Section 6.1. Requirements before the drinking water acceptable solution can be adopted from the *Drinking Water Acceptable Solution for Spring and Bore Drinking Water Supplies*.
  - Section 6.2 Bore and Spring requirements from the *Drinking Water Acceptable Solution for Spring and Bore Drinking Water Supplies*.

  Or
  - Section 10.5. S2 Source water rules from the *Drinking Water Quality Assurance Rules*
- Water from these supplementary sources must be delivered into the untreated water storage tank so that all water provided to the building passes through the treatment system.
- Treatment systems must not be operated:
  - if the UV unit provides a UVI or dose reading below the acceptable level determined by the unit manufacturer
  - if there is a power cut
  - during the lamp warm-up period until the required UVI level or dose is achieved (this may be achieved using either an automated control valve or by controlled start and stop of a pump).
- The treatment system must generate a local alarm if the UVI level or dose is below that recommended by the manufacturer for effective disinfection.

The diagrams below provide examples of how the end point treatment system could be configured. Alternative configurations are acceptable, but they must meet the requirements set out above.

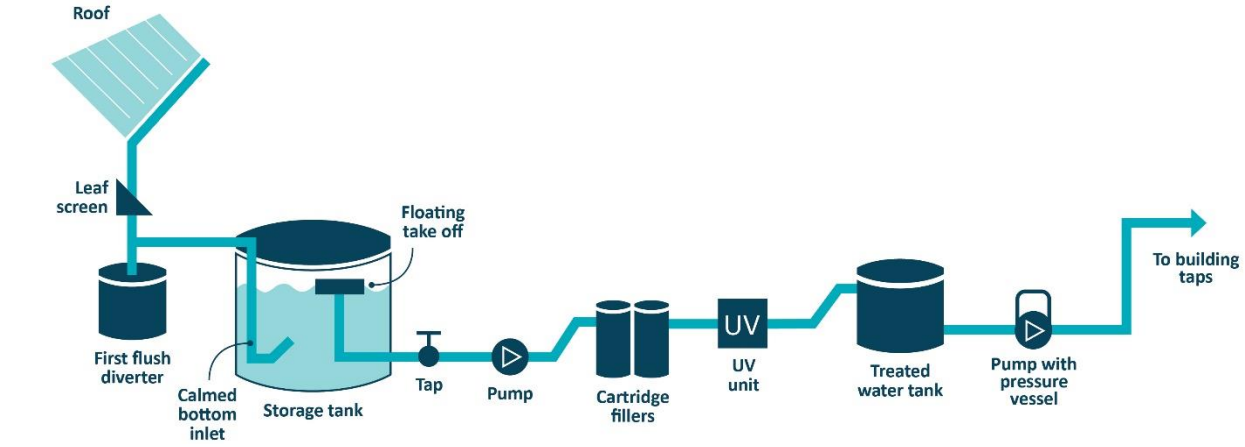

Figure 1. Configuration with pressure pump providing pressure to building taps

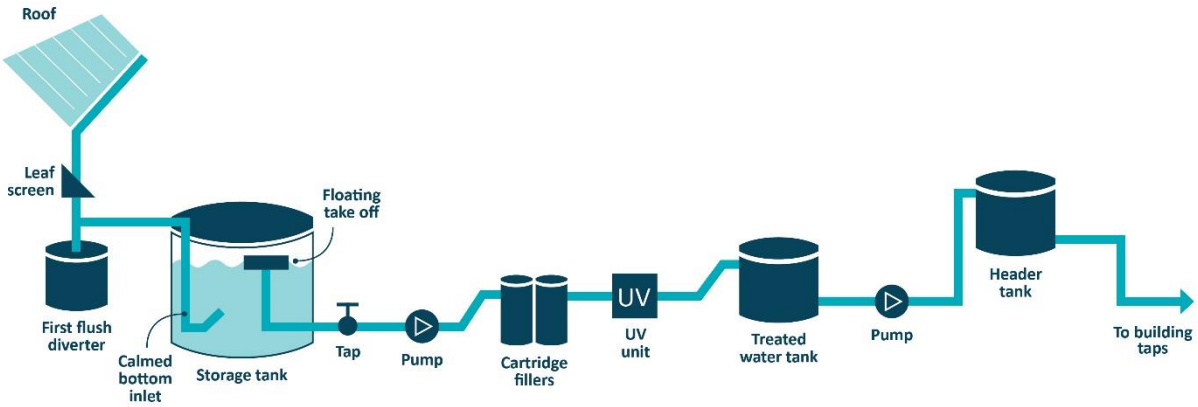

Figure 2. Configuration with header tank providing pressure to building taps

6.4. End point treatment system installation

The treatment system must be installed in accordance with the manufacturer's instructions and by a suitably qualified plumber in accordance with the *Building Code*. All pipework and fixtures must comply with the *Building Code*.

