Guidelines for private drinking water supplies at commercial and community facilities

Victoria
The Place To Be

Guidelines for private drinking water supplies at commercial and community facilities

Acknowledgements

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If you would like to receive this publication in an accessible format, please phone 1300 364 352 or email foodsafety@dhs.vic.gov.au.

This document is also available in pdf format on the Internet at www.health.vic.gov.au/foodsafety/

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1. Introduction

All businesses and community groups relying on a private water supply for drinking (potable) water must take all reasonable precautions to ensure the water is safe for human consumption.

Private water supplies—including water pumped from rivers, creeks, bores, dams and rainwater tanks—can contain a wide range of disease-causing microorganisms and harmful chemicals if the water is not treated correctly.

These guidelines are for any commercial or community facility that supplies people with drinking water, or commercially prepares or processes food using water from a private supply. It does not include individual household supplies or supplies provided by water authorities (such as town water).

Commercial and community facilities with a private drinking water supply can include:

- cafés, restaurants, hotels and mobile caterers
- childcare centres, aged care facilities and hospitals
- food manufacturing premises
- caravan parks and camping grounds
- guest houses and motels, and backpacker, bed and breakfast and farmstay accommodation
- petrol stations and roadhouses
- community halls
- conference centres
- recreational and sporting facilities
- schools
- school and church camps
- mines and worksites.

These guidelines aim to summarise key elements of the *Australian Drinking Water Guidelines 2004*. The Australian Drinking Water Guidelines are available at <www.nhmrc.gov.au/publications/synopses/eh19syn.htm>.

A number of water supply management guidelines have been developed for businesses and community groups with simple water supplies. These guidelines are available from the Department of Health Food Safety website at <www.health.vic.gov.au/foodsafety>, and can be used instead of this document.

2. Regulatory framework

If you use a private water supply to provide drinking water or prepare food for others, you have a responsibility to make sure the water will not harm the health of those people.

Apart from any civil action arising from the provision of unsafe drinking water, there are substantial penalties under various pieces of legislation of up to $100,000 for an individual and $500,000 for a corporation. The relevant Victorian legislation includes:

Food Act 1984

Through its referral to the Food Standards Code, the *Food Act 1984* (Vic) requires that food businesses use drinking (potable) water for food preparation at registered food premises. This includes water used for washing food ingredients, cooking, adding to food and drinks, making ice, cleaning, sanitising and hand-washing.

Health (Prescribed Accommodation) Regulations 2001

The Health (Prescribed Accommodation) Regulations 2001 require proprietors of prescribed accommodation to ensure that water intended for drinking is fit for human consumption. Prescribed accommodation includes hotels, motels, hostels, student dormitories, holiday camps and residential accommodation.

Residential Tenancies (Caravan Parks and Movable Dwellings Registration and Standards) Regulations 1999

The Residential Tenancies (Caravan Parks and Movable Dwellings Registration and Standards) Regulations 1999 require caravan park owners to ensure water intended for drinking in a caravan park is fit for human consumption.

Authorised officers from your local council or the Department of Health may inspect private drinking water supplies at sites covered by the above legislation.

Contact your local council for more information about how the above legislation applies to your business.

Please note: The Health (Prescribed Accommodation) Regulations 2001 will be superseded in January 2010 by new regulations under the *Public Health and Wellbeing Act 2008.*

3. Water sources

Sources of private water supplies include the following:

Rainwater

In this guide the term ‘rainwater’ is used to describe the water that falls on your roof when it rains. It does not include rainfall that is collected from the ground, which is usually called ‘stormwater’.

Surface water

Surface water includes water from rivers, creeks and dams. Livestock, animals and humans can contaminate surface water with disease-causing microorganisms. Industrial, agricultural or other runoff can also contaminate surface water with chemicals.

Groundwater

Groundwater includes water from bores, spear-points (shallow installations), springs or wells. Groundwater can be high quality if the source is well maintained and protected.

Carted water

Carted water is used when your tank needs topping up. Carted water must be drinking quality and obtained from a supply or supply point that a Victorian water authority has approved.

4. Making your drinking water supply safe

A drinking water supply system includes everything from the collection of the source water to the point of use. Keeping the supply safe involves:

- understanding hazards to your water sources
- making sure the water is stored and distributed safely
- treating the water to remove or control any contamination
- monitoring the quality of the water and the integrity of the water supply system
- planning on how to respond to problems in the water supply system.

It is recommended that you develop a water supply management plan. When you start to develop your plan, you should ask yourself three questions:

- What problems could occur between the water source and the point of use?
- How can they be prevented or fixed?
- How do you know that the problem has been prevented or fixed?

The answers to these questions will help you set out in your plan how you will:

- assess and protect the quality of the source water
- make sure treatment processes are appropriate, maintained and working properly
- regularly test the water quality
- make the water supply safe if contamination has occurred
- make sure that water users are warned and/or provided with safe drinking water (e.g. boiled or commercially bottled water) if the normal supply is found to be unsatisfactory or the quality cannot be guaranteed.

These aspects are covered in more detail in the following pages, and a list of what you need to consider for your water supply management plan is provided in Appendix 1.

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

Multiple barriers: a helpful approach

Using multiple barriers (or control measures) against contaminants is a helpful approach, because if one barrier fails, the remaining barriers will reduce the likelihood of contaminants passing through the system and causing harm to consumers.

Barriers include:

- ensuring a clean catchment for your supply. For rainwater tanks, this means keeping roofs and gutters clean. For groundwater sources and surface water catchments, it means good land management in the surrounding area
- regular maintenance of the supply system (tanks, pumps, plumbing and other elements)
- adequate treatment (such as filtration and/or disinfection).

5. Hazards to water quality

Water supplies can be contaminated by sewage, seepage from septic tanks, animal and bird faeces, intensive farming practices (fertiliser, manure and pesticides), blue-green algae, industrial wastes and from the materials used to collect and store the water. These contaminants can introduce disease-causing microorganisms or harmful chemicals into the water. The contaminated water can cause illness in people who drink the water or eat the food that has been prepared with it.

Disease-causing microorganisms found in water supplies include *Giardia, Cryptosporidium, Salmonella, Shigella, Campylobacter,* some strains of *Escherichia coli (E. coli),* cyanobacteria (blue-green algae), and viruses, 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.

Water supplies can be polluted with leaves and other organic materials, which contain nutrients that encourage microorganisms to grow more vigorously. These microorganisms might make the water taste and smell bad.

The quality of a water supply may also vary throughout the year. Natural disasters such as bushfires and floods may heavily pollute a water source. During the warmer months the growth of blue-green algae can make drinking water from surface water sources unsuitable for humans and stock. This water may also be inappropriate for bathing, as high levels of blue-green algae can cause skin rashes.

