

DRAFT
Drinking Water Quality
Assurance Rules
20 December 2021



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1 Introduction

These Drinking Water Quality Assurance Rules (the Rules) set out the requirements that drinking water suppliers must meet as part of their responsibility to demonstrate that they are supplying safe drinking water.

The Rules cover water quality operational requirements from source water abstraction to the point of supply to a consumer (not the consumer's tap).

Compliance with the Rules will demonstrate that water provided by suppliers is not exceeding the maximum acceptable values (MAVs) for determinands that are set out in the *New Zealand Drinking Water Standards 202X (which are still to be determined)*.

Where MAVs cannot be (or are not) used to measure compliance, treatment efficacy is used as the surrogate criteria for demonstrating compliance. When surrogate criteria are used, the Rules specify operational requirements, compliance with which is considered to give confidence that a treatment barrier is working effectively.

Free available chlorine (FAC) and compliance with filter performance parameters such as turbidity are examples of this. These surrogate criteria have the important benefit of being able to be measured frequently and even continuously onsite so that real time feedback about treatment performance can be achieved.

The Rules set out minimum compliance requirements only and water suppliers may need to undertake additional measures, including the management of risks, to ensure that water provided to consumers is safe to drink.

The safety of drinking water is assured when multiple barriers to contamination are in place. These barriers include:

- Preventing hazards from entering the source water.
- Removing particles, pathogens, chemical and radiological hazards from the water by physical treatment.
- Killing or inactivating any pathogenic organisms that may be present in the water by disinfection.
- Maintaining the quality of treated water in the distribution system.

The Rules have been prepared by Taumata Arowai in accordance with the Water Services Act 2021, including the public consultation requirements set out in the Act. The Rules are disallowable instruments for the purposes of the Legislation Act 2012.

Taumata Arowai recognises that the Rules may need to be adjusted from time to time, based on operational experience or developments in water services activities and understanding. Taumata Arowai will establish a mechanism for drinking water suppliers to provide feedback on the implementation of these rules that may be considered as part of the update processes.

The Rules do not set quality requirements for bottled water or water used for industrial or agricultural purposes. For people with certain medical conditions, or for uses of water for purposes other than drinking (e.g. kidney dialysis), additional or other water quality criteria may apply.

Key terms used in these Rules are defined in Section 11, Definitions.

1.1 Water Services Act 2021

These Rules have been prepared pursuant to Part 2, Subpart 6, section 49 of the Water Services Act 2021, which allows Taumata Arowai to make rules setting out requirements relating to the performance of water supplier functions or duties under Part 2 of the Act.

These Rules primarily impose requirements relating to drinking water supplier duties to:

- supply safe drinking water¹
- ensure that drinking water complies with the *New Zealand Drinking Water Standards 202X (which are still to be determined)*.²

Aspects of the Rules relate to drinking water supplier functions or duties under other provisions in Part 2 of the Water Services Act 2021.

1.2 Components of a Drinking Water Supply

A drinking water supply comprises the infrastructure and processes used to abstract water from a source and to store, treat, transmit, or transport drinking water for supply to consumers. It will generally have one or more of each of the following components:

- source water
- water treatment plant
- distribution system.

Networked supplies are those that convey water through a reticulated distribution system.

Through the registration process, Taumata Arowai allocates code numbers to registered water supplies, sources, treatment plants and distribution zones.

Water Carrier Services are drinking water suppliers who use vehicles to carry water, for supply to other drinking water suppliers or consumers. Taumata Arowai allocates code numbers to registered Water Carrier Services.

¹ Water Services Act 2021, section 21.

² Water Services Act 2021, section 22.

1.3 Water Supply Categories

The Rules have been prepared for the following water supply categories:

1. On-demand Networked Drinking Water Supplies –

Water supplies that provide water via a piped network at a pressure and volume to meet consumer demand. These supplies may include storage facilities within the network to buffer demand. The Rules have been prepared for supplies with the following population sizes:

- < 50 (Very Small Supplies).
- 50 – 500 (Small Supplies).
- >500 (Large Supplies).
- Varying Population Size Supplies.

Varying Population Size Supplies are supplies where for most of the time there is a stable base population but at certain times the population increases significantly. An example is a small community with a number of holiday homes where the population may double over the holiday season.

2. Trickle Feed Water Supplies –

Water supplies which provide water at an agreed allocation (trickle feed) to a point of supply storage tank on a consumers' property. Typically, these supplies provide domestic or stock water in rural areas with an agreed quantity over a period of 24 hours.

3. Self-supplied Building Drinking Water Supplies –

Water supplies which provide water to a single building. This category does not include a single domestic dwelling.

4. Water Carrier Services –

Water that is supplied from a vehicle with a water tank (e.g. a truck, trailer, or rail wagon), often to a storage tank on a property. Typically, Water Carrier Services provide potable water to houses that have their own supply but need the quantity of stored water to be augmented. Water Carrier Services can also augment other water supplies particularly during droughts and emergencies and provide water to temporary planned events. Water Carrier Services that fill tankers from their own supply (Water Carrier Supply), must register that supply and comply with the Community Drinking Water Stations/Water Carrier Supplies Rules.

5. Planned Event Temporary Drinking Water Supplies – Short term events where people gather and where a water supply is required for the duration of an event which continues for a limited time of less than 60 days. Typically, this category includes events like music festivals, farm field days, civil defence or military exercises.

Planned temporary events do not meet the definition of a drinking water supply under the Water Services Act 2021 but Taumata Arowai can make rules for Planned Temporary Event Drinking Water Supplies under section 49 1 (b) of the Water Services Act 2021

Planned event temporary drinking water supplies are not emergency supplies which are dealt with differently under the Water Services Act 2021.

6. **Community Drinking Water Stations/Water Carrier Supplies –**

Community drinking water stations are supplies that provide water from a single site to a community who collect the water in containers. Public taps or container filling stations that are connected to a network supply (e.g. community taps that provide water which is chlorinated and then de-chlorinated) are not considered to be community drinking water stations.

Water Carrier Supplies are drinking water supplies owned and operated by water carriers and used by them to fill tanker vehicles used to carry water. These supplies use water from a designated source (bore, spring or surface water) but do not provide water via a piped network to properties or buildings.

Some water supply distribution systems include zones with on-demand connections and zones with trickle feed connections. The category of supply is determined by the zone that is supplied with water from the treatment plant first.

1.4 Structure of the Rules

The Rules are structured as ‘modules’ for source water, treatment systems and distribution systems.

The modules include rules which cover the following areas:

- **Source water (S)** – including monitoring for bacteriological, protozoal, chemical, cyanobacteria and radiological determinands.
- **Treatment systems (T)** – including criteria for bacterial compliance, protozoal compliance, chemical compliance and cyanotoxin compliance.
- **Distribution systems (D)** – including rules for backflow prevention, preventing recontamination of stored water, hygiene practices for maintenance and upgrades, monitoring disinfection by-products and microbial water quality.

There are modules for three complexity levels for each of the source, treatment and distribution rules.

A module for general rules is also provided for all supplies. Additional rule modules are provided for Water Carrier Services and Planned Temporary Event Water Suppliers.

Each water supply must demonstrate compliance against the modules relevant to the supply. Water suppliers can elect to demonstrate compliance against a more complex rule module for source, treatment or distribution rules if they choose to, i.e. a water supply required to comply with the treatment module T2 may elect to comply with the treatment module T3.

The following tables (Table 1 and Table 2) set out the rules structure. Subsequent sections set out which modules each supply category must demonstrate compliance against. Some supply categories have specified rules in addition to the module rules and some have exceptions to some module rules.

Rule type codes

G = General rules

S = Source water rules

T = Treatment rules

D = Distribution rules

WC = Water Carrier Service Rules

PTE = Planned Temporary Event Drinking Water Supplies Rules

Rules complexity levels

1 = simple

2 = moderate

3 = complex

Table 1. Rules modules

G		
S 1	T 1	D 1
S 2	T 2	D 2
S 3	T 3	D 3
WC	PTE	

Table 2. Supply categories and rules that apply to them

1. On-demand	Rule modules that compliance is demonstrated against
a) Very Small Drinking Water Supplies (<50)	G + S1 + T1 + D1
b) Small Drinking Water Supplies (50-500)	G + S2 + T2 + D2
c) Large Drinking Water Supplies (>500)	G + S3 + T3 + D3

d) Varying Population Size	G + S2 + T2 + D2³
2. Trickle Feed Water Supplies	
Any population size	G + S2 + T2 + D2
3. Self-supplied Building Drinking Water Supplies	
a) <50	G + S1 + T1
b) >50	G + S2 + T2
4. Water Carrier Services	
Any population size	G + WC
5. Planned Temporary Event Drinking Water Supplies	
Any population size	G + PTE⁴
6. Community Drinking Water Stations/Water Carrier Supplies	
Any population size	G + S2⁵ + T2

³ Additional monitoring requirements when population exceeds 500

⁴ Specific requirements determined on a case-by-case basis

⁵ Chlorine disinfection rules do not apply

2 Application of the Rule Modules

Water suppliers must select the rule modules that apply to their supply and demonstrate compliance against those rules. For example, if an on-demand water supply serves 10,000 people, level 3 rules must be used for all source, treatment and distribution compliance regardless of the number of people served by any single source, treatment plant or distribution zone. If a distribution zone in a community of 10,000 people serves only 450 people, that zone must still demonstrate compliance against the level 3 rules.

Any water supplier can elect to demonstrate compliance with a higher level of source, treatment or distribution rules if they choose. For example, a small supply which is required to comply with the level 2 rules for source, treatment and distribution, may choose to demonstrate compliance against the level 2 rules for source and distribution but the level 3 rules for treatment if that is more suitable for them. In that case the rules they would demonstrate compliance against would be **S2 + T3 + D2**.

3 Compliance and Reporting

Water suppliers only need to demonstrate compliance against these rules for periods when a water supply is operating. For example, a treatment plant may operate intermittently to fill a treated water storage tank. Compliance for the treatment plant only needs to be demonstrated for the time that the plant is operating to fill the storage tank. If a treatment plant operates for part of a compliance period, data/information must be reported for that compliance period. The distribution zone supplied from the treated water storage tank will be in operation even when the plant is not, so demonstration of compliance for the distribution zone will be continual.

Reporting requirements

Reporting requirements are set out in the General Rules and are based on the rules modules that water suppliers elect to demonstrate compliance against. Suppliers demonstrating compliance against the level one rules must report a limited set of compliance data to Taumata Arowai every six months. Suppliers demonstrating compliance against level two rules must report a limited set of data every three months and suppliers demonstrating compliance against level three rules must report a limited set of data each month. The determinands/parameters that must be reported on in the above timeframes are set out in the General Rules. Other determinands/parameters or operational requirements must be reported to Taumata Arowai annually.

Monitoring rules

Monitoring rules are the rules that must be complied with to demonstrate compliance with the New Zealand Drinking Water Standards 202X (to be determined), i.e. that MAVs are not exceeded. Monitoring rules cover determinands and parameters that need to be either continuously monitored or regularly sampled. They have compliance periods associated with them, i.e. the time period over which compliance is measured. If water suppliers do not undertake any monitoring for any period of time, they must also report that to Taumata Arowai

Suppliers must assess their compliance with the rules and provide a report of compliance to Taumata Arowai as set out in the General Rules.

One day compliance periods

Any determinand that is continuously monitored or sampled daily has a compliance period of 24 hours (midnight to midnight). Each compliance report must indicate for the limited set of compliance data, the number of compliant days in the reporting period. It must also provide a report for each non-compliant day, outlining the reasons for any non-compliance.

Compliance is assessed as the number of days that compliance was achieved during the previous 365 days.

One-week compliance periods

Rules that require weekly monitoring have a compliance period of one week (midnight Sunday to midnight the following Sunday). Each monthly compliance report must indicate, for the limited set of compliance data, the number of compliant weeks in the reporting period. It must also provide a report for each non-compliant week, outlining the reasons for any non-compliance.

Compliance is reported as the number of weeks that compliance was achieved during the previous 52 weeks.

One-month compliance periods

Rules that require monthly monitoring have a compliance period of one calendar month. Each monthly compliance report must indicate, for the limited set of compliance data, the number of compliant months in the reporting period. It must also provide a report outlining any reasons for non-compliance.

Compliance is reported as the number of months that compliance was achieved during the previous 12 months.

