CLUTHA DISTRICT COUNCIL

RULE G11: HYGIENE CODE OF PRACTICE

Clutha
District Council

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	Name	Date / Signed
Prepared by:	**Keiran Medel** *Senior Contracts Engineer*	Keiran Medel 08/02/2023
Reviewed By:	**Ian Evans** *Three Waters Operations Manager*	7/04/2024
	Daniel Pickup *Compliance Team Leader*	17/04/2024
Approved By:	**Linda Till** *Head of Three Waters*	02/05/2024

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1. Clutha District Council Water Supplies

Clutha District Council looks after 22 water scheme schemes that supply water to 15 towns and more than 2,000 rural properties, providing water for households and livestock.

Water supply in the Clutha District consists of town supply e.g. Balclutha, Kaitangata, Lawrence, Milton, Owaka, Clinton, Heriot, Kaka Point and Tapanui and 12 rural water schemes: Moa Flat, Glenkenich, Waipahi, Pomahaka, Clydevale, Tuapeka West, Tuapeka East, Balmoral 1, Balmoral 2, Richardson North, Richardson South, North Bruce, South Bruce and Wangaloa.

All schemes, except for Waipahi, provide water for domestic consumption.

Council processes and treats all water before it is supplied, and then regularly tests the water to make sure the treatments are working. Council is required to chare this information with Otago Regional Council and the regulator, Taumata Arowai. Clutha District Council is vigilant in monitoring the water supply.

All Clutha schemes are chlorinated to kill any germs remaining after the treatment process, and to keep the water safe as it travels to the public.

All the Rural Water Schemes in the Clutha District operate as restricted water supplies, i.e. the flow of water into each property is restricted to a maximum allocated flow to ensure all consumers receive a fair and constant supply.

To keep these schemes affordable, pipes are kept as small as possible and are sized to only allow a restricted amount of flow at each consumer's supply tank. The restrictor allows water to flow steadily into the tank at a low rate, thus sharing the available water fairly. The day's supply flows into each tank over a 24-hour period. The tank ensures there is plenty of water for the demand during the day for stock water and milking sheds for on-farm supplies and at houses for showers, washing machines, hoses, etc.

All the townships that are connected to these schemes also operate as restricted supplies – this includes Kaka Point, Waihola, Clinton, Tokoiti, Tuapeka Mouth, Waitahuna, Heriot, Pukerau and Waikaka. This means that

very property connected to one of these schemes should have the water supply to their property restricted

2. Purpose and Principles

Contamination of the water supply can occur at source, treatment, in reservoirs, and throughout the reticulation system as a result of poor hygiene practices during the installation of new equipment (including pipes, valves, fittings, and reservoirs), inspections, repairs, and maintenance activities.

Rule G11 of the Drinking Water Quality Assurance Rules 2022 (DWQAR) requires Clutha District Council to prepare a Hygiene Code of Practice for people working on its water supply.

The intention of the Hygiene Code of Practice is to prevent water supply contamination by providing defined requirements for water operations staff, contractors, and their managers working on potable water networks.

The objective of the Hygiene Code of Practice is to define the minimum requirements for disinfection of tools and materials, new mains connections and reactive maintenance on the water network, in order to meet hygiene and best practice expectations for staff and contractors.

It is important that the quality of water delivered from the treatment plants is not compromised as the water is transported through the reticulation system, therefore work carried out on the water supply network should follow practices outlined in this Code of Practice in order to preserve water quality and safeguard the water system against contamination.

The contents of the Hygiene Code of Practice do not take precedence over any legislative requirements. The relevant legislation is as stated below:

- The importance of water and its link to our health is reflected in the main purpose of the Water Services Act 2021: to ensure that drinking water suppliers provide safe drinking water to consumers.
- It is the responsibility of the water supplier to safeguard the health of New Zealand's communities by adhering to the requirements set out in the Drinking Water Quality Assurance Rules/Water Services Act 2021.
- As described by the Resource Management Act 1991, it is the obligation of regional councils to protect both the natural resource of New Zealand's water and the general environment. Water suppliers are consequently required to ensure sufficient chlorine neutralisation when discharging hyper-chlorinated water.
- Under Section 25 of the Water Services Act 2021, in the case of maintenance work that involves interruption to a water supply of more than eight hours, it is the duty of the water supplier to inform affected customers and Taumata Arowai.
- In the event of a known contamination occurring resulting in water (potable, waste, or storm) not meeting the legal quality requirement, the water provider is accountable for informing the regulatory body and any customers affected.

