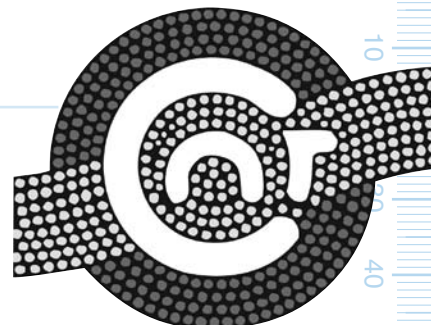


## Water treatment



Settling tank

### OVERVIEW

This BUSHTECH is about the options for treating or removing substances in your water supply to make it safe to drink and use.

All water sources contain a variety of minerals, suspended materials and possible disease-causing organisms (called pathogens). The Australian Drinking Water Guidelines (ADWG) (NHMRC 2004) provide an indication of acceptable levels of these substances, with limits based on both their effects on health and on appearance, taste and odour. The Guidelines also emphasise the importance of pro-actively managing any risks to water supplies.

More than 80% of Indigenous communities rely on groundwater for their water supply. The remainder rely on surface water or rainwater. These water sources may be affected by natural or man-made substances which can affect your health, the water infrastructure, or the effectiveness of other uses of the water.

### PREVENTING RISKS TO YOUR WATER SUPPLY

It is best to develop a water source that needs as little as treatment as possible, as treatment can be expensive. In order to reduce treatment, it is ideal to use multiple barriers to protect your water source, in conjunction with appropriate treatment.

Barriers include concrete slabs around bore holes, adequate maintenance of septic tanks and covers and screens on all inlets and outlets of rainwater tanks and household storage devices.

You could also consider using alternative water supply systems such as rainwater tanks or other bores, or mixing or 'shandyng' the supply to make the water suitable for use.

### TREATING YOUR WATER SUPPLY

Treatment may be short-term measure(s) to deal with contamination of your water supply or an on-going

requirement due to the natural characteristics of your water.

The type of treatment depends on the original quality of the water and possible one-off events.

No single treatment system can remove all pathogens, minerals or suspended matter from a water supply. Water treatment technologies have multiple considerations: seek assistance from a water treatment specialist (preferably a scientist and not a salesperson). The water must be tested before choosing a treatment to provide information about the particular water quality problem to be treated.

### DISINFECTION

Of all treatments, removing pathogens through disinfection is the most important, since they carry the highest risk of making people sick. The Australian Drinking Water Guidelines specify that to guarantee a safe water supply there should be no indicator of disease-causing organisms (called *Escherichia coli*) in a 100mL sample. The most common methods of disinfection in communities are ultra violet irradiation and chlorination. Chlorine can be supplied in three forms: a gas, a liquid (sodium hypochlorite solution) or as a powder (calcium hypochlorite). In general, chlorination is considered the most cost-effective disinfectant and is highly successful in killing pathogens. Manual dosing of sodium hypochlorite is considered the cheapest and easiest form of disinfection.

If your water source should become contaminated by a dead animal or bird, emergency disinfection of small volumes of water can be carried out by boiling the water or adding chlorine tablets to the water (after taking out the dead animal).

### CLARIFICATION

In order to disinfect water successfully, water needs to be clear from suspended materials, such as soil or plant materials, which give the water a hazy appearance. Settling or filtration can help to remove these materials.

### CONDITIONING

Some groundwater may have large amounts of minerals or salts, which may taste, smell or look bad, or accumulate in water pipes, air conditioners and other household

and kitchen fittings. Some of these may also affect health over many years. Some common minerals in ground waters in Australia include calcium carbonate, nitrates and fluoride.

