

Wastewater Re-use

This fact sheet provides information on wastewater re-use for both urban and rural households. On-site wastewater re-use provides numerous opportunities to reduce water use within the home. At present, potable (drinkable) water is used for practically everything in the house and garden.

We are literally flushing our drinking water down the toilet!

Wastewater re-use opportunities vary according to where you live. Urban households typically have a connection to a centralised, or reticulated, sewage system, whereas rural households manage their wastewater on-site.

Consequently, the regulations concerning the treatment and re-use of wastewater vary according to your location. Check with your local council or state health authority for advice on the regulations in your area.

ADVANTAGES

Treated wastewater can be used to flush toilets, water gardens and even to wash clothes. By using wastewater as a resource rather than a waste product you can:

- > Reduce water bills.
- > Use less water resources.
- > Irrigate your gardens during drought water restrictions.
- > Cut down the amount of pollution going into our waterways.
- > Help save money on new infrastructure for water provision and wastewater treatment.

Wastewater re-use decreases the demand on infrastructures for sewage transport, treatment and disposal, allowing the infrastructure to work better and last longer.

DISADVANTAGES

The disadvantages of reusing your wastewater also need to be considered. Currently, one of the main disadvantages for most households is the financial cost of installing and maintaining a re-use system. The attractiveness of the investment would depend on:

- > The extent of centralised wastewater treatment services available where you live.
- > The price of water in your area (urban) or scarcity of water (rural).
- > Whether you are replacing an existing system or starting from scratch.
- > The length of time you intend to live in your current house.
- > The type of system you install – annual operating and maintenance costs vary between systems.
- > Whether a restrictions free, reliable water supply is valuable to you. Wastewater Re-use will provide a much more reliable secondary source of water than common rain tank installations.

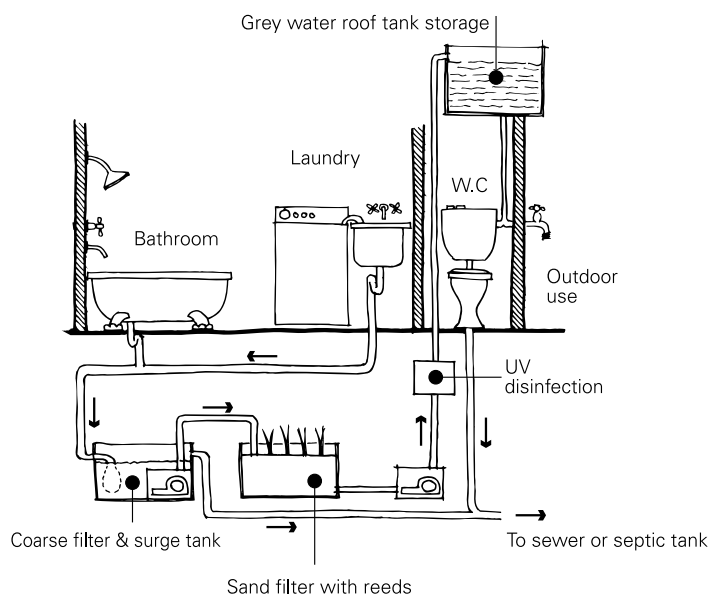
If your house is frequently unoccupied for a fortnight or more, for example a holiday home, then you need to carefully select a re-use system to cope with intermittent use. Most systems that include biological treatment do not function properly if used intermittently.

TYPES OF WASTEWATER

There are two types of wastewater created in a home, each of which can be treated and used in various ways.

Greywater is wastewater from non-toilet plumbing fixtures such as showers, basins and taps. It is advisable to exclude water from kitchens and dishwashers from greywater being recycled, because of the potential for contamination by pathogens. Greywater can be used for garden watering. Appropriately treated greywater can also be re-used indoors for toilet flushing and clothes washing, both of which are significant consumers of water.

