

# Guidelines for private water supplies

May 2019

## Foreword

The Northern Territory Department of Health - Guidelines for Private Water Supplies 2019 supersede the Guidelines for Private Water Supplies 2012.

## Acknowledgment

The Department of Health acknowledges and thanks NSW Health for making available the NSW Health Private Water Supply Guidelines 2016 on which these guidelines are based.

## Contact us

| Department of Health - Environmental Health |                          |                                  |
|---|--------------------------|----------------------------------|
| Policy                                      | Top End Health Service   | Central Australia Health Service |
| Ph. (08) 8922 7152                          | (08) 8922 7377           | (08) 8955 6122                   |
| envirohealth@nt.gov.au                      | envirohealthte@nt.gov.au | envirohealthca@nt.gov.au         |

An electronic version of this document can be accessed at:

<https://nt.gov.au/environment/water/water-and-your-health/private-water-supply-management>

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Users of this document should satisfy themselves concerning its application to private water supplies and where necessary seek expert advice about their situation. The Northern Territory of Australia shall not be liable to any person for any loss or damage caused or alleged to have been caused directly or indirectly as a result of reliance upon this publication.

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# 1 BACKGROUND

Water is essential to life. We use it for drinking, cooking, bathing and washing. Unfortunately, water can also carry disease causing microorganisms and toxic materials. Because water is so important, it is critical that the water we use is protected from these contaminants. These Guidelines are designed to assist private water supply operators in providing water that is safe for consumption.

Throughout the Northern Territory there are many facilities, such as caravan parks, school camps, tourist attractions and home based businesses that rely on private water supplies. Furthermore, there are residential and commercial subdivision developments that also rely on private water supplies. The sources of these supplies can include groundwater, surface water and rainwater. Approximately 90% of the Territory's water supply is from groundwater.

Serious outbreaks of gastroenteritis have occurred as a result of people drinking contaminated water from private water supplies. However, the risk of illness can be greatly reduced by obtaining water from a good quality source and regularly maintaining and monitoring the water supply system.

These Guidelines provide details on managing private water supplies using the risk management approach by providing information on:

- Responsibilities and requirements;
- Water quality;
- Understanding and protecting your water;
- Water treatment;
- Monitoring and checking; and
- Public warnings.

The contact details of support agencies, references and supporting information are provided to assist operators in managing their water supplies.

# 2 SUMMARY

- Operators should maintain a water supply management plan (WSMP) to ensure that safe water is provided (see Section 6 and Section 10).
- The Department Health (DoH) recommends that operators regularly test the quality of their drinking water (see Section 8), check results against Australian Drinking Water Guideline (ADWG) values (see Section 11) and (if necessary) take action immediately to ensure the safety of the water.
- If test results show that *E. coli*, chemicals or blue green algae are present in the water, consumers should be warned with a sign displayed at each tap (see Section 9).
- If the water is contaminated with microorganisms the water should be boiled before consumption or an alternative water supply, such as bottled water, should be provided.
- If a private water supply is not monitored or treated then consumers should be warned that the water might not meet health guidelines (see Section 9).
- If chlorinating the water, it should be tested regularly for free available chlorine to ensure that the treatment is working properly. Chlorine levels in the water can be tested onsite and should be at least 0.5 milligrams per litre (see Section 7).
- Operators should regularly check their water supply system to ensure its safety (see Section 8). Records of these checks and test results should be kept for at least two years.
- Contact DoH for advice (see Page 2 for contact information).

### 3 WHO SHOULD USE THESE GUIDELINES?

These Guidelines are for any business, facility or privately owned subdivision that supplies people with drinking water from a private water supply. This includes water from rivers and creeks, bores and dams, as well as water from rainwater tanks. It does not include supplies provided by the Power and Water Corporation and other water utilities (e.g. town water) or individual household supplies.

Facilities being serviced by a private water supply may include:

- Commercial visitor accommodation;
- Caravan parks, camping grounds;
- Home based businesses (markets and mobile food vehicles);
- Petrol stations and roadhouses;
- Community halls and conference centres;
- Recreational and sporting facilities;
- Schools;
- Food businesses;
- Marinas;
- Mines and worksites; and
- Privately owned subdivisions managed by a body corporate.

#### 3.1 AUSTRALIAN DRINKING WATER GUIDELINES

The ADWG, published by the National Health and Medical Research Council (NHMRC) and the Natural Resource Management Ministerial Council, contain detailed advice and requirements for all drinking water supplies. The ADWG has been endorsed by DoH.

The Australian Drinking Water Guidelines can be accessed at:

<https://www.nhmrc.gov.au/about-us/publications/australian-drinking-water-guidelines>

These Guidelines aim to summarise and provide advice on applying the ADWG to private water supplies.

### 4 RESPONSIBILITIES AND REQUIREMENTS

Operators of businesses or facilities that provide drinking water have a responsibility to ensure that the water is safe to use. If the safety of the water supply cannot be guaranteed, then consumers should be warned (see Section 9).

#### 4.1 LEGISLATIVE RESPONSIBILITIES

Operators using a private water supply to provide drinking water or in preparing food for human consumption have a responsibility to make sure that the water will not harm the health of those people. These responsibilities are outlined in legislation, including:

- *Public and Environmental Health Act* and Public Health Regulations; and
- *Food Act*, Food Regulations and the Food Standards Code.

## 4.2 OTHER REQUIREMENTS

### 4.2.1 DEPARTMENT OF HEALTH

If you are responsible for a business or facility that supplies people with drinking water from a private supply, DoH may request you to:

- Undergo inspection to determine risk and potential contamination points;
- Provide a copy of your WSMP (see Section 6);
- Provide access to records (see Section 8); and
- Provide access to laboratory reports on the quality of drinking water supplied.

DoH may also maintain a register of private water supply operators.

### 4.2.2 DEVELOPMENT CONSENT AUTHORITY

Development applications, which require consent under the Northern Territory Planning Scheme, the provision of a safe water supply may be a condition of the Development Consent Authority (DCA). This could require applicants to:

- Provide a drinking water supply to the site which will consistently meet the ADWG requirements, and/or
- Develop a water supply management plan to the satisfaction of the DCA.

### 4.2.3 DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

A water extraction licence is likely to be required under the *Water Act 1992* where extraction from a river, creek or bore is proposed. Advice regarding licensing requirements can be obtained from the Water Resources Division in the Department of Environment and Natural Resources, telephone (08) 899 4455, email [water.licensing@nt.gov.au](mailto:water.licensing@nt.gov.au) or web [www.nt.gov.au/water](http://www.nt.gov.au/water)

It should be noted that construction of bores inside a declared water control district requires a bore work permit issued under section 57 of the *Water Act 1992*.

Details on bore work permits can be accessed at: [www.nt.gov.au/drillers](http://www.nt.gov.au/drillers)

Details on Water Control Districts can be accessed at:  
<https://nt.gov.au/environment/water/water-resources-of-the-nt/water-control-districts>

## 4.3 FOOD BUSINESS

If the operator of a private water supply is registered as a proprietor of a food business in accordance with the *Food Act*, then the premises being used must be supplied with a potable water supply that meets the requirements with the ADWG. Managers of private water supplies (e.g. rainwater tanks or private bore), as part of their risk management routine, should have their water routinely analysed to ensure that their water is safe.

The Australia New Zealand Food Standards Code require every food business to be supplied with potable water, which is particularly relevant to premises utilising private water supplies.

For the purpose of the annual *Food Act* registration, it is necessary for food business owners to demonstrate to the DoH that they have a potable water supply. To this end, it will be necessary for a food business owner to arrange certified analysis of the water to confirm acceptable levels of microbial, physical and chemical properties. As a minimum an annual credible analysis of a kitchen tap sample showing no detection of *E.coli* in 100 ml of water, must be submitted to DoH.

To simplify this task, arrangements have been made with the Department of Primary Industry and Resources (DPIR) - Water microbiology laboratories at Berrimah and Alice Springs to provide analytical services. They can be contacted to arrange the supply of prepared sample bottles and to book times for samples to be delivered. Note that the food business owner will need to meet the costs for the testing of samples and the results of sample analysis must be provided to DoH.