The people most at risk from unsafe water are the elderly, the very young, and people with weakened immune systems due to disease or taking medication that suppresses the immune system. People who have recently suffered burns may need to be careful about the quality of water they bathe in.

The health effects of consuming water contaminated with microorganisms generally occur quickly. However, the health effects of consuming water contaminated with heavy metals and other chemicals may take much longer to become apparent.

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 from a particular source, while people who consume it regularly will remain healthy.

Regardless of where your water comes from, you should carry out regular inspections to identify and prevent contamination and check the cleanliness of the system from the source right through to the consumer.

Contaminants and control measures are covered in the following sections, and a summary table is provided in Appendix 2.

How to define safe water

To be safe for human consumption, drinking water must not contain disease-causing microorganisms (bacteria, viruses or parasites) 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 it should be clear and colourless, with no unpleasant taste or odour.

Rainwater

Most rainwater harvesting uses the roof as its catchment, which can be contaminated by a number of sources. These include roof materials, animals and birds, leaves, debris, emissions from wood heaters and pesticides and fertilisers from aerial spraying.

Bird and animal droppings can be a source of bacteria and intestinal parasites. Leaves can also cause taste and odour problems or be a source of nutrients to promote the growth of microorganisms.

Roof materials and aerial spraying are a source of chemicals that can accumulate in the water tank.

To avoid or minimise water quality problems in rainwater:

- regularly clean the roof and gutters that collect rainwater to remove leaves, bird droppings and other organic matter
- cut back overhanging tree branches that may drop leaves into gutters, and use gutter shielding devices (‘gutter guard’) or a leaf filter where roof areas are adjacent to trees and vegetation. This will reduce the amount of debris that can enter the rainwater supply
- maintain the roof area, removing rust and flaking paint
- paint, seal or remove any lead flashings or treated timber used in the roof construction

- where possible, remove or modify any roof structure that provides a perching place for birds, e.g. television antennas should be mounted off the side of the roof
- install a first flush or bypass device to reduce the amount of contaminants entering the tank
- 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
- do not collect rainwater from roofs coated in bitumen products or lead-based paints
- ensure that overflows and bleed-off pipes from roof-mounted appliances such as cooling systems and hot-water services do not discharge onto the roof or into gutters that collect the rainwater supply
- make sure that chimneys and flues have been installed in accordance with the relevant Australian Standards; if not, sections of the roof surrounding these should be excluded from the area used to collect rainwater
- if the water is cloudy or dirty then it should be filtered before disinfection, even if the water only becomes cloudy after rainfall. There are a number of different filtration methods available and the choice of filter depends on the contaminants that need to be removed. Refer to Chapter 7 for more information on water treatment
- disinfect the rainwater to kill any 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. Refer to Chapter 7 for more information on disinfection
- test the water for chemical contaminants. A list of chemicals of possible concern, and guideline values for drinking water, are listed in the Australian Drinking Water Guidelines and provided in Appendix 3. However, in your area more chemicals may need to be tested such as chemicals from local industrial emissions or pesticide use. Talk to your local council's environmental health officer for advice if you think there are additional chemicals that might affect your rainwater supply.

More information on the safe use of rainwater and rainwater tanks can be found in *Guidance on the use of rainwater tanks* at <www.health.vic.gov.au/environment>.

What to do if you have an asbestos roof

People often ask whether asbestos is a risk to rainwater systems. Asbestos is no longer used in new buildings, but may be present in some older roofs. Asbestos fibres are dangerous to health when they are inhaled in sufficient quantities, but it is not believed that asbestos in drinking water poses a risk. Where possible, asbestos roofing should be left undisturbed, as fibres can be released into the air by actions such as cutting, grinding and drilling. High-pressure roof cleaning methods should also be avoided. Where the roof has deteriorated badly, it should be replaced with an asbestos-free substitute.

Surface water

Livestock, animals and humans can contaminate surface water with disease-causing microorganisms. Industrial, agricultural or other runoff can also contaminate surface water with chemicals.

Parasites such as *Giardia* and *Cryptosporidium* are most likely to be present in surface water that has sewage discharging into it, livestock accessing it, or runoff entering it from livestock areas upstream of the water supply off-take.

To avoid or minimise water quality problems in surface water:

- make sure that surface water sources are fenced against livestock, and protected from septic tank overflows and spills of domestic, agricultural or industrial chemicals
- check upstream for contamination sources—heavy rains may wash pollution into the water source. During the warmer months the growth of blue-green algae can occur
- install a filter to remove particles from the water and increase the effectiveness of disinfection

- 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. If the water supply comes from a source that is at risk of contamination with the parasites *Giardia* and *Cryptosporidium,* disinfection with chlorine can be used together with ultraviolet light. Refer to Chapter 7 for more information on disinfection
- test the water for chemical contaminants. A list of chemicals of possible concern are listed in the Australian Drinking Water Guidelines and provided in Appendix 3. However, in your area more chemicals may need to be tested: check upstream for contamination sources. Your local council and/or catchment management authority can provide you with information about activities higher up in a stream's catchment that might affect water quality
- provide a buffer distance between the water source (stream, dam) and any septic tank system in compliance with the Code of Practice—onsite wastewater management—contact your local council's environmental health officer for further advice.

Groundwater (bores, springs or wells)

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

Some groundwater supplies in Victoria have been found to contain high levels of chemical contaminants, such as arsenic, which can cause illness in people who drink the water. Some salts that occur naturally in water, including sulfate and nitrate, can be harmful if they are present in large quantities. Other dissolved salts can make the water hard. This may result in scale build-up and corrosion in pipes, which can release harmful metals such as lead and copper into the water.

To avoid or minimise water quality problems in groundwater:

- where possible, avoid using groundwater that is in contact with surface water (open wells) or where water flows freely from the surface down into the groundwater
- only extract groundwater from a place where sub-surface contaminants are unlikely. Avoid sites with known contaminants, including heavy industrial and intensive agriculture areas
- prevent surface runoff from contaminating the groundwater supply—bore heads should be raised above ground level and the soil around the bore casing should be mounded up so that it slopes away from the bore
- test the water for chemical contaminants. A list of chemicals of possible concern are listed in the Australian Drinking Water Guidelines and provided in Appendix 3. However, in your area more chemicals may need to be tested: talk to your rural water authority for advice on the likely chemical contaminants in your groundwater source
- disinfect the water. This is especially important for groundwater from shallow supplies. If the water is cloudy or dirty then it may require filtration before disinfection. Refer to Chapter 7 for more information on water treatment
- inspect the bore regularly. Make sure that a well or bore cover or sanitary seal is securely in place and free from holes or cracks, and check the bore casing is intact by looking for stains below joints and seepage through cracks inside the bore casing
- inspect the areas around the groundwater supply regularly, looking for possible sources of contamination
- provide a buffer distance between the water source (bore) and any septic tank system in compliance with the Code of Practice—onsite wastewater management. A reduced distance may be appropriate, based on factors such as soil type, rainfall and bore depth—contact your local council's environmental health officer for further advice.

