

ENVIRONMENTAL HEALTH

GUIDELINES FOR PRIVATE WATER SUPPLIES

October 2009

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- NSW Health for making available the NSW Health Private Water Supply Guidelines on which these guidelines are based.

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1. Foreword

Throughout the Northern Territory there are many facilities, such as caravan parks, roadhouses, school camps, and tourist facilities that rely on small private water supplies. The sources of these supplies can include groundwater, surface water and rainwater.

Serious outbreaks of gastroenteritis have occurred in other jurisdictions 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.

The Department of Health and Families (DHF) has endorsed the Australian Drinking Water Guidelines 2004 published by the National Health and Medical Research Council and the Natural Resource Management Ministerial Council. The Australian Drinking Water Guidelines 2004 differ from the previous 1996 Guidelines by adopting a risk management approach for water supplies. Chapter 4 of the Australian Drinking Water Guidelines provides advice on application of the Guidelines to small water supplies.

The Guidelines for Private Water Supplies (the Guidelines) aim to assist operators to comply with the requirements of the Australian Drinking Water Guidelines 2004.

The Guidelines provide detail 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
- Public Warnings.

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

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2. Summary

Water is essential to life. We use it for drinking, cooking, bathing and washing. Unfortunately, water can also carry disease-causing organisms 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 to use.

- Operators should have a water supply management plan to ensure that safe water is provided (see Section 6.1 and Section 12.1)
- The Department Health and Families (DHF) recommends that operators regularly test the quality of their drinking water (see Section 8), check results against Australian Drinking Water Guidelines (ADWG) values (see Section 12.3) and (if necessary) take action immediately to ensure the safety of the water
- If test results show that *E. coli* bacteria are present in the water, consumers should be warned with a sign displayed at each tap used for drinking (see Section 9)
- If the water is contaminated with microorganisms the water should be boiled before use or an alternative water supply, such as bottled water, should be provided
- If chemical or blue-green algae contamination is present, then consumers should be warned with a sign displayed at each water tap used for drinking (see Section 9.1)
- 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 9.2)
- If chlorinating the water, it should be tested daily for free available chlorine to ensure that the treatment is working properly. Chlorine levels in the water can be tested on site and should be at least 0.5 milligrams per litre (mg/L) in the storage tank and between 0.2 and 0.5 mg/L in the reticulation (see Section 8.2)
- Operators should regularly check their water supply system to ensure its safety (see Section 8.3). Records of these checks and test results should be kept for at least two years
- Contact your local Department of Health and Families (DHF) Environmental Health Office for advice (see Section 11 for contact information).

3. Who Should Use These Guidelines?

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

Facilities with a private water supply can include:

- caravan parks, camping grounds
- guest houses, backpacker, farmstay and bed and breakfast accommodation
- motels and hotels
- petrol stations and roadhouses
- community halls and conference centres
- recreational and sporting facilities
- schools
- food manufacturing premises
- cafes, restaurants; market stalls and rural food premises
- marinas
- mines and worksites.

3.1 Australian Drinking Water Guidelines

The Australian Drinking Water Guidelines (ADWG), published in 2004 by the National Health and Medical Research Council and the Natural Resource Management Ministerial Council, contain detailed advice and requirements for all drinking water supplies, including monitoring requirements for chemical and microbiological water quality parameters.

The ADWG provide a framework for good management of drinking water supplies. When implemented the ADWG assure the safety of drinking water, and also provide health and aesthetic guideline values for chemical, physical and radiological water quality characteristics.

The Guidelines for Private Water Supplies aim to summarise and provide advice on applying the ADWG to private water supplies. The ADWG can be accessed at:

<http://www.nhmrc.gov.au/publications/synopses/eh19syn.htm>

or by calling 1300 064 672 (local call).

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.

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:

- NT *Public Health Act* and Public Health Regulations
- NT *Food Act 2004*

4.2 Other requirements

If you are responsible for a business or facility that supplies people with drinking water from a private supply, the Department of Health and Families (DHF) Environmental Health Branch may require you to:

- undergo inspection for compliance with the Australian Drinking Water Guidelines
- provide a copy of your water supply management plan (see Section 6.1)
- provide access to records (see Section 8.3)
- provide access to laboratory reports on the quality of drinking water supplied.

The DHF may also maintain a register of private water supply operators.

