

Integrated Water Supply Scheme
Security through Diversity
2005 - 2050

Water Recycling

November 2006



Security through Diversity



www.watercorporation.com.au

INTRODUCTION

The Water Corporation is recycling water for use on sporting ovals and golf courses, and for use in industry and agriculture. Various trials for topping up our groundwater supplies with recycled water are also being conducted.

This brochure highlights these and other projects that the Water Corporation is implementing to ensure we recycle the right amount of water for the right reasons.

The Integrated Water Supply Scheme

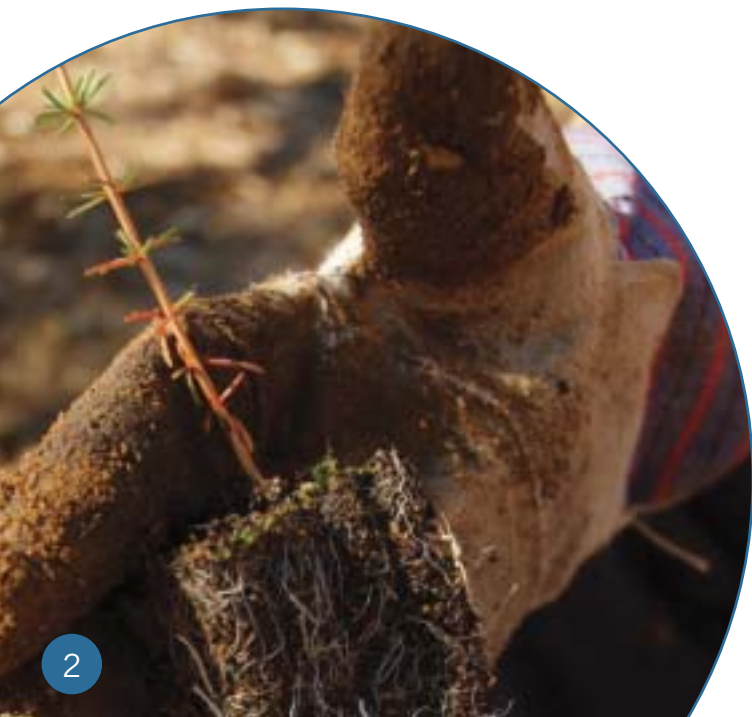
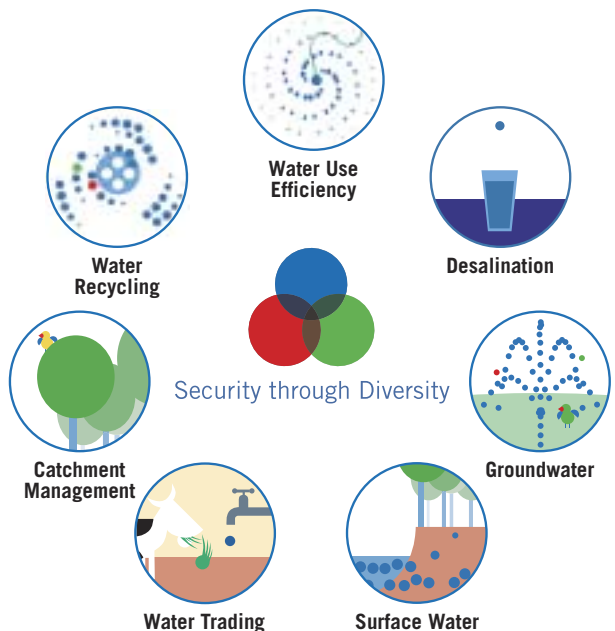
In the south-west of Western Australia, 1.5 million of the 1.9 million people living in WA receive water from the Water Corporation's Integrated Water Supply Scheme (IWSS).

This scheme is supplied from multiple groundwater and surface (dam) water sources and, from November 2006, the Perth Seawater Desalination Plant.



SECURITY THROUGH DIVERSITY

Our drying climate has seen dam inflows reduced to less than one third of the long-term average, with the past five years the driest on record in the south-west. This has meant that other sources of water, particularly those that do not rely on rainfall (e.g. recycled water) are now needed to accommodate this new future. This is the Corporation's 'Security through Diversity' approach.