- It is the responsibility of water operations staff to inform their manager of any concerns they may have regarding the public safety of the water supply post maintenance.
- It is the responsibility of water operations managers to ensure the safety of their staff by understanding both the given situation and the limits of staff capability as discussed in the Health and Safety at Work Act 2015.

3. Definitions

DWQAR: Drinking Water Quality Assurance Rules 2022.
https://www.taumataarowai.govt.nz/assets/Uploads/Rules-and-standards/Drinking-Water-Quality-Assurance-Rules-2022-Released-25-July-2022.pdf

Chlorine neutralisation: A chemical reaction to remove free chlorine from water.

Contact Time: A measurement of the length of time it takes for chlorine (most commonly used water treatment disinfectant) or other disinfectants to kill contaminants at a given disinfectant concentration.

Reservoir: A tank or series of tanks whereby treated water is kept in store aka treated water reservoirs.

PPE: Personal protective equipment used or worn by a person (including clothing) to minimise risks to the person's health and safety.

Backflow: An unintended or undesirable reverse flow of water. This could be from property back to the reticulation, or from a yet-to-be disinfected pipe back into the reticulation. Both have the potential to cause a serious health risk. This could be in the form of a Double Check Valve (DCV) or a Reduced Pressure Zone (RPZ)

Contamination: Presence of an unwanted constituent, harmful substance, impurity in potable water system.

Dead-ends or dead legs: A section of pipe which has no exit, in which water can remain static.

FAC: Free available chlorine. This is the part of the total chlorine measurement that has not yet reacted with contaminants.

Flushing: The process of cleaning, or scouring, the interior of water distribution pipes by sending a rapid flow of water through the potable water pipes.

Hyper-chlorination: Also known as super-chlorination, this is the use of high doses of chlorine (above the DWSNZ MAV of 5 mg/L) to disinfect water systems.

MAV: Maximum acceptable value.

mg.min/L: The concentration of disinfectant in mg/L per min contact time as pertaining to contact time values.

Pigging: The use of a pig (a cylindrical, typically foam, object with a cone-shaped nose) inside pipelines for a variety of purposes including removing debris and biofilm that can be the source of taste and odour issues.

Swabbing: A process of cleaning a water pipe by inserting a soft material shaped like a bullet, often inserted into a fire hydrant, and pushed through the pipe with water and out of a scour point or another hydrant.

4. Scope

The Hygiene Code of Practice provides water operations staff and contractors with the information required to establish a model set of procedures for preventing contamination of a water supply following the installation or upgrade of a pipework, treatment plant, pump station, or reservoir system. Such procedures are necessary to ensure the safety of the water supplied, and to protect the health and safety of workers.

This Hygiene Code of Practice details water services policy for staff and contractors working on potable water networks for the disinfection of both reservoirs and potable pipes after maintenance, refurbishment, or installation of equipment. All water supply contractors must adhere to the Hygiene Code of Practice for all work on Clutha District Council water supply networks.

There are many potential sources of contamination to a water supply network (such as backflow, air valves allowing water from a flooded chamber to enter a pipe during a low-pressure situation, vermin entering a reservoir, leaky roof seals in reservoirs, reverse flow in a pipe, dead legs in a pipe network, etc.) which are not covered in this code of practice. These sources of contamination fall within the domain of regular maintenance and are covered in the relevant water safety plans.

5. Reservoir Disinfection

There are three main factors in reservoir maintenance that could compromise the quality of the water supply:

1 **Contamination through equipment**: Reservoir maintenance may require a person or machinery to enter the reservoir. As there may be contaminants on that person or machinery, a strict disinfection procedure must be adhered to.

2 **Intrusion**: When hatches or valves are opened, there is a risk of contamination entering a reservoir. Risk assessments from both a public health and staff health and safety perspective must be carried out prior to work commencing.

3 **FAC deficiency**: This could arise from a miscalculation, unknown disinfection strength, poor mixing practices, or insufficient sampling. Only competent staff should carry out this work.

Proper workforce training and documentation is required to mitigate each of these risks.

5.1 Preliminary Actions

Before work commences on a reservoir, the asset should be removed from service, and isolated by closing the inlet and outlet valves. If the reservoir inlet/outlet valves must be inspected in the open position, system valves further upstream/downstream should be closed to isolate the asset. An alternative method is to install a spade.

