

10 Small Water Supplies, Alternative Compliance Criteria

Including neighbourhood drinking-water supplies and appropriate components of rural agricultural drinking-water supplies.

10.1 Introduction

The *Drinking-water Standards for New Zealand* (DWSNZ) have three main components.

- The water quality standards, which specify the maximum acceptable values (MAVs) at which the risk of disease or illness from drinking the water is negligible (section 2).
- The compliance criteria and reporting requirements, which define the checks needed to demonstrate the water supply is not exceeding these standards. The stringency of these checks reflects the level of risk that the water supply poses.
- The remedial actions.

This section of the DWSNZ applies to drinking-water supplies serving up to 500 people as defined in the Health Act 1956 as amended by the Health (Drinking Water) Amendment Act 2007 (hereinafter referred to as the Act): **Small¹¹, Neighbourhood¹², and Rural Agricultural Drinking-water Supplies¹³**.

The water quality standards are the same for all supplies, regardless of size or type, because they relate to the health effects on people. The compliance criteria provide different levels of certainty that the standards are being met, balancing the risks to public health and costs. From a public health perspective, the more people served the more certainty that is needed.

Small, neighbourhood and rural agricultural drinking-water supplies have two options for demonstrating compliance with the water quality standards.

1. Comply with the requirements in sections 4, 5 and 7 to 9.
2. Follow a Public Health Risk Management Plan (PHRMP) compliance criteria approach (sections 10.2 to 10.5). These are referred to as **participating supplies**.

11. Small drinking-water supply (the Act, section 69G) means a drinking-water supply that:

- a. supplies drinking-water to 101 to 500 people for at least 60 days per year; and
- b. is not a drinking-water supply to which paragraph (a) or paragraph (b) of the definition of neighbourhood drinking-water applies.

12. Neighbourhood drinking-water supply (the Act, section 69G) means a drinking-water supply that is used to supply drinking-water to:

- a. between 25 and 100 people (inclusive) for at least 60 days per year; or
- b. any number of persons for at least 60 days per year if:
 - i. the number of those persons when multiplied by the number of days per year during which those persons receive water from that supply is 6000 or greater, but
 - ii. the number of those persons is not greater than 100 on 60 or more days in any year.

13. Rural agricultural drinking-water supply (the Act, section 69G) means:

- a. a large, medium, minor, small, or neighbourhood drinking-water supply from which 75 percent or more of the water supplied:
 - i. is used for the purposes of commercial agriculture; and
 - ii. does not enter a dwellinghouse or other building in which water is drunk by people or other domestic and food preparation use occurs; but
- b. does not include a drinking-water supply using a single connection to provide water to:
 - i. a town; or
 - ii. a village or other place with a permanent population of 50 people or more that is used primarily for residential purposes.

10.2 Compliance requirements

The following compliance requirements must be met.

1. A PHRMP must have been approved by a drinking-water assessor (DWA) and be in the process of being implemented.
2. Appropriate bacterial and chemical treatment, as determined from the catchment assessment in the PHRMP must be in use.
3. Appropriate protozoal treatment (Table 10.1) must be in use.
4. Water quality must be monitored and meet the requirements of section 10.4.
5. The remedial actions that have been specified in the PHRMP must be undertaken when a MAV is exceeded or treatment process controls are not met.

When the water supplier can show these requirements have been met, the supply will be deemed to comply with the DWSNZ, otherwise the compliance requirements for the supply revert to those in sections 4, 5 and 7 to 9.

When monitoring data show that water quality is unsatisfactory but the steps specified in the PHRMP to improve the water quality are being taken, reversion to the requirements of sections 4, 5 and 7 to 9 may be delayed to provide time to establish the effectiveness of the remedial actions.

10.3 Treatment requirements

10.3.1 Background

The quality of drinking-water at the point of consumption needs to conform to the same standards throughout New Zealand. However, the quality of source waters, from which drinking-water is drawn, varies. Therefore, the degree of treatment required to provide safe water is greater for contaminated water than for clear waters.

Treatment requirements to remove chemicals contaminants are typically based on the average concentration present or thought to be present. In drinking-water, chemicals just exceeding their MAV typically take a long time (months or years) to cause health problems.

For microbial contaminants, treatment requirements to remove hazardous pathogens are typically based on the maximum predicted contamination levels, not merely the average levels, because the effects of microbial contaminants can occur in just hours or days, so the greatest health risk is caused when contamination peaks.