Contact details for the DPIR laboratories can be accessed at:

<https://dpir.nt.gov.au/primary-industry/laboratory-services/water-laboratories>

## 5 WATER QUALITY

### 5.1 SAFE AND ACCEPTABLE DRINKING WATER

To be safe for human consumption drinking water must not contain:

- Disease-causing microorganisms (bacteria, viruses or parasites); and/or
- Chemicals at potentially harmful levels.

The physical quality (appearance) of the water should be good. It should have no suspended material such as clay or silt, and ideally, it should be clear, colourless and well aerated, with no unpleasant taste or odour.

All groundwater contains various kinds of dissolved salts (minerals) originating from rainwater and the chemical breakdown of rocks. At high concentrations, some of these dissolved salts will alter the taste (e.g. chloride and sulphate) and/or the appearance of water (e.g. iron and magnesium), but will not cause adverse health effects.

### 5.2 WATER QUALITY PROBLEMS

Disease causing microorganisms are the most likely to cause problems like serious illness in drinking water. Water supplies can be polluted by sewage, seepage from septic tanks, animal and bird faeces, intensive farming practices (fertiliser, manure and pesticides), blue-green algae and industrial wastes. These pollutants can introduce disease causing microorganisms or harmful chemicals into the water.

Water supplies can be polluted with leaves and other plant materials, which contain nutrients that encourage microorganisms to grow more vigorously. These materials may not be harmful themselves, but the microorganisms growing on them might cause illness or make the water taste and smell unacceptable.

Some salts that occur naturally in water, including sulfates and nitrates, can be harmful if they are present in large quantities. Other dissolved salts can make the water hard, causing scale build-up and corrosion in pipes, which can release harmful metals such as lead and copper into the water.

The quality of a water supply may also vary throughout the year. Heavy rain may wash pollution into a water source such as bores and roof catchments. During the warmer months, the growth of blue green algae can make drinking water from surface water sources unsuitable for humans and stock. Blue green algae can make water unsuitable for bathing as it can cause rashes.

**If you are operating a private water supply you need to manage and monitor the quality of the water that you provide.**

## 5.2.1 HEALTH EFFECTS

Water contamination affects people in different ways. What causes a minor stomach upset in some people can cause serious illness in others. In some cases, visitors can become sick after consuming water while people who use it regularly will remain healthy.

The people most at risk of health effects from unsafe water are those with weakened immune systems such as the elderly, the very young, transplant recipients, dialysis patients, cancer patients; and some people with HIV and AIDS. People with skin wounds or burns may need to be careful about the quality of water in which they bathe.

Water can be contaminated with a wide range of disease-causing microorganisms such as *Giardia*, *Cryptosporidium*, *Salmonella*, *Shigella*, *Campylobacter*, some strains of *Escherichia coli* (*E. coli*), Cyanobacteria (blue green algae), Rotavirus, Norovirus, and Hepatitis A virus, as well as many others. Most of these can cause diarrhoea, vomiting, or other gastrointestinal (gut) upsets. Some of them can also lead to more serious illnesses and even death.

*Naegleria fowleri* is an amoeba (a microscopic free-living single-celled organism) commonly found in warm freshwater and soil. Its unusual route of infection (intranasal) means that Primary Amoebic Meningoencephalitis (PAM) is associated with bathing rather than with ingesting water. Medical treatment is rarely effective, even in cases diagnosed early, and PAM is almost invariably fatal. Most Australian victims have been children (Dorschet al 1983).

*Burkholderia pseudomallei*, which causes the disease melioidosis is a disease endemic in northern Australia. Melioidosis is a potentially fatal disease. Pneumonia is the most common presentation. Many patients present with milder forms of pneumonia, which respond well to appropriate antibiotics, but some may present with a severe septicaemic pneumonia.

The health effects from microorganisms generally occur quickly. Health effects from water contaminated with heavy metals and other chemicals may take much longer to become apparent.

Disinfection kills most disease causing microorganisms in water but does not remove or inactivate toxic chemicals. Treatment other than disinfection may be necessary to manage chemical that may present a risk to health.

## 6 UNDERSTANDING AND PROTECTING YOUR WATER

Your drinking water supply system includes everything from the collection of the source water to the point where the water reaches the consumer. Keeping the supply safe involves:

- Planning on how to respond to problems in the water supply system (see Section 6);
- Understanding hazards to your water sources; (see Section 6);
- Water treatment to remove or control any contamination (see Section 7);
- Monitoring and checking on the quality of the water and the integrity of the water system (see Section 8); and
- Public warnings for treated and untreated systems (see Section 9).

### 6.1 WATER SUPPLY MANAGEMENT PLAN (WSMP)

All private water supply operators should have a WSMP, which will help identify risks, prevent contamination and protect water quality from the water source to the consumer.

Your WSMP should address three key questions:



- What problems could occur between the water source and the consumer? (i.e. understanding your water supply);
- How can they be prevented or fixed? (i.e. protecting your water supply, treating the water, and providing warnings); and
- How do you know that the problem has been prevented or fixed? (i.e. monitoring).

When you start to check your water supply system, these three stages of risk assessment are useful questions to ask. They will help to apply these Guidelines more directly to your system.

The WSMP for your water supply should set out how you:

- Assess and protect the quality of the source water;
- Make sure treatment processes are appropriate, maintained and working properly;
- Regularly test to assess water quality;
- Make the water supply safe if contamination has occurred; and
- Ensure consumers are warned and/or provided with safe drinking water (e.g. by using boiled or commercially bottled water) if the normal supply is found to be unsatisfactory or quality cannot be guaranteed.

Your WSMP should be kept in a central place that is easily accessible to staff.

A WSMP template has been provided to help private water suppliers to develop a plan. The template can be accessed at:

<https://nt.gov.au/environment/water/water-and-your-health/private-water-supply-management>

Examples of WSMPs that are appropriate to different types of private water supplies are available on the NSW Health website and can be accessed at:

<https://www.health.nsw.gov.au/environment/water/Pages/private-supplies.aspx>

## 6.2 WATER SOURCES

Always use the best quality water source available. Always use the best quality water source available. Levels of risk for different drinking water sources are shown in the risk hierarchy below.

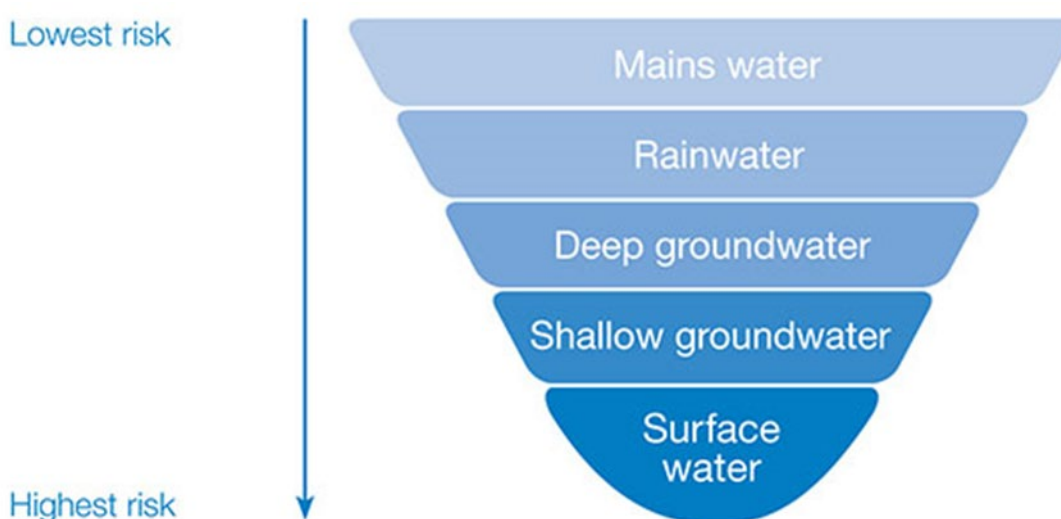


Figure 1: The risk hierarchy for water sources used in private drinking water supplies

For example, rainwater is considered a high-quality water source with lower risk than surface water. Surface water is considered high risk and is not recommended as a drinking water source. The

quality of surface water cannot be guaranteed due to the variability in water quality and possibility of contamination events occurring upstream impacting on the quality of water downstream.