Blackwater is water that has been mixed with waste from the toilet. Blackwater requires biological or chemical treatment and disinfection before re-use. For single dwellings, treated black water is suitable only for outdoor re-use.

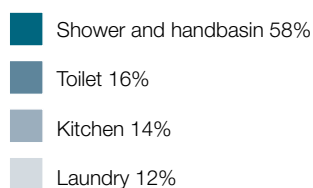
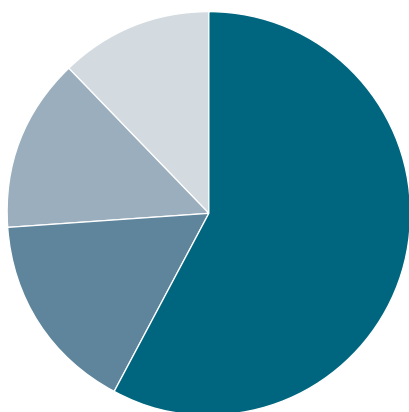


CALCULATING WASTEWATER VOLUME

The table below indicates the approximate amount of wastewater produced per person each day in an average home with WELS 3 Star rated fixtures. [See: 7.2 Reducing Water Demand]

BLACKWATER	LITRES/PERSON/DAY
Toilet	20
GREYWATER	LITRES/PERSON/DAY
Shower	63
Hand Basin	6
Washing Machine	13
Laundry tap	2
OTHER WASTEWATER	LITRES/PERSON/DAY
Kitchen tap	12
Dishwasher	5
Total Greywater	84
Total Wastewater	120

Wastewater by indoor location



RE-USE WATER QUALITY

The quality of your re-use water depends on your treatment system, the water's first use and which chemicals are used in the home.

To reduce your treatment requirements:

- > Minimise use of cleaning chemicals such as coloured toilet dyes. Use natural cleaning products where possible.

- > Do not dispose of household chemicals down the sink or toilet. Contact your local council or water authority for information on collection services.

- > Use a sink strainer in the kitchen to help prevent food scraps and other solid material from entering your wastewater.

- > Use a lint filter on the outlet from your washing machine. A piece of nylon stocking is generally sufficient. Replace as necessary.

WASTEWATER RE-USE IN URBAN AREAS

Consider wastewater re-use if you live in an urban, sewerred area and any of the following apply to you:

- > You wish to reduce water use further and efficiency measures for indoor and outdoor water use have already been undertaken.

[See: 7.2 Reducing Water Demand; 7.6 Outdoor Water Use]

- > Water supplies in your area are often limited, eg frequent restrictions or during droughts.

- > You have a large garden which needs to be watered regularly or would not survive extended water restrictions.

Remember to check with your local council or water authority before you re-use wastewater, as standards and permission requirements vary.

WASTEWATER RE-USE IN RURAL AREAS

Rural households typically have greater scope for reusing wastewater for the following reasons:

- > There is no centralised treatment service, therefore investment in an on-site wastewater treatment system is a necessity.

- > Installing a re-use system in a new house, or adapting an existing treatment system to allow re-use, may not incur significant additional expenditure.

- > Water supply may be restricted, thus placing a premium on using water resources in the most efficient manner. [See: 7.2 Reducing Water Demand; 7.3 Rainwater]

- > Large blocks of land in rural areas allow more scope for on-site disposal of wastewater.

NOTE: that the septic tank system, the most prevalent on-site wastewater treatment system in rural Australia, does not actively treat wastewater to remove disease-causing pathogens. Effluent from a septic tank should be disposed underground at soil depths greater than 300mm.

REUSING GREYWATER INDOORS

Appropriately treated greywater can be re-used indoors for toilet flushing and clothes washing. Toilets and clothes washers are two of the biggest users of water in an average household. [See: 7.2 Reducing Water Demand]

Reusing treated greywater for toilet flushing can save approximately 50L of potable water in an average household every day.

Reusing treated greywater in your clothes washer can save approximately 90L of potable water in an average household every day.