If the reservoir is to stay in service while divers or submersibles are used, the water supplier needs to be confident that the contractor's procedures manage any contamination risks.

To reduce the risk of wind-blown or dropped contaminants entering the asset once a hatch is open, all loose dirt and debris surrounding the hatch must be cleared away prior to opening. The working area in the immediate vicinity of the access hatch must be covered with a protective plastic sheet and, once in place, it must be washed with a disinfectant solution. Wind screens or other protective devices are recommended.

5.2 Free Available Chlorine (FAC)

Chlorination is used to disinfect drinking water by oxidising contaminants. In the case of a diver or submersible being used, the FAC of the reservoir water should be established prior to entry. It is important to have a properly calibrated analyser, which can be achieved through a regular manual calibration check, to ensure accurate measurements are taken.

Representative water samples should be taken from several locations, and analysed for FAC. The results must be recorded.

The pH of the water being chlorinated impacts the effectiveness and availability of FAC. A pH above 8 means the efficacy of FAC is reduced. The disinfection is not valid if the pH of the water is above 9.0. The disinfection process must be repeated once the pH of the water is less than 9.0. This is of concern when disinfecting new concrete reservoirs or cement-lined pipes, as the pH can easily exceed this value.

For FAC and pH measurements, calibrated portable analysers are most commonly used in the Clutha District.

5.3 Equipment Disinfection

Disinfection is required for all equipment that will enter an operating reservoir. All equipment used in the disinfection of reservoirs must be free of oil and dirt. Maintenance records for the equipment must be kept.

Immediately prior to its use, all equipment must be disinfected via submersion in, spraying, or sponging with a disinfectant solution.

If a person will be entering the reservoir, they should be wearing gumboots dedicated solely to potable water work, and a footbath of disinfectant solution must be provided for them to step in immediately before entering the reservoir.

A minimum 1% chlorine solution with a pH value between 7 and 8 must be used for the disinfection of tools, equipment, fittings, and materials. The strength of the disinfectant solution should be verified with a chlorine test kit before use. A new solution must be prepared at least weekly, and the old solution disposed of after it has been dechlorinated.

Between uses, all equipment must be stored in a manner that prevents both chemical and bacteriological contamination. Water supply equipment should be dedicated to water supply use only and stored away from equipment used for wastewater and stormwater to avoid any contamination. All materials should be stored and handled in a manner that minimises contact with foreign materials.

5.4 Post-Work Reservoir Disinfection Procedure

To begin post-work disinfection, the reservoir needs to be thoroughly cleaned. All scaffolding, planks, tools, rags, and other materials that are not part of the structural or operating facilities of the reservoir must be removed. The surfaces of the walls, floors, and operating facilities of the reservoir must be cleaned using a high-pressure water jet, sweeping, scrubbing, or equally effective means. All water, dirt, and foreign material accumulated in this cleaning operation must be discharged or otherwise removed from the reservoir.

Following the cleaning operation, vent screens, overflow screens, and any other screened openings should be reinstated, checked, and/or replaced to ensure they are in a condition to prevent birds, insects, and other animals or vermin from entering the reservoir.

Any equipment required to be in the operating reservoir after the cleaning procedure has been completed must be clean and sanitary when placed in the reservoir. In such instances, care must be taken to minimise the introduction of dirt or other foreign material.

5.5 Contact Time

The concentration of the disinfectant multiplied by contact time (C.t.) value indicates the time necessary to achieve the required percentage inactivation of contaminants at specific disinfectant concentrations. After the water has been dosed with disinfectant, the number of viable organisms remaining is expected to decrease exponentially with time.

C. t. = Disinfection concentration (mg/L) x minutes

The required C.t. value varies with the temperature of the water and the expected pathogens being inactivated. The following table from the World Health Organisation (2004) shows the C.t. value required to achieve a 2-log disinfection (99% of pathogens suspended in water at different temperatures).

Microorganism	C.t. value	Conditions
Bacteria	0.08 mg.min/L 3.3 mg.min/L	1–2°C; pH 7 1–2°C; pH 8.5
Viruses	12 mg.min/L 8 mg.min/L	0–5°C; pH 7–7.5 10°C; pH 7–7.5
Giardia	230 mg.min/L 100 mg.min/L	0.5°C; pH 7–7.5 10°C; pH 7–7.5
Cryptosporidium	Not inactivated	

Higher values are required to treat pathogens that are not in suspension.