Regardless of the source, carry out regular inspections to identify and remove contamination and to check the cleanliness of the system from the source right through to the consumer. (See Section 11 for an example of a regular maintenance checklist).

### 6.2.1 RAINWATER

If water from a rainwater tank is clear, has little taste or smell, is free from suspended material, and comes from a well-maintained catchment (roof and gutters), it is unlikely to cause illness in most users. However, this is not a guarantee of safety, and contamination is not always visible.

To avoid or minimise water quality problems:

- Regularly clean the roof and gutters collecting rainwater by removing leaves, bird droppings and other organic matter. These can be a source of disease causing microorganisms. They can also cause taste and odour problems or be a source of nutrients to promote the growth of microorganisms;
- After the dry season (Top End) or during cleaning of the roof and gutters, divert water from the first rainfall using a first flush or bypass device. This reduces the amount of contaminants entering the tank;
- Remove overhanging tree branches that may drop leaves into gutters;
- Paint or remove any lead flashings used in the roof construction;
- Install screens on tank inlets and overflows to prevent the entry of leaves and small animals. Check the screens regularly to prevent tanks becoming breeding sites for mosquitoes;
- Tanks should be examined for build up of sediments every two to three years or if sediments are seen in the water flow. Any build up of sediment needs to be removed (desludged) as sediments can be a source of contamination, tastes and odours. Sediment can be removed by siphoning the tank without emptying it, or by completely emptying the tank for a thorough clean;
- Regularly inspect in ground tanks to ensure that they do not become contaminated. Water that has flowed over or through the surrounding soil or ponded on the lid must not be allowed to enter the tank. Tanks must be kept in good condition. Lids and inspection openings must be sealed.
- Any nearby onsite wastewater management systems (OWMS) must be maintained and working effectively. OWMS effluent must not be allowed to enter drinking water tanks due to the risk of contamination with disease causing microorganisms; and
- If the water supply has not been used for 24 hours or more, and water has been stagnant in pipes, copper or lead can build up in the water, it is recommended that the pipes be flushed for a few minutes until fresh water flows through from the tank. The flushed water can be used safely on the garden.

Tanks built from different materials need to be treated differently during maintenance:

- Plastic tanks need to be anchored when empty;
- Concrete tanks should not be allowed to dry out in case of cracking;
- Tanks with a 'cone scour' base are easily cleaned by opening the cleaning outlet to allow the water to drain out with the sludge, then rinsing with a hose; and
- Small, flat-bottomed tanks can be drained, rinsed with a hose, and tilted to drain.

In-ground tanks need to be cleaned and refilled quickly in case of tank displacement from the ground. In some cases, when an in-ground tank is not weighted down by water, tanks can be forced out of the ground. This is a particular risk if a tank is emptied after heavy rains, when the surrounding ground is waterlogged.

Do-it-yourself tank cleaning presents a number of risks including working and using disinfectants in confined spaces, and access into and out of the tank. It is important to be aware of NT WorkSafe occupational health and safety requirements and Australian Standard AS2865: 2001.

Occupational Health and Safety information can be obtained by contacting NT WorkSafe at: <http://www.worksafe.nt.gov.au>

For further advice on 'do it yourself' tank cleaning, contact your local tank supplier or plumber. Professional tank cleaners are available in some areas (Google 'tank cleaners').

For further information on rainwater tanks please read *Guidance on the Use of Rainwater Tanks* (See Section 10 for reference documents).

### **6.2.2 CARTED WATER**

If your tank is to be topped up from another source, make sure that the top up water is safe to drink. If possible, use water sourced from a town drinking water supply. Any water carter selling water for human consumption should be registered as a food business under the *Food Act* and operate in compliance with the *Guidelines for Drinking Water Transport in the Northern Territory* which can be accessed at:

<https://nt.gov.au/environment/water/water-and-your-health/private-water-supply-management>.

When water is added to an empty rainwater tank it may resuspend the sludge at the bottom of the tank creating taste and dirty water problems. Ideally, tanks should be cleaned prior to delivery of water.

### **6.2.3 SURFACE WATER (RIVERS, CREEKS AND DAMS)**

Wastes from livestock, animals and humans can contaminate dams, rivers and creeks. These wastes may contain disease-causing microorganisms. To avoid or minimise water quality problems with surface water:

- Make sure that surface water sources are fenced against livestock, and protected from OWMS overflows and spills of domestic, agricultural or industrial chemicals;
- Filter the water. There are a number of different filtration methods available and the choice of filter depends on the contaminants that need to be removed. (See Section 7 for information on filtration); and
- Disinfect the water to kill disease causing microorganisms and to protect the water should re-contamination occur. Chlorine is the most common and cost-effective disinfectant used for drinking water. (See Section 7 for information on disinfection).

### **6.2.4 GROUNDWATER (BORES, SPRINGS OR WELLS)**

Groundwater can be a safe, reliable water source. Water from bores, spear-points (shallow installations), springs or wells may be of high quality if the source is well maintained and protected. However, groundwater can be contaminated by sewage, animal wastes, agricultural run-off (which may contain fertilisers and pesticides), industrial pollution, seepage from rubbish tips and polluted stormwater.

To avoid or minimise water quality problems in groundwater:

- A groundwater source should be uphill from a wastewater management system
- Setbacks from bores to a wastewater management system are detailed Code of practice for onsite wastewater management systems which can be accessed at: <https://nt.gov.au/property/building-and-development/install-a-wastewater-system/wastewater-management>;
- Avoid contamination where groundwater is in contact with surface waters (open wells) or where water flows freely from the surface down into the groundwater;
- Inspect the area around a groundwater supply regularly and protect it from surface contaminants. Bore heads should be raised above ground level to avoid floodwaters contaminating the source;
- Only extract groundwater from a place where subsurface contaminants are unlikely. Avoid sites with known contaminants, including heavy industrial and intensive agriculture areas; and
- For more information on the licensing, construction and protection of bores and groundwater sources, refer Section 6.

### **6.2.5 STORAGE AND DISTRIBUTION**

Materials that come into contact with water, such as gutters, storage tanks, rainwater tanks, pipework and plumbing fittings, can contaminate water in certain situations. All plumbing materials used in the water supply should be approved for use with drinking water, and certified to the appropriate Australian Standards. Tanks, hoses and fittings should be made of, or lined with, a material that will not contaminate the drinking water.

Applicable standards or certification include Watermark, AS/NZ 4020:2005 The testing of products for use in contact with drinking water, AS 2070:1999 - Plastics materials for food contact use, AS/NZ 4766:2006 – Polyethylene storage tanks for water and chemicals, Australian Technical Standard ATS 5200.026: 2004, Technical Specification for Plumbing and Drainage Products and/or Cold Water Storage Products.

### **6.2.6 MULTIPLE BARRIERS**

Using multiple barriers against contamination of the system is a good approach. Should one barrier fail, the others will help to protect the quality of water.

Barriers could include:

- Ensuring a clean catchment for your supply. For rainwater tanks, this means keeping roof and gutters clean. For groundwater sources and surface water catchments, it means good land management in the surrounding area;
- Regular maintenance of the well head and bore casing infrastructure to keep surface water out of the groundwater;
- Regular maintenance of the supply system, e.g. tanks, pumps and other elements;
- Installation of backflow prevention device;
- Adequate treatment, e.g. filtration and disinfection; and
- Should one barrier fail, the others will help to protect the quality of water.

## 7 WATER TREATMENT

### 7.1 ROUTINE TREATMENT

The level of water treatment chosen for a given water supply, needs to be appropriate for the level of risk posed by the raw water source. In consultation with an appropriately skilled treatment specialist, the sanitary and chemical risks posed by a water source will help make an informed decision on the level of treatment.