Information on the licensing, construction and protection of bores and groundwater sources can be obtained from the Department of Sustainability and Environment (see Contacts on page 28).

Carted water

In some circumstances you may need to top up your tank with carted water. Carted water must be drinking quality and obtained from a clean source, i.e. a registered 'standpipe', and transported in clean, sealed, food-grade containers.

You should only buy water from a water carter who can demonstrate they supply safe drinking water. They should also follow the *Guidelines for Drinking (potable) Water Transport in Victoria*. These guidelines are available at <www.health.vic.gov.au/foodsafety>.

Your tank should be cleaned before the water is delivered to prevent any sludge being re-suspended or taste and water-quality issues. If the tank has not been cleaned before delivery, a settling period followed by treatment (such as disinfection) may be needed.

6. Storage and distribution

Storage tanks

Storage tanks should be assembled and installed in accordance with the manufacturer's instructions, and comply with the relevant Australian Standards (refer to Reference list on page 27).

You should take preventative measures to ensure the stored water cannot become contaminated, including:

- installing screens, with a maximum 1 mm mesh, on tank inlets and overflows to prevent the entry of leaves, mosquitoes and small animals. Check the screens regularly
- ensuring tanks are covered and made lightproof to minimise algal growth
- ensuring tanks are adequately ventilated, with at least two vents (covered with mosquito-proof mesh and protected against the light), preferably on opposite sides of the tank
- ensuring in-ground tanks are properly sealed and designed to prevent the entry of any surface runoff, groundwater or soil. Tanks should not be buried in contaminated ground or near underground chemical storage tanks. In-ground tanks should be located at least 15 metres uphill from any septic tank or area where the septic tank discharges (a greater distance may be necessary if the tank cannot be placed uphill—contact your local council's environmental health officer for advice)
- ensuring the draw-off point for taking water from the tank is at least 150–200 mm above the base of the tank, as significant concentrations of contaminants can be found in tank sediments. The manufacturer's minimum distance for the draw-off point should be noted
- examining tanks for build up of sediments every two years, or earlier if sediments are seen in the water flow. Any build up of sediments needs to be removed (desludged) as sediments can be a source of contamination and off-tastes and odours. Sediment can be removed by siphoning the tank without emptying it, or by completely emptying the tank for a thorough clean.
- if the water supply has not been used for some time (e.g. more than one week, or less if water taste and odour problems are noticed), it is recommended that the pipes be flushed until fresh water flows through from the tank. The flushed water can be used safely on the garden.
- if more than one storage tank is used, consider connecting them in series (so water passes through all tanks before entering the supply system). Passing the water through multiple tanks may improve the microbial quality of the water.

Protect your tank from wrigglers

Water tanks can provide an ideal environment for mosquito larvae (wrigglers). This doesn't affect the safety of the water for drinking, but adult mosquitoes can transmit diseases such as Ross River Fever and cause a nuisance. It is therefore important to make sure that your private water supply doesn't become a breeding ground for mosquitoes.

Tank cleaning and maintenance

Tanks should be well maintained and cleaned at least every two years to remove the sediment that builds up on the bottom. Tanks built from different materials need to be treated differently during maintenance and cleaning.

- 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 rinsed with a hose.
- 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 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.

Make sure you follow any manufacturer's instructions when maintaining or cleaning your tank.

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 any occupational health and safety requirements associated with working in confined spaces. Contact WorkSafe Victoria or visit their website for further information (see Contacts on page 28).

Professional tank cleaners are available in some areas—check your business telephone directory under 'tank cleaners'.

Distribution systems

A distribution system is the plumbing of your water supply system including the guttering/spouting, pipes and pumps to move the water from the source through to the end point such as the tap.

Materials that come into contact with water, such as gutters, storage tanks, rainwater tanks, pipes and plumbing fittings, can contaminate water in certain situations. All plumbing materials used for the supply of drinking water should be approved for use with drinking water, and certified to the appropriate Australian Standards.

- Gutters that collect rainwater should be regularly cleaned and well-maintained.
- Water from any overflow pipes should not be allowed to pool and stagnate or provide a breeding site for mosquitoes.
- Buried pipes should be installed away from, and shallower than, septic tanks or wastewater pipe work.
- Pipes that are not self-draining should be drained every six months.

If you use another water supply on your property that is not drinking water standard, then you should make sure the pipes that carry drinking water around your property are clearly distinguishable from the pipes that carry non-drinking water. This is to prevent accidental interconnections between the two supplies that may result in people drinking water that is not suitable quality.

7. Water treatment

Routine treatment

A private drinking water supply should be treated when legislation requires it to be safe for human consumption or 'potable'. Even in cases where there is no legislated requirement for the water supply to be safe for human consumption, you should still consider water treatment: you may have a duty of care to ensure the health of consumers is not placed at risk by your drinking water supply.

You may not have to treat your water supply if the water quality is regularly tested and there is sufficient evidence that the water is free from contaminants. However, it should be noted that this is only likely to apply to some deep groundwater supplies.

A range of treatment processes can be considered, depending on the contaminants that require control. These most commonly include:

- filtration
- chlorine disinfection
- UV disinfection

These common treatment methods are discussed in more detail in this Chapter, although other treatment options may also be suitable for your water supply. It is best to get professional advice on the design and selection of a water treatment system for your particular supply. Consult your plumber, tank supplier or look in the business telephone directory under 'water treatment' for further advice.

Water treatment systems should comply with the Australian Standards, where applicable.

Filtration

Depending on the type of filter used, filtration can remove particles (e.g. sediment), chemicals, algal toxins (which are a specific type of chemical) and microorganisms. Filters are commonly installed 'in-line' with the plumbing system between the water source (e.g. tank, bore, dam or creek) and the other treatment steps.

If the source water appears cloudy or dirty then it will require filtration before it can be disinfected, as particles and dirt in the water make disinfection less effective. Turbidity (cloudiness) in water can be measured as nephlometric turbidity units (or NTU). If the water is filtered as a pre-treatment for disinfection, then the filtered water should be 1 NTU or less.

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

For water supplies with a lot of suspended particles it may also be necessary to use a treatment known as coagulation before filtering the water. Coagulation chemicals make small particles in the water clump together into larger ones, making filtration more effective.

When to use a filtration system

You will need to install a filtration system if your water supply:

- is turbid or contains a lot of suspended particles (above 1 NTU)
- is at risk of contamination with sewage or farm runoff that may contain parasites such as *Cryptosporidium* and *Giardia*.
- contains chemical contaminants or is at risk of chemical contamination
- comes from a source that has regular blue-green algal blooms.