For new development applications, which require consent under the Northern Territory Planning Scheme, provision of a safe water supply may be a condition of development consent. This could require applicants to:

- provide a drinking water supply to the site which will consistently meet the Australian Drinking Water Guidelines requirements, and/or
- develop a water supply management plan to the satisfaction of the DHF.

Before installing a new private water supply it is recommended that you consult your local DHF Environmental Health Office to gain approval if required. Approval may be required where the proposed system is of a significant size or is to be sited in a sensitive location such as a heritage conservation area.

A licence may be required from the Department of Natural Resources, Environment, The Arts and Sport (NRETAS) under the *Water Act* where extraction from a river, creek or bore is proposed (see Section 11 for contact details).

It should be noted that constructions of bores inside a Water Control District require a bore construction permit, by NRETAS, pursuant to section 57 of the *Water Act*. Constructions of bores outside a Water Control District require notification to the DHF under the *Public Health Act* and Regulations.

For details on Water Control District Areas see:

<http://www.nt.gov.au/nreta/water/manage/maps.html>

4.3 Food Business

If the operator is registered as a proprietor of a Food Business in accordance with the *Food Act 2004*, then the premises being used must have a potable water supply that complies with the NH&MRC Australian Drinking Water Guidelines 2004. 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 Safety Standards 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 Department of Health and Families (DHF) that they have a potable water supply. To this end it will be necessary for Food Business owners to arrange certified analysis of the water to confirm acceptable levels of bacteria. 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 the local Environmental Health office.

To simplify this task, arrangements have been made with the Northern Territory Government 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. The results of analysis for your sample should be returned to the relevant local DHF Environmental Health Office where the Food Business is located.

Please note that this is the minimum evidence to ensure that water is potable. Some private supplies will require further examination and will be visited by an Environmental Health Officer after the analysis is complete.

5. Water Quality

5.1 Safe Drinking Water

Drinking water must be safe for human consumption, and 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: that is, it should have no suspended material such as clay or silt, and it should be clear, colourless and well aerated, with no unpleasant taste or odour.

5.2 Water Quality Problems

Water supplies can be polluted by sewage, seepage from septic tanks, animal 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. The contaminated water can cause illness in people who drink the water, eat food that has been prepared with it, or use it for bathing.

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

Some salts that occur naturally in water, including sulfates and nitrates, can be harmful if they are present in large quantities. Some dissolved salts can make the water hard resulting in scale build-up, while others can make the water soft resulting in possible 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. 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 is also dangerous 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.

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 and cancer patients; and some people with HIV and AIDS. People who have recently suffered 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 upsets. Some of them can also lead to more serious illnesses and even death.

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. It is important that you ensure that the supply system is not contaminated with chemicals.

Disinfection kills most disease causing microorganisms in water but does not remove or inactivate toxic chemicals.

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 6.1)
- understanding hazards to your water sources
- 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)
- public warnings for treated and untreated systems (see Section 9).

6.1 Water Supply Management Plan

Private water supplies that provide drinking water to the public, or use it in the preparation of food sold for human consumption should have a management plan, to prevent contamination of the water supply and to protect consumers.

Your management plan should address three key questions of risk assessment:

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

A list of what you need to consider for your water supply management plan is provided at the back of these guidelines (see Section 12).

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

6.2 Water Sources

Always use the best quality water source available.

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 12.2 for an example of a regular maintenance checklist).

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 to remove leaves, bird droppings and other organic matter. These can be a source of bacteria and intestinal parasites. They can also cause taste and odour problems or be a source of nutrients to promote the growth of microorganisms
- After the dry season, 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
- Ensure the rainwater tank is fitted with a rodent and insect proof lid
- 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 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 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
- 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 calling NT WorkSafe. (See Section 11 for contact details.)

For further advice on do-it-yourself tank cleaning, contact your local tank supplier or plumber. Professional tank cleaners are available in some areas. (Check the yellow pages under 'tank cleaning')

For further information on rainwater tanks please read **Guidance on the Use of Rainwater Tanks 2004** (enHealth: <http://enhealth.nphp.gov.au>).

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 town drinking water to top up your system. Any water carter selling water for human consumption should be registered under the Northern Territory *Food Act* and operate in compliance with the Guidelines for Drinking Water Transport in the Northern Territory, for more details contact your local Environmental Health Office.

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.