One-year compliance periods

For all other determinands and parameters, compliance is reported annually (from midnight 1 July to midnight 30 June). Annual reporting is still required even if the determinand is only monitored once every three years or once every five years.

Assurance rules

Assurance rules cover activities that water suppliers need to undertake, for example the preparation of a backflow prevention programme or a distribution zone sampling plan. Assurance rules are not used to demonstrate compliance with the New Zealand Drinking Water Standards 202X (to be determined) but indicate to Taumata Arowai whether water suppliers are undertaking activities that contribute to the provision of safe drinking water. Assurance rules have a compliance period of one year. Compliance with assurance rules needs to be reported to Taumata Arowai within 10 working days of the end of June each year, but they may also be the subject of planned or targeted audits of a water supply that Taumata Arowai may undertake.

3.1 Operational Rules

Respective sections set out the operational rules for different categories of drinking water supply. The rules represent minimum requirements that a drinking water supplier must achieve.

Source water

2rules

Water suppliers are required to monitor a range of determinands in source water to understand which determinands are present in the water and how the levels compare to the MAVs set out in the *New Zealand Drinking Water Standards 202X (to be determined)*. Water quality may change over time or in relation to environmental conditions, land use or

weather events. It is important that water suppliers understand baseline source water quality and how that quality may change so they can ensure that treatment systems are appropriate and operating effectively. Water suppliers also need to understand how changes in water quality may challenge water treatment systems.

Source water rules set out the minimum rules a water supplier must follow for monitoring source water quality.

All source water types are covered by these rules. Where a water supply abstracts water from multiple sources, the rules apply to each source.

Treatment Plant Rules

Treatment plant and treatment system rules set out the minimum compliance requirements for drinking water leaving a treatment plant. Regular monitoring is required to provide evidence that treatment processes have been effective for the range of contaminants and hazards that may affect the source water. The rules are based on four key outcomes:

- Monitoring to ensure determinands do not exceed the MAVs set out in the *New Zealand Drinking Water Standards 202X (to be determined)*.
- Effective particle removal, to remove protozoa, provide the conditions for disinfection to be effective, and reduce levels of some chemical contaminants found in source water.
- Effective disinfection which ensures the correct disinfectants and conditions are provided to kill or deactivate target micro-organisms.
- Effective management of chemical dosing to avoid chemical carry-over or problematic chemical by-products entering the distribution system.

Treatment systems must provide multiple barriers to contaminants. The treatment rules have been prepared for bacterial, protozoal, chemical and cyanotoxin contaminants. Different treatment systems may be required for different contaminant types though some treatment systems can be effective against more than one type of contaminant. For instance, common treatments, such as conventional coagulation-flocculation-filtration and chlorination are effective at dealing with multiple contaminants.

Water suppliers are required to demonstrate that water has been disinfected to kill or inactivate bacterial pathogens. For disinfection processes to be effective water must have low levels of turbidity.

The risk of infection from drinking water contaminated by waterborne protozoa is affected by many factors. The two most important factors are:

- concentration of infectious protozoal (oo)cysts in the raw water
- extent to which (oo)cysts are inactivated or removed by the treatment processes.

The compliance criteria for protozoa are based on the probability that the treatment process has inactivated (by disinfecting to achieve the prescribed C.T. value) and/or removed (by achieving target filtrate turbidity) any protozoa present. To take account of the cumulative effect of a series of treatment processes on the treatment of protozoa, a 'log credit' approach is used for large supplies, where 'log' is a reference to a logarithmic scale.

The log credit approach identifies the level of *Cryptosporidium* treatment, based on a log scale (multiples of 10, e.g., 90%=1 log reduction, 99%=2 log reduction, 99.9%=3 log reduction), that is required for dealing with a range of source waters. Treatment processes need to match or exceed the log level of treatment that is identified for the type of source water that is being used. The use of a logarithmic scale is necessary because of the enormous range of concentrations of (oo)cysts that can occur, up to millions per mL. For small and other supplies the log credit approach is not used as a maximum turbidity level approach is taken.

Distribution System Rules

Distribution system rules set out the minimum compliance requirements for water in a distribution system. The rules are based on two key outcomes:

- maintaining the integrity (barrier) of the distribution system (reticulation piping and treated water storage) to prevent contamination of treated water at all times
- maintaining effective disinfection, to inactivate microorganisms, throughout the entire distribution zone.

Disinfection system rules cover drinking water suppliers' responsibilities for backflow protection, hygiene procedures, monitoring of FAC, microbiological monitoring and for large supplies the operation and maintenance of storage reservoirs and monitoring of disinfection by-products.

4 On Demand Network Drinking Water Supplies

The following rules for on demand supplies apply to networked drinking water supplies that provide water at a pressure and volume to meet consumer demand. Rules are for Very Small Drinking Water Supplies (<50 people), Small Drinking Water Supplies (50-500 people), Large Drinking Water Supplies (>500 people) and Varying Population Supplies Drinking Water Supplies.

4.1 Very Small Drinking Water Supplies

The following rules apply to drinking water supplies that provide networked drinking water to a population of less than 50 people.

Very Small Drinking Water Supplies must demonstrate compliance with the following rule modules:

G + S1 + T1 + D1

4.2 Small Drinking Water Supplies

The following rules apply to drinking water supplies that provide networked drinking water to a population of between 50 and 500 people.

Small Drinking Water Supplies must demonstrate compliance with the following rule modules:

G + S2 + T2 + D2

4.3 Large Drinking Water Supplies

The following rules apply to drinking water supplies that provide networked drinking water to a population greater than 500 people.

Large Drinking Water Supplies must demonstrate compliance with the following rule modules:

G + S3 + T3 + D3

4.4 Varying Population Size Drinking Water Supplies

The following rules apply to drinking water supplies that provide networked drinking water to a population which does not change significantly for most of a year but increases at specific times during the year.

Varying Population Size Drinking Water Supplies that have a base population of less than 500 people must demonstrate compliance with Rule E1 and the following rule modules:

G + S2 + T2 + D2

Rule Number	Requirement	Assurance/ Monitoring	Compliance period
E 1	When the population exceeds 500 people, increased daily and weekly monitoring must be undertaken at the frequencies set out in Table 3 for the day or week that the population increase occurs.	Monitoring	1 Day Or 1 Week as set out in Table 3

Varying Population Size Drinking Water Supplies that have a base population of more than 500 people must demonstrate compliance with the following rule modules:

G + S3 + T3 + D3

The distribution system monitoring requirements must increase according to the frequencies set out in the **D3** rules for the periods that the population is increased above the base population.

Table 3. Varying Population Size Increased monitoring requirements when population exceeds 500

Parameter	Monitoring Frequency	Limit	Notes
[For each day that the population exceeds 500			
Source water turbidity	Daily	No limit	
Turbidity of water leaving the treatment plant	Twice daily	0.5 NTU	There must be at least 6 hours between the collection of samples.
FAC of water leaving the treatment plant	Twice daily	Not less than 0.5mg/L	There must be at least 6 hours between the collection of samples.
pH of water leaving the treatment plant	Twice daily	Between 6.5 and 8.0	There must be at least 6 hours between the collection of samples.
FAC of water in the distribution system	Twice daily	Not less than 0.2mg/L	There must be at least 6 hours between the collection of samples.
pH of water in the distribution system	Twice daily	Between 6.5 and 8.0	There must be at least 6 hours between the collection of samples.
For each week that the population exceeds 500			
Ongoing inspections (between October and May) of area around a surface water intake for the presence of benthic cyanobacterial	Weekly	N/A	N/A

mats and/or planktonic cyanobacterial growth.			
<i>E. coli</i> and total coliforms in water leaving the treatment plant	weekly	<1/100mls for <i>E. coli</i> No limit for total coliforms	There must be at least 4 days and no more than 8 days between sample collection
<i>E. coli</i> and total coliforms in water in the distribution system	weekly	<1/100mls for <i>E. coli</i> No limit for total coliforms	There must be at least 4 days and no more than 8 days between sample collection

5 Trickle Feed Water Supplies

Trickle Feed Water Supplies must demonstrate compliance with Rule F1 and the following rule modules:

G + S2 + T2 + D2

Rule Number	Requirement	Assurance/ Monitoring	Compliance period
F 1	Water supply into the on-site storage tank must be via an air-gap, the tank overflow must be below the discharge point of the inlet and the overflow diameter must be larger than the inlet diameter.	Assurance	1 Year

Water suppliers of Trickle Feed Water Supplies that are rural agricultural supplies have the option of adopting the *Drinking Water Acceptable Solution for Rural Agricultural Water Supplies* as an alternative to demonstrating compliance against the Trickle Feed Water Supplies Rules.

6 Self-Supplied Building Drinking Water Supplies

Self-supplied Building Drinking Water Supplies must demonstrate compliance with the following rule modules:

Supplies serving less than 50 people

G + S1 + T1

Supplies serving between 50 and 500 people

G + S2 + T2

Self-Supplied Building Drinking Water suppliers have the option of adopting the *Drinking Water Acceptable Solution for Roof Water Supplies* if they use roof water as a water source or the *Drinking Water Acceptable Solution for Spring and Bore Drinking Water Supplies* if they use bore or spring water as a source, as an alternative to demonstrating compliance against the Self-Supplied Building Drinking Water Supplies Rules.

7 Water Carrier Services

Water Carrier Services must demonstrate compliance with the following rule modules:

G + WC

8 Planned Event Temporary Drinking Water Supplies

Planned Event Temporary Drinking Water Supplies must demonstrate compliance with the following rule modules:

G + PTE

9 Community Drinking Water Stations/Water Carrier Supplies

Community Drinking Water Stations and Water Carrier Supplies must demonstrate compliance with the following rule modules:

G + S2 + T2⁶

⁶ Does not include the T2 rules for chlorine disinfection.

10 Compliance Rule Modules

10.1 G. General Rules

Rule Number	Requirement	Assurance/ Monitoring	Compliance period
G 1	All water suppliers (excluding Water Carrier Services) must report water quality monitoring information to Taumata Arowai within 10 working days of the timeframes set out in Table 4.	Assurance	N/A
G 2	Monitoring must be undertaken and reported for the determinands/parameters set out in Table 5.	Monitoring	N/A
G 3	All samples collected from water supplies for monitoring that are analysed by laboratories must be labelled with the unique sample identifier allocated by Taumata Arowai that enables identification of the source, treatment plant, distribution zone or Water Carrier Service where the sample was collected.	Assurance	1 Year
G 4	All water samples for <i>E. coli</i> , total coliforms or other micro-biological contaminants must be delivered to a laboratory within 24 hours of the sample being collected and must be transported at a temperature of less than 6 degrees Celcius		
G 5	Equipment used for the analysis of single samples (grab samples) to demonstrate compliance with any rule must be calibrated in accordance with the instrument manufacturer's specified procedures and frequency.	Assurance	1 Year
G 6	All work (planned or unplanned) on a water supply must be completed by suitably trained or experienced personnel.	Assurance	1 Year
G 7	All people working on a water supply must: <ul style="list-style-type: none"> a) maintain personal hygiene at all times b) not be experiencing any gastrointestinal illness c) protect the work site, materials and tools from contamination d) take all reasonable steps to minimize the entry of contamination into the water supply during their activity. 	Assurance	1 Year

G.8	<p>Continuous on-line monitoring equipment used to demonstrate compliance with any rule must be:</p> <ul style="list-style-type: none"> • Calibrated in accordance with the instrument manufacturer's specified procedures and frequency or monthly whichever is more frequent. <p>Have calibration verified in accordance with the instrument manufacturers specified procedures weekly.</p>	Assurance	1 Year
G.9	For all continuous monitoring equipment, the separation between data records must be no more than 1 minute. ⁷	Assurance	1 Year
G.10	Generation of continuous monitoring data must not be interrupted for a period of more than 15 consecutive minutes, or for a total of more than 72 minutes in a one-day compliance period, for compliance to be achieved.	Assurance	1 Year

Table 4. Reporting timeframes

Rule modules	Reporting timeframes ⁸ for determinands/parameters set out in table 5	All other determinands/parameters
S1, D1 rules ⁹	Every 6 months (end of June, end of December)	Annually for year ending June
S2, T2, D2 rules	Every 3 months (end of March, June, September, December)	Annually for year ending June
T3, D3 rules ¹⁰	Every month	Annually for year ending June

Table 5. Reporting parameters

Rule modules that compliance is demonstrated against	Determinands/parameters that must be reported to Taumata Arowai	Relevant rules
S1 rules	<i>E. coli</i> , total coliforms	S1.1

⁷ Separation between data records of up to five minutes is allowed for FAC analysers where the minimum cycle time specified by the analyser manufacturer exceeds 1 minute.