Selecting the appropriate C.t. value depends on the conditions in each individual reservoir. Aspects such as temperature and pH levels can impact the efficiency of the disinfection process, so these must be accounted for when selecting a C.t. value.

The C.t. value must also be appropriate for both the work planned and the pathogens to which the asset has potentially been exposed. It is expected that a new reservoir or pipe being put into service for the first time would have been exposed to significantly more pathogens than a reservoir in a chlorinated system being drained for a short period of time for inspection.

The size of the contact area must also be considered when determining the best disinfection method. For reservoirs or large-diameter pipes, spraying a disinfectant onto the potentially contaminated area may be more effective than dosing the incoming water via an injection method.

The effectiveness of the disinfection process is reduced if there is inadequate mixing of the disinfectant with water in the reservoir. Poor mixing may result in a pathogen not being exposed to an effective disinfectant concentration for the required time.

There is no set method for mixing, so each water utility must use a thorough procedure to ensure proper contact time occurs. Options include introducing the disinfectant with the inlet water as the reservoir is filled in such a way that ensures through mixing with the incoming water, and hanging a submersible pump in the reservoir to ensure sufficient mixing occurs within the reservoir through circulation. Note that aeration of water will reduce FAC levels. Allowance should therefore be made for a reduction of FAC if chlorinated water can free-fall into a reservoir while filling, or a submersible pump is positioned such that water creates a fountain within the reservoir.

It is up to each individual utility to determine its preferred approach for C.t. values in different circumstances. Refer to the Contact Time Calculation SOP.

6. Potable Water Pipes Disinfection

Possible contributors to contamination of the water supply during mains maintenance include:

- **Intrusion**: When blanking plates, end caps, or outside valves are opened, there is a risk that contamination in the form of vermin, contaminated water, dirt, or debris could enter a pipe.
- **FAC deficiency**: This could arise from either a miscalculation, or a contaminant not being accounted for.
- **Contamination through equipment**: There is a risk of contamination from equipment, such as CCTV cameras used to inspect water pipes, or tools used by staff. The staff working on the reticulation system also pose a contamination risk (see Section 11 Staff Management).
- **Unsuitable material choices**: These can lead to permeation or leaching.
- **Backflow**: This can occur if suitable prevention devices are not installed or maintained.

Proper workforce training and documentation is required to mitigate each of these risks.

6.1 Preliminary Actions

A typical sequence of actions for commissioning a new pipe or section of pipe is:

- Inspecting the pipe prior to flushing;
- Flushing the pipe;
- Pressure-testing to confirm there are no leaks and no additional work is required;
- Disinfecting all temporary fittings used before connecting the pipe.

A new pipe should be hyper-chlorinated, subsequently dechlorinated as the pipe is drained, refilled with potable water, and placed into service after receiving clear bacteriological test results. Confirm the water has been dechlorinated before disposing of the water to the network of rivers.

The new pipes with an internal diameter ≥150mm can be inspected using CCTV where practical and deemed necessary. The CCTV report verifies that the pipe is completely free of debris and any pipe shavings before starting disinfection. When suitable this step can be skipped before flushing.

Maintenance on a reticulation system may require a temporary interruption of service to customers due to the necessary isolation of parts of the system. For planned maintenance, Council will send out a notification to the affected customers at least 24 hours prior to supply interruption.

Excavations should be at least 400mm deeper than the bottom of the pipe being worked on. Consider using pea metal, which has already had the fines washed out of it, as draining material for a cleaner work site. Also

make provision prior to starting for sump pumps in order to mitigate contamination due to the work site becoming submerged.

Openings in the pipeline should be closed with watertight plugs when work is interrupted or stopped for any reason. Rodent-proof plugs may be used when watertight plugs are not practicable. A thorough cleaning practice such as pigging, flushing, or disinfection must be carried out before the pipe is put into service.

Fittings should be boxed, capped, or sealed with plastic wrapping prior to installation. It is good practice to have all pipes capped. Pipes delivered for construction should be stored in a manner that minimises the entrance of foreign material. Pipe deliveries should be scheduled as close as possible to installation dates to reduce the risk of contamination.

Only potable water shall be used for disinfection, flushing, and hydrostatic pressure testing. If an adjacent reticulation network is used as the source of potable water and is directly connected to the work site (including via fire hydrants), then the use of an approved backflow device is required to prevent contamination of the reticulation network. Accredited tankers provide an alternative source of water.