Surface Water

Wastes from livestock, animals and humans can contaminate dams, rivers and creeks. These wastes can 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 septic tank overflows and spills of domestic, agricultural or industrial chemicals
- If you are using surface water, check up-stream for contamination sources. Your local offices of Natural Resources, Environment, The Arts and Sport (NRETAS) and the Department of Planning and Infrastructure (DPI) can provide you with information about activities higher up in a stream's catchment that might affect the quality of its water. (See Section 11 for contact details)
- 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 7.1 for information on filtration)
- 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 7.1 for information on disinfection).

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 and at least 100 metres from any on-site wastewater disposal system such as a septic tank and trenches
- Avoid contamination where groundwater is in contact with surface waters (open wells) or where water flows freely from the surface down into the groundwater (e.g. in limestone areas)
- 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.

For more information on the licensing, construction and protection of bores and groundwater sources, contact the Department of Natural Resources, Environment, The Arts and Sport. (See Section 11 for contact details.)

6.3 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.

(AS/NZ 4020:2005 The Testing of products for use in contact with drinking water and/or AS 2070:1999 – Plastics materials for food contact use and AS/NZS 4766:2006 – Polyethylene storage tanks for water and chemicals).

6.4 Multiple Barriers

Using multiple barriers against contamination of the system is a good approach.

Barriers would 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 supply system, e.g. tanks, pumps and other elements
- adequate treatment, e.g. filtration and disinfection.

Should one barrier fail, the others will help to protect the quality of water.

7. Water Treatment

7.1 Routine treatment

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
- UV disinfection

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.

Pre-treatment 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:

- 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
- 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).

Chlorine disinfection

Chlorination is the most common form of disinfection, and it successfully controls many organisms. It involves a regulated addition of chlorine into the water system. The process can be automated to maintain a suitable level of chlorine at the point of injection. However, regular monitoring (weekly or more frequently) of chlorine at taps is recommended to check the level of disinfection in the system (see Section 8).

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

It is best to get professional advice on the selection of a chlorination system and the design of a water treatment system. Consult your local plumber or tank supplier for further advice.

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 tanks, or faecal contamination (animal droppings or septic overflow). Also, water that has been treated can be re-contaminated, for example by dead animals in a storage tank.

If you suspect that water in your supply has been contaminated, it can be manually treated with chlorine. However, be careful not to over-dose the system and make sure you follow occupational health guidelines when using chlorine or other strong chemicals.

The chlorine will not make the water unsafe to drink, but it may create a distinct taste and odour. This should lessen in a few days (depending on temperature).

It takes about 5 milligrams of chlorine per litre to disinfect your tank following contamination. However, this will depend on the quality of the water. For effective disinfection, you need to add sufficient chlorine so that, after 30 minutes, testing shows that there is still 0.5 milligrams per litre (mg/L) present in the water – this is known as “free chlorine residual”. The testing can be done with a suitable chlorine test kit (for example, a swimming pool kit). If the free chlorine residual is below 0.5 mg/L, repeat chlorine dosing until at least 0.5 mg/L is reached.

As a general guide, add:

- 125 millilitres (mL) of liquid bleach, 4% available chlorine (refer to Section 12) for every 1000 litres (L) of water in your tank, OR
- 40 millilitres (mL) of liquid sodium hypochlorite (12.5% available chlorine) for every 1000 litre (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.

These methods provide initial chlorine doses of approximately 5 mg/L (ppm). Methods for calculating the volume of water in a tank are provided in Section 12. **A chlorine ready reckoner is provided in Section 12.6.**

Liquid bleach can be purchased from a supermarket or hardware stores. Check the product has at least 4% available chlorine and has no additives such as fragrances added to the product.

Sodium hypochlorite and calcium hypochlorite can be purchased from large supermarkets, hardware stores or swimming pool suppliers. Stabilised chlorine (which contains isocyanuric acid) is not effective in enclosed tanks and should not be used.

Calcium hypochlorite should be dissolved in water, in a clean plastic bucket, in the open air, before adding it to the tank. **Always add the chlorine to the water rather than vice versa.**

Chlorine reacts as any acid would. If water is added to chlorine, the first drops of water will react completely with it, possibly resulting in 'boiling over' and chlorine splashing out. On the other hand if chlorine is added to water, the chlorine will react completely with the water and dissipate. Therefore, for safety reasons add chlorine to water.

When adding the concentrated chemical mixture to the tank, spread it as widely as possible across the surface, to promote mixing, and let it stand for at least one hour before use.