⁸ If a water supplier demonstrates compliance against rules from different levels e.g. + S2 + T3 + D2, reporting of monitoring for all rules must be the same as the timeframe that is most frequent (e.g. in the example above, monitoring for S2 and D2 would be monthly because the monitoring requirements for T3 rules is monthly).

⁹ 6 monthly reporting is not required for T1 rules

¹⁰ Monthly reporting is not required for S3 rules

D1 rules	<i>E. coli</i> , total coliforms	S1.2
S2 rules	<i>E. coli</i> , total coliforms	S2.1, S2.2, S2.3
T2 rules	FAC, turbidity, pH, UV dose	T2.1
D2 rules	<i>E. coli</i> , total coliforms, FAC, pH	D2.1
T3 rules	FAC	T3.1
	pH	T3.1
	Turbidity Reporting must be against the turbidity limit set in the rule that applies to the protozoa treatment process being used	T3.1, T3.4, T3.5 T3.16 to T3.81 depending on protozoa treatment process
	Ozone residual (if ozone is used as a disinfectant)	T3.6
	UV dose (if UV is used as a disinfectant)	T3.10, T3.79, T3.80, T3.81
D3 rules	FACE	D3.20, D3.21
	<i>E. coli</i> , total coliforms	D3.27

10.2 S1. Source water rules

Rule Number	Requirement	Assurance/ Monitoring	Compliance period
S1.1	Surface and groundwater sources must be monitored for the determinands and at the frequency set out in Table 6.	Monitoring	As set out in Table 6
S1.2	Roof water sources must be monitored for the determinands and at the frequency set out in Table 7.	Monitoring	As set out in Table 7
S1.3	Consumer taste or odour complaints which have the potential to relate to cyanotoxins must be recorded and investigated to determine the cause.	Assurance	1 Year
S1.4	Between October and May, the water and area within 50 metres to a surface water intake must be visually inspected each month for the presence of benthic cyanobacteria mats and planktonic cyanobacterial growth. If there is evidence of cyanobacterial growth the abstracted water must be tested for cyanotoxins or abstraction of water must stop\	Assurance	1 Year
S1.5	If cyanotoxin levels exceed 50% of the MAVs set out in the <i>New Zealand Drinking Water Standards 202X (to be determined)</i> , the source water or raw water for combined sources, must be monitored twice weekly for cyanotoxin levels.	Monitoring	1 week
S1.6	Samples must be collected at the source abstraction point or treatment plant (prior to treatment) for surface or groundwater supplies and at the tank outlet for roof water supplies.	Assurance	1 Year

Table 6. S1 Source Water Monitoring Determinands for Surface Water and Ground Water

Contaminant Group	Determinands	Sampling Frequency	Compliance period
Bacterial	<i>E. coli</i> and total coliforms.	Every six Months	1 Year
Physico-chemical	arsenic, boron, calcium, magnesium, nitrate potassium, bromide, iron, manganese, total organic carbon.	Every three years ¹¹ ,	1 Year

Table 7. S1 Source Water Monitoring Determinands for Roof Water

Contaminant Group	Determinands	Sampling Frequency	Compliance period
Bacterial	<i>E. coli</i> and total coliforms.	Every six months	1 Year
Chemical	cadmium, copper, zinc, lead, benzo [a] pyrene (In winter – June, July or August).	Every three years	1 Year

¹¹ Monitoring must be three monthly if any result exceeds 50% of the MAV.

10.3 T1. Treatment rules

T1 rules require drinking water supplies to include filtration and UV disinfection treatment steps.

Rule Number	Requirement	Assurance/ Monitoring	Compliance period
T1.1	Water abstracted from a river or stream or other source that has intermittently elevated turbidity, must be either filtered by a back-washable media filter, selectively abstracted or provided to a raw water tank (minimum 10,000 litres) with a calmed bottom inlet and floating off take to ensure turbidity is lowered so that it is suitable for further treatment.	Assurance	1 Year
T1.2	All water must be filtered by a cartridge filter system that includes both a 5 micron and a 1-micron cartridge.	Assurance	1 Year
T1.3	The flow through the filters must be within design specifications for the treatment processes 100% of the time.	Assurance	1 Year
T1.4	Pumps must not be connected directly to the discharge side of a cartridge filter. After filtration, the filtrate must pass directly to a tank if there is subsequent pumping.	Assurance	1 Year
T1.5	Filtered water must be disinfected with UV light after filtration.	Assurance	1 Year
T1.6	UV units must be operated according to the manufacturers instructions and must be validated and operated to deliver a minimum of 40 mJ/cm ² or equivalent UV dose.	Assurance	1 Year

10.4 D1. Distribution system rules

Distribution system rules cover two areas, routine monitoring and backflow protection.

Rule Number	Requirement	Assurance/ Monitoring	Compliance period
D1.1	Water in the distribution system must be monitored for the determinands and at the frequencies set out in Table 8 and any other determinands identified in the supply Source Water Risk Management Plan.	Monitoring	1 Year
D1.2	A backflow prevention device must be fitted at any place in the distribution system where there is a high or moderate risk of backflow	Assurance	1 Year

Table 8. D1 Distribution System Monitoring Determinands

Determinands	Limits	Sampling Frequency	Compliance period
<i>E. coli</i>	<1/100mls	Every six months	1 Year
Total coliforms	No limit	Every six months	1 Year
antimony, cadmium, chromium, copper, lead, mercury, nickel, zinc	Must not exceed MAV	Annually ^{12,13}	1 year

¹² Must be sampled monthly if the determinand exceeds 50% of its MAV

¹³ Sampling must begin within 3 months of supply being registered

10.5 S2. Source water rules

Rule Number	Requirement	Assurance/ Monitoring	Compliance period
S2.1	Surface water sources must be monitored for the determinands/parameters and at the frequency set out in Table 9.	Monitoring	As set out in Table 9
S2.2	Bore water sources must be monitored for the determinands/parameters and at the frequency set out in Table 9 and Table 10.	Monitoring	As set out in Table 9 and Table 10
S2.3	Roof water sources must be monitored for the determinands and at the frequency set out in Table 11.	Monitoring	As set out in Table 11
S2.4	Additional monitoring of source water must be undertaken for any contaminants which exceed 50% of the MAVs set out in the <i>New Zealand Drinking Water Standards 202X (to be determined)</i> .	Monitoring	1 Month
S2.5	Water sources must be categorised as either low-risk, medium-risk or high-risk for the presence of cyanobacteria.	Assurance	Annual
S2.6	When a water supply is categorised as medium or high-risk under rule S2.5, a cyanobacteria/cyanotoxin response plan must be prepared which includes vigilance levels for assessing the presence of cyanobacteria, alert levels related to the presence of cyanotoxins and monitoring for cyanotoxins.	Assurance	Annual
S2.7	If cyanotoxin levels exceed 50% of the MAVs set out in the <i>New Zealand Drinking Water Standards 202X (to be determined)</i> , the source water must be monitored twice weekly for cyanotoxin levels.	Monitoring	1 week
S2.8	Samples must be collected at the source abstraction point or treatment plant (prior to treatment) for surface water or groundwater supplies and at the tank outlet for roof water supplies.	Assurance	1 Year
S2.9	Source water quality monitoring data must be reviewed annually for trends and signals of changes in parameters that might indicate an unrecognized change to the quality of the source water and possible challenges to the level of treatment provided.	Assurance	1 Year

Table 9. S2 Source Water Monitoring Determinands/Parameters for Surface Water and Ground Water

Contaminant Group	Determinands/Parameters	Sampling Frequency	Compliance period
Bacterial	<i>E. coli</i> and total coliforms.	Monthly	1 Month
Physico-chemical	arsenic, boron, calcium, magnesium, nitrate potassium.	Every three years ¹⁴ ,	1 Year
	bromide, iron, manganese, total organic carbon.	Annually	1 Year
	pH, turbidity, conductivity.	Monthly	1 Month

Table 10. S2 Additional Source Water Monitoring Determinands for Ground Water (Spring and Bore)

Contaminant Group	Determinands	Sampling Frequency	Compliance period
Radiological	Gross alpha activity. Gross beta activity.	Every five years	1 Year

Table 11. S2 Source Water Monitoring Determinands for Roof Water

Contaminant Group	Determinands	Sampling Frequency	Compliance period
Bacterial	<i>E. coli</i> and total coliforms.	Monthly	1 Month
Chemical	cadmium, copper, zinc, lead, benzo [a] pyrene (In winter – June, July or August).	Every three years	1 Year

¹⁴ Monitoring must be monthly if any result exceeds 50% of the MAV.

10.6 T2. Treatment rules

T2 rules require drinking water supplies to include filtration, UV disinfection and chlorination treatment steps. The rules include requirements for demonstrating compliance for each of those treatment steps.

10.6.1 General Treatment Rules

Rule Number	Requirement	Assurance/ Monitoring	Compliance period
T2.1	Water leaving the treatment plant must be monitored for the determinands/parameters and at the frequencies set out in Table 12.	Monitoring	As set out in table 11
T2.2	If fluoride is added assessments of the amount of fluoride used must be made weekly and compared with the amount of water produced.	Assurance	1 Year
T2.3	There must be no more than 45 days between <i>E. coli</i> samples and consecutive samples must not be taken on the same day of the week and over a year, five different days of the week must be used as sampling days.	Assurance	1 Year

10.6.2 Filtration Rules

Rule Number	Requirement	Assurance/ Monitoring	Compliance period
T2.4	All water must be filtered by a media, membrane or cartridge filter system.	Assurance	1 Year
T2.5	If cartridge filters are used, the downstream cartridge must have a pore size of 1 micron (absolute)	Assurance	1 year
T2.6	The flow through the filters must be within design specifications for the treatment processes 100% of the time.	Assurance	1 Year

10.6.3 UV Rules

Rule Number	Requirement	Assurance/ Monitoring	Compliance period
T2.7	All water must be disinfected with UV light.	Assurance	1 Year
T2.8	UV units must meet (and operate within the specifications of) at least one of the following standards: NSF/ANSI 55 Class A (NSF, ANSI n.d.); Ultraviolet Disinfection Guidance Manual	Assurance	1 Year

	(USEPA 2006b); DVGW Technical Standard W294 (DVGW 2006); öNORM M5873 (Osterreichisches Normungsinstitut 2001).		
T2.9	UV units must be validated and operated to deliver a minimum of 40 mJ/cm ² or equivalent UV dose.	Assurance	1 Year
T2.10	UV dose must be monitored continuously with an alarm installed to alert the operator if UV dose is outside of the required limits. The system must be designed to immediately shut off the treatment plant if it fails to meet the required UV dose.	Assurance	1 Year
T2.11	Lamp usage and lamp outage must be monitored continuously, and an alarm must alert the operator when manufacturers recommended lamp hours are reached, or if there is a lamp outage.	Assurance	1 Year

10.6.4 Chlorine Rules¹⁵

Rule Number	Requirement	Assurance/ Monitoring	Compliance period
T2.12	Chlorine contact time must be at least 30 minutes before the first consumer.	Assurance	1 Year
T2.13	If sodium hypochlorite is used as a disinfectant, chlorate must be monitored in water leaving the treatment plant.	Assurance	1 Year
T2.14	The pH of water leaving the treatment plant must monitored at a point at least 30 minutes after chlorine is added.	Assurance	1 Year

¹⁵ Not applicable to Community Water Stations/Water Carrier Supplies

10.6.5 Chemical Rules

Rule Number	Requirement	Assurance/ Monitoring	Compliance period
T2.15	Should the water supplier become aware of an event that may rapidly introduce high concentrations of chemicals into the water at the source or at the treatment plant, the water supplier must carry out event-based monitoring to show that the threat to the water safety has been adequately managed.	Monitoring	In response to the event
T2.16	All chemical samples for physico-chemical determinands/parameters must be taken from a point as close as practicable after the final treatment process.	Assurance	1 Year

10.6.6 Cyanotoxin Rules

Rule Number	Requirement	Assurance/ Monitoring	Compliance period
T2.17	If cyanotoxin levels in treated water exceed the MAVs in the <i>New Zealand Drinking Water Standards 202X</i> (to be determined) either a 'do not use advisory' must be issued to consumers, or water must be provided from an alternative source	Assurance	Month

Table 12. T2 Treated Water Monitoring Requirements

Determinands/Parameters	Limits	Sampling Frequency	Compliance period
Turbidity (post filter)	0.5 NTU ¹⁶	Daily	1 Day
UV transmittance ¹⁷	Not less than 80%	Daily	1 Day
UV intensity or UV dose	As determined by UV unit manufacturer	Daily	1 Day

¹⁶ For cartridge filters with a 1-micron (absolute) cartridge, 1 NTU is the limit

¹⁷ Does not apply if the UV dose is automatically adjusted as the UV transmittance changes

Flow	As determined by UV unit manufacturer	Daily	1 Day
FAC	Not less than 0.5 mg/L	Daily	1 Day
pH	Between 6.5 and 8	Daily	1 Day
<i>E. coli</i> and total coliforms.	<1/100mls	Monthly	1 Month
Any chemical used in the treatment process	Must not exceed a MAV	Monthly (excluding fluoride and chlorine)	1 Month
Chlorate ¹⁸	0.7 mg/L	monthly	1 Month
Fluoride (if added)	Must not exceed MAV	Weekly	1 Week

¹⁸ Testing for chlorate is only required if sodium hypochlorite is used as a disinfectant

10.7 D2. Distribution system rules

Distribution system rules cover two areas, routine monitoring and backflow protection.