It is best to get professional advice on the design of a water treatment system from a water treatment engineer with appropriate experience. A range of drinking water treatment processes can be considered for use in a private water supply. These include:

- Filtration (pre-treatment filtration and treatment filtration);
- Chlorine disinfection; and
- UV disinfection.

When choosing a treatment device look for certification including AS/NZS 3497:1998 (Plumbing Requirements), AS/NZS 4348:1995 (Performance Requirements – details how to test), NSF/ANSI and EN standards. Performance data should be available if the treatment device has undergone certification under any of the standards mentioned above. Some treatment devices are listed with standards that do not specifically refer to performance for contaminant reduction/removal.

NSW Health has information on various kinds of water treatment that may be useful for private water supplies. This information can be accessed at:

<http://www.health.nsw.gov.au/environment/water/Pages/private-supplies.aspx>

#### 7.1.1 FILTRATION

Commonly, filters are installed 'in-line' in the plumbing system between the water source (tank, bore, dam, creek, etc) and the other treatment steps.

Filters must be regularly maintained and replaced when necessary to be effective. If this is not done, bacteria can grow on them and can then be released into the filtered water. The manufacturer's operating and maintenance instructions should be carefully followed.

Pretreatment filtration removes coarse material from the water, and makes later treatment steps more effective. For water supplies with a lot of suspended particles (dirty water) it may also be necessary to use a treatment known as coagulation before filtering the water. Coagulation chemicals mix with water to make smaller particles clump together into larger ones, and make filtration more effective.

Filtration treats water by passing it through a suitably graded (fine) filter to remove contaminants. Not all filters remove harmful microorganisms.

There are a number of different filtration methods available and the choice of filter depends on the contaminants that need to be removed. Examples include:

- Ceramic filters have a core or 'candle' of ceramic material of small pore size through which the water is passed. They can remove some bacteria and parasites from water but not viruses. The core needs to be cleaned regularly;
- Activated carbon filters help to control taste and odour problems and algal toxins. They do not remove bacteria, parasites or viruses. The cartridge in these filters should be replaced regularly, as the carbon becomes 'used up' or saturated with contaminants;

- Micro and Ultra filtration removes most bacteria, and protozoan such as *Giardia* and *Cryptosporidium*;
- Resin-based ion exchange filters help to soften the water by removing hardness or other dissolved salts. They do not remove microorganisms. The resin must be replaced or regenerated as it becomes exhausted or clogged; and
- Reverse osmosis filtration removes most contaminants including minerals, microorganisms, and sediments.

If a filter is used for health reasons, then it should be certified against an appropriate Standard (such as Australian Standard: AS/NZS 4348:1995 Water supply - Domestic type water treatment appliances - Performance requirements or American National Standards Institute: ANSI/NSF 53 Drinking Water Treatment Units – Health Effects).

### 7.1.2 CHLORINE DISINFECTION

Chlorination involves the addition of chlorine into drinking water to control microorganisms. Chlorination is the most commonly used form of disinfection.

To ensure effective disinfection, add enough chlorine so that after 30 minutes there is at least 0.5 milligrams per litre (mg/L, or parts per million:ppm) present in your water – this remaining chlorine in your water is known as the ‘free chlorine residual’.

Free chlorine residual will naturally decrease over time. You can expect your free chlorine residual after 30 minutes to be less than the chlorine you add. If after 30 minutes the free chlorine residual is below 0.5 mg/L, repeat the addition of chlorine until at least 0.5 mg/L is present after another 30 minutes. Also ensure your free chlorine residual is below 5 mg/L.

Regular monitoring (weekly or more frequently) of free chlorine residual at your taps is recommended to check the effectiveness of disinfection in the water system (see Section 8). Chlorine can be measured with a suitable test kit (for example, a swimming pool chlorine kit).

When adding chlorine to your water system (typically into the water tank), the amount of chlorine you add will differ depending on the chlorine type you use. This is because the percentage of available chlorine is different for each chlorine type.

The three chlorine types commonly used are:

- Liquid bleach (4% available chlorine);
- Liquid sodium hypochlorite (12.5% available chlorine); and
- Granular calcium hypochlorite (65% available chlorine).

Note that any chemical added to water should be an approved food grade chemical.

Contaminants in your water tank such as dirt and leaves may prevent effective disinfection.

Filtration is often necessary to remove these contaminants before adding chlorine. You may need to add more chlorine to achieve a satisfactory free chlorine residual and effective disinfection if you have contaminants in your water.

Chlorine can be added manually or with an automated system to maintain a suitable free chlorine residual. DoH recommends that suppliers seek specialist advice when installing an automated chlorine system. Make sure you follow health and safety guidelines when using chlorine and take care to add the correct amount of chlorine to your water system.

For further guidance on chlorination refer to Section 11. For guidance on calculating the volume of water in a tank refer to Section 11.

Filtration is often necessary to remove suspended particles before chlorination as suspended particles (dirty water) may prevent effective disinfection.

### 7.1.3 ULTRAVIOLET DISINFECTION

Another common and effective form of disinfection is ultraviolet (UV) light, which neutralises many kinds of microorganisms.

UV light cannot penetrate dirty or cloudy water and therefore is less effective in disinfecting that water. Filtration is often necessary to remove suspended particles before UV disinfection.

Filtration, chlorination and UV treatment can be automated; allowing a high level of disinfection, provided the equipment is adequately maintained.

## 7.2 WATER TREATMENT AFTER CONTAMINATION

Unusual events can contaminate water supplies that are usually clean. These events might include heavy rain and stormwater runoff, dead animals in the catchment or faecal contamination (animal droppings or septic overflow). Water that has been treated can be recontaminated in the water system, for example by dead animals in a water tank.

If you suspect that water in your supply has been contaminated, it can be manually treated with chlorine (refer to Section 7.1.2). About 5 mg/L of chlorine is needed to disinfect your water system following contamination.

To achieve an initial chlorine concentration of 5 mg/L in your water tank add:

- 125 millilitres (mL) of liquid bleach (4% available chlorine) for every 1000 litres (L) of water in your tank; or
- 40 mL of liquid sodium hypochlorite (12.5% available chlorine) for every 1000 L of water in your tank; or
- 8 grams (g) of granular calcium hypochlorite (65% available chlorine) for every 1000 L of water in your tank.

Check your calculations carefully to ensure you do not overdose the chlorine. Methods for calculating the volume of water in a tank are provided in Section 10. Further guidance on chlorination is provided in Section 10.

Always measure the free chlorine residual in your water 30 minutes after adding the chlorine. It should measure at least 0.5 mg/L and not more than 5 mg/L. The chlorine may create a distinct taste and odour in the water, but it will be safe for drinking. The taste and odour should lessen in a few days.

## 8 MONITORING AND CHECKING

### 8.1 ROUTINE MONITORING

Monitoring is an essential part of checking the multiple barrier approach to good water management. The results of monitoring indicate whether your barriers to contamination are working properly.

Whether the water is treated or not, DoH recommends the following:

- Monitor the microbiological quality of the water where it is supplied to consumers (for example at a kitchen tap or other regularly used drinking water tap) at least monthly by

testing for the organism *Escherichia coli* (*E. coli*). If *E. coli* is detected, this indicates faecal contamination and the possible presence of disease causing microorganisms;

- Monitor the chemical and physical quality of the water supplied to consumers by testing at least annually. A comprehensive analysis should be undertaken initially to identify any unusual contaminants in the water supply. The range of characteristics to be analysed in ongoing monitoring should be decided according to risk; and
- Test the water if there is any suspicion of blue green algae (cyanobacteria) contamination. This will indicate the level of contamination in the supply, if any.

To ensure safety of the water supply the results of testing must meet values set in the Australian Drinking Water Guidelines. Guideline values for microbiological, physical and chemical characteristics in water are provided in Section 10.

Water samples should be tested at a laboratory accredited by the National Association of Testing Authorities (NATA) to ensure the highest level of accuracy.