Ideally the tank should not be used for at least 24 hours after initial dosing to allow the chlorine taste and smell to dissipate and for harmful microorganisms to be destroyed.

If you are uncertain about this procedure, contact your local DHF Environmental Health Office for help.

8. Monitoring and Checking

8.1 Routine monitoring

Monitoring is an essential part of the overall “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, DHF recommends the following:

- Monitor the microbiological quality of the water supplied to consumers (e.g. at a kitchen tap or a tap where most people drink from.) monthly by testing for the organism *E. coli* (*Escherichia 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 annually
- 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 ADWG. Guideline values for microbiological, physical and chemical characteristics in water are provided in Section 12.3.

Water samples should be tested at a laboratory accredited by the National Association of Testing Authorities (NATA) to ensure the highest level of accuracy. A list of NATA accredited laboratories in the Northern Territory is included in Section 11.

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.

Chlorine treatment

Where chlorine is used, it is desirable to have between 0.2 mg/L and 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 for 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 an environmental health officer from your local Environmental Health Office.

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 all chlorine readings.

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.

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
- 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 the local DHF Environmental Health Office.

Records should include:

- name, date and observations e.g. identify potential contamination hazards in the catchment
- results from any test
- 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
- rainfall observations.

9. Public Warnings

9.1 For Treated Systems

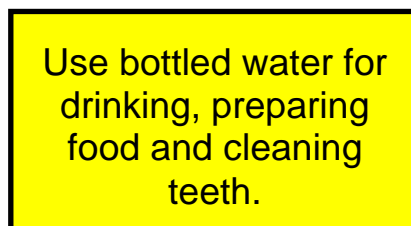
Consumers should be warned if:

- tests show that *E.coli* is present
- the supply is not regularly tested

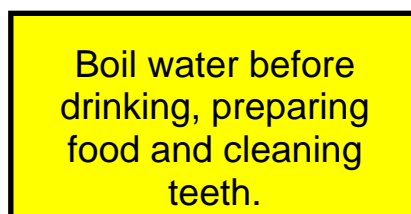
This can be done with a sign displayed at each drinking water tap and in bathing areas. Warning signs should be left in place until a clear test result is obtained. A suggested wording for the warning sign is:



If water is contaminated, it is recommended that an alternative water supply (e.g. commercially bottled water) be provided, or that the water be treated (boiling for three minutes will control disease causing organisms but not blue green algae or chemical contamination). In these cases the signs could include that shown above, and:



or:



If a blue green algal bloom appears in the water supply or chemical contamination has occurred then signs should say:



Contact your local Environmental Health Office if you have any questions regarding the quality of your water supply, or if you need further advice on managing your water supply and delivery system.

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 sign should still be displayed as required by the guidelines.

9.2 For Untreated Systems

If a private water supply is not treated by a reliable process (e.g. filtration and chlorine 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 (as on the previous page)
- an entry in the in-house directory
- an accommodation in-room notification card.

A suggested wording is:



The warning can be removed if a suitable management plan for the water supply is put in place and regular testing shows that the water is free from contamination. Some private water supply operators are required by legislation to provide a safe drinking water supply, such as food businesses. Check with your local DHF Environmental Health Office to see if this legislation applies to you.

10. Reference Documents

1. Australian Drinking Water Guidelines 2004 (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.
<http://www.nhmrc.gov.au/publications/synopses/eh19syn.htm>
2. Environmental Health Fact Sheets on a variety of issues including: – Requirements for the Use of Rainwater Tanks, Disinfection of Water Tanks, and Interpretation of Results from Water Quality Testing.
<http://www.nt.gov.au/health/envirohealth> > Water Quality
3. Guidance on the Use of Rainwater Tanks 2004, 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.nsw.gov.au/public-health/ehb/water/rainwater.html>
4. Australian Standards
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.
AS/NZS 3500:1:2003 Plumbing and Drainage.
<http://www.standards.com.au/>
5. American National Standards Institute
ANSI/NSF 53: Drinking Water Treatment Units – Health Effects
<http://www.nsf.org/>
6. Australian Rainwater Industry Development Group
<http://www.arid.asn.au/>
7. Rainwater Tank Design and Installation Handbook
<http://www.saiglobal.com/shop/Script/Details.asp?docn=AS0733772374AT>
8. Legislation
Northern Territory *Food Act 2004* and *Public Health Act* and Regulations
<http://uluru.nt.gov.au/lant/> > Hansard & Legislation > Current NT Legislation

