

RAINWATER TANKS

Introduction

Rainwater tanks are more popular in South Australia than any other State. They are used:

- in communities without access to reticulated water sources or where good quality water supplies are limited;
- in areas where local regulations require that rainwater storage be provided for bushfire prevention purposes; and
- in urban areas, including Adelaide and regional communities, which have access to mains water.

There are no restrictions on use of household roof-run off for domestic purposes. Generally, the risk of becoming ill from using rainwater is low. However the quality of rainwater cannot be guaranteed under all conditions, so that a decision to use rainwater is the responsibility of the property owner. (See the section “*Is rainwater safe?*” for more information).

Although there are no restrictions on the use of rainwater, there are some restrictions on the installation of rainwater

tanks. Therefore before the rainwater tank is purchased or installed, it is important to check whether there are any local health, building or planning regulations concerning rainwater tanks. Also, note that if rainwater is to be inter-connected with the public mains water supply, it is mandatory to install a dual check valve to safeguard the public mains system. (Details of interconnect requirements are available in the publication “*Rainwater Tanks: Their Selection Use and Maintenance*” or by calling SA Water: see the reference list at the back of this brochure.)

The needs of those who don't rely on rainwater are quite different from those who only have access to rainwater supplies. This fact sheet will help you understand how to get the most value out of a rainwater tank in either situation. If you live in a bushfire prone area you should check with your local council whether any regulations apply regarding minimum water storage for fire fighting purposes.

Types of rainwater tanks



City of West Torrens. Eco House



Unley City Council. Unley Museum



Campbellton City Council. Residence



Whyalla City Council. WERIC House



Rainwater tank system components⁴

All rainwater systems have six basic components:

1 Roof – the surface we collect rainwater from
Rainwater can be collected from iron roofing, clay tiles and slates. Roof materials containing bitumen should be avoided. There are suggestions that rainwater collected from asbestos roof tiles is safe to drink (Cunliffe 1998) however it is recommended that caution should be taken not to inhale asbestos.

2 Gutters and downpipes – the transport channels for captured rainwater
Seamless extruded aluminium and galvanised steel are commonly used as gutters and downpipes. PVC and HDPE (the later is a more environmentally-friendly option) are used for downpipes and connection to the rainwater tank. Gutters and downpipes must be properly sized, sloped and installed to maximise the quantity of rainwater collected.

3 Primary screening and first flush diverters – to remove debris, and divert the first part of rainfall
Primary screening devices prevent larger particles (such as leaves and twigs) entering the rainwater collection system. A 6mm wire mesh leaf screen in a metal or plastic frame installed near the downpipe is a typical screening device. If there are trees nearby and leaves pose a problem, a leaf screen may also be installed along the entire length of the gutter.
The first flush diverter picks up most of the dirt, debris and contaminants (for example, bird droppings that have collected on the roof prior to the rain) by diverting the first few litres of water into a separate small chamber. Typically 10 litres (equivalent to a 1.6m length of 90mm pipe) for every 100 m² of roof area is diverted.

The diverter shown in *Figure 2* works by collecting the first flush of rainfall in a diverter chamber. As this chamber fills, a plastic ball inside floats to the top sealing off against a seat. This isolates the polluted water in the diverter chamber while clean water is allowed to flow to the storage tank. After the rain the polluted water drains slowly out of the chamber drip outlet priming the system for the next rain event. The only maintenance required is occasional removal of the screw cap and drip outlet on the chamber for cleaning.

4 Storage tanks – to store rainwater
available tank materials include plastic, steel, concrete and fibreglass. The tank should have a durable, watertight, opaque exterior and a clean, smooth interior. A tight fitting top cover prevents evaporation, mosquito breeding and keeps insects, rodents, birds and children out of the tank. A suitable overflow outlet(s) and access for cleaning are also important. The tank should be placed high enough for gravity to convey the water or be fitted with a pump. There are also some innovative, patented devices – for example, which store water at gutter level or in an ultra-slim modular property boundary fence. These may be cheaper if built in at construction

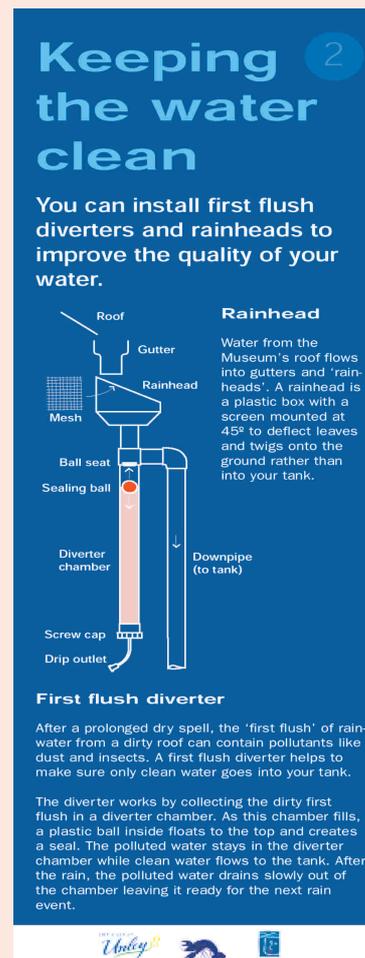
compared with retrofitting to existing houses.