DoH can provide further advice regarding your choice of laboratory. Information on sampling and transporting water samples is accessible at:

<http://www.health.nsw.gov.au/environment/water/Pages/drinkwater-nsw.aspx>

## 8.2 CHECKING TREATMENT PROCESSES

Regular checking and maintenance of water treatment systems are important to ensure that the water supply continues to be safe.

### 8.2.1 FILTRATION

If there is a filter fitted to your supply system, the filter cartridges need to be checked, maintained and replaced in accordance with the manufacturer's advice. Filter cartridges should be free from build up, and should allow a clean, steady flow of water to pass through.

Water quality should be regularly checked after filtration. If flow decreases or the water becomes turbid (dirty or cloudy), the filter cartridge needs to be checked and may need replacing. Some filters include a pressure gauge that indicates the need for replacement.

### 8.2.2 CHLORINE DISINFECTION

Where chlorine is used, it is desirable to have at least 0.5 mg/L free chlorine residual in water coming from all taps used for drinking and food preparation to maintain effective disinfection throughout the supply system.

Regular monitoring of the supply system will help to ensure that this level is maintained. If water varies in quality, for example surface water supplies, daily monitoring may be necessary. For rainwater supplies weekly monitoring may be sufficient. For further advice on the chlorine monitoring required for your systems contact DoH.

Measure and monitor chlorine in the system, using a suitable chlorine test kit (such as a swimming pool chlorine kit) and adjust chlorine dosing if necessary. Keep a record of chlorine readings.

### 8.2.3 UV DISINFECTION

Ultraviolet (UV) disinfection units need to be checked and maintained regularly, following the manufacturer's instructions, to ensure they remain effective. The unit should be checked to ensure:

- A stable power supply is connected and the unit is switched on;
- The lamps are intact and operating; and



- The lamps are free from scum.
- If problems are found, maintenance should take place as soon as possible

### 8.3 CHECKING THE SYSTEM AND KEEPING RECORDS

Regular checks of your entire water system from catchment to the consumer will minimise the risk of contamination and help ensure the safety of your supply. Keep records of checks and any test results for at least two years. They should be made available for review if required by DoH.

Records should include:

- Name, date and observations i.e. identify potential contamination hazards in the catchment;
- Test results;
- Any actions taken to correct faults or prevent contamination affecting supply;
- Equipment checks and maintenance, including any filter change or refurbishment;
- Regular chlorine readings and adjustments to chlorine levels if required;
- Any adverse events, e.g. broken pipe work, flooding, bush fire, aerial spraying, dead animals in the water source, and repairs to the system; and
- Rainfall observations.

## 9 PUBLIC WARNINGS

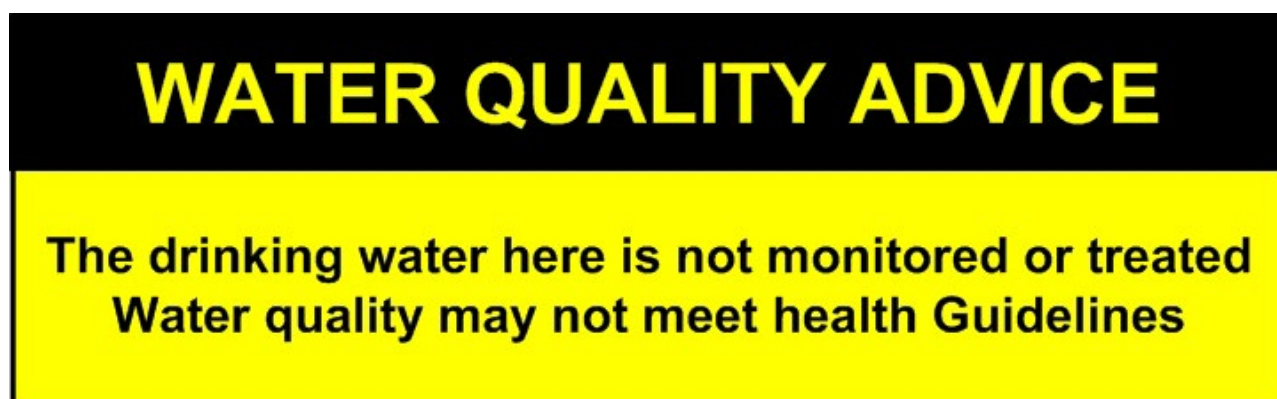
Water suppliers should ensure all consumers are informed about drinking water quality. Signs are useful for this purpose. The type of signage depends on whether the water supply is treated and/or tested and whether water quality problems are known.

### 9.1 SIGNAGE FOR GENERAL USE

If a private water supply is not treated by a reliable process (e.g. filtration and chlorine dosing or UV), suitably maintained, or regularly tested, all potential consumers should be warned. The warning can be in the form of:

- A sign at each water outlet;
- An entry in the 'in house directory'; and
- An accommodation in room notification card, and/or other prominent locations.

Example:



The warning can be removed if a suitable quality assurance program for the water supply is put in place and regular testing shows that the water is free of contamination.

Some private water supply operators such as food businesses are required by legislation to provide a safe drinking water supply. Check with DoH to see if this legislation applies to you.

## 9.2 SIGNAGE FOR WATER NOT SUPPLIED FOR DRINKING

If the water supply is not intended to be used for drinking, then consumers should be warned.

This can be done with a sign displayed at each drinking water tap and in bathing areas. Information folders, notice boards and other locations may also be appropriate places to display signs.

Suggested wording for warning signs is as follows:



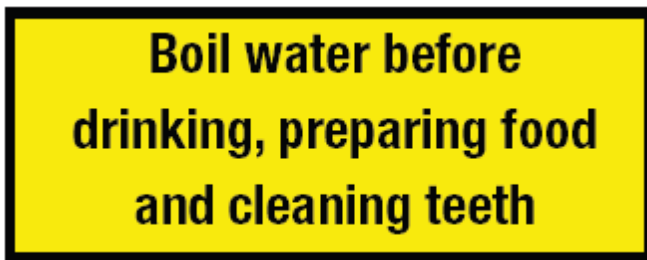
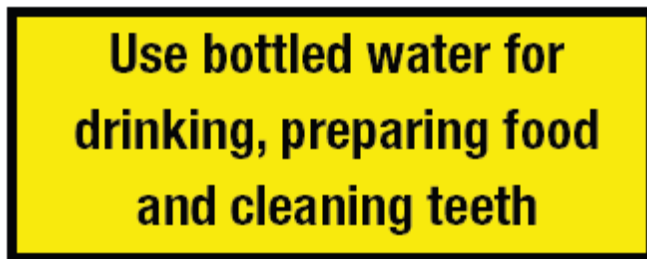
## 9.3 SIGNAGE FOR ADVERSE RESULTS

If testing is carried out and the results show the presence of microorganisms such as *E. coli* then consumers should be warned.



If water is contaminated, it is recommended that an alternative water supply (e.g. commercially bottled water) be provided, or that water be treated. Bringing the water to a rolling boil, such as

with an automatic kettle will control disease causing microorganisms, but not blue green algae or chemicals. In these cases the signs could include the above sign and:



If a blue green algae bloom occurs in the water supply or chemical contamination is present then consumers should be warned that the water is unsuitable for drinking or bathing. Boiling the water will not remove blue green algae or chemicals.



Contact DoH for further advice. Some consumers may wish to use rainwater for all purposes including drinking and cooking, even if it is not treated or tested. In such cases, a warning should still be made as required by these Guidelines.

The rainwater sign below should be prominently displayed on the property so that customers are aware that rain water is in use.



## 10 REFERENCE DOCUMENTS

Australian Drinking Water Guidelines, National Health and Medical Research Council – provides an authoritative reference on safe, good quality water, how it can be achieved and how it can be assured. The guidelines are concerned both with safety from a health point of view and with aesthetic quality.

<https://www.nhmrc.gov.au/about-us/publications/australian-drinking-water-guidelines>

Guide for Submitting Water Samples for Analysis – an easy reference for sampling, reporting and submission of samples to NSW Health Labs.

<https://www.health.nsw.gov.au/environment/water/Documents/dal-analysis.pdf>

Rainwater Tanks, NSW Health Brochure – explains rainwater systems and how they can be maintained to provide safe, high quality drinking water.