A number of factors determine a filter's ability to remove specific types of contaminants, including the material the filter is made from, the filter grade (i.e. how fine the filter is) and the flow rate of the water through the filter. Therefore, it is not possible in this document to provide detailed advice about what type of filter should be used for various contaminants. It is important to consult a water treatment professional or check the filter manufacturer's specifications to help select a filtration method most appropriate for the contaminants you need to remove.

Some of the different filtration methods available are outlined below:

- Cartridge filters usually have a plastic housing that contains a membrane or 'media' through which the water is passed. Depending on the type used, cartridge filters can remove particles of a range of sizes, from suspended dirt through to microorganisms.
- Filters containing a sand or silica media also remove particles, but generally not chemicals and algal toxins. Depending on the media used they may remove microorganisms.

- Ceramic filters have a core or 'candle' of ceramic material of small pore size, through which the water is passed. They can remove bacteria and parasites from water, but only certain types with an extremely small pore size will remove viruses. The core needs to be cleaned regularly. Ceramic filters are not used for removing chemicals.
- Activated carbon filters help to control taste and odour problems, and remove algal toxins. They are not usually used for removing bacteria, parasites or viruses (although some may be effective for this). The carbon in these filters needs to be replaced regularly, as it becomes 'used up' or saturated with contaminants.
- 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.
- Reverse osmosis filtration removes most contaminants including minerals, microorganisms, and sediments.

Disinfection

Disinfection is the single process that has had the greatest impact on drinking water safety. Disinfection is generally the last step of water treatment and will kill most bacterial pathogens and greatly reduce numbers of viral and most protozoan pathogens. Disinfection will not remove chemical contamination.

Chlorine disinfection

Chlorine is often used to disinfect water because it is accessible, economical and can treat large volumes of water.

It controls many microorganisms, but is not very effective in controlling parasites such as *Giardia* and *Cryptosporidium.* These parasites are most likely to be present in surface water and shallow groundwater supplies that are at risk of contamination with sewage discharges (including septic tank discharges), livestock access, or livestock runoff.

Chlorine can be manually dosed directly into the tank (refer to Appendix 7), which is a good method to use for emergency disinfection. However, for regular treatment it is better to use an automated system to maintain a suitable level of chlorine at the point of injection.

Chlorine disappears ('dissipates') from water quite rapidly. This dissipation occurs more quickly as the temperature increases. The concentration of chlorine remaining in the water after 30 minutes should be at least 0.5 milligrams per litre (mg/L).

Regular monitoring (weekly or after heavy rainfall) of chlorine at taps is recommended to check the level of disinfectant in the system.

Filtration is often necessary before chlorination of surface water supplies and some groundwater supplies (dirt and other suspended particles can prevent effective disinfection—see previous section on filtration). Filtration can also be necessary before chlorination if the water supply comes from a source at risk of contamination with the parasites *Giardia* and *Cryptosporidium* (unless disinfection with ultraviolet light is also being used—see next section).

When the water supply has not been used for some time, such as more than one week, you should check the chlorine level and flush the pipes for a few minutes until fresh water flows through from the tank.

Ultraviolet light disinfection

Another common and effective form of disinfection is ultraviolet (UV) light, which kills many kinds of microorganisms, including the parasites *Giardia* and *Cryptosporidium.*

Filtration to remove suspended particles often needs to occur before the water reaches the UV disinfection unit—because UV light cannot penetrate dirty or cloudy water. UV requires a reliable power supply and the UV lamp should be changed regularly (in accordance with the manufacturer's instructions or at least every six months). For best results, you should use UV disinfection either at the point of use, e.g. under the tap, or in combination with chlorination.

UV disinfection systems need to be designed and installed by a water treatment professional. They also need regular and careful maintenance to ensure they remain effective. It is particularly important that the UV lamps are regularly inspected to ensure the light is working and cleaned to remove any build-up of scum.

Emergency water treatment

Unusual events can contaminate water supplies that are normally clean. These events might include:

- Natural events such as heavy rain and bushfires, or faecal contamination (animal droppings or septic tank overflow).
- Water that has been treated being re-contaminated, e.g. by dead animals in a storage tank.
- Disinfection or pump system failing due to power outage.

If you suspect your water has been contaminated, it can be boiled before being used for drinking or food preparation or manually disinfected with chlorine. Boiling and chlorine disinfection will not remove chemical contaminants. Therefore, if chemical contamination is suspected then an alternative drinking water supply should be provided until the normal water supply is shown to be safe.

In the case of an emergency, your local council's environmental health officer will be able to provide advice on how you should treat your water.

When the water has been heavily contaminated, e.g. by floods or bushfires, the microbiological or chemical levels may have to be tested to make sure your water is safe.

If the water cannot be treated to the standard that is safe for drinking, signage must be provided to warn consumers of the risk. Refer to Chapter 9 for public warnings.

Bushfires and your private water supply

Bushfires generate large amounts of smoke, debris and ash. If you are in a bushfire-affected area you need to be aware that your water supply could become contaminated. Information on the effects of bushfires on private water supplies is available from the Better Health Channel <www.betterhealth.vic.gov.au> or from the Department of Health <www.health.vic.gov.au>.

8. Monitoring and corrective actions

Monitoring is an essential part of the overall 'multiple barrier' approach to good water management. Regular monitoring of a private water supply checks the system is well maintained and treatment processes are working properly.

Monitoring includes:

- system inspections
- monitoring treatment processes
- verification
- record keeping.

You must be able to demonstrate to your local council that your drinking water is being adequately treated, for example, by documenting maintenance and system inspections. Failure to do so may result in the council sampling the water for compliance against the *Australian Drinking Water Guidelines 2004,* with your organisation having to pay costs.

System inspections

Regular system inspections identify any issues or maintenance work that is required. A system inspection checklist is provided in Appendix 4, but you may need to add some items to this, depending on your particular system. An inspection should also be undertaken on a regular basis or after an event, for example a storm, to identify any hazards and to make sure that treatment processes are operating properly.

Monitoring treatment processes

Filtration

If there is a filter fitted to your supply system, it should be checked, maintained and replaced in accordance with the manufacturer's advice. Filters should be free from build-up, and 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 needs to be checked and may need replacing. Some filters include a pressure gauge that indicates whether it needs replacing.

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, hand washing and food preparation to maintain effective disinfection throughout the supply system.

For chlorine to work properly, the pH of the water must be 6.5–8.5. A pH of greater than 8 can decrease the efficiency of chlorine disinfection.

Weekly monitoring of the chlorine level will help to ensure that disinfection is maintained. If water varies in quality, as with some surface water supplies, daily monitoring may be necessary.