6.2 Backflow

Council's backflow prevention policy is covered in the Backflow Prevention Programme. Best practice guidance to minimise the risk of backflow is outlined in Boundary Backflow Prevention for Drinking Water Supplies (Water New Zealand, 2019).

The Backflow Prevention Policy is as outlined in the Water Services Bylaw 2019.

All temporary connections of reticulated water to pipes under construction and/or maintenance shall incorporate testable double-check backflow devices to prevent contamination of the source reticulation network. This includes water used for hydrostatic pressure testing, flushing, and disinfection.

6.3 Equipment Disinfection

Immediately prior to its use, all equipment must be disinfected via spraying, sponging, or submersion in disinfectant solution. A minimum 1% solution with a pH value between 7 and 8 should be used for the disinfection of tools, equipment, fittings, and materials. The strength of the disinfectant solution should be verified with a chlorine test kit before use. A newly prepared solution must be made available at least weekly and stored out of direct sunlight if possible. The old solution should be disposed of after it has been dechlorinated.

6.4 Potable Water Pipes Disinfection Procedure

The pipe should be thoroughly flushed in sections through hydrants and scours, producing a minimum 0.91m/s flow velocity to remove all foreign matter. The volume of flushing water used should be equivalent to at least three pipe volumes. A visual inspection should be made of the water being flushed for signs of discolouration and a jar sample collected from the hydrant at 15 second, 1-minute and 5-minute intervals to view quality of the water.

The flow of water shall be from one direction at a time. Depending on the position of the flushing point/s, flushing in alternating directions may be required to ensure all sections of the pipe have been completely flushed, and no unflushed dead-ends exist.

For pipes that have been in service and are being flushed, be aware that flushing the pipe in a reverse flow direction or at higher flow rates than normal service may dislodge biofilm and sediment at quantities higher than expected.

If dirt remains in the pipe following flushing operations, the interior of the pipe should be cleaned using mechanical means such as a hydraulically propelled pig, or other suitable methods such as ice pigging. Following cleaning, the pipe should be drained completely, then slowly filled with chlorinated potable water.

When using an injection method, the chlorine solution must be injected at a continuous flow proportional rate to ensure a uniform concentration is in contact with every part of the pipe. This can be achieved by pumping in the chlorine solution, or by using a chlorine injector while the pipe is being filled with water.

The chlorinated water should be introduced at the lowest point of the section of pipe being disinfected to ensure that no air is trapped. This will ensure all surfaces encounter the disinfectant.

After the requisite contact time, the pH of the water should be recorded. The effectiveness of chlorine as a disinfectant is greatly reduced above pH 8.0. A pH level greater than 9.0 is not accepted as compliant with disinfection requirements, and disinfection must be repeated using a solution producing a pH less than 9.0. This is particularly applicable when disinfecting new or refurbished cement-lined pipes, as the pH can easily exceed these values.

The residual chlorine concentration must be recorded after the contact time period. If the required concentration is not achieved, the chlorination procedure must be repeated. The FAC residual must be greater than 0.2 mg/l.

Once the required pH level, chlorine concentration, and contact time are achieved, the potable water pipe and any service connection pipes should be flushed with potable water until the chlorine concentration of the water meets the expected residual detailed in Table 1. The chlorine residual results are to be forwarded to the

CDC's Reticulation Supervisor. The flush water should be dechlorinated before being released into the environment (see Section 7: Sampling).

Table 1: Expected FAC ranges per distribution network

Distribution Network	Expected FAC (mg/l)
Balclutha	0.5 – 1.0
Clydevale	0.7 – 1.4
Clinton	1.0 – 1.5
Glenkenich	0.5 – 1.5
Kaitangata	1.0 – 1.5
Wangaloa	1.0 – 1.5
Milton	0.7 – 1.5
OCF	1.0 – 1.5
Moa Flat	0.5 – 1.5
North Bruce	0.5 – 1.5
Waihola	0.5 – 1.5
Tapanui	0.5 – 1.0
Balmoral 1	1.0 – 1.5
Balmoral 2	0.5 – 1.5
Tuapeka East	1.0 – 1.5
Richardson South	1.0 – 1.5
Kaka Point	1.0 – 1.5
Richardson North	1.0 – 1.5
Stirling	1.0 – 1.5
South Bruce	1.0 – 1.5
Lawrence	0.5 – 1.0
Owaka	0.5 – 1.0
Tuapeka West	1.0 – 2.0

The disinfection process must align with the KPI Timeframes set out in Table 1. If there is a delay putting the potable pipe in service (days) following disinfection, sampling for FAC and bacteria must be carried out. If the results of this sampling are unacceptable, repeating the disinfection process will be required.