Rule Number	Requirement	Assurance/ Monitoring	Compliance period
D2.1	Water in the distribution system must be monitored for the determinands/parameters and at the frequencies set out in Table 13.	Monitoring	As sets out in table 13
D2.2	There must be no more than 45 days between samples for any <i>E. coli</i> and total coliform samples.	Assurance	1 Year
D2.3	Consecutive samples for <i>E. coli</i> and total coliform must not be taken on the same weekday.	Assurance	1 Year
D2.4	Over a year, five different days of the week must be used as sampling days for <i>E. coli</i> and total coliform sample collection.	Assurance	1 Year
D2.5	Samples for FAC, pH, <i>E. coli</i> and total coliforms must be taken at regular sampling points that are representative of the geographical coverage of the distribution system and include storage reservoirs and the end points of the system.	Assurance	1 Year
D2.6	Samples for metals must be collected from a sampling point near the end point of the system. Taps must be flushed before samples are collected.	Assurance	1 Year

D2.7	<p>An assessment of the distribution system for backflow risk must be performed annually by the water supplier and:</p> <ul style="list-style-type: none"> i. any supply point connections, fittings or other places found to be at risk for backflow must be recorded along with the potential hazard(s). ii. any supply point connections found to be at risk for backflow must have a suitable backflow prevention or containment device fitted. iii. all supply point testable backflow prevention devices installed to protect the distribution system must be inspected and tested annually by a suitably trained and qualified person and remediated if found to be faulty. iv. any cross connections that are identified must be removed. 	Assurance	1 Year
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Table 13. D2 Distribution System Monitoring Determinands/Parameters

Determinands/Parameters	Limits	Sampling Frequency	Compliance period
<i>E. coli</i>	<1/100mls	Monthly	1 Month
Total coliforms	No limit	Monthly	1 Month
FAC	Not less than 0.2 mg/L	Daily	1 Day
pH	Between 6.5 and 8	Daily	1 Day
antimony, cadmium, chromium, copper, lead, mercury, nickel, zinc	Must not exceed MAV	Annually ¹⁹	1 year

¹⁹ Must be sampled monthly if the determinand exceeds 50% of its MAV

10.8 S3 Source water rules

10.8.1 Source water type, treatment log credit requirements

Drinking water suppliers must determine the level of protozoa treatment required for a drinking water supply based on the requirements set out in the source type classifications below. Treatment systems must provide a protozoa barrier equal to or exceeding the source water, log credit treatment requirements.

Class 1

Ground water sources that draw water from a depth of more than 30 metres (measured from the top of the screen) and via a sanitary bore head in which *E. coli* and total coliforms have not been detected over a period of three years (monthly samples with a maximum of 45 days between samples), are not required to provide a protozoa barrier.

Interim Class 1

If a water supplier intends to demonstrate Class 1 status for a bore that draws water from a depth of more than 30 metres (measured from the top of the screen) and via a sanitary bore head but does not have the required *E. coli* or total coliforms data, they may demonstrate Interim Class 1 status by monitoring *E. coli* and total coliforms daily for a month, and then weekly until three years of data has accrued. If any sample for *E. coli* or total coliforms is positive, the process must begin again until three years of data has accrued with negative results.

If a ground water source has demonstrated Category 1 status but any result for *E. coli* or total coliforms is positive, the groundwater source must assume Interim Category 1 status.

Class 2

Ground water sources that draw water from a depth of between 30 metres and 10 metres (measured from the top of the screen) and via a sanitary bore head are required to provide a minimum protozoa treatment barrier of 3-log.

Class 3

Ground water sources that draw water from a depth of less than 10 metres (measured from the top of the screen), ground water sources that draw water from a depth of 10 metres or greater without a sanitary bore head, spring water sources and surface water sources are required to provide a minimum protozoa treatment barrier of 4-log.

Class 4

Water supplies that require a minimum protozoa treatment barrier of 4-log may reduce the level of protozoa treatment to a minimum of 3-log if the source water risk management plan for the supply provides evidence that the source water has a low risk of protozoa contamination.

10.8.2 Sanitary bore head requirements

A bore head is considered a sanitary bore head if it meets the following criteria:

1. The bore head is installed above ground.
2. The bore is installed in an area of ground that is not below the surrounding ground level such that ponding could occur around the bore during rainfall.
3. The annulus of the casing is sealed to prevent the ingress of surface water via the outside of the casing and the bore is grouted to a depth of at least five metres.
4. A concrete apron is installed around the bore head, extending a minimum of one metre in all directions from the casing and sloping away from the casing so that any surface water is carried away from the bore
5. All apertures into the bore (for cables etc) are sealed and watertight to prevent access from water and vermin-proofed to prevent access by small animals.
6. All air vents and any other apertures that are not watertight must be screened to prevent access by small animals, face downwards, and elevated at least 0.5 metres above the surrounding ground level .
7. The bore head is securely protected from unauthorised access.
8. If the borehead is in an area where farm animals are present, it must be fenced to exclude those animals from an area extending at least five metres in all directions from the bore head.
9. A mechanism prevents backflow at the borehead.
10. The borehead is inspected monthly for damage or defects and records kept of all inspections.

10.8.3 Source Water Monitoring Rules

Rule Number	Requirement	Assurance/ Monitoring	Compliance period
S3.1	Water suppliers must determine the category of protozoa log treatment requirements for each of the source waters that are used based on the Source Water Type Log Credit Treatment Requirements set out above.	Assurance	1 Year
S3.2	For any bore used for water supply purposes, the water supplier must determine whether or not the bore meets the requirements of a sanitary bore head and provide written evidence of their determination if it is requested.	Assurance	1 Year
S3.3	Source water must be monitored for the determinands/parameters and at the frequency set out in Table 14 and Table 15	Monitoring	As set out in Table 14 and Table 15
S3.4	Additional monitoring of source water must be undertaken during severe or extreme weather events and immediately after the event finishes.	Monitoring	Determined by the drinking water supplier
S3.5	Monitoring of source water must be undertaken for any determinand additional to those set out in Table 14 and Table 15 if the determinand has been identified in the drinking water supply Source Water Risk Management Plan as presenting a potential risk to the drinking water supply.	Monitoring	As determined by the Source Water Risk Management Plan
S3.6	Water sources must be categorised as either low-risk, medium-risk or high-risk for the presence of cyanobacteria.	Assurance	1 Year
S3.7	When a water supply is categorised as medium or high-risk under rule S3.6, a cyanobacteria/cyanotoxin response plan must be prepared which includes vigilance levels for assessing the presence of cyanobacteria and alert levels related to the presence of cyanotoxins, monitoring for cyanobacteria/cyanotoxins and	Assurance	1 Year

	the action that will be taken to protect consumers.		
S3.8	If cyanotoxin levels exceed 50% of the MAVs set out in the <i>New Zealand Drinking Water Standards 202X (to be determined)</i> the source water must be monitored at least twice weekly for cyanotoxin levels until cyanotoxin levels fall below 50% of the MAVs.	Monitoring	1 week

Table 14. S3 Source Water Monitoring Determinands/Parameters

Contaminant Group	Determinands/Parameters monitored at each source ²⁰	Sampling Frequency
Bacterial	<i>E. coli</i> and total coliforms	Weekly
Physico-chemical	<i>Pre-cursors to health-significant determinands:</i> Bromide, total organic carbon	Monthly
	<i>Determinands of aesthetic concern:</i> Iron, Manganese	Monthly
	<i>Non-metallic determinands with MAVs:</i> Arsenic, Barium, Boron, Fluoride, Nitrate, Potassium	Annually ²¹
	<i>Metallic determinands with MAVs:</i> Antimony, Cadmium, Chromium, Copper, Lead, Mercury, Nickel	Annually ²²
	<i>Major water components:</i> Alkalinity, Calcium, Chloride, Fluoride, Magnesium, Sulphate, Sodium.	Annually ²³
Radiological	Gross alpha activity Gross beta activity	Every five years

²⁰ Samples may be collected either at the source abstraction point or at the treatment plant before any form of treatment.

²¹ Must be sampled monthly if the determinand exceeds 50% of its MAV

²² Must be sampled monthly if the determinand exceeds 50% of its MAV

²³ Must be sampled monthly if the determinand exceeds 50% of its MAV

Table 15. S3 Raw Water Monitoring Parameters

Contaminant Group	Parameters monitored in raw water from each source or combined sources ²⁴	Sampling Frequency
Physico-chemical	<i>Key parameters:</i> Conductivity, pH, Turbidity	Continuous

²⁴ If water is abstracted from more than one source and combined at the treatment plant, only the combined water needs to be analysed and this can be done at the treatment plant before any form of treatment.

10.9 T3. Treatment rules

T3 rules require drinking water supplies to demonstrate compliance with bacterial and protozoa rules to show that bacterial and protozoa treatment barriers are effective. Additionally water suppliers must demonstrate compliance with chemical and cyanotoxin rules.

Water supplies that are required to demonstrate compliance with the T2 rules but elect to demonstrate compliance against the T3 rules, must also comply with rules S3.1 and S3.2 in addition to all of the S2 rules.

10.9.1 Bacterial Rules

One or more of the following options must be used to demonstrate bacterial compliance:

- 1 Disinfection with chlorine
- 2 Disinfection with chlorine dioxide
- 3 Disinfection with ozone
- 4 Disinfection with UV light

T3 Rules for Water Disinfected with Chlorine

Rule Number	Requirement	Assurance/Monitoring	Compliance period
T3.1	All water is treated with chlorine and must be monitored in accordance with Table 16.	Monitoring	1 day
T3.2	Treated water must achieve a chlorine C.t value of at least 15 min.mg/L and be no less than 0.2mg/L before the first consumer for at least 95 % of the day.	Assurance	1 Year
T3.3	T ₁₀ contact time of at least 5 minutes must be demonstrated.	Assurance	1 Day
T3.4	Turbidity of water leaving the treatment plant must be less than 1.0 NTU for at least 95% of the day ²⁵ .	Monitoring	1 day

²⁵ Where lime is used for pH correction, samples may be taken before the lime is dosed.

T3.5	Turbidity must not exceed 2.0 NTU for the duration of any consecutive 15-minute period.	Monitoring	1 day
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Table 16. T3 Requirements for Drinking Water Disinfected with Chlorine

Parameters that need to be continuously monitored and where they need to be monitored:	<p><i>Parameters:</i> FAC</p> <p><i>Where it needs to be monitored:</i> Water at a point after the prescribed disinfection contact time has elapsed but before the first consumer.</p>
	<p><i>Parameters:</i> pH</p> <p><i>Where it needs to be monitored:</i> Water a point after the prescribed disinfection contact time has elapsed but before the first consumer.</p>
	<p><i>Parameters:</i> Turbidity</p> <p><i>Where it needs to be monitored:</i> Water at a point immediately before or after the chlorine dosing point.</p>
	<p><i>Parameters:</i> Flow</p> <p><i>Where it needs to be monitored:</i> Water leaving the contact tank unless there is a high-level outlet weir in which case water entering the contact tank is acceptable.</p>
	Water level in the contact tank (if used)
Calculations that need to be continuously monitored:	Free Available Chlorine Equivalent (FACE).
	T ₁₀ Contact Time.
	C.t.