Above ground tanks are cheapest. Below ground tanks must be made of reinforced concrete and correctly installed, otherwise they can pop out of the ground when empty due to groundwater forces. If you are planning on using a steel tank, check with your tank supplier that galvanic action (a chemical reaction) will not occur between your tank and gutters

5 The delivery system – pipes and pumps
Effective plumbing is important for efficient rainwater delivery and to protect your household or mains water supply from contamination. Interconnecting a rainwater tank with the mains supply to provide a pressure supply to the entire house is permitted providing you install a backflow prevention device (residential dual check valve). The valve must comply with Australian Standard 2845 and be installed above ground on the mains water service, before connection with the tank. You should also consider an automatic switch to change between the rainwater and mains supply – this will maximise your use of rainwater.

6 Overflows
Some Councils require overflows to be connected to the gutter. Care must be taken to where the water is discharged since it has the potential to impact the footings of the tank (especially if it is discharged to the garden).

Figure 2: Diagram of a first flush diverter⁵



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Advantages and disadvantages of using rainwater tanks

Some ADVANTAGES of using rainwater:

- Rainwater is generally much lower in salinity than mains water. This reduces the corrosion of in-house appliances and may extend their life (including hot water services, kettles and irons) and is also good for low salinity plants in the garden.
- Once the tank is installed, rainwater is cheaper than bottled water or mains water.
- Rainwater often tastes better than mains water.
- Being softer than mains water, rainwater may help reduce the amount of soap, shampoo and detergents you need to use.
- A well-utilised rainwater tank will conserve mains water, protecting our water supplies.
- Using a rainwater tank regularly may reduce stormwater run-off from your roof. This may reduce flooding, erosion and environmental damage to our streams and coastal waters. Tanks can also reduce the peak load on the reticulated water supply system.
- Rainwater tanks provide a secondary backup water supply for your home should there be a failure or reduction in the main supply

Some DISADVANTAGES of using rainwater:

- Although the risks of using rainwater are generally low, unless tested the water quality cannot be guaranteed.
- A rainwater tank that is used only for minor uses such as for drinking, or is infrequently used, will not save much mains water or significantly reduce site run-off.
- A rainwater tank may be costly to purchase and install (especially underground) and will require some maintenance.
- If rainwater from the tank is supplied using a pump then this will need to be maintained and occasionally repaired or replaced.
- If a small, 'urban-sized' tank (i.e. less than 9,000 litres) is used to maximise rainwater use, it will probably empty frequently, particularly during summer. (However, it is possible to arrange your system so that you have rainwater available for drinking all year round.)

Other factors to take into consideration

- Rainwater is not treated with chemicals, including chlorine.
- Roof run-off is not "free". When the costs of tanks, connections, stand, pumps and electricity costs are included, the cost per unit of water can be much higher than tap water. **The best way to save money is to reduce water usage in the first instance (i.e. by using water efficient shower heads, tap aerators, dual flush toilets, waterless urinals etc.)**

Rainwater as the sole water supply

Rainwater can be used to supply your entire house water needs only if:

- the tank is extremely large – typically, in the order of 25 to 50 kilolitres;
- you are able to connect most of your roof to the tank;
- you carefully manage the amount of water you use, so there is security of supply even during prolonged periods of low rainfall; and
- your garden water use is very low, or carefully managed.

South Australians in rural areas usually appreciate the value of rainwater and are careful about tank water use. Nevertheless, tank and gutter maintenance is sometimes overlooked. Regular maintenance will help to reduce the risk of poor water quality.

A number of publications have been developed for those relying on rainwater as their sole water supply. Refer to '**Further information**' for details.

Rainwater tanks as a supplementary water supply

If you have access to mains water you should ask yourself the following questions:

- Why install a tank? The following tables can assist you in maximising the potential water use from your tank.
- What will you use the water for? This will determine your daily water usage. Refer to the '**Information Sheet: Saving water at home**' for details of average household water consumption and the breakdown of water use within the home.
- What level of water quality do you want? Is it for drinking or lower grade uses?
- What area of roof can be collected from? Maximising the area of collection will provide you the most benefit from your tank.
- What size tank do you need? Refer to **Table 1** for guidance.
- What type of tank should you use?