If an online chlorine meter is not incorporated into the treatment system, a suitable test kit (such as a swimming pool chlorine kit) can be used to measure and monitor chlorine and pH in the system. Adjust chlorine dosing if necessary and keep a record of chlorine readings.

Ultraviolet disinfection

Ultraviolet (UV) disinfection units need to be checked and maintained regularly, following the manufacturer's instructions, to ensure they remain effective. UV lamps have a limited life and most need to be replaced within 12 months. 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
- the lamps are free from scum.

If the power goes out, an alternative disinfection method will be needed, such as chlorination. If problems are found, maintenance should take place as soon as possible.

Verification

It is important to verify that the treatment of your water supply is working properly. The water quality should comply with the Australian Drinking Water Guidelines and can be tested by sending water samples to a laboratory. Guideline values for microbiological, physical and chemical characteristics outlined in the Australian Water Guidelines are provided in Appendix 3.

Tests of the microbial quality of the water should look for the organism *Escherichia coli (E. coli).* If *E.coli* is detected, this indicates faecal contamination and the possible presence of disease-causing microorganisms. The Australian Drinking Water Guidelines state that *E.coli* should not be detected in 100 mL of water.

When using groundwater or surface water, it is recommended that a comprehensive analysis is initially undertaken to identify any chemical contaminants in the water supply.

Blue-green algae requires light to grow and may occur in surface water during the warmer months. Water should be tested if you suspect the presence of blue-green algae.

The quality of the water should be tested:

- before using the water from a new treatment system
- after a treatment system has been altered
- after a significant event that may have affected water quality, such as heavy rains or bushfires.

You should take water samples at the point of use, for example the kitchen tap. Contact your laboratory to find out about sampling protocol and obtain sampling bottles. Water samples should be tested at a laboratory accredited by the National Association of Testing Authorities (NATA) to ensure the highest level of accuracy.

Look in the business telephone directory under the heading 'Analysts' to find a laboratory in your area.

Guidance on sampling is included in Appendix 5.

Record keeping

Keep records of system inspections, test results and maintenance activities for at least two years. It is important that records are kept for at least this long, as some treatment system components may only need occasional replacement, and some types of monitoring (for example chemicals) will only occur every two years.

Records should include:

- name, date and observations made during the system inspection
- equipment checks and maintenance, including any filter change or refurbishment
- any corrective actions taken, e.g. repairing broken pipe work, dead animals in the water source, cross connections and repairs to the system to fix faults or prevent contamination
- regular chlorine readings and adjustments to chlorine levels if required
- any adverse events, e.g. flooding, bushfire, aerial spraying, dead animals in the water source, and repairs to the system
- rainfall observations (important for surface water supplies)
- results from any test
- delivery details, including source and supplier of any carted water.

A record-keeping template is provided in Appendix 6.

An environmental health officer from your local council has the authority to ask for these records at any time.

Corrective action

You may need to take 'corrective action' when monitoring shows that something is wrong with your water supply system. This may include things like:

- changing filter cartridges or undertaking other maintenance work on water treatment systems
- installing new or different water treatment systems
- increasing the chlorine dose
- emergency disinfection
- stopping the supply, putting up warning signs or notifying water users if the water is suspected to be unsafe
- roof cleaning and gutter repairs
- repairing fences around surface water supplies
- repairing bores and bore covers

It is important that you record any corrective action to demonstrate that the appropriate activities have been conducted.

9. Public warnings

Consumers should be warned in following instances:

- treatment systems have broken down or are not working properly
- tests show that *E. coli* is present or the water supply is unsuitable for drinking
- the safety of the water for drinking cannot be guaranteed.

This can be done with a sign displayed at each drinking water tap and in bathing areas. Warning signs should be left in place until clear test results are obtained.
A suggested warning sign appears below:

If water is contaminated, an alternative drinking water supply, such as commercially bottled water, should be provided. Otherwise the water should be boiled (note that boiling will control microorganisms but not blue-green algae or chemicals). In these cases the signs could include the above sign and:

Use bottled water for drinking, preparing food and cleaning teeth.

OR

Boil water before drinking, preparing food and cleaning teeth.

If a bloom of blue-green algae occurs in the water supply or chemical contamination is present, then signs should say:

What to do if water supplies are unsuitable for drinking

Potential consumers should be warned if a private water supply is not suitable for drinking. The warning can be in the form of:

- a sign at each water outlet
- an entry in an in-house directory or an accommodation in-room notification card.

Appendix 1: Water Supply Management Plan

The following information should be included in your Water Supply Management Plan:

Organisational details

1. Name of property/business
2. Owner/occupier
3. Contact details
4. After-hours contact

Responsibility for system monitoring and maintenance

1. Main person responsible
   - role and responsibilities
   - contact details (including after-hours)
2. Other person responsible
   - role and responsibilities
   - contact details (including after-hours)

Description of system

1. Uses of the water supply (e.g. drinking, food preparation, bathing, clothes washing etc.)
2. Map showing location of:
   - water supply system—water source, pumps, storage, treatment, pipelines etc.
   - waste water system—septic tanks, disposal trenches/dispersal areas, composting toilets etc.
   - any other water supplies (including pipe work), e.g. irrigation water, non-drinking supplies
3. Identify possible sources of contamination and control measures

System operation and maintenance

1. Document procedures for operation and maintenance of pumps and treatment systems etc.
2. List manufacturer and supplier of pumps, treatment systems, replacement filters, chlorine etc.

Monitoring and records

1. Document all monitoring required. For each monitoring activity (e.g. system inspection, disinfection monitoring, microbial testing or chemical testing) include:
   - person responsible
   - frequency of monitoring
   - procedure used
2. Keep records of:
   - system inspection notes
   - all results of microbial and chemical testing
   - chlorine levels (where applicable)
   - any maintenance to the water system (filter change, addition of chlorine, tank cleaning)
   - incidents and the corrective actions taken (e.g. finding a dead animal in the tank, storms that may have affected water quality etc.)
   - deliveries of carted water (include date and name of supplier)
   - the posting of warning signs

Contingency plans

1. Document contingency plans for system failures (warning signs, supply of bottled water)
2. Record details of who to contact in case of an emergency and local maintenance/repair contractors