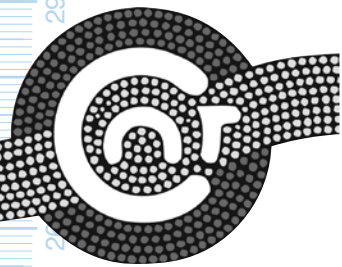
The Australian Drinking Water Guidelines specify different values for different minerals; for instance, the Guideline for calcium carbonate is 200 mg/L; above this,



ceramic filter

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## Water treatment



scale is known to accumulate on pipes and taps. The Guideline for fluoride is 1.5 mg/L, above which your teeth and bones may be affected. Where a guideline relates to a possible health impact, the guideline is very cautious. The water may be safe to use in the short-term, but alternative sources or treatment should be considered for long-term consumption. The guidelines for non-health related substances are much tighter. You are likely to notice the effects of elevated levels of these minerals in taste, colour, smell or the impacts on your water pipes, kitchen and bathroom fittings.

Conditioning includes the processes which can help to remove these minerals. Methods such as filtration and more complex technologies such as reverse osmosis and ion exchange are the most common ways of conditioning. Complex technologies tend to incur high capital costs and ongoing high cost maintenance. Implementing effective risk management strategies can reduce the need to invest in complex water treatment technologies, especially for small water supplies.

### WATER TREATMENT METHODS

METHOD	APPLICATION	COST		MAINTENANCE REQUIREMENTS & ISSUES
		CONSTRUCTION	OPERATION & MAINTENANCE	
<b>Disinfection</b>				
Boiling	Provides complete disinfection. Applies to small volumes.	NIL initial costs	Fuel	Requires some skills in identifying risk of contamination and implementing boil water notifications. Can be applied and managed locally.
Manual chlorine dosing	Kills most pathogens Requires clear water	NIL initial costs	Cost of Chlorine ongoing checks of chlorine levels	Water may need pre-treatment to increase clarity. Skills in correct dosage and regular monitoring of chlorine levels. Can be applied and managed locally.
Simple disinfection unit using chlorine or UV	Kills most pathogens. Requires clear water.	Supply and installation of unit	Chlorine and maintenance	May need pre-treatment to increase clarity. Skills in correct dosage and regular monitoring of chlorine levels. Regular maintenance of unit. With training, can be managed locally.
<b>Clarification</b>				
Storage/ settling tank	Clarification of suspended material for small volumes.	Supply and installation of tank	Labour for cleaning	Settled material will need regular removal. With training can be managed locally.
Sand filtration	Removes silt, sediment, small organisms and some pathogens. Also removes moderate amounts of iron and manganese.	Supply and installation of unit	Labour for cleaning, additional power and chemical costs for some units	Needs regular backwash. Some (small) systems are biological and need no power or chemicals to operate. With training, can be managed locally
<b>Conditioning</b>				
Activated carbon filter (household)	Improves taste and odour. Removes low levels of organic chemicals like pesticides.	Supply and installation of unit	Regular replacement of filters	Pre-treatment required. Trained technician for maintenance and ongoing cost for filters.
Softeners (ion exchange)	Removes calcium carbonate, iron, manganese, barium and radium. Removes some bad odours, colours and tastes	Supply and installation of unit. Significant capital outlay.	Regular replacement of chemical mix.	Chemical mix needs regular replacement. Trained technician for maintenance and significant ongoing cost.
Reverse osmosis	Removes most dissolved minerals and metals. Removes most microbes, particles and some pesticides.	Supply and installation of unit. Significant capital outlay.	Regular replacement of membranes and filters. Significant yearly maintenance outlay.	Regular replacement of membranes. High energy requirements. Disposal of salty water. Trained technician, high ongoing costs. Waste salt water disposal may impact environment.
Ceramic filters	Removes bacteria and parasites, but not viruses.	Supply and installation of unit	Regular replacement of filters	Pre-treatment may be required. Regular replacement of filters required and adequate flow rate. With training can be managed locally.
Aeration	Removes iron	Supply and installation of unit	Labour for cleaning	Periodic cleaning of the storage tank to remove iron sludge, preferable for two storage tanks so one can act as a sedimentation tank. With training can be managed locally

References: NHMRC and NRMCC (2004). Australian Drinking Water Guidelines 6. National Health and Medical Research Council.