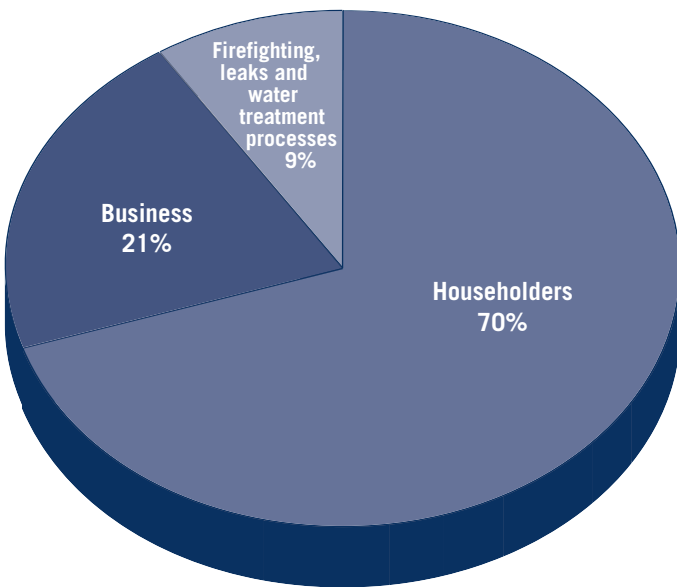
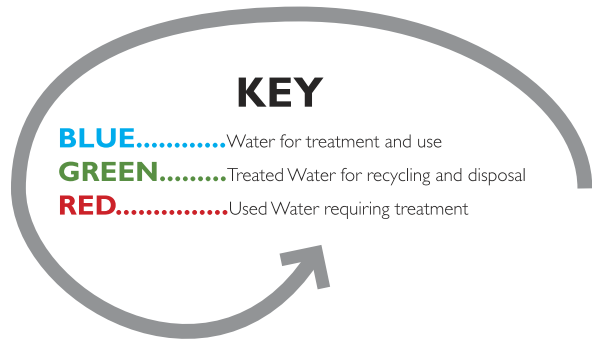


What is the water cycle?



Who is using all the water?

Most (70%) of the drinking-quality water supplied by the Corporation through the IWSS is used by householders. The Corporation's customers represent only 17% of total water use in Western Australia. The Corporation supplies only a small amount of water for mining, agriculture, parks and gardens, and stock.



WHAT IS RECYCLED WATER?

Recycled water is water which has been used and is then cleaned up before being used:

- to water ovals, gardens and golf courses;
- to flush toilets and wash clothes;
- in industrial processes;
- to grow crops; and
- to recharge groundwater from which drinking water is drawn

Why recycle water?

Water is used by industry and householders for many different purposes requiring different qualities of water. For example, some industrial processes require water that is better than drinking water, whereas water used on parks and ovals does not need to be as good as drinking water. Recycled water can be produced to meet these needs and in so doing may reduce the use of drinking water.



WHAT HAVE WE ACHIEVED SO FAR?

There are currently 60 water recycling schemes across the state. In these schemes, recycled water is used on ovals, golf courses, parks, gardens and race courses. Examples include McGillivray Oval in Floreat, parks and the trotting track in Northam, Broome Golf Course and Oval, Busselton Golf Course, Derby wetlands, Kellerberrin Oval, Wickham parks and gardens, and Wyalkatchem Bowls Club.

Recycled water is also being used:

- by industry in Kwinana (see below) and Pinjarra (for dust control);
- to irrigate tree plantations (e.g. Albany, Donnybrook, Dunsborough, Manjimup, Margaret River, Kemerton and Walpole); and
- to irrigate food crops (e.g. Omrah Vineyard in Mount Barker).

Case Study: Albany Tree Farm

Treated wastewater from the Albany Wastewater Treatment Plant has been used to water over 300 hectares of gum trees in Albany for more than ten years. Some trees were harvested in 2003 with more harvested in 2006. Plans are now also underway to increase the size of the tree farm. The harvested trees are used for wood chips and making paper.