T3 Rules for Water Disinfected with Chlorine Dioxide

Rule Number	Requirement	Assurance/Monitoring	Compliance period
T3.6	All water is treated with chlorine dioxide and must be monitored in accordance with Table 16.	Monitoring	1 day
T3.7	Treated water must achieve a chlorine C.t value of at least 15 min.mg/L for at least 95 % of the day.	Assurance	1 Year
T3.8	T ₁₀ contact time of at least 5 minutes must be demonstrated.	Assurance	1 Day
T3.9	Turbidity of water leaving the treatment plant must be less than 1.0 NTU for at least 95% of the day ²⁶ .	Monitoring	1 day
T3.10	Turbidity must not exceed 2.0 NTU for the duration of any consecutive 15-minute period.	Monitoring	1 day

Table 17. T3 Requirements for Drinking Water Disinfected with Chlorine Dioxide

Parameters that need to be continuously monitored and where they need to be monitored:	<p><i>Parameters:</i> Chlorine dioxide</p> <p><i>Where it needs to be monitored:</i> Water at a point after the prescribed disinfection contact time has elapsed but before the first consumer.</p>
	<p><i>Parameters:</i> FAC if used in combination with chlorine dioxide</p> <p><i>Where it needs to be monitored:</i> Water at a point after the prescribed disinfection contact time has elapsed but before the first consumer.</p>
	<p><i>Parameters:</i> pH</p> <p><i>Where it needs to be monitored:</i> Water a point after the prescribed disinfection contact time has elapsed but before the first consumer.</p>
	<p><i>Parameters:</i> Turbidity</p> <p><i>Where it needs to be monitored:</i> Water at a point immediately before or after the chlorine dosing point.</p>

²⁶ Where lime is used for pH correction, samples may be taken before the lime is dosed.

	<i>Parameters:</i> Flow <i>Where it needs to be monitored:</i> Water leaving the treatment plant at a point after the prescribed disinfection contact time has elapsed but before the first consumer unless the contact tank has a high-level outlet weir in which case water entering the contact tank is acceptable.
	Water level in the contact tank (if used)
Calculations that need to be continuously monitored:	Free Available Chlorine Equivalent (FACE) if chlorine is used in combination with chlorine dioxide.
	Total disinfectant
	T ₁₀ Contact Time.
	C.t.

T3 Rules for Water Disinfected with Ozone

Rule Number	Requirement	Assurance/Monitoring	Compliance period
T3.11	All water must pass through the ozone contactor and must be monitored in accordance with Table 18.	Monitoring	1 day
T3.12	C.t of at least 1.2 mg.min/L for more than 95% of the day must be achieved.	Monitoring	1 day
T3.13	Turbidity does not exceed 5.0 NTU for the duration of any consecutive 15-minute period.	Monitoring	1 day

Table 18. T3 Requirements for Water Disinfected with Ozone

Parameters that need to be continuously monitored and where they need to be monitored:	<i>Parameters:</i> Ozone Residual <i>Where it needs to be monitored:</i> Water leaving the contact tank. ²⁷
	<i>Parameters:</i> Turbidity <i>Where it needs to be monitored:</i> Water leaving the contact tank.

²⁷ Additional monitoring sites may be used in addition to the contact tank exit point if the water supplier can demonstrate that they improve the accuracy of the monitoring information.

	<p><i>Parameters:</i> Flow</p> <p><i>Where it needs to be monitored:</i> Water leaving the contact tank unless there is a high-level outlet weir in which case water entering the contact tank is acceptable.</p>
	<p>Level of water in the contact tank (if used)</p>
<p>Calculations that need to be continuously monitored:</p>	<p>T₁₀ Contact Time.</p>
	<p>C.t (Ozone Residual x T₁₀ Contact Time).</p>
<p>Ozone monitor calibration/verification:</p>	<p>Ozone in water monitors used to demonstrate compliance with this rule must be:</p> <ul style="list-style-type: none"> • Calibrated in accordance with the instrument manufacturer's specified procedures and frequency or weekly whichever is more frequent.

T3 Rules for Water Disinfected with Ultraviolet Light

Rule Number	Requirement	Monitoring/Assurance	Compliance period
T3.14	All water must pass through the UV reactor(s) and must be monitored in accordance with Table 19.	Monitoring	1 day
T3.15	A reduction equivalent dose of not less than 40 mJ/cm ² (or equivalent) must be achieved for not less than 95 % of the day.	Monitoring	1 day
T3.16	UVI is not less than 80% of the value (established by validation) required to achieve reduction equivalent dose of not less than 40 mJ/cm ² (or equivalent) any consecutive 15-minute period.	Monitoring	1 day
T3.17	Turbidity does not exceed 5.0 NTU for the duration of any consecutive 15-minute period.	Monitoring	1 day
T3.18	UVT is not less than 95% of the lowest UVT for which the reactor has been validated for more than 5% of the day. ²⁸	Monitoring	1 day
T3.19	UVT is not less than 80% of the lowest UVT for which the reactor has been validated for the duration of any consecutive 15-minute period. ²⁹	Monitoring	1 day
T3.20	The equipment is operated within the flow range for which it was validated for at least 95% of the day.	Monitoring	1 day

²⁸ These requirements do not apply to UV disinfection systems that automatically adjust the UV dose as the UV transmittance of the water flowing through the reactor varies.

²⁹ These requirements do not apply to UV disinfection systems that automatically adjust the UV dose as the UV transmittance of the water flowing through the reactor varies.

Table 19. T3 Requirements for UV disinfection

Parameters that need to be continuously monitored and where they need to be monitored:	<p><i>Parameters:</i> UV Transmittance</p> <p><i>Where it needs to be monitored:</i> Water entering or leaving the UV reactor(s).</p>
	<p><i>Parameters:</i> Turbidity</p> <p><i>Where it needs to be monitored:</i> Water entering or leaving the UV reactor(s).</p>
	<p><i>Parameters:</i> UV Intensity</p> <p><i>Where it needs to be monitored:</i> The same point in the reactor as that used for validation.</p>
	<p><i>Parameters:</i> Flow</p> <p><i>Where it needs to be monitored:</i> Water entering or leaving the reactor(s).</p>
UVT monitor calibration/verification:	<p>UVT monitors used to demonstrate compliance with this rule must be:</p> <ul style="list-style-type: none"> • Calibrated in accordance with the instrument manufacturer’s specified procedures and frequency or weekly whichever is more frequent. <p>Duty UVI sensors must be checked at least monthly against the reference sensor. If the difference between the two readings exceeds the manufacturer’s specified limits, then the Duty UVI sensor shall be replaced.</p> <p>Reference UVI sensor must be standardised at least annually in accordance with Ultraviolet Disinfection Guidance Manual (USEPA 2006b) or other traceable procedure. Alternatively, after 12 months the supplier can use the reference sensor as a duty sensor and purchase a new standardised sensor for use as a reference sensor.</p>
UV validation:	<p>The equipment must be validated to meet the required reduction equivalent dose of 40 mJ/cm² using at least one of the:</p> <ul style="list-style-type: none"> • <i>Ultraviolet Disinfection Guidance Manual (USEPA 2006b).</i> • <i>DVGW Technical Standard W294 (DVGW 2006)</i> • <i>öNORM M5873 (Osterreichisches Normungsinstitut 2001).</i> • <i>NSF/ANSI 55 (NSF, ANSI nd) for Class A systems (for populations of up to 5000) – 3-log.</i>

10.9.2 Protozoal Rules

Drinking water suppliers must provide a protozoa barrier that provides treatment equal to or exceeding the log level identified by a source water type treatment log credit requirements as set out in the source water rules.

Treatment processes and log credit allocations

The processes that can be used for protozoal treatment, and the log credits that can be achieved are³⁰:

1. Coagulation, flocculation and sedimentation process without filtration [0.5-Log]
2. Coagulation, flocculation and direct filtration [2.5-3.5-Log]
3. Coagulation, flocculation, sedimentation, and filtration [3-4-Log]
4. Second stage filtration [0.5-Log]
5. Slow sand filtration [2.5-Log]
6. Membrane filtration [up to 4.0-Log]
7. Cartridge filtration [2.0-Log]
8. Ozone [0.25 to 3.0-Log]
9. Ultraviolet light [up to 4-Log].

The cumulative log credits of a process that includes filtration or sedimentation and a disinfection process can be calculated by adding the log credits of the qualifying processes that are used.

If two filtration processes are used, the second filtration process is considered to be second stage filtration and can add only 0.5-Log to the cumulative log credits.

Water suppliers must comply with the rules set out below that apply to the treatment process (es) they are using.

³⁰ Rules for protozoal disinfection with chlorine dioxide will be provided by Taumata Arowai on request

T3 Coagulation, flocculation and Sedimentation without Filtration Rules [0.5-Log].

Rules T3.16 to T3.18 must be met to achieve 0.5 Log compliance.			
Rule Number	Requirement	Assurance/ Monitoring	Compliance period
T3.16	All water must pass through the sedimentation process.	Assurance	1 Year
T3.17	The sedimentation process must achieve at least a 70% reduction in raw water turbidity each day, based on the arithmetic mean of the turbidity of the raw water and the water leaving the sedimentation process.	Monitoring	1 day
T3.18	All of the requirements in Table 20 must be met	Assurance	1 Year

Table 20. T3 Requirements for Coagulation, flocculation and Sedimentation without Filtration

Parameters that need to be continuously monitored and where they need to be monitored:	<p><i>Parameter:</i> Turbidity.</p> <p><i>Where it needs to be monitored:</i> On the inlet and outlet of sedimentation process, on any recycle streams to the plant inlet [if present].</p>
Process Limitations:	<p>Sedimentation includes dissolved air flotation.</p> <p>Recycled water from other treatment processes must not be added to the raw water.</p>

T3 Coagulation, flocculation and Direct Filtration Rules [2.5 to 3.5-Log]

Rules T3.19 to T3.22 must be met to achieve 2.5 Log compliance:			
Rule Number	Requirement	Assurance/ Monitoring	Compliance period
T3.19	All water must pass through the coagulation, flocculation and filtration process.	Assurance	1 Year
T3.20	Turbidity must not to exceed 0.3 NTU for more than 5% of a day.	Monitoring	1 day
T3.21	Turbidity must not exceed 0.5 NTU for the duration of any consecutive 15-minute period.	Monitoring	1 day
T3.22	All of the requirements in Table 21 must be met.	Assurance	1 Year

Rules T3.23 to T3.26 must be met to achieve 3.0 Log compliance.			
Rule Number	Requirement	Assurance/ Monitoring	Compliance period
T3.23	All water must pass through the coagulation, flocculation and filtration process.	Assurance	1 Year
T3.24	Turbidity must not to exceed 0.15 NTU for more than 5% of a day.	Monitoring	1 day
T3.25	Turbidity must not exceed 0.5 NTU for the duration of any consecutive 15-minute period.	Monitoring	1 day
T3.26	All of the requirements in Table 21 must be met.	Assurance	1 Year

Rules T3.27 to T3.30 must be met to achieve 3.5-Log compliance.			
Rule Number	Requirement	Assurance/ Monitoring	Compliance period
T3.27	All water must pass through the coagulation, flocculation and filtration process.	Assurance	1 Year
T3.28	Turbidity must not to exceed 0.1 NTU for more than 5% of a day.	Monitoring	1 day
T3.29	Turbidity must not exceed 0.3 NTU for the duration of any consecutive 15-minute period.	Monitoring	1 day
T3.30	All of the requirements in 21 must be met.	Assurance	1 Year

Table 21. T3 Requirements for coagulation, flocculation and direct filtration.