The dumping of calcium hypochlorite powder, granules, or tablets into the pipe or through hydrants without mixing is not an acceptable form of disinfection under any circumstances, as it will not instantly dissolve, and will be pushed away from the work area as the pipe is filled. Consequently, the area that is potentially contaminated will not be disinfected, and a slug of water with a high dose of chlorine (probably above the DWQAR limits) will result, potentially creating further customer issues.

6.5 Contact Time

See Section 5.5 for a description of how C.t. values are calculated, and what concentrations and times are required to treat different pathogens. The CDC Standard Operating Procedure (SOPs) for Contact Time Calculation can be found in Appendix D.

6.6 Disinfection Procedures when Cutting/Repairing Existing Pipe

The planned, unplanned, or emergency repair of a water pipe is time sensitive due to the disruption of water services to customers. The repair needs to be made using sanitary and safe procedures by well-trained operators in order to minimise possible public health issues caused by contamination of the potable water occurring at the repair site.

If depressurising the pipe is necessary, it is ideal to delay the depressurisation until the site has been excavated to prevent contamination from trench soil and water.

The exterior of the pipe around the repair site should be cleaned and disinfected with a minimum 1% chlorine solution. If the interior of the pipe is exposed to the environment, it should be inspected and, if debris is present, flushed into the trench. All interior surfaces should be disinfected by either spraying or swabbing with a 1% chlorine solution. If a new section of pipe is required, then the new pipe should be inspected, cleaned, and disinfected by swabbing with a minimum 1% chlorine solution.

Flushing and scouring, ensuring the flushed water is visually clear, should occur immediately on returning the pipe to service. If the supply is normally chlorinated, flushing should continue until the normal chlorine residual is present.

If disinfection procedures cannot be carried out, boil water notices and/or alternative water sources should be provided until clear *E. coli* test results have been obtained for three consecutive days.

In the case of contamination due to pipe breakage, a variant of the slug chlorination method may be used. All service connections should be isolated, and the section of pipe with the break isolated and disinfected with an appropriate method. After disinfection, the individual service connections should be flushed.

If the pipe has been contaminated with chemicals such as hydraulic oil or petrochemical products, the pipe section should be replaced and not used for potable water again.

Refer to Council's Standard operating procedures for planned, unplanned, and emergency repairs for further details as seen in Appendix D.

7. Sampling

Potable water pipe disinfection verification: samples should be tested and recorded along the length of the pipe where collecting a sample is practicable (every hydrant, etc.) to ensure even and effective distribution of the chlorine.

Reservoir disinfection verification: samples should be collected from as many locations around the tank as practicable (most reservoirs have one hatch), and from different depths at each location, to ensure adequate mixing has occurred.

Eurofins Laboratory is accredited by IANZ and is contracted for all sample collection and analysis. Each sample should be analysed for Chlorine Residual, pH, turbidity, *E. coli* and Total Coliforms.

E. coli test samples taken from a chlorinated source are only valid if the requisite additives (i.e., sufficient dechlorinating agent) are present in sterile sample bottles. There is a risk of contamination during sample taking so only trained personnel should collect samples.

E. coli testing must be completed within 24 hours of sample collection. Clutha District Council Potable Sample Plan outlines the procedure for sample handling, preservation, transportation, etc. For further information, refer to the Sampling SOP in Appendix D.

A clear *E. coli* test result is a recognised verification that the disinfection has been effective, however a pH above 9.0 renders the effectiveness of the disinfection process questionable, and it is recommended that the system be flushed again, and the disinfection process repeated.

A sample with a turbidity value greater than 2 NTU also renders the effectiveness of the disinfection process questionable and should result in flushing and repeating the disinfection process.

The DWQAR has a Maximum Acceptable Value for Free Available Chlorine of 5 mg/L. Customer complaints are likely at FAC levels approaching the MAV. Staff must test for FAC in the field following all maintenance activities to ensure the efficacy of disinfection practices. FAC must be at least a minimum of 0.2mg/L but staff/contractors should aim for the expected FAC results as stipulated in Table 1.