[http://www.health.nsw.gov.au/environment/water/Documents/rainwater\\_tanks.pdf](http://www.health.nsw.gov.au/environment/water/Documents/rainwater_tanks.pdf)

Guidance on the Use of Rainwater Tanks 2010, enHEALTH – presents information on a range of potential hazards that threaten water quality, preventive measures, monitoring, and possible maintenance and corrective action.

<http://www.health.gov.au/internet/main/publishing.nsf/Content/ohp-enhealth-raitank-cnt.htm>

Groundwater Use in Urban Areas, NSW Health Factsheet – explains risks of contamination of groundwater sources in urban areas.

<https://www.health.nsw.gov.au/environment/water/pages/groundwater.aspx>

NSW Guidelines for Water Carters, NSW Health – explains regulations and requirements for the operation of water carting vehicles supplying water for drinking and domestic use.

<http://www.health.nsw.gov.au/environment/Pages/nsw-guidelines-for-water-carters.aspx>

Australian Standards including:

- AS/NZ 4020:2005 The testing of products for use in contact with drinking water
- AS 2070:1999 – Plastics materials for food contact use
- AS/NZS 4348:1995 Water supply - Domestic type water treatment appliances – Performance requirements
- AS/NZS 4766:2006 – Polyethylene storage tanks for water and chemicals
- <http://www.standards.com.au/>

# 11 SUPPORTING INFORMATION

## 11.1 REGULAR MAINTENANCE CHECK LIST

| ITEM   |   | RECOMMENDED FREQUENCY        |
|--|---|------------------------------|
| <b>Rainwater</b>                                     |   |                              |
| Tank   | Presence of mosquito larvae in tank water   | 3 monthly                    |
|  | Inlets and outlets covered (prevent mosquito entry)   | 3 monthly                    |
|  | Strainer clear of debris  | 3 monthly                    |
|  | Level of sludge and internal cleanliness  | Annually                     |
|  | Structural condition  | Annually                     |
| Roof and Gutter                                      | Clean gutters   | 3 monthly                    |
|  | Check and trim overhanging branches   | Annually                     |
|  | Inspect and repair downpipes  | Annually                     |
|  | Check condition of roof   | Annually                     |
| <b>Groundwater</b>                                   |   |                              |
| Bore   | Check that system (the pump, piping, and casing) is fully operational, sealed and maintain so that no surface water enters the well/bore                      | Annually                     |
| <b>Surface water (creek, river and dam supplies)</b> |   |                              |
| Catchment  | Check control measures to guard against surface water contamination   | 3 monthly                    |
|  | Assess upstream catchment for new developments and other possible sources for contamination   | Annually                     |
|  | Check that infrastructure (pump, piping, etc.) is fully operational, and maintained   | Annually                     |
| Water Quality  | Check water quality (after heavy rain, it may be necessary increase chlorine dose, and check filters, boil water if treatment system is not working properly) | After heavy rain             |
| <b>All Supply Types</b>                              |   |                              |
| <b>Treatment</b>                                     |   |                              |
|  | Clean/Change filters  | As per manufacturer's advice |
|  | Check the chlorine injection unit is fully operational (if used)  | Weekly                       |
|  | Check chlorine supply is adequate (if chlorinating)   | Weekly                       |
| Testing  | Chlorine test (if chlorinating supply)  | Regularly (minimum weekly)   |
|  | Microbiology test   | Monthly                      |
|  | Physical & chemical test  | Annually                     |

## 11.2 DRINKING WATER GUIDELINE VALUES

### 11.2.1 MICROBIOLOGICAL

- *E. coli* (should not be detected in a 100 mL sample):
  - Used to indicate the presence of faecal contamination.
  - This is a requirement in the Australian Drinking Water Guidelines.
- *Cyanobacteria* (blue green algae).

- If there is a suspicion of cyanobacteria contamination, the water should be tested.

## 11.2.2 CHEMICAL

It is advised that a comprehensive analysis be undertaken initially, to identify any unusual contaminants in the water supply. A chemical test should be done annually. For each characteristic tested, the result should be below or equal to the corresponding Australian Drinking Water Guidelines value. Table 1 shows guideline values for some characteristics. Refer to the Australian Drinking Water Guidelines for a complete listing.

Table 1: Health based chemical guideline values (mg/L).

| HEALTH-BASED CHARACTERISTIC  | AUSTRALIAN DRINKING WATER GUIDELINE VALUE (mg/L) |
|--|--|
| Antimony   | 0.003  |
| Antimony is a metal that can be harmful in high concentrations. Its harmful effects are limited at lower concentrations. It is rare in source waters, but may leach from antimony solder or be deposited in pollution from smelters.   |  |
| Arsenic  | 0.01   |
| Arsenic is a harmful element. Long term consumption of water with a high arsenic concentration (greater than 0.3 mg/L) has been shown to increase the likelihood of skin cancers and other diseases. Arsenic is found in soil and rocks, but is also released by the burning of fossil fuels, and in drainage from old gold mines and some types of sheep dip. |  |
| Cadmium  | 0.002  |
| Cadmium is a toxic metal that, in cases of long exposure, can cause kidney problems. Cadmium may enter water supplies from impurities in the zinc of galvanised metal, from solders, or from some fertilisers.   |  |
| Chromium   | 0.05   |
| Chromium is a toxic heavy metal, which can cause cancers. Chromium is found in small amounts in most rocks and soils, and has been used in many industrial processes.  |  |
| Copper   | 2  |
| Copper is a common metal that can cause ill effects (nausea, abdominal pain and vomiting) in some people. Copper can be found in many rocks and soils, and is also frequently used in plumbing.  |  |
| Fluoride   | 1.5  |
| Fluoride is important for preventing dental decay, but can also be harmful at high concentrations. It is found naturally in rocks and waters, and is sometimes present in industrial air pollution.  |  |
| Lead   | 0.01   |
| Lead is a toxic heavy metal. It may enter a water supply from natural sources or from lead plumbing, solder, or roof flashings.  |  |
| Nickel   | 0.02   |
| Long term exposure to nickel can cause kidney problems. Nickel may enter water supplies from coal-fired power stations or in small concentrations from nickel-plated tap and plumbing fittings.  |  |
| Nitrate  | 50   |
| Nitrite  | 3  |
| Excessive nitrate or nitrite in water can lead to occurrences of 'blue baby syndrome' in infants fed with formula made up using the water. The decomposition of organic wastes such as manure can introduce nitrate to water supplies. Nitrite is only likely to be present in water that has not been aerated.  |  |

These factors may cause taste or odour complaints in your water or may lead to corrosion or the formation of scale.

Table 2: Aesthetic chemical guideline values (mg/L).

| AESTHETIC CHARACTERISTIC | AUSTRALIAN DRINKING WATER GUIDELINE VALUE (mg/L)  |
|--------------------------|---|
| Manganese 0.1            |   |
|                          | Although harmful at higher concentrations, the guideline value for manganese is set to avoid an undesirable taste and staining of laundry and plumbing fittings. Manganese is likely to enter water supplies from natural sources or from contaminated sites.   |
| Sulfate 250              |   |
|                          | Although harmful at higher concentrations, the guideline value for Sulfate ions is set to avoid an undesirable taste in water. Under some conditions, it can also contribute to corrosion of plumbing fittings. Sulfate at levels greater than 500 mg/L can have purgative effects.<br>Sulfate ions are likely to enter water supplies from natural sources. The highest concentrations are likely to be seen in groundwater. |

### 11.2.3 PHYSICAL

These factors may cause taste or odour complaints in your water or may lead to corrosion or the formation of scale. For each of these characteristics, values should be below or equal to the corresponding Australian Drinking Water Guideline value (or for pH, between 6.5 and 8.5). A test for physical characteristics should be done annually.