Parameters that need to be continuously monitored and where they need to be monitored:	<p><i>Parameter:</i> Turbidity</p> <p><i>Where it needs to be monitored:</i> On the outlet of each filter. Monitored when the filter is in service to supply, on any recycle streams to the plant inlet [if present].</p>
	<p><i>Parameter:</i> Service State.</p> <p><i>Where it needs to be monitored:</i> Each filter.</p>
Process Limitations:	<p>Filtration is of a rapid granular media design (pressure or gravity equivalent).</p> <p>Water treatment plants that recycle waste streams (excluding water from rapid granular media filters being diverted during restart after backwash, often called 'filter to waste') must return the recycle stream so that it undergoes the full treatment process and provide flow equalisation such that the instantaneous total return rate does not exceed 10% of the plant inflow. Turbidity monitoring is required to demonstrate that the recycled water has received effective solids/liquid separation. Alternatively, separate treatment of the recycled stream should be considered.</p>

T3 Coagulation, flocculation, Sedimentation, and Filtration Rules [3 to 4-Log]

Rules T3.31 to T3.34 must be met to achieve 3.0 Log compliance.			
Rule Number	Requirement	Assurance/ Monitoring	Compliance period
T3.31	All water must pass through the coagulation, flocculation, sedimentation and filtration process.	Assurance	1 Year
T3.32	Turbidity must not to exceed 0.3 NTU for more than 5% of a day.	Monitoring	1 day
T3.33	Turbidity must not exceed 0.5 NTU for the duration of any consecutive 15-minute period.	Monitoring	1 day
T3.34	All of the requirements in Table 22 must be met.	Assurance	1 Year

Rules T3.35 to Error! Reference source not found. must be met to achieve 3.5 Log compliance			
Rule Number	Requirement	Assurance/ Monitoring	Compliance period
T3.35	All water must pass through the coagulation, flocculation, sedimentation and filtration process.	Assurance	1 Year
T3.36	Turbidity must not to exceed 0.15 NTU for more than 5% of a day.	Monitoring	1 day
T3.37	Turbidity must not exceed 0.5 NTU for the duration of any consecutive 15-minute period.	Monitoring	1 day
T3.38	All of the requirements in 1 must be met.	Assurance	1 Year

Rules T3.39 to T3.42 must be met to achieve 4.0 Log compliance			
Rule Number	Requirement	Assurance/ Monitoring	Compliance period
T3.39	All water must pass through the coagulation, flocculation, sedimentation and filtration process.	Assurance	1 Year
T3.40	Turbidity must not to exceed 0.1 NTU for more than 5% of a day.	Monitoring	1 day
T3.41	Turbidity must not exceed 0.3 NTU for the duration of any consecutive 15-minute period.	Monitoring	1 day
T3.42	All of the requirements in Table 22 must be met.	Assurance	1 Year

Table 22. T3 Requirements for coagulation, flocculation, sedimentation and filtration.

Parameters that need to be continuously monitored and where they need to be monitored:	<p><i>Parameters:</i> Turbidity.</p> <p><i>Where it needs to be monitored:</i> On the outlet of each filter. Monitored when the filter is in service to supply, on any recycle streams to the plant inlet [if present].</p>
	<p><i>Parameters:</i> Service State.</p> <p><i>Where it needs to be monitored:</i> Each filter.</p>
Process Limitations:	<p>Sedimentation includes dissolved air flotation.</p> <p>Filtration is of a rapid granular media design (pressure or gravity equivalent).</p> <p>Water treatment plants that recycle waste streams (excluding water from rapid granular media filters being diverted during restart after backwash, often called 'filter to waste') must return the recycle stream so that it undergoes the full treatment process and provide flow equalisation such that the instantaneous total return rate does not exceed 10% of the plant inflow. Turbidity monitoring is required to demonstrate that the recycled water has received effective solids/liquid separation. Alternatively, separate treatment of the recycled stream should be considered.</p>

T3 Second Stage Filtration Rules [0.5-Log]

Rules T3.43 to T3.46 must be met to achieve 0.5 Log compliance			
Rule Number	Requirement	Assurance/ Monitoring	Compliance period
T3.43	All water must pass through the second stage filtration process.	Assurance	1 Year
T3.44	Turbidity must not to exceed 0.1 NTU for more than 5% of a day.	Monitoring	1 day
T3.45	Turbidity must not exceed 0.3 NTU for the duration of any consecutive 15-minute period.	Monitoring	1 day
T3.46	All of the requirements in Table 23 must be met.	Assurance	1 Year

Table 23. T3 Requirements for Second Stage Filtration

Parameters that need to be continuously monitored and where they need to be monitored:	<i>Parameters:</i> Turbidity. <i>Where it needs to be monitored:</i> On the outlet of each filter, monitored when the filter is in service to supply.
	<i>Parameters:</i> Service State. Each filter.
Process Limitations:	A second filtration stage consists of rapid sand or dual media or granular activated carbon, other fine grain media in a separate stage after granular media filtration with preceding coagulation.

T3 Slow Sand Filtration Rules [2.5-Log]

Rules T3.47 to T3.55 must be met to achieve compliance			
Rule Number	Requirement	Assurance/ Monitoring	Compliance period
T3.47	All water must pass through the slow sand filtration process.	Assurance	1 Year
T3.48	The filter must not dry out.	Assurance	1 Year
T3.49	Disinfecting chemicals must not be dosed such that they leave a residual disinfectant upstream of the filter beds.	Assurance	1 Year
T3.50	Following filter maintenance, water suppliers must not deliver water to consumers until the filtration process has been demonstrated to be effective.	Assurance	1 Year
T3.51	The filters must be operated at a surface loading rate of less than 0.35 m ³ /m ² /h.	Assurance	1 Year
T3.52	The temperature of the water entering the filter must not drop below 6°C at any time	Monitoring	1 day
T3.53	Turbidity must not exceed 0.5 NTU for more than 5 percent of the day.	Monitoring	1 day
T3.54	Turbidity must not exceed 1.0 NTU for the duration of any consecutive 15-minute period.	Monitoring	1 day
T3.55	All of the requirements in Table 24 must be met	Assurance	1 Year

Table 24. T3 Requirements for Slow Sand Filtration

Parameters that need to be continuously monitored and where they need to be monitored:	<i>Parameters:</i> Temperature. <i>Where it needs to be monitored:</i> Water entering the filtration stage.
	<i>Parameters:</i> Turbidity. <i>Where it needs to be monitored:</i> On the outlet of each filter, monitored when the filter is in service to supply.
	<i>Parameters:</i> Flow.

	<i>Where it needs to be monitored:</i> On the outlet of each filter, monitored when the filter is in service to supply.
Calculations that need to be continuously monitored:	Surface loading rate.

T3 Membrane Filtration Rules [up to 4.0-Log]

Rules T3.56 to T3.62 must be met to achieve 4.0 log compliance			
Rule Number	Requirement	Assurance/ Monitoring	Compliance period
T3.56	All water must pass through the membrane filtration process.	Assurance	1 Year
T3.57	Direct integrity tests must be performed on each membrane filtration unit at least daily (midnight to midnight) if the membrane filtration unit has been in service at any point during the day.	Assurance	1 Year
T3.58	The membrane filtrate turbidity must not exceed the turbidity of the membrane feed water for the duration of any consecutive 15-minute period. ³¹	Monitoring	1 day
T3.59	No membrane unit may be used while it has failed its direct integrity test.	Assurance	1 Year
T3.60	If the turbidity of the membrane filtrate exceeds 0.1 NTU for more than 15 minutes the membrane unit must be shut down and not returned to service until it has passed a direct integrity test.	Monitoring	1 Year
T3.61	If the membrane unit has been out of service for maintenance or any other reason a direct integrity test must be completed before the unit is returned to service.	Assurance	1 Year
T3.62	All of the requirements in Table 25 must be met.	Assurance	1 Year

³¹ Exceedances of not more than 2% are allowable to take account of measurement accuracy.

Table 25. T3 Requirements for Membrane Filtration

Parameters that need to be continuously monitored and where they need to be monitored:	<p><i>Parameters:</i> Turbidity.</p> <p><i>Where it needs to be monitored:</i> on the combined inlet to the membrane process.³² On the outlet of each membrane filtration unit when in service to supply. On any recycle streams to the plant inlet [if present].</p>
	<p><i>Parameters:</i> Service State.</p> <p><i>Where it needs to be monitored:</i> Each membrane filtration unit.</p>
Parameters that need to be non-continuously monitored and where they need to be monitored:	<p><i>Parameters:</i> Membrane Integrity.</p> <p><i>Where it needs to be monitored:</i> Each membrane filtration unit.</p>
Process Limitations:	<p>Membrane filtration includes microfiltration and ultrafiltration.</p> <p>Water treatment plants that recycle waste streams must return the recycle stream so that it undergoes the full treatment process and provide flow equalisation such that the instantaneous total return rate does not exceed 10% of the plant inflow. Turbidity monitoring is required to demonstrate that the recycled water has received effective solids/liquid separation.</p>
Membrane Certification:	<p>The maximum number of log credits (up to a maximum of 4.0) that a membrane filtration process is eligible to receive depends on the manufacturer’s certification of the log removal that the filter plant can deliver. The manufacturer’s certificate (or validation) must specify the operational and maintenance requirements to ensure the membrane units will perform to specification and the integrity testing procedure that the water supplier must carry out to demonstrate that the plant is operating at the claimed log credit rating. It must also document the challenge, or other, tests that were carried out to verify the log credit rating. The Membrane Filtration Guidance Manual (USEPA 2005) outlines a suitable verification procedure.</p>
Direct Integrity test requirements:	<p>The test is applied in such a manner that a 3µm hole affects the response from the test.</p> <p>The test can verify the log removal value claimed for the membrane process.</p>

³² This may be source water turbidity before coagulation when membrane filtration is the only process. It may be the average of turbidity from in service pre-treatment units.

T3 Cartridge Filtration Rules [2.0-Log]

Rules T3.63 to T3.72 must be met to achieve 2.0 log compliance			
Rule Number	Requirement	Assurance/ Monitoring	Compliance period
T3.63	All water must pass through the cartridge filtration process.	Assurance	1 Year
T3.64	A slow opening/closing valve must be fitted ahead of each housing, or each feed pump must be fitted with a variable speed drive, to minimise pressure surges onto the cartridges.	Assurance	1 Year
T3.65	Pumps must not be connected directly to the discharge side of a cartridge filter. After filtration, the filtrate must pass directly to a tank if there is subsequent pumping.	Assurance	1 Year
T3.66	Turbidity does not exceed 0.5 NTU (or 1.0 NTU if a 1-micron cartridge is used) for more than 5 percent of the day.	Monitoring	1 day
T3.67	Turbidity does not exceed 1.0 NTU for the duration of any consecutive 15-minute period.	Monitoring	1 day
T3.68	The filtrate turbidity does not exceed the turbidity of the cartridge feed water for the duration of any consecutive 15-minute period. ³³	Monitoring	1 day
T3.69	The equipment is operated within the flow range for which it was certified at all times.	Assurance	1 Year
T3.70	Differential pressure is kept within the manufacturer's recommendations at all times.	Assurance	1 Year
T3.71	Individual cartridges are clearly labelled with the manufacturer's name and the part number that relates to the certification.	Assurance	1 Year
T3.72	All of the requirements in Table 26 must be met.	Assurance	1 Year

³³ Exceedances of not more than 2% are allowable to take account of measurement accuracy.

Table 26. T3 Requirements for Cartridge Filtration

Parameters that need to be continuously monitored and where they need to be monitored:	<p><i>Parameters:</i> Turbidity.</p> <p>Where it needs to be monitored: on the combined inlet to the process. On the outlet of each filtration unit.</p>
	<p><i>Parameters:</i> Differential Pressure.</p> <p>Where it needs to be monitored: Across each filtration unit.</p>
	<p><i>Parameters:</i> Flow.</p> <p>Where it needs to be monitored: On the inlet or outlet of each filtration unit.</p>
	<p><i>Parameters:</i> Service State.</p> <p>Where it needs to be monitored: Each filtration unit.</p>
Cartridge Certification:	<p>Each cartridge has a certified <i>Cryptosporidium</i> (oo)cyst removal efficiency of at least 3-log. The cartridge supplier's certification is acceptable provided a reputable inspection body has performed the testing, the tests are made on filter units including seals and other components integral to the process, that the installed equipment is identical (or validated as equivalent) to the equipment tested during the certification process, individual cartridges are clearly labelled with the manufacturer's name and the part number that relates to the certification and it meets at least one of the following:</p> <ul style="list-style-type: none"> • the USEPA (2010)'s Long Term 2 Enhanced Surface Water Treatment Rule: Toolbox Guidance Manual Part 8: Bag and Cartridge Filters. • the (oo)cyst reduction conditions of Drinking Water Treatment Units: Health effects, NSF/ANSI 53 (NSF, ANSI 2002). • The (oo)cyst removal requirements of a standard recognised by Taumata Arowai as being equivalent (e.g., AS/NZS 4348:1995 in conjunction with AS/NZS 3497:1998 (updated 2001)).