Appendix 2: Common sources of contamination and control measures

Water supply	Source of contaminants	Control measures
Rainwater (roof water)	Roof and gutters (e.g. build-up of leaves, dirt and animal droppings)	• First flush device • Regular cleaning of roof and gutters • Removal of overhanging branches • Regular inspections • Water treatment (disinfection)
	Roof material (e.g. lead-based paint, lead flashing, bitumen-containing products, treated timber, peeling paint)	• Water not collected from roofs coated or painted with substances that may leach hazardous materials • Remove lead flashing • Seal any exposed treated timber
	Insect, birds and animals in system	• Screen all inlets and outlets to the tank • Regular inspections of tank, roof and gutters
	Build up of sludge in tank, dirt in inlet strainers or insect screens	• Regular inspection, cleaning and maintenance program
	Tank materials (e.g. pH of water in concrete tanks, high metals from metallic tanks)	• Materials in contact with water comply with relevant Australian Standards (refer to Appendix 1) • Chemical adjustment of pH in new concrete tanks may be necessary
	Pump and plumbing materials	• All materials in contact with water comply with AS/NZS 4020:2005
Surface water (dams, creeks and rivers)	Surrounding land use (e.g. intensive farming, urban areas, industrial sites and sewage discharges)	• Protect surface water source against livestock, septic tanks/sewage overflows and chemical spills • Water treatment
	Animal and human activities	• Fence water storage or off-take area • Don't permit swimming or public access in off-take area • Water treatment
	Tank materials, where applicable (e.g. pH of water in concrete tanks, high metals from metallic tanks)	• Materials in contact with water comply with relevant Australian Standards (refer to Appendix 1) • Chemical adjustment of pH in new concrete tanks may be necessary
	Pump and plumbing materials	• All materials in contact with water comply with AS/NZS 4020:2005
Groundwater (bore, well, spring)	Surface water seepage	• Raise bore heads above ground level and mound up ground around bore head • Ensure bore covers and casing are intact • Regular inspections
	Sub-surface contamination (e.g. from industry, farming, landfill, sewage)	• Extract groundwater from places where sub-surface contaminants are unlikely • Test the water for chemicals and treat if necessary • Groundwater source is at least 20 metres from any wastewater disposal systems • Water treatment (disinfection)
	Backflow water (e.g. from animal water troughs)	• Backflow prevention device
	Tank materials, where applicable (e.g. pH of water in concrete tanks, high metals from metallic tanks)	• Materials in contact with water comply with relevant Australian Standards (refer to Appendix 1) • Chemical adjustment of pH in new concrete tanks may be necessary
	Leaching from bore casings, pipes or plumbing materials	• All materials in contact with water comply with AS/NZS 4020:2005

Appendix 3: Guideline values for private drinking water supplies

Health-based characteristics

The following microbial and chemical guideline values have been adopted from the *Australian Drinking Water Guidelines 2004*. They represent the most likely contaminants in private drinking water supplies. Guideline values for many other contaminants are also provided in the Australian Drinking Water Guidelines.

It is recommended that an initial comprehensive analysis is undertaken to identify any chemical contaminants in the water supply. The list of chemicals provided here may need to be expanded to include other chemicals that are found in the vicinity of your water source, such as pesticides or industrial chemicals. Contact your local council's environmental health officer or local catchment management authority if you need further advice on this.

After the initial screen, the following regular chemical testing should be undertaken:

- Rainwater—chemicals of concern (e.g. those that are detected at levels close to the guideline value in the initial analysis) should be tested every two years.
- Surface water and groundwater—all chemicals tested in the initial analysis plus any new chemicals of concern should be tested every two years.

To ensure the highest level of accuracy, water samples should be analysed by a laboratory that is certified as having appropriate quality assurance programs for the analysis required, such as a laboratory with National Association of Testing Authorities (NATA) accreditation (refer to Contacts on page 28 for details).

For each characteristic the levels measured in the water should be below or equal to the guideline value.

Microbial	Guideline
E. coli	Not detected in 100 mL
Blue-green algae (cyanobacteria)[1] *Water only needs to be tested for blue-green algae if there is growth (note that blue-green algae are different to green algae and filamentous algae, which are not toxic).* *There are a number of guidelines, depending on the species of blue-green algae detected. The analytical laboratory used should be asked for assistance in deciding whether the water quality meets the guidelines described below.*	
Microcystis aeruginosa	5,000 cells/mL
OR	
Total combined biovolume of known toxic cyanobacterial species	0.4 mm^3/L
OR	
Total combined biovolume of all cyanobacterial species	10 mm^3/L

1 Blue-green algae are most likely to grow in surface water supplies. They are unlikely to be found in covered rainwater tanks or groundwater supplies because they need light to grow.

If blue-green algae are detected at levels above these guideline values then the supply should not be used for drinking unless a suitable activated carbon filter is used to treat the water. The toxins from blue-green algae can remain in the water for several weeks after the cells have died, so the water will not necessarily be safe for drinking, without treatment, even after the blue-green algae cells have disappeared. If you have detected blue-green algae above the guideline values in your water supply and have concerns about the safety of the water, contact the Department of Health for advice—refer to Contacts on page 28.

Chemical	Guideline (mg/L)
Arsenic *Arsenic is found in soil and rocks. It occurs naturally in some groundwater supplies. It may also be released by mining activities, and by the burning of fossil fuels and waste incineration. It is also used in some industrial processes.*	0.007
Cadmium *Cadmium may enter water supplies from impurities in the zinc of galvanised metal, from solders, and from some fertilisers.*	0.002
Chromium *Chromium may be present in rocks and soils. It is also used in a number of industrial processes. The hexavalent form (Cr(VI)) is considered harmful to humans. If total chromium exceeds 0.05 mg/L, then a separate analysis for hexavalent chromium should be undertaken.*	0.05
Copper *Copper is found in many rocks and soils. It is also frequently used in plumbing and some industrial processes. It should be noted that 2 mg/L is a health-based guideline; however, concentrations above 1 mg/L may cause blue or green stains on porcelain baths and basins.*	2
Fluoride *Fluoride is important for preventing tooth decay, but can be harmful at high concentrations. It is found naturally in rocks and waters, and is sometimes present in industrial air pollution. The highest concentrations are likely to be found in groundwater.*	1.5
Lead *Lead may enter the water supply from natural sources or from plumbing or roofing components that contain lead. It can also be present in some industrial emissions.*	0.01
Manganese *Manganese may enter water supplies from natural sources or from contaminated sites. Although the health-based guideline for manganese is 0.5 mg/L, an undesirable taste in the water and staining of laundry and plumbing fittings may occur at concentrations above 0.1 mg/L.*	0.5
Mercury *Mercury may contaminate water supplies via industrial emissions.*	0.001
Nickel *Nickel is used in many industrial processes, and may also be released from burning fossil fuels.*	0.02
Nitrate *See below.*	50
Nitrite *Excessive nitrate and 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 than has not been aerated.*	3

Aesthetic characteristics

Aesthetic characteristics affect the taste, odour and appearance of the water. For each of these characteristics, values should be below or equal to the corresponding guideline value (or for pH, between 6.5 and 8.5).