11. Contacts for Additional Information

Environmental Health

For information on drinking water quality and health contact your local Environmental Health Office on:

GREATER DARWIN REGION & DARWIN RURAL 2nd Floor, Casuarina Plaza Casuarina PO Box 40596 CASUARINA NT 0811 Phone: (08) 8922 7377 Fax: (08) 8922 7036	KATHERINE Ground Floor, O'Keefe House Katherine Hospital PMB 73 KATHERINE NT 0851 Phone: (08) 8973 9061 (08) 8973 9062 Fax: (08) 8973 9063	EAST ARNHEM Community Health Building Endeavour Square, Nhulunbuy PO Box 421 NHULUNBUY NT 0881 Phone: (08) 8987 0440 (08) 8987 0441 Fax: (08) 8987 0444
BARKLY Health Development Building Cnr Schmidt & Windley Sts, Tennant Creek PO Box 346 TENNANT CREEK NT 0861 Phone: (08) 8962 4302 Fax: (08) 8962 4420	ALICE SPRINGS Mwerre House 60 Hartley St, Alice Springs PO Box 721 ALICE SPRINGS NT 0871 Phone: (08) 8955 6122 Fax: (08) 8952 5927	

Or visit the Environmental Health website at <http://www.nt.gov.au/health/envirohealth>

Analytical Laboratories

Northern Territory Environmental Laboratories (NTEL)

Offers chemical and physical analytical testing tailored to suit the Australian Drinking Water Guidelines (ADWG). The microbiological analysis however is outsourced. NTEL is based in Berrimah Darwin and can be contacted on 8947 0510 or visit their website at: http://www.ntel.com.au/water_samples.html

Northern Territory Government Water Laboratories

The NTG laboratories are operated by the Diagnostic Services Division, Department of Regional Development, Primary Industry, Fisheries and Resources in Alice Springs and Darwin and offer microbiological, chemical and physical analytical testing to suit the ADWG for potable water. Diagnostic Services operates laboratories in Alice Springs and Darwin, they can be contacted at:

- Alice Springs - Arid Zone Research Institute, phone (08) 8951 8110
- Darwin - Berrimah Farm, phone (08) 8999 2347 (Microbiology)
(08) 8999 2196 (Chemical)

or visit their website at: <http://www.nt.gov.au/d/> > Primary Industry > Laboratory Services

Department of Natural Resources, Environment, the Arts and Sport (NRETAS)

For advice on construction and protection of bores and groundwater supplies, or water extraction licences call (08) 8999 3678 or visit their website at:

<http://www.nt.gov.au/nreta/water/permits.html>

Department of Planning and Infrastructure (DPI)

For advice on activities in the water catchment and planning requirements contact (08) 8999 5511 or visit their website at:

<http://www.nt.gov.au/lands/planning/index.shtml>

NT WorkSafe

For Occupational Health and Safety advice, call 1800 019 115 or visit their website at: <http://www.worksafe.nt.gov.au/>

Professional tank cleaners

These can be found in some areas. Look under “tank cleaning” in the ‘Yellow Pages’.

Your family doctor

To discuss any specific health concerns.

12. Supporting Information

12.1 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

Description of system

1. Map showing location of:
 - Water supply system; water source, pumps, storage, treatment, pipelines, etc
 - Waste water system; septic tanks, septic trenches, composting toilets, dispersal areas, etc.
2. Identify hazards and control measures: flood areas, contaminated sites, animal grazing/holding areas, etc. (see common contaminants table in Section 10.4) for information on potential hazards).
3. Assessment of risks
 - Assess risks to the water supply system
 - Identify control measures.
4. Document uses of the water supply: drinking, food preparation, bathing, clothes washing, irrigation, etc.

System operation and maintenance

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

Contingency Plan

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

Monitoring and records

1. Keep a record of:
 - visual inspection notes

- all results of microbiological and chemical testing
- chlorine levels if applicable
- the posting of warning signs
- any maintenance to the water system (filter change, addition of chlorine, tank flush or desludge, etc)
- deliveries of carted water (include date and name of supplier).