In order to re-use greywater indoors for toilet flushing and clothes washing you will need to firstly:

- > Separate greywater and blackwater waste streams.

- > Install a greywater treatment and disinfection system that is approved in your State, so it provides a suitable level of treatment and meets local regulations.

NOTE: that while wastewater from the kitchen sink and dishwasher can be classed as greywater, it would require more complex treatment before re-use due to potential contamination by pathogens from food preparation, as well as fats and grease. Many states in Australia do not allow water from kitchens to be included in greywater for re-use, and permit greywater only from showers, (non-kitchen) basins and laundry.

Greywater can be directly diverted from the shower or bathroom sink drains for immediate re-use in the toilet only. However, it should not be stored for more than a couple of hours before re-use or disposal to sewer and will require coarse filtration.

Precautions

Greywater must be treated and disinfected before storage and general re-use because:

- > It can contain significant numbers of pathogens which spread disease.

- > It cannot be stored for longer than a few hours untreated as it begins to turn septic and smell.

When reusing greywater for clothes washing discoloration of clothing from dissolved organic material may be an issue. This can be avoided by installing an activated carbon filter.

Even after on-site treatment and disinfection, blackwater is not suitable for re-use indoors.

Treatment systems for indoor re-use

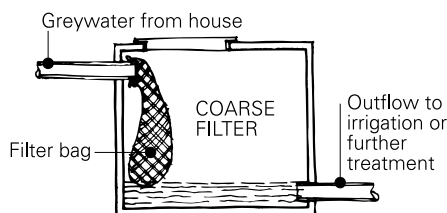
A number of package on-site greywater treatment systems are available for purchase in Australia. Check with your council or state health department which systems are accredited for use in your area.

The different treatment systems can vary greatly in terms of the treatment processes used, that may be biological, chemical or mechanical treatment. The qualities of treated water they produce can vary considerably, as well as their energy consumption and initial cost.

With council approval, it is possible to build your own biological treatment system for greywater treatment. See the references list for more details.

Biological greywater treatment generally consists of several steps.

- > Coarse filtration to remove large particles, including hair, to prevent clogging. This can be as simple as waterproof box and a filter bag or stocking attached with rubber bands. The stocking or bag must be checked regularly and replaced when full.
- > Fine filtration and biological treatment, using a sand filter and reed bed combination. Microbes in the sand break down organic matter in the water while the reeds take up nutrients. The basic structure is a waterproof box filled with coarse sand laid over a gravel bed. Greywater is designed to percolate either vertically or horizontally through the media.



Disinfection

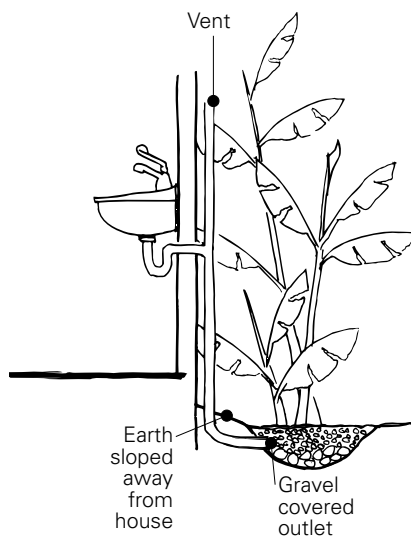
Disinfection is required for indoor re-use of greywater. All disinfection systems require regular maintenance.

Chlorine is most commonly used for disinfection. However, chlorine disinfection has been found to have adverse environmental impacts. Alternatives should be used where possible, such as ultraviolet (UV) or ozone disinfection in place of chlorination.

REUSING WASTEWATER OUTDOORS

Reusing wastewater outdoors can reduce your household's potable water use by 30 to 50 per cent. [See: 7.6 Outdoor Water Use]

Greywater can be re-used in gardens even without treatment. Sub-surface drip irrigation systems spread water evenly around the garden, and are safer for spreading untreated greywater.



Simple greywater sub-surface re-use.