Aesthetic parameter	Australian drinking water guideline
Sulfate *Although harmful at higher concentrations, the guideline value for sulfate is set to avoid an undesirable taste in the water. Under some conditions it can also contribute to the corrosion of plumbing fittings. Sulfate at levels greater than 500 mg/L can have health effects.*	250 mg/L
pH *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 into the water. 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.* ***A pH greater than 8 can decrease the efficiency of chlorine disinfection.***	6.5–8.5
Total dissolved solids (TDS) *Dissolved material, usually salts, in the water supply can affect the taste of the water. It can also cause scale on the inside of plumbing fittings and pipes, or lead to corrosion. Some groundwater supplies have high TDS. The Department of Sustainability and Environment has information on the TDS concentrations in many groundwater supplies (refer to Contacts on page 28).*	500 mg/L
Total hardness *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.*	200 mg/L
Turbidity *Turbidity is the measure of dirtiness or cloudiness of water. It indicates the amount of suspended material present. This can affect the taste of the water and can make the water look dirty. It can also reduce the effectiveness of chlorination and UV disinfection. Unusual increases in turbidity can indicate a disturbance in the water supply system.*	5 NTU (less than 1 NTU is desirable)

Appendix 4: Checklist for inspecting and maintaining your water supply

Item	Frequency
Water source	
Rainwater	
Clean gutters	3 monthly and after storms
Check and trim overhanging branches	Annually
Inspect and repair downpipes	Annually
Check condition of roof	Annually
Surface water	
Check water quality and filters after heavy rain—it may be necessary to increase chlorine dose. Boil water if treatment system is not working properly.	After heavy rain
Assess upstream catchment for new developments and other possible sources of contamination	Weekly
Check infrastructure (pump, piping etc.) is fully operational and well-maintained	Monthly
Groundwater	
Check control measures to guard against surface contamination	Monthly
Check infrastructure (bore casing, pump, piping) is fully operational and well-maintained	Monthly
Tank	
Check inlet and outlet screens	3 monthly
Check access covers	3 monthly
Clear strainer of debris	3 monthly and after storms
Check presence of mosquito larvae in tank water	3 monthly
Check structural condition	Annually
Check sludge level and internal cleanliness	Every 2 years
Distribution system	
Check plumbing/piping is fully operational and well-maintained	Annually
Check any backflow prevention devices, in accordance with manufacturer's instruction	Annually
Treatment system	
Clean/change filters	As per manufacturer's advice
Check chlorine injection unit is fully operational and chlorine supply is adequate	Weekly
Check and maintain UV light system	As per manufacturer's advice
Water quality testing	
E. coli test—as per Australian Water Drinking Guidelines values	System is new, altered or after a significant event
Blue-green algae	If growth suspected
Chemical test—as per Australian Water Drinking Guidelines values	System is new, altered or after a significant event
Chlorine test (where applicable)	Weekly (minimum)
pH level is 6.5–8.5 (where chlorine is used)	Weekly (minimum)

Appendix 5: Sample collection

Before collecting any samples, ask the laboratory:

1. If there are any specific requirements or protocols for sampling.
2. About the type and size of sample bottle that should be used. This varies, depending on the type of test. Many analytical laboratories will provide sample containers, or tell you where sample containers can be bought.
3. How much water should be collected for each test.
4. How the sample should be stored, and how quickly it should be delivered to the laboratory.

To ensure they remain sterile, sample bottles should be kept unopened until they are required for filling.

Bottles used for *E. coli* samples must be sterile, and contain sodium thiosulphate if the water has been treated with chlorine.

Collecting samples for *E. coli* testing

Method (unless otherwise instructed by the laboratory)

1. Label the container with:
   - what the sample is (i.e. water)
   - where it was collected (address)
   - location of collection (i.e. tap or storage location)
   - who collected the sample
   - date and time of sample collection.
2. Wash hands thoroughly before sampling, or wear sterile gloves.
3. Do not allow the screw cap or mouth of the sample container to touch anything that may contaminate the sample.
4. **If filling from a tap:** Swab the tap with an alcohol swab. Let the water run for 20 seconds and then fill the bottle, leaving a head-space of about 2 cm from the neck of the bottle. Immediately replace the screw cap.

   If sampling directly from the storage tank: Hold the sample container in one hand at an angle of 45°, holding the screw cap in the other hand. Plunge the container in vertically to a depth of approximately 20 cm, allow to fill without rinsing, and immediately replace the screw cap.

   A minimum of 200 mL is usually enough for *E. coli* analysis, unless otherwise advised by the analytical laboratory.
5. Maintain samples at a temperature of 2–10°C (normal fridge, do NOT freeze). Transport samples to a laboratory for analysis, preferably within six hours of sampling (no more than 24 hours).

Appendix 6: Record keeping

Date	Name	Type of monitoring or maintenance (e.g. system inspection, chlorine test, filter replacement)	Result	Corrective actions (if applicable)
1/1/08	*John Citizen*	*System inspection*	*Leaf build-up in gutters* *Holes in mesh over tank inlets* *Chlorine supply*	*Cleaned gutters and trimmed overhanging branches* *Replaced mesh on tank* *Replaced chemicals*
10/1/08	*John Citizen*	*Chlorine test*	*0.5 mg/L at kitchen tap*	*N/A*
17/1/08	*John Citizen*	*Chlorine test*	*0.2 mg/L at kitchen tap*	*Increased chlorine dose* *Rechecked chlorine levels—0.6 mg/L*

Appendix 7: Calculations for water chlorination in tanks

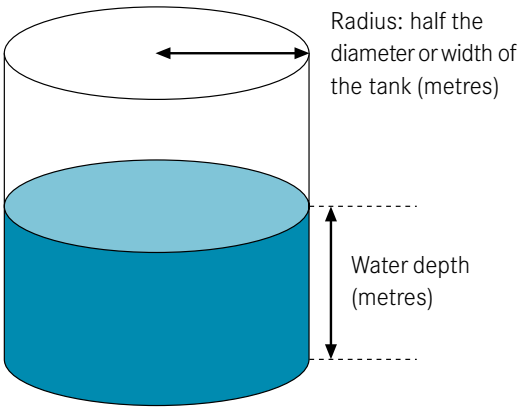
Calculating the volume of water in your tank

Rectangular tanks

Volume (litres) = depth of water in tank (metres) X tank width (metres) X tank length (metres) X 1000

Cylindrical tanks

Volume (litres) = depth of water in tank (metres) X tank radius (metres) X tank radius (metres) X 3140



Calculating the amount of chlorine to add

It usually takes about 5 milligrams of chlorine per litre of water to disinfect your tank following contamination (5 mg/L). Chlorine is available in a number of different forms. As a general guide, you will need to add:

- 125 millilitres of unperfumed liquid bleach (4% available chlorine) for every 1000 litres of water in your tank

  OR

- 40 millilitres of liquid sodium hypochlorite (12.5% available chlorine) for every 1000 litres of water in your tank

  OR

- 8 grams of granular calcium hypochlorite (65% available chlorine) for every 1000 litres of water in your tank.