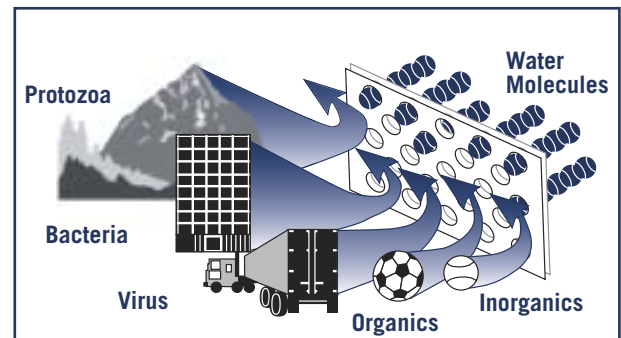
Case Study: Kwinana Water Recycling Plant

The Kwinana Water Recycling Plant (KWRP) is the biggest plant of its kind in Australia. It is a micro filtration reverse osmosis plant that is currently producing 6 billion litres of recycled water (equivalent to 3000 Olympic sized swimming pools) a year for use by major industries in Kwinana including BP, Hismelt, CSBP and Tiwest. The use of recycled water in Kwinana has allowed a further 5 billion litres of drinking water to be made available to householders. Design of the second stage of the plant, supplying an additional 3.5 billion litres a year is underway.

What is microfiltration reverse osmosis?

Microfiltration occurs before reverse osmosis and it involves passing water through fibres that work as microscopic filters. This action removes solids and particles from the water, as well as bacteria and protozoa. Microfiltration improves the quality of the water before it goes through reverse osmosis so that the reverse osmosis membranes do not get clogged.

Reverse osmosis involves applying pressure to push water through a semi-permeable membrane. This is a bit like a microscopic sieve, with tiny holes or 'pores' that allow only very small molecules, like water molecules, to pass through. Pressure is applied on one side of the membrane separating the water molecules from undesirable salts, nutrients, bacteria and viruses.



This picture shows how reverse osmosis works. Large compounds such as protozoa, bacteria and viruses cannot penetrate the membrane as they are too big. Here the relative sizes are compared to mountains, an office block and a truck.



Water recycling schemes substituting drinking water use

The Corporation is focusing its efforts on developing water recycling schemes where the recycled water will be used in place of drinking-quality water, therefore, making this drinking-quality water available for uses which require a high quality of water such as bathing and drinking.

What about households using recycled water?

It is unlikely that large volumes of drinking water currently used in existing suburbs will be replaced with recycled water, given the massive cost and disruption to communities in laying new pipes in every street and re-plumbing every home. For new suburbs, recycled water will only be considered to meet non-drinking water needs if groundwater and/or stormwater are inadequate. Further details on this can be found in the Corporation's brochure titled 'Water Use Efficiency.'

What about other industries and businesses using recycled water?

Most industrial water is used in Kwinana. Therefore, the Kwinana Water Recycling Plant will be expanded to meet future demand for water in the Kwinana Industrial Area. The co-location of this large industrial area and the Woodman Point wastewater treatment plant (which supplies water to KWRP) is fortuitous when it comes to recycling water, however this situation is rare, and this is why only a small proportion of other smaller industrial and commercial premises will be able to use recycled water.