8. Neutralising Chlorine

The Otago Regional Council's Rule 12: Water Take, Use and Management permits the discharge of water from a drinking water supply reservoir and pipeline, providing that the discharge does not contain any free or residual chlorine at the point where the discharge enters water in any surface water body or mean high water springs.

There are many methods to dechlorinate water, but chemical neutralisation using sodium thiosulphate is the most common. This involves the water being dosed as it is being discharged.

Alternatively, the chlorinated water can be captured on site (e.g., in a tanker) prior to discharge. It is suggested that the water be kept contained on site for a minimum of two days until the FAC concentration is reduced to <1 mg/L. It can then be discharged to a sewer. Another acceptable practice is to dechlorinate the water in the tanker prior to discharge.

Where water is discharged to a sanitary sewer, a minimum airgap of 300 mm is required in order to reduce the risk of recontamination of the disinfected pipework.

For more information about chlorine neutralisation procedures, refer to the Chlorine Neutralisation Standard Operating Procedure.

9. Hygiene

9.1 Equipment

Actions of operations staff working on water reticulation systems are a potential source of contamination. Supervisors must ensure that the appropriate safeguards are rigorously applied to each situation. They should only assign work to employees who are free of illness or disease, and who have the appropriate training and competencies.

Operational staff, tools, and vehicles used on a potable water supply should never encounter a contaminated site such as a wastewater site. All personnel working on a water supply are equipped or have access to a hygiene kit as outlined in Appendix C. It is recognised that this is not always possible, so the following general guidelines are advised to minimise contamination risks:

- It is not acceptable to use the same equipment, protective clothing, or tools for the maintenance of both potable water and wastewater reticulation systems. Staff who work on both potable and wastewater assets should have separate protective clothing and tools for each system.
- If personnel are required to work on a potable water system after working on a wastewater system, they should have separate protective clothing and tools for each system and should shower and change into clean overalls and boots between jobs.
- If the same vehicle is used to travel between potable water and wastewater sites, the potable water tools, and personal protective equipment (PPE) must be stored separately from, and not come into contact with, wastewater tools and PPE.
- Provisions such as dedicated cleaning water supply, sanitary wipes, and antibacterial liquid soap must be available for workers to cleanse and sanitise their hands in the field.
- Equipment such as breakers and excavators that have previously been used on a wastewater site should be steam-cleaned and disinfected with a 1% chlorine spray before being transported and used on a potable water site. The equipment may be rinsed off with potable water after disinfection.

Records should be kept of equipment used for repairs, including contractor equipment, which should be available for inspection.

9.2 Personnel

Personal hygiene levels must be high when working on potable water networks. Water treatment facilities and reticulation networks must be treated as food grade factories and delivery systems.

Personnel working on wastewater facilities and sewerage networks may be exposed to a wide range of diseases and pathogens occurring in the communities connected to the networks. They must take measures to protect both their own health and the health of the community.

Those working on both potable water systems and wastewater systems pose a high risk of being the conduit for contamination of the potable water system. Such personnel must be highly cognisant of the risks, and diligently pursue the following safe work practices:

- Any personnel suffering diarrhoea or any notifiable disease or gastrointestinal illness, with or without vomiting, shall not undertake works that involve or potentially involve direct contact with drinking water (treatment and/or network) for 48 hours from the last medical event. All staff should be encouraged to report medical issues without prejudice to ensure the potable water system is not placed at risk.
- Both staff and contractors should have appropriate training for pathogen awareness and correct hand-cleansing practices.
- No person who knowingly has an abnormal temperature or symptoms of illness shall work in a water supply facility.
- All staff must wear clean work attire and correct PPE.
- All staff are personally responsible for thoroughly washing their hands, forearms, and fingernails prior to the commencement of work on a drinking water system. Where this is not practicable, clean, disposable gloves should be worn. This is critical to good hygiene practice.

9.3 Diseases

Legislation exists that prohibits employers from force-medicating employees. Vaccinations, therefore, must be encouraged. This requires advocacy and education, along with a certain amount of delicacy.

Hepatitis A can be transmitted from both faecal and oral sources. It is a virus with a long infectious period (2-3 weeks) before symptoms become evident. Hepatitis A is of high concern to all personnel. The Hepatitis A virus is very susceptible to chlorine, so good disinfection and personal hygiene practices significantly reduce the risk.