DO NOT USE STABILISED CHLORINE. THE CHLORINE USED MUST NOT CONTAIN ISOCYANURIC ACID.

The following table estimates the amount of different preparations of chlorine that should be added to various volumes of water to provide an initial concentration of 5 mg/L.

Chlorine dissipates (disappears) from water quite rapidly. The concentration of chlorine remaining in the water after 30 minutes should be at least 0.5 mg/L. This should be measured using a chlorine test kit to make sure that disinfection has been effective.

If the water quality in the tank is poor, the amount of chlorine added to the tank may need to be increased to above 5 mg/L in order to achieve 0.5 mg/L after 30 minutes.

For routine (i.e. non-emergency) treatment of good-quality water, an initial dose of less than 5 mg/L may be sufficient to achieve 0.5 mg/L after 30 minutes.

	Amount of chlorine to add to achieve 5 mg/L in tank		
Volume of water in tank (litres)	4% liquid bleach (mL)	12.5% liquid sodium hypochlorite (mL)	65% granular or powdered calcium hypochlorite (teaspoon)
1000	125	40	2
2000	250	80	3
5000	625	200	6
6000	750	240	7
7500	938	300	9
10000	1250	400	12
16000	2000	640	19
20000	2500	800	24
30000	3750	1200	35

Glossary of terms

Blue-green algae	Blue-green algae (cyanobacteria) are not true algae but are actually a type of bacteria. They are present in almost all aquatic ecosystems, including creeks, rivers, lakes and wetlands. Some types of blue-green algae produce toxins that can pose a risk to human health when they are consumed or come into contact with skin.
Carted water	Water that is supplied in a tanker.
Disinfection	The treatment of water to kill microorganisms. Disinfection does not remove chemicals.
Filtration	A treatment process that removes contaminants from water by passing it through a filter. The types of contaminants removed depend on factors such as the material the filter is made of, the filter grade (how fine the filter is) and the flow rate of water through the filter.
Groundwater	Water from beneath the earth's surface, which supplies bores, wells and springs.
Hazard	A source of danger or potential harm.
Microorganism	An organism that can only be seen through a microscope. Microorganisms include bacteria, viruses and parasites. Many of these can cause disease.
NTU	Nephlometric turbidity units—a measure of the turbidity of water.
Rainwater	The water that falls on your roof when it rains.
Surface water	Bodies of water on the surface of the earth, for example rivers, creeks and dams.
Turbidity	The cloudiness of water caused by the presence of suspended clay, silt, dirt or other particles.

Reference list

The *Australian Drinking Water Guidelines* 2004 (National Health and Medical Research Council)

The *Australian Drinking Water Guidelines* 2004 have been used as the basis for developing this guideline. It provides an authoritative reference on safe, good quality drinking water. The guidelines cover safety from a both health point of view and aesthetic quality, and include guideline values for hundreds of microbial, chemical and physical water quality parameters.

The Australian Drinking Water Guidelines can be downloaded free-of-charge from: <www.nhmrc.gov.au/publications/synopses/eh19syn.htm>.

Australian Standards

A number of standards relate to private drinking water supplies.

- Water storage tanks

  Above-ground polyethylene tanks should comply with AS/NZS 4766 *Polyethylene storage tanks for water and chemicals*

  Rainwater tanks made of other materials may be certified under ATS 5200.026 (and bear WaterMark certification). ATS 5200.026 is not applicable for some tanks, such as concrete tanks, underground tanks and flexible water storage tanks. In this case these tanks should be structurally sound and water tight.

- Plumbing and distribution systems

  Pipe work and plumbing fittings that carry drinking water should comply with AS/NZS 4020 *The testing of products for use in contact with drinking water* or AS 2070 *Plastics materials for food contact use.*

- Treatment systems

  A number of standards have been developed for water treatment systems, including:

  - AS/NZS 4348 *Water supply—domestic type water treatment appliances—performance requirements*
  - AS/NZS 3497 *Drinking water treatment units—plumbing requirements*
  - ATS 5200.103 *Technical specification for plumbing and draining products—Part 103: water treatment systems*
  - American National Standards Institute standard ANSI/NSF 53 *Drinking water treatment units—health effects.*

If your treatment system does not comply with one or more of these standards, discuss with the supplier or manufacturer whether they apply.

The Australian Standards and Australian Technical Specifications (ATS) can be purchased from: <www.standards.com.au>.

American National Standards Institute standard is available from: <www.nsf.org>.

***Guidance on the use of rainwater tanks* 2004 (enHealth)**

Guidance on the use of rainwater tanks is a national document that covers the safe use of rainwater. It provides detail on sources of contamination and control measures. It also covers aesthetic issues (such as colour, taste and odour), including a table of common causes of aesthetic problems that can be used for trouble-shooting (refer to Appendix 3 on page 19).

Guidance on the use of rainwater tanks can be downloaded free-of-charge from: <http://enhealth.nphp.gov.au/council/pubs/pdf/rainwater_tanks.pdf>.

Groundwater Notes Series

The Department of Sustainability and Environment has produced a series of Groundwater Notes, which cover many aspects of bore construction and groundwater use and licensing.

The Groundwater Notes Series can be downloaded free-of-charge from: <www.dse.vic.gov.au> (search for 'groundwater notes')

Guidelines for potable (drinking) water transport in Victoria

These guidelines have been developed as a best practice document to assist water carters in meeting their legal obligations under the *Food Act 1984* (Vic).

The *Guidelines for potable (drinking) water transport in Victoria* can be downloaded free-of-charge from: <www.health.vic.gov.au/foodsafety>.

Contacts for additional information

For information about developing a water supply management plan, emergency water treatment, and legal requirements for the use of water at food premises, prescribed accommodation and caravan parks:

Environmental Health Officer
Your local council (refer to the white pages for contact details or the Municipal Association of Victoria website: www.mav.asn.au)

For information about the safety of your private drinking water supply:

Department of Health
Environmental Health Unit

Telephone 1300 761 874
www.health.vic.gov.au

For information on safe work practices:

WorkSafe Victoria

Telephone 1800 136 089
www.worksafe.vic.gov.au

For information on groundwater use, licensing and bore construction (note that if you are considering constructing a bore you should also contact the rural water authority in your area):

Department of Sustainability and Environment
Groundwater and Licensing Group

Telephone 136 186
www.dse.vic.gov.au

For the details of laboratories with accreditation for particular water quality tests:

National Association of Testing Authorities (NATA)
www.nata.asn.au

For the details of businesses that provide water treatment advice and solutions, tank supplies, tank cleaning and maintenance services, and water carting look in your business telephone directory.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