These are largely personal considerations for each resident to decide. The following information should be of assistance and you may also find that licensed tank installers provide useful advice. (Some manufacturers offer an installation service however a general "handyman" will usually be able to help with installation.)

How much roof run-off your rainwater tank will capture and how much you use will depend on:

- the annual rainfall;
- the roof area connected to the tank;
- how much rainwater you use and when you use it; and
- the capacity of the tank you choose to connect.

A rough estimate of the maximum water that can be harvested is given in the following formula.

$$Q = 0.7Ai$$

Where: Q= run-off in one year (litres)

A= connected roof area (m²)

i = annual rainfall (mm)

0.7= coefficient that allows for losses such as evaporation and overflow

However, to achieve this requires regular use of tank water for 'high-demand' purposes (rather than just drinking and occasional garden watering). *Table 1* provides a better, simpler estimate of rainwater tank use for tanks up to 10 kilolitres in size for Adelaide plains homes or other areas in South Australia with a similar average annual rainfall to the Adelaide Plains.

It should be noted that in urban areas, reductions in roof run-off overflow to the street can vary from as little as 5% when tanks are used only for drinking supplies, to about 70% if used for all-in-house uses (if most of the roof area is connected to the tank). 'Higher' or 'greater' tank uses can help in reducing the volume of nuisance urban stormwater run-off.

From *Table 1* it can be seen that:

- The use of rainwater for drinking saves very little water and has little impact on reducing the amount of roof run-off to the street;
- The use of rainwater tanks for garden watering will not save much water unless the tank is quite large. This is because most of our rainfall occurs over winter, when we usually do not need it for garden watering;
- The way to maximise the use of rainwater is to interconnect it with the mains supply. Plumbing the tank directly into as many regular water-consuming areas (for example, the toilet, laundry and kitchen) is also a good option. (Note: Interconnecting rainwater with the mains supply must be done in an approved manner to avoid the risk of contaminating the mains supply. See section on "**The delivery system**"), and
- Increasing the size of the rainwater tank does not deliver a corresponding increase in the amount of rainwater used over an average year. This is a common misconception. Of greater importance are the rate of water use, the annual rainfall and the amount of roof area connected to the tank.

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Table I: Available rainwater that can be harvested for various activities in different sized tanks for different sized roof catchments¹

	Roof area connected to the tank	50m ²	100m ²	150m ²	200m ²
Rainwater is used:	Tank size, <i>kl</i> (kilolitres)	Tank use, <i>kl</i>	Tank use, <i>kl</i>	Tank use, <i>kl</i>	Tank use, <i>kl</i>
Only for drinking water	0.5 or larger	Consumption of rainwater for drinking will not usually exceed 2-3 <i>kl</i> per annum. Water should therefore always be available with the smallest tank size (0.5 <i>kl</i>) and smallest connected roof area (50m ²).			
Only for occasional garden watering	1,000 litres (<i>l</i>) (1 kilolitre [<i>kl</i>])	6	9	10	11
	2,000 <i>l</i> (2 <i>kl</i>)	7	11	12	13
	5,000 <i>l</i> (5 <i>kl</i>)	10	14	16	17
	10,000 <i>l</i> (10 <i>kl</i>)	15	18	18	19
Only for toilet flushing	1	15	19	20	21
	2	16	21	23	23
	5	18	24	25	25
	10	18	25	25	25
Only for clothes washing	1	17	24	27	28
	2	18	27	31	34
	5	18	30	35	37
	10	18	34	39	39
For all indoor uses (interconnection with the mains supply)	1	18	31	39	45
	2	18	35	47	56
	5	18	37	53	65
	10	18	37	55	70

Table derived using an average annual rainfall of 450 to 550 mm (e.g. Adelaide Plains) and typical water use by three persons per annum. Expected variations in these figures associated with variable rainfall are considered as not significant.

Is rainwater safe?

'Rainwater is probably safe to drink if it is clear, has little taste or smell and importantly that the source of the rainwater is a well-maintained tank and roof catchment system'³. There have been few reported incidences of illness attributed to drinking tank water. A recent survey of South Australian children who drank rainwater found no evidence that they are more prone to gastrointestinal illnesses than children who only drink filtered mains water.

Nevertheless, it is wise to take simple precautions to minimise any risk. Installing and regularly maintaining your rainwater tank, gutters and other components will help maintain water quality. If the microbial quality of the water is in doubt, you should boil water from the tank before drinking or cooking with it. People who are infirm and/or immuno-compromised are also advised to boil tank water if it is used for drinking.

In areas downwind of smelters and factories (such as Port Pirie), rainwater may be contaminated by heavy metals or chemicals. If you are concerned about the quality of your rainwater you can get it tested. The Australian Water Quality Centre offers a rainwater testing service. Water can be tested for both chemical and biological contaminants and ranges in

price from \$152.90 in metropolitan areas to \$174.90 for country areas. It is generally recommended that advice be sought from local water or environmental health authorities before any testing is performed.