12.2 Regular Maintenance Check List - Template

Item	Recommended Frequency
Tank¹	
• Structural condition	At the start of the wet season
• Inlets and outlets covered (prevent mosquito entry)	3 monthly
• Presence of mosquito larvae in tank water	3 monthly
• Level of sludge and internal cleanliness	At the start of the wet season
• Strainer clear of debris	3 monthly
Roof and Gutter¹	
• Clean gutters	At the start of the wet season
• Check and trim overhanging branches	At the start of the wet season
• Inspect and repair downpipes	At the start of the wet season
• Check condition of roof	At the start of the wet season
Testing	
• Microbiology test	Monthly
• Physical & chemical test	Annually
• Chlorine test	Daily, if chlorinating supply
Treatment and Miscellaneous	
• Filters <ul style="list-style-type: none"> ▪ Clean/Change 	As per manufacturer's advice
• Chlorine injection unit <ul style="list-style-type: none"> ▪ Check the unit is fully operational and chlorine supply is adequate. 	Weekly
• Bore <ul style="list-style-type: none"> ▪ Check that system (pump, piping, casing) is fully operational, and maintain. ▪ Check control measures to guard against surface water contamination. 	Annually 3 monthly
• Surface water (creek, river and dam supplies) <ul style="list-style-type: none"> ▪ Assess upstream catchment for new developments and other possible sources for contamination. ▪ Check that infrastructure (pump, piping, etc) is fully operational, and maintain. ▪ Check water quality after heavy rain, it may be necessary to increase chlorine dose, and check filters, boil water if treatment system is not working properly. 	Annually Annually After heavy rain.

Note 1: It is recommended that roof water is not directed into the tank until regular rainfall is occurring.

12.3 Tests and Drinking Water Guideline Values for Water Supplies

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. Tests for *E.coli* need to be carried out regularly.

Cyanobacteria

- Tests for Cyanobacteria do not need to be carried out regularly, these tests are only necessary if Blue Green Algae is present.

It is important that samples are collected and submitted for testing correctly. For advice on sampling technique and submission of samples either contact the Laboratory you are using, or visit their website at <http://www.nt.gov.au/d/> > Primary Industry > Laboratory Services

Chemical

It is advised that a comprehensive analysis be undertaken initially, to identify any unusual contaminants in the water supply. If none are present then the following list can be relied on for routine sampling.

For each of these characteristics, values should be below or equal to the corresponding ADWG value.

Health-based Characteristic	Australian Drinking Water Guidelines value
Antimony	0.003 mg/L
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	0.007 mg/L
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.	
Barium	0.7 mg/L
Barium is a metal that can be absorbed from the gastrointestinal tract, with the rate of absorption depending on the solubility of the barium compound. At high concentrations barium can cause strong vasoconstriction, convulsions and paralysis.	
Cadmium	0.002 mg/L
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 mg/L
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 mg/L
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 mg/L
Fluoride is important for preventing dental decay, and strengthening teeth, 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 mg/L
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 mg/L
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 mg/L
Nitrite	3 mg/L
Uranium	0.02 mg/L
Occurs naturally in some ground waters, or from release from mine tailings, combustion of coal and phosphate fertiliser	

Notes:

1. Some laboratories will also provide tests for Aluminium, Chloride, Iron, Sodium and Zinc, which are of less of a health concern, but have an influence on water quality
2. Monitoring for additional characteristics may be required depending on the presence of particular materials in the soil, or industrial activities in the catchment. Please contact your local Environmental Health Office or Water Branch at NRETAS for further advice.

Physical

For each of these characteristics, values should be below or equal to the corresponding ADWG value (or for pH, between 6.5 and 8.5):

Aesthetic Characteristic These factors may cause taste or odour complaints in your water or may lead to corrosion or the formation of scale in pipes and equipment	Australian Drinking Water Guidelines value
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. 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 8.0 can decrease the efficiency of chlorine disinfection.	
Manganese	0.1 mg/L
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 mg/L
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. Sulfate ions are likely to enter water supplies from natural sources. The highest concentrations are likely to be seen in groundwater.	
Total dissolved solids (TDS)	500 mg/L
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.	
Total hardness	200 mg/L
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 (less than 1 NTU desirable)
Turbidity is the measure of dirtiness or cloudiness of water. It indicates the amount of suspended solids present in the water. This can affect the taste of the water and can make the water look 'dirty'. It can also reduce the efficiency of chemical and UV disinfection. Unusual increases in turbidity can indicate a disturbance in the water supply system.	