Avoid watering vegetables with re-use water if they will be eaten raw. There is a chance that some pathogenic organisms may still be present even after treatment.

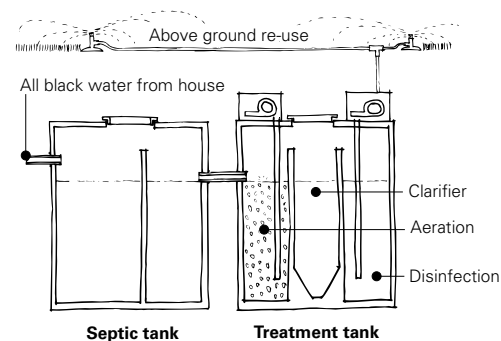
The only place where treated and disinfected blackwater can be safely re-used is outdoors. However, in some states treated blackwater cannot be re-used for above ground irrigation, only in sub-surface irrigation. Check with your local council or state health department.

Precautions

In order to maintain the health of your garden, the level of re-use of wastewater in the garden needs to be balanced with the amount of water, solids and nutrients that the plants and soil in your garden can absorb. If excess wastewater is applied:

- > Excess nutrients may run-off or leach through the soil to enter waterways, contributing to algal blooms and other water quality problems.
- > Soils and plants may become water logged and inhibit plant growth.
- > Soils can become physically clogged with organic and suspended material or damaged by salts in the wastewater.

- > Salinity may increase in problem areas when greywater contributes to raising watertables.



In order to avoid these problems:

- > Plan your garden carefully. [See: 2.4 Sustainable Landscapes; 7.6 Outdoor Water Use]
- > Use Phosphate-free and salt-free liquid or environmentally-friendly detergents.
- > Prefilter to remove solids.

Adjust the amount of wastewater re-used to the conditions in the garden. Do not irrigate if the soil is already saturated, see 'Wet Weather Storage'.

Treatment systems for outdoor re-use

There are many different types of treatment systems suitable for outdoor re-use. Contact your local council for a list of treatment systems accredited for use in your area.

The most common wastewater treatment and re-use system currently in Australia is the aerated wastewater treatment system (AWTS). After settling the solid in wastewater, the effluent is aerated to assist bacterial breakdown of organic matter, followed by a further stage of disinfection, usually using chlorine pellets. There are many commercially available models in all states.

Wastewater treatment systems using microfiltration are now available for onsite use at a household scale. These systems use energy but no chemicals, and produce a high quality effluent suitable for indoor use.

Some treatment systems use worms and microbes to treat all household wastewater using little energy and no chemicals. These systems produce effluent suitable for subsurface irrigation, and compost as a by-product.

Wet weather storage

If you are reusing your wastewater in the garden, you will need to have a method of either disposing or storing the wastewater you do not require during periods of high rainfall.

If storage is not an option and you live in an urban area, excess wastewater can be directed to a sewer. In rural areas sub-surface disposal to a trench in the garden is recommended, provided there is enough space.

Storage is recommended as it maximises the usefulness of wastewater.

Wastewater should be treated and disinfected before storage. Storage requirements depend on:

- > Climate.
- > Household demand for re-use water.
- > Presence/size of disposal area.
- > Maximum daily wastewater output.

ADDITIONAL READING

Contact your State / Territory government or local council for further information on wastewater re-use.
www.gov.au

Brooker, N. (2001) 'Greywater and Blackwater Treatment Strategies' *Environment Design Guide*. Technologies Note No. 11. RAI, Canberra.

Stuart McQuire. (2007), *Water Not Down the Drain: A guide to using rainwater and greywater at home*
www.notdownthedrain.org.au

Water Sensitive Urban Design
www.wsud.org/literature.htm

Windblad U and Simpson-Hebert M (2004), *Ecological Sanitation*, Stockholm Environment Institute, Sweden.
www.ecosanres.org

Principal author:

Simon Fane

Contributing author:

Chris Reardon