As a minimum requirement, treatment processes must be operated and monitored according to the manufacturer's instructions.

10.3.2 Microbial treatment requirements

Most water needs to be treated before it is considered potable. The exception is bore water supplies that have been demonstrated to be secure (section 4.5), for which no additional treatment is required. If source waters cannot be shown to be free from contaminants, treatment is required to provide a barrier to contamination. If there is any doubt about the quality of the source water, treatment is required.

The likely nature and extent of contamination in the water source should be identified as part of the catchment assessment component of the development of the PHRMP for the water supply. In completing the catchment assessment, consideration should be given to the types of potential contamination sources identified in Table 10.1.

Table 10.1 sets out a scheme for identifying default treatment requirements based on the maximum contamination levels estimated to be present in source waters from catchments with particular characteristics. Alternative approaches can be adopted where these can be justified (section 5).

10.3.3 Chemical treatment requirements

Potential sources of chemical contamination (including cyanotoxins) of the source waters or during the treatment process must be identified in the PHRMP and dealt with by an appropriate process.

Steps should be taken to minimise the amount of contaminant entering the source water, and an appropriate treatment process used if further reduction in the concentration is needed to produce safe drinking-water.

10.4 Water quality monitoring

10.4.1 General

Sampling must be carried out according to a predetermined plan.

Analyses must be carried out by a laboratory recognised by the Ministry of Health as competent to carry out the drinking-water compliance testing, except where special procedures or field analyses are authorised by the Ministry of Health (DWSNZ section 3.1.1).

Procedures for the collection, preservation, storage and transport of samples must be agreed beforehand with the laboratory carrying out the analysis, except where the Ministry of Health authorises special procedures for isolated drinking-water supplies or field analyses.

The supplier must specify in the PHRMP the appropriate steps for providing assurance of satisfactory drinking-water quality management when a microbial sample cannot be sent to a recognised laboratory within the required period at the frequency described, because the supply is:

- isolated from courier routes
- temporarily inaccessible (eg, due to severe weather conditions)
- not able to be monitored by a person certified by a DWA as competent to undertake compliance monitoring.

Table 10.1: Microbial treatment requirements for small supplies of different levels of risk

Summary of catchment type as identified in the catchment assessment of the PHRMP	Minimum treatment requirements	Explanation
Secure bore water.	None required	Secure bore water is considered to be free from microbial contamination.
Protected catchment with controlled human access and no livestock operations (eg, non-secure bore water drawn from a depth greater than 30 m, or surface water that is selectively abstracted, or a rainwater supply)	<i>Bacterial treatment and low protozoal risk</i> Prefiltration or selective abstraction ^{1,2} followed by chlorine disinfection ³ or <i>Bacterial and 2-log protozoal treatment</i> Prefiltration or selective abstraction ^{1,2} followed by UV disinfection ⁴	Disinfection is required to inactivate bacterial pathogens, such as <i>Campylobacter</i> spp. and <i>Salmonella</i> spp., that are known to be present in wildlife.
Partially protected catchment with no sewage discharges or human habitations and no intensive livestock operations harbouring gatherings of pre-weaned and juvenile stock (eg, non-secure bore water drawn from a depth of 10-30 m, or a spring, lake or reservoir, stream or river, or surface water that is selectively abstracted)	<i>Bacterial and 3-log protozoal treatment:</i> Prefiltration or selective abstraction ¹ followed by UV disinfection ⁴ or Microfiltration (eg, cartridge) ⁵ followed by chlorine disinfection ³ or Microfiltration (eg, cartridge) ⁶ followed by UV disinfection ⁴	Disinfection is required to treat bacterial pathogens, such as <i>Campylobacter</i> spp. and <i>Salmonella</i> spp., that are known to be present in stock and wildlife; and the removal or disinfection of moderate levels of protozoan pathogens found in stock animals.
Unprotected catchment with septic tanks and/or sewage discharges from human habitations and/or intensive livestock operations harbouring gatherings of pre-weaned and juvenile stock (eg, non-secure bore water drawn from a depth less than 10 m, or a spring, lake or reservoir, stream or river)	<i>Bacterial and 4-log protozoal treatment:</i> Microfiltration (eg, membrane filter) ⁵ followed by chlorine disinfection ³ or Microfiltration (eg, cartridge) ⁶ followed by UV disinfection ⁴	Disinfection is required to treat bacterial pathogens such as <i>Campylobacter</i> , <i>Salmonella</i> , that are known to be present in stock, sewage and wildlife, and viral pathogens such as norovirus, hepatitis A, known to be present in sewage, and high levels of protozoan pathogens found in stock animals.