| AESTHETIC CHARACTERISTIC     | AUSTRALIAN DRINKING WATER GUIDELINE VALUE (mg/L)   |
|------------------------------|--|
| pH                           | 6.5 – 8.5  |
|                              | A pH of 7 is neutral, greater than 7 is alkaline, and less than 7 is acidic. Drinking water with increased acidity (pH less than 6.5) can corrode plumbing fittings and pipes. Apart from the damage caused, this can release harmful metals such as lead or copper.<br>Drinking water with increased alkalinity (pH greater than 8.5) can lead to encrustation of plumbing fittings and pipes. A pH greater than 11 may cause corrosion.<br>A pH greater than 8.0 can decrease the efficiency of chlorine disinfection. |
| Total dissolved solids (TDS) | 600  |
|                              | Dissolved material, usually salts, in the water supply can affect the water's taste. It can also develop scale on the inside of plumbing fittings and pipes, or lead to excessive corrosion. Up to 900 mg/L is regarded as fair quality.   |
| Total hardness               | 200  |
|                              | Hard water can contribute to the formation of scale in hot water pipes and fittings, and makes lathering of soap difficult. Hardness is the measure of calcium and magnesium in the water and comes from the dissolving of these materials from soil and rocks.  |
| Turbidity                    | 5 NTU<br>Less than 1 NTU is the target for effective disinfection. Less than 0.2 NTU is the target for effective filtration of <i>Cryptosporidium</i> and <i>Giardia</i> .   |

#### Notes:

1. Some laboratories will also provide tests for a range of other characteristics including aluminium, chloride, iron, sodium and zinc, which may have an influence on water quality.
2. Monitoring for additional characteristics may be required depending on the presence of particular materials or industrial activities in the catchment.

## 11.3 COMMON SOURCES OF CONTAMINANTS AND PREVENTIVE MEASURES

| WATER SUPPLY                                      | ITEM   | RECOMMENDED FREQUENCY   |
|---|--|---|
| Ground Water<br>(Bore, well, spear point, spring) | Surface water seepage. (e.g. stormwater, wastewater)   | Bore heads should be raised above ground level. Inspect regularly   |
|   | Subsurface contamination<br>Industrial, farming land usage, landfill   | Only extract groundwater from a place where subsurface contaminants are unlikely  |
|   | Backflow water (e.g. from animal water troughs or surface water storage)   | Installation of backflow prevention device  |
|   | Leaching from bore casings, pipes or plumbing materials (e.g. metals, pH)  | Ensure that all materials in contact with water comply with AS/NZ 4020:2005   |
| Rain Water<br>(tanks)                             | Roof and gutters (e.g. build-up of organic matter – leaves/ dirt)  | First flush device, regular cleaning of roof and gutters, removal of overhanging branches. Inspect regularly  |
|   | Roof materials (e.g. lead sheeting, peeling paint)   | Ensure that all materials in contact with water comply with AS/NZ 4020:2005   |
|   | Build-up of sludge in tank, dirt in inlet strainers and/or insect screens.   | Regular cleaning and maintenance program  |
|   | Tank materials (e.g. pH of water with concrete tanks, high metals from metallic tanks, corrosion of metals from pipes) | Ensure that all materials in contact with water comply with AS/NZ 4020:2005. Flush pipes if water has been standing in pipes. (Chemical adjustment for pH in new concrete tanks may be necessary) |
|   | Insect, bird and animals in system (e.g. dead animals, mosquito breeding)  | Ensure that all inlets and outlets to tank are screened   |
| Surface Water<br>(dam, river, creek)              | Surrounding land use (e.g. intensive farming, urban areas, industrial sites sewage discharge)                          | Protect surface water storage from runoff. Inspect regularly  |
|   | Pump and plumbing materials (e.g. piping, pump components)   | Ensure that all materials in contact with water comply with AS/NZ 4020:2005   |
|   | Animal and human activities (cows, sheep, or recreational use)   | Protect surface water storage by fencing storage  |

## 11.4 CALCULATING THE SIZE OF YOUR TANK FOR CHLORINATION

Tanks come in a variety sizes ranging from 750 L (165 gallons) to over 50 000 L (11 000 gallons). To convert a tank volume in gallons to a volume in litres, simply multiply the number of gallons by 4.5.

To calculate tank water volume

- Full Rectangular Tanks (box tanks, some in-ground tanks)  
Volume (in litres) = (depth [m] x width [m] x length [m]) multiplied by 1000 (to convert cubic metres to litres).

Full Cylindrical Tanks

- Volume (in litres) = (3.14 x radius [m] x radius [m] x tank depth [m]) multiplied by 1000 (to convert cubic metres to litres).

[The radius is the half the diameter or width of the tank].



Example:

Tank radius = 2 metres

Tank depth = 3 metres

Tank Volume =  $(3.14 \times 2 \text{ m} \times 2 \text{ m} \times 3 \text{ m}) \times 1000$

=  $(3.14 \times 4 \text{ m}^2 \times 3 \text{ m}) \times 1000$

=  $(3.14 \times 12 \text{ m}^3) \times 1000$

=  $37.68 \text{ m}^3 \times 1000$

= 37 680 Litres

- Part-full cylindrical tanks  
Volume (in litres) =  $(3.14 \times \text{radius} \times \text{radius} [\text{m}] \times \text{water depth} [\text{m}])$  multiplied by 1000.  
(See diagram below)

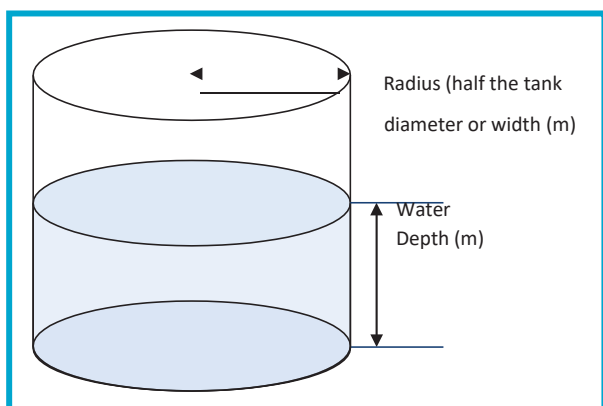


Figure 1: Part full cylindrical tank example diagram.

## 11.5 ADDING CHLORINE TO YOUR WATER TANK FOR DISINFECTION

The three chlorine types commonly used are:

- Liquid bleach (4% available chlorine);
- Liquid sodium hypochlorite (12.5% available chlorine); and
- Granular calcium hypochlorite (65% available chlorine).

Guidance on using these three chlorine types for disinfection is provided below.

### 11.5.1 ADDING 4% LIQUID BLEACH TO YOUR WATER TANK FOR DISINFECTION

**Table 4** shows the amount of **4% liquid bleach** to add to your water tank for chlorination, depending on the initial chlorine concentration you are targeting and the volume of water in your water tank.

The table gives three options for the initial chlorine concentration in the tank (1 mg/L, 2mg/L and 5 mg/L) for a given volume of water in the tank (1000 L – 10 000 L). Methods for calculating the volume of water in a tank are provided in Section 10.

Table 4: Guidance on adding 4% liquid bleach to your water tank

|                         |         | INITIAL CHLORINE CONCENTRATION |        |         |              |
|-------------------------|---------|--------------------------------|--------|---------|--------------|
|                         |         | 1 mg/L                         | 2 mg/L | 5 mg/L  |              |
| VOLUME OF WATER IN TANK | 1000 L  | 25 mL                          | 50 mL  | 125 mL  | AMOUNT OF 4% |
|                         | 2000 L  | 50 mL                          | 100 mL | 250 mL  |              |
|                         | 3000 L  | 75 mL                          | 150 mL | 375 mL  |              |
|                         | 4000 L  | 100 mL                         | 200 mL | 500 mL  |              |
|                         | 5000 L  | 125 mL                         | 250 mL | 625 mL  |              |
|                         | 6000 L  | 150 mL                         | 300 mL | 750 mL  |              |
|                         | 7000 L  | 175 mL                         | 350 mL | 875 mL  |              |
|                         | 8000 L  | 200 mL                         | 400 mL | 1000 mL |              |
|                         | 9000 L  | 225 mL                         | 450 mL | 1125 mL |              |
|                         | 10000 L | 250 mL                         | 500 mL | 1250 mL |              |

For example: To aim for a chlorine concentration of 5 mg/L in a tank with 1000 litres (L) of water, add 125 millilitres (mL) of 4% liquid bleach.