Recharging groundwater used for drinking with recycled water

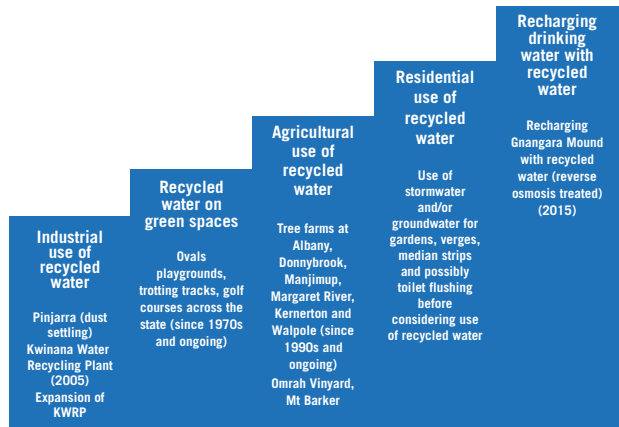
Perth sits on the Swan Coastal Plain which overlies a giant underground water store known as an aquifer. The Corporation draws approximately 60% of our drinking water from part of this (i.e. the Gngangara Mound). Stormwater which runs off our roofs, driveways and other paved areas and into soakwells recharges this groundwater. Many householders (in fact 130,000 of them) draw this water out of the ground to water their gardens; a situation which is rare by world standards.

In California, recycled water has been used to recharge groundwater that supplies drinking-quality water for the last 40 years and this is an approach suited to the Swan Coastal Plain.

'Climbing the stairs'

To ensure that the Corporation and the community are confident in using recycled water in the years to come, we are 'climbing the stairs' to what we believe will be a potential water source option for the IWSS in 2015 i.e. recharging Gngangara Mound with recycled water.

*Refer to the Corporation's brochure titled 'Water Use Efficiency' for more details.



Recharging groundwater with recycled water is the subject of various research projects being conducted by the Corporation in conjunction with the Health Department, CSIRO and Departments of Water and Environment and Conservation. These research projects include:

- identifying and understanding the behaviour of chemicals and micro organisms in recycled water;
- conducting a laboratory experiment where recycled water from KWRP is added to soil-filled columns to determine the effects of passage through groundwater; and
- analysing the groundwater in Gngangara Mound to improve our understanding.

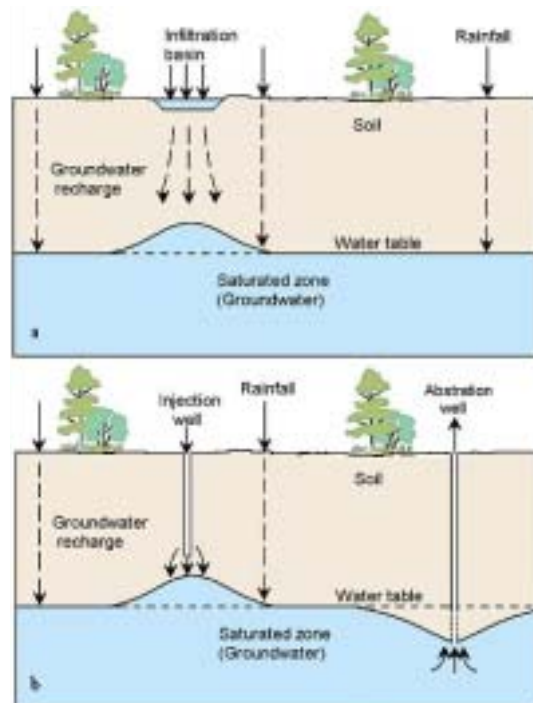
Case Study: Gngangara Mound Replenishment Trial

This trial will involve the development of a reverse osmosis microfiltration plant (similar to KWRP but producing higher quality recycled water that meets drinking water standards) and injection bore at Beenyup. Recycled water from the plant will be injected into the ground (see diagram) at a depth of 200 - 300m. Impacts on the groundwater from the injected recycled water will be monitored for three years. This site at Beenyup has been chosen for the trial because:

- the groundwater environment is very similar to that found on the Gngangara Mound where the Corporation is ultimately planning to recharge the groundwater with recycled water to supplement drinking water supplies; and
- this site presents a very low risk to existing water supplies.

The Corporation may commence a second stage whereby recycled water will be infiltrated into the ground through a basin on the surface (see diagram). From here the water will percolate down into the superficial aquifer, which is the aquifer that reaches the surface in some areas (and forms wetlands, lakes) and stretches down to 50m underground.

The Water Corporation will need to obtain environmental and health approvals and community support for groundwater replenishment to become a viable water supply option.



For more information visit
www.watercorporation.com.au



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