T3 Ozone Rules [0.25 to 3.0-Log]

Rules T3.73 to T3.77 must be met to achieve compliance			
Rule Number	Requirement	Assurance/ Monitoring	Compliance period
T3.73	All water must pass through the ozone process.	Assurance	1 year
T3.74	The C.t and water temperature required for the log credit claimed (Table 27) must be achieved for more than 95% of the day.	Monitoring	1 day
T3.75	The C.t and water temperature required for the log credit claimed (Table 27) must not be less than 80% for the duration of any consecutive 15-minute period.	Monitoring	1 day
T3.76	Turbidity must not exceed 5.0 NTU for the duration of any consecutive 15-minute period.	Monitoring	1 day
T3.77	All of the requirements for ozone disinfection in Table 28 must be met.	Assurance	1 year

Table 27. T3 C.t values³⁴ (min.mg/L) for *Cryptosporidium* inactivation by ozone

Log Credit	Water Temperature (°C) ³⁵					
	1	5	10	15	20	25
0.25	5.8	4.0	2.5	1.6	1.0	0.6
0.5	12	7.9	4.9	3.1	2.0	1.2
1.0	23	16	9.9	6.2	3.9	2.5
1.5	35	24	15	9.3	5.9	3.7
2.0	46	32	20	12	7.8	4.9

³⁴ The C.t data in this table are valid for ozone concentrations in the range 0.2-5.0mg/L.

³⁵ C.t values between the indicated temperatures may be determined by interpolation.

2.5	58	40	25	16	9.8	6.2
3.0	69	47	30	19	12	7.4

Table 28. T3 Requirements for ozone disinfection

Parameters that need to be continuously monitored and where they need to be monitored:	<i>Parameters:</i> Ozone residual. <i>Where it needs to be monitored:</i> Water leaving the contact tank. ³⁶
	<i>Parameters:</i> Temperature. <i>Where it needs to be monitored:</i> Water leaving the contact tank.
	<i>Parameters:</i> Turbidity. <i>Where it needs to be monitored:</i> Water leaving the contact tank.
	<i>Parameters:</i> Flow. <i>Where it needs to be monitored:</i> Water leaving the contact tank unless there is a high-level outlet weir in which case water entering the contact tank is acceptable.
	Water level in the contact tank (if used).
Calculations that need to be continuously monitored:	T ₁₀ Contact Time.
	C.t (Ozone x T ₁₀ Contact Time).
Ozone monitor calibration/verification:	<p>Ozone in water monitors used to demonstrate compliance with this rule must be:</p> <ul style="list-style-type: none"> • Calibrated in accordance with the instrument manufacturers specified procedures and frequency - or weekly (whichever is more frequent). <p>Other instrumentation must be calibrated in accordance with the instrument manufacturers specified procedures and frequency.</p>

³⁶ Additional monitoring sites may be used in addition to the contact tank exit point if the water supplier can demonstrate that they improve the accuracy of the monitoring information.

T3 Ultraviolet Light Rules [up to 4-Log]

Rules T3.78 to T3.85 must be met to achieve 4.0 log compliance			
Rule Number	Requirement	Assurance/ Monitoring	Compliance period
T3.78	All water must pass through the UV reactor.	Assurance	1 year
T3.79	The UV dose must meet or exceed that required to achieve the claimed log credit for at least 95% of the day.	Monitoring	1 day
T3.80	The UV dose must not be less than required to achieve the claimed log credit for any consecutive 15-minute period.	Monitoring	1 day
T3.81	Turbidity must not exceed 5.0 NTU for the duration of any consecutive 15-minute period.	Monitoring	1 day
T3.82	UV Transmittance (UVT) must meet or exceed 95% of the UVT for which the reactor has been validated for at least 95% of the day. ³⁷	Monitoring	1 day
T3.83	UVT must not be less than 80% of the lowest UVT for which the reactor has been validated for the duration of any consecutive 15-minute period. ³⁸	Monitoring	1 day
T3.84	The equipment must be operated within the flow range for which it was validated for at least 95% of the day.	Assurance	1 year
T3.85	All of the requirements for UV disinfection in Table 29 must be met	Assurance	1 year

³⁷ These requirements do not apply to UV disinfection systems that automatically adjust the UV dose as the UV transmittance of the water flowing through the reactor varies.

³⁸ These requirements do not apply to UV disinfection systems that automatically adjust the UV dose as the UV transmittance of the water flowing through the reactor varies.

Table 29. T3 Requirements for UV disinfection

Parameters that need to be continuously monitored and where they need to be monitored:	<p><i>Parameters:</i> UVT.</p> <p><i>Where it needs to be monitored:</i> Water entering or leaving the UV reactor(s).³⁹</p>
	<p><i>Parameters:</i> Turbidity.</p> <p><i>Where it needs to be monitored:</i> Water entering or leaving the UV reactor(s).</p>
	<p><i>Parameters:</i> UVI.</p> <p><i>Where it needs to be monitored:</i> The same point in the reactor as that used for validation.</p>
	<p><i>Parameters:</i> Flow.</p> <p><i>Where it needs to be monitored:</i> Water entering or leaving the reactor(s).</p>
UVT monitor calibration/verification:	<p>UVT monitors used to demonstrate compliance with this rule must be:</p> <ul style="list-style-type: none"> • Calibrated in accordance with the instrument manufacturer’s specified procedures and frequency - or weekly (whichever is more frequent). <p>Duty UVI sensors must be checked at least monthly against the reference sensor. If the difference between the two readings exceeds the manufacturers specified limits, then the Duty UVI sensor shall be replaced.</p> <p>Reference UVI sensor must be standardised at least 1 year in accordance with <i>Ultraviolet Disinfection Guidance Manual (USEPA 2006b)</i> or other traceable procedure. Alternatively, after 12 months the supplier can use the reference sensor as a duty sensor and purchase a new standardised sensor for use as a reference sensor.</p> <p>Other instrumentation must be calibrated in accordance with the instrument manufacturers specified procedures and frequency.</p>
UV validation:	<p>The equipment must be validated to meet the required log credit using at least one of:</p> <ul style="list-style-type: none"> • the <i>Ultraviolet Disinfection Guidance Manual (USEPA 2006b)</i> – variable log credits. • <i>DVGW Technical Standard W294 (DVGW 2006)</i> – 3 log.

³⁹ These requirements do not apply to UV disinfection systems that automatically adjust the UV dose as the UV transmittance of the water flowing through the reactor varies.

- *öNORM M5873 (Osterreichisches Normungsinstitut 2001) – 3 log.*
- *NSF/ANSI 55 (2019) for Class A systems (for populations of up to 5,000) – 3 log.*

10.9.3 Chemical Rules

This section sets out the requirements a water supplier must follow to achieve chemical compliance at the treatment plant.

Chemical monitoring is required to ensure that any chemicals added during the treatment process and any chemicals created during the treatment process do not result in drinking water exceeding the MAVs outlined in the *New Zealand Drinking Water Standards 202X (to be determined)*. Monitoring is also required for any chemicals that exceed 50% of a MAV in the source water.

Typical Value Range

A water supplier must sample the water leaving a treatment plant to determine the typical value range for specified chemical determinands/parameters to identify if any values exceed the MAV in the *New Zealand Drinking Water Standards 202X (to be determined)* and to determine the on-going monitoring frequency for those determinands/parameters.

Standard typical range refers to a determinand for which sample results are always less than 50% of the MAV.

Elevated typical range refers to a determinand for which any sample exceeds 50% of the MAV but does not exceed 100% of the MAV.

If a determinand result in water leaving a treatment plant exceeds the MAV, the supply is not compliant and consumers should be advised and steps taken to reduce the level to below the MAV.

In the first 12 months of monitoring, 15 samples must be taken over a 12-month period (with no more than two samples collected in any calendar month) to determine the range of values for chemical determinands in water leaving a treatment plant.

Values must be identified for determinands in the water leaving the treatment plant if:

- (i) the determinand has a MAV; *and*
- (ii) the determinand is:
 - A. present in the source water at a concentration more than 50% of its MAV (as determined by the supply source water risk management plan); *and/or*
 - B. a chemical added during treatment, or a possible contaminant in a treatment chemical; *or*
 - C. formed as the result of a treatment process and is *not* expected to change in concentration beyond the treatment plant; *or*

Following collection of the first 15 samples to establish a determinand's typical range, the determinand must be monitored at the frequencies set out in Table 30.

The contaminants that may arise from treatment chemicals are listed in Table 31.

If sodium hypochlorite is used, chlorate and perchlorate must be monitored weekly, regardless of the levels determined by sampling.

Table 30. T3 Treatment Chemical Determinand Minimum Sampling Frequencies

Minimum sampling frequency		
Standard typical range determinands (Typical value < 50% MAV)	Elevated typical range determinands (Value range 50% - 100% MAV)	Fluoride ⁴⁰ ClO ₃ ⁻ , ClO ₄ ⁻⁴¹
Annually	Monthly	Weekly

Table 31. T3 Treatment Chemical Determinand Monitoring

Treatment Chemical	Determinands/parameters to monitor ⁴²
Al-based coagulants/flocculants	aluminium, antimony, cadmium, copper, chromium, lead, mercury, nickel
Fe-based coagulants/flocculants	antimony, cadmium, copper, chromium, lead, mercury, nickel
Polyacrylamide (polyelectrolyte)	Acrylamide
EP-DMA (polyelectrolyte)	Epichlorohydrin
Chlorine (gas)	FAC
Hypochlorite	FAC
	ClO ₃ ⁻ , ClO ₄ ⁻ , BrO ₃ ⁻
Ozone	BrO ₃ ⁻
Permanganate	Mn
Fluoride (in any compound)	F ⁻

⁴⁰ If fluoride is added as part of the treatment process

⁴¹ if sodium hypochlorite is used for disinfection

⁴² Monitoring is only required for treatment chemicals that are used in a treatment process.

T3 Chemical Rules

Rule Number	Requirement	Assurance/Monitoring	Compliance period
T3.86	Values for determinands in treated water that exceeded 50% of their MAV in the source water, are added or formed in the treatment process (as well as impurities in treatment chemicals) including the determinands set out in table 31, must be identified by the collection and analyses of 15 samples over a 12-month period (with no more than two samples collected in any calendar month).	Assurance	1 year
T3.87	Determinands identified by the sampling programme outlined in rule T3.86 must continue to be sampled at the rate set out in Table 30.	Monitoring	1 month
T3.88	If sodium hypochlorite is used as a disinfectant, chlorate and perchlorate and must be sampled weekly	Monitoring	1 week
T3.89	If fluoride is added to treated water, it must be continuously monitored.	Monitoring	1 week
T3.90	Samples must be taken from a point directly after the final treatment process.	Assurance	1 year
T3.91	Containers used for collecting samples must be obtained from a laboratory and appropriate for the target determinand.	Assurance	1 year
T3.92	Event based monitoring (determined by the water supplier) must be undertaken for any event that may rapidly introduce high concentrations of health-significant chemical determinands into the water at the source or at the treatment plant.	Monitoring	As determined by the water supplier

10.9.4 Cyanotoxin Rules

Different source water types have different levels of cyanotoxin risk associated with them, mostly related to environmental conditions. Low risk source waters have lower compliance requirements than medium-risk and high-risk source waters. Drinking water suppliers must establish whether source waters are low-risk, medium-risk or high-risk for cyanotoxins. They must then undertake on-going assessment of cyanobacterial risk. When cyanobacteria are found to be present in a water source, the water supplier must monitor the treated water for cyanotoxins and manage the risk of cyanotoxins in treated water.