To ensure effective disinfection, add enough chlorine so that after 30 minutes, there is at least 0.5 milligrams per litre (mg/L, or parts per million, ppm) present in your water – this remaining chlorine in your water is known as the ‘free chlorine residual’. Free chlorine residual will naturally decrease over time. You can expect your free chlorine residual after 30 minutes to be less than the chlorine you add.

If the free chlorine residual is below 0.5 mg/L after 30 minutes, repeat the addition of chlorine until at least 0.5 mg/L is present after another 30 minutes. Be careful not to overdose the chlorine and ensure your free chlorine residual is below 5 mg/L. Chlorine can be measured with a suitable test kit (for example, a swimming pool chlorine kit).

Remove any visible contaminants such as dirt and leaves from your water tank before adding chlorine. You may need to add more chlorine to achieve a satisfactory free chlorine residual and effective disinfection if you have contaminants in your water.

Make sure you follow instructions and health and safety guidance on the product you purchase. The water in your tank should be well mixed after you add liquid bleach to your water.

Liquid bleach can be purchased from supermarkets or hardware stores. Check the label of the bleach product has at least 4% available chlorine and has no additives such as fragrances.

There is more guidance on water treatment in Section 7.

### 11.5.2 ADDING 12.5% LIQUID SODIUM HYPOCHLORITE TO YOUR WATER TANK FOR DISINFECTION

Table 5 shows the amount of **12.5% liquid sodium hypochlorite** to add to your water tank for chlorination, depending on the initial chlorine concentration you are targeting and the volume of water in your water tank.

The table gives three options for the initial chlorine concentration in the tank (1 mg/L, 2mg/L and 5 mg/L) for a given volume of water in the tank (1000 L – 10 000 L). Methods for calculating the volume of water in a tank are provided in Section 10.

Table 5: Guidance on adding 12.5% liquid sodium hypochlorite to your water tank

|                         |         | INITIAL CHLORINE CONCENTRATION |        |         |                        |
|-------------------------|---------|--------------------------------|--------|---------|------------------------|
|                         |         | 1 mg/L                         | 2 mg/L | 5 mg/L  |                        |
| VOLUME OF WATER IN TANK | 1000 L  | 8 mL                           | 16 mL  | 40 mL   | AMOUNT OF 12.5% SODIUM |
|                         | 2000 L  | 16 mL                          | 32 mL  | 80 mL   |                        |
|                         | 5000 L  | 40 mL                          | 80 mL  | 200 mL  |                        |
|                         | 6000 L  | 48 mL                          | 96 mL  | 240 mL  |                        |
|                         | 7500 L  | 60 mL                          | 120 mL | 300 mL  |                        |
|                         | 10000 L | 80 mL                          | 160 mL | 400 mL  |                        |
|                         | 16000 L | 128 mL                         | 256 mL | 640 mL  |                        |
|                         | 20000 L | 160 mL                         | 320 mL | 800 mL  |                        |
|                         | 30000 L | 240 mL                         | 480 mL | 1200 mL |                        |

For example: To aim for a chlorine concentration of 5 mg/L in a tank with 1000 litres (L) of water, add approximately 40 millilitres (mL) of 12.5% liquid sodium hypochlorite.

To ensure effective disinfection, add enough chlorine so that after 30 minutes, there is at least 0.5 milligrams per litre (mg/L, or parts per million, ppm) present in your water – this remaining chlorine in your water is known as the ‘free chlorine residual’.

Free chlorine residual will naturally decrease over time. You can expect your free chlorine residual after 30 minutes to be less than the chlorine you add. If the free chlorine residual is below 0.5 mg/L after 30 minutes, repeat the addition of chlorine until at least 0.5 mg/L is present after another 30 minutes. Be careful not to overdose the chlorine and ensure your free chlorine residual is below 5 mg/L. Chlorine can be measured with a suitable test kit (e.g. a swimming pool chlorine kit).

Remove any visible contaminants such as dirt and leaves from your water tank before adding chlorine. You may need to add more chlorine to achieve a satisfactory free chlorine residual and effective disinfection if you have contaminants in your water.

Make sure you follow instructions and health and safety guidance on the product you purchase. The water in your tank should be well mixed after you add liquid sodium hypochlorite to your water.

Liquid sodium hypochlorite can be purchased from swimming pool suppliers, hardware stores and some large supermarkets.

Do not use stabilised swimming pool chlorine for disinfection because it contains cyanuric acid (also known as isocyanuric or trichloroisocyanuric acid) and is not effective in enclosed tanks. Check the active constituent on the label.

There is more guidance on water treatment in Section 7.

### 11.5.3 ADDING 65% GRANULAR CALCIUM HYPOCHLORITE TO YOUR WATER TANK FOR DISINFECTION

**Table 6** provides guidance on the amount of **65% granular calcium hypochlorite** to add to your water tank for chlorination, depending on the initial chlorine concentration you are targeting and the volume of water in your water tank.

The table gives three options for the initial chlorine concentration in the tank (1 mg/L, 2mg/L and 5 mg/L) for a given volume of water in the tank (1000 L – 10 000 L). Methods for calculating the volume of water in a tank are provided in Section 11.

Table 6: Guidance on adding 65% granular calcium hypochlorite to your water tank:

|                         |         | INITIAL CHLORINE CONCENTRATION |        |        |                       |
|-------------------------|---------|--------------------------------|--------|--------|-----------------------|
|                         |         | 1 mg/L                         | 2 mg/L | 5 mg/L |                       |
| VOLUME OF WATER IN TANK | 1000 L  | 2 g                            | 3 g    | 8 g    | AMOUNT OF 65% CALCIUM |
|                         | 2000 L  | 3 g                            | 6 g    | 15 g   |                       |
|                         | 5000 L  | 8 g                            | 15 g   | 38 g   |                       |
|                         | 6000 L  | 9 g                            | 18 g   | 46 g   |                       |
|                         | 7500 L  | 12 g                           | 23 g   | 58 g   |                       |
|                         | 10000 L | 15 g                           | 31 g   | 77 g   |                       |
|                         | 16000 L | 25 g                           | 49 g   | 123 g  |                       |
|                         | 20000 L | 31 g                           | 62 g   | 154 g  |                       |
|                         | 30000 L | 46 g                           | 92 g   | 231 g  |                       |

For example: To aim for a chlorine concentration of 5 mg/L in a tank with 1000 litres (L) of water, add approximately 8 grams (g) of 65% granular calcium hypochlorite.

To ensure effective disinfection, add enough chlorine so that after 30 minutes, there is at least 0.5 milligrams per litre (mg/L, or parts per million, ppm) present in your water – this remaining chlorine in your water is known as the ‘free chlorine residual’.

Free chlorine residual will naturally decrease over time. You can expect your free chlorine residual after 30 minutes to be less than the chlorine you add.

If the free chlorine residual is below 0.5 mg/L after 30 minutes, repeat the addition of chlorine until at least 0.5 mg/L is present after another 30 minutes. Be careful not to overdose the chlorine and ensure your free chlorine residual is below 5 mg/L. Chlorine can be measured with a suitable test kit (for example, a swimming pool chlorine kit).

Remove any visible contaminants such as dirt and leaves from your water tank before adding chlorine. You may need to add more chlorine to achieve a satisfactory free chlorine residual and effective disinfection if you have contaminants in your water.

Make sure you follow instructions and health and safety guidance on the product you purchase. Granular calcium hypochlorite should be dissolved in a bucket of water before being added to your water tank. The water in your tank should be well mixed after you add the dissolved calcium hypochlorite.

Granular calcium hypochlorite can be purchased from swimming pool suppliers, hardware stores and some large supermarkets.

Do not use stabilised swimming pool chlorine for disinfection because it contains cyanuric acid (also known as isocyanuric or trichloroisocyanuric acid) and is not effective in enclosed tanks. Check the active constituent on the label.

There is more guidance on water treatment in Section 7.