12.4 Sources of Contaminants and Preventive Measures

Water Supply	Common Sources of Contaminants	Typical Preventive Measures
<p>Groundwater (bore, well, spear point, spring)</p>	<ol style="list-style-type: none"> 1. Surface water seepage. (e.g. wastewater) 2. Sub-surface contamination Industrial, farming land usage, landfill. 3. Backflow water (e.g. from animal water troughs or surface water storage) 4. Leaching from bore casings, pipes or plumbing materials (e.g. metals, pH) 	<ol style="list-style-type: none"> 1. Bore heads should be raised above ground level. Inspect regularly. 2. Only extract groundwater from a place where subsurface contaminants are unlikely. 3. Installation of backflow prevention device. Details on forms of backflow prevention appropriate for different settings and hazard ratings are listed in AS/NZS 3500:1:2003 Plumbing and Drainage. 4. Ensure that all materials in contact with water comply with AS/NZ 4020:2005.
<p>Rain Water (tanks)</p>	<ol style="list-style-type: none"> 1. Roof and gutters (e.g. build up of organic matter – leaves/dirt, and faecal material from birds and small animals) 2. Roof materials (e.g. lead sheeting, peeling paint) 3. Build up of sludge in tank, dirt in inlet strainers and/or insect screens. 4. Tank materials (e.g. pH of water with concrete tanks, high metals from metallic tanks, corrosion of metals from pipes.) 5. Insects and animals in system (e.g. dead animals, mosquito breeding) 	<ol style="list-style-type: none"> 1. First flush device, regular cleaning of roof and gutters, removal of overhanging branches. Direct roof water only to tank once regular rainfall is occurring. Inspect prior to the start of the wet season 2. Ensure that all materials in contact with water comply with AS/NZ 4020:2005. 3. Regular cleaning and maintenance program. 4. 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.) 5. Ensure that all inlets and outlets to tank are screened in compliance with the <i>NT Public Health (General Sanitation, Mosquito Prevention, Rat Exclusion and Prevention) Regulations</i>
<p>Surface Water (dam, river, creek)</p>	<ol style="list-style-type: none"> 1. Surrounding land use (e.g. intensive farming, urban areas, industrial sites sewage discharge) 2. Pump and plumbing materials (e.g. piping, pump components) 3. Animal and human activities (cattle, dead animals or recreational use) 	<ol style="list-style-type: none"> 1. Protect surface water storage from runoff. Inspect regularly. 2. Ensure that all materials in contact with water comply with AS/NZ 4020:2005. 3. Protect surface water storage by fencing storage.

Note: Investigation of treatment options (filtration, chlorination, UV) to protect a water supply and regular testing for microbiological and chemical characteristics is also required. (See Section 7 for more detail).

12.5 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 x 2 m X 2 m x 3m) x 1000

= (3.14 x 4 m² x 3 m) x 1000

= (3.14 x 12 m³) x 1000

= 37.68 m³ x 1000

= 37 680 Litres

Part-full Cylindrical Tanks -

Volume (in litres) = (3.14 x radius x radius [m] x water depth [m]) multiplied by 1000.

(See diagram below)

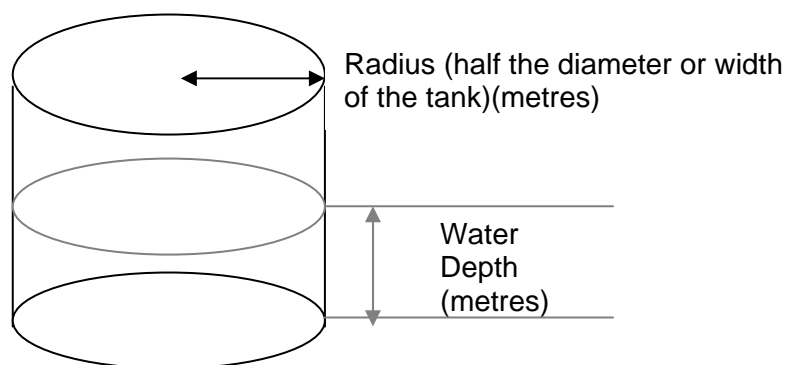


Diagram adapted from Guidance on the Use of Rainwater Tanks, 2004, enHealth.

12.6 Chlorine Concentration: Ready Reckoners for Water Tanks

- To calculate millilitres of 4% liquid bleach required to disinfect the water in a tank.