Rule Number	Requirement	Assurance/Monitoring	Compliance period
T3.93	If a water supplier becomes aware of the presence of cyanobacteria in source water, monitoring of treated water for cyanotoxin levels must commence in accordance with the supply cyanobacteria/cyanotoxin response plan.	Monitoring	
T3.94	If cyanotoxins are identified in treated water, cyanotoxin testing must be undertaken in accordance with the supply response plan but must be at a frequency of at least twice weekly until cyanotoxins are not present.	Monitoring	1 week
T3.95	If cyanotoxin levels in treated water exceed the MAVs in the <i>New Zealand Drinking Water Standards 202X (to be determined)</i> neither a 'do not use advisory' must be issued to consumers, or water must be provided from an alternative source	Assurance	Month

10.10 D3. Distribution system rules

Distribution system rules cover four areas:

- backflow protection,
- watermain hygiene,
- facilities operation and maintenance,
- residual disinfection, disinfection by-products and plumbosolvent metals
- micro-biological monitoring.

Water suppliers are required to comply with the rules in all of the sections.

10.10.1 Backflow Protection Rules

Rule Number	Requirement	Assurance/ Monitoring	Compliance period
D3.1	Drinking water suppliers must prepare and implement a backflow prevention programme to protect their network against the risk of backflow.	Assurance	1 year
D3.2	Periodic surveys of customer premises to determine medium and high-risk sites must be undertaken by the water supplier at a minimum of once every five years to assess the adequacy of backflow protection at the supply point.	Assurance	1 year
D3.3	Where backflow requirements at customer premises are deemed inadequate, the water supplier must notify the local authority with details of the situation and risk, determine the type of backflow device that should be installed at the supply point and ensure that it is installed in a timeframe commensurate with the risk but as soon as reasonably practicable.	Assurance	1 year
D3.4	Testing of all testable backflow prevention devices installed at a supply point specifically to protect the network (generally boundary devices) ⁴³ must be undertaken, at least annually.	Assurance	1 year
D3.5	A water supplier must maintain a register of the location of all supply point testable backflow protection devices, device types, risk level and the results of testing of all devices.	Assurance	1 year

⁴³ Does not include devices that are installed within buildings that have the purpose of protecting building users and preventing backflow into a network.

D3.6	Access to a water network through use of a standpipe is not permitted except by Fire and Emergency New Zealand, other emergency services, the water supplier or authorised contractors to the water supplier where it is reasonably necessary to access the network for the operation of the drinking water supply.	Assurance	1 year
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10.10.2 Facilities Operation, Maintenance and Disinfection Rules

Rule Number	Requirement	Assurance/ Monitoring	Compliance period
D3.12	Water suppliers that have storage facilities within a distribution system must prepare a water storage management plan for the operation of storage facilities which includes the minimum and maximum operating levels, target turnover rates, inspection and cleaning.	Assurance	1 year
D3.13	All storage facilities must be subject to a security and contamination inspection and assessment by the drinking water supplier, annually.	Assurance	1 year
D3.14	Water suppliers must prepare and use written disinfection procedures for storage facilities that are consistent with industry best management practices.	Assurance	1 year
D3.15	All new storage facilities and existing storage facilities that have been drained for maintenance purposes must be cleaned and disinfected prior to being brought back into use.	Assurance	1 year
D3.16	Divers' suits, rafts, remotely operated vehicles (ROVs) and other materials used during inspection, maintenance or other activities within storage facility interiors must be made from materials acceptable for contact with potable water and suitable for disinfection.	Assurance	1 year
D3.17	All equipment and materials entering storage facilities must be disinfected immediately prior to entry according to industry best management practices.	Assurance	1 year

D3.18	Following full or partial draining of storage facilities for maintenance and after completion of disinfection procedures, storage facilities must be refilled with potable water and tested for <i>E. coli</i> , total coliforms and disinfectant residual to ensure there is no contamination.	Assurance	1 year
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10.10.3 New and Repaired Watermains Hygiene Procedures Rules

Rule Number	Requirement	Assurance/ Monitoring	Compliance period
D3.7	Before carrying out or commissioning repairs to pipes in a water distribution network, a drinking water supplier must undertake and keep records of a risk assessment to determine the risk of contamination of the network and the procedures required to minimise that risk.	Assurance	1 year
D3.8	All materials used in construction and repairs must be free of visible contamination and remain protected from contamination until installation.	Assurance	1 year
D3.9	All tools contacting the water supply or its parts, particularly cutting surfaces, must be adequately disinfected prior to commencing work and subsequently as necessary when tools contact soil or backfill material.	Assurance	1 year
D3.10	Disinfection of mains (when required) must follow best management practices including but not limited to methods such as tablet, continuous feed, slug, spray chlorination, or equivalent as appropriate.	Assurance	1 year
D3.11	Water suppliers must develop and document standard operating procedures for planned, unplanned and emergency repairs.	Assurance	1 year

10.10.4 Residual Disinfection, Disinfection By-product and Plumbosolvent Metal Rules

Rule Number	Requirement	Assurance/ Monitoring	Compliance period
D3.19	A written sampling plan for determinands to be sampled in relation to disinfection, disinfection by-products and plumbosolvent metals must be prepared including a system map indicating sampling locations and response procedures to be followed when sample results do not meet prescribed levels.	Assurance	1 year
D3.20	A FACE of at least 0.2 mg/L must be maintained at all locations at all times.	Monitoring	1 day
D3.21	Samples must be collected for FAC and pH at the frequencies outlined in 32. ⁴⁴	Monitoring	1 day
D3.22	Routine sampling sites must be located to adequately represent the distribution system and areas associated with higher risk of deterioration in water quality and population exposure. ⁴⁵	Assurance	1 year
D3.23	Analyses must be undertaken for the following disinfection by-products, trihalomethanes: chloroform, bromodichloromethane, dibromochloromethane, and bromoform; and the haloacetic acids: dichloroacetic acid and trichloroacetic acid in each distribution zone according to the frequencies set out in Table 33.	Monitoring	1 month or 1 year as set out in Table 33
D3.24	Sample sites for disinfection by-products should represent both peripheral and central locations in the distribution system.	Assurance	1 year
D3.25	Analyses must be undertaken in each distribution zone for the plumbosolvent metals outlined in Table 34.	Monitoring	1 year

Water suppliers may continuously monitor FAC and pH in a distribution zone in accordance with rules D3.26 and D3.27 as an alternative to demonstrating compliance against rules D3.21, D3.22 and the sampling frequencies set out in the Table 32.

⁴⁴ Demonstrating compliance with this rule (D3.21) is not required if FAC is continuously monitored according to rules D3.26 and D3.27.

⁴⁵ Demonstrating compliance with this rule (D3.22) is not required if FAC is continuously monitored according to rules D3.26 and D3.27.

Rule Number	Requirement	Assurance/ Monitoring	Compliance period
D3.26	Continuous monitoring analysers for FAC and pH must be installed in each distribution at the following locations: <ol style="list-style-type: none"> 1. At the supply point to a distribution zone, e.g. a reservoir or bulk supply point. 2. At a supply main near to the outer extent of the distribution zone in an area associated with higher risk of deterioration in water quality. 	Monitoring	1 year
D3.27	Verification of the representative nature of the continuous monitoring results must be undertaken by the collection and analysis of five FAC and pH grab samples each month from within the distribution zone. Samples should be taken from the outer extent of the distribution zone at times of normal demand.	Assurance	Results not required for compliance

Table 32. D3 FAC and pH sampling frequency

Distribution zone population	Number of samples per day
501 – 20,000	1
20,001 – 100,000	2
100,001 – 200,000	3
For each additional 100,000 people above 200,000	+1

Table 33. D3 Disinfection by-product sampling frequency

Disinfection by- products sampling requirements	Number samples
Each distribution zone	1 per quarter ⁴⁶
After 2 years consecutive samples less than 50% of the MAV	1 per year

Table 34. D3 Distribution zone for plumbosolvent metals.

Plumbosolvent metals	Frequency
antimony, cadmium, chromium, copper, lead, mercury, nickel, zinc	Every 6 months ⁴⁷

⁴⁶ Additional targeted sampling should be undertaken in accordance with the sampling programme to understand the conditions and circumstances that lead to DBP formation.

⁴⁷ Must be sampled monthly if the determinand exceeds 50% of its MAV.

10.10.5 Microbiological Monitoring Rules

Rule Number	Requirement	Assurance/ Monitoring	Compliance period
D3.28	A written sampling plan for monitoring total coliforms, <i>E. coli</i> and any other determinands/parameters deemed necessary by the water supplier must be prepared, including a system map indicating sampling locations.	Assurance	1 year
D3.29	<i>E. coli</i> and total coliforms must be monitored in each zone of the distribution system according to the frequencies set out in Table 35.	Reporting	1 week
D3.30	Routine sampling sites must be located to adequately represent water in the distribution system, including water leaving storage facilities, and entry points for water from another water supplier.	Assurance	1 year
D3.31	Samples must be collected according to written sampling protocols prepared by the drinking water supplier or the laboratory undertaking the sample analysis.	Assurance	1 year

Table 35. D3 Minimum Microbiological Sampling Frequencies

Distribution zone population	Number of samples per week	Maximum interval between samples (days)	Minimum number of days of the week used
501–5000	1	11	5
5001–45,000	2	6	6 (at least one Saturday or one Sunday sample each year)
45,001–65,000	3	4	7 (at least one Saturday and one Sunday sample each year)
65,001–90,000	4	3	7 (at least four Saturday and four Sunday samples each year)
90,001–120,000	5	2	7 (at least one Saturday or one Sunday sample each week)
120,001–160,000	6	2	7 (at least one Saturday or one Sunday sample each week)
160,001–200,000	7	1 (day)	7 (includes Saturdays, Sundays and public holidays)
For each 40,000 people above 200,000	+1	1 (day)	7 (includes at least one sample each Saturday, Sunday and public holiday)

10.11 Water Carrier Service Rules

Rule Number	Requirement	Assurance/ Monitoring	Compliance period
WC.1	All water to be carried must be sourced from a registered drinking water supplier where the water is (a) safe to drink (b) complies with the <i>New Zealand Drinking Water Standards 202X</i> and (c) complies with the rules relevant to the supply.	Assurance	1 Year
7WC.2	The water carrier must only take water from a point in a distribution system prescribed by the water supplier.	Assurance	1 Year
WC.3	If water is sourced from a supply owned and operated by a water carrier, that supply must be registered and comply with the rules for Community Drinking Water Stations/Water Carrier Supplies.	Assurance	1 Year
WC.4	The operator of any vehicle used to transport water must ensure all tanks, and the equipment used for loading or unloading water, must only be used for drinking water.	Assurance	1 Year
WC.5	The operator of any vehicle used to transport water must ensure all tanks, and the equipment used for loading and unloading water, are kept clean and clear of any possible contaminants at all times, with all openings and connections sealed to protect them from possible contamination. The drinking water is to be protected from contamination at all times during its loading, transit and delivery.	Assurance	1 Year
WC.6	If tanks and the equipment used for loading and unloading water are not used for the transport of drinking water for a period of 30 days, the tank and fittings must be disinfected by filling with drinking water containing at least 5 mg/L FAC for not less than 30 minutes before discharging safely to waste.	Assurance	1 Year
WC.7	The carrier operator must ensure there is backflow prevention or an adequate air gap in place when discharging drinking water from the carrier's tank.	Assurance	1 Year

WC.8	<p>When drinking water is delivered, a written statement must be supplied to the customer/consumer stating the:</p> <ul style="list-style-type: none"> i. Fill date and time. ii. Registered drinking water supply from which the tanker was loaded. iii. Delivery date, time, location and volume of water delivered. iv. Name of water carrier company. v. Name and signature of delivery person and carrier registration number. 	Assurance	1 Year
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10.12 PTE. Planned temporary event rules

Planned Temporary Event Compliance Rules

Rule Number	Requirement	Assurance/Monitoring	Compliance period
PTE.1	Proposed surface water sources must be tested for a range of source water determinands before being considered as a drinking water source (See Table 14 and Table 15)	Assurance	Determined by event length
PTE.2	Any proposed surface water source must be assessed for the risk of cyanobacteria and cyanotoxins and must not be used if the source is assessed as being at medium or high risk for cyanotoxins.	Assurance	Determined by event length
PTE.3	All water provided as drinking water must be filtered.	Monitoring	Determined by event length
PTE.4	All water provided as drinking water must be disinfected including with chlorine.	Monitoring	Determined by event length
PTE.5	All water provided as drinking water must be monitored for FAC residual, pH and turbidity.	Monitoring	Determined by event length