Notes:

1. Selective abstraction (achieving a turbidity less than 1 NTU) means taking source water only at a time when it is least contaminated. This ensures substances that may interfere with disinfection are avoided and/or reduced to levels that will not overwhelm disinfection eg, large particles, turbidity, chlorine demand and UV-absorbing substances need to be kept within acceptable levels.
2. Selective abstraction for a rainwater supply includes use of a leaf screen, first flush diverter, bottom tank inlet or floating top draw-off.
3. To meet greater than 0.5 mg/L FAC after 30 minutes' contact with pH less than 8.5 or equivalent C.t.
4. The UV unit must meet (and operate within the specifications of) one of the following standards: NSF/ANSI 55-2002 Class A (NSF and ANSI 2002b); DVGW Technical Standard W294; öNORM M5873-1 (Osterreichisches Normungsinstitut 2001); or equivalent (ie, to deliver at least 40 mJ/cm² validated reduction equivalent dose at the UVT and turbidity present).
5. Pore size must be less than or equal to 1 µm absolute, or tested and rated to remove at least 99.9 percent (3-log) of *Cryptosporidium* spp. oocysts, and the vendor must guarantee the system will meet defined performance standards.
6. The final cartridge before the UV reactor must have a pore size no greater than 5 µm (nominal) and be a rigid cartridge (ie, not pleated), fabric or wound string.

10.4.2 Bacterial monitoring

Compliance monitoring for *E. coli* must be conducted at least three monthly with a maximum interval between successive samples of 135 days. Presence/absence tests or other rapid-test methods for *E. coli* or faecal coliforms that are acceptable to the Ministry of Health may be used for compliance monitoring.

Samples must be taken from randomly selected locations throughout the distribution system.

The testing of samples should start within six hours of sample collection and must not be delayed more than 24 hours after collection. Samples must be transferred to the laboratory in a cool, dark container. It is important the temperature of samples does not increase between the samples being taken and being analysed. To be valid for compliance testing, samples must not be frozen and must arrive at the laboratory at a temperature not greater than 10°C or not warmer than the temperature of the water when it was sampled. If samples cannot be processed immediately on their arrival in the laboratory, they must be stored in a refrigerator no warmer than 5°C.

10.4.3 Protozoal monitoring

Monitoring of protozoa is not required. As a surrogate, inspection and monitoring of the source protection, abstraction and treatment practices and the network protection is required.

The operational requirements that need to be monitored to demonstrate protozoal compliance are dependent on the water treatment process being used. The monitoring programme adopted must be given in the PHRMP.

10.4.4 Chemical monitoring

When any chemical is found in treated water at greater than 50 percent of its MAV it must be noted in the PHRMP and monitored at least annually until its concentration has been found to be less than 50 percent of its MAV in three consecutive samples and a reason for the drop in concentration has been identified.

If chlorine is used as a disinfectant and the presence of disinfection by-products is suspected, samples must be taken as far downstream of the point of disinfection as practicable.

10.5 Responses required when a maximum acceptable value is exceeded or treatment failure is detected

The sampling plan is used to determine whether the MAV or operational requirements:

- are exceeded continually
- are exceeded seasonally or intermittently
- have exceeded the transgression limits as the result of a once-only event.

Actions required to be taken when a MAV is exceeded are defined in the supply PHRMP, which must contain, but is not limited to, the following elements.

- When *E. coli* is detected in a sample there must be an immediate response to discover the reason and minimise the likelihood of a recurrence (Figure 4.2).

- When a protozoal treatment process fails to perform within its operational requirements defined in the PHRMP, remedial action must be agreed with the DWA or medical officer of health and carried out.
- A **sanitary inspection of the water supply** is conducted.
- If a permanent 'Boil Water' notice is issued, approved signage must be displayed next to all taps connected to the supply.
- If the concentration of any chemical exceeds its MAV, remedial action must be agreed with the DWA or medical officer of health and carried out.

In many places in New Zealand, the water is plumbosolvent (ie, it corrodes metal plumbing fittings) and may give rise to undesirable concentrations of lead or other metals in the supply. It is not necessary to test for this, but consumers must be warned at least annually of this fact and advised to flush about 500 mL of water (about two standard glasses) from the tap each morning before drawing water for drinking.