The National Monograph (**refer to further information**) provides a detailed discussion on water quality aspects of rainwater tanks.

Rainwater tank maintenance

Ongoing planned maintenance will maintain your rainwater quality and extend the life of your system. Maintenance should include the following:

- Regularly check the tank to ensure there are no unscreened or damaged openings that allow insects, rodents or animals to get into the tank.
- Check gutters, strainers and first flush devices at least every three months, or more if trees overhang. Keep them clean and free of leaves and debris. Ensure the tank lid is tight.
- Check the tank every two years for sludge and have the tank cleaned if there is a thick layer of sludge on the bottom of the tank.

Considerations for new homes

If you are building a new home or undertaking a major renovation, then this is the best time to install a rainwater tank system. If you decide to install a rainwater tank then you should consider having the roof and gutters designed so that run-off from the whole roof is collected in a single tank (or series of tanks).

You can also integrate the tank itself into your house design so that it is convenient and aesthetically pleasing. Design considerations include locating the tank close to the mains water inlet (for mains connected systems) or close to the point of use (for gravity fed systems). To improve aesthetics or reduce space some tanks can be buried (at a cost) or integrated into the design.

Costs

The cost of rainwater tank systems depends on many factors. Table 2 provides indicative costs for several tank sizes. It should be noted that costs may vary and should be checked with individual suppliers.

Table 2: Indicative rainwater system costs⁶ (Nov 2003)

Item	Approximate cost for each tank size			
	5.3kl	9.4kl	11.5kl	22.5kl
Round galvanised tank	\$650	\$850	\$1100	\$1650
Downpipe connection with leaf diverter	\$200	\$200	\$200	\$200
Pump (Average)	\$450	\$450	\$450	\$450
Plumber and fittings	\$400	\$400	\$400	\$400
Float system	\$75	\$75	\$75	\$75
Concrete base	\$200	\$300	\$400	\$500
	\$1975	\$2275	\$2625	\$3275
GST	\$197.5	\$227.5	\$262.5	\$327.5
Total	\$2172.5	\$2502.5	\$2887.5	\$3602.5

Prices of pumps can vary between \$250 and \$600 (we have used \$450) depending on the size of the tank and use. More expensive pumps should provide better quality and last longer without failing. The total figures can vary between an estimated total of \$500 - \$1000

Tanks over around 15 kilolitres will usually need to be built on site (prices for 15kl and 20kl tanks in Table 2 include the cost for this).

Prices quoted in Table 2 are for round galvanised tanks. Modular tanks are more expensive and other materials such as polyethylene or fibre-reinforced plastic are usually around 25 – 30 % more

expensive but can have a guaranteed life of between 20 – 25 years. A UV Filter system can vary for between \$300 – \$900 dollars depending on whether it is for whole use or single appliance use.

Further information

Further information is available from:

- The National Monograph is available from the Department of Human Services or at <http://www.dhs.sa.gov.au/pehs/publications/monograph-rainwater.pdf>. This describes rainwater quality issues and appropriate ways to maintain your rainwater tank and other components.
- Rainwater Tanks: Their Selection, Use and Maintenance (DEHAA, 1999) is available at <http://www.dwr.sa.gov.au/publications/factsheets.html>. This will assist you determine the appropriate size of tank to meet your needs if you rely on rainwater.
- SA Water, Tel (08) 8240 1000, can provide advice on interconnecting tank and mains water supplies.
- Water Conservation Partnership Project demonstration rainwater tank projects – Justin Lang, Campbelltown City Council, Tel (08) 8366 9257, and Patrick Dupont, Unley City Council Museum Rainwater Tanks Demonstration Site, Tel (08) 8372 5111 – can provide practical advice.
- Your Home: Design for Lifestyle and the Future is available at <http://www.yourhome.gov.au>. It includes information and diagrams on rainwater tanks.
- Australian Drinking Water Guideline (Cooperative Research Centre for Water Quality 2002). This document highlights issues in water quality from both health and aesthetics and forms the basis for negotiating the quality of drinking water supplies throughout Australia. The document is available at <http://www.waterquality.crc.org.au/guide.htm>. Australian Water Quality Centre. This business unit of SA Water offers water quality testing services. Visit <http://www.awqc.com.au/> for further information.

Unley Museum Rainwater Tank Trail

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- Coombes 2001, Rainwater tank design for water supply and stormwater management
Photos courtesy of: Justin Lang / City of Campbelltown, Patrick Dupont / City of Unley, Tanya Miller / City of West Torrens, Steve West / City of Burnside, Phil Donaldson / DEH WCPP, Pilot projects and Ian McKursie Rainwater tank centre.