Hepatitis B can only be transmitted via blood-to-blood contact. If an employee has no open wounds there is a lower level of risk. Vaccines and booster shots are typically given for both Hepatitis A and B together. As every person is unique in their past exposure and immunity to Hepatitis A and B, some people may require more booster shots than others in order to build up immunity.

All staff should receive a Tetanus vaccination booster at a minimum interval of 10 years.

Typhoid fever is a water-borne disease that can also be transferred person to person. While it is uncommon in New Zealand, it is more common in several Pacific Island nations, and should therefore be of concern to staff if it exists in the community in which they are working. While polio is no longer a significant risk in New Zealand, staff are encouraged to be vaccinated.

Where personnel working on drinking water systems have been to countries with significant levels of typhoid or cholera, they need to check their health status to ensure the potable water system is not at risk.

10. Staff Management

Operational staff and contractors must adopt the same best practices to minimise the risks to both them and the public's health.

10.1 Site Facilities

It is imperative that a lack of toilet facilities or alternative arrangements does not lead to contamination of water supplies. Satisfactory toilet arrangements must, therefore, be made for all personnel working on water supply activities, and hands must be washed thoroughly after using any toilet facilities. Where permanent or temporary toilet facilities are provided on site, these must be maintained in a clean and hygienic condition, and arrangements made for regular and safe disposal of toilet wastes. For work on sites where there are no toilet facilities, alternative hygienic arrangements must be agreed locally, and all personnel concerned formally told of the arrangement. In all situations involving water supply work, adequate handwashing facilities, using soap and water or a suitable antiseptic hand cream, must be provided. All staff working on the water supply have access to clean water and antibacterial soap to clean their hands. This should be provided in the hygiene kit. Refer to Appendix C.

10.2 Requirements of Contractors

Contractual requirements to minimise contamination may include processes such as lines of communication, responsibilities, accountability, safe systems of work, method statements, and use of client services. These details provide a deeper understanding of what is expected of the contractor/staff member.

Refer to Appendix B for information required by Council contractors to confirm they are carrying out work in accordance with the Hygiene Code of Practice requirements.

10.3 Audits

It is important to remember that work on the water network provides a public health service. The water supplier needs to be sure that correct procedures are being followed in order to gain and retain the community's trust. Council is committing to twice monthly audits to be carried out in reactive jobs done in the reticulation network by the Contractor. The intention of the audit is to check the safety of jobs carried out but will also incorporate relevant hygiene commitments and proof of completion.

An example audit template is provided in Appendix A. Clutha District Council uses Safety Culture to complete their site audits.

A

Appendix A – Reticulation Site Audit

Reticulation Site Audit	Complete? Y/N
Site location	
Date	
Work Request number	
Asset ID	
Location	
Weather description	
Safety check	
Is a site sign in sheet and necessary permits available?	
Have any hazards been identified?	
Have health and safety measures been observed?	
Is the site appropriately isolated from the public?	
If required, has the traffic management plan been done properly?	
If applicable, not the CAR number?	
Hygiene Check	
Were hygiene practices observed and declaration completed?	
General comments	
Note any general comments	
Sign off	
The site safety check meets expectations?	
Photo 1	
Photo 2	
Photo 3 (at least one photo showing job setup and hygiene practices)	

B

Appendix B – Hygiene Declaration

To be provided by the contractor(s) on letter head with their monthly claim documentation:

I confirm that all work undertaken on the Clutha District Council reticulation network in [Month and Year] by [name Contractor Company], was carried out in accordance with:

- Clutha District Council's Hygiene Code of Practice.
- Rules G10 and G11 of the Drinking Water Quality Assurance Rules.
- Relevant sections of the Water Services Act 2021.

Confirmed by:
Name
Qualification held *(minimum NZ Certificate in Utilities Maintenance with Water Strand (Level 4), or equivalent.*
Signature

Supported by:
Name
Office holder/job title
Signature

C

Appendix C – Hygiene Kit

Hygiene Kit Check List	Date added	Date last used
Chlorine spray bottle (1% strength)		
Alcohol wipes		
Antibacterial hand soap		
Water tank		
Clean rags		
Paper towels		
Microbiological sample bottles		
Sanitary drop sheet		
Disposable gloves		
Protective gloves		

D

Appendix D – Standard Operating Procedures

Standard Operating Procedures
Pipe disinfection
Reservoir disinfection
Mixing chlorine solution
Equipment, tools, and materials disinfection
Ct calculation
Flushing
Microbiological sampling
Super chlorination
FAC residual testing
Chlorine neutralisation