Amount of Water in Tank (Litres)	Concentration of Chlorine Required (mg/L)		
	1	2	5
1000	25 mL	50 mL	125 mL
2000	50 mL	100 mL	250 mL
3000	75 mL	150 mL	375 mL
4000	100 mL	200 mL	500 mL
5000	125 mL	250 mL	625 mL
6000	150 mL	300 mL	750 mL
7000	175 mL	350 mL	875 mL
8000	200 mL	400 mL	1000 mL
9000	225 mL	450 mL	1125 mL
10000	250 mL	500 mL	1250 mL

For example: To achieve 5 mg/L chlorine in a 1000 litre tank add approximately 125 ml of 4 % liquid bleach.

Please note the above calculations are only estimates. The amount of liquid bleach required to be added to your water supply will depend on the quality of the water.

CHECK THE LABEL OF THE PRODUCT TO ENSURE THAT NO ADDITIVES SUCH AS FRAGRANCES ARE ADDED TO THE BLEACH.

- To calculate millilitres of 12.5% sodium hypochlorite (liquid) required to disinfect the water in a tank.

Amount of Water in Tank (Litres)	Concentration of Chlorine Required (mg/L)		
	1	2	5
1000	8 mL	16 mL	40 mL
2000	16 mL	32 mL	80 mL
5000	40 mL	80 mL	200 mL
6000	48 mL	96 mL	240 mL
7500	60 mL	120 mL	300 mL
10000	80 mL	160 mL	400 mL
16000	128 mL	256 mL	640 mL
20000	160 mL	320 mL	800 mL
30000	240 mL	480 mL	1200 mL

For example: To achieve 5 mg/L chlorine in a 1000 litre tank add approximately 40 ml of 12.5 % sodium hypochlorite.

Please note the above calculations are only estimates. The amount of chlorine required to be added to your water supply would depend on the quality of the water.

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

3. To calculate grams of 65% Calcium Hypochlorite (granular or powdered chlorine) required to disinfect the water in a tank.

	Concentration of Chlorine Required (mg/L)		
	1	2	5
Amount of Water in Tank (Litres)			
1000	2 grams	3 grams	8 grams
2000	3 grams	6 grams	15 grams
5000	8 grams	15 grams	38 grams
6000	9 grams	18 grams	46 grams
7500	12 grams	23 grams	58 grams
10000	15 grams	31 grams	77 grams
16000	25 grams	49 grams	123 grams
20000	31 grams	62 grams	154 grams
30000	46 grams	92 grams	231 grams

For example: To achieve 5 mg/L chlorine in a 1000 litre tank add approximately 8 grams of 65 % calcium hypochlorite.

4. To calculate grams of 70 % Calcium Hypochlorite (granular or powdered chlorine) required to disinfect the water in a tank.

	Concentration of Chlorine Required (mg/L)		
	1	2	5
Amount of Water in Tank (Litres)			
1000	2 grams	3 grams	9 grams
2000	3 grams	6.5 grams	16grams
5000	9 grams	16 grams	41 grams
6000	10 grams	19 grams	50 grams
7500	13 grams	25 grams	62 grams
10000	17 grams	33 grams	83 grams
16000	27 grams	53 grams	132 grams
20000	33 grams	67 grams	166 grams
30000	50 grams	99 grams	249 grams

For example: To achieve 5 mg/L chlorine in a 1000 litre tank add approximately 9 grams of 70 % calcium hypochlorite.

Please note the above calculations are only estimates. The amount of chlorine required to be added to your water supply would depend on the quality of the water.

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

How to use the tables:

1. Calculate the volume of the tank in litres
2. Select the concentration of chlorine required:
 - 1mg/L: Routine disinfection for clean water
 - 2 mg/L: Routine disinfection for reasonable clean water
 - 5 mg/L: Disinfection for tanks and pipes

13. Glossary

<i>E.coli</i>	<i>Escherichia coli</i> a common rod-shaped bacterium whose presence indicates faecal contamination of water.
Potable Water	Water of drinking quality
ppm	Parts per million, unit of measurement that is equivalent to mg/L or g/m ³
Private Water Supply	Independent drinking water supply, that is not managed by the Power and Water Corporation or equivalent utility, but supplies water to the public either directly for drinking or in the preparation of food sold for human consumption. (Does not include individual residential household supplies)