7. Operation and maintenance

The operation and maintenance of the roof water supply, including all building treatment systems under this drinking water acceptable solution, is the responsibility of the drinking water supplier.

7.1. Operations and maintenance manual

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

- a description of the drinking water supply and key components
- a flow diagram that shows all the components in the treatment system, including all valves, pumps and bypasses
- standard operating procedures as outlined in Section 7.2
- incident and emergency response procedures listed in Section 9
- key contacts including operations and maintenance personnel, manufacturers and suppliers, regulators and consumers
- maintenance schedules
- monitoring schedules, procedures and records
- a quick reference troubleshooting section for operators and water suppliers.

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 systems
- regular inspections
- routine maintenance including:
    - roof and gutter cleaning
    - clearing debris
    - roof painting
    - trimming overhanging vegetation.
- protecting the water supply during routine maintenance (e.g., downpipe diverters for when gutters are cleaned)
- 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:

- no vegetation has grown since the last inspection to overhang the roof catchment
- there is no damage to the roof and gutters
- the roof catchment is clean and clear of moss, lichen, debris and leaves
- gutters are free from debris and leaf litter
- water trapped in the gutter is not showing signs of algal growth
- storage tanks are intact to prevent access of vermin or ingress of contaminants
- there is no evidence of rodents, birds or other animals accessing storage tanks
- underground storage tanks are protected from the entry of groundwater
- leaf screens, first flush diverters, calmed inlets and floating outtakes are intact and operating correctly
- cartridge filter systems have the correct cartridge types installed and are operating effectively
- UV systems are installed correctly and operating effectively and according to the manufacturers requirements
- calibration of any process monitoring, or control equipment is being carried out according to, and at the frequency specified by, the manufacturer.

7.4. Maintenance, Inspection and Calibration

The minimum frequency of operation and maintenance visits by the water supplier to the roof water supply is:

- every three months if alarms from the treatment system are notified to the supplier remotely
- every month if alarms from the treatment system are only displayed at the site.

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

- replacing cartridge filters at least every six months, unless the manufacturer recommends a shorter period is necessary given the quality of raw water in the system
- 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 LED UV lamps at the frequency recommended by the manufacturer to achieve the certified UV dose at the end of the lamp life. An alternative UV lamp must be available as a replacement.
- replacing (or calibrating/validating) UVI sensors or dose meters every two years, unless the manufacturer recommends an alternative period to maintain validation status
- cleaning the untreated water tank upstream of the treatment system at least every 10 years. (Further cleaning will be required if inspection finds significant build-up of sludge and/or biological growth).

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
RF1	All testing is to be undertaken by a laboratory that is accredited by International Accreditation New Zealand (IANZ) and listed on the Taumata Arowai register of laboratories.	N/A
RF2	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

Rule Number	Requirement	Limits
RF3	Water sources must be monitored for the following determinands once between June and August when this drinking water acceptable solution is first adopted and then every three years between June and August: • Benzo[a]pyrene. • Cadmium. • Copper. • Lead. • Zinc.	Must not exceed MAV
RF4	Testing for any determined that has a level that exceeds 50% of the MAV must be undertaken monthly.	Must not exceed MAV

Treated water monitoring requirements

Rule Number	Requirement	Limits
RF5	One sample for *E. coli* is to be taken from a tap post-treatment every three months.	Not present

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:
    - insufficient water due to lack of rain
    - damage to the untreated water storage
    - overspray or spray drift incidents (in rural areas)
    - a positive *E. coli* test in the treated water
    - a failure of a component in the UV system

- 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

    - 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. They must record all boil water notice incidents 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.

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

- The treatment system has been designed, configured and installed according to the drinking water acceptable solution requirements. This includes but is not limited to the following requirements
  - The quantity of untreated water storage is sufficient.
  - The treatment system is sized to meet the flow rates required to comply with clause G12 Water supplies of the *Building Code.*
  - The treatment system configurations ensure that untreated water cannot enter the building.
- 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 in accordance with the Operations and Maintenance Manual
  - evidence that operators have been trained in 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
  - details on the use of flow restrictors
  - whether the UVI or dose alarms are operational (including remote signalling if appropriate)
  - whether the visual indication of the UV reactor operation is working.
- Maintenance and testing records are present for each treatment system including:
  - inspection records for the storage tank
  - cartridge filter replacement
  - UV sleeve cleaning
  - UV lamp replacements
  - UVI sensor replacement or calibration.
- 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.