# Appendix 4: How water can get contaminated

## Groundwater

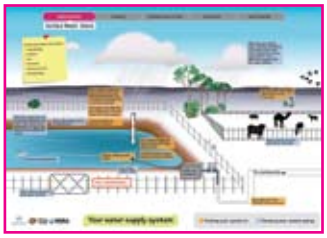
Groundwater includes water from bores and springs. Water from every bore has different attributes because each aquifer—the geological formation that holds the water—is affected by the surrounding rock. For example, water from a limestone aquifer will be high in calcium. Shallow bores are more likely to be immediately affected by rainfall and surface contamination than deep bores.

The natural chemical content of the groundwater (e.g. hardness, nitrate) will stay relatively constant over time. Although natural, in some cases groundwater chemicals can be present in harmful levels. Groundwater can be contaminated by sewage, fertiliser or fuel leaching through the soil. Microbiological contamination can also enter the water through the soil or by animals falling into the borehole.

The hazards for groundwater supplies include surface run-off and contamination from human activities such as fuel spills. A bore must be well protected with a concrete apron. Never use herbicides when clearing vegetation from around a bore.

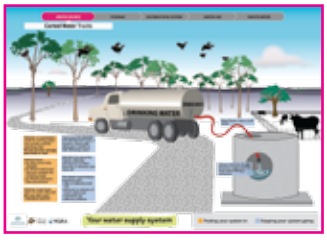
## Rivers

River water is vulnerable to microbiological contamination, which can come from animal waste, dead animals falling into the river, and algae. Chemical contamination can come from a variety of sources including road run-off and crop spraying. Activities upstream can impact people using the river water downstream.



## Dams

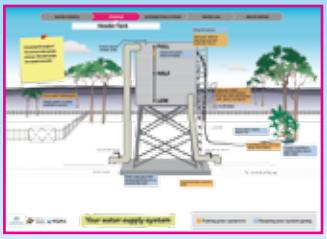
Dams catch water from surface run-off. This process means that dam water is vulnerable to collecting debris and contamination from the ground. The area around a dam must be clear of vegetation, protected from herbicide contamination and fenced. The water level must be monitored. If the water level drops or the water stratifies, blue-green algae can bloom and dissolved oxygen levels can drop. Dams used for drinking water should be protected from human activity, such as swimming, even if they are large in size.



## Carted water

Communities with an interrupted drinking water supply, or no drinking water, might cart in water on trucks. The containers and hoses on these trucks must be kept clean and must not be used for other purposes such as transporting fuel.

Some communities may have packaged water delivered. Packaged water is, by definition, carted water; however, the standards for carting water only apply to trucks.



## Header tanks

Header tanks are usually included in a water supply to provide water pressure. Each metre of tank height will provide 10 kilopascals of head pressure. The main water quality consideration is keeping animals, animal waste, birds and other contaminants out. If water sits for long periods of time, the tank can become contaminated with algae (especially if light is getting in) or the infrastructure can corrode.

## Ground storage tanks

A ground storage tank might be installed at a location that has enough head pressure to distribute the water to the community. Or water from a ground storage tank might be pumped up into a header tank. Ground storage tanks are often where water treatment takes place. Typically, the water supply is chlorinated before entering the storage tank. This allows enough contact time between the chlorine and the water. Problems can arise if contact time is too short, there is not enough chlorine, or contamination enters the storage tank because the lid is lost or broken.

## Pipes

In many Indigenous communities, pipes are made of polyethylene ‘blue line’. Burying pipes underground is a good way to protect them from damage and prevent the water from getting hot. Pipework should be marked with bollards. Pipe breakages should be fixed promptly to minimise contamination from soil. Taste, odour or discolouration can be caused by pipe corrosion or algae inside the pipe.

## Water use

Water needs are conventionally determined by the minimum amount of water required for drinking and hygiene purposes, which is 50 litres per person per day. In remote communities, water needs for all purposes range between 250 and 1000 litres per person per day.

Both water quality and quantity will affect water management decisions. Diversifying water sources is often necessary when drinking water is limited. Water from different sources may be allocated as follows:

- 20–50 litres per person per day of safe, high quality water is the minimum amount for drinking and cooking purposes.
- 50–100 litres per person per day of lower quality water is appropriate for bathing or washing, cleaning and swimming.
- Poor quality water can be used for outdoor uses such as landscaping, evaporative air conditioning, washing cars and fighting fires.

If consumption threatens to exceed supply, consider a water conservation program. It could include:

- changing house hardware; for example, using low-flow showerheads and tap aerators

- fixing household leaks and maintaining hardware on an ongoing basis
- educating householders about water-wise habits such as making sure taps are properly turned off when not in use
- finding and fixing leaks in the distribution system
- fixing storage tank leaks and malfunctioning float valves
- re-evaluating water-use priorities and introducing restrictions on non-essential uses
- supplementing the water supply with another source; poor quality water can often be used for landscaping, firefighting or toilet flushing, leaving good quality water for drinking and indoor use.

## Rainwater

Rainwater can be used as drinking water or to supplement the main supply for outdoor uses. Rainwater tanks and parts (e.g. screens, gutters, lids) need to be maintained. Rainwater tanks must be installed with a first-flush diverter, and screens to protect the water from mosquitoes. The rainwater catchment (roof and gutters) needs to be kept clean and the roof must be rinsed if it is exposed to a lot of leaf litter, dust or unusual events such as chemical pesticides from crop spraying. Make sure the dirty rinse water doesn't get in the tank.

In most cases, rainwater tanks do not need regular disinfection. However, boiling or chlorinating rainwater is recommended if very young children, very old people or sick people drink it. Remedial chlorination may be needed if the tank has recently been cleaned or the water has been contaminated. See the chlorine-dosing ready reckoner in Appendix 7.

## Absorption trenches

When sewage from a house or building is collected in a septic tank, the solids settle to the bottom and are broken down by micro-organisms. The liquid flows into an absorption trench where it slowly seeps into, or infiltrates, the surrounding soil. Sandy soils have the highest infiltration rates. Water can take a long time to infiltrate clay soils, and sometimes this results in the septic tank overflowing. Absorption trenches can contaminate groundwater and are a health hazard if they overflow.

## Treatment ponds

Treatment ponds consist of a set of ponds (usually four) to treat sewage. During treatment, the solids settle out and are broken down by micro-organisms. The water eventually evaporates or seeps into the ground. The water from the final pond in the system may look clean but, unless it has been disinfected, it still contains pathogens. Wastewater can contain high levels of nutrients and chemicals, such as cleaning products.